SIEMENS

Edition 11/2023

OPERATING INSTRUCTIONS

SINAMICS/SIMOTICS

SINAMICS S200 pulse train servo drive system

SINAMICS S200 converter product line, pulse train input version (PTI)
SIMOTICS S-1FL2 servo motor

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SINAMICS/SIMOTICS

SINAMICS S200 pulse train servo drive system with SIMOTICS S-1FL2

Operating Instructions

Pulse train input version (PTI), Firmware V6.3

11/2023, FW V6.3
A5E51646767B AA

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.

⚠ **WARNING**
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.

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 personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ **WARNING**
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens Aktiengesellschaft. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

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

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1.1 About SINAMICS

Description

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

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

1.2 About this manual

1.2.1 Content

Description

This manual provides a summary of all of the information required to safely and reliably operate the converter-motor combination.

The manual enables the target groups being addressed to mount, connect, and commission the converter and motor safely and correctly.

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

1.2.2 Target group

Description

This manual is intended for persons who perform different tasks in the drive environment. The intended target groups include, but are not limited to the following:

- Planning engineers
- Project engineers
- Machine manufacturers
- Commissioning engineers
- Electricians
- Installation personnel
- Service and maintenance personnel

1.2.3 Standard scope

Description

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

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

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

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

1.2.4 Use of third-party products in this documentation

Description

This documentation contains recommendations relating to third-party products. Siemens accepts the fundamental suitability of these third-party products. You can use equivalent products from other manufacturers.

Siemens does not accept any warranty for the use of third-party products.

1.2.5 Websites of third-party companies

Description

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

1.3 SINAMICS documentation

Description

The documentation on the SINAMICS product series is available under Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/view/109807358).

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

The SINAMICS product documentation essentially includes the following manuals:

Table 1-1 SINAMICS product documentation

Information	Documentation class	Content
Device information	Operating Instructions	Compilation of all of the information required to operate the SINAMICS product
	Compact Operating Instructions	Essential contents of the Operating Instructions in reduced and compressed form
	Product Information	Information that only becomes known shortly before or even after start of delivery and is therefore not included in the associated user documentation
General information	Industrial Cybersecurity Configuration Manual	Information on the Industrial Cybersecurity functions and on the safe operation of SINAMICS product

1.4 Service and Support

1.4.1 Siemens Industry Online Support on the Web

Important product information is available through Siemens Industry Online Support using the following options:

- Website: SIOS (https://support.industry.siemens.com/cs/ww/en/)
- App Industry Online Support (for Apple iOS and Android)

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

For products with QR code, the manual and certificate can be directly called.

1.4.2 Spare parts services

Description

The online spare part service "Spares on Web" offers certain spare parts for the product:

- Website: SOW address (https://www.sow.siemens.com).

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.

- 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.

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://support.industry.siemens.com/cs/ww/en/view/109812409)

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

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 Icc) of the protective device used.

⚠ WARNING

Electric shock if there is no ground connection

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

- Ground the device in compliance with the applicable regulations.

⚠ WARNING

Electric shock due to connection to an unsuitable power supply

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

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

⚠ WARNING

Electric shock due to damaged motors or devices

Improper handling of motors or devices can damage them.

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

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

⚠ WARNING

Electric shock due to unconnected cable shields

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

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

⚠ WARNING

Arcing when a plug connection is opened during operation

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

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

⚠ WARNING

Electric shock due to residual charges in power components

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

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

NOTICE

Damage to equipment due to unsuitable tightening tools.

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

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

⚠ WARNING

Electromagnetic interference due to inadequate shield support

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

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

⚠ WARNING

Spread of fire from built-in devices

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

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

⚠ WARNING

Active implant malfunctions due to electromagnetic fields

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

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

⚠ WARNING

Active implant malfunctions due to permanent-magnet fields

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

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

⚠ CAUTION

Symptomatic respiratory and skin reaction to chemicals

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

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

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

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

⚠ WARNING

Unexpected machine movement caused by radio devices or mobile phones

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

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

⚠ CAUTION

Radio frequency interference in residential areas

When you operate EMC category C2 devices in residential areas, the devices can cause radio frequency interference.

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

- Do not operate EMC category C2 devices in residential areas.
- Do not operate EMC category C3 or C4 devices in public low-voltage networks supplying 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 overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

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

NOTICE

Overheating due to inadmissible mounting position

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

- Only operate the device in admissible mounting positions.

⚠ WARNING

Unrecognized dangers due to missing or illegible warning labels

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

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

NOTICE

Device damage caused by incorrect voltage/insulation tests

Incorrect voltage/insulation tests can damage the device.

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

⚠ WARNING

Unexpected movement of machines caused by inactive safety functions

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

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

⚠ WARNING

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

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

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

⚠ WARNING

Injury caused by moving or ejected parts

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

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

⚠ WARNING

Fire due to incorrect operation of the motor

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

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

⚠ CAUTION

Burns and thermal damage caused by hot surfaces

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

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

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

Measures when maintenance is required:

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

2.2 Equipment damage due to electric fields or electrostatic discharge

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

NOTICE

Equipment damage due to electric fields or electrostatic discharge

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

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

2.3 Warranty and liability for application examples

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

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

2.4 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.

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://new.siemens.com/cert.

Further information is provided on the Internet:

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

⚠ WARNING

Unsafe operating states resulting from software manipulation

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

- Keep the software up to date.
- Incorporate the automation and drive components into a 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 by 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

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

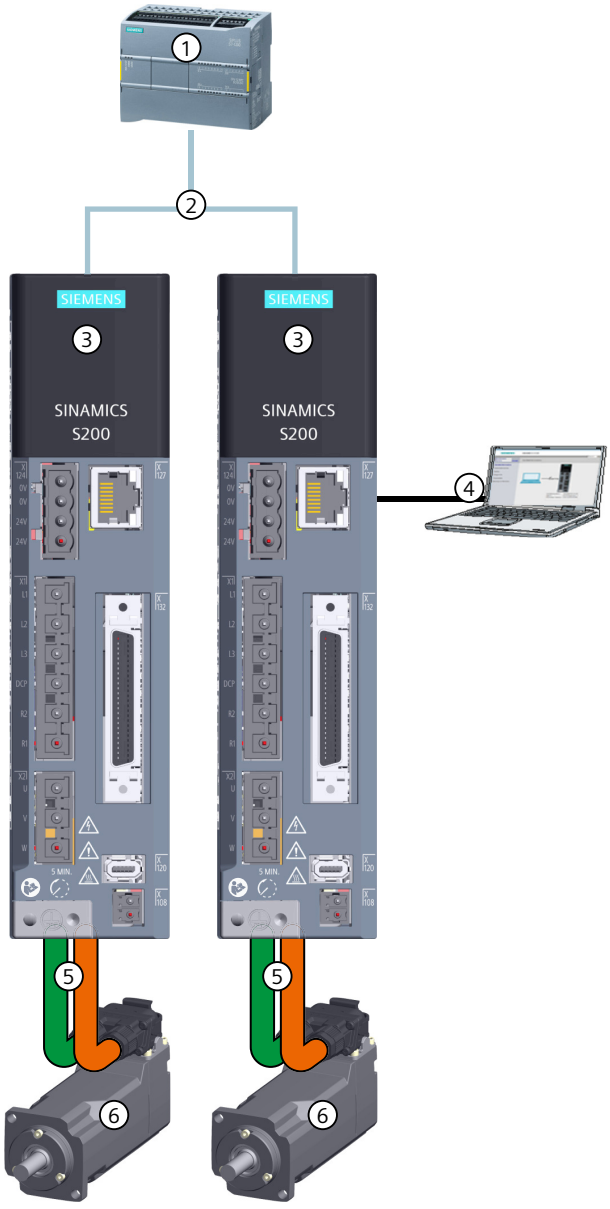
3.1 System overview

Description

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

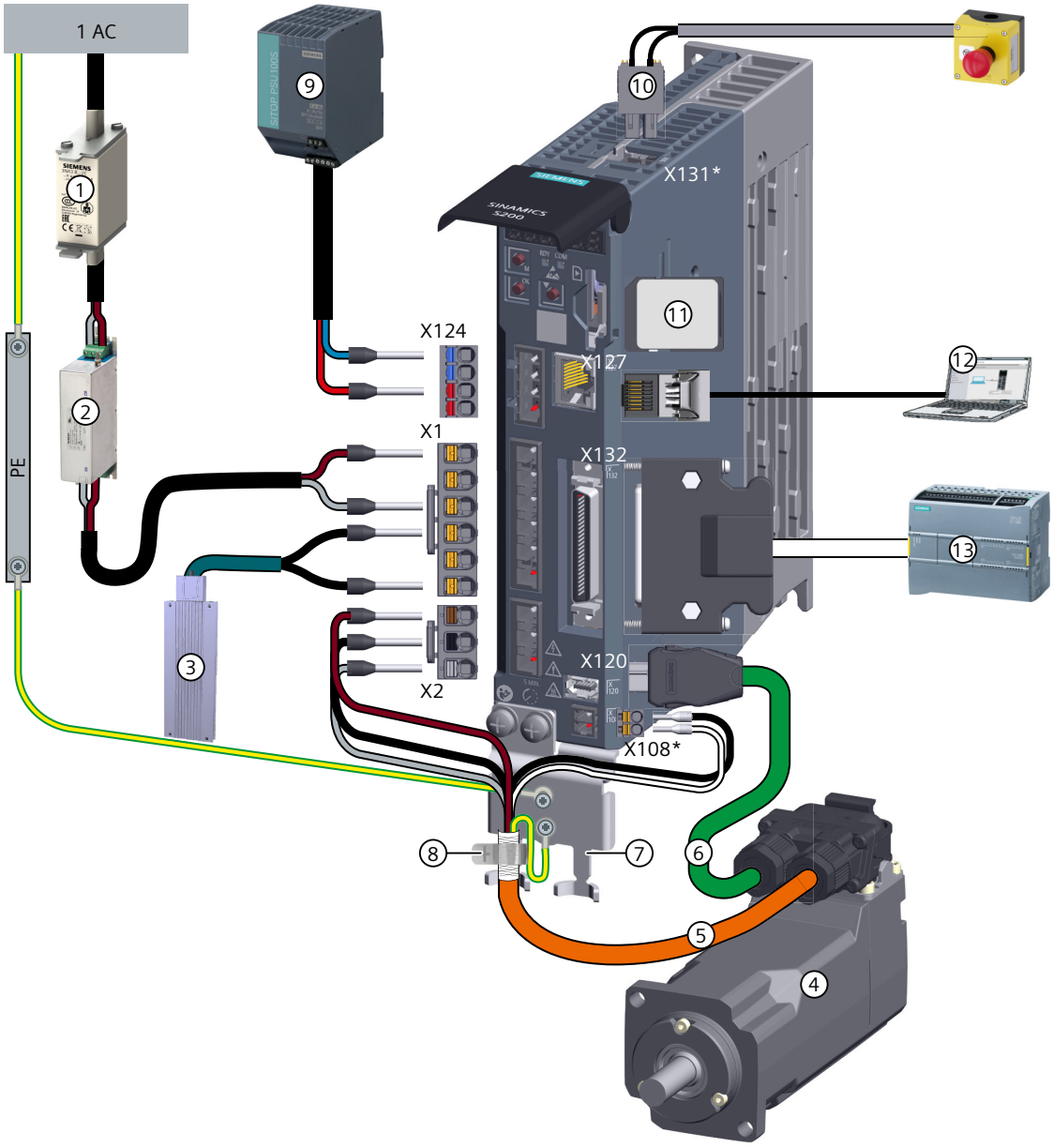
- SINAMICS S200 converter product line (PTI version), which is available in the following two variants:
  - SINAMICS S200 Basic PTI converter (referred to as "S200 Basic PTI")
  - SINAMICS S200 PTI converter (referred to as "S200 PTI")
- SIMOTICS S-1FL2 motor (referred to as "1FL2")
- MOTION-CONNECT 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). Prefabricated MOTION-CONNECT 350 and MOTION-CONNECT 380 cables are available in various lengths for simple and reliable connection of the motor to the converter.



① Controller (for example, SIMATIC S7-1200)
② Communication between the converter and the controller via setpoint cables
③ SINAMICS S200 converter product line (PTI version)
④ Engineering via LAN with the web server in the converter
⑤ MOTION-CONNECT 350 or MOTION-CONNECT 380 cables for the motor power, motor holding brake, and the encoder connections
⑥ SIMOTICS S-1FL2 motor

Figure 3-1 System overview

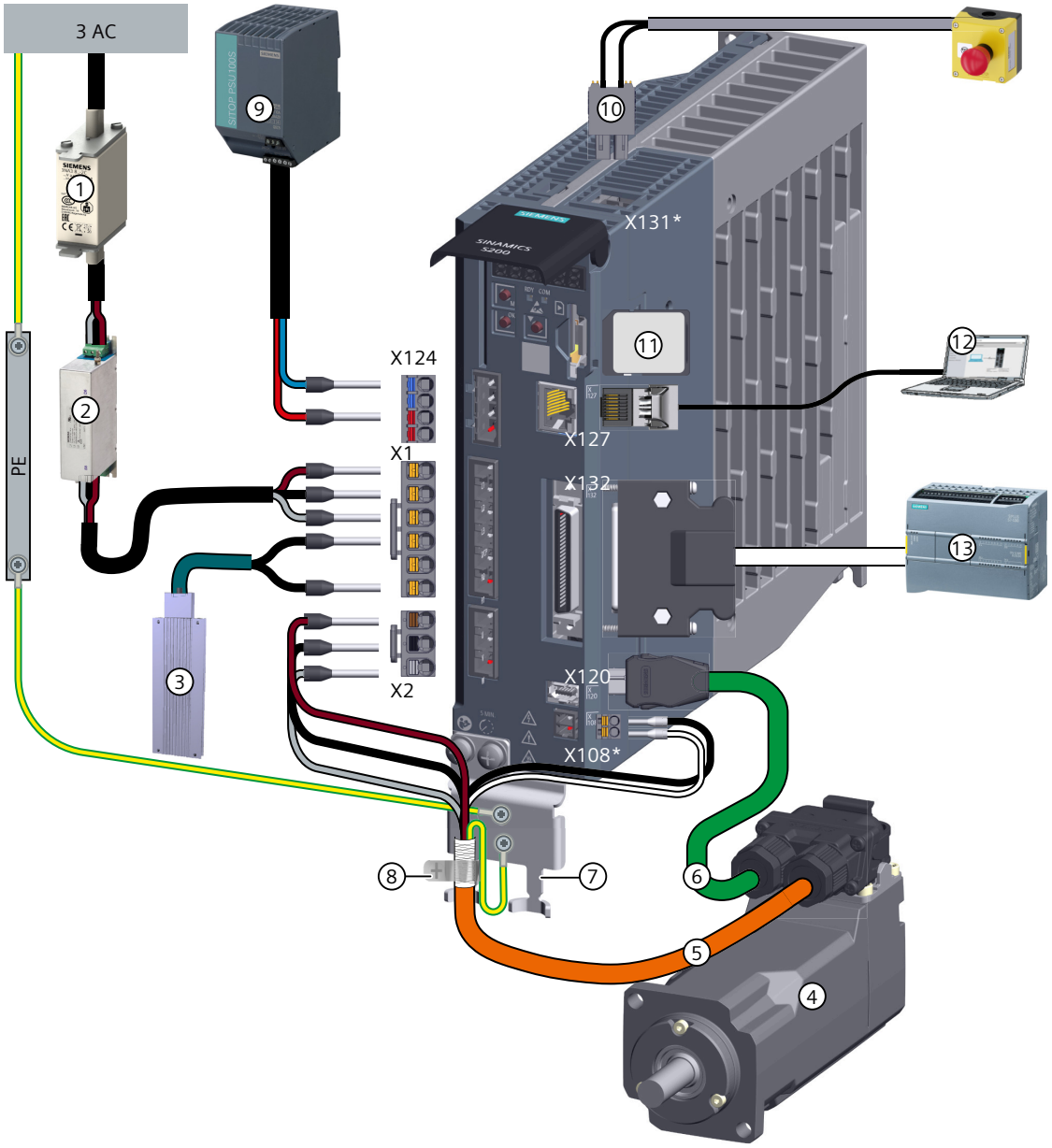


* The interfaces X131 and X108 are available on S200 PTI only. For more information about the motor holding brake connection on S200 Basic PTI, see Section "Connecting the motor holding brake (Page 133)".

① Fuse or motor starter protector
② Line filter (optional)[1)]
③ External braking resistor (optional)[1)]
④ SIMOTICS S-1FL2 motor
⑤ Motor power cable (with brake conductors)
⑥ Encoder cable
⑦ Shield plate
⑧ Shield clamp
⑨ 24 V DC power supply
⑩ STO plug
⑪ SD card (optional)
⑫ Commissioning device
⑬ Controller (for example, SIMATIC S7-1200)

[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 1 AC line connection



* The interfaces X131 and X108 are available on S200 PTI only. For more information about the motor holding brake connection on S200 Basic PTI, see Section "Connecting the motor holding brake (Page 133)".

① Fuse or motor starter protector
② Line filter (optional)[1)]
③ External braking resistor (optional)[1)]
④ SIMOTICS S-1FL2 motor
⑤ Motor power cable (with brake conductors)
⑥ Encoder cable
⑦ Shield plate
⑧ Shield clamp
⑨ 24 V DC power supply
⑩ STO plug
⑪ SD card (optional)
⑫ Commissioning device
⑬ Controller (for example, SIMATIC S7-1200)

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

Figure 3-3 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 52)".

For more information about the interface connection, see Section "Connecting (Page 121)".

3.1.1 Converter

Description

The S200 converter product line (PTI version) includes two converter variants: S200 Basic PTI (200 V only) and S200 PTI (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 PTI 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 PTI/S200 PTI	FSA	0.1, 0.2	1 AC/3 AC 200 V ... 240 V
	FSB	0.4	
	FSC	0.75, 1.0	
S200 PTI	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	
SH48	Medium inertia	1.0, 1.5	400 V
SH52	Low inertia	1.45, 2.1	
SH45	High inertia	0.4, 0.75	
SH65		0.75, 1.0, 1.5, 1.75, 2.0	
SH90		2.5, 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

Description

You must order the converter, motor, and cable components individually.

3.2.1 Converter

Description

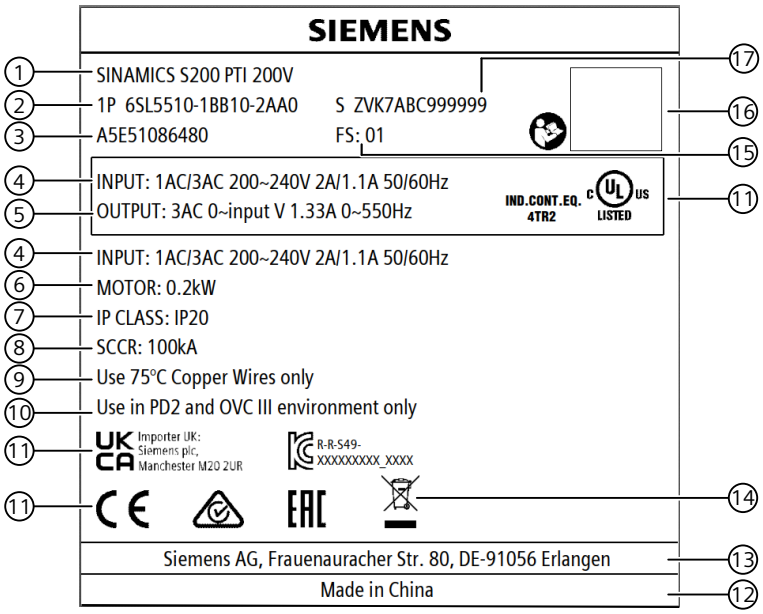
The converter delivery includes at least the following components:

- 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 PTI)
  - X131 (STO) plug: connector for connecting the external safety devices (only available in the delivery scope of S200 PTI)
  - X131 (STO) disable plug: connector for disabling Safety Integrated Functions (only available in the delivery scope of S200 PTI)
  - A shield plate kit
- A "Safety instructions" sheet
- 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.



1	Converter type	10	Pollution degree and overvoltage category
2	Article number	11	Certifications
3	Material number	12	Country of origin
4	Mains input	13	Manufacturer's address
5	Output data	14	Note on disposal
6	Supported motor rated power	15	Function release/version
7	Degree of protection	16	QR code
8	Rated short-circuit current	17	Serial number
9	Copper wire		

Figure 3-4 Rating plate example

3.2.1.2 Article number explanation

Description

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

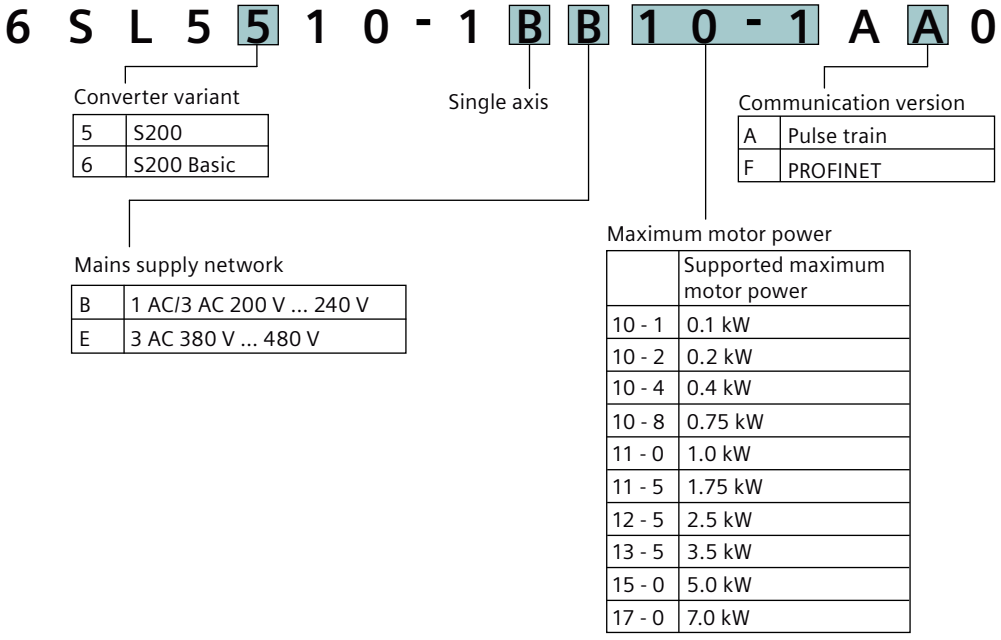
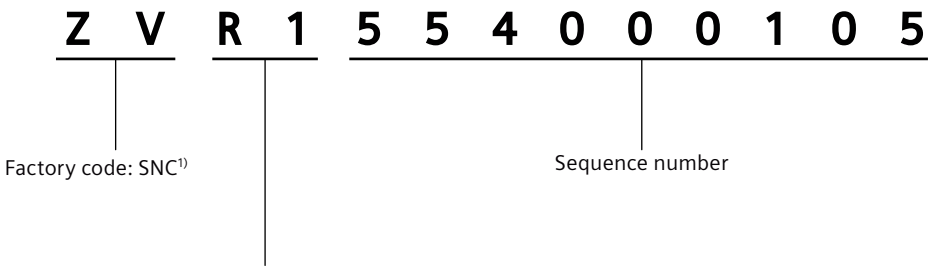


Figure 3-5 Article number for the S200 converter product line

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		

1) SNC = Siemens Numerical Control Ltd., Nanjing

Figure 3-6 Serial number for S200 converter product line

3.2.2 Motor

Description

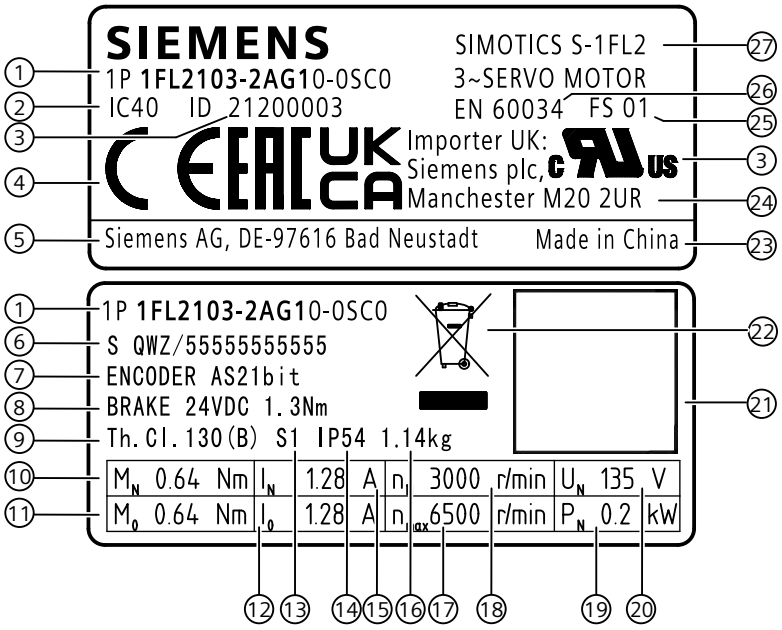
The 1FL2 motor is a servo motor with an integrated encoder and a high degree of protection.
The motor delivery includes the following components:

- A ready-to-run motor
- A "Safety instructions" sheet
- Three "Hot surface" warning labels

3.2.2.1 Rating plate

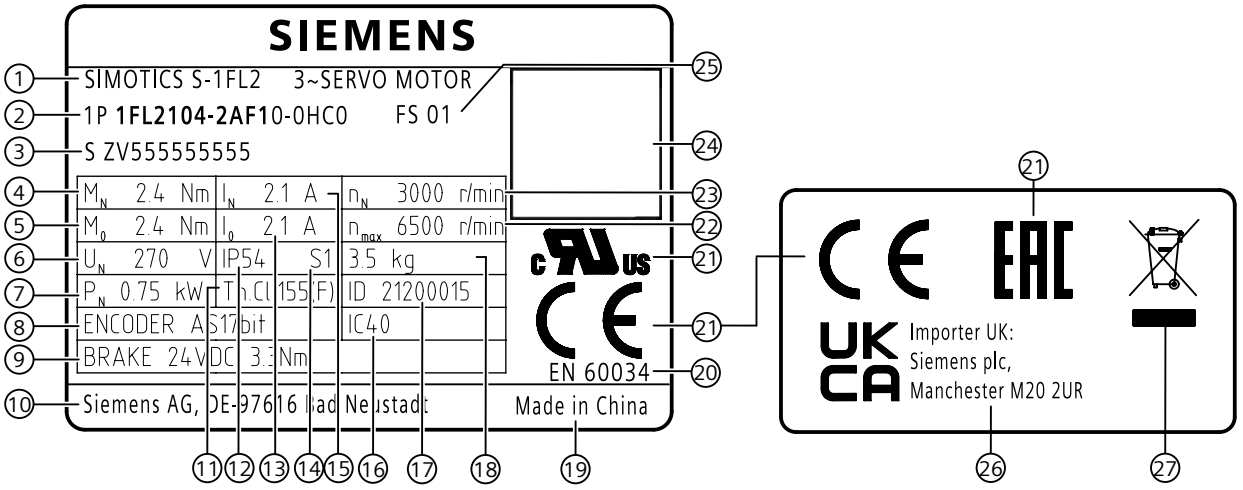
Description

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



1	Article number	15	Rated current I_N
2	Cooling method according to EN 60034-6	16	Weight
3	Motor ID	17	Maximum speed n_{max}
4	Certifications	18	Rated speed n_N
5	Manufacturer's address	19	Rated power P_N
6	Serial number	20	Rated voltage U_N
7	Encoder type and resolution	21	QR code
8	Holding brake	22	Note on disposal
9	Thermal class	23	Country of origin
10	Rated torque M_N	24	UK importer address
11	Static torque M_0	25	Function release/version
12	Stall current I_0	26	Standard for all rotating electrical machines
13	Motor operating mode	27	Motor type
14	Degree of protection		

Figure 3-7 Rating plate example for 1FL2 SH20 and SH30



1	Motor type	15	Rated current I_N
2	Article number	16	Cooling method according to EN 60034-6
3	Serial number	17	Motor ID
4	Rated torque M_N	18	Weight
5	Static torque M_0	19	Country of origin
6	Rated voltage U_N	20	Standard for all rotating electrical machines
7	Rated power P_N	21	Certifications
8	Encoder type and resolution	22	Maximum speed n_{max}
9	Holding brake	23	Rated speed n_N
10	Manufacturer's address	24	QR code
11	Thermal class	25	Function release/version
12	Degree of protection	26	UK importer address
13	Stall current I_0	27	Note on disposal
14	Motor operating mode		

Figure 3-8 Rating plate example for 1FL2 SH40 and above

3.2.2.2 Article number explanation

Description

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

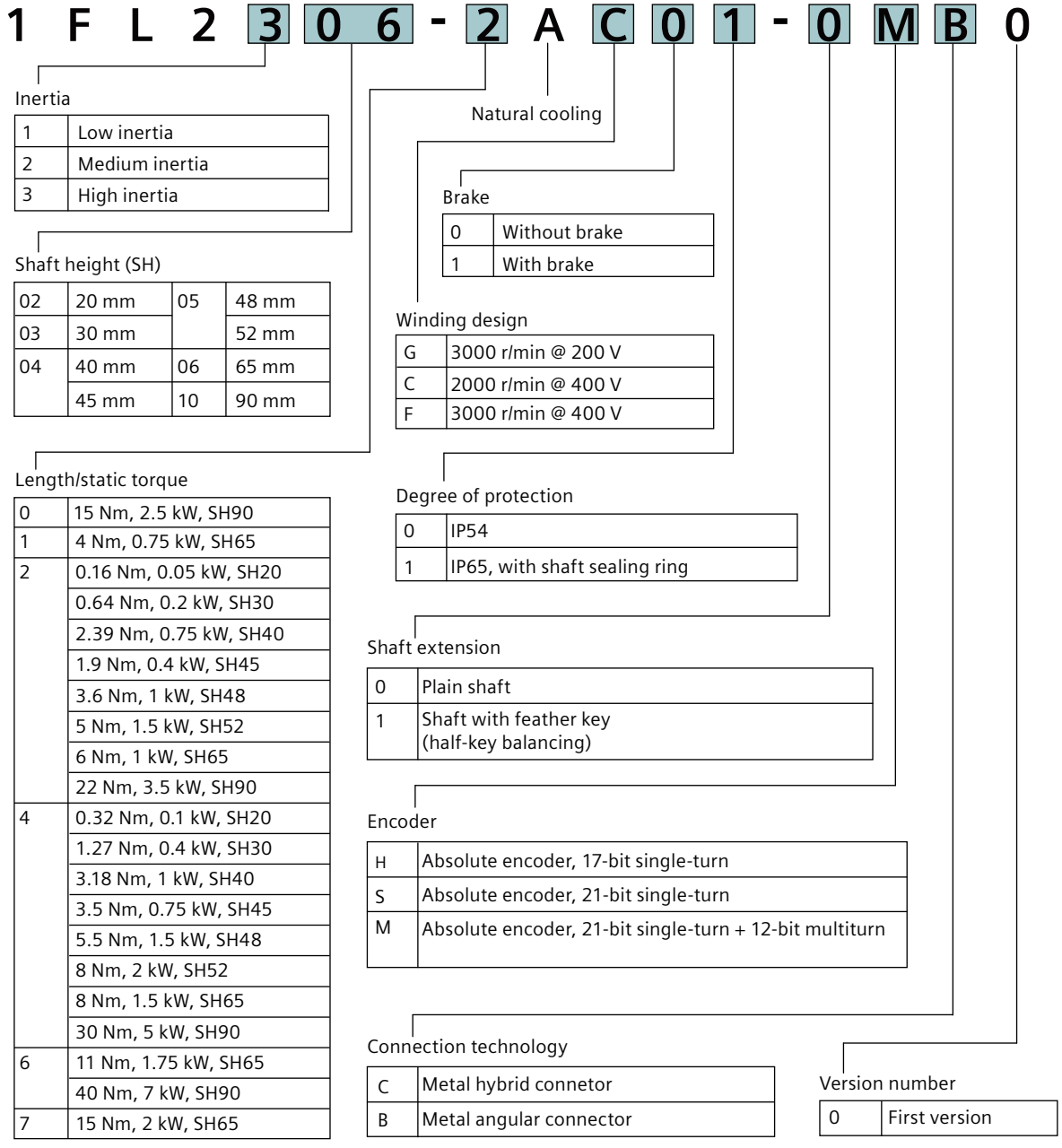
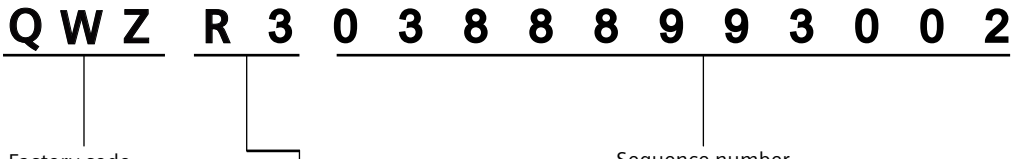


Figure 3-9 Article number for 1FL2 servo motors

3.2.2.3 Serial number explanation

Description



Code	Factory
ZV	SNC[1)]
QWZ	SMTJ[2)]

Production date (year/month)

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

[2)] SMTJ = Siemens Mechatronics Technology JiangSu Ltd.

Figure 3-10 Serial number for 1FL2 servo motors

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
- A "Safety instructions" sheet

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									2	X	B							
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)									5	B	L	0	3					
	Encoder cable (0.25 mm²/24 AWG and 0.38 mm²/22 AWG)									2	X	B	1	1					
										2	X	B	1	2					
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 56)".

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 PTI/S200 Basic PTI)		MOTION-CONNECT prefabricated 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□□0 1-[1]
0.16	0.05	3000	20	Low	102-2AG□□-□□C0	10-1AA0	FSA	□□□□
0.32	0.1	3000			102-4AG□□-□□C0			
0.64	0.2	3000	30	Low	103-2AG□□-□□C0	10-2AA0		
				Medium	203-2AG□□-□□C0			
1.27	0.4	3000		Low	103-4AG□□-□□C0	10-4AA0	FSB	
				Medium	203-4AG□□-□□C0			
2.4	0.75	3000	40	Low	104-2AG□□-□□C0	10-8AA0	FSC	
				Medium	204-2AG□□-□□C0			
3.2	1.0	3000		Low	104-4AG□□-□□C0	11-0AA0		
				Medium	204-4AG□□-□□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 digits (□□□□) 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

1FL2 servo motors						400 V converters (S200 PTI only)		MOTION-CONNECT pre-fabricated cables
Rated torque (Nm)	Rated power (kW)	Rated speed (r/min)	Shaft height (mm)	Inertia	Article number 1FL2	Article number 6SL5□10-1BE	Frame size	Article number 6FX3□02-[1)]
0.16	0.05	3000	20	Low	102-2AF□□-□□C0	10-2AA0	FSA	Dual cable with hybrid connector: 7□□01-□□□□ Dual cable variants: • Power cable (with brake conductors) + encoder cable • Power 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		Low	103-4AF□□-□□C0	10-4AA0		
				Medium	203-4AF□□-□□C0			
2.4	0.75	3000	40	Low	104-2AF□□-□□C0	10-8AA0	FSB	
				Medium	204-2AF□□-□□C0			
3.2	1.0	3000		Low	104-4AF□□-□□C0	11-0AA0		
				Medium	204-4AF□□-□□C0			
3.0	1.0	3000	48	Medium	205-2AF□□-□□B0			Power cable (with brake conductors): 5DK32-□□□□ Power cable (without brake conductors): 5CK32-□□□□ Encoder cable: 2XB11-□□□□
4.6	1.45	3000			205-4AF□□-□□B0	11-5AA0	FSC	
4.6	1.45	3000	52	Low	105-2AF□□-□□B0			
6.6	2.1	3000			105-4AF□□-□□B0	12-5AA0		
1.27	0.4	3000	45	High	304-2AF□□-□□B0	10-4AA0	FSA	Power cable: 5CL□□-□□□□ Brake cable: 5BL03-□□□□ Encoder cable: 2XB12-□□□□
2.39	0.75	3000			304-4AF□□-□□B0	10-8AA0	FSB	
3.58	0.75	2000	65		306-1AC□□-□□B0			
4.78	1.0	2000			306-2AC□□-□□B0	11-0AA0		
7.16	1.5	2000			306-4AC□□-□□B0	11-5AA0	FSC	
8.4	1.75	2000			306-6AC□□-□□B0			
9.6	2.0	2000			306-7AC□□-□□B0	12-5AA0		
11.9	2.5	2000	90		310-0AC□□-□□B0			
16.7	3.5	2000			310-2AC□□-□□B0	13-5AA0	FSD	
23.9	5.0	2000			310-4AC□□-□□B0	15-0AA0		
33.4	7.0	2000			310-6AC□□-□□B0	17-0AA0		
Cable length								

1FL2 servo motors						400 V converters (S200 PTI only)		MOTION-CONNECT pre-fabricated cables
Rated torque (Nm)	**Rated power (kW)**	**Rated speed (r/min)**	**Shaft height (mm)**	**Inertia**	**Article number 1FL2**	**Article number 6SL5□10-1BE**	**Frame size**	**Article number 6FX3□02-[1)]**
3 m								1AD0
5 m								1AF0
7 m								1AH0
10 m								1BA0
15 m								1BF0
20 m								1CA0
30 m								1DA0

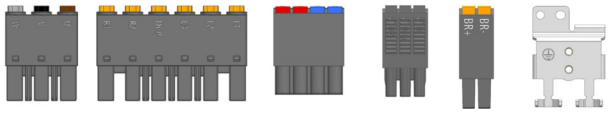
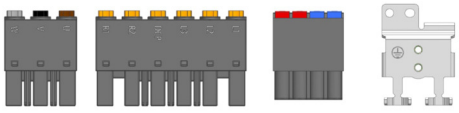
[1)] The last four digits (□□□□) in the cable article number define the cable length corresponding to the length code.

3.4 Accessories

3.4.1 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.

Converter	Article number	Illustration
S200 PTI	6SL5568-0XX00-0AA0	
S200 Basic PTI	6SL5668-0XX00-0AA0	

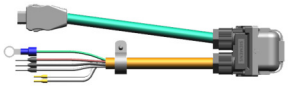
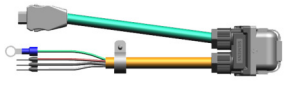
3.4.2 Cables and connectors

3.4.2.1 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 3-6 Overview of MOTION-CONNECT 350 and 380 cables

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 SH40	• Power cable (with brake conductors): – 4 × 0.75 + 2 × 0.38 (4 × 18 AWG + 2 × 22 AWG) • Encoder cable: – 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	3HD00
	7DN01-□□□□				3HN00
Dual cable with hybrid connector: Power cable (without brake conductors) + encoder cable 	7CD01-□□□□		• Power cable (without brake conductors): – 4 × 0.75 (4 × 18 AWG) • Encoder cable: – 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)		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)	-	0LL63
Power cable (without brake conductors) 	5CK32-□□□□		4 × 0.75 (4 × 18 AWG)		
	5CL01-□□□□	SH45 SH65 SH90	4 × 0.75 (4 × 18 AWG)		0LL13
	5CL02-□□□□		4 × 1.5 (4 × 16 AWG)		
	5CL12-□□□□		4 × 2.5 (4 × 14 AWG)		
Encoder cable 	2XB11-□□□□	SH48 SH52	• 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 digits (□□□□) 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.

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 3-7 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	
	0DB13	M17 circular connector	Crimping	5 pieces/pack	
	0LL53	M23 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 51)".

For more information about assembling cables, see Section "Assembling cables (Page 734)".

3.4.2.2 Setpoint cables and connectors

Description

The cable is used to connect the converter to a controller.

Table 3-8 Setpoint cables and connectors

Name	Article number	Length (m)
Option 1		
Setpoint connector (50 pins)	6SL3260-2NA00-0VA0	-
Setpoint cable (50 pins)	6SL3260-4NA00-1VB0	1
Option 2		
Setpoint cable with terminal block (50 pins)	6SL5562-0XX00-0AD0	0.5

More information

For more information about the setpoint cables and connectors, see Section "Interface description - X132 (Page 147)".

For more information about how to assemble the setpoint connectors, see Section "Assembling the setpoint connector (Page 738)".

3.4.3 Line filters

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 in European Union, UK, and Korea, the use of the recommended line filters is mandatory to fulfill the local EMC directives.

Note

The maximum length of the cable used to connect the line filter to the converter is 3 m.

Table 3-9 Recommended line filters

Converter frame size	Rated current (A)	Article number	Degree of protection
1 AC, 200 V ... 240 V			
FSA/FSB/FSC	18	6SL5550-0XB21-8CA0	IP20
3 AC, 200 V ... 240 V			
FSA/FSB/FSC	5	6SL3203-0BE15-0VA0	IP20
3 AC, 380 V ... 480 V			
FSA/FSB	5	6SL5550-0XE20-5CA0	IP20
FSC	12	6SL5550-0XE21-2CA0	
FSD	20	6SL5550-0XE22-0CA0	

3.4.3.1 Technical data

Technical data

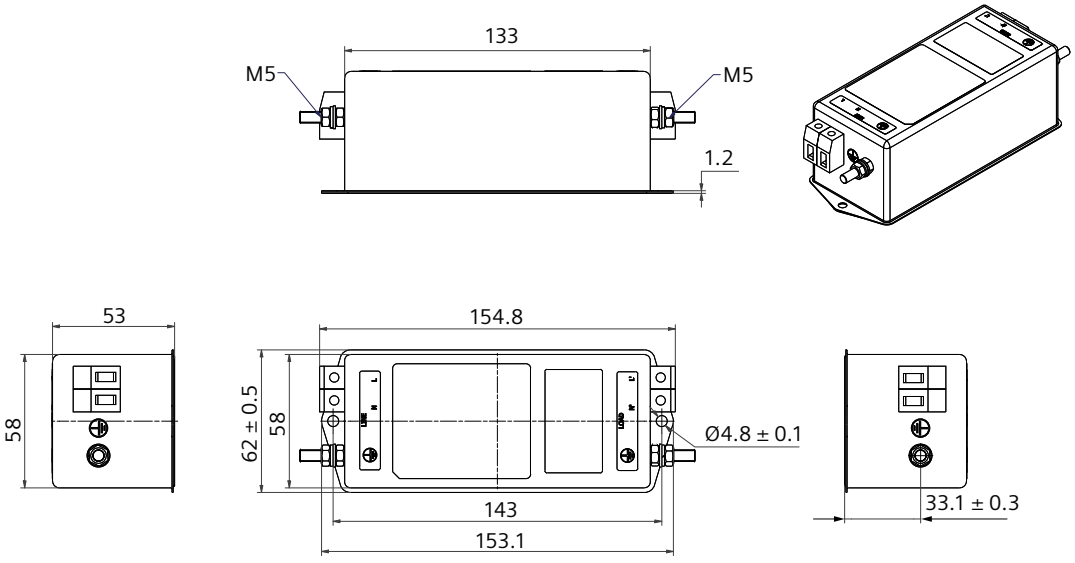
Table 3-10 Technical data of line filters

Article number	6SL5550-0XB21-8CA0	6SL3203-0BE15-0VA0	6SL5550-0XE20-5CA0	6SL5550-0XE21-2CA0	6SL5550-0XE22-0CA0
Line voltage (V)	200 ... 240 V, 1 AC	275 ... 480 V, 3 AC	275 ... 480 V, 3 AC	275 ... 480 V, 3 AC	275 ... 480 V, 3 AC
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

3.4.3.2 Dimension drawing

6SL5550-0XB21-8CA0

All dimensions are specified in millimeters.



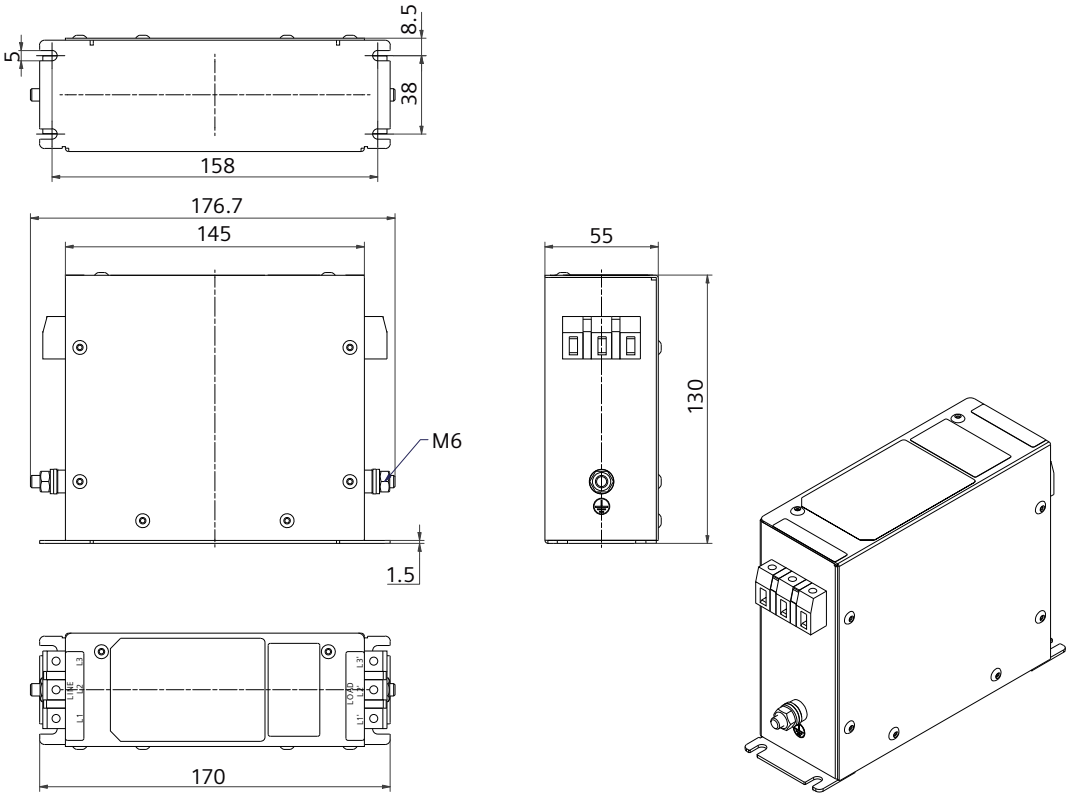
Tightening torque for the mounting screws: 2.5 Nm

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.



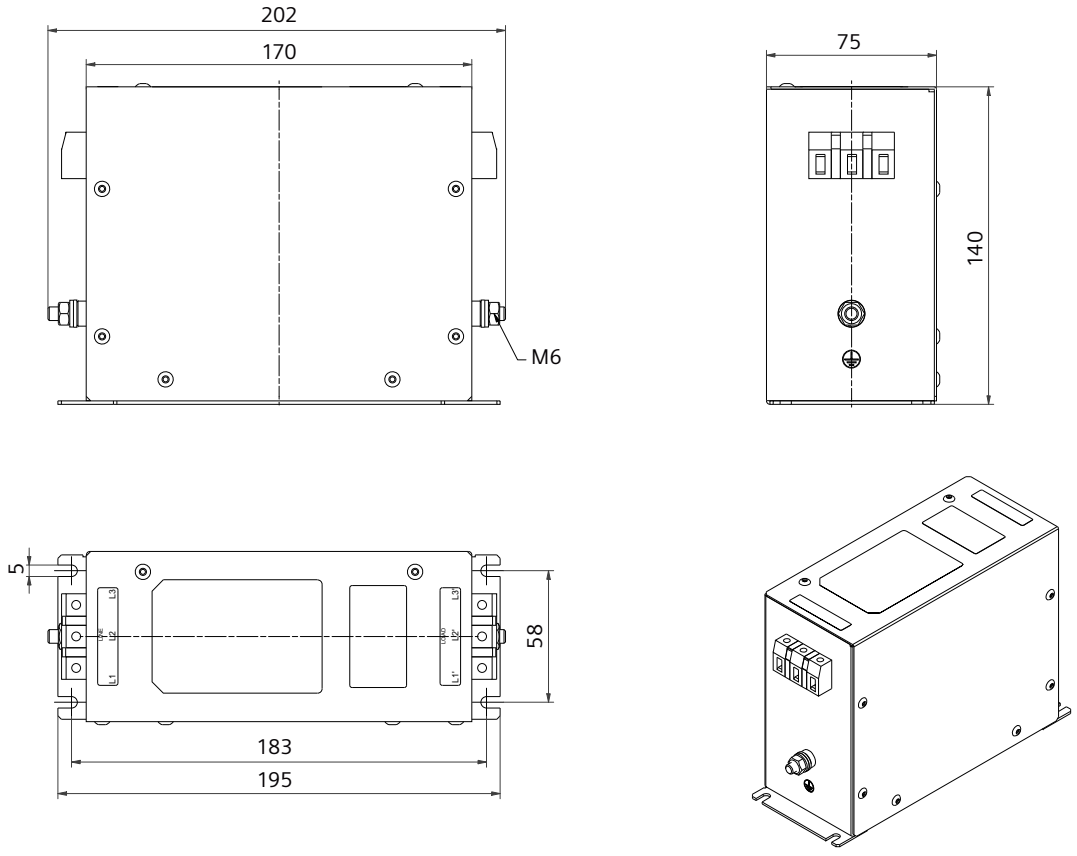
Tightening torque for the mounting screws: 2.5 Nm

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.



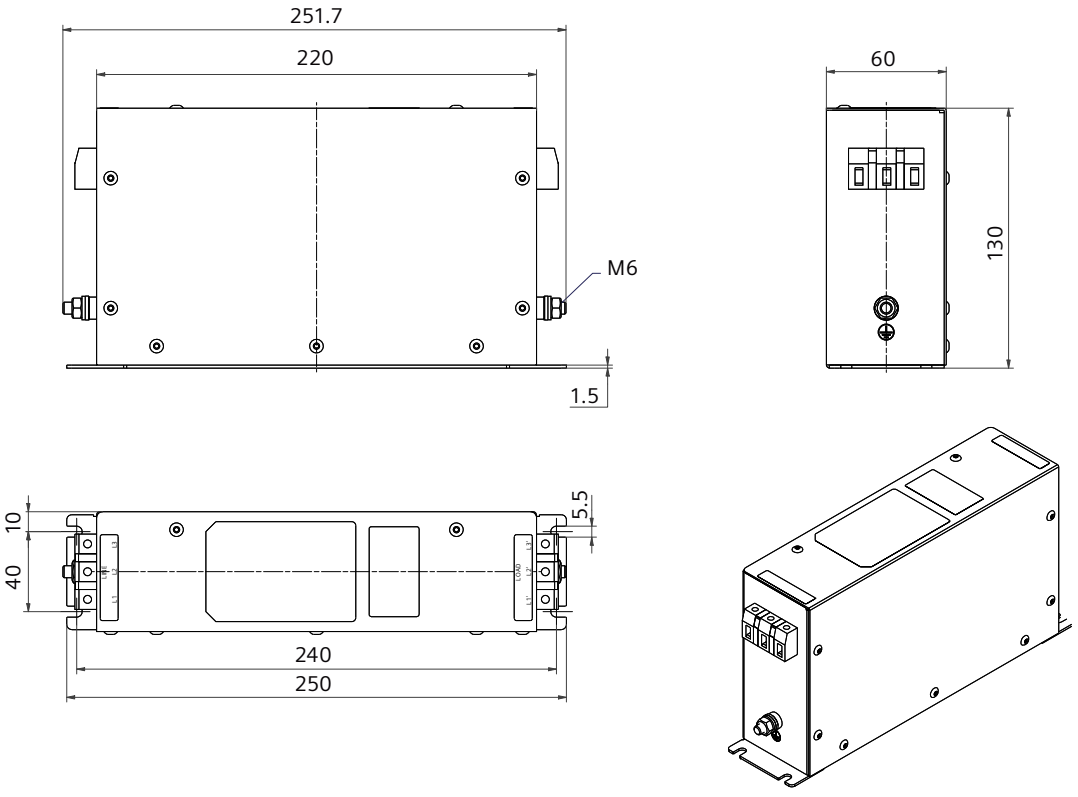
Tightening torque for the mounting screws: 2.5 Nm

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

3.4.3.3 Mounting instructions for the line filter

Description

- Observe the requirements for "EMC-compliant installation (Page 88)" when mounting the line filter.
- To achieve a low-impedance connection, mount the line filter on the same metallic mounting plate as the converter. Mount these two components as close as possible.

Figure 3-11 Connecting the line filter (example)

3.4.4 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 3-11 Specifications of the required external 24 V DC power supply

Parameter	Description
Rated voltage (V)	24 (-15% to +20%)[1]
Permissible voltage fluctuation (V)	When using a motor without brake: 20.4 ... 28.8 When using a motor with brake: 22.8 ... 28.8
Maximum current (A)	• For 200 V variants When using a motor without brake: 1.2 When using a motor with brake: 2.2 • For 400 V variants When using a motor without brake: 1.2 When using a motor with brake: 3.2
Safety insulation class	SELV/PELV

[1] When using a motor with brake, the minimum voltage of 24 V DC -5% must be available at the connector on the motor side to guarantee that the brake reliably opens. If the maximum voltage of 24 V DC +20% is exceeded, then the brake could re-close. The voltage drop along the brake feeder cable must be taken into consideration. The voltage drop ΔU for copper cables can be approximately calculated as follows:

$\Delta U\ [V] = 0.01742\ \Omega \cdot mm^2/m \cdot (2*l/q) \cdot I_{Brake}$

Where: l = cable length [m], q = brake cable cross section [mm^2], I_{Brake} = DC current of brake [A]

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.

3.4.5 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 3-12 Replacement fans

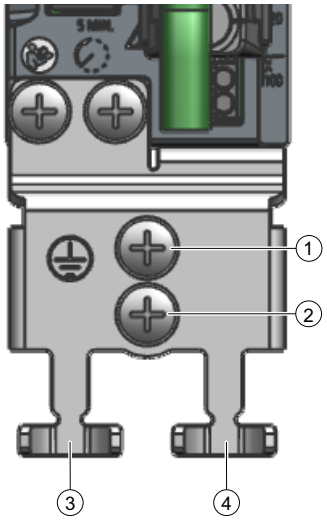
SINAMICS S200 PTI	Article number
3 AC, 380 V ... 480 V	
FSC	6SL5560-0CE00-0AA0
FSD	6SL5560-0DE00-0AA0

3.4.6 Shield plate kit

Description

The shield plate kit (article number: 6SL5566-0AB00-0AA0) includes a shield plate and four 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 with a tightening torque of 2.2 Nm.



① Converter grounding
② Motor cable grounding
③ Fixing motor power cable
④ Reserved (recommended to fix brake cable and encoder cable)

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.

3.4.7 SD card

Description

The converter can be operated with or without an SD card.

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

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

An SD 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 3-13 SD card ordering data

Siemens SD card	Article number
SD card without firmware	6SL5970-0AA00-0AA0
SD card with firmware V6.3	6SL5570-0GD00-0AA0

3.5 Directives and standards

3.5.1 Directives, standards and certificates 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 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.

European Directive on Waste Electrical and Electronic Equipment (WEEE)

The converter complies with the 2012/19/EU directive on taking back and recycling waste electrical and electronic equipment.

Safety Integrated

The S200 PTI converter complies with the requirements relating to functional safety/safety of machinery.

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.

China RoHS

The converter complies with the requirements of China RoHS. You can find additional information on the Internet:

China RoHS (https://support.industry.siemens.com/cs/ww/en/ps/29596/cert)

Immunity to voltage drop of semiconductor process equipment

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

Quality systems

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

Certificates for download

You can find all relevant certificates for download on the Internet:

Certificates (https://support.industry.siemens.com/cs/ww/en/ps/29596/cert)

3.5.2 Directives, standards and certificates 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 Machinery Directive

The motors fulfill the requirements stipulated in the Machinery Directive 2006/42/EC, if they are covered by the application area of this directive.

However, the use of the motors in a typical machine application has been fully assessed for compliance with the main regulations in this directive concerning health and safety.

European Directive on rotating electrical machines

The motors comply with the requirements of EN 60034 directive on rotating electrical machines.

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/EN 61800-3.

European Directive on Waste Electrical and Electronic Equipment (WEEE)

The motors comply with the 2012/19/EU directive on taking back and recycling waste electrical and electronic equipment.

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).

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. You can find additional information on the Internet:

China RoHS (https://support.industry.siemens.com/cs/ww/en/ps/29685/cert)

Quality systems

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

China Energy Label

The motors fulfill the China Energy Label Grade 2 according to GB 30253-2013.

Table 3-14 Specifications of China Energy Label

Name of the standard	Minimum allowable values for energy efficiency and energy efficiency class of permanent-magnet synchronous motors (GB30253-2013)
Date of entry into force	July 1, 2020
Affected motors	Permanent-magnet synchronous motors (without incorporated brake) with a rated power of 0.55 kW to 90 kW and a rated speed of 500 r/min to 3000 r/min driven by variable-frequency equipment on a power supply below 1000 V.

Motor requirements	As of the implementation date of the standard, all affected motors must be provided with the "China Energy Label".
Affected Siemens products	Affected Siemens motors are subject to the requirements of standard GB30253-2013: SIMOTICS S-1FL2 servo motors.

Figure 3-13 Example of the China Energy Label

The article number ① stated on the China Energy Label corresponds to the first 11 digits of the article number of the SIMOTICS S-1FL2 motor.

Certificates for download

You can find all relevant certificates for download on the Internet:

Certificates (https://support.industry.siemens.com/cs/ww/en/ps/29685/cert)

3.5.3 Directives, standards and certificates for the MOTION-CONNECT cable

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

CE

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 Machinery Directive

The MOTION-CONNECT cables fulfill the requirements stipulated in the Machinery Directive 2006/42/EC, if they are covered by the application area of this directive.

However, the use of the converters and motors 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 MOTION-CONNECT cables comply with Directive 2011/65/EU regarding limiting the use of certain hazardous substances.

European EMC Directive

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

European Directive on Waste Electrical and Electronic Equipment (WEEE)

The MOTION-CONNECT cables comply with the 2012/19/EU directive on taking back and recycling waste electrical and electronic equipment.

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).

Eurasian Conformity

The MOTION-CONNECT cables comply with the requirements of the Russia/Belarus/ Kazakhstan customs union (EAC).

China RoHS

The MOTION-CONNECT cables comply with the requirements of China RoHS. You can find additional information on the Internet:

China RoHS (https://support.industry.siemens.com/cs/ww/en/ps/14662/cert)

Quality systems

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

Certificates for download

You can find all relevant certificates for download on the Internet:

Certificates (https://support.industry.siemens.com/cs/ww/en/ps/14662/cert)

Application planning

4

4.1 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 88)").

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 4-1 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.	

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.

The following special features should be noted:

- 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, it is recommended that the first fault is removed as quickly as practically possible.
  Motor operation in such a fault situation can reduce the service life due to a damage 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) must be connected between the mains supply and the drive system to protect the motor insulation from excessive stress.

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 4-2 Line connection conditions for the converter with the motor 1FL2

Motor	Converter input voltage	Permissible line system configurations for installation altitude no higher than 2000 m	Permissible line system configurations for installation between 2000 m and 4000 m
200 V	1 AC 200 V ... 240 V (-15% ... +10%)	• 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%)	• TN and TT line systems with grounding at any potential • IT line systems*)	• 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%)	• TN and TT line systems with grounded neutral point • IT line systems*)	Install an isolating transformer and ground the secondary side at the neutral point.

*) With the IT screw for the functional grounding removed. For more information about removing the IT screw, see Section "Removing the IT screw for the functional grounding (Page 80)".

NOTICE

Damage to motor insulation due to excessive voltages

In the event of a ground fault in the IT supply 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 IT screw for the functional grounding

Overview

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

- Remove the IT screw of the converter.

⚠ WARNING

Electric shock as a result of a residual charge in power components

After the power supply has been switched off, it takes up to 5 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 IT screw for the functional grounding

Proceed as follows to remove the IT screw of the converter:

1. Open the protective flap at the converter housing, e.g. using a slotted screwdriver.
2. Release the IT screw for the 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.

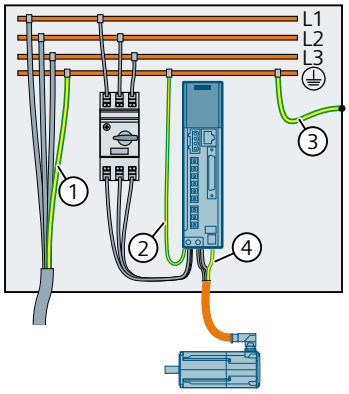
Description

⚠ 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. As a minimum, one of the following conditions must be satisfied:

- The protective conductor is routed so that along its complete length it is protected against mechanical damage.
- The protective conductor has a cross-section ≥ 10 mm² Cu.
- A second protective conductor with the same cross-section is provided.
- The protective conductor of a multi-conductor cable has a cross-section ≥ 2.5 mm² 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 Electromagnetic compatibility (EMC)

4.7.1 Interference caused by electromagnetic fields

Description

Fluctuating currents and voltages generate electromagnetic fields. Electromagnetic fields can interfere with the operation of electrical devices.

Equipment that generates electromagnetic fields is called a source of interference. Sources of interference may be converters that have not been correctly installed, for example. On the other hand, interference sinks are devices that are disturbed by electromagnetic fields, e.g. mobile telephones.

The type of transmission is another distinguishing feature of interference. A source of interference transmits the interference to the sink either through conduction or through radiation.

4.7.2 Electromagnetic compatibility (EMC)

Description

Interference suppression measures increase the electromagnetic compatibility (EMC).

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

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).

4.7.3 EMC environments in residential and industrial areas

Description

IEC 61800-3 defines EMC requirements for using variable-speed drives in the following 2 environments:

- 1st environment: Residential environment
  The residential environment includes residential buildings or locations where the drive is directly connected to the public low-voltage grid without using an intermediate transformer. Equipment and systems that are operated on the public low-voltage grid must comply with defined limit values for interference immunity and interference emission. The limit values are specified in the applicable standards. Especially for interference emissions, increased requirements apply regarding the 2nd environment.
- 2nd environment: Industrial Environment
  An industrial environment includes all other installations that are not directly connected to the low-voltage supply for residential buildings. The 2nd environment essentially encompasses industrial areas that are supplied from the medium voltage grid via their own transformers.

4.7.4 EMC category

Description

Together with the associated motors and encoders, including the connecting cables, the converter forms a variable-speed drive. Product standard IEC 61800-3 defines the EMC requirements for a variable-speed drive. Product standard IEC 61800-3 calls a variable-speed drive a "Power Drive System" (PDS).

IEC 61800-3 defines categories for electromagnetic compatibility in the 1st environment and the 2nd environment.

Table 4-3 Environments and categories according to IEC 61800-3

Environment	1st environment		2nd environment	
Category	C1	C2	C3	C4 [1]
Voltage, current	< 1 000 V			≥ 1 000 V or ≥ 400 A
Line system configuration	TN, TT			TN, TT, IT
Installation, commissioning	No requirement	By professional personnel		

[1] Precondition: Plant manufacturers and operating companies agree on plant-specific measures in an appropriate EMC plan. If specified in the product documentation, the drive can also be operated on ungrounded line supplies (IT line systems) in accordance with product standard IEC 61800-3.

More information

To comply with product standards of plants and/or machines, when integrating the converter in plants or machines, additional measures may be required. The additional measures are the responsibility of the plant builder or machine OEM.

Disturbance-free operation of the converter is only guaranteed when specialist personnel carry out the installation work in strict compliance with EMC regulations.

4.7.5 Harmonic current emissions

Overview

IEC 61800-3 does not define any current harmonic limits when converters are operated on industrial line supplies. A system evaluation according to 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

4.7.6 EMC limit values in South Korea

Description

이 기기는 업무용(A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
For sellers or users, please keep in mind that this device is an A-grade electromagnetic wave device. This device is intended to be used in areas other than home.

The EMC limit values to be observed for Korea correspond to the limit values of the EMC product standard for variable-speed electric drives EN 61800-3 of category C2 or the limit value class A, Group 1 to KN11.

By implementing appropriate additional measures, the limit values according to category C2 or limit value class A, Group 1, are observed.

Additional measures, such as the use of an additional RFI suppression filter (EMC filter), may be necessary.

In addition, measures for EMC-compliant configuration of the plant or system are described in detail in this manual.

The final statement on compliance with the applicable standard is given by the respective label attached to the individual device.

4.8 EMC-compliant installation

4.8.1 EMC zones in the control cabinet

Description

Spatially separating disturbance sources and disturbance sinks avoids mutual disturbances. To achieve this, the control cabinet and the plant or machine are split up into EMC zones. Disturbance sources and disturbance sinks are installed in their own specific EMC zones.

An EMC-compliant control cabinet is structured as follows:

- All devices in the control cabinet are assigned to the appropriate EMC zones.
- Using one of the following measures, the zones are electromagnetically decoupled from one another:
  - Lateral clearance
  - Separate metal enclosure
  - Partition panels with large surface areas
- The cables associated with various EMC zones are routed in separate cable harnesses or cable ducts.
- Filters or isolating amplifiers are used at the interfaces of the EMC zones.

4.8.2 Shielding and potential equalization inside the control cabinet

Description

A control cabinet with EMC-compliant shielding is structured as follows:

- The size of the openings and breakouts at the control cabinet depend on whether it is to be used in the 1st or 2nd environment.
- Connect the door, side panels, top and base panels of the control cabinet with the control cabinet frame using one of the following methods:
  - Electrical contact surface of several cm^2 for each contact location
  - Several screwed connections
  - Short, finely stranded, braided copper wires with cross-sections ≥ 95 mm^2 / 000 (3/0) (-2) AWG
- A shield support is provided for shielded cables that are routed out of the control cabinet.
- The PE rail and shield support should be connected to the control cabinet frame through a large surface area to establish a good electrical connection.
- Devices and components are mounted on a bare, metal mounting plate.

- The mounting plate is connected to the control cabinet frame, PE rail and shield support through a large surface area to establish a good electrical connection.
- For screwed connections on painted or anodized surfaces, establish a good electrical connection by using one of the following methods:
  - Serrated contact washers that cut through the painted or anodized surface
  - The insulating coating (e.g. paint) at the contact locations has been removed.

4.8.3 Potential equalization between control cabinets

Description

EMC-compliant potential equalization between control cabinets is structured as follows:

- The PE rail runs through all control cabinets without any interruption.
- The frames of the control cabinets are connected at multiple locations using serrated washers through a large surface area to establish a good electrical connection.
- In systems where the control cabinets are lined up next to one another, and which are installed in two groups back to back, the PE rails of the two cabinet line-ups are connected with one another at multiple locations.

4.8.4 Electromechanical components

Description

EMC-compliant installation includes overvoltage protection. Different components are suitable depending on the type of voltage:

- RC elements or varistors for AC-operated coils
- Freewheeling diodes or varistors for DC-operated coils

The following components have overvoltage protection connected directly to the coil:

- Coils of contactors
- Relays
- Solenoid valves
- Motor holding brakes

4.8.5 EMC-compliant cable routing

Overview

Power cables with a high interference level significantly influence the electromagnetic fields in a system or a machine.

Routing cables to be compliant with EMC is a requirement for disturbance-free operation of a system or machine.

Description

The converter connection cables have different interference levels:

- Cables with a high level of interference:
  - Cable between the line filter and converter
  - Motor connection cables
  - Cable at the converter DC link connection
- Cables with a low level of interference:
  - Cable between the line and line filter
  - Signal and data cables

EMC-compliant cable routing complies with the following requirements:

- All cables are as short as possible.
- All cables are routed close to the mounting plates or control cabinet frames.
- Power cables with a high level of interference are routed so that there is a minimum clearance of 20 cm to cables with a low level of interference.
  If the minimum clearance of 20 cm is not possible, insert separating metal panels between the cables with a high level of interference and those with a low level of interference. The separating metal panels are connected to the mounting plate to establish a good electrical connection.
- Cables with a high level of interference and cables with a low level of interference only cross over at right angles.
- All signal and data cables enter the control cabinet from only one side, from below, for example.
- Signal and data cables, as well as the associated equipotential bonding cables, are routed in parallel and close to one another.
- Any unused conductors of signal and data cables are grounded at both ends.
- Incoming and outgoing individual conductors that are not shielded are twisted with one another.
  Alternatively, incoming and outgoing conductors are routed in parallel, but close to one another.

4.8.6 Shielded cables for the converter

Description

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

- Inside the control cabinet:
  - Cable between the converter and line filter
  - Signal and data cables
- Outside the control cabinet:
  - Motor connection cables
  - Signal and data cables

To achieve EMC-compliant installation 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, encoder cable, and setpoint cable, and connect the cable shields to earth. Make sure that the shield plate, the converter and the motor are properly grounded.

1. Remove the insulation and expose the cable shield.
2. Connect shields of the brake cable and encoder cable to the shield plate.
3. Connect shield of the setpoint cable to the mounting plate. Make sure the mounting plane is well grounded.

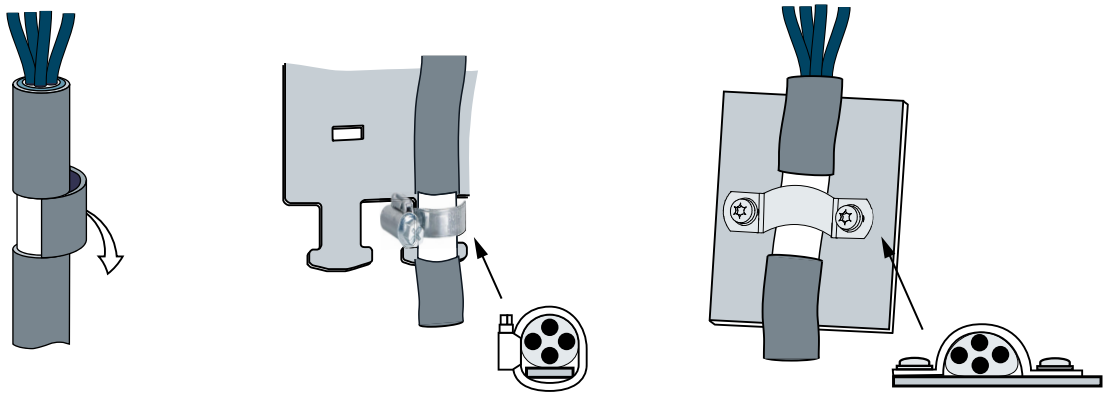


Figure 4-2 Recommended EMC-compliant shield connection

4.8.7 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	3 m	3 m
Permissible application environment	Residential	No	No
	Light industrial	Yes	Yes
	Commercial	Yes	Yes
Permissible line system	Public	Yes	Yes
	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

To be observed for devices used in Category C2

In a residential environment this product may cause radio-frequency interference, which may make interference suppression measures necessary.

- Have qualified personnel carry out the installation and commissioning with suitable interference suppression measures.

Note

To be observed for devices used in Category C3

In a residential environment this product may cause radio-frequency interference.

- Do not use this device in the first environment (residential area).

Mounting 5

5.1 Converter

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 88)".
- Use a conductive steel sheet no thinner than 2 mm as the mounting plate.

Note

Keep the cover of the integrated operator panel closed to protect the control buttons and the SD card.

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 facing upwards.

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.

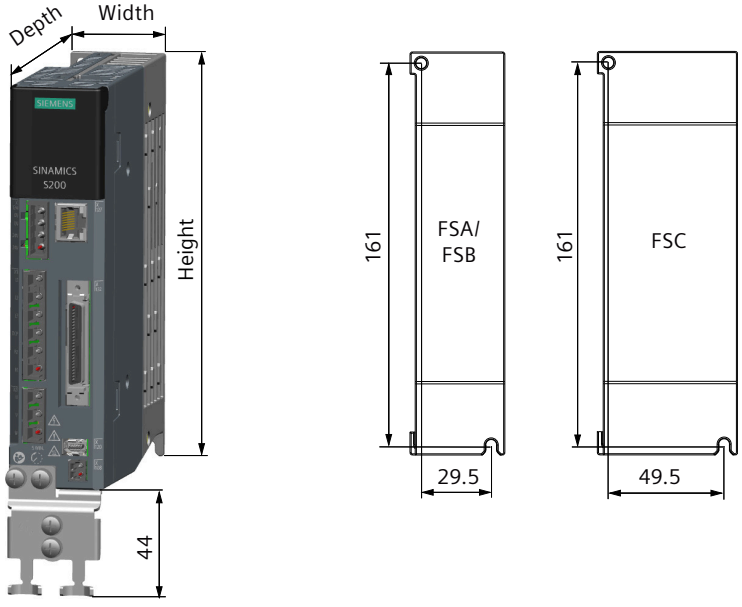


Table 5-1 Dimensions and mounting, 1 AC/3 AC 200 V, FSA ... FSC, IP20

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.

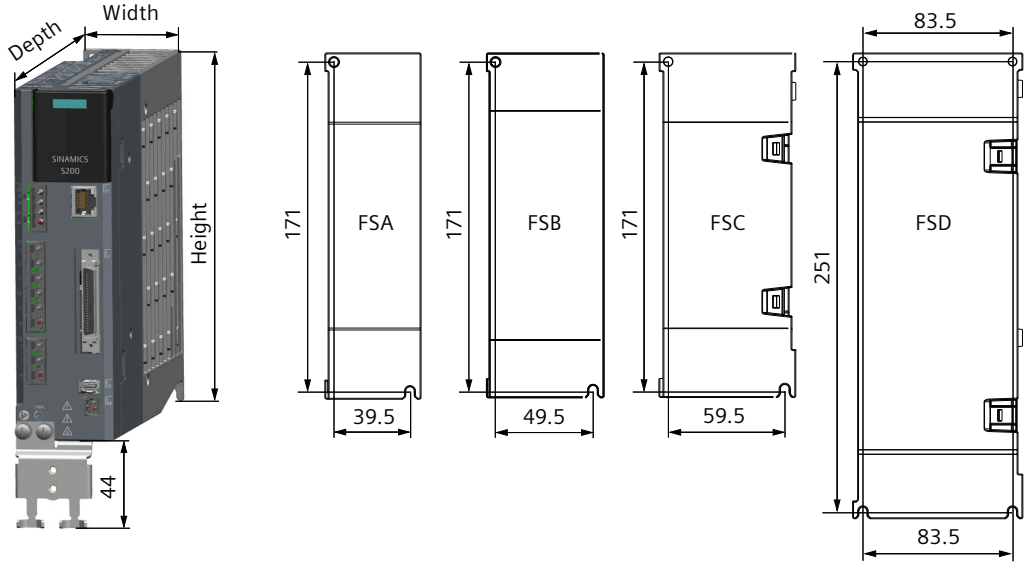


Table 5-2 Dimensions and mounting, 3 AC 400 V, FSA ... FSD, IP20

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 ≥ 45 °C (for 200 V FSA: ≥ 40 °C), the airflow velocity above the converters must be greater than 0.5 m/s.

All dimensions are specified in millimeters.

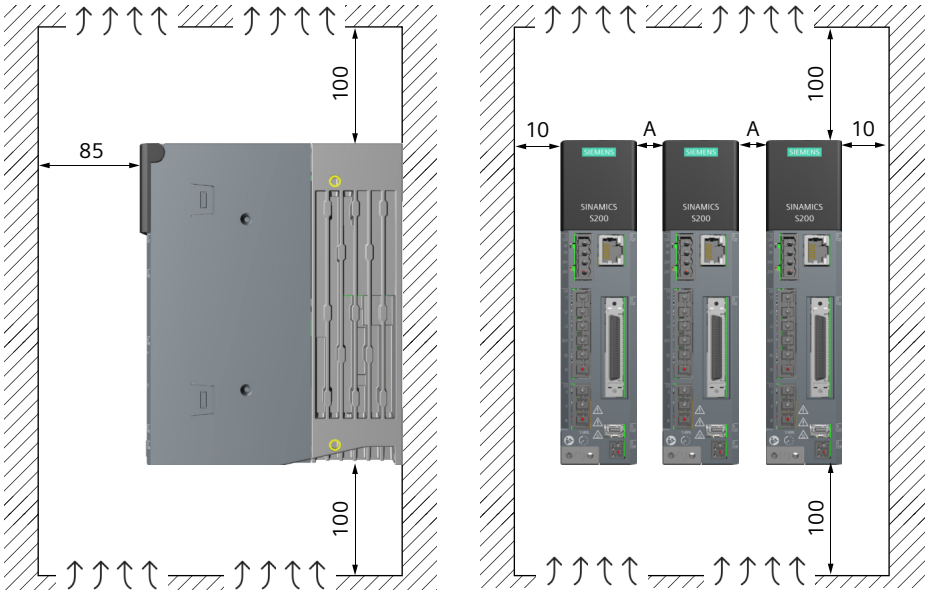


Table 5-3 Minimum clearances to other devices or components

	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

You can lift and transport the motor using lifting slings.

⚠ 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.

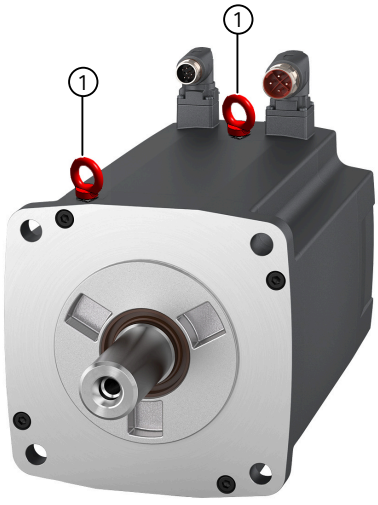
⚠ WARNING

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.

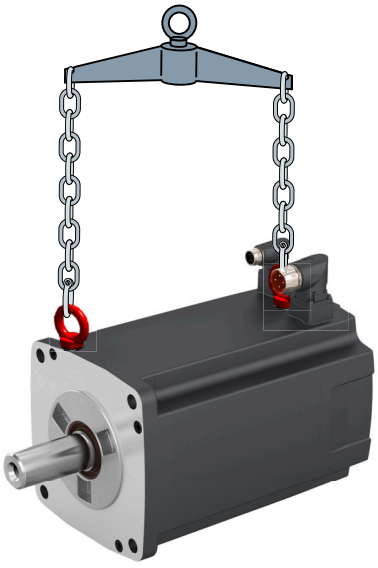


Figure 5-3 Lifting and transporting with a crossbar (example diagram)

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. • Do not exert any shock at the shaft extension.

In the delivery state, the following two warning labels are attached to the motor. In addition, there are three "hot surface" warning labels included in the scope of delivery. Before mounting the motor, attach them to the motor surfaces and make sure that they are clearly visible on all the four longitudinal sides of 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. • Avoid contact between solvents and shaft sealing rings.

NOTICE
Damage to the motor due to radial eccentricity at the shaft extension Radial eccentricity and axial forces at the shaft extension can damage the motor. • Mount the motor in such a way that no radial eccentricity and axial forces at the shaft extension occur.

- Adhere to the specifications on the rating plate (Page 46).
- 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 518)".
- 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 520)".
- 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.
  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

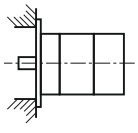
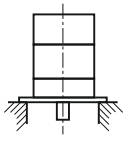
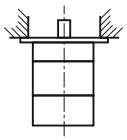
Tightening torques for the fastening screws

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

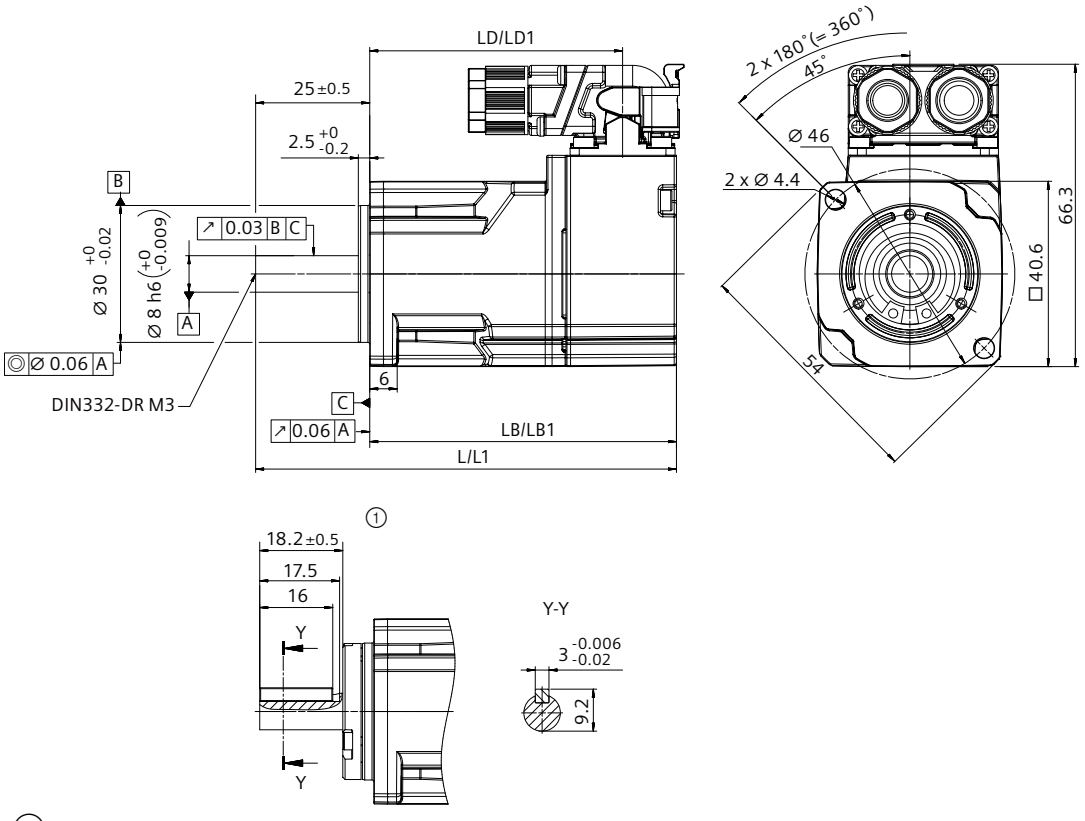
When configuring the IM V3 type of construction, pay attention to the permissible axial forces and especially to the necessary degree of protection.

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

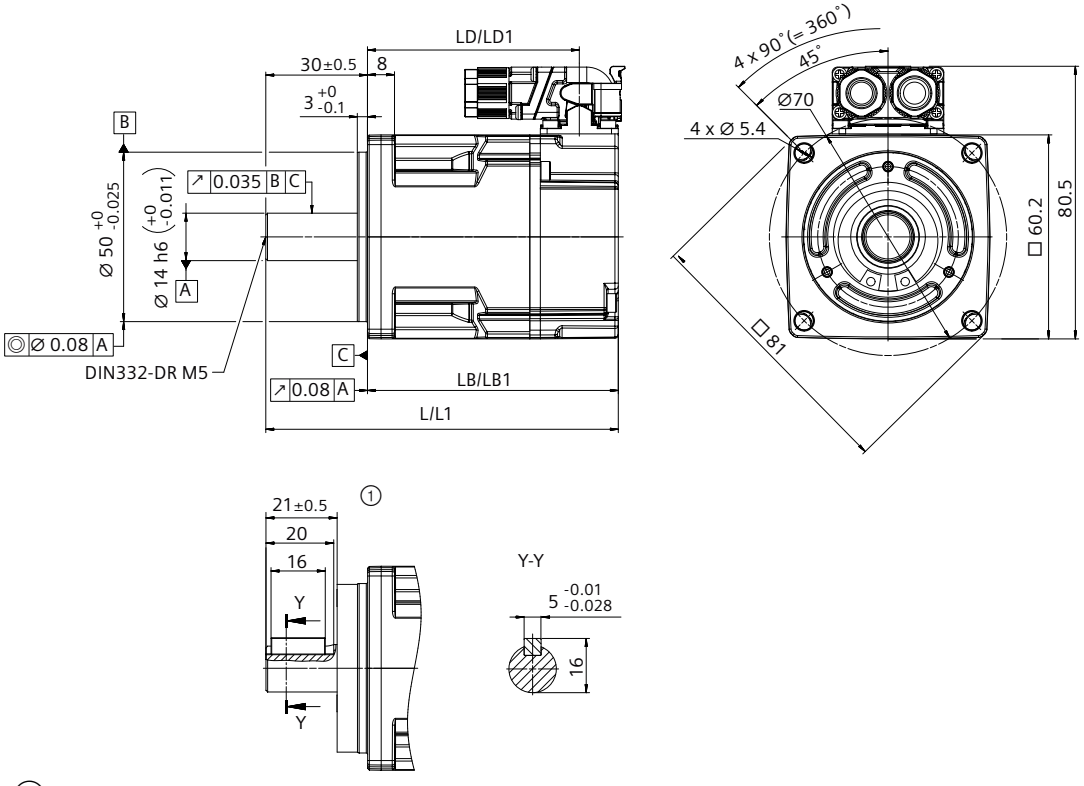
Table 5-6 Dimensions, 1FL2102

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

5.2.6.2 Dimension drawing for the 1FL2 motor, shaft height 30

Dimension drawing

All dimensions are specified in millimeters.



① With shaft sealing ring (IP65) and feather key

Table 5-7 Dimensions, 1FL2□03

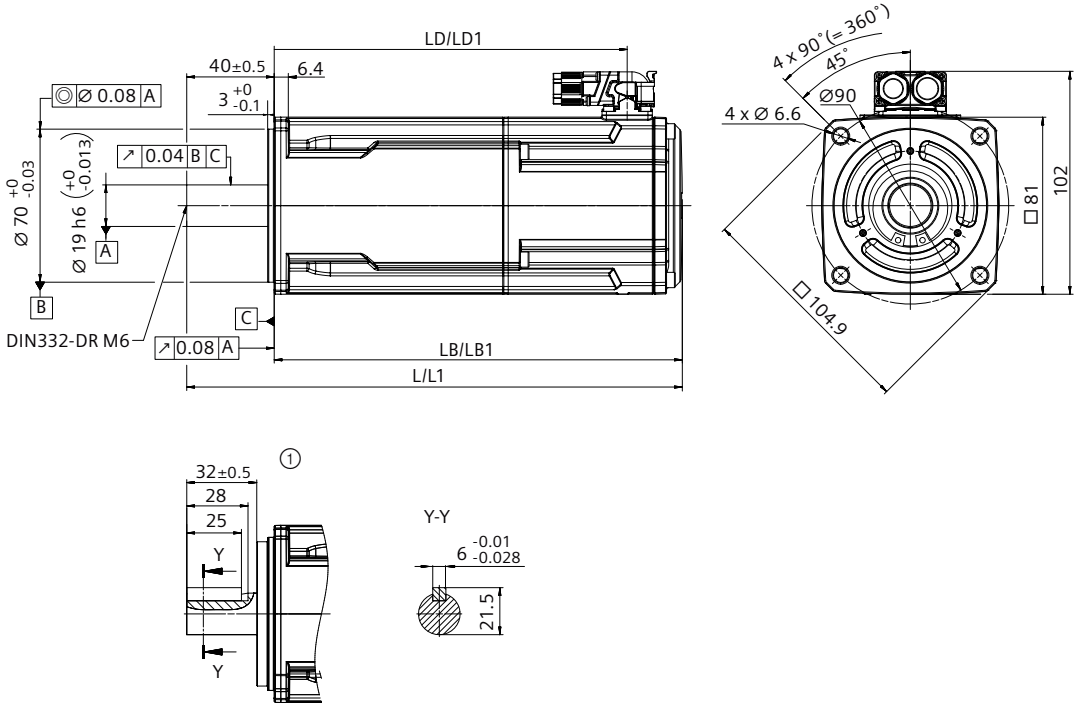
SIMOTICS S-1FL2 Shaft height 30	Motor length					
	Without brake			With brake		
	L	LB	LD	L1	LB1	LD1
1FL2103-2	105.5	75.5	63.8	135.5	105.5	93.8
1FL2103-4	124.5	94.5	82.8	154.5	124.5	112.8

SIMOTICS S-1FL2 Shaft height 30	Motor length					
	Without brake			With brake		
	L	LB	LD	L1	LB1	LD1
1FL2203-2	104	74	62.3	134	104	92.3
1FL2203-4	121.5	91.5	79.8	151.5	121.5	109.8

5.2.6.3 Dimension drawing for the 1FL2 motor, shaft height 40

Dimension drawing

All dimensions are specified in millimeters.



① With shaft sealing ring (IP65) and feather key

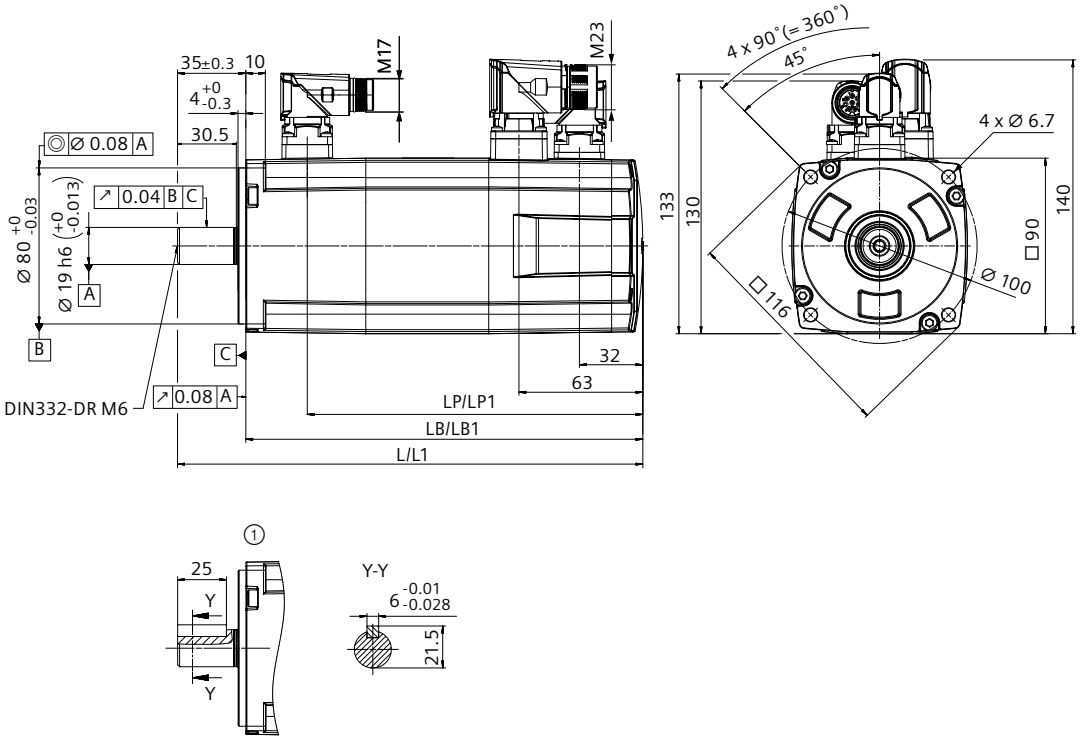
Table 5-8 Dimensions, 1FL2104, 1FL2204

SIMOTICS S-1FL2 Shaft height 40	Motor length					
	Without brake			With brake		
	L	LB	LD	L1	LB1	LD1
1FL2104-2	164.6	124.6	99.4	208.6	168.6	143.4
1FL2204-2						
1FL2104-4	182.6	142.6	117.4	226.6	186.6	161.4
1FL2204-4						

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

Dimension drawing

All dimensions are specified in millimeters.



① With feather key

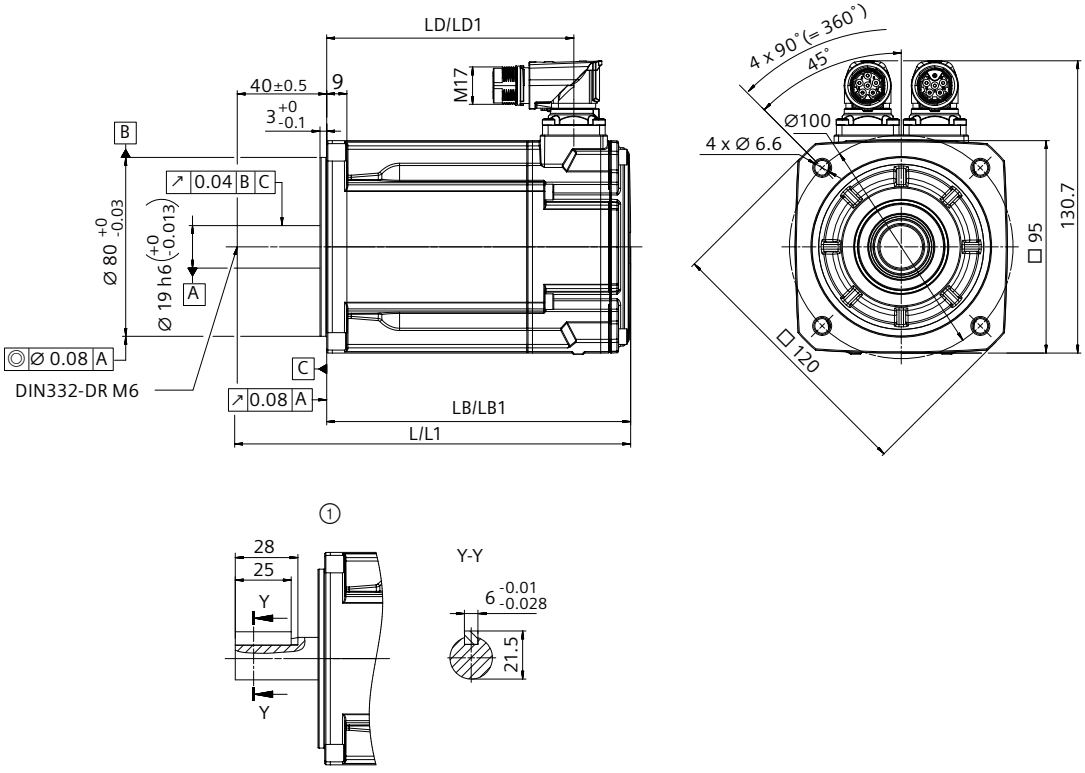
Table 5-9 Dimensions, 1FL2304

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

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

Dimension drawing

All dimensions are specified in millimeters.



① With feather key

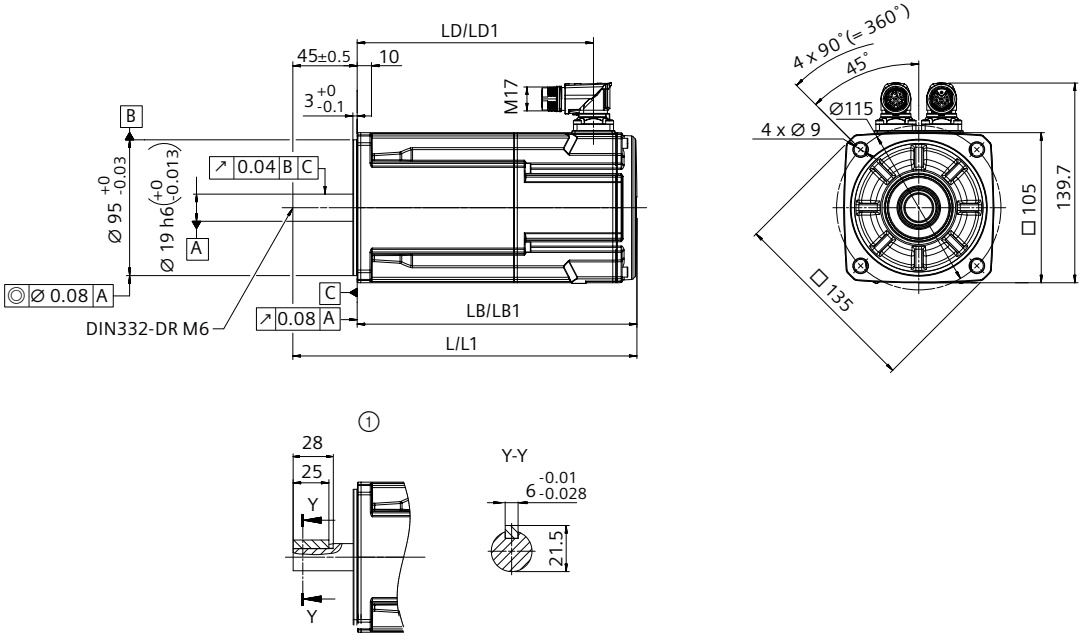
Table 5-10 Dimensions, 1FL2205

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

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

Dimension drawing

All dimensions are specified in millimeters.



① With feather key

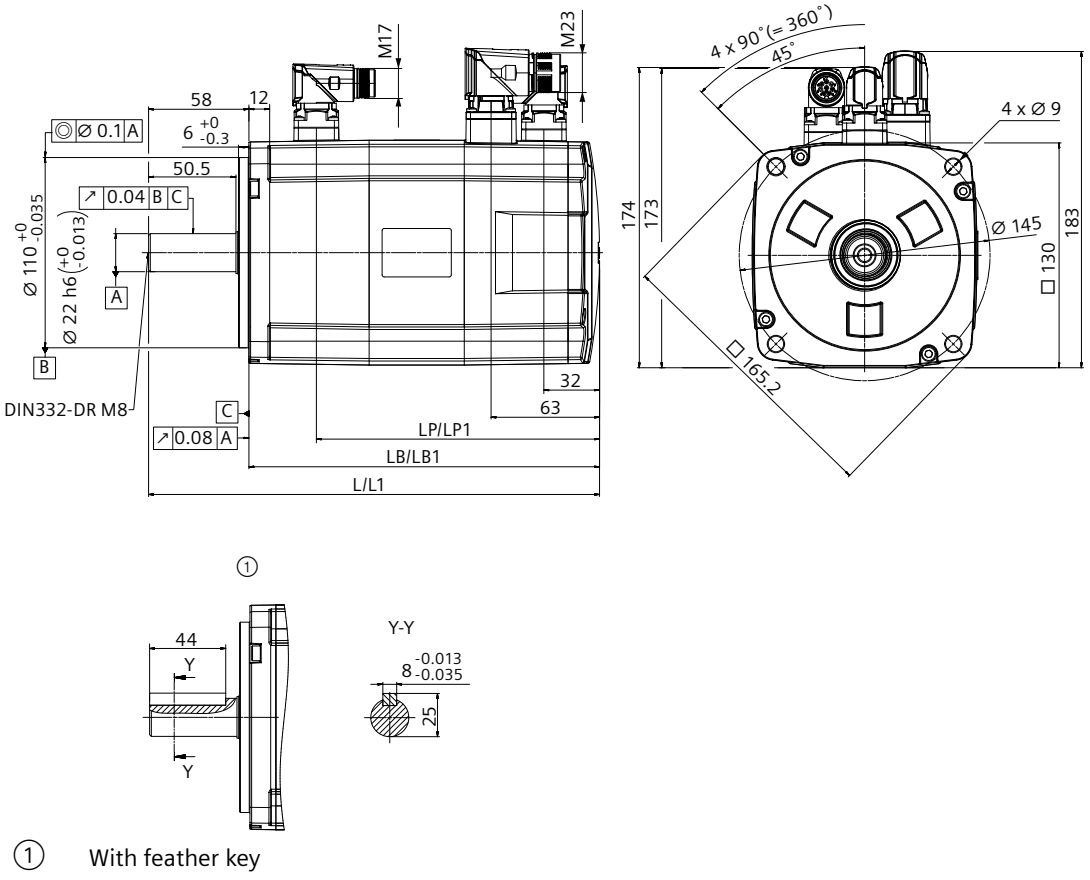
Table 5-11 Dimensions, 1FL2105

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

5.2.6.7 Dimension drawing for the 1FL2 motor, shaft height 65

Dimension drawing

All dimensions are specified in millimeters.



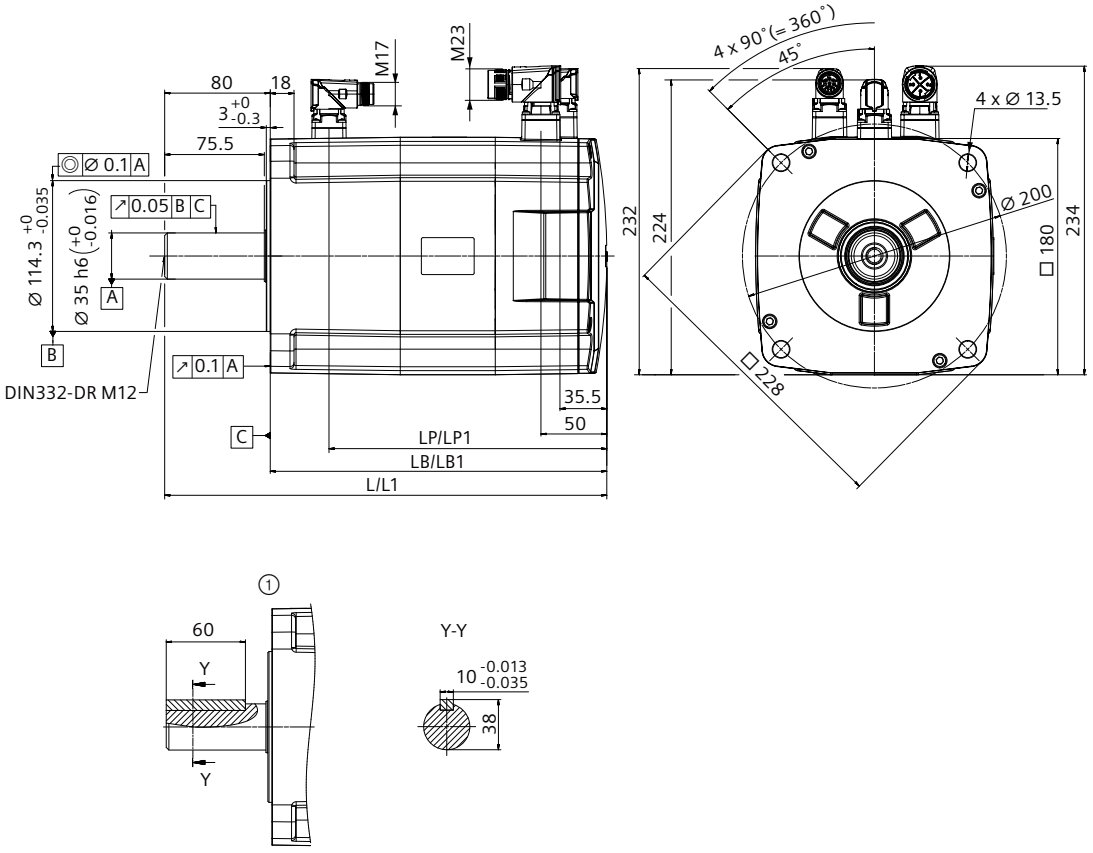
① With feather key

Table 5-12 Dimensions, 1FL2306

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

5.2.6.8 Dimension drawing for the 1FL2 motor, shaft height 90

All dimensions are specified in millimeters.



① With feather key

Table 5-13 Dimensions, 1FL2310

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

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

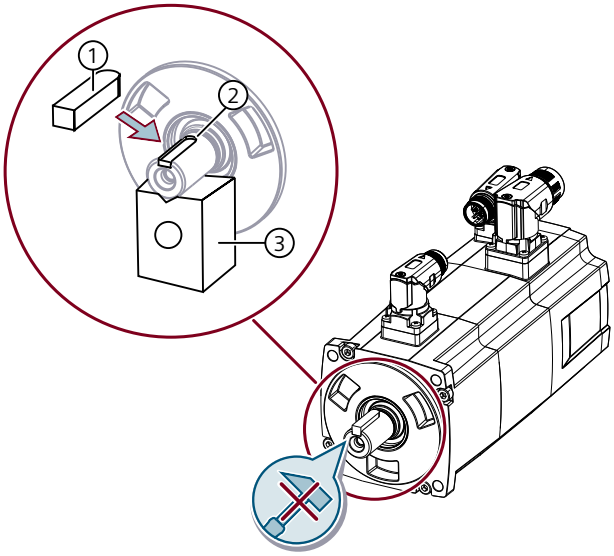
Never mount the feather key by hammering into the key slot; otherwise, there is a risk of bearing damage.

- 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 feature 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.



① Well-lubricated feather key
② Key slot
③ V-type block

Figure 5-4 Mounting the feather key

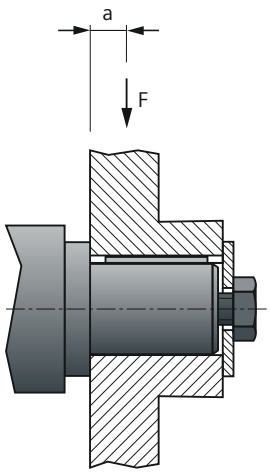
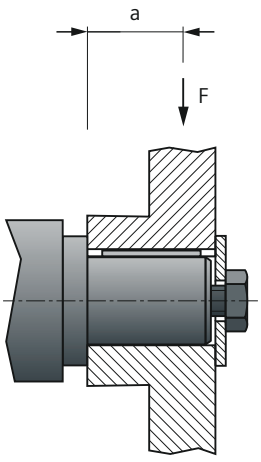
5.2.8 Attaching output elements

Overview

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

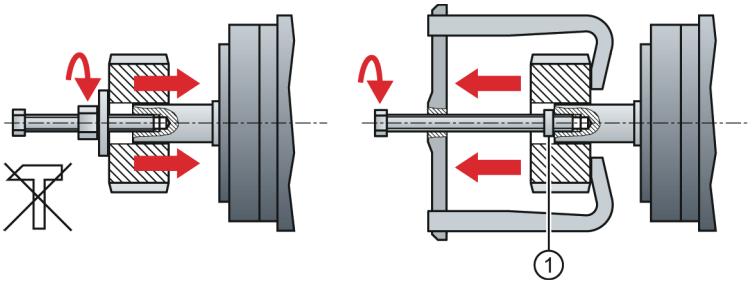
Requirement

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.

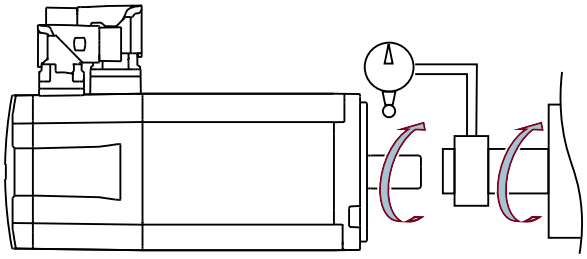
Note

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

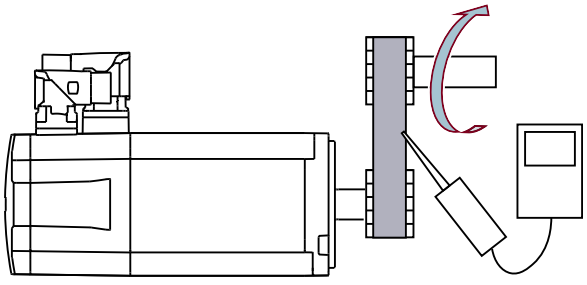
Procedure

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 529)".
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)

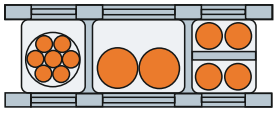
Requirement

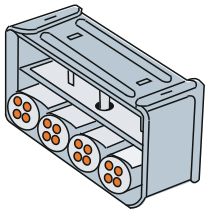
None

Procedure

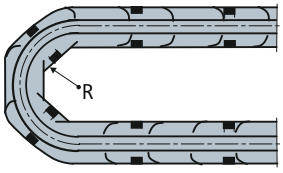
Proceed as follows to arrange cables in cable carriers:

1. Lay the 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.





2. Move the 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

3. Fix the 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

6

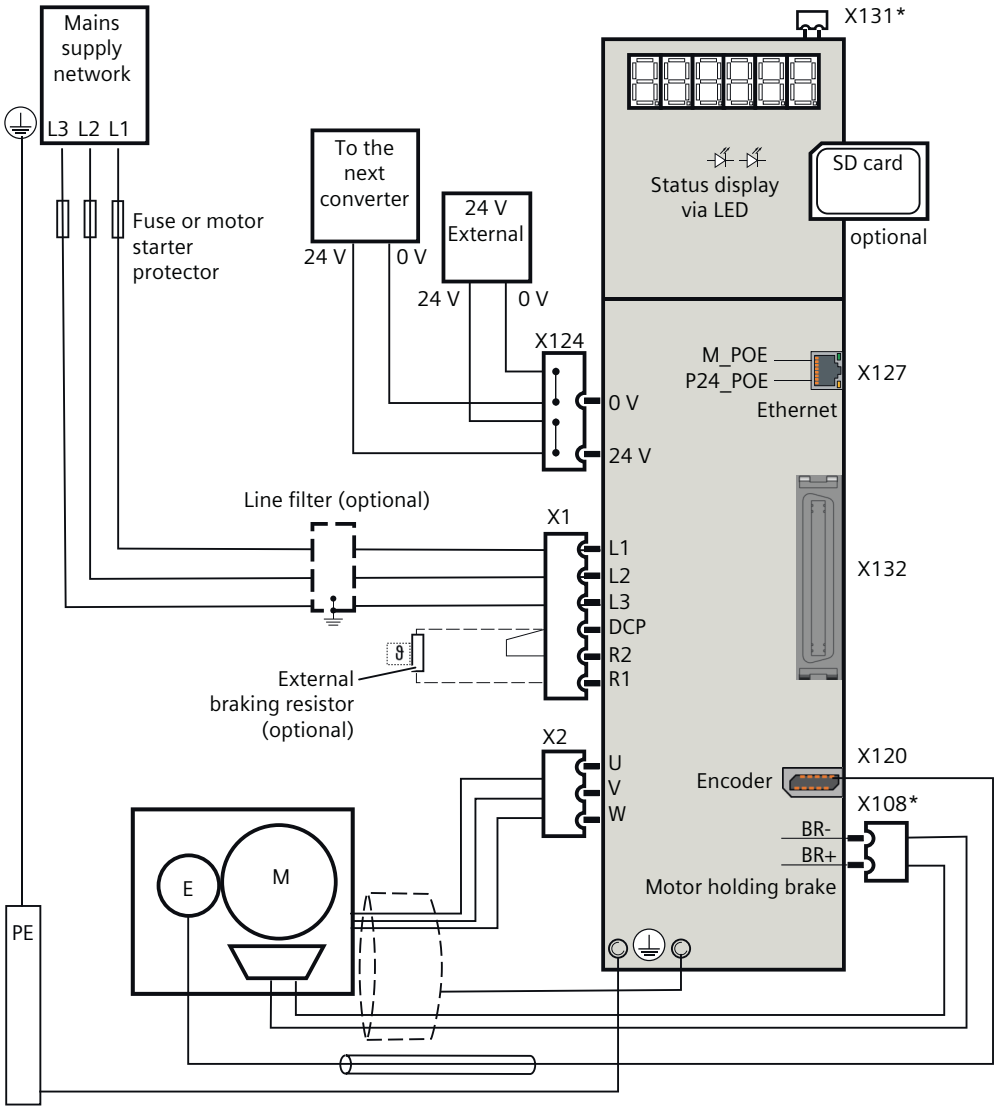
Note

Note for connecting the drive system

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

6.1 System connection

Overview diagram

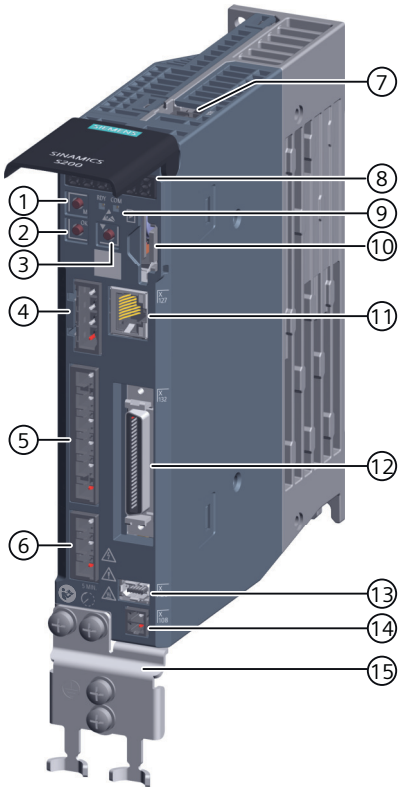


* The interfaces X131 and X108 are available on S200 PTI only.

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

6.2 Overview of the converter interfaces

Overview diagram



① M button
② OK button
③ DOWN button
④ 24 V DC power supply - X124
⑤ Mains and braking resistor interface - X1
⑥ Motor power interface - X2
⑦ STO interface - X131[1)]
⑧ 6-digit display
⑨ LED status indicators
⑩ SD card slot
⑪ Service interface (Ethernet) - X127
⑫ Control/status inputs and outputs - X132
⑬ Encoder interface - X120
⑭ Motor holding brake interface - X108[1)]
⑮ Shield plate

[1)] The interfaces X131 and X108 are available on S200 PTI only.

Figure 6-2 Converter interfaces

6.3 Cables and connectors

6.3.1 Maximum permissible cable lengths

Technical data

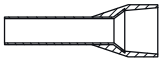
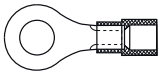
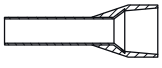
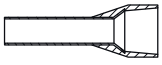
Table 6-1 Maximum permissible cable length

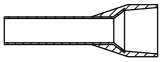
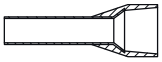
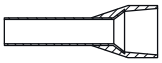
Connection type	Interface on the converter	Maximum permissible cable length (m)
Mains supply	X1 (L1, L2, and L3)	No restriction
External braking resistor	X1 (DCP and R1)	3
24 V DC power supply	X124	30
Motor power connection	X2	30
Encoder connection	X120	30
Motor holding brake	X108	30
Control/status inputs and outputs	X132	3
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 mm² ... 2.5 mm² (AWG: 14 ... 12)	9 mm ... 10 mm	Pin-type 
Mains supply (PE)	Screw-type	0.75 mm² ... 2.5 mm² (AWG: 14 ... 12)	10 mm	Ring type 
24 V DC power supply	Spring-loaded	0.5 mm² ... 2.5 mm² (AWG: 20 ... 12)	10 mm ... 11 mm[1)]	Pin-type 
External braking resistor	Spring-loaded	0.75 mm² ... 2.5 mm² (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 mm² ... 1.5 mm² (AWG: 24 ... 16)	10 mm	Pin-type 
Motor power connection	Spring-loaded	0.75 mm² ... 2.5 mm² (AWG: 18 ... 12)	9 mm ... 10 mm	Pin-type 
Motor holding brake[2)]	Spring-loaded	0.38 mm² ... 0.75 mm² (AWG: 22 ... 18)	9 mm ... 10 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 PTI only

More information

For more information about assembling cable terminals, see Section "Assembling cables (Page 734)".

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 L2 L3 DCP R2 R1	L1	Line phase L1/line phase L[1)]	Maximum current limit: 20 A
	L2	Line phase L2	
	L3	Line phase L3/neutral N[1)]	

[1)] For applications on the single-phase mains supply network

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:

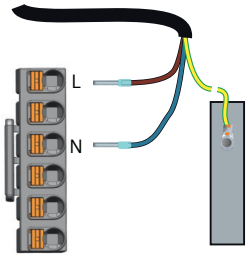


Figure 6-3 Connecting to the single-phase mains supply network

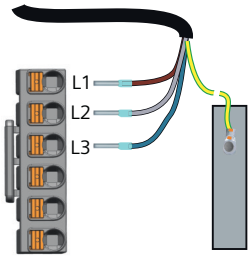


Figure 6-4 Connecting to the three-phase mains supply network

More information

For more information about cable requirements, see Section "Cables and connectors (Page 124)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 734)".

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:

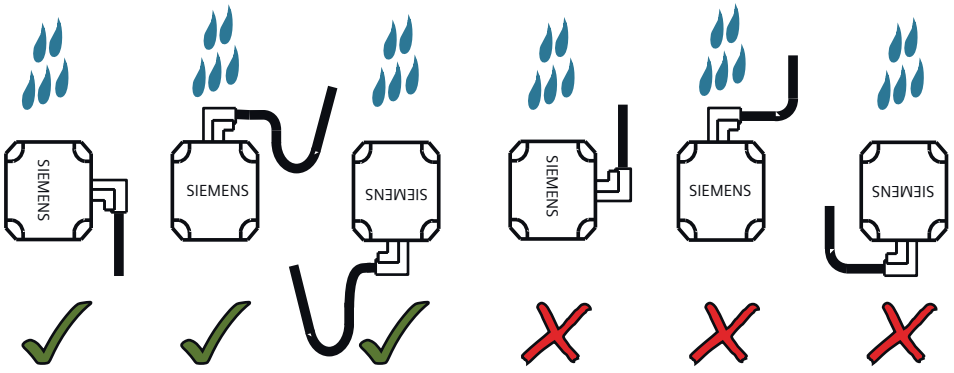


Figure 6-5 Routing cables in damp environments

6.5.2 Connecting the motor power interface

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)

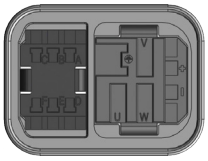
Overview

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

- SH20, 30, and 40: hybrid connector that integrates power, encoder, and holding brake interfaces
- SH48 and 52: M17 angular connector that integrates power and holding brake interfaces
- SH45, 65, and 90: M23 angular connector

Description

- 1FL2 shaft heights 20, 30, and 40

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

- 1FL2 shaft heights 45, 65, and 90

Motor power interface	Pin	Designation
 M23 angular connector	1	Phase U
	2	Phase V
	3	Phase W
	PE	Protective grounding

6.5.2.3 Wiring

Connection example

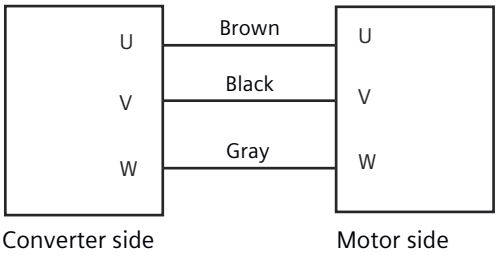
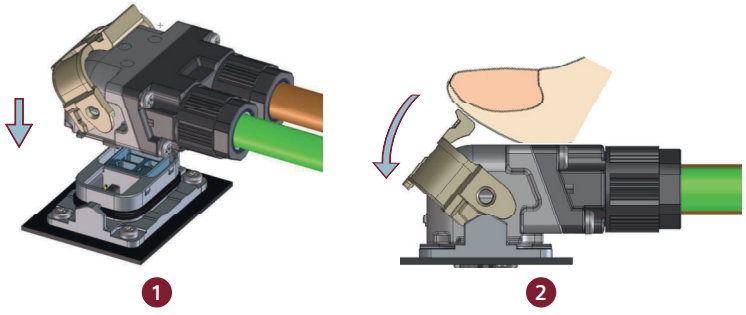


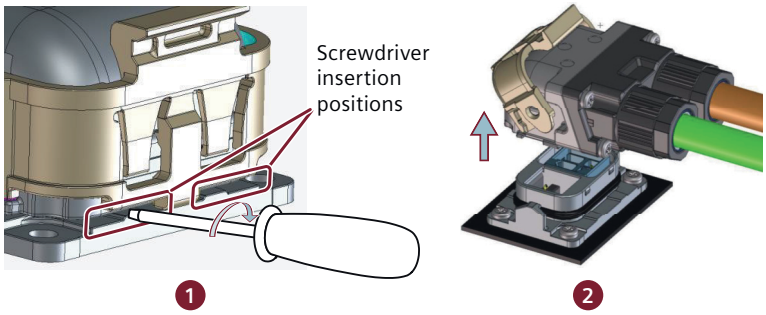
Figure 6-6 Motor power connection

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 124)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 734)".

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.

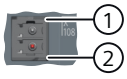
The holding brake is activated once the motor power is cut off. Use the holding brake only when the motor is at a standstill. Do not use the holding brake to stop the load in motion.

Description

S200 PTI

S200 PTI 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 PTI

S200 Basic PTI 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 X132 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 130)".
- 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 130)".
- 1FL2 shaft heights 45, 65, and 90

Holding brake interface	Pin	Designation
 M17 angular connector	1	Holding brake, positive
	2	Holding brake, negative

6.5.3.3 Wiring

Connection example

Connecting S200 PTI to the motor holding brake

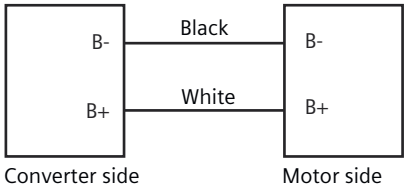


Figure 6-7 Motor holding brake connection via X108

Connecting S200 Basic PTI to the motor holding brake

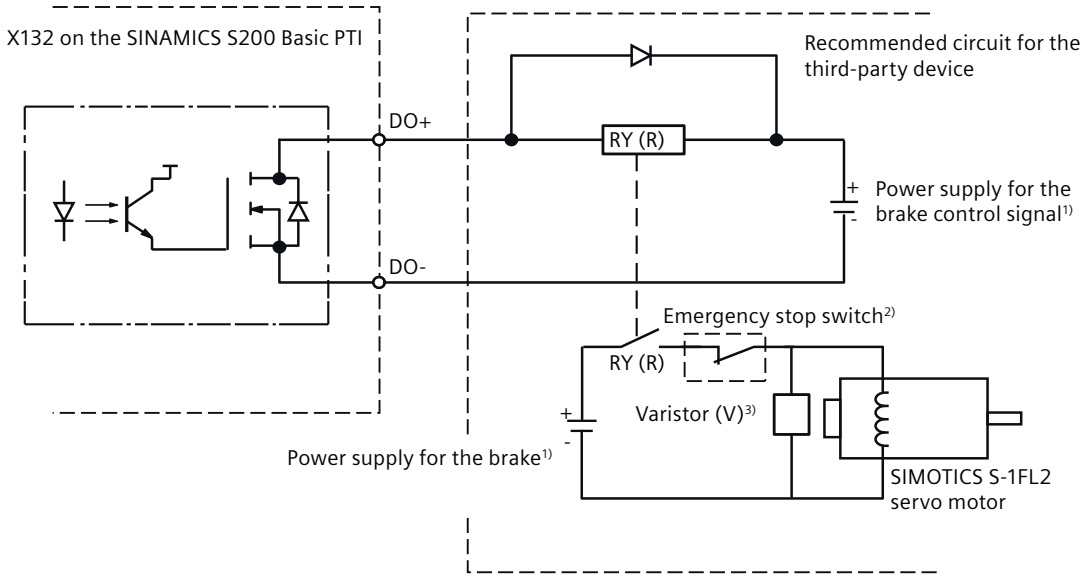


Figure 6-8 Motor holding brake connection via a digital output

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.

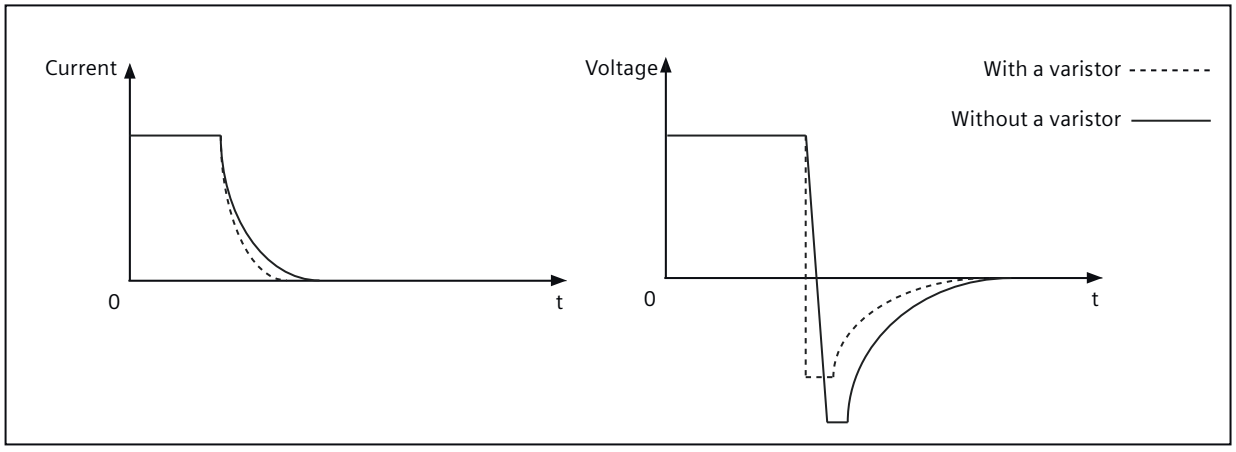
3) Install a varistor to suppress the surge voltage or surge current generated by the relay (RY) during its ON/OFF operation.

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 • At DC-13 at 24 V	2 A

More information

For more information about cable requirements, see Section "Cables and connectors (Page 124)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 734)".

6.5.4 Connecting the encoder

6.5.4.1 Interface description - X120 (converter side)

Overview

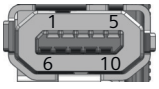
The servo drive system supports three types of encoders:

- 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	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 130)".
- 1FL2 shaft heights 48 and 52

Encoder interface	Pin	Designation
 M17 angular connector	1	Encoder power supply, 5 V
	2	Encoder power supply, reference ground
	3	Absolute encoder clock signal, positive
	4	Absolute encoder clock signal, negative
	5	Absolute encoder data signal, positive
	6	Absolute encoder data signal, negative

- 1FL2 shaft heights 45, 65, and 90

Encoder interface	Pin	Designation
 M17 angular connector	1	Encoder power supply, 5 V
	2	Encoder power supply, reference ground
	3	Reserved
	4	Absolute encoder clock signal, negative
	5	Absolute encoder data signal, positive
	6	Absolute encoder clock signal, positive
	7	Reserved
	8	Absolute encoder data signal, negative

6.5.4.3 Wiring

Connection example

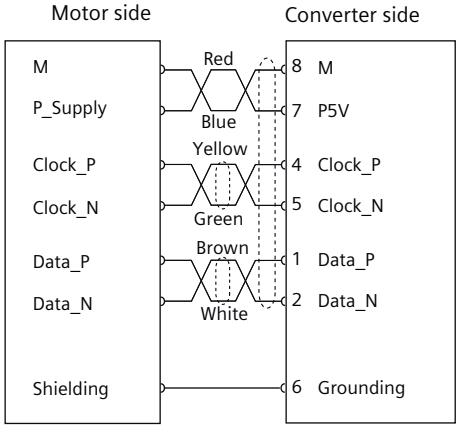


Figure 6-9 Encoder connection

More information

For more information about cable requirements, see Section "Cables and connectors (Page 124)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 734)".

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.

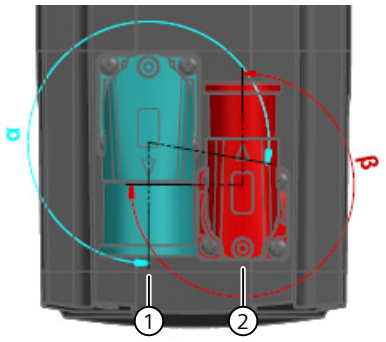
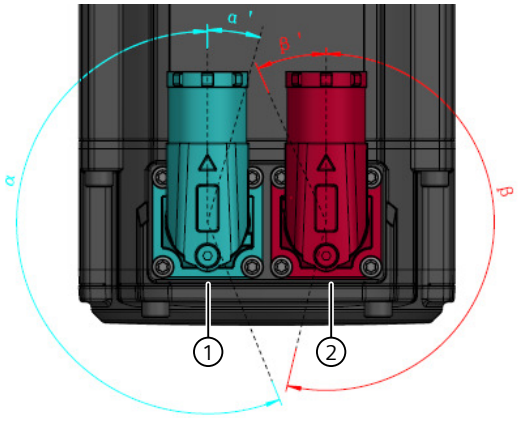
⚠ WARNING

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°	

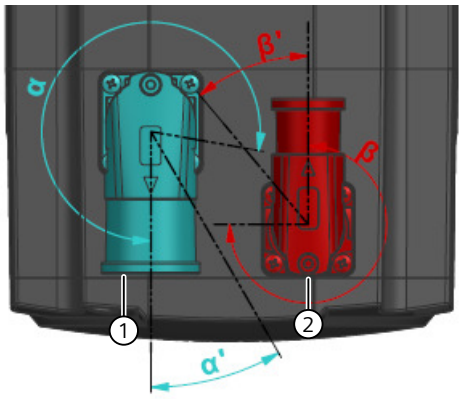
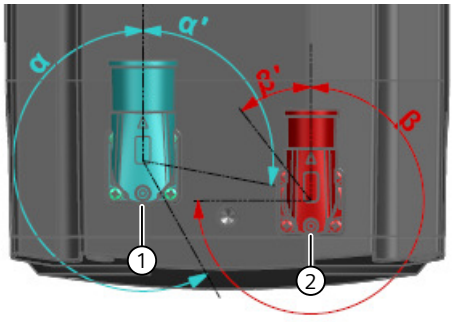
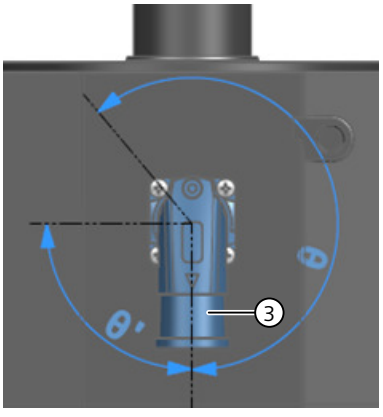
Motor	Power connector ①, size M17 and M23			Encoder connector ②, size M17		Drawing
	Size	Angle α	Angle α'	Angle β	Angle β'	
SH65	M23	280°	30°	270°	40°	
SH90	M23	210°	100°	270°	40°	

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 SH90	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
 L1 L2 L3 DCP R2 R1	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 PTI (FSA and FSB) and S200 PTI FSA (0.1 kW) do not have an internal braking resistor.

6.6.2 Wiring

Overview

S200 Basic PTI FSC and S200 PTI (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

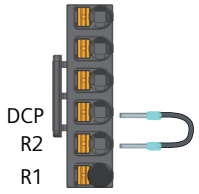
Using an unsuitable or improperly installed braking resistor can result in fire and formation of smoke. Fire and smoke can cause severe personal injury or property damage.

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

Procedure

Connecting the internal braking resistor

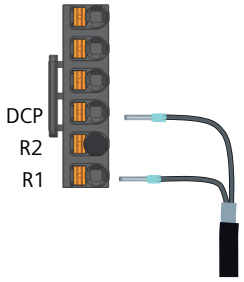
1. Switch off all power supplies to the converter, including the mains supply and the 24 V DC power supply.
2. Cover the terminal R1 with the blanking plug.
3. Connect DCP and R2 with the jumper included in the scope of delivery as shown below:



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 connection between DCP and R2.

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 124)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 734)".

6.7 Connecting the 24 V DC power supply

6.7.1 Interface description - X124

Overview

The servo drive system supports the daisy-chain connection of multiple converters to an external 24 V power supply via interface X124. 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 0 V 24 V 24 V	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

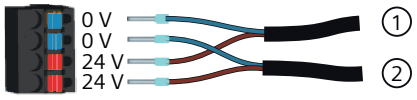
Electric shock due to unsuitable power supply

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 124)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 734)".

6.8 Connecting the inputs and outputs

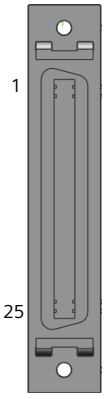
6.8.1 Interface description - X132

Overview

The converter connects to the controller for signal transmission on the interface X132.

Description

Table 6-11 Interface X132

X132	Pin	Designation		Technical specifications	Conductor color
		S200 PTI	S200 Basic PTI		
 50-pin MDR socket Tightening torque: 0.2 Nm	1	PTIA_D+	PTIA_D+	High-speed 5 V differential pulse train input A (+)	Gray-Pink
	2	PTIA_D-	PTIA_D-	High-speed 5 V differential pulse train input A (-)	Red-Blue
	3	DI_COM	DI_COM	Common terminal for digital inputs	Green
	4	DI_COM	DI_COM	Common terminal for digital inputs	Yellow
	5	DI0	-	Digital input 0 (high-speed digital input)	Gray
	6	DI1	-	Digital input 1 (high-speed digital input)	Pink
	7	DI2	DI2	Digital input 2	Blue
	8	DI3	DI3	Digital input 3	Red
	9	DI4	DI4	Digital input 4	Black
	10	DI5	DI5	Digital input 5	Violet
	11	DI6	DI6	Digital input 6	White
	12	DI7	DI7	Digital input 7	Brown
	13	DI8	-	Digital input 8	White-Green
	14	DI9	-	Digital input 9	Brown-Green
	15	PTOA+	PTOA+	High-speed 5 V differential pulse train encoder output A (+)	White-Yellow
	16	PTOA-	PTOA-	High-speed 5 V differential pulse train encoder output A (-)	Yellow-Brown
	17	PTOZ(OC)	PTOZ(OC)	Pulse train encoder zero mark signal (open collector output)	White-Gray
	18	P12OPVADC	P12OPVADC	12 V power output	Gray-Brown
	19	AI0+	-	Analog input channel 0, positive	White-Pink
	20	AI0-	-	Analog input channel 0, negative	Pink-Brown
	21	AI1+	-	Analog input channel 1, positive	White-Blue
	22	AI1-	-	Analog input channel 1, negative	Brown-Blue
	23	RS485+	-	RS485 differential signal, positive	White-Red
	24	M	M	Reference ground	Brown-Red
	25	RS485-	-	RS485 differential signal, negative	Gray-Green
	26	PTIB_D+	PTIB_D+	High-speed 5 V differential pulse train input B (+)	White-Black
	27	PTIB_D-	PTIB_D-	High-speed 5 V differential pulse train input B (-)	Brown-Black
	28	P24_DO	P24_DO	External 24 V supply for digital outputs	Yellow-Gray
	29	DO3+	DO3+	Digital output 3, positive	Green
	30	DO0	-	Digital output 0	Yellow
	31	DO1	-	Digital output 1	Gray
	32	DO2	DO2	Digital output 2	Pink
	33	DO3-	DO3-	Digital output 3, negative	Pink-Green
	34	DO4+	DO4+	Digital output 4, positive	Yellow-Pink
	35	DO5+	DO5+	Digital output 5, positive	Green-Red

X132	Pin	Designation		Technical specifications	Conductor color
		S200 PTI	S200 Basic PTI		
	36	PTIA_P	PTIA_P	24 V pulse train input A, positive	Green-Blue
	37	PTIA_M	PTIA_M	24 V pulse train input A, ground	Yellow-Blue
	38	PTIB_P	PTIB_P	24 V pulse train input B, positive	Green-Black
	39	PTIB_M	PTIB_M	24 V pulse train input B, ground	Yellow-Black
	40	PTOB+	PTOB+	High-speed 5 V differential pulse train encoder output B (+)	Gray-Blue
	41	PTOB-	PTOB-	High-speed 5 V differential pulse train encoder output B (-)	Pink-Blue
	42	PTOZ+	PTOZ+	High-speed 5 V differential pulse train encoder output Z (+)	Gray-Red
	43	PTOZ-	PTOZ-	High-speed 5 V differential pulse train encoder output Z (-)	Pink-Red
	44	DO4-	DO4-	Digital output 4, negative	Yellow-Red
	45	AO_M	-	Analog output ground	Gray-Black
	46	AO0	-	Analog output channel 0	Pink-Black
	47	AO_M	-	Analog output ground	Blue-Black
	48	AO1	-	Analog output channel 1	Red-Black
	49	DO5-	DO5-	Digital output 5, negative	White
	50	MEXT_DO	MEXT_DO	External 24 V ground for digital outputs	Brown

More information

For more information about cable requirements, see Section "Cables and connectors (Page 124)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 734)".

6.8.2 Wiring

6.8.2.1 Wiring of digital inputs

Overview

S200 PTI offers ten digital inputs (from DI0 to DI9), and S200 Basic PTI offers six digital inputs (from DI2 to DI7). DI0 and DI1 only support PNP wiring, and other digital inputs support both NPN and PNP types of wiring.

Connection example

Connecting DI0 and DI1

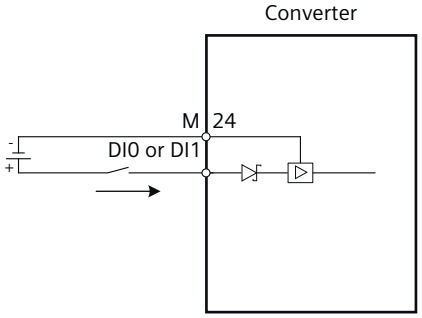
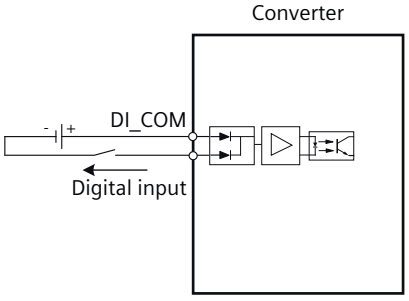
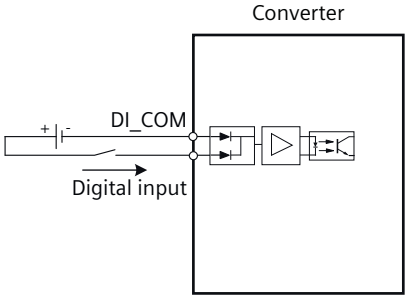


Figure 6-10 PNP wiring

Connecting DI2 to DI9



NPN wiring



PNP wiring

More information

For more information about the technical data of digital inputs, see Section "General technical data (Page 504)".

6.8.2.2 Wiring of digital outputs

Overview

S200 PTI offers six digital outputs (from DO0 to DO5), and S200 Basic PTI offers four digital outputs (from DO2 to DO5). DO0, DO1, and DO2 only support NPN wiring, and DO3, DO4, and DO5 support both NPN and PNP types of wiring.

Condition

⚠ 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 DO0, DO1, and DO2 as shown below:

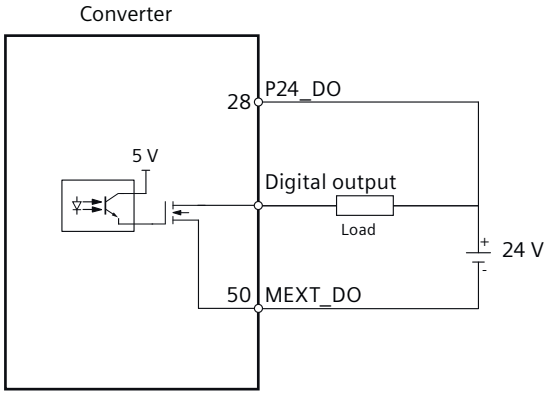
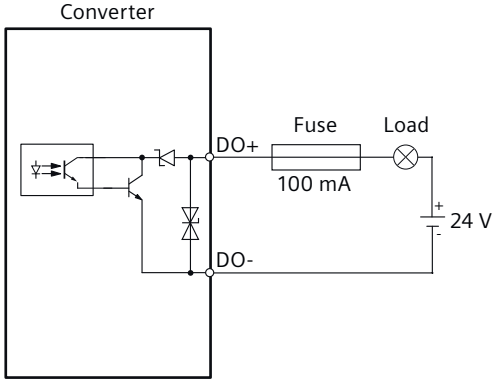
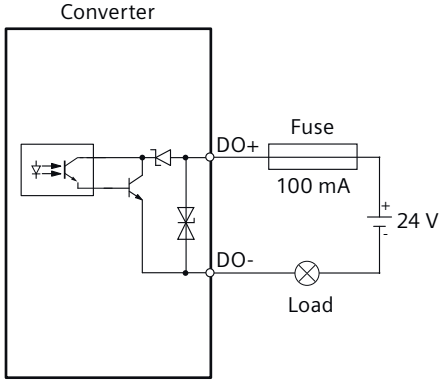


Figure 6-11 NPN wiring

You can connect DO3, DO4, and DO5 as shown below:



NPN wiring



PNP wiring

More information

For more information about the technical data of digital outputs, see Section "General technical data (Page 504)".

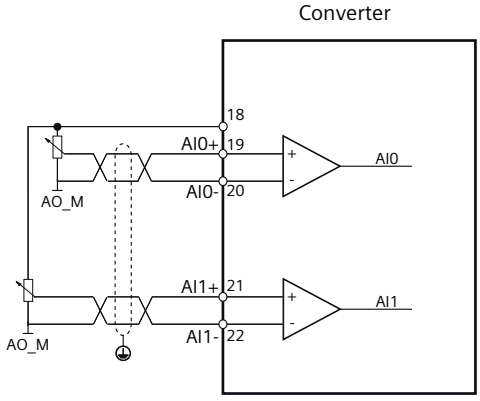
6.8.2.3 Wiring of analog inputs

Overview

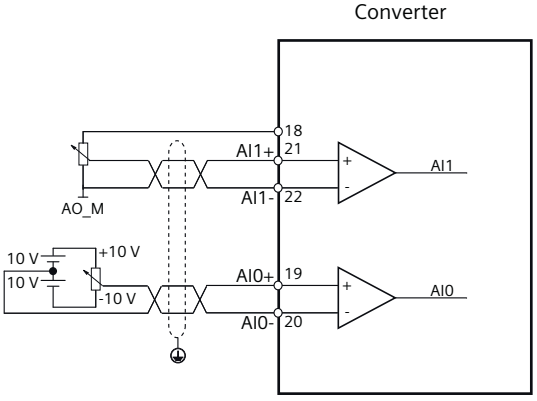
S200 PTI offers two analog inputs for torque and speed control. The wiring of the terminals varies depending on the selected control mode.

Connection example

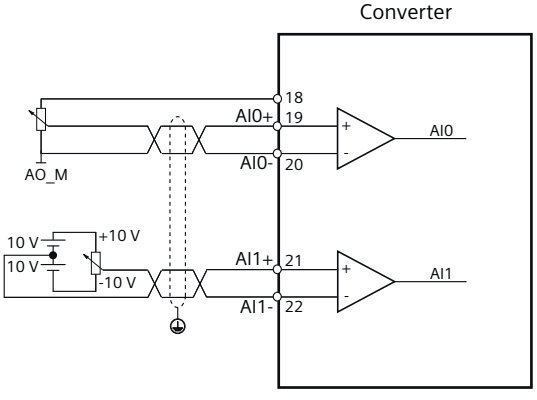
- To use AI0 for the speed limit signal and AI1 for the torque limit signal, connect the terminals as shown below:



- To use AI0 for the speed setpoint signal and AI1 for the torque limit signal, connect the terminals as shown below:



- To use AI0 for the speed limit signal and AI1 for the torque setpoint signal, connect the terminals as shown below:



More information

For more information about the technical data of analog inputs, see Section "General technical data (Page 504)".

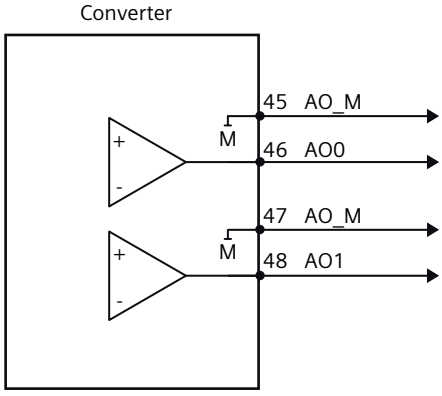
6.8.2.4 Wiring of analog outputs

Overview

S200 PTI offers two analog outputs for transmitting torque and speed signals to the controller.

Connection example

You can connect the analog outputs as shown below:



More information

For more information about the technical data of analog outputs, see Section "General technical data (Page 504)".

6.8.2.5 Wiring of pulse train inputs

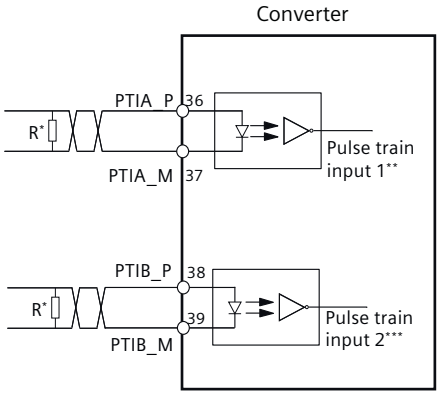
Overview

The converter offers two channels of pulse train inputs:

- 24 V single-end pulse train inputs
  The maximum input pulse frequency for the channel is 200 kHz.
- High-speed 5 V differential pulse train inputs
  The maximum input pulse frequency for the channel is 4 MHz.
  The channel supports wire-break detection for input pulse frequency up to 1 MHz. When the converter detects a disconnection in the wire, it outputs fault F07217.

Description

You can connect the pulse train inputs as shown below.

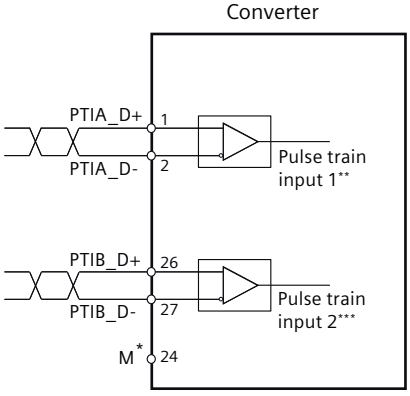


* When the input pulse frequency for the channel exceeds 100 kHz, install the resistor R (200 Ohm to 500 Ohm, recommended power ≥ 5 W).

** Depending on the selected setpoint pulse train input form, the pulse train input 1 can be A phase, CW, or pulse signals.

*** Depending on the selected setpoint pulse train input form, the pulse train input 2 can be B phase, CCW, or direction signals.

Figure 6-12 Wiring of 24 V single-end pulse train inputs



* Connected to the reference ground of the PLC

** Depending on the selected setpoint pulse train input form, the pulse train input 1 can be A phase, CW, or pulse signals.

*** Depending on the selected setpoint pulse train input form, the pulse train input 2 can be B phase, CCW, or direction signals.

Figure 6-13 Wiring of high-speed 5 V differential pulse train inputs

More information

For more information about the technical data of pulse train inputs, see Section "General technical data (Page 504)".

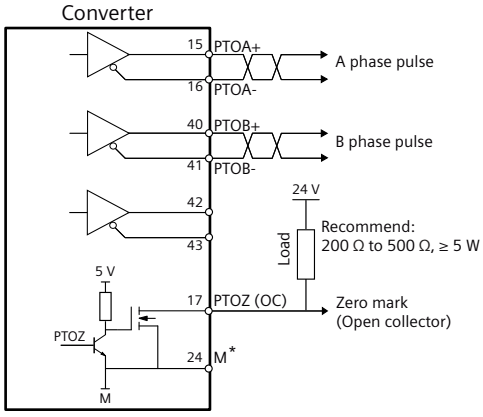
6.8.2.6 Wiring of pulse train outputs

Overview

The converter supports high-speed 5 V differential signals (A+/A-, B+/B-, Z+/Z-) and the open collector (zero pulse).

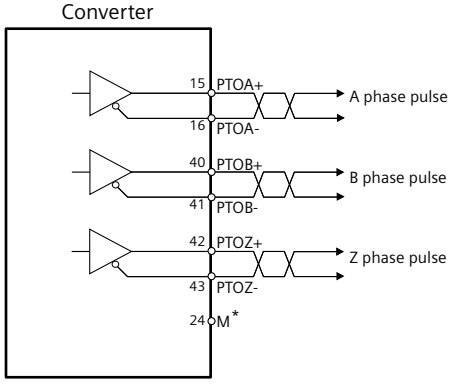
Description

You can connect the pulse train outputs as shown below:



* Connected to the reference ground of the PLC

Figure 6-14 Wiring with the open collector



* Connected to the reference ground of the PLC

Figure 6-15 Wiring without the open collector

More information

For more information about the technical data of pulse train outputs, see Section "General technical data (Page 504)".

6.8.2.7 Connection examples with SIMATIC S7-1200

Overview

This section shows the examples of connection between S200 PTI and SIMATIC S7-1200. The signal assignment shown in the examples is based on default settings. You can assign different signals to inputs and outputs based on your needs.

Connection example

Fast pulse train input position control mode (Fast PTI)

The following illustration uses high-speed 5 V differential pulse train inputs and outputs as an example.

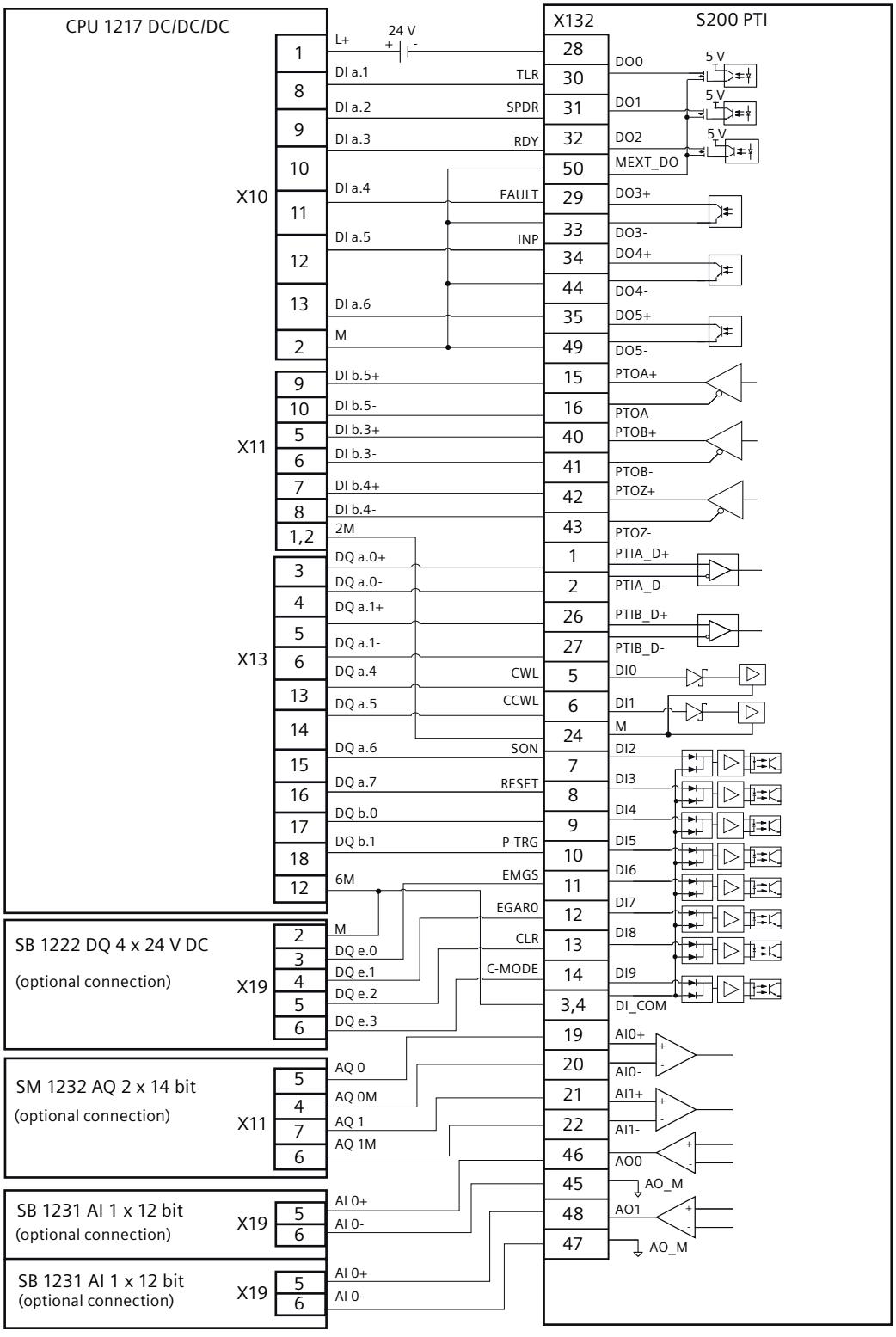


Figure 6-16 Connecting to S7-1200 for fast PTI mode

Speed control mode (S)

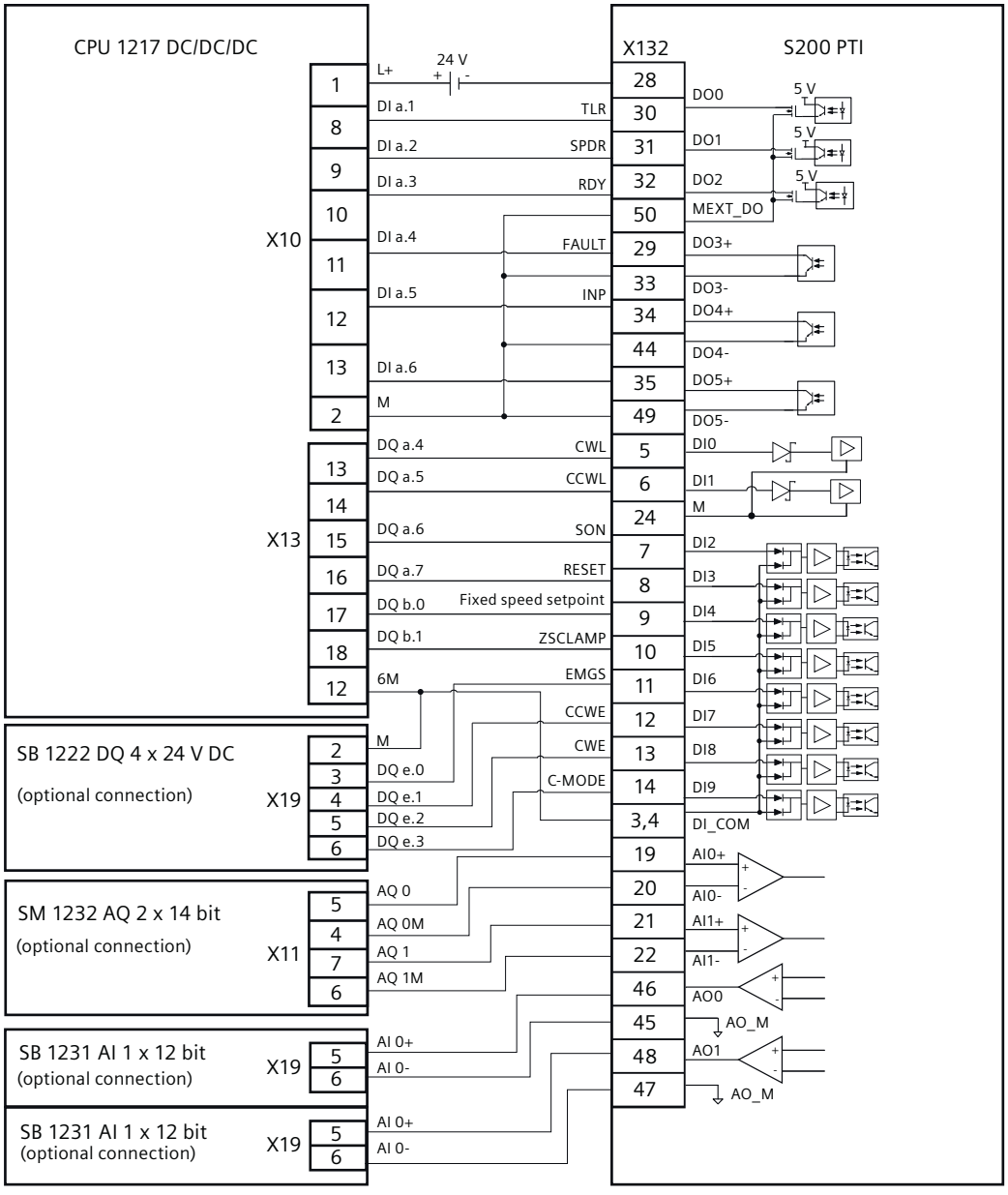


Figure 6-17 Connecting to S7-1200 for speed control mode

Torque control mode (T)

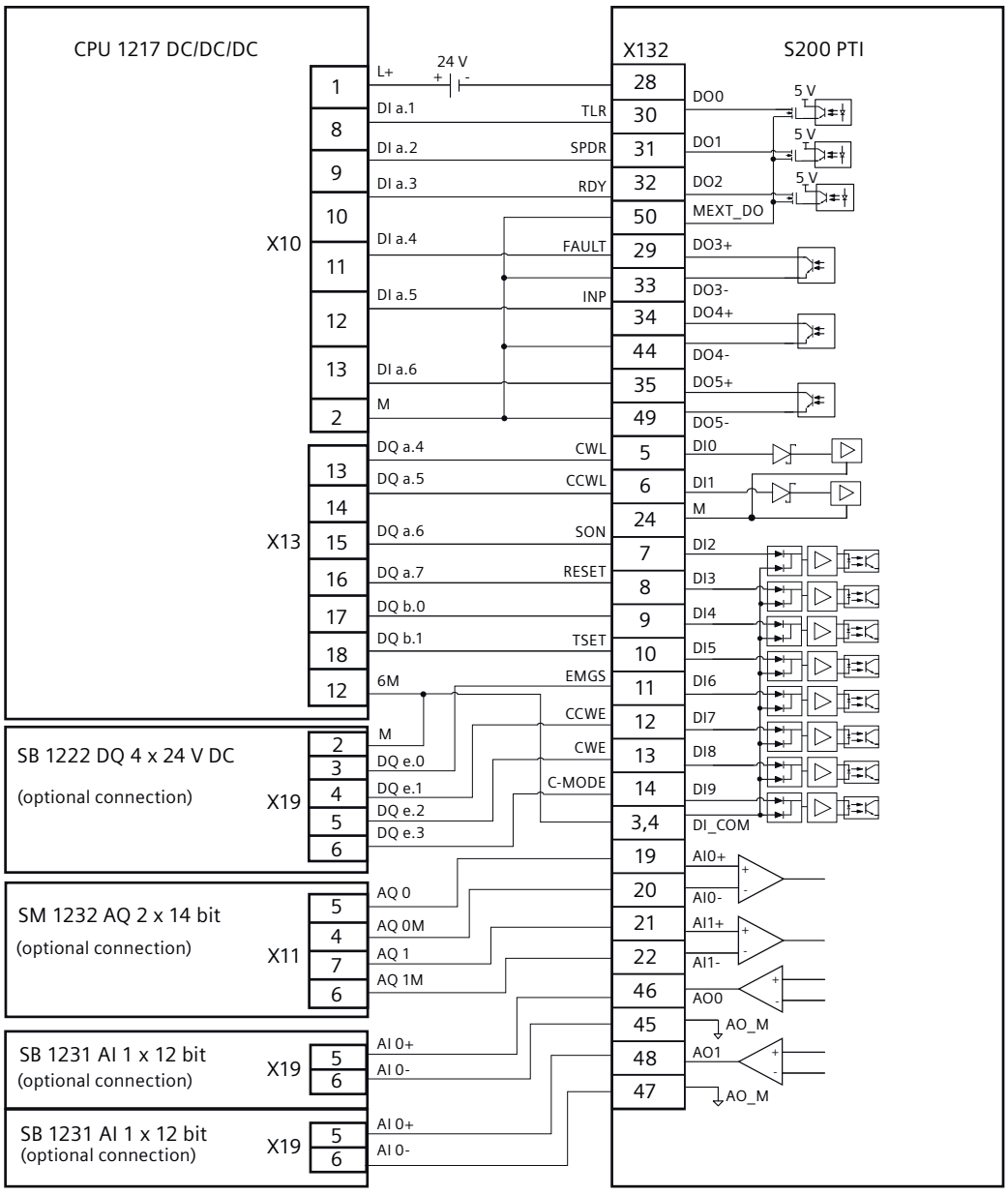


Figure 6-18 Connecting to S7-1200 for torque control mode

6.9 Connecting STO (for S200 PTI only)

6.9.1 Interface description - X131

Overview

S200 PTI offers the Safe Torque Off (STO) function. The function is enabled by default and cannot be configured.

To disable the Safety Integrated Functions, cover the interface X131 with the STO disable plug included in the connector kit.

Requirement

⚠ WARNING

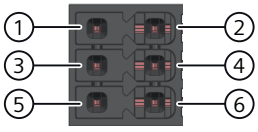
Material damages and personal injuries by the drop of a vertical axis

Unexpected drop of the vertical axis can cause material damages and personal injuries.

- Do not use the STO function with a vertical axis.

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

Two STO channels are available for connection to external safety devices.

To connection 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.

Connection example

The following illustrations take EMERGENCY STOP buttons as an example.

Interconnection for an EMERGENCY STOP button with 24 V DC internal

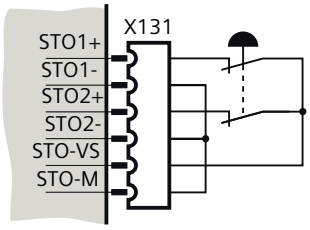


Figure 6-19 STO connection example with 24 V internal

Interconnection for an EMERGENCY STOP button with 24 V DC external

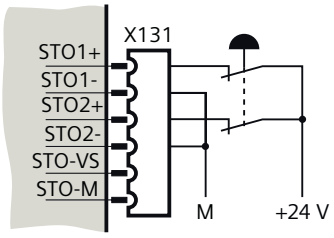


Figure 6-20 STO connection example with 24 V external

More information

For more information about cable requirements, see Section "Cables and connectors (Page 124)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 734)".

For more information about the STO function, see Section "Safety Integrated (for S200 PTI only) (Page 282)".

6.10 Connecting the service interface (Ethernet)

6.10.1 Interface description - X127

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.

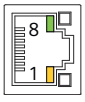
Requirement

Note

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

Description

Table 6-13 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 a yellow LED.

Table 6-14 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	No activity
	Yellow	Flashing light	Sending or receiving data

More information

For more information about cable requirements, see Section "Cables and connectors (Page 124)".

Commissioning (web server) 7

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

7.2 Fundamentals

7.2.1 Supported operating units

Description

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

- Programming device, PC, notebook
- Smartphone, tablet PC
  Mobile devices can be connected to the converter via third-party Ethernet OTG adapters or external WLAN access points.

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

7.2.2 Requirements for commissioning

Description

- You have correctly installed the converter and the motor.
- You have attached the motor including encoder to the mechanical system.
- You have connected the motor to the converter.
- You have connected the converter to the operating unit via the service interface (X127).
- You have switched on the converter supply voltage.
- The converter has ramped up.

7.2.3 Supported browsers

Description

Table 7-1 Browsers supported by the web server

Browser[1)]	Version
Apple Safari	≥ Version 15.0
Google Chrome	≥ Version 83
Microsoft Edge	≥ Version 88
Mozilla Firefox	≥ Version 91

1) Siemens recommends that you use the latest version of the browsers.

7.2.4 Communication interface

Description

The following interface is available for accessing the converter:

Interface	Information
Service interface X127	The default access to the web server is via the service interface X127.
	Service interface X127 is intended for commissioning and diagnostics, which means that it must always be accessible.
	Defaults: • IP address: 169.254.11.22 • Subnet mask: 255.255.0.0 • Data transfer via HTTPS is activated in the factory setting.
	Restrictions: • 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.

7.2.5 Making the operating instructions available for the web server information system

Overview

For selected topics, you can use the information system of the web server to access the product documentation directly. To do this, you must make the product documentation available on a prepared SD card.

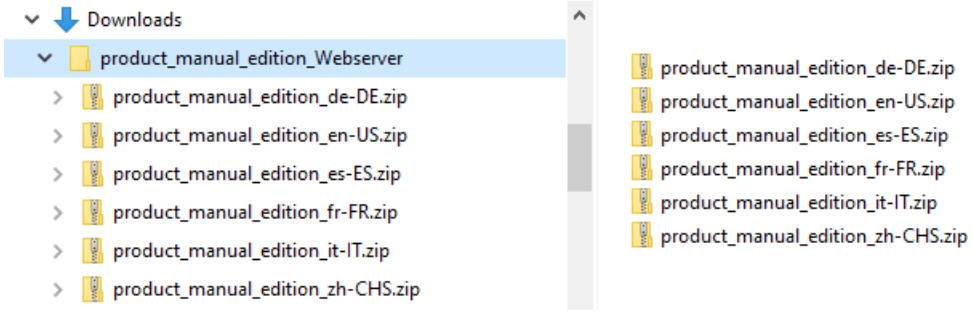
Requirement

- You have an empty SD card with a maximum storage capacity of 32 GB (e.g. 6SL5570-0GC00-0AA0) onto which you can load the product documentation.
- You have connected a suitable SD card reader to your PC.

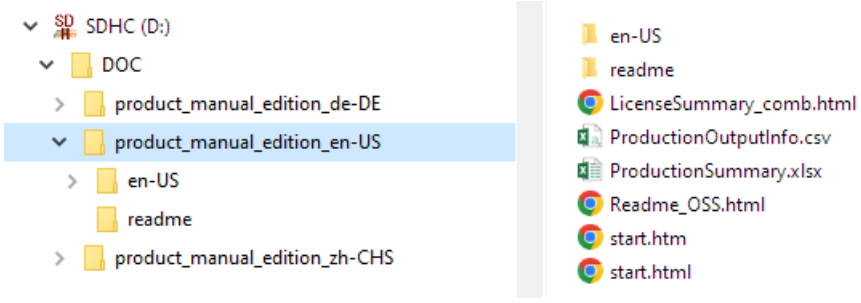
Procedure

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

1. Download the product documentation to your PC.
   The product documentation for the web server information system can be found at this address (https://support.industry.siemens.com/cs/ww/en/ps/29596).
   The file "product_manual_edition_Webserver.zip" is located under "Appendix to this entry".
   Explanation of the file name:
   - Product: Abbreviated form of product names
   - Manual: Abbreviated form of the manual title, for example "op_instr" for operating instructions
   - Edition: Month and year of publication of the manual in the format MMYY
2. Unzip the file that you downloaded "product_manual_edition_Webserver.zip".
   The file contains all available language versions as separately zipped files.



3. Unzip the required language version to a folder with the name of the ZIP file (e.g. for the English version "product_manual_edition_en-US").
4. Insert the SD card into your PC's SD card reader.
5. In the root directory of the SD card, create a folder called "DOC".
6. Copy the unzipped folder (for example "product_manual_edition_en-US") to the "DOC" directory on the SD card.



   Depending on the available space on the SD card, you can copy all available language versions to the SD card. To do this, repeat the unzip/copy process for each language version.
7. Eject the SD card from the PC.
8. Remove the SD card from the reader.
9. Insert the SD card into the converter.

Result

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

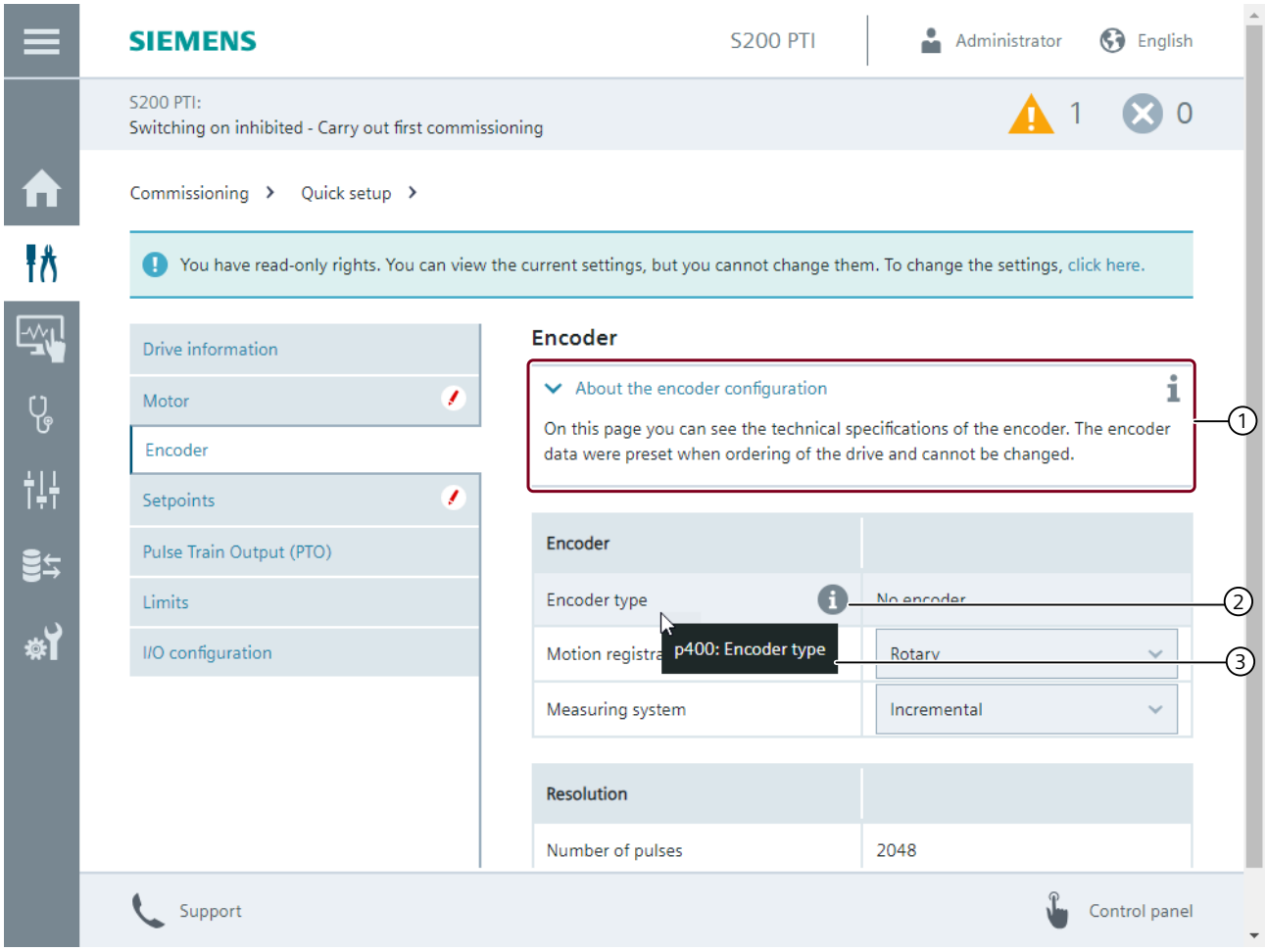
For selected topics, you can now access the instructions via the context-sensitive information system.

7.2.6 Using the web server information system

Overview

In the web server, you have the support of an integrated, multi-level information system.
You decide in a context-sensitive interface how much and what kind of information is displayed.

Description of function



① **Display general information about the function of the current view**

Click or tap on the header or on the expand icon to show general information about the function of the current view.

Click or tap again on the header or on the collapse icon to hide the general information about the function of the current view.

② **Display detailed information in a context-sensitive help window**

Point with the mouse pointer or tap on the setting you need information about.

The setting is highlighted and the assigned info icon appears.

When you move the mouse pointer to the info icon, the icon and the mouse pointer change their appearance.

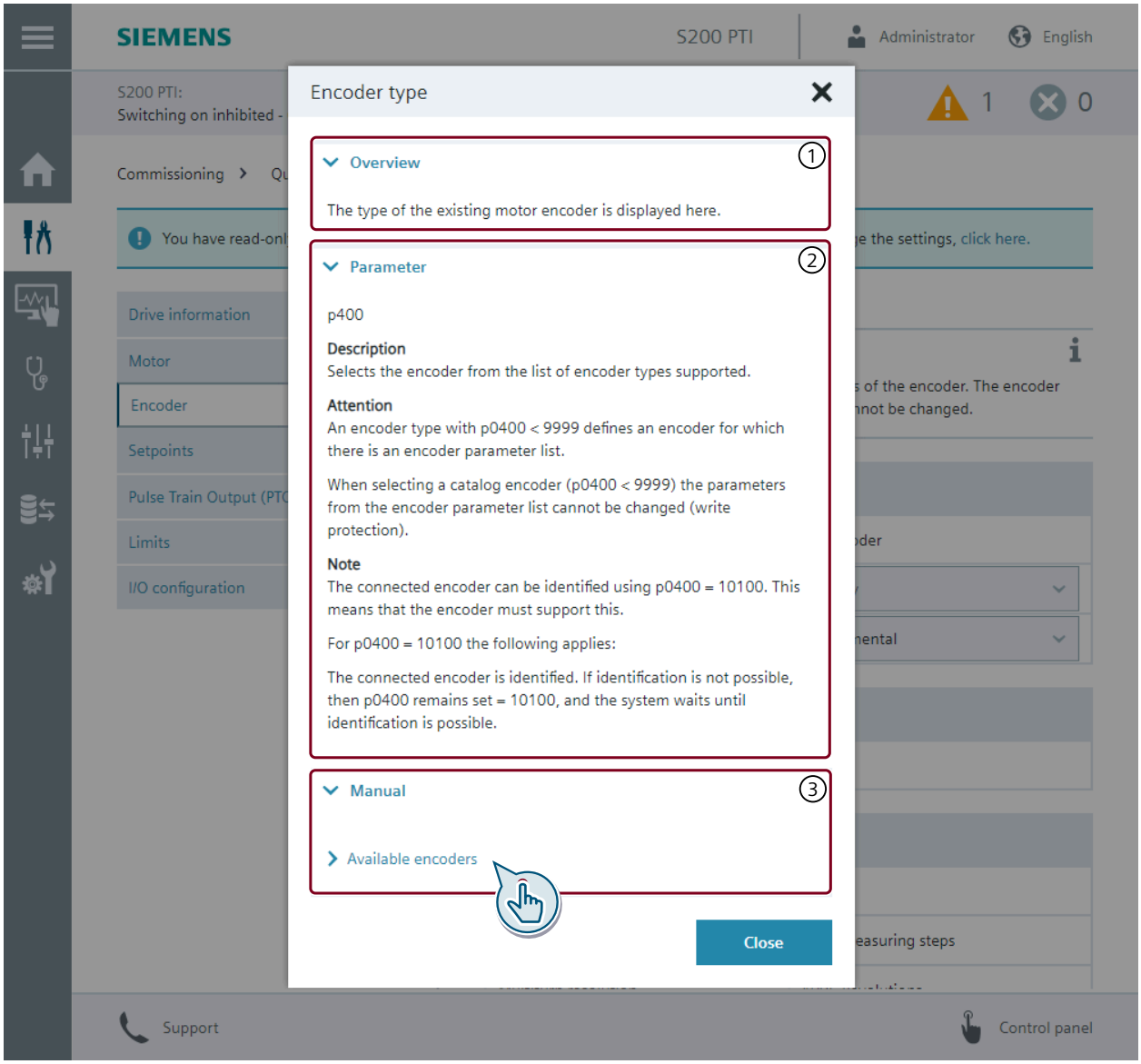
If you now click or tap on the info icon, a context-sensitive help window appears with detailed information.

③ **Display a tooltip with context-sensitive short information about a setting**

Point with the mouse pointer or tap on the setting you need information about.

If you hold the mouse pointer or keep the tap pressed on the setting for longer, a tooltip with the context-sensitive short information is displayed.

Figure 7-1 Information displayed in the current view



① **Overview**

Displays general information about the meaning or function of the setting.

- Click or tap on "Overview" or on the associated expand icon to show general information about the meaning or function of the setting.
- Click or tap again on "Overview" or on the associated collapse icon to hide the general information about the meaning or function of the setting.

② **Parameters**

Displays detailed information about the parameter defined by the setting.

- Click or tap on "Parameter" or on the associated expand icon to show detailed information about the parameter.
- Click or tap again on "Parameter" or on the associated collapse icon to hide the detailed information about the parameter.

③ **Manual**

For selected settings, you can use the links under "Manual" to access the operating instructions directly.

The requirements in order to do this are set out in Chapter "Making the operating instructions available for the web server information system (Page 167)".

- Click or tap on "Manual" or on the associated expand icon to show links to the operating instructions.

  Then, you can click or tap on a link to open the web browser and display the linked information in the operating instructions.
- Click or tap again on "Manual" or on the associated collapse icon to hide the links to the operating instructions.

Figure 7-2 Product-dependent information in a context-sensitive help window

7.2.7 Reloading pages

Procedure

If the web server does not respond, or if buttons are inactive or not labeled, although the converter is not fully utilized with internal calculations, then reload the web server pages.

Examples:

- At the PG/PC via <F5>
- At the tablet PC or smartphone via

7.3 Getting started

7.3.1 Calling the web server

Overview

Converter commissioning takes place with the user interface of the web server.

Requirement

- You have connected the converter and the operating unit via the service interface X127.

Procedure

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

More information

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

If you have already made the basic settings, then the web server starts and opens the home page. You can commission the converter, troubleshoot it, operate it, monitor it or call up support through the support pages.

7.3.2 Settings for brand-new converters

Overview

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

Requirement

- The operating unit is connected to the converter via the service interface X127.
- The web server is accessed with the IP address (default: 169.254.11.22).

Description of function

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

- Basic settings (Page 174)
- Security settings (Page 174)

7.3.3 Basic settings

Overview

Initial basic settings are defined in the function view.

Requirement

The web server is being called for the first time.

Description of function

The basic settings are as follows:

- Preferred language of the user interface
- Converter date and time

After these entries have been made, using the "Next" button, you can continue to the Security Wizard.

7.3.4 Security settings

Overview

The Security Wizard offers the following settings:

- User Management & Access Control (UMAC)
- Access to the integrated web server via the service interface with HTTP or HTTPS protocol
- Drive data encryption

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. You can find information about the following actions on the Internet:Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578). • 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.

Description of function

One of the following options can be selected:

- "Configure security settings"
  Siemens recommends this setting for comprehensive protection.
- "Continue with low security settings"
  With this setting, UMAC is deactivated.
  You can configure the security settings at a later time, see Section "Protection & Security (Page 213)".

Select "Configure security settings"

Define the settings for UMAC:

- "Activate User Management & Access Control":
  Activation is preset.
  If UMAC is activated, it can only be deactivated by a full reset of the converter to factory settings. This causes all security settings to be lost.
  You can find more information about the full reset to factory settings in Section "Restore factory settings (Page 209)".
- "Administrator setup":
  Specify the user name and password of the drive administrator.
  The drive administrator is permanently assigned the runtime role "Drive Administrator". This assignment cannot be changed.
- "Guest access configuration":
  Specify whether the user has read rights without logging in and whether the user is allowed to acknowledge results without logging in.
  The option is deactivated in the factory setting. If guest access is not permitted, then the login page is displayed when the web server is called.

Define the settings to access the web server:

- "Web server activation":
  - The factory setting to access the web server is service interface X127 with HTTPS protocol.
  - It is also possible to enable web server access via the service interface X127 with HTTP protocol.

Assign an additional password for encryption of the drive data:

- "Drive data encryption":
  The function is activated by default.
  The function encrypts sensitive data in the backup file and on the memory card of the converter. UMAC user data and passwords are sensitive data.
  To use function "Drive data encryption" independent of UMAC, option "Activate UMAC for the drive" must be deselected on page "Activate User Management & Access Control".

Check the configured settings:

- "Summary":
  The summary provides an overview of the configured settings.

Finish and continue

The settings are checked by clicking on "Finish". If there is no error, the settings are applied.

After finishing, you can continue with one of the following options:

- Continue with commissioning
- Continue with the web server home page

More information

More information about "Drive data encryption" can be found on the Internet.

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

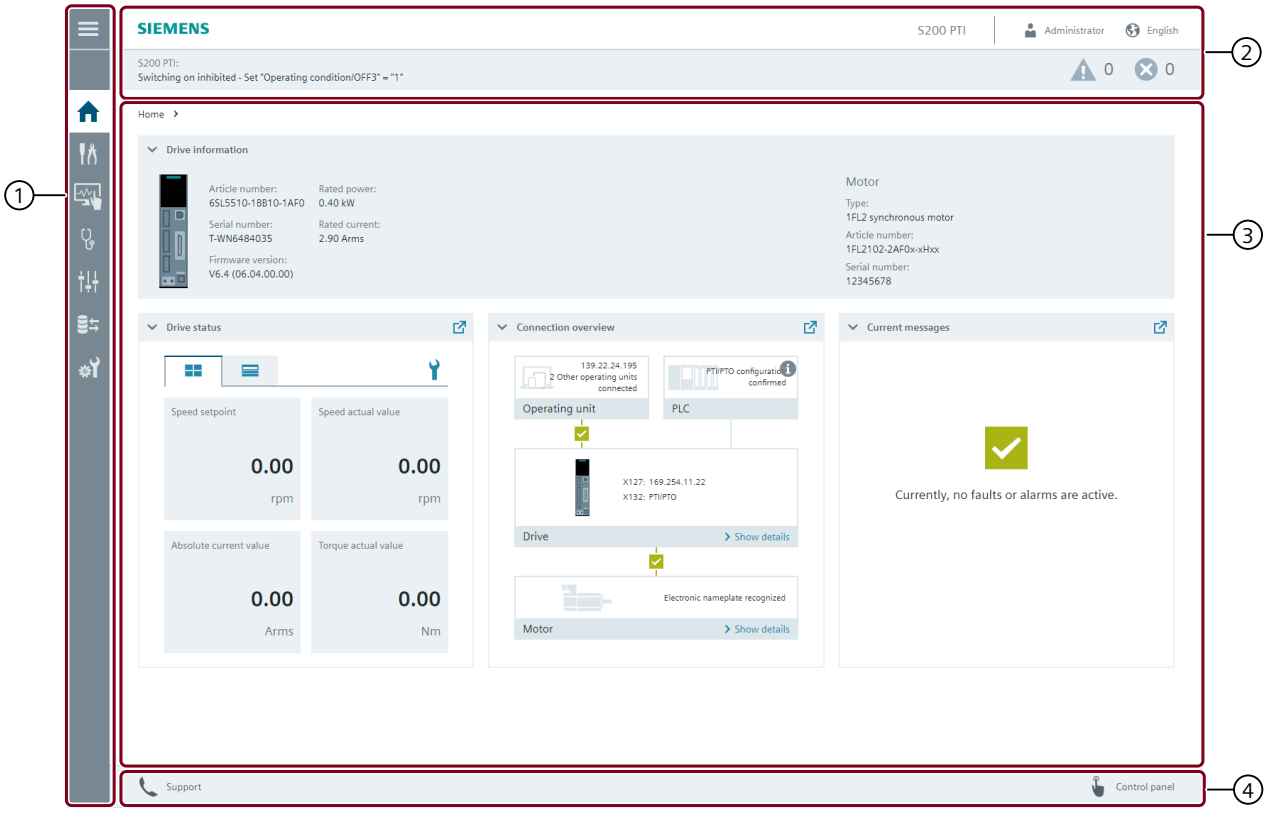
7.4 Functions and menus

7.4.1 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.



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 7-3 Structure of the web server (example)

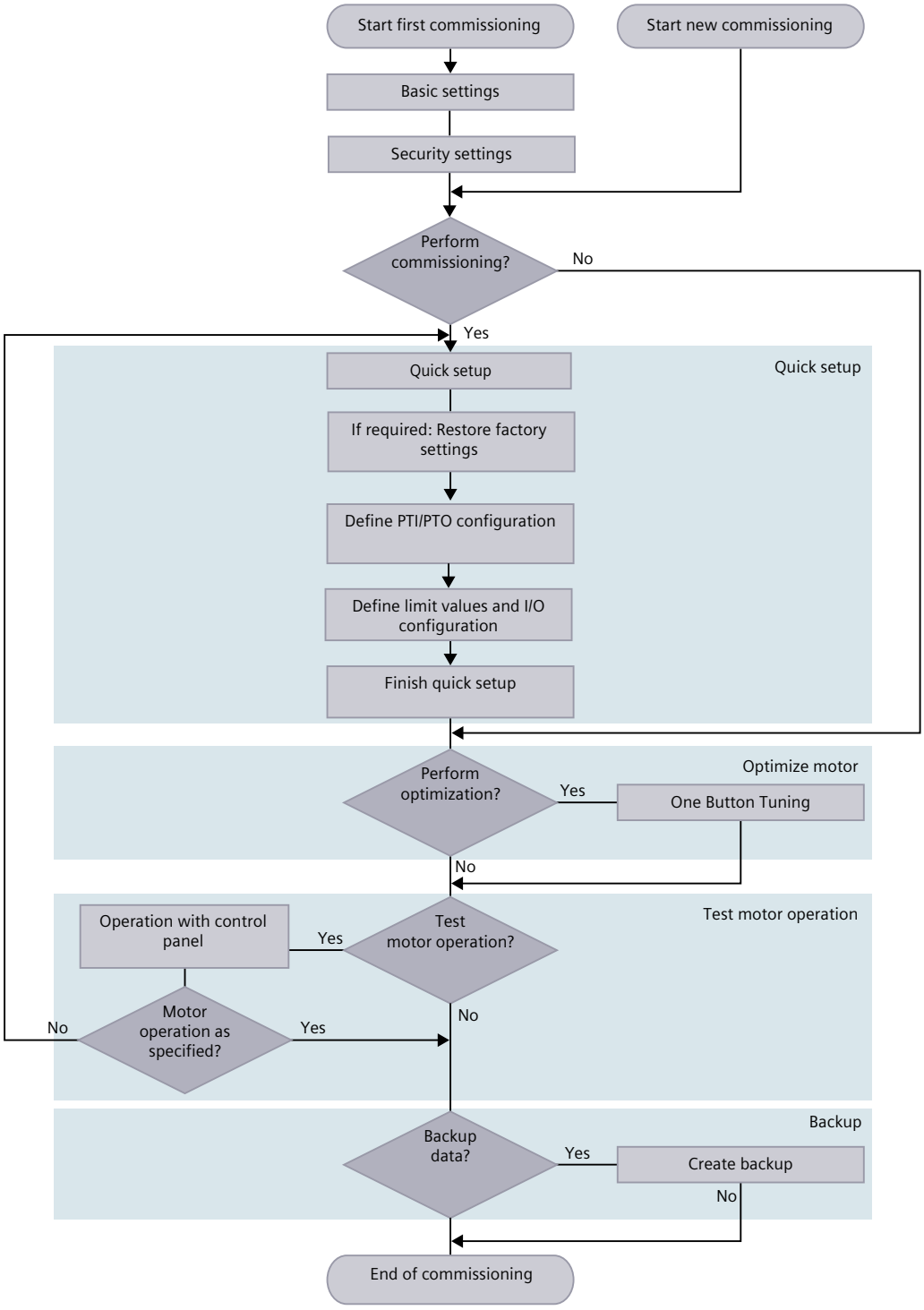
7.4.2 Commissioning

7.4.2.1 Complete commissioning workflow

Overview

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

Description of function



Commissioning involves the following steps:

- Basic settings:
  If the converter has already been commissioned, then the web server jumps to the basic settings.
  The following settings are required for a brand-new converter:
  - Language, date, time
- Security settings:
  The settings are configured with the help of the Security Wizard.
  You can find more information in Section "Security settings (Page 174)".
- Quick setup:
  Menu "Commissioning" > "Quick setup"
  - Entry or checking of motor and encoder data
  - PTI and PTO configuration
  - Limit values and I/O configuration
- Optimize motor:
  Menu "Commissioning" > "Optimization"
  The Optimization function measures the mechanical drive train using short test signals and adapts the controller parameters to the mechanics installed.
- Test motor operation:
  Action bar > "Control panel"
  Test of motor operation using the control panel in jog mode or continuous operation
- Backup:
  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, seeIndustrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578).

7.4.2.2 Quick setup

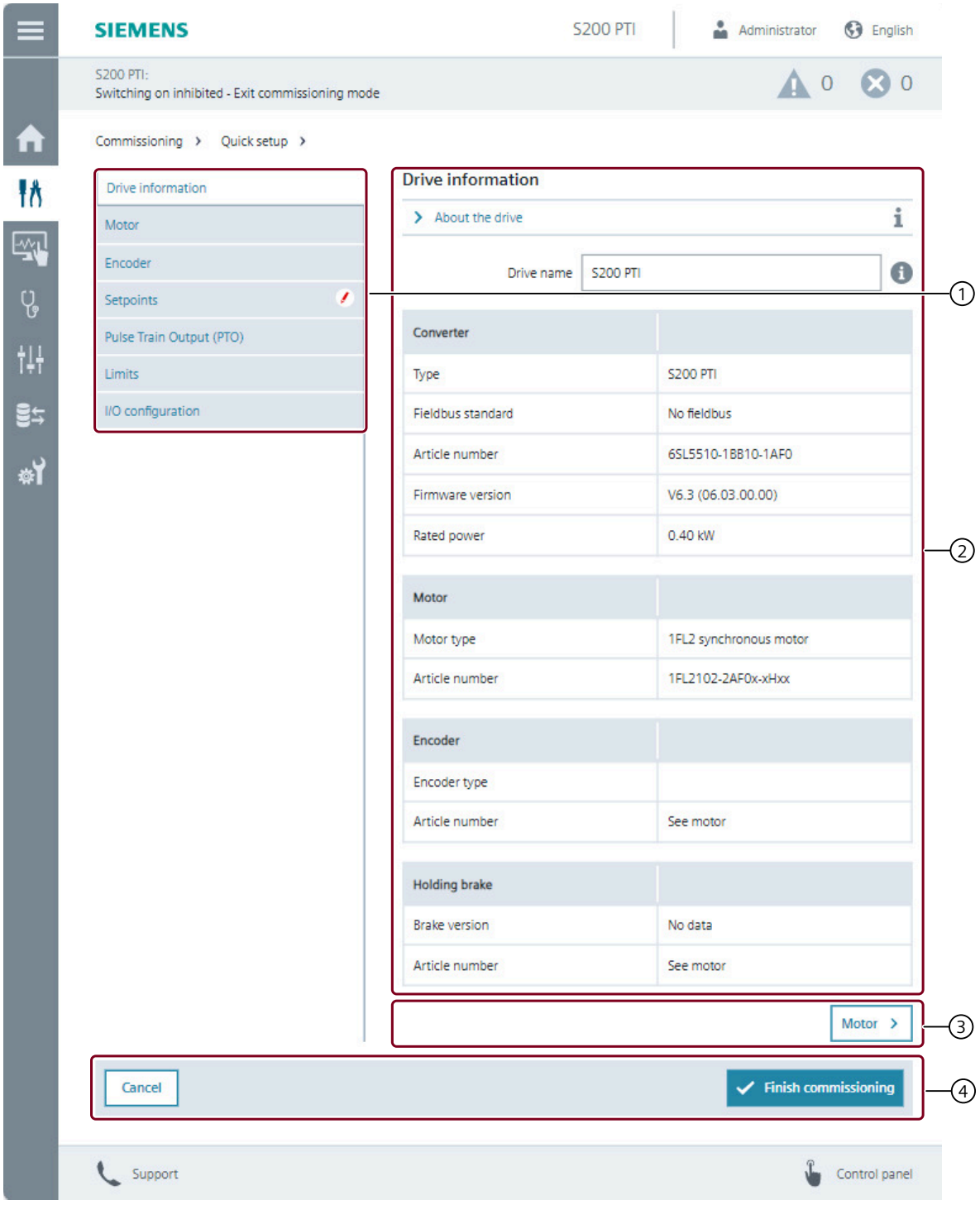
Overview

The converter can generally be operated without making additional settings using quick setup. Siemens recommends that you perform the quick setup for the target application.

Requirement

- The drive system has been configured. The components are wired.
- Web server access is active.

Description of function



① Navigation menu for quick setup
② Display of the individual quick setup steps
③ Alternative navigation
④ Control bar to cancel or complete quick setup

Display if changes have been made to the factory settings
The values entered are valid.

Display for checking of the modified values

At least one of the values needs to be modified.
Mandatory to complete quick setup

Figure 7-4 Quick setup (example)

The most important properties of the converter are configured in the quick setup.

Motor and encoder are directly detected during ramp-up. The data are accepted and shown in steps "Motor" and "Encoder". These data are for information only and cannot be changed during quick setup.

The converter creates a restore point when the quick setup is started. The converter saves the changes after every commissioning step. The converter is reset to the restore point if the quick setup is canceled.

The web server has a read-only mode for quick verification of the configuration data set.

Quick Setup Wizard

The Quick Setup Wizard of the web server guides you through the following quick setup steps.

- "Drive information"
  The step provides information about the converter, motor, encoder and motor holding brake being used.
  The following data can be changed:
  - Drive name
    A specific drive name can be assigned.
- "Motor"
  The data of the motor being used are displayed. It is not possible to configure another motor.
  The direction of rotation of the motor can be selected.
- "Encoder"
  The data of the encoder being used are displayed. Configuration is not possible.

- "Setpoints"
  The following settings can be configured through "Input configuration" for position control via Pulse Train Input (PTI):
  - Pulse train input channel
    Select between the 24 V single end pulse train input channel and the high-speed 5 V differential pulse train input channel.
  - Pulse train input form
    Select a pulse train input form according to the setting of the higher-level controller.
  - Filter time
    Set the filter time for pulse train input signals to improve tolerance with respect to external noise or disturbances. For the high-frequency input signal (> 200 kHz), Siemens recommends that you set the filter time to 0.04 us.

  The following functions can be configured through "Electronic gear ratio" for position control via Pulse Train Input (PTI):
  - Transmission ratio
    Set the number of setpoint pulses per motor revolution to define the motor revolutions and then define the distance of mechanical movement.
  - Position setpoint smoothing filter
    Configure smoothing time for the moving average filters and the low pass filter to achieve a softer control behavior.
- "Pulse Train Output (PTO)"
  The following settings can be configured through "Output configuration" for PTO position control:
  - 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.

  The following settings can be configured through "Electronic gear ratio" for PTO position control:
  - Gear ratio configuration
    Set the number of PTO pulses per motor revolution to transfer the distance of mechanical movement to a controller

- "Limits"
  - Torque and speed limits
    The converter limit values are shown graphically and in a tabular form.
  - "In-position" state
    Define the positioning window for the in-position monitoring function.
  - Device supply voltage (only available for 400 V variants)
- "I/O configuration"
  The configuration of the converter inputs and outputs is shown in a tabular form.
  - In the table, a function can be assigned to an input or output of the terminal. Specified functions can be selected.
  - The analog inputs 0 and 1 have been defined for speed limit and torque limit respectively by default. The corresponding fields are read-only.
  - You can click the icon to set the scaling and smoothing of functions assigned to the analog inputs and outputs.

More information

For more information about configuring setpoints, PTO, limits, and inputs/outputs, see Section "Functions (Page 225)"

7.4.2.3 Testing the converter configuration

Overview

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

Description of function

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

There are 2 ways of opening the control panel:

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

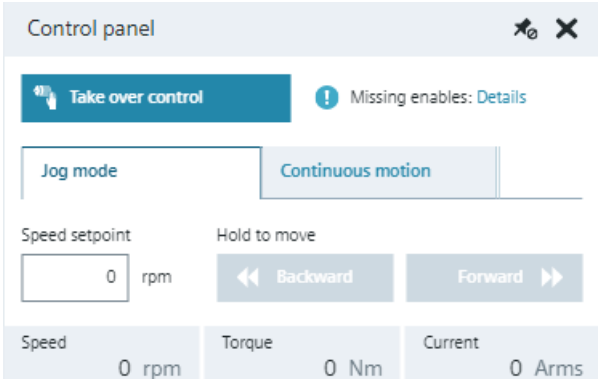


Figure 7-5 Testing the converter configuration via the control panel

More information

For more information, see Section "Control panel (Page 219)"

7.4.2.4 Optimization

Overview

After quick setup has been completed, 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. • If a particular direction of motion of the motor is impermissible, do not carry out One Button Tuning.

Description of function

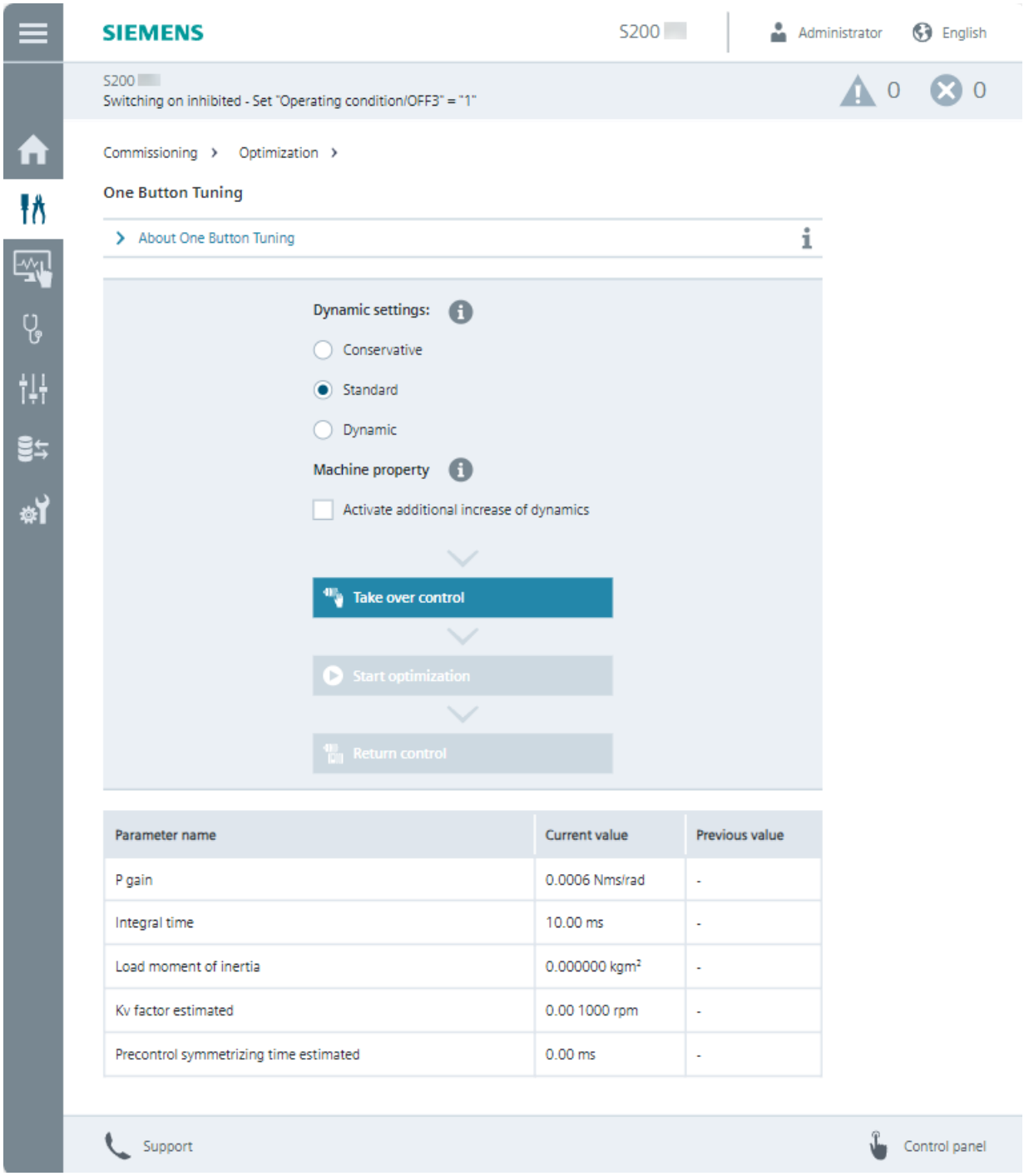


Figure 7-6 One Button Tuning

The optimum controller settings are determined using the following settings:

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

7.4.3 Monitoring and operation

7.4.3.1 Drive status

Overview

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

Description of function

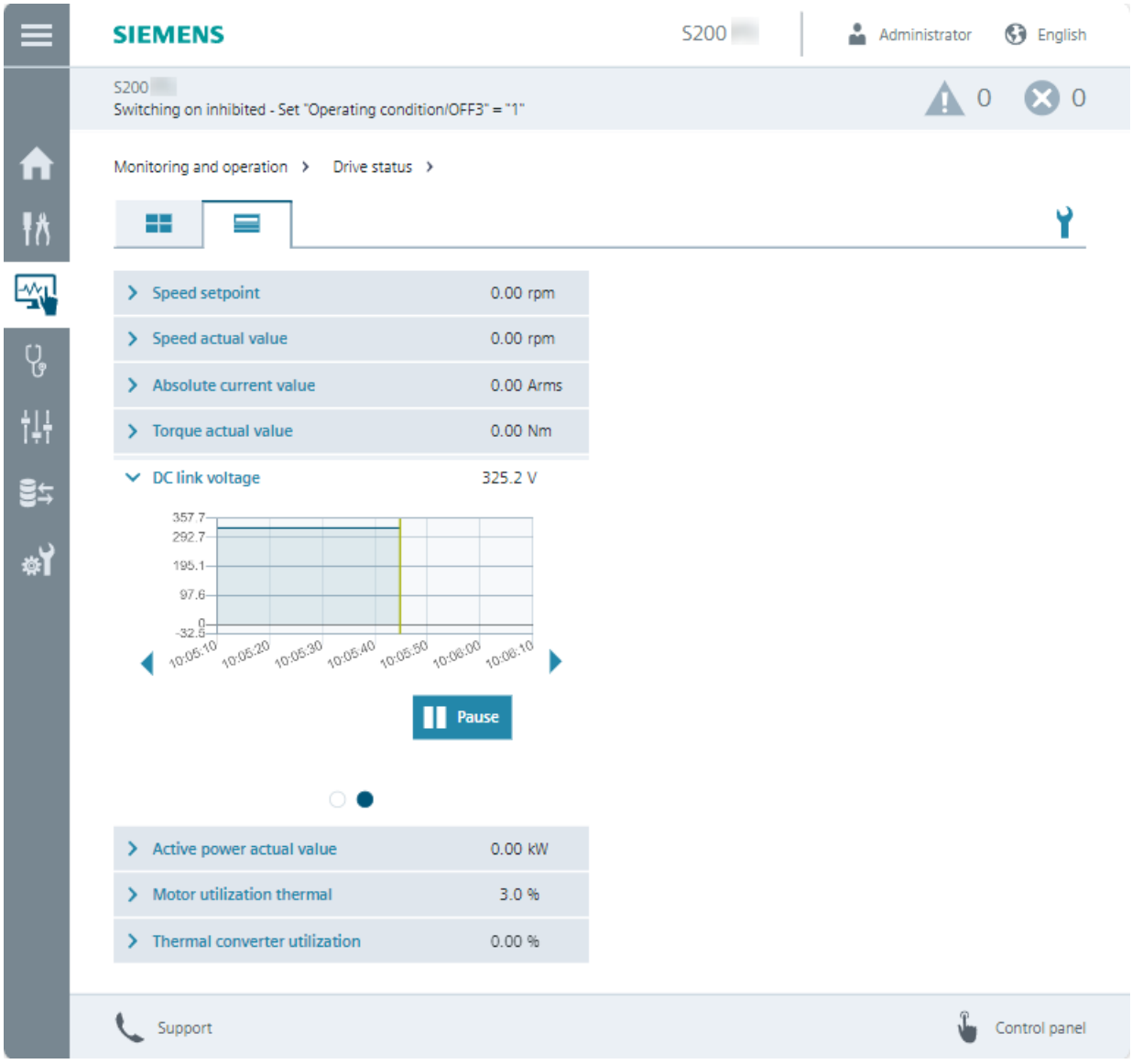


Figure 7-7 Drive status

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:

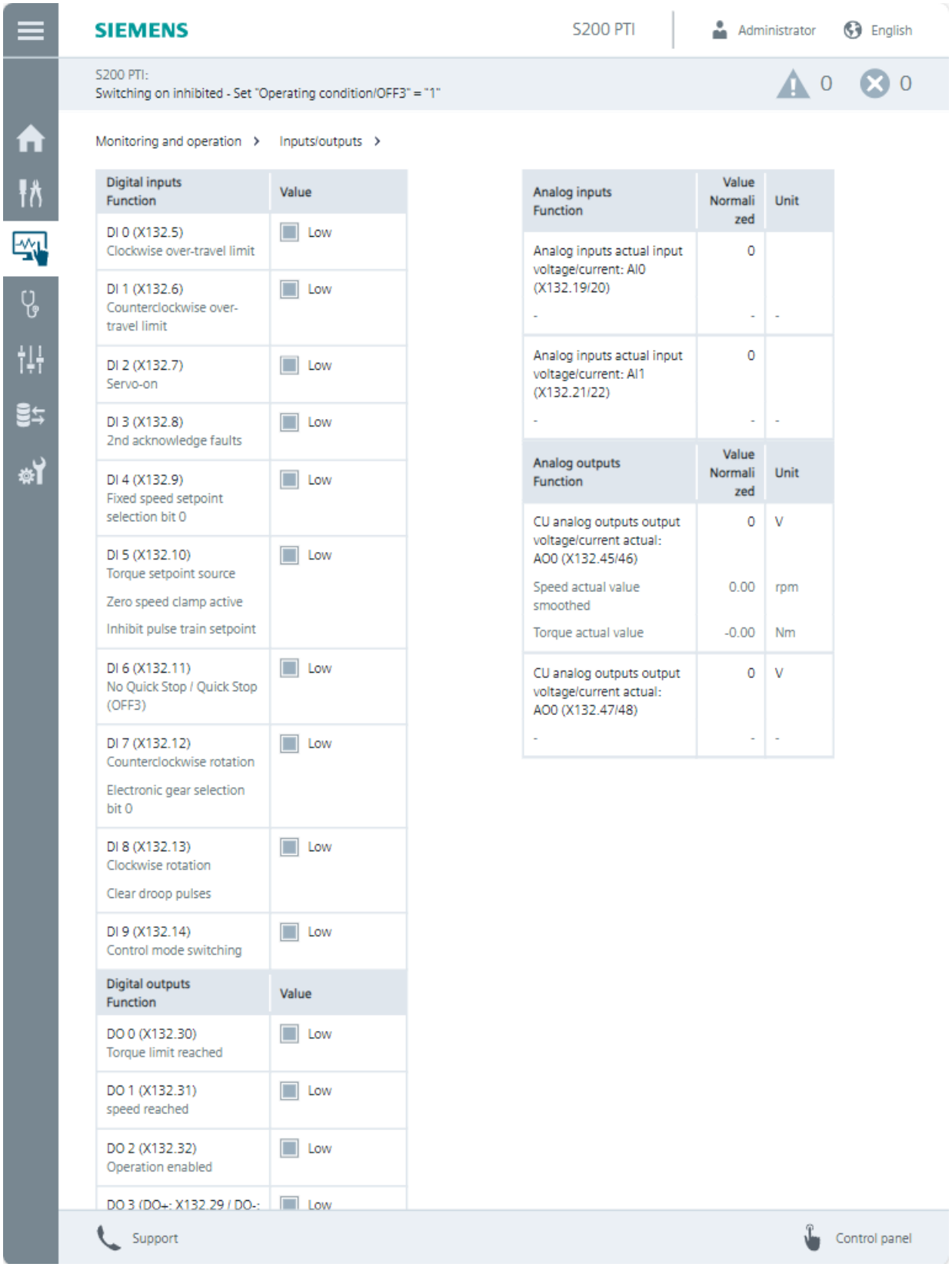
- : Individual values are continuously displayed
- : Individual values and trend diagrams are continuously displayed

7.4.3.2 Inputs/outputs

Overview

The function view "Inputs/outputs" shows the status of the digital inputs, digital outputs, analog inputs, and analog outputs offered by the converter.

Description of function


SIEMENS
S200 PTI
Administrator
English
S200 PTI:
Switching on inhibited - Set "Operating condition/OFF3" = "1"
0
0
Monitoring and operation
Inputs/outputs
Digital inputs Function
Value
DI 0 (X132.5) Clockwise over-travel limit
Low
DI 1 (X132.6) Counterclockwise over-travel limit
Low
DI 2 (X132.7) Servo-on
Low
DI 3 (X132.8) 2nd acknowledge faults
Low
DI 4 (X132.9) Fixed speed setpoint selection bit 0
Low
DI 5 (X132.10) Torque setpoint source
Zero speed clamp active
Inhibit pulse train setpoint
Low
DI 6 (X132.11) No Quick Stop / Quick Stop (OFF3)
Low
DI 7 (X132.12) Counterclockwise rotation
Electronic gear selection bit 0
Low
DI 8 (X132.13) Clockwise rotation
Clear droop pulses
Low
DI 9 (X132.14) Control mode switching
Low
Digital outputs Function
Value
DO 0 (X132.30) Torque limit reached
Low
DO 1 (X132.31) speed reached
Low
DO 2 (X132.32) Operation enabled
Low
DO 3 (DO+: X132.29 / DO-:
Low
Analog inputs Function
Value Normalized
Unit
Analog inputs actual input voltage/current: AI0 (X132.19/20)
0
-
-
-
Analog inputs actual input voltage/current: AI1 (X132.21/22)
0
-
-
-
Analog outputs Function
Value Normalized
Unit
CU analog outputs output voltage/current actual: AO0 (X132.45/46)
0
V
Speed actual value smoothed
0.00
rpm
Torque actual value
-0.00
Nm
CU analog outputs output voltage/current actual: AO0 (X132.47/48)
0
V
-
-
-
Support
Control panel

7.4.4 Diagnostics

7.4.4.1 Messages

Overview

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

Description of function

With search and filter options, the number of alarms and faults can be restricted. The available filter options can be combined with one another and can be reset at any time.

The message history can be optionally displayed.

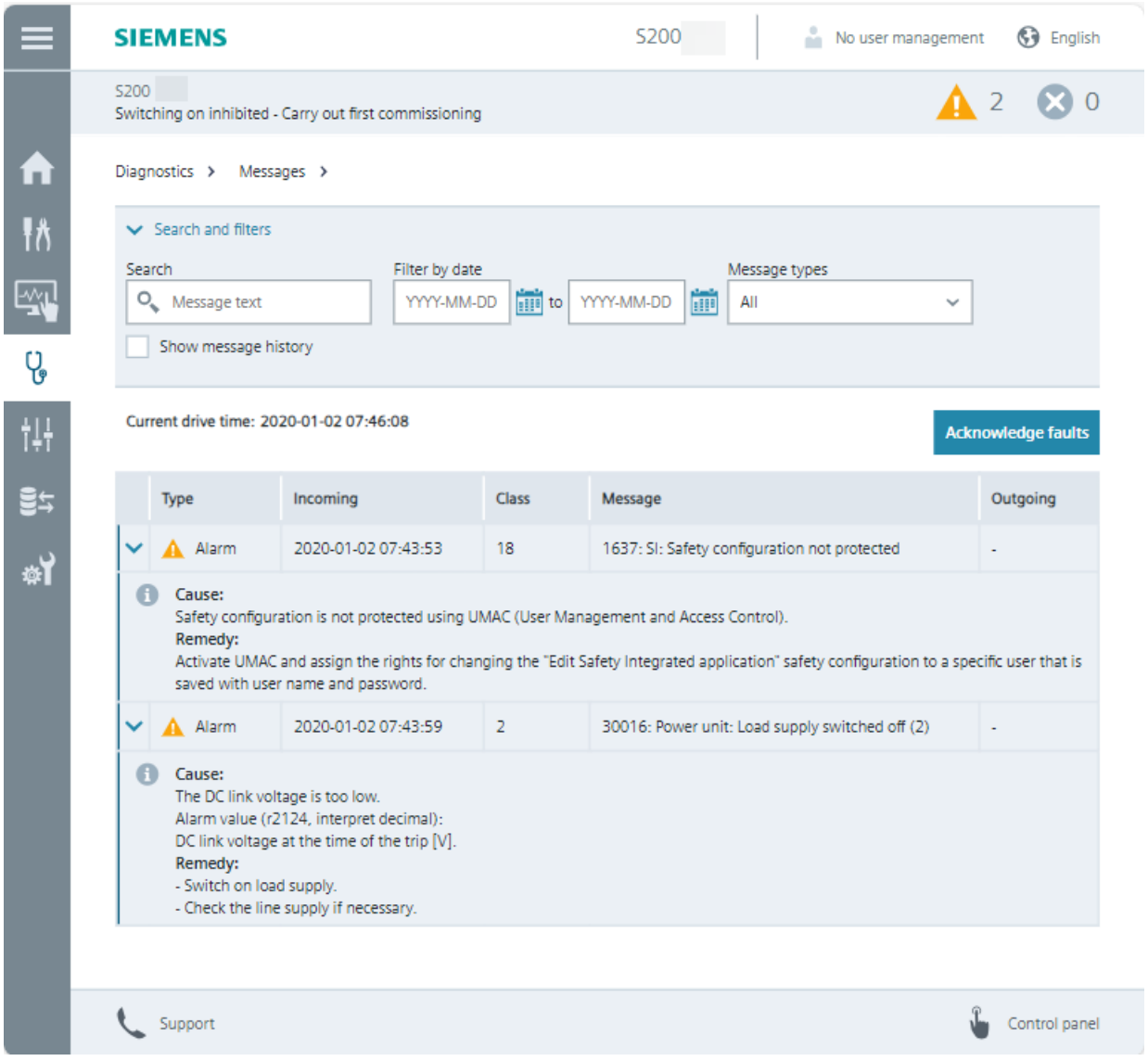


Figure 7-8 Messages

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: • Alarm • Fault
Incoming	Time when the message was received
Class	Assign the message to a message class according to PROFIdrive • 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 • Faults are given the status "Outgoing" if the following are true: – The causes have been eliminated. – The message has been acknowledged.
›	Selection for more information: • Description of the message with cause and remedy

7.4.4.2 Diagnostic 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

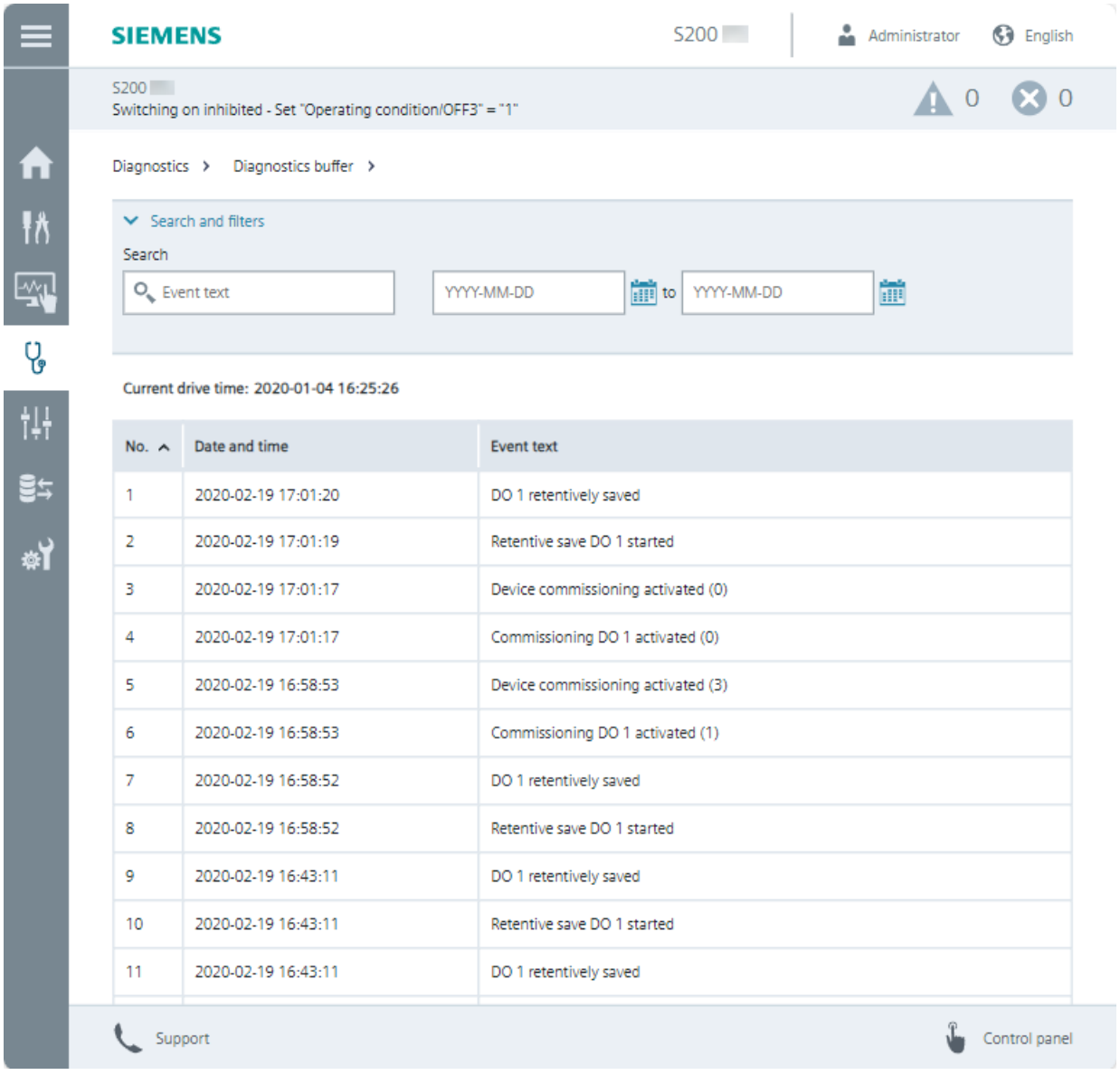


Figure 7-9 Diagnostic buffer

Reading out the diagnostic buffer facilitates converter diagnostics and supports fault analysis.

The search can be limited by searching for keywords and using the filter function according to date.

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

7.4.4.3 Safety Integrated (for S200 PTI only)

Overview

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

Description of function

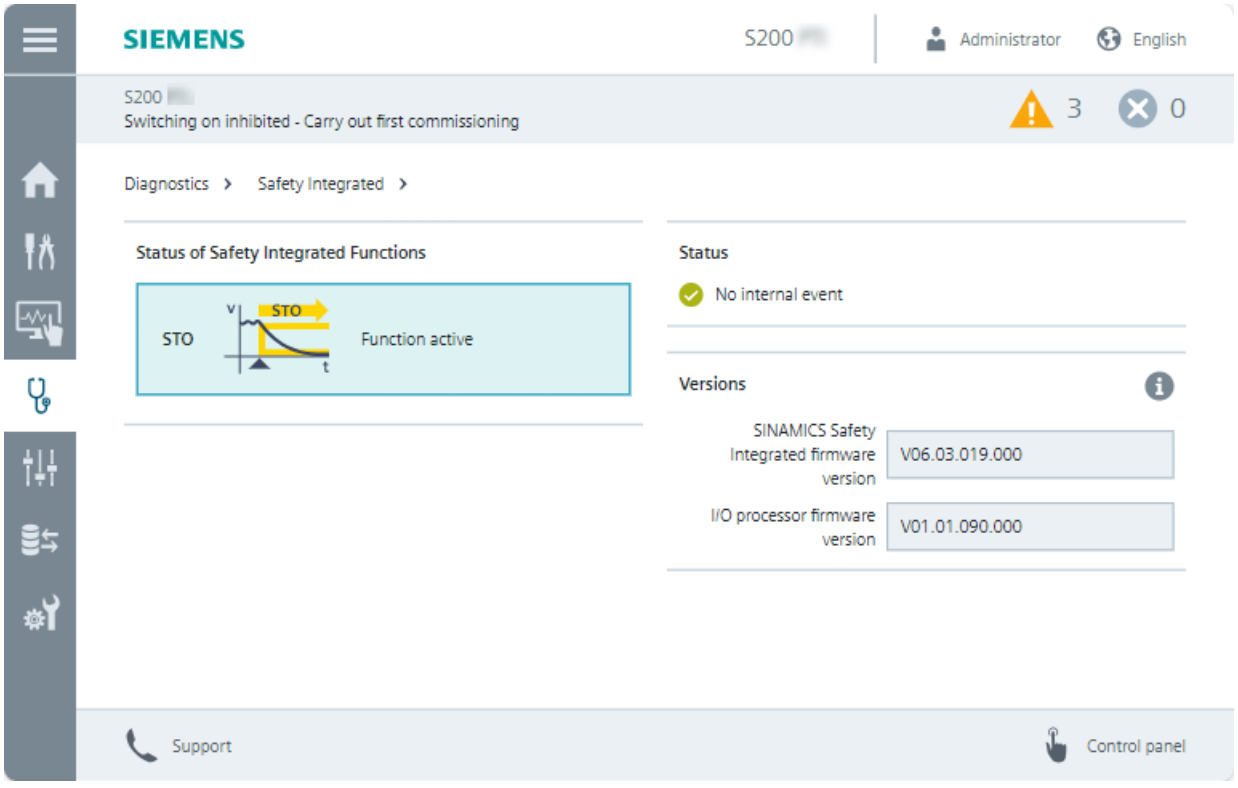


Figure 7-10 Monitoring Safety Integrated Functions

The following content is displayed:

- "Status of Safety Integrated Functions"
  Displays the status of STO
- "Status"
  Displays "Active" if STO is active
- "Versions"
  Displays the safety-relevant software versions of the corresponding components

7.4.4.4 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.

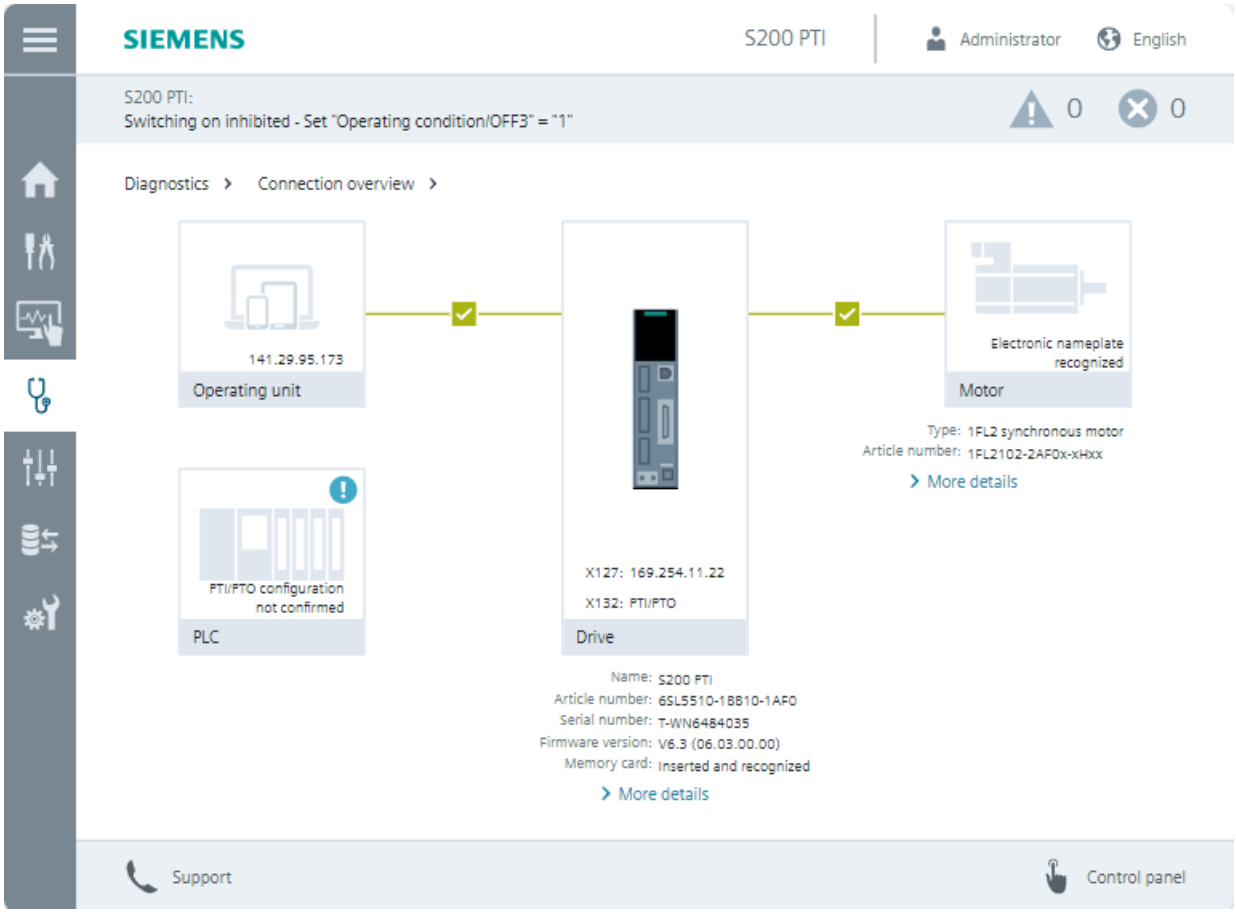


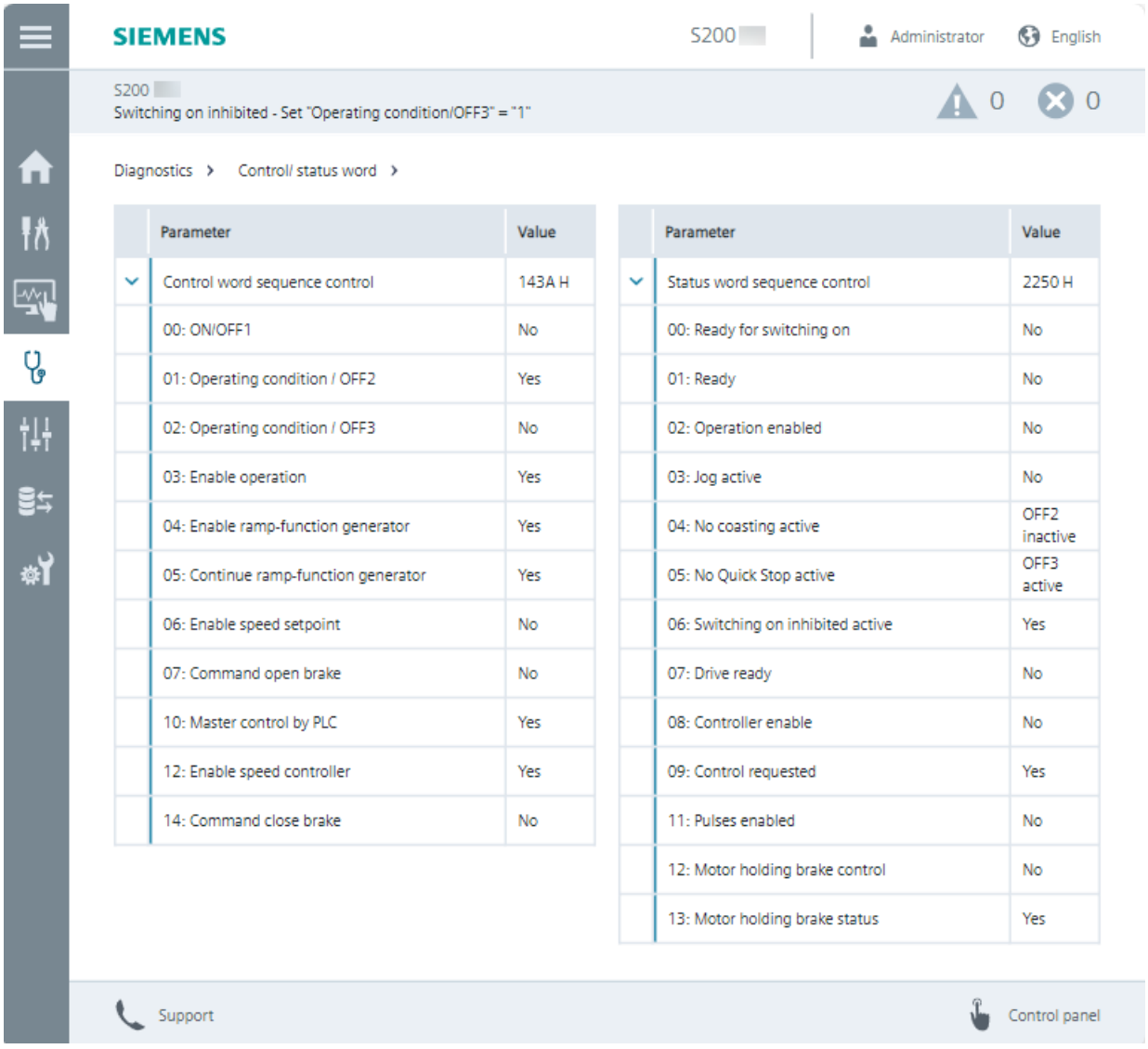
Figure 7-11 Connection overview

7.4.4.5 Status word and control word

Overview

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

Description of function



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

Figure 7-12 Control and status word

The control and status word is indicated by all sequence control states. This also includes states that are not available, which prevent the motor from being switched on and switched off. Diagnostics supports fault analysis.

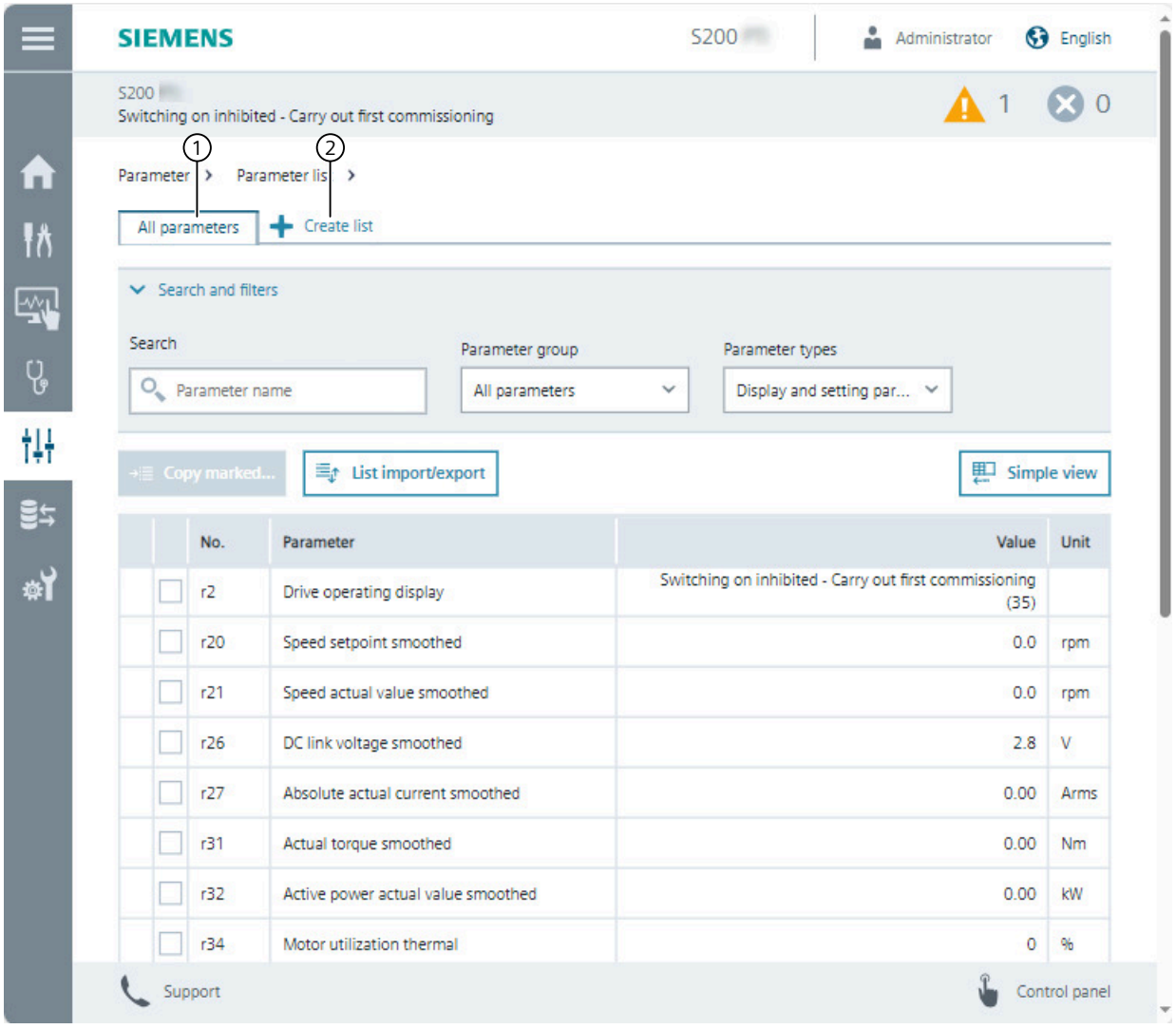
7.4.5 Parameters

7.4.5.1 Parameter lists

Overview

The parameter list shows all the parameters of the converter. The parameter list allows specific parameters to be changed.

Description of function



① Displays all the parameter of the converter

② Creates a user-defined parameter list

For details, see User-defined parameter list (Page 201).

Figure 7-13 Parameter list

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	Are read/write.
		The setting parameter can only be parameterized in the active commissioning mode. Depending on the parameter, changes are possible in the quick setup.
		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.

7.4.5.2 User-defined parameter list

Overview

A user-defined parameter list is a combination of specific parameters from the standard parameter list of the converter. These can be used to configure frequently used user functions, for example.

Description of function

To create a user-defined parameter list, click + Create list in the function view "Parameter list".

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.

7.4.6 Backup and restore

7.4.6.1 Overview

Overview

With "Backup and restore" you can back up parameters and other settings and restore the settings again if necessary.

Description of function

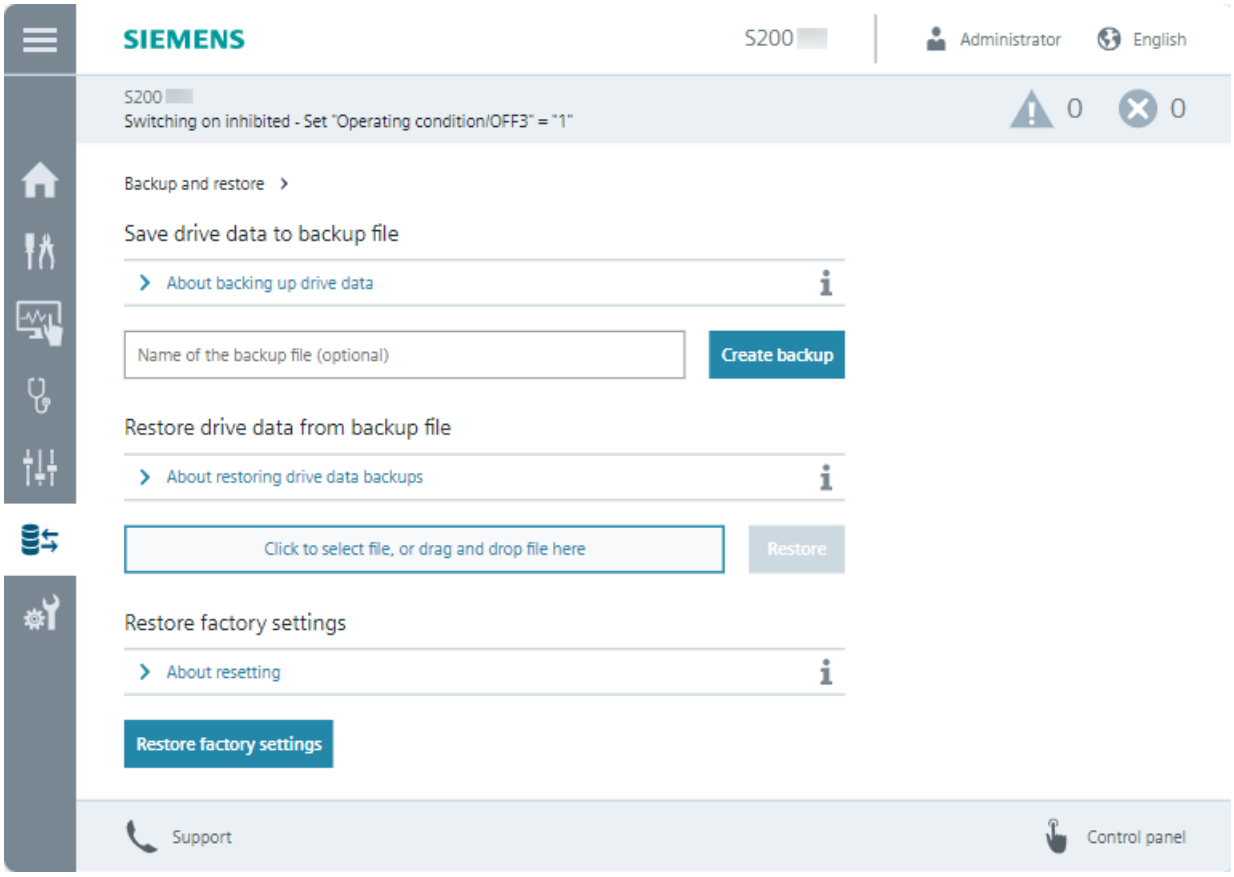


Figure 7-14 Backup and restore

The following functions are available to back up and restore 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 device or for series commissioning, load the backed-up parameter settings to the converter.
  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 Section "Restoring data from an encrypted backup data (Page 206)".
- Restore factory settings
  The user-specific parameterization of the converter is deleted.
  The following settings are retained after you restore factory settings via the web server:
  - Settings of the communication interfaces
  - UMAC and security data

  To restore all settings, an SD card is required. For more details, see section "Reset of all user-defined settings to the factory setting via an SD card (Page 481)"

7.4.6.2 Save drive data to backup file

Overview

Run the "Save drive data to backup file" function in the following situations:

- After commissioning
- Before drive data is reset using function "Restore factory settings" in the web server
  You can find more information in Chapter "Restore factory settings (Page 209)".
- Before drive data is completely reset
  You can find more information in Chapter "Reset of all user-defined settings to the factory setting via an SD card (Page 481)".
- Before a firmware upgrade/downgrade

Requirement

None

Procedure

1. Call the "Backup and restore" menu.
2. Click on the "Save drive data to backup file" button.
   Optional: Assign a name for the backup file.
   The drive data is backed up. The backup file is saved in the download folder of your operating unit.

Result

- The drive data are not encrypted in the backup file if you deactivated function "Drive data encryption" in the Security Wizard.
- The drive data are encrypted in the backup file if function "Drive data encryption" is activated in the Security Wizard and you have configured a drive password.
  Recommendation:
  - Store the password in a secure location, for example, in a password manager. Ensure that you can access the password if needed.

7.4.6.3 Scope of the backup

Overview

The "Back up parameters" function backs up all converter settings to one file.

Description

The converter backs up the following data and settings:

- Communication interface settings
- Parameters (including safety parameters)
- Security settings
- UMAC data
- Web server settings:
  - Modified settings in window "Drive status" on the home page
  - User-defined parameter lists
  - Support settings
  - Save changes manually/automatically
- Displayed parameters (display standard parameters/all parameters):
  - Standard parameters
  - View all parameters
  - Display brightness

The converter firmware files are not backed up.

7.4.6.4 Restoring data from an unencrypted backup data

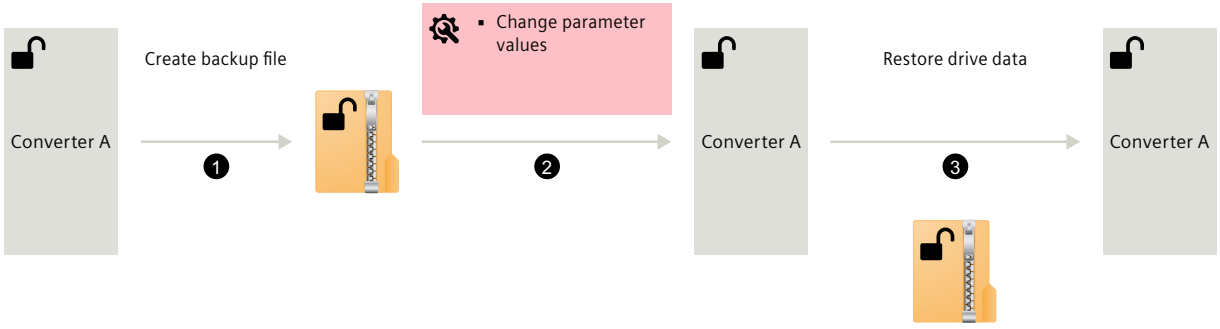
Requirement

- You have an unencrypted backup file of the converter on your operating unit.
- Rights required for active user management (UMAC):
  - "Create backup or load drive data to Startdrive"

Procedure

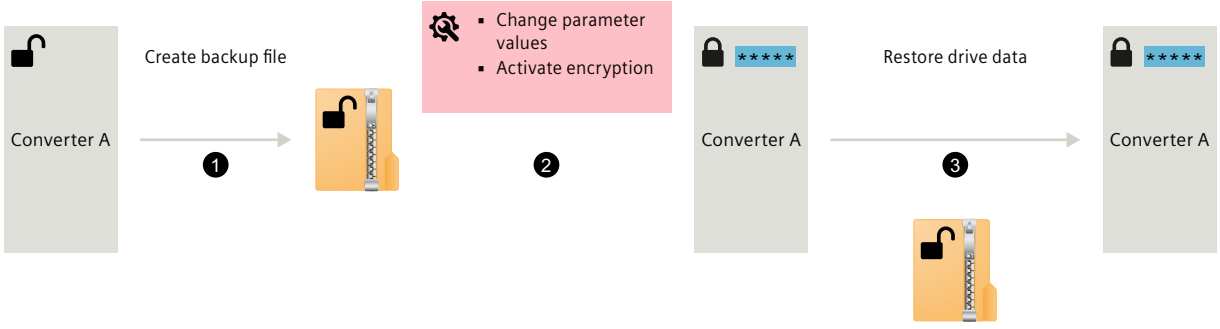
1. Call the "Backup and restore" menu.
2. Navigate to the "Restore drive data from backup file" area.
3. Use the "Click to select file, or drag and drop file here" button to select the backup file.
4. To restore the drive data, proceed as described below depending on the specific application. This step is included in the following diagrams as step 3.

- **Scenario 1:** A drive password has not been configured as function "Drive data encryption" has not been activated.



  – Click on "Restore".
    The drive data are loaded into the converter from the backup file.
    As a consequence, the status of the settings at the instant of the backup are restored.

- **Scenario 2:** A drive password is configured after the backup file has been created.



*****: Configured drive password

  – Click on "Restore".
    A dialog to enter the password opens.
  – Enter the drive password.
    The drive data are loaded into the converter from the backup file.
    As a consequence, the status of the settings at the instant of the backup are restored.
    Function "Drive data encryption" is activated. The drive password configured in step 2 is still effective in the converter after data has been restored.

More information

- Series commissioning:
  For series commissioning, save the drive data of a source converter and transfer this data to one or several target converters. You can find more information in Chapter "Series commissioning (Page 221)".
- Replacing the converter without memory card:
  If a converter has to be replaced, restore the drive data of a defective converter via the web server. You can find more information in Chapter "Replacing the converter (Page 484)".

7.4.6.5 Restoring data from an encrypted backup data

Requirement

- You have an encrypted backup file of the converter on your operating unit.
- Configured drive password:
  - You know the originally configured drive password with which the drive data in the backup file were encrypted.
  - You know the currently configured drive password.
    This is only applicable if the currently configured drive password deviates from the originally configured drive password, with which the drive data in the backup file were encrypted.
- Rights required for active user management (UMAC):
  - "Create backup or load drive data to Startdrive"

Note

Lost password

The following restrictions apply if the password is lost:

- Drive data encryption cannot be deactivated.
- The drive data cannot be restored from an encrypted backup file.

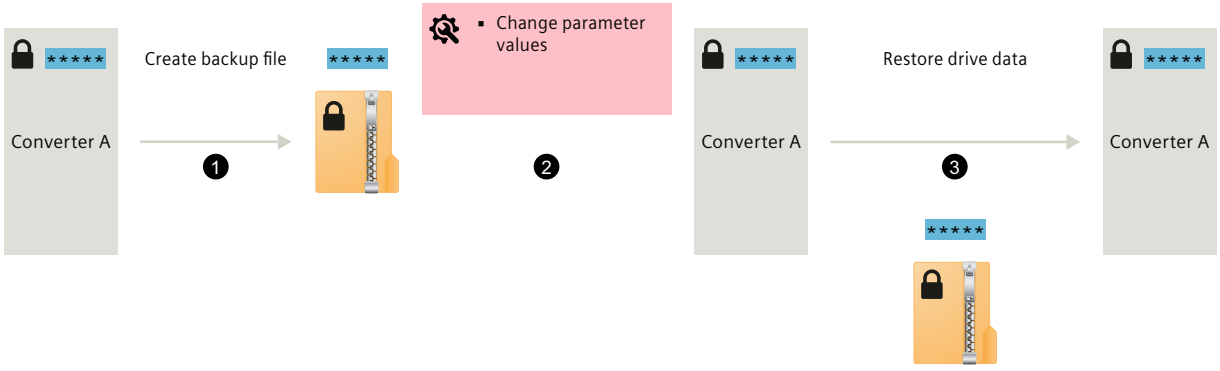
Recommendation:

- Store the password in a secure location, for example, in a password manager. Ensure that you can access the password if needed.

Procedure

1. Call the "Backup and restore" menu.
2. Navigate to the "Restore drive data from backup file" area.
3. Use the "Click to select file, or drag and drop file here" button to select the backup file.
4. To restore the drive data, proceed as described below depending on the specific application. This step is included in the following diagrams as step 3.

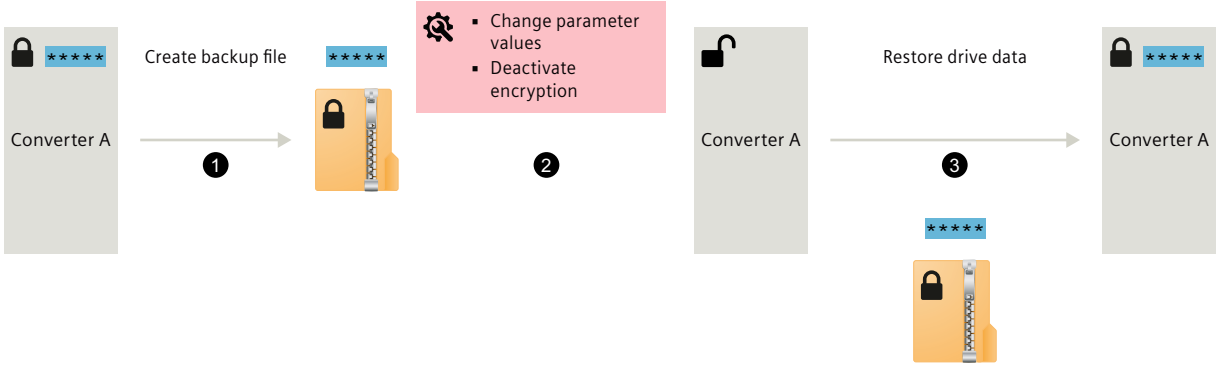
- **Scenario 1:** A drive password is configured. The drive data in the backup file were encrypted using this password.



*****: Originally configured drive password

  – Click on "Restore".
    A dialog to enter the password opens.
  – Enter the drive password.
    The drive data are loaded into the converter from the backup file.
    As a consequence, the status of the settings at the instant of the backup are restored.
    Function "Drive data encryption" is activated. The drive password configured in step 2 is still effective in the converter after data has been restored.

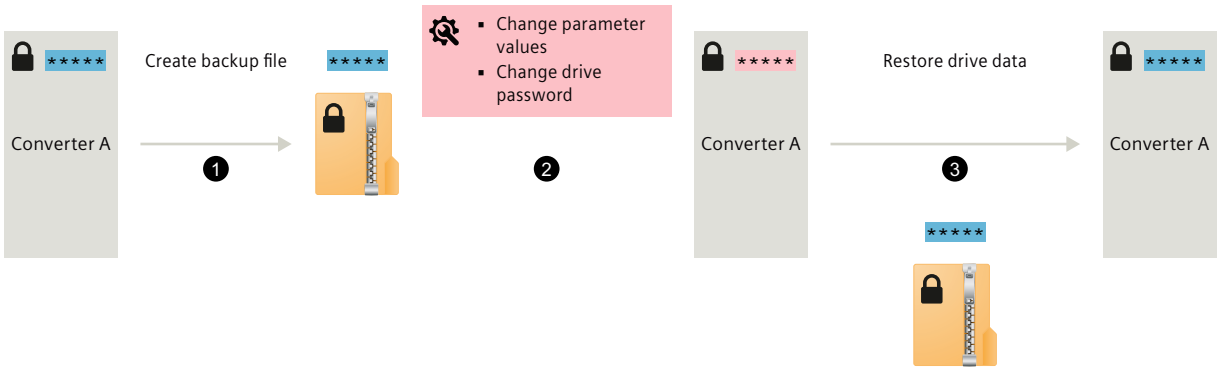
- **Scenario 2:** A drive password is configured. The drive data in the backup file were encrypted using this password. Function "Drive data encryption" is deactivated after creating the backup file.



*****: Originally configured drive password

  – Click on "Restore".
    A dialog to enter the password opens.
  – Enter the drive password.
    The drive data are loaded into the converter from the backup file.
    As a consequence, the status of the settings at the instant of the backup are restored.
    Function "Drive data encryption" is activated. The originally configured drive password is applied.

- **Scenario 3:** The originally configured drive password is modified.

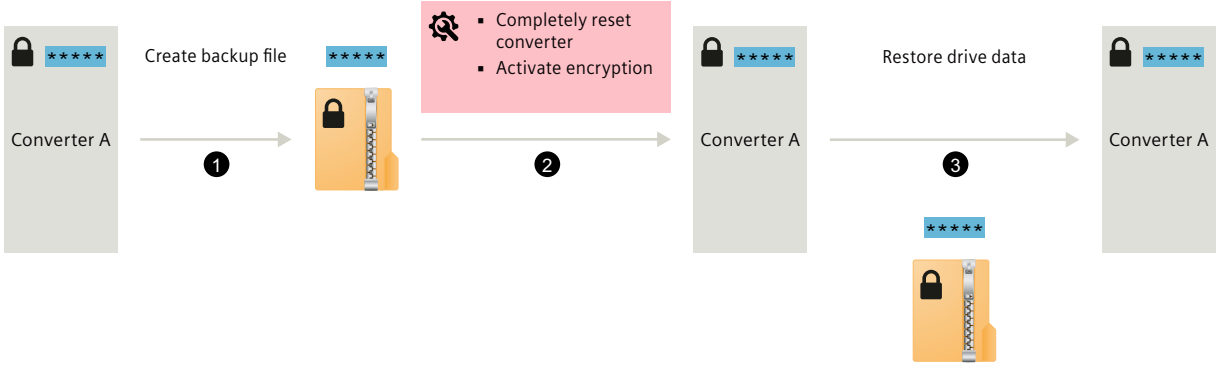


*****: Originally configured drive password

*****: Subsequently changed drive password

  – Click on "Restore".
    A dialog to enter the password opens.
  – Enter the drive password configured in step 2.
    The drive password configured in this step differs from the drive password with which the drive data in the backup file were encrypted.
    A dialog to enter the password opens.
  – Enter the drive password that was used to encrypt the drive data in the backup file.
    The drive data are loaded into the converter from the backup file.
    As a consequence, the status of the settings at the instant of the backup are restored.
    Function "Drive data encryption" is activated. The originally configured drive password is applied. The drive password configured in step 2 is then overwritten.

- **Scenario 4:** Before restoring, the converter is completely reset to the factory settings and a drive password is configured. More information about the complete reset is provided in Section "Reset of all user-defined settings to the factory setting via an SD card (Page 481)".



*****: Originally configured drive password

  – Click on "Restore".
    A dialog to enter the password opens.

- Enter the drive password configured in step 2.
  The drive password configured in this step corresponds to the drive password with which the drive data in the backup file were encrypted.
  A dialog to enter the password opens.
- Enter the drive password that was used to encrypt the drive data in the backup file.
  The drive data are loaded into the converter from the backup file.
  As a consequence, the status of the settings at the instant of the backup are restored.
  Function "Drive data encryption" is activated. The originally configured drive password is applied.

7.4.6.6 Restore factory settings

Overview

The reset to factory settings with the web server deletes the user-specific parameterization of the converter, for example the motor data.

The following data are retained when the factory settings are restored:

- Communication interface settings
- Security settings (including UMAC)
- Language setting
- Date and time

In the following cases it may be necessary to restore the converter to factory settings:

- If the motor is changed
- If there is uncertainty regarding the previous parameterization and/or the previous use of the converter

Requirement

If User Management & Access Control is activated, you will need the following function rights:

- Edit device configuration or drive applications

Procedure

1. Call the "Backup and restore" menu.
2. Click the "Restore factory settings" button.
3. Acknowledge the confirmation prompt.

The converter is reset and then restarted.

More information

For a full reset of the converter, proceed as described in Chapter "Reset of all user-defined settings to the factory setting via an SD card (Page 481)".

7.4.7 System

7.4.7.1 Settings

Overview

The function view "Settings" offers basic settings for the web server and the converter.

Requirement

- To edit the web server settings you will need the "Edit web server configuration" right.
- To edit the drive settings you will need the "Edit device configuration or drive applications" right.

Description of function

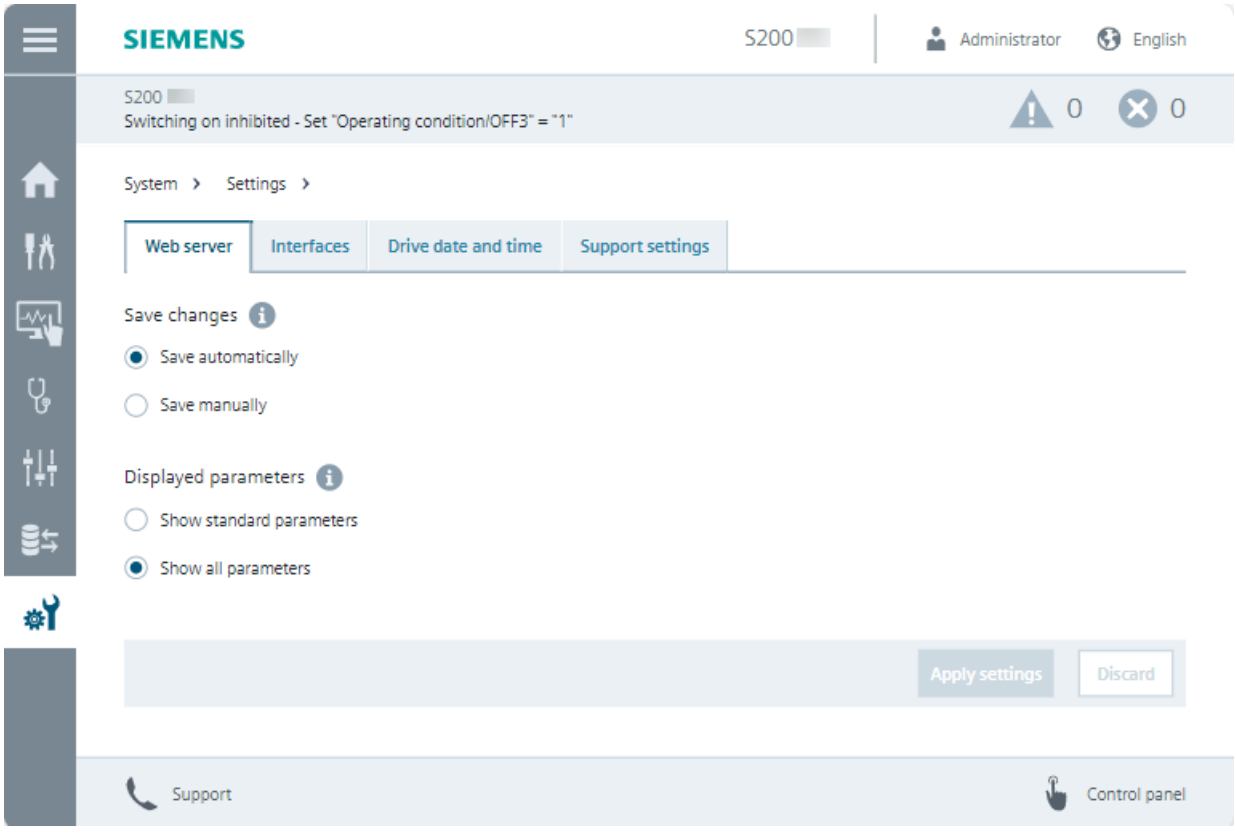


Figure 7-15 Web server system setting

Web server

Under "Web server", the web server offers options for saving changes and displaying parameters.

Interfaces

Under "Interfaces", the web server provides information about the status and the settings of the interfaces of the converter.

Drive date and time

Under "Drive date and time", the web server provides options for setting the date format and for obtaining the date, time and time zone of the converter.

Support settings

Under "Support settings", the web server provides the option to store additional support and hotline data. The web server displays these data in the function view "Support".

7.4.7.2 User management

Overview

In "User management" you manage users and configure their roles and rights for accessing the converter.

Requirement

- You activated user management (UMAC) in Security Wizard at the step "Configure security settings (Page 174)" during first commissioning.
- You are logged into the web server and have the necessary rights to manage users.

Description of function

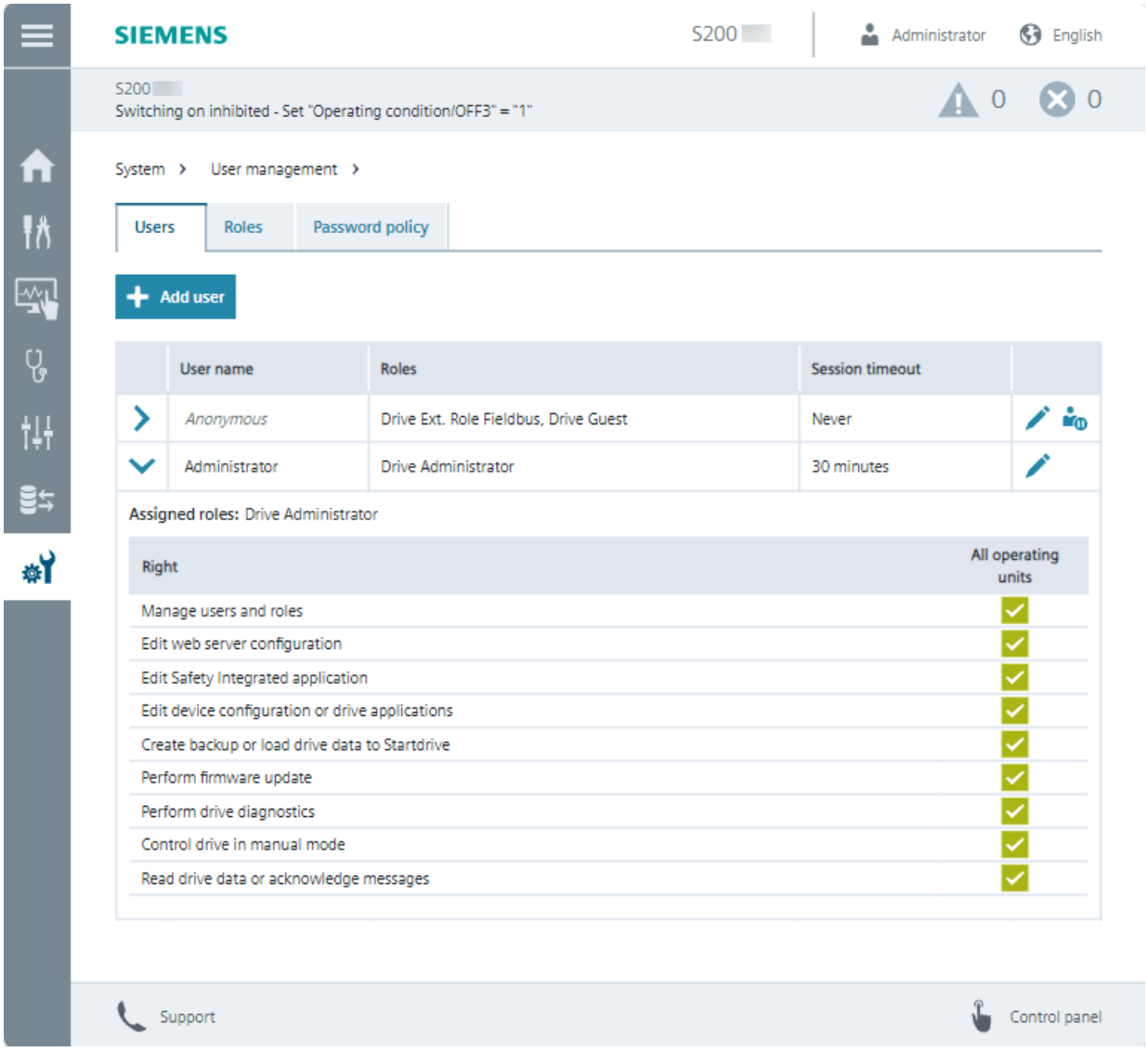


Figure 7-16 User management

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.

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

7.4.7.3 Protection & Security

Overview

In "Protection & Security", you configure basic security settings using the Security Wizard and the tables it contains.

Requirement

- You activated the security settings during first commissioning.
- You are logged into the web server and have the necessary rights to edit drive data.

Description of function

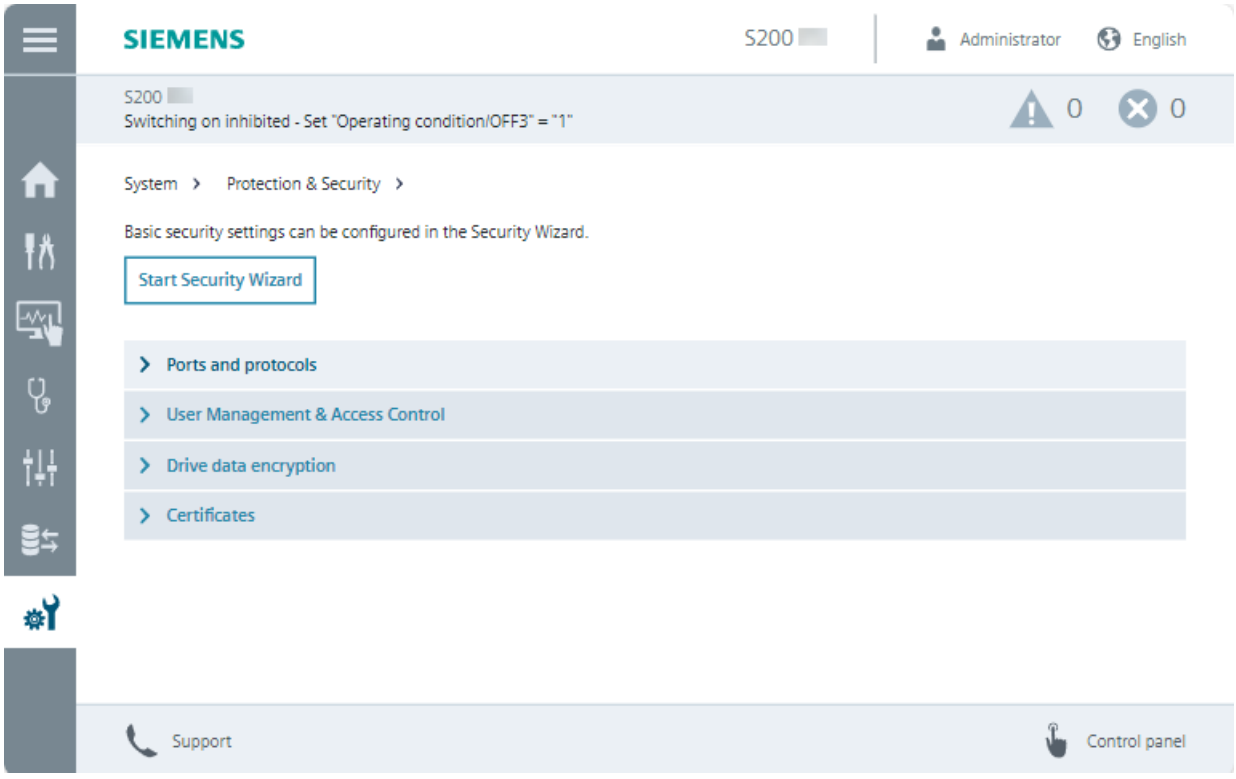


Figure 7-17 Protection & Security

Start Security Wizard

In the Security Wizard, you configure the most important security settings for the converter. They include User Management & Access Control and web server activation.

Ports and protocols

The web server provides an overview of the available ports and protocols and their status. This is where you activate or deactivate the communication interfaces.

User Management & Access Control

The web server provides an overview of the settings in user management.

Drive data encryption

The web server shows whether the function of drive data encryption is enabled.

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

7.4.7.4 Licenses

Overview

You must purchase licenses for supplementary functions and options.

Use the function view "Licenses" to manage the licenses for drive functions and options.

Requirement

- You are logged into the web server and have the necessary rights to edit drive data.
- The operating panel is connected online with the drive.

Description of function

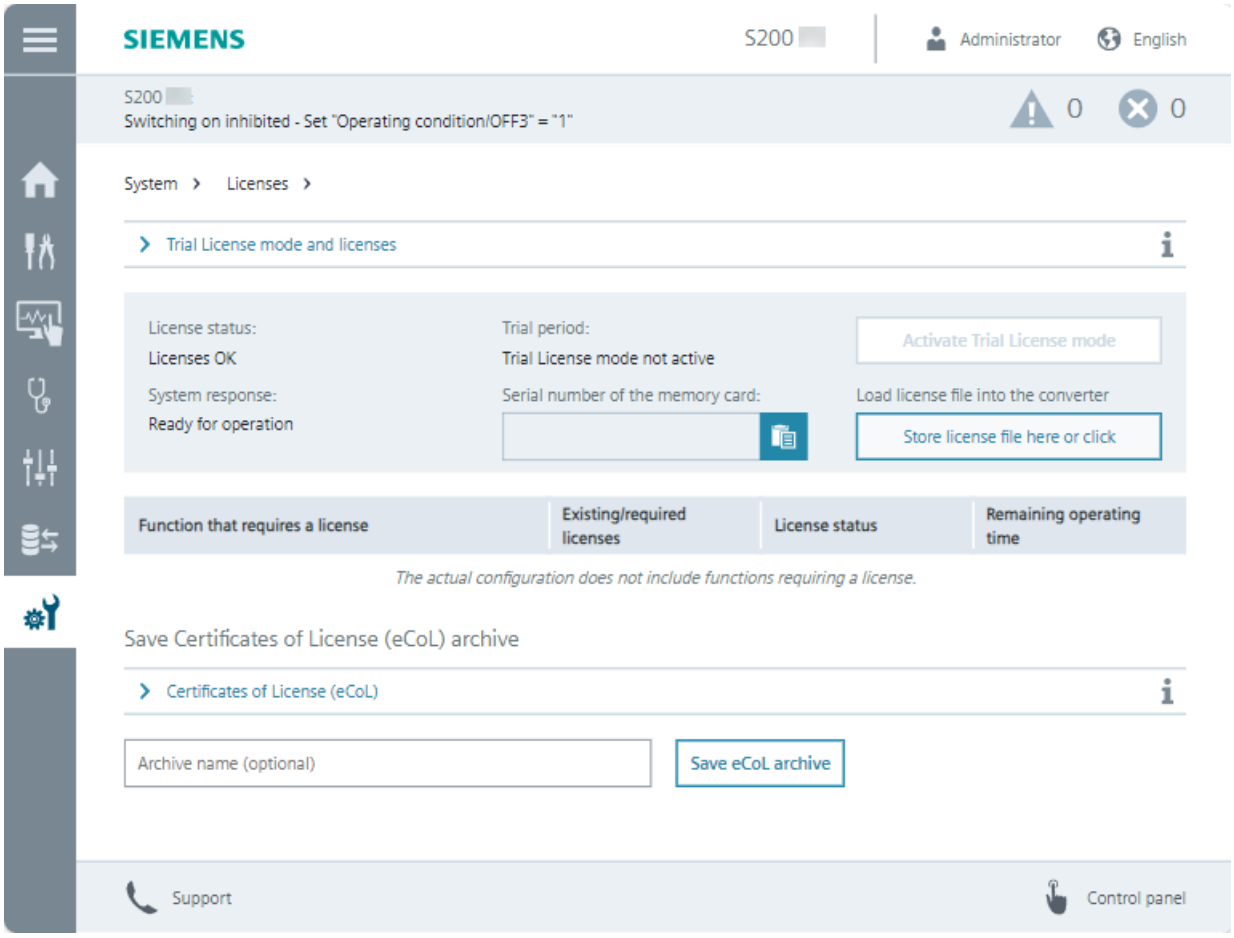


Figure 7-18 Licenses

The function view "Licenses" offers the following functions:

- Display the installed functions requiring licenses
- Read and copy the serial number of the SD card inserted into the converter
- Load and activate purchased licenses

Load and activate licenses

Under "Trial License mode and licenses", you upload license files created with the Web License Manager.

In Trial License mode, you can try out functions for a specified period.

Using functions/options requiring a license

The web server provides an overview of the options that require licensing and their license status.

Certificates of License (eCoL)

Under "Certificates of License (eCoL)", you load purchased licenses directly from an SD card into the file system of the operating unit.

7.4.7.5 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" communication settings of the service interface (X127)
  - Self-generated certificates
  - User-defined parameter lists in the web server

Requirement

- The operating unit is connected to the converter's web server.
- An empty SD card is inserted into the card slot of the converter before starting the firmware update for storing the user data temporarily.
  Note: The SD card must be inserted when the converter is switched off.
- The converter is in servo-off state.

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 panel.

7.4.7.6 About web server

Overview

"About web server" contains information about the web server and links to additional information.

Description of function

Under "Versions" you can see the revision levels of the web server and the loaded firmware.

Under "Third-party software" there is a link to information about any third-party software used. The license conditions are loaded to the operating panel in the file "READ_OSS.ZIP". You can display the HTML file included in the ZIP file using your browser.

There are more links to information about:

- Cookie policies
- Industrial Cybersecurity
- Privacy policy

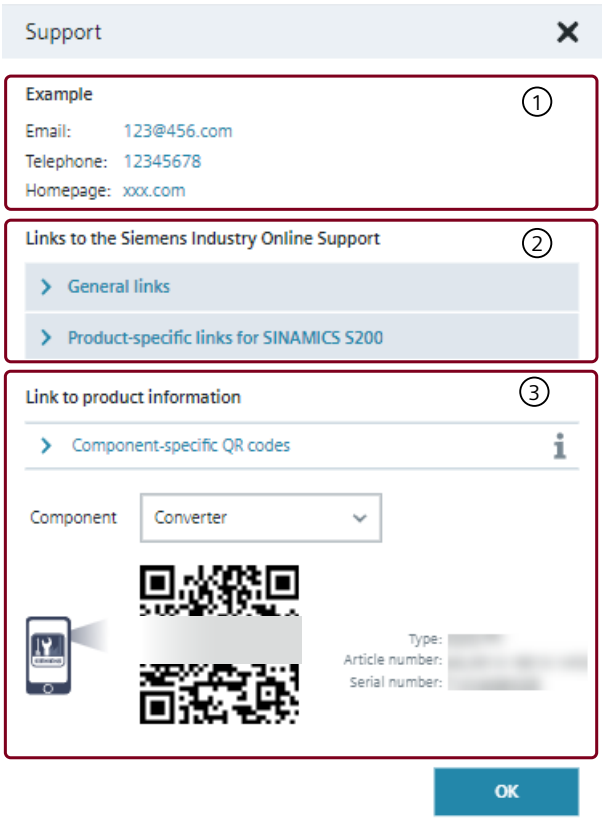
7.4.8 Support

Overview

The footer of the web server contains a support dialog.

Description of function

The support dialog contains links to additional information for the converter.



① Displays additional support and hotline data
For more information about configuration, see Chapter "Settings (Page 210)".

② Displays the links to product support websites

③ Displays QR codes of online support pages for individual components

Figure 7-19 Support information

7.4.9 Control panel

Overview

The control panel moves the motor using the operating unit, bypassing the higher-level controller, for example to test the converter settings after commissioning.

Requirement

⚠ WARNING

Unexpected motor movement through incorrect operation

If the control panel is active, the safety shutdowns of the higher-level controller have no effect. The "Stop with space bar" function is not guaranteed in all operating states. Incorrect operation by untrained personnel may result in unexpected motor movement which can cause death or serious injuries.

- Only use the control panel for commissioning, diagnostics and service purposes.
- Only use the control panel if you are trained and authorized accordingly.
- Install an EMERGENCY STOP for the drive which is independent of the higher-level controller.

Description of function

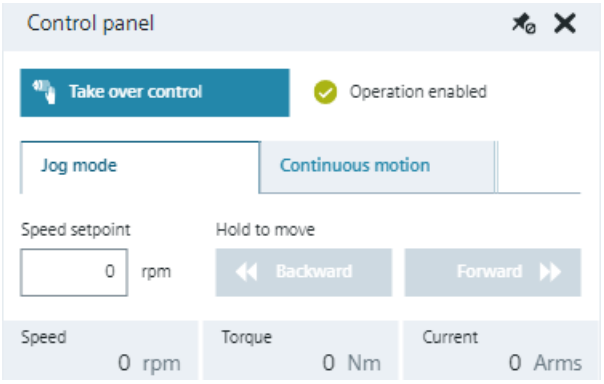


Figure 7-20 Control panel

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 operation starts the motor when a direction button is pressed.

Series commissioning

8

8.1 Series commissioning

Overview

In series commissioning, the backed-up data and settings of a converter are loaded to other converters.

Requirement

The target converter must satisfy the following prerequisites:

- The rated power of the target converter is the same as the rated power of the converter from which the backed-up data and settings originate.
- The firmware version of the target converter is higher than or equal to the firmware version of the converter from which the backed-up data and settings originate.
- The machines that are commissioned via series commissioning are identical in terms of the application, converter and motor.
- The target converters are all configured to factory settings.

Description of function

There are two options when carrying out series commissioning of the converter:

- **Series commissioning with SD card**
  All settings on the SD card (including user management and access control) are transferred to the converter.
- **Series commissioning using the web server**
  All settings from the parameter backup (including user management and access control) are transferred to the converter.
  When performing series commissioning, also observe the fundamental principles for working with the web server (see section "Fundamentals (Page 166)").

8.2 Series commissioning with SD card

Requirement

- The machines that are commissioned via series commissioning are identical in terms of the application, converter and motor.

Procedure

Proceed as follows to perform series commissioning using an SD card:

1. Insert an empty SD card with a maximum capacity of 32 GB (e.g.: 6SL5570-0GC00-0AA0) into the card slot of the converter while it is switched off.
2. Switch on the converter and perform commissioning.
3. Save the settings at the end of commissioning.
   This saves the settings in a non-volatile manner not only on the converter but also to the SD card.
4. Switch off the converter and remove the SD card from the converter.
5. Insert the SD card into the next, and switched off converter.
6. Switch on the converter and wait until it has ramped up - the RDY LED lights green.
   During ramp-up, the converter takes the settings from the SD card - including user management and access control.
7. Switch off the converter and remove the SD card from the converter.

Repeat steps 5 to 7 for all converters to which you want to transfer these settings.

8.3 Series commissioning using the web server

Requirement

- The machines that are commissioned via series commissioning are identical in terms of the application, converter and motor.

Procedure

Proceed as follows to perform series commissioning using the web server:

1. Switch on the converter supply voltage and use your operating unit, e.g. a PC, to perform commissioning.
   You can find more information in Chapter "Commissioning (web server) (Page 165)".
2. Save the settings at the end of commissioning.
3. Select "Backup and Restore" in the navigation - and back up the parameter settings in a file using "Back up parameters".
4. Connect your operating unit to the next converter.
5. Switch on the supply voltage to the converter.
6. Enter the IP address of the converter, e.g. https://169.254.11.22, in the browser.
7. Select the option "Exit the Security Wizard and continue with low security settings".
   User management and access control (UMAC) is not activated.
   You can configure the security settings at a later time, see Chapter "Protection & Security (Page 213)".
8. In the navigation, select "Backup and Restore" - and load the parameter settings using "Restore drive data from backup file" to the converter.
   The converter accepts the parameters (including from user management and access control) from the file and restarts.

Repeat steps 4 to 7 for all converters to which you want to transfer these settings.

Functions

9

9.1 Overview of the functions

Overview

The S200 PTI converter supports both the following basic control modes and the compound control mode to realize different control functions. You can select the desired control mode via the parameter p29003.

- Basic control modes
  - Fast position control with pulse train input mode (Fast PTI) (default control mode)
  - Speed control mode (S)
  - Torque control mode (T)
- Compound control mode
  - S/T

The basic control modes can only support a single control mode. The compound control mode can support both the speed control mode and the torque control mode. You can switch the two control modes via the DI signal C-MODE.

Note

For S200 Basic PTI, only the basic control mode "Fast PTI" is supported.

Description of function

General functions

- Servo-on
- Over-travel
- Stopping method at servo-off
- Vertical axis
- PTO function
- Motor overload protection

Control functions

- Fast position control with pulse train input (Fast PTI)
- Speed control (S) (for S200 PTI only)
- Torque control (T) (for S200 PTI only)

Safety functions (for S200 PTI only)

- Safe Torque Off (STO) safety function
  Safe Torque Off (STO) is a safety function that immediately ensures that torque or force-generating energy is not fed to the motor.

9.2 Compound controls

Overview

The S200 PTI converter supports the compound control mode of the speed control (S) and the torque control (T).

Description of function

You can change between the two basic control modes by setting the parameter p29003 and configuring the level sensitive signal C-MODE on DI9.

p29003	C-MODE	
	0 (the first control mode)	1 (the second control mode)
7	S	T

Note

Fault F52904 occurs when the control mode is changed via p29003. The default signals assigned to the digital inputs might be changed. You must save the parameter and then restart the converter to apply relevant configurations.

Note

If you switch between the two compound control modes by configuring the DI signal C-MODE, some default signals assigned to the digital inputs will be changed accordingly.

9.3 Inputs/outputs

9.3.1 Digital inputs

Overview

A digital input detects a signal coming from outside. The function of a digital input is adjustable.

Description of function

The S200 PTI converter has ten digital inputs, from DI0 to DI9. The S200 Basic PTI converter has six digital inputs, from DI2 to DI7. A parameter r0722.x is assigned to each digital input. You can adjust the function of digital inputs by interconnecting the signal parameters to r0722.x in commissioning tools.

The following signals are assignable to the digital inputs.

Table 9-1 Assignable signals

Parameter	Signal	Type	Description	Available control mode		
				Fast PTI	S	T
c29300	Servo-on (SON)	Edge 0→1 1→0	• 0→1: power on the power circuit and prepare the converter for operation. • 1→0: the motor ramps down (OFF1) in Fast PTI and S modes; the motor coasts down (OFF2) in T mode.	✓	✓	✓
p2104	Acknowledge all faults (RESET)	Edge 0→1	0→1: reset alarms	✓	✓	✓
c29301	Clockwise over-travel limit (CWL)	Edge 1→0	• 1: condition for operation • 1→0: quick stop (OFF3)	✓	✓	✓
c29302	Counterclockwise over-travel limit (CCWL)	Edge 1→0	• 1: condition for operation • 1→0: quick stop (OFF3)	✓	✓	✓
c29149	Gain switching or PI/P switching (G-CHANGE)	Level	• 0: scaling factor 1 or PI control is selected. • 1: scaling factor 2 or P control is selected.	✓	✓	-
c29265	Inhibit pulse train setpoint (P-TRG)	Level Edge 0→1	• 0: operation with pulse train setpoint is possible • 1: inhibit the pulse train setpoint	✓	-	-
c29267	Clear droop pulses (CLR)	Level	• 0: not clear • 1: clear the droop pulses based on the selected clear mode (p29242)	✓	-	-

Parameter	Signal	Type	Description	Available control mode		
				Fast PTI	S	T
c29275	Electronic gear selection bit 0 (EGEAR0)	Level	EGEAR1 : EGEAR0 • 0 : 0: electronic gear ratios 1 • 0 : 1: electronic gear ratios 2 • 1 : 0: electronic gear ratios 3 • 1 : 1: electronic gear ratios 4	✓	-	-
c29276	Electronic gear selection bit 1 (EGEAR1)	Level		✓	-	-
c29048	Torque limit selection bit 0 (TLIM0)	Level	TLIM1 : TLIM0 • 0 : 0: internal torque limit 0 • 0 : 1: internal torque limit 1 (analog input 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 • 0 : 0: internal speed limit 0 • 0 : 1: internal speed limit 1 (analog input 0) • 1 : 0: internal speed limit 2 • 1 : 1: internal speed limit 3	✓	✓	✓
c29064	Speed limit selection bit 1 (SLIM1)	Level		✓	✓	✓
c29303	Clockwise rotations (CWE)	Level	• 1: enable clockwise rotation, ramp up • 0: disable clockwise rotation, ramp down	-	✓	✓
c29304	Counterclockwise rotations (CCWE)	Level	• 1: enable counter-clockwise rotation, ramp down • 0: disable counter-clockwise rotation, ramp up	-	✓	✓
c29074	Zero speed clamps (ZSCLAMP)	Level	• 1: when the motor speed setpoint is an analog signal and lower than the threshold level (p29075), the motor is clamped. • 0: no action	-	✓	-
p1020	Fixed speed setpoint selection bit 0 (SPD0)	Level	SPD2 : SPD1 : SPD0 • 0 : 0 : 0: analog speed setpoint • 0 : 0 : 1: fixed speed setpoint 1 • 0 : 1 : 0: fixed speed setpoint 2 • 0 : 1 : 1: fixed speed setpoint 3 • 1 : 0 : 0: fixed speed setpoint 4 • 1 : 0 : 1: fixed speed setpoint 5 • 1 : 1 : 0: fixed speed setpoint 6 • 1 : 1 : 1: fixed speed setpoint 7	-	✓	-
p1021	Fixed speed setpoint selection bit 1 (SPD1)	Level				
p1022	Fixed speed setpoint selection bit 2 (SPD2)	Level				
c29047	Torque setpoint source (TSET)	Level	• 0: analog torque setpoint • 1: fixed torque setpoint	-	-	✓
r849	No quick stop OFF3 (EMGS)	Level	• 0: OFF3 • 1: no OFF3	✓	✓	✓
c29305	Control mode switch (C-MODE)	Level	• 0: the first control mode • 1: the second control mode	✓	✓	✓

The following signals are assigned to the digital inputs by default.

Table 9-2 Default signals of digital inputs for S200 PTI

Digital input	Parameter	Default signal		
		Fast PTI	S	T
DI0	r0722.0	CWL	CWL	CWL
DI1	r0722.1	CCWL	CCWL	CCWL
DI2	r0722.2	SON	SON	SON
DI3	r0722.3	RESET	RESET	RESET
DI4	r0722.4	-	Fixed speed setpoint 1	-
DI5	r0722.5	P-TRG	ZSCLAMP	TSET
DI6	r0722.6	EMGS	EMGS	EMGS
DI7	r0722.7	EGEAR0	CCWE	CCWE
DI8	r0722.8	CLR	CWE	CWE
DI9	r0722.9	C-MODE	C-MODE	C-MODE

Table 9-3 Default signals of digital inputs for S200 Basic PTI

Digital input	Parameter	Default signal
DI2	r0722.2	SON
DI3	r0722.3	RESET
DI4	r0722.4	-
DI5	r0722.5	P-TRG
DI6	r0722.6	EMGS
DI7	r0722.7	EGEAR0

More information

For more information about wiring digital inputs, see Section "Connecting the inputs and outputs (Page 147)".

Parameters

The following list includes the parameters of the "Digital inputs" function.

Number	Name	Unit
r0722.2...7	Digital inputs status	
r0722.0...9	Digital inputs status	
c0849[0]	No Quick Stop / Quick Stop (OFF3)	
c1020[0]	Fixed speed setpoint selection bit 0	
c1021[0]	Fixed speed setpoint selection bit 1	
c1022[0]	Fixed speed setpoint selection bit 2	
c2104[0]	2nd acknowledge faults	
c29047	Torque setpoint source	
c29048	Torque limit selection bit 0	

c29049	Torque limit selection bit 1
c29063	Speed limit selection bit 0
c29064	Speed limit selection bit 1
c29074	Zero speed clamp active
c29149	Gain switching or PI/P switching
c29265	Inhibit pulse train setpoint
c29267	Clear droop pulses
c29267	Clear droop pulses
c29275	Electronic gear selection bit 0
c29276	Electronic gear selection bit 1
c29300	Servo-on
c29301	Clockwise over-travel limit
c29301	Clockwise over-travel limit
c29302	Counterclockwise over-travel limit
c29302	Counterclockwise over-travel limit
c29303	Clockwise rotation
c29304	Counterclockwise rotation
c29305	Control mode switching

9.3.2 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

The S200 PTI converter has six digital outputs, from DO0 to DO5. The S200 Basic PTI converter has four digital outputs, from DO2 to DO5.

A parameter c073x is assigned to each digital output. You can adjust the function of digital outputs by interconnecting the signal parameters to c073x in commissioning tools.

The following signals are assignable to the digital outputs.

Table 9-4 Assignable signals

Parameter	Signal	Available control mode		
		Fast PTI	S	T
r899.2	Operation enabled (RDY) • 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) • 1: the converter is ready for servo-on. • 0: the converter is not ready for servo-on.	✓	✓	✓

Parameter	Signal	Available control mode		
		Fast PTI	S	T
r2139.3	Fault present (FAULT) • 1: in the fault state. • 0: no fault.	✓	✓	✓
r29289.10	In-position (INP) • 1: the number of droop pulses is in the preset in-position range (parameter p29291). • 0: the number of droop pulses is beyond the preset in-position range.	✓	-	-
r2199.0	|n_act| < p2161: zero speed detection (ZSP) • 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) • 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 • 1: deactivate the motor holding brake. The motor can rotate. • 0: activate the motor holding brake. The motor cannot rotate.	✓	✓	✓
r899.13	Motor holding brake status • 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) • 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.	✓	✓	✓
r29404.4	Warning 1 condition satisfied (WARNING 1) • 1: the parameterizable warning 1 condition has been satisfied. • 0: the parameterizable warning 1 condition has not been satisfied.	✓	✓	✓
r29404.5	Warning 2 condition satisfied (WARNING 2) • 1: the parameterizable warning 2 condition has been satisfied. • 0: the parameterizable warning 2 condition has not been satisfied.	✓	✓	✓
r29404.3	Speed reached (SPDR) • 1: the actual motor speed has nearly (internal hysteresis 10 rpm) reached the speed of the internal speed command or analog speed command. The speed approaching range can be set via parameter p29078. • 0: the speed difference between the speed setpoint and the actual speed is larger than the internal hysteresis.	-	✓	-

Parameter	Signal	Available control mode		
		Fast PTI	S	T
r29404.1	Current control mode (CM_STA) • 1: the second mode in compound control modes. • 0: the first mode in compound control modes or the five basic mode.	-	✓	✓
r46.8	Safety enable missing (STO_EP) • 1: the enable signal is missing, indicating that STO is active. • 0: the enable signal is available, indicating that STO is inactive. Note: STO_EP is a status signal for STO terminals, not a safe DO for the Safety Integrated function.	✓	✓	✓

The following signals are assigned to the digital outputs by default.

Table 9-5 Default signals of digital outputs

Digital output	Parameter	Default signal	
		S200 PTI	S200 Basic PTI
DO0	c0730	TLR	-
DO1	c0731	SPDR	-
DO2	c0732	RDY	RDY
DO3	c0733	FAULT	FAULT
DO4	c0734	INP	INP
DO5	c0735	-	-

More information

For more information about wiring digital outputs, see Section "Connecting the inputs and outputs (Page 147)".

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	
c0732	Signal for terminal DO 2	
c0733	CU signal for terminal DO 3	
c0734	CU signal for terminal DO 4	
c0735	CU signal for terminal DO 5	
p0748.2...5	Digitalausgänge invertieren	
p0748.0...5	Digitalausgänge invertieren	
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	

r29289.0...15	Pulse setpoint status word
r29404.0...5	DO status word

9.3.3 Analog inputs

Overview

An analog input can evaluate a voltage signal. Based on an adjustable characteristic, the S200 PTI converter converts the voltage signal into an internal percentage value. A signal interconnection defines the function of the analog input.

Description of function

The S200 PTI converter has two analog inputs, AI0 and AI1. AI0 is used for speed signals such as speed limit and speed setpoint. AI1 is used for torque signals such as torque limit and torque setpoint. You can adjust the function of the analog inputs in commissioning tools.

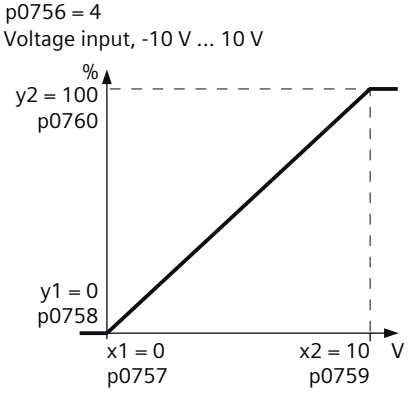
The following signals are assigned to the analog inputs by default.

Table 9-6 Default signals of analog inputs

Analog input	Default signal		
	Fast PTI	**S**	**T**
AI0	Speed limit	Speed setpoint	Speed limit
AI1	Torque limit	Torque limit	Torque setpoint

S200 PTI converts the voltage that the analog input reads in to a percentage value using a scaling characteristic.

The linear scaling characteristic is defined by two points (p0757, p0758) and (p0759, p0760). Parameters p0757 ... p0760 are assigned to an analog input by their index, e.g. parameters p0757[0] ... p0760[0] belong to analog input 0.



More information

For more information about wiring analog inputs, see Section "Connecting the inputs and outputs (Page 147)".

Parameters

The following list includes the parameters of the "Analog inputs" function.

Number	Name	Unit
r0755[0...1]	Analog inputs, actual value in percent	[%]
p0756[0...1]	Analog inputs type	
p0757[0...1]	Analog inputs characteristic value x1	
p0758[0...1]	Analog inputs characteristic value y1	[%]
p0759[0...1]	Analog inputs characteristic value x2	
p0760[0...1]	Analog inputs characteristic value y2	[%]
p0768[0...1]	Analog inputs noise suppression window	[%]

9.3.4 Analog outputs

Overview

An analog output can output a voltage signal. Based on an adjustable characteristic, the S200 PTI converter converts an internal percentage value into a voltage signal. A signal interconnection defines the function of the analog output.

Description of function

The S200 PTI converter has two analog outputs, AO0 and AO1. The parameter c0771[x] is assigned to the two analog outputs. You can adjust the function of the analog outputs in commissioning tools.

The following signals are assignable to the analog outputs.

Parameter	Signal	Available control mode		
		Fast PTI	S	T
r0063	Actual speed smoothed	✓	✓	✓
r0080	Torque actual value	✓	✓	✓
r0062	Speed setpoint after the filter	✓	✓	✓
r0079	Torque setpoint	✓	✓	✓
r0070	Actual DC link voltage	✓	✓	✓
r29350	Pulse input frequency	✓	-	-
r29351	Remaining number of pulses	✓	-	-

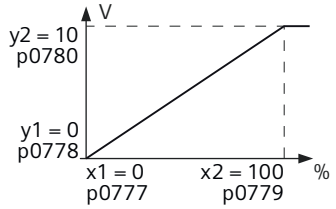
The following signals are assigned to the analog outputs by default.

Table 9-7 Default signals of analog outputs

Analog output	Parameter	Default signal
AO0	c0771[0]	Actual speed smoothed
AO1	c0771[1]	Torque actual value

S200 PTI uses a scaling characteristic to convert the value range -100% ... 100% of the internal signal to the selected voltage range. The two points (x1, y1) and (x2, y2) define the scaling characteristic.

p0776 = 1
Voltage output, 0 V ... 10 V



More information

For more information about wiring analog outputs, see Section "Connecting the inputs and outputs (Page 147)".

Parameters

The following list includes the parameters of the "Analog outputs" function.

Number	Name	Unit
r0062	Speed setpoint after the filter	[rpm]
r0063	Speed actual value smoothed	[rpm]
r0070	Actual DC link voltage	[V]
r0079[0...1]	Torque setpoint total	[Nm]
r0080	Torque actual value	[Nm]
c0771[0...1]	CU analog outputs signal	
p29342	Reference frequency assigned to pulse input frequency	
p29343	Reference frequency assigned to remaining number of pulses	
r29350	Pulse input frequency	
r29351	Remaining number of pulses	

9.4 General functions

9.4.1 Servo-on

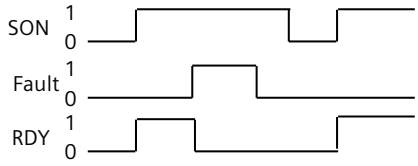
Overview

"Servo-on" powers on the power circuit and makes the servo drive system ready to operate. You can enable the "servo-on" function via the digital input signal SON.

Description of function

Table 9-8 SON signal

Signal type	Signal name	Setting	Description
DI	SON	ON = rising edge	Servo motor circuit is connected (the motor is in "servo-on" state). Servo motor is ready to run.
		OFF = falling edge	Servo motor circuit is shut off (the motor is in "servo-off" state). Servo motor is not ready to run.



When the converter detects the rising edge of the SON signal without faults, the RDY signal turns to high level. When a fault occurs, the RDY signal turns to low level. The RDY signal will keep at low level even if the fault is acknowledged, unless the converter detects another rising edge of the SON signal again.

9.4.2 Over-travel

Overview

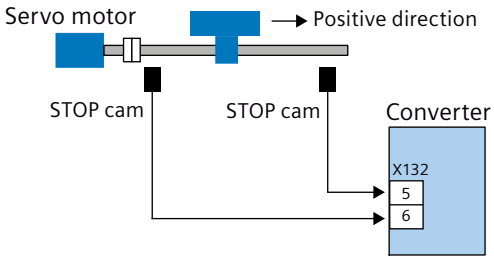
When the servo motor travels over the distance limit, the limit switch is turned on and then the servo motor has a quick stop.

Description of function

Signal CWL functions as the clockwise travel limit while the signal CCWL functions as the counter-clockwise travel limit. Both of them are level and edge sensitive signals.

Table 9-9 CWL and CCWL signals overview

Signal type	Signal name	Setting	Description
DI	CWL	Falling edge (1 → 0)	The servo motor has travelled to the clockwise travel limit and has a quick stop after that.
DI	CCWL	Falling edge (1 → 0)	The servo motor has travelled to the counterclockwise travel limit and has a quick stop after that.



In S, T, or Fast PTI control mode, the motor rotates properly after you do as follows:

- When F52961 is triggered after the STOP cam plus is reached in a positive traversing direction, acknowledge the fault using the RESET signal, and then move the axis away from the STOP cam plus in a negative traversing direction to return it to a position within the valid traversing range.
- When F52960 is triggered after the STOP cam minus is reached in a negative traversing direction, acknowledge the fault using the RESET signal, and then move the axis away from the STOP cam minus in a positive traversing direction to return it to a position within the valid traversing range.

⚠ WARNING

Danger to life or malfunctions of the machine due to the motor travelling over the distance limit

In T control mode, the motor travels over the distance limit if you only acknowledge the fault without returning the axis to a position within the valid traversing range.

In S control mode, the motor travels over the distance limit if you only acknowledge the fault without returning the axis to a position within the valid traversing range while signal CWL or CCWL becomes from a low level (logic 0) to a high level (logic 1).

- Acknowledge the fault, and then return the axis to a position within the valid traversing range to prevent the motor from travelling over the distance limit.

Note

- Make sure both signals CWL and CCWL are at a high level when the converter is powered on.
- In S control mode, the motor cannot rotate with no fault if you only acknowledge the fault without returning the axis to a position within the valid traversing range while signal CWL or CCWL keeps at a low level.

Parameters

The following list includes the parameters of the "Over-travel" function.

Number	Name	Unit
c29301	Clockwise over-travel limit	
c29301	Clockwise over-travel limit	
c29302	Counterclockwise over-travel limit	
c29302	Counterclockwise over-travel limit	

9.4.3 Stopping methods 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)

The ramp-down can be configured with the digital input signal SON in all control modes. When it is configured in T mode, the motor responds according to OFF2.

Table 9-10 SON signal

Signal type	Signal name	Pin assignment	Setting	Description
DI	SON	X132-7	Rising edge (0 → 1)	Power circuit is powered on and the servo drive system is ready to run.
			Falling edge (1 → 0)	Motor ramps down.

Coast-down (OFF2)

The coast-down can be configured with the digital input signal SON in T mode.

Table 9-11 SON signal

Signal type	Signal name	Pin assignment	Setting	Description
DI	SON	X132-7	Rising edge (0 → 1)	Power circuit is powered on and the servo drive system is ready to run.
			Falling edge (1 → 0)	Motor coasts down.

Quick stop (OFF3)

The quick stop can be configured with the digital input signal EMGS in all control modes.

Table 9-12 EMGS signal

Signal type	Signal name	Pin assignment	Setting	Description
DI	EMGS	X132-11	1	Servo drive system is ready to run.
			0	Quick stop.

9.4.4 Vertical axis

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.

9.4.5 PTO function

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.

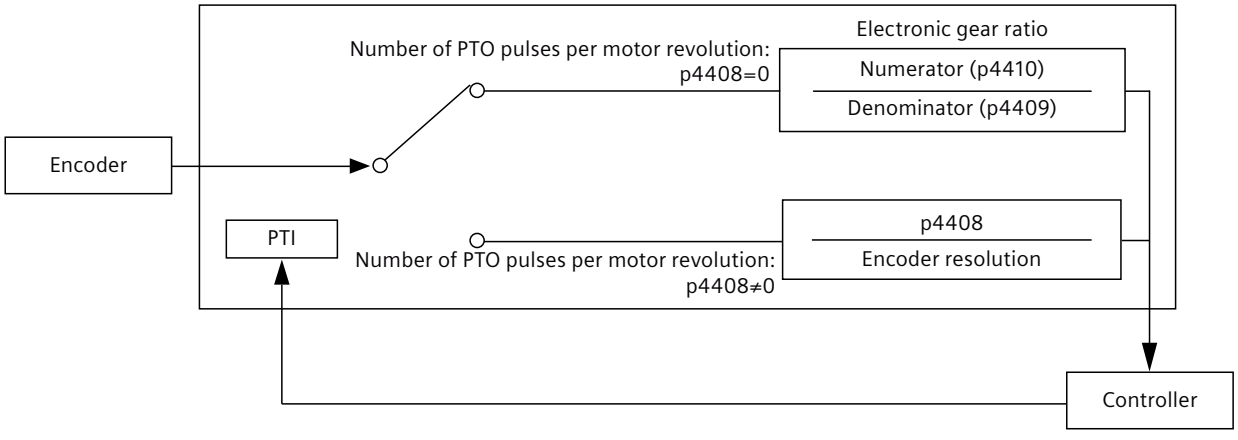
A pulse train encoder output which provides pulse signals can transmit the signals to the controller to realize a closed-loop control system inside the controller, or transmit them to another drive as pulse train setpoint for a synchronous axis or as control interface of another device (for example, a line scan camera).

Description of function

PTO is also referred to as pulse/direction interface. The pulse/direction interface comprises two signals.

- **PTO direction output**
  The direction output defines the traversing direction. 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 velocity and the number of output pulses for the section to be traversed. You can set the maximal output frequency of the pulse train output via p4405.

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).
- Gear ratio by using a numerator (p4410) and a denominator (p4409).

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 r0979[2] 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.

Parameters

The following list includes the parameters of the "PTO" function.

Number	Name	Unit
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	

9.4.6 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

9.5 Fast position control with pulse train input (Fast PTI)

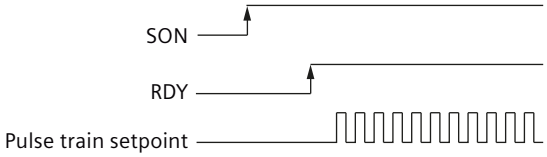
9.5.1 Sequence of SON

Overview

Observe the correct sequence to servo-on the converter smoothly.

Description of function

When the converter operates in the fast pulse train input position control mode (Fast PTI), the pulse train setpoint must be sent out after the RDY signal is at high level.



9.5.2 Selecting a setpoint pulse train input channel

Overview

The converter supports two channels for the setpoint pulse train input:

- 24 V single end pulse train input
- High-speed 5 V differential pulse train input (RS485)

Description of function

You can select one of the two channels. The position pulse train inputs come from either of the following two terminal groups.

Table 9-13 Two terminal groups

Group 1 (high-speed 5 V differential)		Group 2 (24 V single end)	
Signal name	**Pin assignment**	**Signal name**	**Pin assignment**
PTIA_D+	X132-1	PTIA_24P	X132-36
PTIA_D-	X132-2	PTIA_24M	X132-37
PTIB_D+	X132-26	PTIB_24P	X132-38
PTIB_D-	X132-27	PTIB_24M	X132-39

The maximum input pulse frequency for the 24 V single end pulse train input channel is 200 kHz.

The maximum input pulse frequency for the high-speed 5 V differential pulse train input (RS485) channel is 4 MHz. The channel supports wire-break detection for input pulse frequency up to 1 MHz. When the converter detects a disconnection in the wire, it outputs fault F07217.

For the high-frequency input signal (> 200 kHz), Siemens recommends that you set the filter time for the pulse train input signals (p0438) to 0.04 us.

9.5.3 Selecting a setpoint pulse train input form

Overview

The converter supports three kinds of setpoint pulse train input forms:

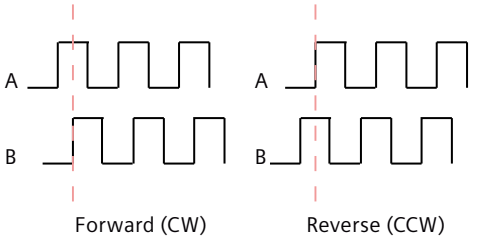
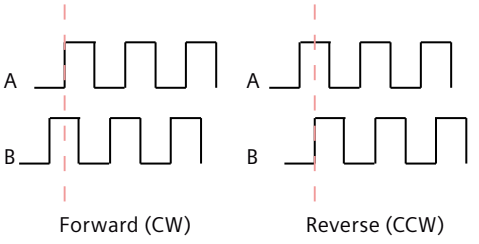
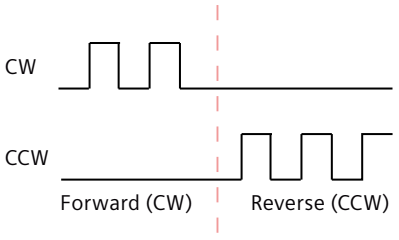
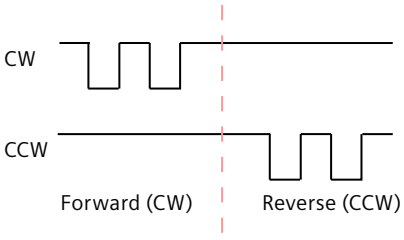
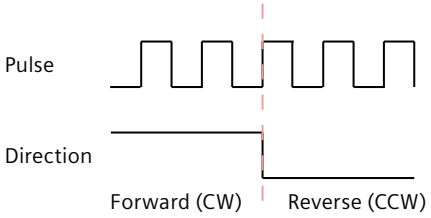
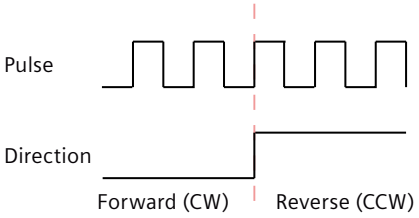
- AB phase pulse
- CW + CCW pulse
- Pulse + Direction

The available pulse train input form depends on the connected controller.

Description of function

For all the three forms, positive logic and negative logic are supported. You can select the desired form during in the commissioning tool.

Table 9-14 Three kinds of setpoint pulse train input forms

Pulse train input form	Positive logic = 0	Negative logic = 1
AB phase pulse		
CW + CCW pulse		
Pulse + Direction		

9.5.4 Position monitoring function

Overview

The position monitoring function monitors the deviation of the position setpoint and the actual position. It includes the in-position state monitoring and the following error monitoring.

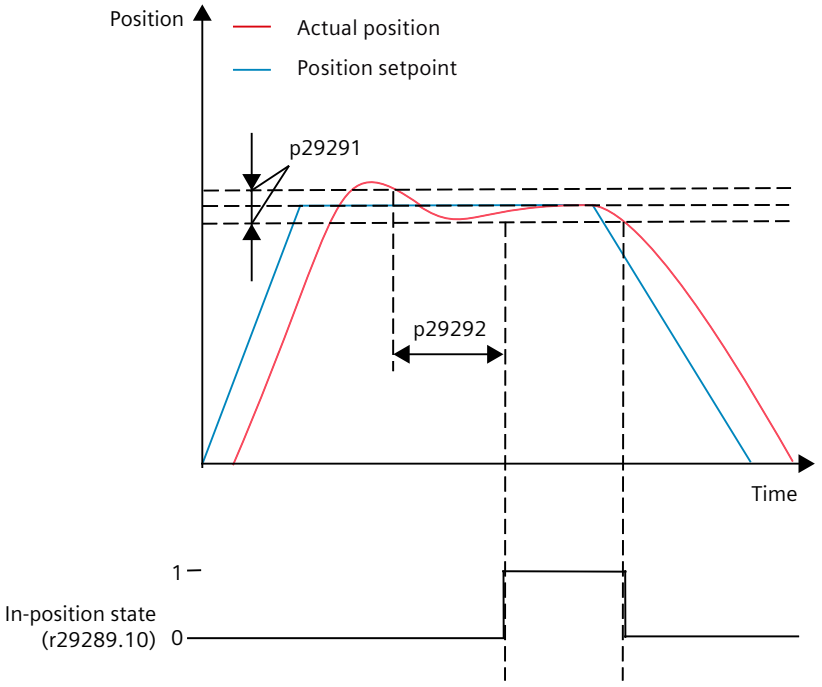
Description of function

In-position monitoring

The in-position state is monitored by the position setpoint, the actual position, and the motor speed. There are three modes available for in-position state monitoring via p29290. When

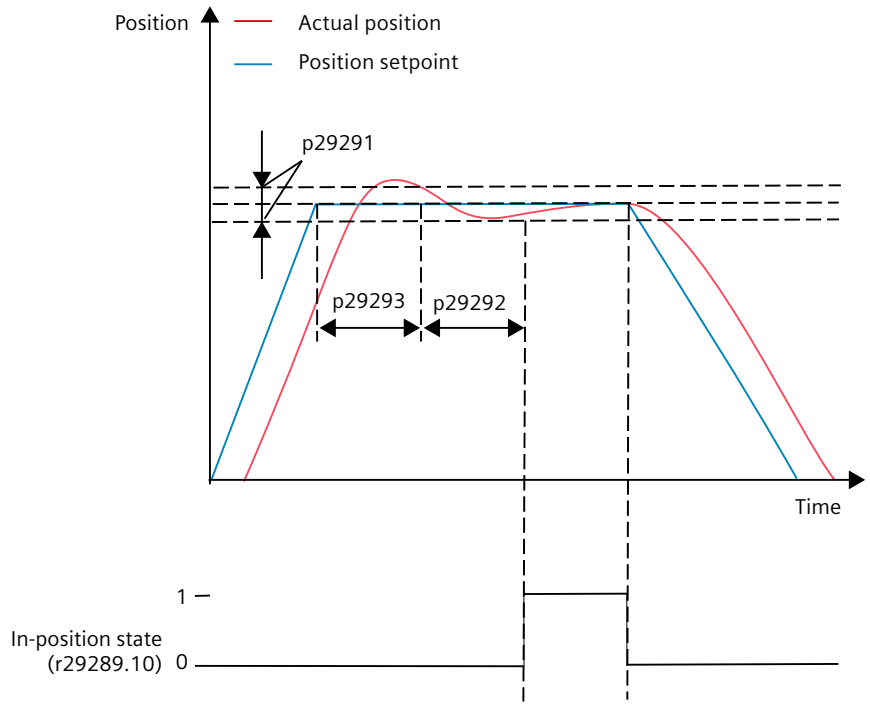
the deviation between the position setpoint and the actual position fulfills all the conditions specified in your selected mode, the signal INP (in-position) is output.

- **p29290 = 0: with the deviation of the actual position**
  Condition: the deviation of position is within the in-position window range (p29291).



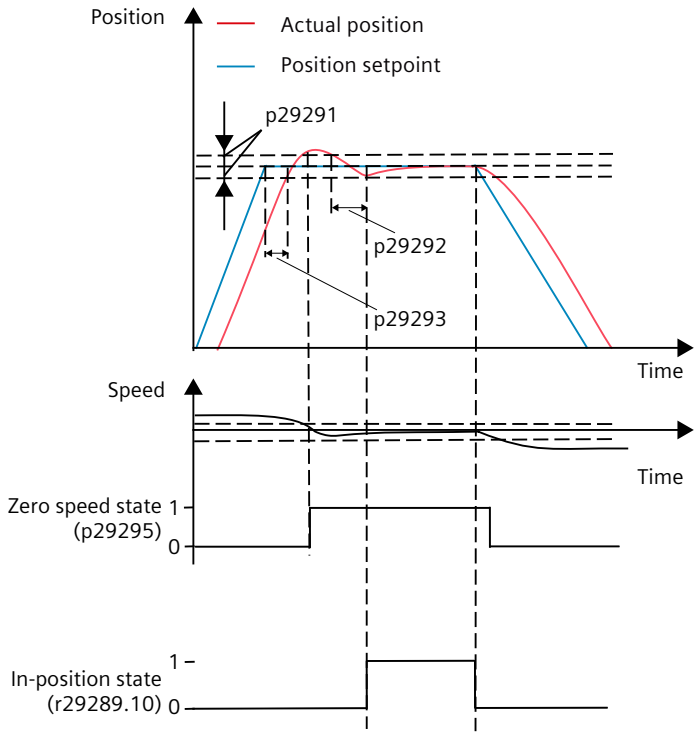
① Actual position
② Position setpoint

- **p29290 = 1: with the deviation of the actual position and the position setpoint**
  Condition: the deviation of position is within the in-position window range (p29291) and no new position setpoint is active.



① Actual position
② Position setpoint

- **p29290 = 2: with the deviation of the actual position, the position setpoint, and the actual speed**
  Condition: the deviation of position is within the in-position window range (p29291); no new position setpoint is active; and the actual motor speed is almost zero.



① Actual position
② Position setpoint

Following error monitoring

The following error monitoring is activated when the following error monitoring threshold (p29294) is not 0. When the absolute value of the deviation between the position setpoint and the actual position is greater than p29294, fault F52940 is output and bit r29289.8 is reset immediately.

Parameters

The following list includes the parameters of the "Position monitoring" function.

Number	Name	Unit
r29289.0...15	Pulse setpoint status word	
p29290	In-position monitoring mode	
p29291	In-position window range	
p29292	In-position monitoring time	[ms]
p29293	New setpoint monitoring time	[ms]
p29294	Following error monitoring threshold	

9.5.5 Smoothing function

Overview

Smoothing function is used to filter the position commands to make the servo motor rotate more smoothly. With the smoothing function, the position characteristics curve from the pulse train input setpoint can be transformed into an S-curve profile with a time constant.

Description of function

The converter supports three filters (two moving averaging filters and one low pass filter PT1) to fulfill different smoothing purposes. The moving averaging filters are usually used to smooth the high step position commands and the acceleration or deceleration limit, while the PT1 filter is used to smooth the high frequency noise.

Smoothing should be considered in the following situations:

- Low pulse frequency and high electronic gear ratio
- No acceleration/deceleration processing in the high-level controller
- High frequency noise

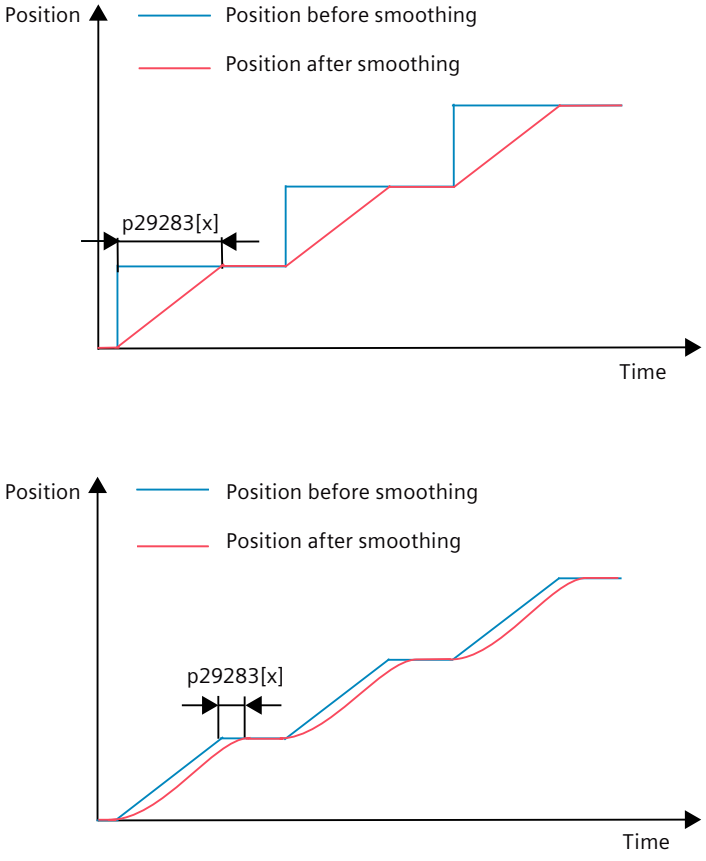


Figure 9-1 Smoothing with moving average filter

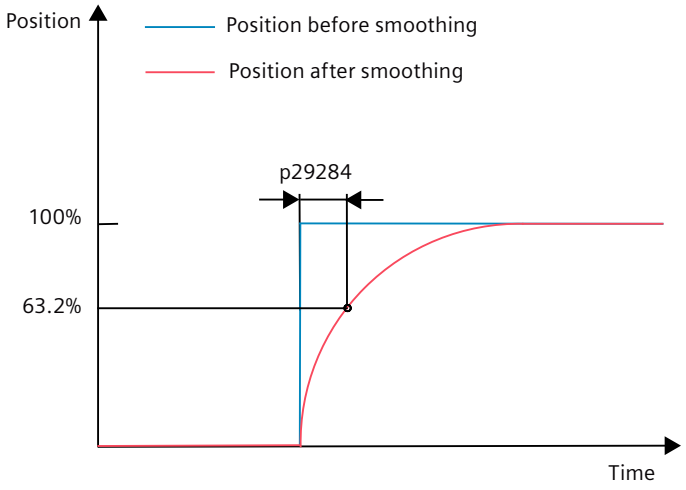


Figure 9-2 Smoothing with PT1 filter

Parameters

The following list includes the parameters of the "Smoothing" function.

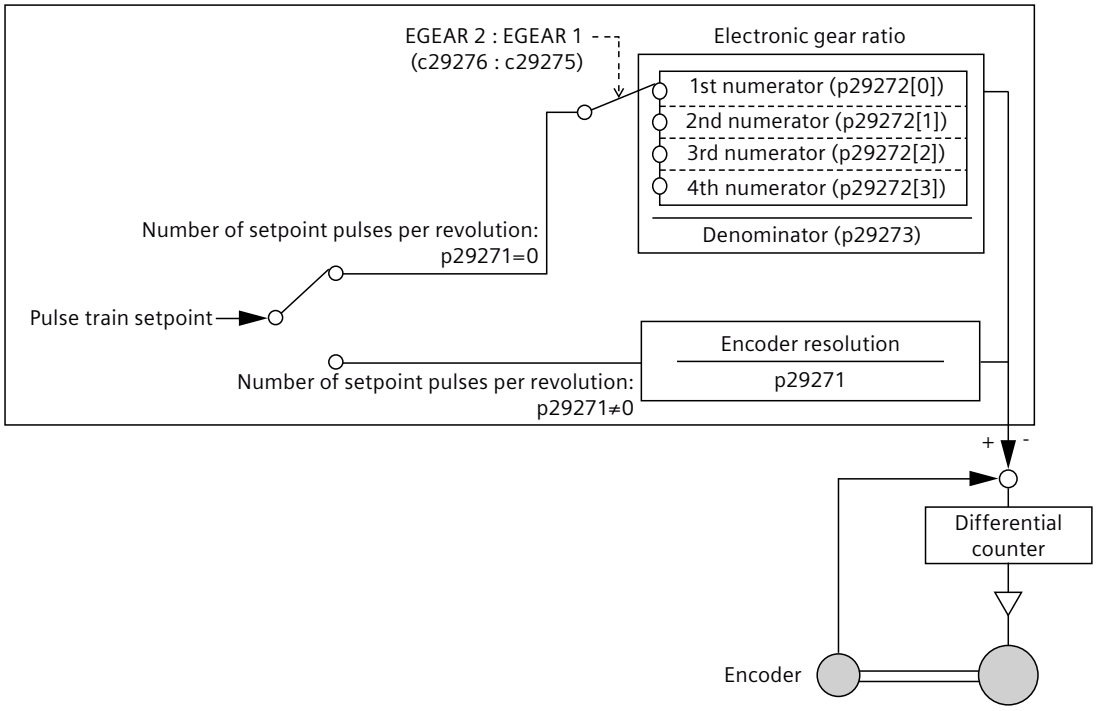
Number	Name	Unit
p29283[0...1]	Pulse setpoint moving average time	[ms]
p29284	Pulse setpoint PT1 filter time constant	[ms]

9.5.6 Electronic gear ratio

Overview

With the function of electronic gear, you can define the motor revolutions according to the number of setpoint pulses, and sequentially define the distance of mechanical movement. The minimum traveling distance of load shaft corresponding to one setpoint pulse is called a length unit (LU); for example, one pulse results in 1 µm movement.

Description of function



The electronic gear ratio is a multiplier factor to pulse train setpoint. It is realized with a numerator and a denominator. Four numerators (p29272[0], p29272[1], p29272[2], p29272[3]) and one denominator (p29273) are used for the four electronic gear ratios. These four electronic gear ratios can be selected with the combination of the digital input signals EGEAR1 and EGEAR2.

Table 9-15 Combination of electronic gear ratio and EGEAR1 and EGEAR2 signals

EGEAR2 : EGEAR1	Electronic gear ratio	Ratio value
0 : 0	Electronic gear ratio 1	p29272[0] : p29273
0 : 1	Electronic gear ratio 2	p29272[1] : p29273
1 : 0	Electronic gear ratio 3	p29272[2] : p29273
1 : 1	Electronic gear ratio 4	p29272[3] : p29273

Note

The range of the electronic gear ratio is from 0.001 to 64000.

The electronic gear ratio can be set either at servo-off state or at servo-on state.

- When setting at servo-on state, the pulse train input signal may be lost by the differential counter during the electronic gear ratio changing.

Example

Calculation formula for the electronic gear ratio

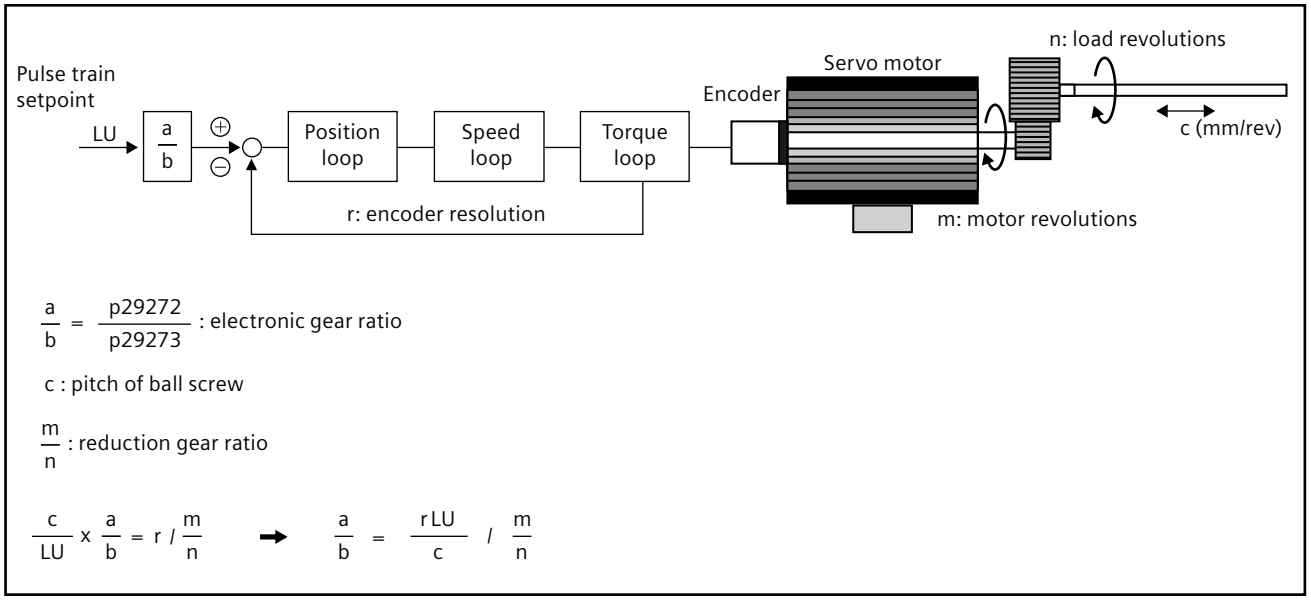
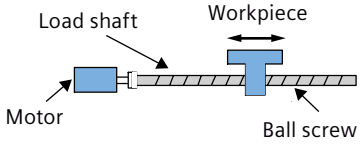
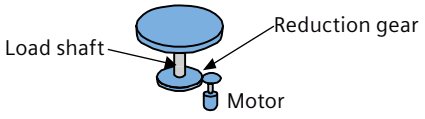


Table 9-16 Examples for calculating the electronic gear ratio

Step	Description	Mechanism	
		Ball screw	Disc table
		LU: 1 µm 	LU: 0.01° 
1	Identify mechanism	• Pitch of ball screw: 8 mm • Reduction gear ratio: 1 : 1	• Rotary angle: 360° • Reduction gear ratio: 3 : 1
2	Identify the encoder resolution (r)	21-bit	21-bit
3	Define LU	1 LU = 1 µm	1 LU = 0.01°
4	Calculate the travel distance per load shaft revolution	8/0.001 = 8000 LU	360°/0.01° = 36000 LU
5	Calculate the electronic gear ratio	(1/8000)/(1/1) × 2^{21} = 2^{21}/8000 = 32768/125	(1/36000)/(3/1) × 2^{21} = 2^{21}/12000 131072/75

Parameters

The following list includes the parameters of the "Electronic gear ratio" function.

Number	Name	Unit

p29271	Number of setpoint pulses per revolution
p29272[0...3]	Numerator of electronic gear
p29273	Denominator of electronic gear
c29275	Electronic gear selection bit 0
c29276	Electronic gear selection bit 1

9.5.7 Inhibiting pulse train input setpoint (P-TRG)

Overview

The digital input signal P-TRG is the default connection of DI5 in the position control mode.

Description of function

In the fast position control with pulse train input control mode (Fast PTI), P-TRG is level sensitive and can be used to allow or inhibit positioning operation according to the pulse train input setpoint:

- 0: positioning according to the pulse train input setpoint
- 1: inhibit the pulse train input setpoint

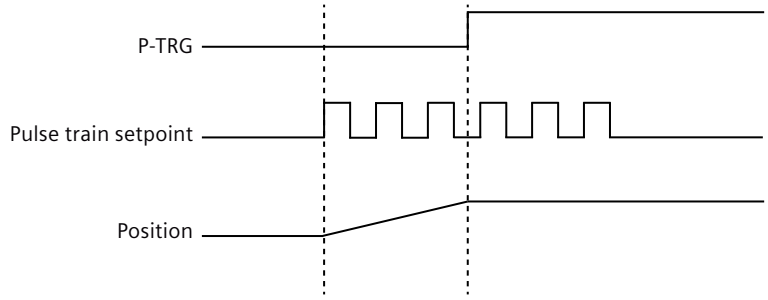


Figure 9-3 Timing diagram

Table 9-17 P-TRG signal

Signal type	Signal name	Setting	Description
DI	P-TRG	1 (high level)	Inhibit the pulse train input setpoint
		0 (low level)	Positioning according to the pulse train input setpoint

9.5.8 Clearing droop pulses (CLR)

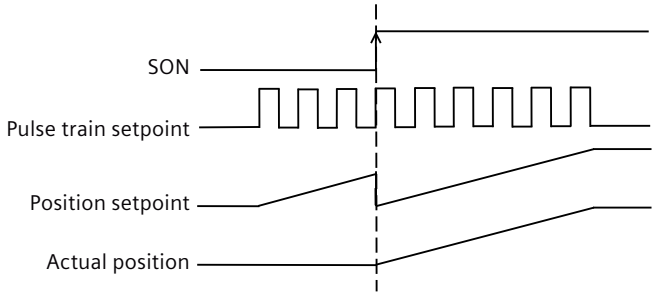
Overview

The droop pulses can be cleared with the parameter p29266 and the digital input signal CLR.

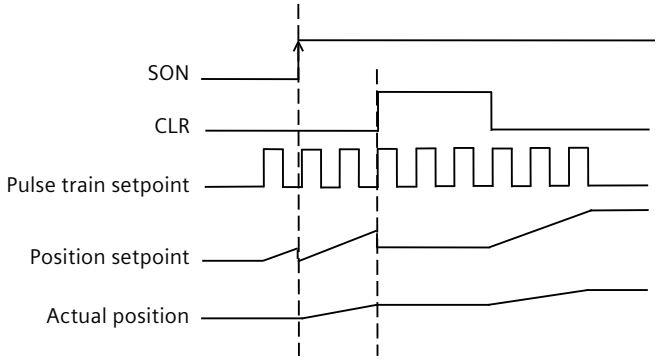
Description of function

The droop pulse clearing is executed depending on the clearing mode selected via p29266.

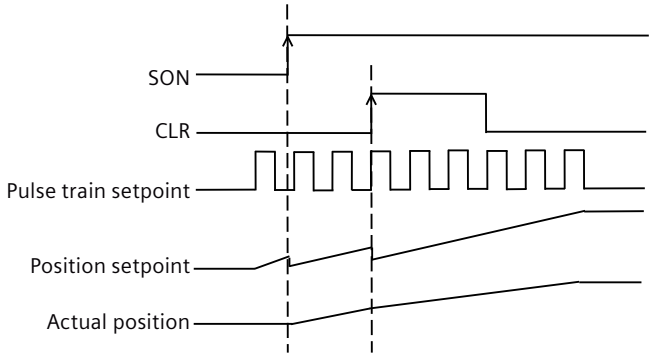
- **p29266 = 0: Clear droop pulses before enabling servo-on signal**



- **p29266 = 1: Clear droop pulses before enabling servo-on signal or with the CLR high level**



- **p29266 = 2: Clear droop pulses before enabling servo-on signal or with the CLR rising edge**



Parameters

The following list includes the parameters of the "Clearing droop pulses (CLR)" function.

Number	Name	Unit
p29266	Droop pulse clearing mode selection	
c29267	Clear droop pulses	
c29267	Clear droop pulses	

9.5.9 Speed limit

Overview

The following four sources are available for the speed limit in all control modes. 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 9-18 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 9-19 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

Note

Analog speed limit for S200 PTI

For S200 PTI, when the signal SLM1-SLM0 status is 0-1, p29070[1] is invalid and the analog voltage from the analog input 0 is used as the speed limit.

The analog voltage from the analog input 0 corresponds to an internal percentage value. Default speed value is the rated motor speed. The analog voltage of 10 V corresponds to the maximum speed setpoint (V_max) and this maximum speed setpoint can be specified by parameter p2000.

Overall speed limit

The overall speed limit can be configured by setting the following parameters.

Table 9-20 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 and the overall speed limit are 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]
p2000	Reference speed	[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]

9.5.10 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 9-21 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 TLIM0 and TLIM1, fault F07900 occurs.

Description of function

Internal torque limit

Select an internal torque limit by setting the following parameters.

Table 9-22 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

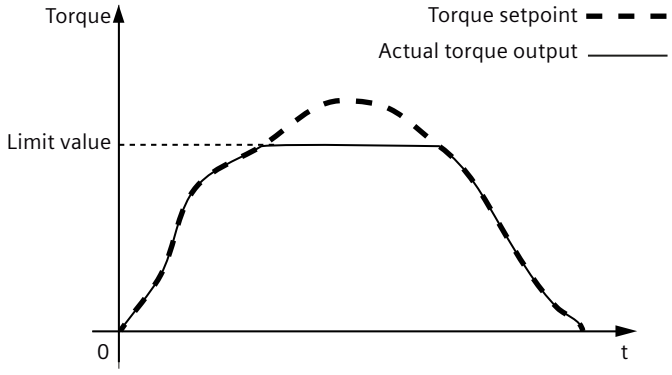
Note

Analog torque limit for S200 PTI

For S200 PTI, when the signal TLM1-TLM0 status is 0-1, p29050[1] is invalid and the analog voltage from the analog input 1 is used as the torque limit.

The analog voltage from the analog input 1 corresponds to an internal percentage value. Default torque value is the rated motor torque (r0312). The analog voltage of 10 V corresponds to the rated motor torque.

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 9-23 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
p0312[0]	Rated motor torque	[Nm]
p1520[0]	Torque limit upper	[Nm]
p1521[0]	Torque limit lower	[Nm]

p29050[0...3]	Upper torque limit	[%]
p29051[0...3]	Lower torque limit	[%]

9.5.11 Torque overload monitoring

Overview

The torque overload monitoring function monitors the status of the output torque.

Description of function

The overload threshold for the output torque can be set with the parameter p29054. The torque overload level window is calculated by p29054 * p0312. When the output torque exceeds the overload reached level, the signal OLL (overload level reached) is output.

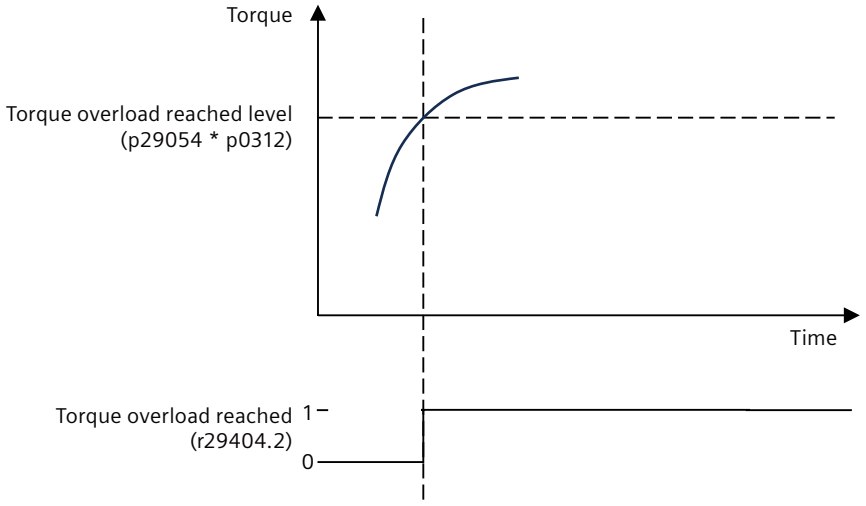


Figure 9-4 Torque overload monitoring

Parameters

The following list includes the parameters of the "Torque overload monitoring" function.

Number	Name	Unit
p0312[0]	Rated motor torque	[Nm]
p29054	Overload threshold for output signal triggering	[%]
r29404.0...5	DO status word	

9.6 Speed control (S) (for S200 PTI only)

9.6.1 Speed setpoint

Overview

Eight sources in total are available for the speed setpoint. You can select one of them with the combination of digital input signals SPD1, SPD2 and SPD3:

Table 9-24 Speed setpoint source overview

Digital signal			Speed setpoint
SPD3	SPD2	SPD1	
0	0	0	Analog speed setpoint (analog input 0)*
0	0	1	Fixed speed setpoint 1
0	1	0	Fixed speed setpoint 2
0	1	1	Fixed speed setpoint 3
1	0	0	Fixed speed setpoint 4
1	0	1	Fixed speed setpoint 5
1	1	0	Fixed speed setpoint 6
1	1	1	Fixed speed setpoint 7

* Default speed setpoint source

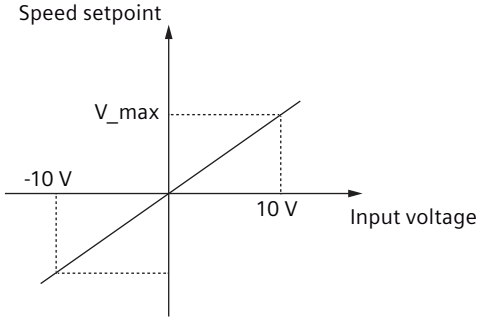
Description of function

Speed control with analog speed setpoint

In the S mode, when the digital input signals SPD1, SPD2 and SPD3 are all at low level (0), analog voltage from the analog input 0 is used as the speed setpoint.

The analog voltage from the analog input 0 corresponds to an internal percentage value. Default speed value is the rated motor speed. The analog voltage of 10 V corresponds to the maximum speed setpoint (V_max) and this maximum speed setpoint can be specified by parameter p2000.

The relationship between the analog voltage and the speed setpoint is shown as follows:



Note

When the converter is working with external analog speed setpoint, the system continues to work automatically after you repower on the 24 V DC power supply which was unexpectedly shut off for the converter. In this case, do not touch the equipment.

Speed control with fixed speed setpoint

In the S mode, when at least one of the three digital input signals SPD1, SPD2 and SPD3 is at high level, one of the following parameter values is used as the speed setpoint.

Table 9-25 Fixed speed setpoint overview

Parameter	Speed setpoint	Digital signal		
		SPD3	SPD2	SPD1
p1001	Fixed speed setpoint 1	0	0	1
p1002	Fixed speed setpoint 2	0	1	0
p1003	Fixed speed setpoint 3	0	1	1
p1004	Fixed speed setpoint 4	1	0	0
p1005	Fixed speed setpoint 5	1	0	1
p1006	Fixed speed setpoint 6	1	1	0
p1007	Fixed speed setpoint 7	1	1	1

Parameters

The following list includes the parameters of the "Speed setpoint" function.

Number	Name	Unit
p1001[0]	Fixed speed setpoint 1	[rpm]
p1002[0]	Fixed speed setpoint 2	[rpm]
p1003[0]	Fixed speed setpoint 3	[rpm]
p1004[0]	Fixed speed setpoint 4	[rpm]
p1005[0]	Fixed speed setpoint 5	[rpm]
p1006[0]	Fixed speed setpoint 6	[rpm]
p1007[0]	Fixed speed setpoint 7	[rpm]
p2000	Reference speed	[rpm]

9.6.2 Direction and stop

Overview

Two digital input signals are used to control motor direction and run/stop:

- CWE: enable clockwise rotations
- CCWE: enable counterclockwise rotations

Description of function

The following table shows you the details:

Signal		Fixed torque set-point	Analog torque setpoint		
CCWE	CWE		+ polarity	- polarity	0 V
0	0	0	0	0	0
0	1	CW	CW	CCW	0
1	0	CCW	CCW	CW	0
1	1	0	0	0	0

Note

In S mode or T mode, when the servo motor is ready to run, signal CWE or CCWE is a must to start running the motor.

9.6.3 Speed limit

Overview

The following four sources are available for the speed limit in all control modes. 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 9-26 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 9-27 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

Note

Analog speed limit for S200 PTI

For S200 PTI, when the signal SLM1-SLM0 status is 0-1, p29070[1] is invalid and the analog voltage from the analog input 0 is used as the speed limit.

The analog voltage from the analog input 0 corresponds to an internal percentage value. Default speed value is the rated motor speed. The analog voltage of 10 V corresponds to the maximum speed setpoint (V_max) and this maximum speed setpoint can be specified by parameter p2000.

Overall speed limit

The overall speed limit can be configured by setting the following parameters.

Table 9-28 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 and the overall speed limit are 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]
p2000	Reference speed	[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]

9.6.4 Speed reached monitoring

Overview

The speed reached monitoring function monitors the status of the actual speed.

Description of function

The threshold for triggering the signal SPDR (speed reached) can be set with the parameter p29078. When the actual speed is in the range of this window, the signal SPDR is output.

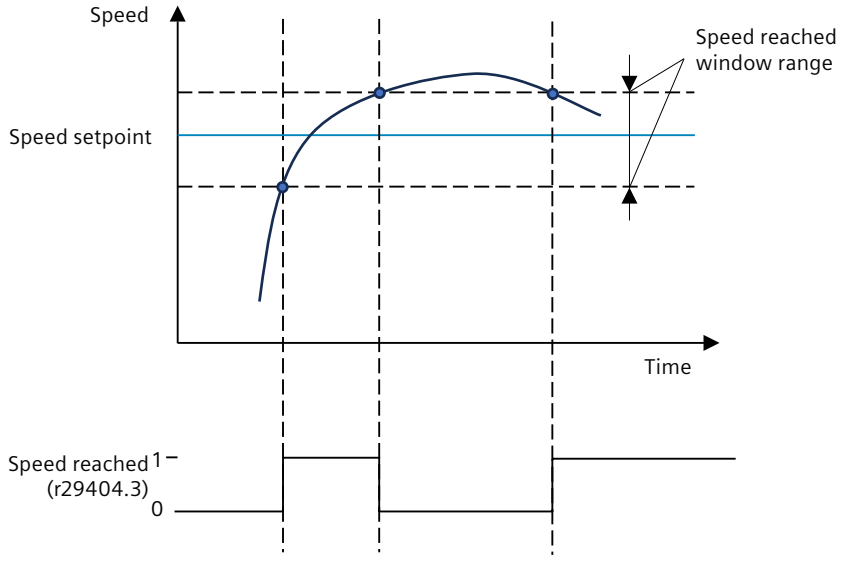


Figure 9-5 Speed reached monitoring

Parameters

The following list includes the parameters of the "Speed reached monitoring" function.

Number	Name	Unit
p29078	Threshold for speed reached	[rpm]
r29404.0...5	DO status word	

9.6.5 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 9-29 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 TLIM0 and TLIM1, fault F07900 occurs.

Description of function

Internal torque limit

Select an internal torque limit by setting the following parameters.

Table 9-30 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

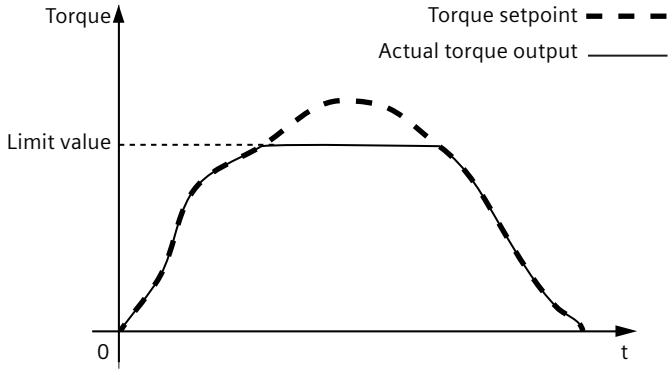
Note

Analog torque limit for S200 PTI

For S200 PTI, when the signal TLM1-TLM0 status is 0-1, p29050[1] is invalid and the analog voltage from the analog input 1 is used as the torque limit.

The analog voltage from the analog input 1 corresponds to an internal percentage value. Default torque value is the rated motor torque (r0312). The analog voltage of 10 V corresponds to the rated motor torque.

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 9-31 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
p0312[0]	Rated motor torque	[Nm]
p1520[0]	Torque limit upper	[Nm]
p1521[0]	Torque limit lower	[Nm]

p29050[0...3]	Upper torque limit	[%]
p29051[0...3]	Lower torque limit	[%]

9.6.6 Torque overload monitoring

Overview

The torque overload monitoring function monitors the status of the output torque.

Description of function

The overload threshold for the output torque can be set with the parameter p29054. The torque overload level window is calculated by p29054 * p0312. When the output torque exceeds the overload reached level, the signal OLL (overload level reached) is output.

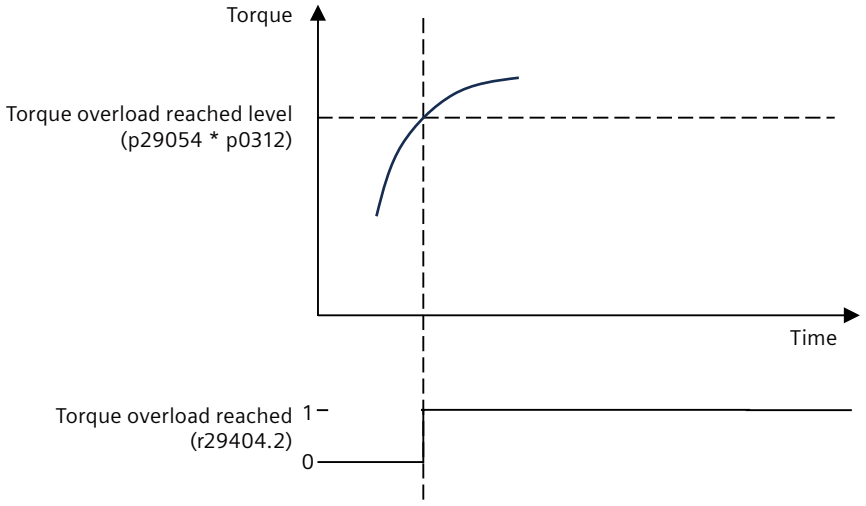


Figure 9-6 Torque overload monitoring

Parameters

The following list includes the parameters of the "Torque overload monitoring" function.

Number	Name	Unit
p0312[0]	Rated motor torque	[Nm]
p29054	Overload threshold for output signal triggering	[%]
r29404.0...5	DO status word	

9.6.7 Zero speed clamp

Overview

The function of zero speed clamp is used to stop the motor and lock the motor axis when motor speed setpoint is below a parameterized threshold level (p29075).

Description of function

The zero speed clamp function is available only when the analog input 0 is used as the source of the speed setpoint. The digital input signal ZSCLAMP is used to activate this function. When both the motor speed setpoint and the motor actual speed are below the parameterized threshold level and the signal ZSCLAMP is logic "1", the motor is locked. The converter exits from clamping state either when the motor speed setpoint is above the threshold level or when the signal ZSCLAMP is logic "0".

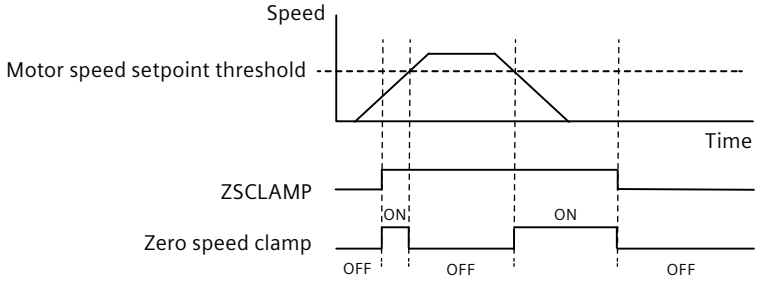


Table 9-32 DI configuration

Signal type	Signal name	Setting	Description
DI	ZSCLAMP	1	When the motor speed setpoint is below the zero speed clamp threshold, the motor is locked.
		0	No action

9.6.8 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:

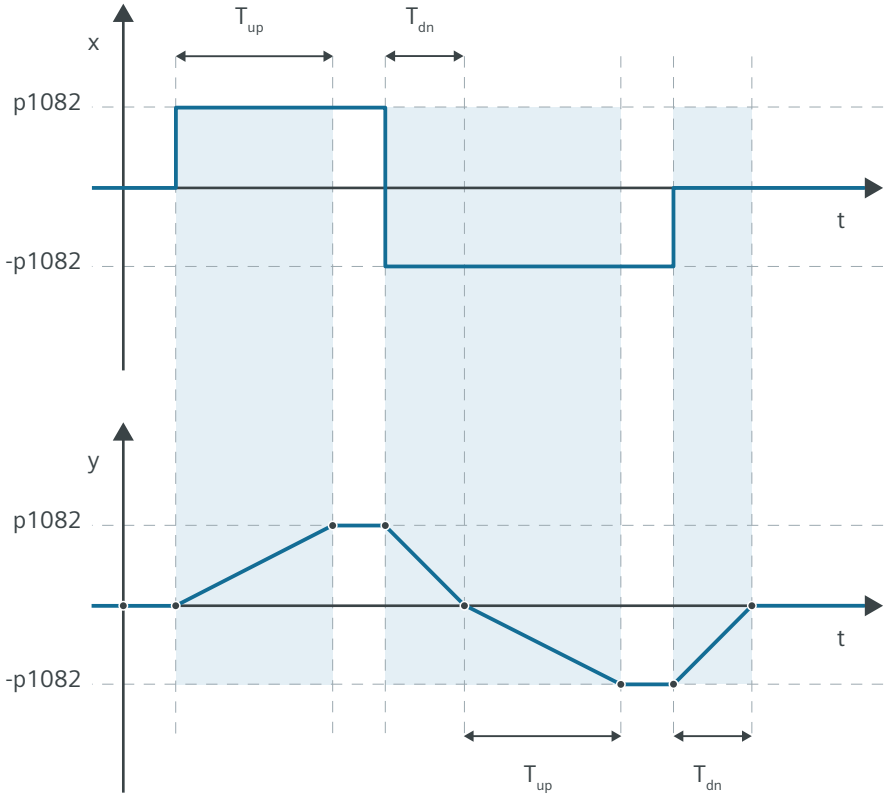


Figure 9-7 Basic ramp-function generator

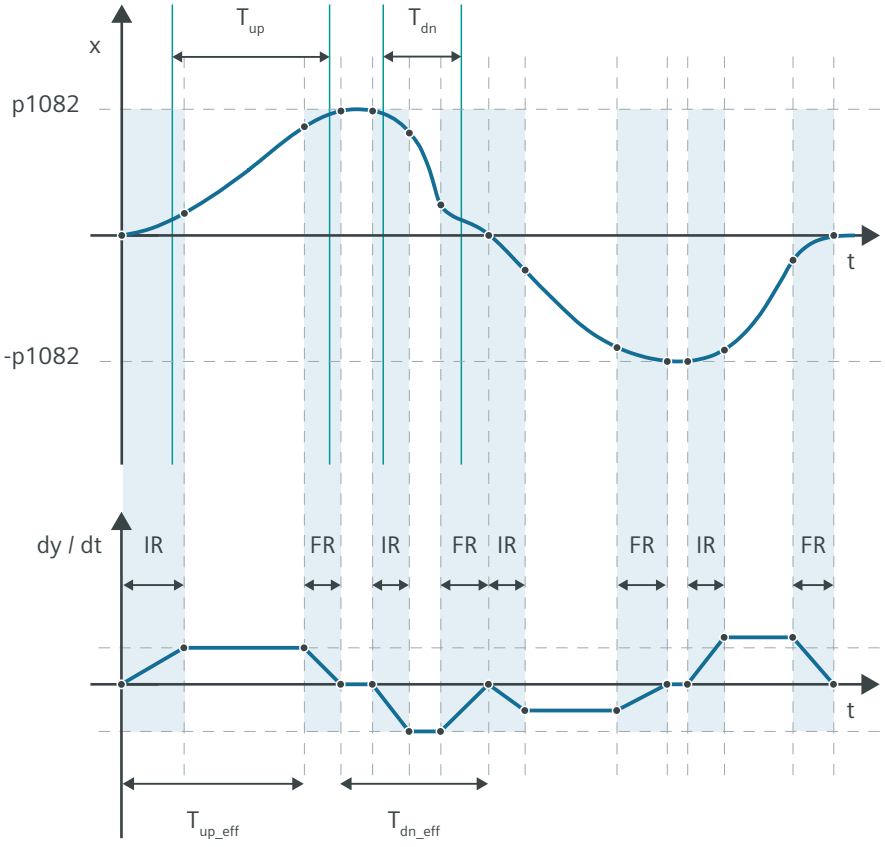
Extended ramp-function generator

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:



$T_{up\_eff} = T_{up} + (IR/2 + FR/2)$

$T_{dn\_eff} = T_{dn} + (IR/2 + FR/2)$

Figure 9-8 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]

9.7 Torque control (T) (for S200 PTI only)

Overview

When using the torque control mode of the S200 PTI converter, the torque on the motor shaft is output in accordance with the torque setpoint.

Description of function

In most of the applications, a motor with torque control works with a speed master, for example, to realize the line tension control or pressure control, and so on.
Otherwise, if a motor with torque control works alone, and the output torque is larger than the load torque, the motor will keep accelerating, until overspeed occurs. The converter will inhibit the pulse and output a fault signal when overspeed occurs.

9.7.1 Torque setpoint

Overview

Two sources are available for torque setpoint:

- Analog torque setpoint
- Internal fixed torque setpoint

These two resources can be selected with the digital input signal TSET.

Table 9-33 Digital input signal TSET

Signal	Level	Source of torque setpoint
TSET	0 (default)	Analog torque setpoint (analog input 1)
	1	Internal fixed torque setpoint (p29043)

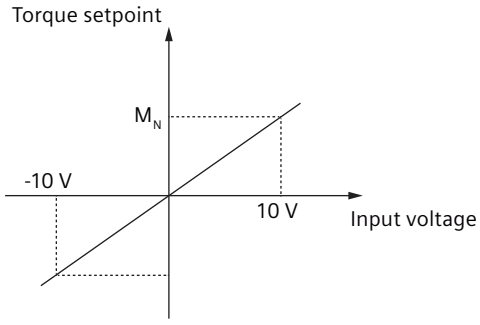
Description of function

Torque control with analog torque setpoint

When the digital input signal TSET is at low level (0), analog voltage from the analog input 1 is used as the torque setpoint.

The analog voltage from the analog input 1 corresponds to an internal percentage value. The analog voltage of 10 V corresponds to the rated motor torque (r0312). For example, when the analog input is -2 V, the actual torque setpoint is -20% * p0312.

The relationship between the analog voltage and the torque setpoint is shown as follows:



Torque control with internal fixed torque setpoint

When the digital input signal TSET is at high level (1), the internal fixed torque setpoint is used. You can define the desired torque setpoint value via the parameter p29043. For example, when you set p29043 to 50%, the actual torque setpoint will be 50% * p0312.

Table 9-34 Internal fixed torque setpoint

Parameter	Range	Default	Unit	Description
p29043	-350 ... +350	0	%	Fixed torque setpoint

Parameters

The following list includes the parameters of the "Torque setpoint" function.

Number	Name	Unit
p0312[0]	Rated motor torque	[Nm]
p29043	Fixed torque setpoint	[%]

9.7.2 Direction and stop

Overview

Two digital input signals are used to control motor direction and run/stop:

- CWE: enable clockwise rotations
- CCWE: enable counterclockwise rotations

Description of function

The following table shows you the details:

Signal		Fixed torque set-point	Analog torque setpoint		
CCWE	CWE		+ polarity	- polarity	0 V
0	0	0	0	0	0
0	1	CW	CW	CCW	0

Signal		Fixed torque set-point	Analog torque setpoint		
CCWE	CWE		+ polarity	- polarity	0 V
1	0	CCW	CCW	CW	0
1	1	0	0	0	0

Note

In S mode or T mode, when the servo motor is ready to run, signal CWE or CCWE is a must to start running the motor.

9.7.3 Speed limit

Overview

The following four sources are available for the speed limit in all control modes. 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 9-35 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 9-36 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

Note

Analog speed limit for S200 PTI

For S200 PTI, when the signal SLM1-SLM0 status is 0-1, p29070[1] is invalid and the analog voltage from the analog input 0 is used as the speed limit.

The analog voltage from the analog input 0 corresponds to an internal percentage value. Default speed value is the rated motor speed. The analog voltage of 10 V corresponds to the maximum speed setpoint (V_max) and this maximum speed setpoint can be specified by parameter p2000.

Overall speed limit

The overall speed limit can be configured by setting the following parameters.

Table 9-37 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 and the overall speed limit are 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]
p2000	Reference speed	[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]

9.7.4 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 9-38 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 TLIM0 and TLIM1, the motor stops.

Description of function

Internal torque limit

Select an internal torque limit by setting the following parameters.

Table 9-39 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

Parameter	Value range	Default	Unit	Description	Digital input	
					TLIM1	TLIM0
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

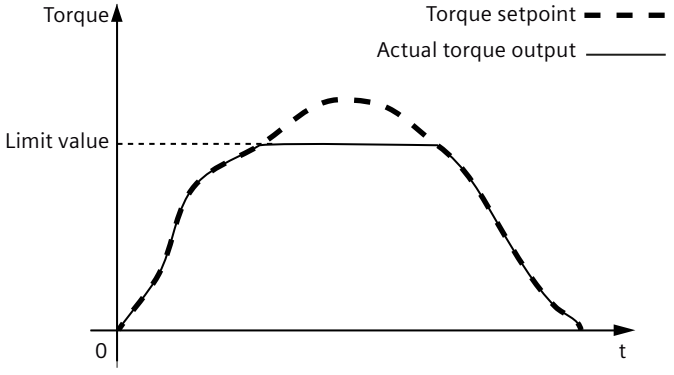
Note

Analog torque limit for S200 PTI

For S200 PTI, when the signal TLM1-TLM0 status is 0-1, p29050[1] is invalid and the analog voltage from the analog input 1 is used as the torque limit.

The analog voltage from the analog input 1 corresponds to an internal percentage value. Default torque value is the rated motor torque (r0312). The analog voltage of 10 V corresponds to the rated motor torque.

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 9-40 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
p0312[0]	Rated motor torque	[Nm]
p1520[0]	Torque limit upper	[Nm]
p1521[0]	Torque limit lower	[Nm]
p29050[0...3]	Upper torque limit	[%]
p29051[0...3]	Lower torque limit	[%]

9.7.5 Torque overload monitoring

Overview

The torque overload monitoring function monitors the status of the output torque.

Description of function

The overload threshold for the output torque can be set with the parameter p29054. The torque overload level window is calculated by p29054 * p0312. When the output torque exceeds the overload reached level, the signal OLL (overload level reached) is output.

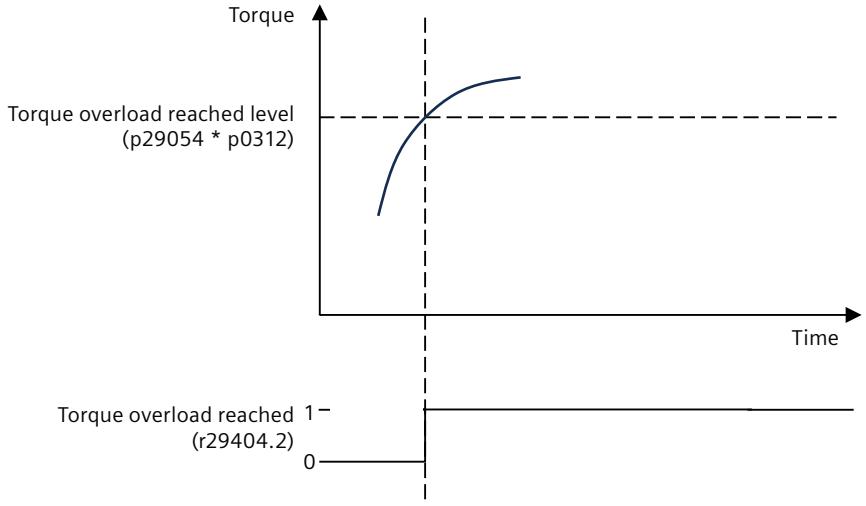


Figure 9-9 Torque overload monitoring

Parameters

The following list includes the parameters of the "Torque overload monitoring" function.

Number	Name	Unit
p0312[0]	Rated motor torque	[Nm]
p29054	Overload threshold for output signal triggering	[%]

r29404.0...5 DO status word

9.7.6 Protective speed limit

Overview

The protective speed limit function can limit the maximum speed in the torque control mode.

Description of function

You can select the protective speed limit source via the parameter p29101:

- p29101 = 0: Inhibit the protective speed limit function
- p29101 = 1: The protective speed limit values are selected by the fixed value defined by parameter p29102
  - p29102[0]: Protective speed limit value in positive direction
  - p29102[1]: Protective speed limit value in negative direction
- p29101 = 2: The protective speed limit values are selected by the analog input 0

When the actual speed is lower than the protective speed limit, the protective speed control output will be higher than the torque setpoint in p29106. If the actual speed is close to the protective speed limit, the protective speed control output will be lower than the torque setpoint in p29106. The torque setpoint in torque control mode will derive from the protective speed control.

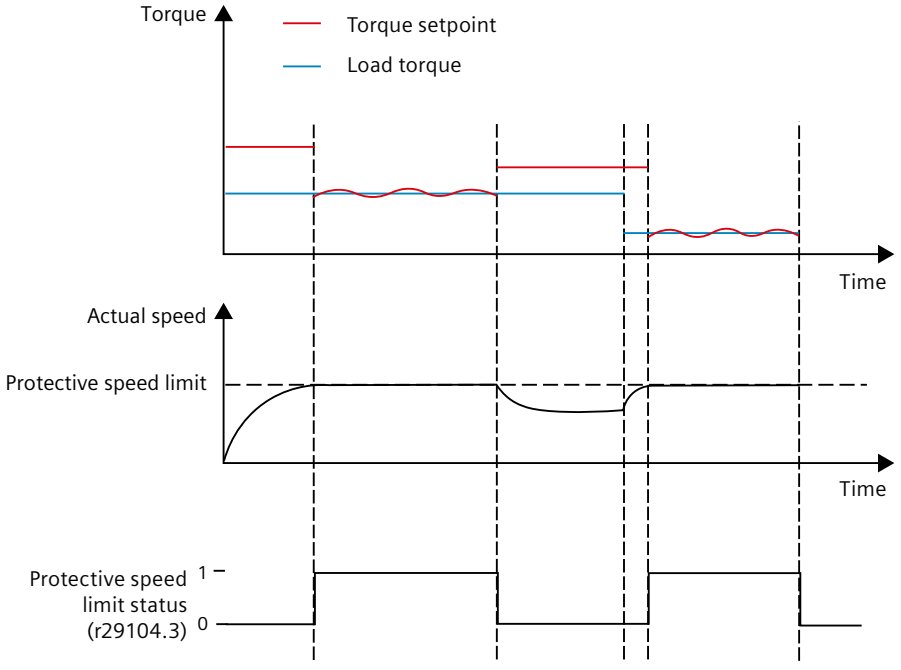


Figure 9-10 Timing diagram

Parameters

The following list includes the parameters of the "Protective speed limit" function.

Number	Name	Unit
p29101	Protective speed limit source selection	
p29102[0...1]	Positive/negative protective speed limit fixed value	[rpm]
c29103[0...1]	Protective speed limit	
r29104.0...3	Protective speed limit status	

9.8 Safety Integrated (for S200 PTI only)

⚠ DANGER

Risk minimization through Safety Integrated

Safety Integrated can be used to minimize the level of risk associated with machines and plants.

Machines and plants can only be operated safely in conjunction with Safety Integrated, however, when the machine manufacturer:

- Precisely knows and observes this technical user documentation - including the documented limitations, safety information and residual risks.
- Carefully constructs and configures the machine/plant. 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 machine/plant risk analysis by means of the programmed and configured Safety Integrated Functions or by other means.

The use of Safety Integrated does not replace the machine/plant risk assessment carried out by the machine manufacturer as required by the EC machinery directive.

In addition to using Safety Integrated Functions, further risk reduction measures must be implemented.

⚠ 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.
  - Lay the cables in empty conduits.

NOTICE

Danger to life as a result of inactive Safety Integrated Functions after powering up

The Safety Integrated Functions are only activated after the system has completely powered up. System startup is a critical operating state with increased risk. When accidents occur, this can result in death or severe injury.

- Make sure that the machine is safe during the system start-up.

⚠ 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).

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

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 Safety Integrated function faults.

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

9.8.1 Safety Integrated Functions

Overview

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

Description of function

In comparison to standard converter functions, Safety Integrated Functions have especially high 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 self-test of the shutdown paths (Safe Torque Off), functions as well as interfaces (fail-safe digital inputs and outputs) cyclically and in compliance with the standards. A test stop (forced checking procedure) by the operator is not required.

Note

Protection against manipulation by unauthorized third parties

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

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

- Parameter configuration of the safety functions
- Connection
- Hardware components

9.8.2 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 4 according to ISO 13849-1

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

9.8.3 PFH values

Description

The probability of failure for Safety Integrated Functions must be specified in the form of a PFH value (Probability of Failure per Hour) according to IEC 61800-5-2, IEC 62061, and 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)

9.8.4 Usage time

Description

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

9.8.5 Stop functions

9.8.5.1 Safe Torque Off (STO)

Overview

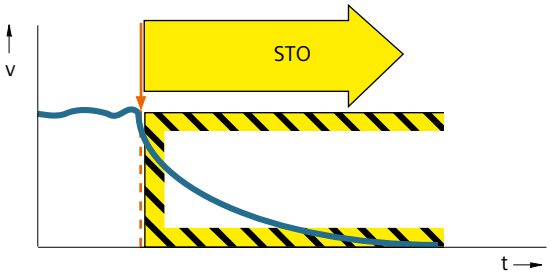


Figure 9-11 Overview STO

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

Requirement

⚠ 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.

- 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.

The STO function is enabled.

Description of function

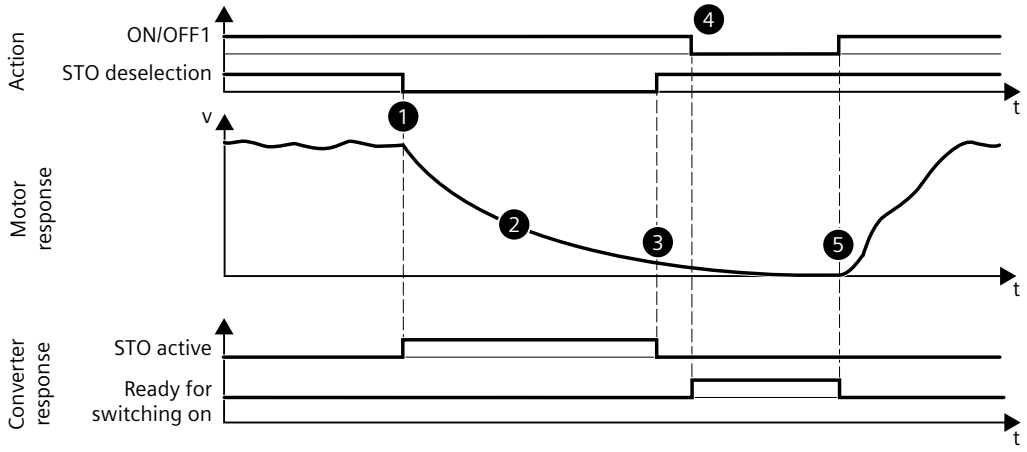


Figure 9-12 Flow diagram STO

Action		Motor/converter response
①	Selection of STO	• The converter detects selection of STO and signals the status "STO active" (r9722.0). • The converter interrupts the torque-generating energy feed to the motor. • If you use a line contactor, the converter opens the line contactor. • The "switching on inhibited" status prevents the motor from restarting automatically.
②		• The motor coasts down to a standstill.
③	Deselection of STO	• The converter detects deselection of STO.

④	Signal change at ON/OFF1 from 1 to 0	• The converter is ready to start again.
⑤	Signal change at ON/OFF1 from 0 to 1	• 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. The drive remains connected to the line power supply and can be fully diagnosed.

Parameters

The following list includes the parameters of the "Safe Torque Off (STO)" function.

Number	Name	Unit
r9722.0...7	SI status signals	

9.8.5.2 Functional features of STO

Overview

The STO function is enabled by default and it is active with specified default settings. No additional settings are required.

Description of function

A stop function for Emergency Stop via X131 terminal is defined and is permanently assigned.

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 STO function, insert the provided STO disable plug into the X131 socket to disable the STO function.

More information

For more information about the terminal description and terminal wiring, see Section "Connecting STO (for S200 PTI only) (Page 161)".

9.8.5.3 Discrepancy time

Overview

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

Description of function

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

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

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

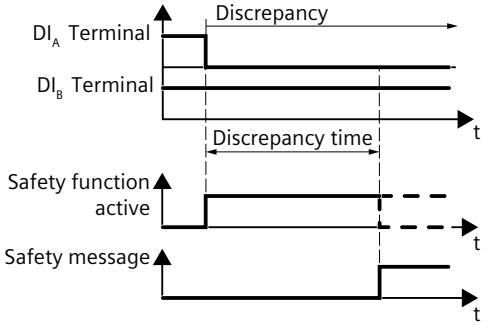


Figure 9-13 Permanent discrepancy

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

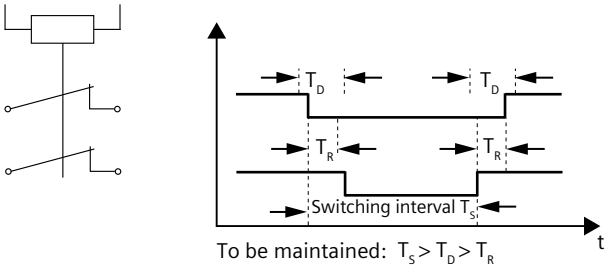


Figure 9-14 Discrepancy time

Note

For S200 PTI, the discrepancy time is fixed to 500 ms.

9.8.5.4 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 input filter time is fixed to 4 ms.

The set input filter impacts the response time of the safety function connected to the F-DI.

9.8.5.5 Self-test of the fail-safe digital input (F-DI)

Overview

To detect faults at an early stage, the converter tests its shutdown paths, functions and interfaces using the online self-test.
Self-test with internal test signals is available to test a fail-safe digital input (F-DI).

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 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 EN ISO 13849-1
- Category 4 according to EN ISO 138491

9.8.6 Safety Integrated function status/diagnostics

Overview

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

Description of function

Function status/diagnostics shows the status of STO. If STO is active, then the status indicates "active" (r9722). When STO is active, then Emergency Stop is initiated.

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

- Status of the converter
  Provides information as to whether internal events (e.g. software errors in the converter or a discrepancy in the monitoring channels) have been signaled and whether the communication functions.
- Version
  The version shows the software versions of the corresponding components relevant for Safety Integrated. This data is predominantly provided as information for service and update.
  - SINAMICS Safety Integrated firmware version
  - I/O processor firmware version

9.8.7 Responses to safety messages

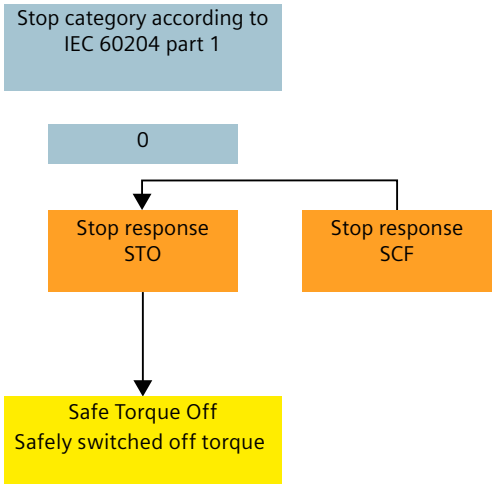
9.8.7.1 Stop responses

Description of function

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

- Stop response SCF
  The converter detects a discrepancy in the Safety Integrated monitoring channels, for example, an error in the result and data comparison.

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 9-15 Stop responses

9.8.7.2 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

By selecting and then deselecting STO, the safety messages are automatically withdrawn.

By switching the supply voltage off and on

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

9.8.8 Response time

Technical data

The following response time is applicable to the stop function control via the STO terminal. The response time of the stop function is the time between the selection of the stop function and the initiation of a stop response. The monitoring cycle (p9500) is 4 ms.

The specified response time is applicable to a fault-free drive system as well as when a fault is active in the system.

Table 9-41 Technical data - response time

Function	Unit	Worst case delay time
STO	[ms]	20 ms

9.8.9 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 the reason that a distinction 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 EN 61508, IEC 62061 "Safety Integrity Level" (SIL) and EN ISO 13849-1 "Category" and "Performance Level" (PL).

9.8.10 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 IEC 61508, IEC 61800-5-2 considers adjustable speed electric 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.

Tuning

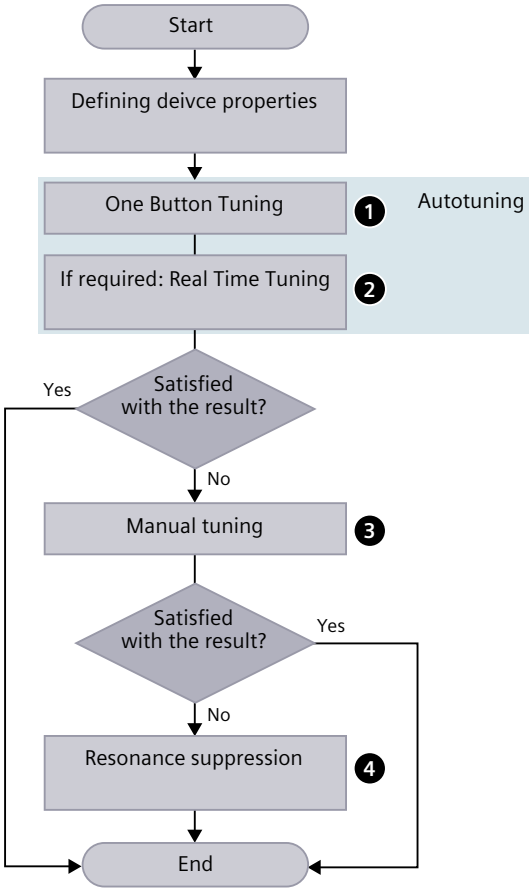
10

10.1 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



① One Button Tuning (Page 297)
② Real Time Tuning (Online Tuning) (Page 298)
③ Manual tuning (Page 299)
④ Resonance suppression (Page 309)

10.2 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.

10.2.1 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. • 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, p29174, p29175, p29176, p29178

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 motor (p5308).
   Generally, longer traversing distances result in better tuning results.
3. Configure the One Button Tuning function (p5301).
4. Activate the One Button Tuning function (p5300 = 1).

More information

For the detailed One Button Tuning procedures in the web server, see Section "Optimization (Page 185)".

Parameters

The following list includes the parameters of the "One Button Tuning" function.

Number	Name	Unit
p5271[0].0...7	Online / 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	[°]

10.2.2 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, p29174, p29175, p29176, p29178

Procedure

Proceed as follows to perform Real Time Tuning with your operating unit:

1. Configure the Real Time Tuning function (p5302).
2. Set the controllers via p5271.
3. Activate Real Time Tuning (p5300 = 2).
4. 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.

Parameters

The following list includes the parameters of the "Real Time Tuning" function.

Number	Name	Unit
p5271[0].0...7	Online / One Button Tuning configuration	
p5300[0]	Autotuning selection	
p5302[0].2...8	Online tuning configuration	

10.3 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:

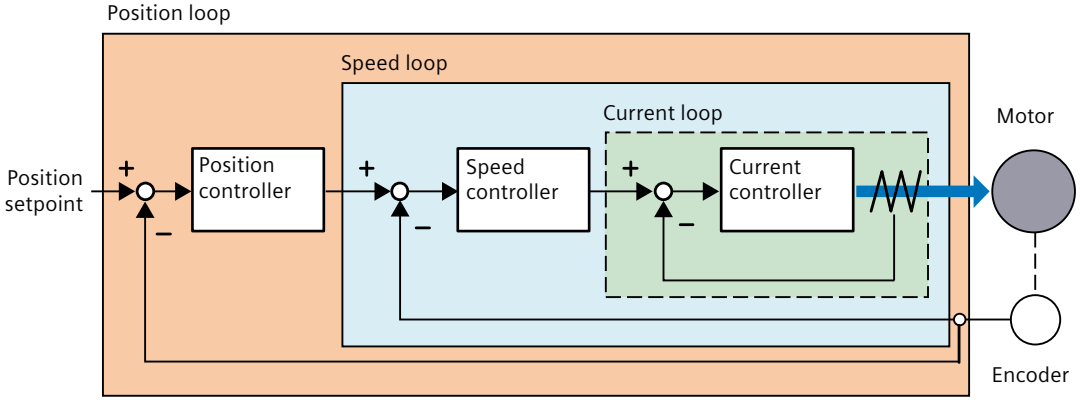
- p5300 = -1: The autotuning function is disabled and the default values for the speed and position controller are restored.
- p5300 = 0: The autotuning function is disabled and the existing controller parameters are not changed.
  To store the determined values for the speed and position controller retentively, set p0977 = 1 or execute the "Copy RAM to ROM" command.

10.3.1 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

10.3.2 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]
p29174	FPC speed precontrol factor	[%]
p29178	FPC proportional gain	[1000 rpm]

10.4 Gain switching

Overview

The function of gain switching is used to switch between two sets of scaling factors.

With the gain switching function, you can implement the following operations:

- Increase the gains during servo lock and decrease gains to reduce noise during rotation.
- Increase the gains during settling to shorten the stop settling time.
- Ensure the stability of the servo system when the load inertia moment ratio varies greatly during a stop.

Note

Set the scaling factors according to the following formulas to obtain expected servo gains:

- Position loop gain = p29178*p29110 (fast PTI mode)
- Speed loop gain = p1460*p29120
- Speed loop integral time = p1462/p29121

Requirement

- Do not use the function in the torque control mode.
- Disable the functions of autotuning.

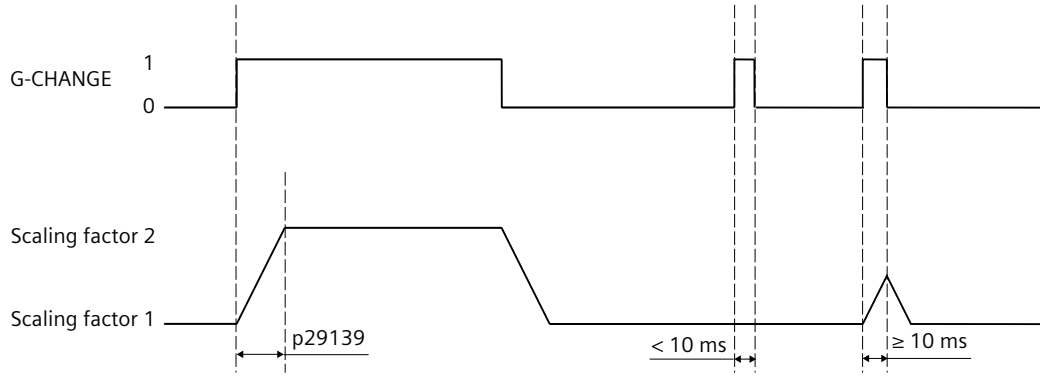
Description of function

The function of gain switching is disabled by default (p29130 = 0), and only scaling factor 1 is valid in this case.

Four switching modes with different conditions are available.

- **Using digital input signal (G-CHANGE) (p29130 = 1)**

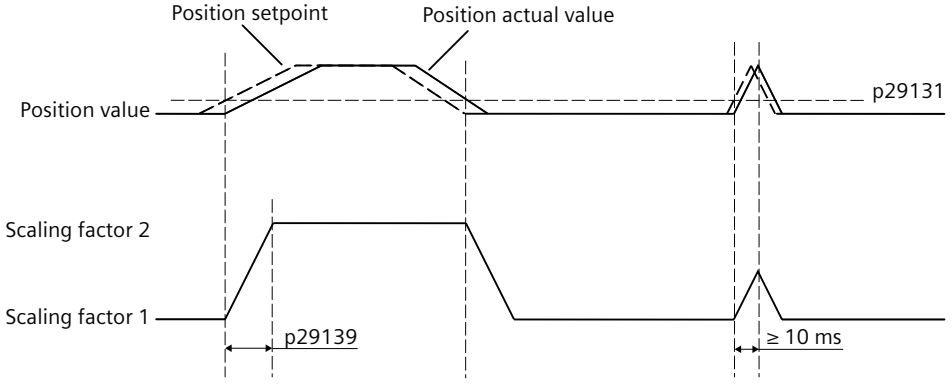
Signal	Pin assignment	Setting	Description
G-CHANGE	X132-5	0	Scaling factor 1 is selected.
		1	Scaling factor 2 is selected.



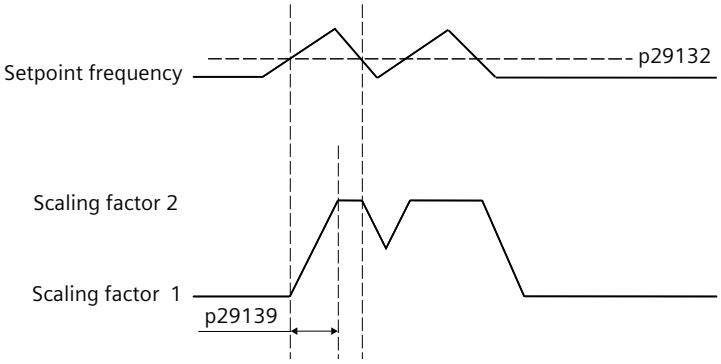
Note

If the pulse duration is shorter than 10 ms, the scaling factor remains unchanged.

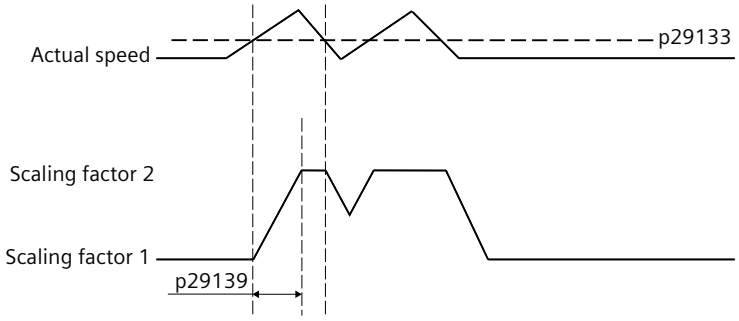
- **Using position deviation (p29130 = 2)**
  In the fast PTI mode, if the position deviation is less than the preset value (p29131), scaling factor 1 is selected; if the position deviation is greater than the value, scaling factor 2 is selected.



- **Using position setpoint frequency (p29130 = 3)**
  In the fast PTI mode, if the pulse train input is lower than the preset value (p29132), scaling factor 1 is selected; if the pulse train input is greater than the value, scaling factor 2 is selected.



- **Gain switching using actual speed (p29130 = 4)**
  In the S mode, if the actual speed is less than the preset value (p29133), scaling factor 1 is selected; if the actual speed is greater than the value, scaling factor 2 is selected.



Parameters

The following list includes the parameters of the "Gain switching" function.

Number	Name	Unit
p5300[0]	Autotuning selection	
p29110[0...1]	Position loop gain scaling	[%]
p29120[0...1]	Speed loop gain scaling	[%]
p29121[0...1]	Speed loop integral time scaling	[%]
p29130	Gain switching mode selection	
p29131	Gain switching condition: Pulse deviation	
p29132	Gain switching condition: Position setpoint frequency	
p29133	Gain switching condition: Actual speed	[rpm]
p29139	Gain switching time constant	[ms]

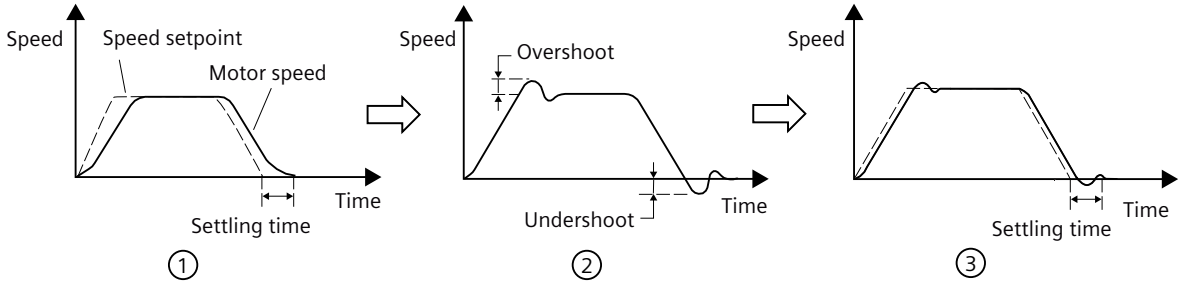
10.5 PI/P switching

Overview

The function of PI/P switching is used to switch from PI (Proportional/Integral) control of the speed controller to P (Proportional) control.

With the function of PI/P switching, you can implement the following operations:

- Avoid overshooting of actual speed value during acceleration or deceleration.
- Shorten the position settling time.
- Avoid unnecessary torque when the target position is at a mechanical limitation.



① Without tuning
② Speed loop gain increased
③ Speed loop gain increased + PI/P switching

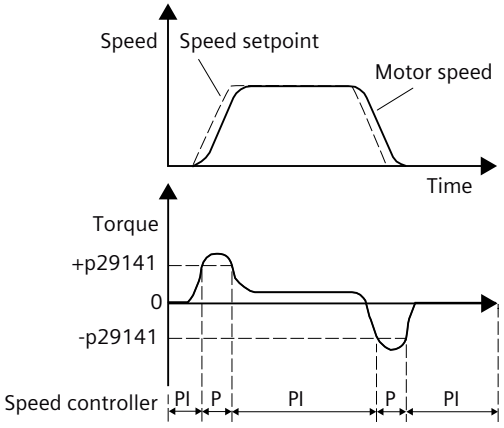
Requirement

- Do not use the function in the torque control mode.
- Disable the functions of autotuning and gain switching.

Description of function

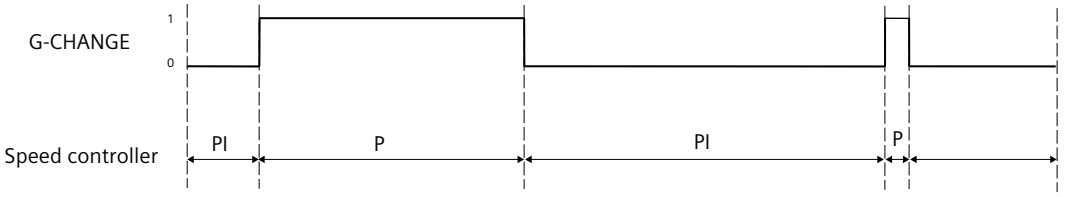
The function of PI/P switching is disabled by default (p29140 = 0). Five switching modes with different conditions are available.

- **Using torque setpoint (p29140 = 1)**
  When torque setpoint is greater than the preset value (p29141), P control is selected; when torque setpoint is less than the value, PI control is selected.

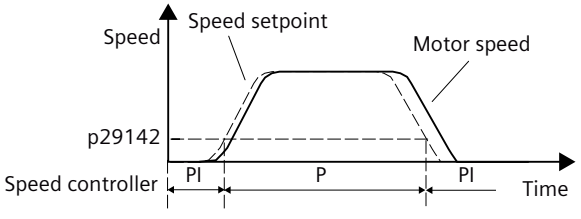


- **Using an external digital input signal (G-CHANGE) (p29140 = 2)**

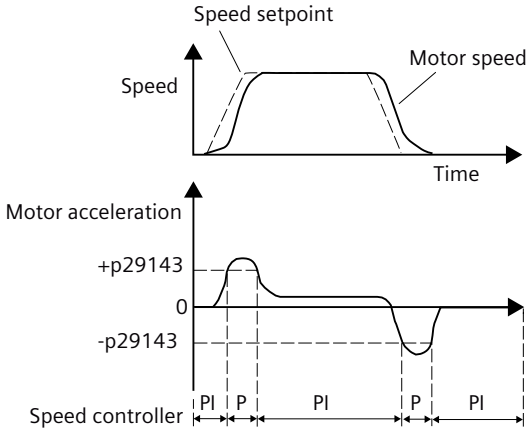
Signal	Pin assignment	Setting	Description
G-CHANGE	X132-5	0	PI control is selected.
		1	P control is selected.



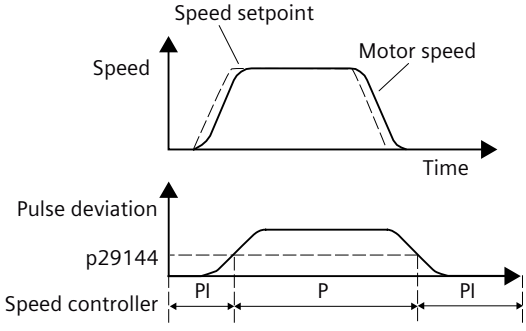
- **Using speed setpoint (p29140 = 3)**
  When the speed setpoint is greater than the preset speed value (p29142), P control is selected; when the speed setpoint is less than the value, PI control is selected.



- **Using acceleration setpoint (p29140 = 4)**
  When the motor acceleration is greater than the preset value (p29143), P control is selected; when the motor acceleration is less than the value, PI control is selected.



- **Using pulse deviation (p29140 = 5)**
  When the pulse deviation is greater than the preset value (p29144), P control is selected; whent the pulse deviation is less than the value, PI control is selected.



More information

For more information about the following settings, see corresponding sections:

- Speed setpoint: Speed setpoint (Page 261)
- Torque setpoint: Torque setpoint (Page 273)

Parameters

The following list includes the parameters of the "PI/P switching" function.

Number	Name	Unit
p5300[0]	Autotuning selection	
p29130	Gain switching mode selection	
p29140	PI/P switching mode selection	
p29141	PI/P switching condition: Torque	[%]
p29142	PI/P switching condition: Actual speed	[rpm]

p29143	PI/P switching condition: Acceleration	[rev/s²]
p29144	PI/P switching condition: Pulse deviation	

10.6 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.

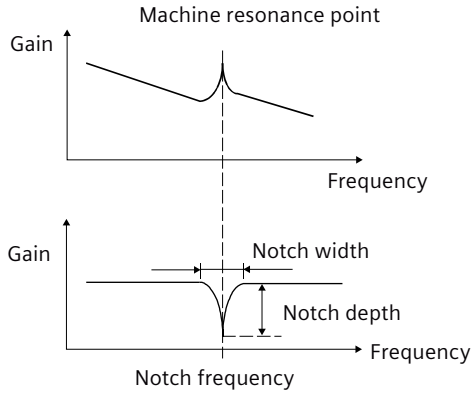


Figure 10-1 Working principle of a bandstop filter

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 $\mathbf{f}_{sp}$, notch width is $\mathbf{f}_{BB}$, and notch depth is **K**, then the filter parameters can be calculated as follows:

- Denominator natural frequency = Numerator natural frequency = $\mathbf{f}_{sp}$
- Denominator damping = $\mathbf{f}_{BB}/(2 \times \mathbf{f}_{sp})$
- Numerator damping = $(\mathbf{f}_{BB} \times 10^{(k/20)})/(2 \times \mathbf{f}_{sp})$

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	Online tuning configuration

System messages

11

11.1 SDI Status

11.1.1 SDI Status overview

Description

The SINAMICS S200 converter product line is designed with a SINAMICS SDI (Smart Drive Interface) Status panel on the front of the converter.

① Cover*
② 6-digit 7-segment display
③ LED display
④ Function buttons

* Open the cover gently from the lower right corner.

Figure 11-1 SDI Status layout

You can use the SDI Status panel for the following operations:

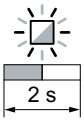
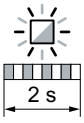
- Monitoring
  The SINAMICS SDI Status enters the monitoring mode when the servo state changes from OFF to ON. In this mode, it displays the actual speed, actual torque, actual position, actual DC link voltage, and position following error. You can press the DOWN button to navigate to the next item.
- Diagnosis
  The SINAMICS SDI Status enters the diagnosis 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 diagnosis mode.
- Converter restart
  You can press the key combination of the M button and the OK button for four seconds to restart the converter.

11.1.2 Status display via LEDs

Description

The following tables explain the LED icons and states:

Table 11-1 Explanation of LED icons

LED	Explanation
	LED is ON.
	LED is OFF.
	LED flashes slowly.
	LED flashes quickly.
	LED flashes with variable frequency.

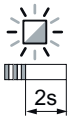
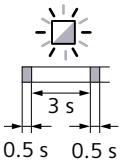
LED	Explanation
	LED flashes in alternating order 3 times quickly - 2 s pause - ...
	LED flashes briefly every 3 s

Table 11-2 Signal states of RDY and COM LEDs during converter ramp-up and operation

RDY	COM	Description	Remedy
 Orange	 Orange	• 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.	-
-	 Green	Cyclic communication in progress	-
☐	 Red	No fieldbus link: • No data exchange or configuration error • Data exchange lost • Data exchange in progress, but there are no setpoints (controller in stop state)	• Check message display and rectify cause of fault. • Check operating mode of controller (PLC).
 Red	☐	• Converter signals a fault. • Firmware error	Check message display, rectify cause of fault.
 Green	-	Converter is ready for operation and error-free.	-
☐	 Red	• BIOS error: – General error – Loading error • File error: – SD card is not available or is faulty. – File corrupt • CRC error	• Switch the converter supply voltage off and on. • Check SD card if available. • Reload firmware. • Contact Hotline/Support.

RDY	COM	Description	Remedy
 Orange	☐	Converter detection via DCP flashing	-
 Orange	☐	Commissioning or restore factory settings via commissioning tool	-

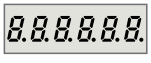
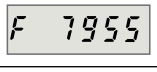
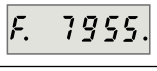
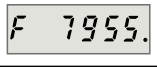
Table 11-3 Signal states of RDY and COM LEDs during firmware update

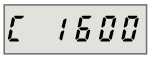
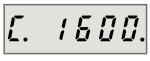
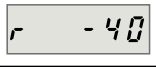
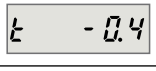
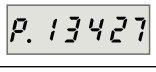
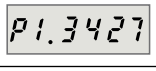
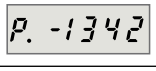
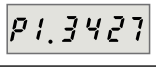
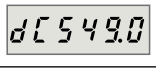
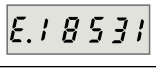
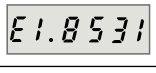
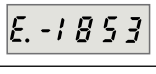
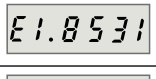
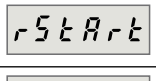
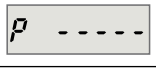
RDY	COM	Description	Remedy
 Green	 Green	Firmware update in progress	-
☐	 Red	Firmware update signals an error.	• Switch the converter supply voltage off and on, and repeat the firmware update. • Firmware update via memory card: Replace memory card and repeat firmware update. • Contact Support/Hotline.
 Green	☐	Firmware update is completed. The converter is waiting.	Switch the converter supply voltage off and on.

Please contact Technical Support for LED states that are not described above.

11.1.3 SDI Status display

Description

Display	Example	Description	Remarks
8.8.8.8.8.8.		Converter is in startup state	-
Fxxxxx		Fault code	In the case of a single fault
F.xxxxx.		Fault code of the first fault	In the case of multiple faults
Fxxxxx.		Fault code	In the case of multiple faults

Display	Example	Description	Remarks
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.
Restart		Restart the converter	-
P-----		The parameter does not exist.	The symbol "P" could be other parameter symbols, like "T", "E", etc.

11.1.4 Function buttons

Description

Button	Description	Functions
M	M button	Switch between the diagnosis mode and the monitoring mode
OK	OK button	Acknowledge faults in the diagnosis mode
▼	DOWN button	Navigate to the next item
OK + M	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.

11.2 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:

System runtime = r2114[1] × days + r2114[0] × 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	

11.3 Faults and alarms

11.3.1 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 11-4 Differences between faults and alarms

Type	Description
Faults	How does a converter respond when a fault occurs? • Initiate the appropriate fault reaction. • Set the status signal ZSW1.3. • Enter the fault into the fault buffer. How are faults eliminated? • Remove the cause of the fault. • Acknowledge the fault. What happens when the converter is switched off and switched on? • Faults are saved retentively.
Alarms	How does a converter respond when an alarm occurs? • Set the status signal ZSW1.7. • Enter the alarm into the alarm buffer. How are alarms eliminated? • Alarms are self-acknowledging. If the cause of the alarm is no longer present, the converter resets the alarm. What happens when the converter is switched off and switched on? • 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.

11.3.2 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 192)".

Acknowledge faults

You need to resolve the cause of the fault before you can acknowledge it.

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
- The Safety Integrated fault is acknowledged by selecting and then deselecting the STO 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 320)".

11.3.3 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 192)".

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 320)".

11.3.4 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 **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

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.

Description of function

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 11-5 Message classes and coding of various diagnostic interfaces

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
Cause and remedy		**PN (hex)**	**DS1 (dec)**
Hardware/software fault A hardware or software malfunction was detected. • 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...). • 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. • Check the wiring. • Check the voltage level.	(3)	9002	2
DC link overvoltage The DC link voltage has assumed an inadmissibly high value. • 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...). • Check that the permissible duty cycles are complied with. • Check the ambient temperatures (fan).	(5)	9004	4
Electronic component overload The temperature in the component has exceeded the highest permissible limit. • 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. • Check the power cables (connection). • Check the motor.	(7)	9006	6
Motor overload The motor was operated outside the permissible limits (temperature, current, torque...). • Check the duty cycles and set limits. • Check the ambient temperature/motor cooling.	(8)	9007	7

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
Cause and remedy		**PN (hex)**	**DS1 (dec)**
Communication error to the higher-level controller The communication to the higher-level controller (internal coupling, PROFIBUS, PROFINET...) is faulted or interrupted. • 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...). • 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. • 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. • Check the infeed and its environment (line supply, filters, reactors, fuses...). • Check the infeed control.	(13)	900C	12
Braking controller/Braking Module faulted The internal or external Braking Module is faulted or overloaded (temperature). • 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. • Check the temperature/temperature monitoring. • Check the configuration to ensure that it is permissible (filter type, infeed, thresholds).	(15)	900E	14

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
Cause and remedy		PN (hex)	DS1 (dec)
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. • 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...). • 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. • 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. • 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. • 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 11-6 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** • 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** • 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** • Immediate pulse cancellation, the motor "coasts down " to a standstill. • "Switching on inhibited" is activated.
OFF3	QUICKSTOP	Braking along the OFF3 deceleration ramp followed by pulse inhibit	**Closed-loop speed control** • 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** • Switchover to closed-loop speed control and other responses as described for closed-loop speed control.
STOP2	–	STOP2	• 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 11-7 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.

11.3.5 List of fault codes and alarm codes

Product: SINAMICS S200, Version: 603021000, Language: eng
Objects: S200 Basic PTI, S200 PTI

F01000 Internal software error

Message class: Hardware/software error (1)
Message value: Module: %1, line: %2
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: POWER ON
Cause: An internal software error has occurred.
Fault value (r0949, interpret hexadecimal):
Only for internal Siemens troubleshooting.
Remedy: - Evaluate fault buffer (r0945).
- Carry out a POWER ON (switch-off/switch-on) for all components.
- If required, check the data on the non-volatile memory (e.g. memory card).
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace the 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 for internal Siemens troubleshooting.
Remedy: - 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 for internal Siemens troubleshooting.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

F01003 Acknowledgment delay when accessing the memory

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A memory area was accessed that does not return a "READY".
Fault value (r0949, interpret hexadecimal):
Only for internal Siemens troubleshooting.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Contact Technical Support.

N01004 Internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: An internal software error has occurred.
Fault value (r0949, hexadecimal):
Only for internal Siemens troubleshooting.
Remedy: - Contact Technical Support.

A01007 POWER ON for DRIVE-CLiQ component required

Message class: General drive fault (19)

Message value: Component number: %1

Component: None

Response: NONE

Acknowledgment: NONE

Explanation of the message value: For %1

Component in target topology

Cause: A DRIVE-CLiQ component must be switched on again (POWER ON) (e.g. due to a firmware update).

Alarm value (r2124, interpret decimal):

Component number of the DRIVE-CLiQ component.

Note:

For a component number = 1, a POWER ON of the Control Unit is required.

Remedy: - Switch off the power supply of the specified DRIVE-CLiQ component and switch it on again.

- For SINUMERIK, auto commissioning is prevented. In this case, a POWER ON is required for all components and the auto commissioning must be restarted.

A01009 Control Unit overtemperature

Message class: Overtemperature of the electronic components (6)

Message value: -

Component: Control Unit (CU)

Response: NONE

Acknowledgment: NONE

Cause: The temperature (r0037[0]) of the converter has exceeded the specified limit value.

Remedy: - Check the converter air intake.

- Check the converter fan.

Note:

The alarm is automatically withdrawn once the limit value has been fallen below.

F01011 Download interrupted

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The project download was interrupted.

Fault value (r0949, interpret decimal):

1: The user prematurely interrupted the project download.

2: The communication cable was interrupted (e.g. cable breakage, cable withdrawn).

3: The project download was prematurely exited by the commissioning tool.

100: Different versions between the firmware version and project files which were loaded by loading into the file system "Download from memory card".

Note:

The response to an interrupted download is the state "first commissioning".

Remedy: - Check the communication cable.

- Download the project again.

- Boot from previously saved files (switch-off/switch-on or p0976).

- When loading into the file system (download from memory card), use the matching version.

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 for internal Siemens troubleshooting.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

A01016 Firmware changed

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: At least one firmware file in the directory was illegally changed on the non-volatile memory (memory card/device memory) with respect to the version when shipped from the factory.
Alarm value (r2124, interpret decimal):
0: Checksum of one file is incorrect.
1: File missing.
2: File too many.
3: Incorrect firmware version.
4: Incorrect checksum of the backup file.
Remedy: Restore the delivery condition of the non-volatile memory for the firmware (memory card/device memory).

A01017 Component lists changed

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE

Cause: The memory card has a defective file.
Alarm value (r2124, interpret decimal):
xyz dec: x = problem, y = file name
x = 1: file checksum is incorrect.
x = 2: error when parsing the file.
y = 1: file MOTARM.ACX
y = 2: file MOTARMLD.ACX
y = 3: file MOTSRM.ACX
y = 4: file MOTSLM.ACX
y = 5: file MOTRESM.ACX
y = 6: file BEARING.ACX
y = 7: file CFG_BEAR.ACX
y = 8: file BEARINGTYPE.ACX
y = 9: file BRAKE.ACX
y = 10: file CFG_BRAKE.ACX
y = 11: file ENCODER.ACX
y = 12: file CFG_ENCODER.ACX
y = 13: file ENCODERGEAR.ACX
y = 14: file CFG_ENC_GEAR.ACX
y = 15: file LOADGEAR.ACX
y = 16: file THERMMOTMOD3.ACX
y = 17: file CFG_THERMMOTMOD3.ACX
y = 30: file WHITELIST.ACX

Remedy: Correct the file involved.

F01018 Runup has been interrupted several times

Message class: Hardware/software error (1)
Message value: -
Component: None
Response: NONE
Acknowledgment: POWER ON
Cause: Module booting was interrupted several times. As a consequence, the module boots with the factory setting.
Possible reasons for booting being interrupted:
- Power supply interrupted.
- CPU crashed.
- Parameterization invalid.

Remedy: - Carry out a POWER ON (switch-off/switch-on). After switching on, the module reboots from the valid parameterization (if available).
- Restore the valid parameterization.
Examples:
a) Carry out a first commissioning, save, carry out a POWER ON (switch-off/switch-on).
b) Load another valid parameter backup (e.g. from the memory card), save, carry out a POWER ON (switch-off/switch-on).
Note:
If the fault situation is repeated, then this fault is again output after several interrupted boots.

A01019 Writing to the removable data medium unsuccessful

Message class: Hardware/software error (1)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE

Cause: The write access to the removable data medium was unsuccessful.
Remedy: - Check the removable data medium and if required replace.
- Repeat the data backup.

A01020 Writing to RAM disk unsuccessful

Message class: Hardware/software error (1)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: A write access to the internal RAM disk was unsuccessful.
Remedy: Adapt the file size for the system logbook to the internal RAM disk (p9930).

F01023 Software timeout (internal)

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: An internal software timeout has occurred.
Fault value (r0949, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

F01030 Sign-of-life failure for master control

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: For active PC master control of the PC, no sign-of-life was received within the monitoring time.
The master control was returned to the drive.
Remedy: Set the monitoring time higher at the PC or, if required, completely disable the monitoring function.
The monitoring time is set as follows using the commissioning tool:
<Drive> -> Commissioning -> Control panel -> Button "Fetch master control" -> A window is displayed to set the monitoring time in milliseconds.
Notice:
The monitoring time should be set as short as possible. A long monitoring time means a late response when the communication fails!

A01032 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 for internal Siemens troubleshooting.
Remedy: Save all parameters.
See also: p0977 (Save all parameters)

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, p2002, p2003

F01034 Units changeover: Calculation parameter values after reference value change unsuccessful

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The change of a reference parameter meant that for an involved parameter the selected value was not able to be re-calculated in the per unit representation. The change was rejected and the original parameter value restored.
Fault value (r0949, parameter):
Parameter whose value was not able to be re-calculated.
See also: p0304, p0305, p2000, p2002, p2003
Remedy: - Select the value of the reference parameter such that the parameter involved can be calculated in the per unit representation.

A01035 ACX: Parameter backup file corrupted

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE

Cause: When the 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:
Power up was realized without data backup. The drive is in the factory setting.
aa = 02 hex:
The last available backup data record was loaded. The parameterization must be checked. It is recommended that the parameterization is downloaded again.
dd, cc, bb:
Only for internal Siemens troubleshooting.
See also: p0977 (Save all parameters)

Remedy: - Download the project again using the commissioning tool.
- Retentively save parameters (save all parameters p0977 = 1)
See also: p0977 (Save all parameters)

F01036 Parameter backup file missing

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: When loading the device parameterization, a parameter backup file cannot be found.
Remedy: If 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.

F01038 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.

F01039 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.

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: - Back up parameters.
- Carry out a POWER ON (switch-off/switch-on) for all components.
Then:
- Upload the drive unit (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 for internal Siemens troubleshooting.
Remedy: - Save the parameters.
- Download the project again to the drive unit.
- 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):
1: Device status cannot be changed to device download (drive object ON?).
2: Drive object number incorrect.
3: A drive object that has already been deleted is deleted again.
4: A drive object that has already been registered for generation is deleted.
5: A drive object that does not exist is deleted.
6: An undeleted drive object that already existed is generated.
7: A drive object already registered for generation is generated again.
8: Maximum number of drive objects that can be generated is exceeded.
9: Error when generating the device drive object.
10: Error when generating the target topology parameter.
11: Error when generating a drive object (global component).
12: Error when generating a drive object (drive component).
13: Drive object type unknown.
14: Drive status cannot be changed to "ready for operation" (r0947 and r0949).
15: Drive status cannot be changed to drive download.
16: Device status cannot be changed to "ready for operation".
17: It is not possible to download the topology. The component wiring should be checked, taking into account the various messages/signals.
18: A new download is only possible if the factory settings are restored for the drive unit.
19: The slot for the option module has been configured several times (e.g. CAN and COMM BOARD).
20: The configuration is inconsistent.
21: Error when accepting the download parameters.
22: Software-internal download error.
24: Download not possible during a partial run-up after inserting a component.
Additional values:
Only for internal Siemens troubleshooting.

Remedy: - Use the current version of the commissioning tool.
- Modify the offline project and carry out a new download (e.g. compare the number of drive objects, 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.

A01045 CU: Configuring data invalid

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: An error was detected when evaluating the parameter files PSxxxyyy.ACX, PTxxxyyy.ACX, CAxxxyyy.ACX, or CCxxxyyy.ACX saved in the non-volatile memory. Under certain circumstances, several of the saved parameter values were not able to be accepted.
Alarm value (r2124, interpret hexadecimal):
Only for internal Siemens troubleshooting.
Remedy: - Restore the factory setting (p0976 = 1) and reload the project into the converter.
Then retentively save the parameterization or set p0977 = 1. This overwrites the incorrect parameter files in the non-volatile memory – and this alarm is withdrawn.

A01049 CU: It is not possible to write to file

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: It is not possible to write to a write-protected parameter backup file. The write request was interrupted.
Alarm value (r2124, interpret decimal):
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.

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).
Remedy: - Reduce the computing time load of the drive unit to below 100 %.
- Deactivate functions.
- Deactivate drive objects.
- Remove drive objects from the target topology.
- Note the DRIVE-CLiQ topology rules and if required, change the DRIVE-CLiQ topology.

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 and device 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 the drive unit do not match.
The module boots with the factory settings.
Example:
Devices A and B. are not compatible and a memory card with the parameter backup for device A is inserted in device B.
Remedy: - Insert a memory card with compatible parameter backup and carry out a POWER ON.
- Insert a memory card without parameter backup and carry out a POWER ON.
- Save the parameters (p0977 = 1).

F01070 Project/firmware is being downloaded to the memory card

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Control Unit (CU)
Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: An upgrade (project/firmware download) was initiated on the memory card.
While this fault is active, the corresponding update takes place with plausibility and consistency checks. After this, depending on the command option, a new boot (reset) for the converter is initiated.
Caution:
While upgrading and while this fault is active, it is not permissible to switch off the converter.
If the operation is interrupted, this can destroy the file system on the memory card. The memory card will then no longer work properly and must be repaired.

Remedy: Not necessary.
The fault is automatically withdrawn after the upgrade has been completed.

F01072 Memory card restored from the backup copy

Message class: General drive fault (19)

Message value: -

Component: Control Unit (CU)

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The converter was switched-off while writing to the memory card. This is why the visible partition became defective.
After switching on, the data from the non-visible partition (backup copy) were written to the visible partition.

Remedy: Check that the firmware and parameterization is up-to-date.

A01073 POWER ON required for backup copy on memory card

Message class: General drive fault (19)

Message value: -

Component: Control Unit (CU)

Response: NONE

Acknowledgment: NONE

Cause: The parameter assignment on the visible partition of the memory card has changed.
In order that the backup copy on the memory card is updated on the non-visible partition, it is necessary to carry out a POWER ON or hardware reset (p0972) of the Control Unit.
Note:
It is possible that a new POWER ON is requested via this alarm (e.g. after saving with p0971 = 1).

Remedy: - Carry out a POWER ON (switch-off/switch-on) for the Control Unit.
- Carry out a hardware reset (RESET button, p0972).

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: Parameterizing errors have been detected (e.g. incorrect parameter value). It is possible that the parameter limits are dependent on other parameters.
The detailed cause of the fault can be determined using the fault value.
Fault value (r0949, interpret hexadecimal):
ccbbaaaa hex
aaaa = Parameter
bb = Index
cc = fault cause
0: Parameter number illegal.
1: Parameter value cannot be changed.
2: Lower or upper value limit exceeded.
3: Sub-index incorrect.
4: No array, no sub-index.
5: Data type incorrect.
6: Setting not permitted (only resetting).
7: Descriptive element cannot be changed.
9: Descriptive data not available.
11: No master control.
15: No text array available.
17: Task cannot be executed due to operating state.
20: Illegal value.
21: Response too long.
22: Parameter address illegal.
23: Format illegal.
24: Number of values not consistent.
25: Drive object does not exist.
101: Presently deactivated.
104: Illegal value.
107: Write access not permitted when controller enabled.
108: Unit unknown.
109: Write access only in the commissioning status, encoder.
110: Write access only in the commissioning status, motor.
111: Write access only in the commissioning status, power unit.
112: Write access only in the quick commissioning mode.
113: Write access only in the ready mode.
114: Write access only in the commissioning status, parameter reset.
115: Write access only in the Safety Integrated commissioning status.
116: Write access only in the commissioning status, technological application/units.
117: Write access only in the commissioning status.
118: Write access only in the commissioning status, download.
119: Parameter may not be written in download.
120: Write access only in the commissioning status, drive basis configuration.
121: Write access only in the commissioning status, define drive type.
122: Write access only in the commissioning status, data set basis configuration.
123: Write access only in the commissioning status, device configuration.
124: Write access only in the commissioning status, device download.
125: Write access only in the commissioning status, device parameter reset.
126: Write access only in the commissioning status, device ready.
127: Write access only in the commissioning status, device.
129: Parameter may not be written in download.
131: Requested signal interconnection not possible as the signal source supplies non-float value.
132: Free signal interconnection via PROFIdrive telegram setting inhibited.

133: Access method not defined.
200: Below the valid values.
201: Above the valid values.
202: Cannot be accessed from the Basic Operator Panel (BOP).
203: Cannot be read from the Basic Operator Panel (BOP).
204: Write access not permitted.

Remedy: - Correct the parameterization in the commissioning tool and download the project again.
- Enter the correct value in the specified parameter.
- Identify the parameter that restricts the limits of the specified parameter.

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.

F01105 CU: Insufficient memory

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Control Unit (CU)
Response: OFF1
Acknowledgment: POWER ON
Cause: The functionality on this Control Unit is too extensive (e.g. too many drives, functions, data sets, Technology Extensions, blocks, etc).
Fault value (r0949, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: - Change the configuration on this Control Unit, e.g.
-- Use fewer axes
-- Reduce the number of configurable functions
-- Use fewer data sets
-- Reduce Technology Extensions and blocks
- Use an additional Control Unit.

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 for internal Siemens troubleshooting.

Remedy:
- Try to save again.
- Replace the memory card or Control Unit.

F01110 CU: More than one SINAMICS G on one Control Unit

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: More than one SINAMICS G type power unit is being operated from the Control Unit.
Fault value (r0949, interpret decimal):
Number of the second drive with a SINAMICS G type power unit.
Remedy: Only one SINAMICS G drive type is permitted.

F01111 CU: Mixed operation of drive units illegal

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: Illegal operation of various drive units on one Control Unit:
- SINAMICS S together with SINAMICS G
- SINAMICS S together with SINAMICS S Value or Combi
Fault value (r0949, interpret decimal):
Number of the first drive object with a different power unit type.
Remedy: Only power units of one particular drive type may be operated with one Control Unit.

F01120 Terminal initialization has failed

Message class: Hardware/software error (1)
Message value: %1
Variant: S200 PTI
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: An internal software error occurred while the terminal functions were being initialized.
Fault value (r0949, interpret hexadecimal):
Only for internal Siemens troubleshooting.
Remedy:
- Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace the Control Unit.

F01122 Frequency at the measuring probe input too high

Message class: Application/technological function faulted (17)

Message value: %1
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The frequency of the pulses at the measuring probe input is too high.
Fault value (r0949, interpret decimal):
1: DI/DO 9 (X122.8)
2: DI/DO 10 (X122.10)
4: DI/DO 11 (X122.11)
8: DI/DO 13 (X132.8)
16: DI/DO 14 (X132.10)
32: DI/DO 15 (X132.11)
64: DI/DO 8 (X122.7)
128: DI/DO 12 (X132.7)
Remedy: Reduce the frequency of the pulses at the measuring probe input.

F01123 Power unit does not support digital inputs/outputs

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Power Unit
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The power unit does not support the activated "Digital inputs/outputs" function.
Remedy: Deactivate function.

F01150 CU: Number of instances of a drive object type exceeded

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Drive object type: %1, number permitted: %2, actual number: %3
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The maximum permissible number of instances of a drive object type was exceeded.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
ddccbbaa hex:
aa = drive object type:
- Drive object type (p0107), for which the maximum permissible number of instances was exceeded.
bb = number permitted:
- Maximum permissible number of instances for this drive object type.
cc = actual number:
- Actual number of instances for this drive object type.
dd = no significance
Remedy: - Switch off the unit.
- Suitably restrict the number of instances of a drive object type by reducing the number of inserted components.
- Re-commission the unit.

F01151 CU: Number of drive objects of a category exceeded

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Drive object category: %1, number permitted: %2, actual number: %3
Component: None

Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The maximum permissible number of drive objects of a category was exceeded.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
ddccbbaa hex:
aa = drive object category:
- Drive object category, for which the maximum permissible number of drive objects was exceeded.
bb = number permitted:
- Maximum permissible number for this drive object category.
cc = actual number:
- Actual number for this drive object category.
dd = no significance
Remedy: - Switch off the unit.
- Suitably restrict the number of drive objects of the specified category by reducing the number of inserted components.
- Re-commission the unit.

F01152 CU: Invalid constellation of drive object types

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: POWER ON
Cause: It is not possible to simultaneously operate drive object types SERVO, VECTOR and HLA.
A maximum of 2 of these drive object types can be operated on a Control Unit.
Remedy: - Switch off the unit.
- Restrict the use of drive object types SERVO, VECTOR, HLA to a maximum of 2.
- Re-commission the unit.

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, interpret hexadecimal):
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 for internal Siemens troubleshooting.
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 for internal Siemens troubleshooting.
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 for internal Siemens troubleshooting.
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 for internal Siemens troubleshooting.
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 for internal Siemens troubleshooting.
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 for internal Siemens troubleshooting.
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
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	

Explanation of the message value: For %3

Component in target topology

Explanation of the message value: For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	

25	X205
40	X400
41	X401
42	X402
50	X500
51	X501
52	X502
53	X503
54	X504
55	X505
56	X506
57	X507

Cause: 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).

A01317 Deactivated component again present

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: If a component of the target topology for an active drive object is inserted and the associated parameter of the component is set to "deactivate" (p0125, p0145, p0155, p0165).
Note:
This is the only message that is displayed for a deactivated component.
Remedy: The alarm is automatically withdrawn for the following actions:
- Activate the components involved (p0125 = 1, p0145 = 1, p0155 = 1, p0165 = 1).
- Again withdraw the component involved.

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 (e.g. PDS, MDS or EDS) 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.
Remedy: - Check the motor connection.
- Carry out a POWER ON (switch-off/switch-on).

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

Acknowledgment: NONE

Explanation of the message value: For %1

Component in target topology

Explanation of the message value: For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

Explanation of the message value: For %3

Component in actual topology

Explanation of the message value: For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	

22 X202
23 X203
24 X204
25 X205
40 X400
41 X401
42 X402
50 X500
51 X501
52 X502
53 X503
54 X504
55 X505
56 X506
57 X507

Cause: The topology comparison has detected a 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 value: For %1

Component in target topology

Explanation of the message value: For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

Explanation of the message value: For %3

Component in actual topology

Explanation of the message value: For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	

22 X202
23 X203
24 X204
25 X205
40 X400
41 X401
42 X402
50 X500
51 X501
52 X502
53 X503
54 X504
55 X505
56 X506
57 X507

Cause: The topology comparison has detected 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).

A01416 Topology: Component additionally inserted

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1, to %2, %3, connection: %4

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	

Explanation of the message value: For %3

Component in target topology

Explanation of the message value: For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	

25 X205
40 X400
41 X401
42 X402
50 X500
51 X501
52 X502
53 X503
54 X504
55 X505
56 X506
57 X507

Cause: The topology comparison has found a component in the actual topology which is not specified in the target topology.
Alarm value (r2124, interpret hexadecimal):
ddccbbaa hex:
dd = component class (%2)
cc = connection number (%4)
bb = component class of the additional component (%1)
aa = component number (%3)
Note:
The component class of the additional component is contained in bb.
The component is described in dd, cc and aa, where the additional component is inserted.
Component class and connection number are described in F01375.

Remedy: Adapting topologies:
- Remove the additional 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).

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

Explanation of the message value: 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	

Explanation of the message value: 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).

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

Explanation of the message value: For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

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 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

Explanation of the message value: For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

Explanation of the message value: For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	

25	X205
40	X400
41	X401
42	X402
50	X500
51	X501
52	X502
53	X503
54	X504
55	X505
56	X506
57	X507

Cause: Internal communications faulted.

Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Replace the device.

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

Explanation of the message value: For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

Explanation of the message value: For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	

25	X205
40	X400
41	X401
42	X402
50	X500
51	X501
52	X502
53	X503
54	X504
55	X505
56	X506
57	X507

Cause: The topology comparison has detected a 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

Explanation of the message value: For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

Explanation of the message value: For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	

25	X205
40	X400
41	X401
42	X402
50	X500
51	X501
52	X502
53	X503
54	X504
55	X505
56	X506
57	X507

Cause: The topology comparison has detected 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

Explanation of the message value: For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

Explanation of the message value: For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	

25 X205
40 X400
41 X401
42 X402
50 X500
51 X501
52 X502
53 X503
54 X504
55 X505
56 X506
57 X507

Cause: The topology comparison has detected a motor 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 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.

A01550 Security: Drive data encryption invalid

Message class: Hardware/software error (1)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
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.

A01590 Drive: Motor maintenance interval expired

Message class: General drive fault (19)
Message value: Fault cause: %1 bin
Component: Motor
Response: NONE
Acknowledgment: NONE
Cause: The selected service/maintenance interval for this motor was reached.
Alarm value (r2124, interpret decimal):
Motor data set number.
Remedy: carry out service/maintenance and reset the service/maintenance interval (p0651).

C01600 SI: STO self test failed

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Variant: S200 PTI
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The "Safety Integrated" function integrated in the drive has identified a fault in the self test of the switch-off signal path, and has initiated an STO (Safe Torque Off).
Fault value (r60049, interpret decimal):
1005: STO active, although STO not selected and there is no internal STO active.
1010: STO inactive, although STO is selected or an internal STO is active.
1015: The self test was unsuccessful in operation.
1016: Error in the communication path for brake/F-DI/F-DO/STO

Remedy:
- Select STO and then deselect again.
- Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade software to a later version.
- Contact Technical Support.

C01603 SI: Module temperature - limit value exceeded

Message class: Safety monitoring channel has identified an error (10)
Message value: -
Variant: S200 PTI
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A safe monitoring function has detected that the module temperature has exceeded a limit value. STO (Safe Torque Off) was initiated to maintain the safe state.
Remedy:
- Check the ambient temperature.
- Check the module fan.
- Operate the module in the permissible range.

F01604 SI: Safety EEPROM data error

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Variant: S200 PTI
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: POWER ON
Cause: Safety relevant EEPROM data are not correct.
This message results in an STO (Safe Torque Off).

Message value (r0949, interpret decimal): Only for internal Siemens fault diagnostics.
Remedy: Replace the module.

A01605 SI: Checksum error has occurred

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Variant: S200 PTI
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: A checksum error (CRC error) has occurred in the converter program memory.
Alarm value (r2124, interpret decimal):
Only for internal Siemens troubleshooting.

Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Upgrade firmware to later version.
- Contact Technical Support.

C01630 SI: Brake control error

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Variant: S200 PTI
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The "Safety Integrated" function integrated in the drive has identified a brake control fault, and has initiated an STO.
Fault value (r0949, interpret decimal):
1:
Fault in the "Open brake" state.
- Parameter p1278 incorrectly set.
- Brake not connected or interrupted cable (check whether for p1278 = 1 and p9604 bit 1 = 0 (SBC deactivated) the brake opens).
- Ground fault in brake cable.
2:
Fault in the "Close brake" state.
- Brake not connected or interrupted cable (check whether for p1278 = 1 and p9604 bit 1 = 0 (SBC deactivated) the brake opens).
- Short-circuit in brake winding.
3:
Hardware is defective or does not support the brake control.
- Communication with the brake control has failed.
- SBC is enabled on a module that does not support brake control.
4:
- Brake is not connected or interrupted cable.
Remedy: - Check the motor holding brake connection.
- Check the function of the motor holding brake.
- Check whether the brake control is supported.
- Check whether there are disturbances in the communications from the self-identifying brake, and if required carry out a diagnostics routine for the faults involved.
- Check that the electrical cabinet design and cable routing are in compliance with EMC regulations (e.g. shield of the motor cable and brake conductors are connected with the shield connecting plate and the motor connectors are tightly screwed to the housing).
- Replace the hardware.

Note:
SBC: Safe Brake Control
SI: Safety Integrated

A01637 SI: Safety configuration not protected

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Variant: S200 PTI
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.

A01641 SI: Component exchange identified and save necessary

Message class: General drive fault (19)

Message value: Fault cause: %1

Variant: S200 PTI

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 has been replaced	
4	It was identified that the Sensor Module has been replaced	
5	It was identified that the sensor has been replaced	

Cause: "Safety Integrated" has identified that a component has been replaced.
No additional stop response is initiated, and therefore the operation of the specific drive is not restricted.
When safety functions are active, after a component has been replaced it is necessary to carry out a partial acceptance test.
Alarm value (r2124, interpret binary).

Remedy: - Save all parameters (p0977 = 1 or retentively save).
- Acknowledge fault.
See also: r9776 (SI diagnostics)

F01646 SI: Change logbook

Message class: Safety monitoring channel has identified an error (10)

Message value: %1

Variant: S200 PTI

Component: Control Unit (CU)

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The saved functional safety checksum (r9780[0]) or hardware-related safety checksum (r9780[1]) differs from the safety checksum calculated when running up or a previously calculated safety checksum was not found.
An acceptance test is required as changes have been made to a safety parameter or the safety hardware.
Fault value (r0949, interpret decimal):
1: The safety logbook has identified that a functional safety checksum has changed. An acceptance test is required.
2: The safety logbook has identified that a hardware-related safety checksum has changed. An acceptance test is required.

Remedy: For fault value = 1:
- Carry out an acceptance test and generate an acceptance report.
For fault value = 2:
- Carry out the function checks for the modified hardware and generate an acceptance report.
Note:
The procedure when carrying out an acceptance test as well as an example of the acceptance report are provided in the following literature:
SINAMICS Function Manual Safety Integrated

C01649 SI: Internal software error

Message class: Hardware/software error (1)

Message value: Module: %1, line: %2
Variant: S200 PTI
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: An internal error has occurred in the Safety Integrated software.
Note:
This message results in an STO (Safe Torque Off) that cannot be acknowledged.
Message value (r60049, interpret hexadecimal): Only for internal Siemens fault diagnostics.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Re-commission the "Safety Integrated" function and carry out a POWER ON.
- Upgrade firmware to later version.
- 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 PTI
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The drive-integrated "Safety Integrated" function requires an acceptance test.
Message value (r0949, interpret decimal):
2003: Acceptance test is required as a safety parameter has been changed.
Remedy: For message value = 2003:
- Carry out an acceptance test and generate an acceptance report.
The procedure when carrying out an acceptance test as well as an example of the acceptance report are provided in the product operating instructions.

F01661 SI: Simulation of the safety inputs active

Message class: General drive fault (19)
Message value: Fault cause: %1 bin
Variant: S200 PTI
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.
Fault 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 fault.

C01668 SI: Checksum error safety monitoring functions

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Variant: S200 PTI
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 Siemens diagnostics)

Remedy: - Carry out safety commissioning.
- Carry out an acceptance test.

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 PTI

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The parameter cannot be parameterized with this value.
Note:
This message does not result in a safety stop response.
Message value (r60049, interpret decimal): yyyyxxxx dec:
yyyy = supplementary information
xxxx = parameter

yyyy = 0:
No additional information available.

xxxx = 10000 and
yyyy = F-DI number:
A non-existent F-DI was enabled.

xxxx = 10002:
The F-DI discrepancy time (p10002) is less than or equal to the SI monitoring clock cycle.

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).

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).

xxxx = 10041 and
yyyy = F-DI number:
An invalid value was set in "F-DI self test mode selection" (p10041[y]).

xxxx = 10071 and
yyyy = F-DI number:
An F-DI status r10071[y], which was not enabled in p10000, was set.

Remedy: Correct the parameter value.
For xxxx = 10000 and yyyy = F-DI number:
- Correct "SI F-DI enable" (p10000).
For xxxx = 10002:
- Set "SI F-DI switchover discrepancy time" (p10002) greater than the "SI monitoring clock cycle".
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])
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".
For xxxx = 10041 and yyyy = F-DI number:
- Change "SI F-DI self test mode selection" (p10041[y])
For xxxx = 10071 and yyyy = F-DI number:
- Correct "SI F-DI enable" (p10000).

C01680 SI: Checksum error safety monitoring functions

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Variant: S200 PTI
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 Siemens diagnostics)
Remedy: - Check the safety-relevant parameters and if required, correct.
- Retentively save parameters.
- Perform a POWER ON if safety parameters requiring a POWER ON have been modified.
- Carry out an acceptance test.

C01681 SI: Incorrect parameter value

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1, supplementary information: %2
Variant: S200 PTI
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The parameter cannot be parameterized with this value.
Note:
This fault results in STO.
Fault value (r60049, interpret decimal):
yyyyxxxx dec: yyyy = supplementary information, xxxx = parameter
yyyy = 0:
No additional information available.
xxxx = 10006 or 10022:
An inadmissible signal source for the control via F-DI was set.

Remedy: Correct parameters:
For xxxx = 10006 or 10022:
- Set a valid signal source in pxxxx.

C01682 SI: Monitoring function not supported

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Variant: S200 PTI
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: At least one of the monitoring functions enabled in p9604 is not supported with this firmware version on this device.
Note:
The message value (r60049, interpret binary) indicates the bits of the monitoring functions, which form this firmware version on this device, are not supported. If several, non-supported monitoring functions are simultaneously enabled, then these are all displayed in the message value.
This message results in an STO (Safe Torque Off).
See also: p9604 (SI enable)
Remedy: Correct parameter p9604 so that monitoring functions only permitted for this firmware version and for this device are enabled.
See also: p9604 (SI enable)

C01690 SI: Data backup problem for the NVRAM

Message class: Hardware/software error (1)
Message value: %1
Variant: S200 PTI
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: POWER ON
Cause: When saving parameters r9780, r9781 and r9782 (Safety logbook) says, an error has occurred in conjunction with the NVRAM.
Note:
This fault does not result in a safety stop response.
Fault value (r60049, interpret decimal):
1: There is no physical NVRAM in the drive.
2: There is no longer any free memory space in the NVRAM.
Remedy: For fault value = 1:
- Replace the hardware.
For fault value = 2:
- De-select functions that are not required and that take up memory space in the NVRAM.
- Contact Technical Support.
Note:
NVRAM: Non-Volatile Random Access Memory (non-volatile read and write memory)

C01700 SI: STO (Safe Torque Off) initiated

Message class: Safety monitoring channel has identified an error (10)
Message value: -
Variant: S200 PTI
Component: None
Response: OFF2

Acknowledgment: IMMEDIATELY
Cause: The drive is stopped using STO (Safe Torque Off).
Possible causes:
Subsequent response, following messages: C01706, C01714, C01715, C01716.
Remedy: Carry out diagnostics for the active messages (C01706, C01714, C01715, C01716).

C01711 SI: SCF (Safety Channel Failure) initiated

Message class: Safety monitoring channel has identified an error (10)
Message value: -
Variant: S200 PTI
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The drive has detected an error in a safe monitoring function and has initiated SCF (Safety Channel Failure).
Monitoring functions are no longer reliable. Safe operation not possible.
Possible causes:
Subsequent response, following messages: C01648, C01750, C01751, C01753, C01754, C01769.

Note:
This fault results in an SS1 (Safe Stop 1) and as a consequence STO (Safe Torque Off) is initiated.
Remedy: Carry out diagnostics for the active messages (C01648, C01750, C01751, C01753, C01754, C01769).

C01717 SI: SLA limit exceeded

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The acceleration limit for function SLA was exceeded. The drive is stopped as a result of the configured stop response (p9579).
Message value (r60049, interpret decimal):
0: The monitoring of the coarsely resolved acceleration has violated the acceleration limit.
1: The monitoring of the finely resolved acceleration and possibly filtered acceleration has violated the acceleration limit.
Remedy: - Check the traversing/motion program in the control.
- Check the acceleration limit for the SLA function and if required, adapt (p9578).
- Carry out a safe acknowledgment.
For message value = 0:
Analyze the causes using r9714[0] and r9714[3].
For message value = 1:
Analyze the causes using r9789[0], r9789[1] and r9789[2].
Note:
SI: Safety Integrated
SLA: Safely-Limited Acceleration

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 PTI
Component: Control Unit (CU)
Response: NONE

Acknowledgment: IMMEDIATELY

Explanation of the message value: For %1

Value	Cause	Remedy
1	Discrepancy error (state between two monitoring channels different for too long)	Check the F-DI wiring
2	Too many switching operations	Reduce the switching frequency
3	Test pulse error	Check the F-DI wiring
4	Internal software error	

Cause: The failsafe digital inputs (F-DI) have a fault condition.
Message value (r60049, interpret hexadecimal):
yyyyxxxx hex
xxxx: number of the failsafe digital input (F-DI).
yyyy: fault cause

Note:
If several faults occur consecutively, then this message is only signaled for the first fault that occurs.

Remedy: - Check the wiring of the F-DI (contact problems).
- If the wiring is correct, and for example there is no wire breakage, then a check must be made as to whether the switching frequency at F-DI is too high and must therefore be reduced (switching pulses must have a longer time between them). The time interval between each signal edge at an F-DI must be at least equal to the discrepancy time before the input is switched again.

Note:
This message can be acknowledged via F-DI (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 PTI
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

F01800 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.

A01900 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/r2053.
3:
Uneven number of bytes for input or output.
4:
Setting data for synchronization not accepted. For more information, see A01902.
211:
Unknown parameterizing block.
Additional values:
Only for internal Siemens troubleshooting.
Remedy: Check the bus configuration on the controller and device sides.

A01902 PN: Isochronous operation parameterization not permissible

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE

Cause: Parameterization for isochronous operation is not permissible.
Alarm value (r2124, interpret decimal):
0: Bus cycle time Tdp < 0.5 ms.
1: Bus cycle time Tdp > 32 ms.
2: Bus cycle time Tdp is not an integer multiple of the current controller sampling time.
3: Instant of the actual value sensing Ti > Bus cycle time Tdp or Ti = 0.
4: Instant of the actual value sensing Ti is not an integer multiple of the current controller sampling time.
5: Instant of the setpoint acceptance To >= Bus cycle time Tdp or To = 0.
6: Instant of the setpoint acceptance To is not an integer multiple of the current controller sampling time.
7: Controller application cycle time Tmapc is not an integer multiple of the speed controller sampling time.
8: Bus reserve bus cycle time Tdp - Data exchange time Tdx less than two current controller sampling times.
10: Instant of the setpoint acceptance To <= data exchange time Tdx + current controller sampling time
11: Controller application cycle time Tmapc > 14 x Tdp or Tmapc = 0.
12: PLL tolerance window Tpll_w > Tpll_w_max.
13: Bus cycle time Tdp is not a multiple of the speed controller clock cycle.

Remedy: - Adapt the bus parameterization Tdp, Ti, To.
- Adapt the sampling time for the current controller or speed controller.
For alarm value = 10:
- Reduce Tdx by using fewer bus participants or shorter telegrams.
Note:
PB: PROFIBUS
PN: PROFINET

A01904 PN: Controller setting of the PZD telegram rejected

Message class: Communication error to the higher-level control system (9)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: A controller attempts to set a PZD telegram. The setting is not applied.
Alarm value (r2124, interpret decimal):
3: Controllers have no function rights for making changes.
4: Telegram cannot be set as a result of the drive configuration.
Remedy: Check and align the telegram settings in the drive project and in the controller.

A01905 PN: Controller setting to activate the channel diagnostics rejected

Message class: Communication error to the higher-level control system (9)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: A controller attempted to change the activation of the channel diagnostics. The setting is not applied as the controller does not have the function rights to make a change.
Alarm value (r2124, interpret decimal):
1: Channel diagnostics are activated. Controller attempts to deactivate them.
2: Channel diagnostics are not activated. Controller attempts to activate them.
Remedy: Activate channel diagnostics in the bus configuration and check and align function rights in the drive.

F01910 Fieldbus: setpoint timeout

Message class: Communication error to the higher-level control system (9)

Message value: -
Component: None
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: The reception of setpoints from the fieldbus interface (PROFINET) is interrupted.
- Bus connection interrupted.
- Controller switched off.
- Controller set into the STOP state.

Remedy: Restore the bus connection and set the controller to RUN.

F01911 PN: Isochronous operation, clock cycle failure

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The telegram to synchronize the clock cycles has failed for several bus clock cycles or in several bus clock cycles has consecutively violated the specified time grid (see bus cycle time, Tdp and Tpllw).
Remedy: - Check the physical bus configuration (cable, connector, terminating resistor, shielding, etc.).
- Check whether communication was briefly or permanently interrupted.
- Check the utilization level of the bus and controller (e.g. bus cycle time Tdp was set too short).

Note:
PN: PROFINET

F01912 PN: Isochronous operation sign-of-life missing

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The maximum permissible number of errors in the controller sign-of-life (isochronous operation) has been exceeded in cyclic operation.
Remedy: - Check the physical bus configuration (cables, connectors, etc.).
- Check whether the controller correctly sends the sign-of-life (e.g. create a trace with STW2.12 ... STW2.15 and trigger signal ZSW1.3).
- Check the permissible telegram failure rate (p0925).
- Check the utilization level of the bus and controller (e.g. bus cycle time Tdp was set too short).

Note:
PN: PROFINET

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: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

A01932 **PN: Clock cycle synchronization missing for DSC**

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: There is no clock synchronization or clock synchronous sign of life and DSC is selected.
Note:
DSC: Dynamic Servo Control
Remedy: Set clock synchronization across the bus configuration and transfer clock synchronous sign-of-life.

A01940 **PB/PN: clock cycle synchronism not reached**

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram. Synchronization with the clock cycle specified by the controller was still not able to be performed.
- The controller does not send an isochronous 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: - Check the controller application and bus configuration.
- Check the consistency between the clock cycle input when configuring the device and clock cycle setting at the controller.
Note:
PB: PROFIBUS
PN: PROFINET

A01941 **PN: Clock cycle signal missing when the bus is being established**

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram. The synchronization telegram is not received.
Remedy: Check the controller application and bus configuration.
Note:
PN: PROFINET

A01943 **PN: Clock cycle signal error when the bus is being established**

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE

Cause: The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram.
The synchronization telegram is irregularly received.
- The controller sends an irregular synchronization telegram.
- The controller uses another isochronous bus clock cycle than was transferred to the device in the parameterizing telegram.

Remedy: - Check the controller application and bus configuration.
- Check the consistency between the clock cycle input when configuring the device and clock cycle setting at the controller.
Note:
PN: PROFINET

A01944 PN: Sign-of-life synchronism not reached

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram.
Synchronization with the controller sign-of-life (STW2.12 ... STW2.15) could not be completed because the sign-of-life changes differently to how it was configured in the Tmapc time grid.
Remedy: - Ensure that the controller correctly increments the sign-of-life in the controller application clock cycle Tmapc.
Note:
PN: PROFINET

F01950 PN: Isochronous operation, synchronization unsuccessful

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: Synchronization of the internal clock cycle to the controller clock cycle has failed. The internal clock cycle exhibits an unexpected shift.
Remedy: Only for internal Siemens troubleshooting.
Note:
PN: PROFINET

A01980 PN: cyclic connection interrupted

Message class: Communication error to the higher-level control system (9)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The cyclic connection to the PROFINET controller is interrupted.
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: A controller attempts to establish a connection to the drive, and as a consequence exceeds the permitted number of PROFINET connections.
The alarm is automatically withdrawn after approx. 30 seconds.
Alarm value (r2124, interpret hexadecimal):
yyyyxxxx hex: yyyy = info. 1, xxxx = info. 2
Info 1 = 0: number of RT connections exceeded
Info 1 > 0: number of IRT connections exceeded
Info 2: permitted number of connections
Remedy: Check the configuration of the PROFINET controllers.

A01989 PN: internal cyclic data transfer error

Message class: Communication error to the higher-level control system (9)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The cyclic actual values and/or setpoints were not transferred within the specified times.
Alarm value (r2124, interpret hexadecimal):
Only for internal Siemens troubleshooting.
Remedy: Correctly set T_io_input or T_io_output.

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: Stop the function generator and restart again if necessary.
Note:
The alarm is reset as follows:
- 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: At least one drive to be connected must be specified.
Note:
The alarm is reset as follows:
- 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: -
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:
Bandwidth_max = 1 / (2 x time slice clock cycle)
Bandwidth_min = Bandwidth_max / 100000
Example:
Assumption: Time slice clock cycle = 125 µs
--> Bandwidth_max = 1 / (2 x 125 µs) = 4000 Hz
--> Bandwidth_min = 4000 Hz / 100000 = 0.04 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.

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.

A02051 Trace: recording not possible as a result of know-how protection

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: initiating recorder: %1, parameter %2
Component: None
Response: NONE
Acknowledgment: NONE
Explanation of the message value: For %1

Value	Cause	Remedy
1	Recorder 0	
2	Recorder 1	
3	Recorders 0 and 1	

Cause: TRACE recording is not possible as at least one signal or trigger signal being used is under know-how protection.
Alarm value (r2124, interpret hexadecimal):
bbbbaaaa hex:
aaaa = 1: recorder 0
aaaa = 2: recorder 1
aaaa = 3: recorders 0 and 1
bbbb = parameter number (hexadecimal), that was not able to be written to.
Remedy: - Temporarily activate or deactivate know-how protection (p7766).
- Include the signal in the OEM exception list (p7763, p7764).
- Where relevant do not record the signal.

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.

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.

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.

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.

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 drive unit 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 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: - 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: - 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:
- Reduce the trace time.
- Increase the trace clock cycle.
- Reduce the number of signals to be traced.

A02150 TEC: Technology Extension cannot be loaded

Message class: Hardware/software error (1)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The system was not able to load a Technology Extension.
Alarm value (r2124, interpret hexadecimal):
10 hex (16 dec):
The interface version in the DCB user library is not compatible to the DCC standard library that has been loaded.
12 hex (18 dec):
A technology package was not able to be downloaded to a Control Unit because the warm restart necessary was not able to be performed.
Only for internal Siemens troubleshooting.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.
For alarm value = 10 hex (16 dec):
Load a compatible DCB user library (compatible to the interface of the DCC standard library).
For alarm value = 12 hex (18 dec):
Carry out a POWER ON (switch-off/switch-on) for all components.
Note:
DCB: Drive Control Block
DCC: Drive Control Chart
TEC: Technology Extension

F02151 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 for internal Siemens troubleshooting.

Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace the Control Unit.

Note:
TEC: Technology Extension

F02152 TEC: insufficient memory

Message class: Hardware/software error (1)
Message value: %1
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The functionality on this Control Unit is too extensive (e.g. too many drives, functions, data sets, Technology Extensions, blocks, etc).

Fault value (r0949, interpret decimal):

Only for internal Siemens troubleshooting.

Remedy: - Change the configuration on this Control Unit, e.g.
-- Use fewer axes
-- Reduce the number of configurable functions
-- Use fewer data sets
-- Reduce Technology Extensions and blocks
- Use an additional Control Unit.

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 (e.g. Technology Extension, DCB library) does not exist on the drive device.

When configuring, a technology function is activated, which does not exist on the drive device. This can occur when downloading a project or when powering up.

Remedy: - Load the required technology function to the drive device.
- If required, deactivate the technology function not required in the configuration.

Note:
DCB: Drive Control Block
TEC: Technology Extension

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.

F03505 Analog input wire breakage

Message class: External measured value / signal state outside the permissible range (16)
Message value: %1
Variant: S200 PTI
Component: Terminal Module (TM)
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The wire-break monitoring for an analog input has responded.
Remedy: Check the wiring for interruptions.

A03506 24 V power supply missing

Message class: Supply voltage fault (undervoltage) (3)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The 24 V power supply for the digital outputs (X124) is missing.
Remedy: Check the terminals for the power supply voltage (X124, L1+, M).

A03520 Temperature sensor fault

Message class: External measured value / signal state outside the permissible range (16)
Message value: %1
Variant: S200 PTI
Component: Terminal Module (TM)
Response: NONE
Acknowledgment: NONE
Cause: When evaluating the temperature sensor, an error occurred.
Alarm value (r2124, interpret decimal):
1: Wire breakage or sensor not connected (KTY: R > 1630 Ohm).
2: Measured resistance too low (PTC: R < 20 Ohm, KTY: R < 50 Ohm).
Remedy: - Make sure that the sensor is connected correctly.
- Replace the sensor.

F03590 TM: Module not ready

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Terminal Module (TM)
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The Terminal Module involved does not send a ready signal and no valid cyclic data.
Fault value (r0949, interpret decimal):
Drive object number of the Terminal Module involved.
Remedy: - Check the 24 V power supply.
- Check the DRIVE-CLiQ wiring.

F05055 Parallel connection: Power units with illegal code numbers

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: Power Unit

Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The code numbers of the power units do not match.
Fault value (r0949, interpret decimal):
Parameter in which the first different power unit code number was detected.
Remedy: Use power units with the same code number.
For parallel circuit configurations, only power units with identical power unit data may be used.

F05056 Parallel circuit: Power unit EEPROM versions differ

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The EEPROM versions of the power units do not match.
Fault value (r0949, interpret decimal):
Parameter in which the first different version number was detected.
Remedy: Use power units with the same EEPROM version.
Note:
For parallel circuit configurations, only power units with identical EEPROM versions may be used.

F05057 Parallel circuit: Power unit firmware versions differ

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The firmware versions of the power units connected in parallel do not match.
Fault value (r0949, interpret decimal):
Parameter in which the first different version number was detected.
Remedy: Use power units with the same firmware version.
For parallel circuit configurations, only power units with identical firmware versions may be used.

F05058 Parallel circuit: VSM EEPROM versions differ

Message class: General drive fault (19)
Message value: Parameter: %1
Component: Voltage Sensing Module (VSM)
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The EEPROM versions of the Voltage Sensing Modules (VSM) do not match.
Fault value (r0949, interpret decimal):
Parameter in which the first different version number was detected.
Remedy: For parallel circuit configurations, only Voltage Sensing Modules (VSM) with identical EEPROM versions may be used.

F05059 Parallel circuit: VSM firmware versions differ

Message class: General drive fault (19)
Message value: Parameter: %1
Component: Voltage Sensing Module (VSM)
Response: NONE

Acknowledgment: IMMEDIATELY
Cause: The firmware versions of the Voltage Sensing Module (VSM) do not match.
Fault value (r0949, interpret decimal):
Parameter in which the first different version number was detected.
Remedy: For parallel circuit configurations, only Voltage Sensing Modules (VSM) with identical firmware versions may be used.

F05060 Parallel circuit: Power unit firmware version does not match

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: Firmware from version V02.30.01.00 is required when connecting the power units in parallel.
Remedy: Update the firmware of the power units (at least V02.30.01.00).

F05068 Parallel connection: AIM EEPROM versions different

Message class: General drive fault (19)
Message value: Parameter: %1
Component: -
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The EEPROM versions of the Active Interface Module (AIM) do not match.
Fault value (r0949, interpret decimal):
Parameter in which the first different version number was detected.
Remedy: For parallel connections, only Active Interface Modules (AIM) with identical EEPROM versions may be used.

F05069 Parallel connection: AIM firmware versions different

Message class: General drive fault (19)
Message value: Parameter: %1
Component: -
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The firmware versions of the Active Interface Module (AIM) do not match.
Fault value (r0949, interpret decimal):
Parameter in which the first different version number was detected.
Remedy: For parallel connections, only Active Interface Modules (AIM) with identical firmware versions may be used.

F06310 Supply voltage (p0210) incorrectly parameterized

Message class: Network fault (2)
Message value: -
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: For AC/AC drive units, the measured DC 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)

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 Drive: Motor temperature model overtemperature

Message class: Motor overload (8)
Message value: %1
Component: Motor
Response: NONE
Acknowledgment: NONE
Cause: Motor temperature model 1/3 or the additional motor overload protection identified that the alarm threshold was exceeded.
Hysteresis:2K
Alarm value (r2124, interpret decimal):
200:
Motor temperature model 1 (I2t): temperature too high.
300:
Motor temperature model 3: temperature too high.
400:
Additional motor overload protection: the load is too high. If the load remains at this level, the drive is shut down with fault F07011.
See also: r0034, 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)

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: The macro cannot be executed.
Fault value (r0949, interpret hexadecimal):
ccccbbaa hex:
cccc = preliminary parameter number, bb = supplementary information, aa = fault cause
Fault causes for the trigger parameter itself:
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).
Fault causes for the parameters to be set:
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.
Remedy: - Check the parameter involved.
- Check the macro file and signal interconnection.

F07083 Template: ACX file not found

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY

Cause: The template to be executed was not able to be found.
Fault value (r0949, interpret decimal):
Parameter number with which the execution was started.
Remedy: - Check whether the corresponding template number is available.

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: The WaitUntil condition set in the macro was not fulfilled in a certain number of attempts.
Fault value (r0949, interpret decimal):
Parameter number for which the condition was set.
Remedy: Check and correct the conditions for the WaitUntil loop.

F07085 Drive: Open-loop/closed-loop control parameters changed

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: Open-loop/closed-loop control parameters have had to be changed.
Possible causes:
1. As a result of other parameters, they have exceeded the dynamic limits.
2. They cannot be used due to the fact that the hardware detected not having certain features.
3. The value is estimated as the thermal time constant is missing.
4. Motor temperature model 1 is activated as thermal motor protection is missing.
See also: p1082 (Maximum speed)
Remedy: Not necessary.
It is not necessary to change the parameters as they have already been correctly limited.

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 selected 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, p2002, p2003
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 >= 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 Drive: Test signal error

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Control Unit (CU)
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: An error was identified when executing the "Test signal" function.
The function was not executed or was canceled.
Fault value (r0949, interpret decimal):
1: No distance limit has been defined (p5308 = 0).
2: The moment of inertia estimator has not stabilized in the parameterized time (p5309).
3: The parameterized distance (p5308) was exceeded.
4: No motor encoder parameterized (closed-loop speed control without encoder).
6: Pulse enable was withdrawn while traversing.
7: speed setpoint not equal to zero.
See also: p5308, p5309
Remedy: For fault value = 1:
- Define distance limiting (p5308).
For fault value = 2:
- Increase the duration, distance limit or speed limit (p5309, p5308, p1082, p1083, p1086).
For fault value = 3:
- Check distance limiting (p5308).
For fault value = 4:
- Configure speed control with encoder.
For fault value = 6:
- Keep the drive switched on until the "Test signal" function has been completely exited.
For fault value = 7:
- Set the speed setpoint to zero. It is possible that the setpoint was specified from the control panel.

F07094 General parameter limit violation

Message class: Hardware/software error (1)
Message value: Parameter: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY

Cause: As a result of the violation of a parameter limit, the parameter value was automatically corrected.
Minimum limit violated --> parameter is set to the minimum value.
Maximum limit violated --> parameter is set to the maximum value.
Alarm value (r2124, interpret decimal):
Parameter number, whose value had to be adapted.
Remedy: Check the adapted parameter values and if required correct.

A07095 Drive: One Button Tuning activated

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The One Button Tuning function is active.
One Button Tuning is performed at the next switch-on command.
See also: p5300 (Autotuning selection)
Remedy: Not necessary.
The alarm is automatically withdrawn after One Button Tuning has been exited (p5300 = 0).

F07097 Drive: Test signal error distance limiting

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Fault cause: %1, traversing distance: %2
Component: Control Unit (CU)
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: An error was identified when executing function "Test signal" or One Button Tuning selection (p5300 = 1).
The function was not executed or was canceled.
Fault value (r0949, interpret decimal):
yyyyxxxx hex: yyyy = 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.

A07200 Drive: Master control ON command present

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The ON/OFF1 command is present (no 0 signal).
The command is either influenced via binary signal sink c0840 (actual CDS) or control word bit 0 via the master control.
Remedy: Switch the signal to 0 via binary signal sink c0840 (actual CDS) or control word bit 0 via the master control.

F07217 PTI: A/B/R signal inversion error

Message class: Position/speed actual value incorrect or not available (11)
Message value: Fault cause: %1 bin
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: For PTI input, signal A*, B* is not inverted with respect to signal A, B.
Fault value (r0949, interpret binary):
Bit 16: Error track A.
Bit 17: Error track B.
Remedy: Check the PTI cable.

F07220 Drive: Master control by PLC missing

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The "master control by PLC" signal was missing in operation.
- The higher-level control has withdrawn the "master control by PLC" signal.
- Data transfer via the fieldbus (controller/drive) was interrupted.

Remedy: - Check the "master control by PLC" signal and, if required, switch in.
- Check data transfer via the fieldbus (controller/drive).

Note:
If the drive should continue to operate after withdrawing "master control by PLC", then the fault response must be parameterized to NONE or the message type should be parameterized as alarm.

F07300 Drive: Line contactor feedback signal missing

Message class: Auxiliary unit faulted (20)
Message value: -
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: - The line contactor was not able to be closed within the time in p0861.
- The line contactor was not able to be opened within the time in p0861.
- The line contactor dropped out during operation
- The line contactor has closed although the drive converter is switched off.

Remedy: - Check the setting of p0860.
- Check the feedback circuit from the line contactor.
- Increase the monitoring time in p0861.

A07350 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 bidirectional digital input/output and the terminal is set as output.
Alarm value (r2124, interpret decimal):
8: DI/DO 8 (X122.9/X132.1)
9: DI/DO 9 (X122.10/X132.2)
10: DI/DO 10 (X122.12/X132.3)
11: DI/DO 11 (X122.13/X132.4)
12: DI/DO 12 (X132.9)
13: DI/DO 13 (X132.10)
14: DI/DO 14 (X132.12)
15: DI/DO 15 (X132.13)
Regarding the terminal designation:
The first designation is valid for CU320, the second for CU305.
Remedy: - Deselect measuring probe (p0488, p0489).

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 Uq_set_1 longer than 16 ms at its limit" is present and can be caused by the following:
- Motor not connected or motor contactor open.
- No DC link voltage present.
- Power unit defective.

Remedy:
- Connect the motor or check the motor contactor.
- Check the DC link voltage (r0070).
- Check the power unit.

F07412 Drive: Commutation angle incorrect (motor model)

Message class: Position/speed actual value incorrect or not available (11)
Message value: %1
Component: None
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: An incorrect commutation angle was detected, which can result in a positive coupling in the speed controller.
Possible causes:
- The phase sequence of the output phases for the motor is incorrect (e.g. the phases are interchanged).
- The motor encoder is incorrectly adjusted with respect to the magnet position.
- The motor encoder is damaged.
- The motor encoder speed signal is faulted.
- The control loop is instable due to incorrect parameterization.

Remedy:
- Check the phase sequence for the motor, and if required, correct.
- If the encoder mounting was changed, re-adjust the encoder.
- Replace the defective motor and/or motor encoder.

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:
- 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 / 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: - 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 / 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 / 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 <= 11.695 * 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 Tr = max(p2572, p2573) / p2574 resulted in an excessively high value so that the jerk time is internally limited to 1000 ms.
Note:
The alarm is also output if jerk limiting is not active.
Remedy: - Increase the jerk limiting (p2574).
- Reduce maximum acceleration or maximum deceleration (p2572, p2573).

A07441 LR: Save the position offset of the absolute encoder adjustment

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -

Component: None
Response: NONE
Acknowledgment: NONE
Cause: The status of the absolute encoder adjustment has changed.
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.

F07442 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:
v = (p0421 * p2506 * p2505) / (p2504 * p2576)

F07443 LR: Home position not in the permissible range

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The home position received when adjusting the encoder via numerical signal sink r2599 lies outside the half of the encoder range and cannot be set as actual axis position.
Fault value (r0949, interpret decimal):
Maximum permissible value for the home position
Remedy: Set the home position to a lower value than specified in the fault value.

F07446 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).

F07450 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.

F07451 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.

F07452 LR: Following error too high

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The difference between the position setpoint position actual value (following error dynamic model, r2563) is higher than the tolerance (p2546).
- 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.

F07453 LR: Position actual value preprocessing error

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF1

Acknowledgment: IMMEDIATELY
Cause: A position measuring system fault has occurred (F31110, F31111).
An error has occurred during the position actual value preprocessing.
Remedy: Resolve the cause of the position measuring position fault.
Check the encoder for the position actual value preprocessing.

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: One of the following problems has occurred with the position actual value preprocessing:
- An encoder is not assigned for the position actual value preprocessing (p2502 = 0).
- An encoder is assigned, but no encoder data set (p0187 = 99 or p0188 = 99 or p0189 = 99).
- 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: Check the drive data sets, encoder data sets and encoder assignment.
See also: p0400 (Encoder type selection)

A07455 EPOS: Maximum velocity limited

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The maximum velocity (p2571) is too high to correctly calculate the modulo correction.
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.
Remedy: - Reduce the maximum velocity (p2571).

A07456 EPOS: Setpoint velocity limited

Message class: Application/technological function faulted (17)
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: - 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: An illegal combination of input signals that are simultaneously set was identified.
Alarm value (r2124, interpret decimal):
0: Jog 1 and jog 2 (c2589, c2590).
1: Jog 1 or jog 2 and direct setpoint input/MDI (c2589, c2590, c2647).
2: Jog 1 or jog 2 and start homing (c2589, c2590, c2595).
3: Jog 1 or jog 2 and activate traversing task (c2589, c2590, c2631).
4: Direct setpoint input/MDI and starting homing (c2647, c2595).
5: Direct setpoint input/MDI and activate traversing task (c2647, c2631).
6: Start homing and activate traversing task (c2595, c2631).
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: - 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.

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).

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.

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 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.

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.
Alarm value (r2124, 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 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.

A07474 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.

F07475 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.

F07476 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.

A07477 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).

A07478 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).

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).

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).

F07481 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).

F07482 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).

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 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).

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.

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.

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.

F07490 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.

F07491 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.
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.

F07492 EPOS: Positive 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 c2570, i.e. the positive hardware limit switch was reached.
For a negative traversing direction, the positive hardware limit switch was reached - i.e. the hardware limit switch wiring is incorrect.
Remedy: - Leave the positive hardware limit switch in the negative traversing direction and return the axis to the valid traversing range.
- Check the wiring of the hardware limit switch.

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: The value range (-2147483648 ... 2147483647) for the position actual value representation was exceeded.
When the overflow occurs, the "homed" or "adjustment absolute measuring system" status is reset.
Fault value (r0949, 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 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: If required, reduce the traversing range or position resolution (p2506).
Note for fault value = 3:
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.
For rotary encoders, the maximum possible absolute position (LU) is calculated as follows:
p2506 * p2505 / p2504
p2506 * p2505 * p0421 / p2504 for multiturn encoders

F07494 LR: Drive Data Set changeover in operation

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: A Drive Data Set changeover (DDS) with a change of the mechanical relationships (p2503 ... 2506), direction of rotation (p1821) or the encoder assignment (p2502) was requested in operation.
Note:
DDS: Drive Data Set
Remedy: To changeover the drive data set, initially, exit the "operation" mode.

A07495 LR: Homing function interrupted

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: An activated homing function (homing mark search or measuring probe evaluation) was canceled.
Possible causes:
- 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 de-activated.

Remedy: - Check the causes and resolve.
- Reset the control and activate the required function.

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 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 (c2509 = 0 signal).
For alarm value = 6:
Set the input terminal for the measuring probe (p0488, p0489 or p2517, p2518).
For alarm value = 4098:
Check the Control Unit 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:
Tmeas [125 µs] = alarm value - 50000
With PROFIBUS, the measuring clock cycle corresponds to the bus clock cycle (r2064[1]).
Without PROFIBUS, the measuring clock cycle is an internal cycle time that cannot be influenced.

F07499 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.
Remedy: - Check the wiring of the reversing cam (c2613, c2614).
- Check the traversing direction to approach the reversing cam.

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.

A07520 Drive: Motor cannot be changed over

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: A motor data set switchover was requested via PROFINET that the converter does not support.
Remedy: - Check the PROFINET telegram

A07530 Drive: Drive Data Set DDS not present

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: A data set switchover was requested via PROFINET that the converter does not support.
Remedy: - Check the PROFINET telegram

A07531 Drive: Command Data Set CDS not present

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The selected command data set is not available (r0836 > p0170). The command data set was not changed over.
Remedy: - Select the existing command data set.
- Set up additional command data sets.

A07550 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.

F07555 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 (p0411 for the measuring gearbox, 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.

F07556 Measuring gearbox: Position tracking, maximum actual value exceeded

Message class: Position/speed actual value incorrect or not available (11)

Message value: Component number: %1, encoder data set: %2
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: When the position tracking of the measuring gearbox is configured, the drive/encoder identifies a maximum possible absolute position actual value (r0483) that cannot be represented within 32 bits.
Maximum value: p0408 * p0412 * 2^p0419
Fault value (r0949, interpret decimal):
aaaayyxx hex: yy = component number, xx = encoder data set
See also: p0408 (Rotary encoder pulse number)
Remedy: - Reduce the fine resolution (p0419).
- Reduce the multiturn resolution (p0412).

A07557 Motor encoder: Home position not in the permissible range

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The home position received 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.

F07562 Drive, encoder: Position tracking, incremental encoder not possible

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Fault cause: %1, component number: %2, encoder data set: %3
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The requested position tracking for incremental encoders is not supported.
Fault value (r0949, interpret hexadecimal):
ccccbbaa hex
aa = encoder data set
bb = component number
cccc = fault cause
cccc = 00 hex = 0 dec
The encoder type does not support the "Position tracking incremental encoder" function.
cccc = 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.
cccc = 04 hex = 4 dec
A linear encoder is used that does not support the "position tracking" function.
See also: p0404 (Encoder configuration effective)
Remedy: - Check the encoder parameterization (p0400, p0404).
- Use a Control Unit with sufficient NVRAM.
- If required, deselect position tracking for the incremental encoder (p0411.3 = 0).

A07565 Drive: Encoder error in PROFIdrive encoder interface 1

Message class: Position/speed actual value incorrect or not available (11)

Message value: %1
Component: Sensor Module Encoder 1
Response: NONE
Acknowledgment: NONE
Cause: An encoder error was signaled for encoder 1 via the PROFIdrive encoder interface (G1_ZSW.15).
Alarm value (r2124, interpret decimal):
Error code from G1_XIST2.
Remedy: Acknowledge the encoder error using the encoder control word (G1_STW.15 = 1).

A07569 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.

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
Cause: The motor encoder signals that it is not ready.
- Initialization of encoder 1 (motor encoder) was unsuccessful.
- The function "parking encoder" is active (encoder control word G1_STW.14 = 1).
- The Sensor Module is defective.
Remedy: Evaluate other active faults via the motor encoder.

A07577 Motor encoder: Measuring probe evaluation not possible

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: When evaluating the measuring probe, an error occurred.
Alarm value (r2124, interpret decimal):
6: The input terminal for the measuring probe is not set.
4098: Error when initializing the probe.
4100: The measuring pulse frequency is too high.
4200: The bus cycle time is not a multiple integer of the position controller clock cycle.

Remedy: Deactivate measuring probe evaluation (c2509 = 0 signal).
For alarm value = 6:
Set the input terminal for the measuring probe (p0488, p0489 or p2517, p2518).
For alarm value = 4098:
Check the Control Unit 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.

A07580 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.

A07581 Motor encoder: Position actual value preprocessing error

Message class: Position/speed actual value incorrect or not available (11)
Message value: -
Component: Encoder 1
Response: NONE
Acknowledgment: NONE
Cause: An error has occurred during the position actual value preprocessing.
Remedy: Check the encoder for the position actual value preprocessing.

A07587 Motor encoder: Position actual value preprocessing has no valid encoder

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Encoder 1
Response: NONE
Acknowledgment: NONE
Cause: The following problem has occurred during the position actual value preprocessing:
- An encoder data set has been assigned, however, the encoder data set does not contain any encoder data (p0400 = 0) or invalid data (e.g. p0408 = 0).
Remedy: Check the drive data sets, encoder data sets.
See also: p0400 (Encoder type selection)

A07593 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).

A07596 Motor encoder: Homing function interrupted

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
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 de-activated.

Remedy:
- Check the causes and resolve.
- Reset the control and activate the required function.

F07801 Drive: Motor overcurrent

Message class: Motor overload (8)
Message value: -
Component: Motor
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The permissible motor limit current was exceeded.
- Active current limit too low.
- Current controller not correctly set.
- Load is too high.
- Short-circuit in the motor cable or ground fault.
- Motor current does not match the drive current.

Remedy:
- Reduce the load.
- Check the motor and motor cables for short-circuit and ground fault.
- Check the drive and motor combination.

F07802 Drive: Infeed not ready

Message class: Infeed faulted (13)
Message value: -
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The drive does not signal a ready state after an internal switch-on command.
- DC link voltage is not present.
- Defective drive.
- Supply voltage incorrectly set.

Remedy:
- Check the enable signals for the drive.
- Replace the drive.
- Check the supply voltage setting (p0210).

F07808 HF Damping Module: damping not ready

Message class: Power electronics faulted (5)
Message value: %1
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: When switching on or in the switched-on state, the HF Damping Module does not return a ready signal.
Fault value (r0949, interpret hexadecimal):
1: Fault at switch-on identified.
2: Fault during operation identified.
Remedy:
- Check the DRIVE-CLiQ wiring to the HF Damping Module.
- Check the 24 V supply voltage.
- If required, replace the HF Damping Module.

Note:
HF Damping Module

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 or inform Siemens Customer Service.

F07815 Drive: Power unit has been changed

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: Power Unit
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The code number of the actual power unit does not match the saved number. This occurs if a saved configuration (SD card, backup file) of a converter with another power rating is used.
Fault value only for internal Siemens diagnostics.
See also: p0201 (Power unit code number)
Remedy:
- Reset to the factory settings, which corresponds to recommissioning the converter.
- Use an SD card or backup file with the configuration correct for the drive being used and switch-off/switch-on the drive.
- In case of doubt, before using an SD card, delete the existing configuration of the USER folder.
- For a series commissioning, only use the same converter types (order number, power class).

F07860 External 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.

F07900 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 is oscillating and the speed controller output repeatedly goes to its limit.
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).

F07901 Drive: Motor overspeed

Message class: Application/technological function faulted (17)
Message value: -
Component: Motor
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The maximum permissible speed was either positively or negatively exceeded (p1082).
Remedy: - Check the speed controller (p1460, p1462).
- Check the moment of inertia (p1498).
- Check the maximum speed (p1082).

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.

F07955 Drive: Motor has been changed

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Motor
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The code number of the actual self-identifying motor does not match the saved number.
If available:
The code numbers of the bearings, gearbox and brake do not match the saved numbers.
Remedy: Connect the original motor and switch on the converter again (POWER ON) - or restore the factory settings.
Note:
The data for bearings, gearbox and brake are reloaded.

F07956 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 self-identifying 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 self-identifying motor with the matching motor code.

F08000 TB: +/-15 V power supply faulted

Message class: Supply voltage fault (undervoltage) (3)
Message value: %1
Component: Controller Extension (CX)
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: Terminal Board 30 detects an incorrect internal power supply voltage.
Fault value (r0949, interpret decimal):
0: Error when testing the monitoring circuit.
1: Fault in normal operation.
Remedy: - Replace Terminal Board 30.
- Replace Control Unit.

F08010 TB: Analog-digital converter

Message class: Hardware/software error (1)
Message value: -
Component: Controller Extension (CX)
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The analog/digital converter on Terminal Board 30 has not supplied any converted data.

Remedy: - Check the power supply.
- Replace Terminal Board 30.

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: A consistency error was detected when activating the configuration for the PROFINET interface (X150).
Alarm value (r2124, interpret decimal):
0: General consistency error
1: Error in the IP configuration (IP address, subnet mask or standard gateway).
2: Error in the station names.
3: DHCP was not able to be activated, as a cyclic PROFINET connection already exists.
5: Standard gateway is also set at the Industrial Ethernet interface (X127).
6: Standard station name is also set at the Industrial Ethernet interface (X127).
7: IP address is located in the same subnet as the IP address of the Industrial Ethernet interface (X127).
Note:
For alarm value = 0, 1, 2, 3, 4, 5, 7, the following applies: the configuration was not changed.
For alarm value = 6 the following applies: The new configuration was however activated.
DHCP: Dynamic Host Configuration Protocol

Remedy: Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).

A08566 IIOT: 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 IIoT interface (X128). The saved configuration file has not been loaded.
Note:
IIoT: Industrial Internet of Things

Remedy: Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).

A08567 IIoT: Consistency error for 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 IIoT interface (X128).
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).

A08800 PROFIenergy energy-saving mode active

Message class: Communication error to the higher-level control system (9)

Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The PROFIenergy energy-saving mode is active
Alarm value (r2124, interpret decimal):
Mode ID of the active PROFIenergy energy-saving mode.
Remedy: The alarm is automatically withdrawn when the energy-saving mode is exited.
Note:
The energy-saving mode is exited after the following events:
- The PROFIenergy command end_pause is received from the higher-level control.
- The higher-level control has changed into the STOP operating state.
- The PROFINET connection to the higher-level control has been disconnected.

F13000 License not adequate

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: - The converter uses options that require a license and the licenses are not sufficient.
- An error has occurred when checking the licensing.
Fault value (r0949, interpret decimal):
0: Adequate licensing was not able to be determined as there is no licensing data available on the memory card.
1: Adequate licensing was not able to be determined as the memory card with the required licensing data was withdrawn in operation or the memory card is defective.
2: Adequate licensing was not able to be determined as there is no licensing data available on the memory card.
3: Adequate licensing was not able to be determined as the licensing data does not match the serial number of the memory card being used.
4, 5, 6, 7: Adequate licensing was not able to be determined as the licensing data were manipulated and are therefore invalid.
8, 9: An internal error occurred when checking the license.
Remedy: For fault value = 0:
Transfer a license file with the required licenses to the converter.
For fault value = 1:
Reinsert the memory card into the converter. If you have to replace a defective memory card, contact Technical Support.
For fault value = 2:
Transfer a license file with the required licenses to the converter.
For fault value = 3:
Compare the license file name (after "LK_" to ".ZIP") with the serial number of the memory card.
Transfer the appropriate license file to the converter.
For fault value = 4, 5, 6, 7, 8, 9:
- Carry out a POWER ON.
- Upgrade firmware to later version.
- Contact Technical Support.
Note:
An overview of the converter functions requiring a license can be displayed using a commissioning tool in the online mode. Depending on the commissioning tool, you can also obtain the necessary licensing (serial number, license file, Trial License Mode).

A13002 Licensing not sufficient in operation

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: - For the converter, the options that require a license are being used but the licenses are not sufficient.
- An error occurred when checking the existing licenses.
Alarm value (r2124, interpret decimal):
0: The existing license is not sufficient.
1: An adequate license was not able to be determined as the memory card with the required licensing data was withdrawn in operation or the memory card has developed a defect.
2: An adequate license was not able to be determined as there is no licensing data available on the memory card.
3: An adequate license was not able to be determined as there is no licensing data available on the memory card.
4, 5, 6, 7: An adequate license was not able to be determined as the licensing data were manipulated and are therefore invalid.
8,9: An internal error occurred when checking the license.
Remedy: For alarm value = 0:
Additional licenses are required and must be activated.
For alarm value = 1:
Reinsert or replace the memory card that matches the system.
For alarm value = 2:
Transfer the license file to the converter.
For alarm value = 3:
Compare the license file name (after "LK_" to ".ZIP") with the serial number of the memory card.
Transfer the appropriate license file to the converter.
For alarm value = 4, 5, 6, 7, 8, 9:
- Carry out a POWER ON.
- Upgrade firmware to later version.
- Contact Technical Support.
Note:
An overview of the converter functions requiring a license can be displayed using a commissioning tool in the online mode. Depending on the commissioning tool, you can also obtain the necessary licensing (serial number, license file, Trial License Mode).

A13030 Trial License activated

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: The "Trial License" function was activated. One of the available periods is expiring.
Remedy: Not necessary.
The alarm is automatically withdrawn after the periods have expired.

A13031 Trial License period expired

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: One of the available periods of the "Trial License" function has expired.

Remedy: - If required, start an additional period.
- Deactivate functions requiring a license.
- Appropriately license the drive unit.
Note:
A license that is not adequate will only become evident after the next time the system runs up.

A13032 Trial License last period activated

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: The "Trial License" function was activated. The last of the available periods is expiring.
Remedy: Not necessary.
The alarm is automatically withdrawn after the last period has expired.

A13033 Trial License last period expired

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: The last period of the "Trial License" function has expired. No additional periods available.
Remedy: - Deactivate functions requiring a license.
- Appropriately license the drive unit.
Note:
A license that is not adequate will only become evident after the next time the system runs up.

F30001 Drive: overcurrent

Message class: Power electronics faulted (5)
Message value: Fault cause: %1 bin
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The drive has detected an overcurrent condition.
- Closed-loop control is incorrectly parameterized.
- Motor has a short-circuit or fault to ground (frame).
- The rated motor current is significantly higher than that of the drive.
- Infeed: High discharge and post-charging currents for line voltage dip.
- Infeed: High post-charging currents for overload when motoring and DC link voltage dip.
- Infeed: Short-circuit currents at switch-on as there is no line reactor.
- Power cables are not correctly connected.
- The power cables exceed the maximum permissible length.
- Defective drive.
- Line phase interrupted.
Fault value (r0949, interpret bit-serial):
Bit 0: Phase U.
Bit 1: Phase V.
Bit 2: Phase W.

Remedy:
- Check the motor data - If required, carry out commissioning.
- 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.
- Replace drive.
- Check the line phases.

F30002 Drive: DC link overvoltage

Message class: DC link overvoltage (4)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The drive has detected an overvoltage condition in the DC link.
- Motor regenerates too much energy.
- Device supply voltage too high.
- Line phase interrupted.

Fault value only for internal Siemens diagnostics.
Remedy:
- Increase the ramp-down time.
- Use a braking resistor.
- Use a drive with a higher power rating.
- Check the device supply voltage (p0210).
- Check the line phases.

See also: p0210 (Device supply voltage)

F30003 Power unit: DC link voltage undervoltage

Message class: Infeed faulted (13)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The power unit has detected an undervoltage condition in the DC link.
- Line supply failure.
- Line 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 load 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 load duty cycle.
- Check the rated currents of the motor and power unit.

See also: p0307 (Rated motor power)

F30011 Power unit: Line phase failure in main circuit

Message class: Network fault (2)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: At the power unit, the DC link voltage ripple has exceeded the permissible limit value.
Possible causes:
- A line phase has failed.
- The 3 line phases are inadmissibly asymmetrical.
- The capacitance of the DC link capacitor forms a resonance frequency with the line inductance and the reactor integrated in the power unit.
- The fuse of a phase of a main circuit has ruptured.
- A motor phase has failed.
- For power units operated on a single phase, the permissible active power was exceeded.

Only for internal Siemens troubleshooting.

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.

F30012 Power unit: Temperature sensor wire breakage

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The connection to a temperature sensor in the power unit is interrupted.
Fault value (r0949, interpret binary):
Bit 1: Air intake
Bit 2: Inverter 1
Bit 3: Inverter 2
Bit 4: Inverter 3
Bit 5: Inverter 4
Bit 6: Inverter 5
Bit 7: Inverter 6
Bit 8: Rectifier
Bit 10: Moisture ext. moisture sensor
Bit 11: Temperature ext. moisture sensor
Bit 13: Balance resistor
Bit 14: Capacitor air discharge
Bit 15: Liquid intake
Remedy: Contact Technical Support.

F30013 Power unit: Temperature sensor short-circuit

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: A temperature sensor in the power unit is short-circuited.
Fault value (r0949, interpret binary):
Bit 1: Air intake
Bit 2: Inverter 1
Bit 3: Inverter 2
Bit 4: Inverter 3
Bit 5: Inverter 4
Bit 6: Inverter 5
Bit 7: Inverter 6
Bit 8: Rectifier
Bit 10: Moisture ext. moisture sensor
Bit 11: Temperature ext. moisture sensor
Bit 14: Capacitor air discharge
Bit 15: Liquid intake
Remedy: Contact Technical Support.

F30015 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.

A30016 Power unit: Load supply switched off

Message class: Network fault (2)

Message value: %1

Component: Power Unit

Response: NONE

Acknowledgment: NONE

Cause: The DC link voltage is too low.
Alarm value (r2124, interpret decimal):
DC link voltage at the time of the trip [V].

Remedy:
- Switch on load supply.
- Check the line supply if necessary.

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 for internal Siemens troubleshooting.
Note:
Fault value = 0 means that the phase with current limiting is not recognized (e.g. for blocksize device).

Remedy:
- Check the motor data.
- Check the motor circuit configuration (star-delta).
- Check the motor load.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.
- Replace power unit.

F30020 Power unit: Configuration not supported

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Fault cause: %1, additional information: %2

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: A configuration is requested that is not supported by the power unit.
Fault value (r0949, interpret hexadecimal):
yyyyxxxx hex: xxxx = fault cause, yyyy = additional information (internal Siemens)
xxxx = 1: The requested DRIVE-CLiQ timing is not permissible.
xxxx = 3: Initialization was not able to be successfully completed. It is possible that the converter was switched-off before or while running up.
xxxx = 4: The combination of power unit and converters is not supported.
xxxx = 8: The version of the ASIC installed in the power unit is no longer supported.

Remedy: For fault cause = 1:
Update the converter firmware or change the DRIVE-CLiQ topology.
For fault cause = 3, 4:
Use a converter with the appropriate power unit and carry out a POWER ON for the converter.
For fault cause = 8:
Replace the power unit by one which has a newer ASIC version.

F30021 Drive: Ground fault

Message class: Ground fault / inter-phase short-circuit detected (7)

Message value: %1

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The drive has detected a ground fault.
Possible causes:
- Ground fault in the power cables.
- Ground fault at the motor.
- When the brake closes, this causes the hardware DC current monitoring to respond.
- Short-circuit at the braking resistor.

Fault value (r0949, interpret decimal):
0:
- The hardware DC current monitoring has responded.
- Short-circuit at the braking resistor.

> 0:
Absolute value summation current amplitude.

Remedy:
- Check the power cable connections.
- Check the motor.
- Check the cables and contacts of the brake connection (a wire is possibly broken).
- Check the braking resistor.

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: POWER ON

Cause: In the power unit, the monitoring of the collector-emitter voltage (U_ce) of the semiconductor has responded.
Possible causes:
- Fiber-optic cable interrupted.
- The power supply for power semiconductor gating missing.
- Short-circuit at the power unit output.
- Defective semiconductor in the power unit.

Fault value (r0949, interpret binary):
Bit 0: Short-circuit in phase U
Bit 1: Short-circuit in phase V
Bit 2: Short-circuit in phase W
Bit 3: Short-circuit in phase N
See also: r0949 (Fault value)

Remedy:
- Check the fiber-optic cable and if required, replace.
- Check the power supply for the power semiconductor gating (24 V).
- Check the power cable connections.
- Select the defective semiconductor and replace.

F30024 Power unit: Overtemperature thermal model

Message class: Power electronics faulted (5)

Message value: Power semiconductor: %1, temperature: [0.01 degrees C] %2

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The temperature difference between the power semiconductor involved and the heat sink has exceeded the permissible fault threshold.
- The permissible load duty cycle was not maintained.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.
- Pulse frequency too high.

Fault value (r0949, interpret hexadecimal):
yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C
See also: r0037 (Power unit temperatures)

Remedy:
- Adapt the load duty cycle.
- Check whether the fan is running.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.
- Check the motor load.
- Reduce the pulse frequency if this is higher than the rated pulse frequency.

F30025 Power unit: Chip overtemperature

Message class: Power electronics faulted (5)

Message value: Power semiconductor: %1, temperature: [0.01 degrees C] %2

Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The chip temperature of the power semiconductor involved has exceeded the permissible fault threshold.
- The permissible load duty cycle was not maintained.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.
- Pulse frequency too high.

Fault value (r0949, interpret hexadecimal):
yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C
Remedy:
- Adapt the load duty cycle.
- Check whether the fan is running.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.
- Check the motor load.
- Reduce the pulse frequency if this is higher than the rated pulse frequency.

Note:
This fault can only be acknowledged after the alarm threshold for alarm A030252 has been fallen below.
See also: r0037 (Power unit temperatures)

F30027 Power unit: Precharging DC link time monitoring

Message class: Infeed faulted (13)
Message value: Enable signals: %1, Status: %2
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The power unit DC link was not able to be precharged within the expected time.
1) There is no line voltage connected.
2) The line contactor/line side switch has not been closed.
3) The line voltage is too low.
4) Line voltage incorrectly set (p0210).
5) The precharging resistors are overheated as there were too many precharging operations per time unit.
6) The precharging resistors are overheated as the DC link capacitance is too high.
7) The precharging resistors are overheated because when there is no "ready for operation" (r0863.0) of the infeed unit, power is taken from the DC link.
8) The precharging resistors are overheated as the line contactor was closed during the DC link fast discharge through the Braking Module.
9) The DC link has either a ground fault or a short-circuit.
10) The precharging circuit is possibly defective (only for chassis units).
11) Infeed defective and/or fuse ruptured

Fault value (r0949, interpret binary):
yyyyxxxx hex:

yyyy = power unit state
0: Fault status (wait for OFF and fault acknowledgment).
1: Restart inhibit (wait for OFF).
2: Overvoltage condition detected -> change into the fault state.
3: Undervoltage condition detected -> change into the fault state.
4: Wait for bridging contactor to open -> change into the fault state.
5: Wait for bridging contactor to open -> change into restart inhibit.
6: Wait for bypass contactor to open
7: Commissioning.
8: Ready for precharging.
9: Precharging started, DC link voltage lower than the minimum switch-on voltage.
10: Precharging, DC link voltage end of precharging still not detected.
11: Wait for the end of the de-bounce time of the main contactor after precharging has been completed.
12: Precharging completed, ready for pulse enable.
13: It was detected that the STO terminal was energized at the power unit.

xxxx = Missing internal enable signals, power unit (inverted bit-coded, FFFF hex -> all internal enable signals available)
Bit 0: Power supply for the power semiconductor gating shut down.
Bit 1: Ground fault detected.
Bit 2: Peak current intervention.
Bit 3: I2t exceeded.
Bit 4. Thermal model overtemperature calculated.
Bit 5: (heat sink, gating module, power unit) overtemperature measured.
Bit 6: Reserved.
Bit 7: Overvoltage detected.
Bit 8: Power unit has completed precharging, ready for pulse enable.
Bit 9: STO terminal missing.
Bit 10: Overcurrent detected.
Bit 11: Armature short-circuit active.
Bit 12: DRIVE-CLiQ fault active.
Bit 13: Vce fault detected, transistor de-saturated due to overcurrent/short-circuit.
Bit 14: Undervoltage detected.
See also: p0210 (Device supply voltage)

Remedy: In general:
- Check the line voltage at the input terminals.
- Check the line voltage setting (p0210).

For booksize drive units, the following applies:
- Wait (approx. 8 minutes) until the precharging resistors have cooled down. For this purpose, preferably disconnect the infeed unit from the line supply.

For 5):
- Carefully observe the permissible precharging frequency (refer to the product documentation).

For 6):
- Check the total capacitance of the DC link and reduce in accordance with the maximum permissible DC link capacitance if necessary (refer to the product documentation).

For 7):
- Interconnect the ready-for-operation signal from the infeed unit (r0863.0) in the enable logic of the drives connected to this DC link.

For 8):
- Check the connections of the external line contactor. The line contactor must be open during DC link fast discharge.

For 9):
- Check the DC link for ground faults or short-circuits.

For 11):
- Check the DC link voltage of the infeed (r0070) and Motor Modules (r0070).

If the DC link voltage generated by the infeed (or external) is not displayed for the Motor Modules (r0070), then a fuse has ruptured in the Motor Module.

See also: p0210 (Device supply voltage)

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 for internal Siemens troubleshooting.

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: -
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.

Remedy:
- Check the motor data.
- Check the motor circuit configuration (star/delta).
- Check the motor load.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.

A30032 Power unit: Hardware current limiting in phase V

Message class: Power electronics faulted (5)
Message value: -
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 motor data.
- Check the motor circuit configuration (star/delta).
- Check the motor load.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.

A30033 Power unit: Hardware current limiting in phase W

Message class: Power electronics faulted (5)
Message value: -
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 motor data.
- Check the motor circuit configuration (star/delta).
- Check the motor load.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.

A30034 Power unit: Internal overtemperature

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The alarm threshold for internal overtemperature has been reached.
If the temperature inside the power unit increases up to the fault threshold, then fault F30036 is triggered.
- Ambient temperature might be too high.
- Insufficient cooling, fan failure.
Alarm value (r2124, interpret binary):
Bit 0 = 1: Overtemperature in the control electronics area.
Bit 1 = 1: Overtemperature in the power electronics area.
Bit 2 = 1: Overtemperature in the processor area.
Bit 3 = 1: Overtemperature in the processor area.
Bit 4 = 1: Overtemperature when the internal fan is defective.
Bit 5 = 1: Intake air overtemperature.
Remedy: - Check the ambient temperature.
- Check the fan for the inside of the unit.

F30036 Power unit: Internal overtemperature

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The temperature inside the converter has exceeded the permissible limit value.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.
Fault value (r0949, interpret binary):
Bit 0 = 1: Overtemperature in the control electronics area.
Bit 1 = 1: Overtemperature in the power electronics area.
Bit 2 = 1: Overtemperature in the processor area.
Bit 3 = 1: Overtemperature in the processor area.
Bit 4 = 1: Overtemperature when the internal fan is defective.
Bit 5 = 1: Intake air overtemperature.
Remedy: - Check the internal fan.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.
Notice:
This fault can only be acknowledged once the permissible temperature limit minus 5 K has been fallen below.

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.

F30040 Power unit: 24/48 V undervoltage

Message class: Supply voltage fault (undervoltage) (3)
Message value: Channel: %1, voltage: %2 [0.1 V]
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The undervoltage threshold of the 24 V power supply for the power unit was fallen below for longer than 3 ms.
Note:
- For booksize power units, the undervoltage threshold is 15 V.
- For CU310-2, CUA31 and CUA32 the undervoltage threshold is 16 V.
- for all other power units (e.g. S120M), the undervoltage threshold depends on the power unit, and is not displayed.

Fault value (r0949, interpret hexadecimal):
yyxxxx hex: yy = channel, xxxx = voltage [0.1 V]
yy = 0: 24 V power supply
yy = 1: 48 V power supply

Remedy:
- Check the power supply of the power unit.
- Carry out a POWER ON (switch-off/switch-on) for the component.

A30041 Power unit: Undervolt 24/48 V alarm

Message class: Supply voltage fault (undervoltage) (3)
Message value: Channel: %1, voltage: %2 [0.1 V]
Component: Power Unit
Response: NONE
Acknowledgment: NONE

Cause: For the power unit power supply, the lower threshold has been violated.
Alarm value (r2124, interpret hexadecimal):
yyxxxx hex: yy = channel, xxxx = voltage [0.1 V]
yy = 0: 24 V power supply
yy = 1: 48 V power supply

Remedy:
- Check the power supply of the power unit.
- Carry out a POWER ON (switch-off/switch-on) for the component.

A30042 Power unit: Fan has reached the maximum operating hours

Message class: Power electronics faulted (5)
Message value: %1

Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The maximum operating time of at least one fan will soon be reached, or has already been exceeded.
Alarm value (r2124, interpret binary):
Bit 0 = 1:
The wear counter of the heat sink fan has reached 99 %. The remaining service life is 1 %. After this 1 % has elapsed, bit 0 is cleared and bit 2 is set in the alarm value.
Bit 2 = 1:
The wear counter of the heat sink fan has exceeded 100 %.
Bit 8 = 1:
The wear counter of the 1st internal fan has reached 99 %. The remaining service life is 1 %. After this 1 % has elapsed, bit 8 is cleared and bit 10 is set in the alarm value.
Bit 10 = 1:
The wear counter of the 1st internal fan has exceeded 100 %.
Bit 16 = 1:
The wear counter of the 2nd internal fan has reached 99 %. The remaining service life is 1 %. After this 1 % has elapsed, bit 16 is cleared and bit 18 is set in the alarm value.
Bit 18 = 1:
The wear counter of the 2nd internal fan has exceeded 100 %.
Remedy: For the fan involved, carry out the following:
1. Replace the fan.
2. Reset the wear counter using the appropriate button in Startdrive or the web server.
See also: r0277 (Power unit heat sink fan wear counter)

F30043 Power unit: Overvolt 24/48 V

Message class: Supply voltage fault (overvoltage) (3)
Message value: Channel: %1, voltage: %2 [0.1 V]
Component: Power Unit
Response: OFF2
Acknowledgment: POWER ON
Cause: For the power unit power supply, the upper threshold has been violated.
Fault value (r0949, interpret hexadecimal):
yyxxxx hex: yy = channel, xxxx = voltage [0.1 V]
yy = 0: 24 V power supply
yy = 1: 48 V power supply
Remedy: Check the power supply of the power unit.

A30044 Power unit: Overvolt 24/48 V alarm

Message class: Supply voltage fault (overvoltage) (3)
Message value: Channel: %1, voltage: %2 [0.1 V]
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: For the power unit power supply, the upper threshold has been violated.
Alarm value (r2124, interpret hexadecimal):
yyxxxx hex: yy = channel, xxxx = voltage [0.1 V]
yy = 0: 24 V power supply
yy = 1: 48 V power supply
Remedy: Check the power supply of the power unit.

F30045 Power unit: Supply undervoltage

Message class: Supply voltage fault (undervoltage) (3)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: Power supply fault in the power unit.
- The voltage monitor signals an undervoltage fault on the module.
The following applies for CU31x:
- The voltage monitoring on the DAC board signals an undervoltage fault on the module.
For S120M, the following applies:
- This message is displayed for undervoltage or overvoltage.

Remedy:
- Check the power supply of the power unit.
- Carry out a POWER ON (switch-off/switch-on) for the component.
- Replace the module if necessary.

A30046 Power unit: Undervoltage alarm

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: Before the last restart, a problem occurred at the power unit power supply.
The voltage monitor in the internal FPGA of the PSA signals an undervoltage fault on the module.
Alarm value (r2124, interpret decimal):
Register value of the voltage fault register.

Remedy:
- 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.

A30048 Power unit: fan defective

Message class: External measured value / signal state outside the permissible range (16)
Message value: Fault cause: %1 bin
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The feedback signal of a fan signals a fault, or there is a communication error with one or several fans.
- Fan defective.
- Fan blocked.
- Feedback signal error.
Alarm value (r2124, interpret binary):
Bit 0 = 1: heat sink fan
Bit 1 = 1: fan 1 inside the device
Bit 2 = 1: fan 2 inside the device
Bit 4 = 1: Internal communication error to one or several fans
Bits 16 to 31 are only for internal Siemens diagnostics.

Remedy: - Check the fan involved.
- If required, replace the fan.
- For communication errors, update the software or replace the power unit.
Note:
If the alarm has been withdrawn, 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.

F30050 Power unit: 24 V supply overvoltage

Message class: Supply voltage fault (overvoltage) (3)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: POWER ON
Cause: The voltage monitor signals an overvoltage fault on the module.
Remedy: - Check the 24 V power supply.
- Replace the module if necessary.

F30051 Power unit: Motor holding brake short-circuit detected

Message class: External measured value / signal state outside the permissible range (16)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A short-circuit at the motor holding brake terminals has been detected.
Fault value (r0949, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: - Check the motor holding brake for a short-circuit.
- Check the connection and cable for the motor holding brake.

F30052 EEPROM data error

Message class: Hardware/software error (1)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: POWER ON
Cause: The EEPROM data of the power unit module are incorrect.
Fault value (r0949, interpret hexadecimal):
Only for internal Siemens troubleshooting.
Remedy: Replace the power unit module or update the EEPROM data.

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 chopper overcurrent

Message class: Braking Module faulted (14)
Message value: -
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: An overcurrent condition has occurred in the braking chopper.
Remedy: - Check whether the braking resistor has a short-circuit.
- For an external braking resistor, check whether the resistor may have been dimensioned too small.
Note:
The braking chopper is only enabled again at pulse enable after the fault has been acknowledged.

A30057 Power unit: Line asymmetry

Message class: Network fault (2)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: Frequencies have been detected on the DC link voltage that would suggest line asymmetry or failure of a line phase.
It is also possible that a motor phase has failed.
If these frequencies occur with the same or even higher amplitudes, then after a device-specific time elapses, fault F30011 is output
Alarm value, only for internal Siemens troubleshooting.
Remedy: - Check the line phase connection.
- Check the motor feeder cable connections.
If there is no phase failure of the line or motor, then line asymmetry is involved.
- Reduce the power in order to avoid fault F30011.

F30058 Power unit: heat sink 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: The feedback signal of the heat sink fan signals a fault, or there is a communication error with the fan.
- Fan defective.
- Fan blocked.
- Feedback signal error.
Fault value (r0949, interpret binary):
Value in bits 0 to 15:
0: Feedback signal of the fan signals a fault
1: Internal communication error to the fan
Bits 16 to 31 are only for internal Siemens diagnostics.

Remedy: - Check the heat sink fan 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.

F30059 Power unit: Internal fan 1 defective

Message class: Auxiliary unit faulted (20)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The feedback signal of internal fan 1 signals a fault, or there is a communication 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 internal 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 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.

A30077 Power unit: Thermal overload braking resistor

Message class: Braking Module faulted (14)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The braking resistor is thermally overloaded. This is the reason that its use was inhibited.
Alarm value (r2124, interpret decimal):
Energy absorbed by the braking resistor [Ws].
Remedy: Reduce the power when generating.
Note:
- Once the braking resistor has thermally recovered, it is enabled for further use.
- For a DC link coupling, the generating power of all the coupled power units must be taken into consideration.

F30078 Power unit: Line reactor overheated

Message class: Overtemperature of the electronic components (6)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The temperature monitoring of the line reactor has responded. In addition to the OFF2 response, the use of the braking resistor was inhibited.
Note:
- An overtemperature condition of the line reactor can occur when a DC link coupling is used – and if the power when motoring, which is fed into the DC link - Is not evenly distributed across the rectifiers of the power units.
Remedy: - Check the converter fan and replace if necessary.
- Reduce the motoring power.

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).
- U/f operation: Up ramp set too low.
- U/f operation: Rated motor current is significantly higher than that of the power section.
- 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.

Additional causes for a parallel switching device (r0108.15 = 1):
- A power unit has tripped (switched off) due to a ground fault.
- The closed-loop circulating current control is either too slow or has been set too fast.

Fault value (r0949, interpret bit-serial):
Bit 0: Phase U.
Bit 1: Phase V.
Bit 2: Phase W.

Remedy:
- Check the motor data - If required, carry out commissioning.
- Check the motor circuit configuration (star-delta)
- U/f operation: Increase up ramp.
- U/f operation: Check the rated currents of the motor and power unit.
- 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 power unit.

For a parallel switching device (r0108.15 = 1) the following additionally applies:
- Check the ground fault monitoring thresholds (p0287).
- Check the setting of the closed-loop circulating current control (p7036, p7037).

A30082 Power unit: cooling medium flow rate too low alarm threshold

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The flow rate is too low, and has fallen below the specified alarm threshold. If the flow rate is still too low after the specified time has expired, then fault F30083 is output.
Remedy:
- Check the coolant flow rate.
- Check the thermal conductivity of the coolant.
- Check the coolant concentration.

F30083 Power unit: cooling medium flow rate too low fault threshold

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The flow rate is too low, and has fallen below the specified fault threshold.
Remedy: - Check the coolant flow rate.
- Check the thermal conductivity of the coolant.
- Check the coolant concentration.

A30086 Power unit: coolant temperature has exceeded the alarm threshold

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The coolant temperature has exceeded the specified alarm threshold.
If the coolant temperature increases up to the specified fault threshold, then fault F30087 is output.
Alarm value (r2124, interpret decimal):
Coolant temperature.
Remedy: Check the cooling system and the ambient conditions.

F30087 Power unit: coolant temperature has exceeded the fault threshold

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The coolant temperature has exceeded the specified fault threshold.
Fault value (r0949, interpret decimal):
Coolant temperature.
Remedy: Check the cooling system and the ambient conditions.

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 Power unit: Overtemperature heat sink inverter

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The alarm threshold for overtemperature at the inverter heat sink has been reached.
Fault F30004 is initiated if the temperature of the heat sink increases by 5 K.

Remedy: Check the following:
- Is the ambient temperature within the defined limit values?
- Have the load conditions and the load duty cycle been appropriately dimensioned?
- Has the cooling failed?

A30251 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 load 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?

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 load duty cycle been appropriately dimensioned?
- Has the cooling failed?
- Pulse frequency too high?

A30253 Power unit: Overtemperature thermal model alarm

Message class: Power electronics faulted (5)
Message value: Power semiconductor: %1, temperature: [0.01 degrees C] %2
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The temperature difference between the power semiconductor involved and the heat sink has exceeded the permissible alarm threshold.
The maximum output current is reduced as overload response.

Alarm value (r2124, interpret hexadecimal):
yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C

Remedy: Not necessary.
The alarm is automatically withdrawn once the alarm threshold has been fallen below.
Note:
If the temperature continues to increase, this can result in fault F30024.

A30256 Power unit: Overload I2t (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 load 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 load 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 load 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 load 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: Hardware/software error (1)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A fault has occurred in the driver supply of the power semiconductor.
Remedy: There is a hardware defect. The device must be replaced.

F30262 Power unit: Braking chopper defective

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The braking chopper is defective.
Remedy: Replace the converter.

F30263 Power unit: Braking chopper upper defective

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The upper braking chopper is defective.
Remedy: Replace the converter.

F30264 Power unit: Braking chopper inhibited 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 chopper was inhibited because the unloaded DC link voltage continuously reaches or exceeds the chopper activation threshold. This prevents the braking chopper 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.

F30265 Power unit: Line voltage failure detected

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: Line voltage failure was detected
Remedy: - Switch on the line voltage.
- To increase the degree of ruggedness, the delay time in p3234 can be increased.
- If necessary, line voltage failure detection can be deactivated using p2149.16.
See also: p2149, p3234

A30266 Power unit: Required modulator setting cannot be implemented

Message class: Hardware/software error (1)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The required modulator setting was not able to be implemented. This can involve some undesirable effects; for example, unexpectedly high switching losses can occur or the current controller bandwidth can be reduced.

Alarm value (r2124, interpret hexadecimal):
Only for internal Siemens troubleshooting.

Remedy: - Carry out a POWER ON (switch-off/switch-on).

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 load 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 load 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 load duty cycle.
See also: p0307 (Rated motor power)

F30314 Power unit: 24 V power supply overloaded by PM

Message class: Supply voltage fault (undervoltage) (3)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The 24 V power supply through the Power Module (PM) is overloaded.
An external 24 V power supply via X124 on the Control Unit is not connected.
Remedy: Connect an external 24 V power supply via X124 at the Control Unit.

A30315 Power unit: 24 V power supply overloaded by PM

Message class: Supply voltage fault (undervoltage) (3)
Message value: -
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The 24 V power supply through the Power Module (PM) is overloaded.
An external 24 V power supply via X124 on the Control Unit is not connected.
Remedy: Connect an external 24 V power supply via X124 at the Control Unit.

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 PTI
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A safe monitoring function has detected that the module temperature has exceeded a limit value. STO (Safe Torque Off) was initiated to maintain the safe state.
Remedy: - Check the ambient temperature.
- Check the module fan.
- Operate the module in the permissible range.

F30604 SI: Safety EEPROM data error

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Variant: S200 PTI
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 for internal Siemens fault diagnostics.
Remedy: Replace the module

A30605 SI: Checksum error has occurred

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Variant: S200 PTI
Component: None
Response: NONE
Acknowledgment: NONE
Cause: A checksum error (CRC error) has occurred in the converter program memory.
Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Upgrade firmware to later version.
- Contact Technical Support.

C30649 SI: Internal software error

Message class: Hardware/software error (1)
Message value: Module: %1, line: %2
Variant: S200 PTI
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: An internal error has occurred in the Safety Integrated software.
Note:
This message results in an STO (Safe Torque Off) that cannot be acknowledged.
Message value (r60049, interpret hexadecimal):
Only for internal Siemens troubleshooting.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Re-commission the "Safety Integrated" function and carry out a POWER ON.
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace hardware component.

N30800 Power unit: Group signal

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: NONE
Cause: The power unit has detected at least one fault.
Remedy: Evaluate the other messages that are presently available.

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 receive telegram is not set.
Remedy: - Deselect functions that are not required.

F30802 Power unit: Time slice overflow

Message class: Hardware/software error (1)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
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 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.

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: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

F30815 Power unit: Processor clock signal error

Message class: Hardware/software error (1)
Message value: -
Component: Power Unit
Response: OFF2

Acknowledgment: POWER ON
Cause: The processor clock signal monitoring has signaled an error. This can involve the signal itself or its PLL.
Remedy: - Replace the hardware.
- Contact Technical Support.

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: Internal communications error.
Error cause:
1 (= 01 hex):
Checksum error (CRC error).
2 (= 02 hex):
Telegram is shorter than specified in the length byte or in the receive list.
3 (= 03 hex):
Telegram is longer than specified in the length byte or in the receive list.
4 (= 04 hex):
The length of the receive telegram does not match the receive list.
5 (= 05 hex):
The type of the receive telegram does not match the receive list.
6 (= 06 hex):
The address of the component in the telegram and in the receive list do not match.
7 (= 07 hex):
A SYNC telegram is expected - but the received telegram is not a SYNC telegram.
8 (= 08 hex):
No SYNC telegram is expected - but the received telegram is one.
9 (= 09 hex):
The error bit in the receive telegram is set.
16 (= 10 hex):
The receive telegram is too early.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause
Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Check the electrical cabinet design and cable routing for EMC compliance.

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 for internal Siemens troubleshooting.
Remedy: - Replace power unit.
- If required, upgrade the firmware in 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 receive 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: Internal communications error.
Error cause:
1 (= 01 hex):
Checksum error (CRC error).
2 (= 02 hex):
Telegram is shorter than specified in the length byte or in the receive list.
3 (= 03 hex):
Telegram is longer than specified in the length byte or in the receive list.
4 (= 04 hex):
The length of the receive telegram does not match the receive list.
5 (= 05 hex):
The type of the receive telegram does not match the receive list.
6 (= 06 hex):
The address of the power unit in the telegram and in the receive list do not match.
9 (= 09 hex):
The internal communications from the component involved signals a failure of the supply voltage.
16 (= 10 hex):
The receive telegram is too early.
17 (= 11 hex):
CRC error and the receive telegram is too early.
18 (= 12 hex):
The telegram is shorter than that specified in the length byte or in the receive list and the receive telegram is too early.
19 (= 13 hex):
The telegram is longer than that specified in the length byte or in the receive list and the receive telegram is too early.
20 (= 14 hex):
The length of the receive telegram does not match the receive list and the receive telegram is too early.
21 (= 15 hex):
The type of the receive telegram does not match the receive list and the receive telegram is too early.
22 (= 16 hex):
The address of the power unit in the telegram and in the receive list does not match and the receive telegram is too early.
25 (= 19 hex):
The error bit in the receive telegram is set and the receive telegram is too early.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause

Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Check the electrical cabinet design and cable routing for EMC compliance.

F30875 Power unit: power 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: The component involved has signaled that the 24 V supply has failed.
Error cause:
9 (= 09 hex):
The power supply voltage for the components has failed.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause

Remedy: - Check the supply voltage wiring (interrupted cable, contacts, ...).
- Check the dimensioning of the 24 V supply, check cable lengths.

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: Internal communications error.
The nodes do not send and receive in synchronism.
Error cause:
26 (= 1A hex):
Sign-of-life bit in the receive telegram not set and the receive telegram is too early.
33 (= 21 hex):
The cyclic telegram has not been received.
34 (= 22 hex):
Timeout in the telegram receive list.
64 (= 40 hex):
Timeout in the telegram send list.
98 (= 62 hex):
Error at the transition to cyclic operation.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause
Remedy: - Check the power supply voltage of the component involved.
- Carry out a POWER ON.
- Replace the component involved.

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: 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.

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 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.

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 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
Cause: An internal software error has occurred.
Fault value (r0949, interpret decimal):
Information about the fault source.
Only for internal Siemens troubleshooting.
Remedy: - If necessary, upgrade the firmware in the power unit to a later version.
- Contact Technical Support.

A30999 Power unit: Unknown alarm

Message class: Power electronics faulted (5)
Message value: New message: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: An alarm 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.

F31110 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: For fault value, bit 0 = 1:
- Encoder defect F31111 may provide further details.
For fault value, bit 2 = 1:
- Incorrect encoder type / replace the encoder or encoder cable.
For fault value, bit 3 = 1:
- EMC / connect the cable shield, replace the encoder or encoder cable.
For fault value, bit 6 = 1:
- Update the firmware
For fault value, bit 7 = 1:
- Incorrect encoder type / replace the encoder or encoder cable.
For fault value, bit 14 = 1:
- Incorrect encoder type / replace the encoder or encoder cable.

F31111 Motor encoder: Encoder signals an internal error (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: ENCODER
Acknowledgment: PULSE INHIBIT

Cause: The encoder error word provides detailed information (error bit).
Fault value (r0949, interpret binary):
yyyyxxxx hex: yyyy = supplementary information, xxxx = fault cause
Bit 0: Error in the multiturn block.
Bit 1: EEPROM error.
Bit 2: Singleturn position incorrect.
Bit 3: Multiturn position incorrect.
Bit 4: MLS generation error.
Bit 5: Reserved.
Bit 6: Overtemperature.
Bit 7: Internal fault.
Remedy: Encoder is defective. Replace the encoder or motor.

F31112 Motor encoder: Encoder signals an internal error

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.

F31150 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.

A31407 Motor encoder: Function limit reached

Message class: Position/speed actual value incorrect or not available (11)
Message value: %1
Component: Encoder 1
Response: NONE
Acknowledgment: NONE

Cause: The encoder has reached one of its function limits. A service is recommended.
Alarm value (r2124, interpret decimal):
1: Incremental signals
3: Absolute track
4: Code connection

Remedy: Perform service. Replace the encoder if necessary.

A31410 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.

A31411 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.

Remedy: Replace encoder.

A31412 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.

F31502 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.

F31503 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.
- Reset the position tracking as follows (p0411.2 = 1).
- Deselect commissioning.
The fault should then be acknowledged and the absolute encoder adjusted.

A31700 Motor encoder: Functional safety monitoring initiated

Message class: Safety monitoring channel has identified an error (10)
Message value: Fault cause: %1 bin
Component: Sensor Module Encoder 1
Response: NONE
Acknowledgment: NONE
Cause: Functional safety was activated. Self test of the DRIVE-CLiQ encoder has detected a fault.
Alarm value (r2124, interpret binary):
Bit x = 1: Effectivity test x unsuccessful.
Remedy: Replace encoder.

F31802 Motor encoder: Time slice overflow

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: IMMEDIATELY

Cause: A time slice overflow for the motor encoder has occurred.
Fault value (r0949, interpret hexadecimal):
yx hex: y = function involved (Siemens-internal fault diagnostics), x = time slice involved
x = 9:
Time slice overflow of the fast (current controller clock cycle) time slice.
x = A:
Time slice overflow of the average time slice.
x = C:
Time slice overflow of the slow time slice.
yx = 3E7:
Timeout when waiting for SYNO (e.g. unexpected return to non-cyclic operation).
Remedy: Increase the current controller sampling time
Note:
For a current controller sampling time = 31.25 µs, use an SMx20 with Article No. 6SL3055-0AA00-5xA3.

F31804 Motor encoder: Sensor Module checksum error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: POWER ON
Cause: A checksum error has occurred when reading-out the program memory on the Sensor Module.
Fault value (r0949, interpret hexadecimal):
yyyyxxxx hex
yyyy: Memory area involved.
xxxx: Difference between the checksum at POWER ON and the actual checksum.
Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Upgrade firmware to later version.
- Check whether the permissible ambient temperature for the component is maintained.

F31805 Motor encoder: EEPROM checksum error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: Data in the EEPROM corrupted .
Fault value (r0949, interpret hexadecimal):
01: EEPROM access error.
02: Too many blocks in the EEPROM.
Remedy: Replace the module.

F31813 Motor encoder: Hardware logic unit failed

Message class: Hardware/software error (1)
Message value: Fault cause: %1 bin
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: PULSE INHIBIT

Cause: The logic unit of the DRIVE-CLiQ encoder has failed.
Fault value (r0949, interpret binary):
Bit 0: ALU watchdog has responded.
Bit 1: ALU has detected a sign-of-life error.
Remedy: When the error reoccurs, replace the encoder.

F31850 Motor encoder: Encoder evaluation internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: POWER ON
Cause: An internal software error has occurred in the Sensor Module of the motor encoder.
Fault value (r0949, interpret decimal):
1: Background time slice is blocked.
2: Checksum over the code memory is not correct.
10000: OEM memory of the EnDat encoder contains data that cannot be interpreted.
11000 ... 11499: Descriptive data from EEPROM incorrect.
11500 ... 11899: Calibration data from EEPROM incorrect.
11900 ... 11999: Configuration data from EEPROM incorrect.
12000 ... 12008: communication with analog/digital converter faulted.
16000: DRIVE-CLiQ encoder initialization application error.
16001: DRIVE-CLiQ encoder initialization ALU error.
16002: DRIVE-CLiQ encoder HISI / SISI initialization error.
16003: DRIVE-CLiQ encoder safety initialization error.
16004: DRIVE-CLiQ encoder internal system error.
Remedy: - Replace the Sensor Module.
- If required, upgrade the firmware.
- Contact Technical Support.

F31899 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: A fault has occurred on the Sensor Module for the motor encoder, which cannot be interpreted by the Control Unit firmware.
This can occur if the firmware on this component is more recent than the firmware on the Control Unit.
Fault value (r0949, interpret decimal):
Fault number.
Note:
If required, the significance of this new fault can be read about in a more recent description of the Control Unit.
Remedy: - Replace the firmware on the Sensor Module by an older firmware version (r0148).
- Upgrade the firmware on the Control Unit (r0018).

A31902 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 for internal Siemens troubleshooting.
Remedy: - Replace the Sensor Module.
- If required, upgrade the firmware in the Sensor Module.
- Contact Technical Support.

A31903 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 for internal Siemens troubleshooting.
Remedy: - Replace the Sensor Module.
- If required, upgrade the firmware in the Sensor Module.
- Contact Technical Support.

F31905 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: An error was identified in the encoder parameterization.
It is possible that the parameterized encoder type does not match the connected encoder.
Determine the parameter number using the fault value (r0949).

Fault value (r0949, interpret decimal):
yyyyxxxx dec: yyyy = supplementary information, xxxx = parameter
yyyy = 0:
No additional information available.
yyyy = 10:
The connected encoder is not supported.
Remedy: - Check whether the connected encoder type matches the encoder that has been parameterized.
- Correct the parameter specified by the fault value (r0949).

F31950 Motor encoder: Internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: POWER ON
Cause: An internal software error has occurred.
Fault value (r0949, interpret decimal):
The fault value contains information regarding the fault source.
Only for internal Siemens troubleshooting.

Remedy: - If necessary, upgrade the firmware in the Sensor Module to a later version.
- Contact Technical Support.

A31999 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: An alarm has occurred on the Sensor Module for encoder 1, which cannot be interpreted by the converter firmware.
This can occur if the firmware on this component is more recent than the converter firmware.
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 Sensor Module by an older firmware version.
- Upgrade the converter firmware.

F32805 Encoder 2: EEPROM checksum error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 2
Response: OFF1
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.

F32899 Encoder 2: Unknown fault

Message class: Position/speed actual value incorrect or not available (11)
Message value: New message: %1
Component: Sensor Module Encoder 2
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: A fault occurred on the Sensor Module for encoder 2, 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 Sensor Module by an older firmware version.
- Upgrade the converter firmware.

F32950 Encoder 2: Internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 2

Response: OFF1
Acknowledgment: POWER ON
Cause: An internal software error has occurred.
Fault value (r0949, interpret decimal):
Information about the fault source.
Only for internal Siemens troubleshooting.
Remedy: - If necessary, upgrade the firmware in the Sensor Module to a later version.
- Contact Technical Support.

A32999 Encoder 2: Unknown alarm

Message class: Position/speed actual value incorrect or not available (11)
Message value: New message: %1
Component: Sensor Module Encoder 2
Response: NONE
Acknowledgment: NONE
Cause: An alarm has occurred on the Sensor Module for encoder 2, which cannot be interpreted by the converter firmware.
This can occur if the firmware on this component is more recent than the converter firmware.
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 Sensor Module by an older firmware version.
- Upgrade the converter firmware.

F33899 Encoder 3: Unknown fault

Message class: Position/speed actual value incorrect or not available (11)
Message value: New message: %1
Component: Sensor Module Encoder 3
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: A fault occurred on the Sensor Module for encoder 3, 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 Sensor Module by an older firmware version.
- Upgrade the converter firmware.

A33999 Encoder 3: Unknown alarm

Message class: Position/speed actual value incorrect or not available (11)
Message value: New message: %1
Component: Sensor Module Encoder 3
Response: NONE
Acknowledgment: NONE

Cause: An alarm has occurred on the Sensor Module for encoder 3, which cannot be interpreted by the converter firmware.
This can occur if the firmware on this component is more recent than the converter firmware.
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 Sensor Module by an older firmware version.
- Upgrade the converter firmware.

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: An internal software error in the Voltage Sensing Module (VSM) has occurred.
Fault value (r0949, interpret decimal):
Information about the fault source.
Only for internal Siemens troubleshooting.

Remedy: - If necessary, upgrade the firmware in the Voltage Sensing Module to a later version.
- Contact Technical Support.

F35220 TM: Frequency limit reached for signal output

Message class: Application/technological function faulted (17)

Message value: -

Component: Terminal Module (TM)

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: The signals output from the Terminal Module 41 (TM41) for tracks A/B have reached the limit frequency. The output signals are no longer in synchronism with the specified setpoint.
SIMOTION (p4400 = 0) operating mode:
- If the TM41 has been configured as the technology project, this fault is also output in response to short-circuited A/B signals in X520.
SINAMICS (p4400 = 1) operating mode:
- The fine resolution of TM41 in p0418 does not match that of the encoder that was interconnected at connector input p4420.
- The encoder position actual value r0479 interconnected at connector input p4420 has an excessively high actual speed.
- The output signals correspond to a speed, which is greater than the maximum speed (r1082 of TM41).

Remedy: SIMOTION (p4400 = 0) operating mode:
- Enter a lower speed setpoint (p1155).
- Reduce the encoder pulse number (p0408).
- Check track A/B for short-circuits.
SINAMICS (p4400 = 1) operating mode:
- Enter a lower speed setpoint (p1155).
- Reduce the encoder pulse number (p0408).
Notice:
The output signal is no longer monitored after changing the message type to "Alarm" (A).

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 for internal Siemens troubleshooting.
Remedy: - If necessary, upgrade the firmware in the Terminal Module to a later version.
- Contact Technical Support.

A52902 Emergency stop (EMGS) signal missing

Message class: General drive fault (19)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: Before enabling the SON signal, the emergency stop (EMGS) signal wasn't enabled.
Remedy: Enable the emergency stop (EMGS) signal first and then the SON signal.

F52904 Control mode changed

Message class: General drive fault (19)
Message value: -
Component: None
Response: OFF2
Acknowledgment: POWER ON
Cause: The control mode was changed.
Remedy: Save the parameter and then restart the drive.

F52940 FPC: Following error too high

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The difference between the position setpoint and actual value (r29187) was greater than the tolerance (p29294).
- The drive torque or accelerating capacity exceeded.
- Command input via PTI changed too fast.
Remedy: - Check the causes and resolve.
- Change the tolerance (p29294).

F52960 STOP cam minus reached

Message class: General drive fault (19)
Message value: -
Component: Control Unit (CU)
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: A 0 signal was detected at binector input, i.e. the STOP cam minus was actuated.
For a positive traversing direction, the STOP cam minus was reached - i.e. the wiring of the STOP cam is incorrect.

Remedy: - Leave the STOP cam minus in the positive traversing direction and return the axis to the valid traversing range.
- Check the wiring of the STOP cam.

F52961 STOP cam plus reached

Message class: General drive fault (19)
Message value: -
Component: Control Unit (CU)
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: A 0 signal was detected at binector input, i.e. the STOP cam plus was reached.
For a negative traversing direction, the STOP cam plus was reached - i.e. the wiring of the STOP cam is incorrect.
Remedy: - Leave the STOP cam plus in the negative traversing direction and return the axis to the valid traversing range.
- Check the wiring of the STOP cam.

Corrective maintenance 12

12.1 Service and maintenance for the converter

12.1.1 Restoring the converter to factory settings

12.1.1.1 Restoring factory settings via a commissioning tool

Description

The restoring to factory settings with a commissioning tool (web server) 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)
- Installed firmware on the converter

The restoring to factory settings with the commissioning tool is described in Section "Restore factory settings (Page 209)".

12.1.1.2 Reset of all user-defined settings to the factory setting via an SD card

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)
- Self-generated certificates
- User-defined parameter lists in the web server

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

- You can access the converter manually.
- All electrical connections from the converter to the motor are disconnected.
- You have an empty writable SD card with a maximum of 32 GB; e.g. 6SL5970-0AA00-0AA0.

Procedure

Proceed as follows to reset all user-defined converter settings to the factory setting:

1. Create an empty file called RESET.TXT in the root directory of the SD card.
2. Switch off the supply voltage to the converter.
3. Wait until all the LEDS on the converter have gone out.
4. Insert the SD card into the converter.
5. Switch on the supply voltage to the converter.
6. The converter deletes the user-defined settings.
7. The user-defined settings are deleted.
8. Remove the SD card.

Result

All user-defined converter settings are deleted.

The converter firmware is unchanged.

After the manual reset to factory settings, access to the web server is possible via the service interface (X127). For access via the service interface (X127), use the secure transmission protocol HTTPS.

12.1.2 Converter firmware update

12.1.2.1 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. • 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 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)
  - Self-generated certificates
  - User-defined parameter lists in the web server

The following options are available for a firmware update:

- Firmware update via an SD card (Page 483)
- Firmware update via web server (Page 217)

12.1.2.2 Firmware update via an SD card

Overview

If you have physical access to your converter, you can update the firmware directly on the converter by using an SD card.

Requirement

You have an SD card with the appropriate firmware, or you have an empty SD card with a maximum capacity of 32 GB onto which you can load the firmware.

You can download the available firmware versions at the following link (https://support.industry.siemens.com/cs/ww/en/ps/29596/dl).

Procedure

Proceed as follows to update the firmware using an SD card:

1. Switch off the converter.
2. Insert the SD card into the converter and switch on the converter.
   The new firmware is installed. This process takes approximately two minutes.

RDY	COM	Explanation of LED displays
		Firmware update is active: • Do not switch off the power supply. • Do not disconnect the motor from the converter.
	-	Firmware update is completed

3. Switch the converter off and remove the SD card.
4. Switch on the converter again. Check whether the new version is installed. The firmware version of the converter is displayed on the home page of the web server.

More information

You can find more information about the SD card in Section "AUTOHOTSPOT".

12.1.3 Replacing the converter

Overview

You may only replace a converter with another converter if certain requirements are adhered to.

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 power rating.
  - The new converter has a different power rating to the converter it replaced but the same frame size.
    In this case, the rated power of the converter and motor power must not differ too much. The following values are permissible for the quotients (rated motor power)/(rated converter power): 0.25 ... 1.5

⚠ 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 five minutes for the capacitors in the converter to discharge enough that the residual charge is safe.

- 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.

- Back up the settings of the converter to be replaced by uploading them to an external storage medium, e.g. an SD card.
- Transfer the settings of the converter to be replaced by downloading them to the new converter.
- If you do not have a backup of the converter settings, recommission the new converter.
- Check the new converter for proper functioning.

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 three phases of the motor cables in the correct sequence.

Procedure

Proceed as follows to replace a converter:

1. Disconnect the line voltage to the converter.
2. Remove the connecting cables of the converter.
3. Remove the defective converter.
4. Install the new converter.
5. Connect all of the cables to the converter.
6. Switch on the line voltage of 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. an SD card:
     If the new converter has the same power rating 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 power rating, commission the converter as a new converter.

12.1.3.1 Restoring the drive data via the web server

Requirement

- The converter is operated without an SD card.
- You have a backup file of the source converter on your operating unit.
  In the description below, a distinction is made between restoring drive data from an encrypted backup file or from an unencrypted backup file.
- The rated power of the target converter is the same as the rated power of the converter from which the backed-up data and settings originate.
- Ideally, the target converter is in the factory setting.
  It either involves a brand-new target converter or a target converter where all user-defined settings have been restored to the factory setting. You can find more information in Section "Reset of all user-defined settings to the factory setting via an SD card (Page 481)".

Procedure

1. Switch off the supply voltage of the source converter.
2. Release all of the connections at the source converter, replace the converter and re-establish the connections at the target converter.
3. Switch on the supply voltage of the target converter.
4. Enter the IP address of the target converter, e.g. https://169.254.11.22, in the web browser.
   The web server is started. The "Basic settings" page is displayed.
5. Make the basic settings for the converter.
   You can find more information in Section "Basic settings (Page 174)".
6. Click "Next".
   The "Welcome to the Security Wizard" page is displayed.
7. Select the option "Exit the Security Wizard and continue with low security settings".
8. Call the "Backup and restore" menu.
9. Click the "Click to select file, or drag and drop file here" button to select the backup file.
10. To restore the drive data, proceed as described below depending on the specific application.

- **Scenario 1:** The target converter has the same or a higher firmware version.
  - If the drive data are restored from an encrypted backup file, then proceed as follows, see Section "Restoring data from an encrypted backup file (Page 490)".
  - If the drive data are restored from an unencrypted backup file, then proceed as follows, see Section "Restoring data from an unencrypted backup file (Page 488)".
- **Scenario 2:** The target converter has an older firmware version.
  - The operation is canceled.
  - Restore the firmware to the version of the source converter. The firmware version can be ≥ firmware version of the source converter.

    Note

    Determining the firmware version of the source converter

    Review the machine documentation. Alternatively: Check which firmware version is installed on the other converters of the same type in the machine.

  - Proceed as described in scenario 1.

Result

When running up, the converter retrieves the settings from the backup file. Commissioning has been completed once the converter has run up.

More information

- Update the connected components:
  When the converter runs up after being restored, the connected components are updated. The converter must then be switched off and switched on.

12.1.3.2 Restoring data from an unencrypted backup file

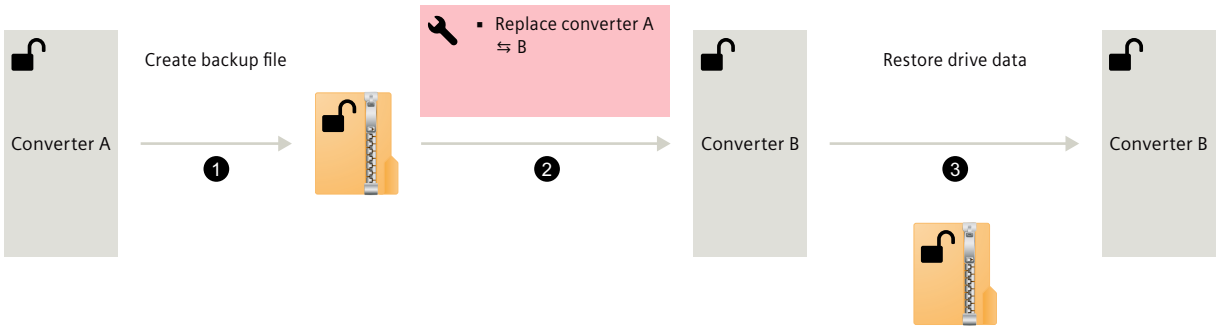
Requirement

- You have an unencrypted backup file of the source converter on your operating unit.
- Rights required for active user management (UMAC):
  - "Create backup or load drive data to Startdrive"

Procedure

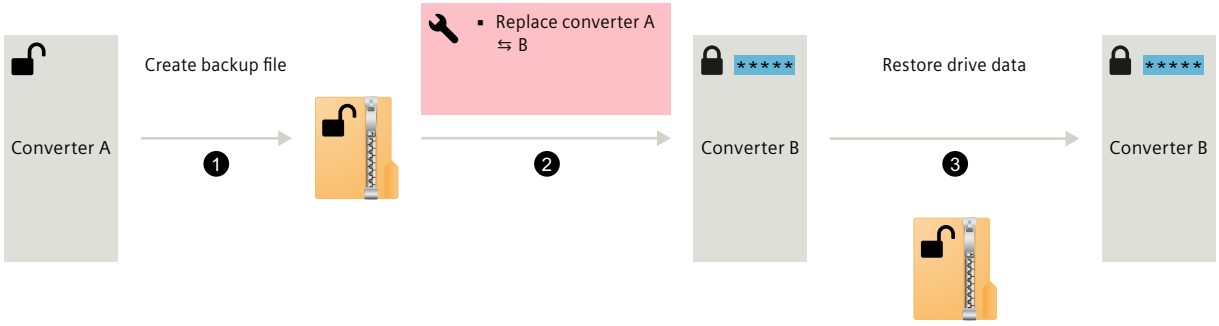
1. Call menu "Backup and restore" in the web server.
2. Navigate to the "Restore drive data from backup file" area.
3. Use the "Click to select file, or drag and drop file here" button to select the backup file.
4. To restore the drive data, proceed as described below depending on the specific application. This step is included in the following diagrams as step 3.

- **Scenario 1:** No drive password is configured in the source and target converters.



  – Click on "Restore".
    The drive data are loaded into the converter from the backup file.
    As a consequence, the status of the settings at the instant of the backup are restored.

- **Scenario 2:** No drive password is configured in the source converter. On the other hand, in the target converter function "Drive data encryption" had been previously activated and a drive password configured.



*****: Drive password for converter B

  – Click on "Restore".
    A dialog to enter the password opens.
  – Enter the drive password of the target converter.
    The drive data are loaded into the converter from the backup file.
    As a consequence, the status of the settings at the instant of the backup are restored.
    Function "Drive data encryption" is activated. The configured drive password is still effective in the target converter after data has been restored.

12.1.3.3 Restoring data from an encrypted backup file

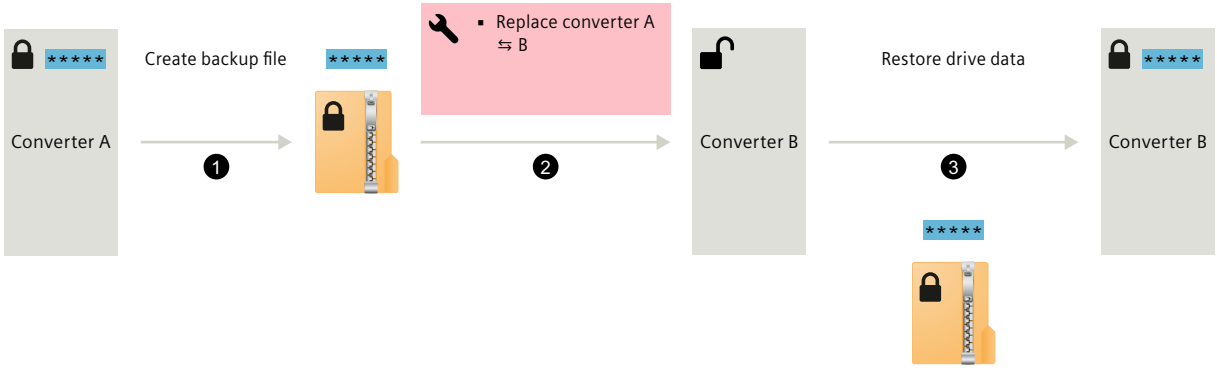
Requirement

- You have an encrypted backup file of the source converter on your operating unit.
- Configured drive password:
  - You know the drive password of the source converter with which the drive data in the backup file were encrypted.
  - You know the drive password of the target converter.
    Only applicable if the drive password of the target converter deviates from the drive password of the source converter.
- Rights required for active user management (UMAC):
  - "Create backup or load drive data to Startdrive"

Procedure

1. Call menu "Backup and restore" in the web server.
2. Navigate to the "Restore drive data from backup file" area.
3. Use the "Click to select file, or drag and drop file here" button to select the backup file.
4. To restore the drive data, proceed as described below depending on the specific application.
   This step is included in the following diagrams as step 3.

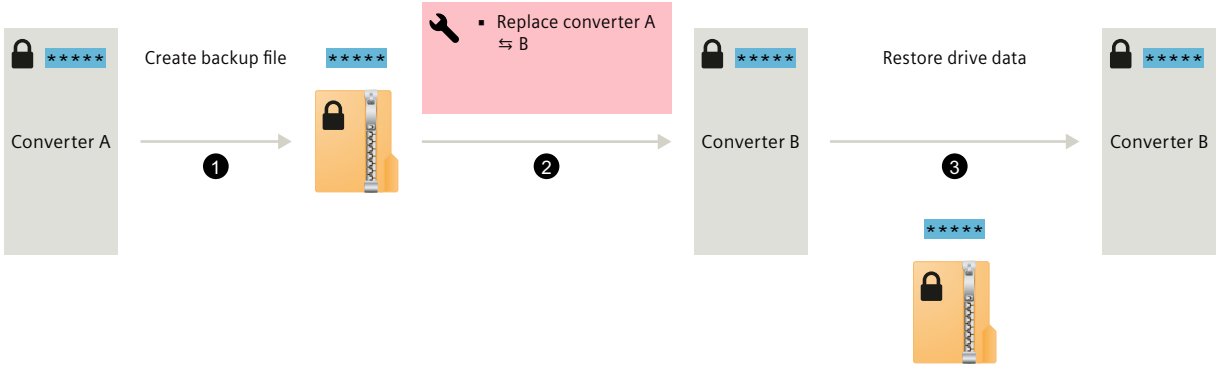
- **Scenario 1:** A drive password is configured in the source converter. On the other hand, function "Drive data encryption" had been previously de-activated in the target converter.



*****: Drive password for converter A

  – Click on "Restore".
    A dialog to enter the password opens.
  – Enter the drive password of the source converter.
    The drive data are loaded into the converter from the backup file.
    As a consequence, the status of the settings at the instant of the backup are restored.
    Function "Drive data encryption" is activated. The drive password of the source converter is transferred to the target converter.

- **Scenario 2:** The same drive password is configured in the source and target converters.

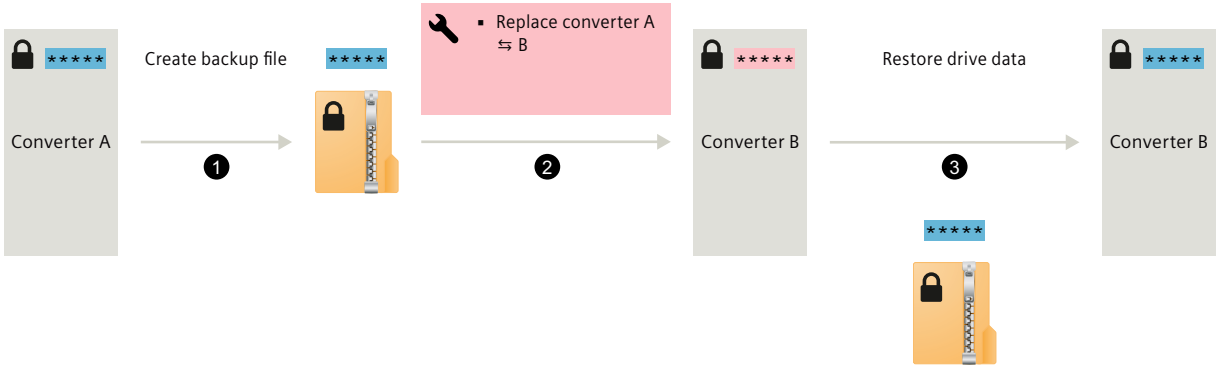


*****: Drive password for converters A and B

  – Click on "Restore".
    A dialog to enter the password opens.
  – Enter the drive password of the target converter.
    A dialog to enter the password opens.

– Enter the drive password of the source converter.
The drive data are loaded into the converter from the backup file.
As a consequence, the status of the settings at the instant of the backup are restored.
Function "Drive data encryption" is activated. The drive password of the source converter is transferred to the target converter.

- **Scenario 3:** A different drive password is configured in the target converter and the source converter.



*****: Drive password for converter A

*****: Drive password for converter B

– Click on "Restore".
A dialog to enter the password opens.

– Enter the drive password of the target converter.
A dialog to enter the password opens.

– Enter the drive password of the source converter.
The drive data are loaded into the converter from the backup file.
As a consequence, the status of the settings at the instant of the backup are restored.
Function "Drive data encryption" is activated. The drive password of the source converter is transferred to the target converter. When doing this, the drive password of the target converter is overwritten.

12.1.4 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 ZV**F1**Y54000105 → Production date January 2015

Table 12-1 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
C	2012, 2032		N	November
...	...		D	December

Procedure

Form the DC link capacitors by connecting power to the converters as shown below:

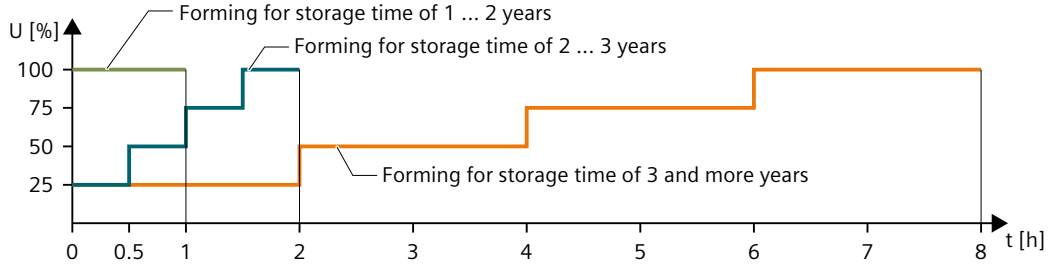


Figure 12-1 Forming the DC link capacitors

12.2 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 gearbox	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.

12.2.1 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.

12.2.2 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 the converter power supply.
2. Replace the motor.
   - Disconnect the motor from the converter. You can find detailed information in Section "Connecting the motor (Page 129)".
   - 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 99)".
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".
2. Commission the converter. You can find more information in the following sections:
   "Commissioning (web server) (Page 165)"
   "Series commissioning (Page 221)"

Result

You have now replaced the motor.

12.3 Service and maintenance for spare parts

12.3.1 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.

These further developments are "spare parts-compatible" and do not change the article number.

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).

12.3.2 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 fan wear 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 wear counter has reached 99%, and after the remaining 1% has elapsed, bit 0 is cleared and bit 2 is set.
- Bit 2 = 1: The wear counter has exceeded 100%.

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 66)"

Requirement

You have switched off the converter power supply 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

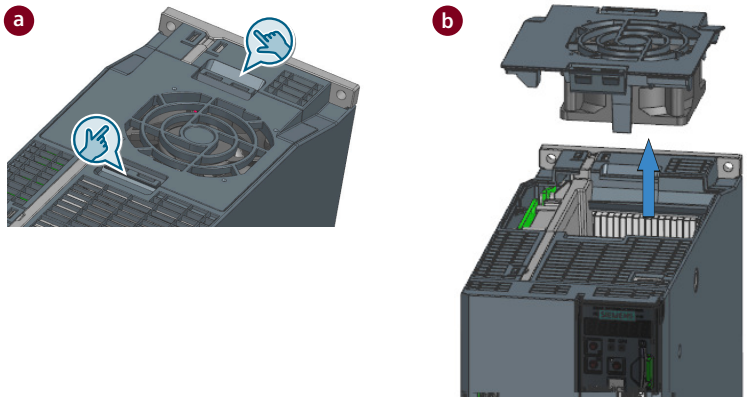
After the fan unit is removed, the live components of the converter are no longer protected from being touched. Contact with live parts can result in death or serious injury.

- 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.

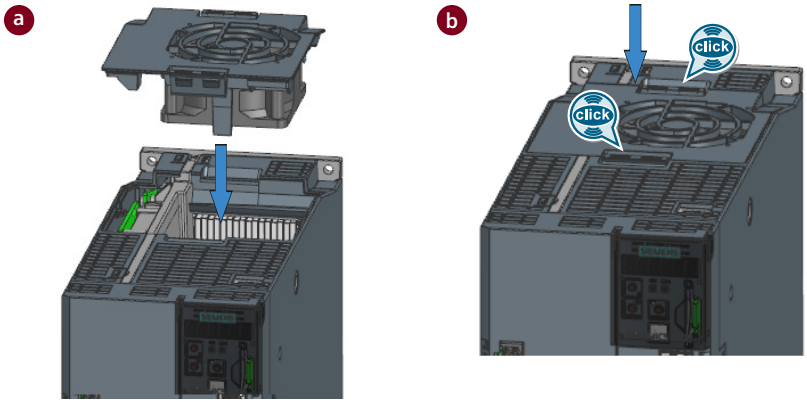
Procedure

The fan unit is installed at the top of the converter.

1. Switch off the converter power supply.
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.

12.4 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.

Technical data

13

13.1 Technical data of the converter

13.1.1 Permissible environmental conditions for the converter

Technical data

Table 13-1 Environmental conditions

Property	Description
Environmental conditions for transport in the transport packaging	
Climatic environmental conditions	• Surrounding air temperature: -40 °C ... +70 °C Suitable according to Class 2K4 to IEC 60721-3-2 • Humidity: Max. 95% at 45 °C according to IEC 60721-3-2
Mechanical environmental conditions	Vibration: • 2 Hz ... 9 Hz: 7.5 mm deflection • 9 Hz ... 200 Hz: 2 g vibration Vibrations permissible according to Class 2M3 to IEC 60721-3-2
Protection against chemical substances	Protected according to Class 2C2 to IEC 60721-3-2
Biological environmental conditions	Suitable according to Class 2B2 to IEC 60721-3-2
Environmental conditions for long-term storage in the product packaging	
Climatic environmental conditions	• 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
Protection against chemical substances	Protected according to Class 1C2 to IEC 60721-3-1
Biological environmental conditions	Suitable according to Class 1B2 to IEC 60721-3-1
Environmental conditions in operation	
Installation altitude	• Up to 2000 m above sea level without power derating • Up to 4000 m with power derating
Climatic environmental conditions	• Surrounding air temperature: – for 200 V FSA: 0 °C ... 50 °C, > 45 °C with power derating – for other converters: 0 °C ... 55 °C, > 45 °C with power derating • Relative humidity: Max. 95%, condensation not permissible

Property	Description
Mechanical environmental conditions	• Shock: – Peak acceleration: 5 g – Duration of shock: 30 ms • Vibration: – 10 Hz ... 58 Hz: 0.075 mm deflection – 58 Hz ... 200 Hz: 1 g vibration Shocks and vibrations permissible according to Class 3M1 to IEC 60721-3-3
Protection against chemical substances	Protected according to Class 3C2 to IEC 60721-3-3
Biological environmental conditions	Suitable according to Class 3B1 to IEC 60721-3-3
Pollution	Suitable for environments with degree of pollution 2 according to IEC 61800-5-1

13.1.2 General technical data

Technical data

Table 13-2 General technical data of the converter

Parameter	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^2t 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
Cooling type	• For 200 V variants: Natural cooling • For 400 V variants: – FSA and FSB: Natural cooling – FSC and FSD: Fan cooling

Parameter	Description
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 (-15% ... +20%)[6)]
Permissible voltage fluctuation (V)	When using a motor without brake: 20.4 ... 28.8 When using a motor with brake: 22.8 ... 28.8
Maximum current (A)	• For 200 V variants: – When using a motor without a brake: 1.2 – When using a motor with a brake: 2.2 • For 400 V variants: – When using a motor without a brake: 1.2 – When using a motor with a brake: 3.2
Safety insulation class	SELV
Speed control mode	
Speed control range	Analog speed command 1:2000, internal speed command 1:5000
Analog speed command input	-10 V DC to +10 V DC/rated speed
Torque limit	Set through a parameter or the analog input command (0 V DC to +10 V DC/maximum torque)
Position control mode	
Maximum input pulse frequency	4 M (differential input), 200 kpps (open collector input)
Command pulse multiplying factor	Recommended electronic gear ratio (A/B) A: 1 - 10000, B: 1 - 10000 1/1000 < A/B < 64000
In-position range setting	0 to 2147483647 pulse (command pulse unit)
Error excessive	±1/10 revolutions
Torque limit	Set through a parameter or the analog input command (0 V DC to +10 V DC/maximum torque)
Torque control mode	
Analog torque command input	-10 V DC to +10 V DC/maximum torque (input impedance 10 kΩ to 12 kΩ)
Speed limit	Set through a parameter or the analog input command (0 V DC to +10 V DC/maximum speed)
Inputs and outputs	

Parameter	Description
Digital inputs	• Maximum input current: 4 mA (for "1" signal: > 1.5 mA) • General delay time: – DI 0 → 1: < 10 µs – DI 1 → 0: < 150 µs • Fast digital input delay time: – F-DI 0 → 1: < 5 µs – F-DI 1 → 0: < 5 µs
Digital outputs	• Maximum output current: 100 mA • Delay time: < 2 ms
Analog input (for S200 PTI only)	Input voltage range: -10 V ... + 10 V Common mode voltage range: -12 V ... + 12 V Resolution: 16-bit
Analog output (for S200 PTI only)	Output voltage range: -10 V ... +10 V Resolution: 12-bit
Pulse train input	Maximum required input frequency: • Open collector 24 V: 200 kHz • Line driver 5 V: 4 MHz
Pulse train output	Output voltage: line driver (5 V differential)
	Output frequency: ≤ 4 MHz
Safety Integrated (for S200 PTI only)	
Safety function	STO, SIL 3 / PL e / Category 4
	STO fulfills the requirements of the following standards: • SIL 3 according to IEC 61800-5-2 • PL e according to ISO 13849-1 • Category 4 according to ISO 13849-1
	Response time: ≤ 20 ms The response time of the Safe Torque Off function is the time between selecting the function and the function becoming active.
	Probability of Failure per Hour (PFH): < 10^{-7} 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 EN 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.
	Mission time: 20 years 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.

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.

[6] When the converter works with a motor with a brake, the voltage tolerance of 24 V DC power supply must be -5% to +20% to meet the voltage requirement of the brake.

13.1.3 Specific data of the 200 V converters

Technical data

Table 13-3 Specific technical data of 200 V converters frame size A

Article No. 6SL5□10-1BB		**10-1AA0**	**10-2AA0**
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	15
Inrush current (A)		10.5	10.5
Fuse according to IEC		3NA3804 (4 A)	3NA3804 (4 A)
		3NW6304-1 (4 A)	3NW6304-1 (4 A)
Fuse according to UL, Class J		3 A	3 A
Leakage current (mA)	1 AC	19	19
	3 AC	24	24
Outline dimensions (W x H x D, mm)		40 x 170 x 135	40 x 170 x 135
Weight (g)	S200 PTI	763	809.6
	S200 Basic PTI	763	763

Table 13-4 Specific technical data of 200 V converters frame size B

Article No. 6SL5□10-1BB		**10-4AA0**
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
Inrush current (A)		8.5

Article No. 6SL5□10-1BB		**10-4AA0**
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
	3 AC	24
Outline dimensions (W x H x D, mm)		40 x 170 x 170
Weight (g)	S200 PTI	1028.9
	S200 Basic PTI	960

Table 13-5 Specific technical data of 200 V converters frame size C

Article No. 6SL5□10-1BB		**10-8AA0**	**11-0AA0**
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	46
Inrush current (A)		7.6	7.6
Fuse according to IEC		3NA3805 (16 A)	3NA3805 (16 A)
		3NW6006-1 (12 A)	3NW6006-1 (12 A)
Fuse according to UL, Class J		15 A	15 A
Leakage current (mA)	1 AC	20	20
	3 AC	23	23
Outline dimensions (W x H x D, mm)		60 x 170 x 195	60 x 170 x 195
Weight (g)	S200 PTI	1741.4	1741.4
	S200 Basic PTI	1741.4	1741.4

13.1.4 Specific data of the 400 V converters

Technical data

Table 13-6 Specific technical data of 400 V converters frame size A

Article No. 6SL5510-1BE	**10-2AA0**	**10-4AA0**
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

Article No. 6SL5510-1BE	10-2AA0	10-4AA0
Maximum supported motor power (kW)	0.2	0.4
Power loss (W)	31	32
Inrush current (A)	7.5	7.5
Fuse according to IEC	3NA3804 (4 A)	3NA3804 (4 A)
	3NW6304-1 (4 A)	3NW6304-1 (4 A)
Fuse according to UL, Class J	3 A	3 A
Leakage current (mA)	36	36
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 13-7 Specific technical data of 400 V converters frame size B

Article No. 6SL5510-1BE	10-8AA0	11-0AA0
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
Power loss (W)	46	54
Inrush current (A)	7.5	7.5
Fuse according to IEC	3NA3803 (10 A)	3NA3803 (10 A)
	3NW6303-1 (10 A)	3NW6303-1 (10 A)
Fuse according to UL, Class J	10 A	10 A
Leakage current (mA)	39	39
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 13-8 Specific technical data of 400 V converters frame size C

Article No. 6SL5510-1BE	11-5AA0	12-5AA0
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	26.5
Maximum supported motor power (kW)	1.75	2.5
Power loss (W)	84	123
Inrush current (A)	15	15
Fuse according to IEC	3NA3805 (16 A)	3NA3805 (16 A)
	3NW6006-1 (12 A)	3NW6305-1 (16 A)
Fuse according to UL, Class J	15 A	20 A
Leakage current (mA)	46	46

Article No. 6SL5510-1BE	**11-5AA0**	**12-5AA0**
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 13-9 Specific technical data of 400 V converters frame size D

Article No. 6SL5510-1BE	**13-5AA0**	**15-0AA0**	**17-0AA0**
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	194	205
Inrush current (A)	3	3	3
Fuse according to IEC	3NA3807 (20 A)	3NA3807 (20 A)	3NA3810 (25 A)
	3NW6307-1 (20 A)	3NW6007-1 (20 A)	3NW6010-1 (25 A)
Fuse according to UL, Class J	25 A	25 A	25 A
Leakage current (mA)	60	60	60
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

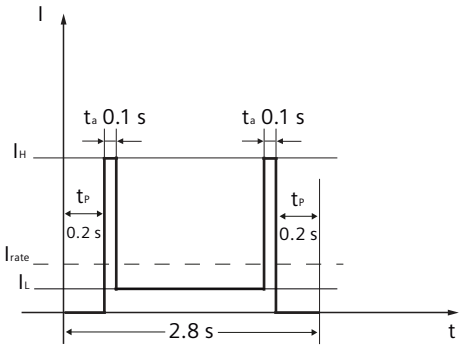
13.1.5 Overload capacity

Description

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

The typical load cycle can be repeated without limitation.



I_H	Maximum current	t_a	Acceleration time
I_{rate}	Rated current	t_p	Preset time
I_L	Minimum current	T	Total cycle period
I_0	Stall current		

Figure 13-1 Typical load cycle

The other duty cycle can be calculated by the following formula:

$I_{rate}^2 \times T = I_0^2 \times t_p \times 2 + I_H^2 \times t_a \times 2 + I_L^2 \times (T - t_p \times 2 - t_a \times 2)$

$I_H = n \times I_{rate} (3 < n < 4.2)$

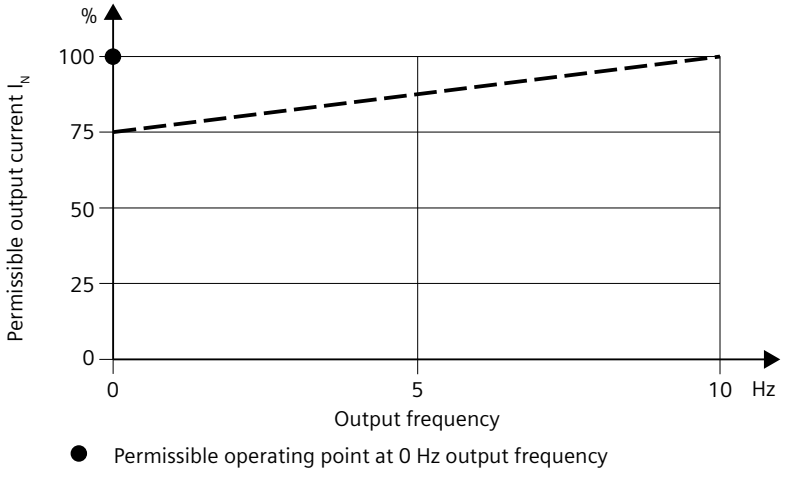
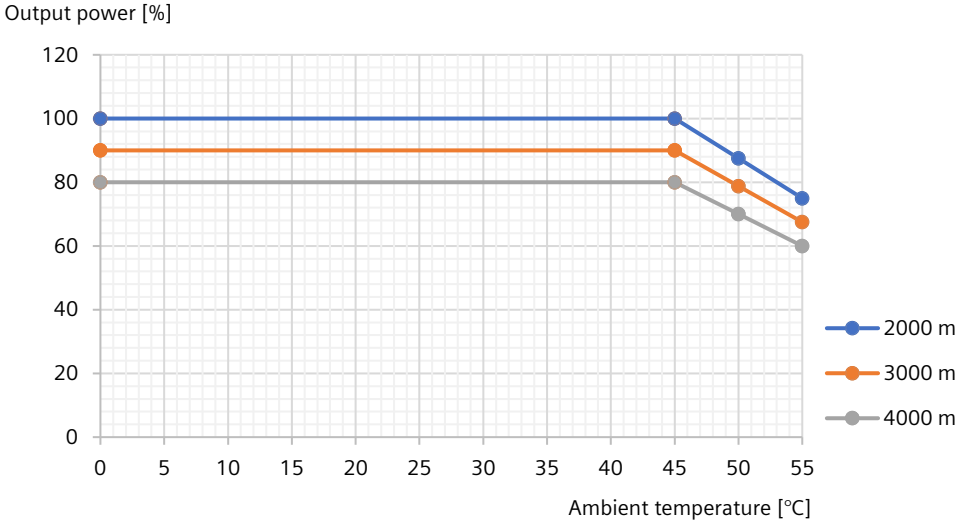


Figure 13-2 Permitted output current at low frequency

13.1.6 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.

13.1.7 Braking resistor

13.1.7.1 Internal braking resistor

Description

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

Table 13-10 Internal braking resistor of the SINAMICS S200 converter product line (PTI version)

Frame size	Resistance (Ω)	Maximum continuous power (P_{cont_int}) (W)	Maximum peak power (P_{max_int}) (W)	Maximum braking energy (E_{max_int}) (J)
1 AC/3 AC, 200 V ... 240 V				
FSA (0.2 kW)	200	8	373	63

Frame size	Resistance (Ω)	Maximum continuous power (P_{cont_int}) (W)	Maximum peak power (P_{max_int}) (W)	Maximum braking energy (E_{max_int}) (J)
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 ... 7.0 kW)	27	65	9896	1948

More information

For more information about connecting the braking resistor, see Section "Connecting the braking resistor (Page 142)".

13.1.7.2 External braking resistor

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.

For more information about selecting a motor, see Section "Motor selection (Page 755)".

⚠ 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 Module). This can result in severe injury or death and/or the enclosure could melt.

- Use only braking resistors that are intrinsically safe.

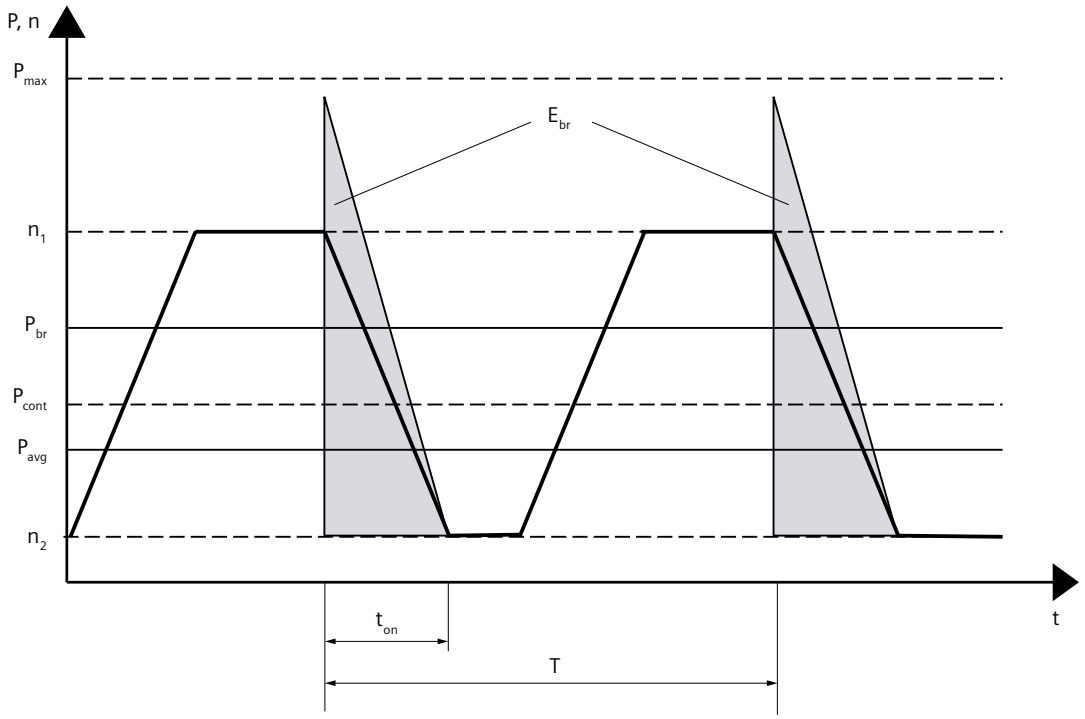
NOTICE

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.

Load cycles for braking resistors



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_{max_int} [W]: Maximum peak power of internal braking resistor
P_{max_ext} [W]: Maximum peak power of external braking resistor
P_{cont_int} [W]: Maximum continuous power of internal braking resistor
P_{cont_ext} [W]: Maximum continuous power of external braking resistor
E_{max_int} [J]: Maximum braking energy of internal braking resistor
E_{max_ext} [J]: Maximum braking energy of external braking resistor

Figure 13-3 Peak power, continuous power and duty cycle of the braking resistor

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 $E_{br} < E_{max\_int}$, you don't require an external braking resistor. If $E_{br} > E_{max\_int}$, 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 $P_{br} > P_{max\_int}$, you can adjust the braking duration t_{on}. If the requirement ($P_{br} < P_{max\_int}$) 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 $P_{avg} > P_{cont\_int}$, you can adjust the braking cycle duration T. If the requirement ($P_{avg} < P_{cont\_int}$) 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 the table "Internal braking resistor of the SINAMICS S200 converter product line (PTI version)" in Section "Internal braking resistor (Page 512)".

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

- 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 For the technical data and characteristics of the 1FL2 motors, see Section "Technical data and characteristics of the 1FL2 (Page 537)".
J / kgm^2	Moment of inertia of the driven mechanical system in relation to the shaft of the servomotor
n_1 / r/min	Initial speed
n_2 / 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_{on} = 0.05 s, T = 2 s.

Moment of inertia of the servomotor 1FL2104-4AG... $J_{mot} = 0.71 \times 10^{-4}$ kgm²

Moment of inertia of the driven mechanical system $J = 4 \times 10^{-4}$ kgm²

n_1 = 3000 r/min n_2 = 600 r/min

⇒ $E_{br} = 22.31$ J < $E_{max\_int} = 292$ J (1 J = 1 Ws)

⇒ $P_{br} = 446.26$ W < $P_{max\_int} = 1884$ W

⇒ $P_{avg} = 11.16$ W < $P_{cont\_int} = 30$ 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_{on} = 0.05 s, T = 2 s.

Moment of inertia of the servomotor 1FL2104-4AG... $J_{mot} = 0.71 \times 10^{-4}$ kgm²

Moment of inertia of the driven mechanical system $J = 8 \times 10^{-4}$ kgm²

n_1 = 6000 r/min n_2 = 600 r/min

⇒ $E_{br} = 170.21$ J < $E_{max\_int} = 292$ J (1 J = 1 Ws)

⇒ $P_{br} = 3404.18$ W > $P_{max\_int} = 1884$ W

⇒ $P_{avg} = 85.10$ W > $P_{cont\_int} = 30$ 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

More information

For more information about connecting the braking resistor, see Section "Connecting the braking resistor (Page 142)".

13.2 Technical data of the motor

13.2.1 General technical data

Technical data

Table 13-11 General technical data of the motor

Property	Description
Type of motor	Servo motor
Rotor inertia	• 1FL21: motor with low rotor inertia • 1FL22: motor with medium rotor inertia • 1FL23: motor with high rotor inertia
Cooling	Natural cooling
Thermal class	• 1FL2102, 1FL2□03, 1FL23□□: B • 1FL2104, 1FL2204, 1FL2□05: F
Impulse voltage insulation class (IVIC) according to IEC/EN 60034-18-41	C
Operating temperature	-15 °C ... +40 °C, power derating at higher temperatures
Relative humidity	< 90% at 30 °C, condensation not permissible
Installation altitude according to EN 60034-6	≤ 1000 m above sea level; otherwise power derating
Type of construction according to IEC/EN 60034-7	IM B5 (IM V1, IM V3)
Degree of protection according to IEC/EN 60034-5	• 1FL2102, 1FL2□03, 1FL2104, 1FL2204: IP54 for the shaft extension (without shaft sealing) and IP65 for the motor body, optionally IP65 for the whole motor (with shaft sealing) • 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)
Radial eccentricity, concentricity, and axial eccentricity according to DIN 42955 and IEC 60072-1	Tolerance N (normal)
Vibration severity grade according to IEC/EN 60034-14	Grade A
Sound pressure level L_{pA} (1 m) according to DIN EN ISO 1680, max. tolerance +3 dB(A)	• 1FL2102, 1FL2□03, 1FL2104, 1FL2204: 60 dB(A) • 1FL2□05, 1FL2304: 65 dB(A) • 1FL2306, 1FL2310: 70 dB(A)
Encoder	• Absolute encoder single-turn, 17-bit (identification letter: H) • Absolute encoder single-turn, 21-bit (identification letter: S) • Absolute encoder, 21-bit single-turn + 12-bit multiturn (identification letter: M)

Property	Description
Holding brake	Optional integrated holding brake
Connection	• 1FL2102, 1FL2□03, 1FL2104, 1FL2204: dual-cable connections with a hybrid connector • 1FL2□05: two-cable connections with two angular connectors • 1FL23□□: three-cable connections with three angular connectors

13.2.2 Permissible environmental conditions for the motor

Technical data

Table 13-12 Environmental conditions for transport

Environmental conditions for transport in the transport packaging according to Class 2K3 to DIN EN IEC 60721-3-2, except for environmental variables "air temperature" and "condensation"	
Climatic environmental conditions	• Temperature: -15 °C ... +70 °C • Highest relative humidity: < 90% at 30 °C, condensation not permissible
Mechanical environmental conditions	Single shocks (6 ms), max. 300 m/s²
Protection against chemical substances	Protected according to Class 2C2
Biological environmental conditions	Suitable according to Class 2B2

Table 13-13 Environmental conditions for long-term storage

Environmental conditions for long-term storage in the product packaging according to Class 1K3 to DIN EN IEC 60721-3-1, except for environmental variables "air temperature", "highest relative humidity" and "condensation"	
Climatic environmental conditions	• 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
Biological environmental conditions	Suitable according to Class 1B2
Duration	• 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. For more information, please contact your local sales partner.

Table 13-14 Environmental conditions during operation

Environmental conditions during operation according to 3K4 to DIN EN IEC 60721-3-3, except for environmental variables "low air temperature", "condensation" and "low air pressure"	
Installation altitude	Up to 1000 m above sea level without limitations You can get additional information in Section "Derating factors (Page 521)".
Climatic environmental conditions[1)]	• 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 change[2)]: 0.5°/min • Atmospheric pressure: 89 kPa[1) 3)] ... 106 kPa[4)] • Solar radiation: 700 W/m² [2)] • Movement of the air: 1.0 m/s • Water (other than rain): see Section "Degree of protection (Page 523)"
Mechanical environmental conditions	• Vibration severity grade: A (according to IEC 60034-14:2003) • Shock resistance (m/s²): – 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 DIN EN IEC 60721-3-3
Biological environmental conditions	Suitable according to 3B2 to DIN EN IEC 60721-3-3
Pollution	Suitable for environments with degree of pollution 2 according to IEC 61800-5-1
Cooling air	Clean and dry air
The motors are not suitable for operation under the following circumstances: • In a vacuum[5)] • 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 DIN EN IEC 60721-3-3

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.

13.2.3 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.

13.2.4 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 13-15 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	300 x 300 x 12
1FL2304	270 x 270 x 10

Motor	Steel plate: width x height x thickness (mm)
1FL2306	390 x 390 x 15
1FL2310	420 x 420 x 20

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 521)".

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 589)".

13.2.5 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 13-16 Power derating factors

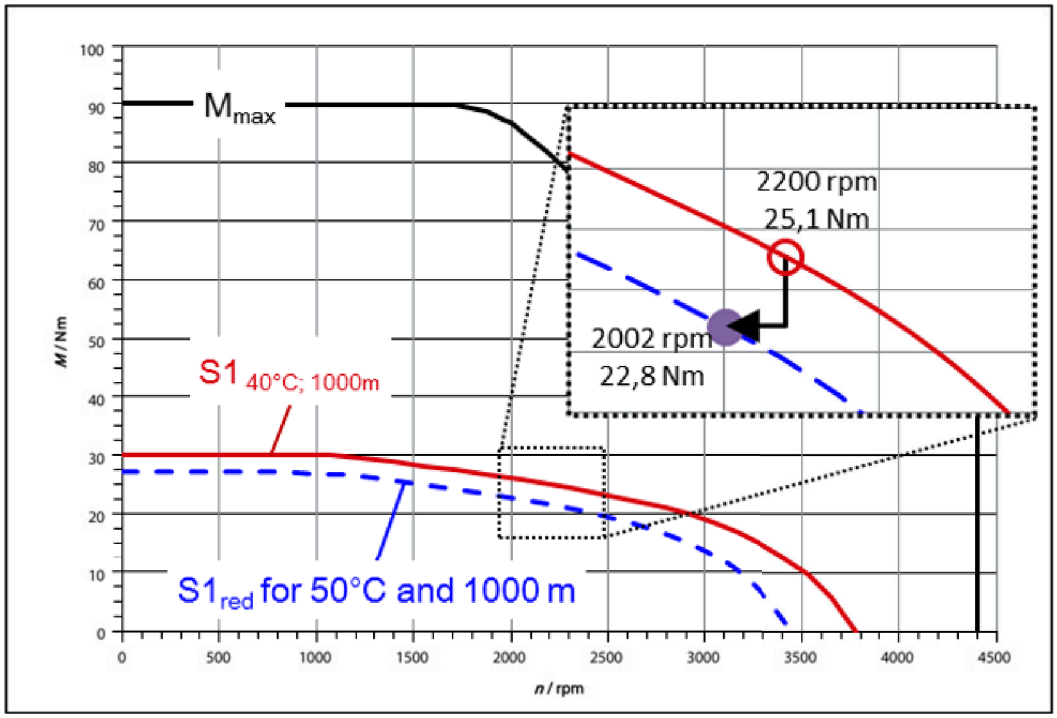
Installation altitude above sea level in m	Ambient temperature in °C			
	30	40	45	50
1000	1.08	1.00	0.96	0.91
2000	1.02	0.93	0.89	0.84
3000	0.95	0.86	0.81	0.75
4000	0.88	0.77	0.72	0.66
5000	0.80	0.68	0.62	0.55

Calculating the reduced characteristic curve

$M_{S1\ red}(n) = x_d \bullet M_{S1}(n / x_d)$

$M_{S1\ red}$	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 13-17 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 13-18 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
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 537).

13.2.6 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 EN 60034-5 (IEC 60034-5).

IP = International Protection
1st digit = protection against the ingress of foreign bodies
2nd digit = protection against water

DIN 60034-5 is valid for water as potentially occurring medium, not for oil or other creeping fluids.

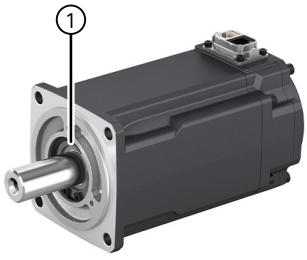
Configure the motor in the required degree of protection.

Description

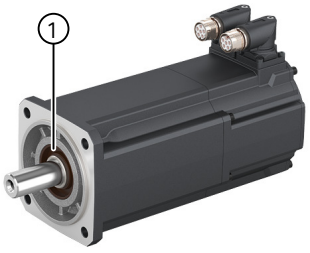
Table 13-19 Degree of protection of 1FL2

Article number	Degree of protection[1)]
1FL2102 1FL2□03 1FL2104 1FL2204	IP54 for the shaft extension (without shaft sealing) and IP65 for the motor body, optionally IP65 for the whole motor (with shaft sealing)
1FL2□05 1FL23□□	IP65

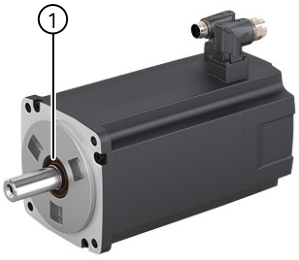
1) The degree of protection is specified on the rating plate.



1FL2102
1FL2□03
1FL2104
1FL2204



1FL2□05



1FL23□□

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 526)".

13.2.7 Balancing

Description

The motors are balanced according to EN 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.

13.2.8 Vibrational behavior

Description

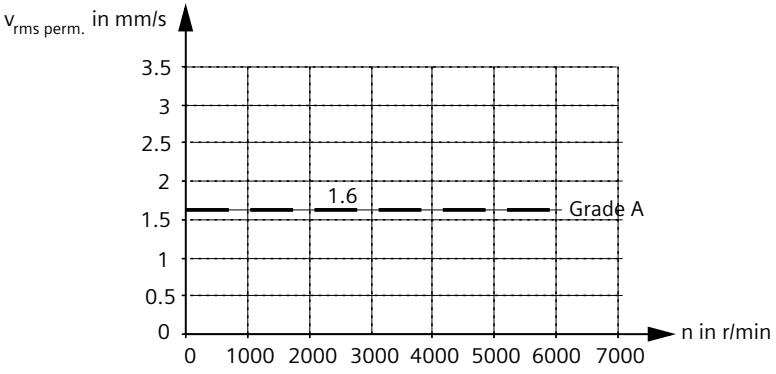
Vibration severity grade

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/EN 60034-14: 2003.

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 13-20 Vibration values for motors with low or medium inertia

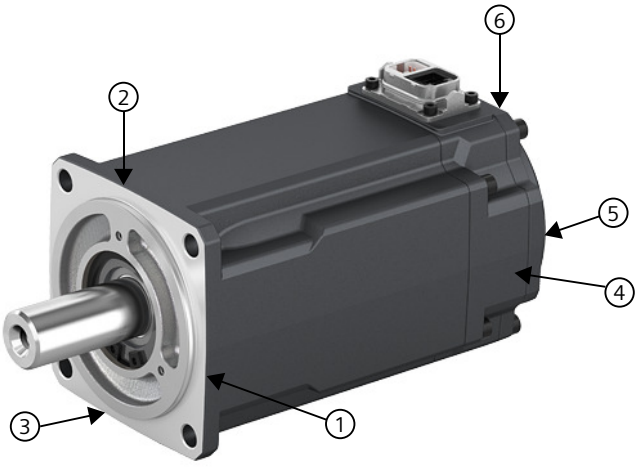
Vibration velocity V_{rms} to ISO 10816	Vibration acceleration a_{peak} axial	Vibration acceleration a_{peak} radial
Max. 4.5 mm/s	50 m/s²	50 m/s²

Table 13-21 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/s²	50 m/s²

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.

13.2.9 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.

With motors 1FL2102, 1FL2□03, 1FL2104, and 1FL2204, the usable shaft extension is reduced by the radial shaft sealing ring with the IP65 degree of protection.

Table 13-22 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 1FL2204	19 (h6) × 37	19 (h6) × 32	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	10 × 8 × 60	M12

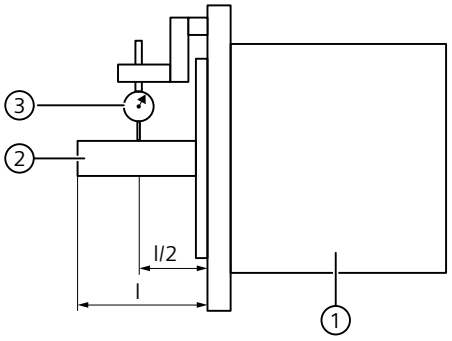
13.2.10 Radial eccentricity, concentricity, and axial eccentricity

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 13-23 Radial eccentricity tolerance of the shaft to the frame axis (referring to cylindrical shaft extensions)

Motor	Standard (Normal class)
1FL2102	0.03 mm
1FL2□03	0.035 mm
1FL2□04 1FL2□05 1FL2306	0.04 mm
1FL2310	0.05 mm

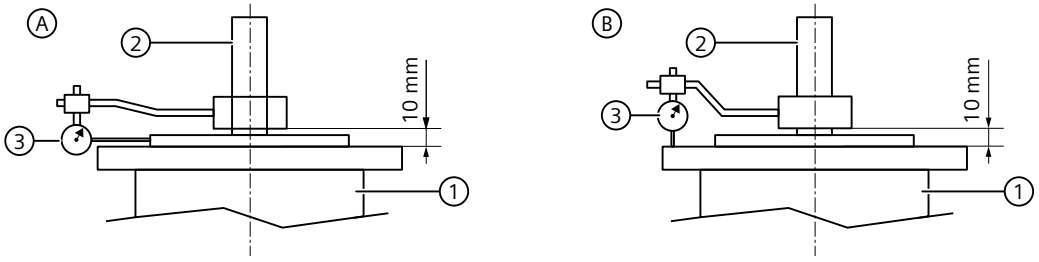


① Motor
② Motor shaft
③ Dial gauge

Figure 13-4 Checking the radial eccentricity

Table 13-24 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
1FL2□03 1FL2□04 1FL2□05	0.08 mm
1FL2306 1FL2310	0.1 mm



A Check for concentricity
B Check for axial eccentricity

① Motor
② Motor shaft
③ Dial gauge

Figure 13-5 Checking the concentricity and axial eccentricity

13.2.11 Axial and radial forces

13.2.11.1 Permissible axial forces

Technical data

Table 13-25 Permissible axial forces

Type	Axial force, static[1)] $F_{A\,stat}$ / N
1FL2102	50
1FL2□03	98
1FL2104 1FL2204	100
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.

13.2.11.2 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.

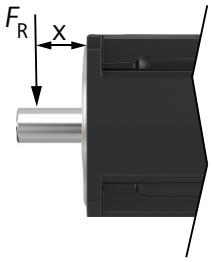
All radial forces always refer to aligned forces.

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 13-6 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.

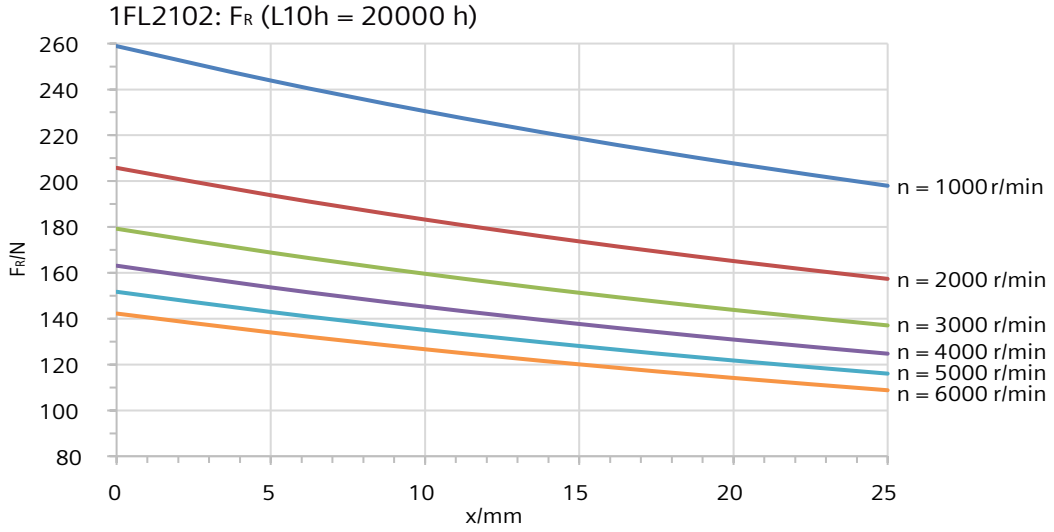


Figure 13-7 Radial force diagram 1FL2102

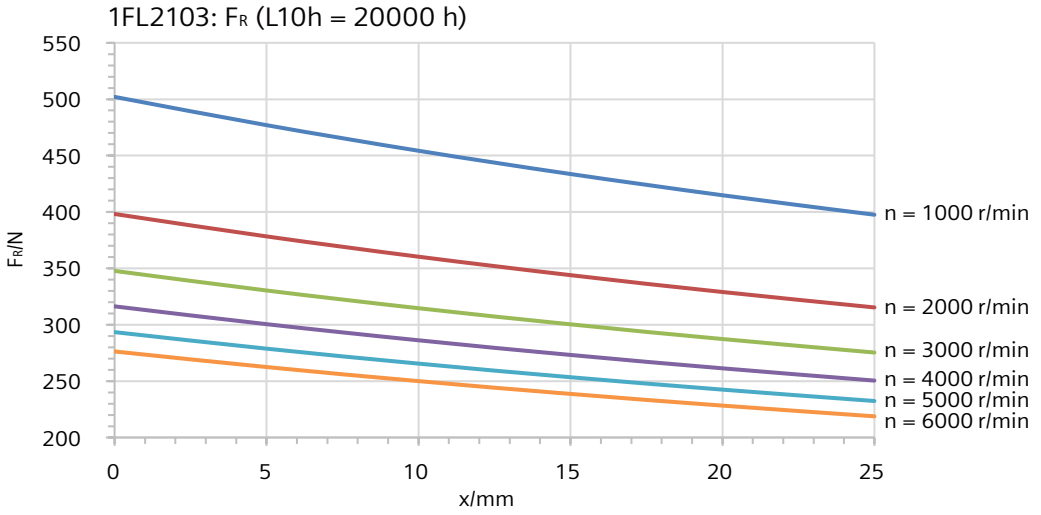


Figure 13-8 Radial force diagram 1FL2103

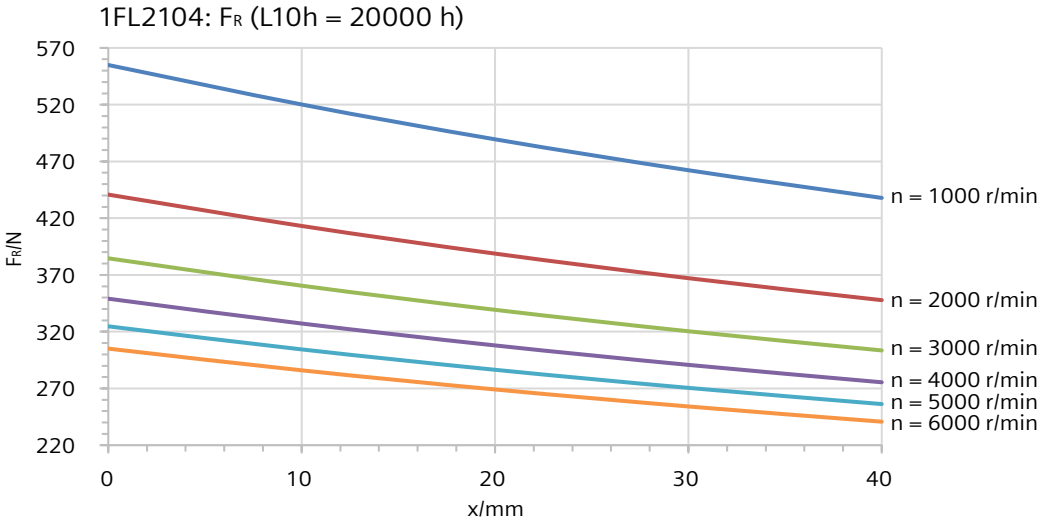


Figure 13-9 Radial force diagram 1FL2104

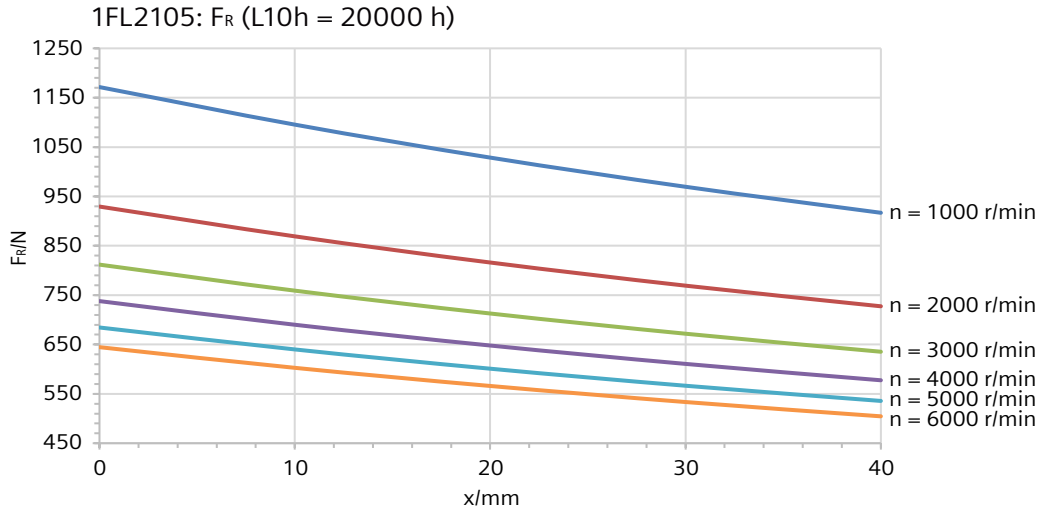


Figure 13-10 Radial force diagram 1FL2105

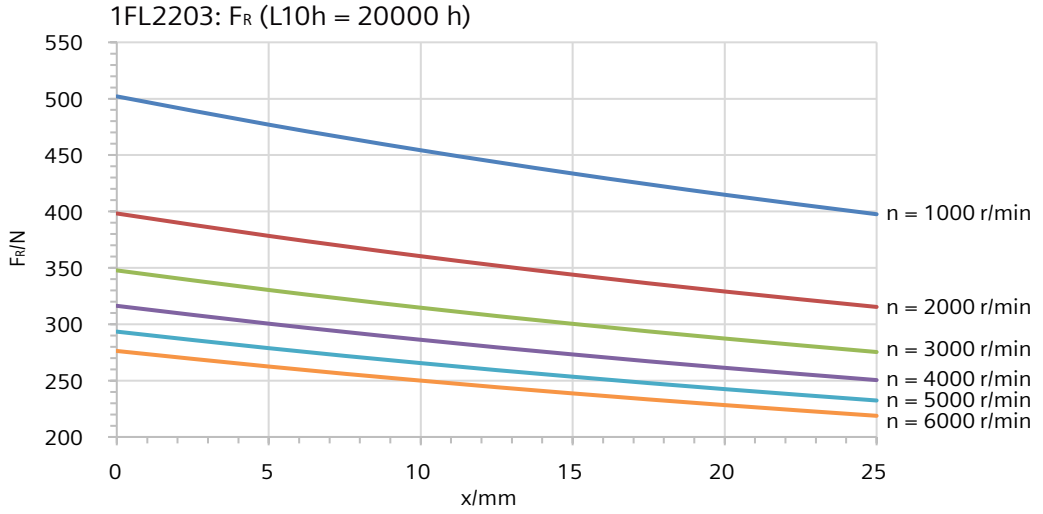


Figure 13-11 Radial force diagram 1FL2203

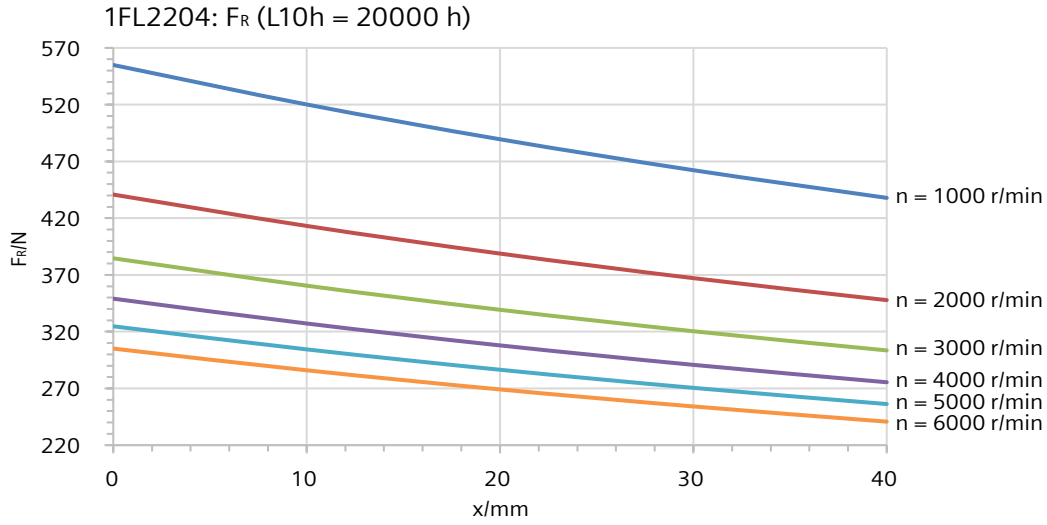


Figure 13-12 Radial force diagram 1FL2204

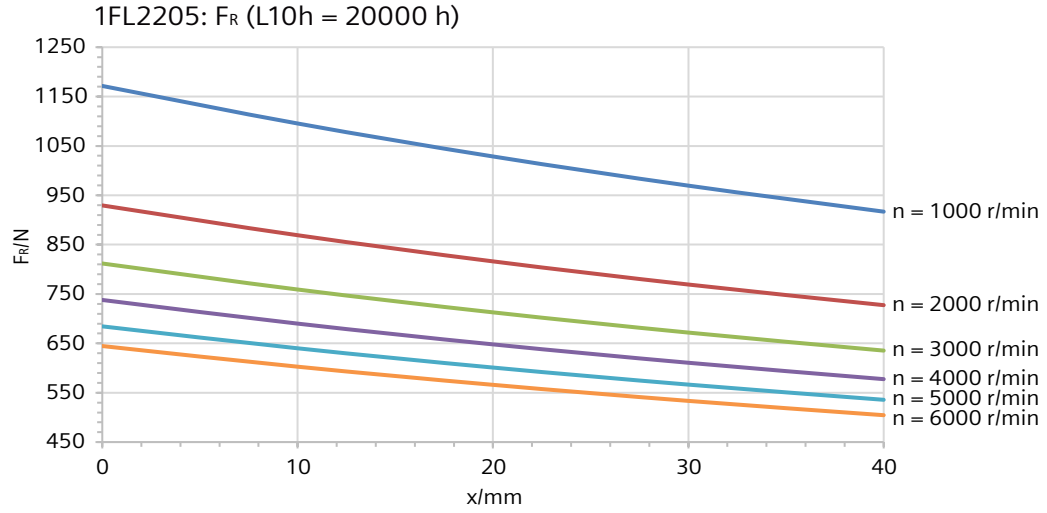


Figure 13-13 Radial force diagram 1FL2205

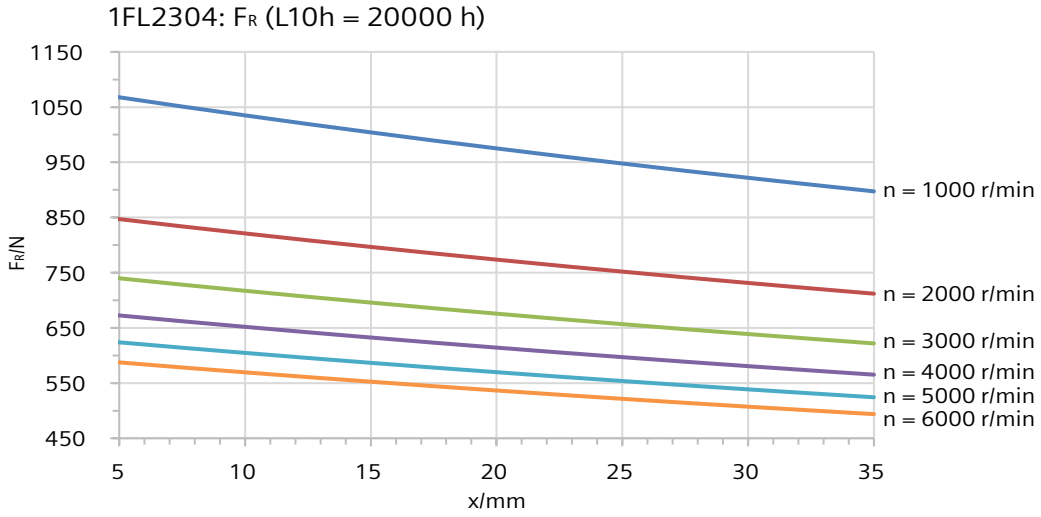


Figure 13-14 Radial force diagram 1FL2304

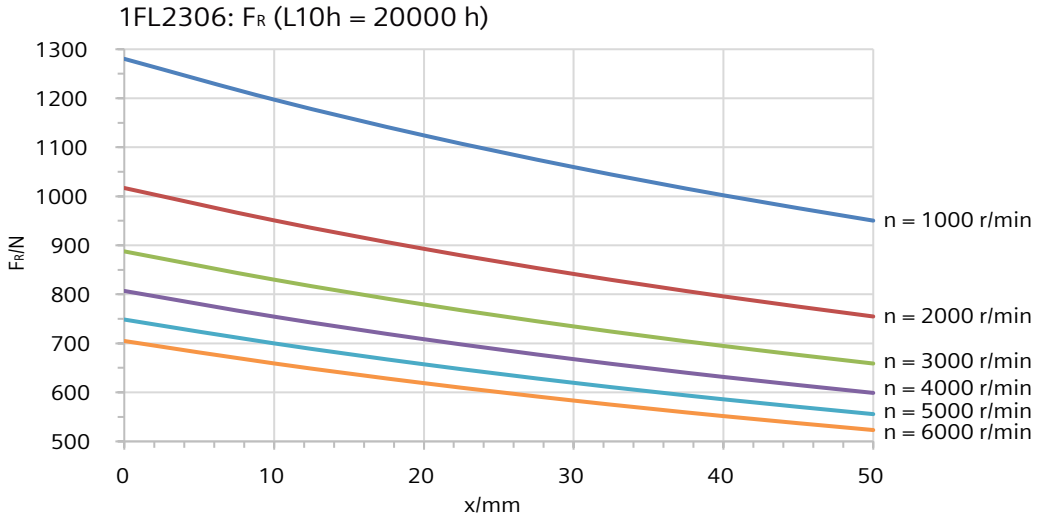


Figure 13-15 Radial force diagram 1FL2306

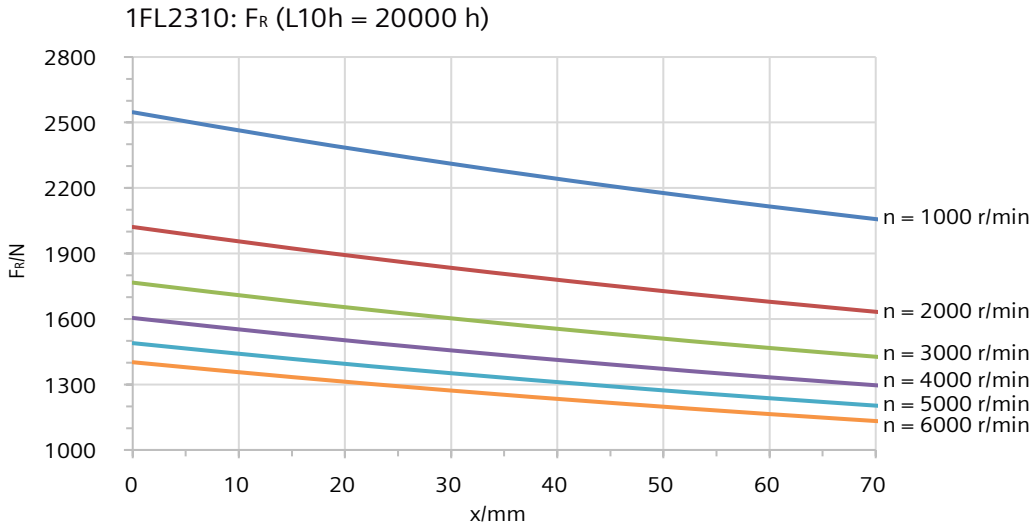


Figure 13-16 Radial force diagram 1FL2310

13.2.12 Available encoders

Technical data

Table 13-26 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
Identification in the article number	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	± 120"	± 120"	± 120"

13.2.13 Brake data

13.2.13.1 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 service life, total operating energy 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°.

13.2.13.2 Technical data of the 1FL2 holding brake

Technical data

Table 13-27 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 A
Spring-loaded brake							
1FL2102	0.32	-	35	10	1	2	< 1 A
1FL2□03	1.3	-	60	10	10	20	< 1 A
1FL2104 1FL2204	3.3	-	110	30	43	86	< 1 A
1FL2304	3.5	-	60	45	140	280	< 2 A
1FL2306	12		180	60	600	1200	< 2 A
1FL2310	30	-	220	115	1100	2200	< 2 A

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

$W_{br} = (J_{mot\,br} + J_{load}) \bullet n_{mot}^2 / 182.4$

W_{br} / J	Operating energy per braking operation
n_{mot} / r/min	Speed at which the brake is engaged
$J_{mot\,br}$ / kgm²	Rotor moment of inertia of the motor with brake (see Technical data and characteristics of the 1FL2 (Page 537))
J_{load} / kgm²	Load moment of inertia of the mounting part on the motor with brake
182.4	Constant for calculating the circular frequency and SI units

13.2.14 Technical data and characteristics of the 1FL2

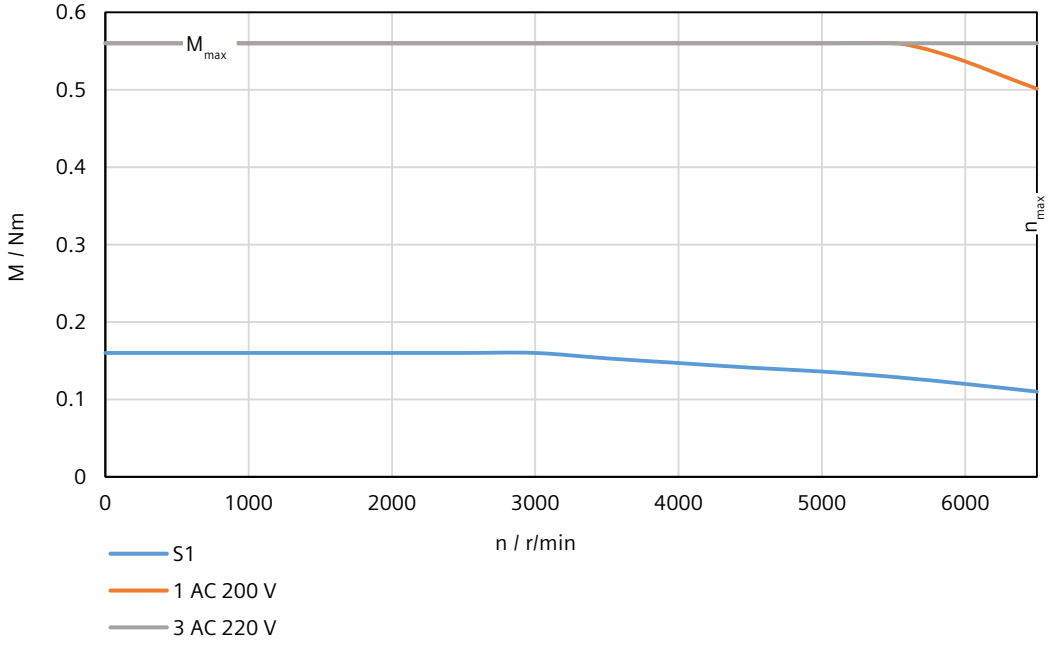
13.2.14.1 1FL2102-2AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 13-28 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

Feature	Symbol	Unit	Value
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

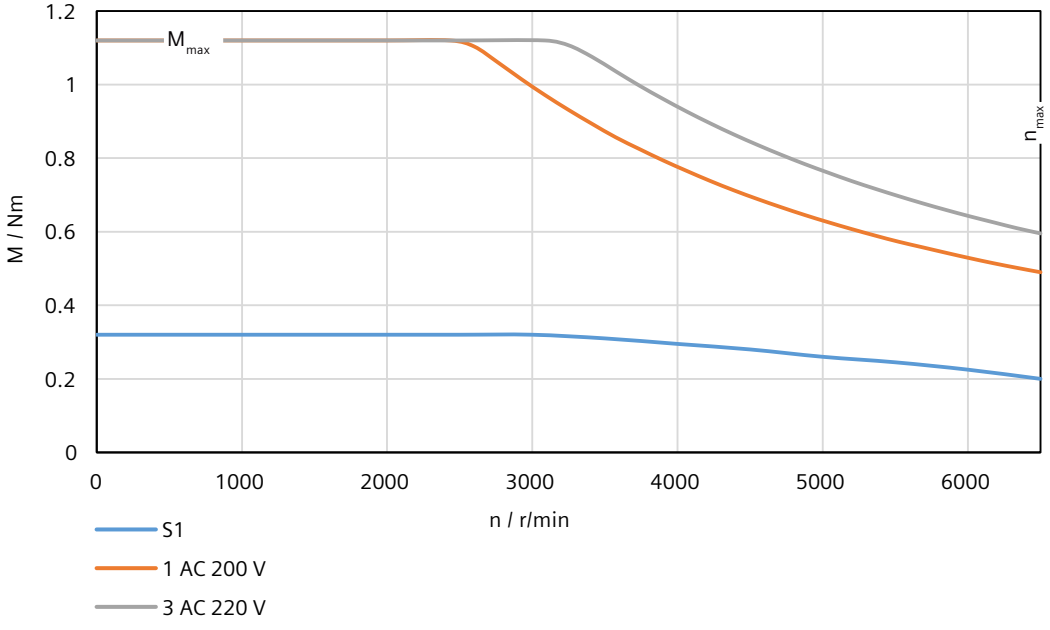


13.2.14.2 1FL2102-4AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 13-29 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

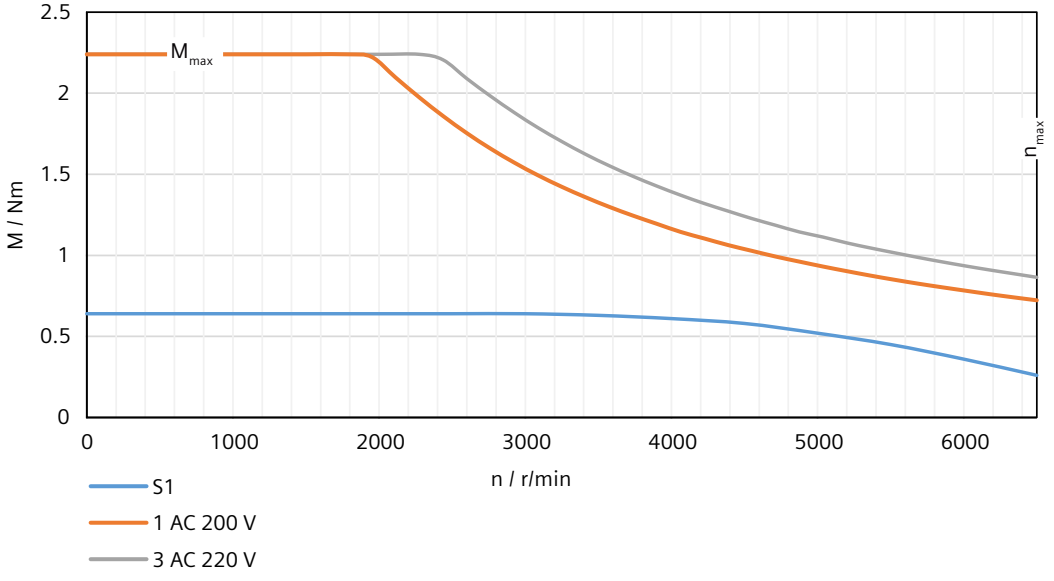


13.2.14.3 1FL2103-2AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 13-30 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)	$J_{mot\ br}$	$kgcm^2$	0.110
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	0.79
Weight (with brake)	$m_{mot\ br}$	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

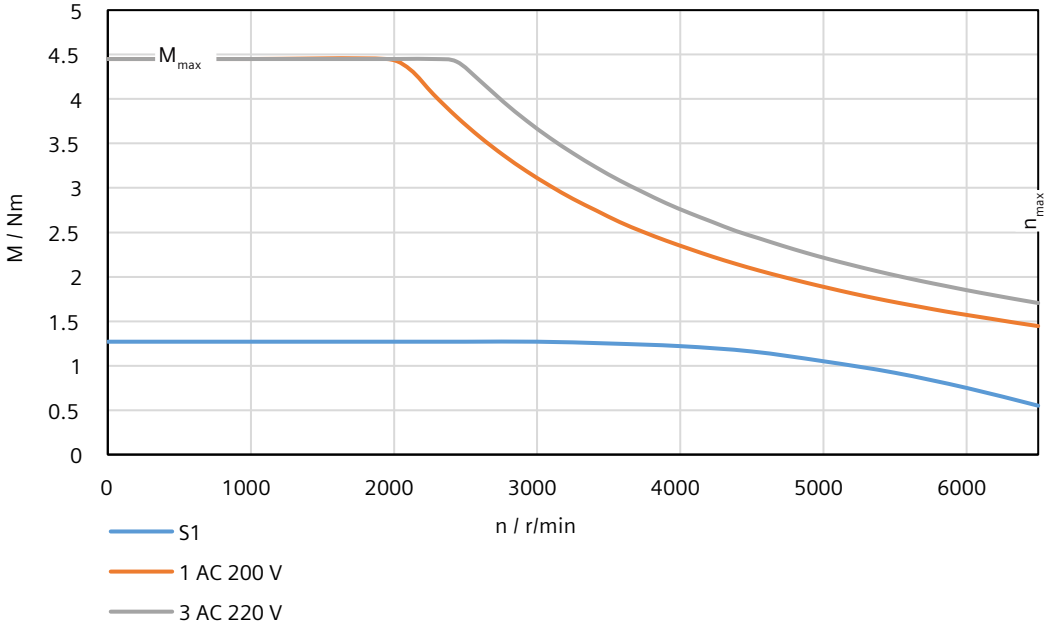


13.2.14.4 1FL2103-4AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 13-31 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

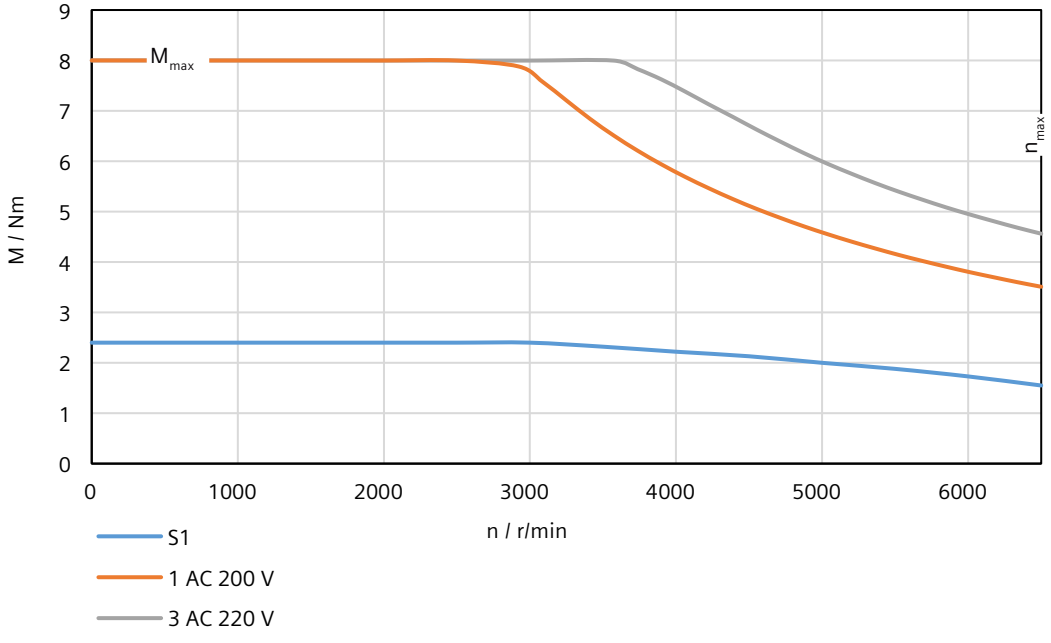


13.2.14.5 1FL2104-2AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 13-32 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)	$J_{mot\ br}$	$kgcm^2$	0.58
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	2.7
Weight (with brake)	$m_{mot\ br}$	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

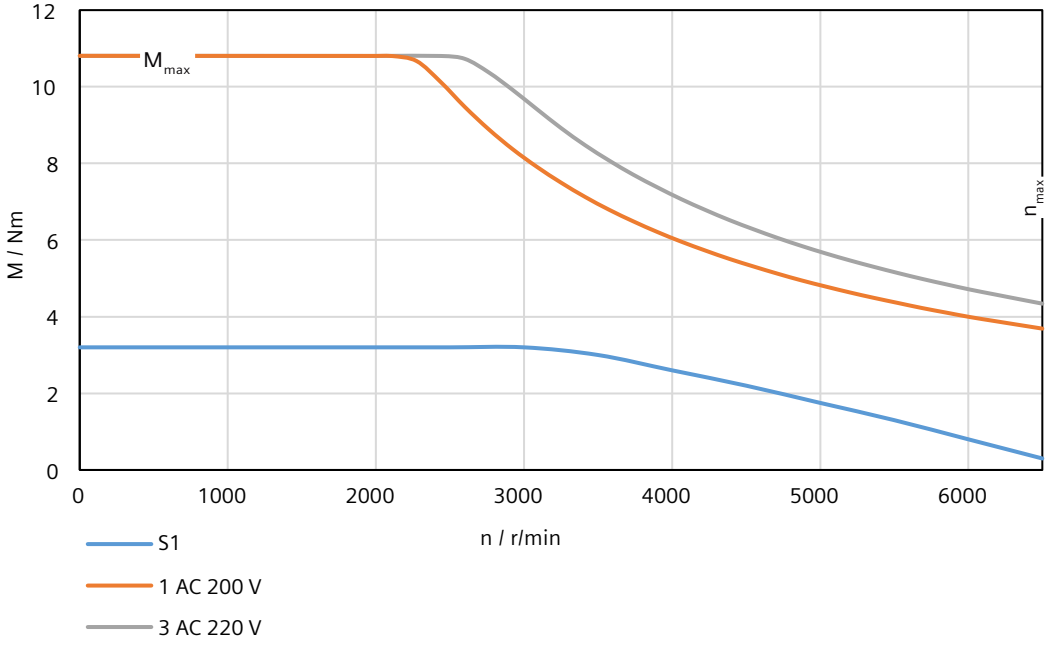


13.2.14.6 1FL2104-4AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 13-33 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}	kgcm²	0.63
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	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

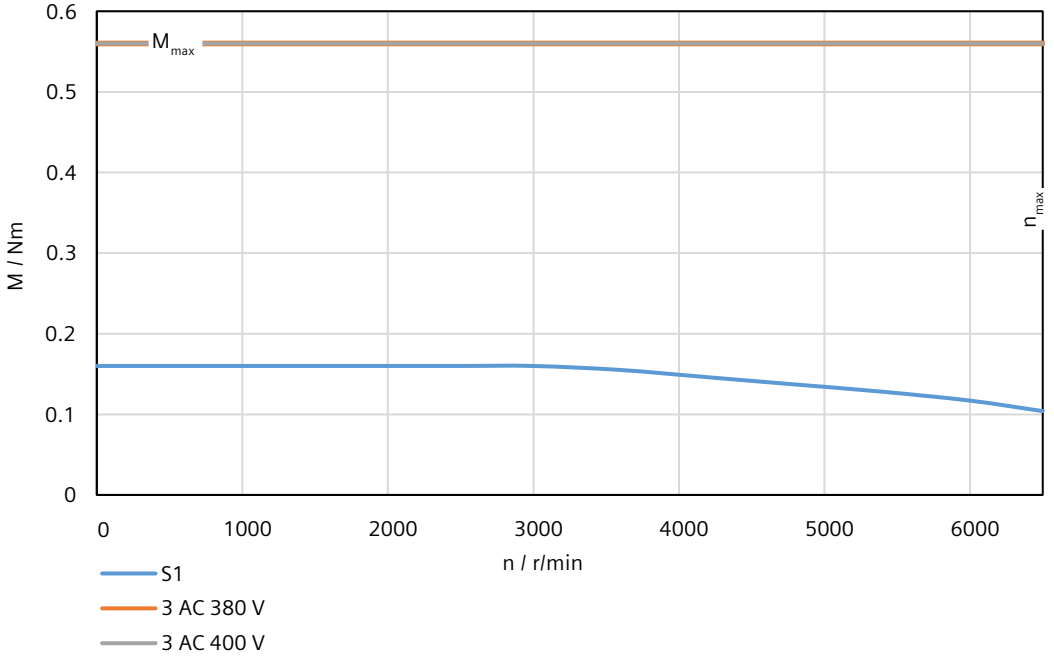


13.2.14.7 1FL2102-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-34 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)	$J_{mot\ br}$	$kgcm^2$	0.022
Recommended load to motor inertia ratio	-	-	Maximum 40x
Weight	m_{mot}	kg	0.29
Weight (with brake)	$m_{mot\ br}$	kg	0.45
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

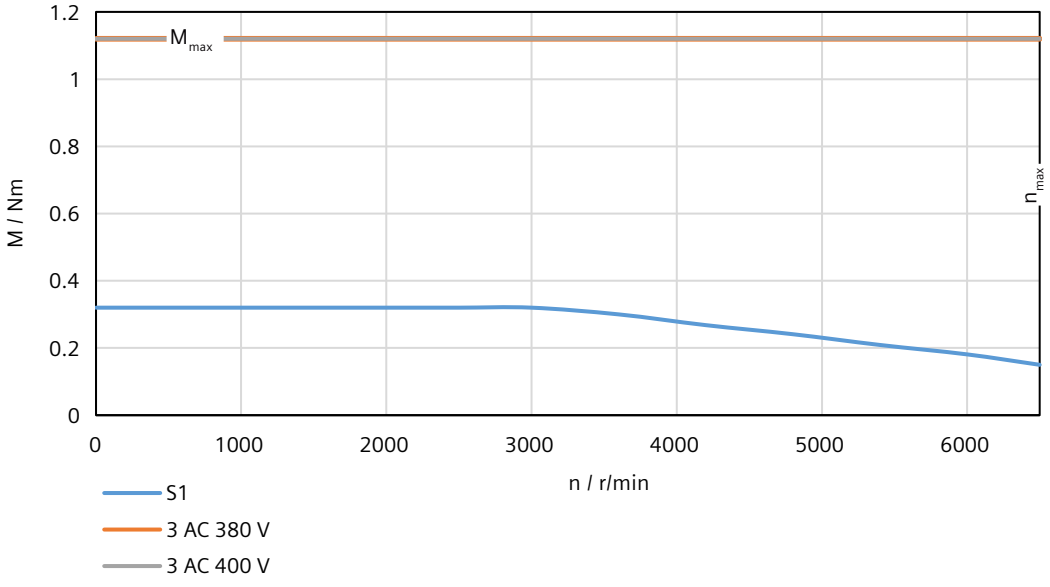


13.2.14.8 1FL2102-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-35 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

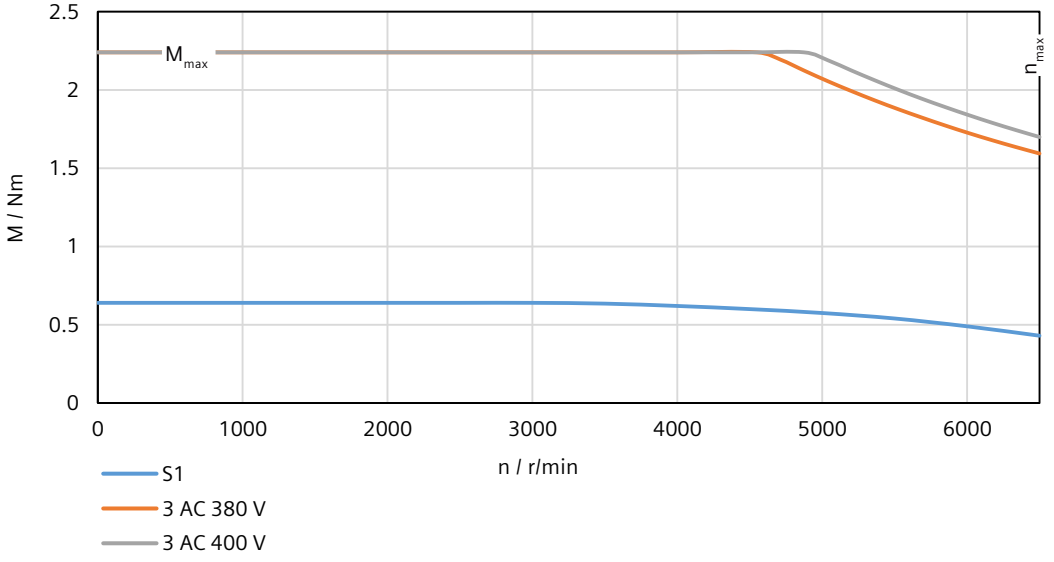


13.2.14.9 1FL2103-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-36 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)	$J_{mot\ br}$	$kgcm^2$	0.110
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	0.78
Weight (with brake)	$m_{mot\ br}$	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

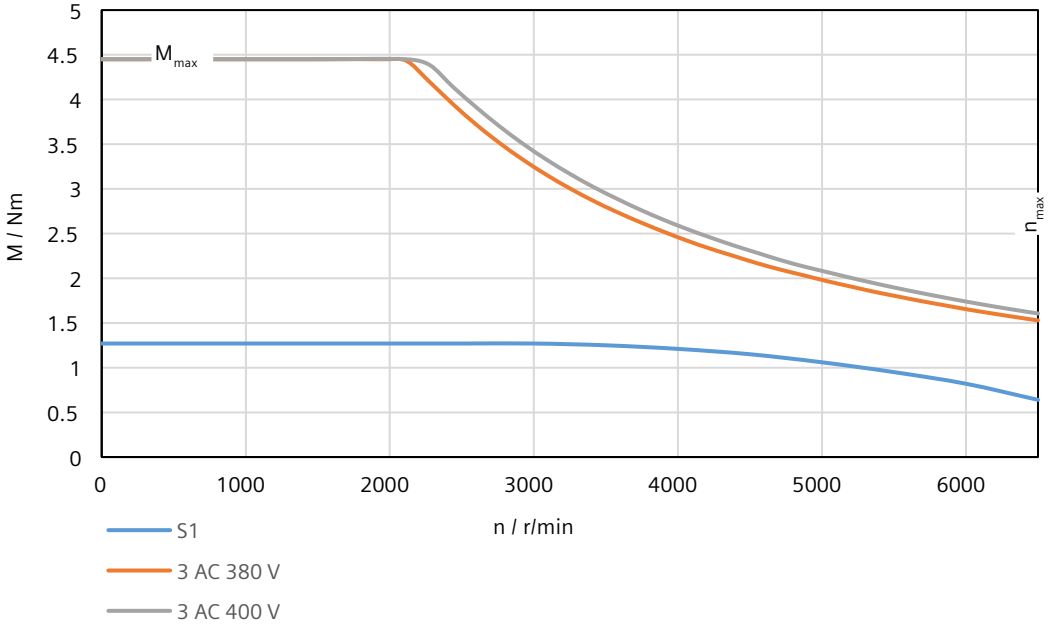


13.2.14.10 1FL2103-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-37 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

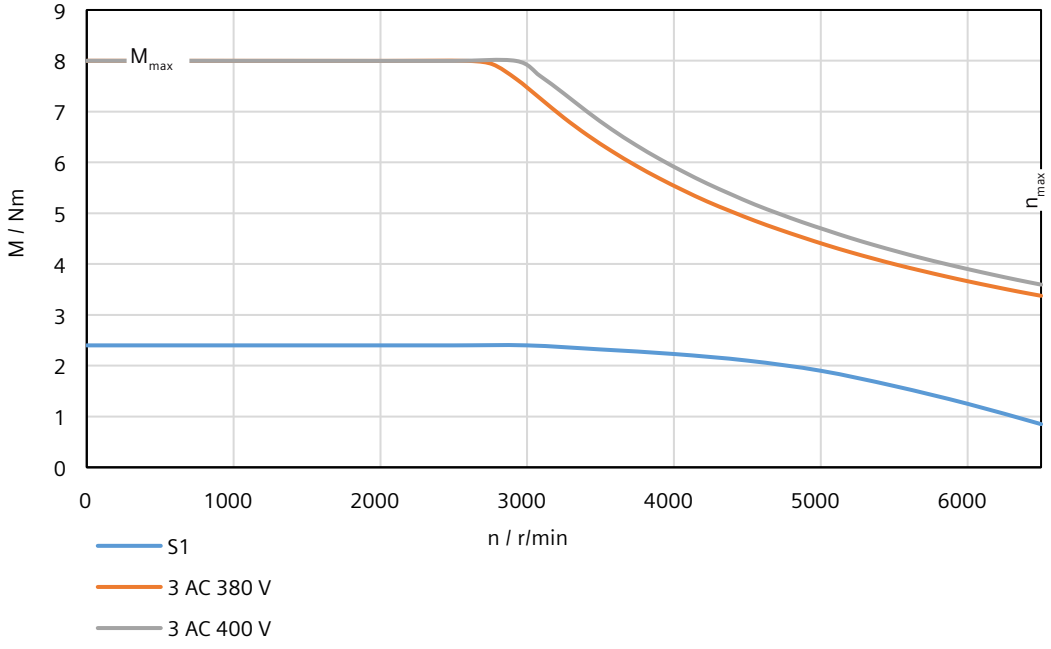


13.2.14.11 1FL2104-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-38 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)	$J_{mot\ br}$	$kgcm^2$	0.58
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	2.7
Weight (with brake)	$m_{mot\ br}$	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

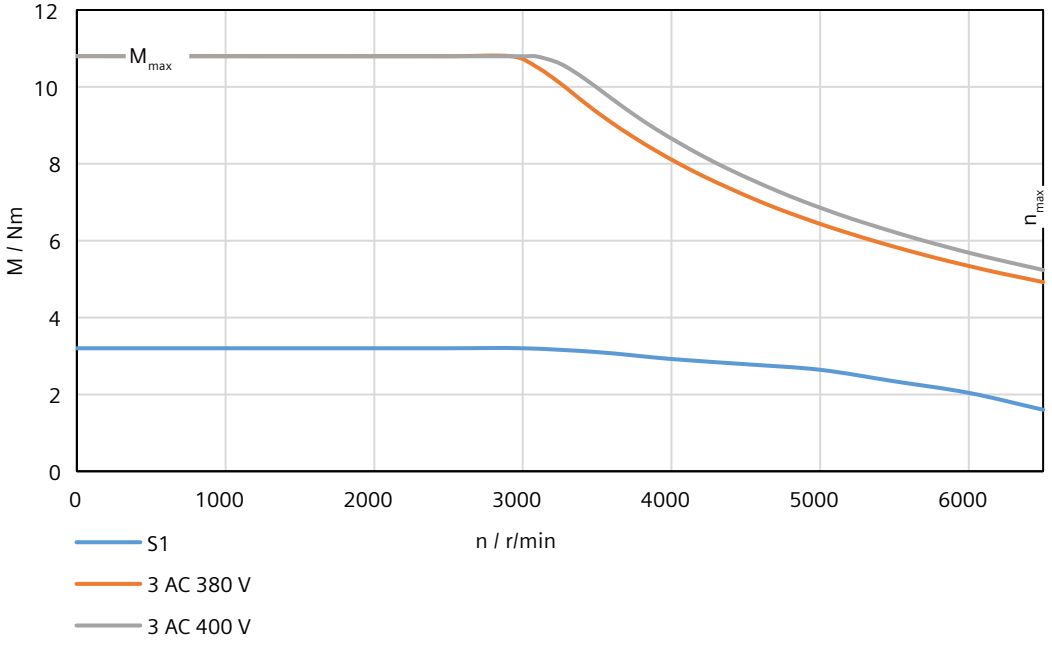


13.2.14.12 1FL2104-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-39 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}	kgcm²	0.63
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	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

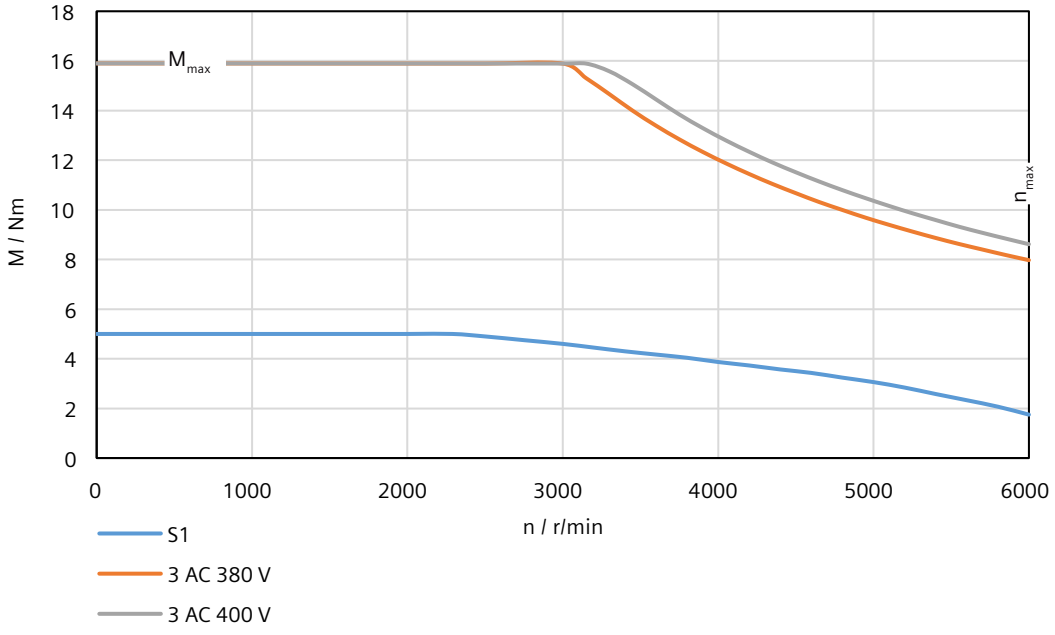


13.2.14.13 1FL2105-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-40 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}	kgcm²	1.71
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	2.54
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	5.5
Weight (with brake)	$m_{mot\ br}$	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

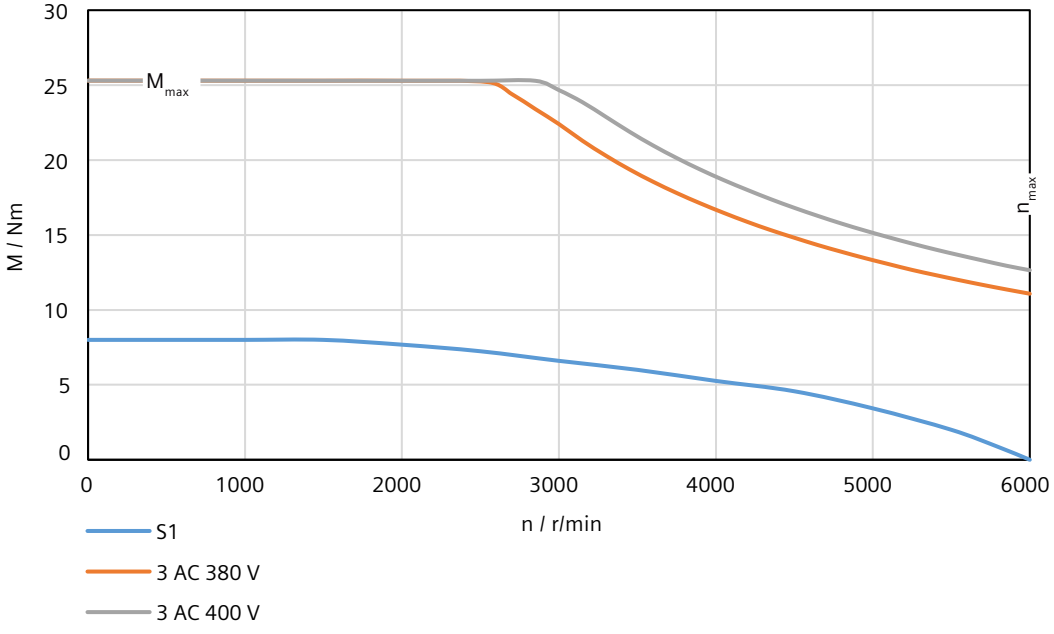


13.2.14.14 1FL2105-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-41 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}	kgcm²	2.65
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	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

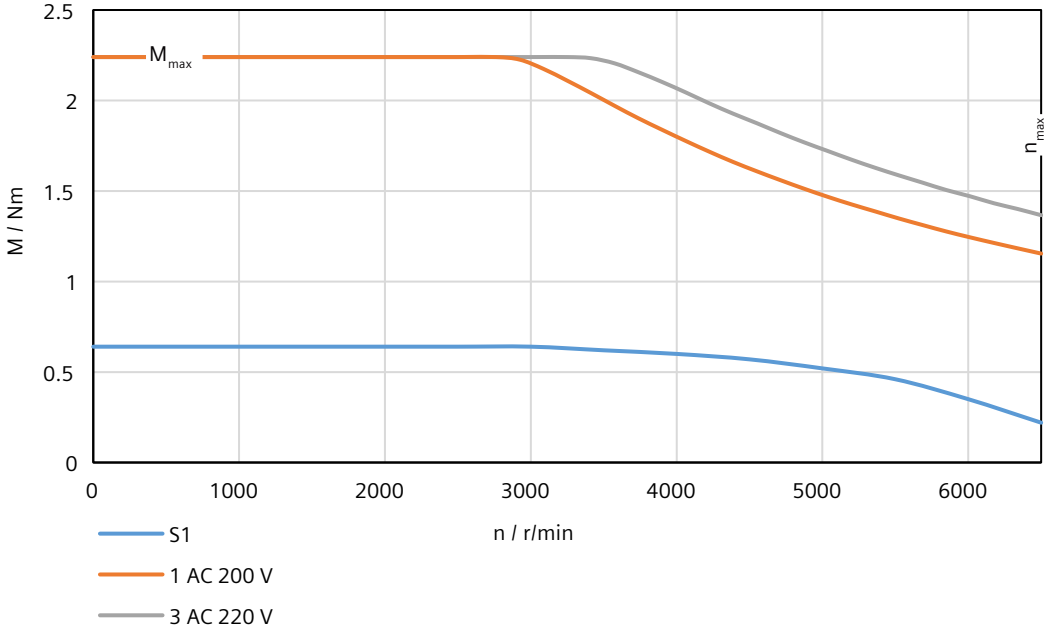


13.2.14.15 1FL2203-2AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 13-42 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)	$J_{mot\ br}$	$kgcm^2$	0.210
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	0.76
Weight (with brake)	$m_{mot\ br}$	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

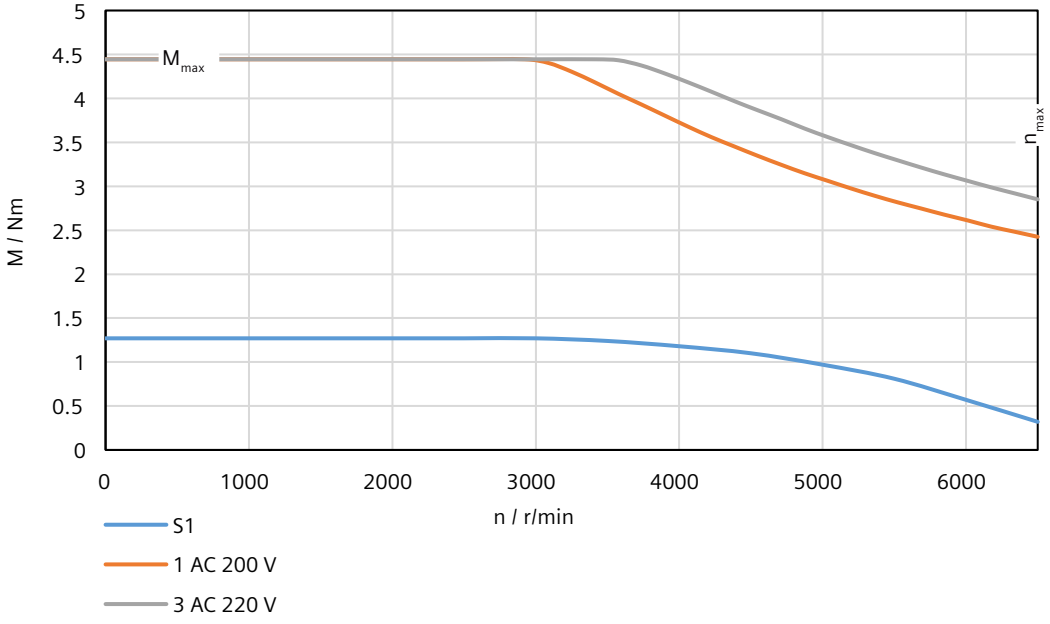


13.2.14.16 1FL2203-4AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 13-43 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}	kgcm²	0.350
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	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

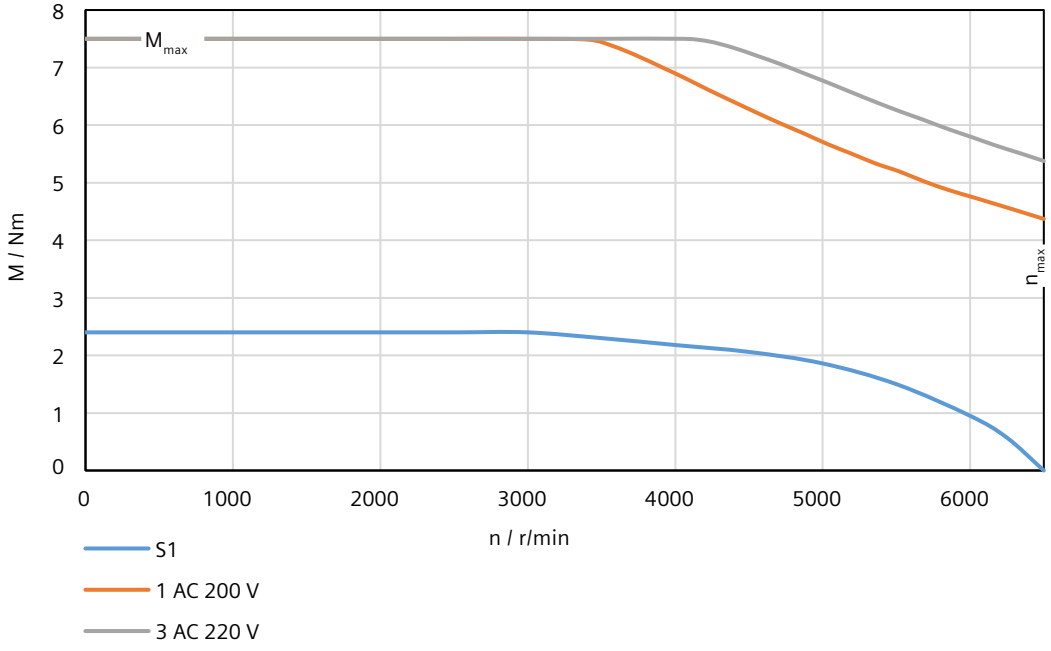


13.2.14.17 1FL2204-2AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 13-44 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)	$J_{mot\ br}$	$kgcm^2$	1.31
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	2.6
Weight (with brake)	$m_{mot\ br}$	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

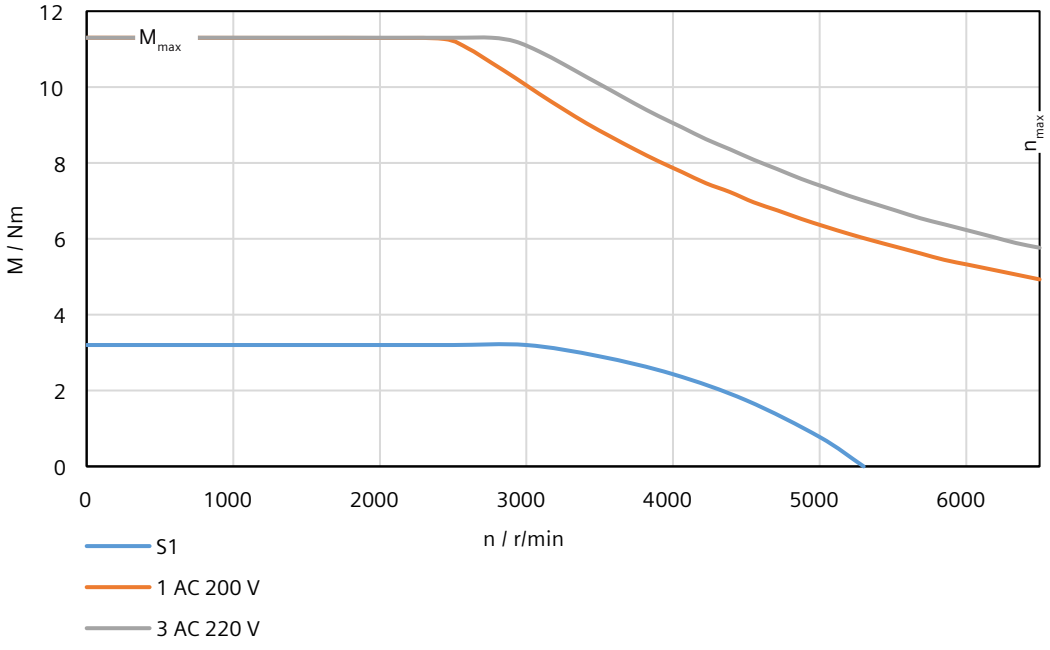


13.2.14.18 1FL2204-4AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 13-45 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}	kgcm²	1.61
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	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	4.4
Rated power	P_{rated}	kW	1

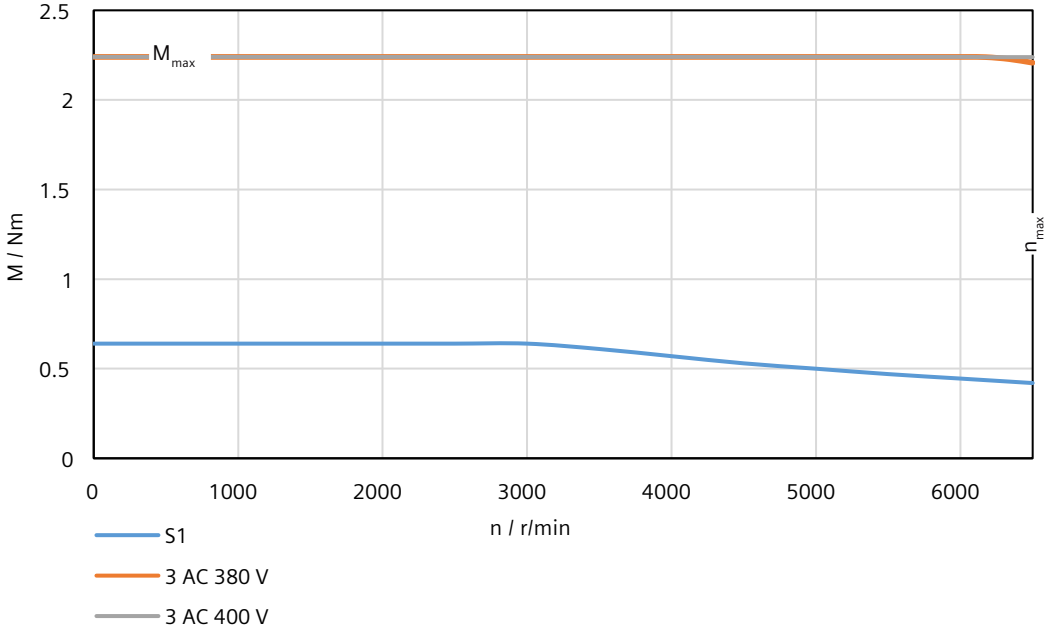


13.2.14.19 1FL2203-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-46 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)	$J_{mot\ br}$	$kgcm^2$	0.210
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	0.77
Weight (with brake)	$m_{mot\ br}$	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

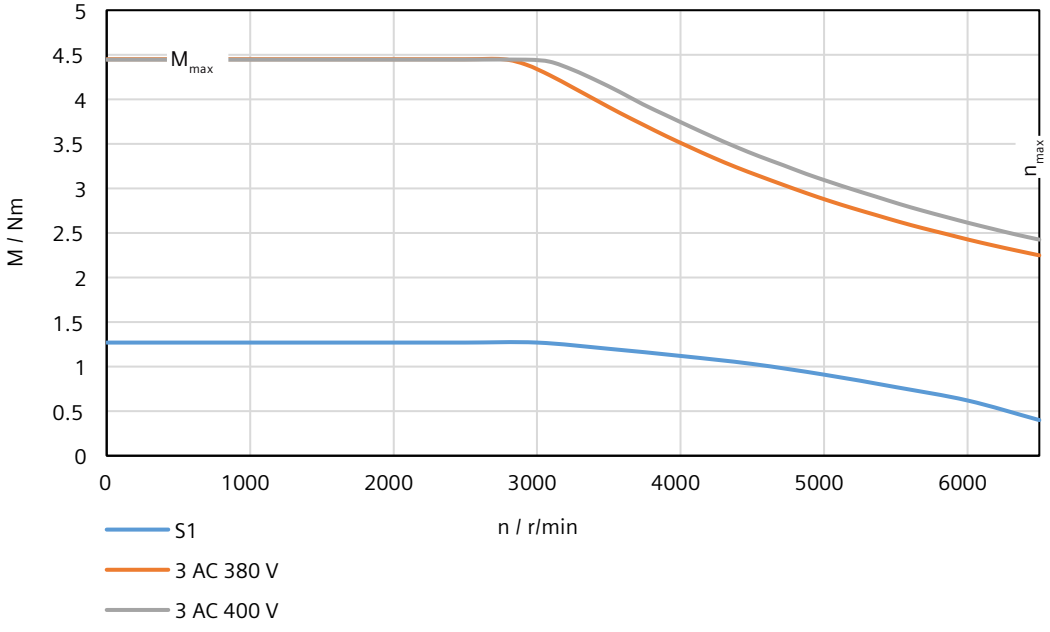


13.2.14.20 1FL2203-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-47 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

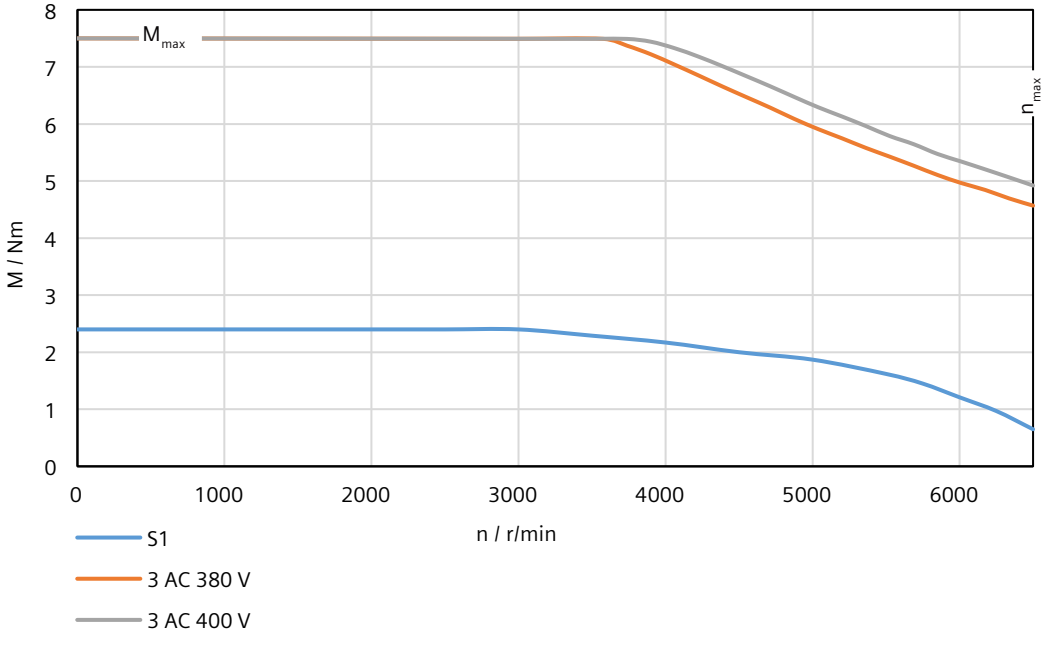


13.2.14.21 1FL2204-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-48 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)	$J_{mot\ br}$	$kgcm^2$	1.31
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	2.6
Weight (with brake)	$m_{mot\ br}$	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

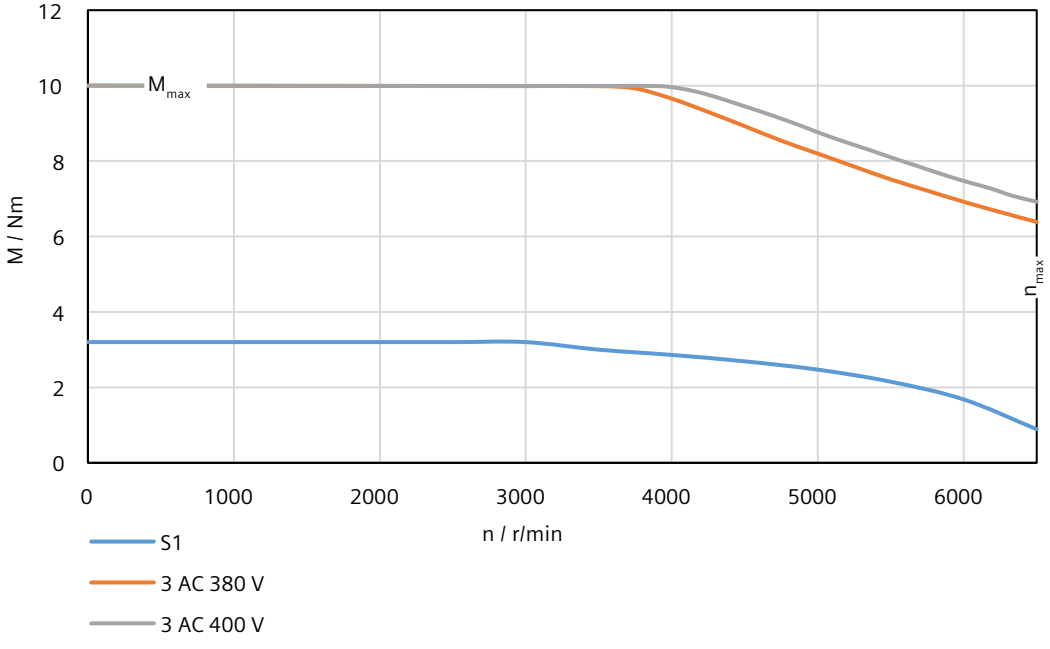


13.2.14.22 1FL2204-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-49 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}	kgcm²	1.61
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	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

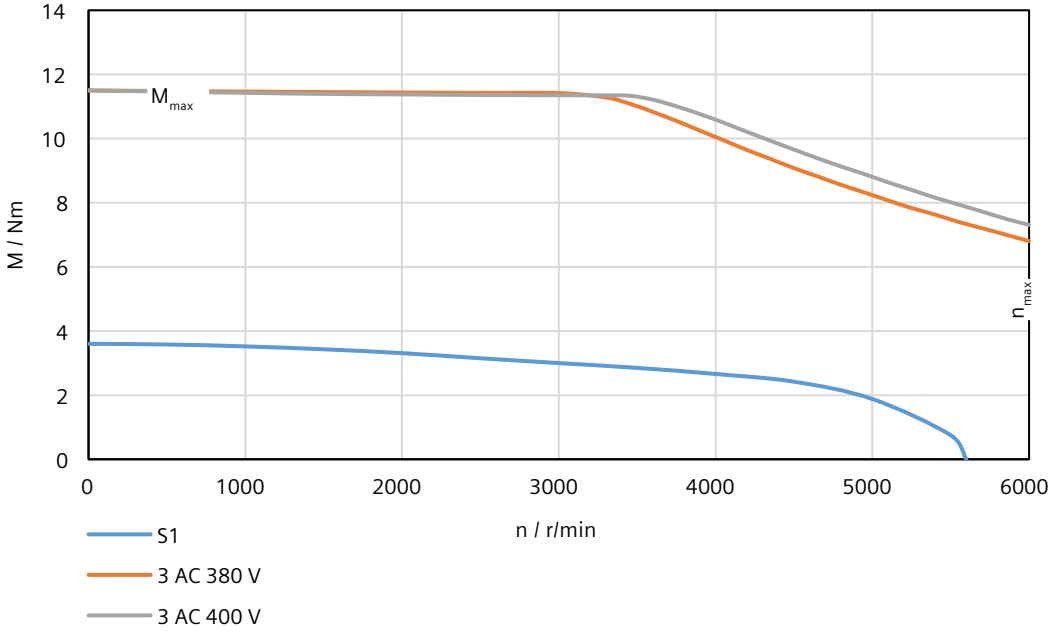


13.2.14.23 1FL2205-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-50 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)	$J_{mot\ br}$	$kgcm^2$	4.03
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	3.6
Weight (with brake)	$m_{mot\ br}$	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

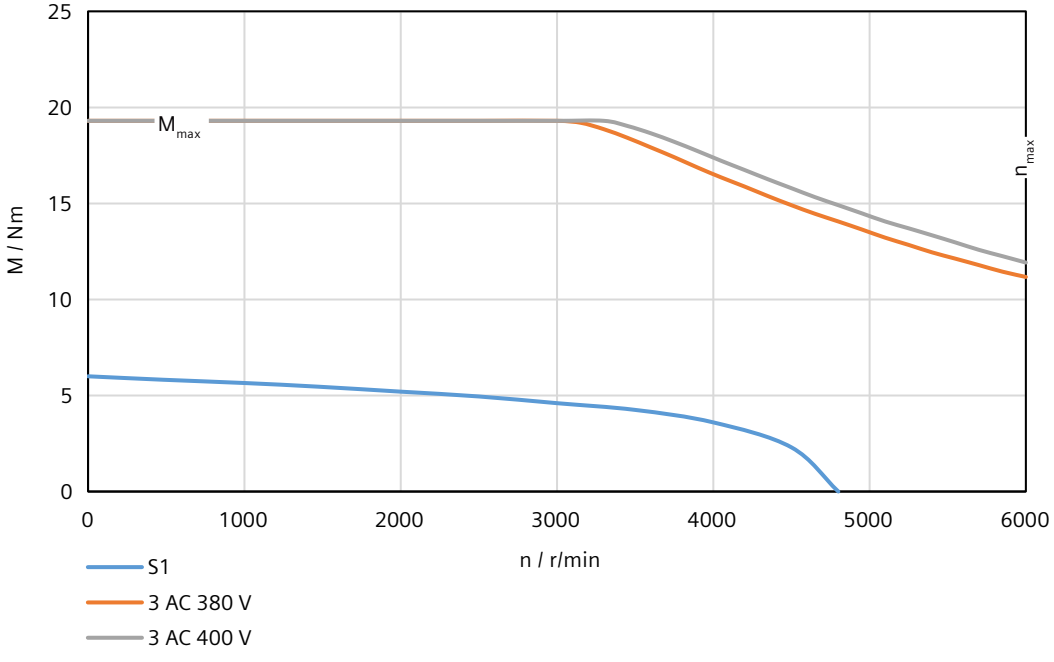


13.2.14.24 1FL2205-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-51 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

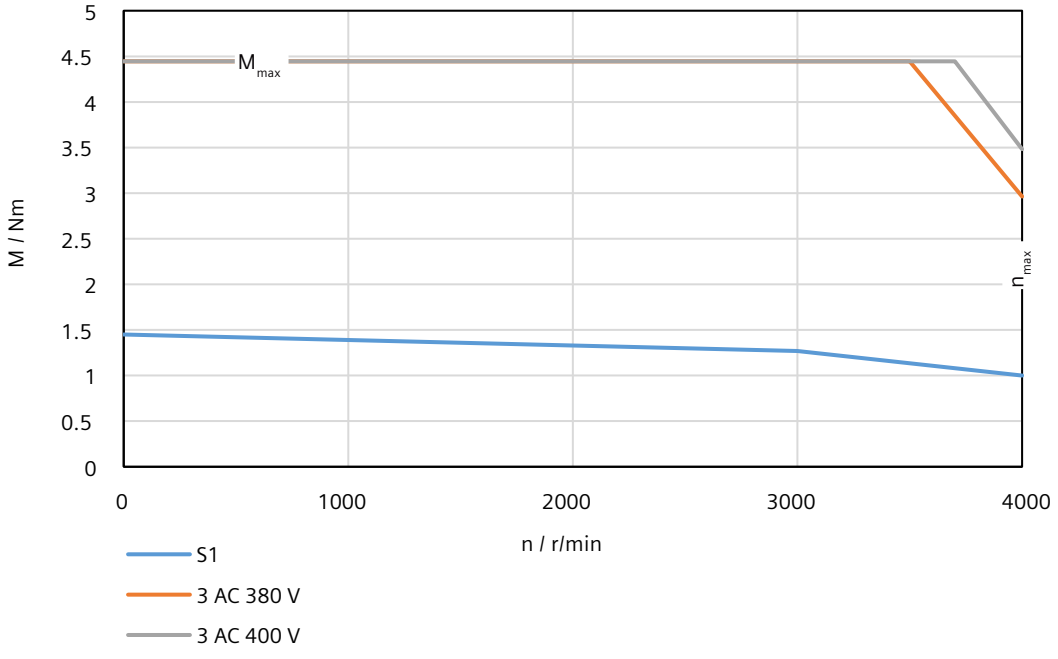


13.2.14.25 1FL2304-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-52 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)	$J_{mot\ br}$	$kgcm^2$	3.05
Recommended load to motor inertia ratio	-	-	Maximum 10x
Weight	m_{mot}	kg	3.5
Weight (with brake)	$m_{mot\ br}$	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

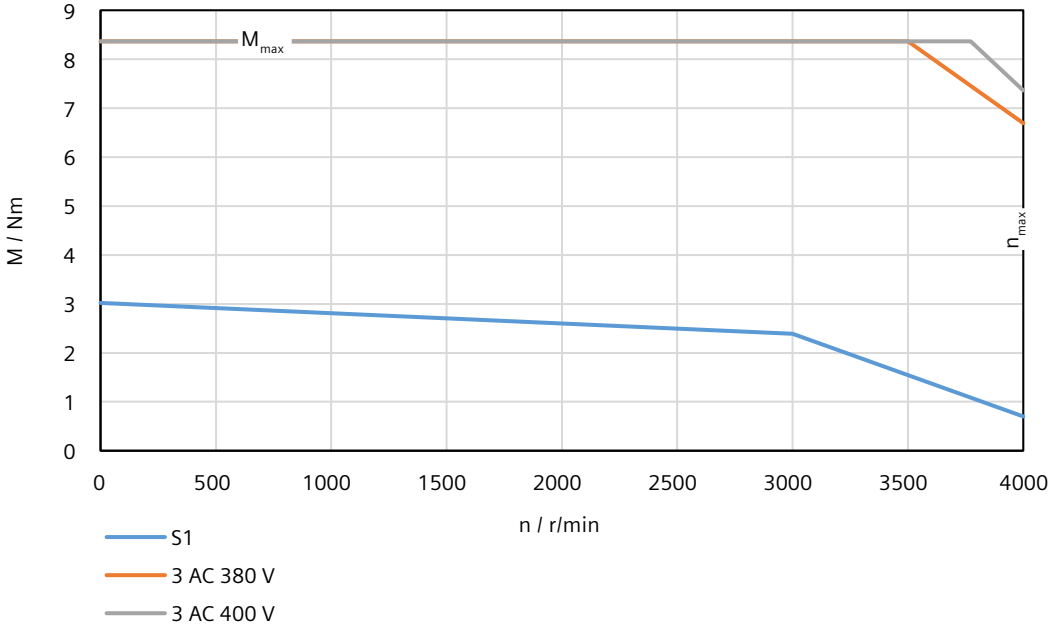


13.2.14.26 1FL2304-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-53 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

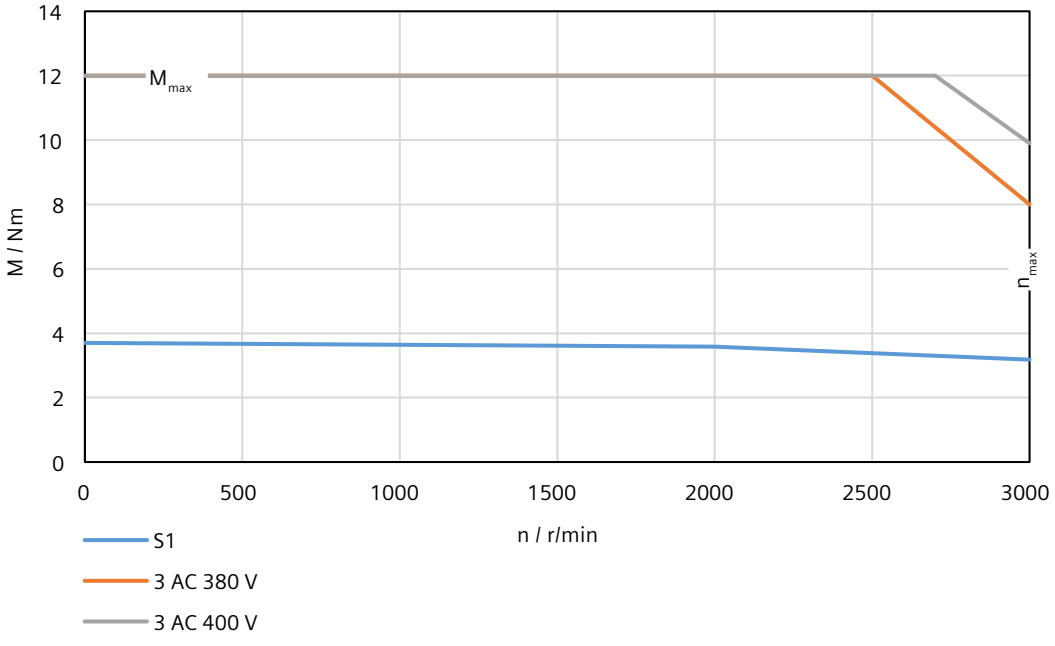


13.2.14.27 1FL2306-1AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-54 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)	$J_{mot\ br}$	$kgcm^2$	9.57
Recommended load to motor inertia ratio	-	-	Maximum 10x
Weight	m_{mot}	kg	5.9
Weight (with brake)	$m_{mot\ br}$	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

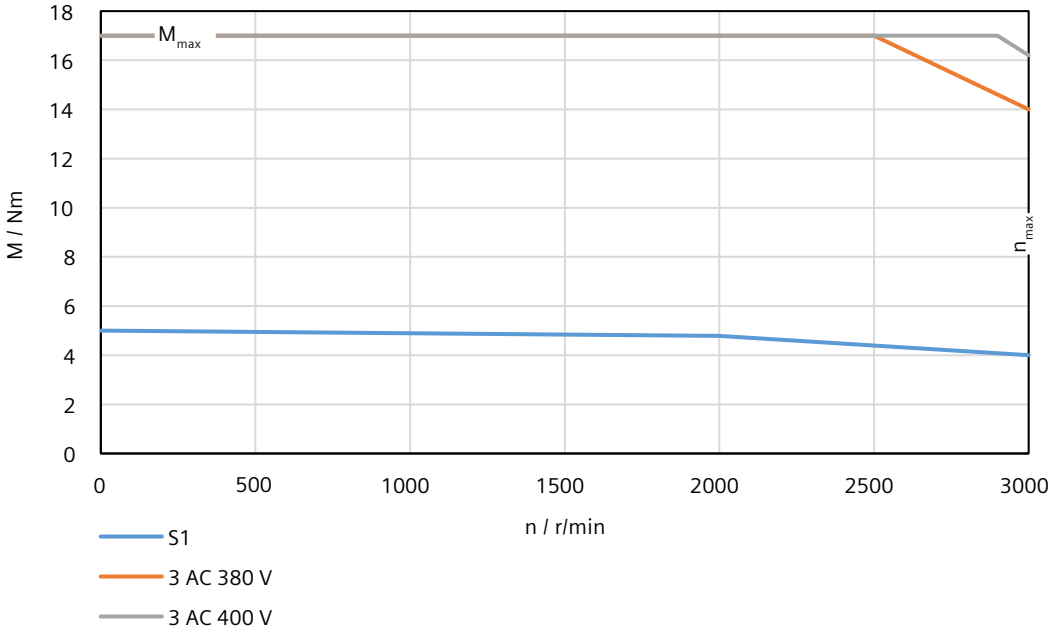


13.2.14.28 1FL2306-2AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-55 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

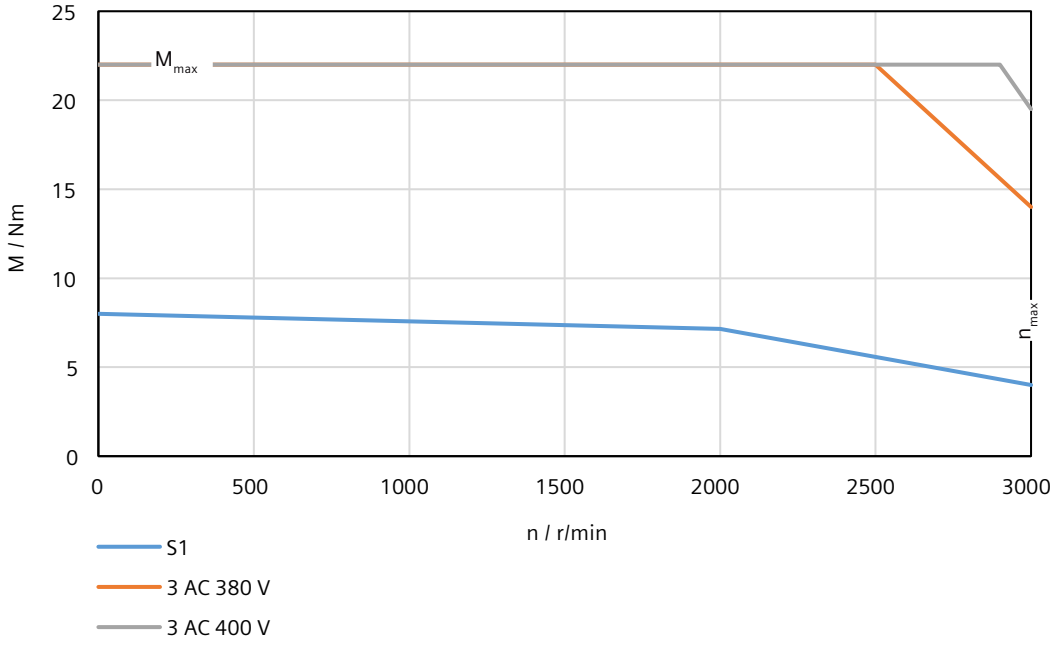


13.2.14.29 1FL2306-4AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-56 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)	$J_{mot\ br}$	$kgcm^2$	16.90
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	8.6
Weight (with brake)	$m_{mot\ br}$	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

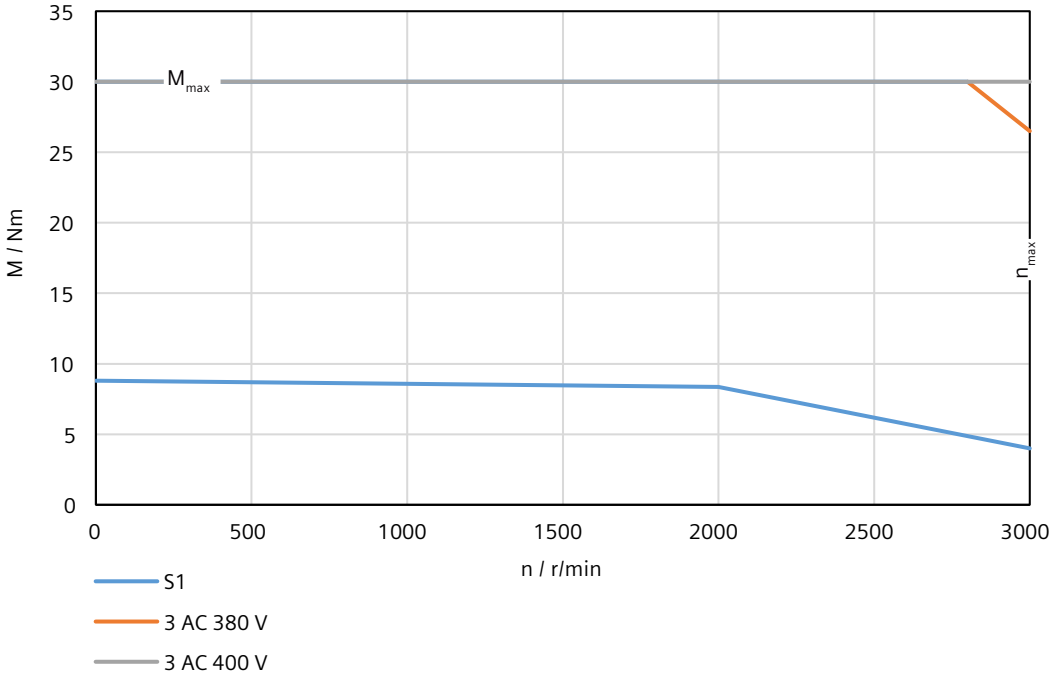


13.2.14.30 1FL2306-6AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-57 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

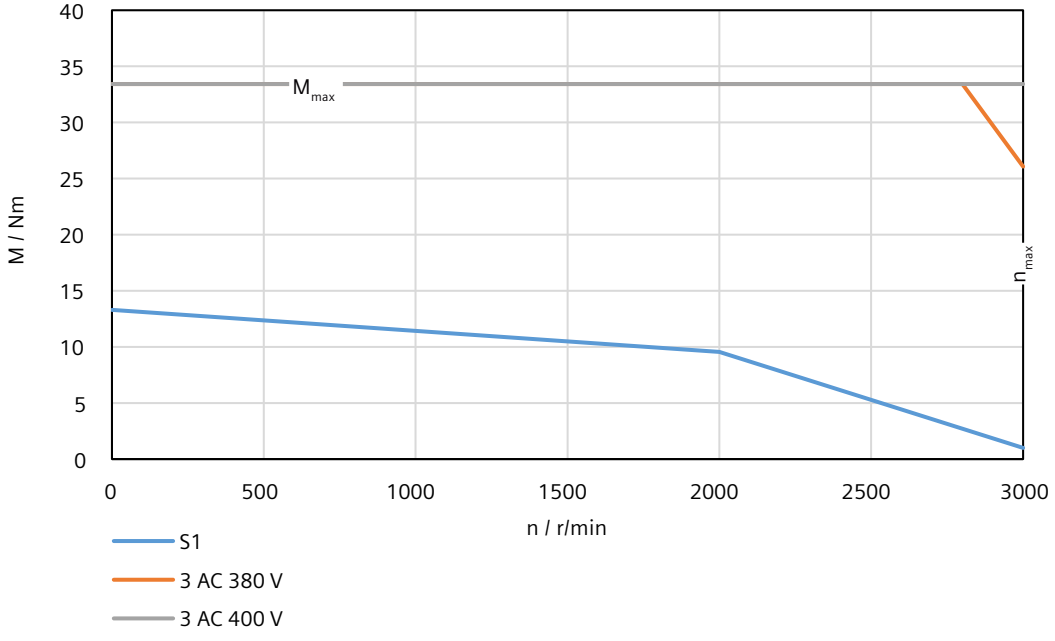


13.2.14.31 1FL2306-7AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-58 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}	kgcm²	29.94
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	31.55
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	13.7
Weight (with brake)	$m_{mot\ br}$	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

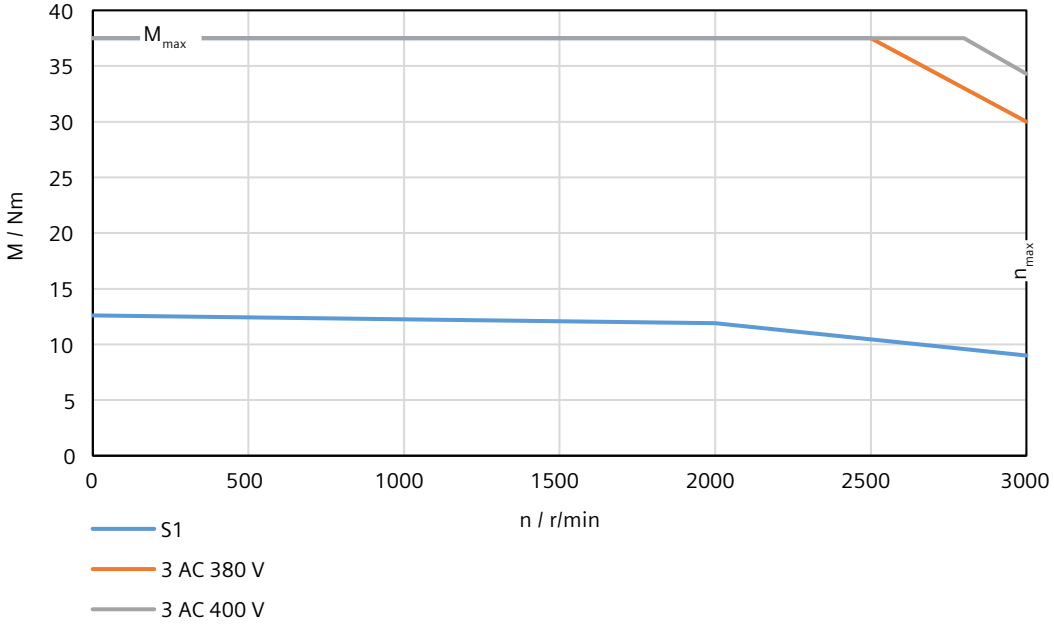


13.2.14.32 1FL2310-0AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-59 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}	kgcm²	47.41
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	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

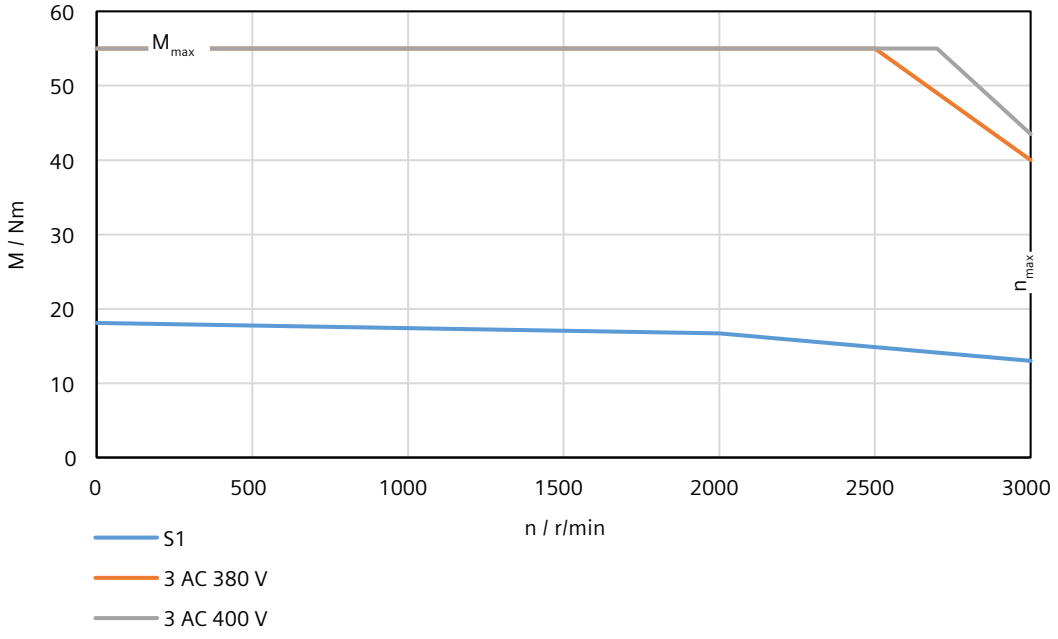


13.2.14.33 1FL2310-2AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-60 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)	$J_{mot\ br}$	$kgcm^2$	78.47
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	19.4
Weight (with brake)	$m_{mot\ br}$	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

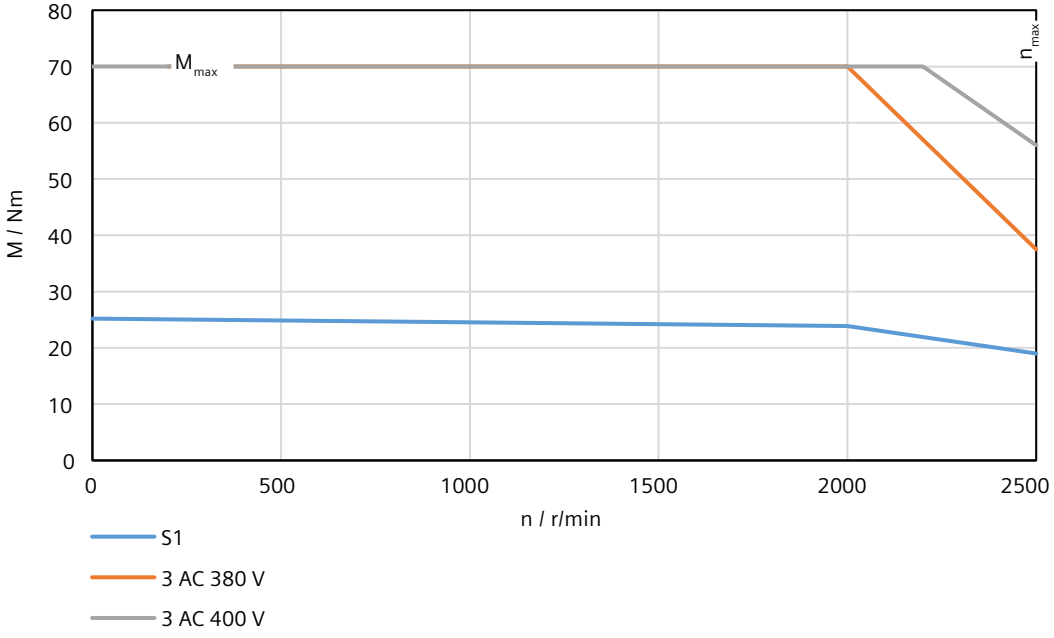


13.2.14.34 1FL2310-4AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-61 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

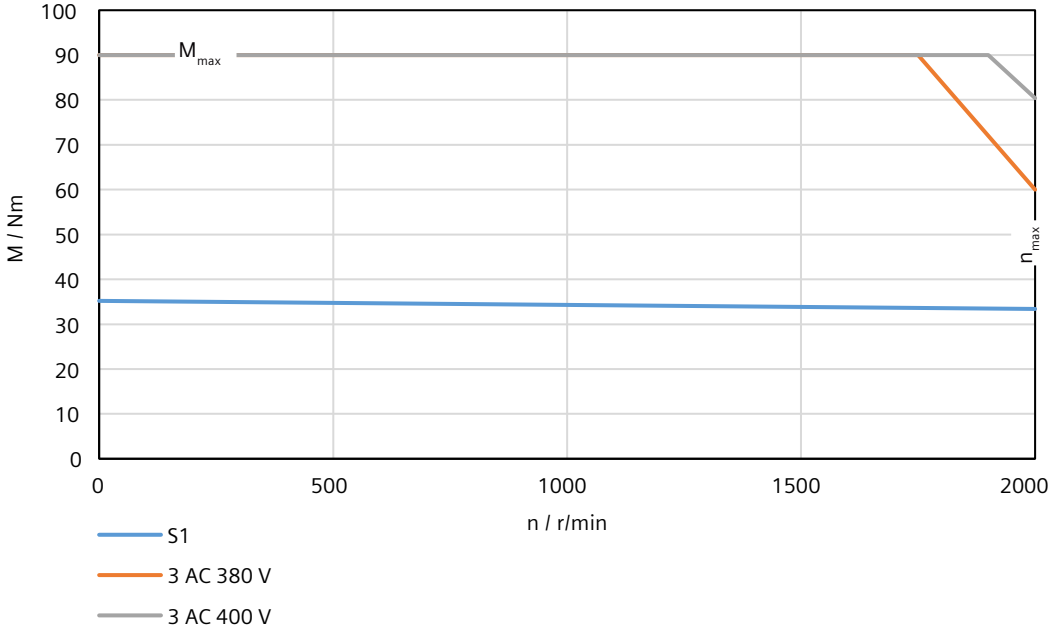


13.2.14.35 1FL2310-6AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 13-62 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}	kgcm²	134.29
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	143.66
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	31.9
Weight (with brake)	$m_{mot\ br}$	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



13.3 Technical data of MOTION-CONNECT cables

13.3.1 Technical data of MOTION-CONNECT 350

13.3.1.1 General technical data

Technical data

Table 13-63 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	• 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)	• 200 V converters: 300/1000 • 400 V converters: 600/1000	30/300	30/300

13.3.1.2 Specific technical data

Technical data

Table 13-64 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)	• With brake conductors: 4 x 0.75 + 2 x 0.38 (4 × 18 AWG + 2 × 22 AWG) • Without brake conductors: 4 x 0.75 (4 × 18 AWG)	• Cable length up to 15 m: 3 x 2 x 0.25 (3 × 2 × 24 AWG) • Cable length 20 m or 30 m: 2 x 2 x 0.25 + 2 x 0.38 (2 × 2 × 24 AWG + 2 × 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 13-65 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)	• 1FL2 0.4 kW ... 2 kW: 4 x 0.75 (4 × 18 AWG) • 1FL2 2.5 kW: 4 x 1.5 (4 × 16 AWG) • 1FL2 3.5 kW ... 7 kW: 4 x 2.5 (4 × 14 AWG)	• Cable length up to 15 m: 3 x 2 x 0.25 (3 × 2 × 24 AWG) • Cable length 20 m or 30 m: 2 x 2 x 0.25 + 2 x 0.38 (2 × 2 × 24 AWG + 2 × 22 AWG)	2 x 0.75 (2 × 18 AWG)
Outer diameter (mm)	• 1FL2 0.4 kW ... 2 kW: ø (7.5 ± 0.2) • 1FL2 2.5 kW: ø (7.8 ± 0.3) • 1FL2 3.5 kW ... 7 kW: ø (9 ± 0.3)	ø (7 ± 0.2)	ø (6 ± 0.2)
Minimum bending radius, static (mm)	4 x outer diameter	4 x outer diameter	4 x outer diameter

Property	MOTION-CONNECT 350 power cable	MOTION-CONNECT 350 encoder cable	MOTION-CONNECT 350 brake cable
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)	• 1FL2 0.4 kW ... 2 kW: 40 • 1FL2 2.5 kW: 50 • 1FL2 3.5 kW ... 7 kW: 50	40	50

13.3.2 Technical data of MOTION-CONNECT 380

13.3.2.1 General technical data

Technical data

Table 13-66 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	• 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	5 million	5 million	5 million
Rated voltage U_0/U (V)	• 200 V converters: 300/1000 • 400 V converters: 600/1000	30/300	30/300

13.3.2.2 Specific technical data

Technical data

Table 13-67 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)	• With brake conductors: 4 x 0.75 + 2 x 0.38 (4 × 18 AWG + 2 × 22 AWG) • Without brake conductors: 4 x 0.75 (4 × 18 AWG)	• Cable length up to 15 m: 3 x 2 x 0.25 (3 × 2 × 24 AWG) • Cable length 20 m or 30 m: 2 x 2 x 0.25 + 2 x 0.38 (2 × 2 × 24 AWG + 2 × 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	-

Table 13-68 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)	• 1FL2 0.4 kW ... 2 kW: 4 x 0.75 (4 × 18 AWG) • 1FL2 2.5 kW: 4 x 1.5 (4 × 16 AWG) • 1FL2 3.5 kW ... 7 kW: 4 x 2.5 (4 × 14 AWG)	• Cable length up to 15 m: 3 x 2 x 0.25 (3 × 2 × 24 AWG) • Cable length 20 m or 30 m: 2 x 2 x 0.25 + 2 x 0.38 (2 × 2 × 24 AWG + 2 × 22 AWG)	2 x 0.75 (2 × 18 AWG)
Outer diameter (mm)	• 1FL2 0.4 kW ... 2 kW: ø (7.5 ± 0.2) • 1FL2 2.5 kW: ø (9 ± 0.3) • 1FL2 3.5 kW ... 7 kW: ø (10.5 ± 0.3)	ø (7 ± 0.2)	ø (6 ± 0.3)
Minimum bending radius, static (mm)	4 x outer diameter	4 x outer diameter	4 x outer diameter

Property	MOTION-CONNECT 380 power cable	MOTION-CONNECT 380 encoder cable	MOTION-CONNECT 380 brake cable
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

Examples/applications

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Description

You can find SINAMICS application examples in the Application examples (https://support.industry.siemens.com/cs/ww/en/view/60733299).

Appendix

A

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 "Cooling (Page 520)".

MOTION-CONNECT connection system

The recommended assignment of motors and cables can be found in Section "Device combinations (Page 52)".

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 573)".

A.2 EMERGENCY OFF and EMERGENCY STOP

Overview

In plants, systems and machines a distinction must be made between "EMERGENCY OFF" and "EMERGENCY STOP".

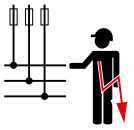
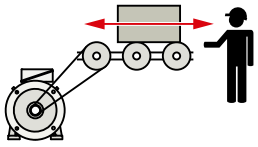
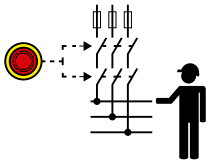
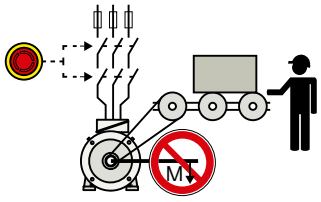
The Safe Torque Off (STO) Safety Integrated function is suitable for implementing an "EMERGENCY STOP" but is not suitable for implementing an "EMERGENCY OFF".

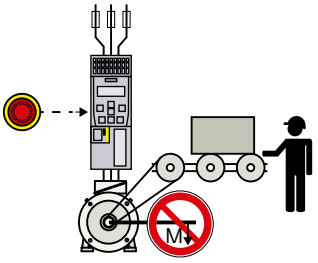
Description of function

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** **Stop category 0 according to IEC 60204-1**
Risk:	 Electric shock	 Unexpected motion
Measure to minimize risk:	**Switch off voltage** Switch off hazardous voltages completely or in part	**Prevent movement** Prevent any hazardous movement
Classic solution:	Switch off the voltage: 	Switch off the power supply of the drive: 

Action:	**EMERGENCY OFF**	**EMERGENCY STOP**
		Stop category 0 according to IEC 60204-1
Solution with the STO Safety Integrated function integrated into the drive:	STO is not suitable for switching off an electrical voltage.	Select STO:  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

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	0 signal
00	Name of bit 0	Yes	No
01	Name of bit 1	Yes	No

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

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.

Data type

Each parameter is assigned one of the following data types:

• Integer8	I8	8-bit integer
• Integer16	I16	16-bit integer
• Integer32	I32	32-bit integer
• Unsigned8	U8	8-bit without sign
• Unsigned16	U16	16-bit without sign
• Unsigned32	U32	32-bit without sign
• FloatingPoint32	Float	32-bit floating-point number

Visible in

You change the number of parameters displayed in the commissioning tool via:

- Standard display
  Only the basic parameters are displayed.
- Extended display
  The full scope of parameters is displayed.

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 the commissioning tool
- Edit device configuration or drive applications
- Edit web server configuration
- Manage users and roles

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

Product: SINAMICS S200, Version: 603021000, Language: eng
Objects: S200 Basic PTI, S200 PTI

r0002 Drive operating display

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
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 ramp-function generator" = "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"
22:	Ready for operation - De-magnetizing running
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 - Supply STO terminal w/ 24 V (hardware)
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/partial 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
COM: Commissioning
MotID: Motor data identification

r0020 Speed setpoint smoothed

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Mode signals / displays
Unit: rpm

Description: Displays the currently smoothed speed setpoint at the input of the speed controller or U/f characteristic (after the interpolator).

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
Write permission: Edit device configuration or drive applications
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
Write permission: Edit device configuration or drive applications
Parameter group: Brake control, Mode signals / displays
Unit: V

Description: Displays the smoothed actual value of the DC link voltage.

Dependency: See also: r0070

NOTICE
This smoothed signal is not suitable for diagnostics or evaluation of dynamic operations. In this case, the unsmoothed value should be used.

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 DC link voltage is available smoothed (r0026) and unsmoothed (r0070).

r0027 Absolute actual current smoothed

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Mode signals / displays, Power unit
Unit: Arms

Description: Displays the smoothed absolute current actual value.

Dependency: See also: r0068

NOTICE
This smoothed signal is not suitable for diagnostics or evaluation of dynamic operations. In this case, the unsmoothed value should be used.

Note
A_INF, S_INF, VECTOR: Smoothing time constant = 300 ms
SERVO: Smoothing time constant = 100 ms
The signal is not suitable as a process quantity and may only be used as a display quantity.
The absolute current actual value is available smoothed (r0027) and unsmoothed (r0068).

r0031 Actual torque smoothed

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: Brake control, Mode signals / displays
Unit: Nm

Description: Displays the smoothed torque actual value.

Dependency: See also: r0080

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 torque actual value is available smoothed (r0031) and unsmoothed (r0080).

r0032 Active power actual value smoothed

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Mode signals / displays
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
Write permission: Edit device configuration or drive applications
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.

r0036[0...2] Power unit overload

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Mode signals / displays, 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
Write permission: Edit device configuration or drive applications
Parameter group: Mode signals / displays, Power unit
Unit: °C

Description: Display for the temperatures in the power unit.

Index: [0] = Inverter maximum value
[1] = Depletion layer maximum value
[2] = Rectifier maximum value
[3] = Air intake
[4] = Interior of power unit
[5] = Cooling unit liquid intake
[6] = Capacitor air discharge
[7] = Depletion layer maximum value 1
[8] = Depletion layer maximum value 2
[9] = Depletion layer maximum value 3
[10] = Depletion layer maximum value 4

Note
The value of -200 indicates that there is no measuring signal.
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
Write permission: Edit device configuration or drive applications
Parameter group: Mode signals / displays, Power loss optimization
Unit: kWh

Description: Display for the energy values at the drive output terminals.

Index: [0] = Energy balance (sum)
[1] = Energy drawn
[2] = Energy fed back

Note
For index [0]:
Difference between the energy drawn and energy that is fed back.

r0044 Thermal converter utilization

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Mode signals / displays, Power unit
Unit: %

Description: Displays the thermal converter utilization as a percentage.
With this value, various thermal monitoring functions are taken into account.

Dependency: See also: r0034

Note
The thermal motor utilization is displayed in parameter r0034.

r0046.0...30 Missing enable signals

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Control/status words, Drive enable signals
Unit: -

Description: Displays the missing enable signals. All enable signals are required to operate the drive. The enable signals are set by the control.

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
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 is active.
- A safety-relevant message with STO as response is active.
STO enabled via terminals:
- Pulse enable via the STO terminals has a 0 signal.
- Additional details relating to the reason that STO was selected, see parameter r10352.

Bit 10 = 1 (enable signal missing), if:
- "Enable ramp-function generator" from the PROFINET interface missing.

Bit 12 = 1 (enable signal missing), if:
- "Enable setpoint" from the PROFINET interface missing.

Bit 16 = 1 (enable signal missing), if:
- There is an OFF1 fault response. The system is only enabled if the fault is removed and was acknowledged and the "switching on inhibited" withdrawn with OFF1 = 0.

Bit 17 = 1 (enable signal missing), if:
- The commissioning mode is selected.
- There is an OFF2 fault response.
- The drive is inactive or not capable of operation.

Bit 18 = 1 (enable signal missing), if:
- OFF3 has still not been completed or an OFF3 fault response is present.

Bit 19 = 1 (internal pulse enable missing), if:
- Synchronization still not completed.

Bit 21 = 1 (enable signal missing), if:
The pulses have been enabled and the speed setpoint has still not been enabled, because:
- The holding brake opening time has still not elapsed.
- The encoder has not been calibrated (synchronous motor).

Bit 26 = 1 (enable signal missing), if:
- The drive is inactive or not capable of operation.
- The drive device is in the "PROFIenergy energy-saving mode".

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 one of the following applies:
- Pulse enable missing

- The function generator with current input is active.
- The measuring function "current controller reference frequency characteristic" is active.
- The pole position identification is active.
- Motor data identification is active (only certain steps).

r0061[0...1] Actual speed unsmoothed

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Motor encoder, Mode signals / displays
Unit: rpm

Description: Displays the unsmoothed speed actual values sensed by the encoders.
Index: [0] = Motor encoder
[1] = Encoder 2

r0062 Speed setpoint after the filter

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: U/f control, Speed controller, Mode signals / displays, Speed setpoint filter
Unit: rpm

Description: Display and numerical signal source for the speed setpoint after the setpoint filters.

r0063 Speed actual value smoothed

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: U/f control, 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
Write permission: Edit device configuration or drive applications
Parameter group: Mode signals / displays
Unit: Arms

Description: Displays actual absolute current.
Dependency: See also: r0027

NOTICE
For A_INF, S_INF the following applies:
The value is updated with the current controller sampling time.
The following applies for SERVO:
The value is updated with a sampling time of 1 ms.

Note
Absolute current value = sqrt(Iq^2 + Id^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
Write permission: Edit device configuration or drive applications
Parameter group: Vdc-min/max controller, Mode signals / displays, Power unit, Vdc controller
Unit: V

Description: Display and numerical signal source 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
Write permission: Edit device configuration or drive applications
Parameter group: U/f control, 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
Write permission: Edit device configuration or drive applications
Parameter group: U/f control, Current controller, Mode signals / displays
Unit: Arms

Description: Display for the field-generating current actual value.

r0077 Current setpoint torque-generating

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: Current controller, Mode signals / displays
Unit: Arms

Description: Display and numerical signal source for the torque/force-generating current setpoint.

Note
This value is irrelevant for the U/f control mode.

r0078[0...1] Current actual value torque-generating

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Mode signals / displays
Unit: Arms

Description: 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
Write permission: Edit device configuration or drive applications
Parameter group: Torque limiting, Mode signals / displays
Unit: Nm

Description: Display for 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
Write permission: Edit device configuration or drive applications
Parameter group: Motor model, Mode signals / displays
Unit: Nm

Description: Display and numerical signal source for the torque actual 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
Write permission: Edit device configuration or drive applications
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
Write permission: Edit device configuration or drive applications
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

r0196[0...255].0...15 Topology component status

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: 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	
Can be changed in the operating state:	Commissioning	
Parameter group:	Power unit	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	65535	0

Description: Sets the actual code number of the power unit being used.

p0210 Device supply voltage

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Power unit, Quick commissioning	
Unit: V		
Min:	**Max:**	**Factory setting:**
1 [V]	63000 [V]	400 [V]

Description: Sets the device supply voltage.
The voltage between two phases should be entered as the device supply voltage.
This setting is important for operating with voltages that are less than the voltage range for which the drive is designed.

Note
Setting ranges for p0210 as a function of the rated power unit voltage:
U_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	
Can be changed in the operating state:	Commissioning	
Parameter group:	Dynamic braking, Quick commissioning	
Unit: -		
Min:	**Max:**	**Factory setting:**
3	10	10

Description: Sets the external braking resistor.

Value:
3: Third-party braking resistor (with 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.
The internal braking resistor 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	
Can be changed in the operating state:	Commissioning	
Parameter group:	Dynamic braking, Quick commissioning	
Unit: ohm		
Min:	**Max:**	**Factory setting:**
0.0 [ohm]	1000.0 [ohm]	0.0 [ohm]

Description: Sets the resistance value of a connected external braking resistor.
Dependency: The parameter is only relevant for p0215 = 2, 3.

p0218 Braking resistor maximum power duration

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Dynamic braking, Quick commissioning	
Unit: s		
Min:	**Max:**	**Factory setting:**
0.00 [s]	2000.00 [s]	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 = 2, 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	
Can be changed in the 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] Power unit heat sink fan wear counter

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:	Power unit	
Unit: %		

Description: Displays the wear counter of the heat sink fan in the power unit.
After a fan has been replaced, using an appropriate button, the value can be reset in the commissioning tool to 0.

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	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Power unit	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Sets the response to a thermal overload condition of the power unit.

The following quantities can result in a response to thermal overload:

- Heat sink temperature (r0037[0]).
- Chip temperature (r0037[1]).
- Power unit overload I2t (r0036).

Possible measures to avoid thermal overload:

- Reduce the output current limit r0289 and r0067 (for closed-loop speed/velocity or torque/force control) or the output frequency (for U/f control indirectly via the output current limit and the intervention of the current limiting controller).
- Reduce the pulse frequency.

A reduction, if parameterized, is always realized after an appropriate alarm is output.

For p0290 = 0:

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.

This setting is not suitable for drives requiring a constant torque.

Application:

pumps, fans

For p0290 = 1:

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.

Application:

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.

For p0290 = 2:

The pulse frequency is reduced to a permissible minimum when a temperature alarm threshold is exceeded. If the pulse frequency reduction is not sufficient to thermally relieve the power unit, then the output current is also reduced.

Application:

Drives with a low dynamic performance and occasional overload where speed deviations are permissible.

For p0290 = 3:

Only the pulse frequency is reduced to a permissible minimum when a temperature alarm threshold is exceeded.

Application:

Drives with a low dynamic performance and occasional overload where a speed deviation is not permissible.

For p0290 = 10:

For Booksize devices, in addition to the heat sink and chip temperatures, the difference between the two temperatures is monitored as an additional variable. When a temperature threshold is exceeded, the output current is reduced - and in turn, the output frequency.

This overload response is activated as default setting for Booksize devices with a pulse frequency higher than or equal to 16 kHz.

For p0290 = 12:

In this particular case, the chip temperature is evaluated based on the actual load. If the temperature exceeds this alarm threshold, then the pulse frequency is reduced to a permissible minimum. The output current is only reduced if the actual chip temperature increases above a certain temperature threshold.

Application:

Drives that are frequently started and accelerated - and which manifest a significantly fluctuating torque profile (e.g. centrifuges, flywheel presses, cranes).

For p0290 = 13:

In this particular case, the chip temperature is evaluated based on the actual load. If the temperature exceeds this alarm threshold, then the pulse frequency is reduced to a permissible minimum.

Application:

Drives that are frequently started and accelerated - and which manifest a significantly fluctuating torque profile, and where the output current is not to be reduced (e.g. centrifuges, flywheel presses, cranes).

Value:

0: Reduce output current

1: No reduction shutdown when overload threshold is reached

Dependency: For a thermal power unit overload, an appropriate alarm or fault is output and r2135.15 or r2135.13 set.
Settings, where the pulse frequency is reduced, are not possible if the "Extended torque control" function module (r0108.1) is activated.
For p0290 = 2, 3:
These responses are only applicable for blocksize power units.
For p0290 = 10:
This response is only applicable for booksize power units.
See also: r0036, r0037

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.

Note
Under overload conditions, the current and torque limit are reduced, and therefore the motor is braked and forbidden speed ranges (e.g. minimum speed p1080 and suppression [skip] speeds p1091 ... p1094) can be passed through.
When the motor data identification routine is selected, parameter p0290 cannot be changed.
For p0290 = 0, 2, 12:
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).
For p0290 = 2, 3, 12, 13:
The I2t overload detection of the power unit does not influence the response "Reduce pulse frequency".
For p0290 = 10, 12, 13:
The possible load duty cycles, calculated based on the previous model (p0290 = 0, 1, 2, 3) for booksize power units cannot be transferred in every case. This is the reason that we recommend that you contact our application support department if you are uncertain about dimensioning the device.

r0296 DC link voltage undervoltage threshold

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Power unit
Unit: V

Description: Threshold to detect a DC link undervoltage.
If the DC link voltage falls below this threshold, the drive unit is tripped due to a DC link undervoltage condition.

Dependency: See also: F30003

Note
The actual threshold value depends on the device type and the selected device supply voltage (p0210).

r0297 DC link voltage overvoltage threshold

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: 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
Can be changed in the operating state: Commissioning
Parameter group: Motor data, Quick commissioning
Unit: -

Min:	Max:	Factory setting:
0	10000	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

Value:
0: No motor
2: Synchronous motor
2120: 1FL2 synchronous motor
10000: Motor with data set

Dependency: See also: p0301

p0301[0] Motor code number selection

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Motor data, Quick commissioning
Unit: -

Min:	Max:	Factory setting:
0	99999999	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
Write permission: Edit device configuration or drive applications
Parameter group: Motor data, Quick commissioning
Unit: -

Description: Displays the identified motor code number.
When the drive powers up, the motor code is read out the motor. For r0302 = 0, the motor data were not identified.

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
Can be changed in the 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
Can be changed in the 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
Can be changed in the 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
Can be changed in the 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
Can be changed in the operating state: Commissioning
Parameter group: Motor data
Unit: Nm

Min:	Max:	Factory setting:
0.00 [Nm]	1000000.00 [Nm]	0.00 [Nm]

Description: Displays the rated motor torque.

r0316[0] Motor torque constant

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Motor data, Quick commissioning
Unit: Nm/A

Description: Sets the torque constant of the synchronous motor.
r0316 = 0:
The torque constant is calculated from the motor data.
r0316 > 0:
The selected value is used as torque constant.

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
Can be changed in the operating state: Commissioning
Parameter group: Motor data
Unit: Arms

Min:	Max:	Factory setting:
0.00 [Arms]	10000.00 [Arms]	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
Can be changed in the operating state: Commissioning
Parameter group: Motor data
Unit: Nm

Min:	Max:	Factory setting:
0.00 [Nm]	100000.00 [Nm]	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
Can be changed in the 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 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
Can be changed in the operating state: Commissioning
Parameter group: Motor data, Quick commissioning
Unit: Arms

Min:	Max:	Factory setting:
0.00 [Arms]	20000.00 [Arms]	0.00 [Arms]

Description: Displays the maximum permissible motor current.

r0341[0] Motor 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
Parameter group: Motor data, Speed controller
Unit: kgm²

Description: Displays the motor moment of inertia (without load).

p0400[0] 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
Can be changed in the operating state: Commissioning
Parameter group: Motor encoder, Quick commissioning
Unit: -

Min:	Max:	Factory setting:
0	10100	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].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
Can be changed in the operating state: Commissioning
Parameter group: Motor encoder
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
03	Track A/B square-wave	Yes	No
07	Digital Encoder Interface	Yes	No
20	Voltage level 5 V	Yes	No

NOTICE

This parameter is automatically pre-assigned for encoders from the encoder list and for identify encoder (p0400).
When selecting a catalog encoder, this parameter cannot be changed (write protection). Information in p0400 should be carefully observed when removing write protection.

Note

For bit 01, 02 (absolute encoder, multiturn encoder):
These bits can only be selected for a DEI encoder.

p0405[0].1...6 Square-wave encoder track A/B

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Motor encoder
Unit: -

Min:	Max:	Factory setting:
-	-	0000 1111 bin

Description: Settings for the track A/B in a square-wave encoder.
For square-wave encoders, p0404.3 must also be 1.

Bit array:

Bit	Signal name	1 signal	0 signal
01	Level	TTL	HTL
02	Track monitoring	A/B <> -A/B	None
05	Pulse/direction	Active	Inactive
06	Clockwise/counterclockwise	Active	Inactive

NOTICE

This parameter is automatically pre-assigned for encoders from the encoder list and for identify encoder (p0400). When selecting a catalog encoder, this parameter cannot be changed (write protection). Information in p0400 should be carefully observed when removing write protection.

Note

For bit 05:

When the function is activated, a frequency setpoint and a direction for traveling can be specified via an encoder interface.

For bit 06:

When the function is activated, a clockwise and counterclockwise signal (CW/CCW) for traveling can be specified via an encoder interface.

p0408[0] 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

Can be changed in the operating state: Commissioning

Parameter group: Motor encoder

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 pre-assigned for encoders from the encoder list and for identify encoder (p0400). When selecting a catalog encoder, this parameter cannot be changed (write protection).

Note

The smallest permissible value is 1 pulse.

This value does not always correspond to the pulse number of the measuring device. For a DEI encoder, a value is entered here that facilitates optimum transfer of the resolution (p0423).

p0410[0].0...1 Encoder/PTI inversion actual value

Data type: Unsigned16 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Commissioning

Parameter group: Motor encoder

Unit: -

Min:	Max:	Factory setting:
-	-	0000 bin

Description: Setting to invert actual values.

Bit array:

Bit	Signal name	1 signal	0 signal

00	Invert speed actual value	Yes	No
01	Invert position actual value	Yes	No

Note
The inversion influences the following parameters:
Bit 00: r0061, r0063 (exception: encoderless control), r0094
Bit 01: r0482, r0483

p0421[0] 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
Can be changed in the operating state: Commissioning
Parameter group: Motor encoder
Unit: -

Min:	Max:	Factory setting:
0	4294967295	4096

Description: Sets the number of revolutions that can be resolved for a rotary absolute encoder.

NOTICE
This parameter is automatically pre-assigned for encoders from the encoder list and for identify encoder (p0400). When selecting a catalog encoder, this parameter cannot be changed (write protection). Information in p0400 should be carefully observed when removing write protection.

p0423[0] 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
Can be changed in the operating state: Commissioning
Parameter group: Motor encoder
Unit: -

Min:	Max:	Factory setting:
0	1073741823	8192

Description: Sets the number of measuring steps per revolution for a rotary absolute encoder.
The resolution refers to the absolute position.

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). Information in p0400 should be carefully observed when removing write protection.

p0438[0] PTI evaluation filter time

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Motor encoder
Unit: µs

Min:	Max:	Factory setting:
0.00 [µs]	100.00 [µs]	0.64 [µs]

Description: Sets the filter time for a square-wave encoder.

NOTICE
If the filter time is too long, the PTI signals A/B may be suppressed.

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
Write permission: Edit device configuration or drive applications
Parameter group: Motor encoder
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] = Encoder 2
[2] = Reserved

p0488[0...2] Measuring probe 1 input terminal

S200 PTI

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Measuring probe, Traversing blocks
Unit: -

Min:	Max:	Factory setting:
0	210	0

Description: Sets the input terminal to connect probe 1.

Value: 0: No measuring probe
210: DI 0 (X132.5)

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
If parameterization is rejected, check whether the terminal is already being used in p2517 or p2518.

p0489[0...2] Measuring probe 2 input terminal

S200 PTI

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Measuring probe, Traversing blocks
Unit: -

Min:	Max:	Factory setting:
0	211	0

Description: Sets the input terminal to connect probe 2.

Value:
0: No measuring probe
211: DI 1 (X132.6)

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
If parameterization is rejected, check whether the terminal is already being used in p2517 or p2518.

p0490.0...1 Invert measuring probe or equivalent zero mark

S200 PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
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 array:

Bit	Signal name	1 signal	0 signal
00	DI 0 (X132.5)	Inverted	Not inverted
01	DI 1 (X132.6)	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] Equivalent zero mark input terminal

S200 PTI

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Motor encoder, 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 (X132.5)
211: DI 1 (X132.6)

Dependency: See also: p0490

⚠ CAUTION
In order to prevent incorrect measurement values, these parameters may not be written during an active measurement.

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
Can be changed in the 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
Can be changed in the 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] Mot_temp_mod 1/3 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
Can be changed in the operating state: Operation
Parameter group: Motor temperature
Unit: °C

Min:	Max:	Factory setting:
-40 [°C]	100 [°C]	20 [°C]

Description: 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.

Dependency: 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.

r0721.2...7 CU digital inputs terminal actual value

S200 Basic PTI

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: 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	0 signal
02	DI 2 (X132.7)	High	Low
03	DI 3 (X132.8)	High	Low
04	DI 4 (X132.9)	High	Low
05	DI 5 (X132.10)	High	Low
06	DI 6 (X132.11)	High	Low
07	DI 7 (X132.12)	High	Low

Note
DI: Digital Input

r0721.0...9 CU digital inputs terminal actual value

S200 PTI

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: 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	0 signal

00	DI 0 (X132.5)	High	Low
01	DI 1 (X132.5)	High	Low
02	DI 2 (X132.7)	High	Low
03	DI 3 (X132.8)	High	Low
04	DI 4 (X132.9)	High	Low
05	DI 5 (X132.10)	High	Low
06	DI 6 (X132.11)	High	Low
07	DI 7 (X132.12)	High	Low
08	DI 8 (X132.13)	High	Low
09	DI 9 (X132.14)	High	Low

Note
DI: Digital Input

r0722.2...7 Digital inputs status

S200 Basic PTI

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: Digital inputs
Unit: -

Description: Display and signal source for the status of the digital inputs.

Bit array:

Bit	Signal name	1 signal	0 signal
02	DI 2 (X132.7)	High	Low
03	DI 3 (X132.8)	High	Low
04	DI 4 (X132.9)	High	Low
05	DI 5 (X132.10)	High	Low
06	DI 6 (X132.11)	High	Low
07	DI 7 (X132.12)	High	Low

Dependency: See also: p0488, p0489

Note
DI: Digital Input

r0722.0...9 Digital inputs status

S200 PTI

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: Digital inputs
Unit: -

Description: Display and signal source for the status of the digital inputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	DI 0 (X132.5)	High	Low
01	DI 1 (X132.6)	High	Low
02	DI 2 (X132.7)	High	Low
03	DI 3 (X132.8)	High	Low
04	DI 4 (X132.9)	High	Low
05	DI 5 (X132.10)	High	Low
06	DI 6 (X132.11)	High	Low
07	DI 7 (X132.12)	High	Low
08	DI 8 (X132.13)	High	Low

	09 DI 9 (X132.14)	High	Low

Dependency: See also: p0488, p0489

Note
DI: Digital Input
For bits 00, 01: DI 0 and DI 1 are fast digital inputs and can be used as measuring probe (p0488, p0489).

c0730 Signal for terminal DO 0

S200 PTI

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: Relay outputs, Digital outputs
Unit: -

Description: Signal for terminal DO 0 (X132.30).

Note
DO: Digital Output

c0731 Signal for terminal DO 1

S200 PTI

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: Relay outputs, Digital outputs
Unit: -

Description: Signal for terminal DO 1 (X132.31).

Note
DO: Digital Output

c0732 Signal for terminal DO 2

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: Relay outputs
Unit: -

Description: Signal for terminal DO 2 (X132.32).

Note
DO: Digital Output

c0733 CU signal for terminal DO 3

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:
Unit: -

Description: Signal for terminal DO3 (DO+: X132.29 / DO-: X132.33).

Note
DO: Digital Output

c0734 CU signal for terminal DO 4

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:
Unit: -

Description: Signal for terminal DO 4 (DO+: X132.34 / DO-: X132.44).

Note
DO: Digital Output

c0735 CU signal for terminal DO 5

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:
Unit: -

Description: Signal for terminal DO 5 (DO+: X132.35 / DO-: X132.49).

Note
DO: Digital Output

r0747.2...5 Digital outputs status

S200 Basic PTI

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: Relay outputs, Digital outputs
Unit: -

Description: Displays the status of digital outputs.

Bit array:

Bit	Signal name	1 signal	0 signal
02	DO 2 (X132.32)	High	Low
03	DO 3 (DO+: X132.29 / DO-: X132.33)	High	Low
04	DO 4 (DO+: X132.34 / DO-: X132.44)	High	Low
05	DO 5 (DO+: X132.35 / DO-: X132.49)	High	Low

Note
DO: Digital Output

r0747.0...5 Digital outputs status

S200 PTI

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: Relay outputs, Digital outputs
Unit: -

Description: Displays the status of digital outputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	DO 0 (X132.30)	High	Low
01	DO 1 (X132.31)	High	Low
02	DO 2 (X132.32)	High	Low
03	DO 3 (DO+: X132.29 / DO-: X132.33)	High	Low
04	DO 4 (DO+: X132.34 / DO-: X132.44)	High	Low

05	DO 5 (DO+: X132.35 / DO-: X132.49)	High	Low

Note
DO: Digital Output

p0748.2...5 Digitalausgänge invertieren

S200 Basic PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Relay outputs, Digital outputs
Unit: -

Min:	Max:	Factory setting:
-	-	0000 0000 bin

Description: Einstellung zur Invertierung der Signale an den Digitalausgängen.

Bit array:

Bit	Signal name	1 signal	0 signal
02	DO 2 (X132.32)	Invertiert	Nicht invertiert
03	DO 3 (DO+: X132.29 / DO-: X132.33)	Invertiert	Nicht invertiert
04	DO 4 (DO+: X132.34 / DO-: X132.44)	Invertiert	Nicht invertiert
05	DO 5 (DO+: X132.35 / DO-: X132.49)	Invertiert	Nicht invertiert

Note
DO: Digital Output (Digitalausgang)

p0748.0...5 Digitalausgänge invertieren

S200 PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Relay outputs, Digital outputs
Unit: -

Min:	Max:	Factory setting:
-	-	0000 0000 bin

Description: Einstellung zur Invertierung der Signale an den Digitalausgängen.

Bit array:

Bit	Signal name	1 signal	0 signal
00	DO 0 (X132.30)	Invertiert	Nicht invertiert
01	DO 1 (X132.31)	Invertiert	Nicht invertiert
02	DO 2 (X132.32)	Invertiert	Nicht invertiert
03	DO 3 (DO+: X132.29 / DO-: X132.33)	Invertiert	Nicht invertiert
04	DO 4 (DO+: X132.34 / DO-: X132.44)	Invertiert	Nicht invertiert
05	DO 5 (DO+: X132.35 / DO-: X132.49)	Invertiert	Nicht invertiert

Note
DO: Digital Output (Digitalausgang)

r0751.0...9 Analog inputs status word

S200 PTI

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: Analog inputs
Unit: -

Description: Display and binary signal source for the status of the analog inputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Analog input AI0 wire breakage	Yes	No
01	Analog input AI1 wire breakage	Yes	No
08	Analog input AI0 no wire breakage	Yes	No
09	Analog input AI1 no wire breakage	Yes	No

Note
AI: Analog Input

r0752[0...1] Analog inputs actual input voltage/current

S200 PTI

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: Analog inputs
Unit: -

Description: Displays the actual input voltage in V when set as voltage input.
Displays the actual input current in mA when set as current input and with the load resistor switched in.

Index: [0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Dependency: The type of analog input AIx (voltage or current input) is set using p0756.
See also: p0756

Note
AI: Analog Input

p0753[0...1] Analog inputs smoothing time constant

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog inputs
Unit: ms

Min:	Max:	Factory setting:
0.0 [ms]	1000.0 [ms]	0.0 [ms]

Description: Sets the smoothing time constant of the 1st order lowpass filter for the analog inputs.

Index: [0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Note
AI: Analog Input

r0755[0...1] Analog inputs, actual value in percent

S200 PTI

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: Analog inputs
Unit: %

Description: Displays the currently referred input value of the analog inputs.
When interconnected, the signals are referred to the reference quantities p200x and p205x.

Index: [0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Note
AI: Analog Input

p0756[0...1] Analog inputs type

S200 PTI

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog inputs
Unit: -

Min:	Max:	Factory setting:
0	4	[0] 4 [1] 4

Description: Sets the type of analog inputs.
p0756[0...1] = 0, 1, 4 corresponds to a voltage input (r0752, p0757, p0759 are displayed in V).

Value:
0: Unipolar voltage input (0 V ... +10 V)
1: Unipolar voltage input monitored (+2 V ... +10 V)
4: Bipolar voltage input (-10 V ... +10 V)

Index: [0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

⚠ WARNING
The maximum voltage difference between analog input terminals AI+, AI-, and the ground must not exceed 35 V.

Note
When changing p0756, the parameters of the scaling characteristic (p0757, p0758, p0759, p0760) are overwritten with the following default values:
For p0756 = 0, 4, p0757 is set to 0.0 V, p0758 = 0.0 %, p0759 = 10.0 V and p0760 = 100.0 %.

p0757[0...1] Analog inputs characteristic value x1

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog inputs
Unit: -

Min:	Max:	Factory setting:
-50.000	160.000	0.000

Description: Sets the scaling characteristic for the analog inputs.
The scaling characteristic for the analog inputs is defined using 2 points.
This parameter specifies the x coordinate (input voltage in V) of the 1st value pair of the characteristic.

Index: [0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Note
The parameters for the characteristic do not have a limiting effect.

p0758[0...1] Analog inputs characteristic value y1

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog inputs
Unit: %

Min:	Max:	Factory setting:
-1000.00 [%]	1000.00 [%]	0.00 [%]

Description: Sets the scaling characteristic for the analog inputs.
The scaling characteristic for the analog inputs is defined using 2 points.
This parameter specifies the y coordinate (percentage) of the 1st value pair of the characteristic.

Index: [0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Note
The parameters for the characteristic do not have a limiting effect.

p0759[0...1] Analog inputs characteristic value x2

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog inputs
Unit: -

Min:	Max:	Factory setting:
-50.000	160.000	10.000

Description: Sets the scaling characteristic for the analog inputs.
The scaling characteristic for the analog inputs is defined using 2 points.
This parameter specifies the x coordinate (input voltage in V) of the 2nd value pair of the characteristic.

Index: [0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Note
The parameters for the characteristic do not have a limiting effect.

p0760[0...1] Analog inputs characteristic value y2

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog inputs
Unit: %

Min:	Max:	Factory setting:
-1000.00 [%]	1000.00 [%]	100.00 [%]

Description: Sets the scaling characteristic for the analog inputs.
The scaling characteristic for the analog inputs is defined using 2 points.
This parameter specifies the y coordinate (percentage) of the 2nd value pair of the characteristic.

Index: [0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Note
The parameters for the characteristic do not have a limiting effect.

p0761[0...1] Analog inputs wire break monitoring, response threshold

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog inputs
Unit: -

Min:	Max:	Factory setting:
0.00	10.00	2.00

Description: Sets the response threshold for the wire breakage monitoring of the analog inputs.

Index: [0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Dependency: For the following analog input type, the wire breakage monitoring is active:
p0756[0...1] = 1 (monitored unipolar voltage input (+2 V ... +10 V)), unit [V].
See also: p0756

Note
AI: Analog Input

p0762[0...1] Analog inputs wire-break monitoring delay time

S200 PTI

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog inputs
Unit: ms

Min:	Max:	Factory setting:
0 [ms]	1000 [ms]	100 [ms]

Description: Sets the delay time for the wire breakage monitoring of the analog inputs.

Index: [0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Note
AI: Analog Input

p0763[0...1] Analog inputs offset

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog outputs
Unit: -

Min:	Max:	Factory setting:
-20.000	20.000	0.000

Description: Sets the offset for the analog inputs.
The offset is added to the input signal before the scaling characteristic.

Index: [0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Note
AI: Analog Input

p0764[0...1] Analog inputs dead zone

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog outputs
Unit: -

Min:	Max:	Factory setting:
0.000	20.000	0.000

Description: Determines the width of the dead zone at the analog input.
Analog input type unipolar (e.g. 0 ... +10 V):
The dead zone starts with the characteristic value x1/y1 (p0757/p0758).
Analog input type bipolar (e.g. -10 V ... +10 V):
The dead zone is located at the symmetrical center between characteristic value x1/y1 (p0757/p0758) and x2/y2 (p0759/p0760). The set value doubles the dead zone.

Index: [0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Note
AI: Analog Input

p0766[0...1] Analog inputs activate absolute value generation

S200 PTI

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog outputs
Unit: -

Min:	Max:	Factory setting:
0	1	0

Description: Activates the absolute value generation of the analog input signals.

Value:
0: No absolute value generation
1: Absolute value generation switched in

Index:
[0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Note
AI: Analog Input

c0767[0...1] Analog inputs inversion

S200 PTI

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: Analog outputs
Unit: -

Description: Signal to invert the analog input signals.

Index:
[0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Note
AI: Analog Input

p0768[0...1] Analog inputs noise suppression window

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog outputs
Unit: %

Min:	Max:	Factory setting:
0.00 [%]	20.00 [%]	0.00 [%]

Description: Sets the window for noise suppression of the analog inputs.
Changes less than the window are suppressed.

Index:
[0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Note
AI: Analog Input

c0769[0...1] Analog inputs enable

S200 PTI

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: Analog outputs
Unit: -

Description: Signal to enable the analog inputs.

Index: [0] = AI0 (X132.19/20)
[1] = AI1 (X132.21/22)

Note
AI: Analog Input

c0771[0...1] CU analog outputs signal

S200 PTI

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: Analog outputs
Unit: %

Description: Signal for the analog outputs.

Index: [0] = AO0 (X132.45/46)
[1] = AO1 (X132.47/48)

Note
AO: Analog Output

r0772[0...1] CU analog outputs output value currently referred

S200 PTI

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: Analog outputs
Unit: %

Description: Displays the actual referred output value of the analog outputs.

Index: [0] = AO0 (X132.45/46)
[1] = AO1 (X132.47/48)

Note
AO: Analog Output

p0773[0...1] CU analog outputs smoothing time constant

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog outputs
Unit: ms

Min:	Max:	Factory setting:
0.0 [ms]	1000.0 [ms]	0.0 [ms]

Description: Sets the smoothing time constant of the 1st order lowpass filter for the analog outputs.

Index: [0] = AO0 (X132.45/46)
[1] = AO1 (X132.47/48)

Note
AO: Analog Output

r0774[0...1] CU analog outputs output voltage/current actual

S200 PTI

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: Analog outputs
Unit: V

Description: Displays the actual output voltage at the analog outputs.
Index: [0] = AO0 (X132.45/46)
[1] = AO1 (X132.47/48)
Dependency: See also: p0776

Note
AO: Analog Output

p0775[0...1] CU analog outputs activate absolute value generation

S200 PTI

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: Analog outputs
Unit: -

Min:	Max:	Factory setting:
0	1	0

Description: Activates the absolute value generation for the analog outputs.
Value:
0: No absolute value generation
1: Absolute value generation switched in
Index: [0] = AO0 (X132.45/46)
[1] = AO1 (X132.47/48)

Note
AO: Analog Output

p0776[0...1] CU analog outputs type

S200 PTI

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog outputs
Unit: -

Min:	Max:	Factory setting:
1	4	1

Description: Sets the analog output type.
p0776[x] = 1, 4 corresponds to a voltage output.
Value:
1: Voltage output (0 V ... +10 V)

4: Voltage output (-10 V ... +10 V)

Index: [0] = AO0 (X132.45/46)
[1] = AO1 (X132.47/48)

Note
When changing p0776, the parameters of the scaling characteristic (p0777, p0778, p0779, p0780) are overwritten with the following default values:
For p0776 = 1 and 4, p0777 is set to 0.0 %, p0778 = 0.0 V, p0779 = 100.0 % and p0780 to 10.0 V.
AO: Analog Output

p0777[0...1] CU analog outputs characteristic value x1

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog outputs
Unit: %

Min:	Max:	Factory setting:
-1000.00 [%]	1000.00 [%]	0.00 [%]

Description: Sets the scaling characteristic for the analog outputs.
The scaling characteristic for the analog outputs is defined using 2 points.
This parameter specifies the x coordinate (percentage) of the 1st value pair of the characteristic.

Index: [0] = AO0 (X132.45/46)
[1] = AO1 (X132.47/48)

Dependency: See also: p0776

NOTICE
This parameter is automatically overwritten when changing p0776 (type of analog outputs).

Note
The parameters for the characteristic do not have a limiting effect.

p0778[0...1] CU analog outputs characteristic value y1

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog outputs
Unit: V

Min:	Max:	Factory setting:
0.000 [V]	10.000 [V]	0.000 [V]

Description: Sets the scaling characteristic for the analog outputs.
The scaling characteristic for the analog outputs is defined using 2 points.
This parameter specifies the y coordinate (output voltage in V) of the 1st value pair of the characteristic.

Index: [0] = AO0 (X132.45/46)
[1] = AO1 (X132.47/48)

Dependency: See also: p0776

NOTICE
This parameter is automatically overwritten when changing p0776 (type of analog outputs).

Note
The parameters for the characteristic do not have a limiting effect.

p0779[0...1] CU analog outputs characteristic value x2

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog outputs
Unit: %

Min:	Max:	Factory setting:
-1000.00 [%]	1000.00 [%]	100.00 [%]

Description: Sets the scaling characteristic for the analog outputs.
The scaling characteristic for the analog outputs is defined using 2 points.
This parameter specifies the x coordinate (percentage) of the 2nd value pair of the characteristic.

Index: [0] = AO0 (X132.45/46)
[1] = AO1 (X132.47/48)

Dependency: See also: p0776

NOTICE
This parameter is automatically overwritten when changing p0776 (type of analog outputs).

Note
The parameters for the characteristic do not have a limiting effect.

p0780[0...1] CU analog outputs characteristic value y2

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog outputs
Unit: V

Min:	Max:	Factory setting:
0.000 [V]	10.000 [V]	10.000 [V]

Description: Sets the scaling characteristic for the analog outputs.
The scaling characteristic for the analog outputs is defined using 2 points.
This parameter specifies the y coordinate (output voltage in V) of the 2nd value pair of the characteristic.

Index: [0] = AO0 (X132.45/46)
[1] = AO1 (X132.47/48)

Dependency: See also: p0776

NOTICE
This parameter is automatically overwritten when changing p0776 (type of analog outputs).

Note
The parameters for the characteristic do not have a limiting effect.

c0782[0...1] CU analog outputs inversion

S200 PTI

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: Analog outputs
Unit: -

Description: Signal to invert the analog output signals.

Index: [0] = AO0 (X132.45/46)
[1] = AO1 (X132.47/48)

Note
AO: Analog Output

p0783[0...1] CU analog outputs offset

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Analog outputs
Unit: V

Min:	Max:	Factory setting:
-10.000 [V]	10.000 [V]	0.000 [V]

Description: Sets the offset for the analog outputs.
The offset is added to the output signal after the scaling characteristic.

Index: [0] = AO0 (X132.45/46)
[1] = AO1 (X132.47/48)

Dependency: See also: p0776

Note
This means, for example, the offset of a downstream isolating amplifier can be compensated.

p0795.2...7 Digital inputs simulation mode

S200 Basic PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Digital inputs
Unit: -

Min:	Max:	Factory setting:
-	-	0000 0000 bin

Description: Sets the simulation mode for digital inputs.

Bit array:

Bit	Signal name	1 signal	0 signal
02	DI 2 (X132.7)	Simulation	Terminal eval
03	DI 3 (X132.8)	Simulation	Terminal eval
04	DI 4 (X132.9)	Simulation	Terminal eval
05	DI 5 (X132.10)	Simulation	Terminal eval
06	DI 6 (X132.11)	Simulation	Terminal eval
07	DI 7 (X132.12)	Simulation	Terminal eval

Dependency: The setpoint for the input signals is specified using p0796.
See also: p0796

Note
This parameter is not saved when backing up data (p0977).
DI: Digital Input

p0795.0...9 Digital inputs simulation mode

S200 PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Digital inputs
Unit: -

Min:	Max:	Factory setting:
-	-	0000 0000 0000 0000 bin

Description: Sets the simulation mode for digital inputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	DI 0 (X132.5)	Simulation	Terminal eval
01	DI 1 (X132.6)	Simulation	Terminal eval
02	DI 2 (X132.7)	Simulation	Terminal eval
03	DI 3 (X132.8)	Simulation	Terminal eval
04	DI 4 (X132.9)	Simulation	Terminal eval
05	DI 5 (X132.10)	Simulation	Terminal eval
06	DI 6 (X132.11)	Simulation	Terminal eval
07	DI 7 (X132.12)	Simulation	Terminal eval
08	DI 8 (X132.13)	Simulation	Terminal eval
09	DI 9 (X132.14)	Simulation	Terminal eval

Dependency: The setpoint for the input signals is specified using p0796.
See also: p0796

Note
This parameter is not saved when backing up data (p0977).
DI: Digital Input

p0796.2...7 Digital inputs simulation mode setpoint

S200 Basic PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Digital inputs
Unit: -

Min:	Max:	Factory setting:
-	-	0000 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
02	DI 2 (X132.7)	High	Low
03	DI 3 (X132.8)	High	Low
04	DI 4 (X132.9)	High	Low

	05	DI 5 (X132.10)	High	Low
	06	DI 6 (X132.11)	High	Low
	07	DI 7 (X132.12)	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

p0796.0...9 Digital inputs simulation mode setpoint

S200 PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Digital inputs
Unit: -

Min:	Max:	Factory setting:
-	-	0000 0000 0000 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 (X132.5)	High	Low
01	DI 1 (X132.6)	High	Low
02	DI 2 (X132.7)	High	Low
03	DI 3 (X132.8)	High	Low
04	DI 4 (X132.9)	High	Low
05	DI 5 (X132.10)	High	Low
06	DI 6 (X132.11)	High	Low
07	DI 7 (X132.12)	High	Low
08	DI 8 (X132.13)	High	Low
09	DI 9 (X132.14)	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: Shutdown functions, Drive enable signals
Unit: -

Description: Second signal for command "No Quick Stop / Quick Stop (OFF3)"
The following signals are AND'ed:
- c0848 "No Quick Stop / Quick Stop (OFF3) signal 1"
- 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).
c0848 = 0 signal or c0849 = 0 signal
- OFF3 (braking along the OFF3 ramp (p1135), then pulse cancellation and switching on inhibited)
c0848 = 1 signal or c0849 = 1 signal
- No OFF3 (enable is possible)

⚠ CAUTION
When "master control from PC" is activated, then this binary signal sink is effective.

Note
For drives with closed-loop torque control (activated using c1501), the following applies:
0 signal:
- No dedicated braking response, but pulse cancellation 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
Write permission: Edit device configuration or drive applications
Parameter group: Control/status words
Unit: -

Description: Display and numerical signal source for the control word of the sequence control.

Bit array:

Bit	Signal name	1 signal	0 signal
00	ON/OFF1	Yes	No
01	Operating condition / OFF2	Yes	No
02	Operating condition / OFF3	Yes	No
03	Enable operation	Yes	No
04	Enable ramp-function generator	Yes	No
05	Continue ramp-function generator	Yes	No
06	Enable speed setpoint	Yes	No
07	Command open brake	Yes	No
10	Master control by PLC	Yes	No
12	Enable speed controller	Yes	No
14	Command close brake	Yes	No

Note
OC: Operating condition

r0899.0...13 Status word sequence control

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: 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

Note
For bits 00, 01, 02, 04, 05, 06, 09:
For PROFIdrive, these signals are used for status word 1.
For bit 13:
When function "SBC (Safe Brake Control)" is activated and selected, the brake is no longer controlled using this signal.

r0944 Counter for fault buffer changes

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: 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
Write permission: Edit device configuration or drive applications
Parameter group: Faults / alarms
Unit: -

Description: Displays the codes of faults that have occurred.
Dependency: See also: r0947, r0948, r0949, r2109, r2130, r2133, r2136, r3122

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 (oldest active fault) of the active incident

For more than 8 active faults, only the entries are overwritten at the eighth position (index 7).

History of acknowledged faults:
If a fault incident is acknowledged, then all alarms of the 1st fault incident are transferred into the 2nd fault incident, this becomes the 1st acknowledged fault incident.
The 2nd incident is transferred into the 3rd, the 3rd into the 4th etc. The last incident is rejected.

r0945[8], r0949[8] or r2133[8], r2130[0], r0948[8], r2136[8], r2109[8]
--> fault 1 of the 1st acknowledged incident
. . .
r0945[16], r0949[16] or r2133[16], r2130[16], r0948[16], r2136[16], r2109[16]
--> fault 1 of the 2nd acknowledged incident
. . .
r0945[56], r0949[56] or r2133[56], r2130[56], r0948[56], r2136[56], r2109[56]
--> fault 1 of the 7th acknowledged incident
. . .
r0945[63], r0949[63] or r2133[63], r2130[63], r0948[63], r2136[63], r2109[63]
--> fault 8 (oldest fault that has gone) of the 7th acknowledged incident

r0947[0...63] Fault number

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Faults / alarms
Unit: -

Description: Displays the numbers of faults that have occurred.

Dependency: See also: r0945

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
Write permission: Edit device configuration or drive applications
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
Write permission: Edit device configuration or drive applications
Parameter group: Faults / alarms
Unit: -

Description: Displays additional information about the fault that occurred (as integer number).
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
Can be changed in the 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
Write permission: Edit device configuration or drive applications
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

p0972 Drive unit reset

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Save & reset	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	3	0

Description: Sets the required procedure to execute a hardware reset for the drive unit.

Value:

0: Inactive

1: Hardware-Reset immediate

2: Hardware reset preparation

3: Hardware reset after cyclic communication has failed

⚠ DANGER

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.

Note

For value = 1:
Reset is immediately executed and communications interrupted.
After communications have been established, check the reset operation (refer below).
This value cannot be set in operation.
For value = 2:
Help to check the reset operation.
Firstly, set p0972 = 2 and then read back. Secondly, set p0972 = 1 (it is possible that this request is possibly no longer acknowledged). The communication is then interrupted.
After communications have been established, check the reset operation (refer below).
For value = 3:
The reset is executed after interrupting cyclic communication. This setting is used to implement a synchronized reset by a control for several drive units.
If cyclic communication is not active, then the reset is immediately executed.
After communications have been established, check the reset operation (refer below).
To check the reset operation:
After the drive unit has been restarted and communications have been established, read p0972 and check the following:
p0972 = 0 --> the reset was successfully executed.
p0972 > 0 --> the reset was not executed.

r0975[0...10] Converter identification

Data type: Unsigned16	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	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

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
Can be changed in the operating state: Ready for operation
Parameter group: Save & reset
Unit: -

Min:	Max:	Factory setting:
0	1	0

Description: Resets all 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
Can be changed in the operating state: Operation
Parameter group: Save & reset
Unit: -

Min:	Max:	Factory setting:
0	1	0

Description: Retentively saves all parameters of the drive system to the non-volatile memory.
When saving, only the adjustable parameters intended to be saved are taken into account.

Value:
0: Inactive
1: Save in non-volatile memory - Loaded at POWER ON

Dependency: See also: p0976

NOTICE
The converter power supply 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
Write permission: Edit device configuration or drive applications
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...10] = Reserved
[11] = Type encoder 2
[12] = Resolution encoder 2
[13] = Shift factor G2_XIST1
[14] = Shift factor G2_XIST2
[15] = Distinguishable revolutions encoder 2
[16...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
Write permission: Edit device configuration or drive applications
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 (e.g. PROFIBUS master).

p1001[0] **Fixed speed setpoint 1**

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Fixed setpoints
Unit: rpm

Min:	Max:	Factory setting:
-210000.000 [rpm]	210000.000 [rpm]	0.000 [rpm]

Description: Signal for fixed speed setpoint 1.
Dependency: See also: c1020, c1021, c1022

p1002[0] **Fixed speed setpoint 2**

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Fixed setpoints
Unit: rpm

Min:	Max:	Factory setting:
-210000.000 [rpm]	210000.000 [rpm]	0.000 [rpm]

Description: Signal for fixed speed setpoint 2.
Dependency: See also: c1020, c1021, c1022

p1003[0] **Fixed speed setpoint 3**

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Fixed setpoints
Unit: rpm

Min:	Max:	Factory setting:
-210000.000 [rpm]	210000.000 [rpm]	0.000 [rpm]

Description: Signal for fixed speed setpoint 3.
Dependency: See also: c1020, c1021, c1022

p1004[0] **Fixed speed setpoint 4**

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Fixed setpoints
Unit: rpm

Min:	Max:	Factory setting:
-210000.000 [rpm]	210000.000 [rpm]	0.000 [rpm]

Description: Signal for fixed speed setpoint 4.
Dependency: See also: c1020, c1021, c1022

p1005[0] Fixed speed setpoint 5

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Fixed setpoints
Unit: rpm

Min:	Max:	Factory setting:
-210000.000 [rpm]	210000.000 [rpm]	0.000 [rpm]

Description: Signal for fixed speed setpoint 5.
Dependency: See also: c1020, c1021, c1022

p1006[0] Fixed speed setpoint 6

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Fixed setpoints
Unit: rpm

Min:	Max:	Factory setting:
-210000.000 [rpm]	210000.000 [rpm]	0.000 [rpm]

Description: Signal for fixed speed setpoint 6.
Dependency: See also: c1020, c1021, c1022

p1007[0] Fixed speed setpoint 7

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Fixed setpoints
Unit: rpm

Min:	Max:	Factory setting:
-210000.000 [rpm]	210000.000 [rpm]	0.000 [rpm]

Description: Signal for fixed speed setpoint 7.
Dependency: See also: c1020, c1021, c1022

p1008[0] Fixed speed setpoint 8

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Fixed setpoints
Unit: rpm

Min:	Max:	Factory setting:
-210000.000 [rpm]	210000.000 [rpm]	0.000 [rpm]

Description: Signal for fixed speed setpoint 8.
Dependency: See also: c1020, c1021, c1022

c1020[0] Fixed speed setpoint selection bit 0

S200 PTI

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: Fixed setpoints
Unit: -

Description: Signal to select the fixed speed setpoint.
Dependency: Selects the required fixed speed setpoint using c1020 ... c1023.
Displays the number of the actual fixed speed setpoint in r1197.
Sets the values for the fixed speed setpoints 1 ... 15 using p1001 ... p1015.
See also: c1021, c1022

Note
If a fixed speed setpoint has not been selected (c1020 ... c1023 = 0, r1197 = 0), then r1024 = 0 (setpoint = 0).

c1021[0] Fixed speed setpoint selection bit 1

S200 PTI

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: Fixed setpoints
Unit: -

Description: Signal to select the fixed speed setpoint.
Dependency: Selects the required fixed speed setpoint using c1020 ... c1023.
Displays the number of the actual fixed speed setpoint in r1197.
Sets the values for the fixed speed setpoints 1 ... 15 using p1001 ... p1015.
See also: c1020, c1022

Note
If a fixed speed setpoint has not been selected (c1020 ... c1023 = 0, r1197 = 0), then r1024 = 0 (setpoint = 0).

c1022[0] Fixed speed setpoint selection bit 2

S200 PTI

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: Fixed setpoints
Unit: -

Description: Signal to select the fixed speed setpoint.

Dependency: Selects the required fixed speed setpoint using c1020 ... c1023.
Displays the number of the actual fixed speed setpoint in r1197.
Sets the values for the fixed speed setpoints 1 ... 15 using p1001 ... p1015.
See also: c1020, c1021

Note
If a fixed speed setpoint has not been selected (c1020 ... c1023 = 0, r1197 = 0), then r1024 = 0 (setpoint = 0).

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
Can be changed in the operating state: Ready for operation
Parameter group: Motorized potentiometer, Speed limiting, U/f control, Speed controller, Quick commissioning
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: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed limiting, U/f control, Speed controller
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: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed limiting, U/f control, Speed controller
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

S200 PTI

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: 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

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Ramp-function generator, Quick commissioning
Unit: s

Min:	Max:	Factory setting:
0.000 [s]	999999.000 [s]	10.000 [s]

Description: 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

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
Can be changed in the 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

p1130[0] Ramp-function generator initial rounding-off time

S200 PTI

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
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.

Note
Rounding-off times avoid an abrupt response and prevent damage to the mechanical system.

p1131[0] Ramp-function generator final rounding-off time

S200 PTI

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
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
Can be changed in the operating state: Operation
Parameter group: Ramp-function generator, Shutdown functions, Setpoint addition, Quick commissioning
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.

Note
This time can be exceeded if the DC link voltage reaches its maximum value.

p1215[0] Motor holding brake configuration

S200 Basic PTI

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Motor holding brake
Unit: -

Min:	Max:	Factory setting:
0	3	0

Description: Sets the configuration for the motor holding brake.

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

⚠ CAUTION

For the setting p1215 = 0, if a brake is used, it remains closed. If the motor moves, this will destroy the brake.

NOTICE

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.

Note

If an external motor holding brake is being used, then p1215 should be set to 3 and r0899.12 should be used as brake control signal.
The parameter can only be set to zero when the pulses are inhibited.

p1215[0] Motor holding brake configuration

S200 PTI

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Motor holding brake
Unit: -

Min:	Max:	Factory setting:
0	2	0

Description: Sets the configuration for the motor holding brake.
For value 2:
This setting allows the motor shaft to be rotated for installation purposes.

Value:
0: No motor holding brake available
1: Motor holding brake acc. to sequence control
2: Motor holding brake always open

Dependency: See also: p1216, p1217, p1226, p1227, p1228

⚠ CAUTION

For the setting p1215 = 0, if a brake is used, it remains closed. If the motor moves, this will destroy the brake.
Setting p1215 = 2 is not permissible if the brake is used to hold loads.

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
Can be changed in the operating state: Operation
Parameter group: Motor holding brake
Unit: ms

Min:	Max:	Factory setting:
0 [ms]	10000 [ms]	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
Can be changed in the operating state: Operation
Parameter group: Motor holding brake
Unit: ms

Min:	Max:	Factory setting:
0 [ms]	10000 [ms]	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 zero speed detection

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Motor holding brake, Shutdown functions
Unit: rpm

Min:	Max:	Factory setting:
0.00 [rpm]	210000.00 [rpm]	20.00 [rpm]

Description: Sets the speed threshold for the standstill identification.
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

NOTICE
For reasons relating to the compatibility to earlier firmware versions, a parameter value of zero in indices 1 to 31 is overwritten with the parameter value in index 0 when the Control Unit boots.

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] Zero speed 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	
Can be changed in the operating state:	Operation	
Parameter group:	Motor holding brake, Shutdown functions	
Unit: s		
Min:	**Max:**	**Factory setting:**
0.000 [s]	300.000 [s]	4.000 [s]

Description: Sets the monitoring time for the standstill identification.
When braking with OFF1 or OFF3, standstill is identified after the time set here has expired, after the setpoint speed has fallen below p1226.
After this, the brake control is started, the system waits for the closing time in 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
Can be changed in the operating state: Operation
Parameter group: Motor holding brake, Shutdown functions
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
Write permission: Edit device configuration or drive applications
Parameter group: Torque setpoints, U/f control, 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	Encoderless operation due to a fault	Yes	No
19	Reserved	Yes	No
20	Reserved	Yes	No
21	Reserved	Yes	No
22	Reserved	Yes	No
23	Torque-speed precontrol with encoder 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 01, 13:
If, after a fault, the encoder still provides a valid commutation position (p1992.10 = 1), then a switch is not immediately made into encoderless operation. Both bits remain at 0 for this time.
For bit 04:
The following conditions must be fulfilled to set to 1:
- Connector input p1190 and p1191 must be interconnected with a signal source that is not equal to zero.
- OFF1, OFF3 or STOP2 must not be active.
- It is not permissible that the motor data identification is 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:
- Isochronous operation is not selected (r2054 not equal to 4).
- The PROFIBUS is not isochronous (r2064[0] not equal to 1).
- DSC is not activated on the control side, therefore KPC = 0 is transferred as value to connector input p1191.

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
Can be changed in the 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
Can be changed in the 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
Can be changed in the 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
Can be changed in the 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 1 (PT2, general filter).
Dependency: See also: p1414, p1415

Note
This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.
The filter is only effective if the natural frequency is less than half of the sampling frequency.

p1418[0] Speed setpoint filter 1 denominator damping

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
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 1 (PT2, general filter).
Dependency: See also: p1414, p1415

Note
This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.

p1419[0] Speed setpoint filter 1 numerator natural frequency

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
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 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
Can be changed in the 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
Can be changed in the 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
Can be changed in the 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
Can be changed in the 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

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
Can be changed in the 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

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
Can be changed in the 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

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
Can be changed in the 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 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
Can be changed in the operating state: Operation
Parameter group: Speed controller
Unit: Hz

Min:	Max:	Factory setting:
0.00 [Hz]	8000.00 [Hz]	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.

r1438 Speed controller speed setpoint

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: U/f control, Speed controller
Unit: rpm

Description: Displays the speed setpoint after setpoint limiting for the P component of the speed controller.

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
Can be changed in the operating state: Operation
Parameter group: Speed controller, Speed actual value filter
Unit: ms

Min:	Max:	Factory setting:
0.00 [ms]	50.00 [ms]	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).

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
Can be changed in the operating state: Operation
Parameter group: Speed controller
Unit: Nms/rad

Min:	Max:	Factory setting:
0.0000 [Nms/rad]	5e+08 [Nms/rad]	0.3000 [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

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	
Can be changed in the 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	
Can be changed in the 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	
Can be changed in the operating state:	Operation	
Parameter group:	Torque limiting	
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
Can be changed in the operating state: Operation
Parameter group: Torque limiting
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
Can be changed in the 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
Write permission: Edit device configuration or drive applications
Parameter group: Torque limiting
Unit: Nm

Description: Displays the currently effective upper torque limit.

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
Write permission: Edit device configuration or drive applications
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
Can be changed in the operating state: Operation
Parameter group: Motor data identification routine
Unit: -

Min:	Max:	Factory setting:
-1	1	0

Description: Setting to start/reset the measurement of the force due to weight for a hanging/suspended axis.
The measurement can be started when the pulses are inhibited or the pulses are enabled (p1558 = 1). If it was started when the pulses were inhibited, then it is only executed after the pulses have been enabled.
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
Write permission: Edit device configuration or drive applications
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
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Unit: -

Min:	Max:	Factory setting:
-	-	0001 bin

Description: Setting for activating/de-activating 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
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Unit: -

Min:	Max:	Factory setting:
1	2	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, 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 bandwidth = 2 * D_denominator * f_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
Can be changed in the 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 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
Can be changed in the 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 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
Can be changed in the 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
Can be changed in the 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 1.
Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

p1662[0] Current setpoint filter 2 type

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Unit: -

Min:	Max:	Factory setting:
1	2	1

Description: Sets current setpoint filter 2 as lowpass filter (PT2) or general 2nd order filter.
Value:
1: PT2 low pass
2: General 2nd order filter
Dependency: Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

Note
For a general 2nd order filter, by inserting the same natural frequency in both the numerator and in the denominator, i.e. bandstop frequency, a bandstop filter is implemented. If the numerator damping of zero is selected, the bandstop frequency is completely suppressed.
The denominator damping can be determined from the equation for the 3 dB bandwidth:
f_3dB bandwidth = 2 * D_denominator * f_bandstop frequency

p1663[0] Current setpoint filter 2 denominator natural frequency

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Unit: Hz

Min:	Max:	Factory setting:
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the denominator natural frequency for current setpoint filter 2 (PT2, general filter).
Dependency: Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

p1664[0] Current setpoint filter 2 denominator damping

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
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
Can be changed in the 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
Can be changed in the 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
Can be changed in the 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
Can be changed in the 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 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
Can be changed in the 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 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
Can be changed in the 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 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
Can be changed in the 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
Can be changed in the 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
Can be changed in the 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

Can be changed in the 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

Can be changed in the 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

Can be changed in the 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.

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
Can be changed in the operating state: Operation
Parameter group: Current controller
Unit: %

Min:	Max:	Factory setting:
0.0 [%]	200.0 [%]	0.0 [%]

Description: Sets the scaling of the dynamic current controller precontrol for the torque/force-generating current component Isq.

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
Can be changed in the 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.

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
Can be changed in the operating state: Ready for operation
Parameter group: Reference variables
Unit: rpm

Min:	Max:	Factory setting:
6.00 [rpm]	210000.00 [rpm]	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

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
Can be changed in the operating state: Ready for operation
Parameter group: Reference variables
Unit: Arms

Min:	Max:	Factory setting:
0.10 [Arms]	100000.00 [Arms]	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).

Note
Default 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
Can be changed in the operating state: Ready for operation
Parameter group: Reference variables
Unit: Nm

Min:	Max:	Factory setting:
0.01 [Nm]	2e+07 [Nm]	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).

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 initiated with a 1->0 edge.
If this fault is initiated at the Control Unit, then it is transferred to all of the drive objects available.

r2109[0...63] Fault time removed in milliseconds

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: 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
Write permission: Edit device configuration or drive applications
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
Write permission: Edit device configuration or drive applications
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.

r2121 Counter alarm buffer changes

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: 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
Write permission: Edit device configuration or drive applications
Parameter group: Faults / alarms
Unit: -

Description: Displays the numbers of the last 64 alarms.
Dependency: See also: r2123, r2124, r2125, r2134, r2145, r2146, r3123

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
Write permission: Edit device configuration or drive applications
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

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
Write permission: Edit device configuration or drive applications
Parameter group: Faults / alarms
Unit: -

Description: Displays additional information about the active alarm (as integer number).

Dependency: See also: r2122, r2123, r2125, r2134, r2145, r2146, 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
Write permission: Edit device configuration or drive applications
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
Write permission: Edit device configuration or drive applications
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:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Faults / alarms
Unit: -

Description: Displays the code of the oldest active fault.

Note
0: No fault present.

r2132 Actual alarm code

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Faults / alarms
Unit: -

Description: Displays the 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
Write permission: Edit device configuration or drive applications
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
Write permission: Edit device configuration or drive applications
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
Write permission: Edit device configuration or drive applications
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
Write permission: Edit device configuration or drive applications
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
Write permission: Edit device configuration or drive applications
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

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
Write permission: Edit device configuration or drive applications
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

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

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: 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
Can be changed in the 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
Can be changed in the 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
Can be changed in the 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 <= 0.1 * p0311
For p0322 > 0, the following applies: p2162 <= 1.02 * 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
Can be changed in the 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
Can be changed in the 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
Write permission: Edit device configuration or drive applications
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 3 is set in p2161.
For bit 01:
The comparison value is set in p2141. We recommend setting the hysteresis (p2142) for canceling the bit to a value lower than that in p2141. Otherwise, the bit is not reset.
For bit 11:
The torque threshold value 2 is set in p2194.

p3117 Change safety message type

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning (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)
1: Safety messages are reparameterized (no safety message buffer)

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
Write permission: Edit device configuration or drive applications
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.
For bits 20 ... 16:
Bits 20, 19, 18, 17, 16 = 0, 0, 0, 0, 0 --> PROFIdrive message class 0: not assigned
Bits 20, 19, 18, 17, 16 = 0, 0, 0, 0, 1 --> PROFIdrive message class 1: hardware fault/software error
Bits 20, 19, 18, 17, 16 = 0, 0, 0, 1, 0 --> PROFIdrive message class 2: line fault
Bits 20, 19, 18, 17, 16 = 0, 0, 0, 1, 1 --> PROFIdrive message class 3: supply voltage fault
Bits 20, 19, 18, 17, 16 = 0, 0, 1, 0, 0 --> PROFIdrive message class 4: DC link fault
Bits 20, 19, 18, 17, 16 = 0, 0, 1, 0, 1 --> PROFIdrive message class 5: power electronics faulted
Bits 20, 19, 18, 17, 16 = 0, 0, 1, 1, 0 --> PROFIdrive message class 6: overtemperature electronic components
Bits 20, 19, 18, 17, 16 = 0, 0, 1, 1, 1 --> PROFIdrive message class 7: ground fault/phase fault detected
Bits 20, 19, 18, 17, 16 = 0, 1, 0, 0, 0 --> PROFIdrive message class 8: motor overload
Bits 20, 19, 18, 17, 16 = 0, 1, 0, 0, 1 --> PROFIdrive message class 9: communication error to the higher-level control
Bits 20, 19, 18, 17, 16 = 0, 1, 0, 1, 0 --> PROFIdrive message class 10: safe monitoring channel has identified an error
Bits 20, 19, 18, 17, 16 = 0, 1, 0, 1, 1 --> PROFIdrive message class 11: incorrect position actual value/speed actual value or not available
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 0, 0 --> PROFIdrive message class 12: internal (DRIVE-CLiQ) communication error
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 0, 1 --> PROFIdrive message class 13: infeed unit faulted
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 1, 0 --> PROFIdrive message class 14: braking controller/Braking Module faulted
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 1, 1 --> PROFIdrive message class 15: line filter faulted
Bits 20, 19, 18, 17, 16 = 1, 0, 0, 0, 0 --> PROFIdrive message class 16: external measured value/signal state outside the permissible range
Bits 20, 19, 18, 17, 16 = 1, 0, 0, 0, 1 --> PROFIdrive message class 17: application/technology function faulted
Bits 20, 19, 18, 17, 16 = 1, 0, 0, 1, 0 --> PROFIdrive message class 18: error in the parameterization/configuration/commissioning sequence
Bits 20, 19, 18, 17, 16 = 1, 0, 0, 1, 1 --> PROFIdrive message class 19: general drive fault
Bits 20, 19, 18, 17, 16 = 0, 1, 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
Write permission: Edit device configuration or drive applications
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.
For bits 20 ... 16:
Bits 20, 19, 18, 17, 16 = 0, 0, 0, 0, 0 --> PROFIdrive message class 0: not assigned
Bits 20, 19, 18, 17, 16 = 0, 0, 0, 0, 1 --> PROFIdrive message class 1: hardware fault/software error
Bits 20, 19, 18, 17, 16 = 0, 0, 0, 1, 0 --> PROFIdrive message class 2: line fault
Bits 20, 19, 18, 17, 16 = 0, 0, 0, 1, 1 --> PROFIdrive message class 3: supply voltage fault
Bits 20, 19, 18, 17, 16 = 0, 0, 1, 0, 0 --> PROFIdrive message class 4: DC link fault
Bits 20, 19, 18, 17, 16 = 0, 0, 1, 0, 1 --> PROFIdrive message class 5: power electronics faulted
Bits 20, 19, 18, 17, 16 = 0, 0, 1, 1, 0 --> PROFIdrive message class 6: overtemperature electronic components
Bits 20, 19, 18, 17, 16 = 0, 0, 1, 1, 1 --> PROFIdrive message class 7: ground fault/phase fault detected
Bits 20, 19, 18, 17, 16 = 0, 1, 0, 0, 0 --> PROFIdrive message class 8: motor overload
Bits 20, 19, 18, 17, 16 = 0, 1, 0, 0, 1 --> PROFIdrive message class 9: communication error to the higher-level control
Bits 20, 19, 18, 17, 16 = 0, 1, 0, 1, 0 --> PROFIdrive message class 10: safe monitoring channel has identified an error
Bits 20, 19, 18, 17, 16 = 0, 1, 0, 1, 1 --> PROFIdrive message class 11: incorrect position actual value/speed actual value or not available
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 0, 0 --> PROFIdrive message class 12: internal (DRIVE-CLiQ) communication error
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 0, 1 --> PROFIdrive message class 13: infeed unit faulted
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 1, 0 --> PROFIdrive message class 14: braking controller/Braking Module faulted
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 1, 1 --> PROFIdrive message class 15: line filter faulted
Bits 20, 19, 18, 17, 16 = 1, 0, 0, 0, 0 --> PROFIdrive message class 16: external measured value/signal state outside the permissible range
Bits 20, 19, 18, 17, 16 = 1, 0, 0, 0, 1 --> PROFIdrive message class 17: application/technology function faulted
Bits 20, 19, 18, 17, 16 = 1, 0, 0, 1, 0 --> PROFIdrive message class 18: error in the parameterization/configuration/commissioning sequence
Bits 20, 19, 18, 17, 16 = 1, 0, 0, 1, 1 --> PROFIdrive message class 19: general drive fault
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 0, 0 --> PROFIdrive message class 20: auxiliary unit faulted

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
Can be changed in the operating state: Operation
Parameter group: Load torque monitoring
Unit: ms

Min:	Max:	Factory setting:
0 [ms]	100 [ms]	10 [ms]

Description: Sets the time delay for detecting the line voltage failure.
The function must be activated via p2149.16.

Dependency: See also: p2149
See also: F30265

r3988 Final boot state

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: System identification
Unit: -

Description: Displays the final boot states.
001 - Software error
200 - Carry out first commissioning
250 - Topology error (check the connected hardware)
800 - Ready
The following options are available to reach the "Ready" state:
- Check the project and load again.
- Restore factory setting.
- Check the hardware.
- Carry out a POWER ON (switch-off/switch-on).

p4405 PTO maximum output frequency

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Pulse encoder emulation
Unit: kHz

Min:	Max:	Factory setting:
1 [kHz]	5000 [kHz]	1000 [kHz]

Description: 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

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Pulse encoder emulation
Unit: -

Min:	Max:	Factory setting:
0	16777216	1024

Description: Sets the pulse number output from the PTO.

p4409 Gearbox encoder (motor)/PTO denominator (Control Unit)

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group:
Unit: -

Min:	Max:	Factory setting:
1	2147000000	1

Description: 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)

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group:
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

Data type: Integer32 **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: Displays the position setpoint after taking into account the step up / step down.

c4420 PTO position setpoint

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 incremental encoder emulation position setpoint.
Recommendation: The position actual value of the leading encoder in the current controller clock cycle is available in r0479.

p4422.0 PTO configuration

Data type: Unsigned16	**Visible in:** Standard display		
Read permission:	Read drive data or acknowledge messages		
Write permission:	Edit device configuration or drive applications		
Can be changed in the operating state:	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

Data type: Unsigned32	**Visible in:** Standard display		
Read permission:	Read drive data or acknowledge messages		
Write permission:	Edit device configuration or drive applications		
Can be changed in the operating state:	Commissioning		
Parameter group:	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

Data type: Integer32	**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: Display and numerical signal source for the PTO position actual value.

p5271[0].0...7 Online / 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
Can be changed in the operating state: Ready for operation
Parameter group:
Unit: -

Min:	Max:	Factory setting:
-	-	0000 1100 bin

Description: Sets the configuration for online 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.
Prerequisite:
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] Online 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
Can be changed in the 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 online 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 Online / One Button Tuning dynamic response estimated

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:
Unit: ms

Description: Display and signal source for the estimated dynamic response of the speed control loop as PT1 time constant for online 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] Online / 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
Can be changed in the 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 online tuning / One Button Tuning.
As a consequence, the drive is allocated a defined, dynamic response via its precontrol.
For axes, which must interpolate with one another, the same value must be entered.
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 effective if p5302.7 is set = 1.
Otherwise, the precontrol symmetrization is adapted to the estimated dynamic response, therefore setting positioning without any overshoot.

r5276[0] Online / One Button Tuning maximum Kv factor estimated

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:
Unit: 1000 rpm

Description: Displays the estimated maximum position controller gain for online 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] Online/One Button Tuning precontrol symmetrizing time estimated

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:
Unit: ms

Description: Displays the estimated time constant for symmetrization of the speed precontrol.
This is required to symmetrize the position controller for online tuning / One Button Tuning if the 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
Can be changed in the 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, p5296

Note

HF: high frequency
LF: low frequency
For bit 00:
A PRBS signal (pseudo random binary signal) is superimposed on the current setpoint to be able to better identify the mechanical controlled system.
For bit 01:
The identified mechanical resonance points are suppressed using current setpoint filters.
For bit 02:
The maximum speed controller gain is determined from the identified mechanical controlled system.
For bits 03, 04:
The measured value buffer length is set using these bits:
Bit 04 = 0 and bit 03 = 0 -> buffer length = 256
Bit 04 = 0 and bit 03 = 1 -> buffer length = 512
Bit 04 = 1 and bit 03 = 0 -> buffer length = 1024
Bit 04 = 1 and bit 03 = 1 -> buffer length = 2048
For bit 05:
A Hamming window is used to filter the measured time signals.
For bit 06:
The measurement checks the current controller frequency response and this is taken into account in the speed controller loop.
For bits 07, 08, 09:
The measurement bandwidth is set using these bits:
Bit 09 = 0, bit 08 = 0, bit 07 = 0 -> bandwidth = 50 Hz
Bit 09 = 0, bit 08 = 0, bit 07 = 1 -> bandwidth = 100 Hz
Bit 09 = 0, bit 08 = 1, bit 07 = 0 -> bandwidth = 200 Hz
Bit 09 = 0, bit 08 = 1, bit 07 = 1 -> bandwidth = 400 Hz
Bit 09 = 1, bit 08 = 0, bit 07 = 0 -> bandwidth = 800 Hz
Bit 09 = 1, bit 08 = 0, bit 07 = 1 -> bandwidth = 1600 Hz
For bits 10, 11:
Number of measuring periods.
Bit 11 = 0 and bit 10 = 0 -> number of measurements = 1
Bit 11 = 0 and bit 10 = 1 -> number of measurements = 2
Bit 11 = 1 and bit 10 = 0 -> number of measurements = 4
Bit 11 = 1 and bit 10 = 1 -> number of measurements = 8
For bit 12:
The PRBS signal is switched to the speed setpoint (in front of the filter).
For bit 13:
The input signal for the torque actual value is taken from in front of the current setpoints filters.
For bit 14:
When the bit is set, a current setpoint filter is used to partially compensate the mechanical system.
This is recommended for the following machine attributes:
- The load moment of inertia is significantly higher than the motor moment of inertia (e.g. > 6x).
- The coupling between the machine elements has almost no backlash (no play).
- The stiffness of the mechanical transmission elements does not change significantly in the traversing range.

p5292 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
Can be changed in the operating state:	Operation
Parameter group:	
Unit: %	

Min:	Max:	Factory setting:
25.0 [%]	125.0 [%]	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
Write permission: Edit device configuration or drive applications
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

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
Can be changed in the operating state: Operation
Parameter group:
Unit: %

Min:	Max:	Factory setting:
1.0 [%]	300.0 [%]	[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
Can be changed in the operating state: Ready for operation
Parameter group:
Unit: -

Min:	Max:	Factory setting:
-1	2	0

Description: Setting to activate/deactivate the One Button Tuning function. For p5300 = 1: Function One Button Tuning is configured using p5271 and p5301.
If p5300 = 2:
The "Online tuning" function is configured using p5302.

Value:
-1: Reset controller parameters
0: Inactive
1: One Button Tuning
2: Online 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.

Online tuning:

p5302 configures the "Online tuning" function.

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, p5296, p5301, p5302, p5308, p5309

⚠ CAUTION

For some drive trains, the "online 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:

Online tuning is inactive.

To permanently save the values determined for the speed and position controllers, the parameters must be saved in a non-volatile manner (p0977 = 1 or "copy RAM to ROM").

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.

If p5300 = 2:

Online 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	
Can be changed in the 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
08	Moment of inertia determination from frequency response	Yes	No

Dependency: It is only possible to change the configuration if One Button Tuning is not active (p5300 = 0).

See also: p5292, r5293, p5296, p5300, p5308, p5309

Note
For bit 00:
The speed controller gain is determined and set using a noise signal.
For bit 01:
Possibly required current setpoint filters are determined and set using a noise signal.
As a consequence, a higher dynamic performance can be achieved in the speed control loop.
For bit 02:
Using this bit, the moment of inertia is determined using a test signal. If this bit is not set, then the load moment of inertia must be manually set using parameter p1498. The test signal must have been previously set using parameters p5308 and p5309.
For bit 08:
Using this bit, the moment of inertia is determined from the frequency characteristic using a test signal, and is transferred to p1498. The traversing path must first be set using parameter p5308.

p5302[0].2...8 Online 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	
Can be changed in the operating state:	Operation	
Parameter group:		
Unit: -		
Min:	**Max:**	**Factory setting:**
-	-	0000 0000 0000 1100 bin

Description: Setting the functions for online 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

⚠ CAUTION
Please note the general conditions for the moment of inertia estimator, online tuning as well as adaptive resonance filter in the following reference:
SINAMICS S120 Function Manual Drive Functions

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
Write permission: Edit device configuration or drive applications
Parameter group:
Unit: -

Description: Displays the status of the auto tuning functions performed - "Online 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	Online 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 online tuning are active.
For bit 12 = 1: Online 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
Can be changed in the operating state: Ready for operation
Parameter group:
Unit: °

Min:	Max:	Factory setting:
-30000 [°]	30000 [°]	0 [°]

Description: Setting the distance limiting (permissible traversing range of the motor).
The traversing range is limited in the positive and negative directions.

Note
A value of 360 degrees corresponds to one motor revolution.
The position before the pulse enable is used as zero point.

p5309[0] One Button Tuning 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
Can be changed in the operating state: Ready for operation
Parameter group:
Unit: ms

Min:	Max:	Factory setting:
0 [ms]	5000 [ms]	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
Can be changed in the 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	1 signal	0 signal
00	Activate monitoring	Yes	No
01	Activation of speed dependency	Yes	No

Note
To comply with standard UL 61800-5-1 Ed. 2, bit 0 and bit 1 must be set.
These bits activate electronic motor overload protection according to IEC 61800-5-1 Ed. 3 / UL 61800-5-1 Ed. 2, with the emulation of an electronic overload relay, Class 20 and the speed sensitivity.
For bit 00:
This bit activates electronic motor overload protection with emulation of an electronic overload relay, Class 20.
For bit 01:
This bit activates the speed dependency of the electronic motor overload protection. Not active, if bit 00 is also set.

r8400[0...2] Date

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Diagnostics general
Unit: -

Description: Displays the actual date in year, month and day.

Index: [0] = Year (YYYY)
[1] = Month (1 ... 12)
[2] = Day (1 ... 31)

Note
The time in r8400 and r8401 is used to display the fault and alarm times.
The date/time are set using the web server (manually).
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
Write permission: Edit device configuration or drive applications
Parameter group: Diagnostics general
Unit: -

Description: Displays the current time in hours, minutes and seconds.

Index: [0] = Hour (0 ... 23)
[1] = Minute (0 ... 59)
[2] = Second (0 ... 59)

Note
The time in r8400 and r8401 is used to display the fault and alarm times.
The time is displayed in the 24-hour format.
The date/time are set using the web server (manually).
When the converter is switched off, date/time are not updated. After power on the instant of the previous power off is valid.

c8995[0...3] Ethernet X127 enable

Data type: Unsigned8 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Configuration
Unit: -

Description: Signal to enable the Ethernet interface X127 for applications.

Index: [0] = Secure S7 Protocol Startdrive
[1] = Web server HTTPS
[2] = S7 protocol 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.

p9603.0 SI control

S200 PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Safety Integrated
Unit: -

Min:	Max:	Factory setting:
-	-	0001 bin

Description: Sets the type of control for the safety functions integrated in the drive.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Control via F-DI	Enable	Inhibit

Note
When online safety commissioning has been completed, a change results in an automatic restart.

p9604.0 SI enable

S200 PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Safety Integrated
Unit: -

Min:	Max:	Factory setting:
-	-	0001 bin

Description: Sets the enable signal for the safety functions integrated in the drive.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Enable STO	Enable	Inhibit

p9670 SI module identification drive

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: 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

S200 PTI

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Basic functions
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
Parameter is active after a POWER ON

r9720.0...7 SI control word

S200 PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: -

Description: Control signals for safety functions integrated in the drive.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Deselect STO	Yes	No
07	Acknowledgment	Signal edge active	No

r9722.0...7 SI status signals

S200 PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: -

Description: Display and signal source for the status signals for the safety functions (synchronized signal).

Bit array:

Bit	Signal name	1 signal	0 signal
00	STO or safe pulse cancellation 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

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: -

Description: Displays the 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

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: -

Description: Displays the checksum over the checked parameters used to configure safety functions (actual checksum).
Dependency: See also: p9729

p9729 SI reference checksum configuration of the safety functions

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Unit: -

Min:	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

r9750[0...63].0...20 SI diagnostic attributes

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: -

Description: Displays the 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.
For bits 20 ... 16:
Bits 20, 19, 18, 17, 16 = 0, 0, 0, 0, 0 --> PROFIdrive message class 0: not assigned
Bit 20, 19, 18, 17, 16 = 0, 0, 0, 0, 1 --> PROFIdrive message class 1: hardware fault/software error
Bits 20, 19, 18, 17, 16 = 0, 0, 0, 1, 0 --> PROFIdrive message class 2: line fault
Bits 20, 19, 18, 17, 16 = 0, 0, 0, 1, 1 --> PROFIdrive message class 3: supply voltage fault
Bits 20, 19, 18, 17, 16 = 0, 0, 1, 0, 0 --> PROFIdrive message class 4: DC link fault
Bits 20, 19, 18, 17, 16 = 0, 0, 1, 0, 1 --> PROFIdrive message class 5: power electronics faulted
Bits 20, 19, 18, 17, 16 = 0, 0, 1, 1, 0 --> PROFIdrive message class 6: overtemperature electronic components
Bits 20, 19, 18, 17, 16 = 0, 0, 1, 1, 1 --> PROFIdrive message class 7: ground fault/phase fault detected
Bits 20, 19, 18, 17, 16 = 0, 1, 0, 0, 0 --> PROFIdrive message class 8: motor overload
Bits 20, 19, 18, 17, 16 = 0, 1, 0, 0, 1 --> PROFIdrive message class 9: communication error to the higher-level control
Bits 20, 19, 18, 17, 16 = 0, 1, 0, 1, 0 --> PROFIdrive message class 10: safe monitoring channel has identified an error
Bits 20, 19, 18, 17, 16 = 0, 1, 0, 1, 1 --> PROFIdrive message class 11: incorrect position actual value/speed actual value or not available
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 0, 0 --> PROFIdrive message class 12: internal (DRIVE-CLiQ) communication error
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 0, 1 --> PROFIdrive message class 13: infeed unit faulted
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 1, 0 --> PROFIdrive message class 14: braking controller/Braking Module faulted
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 1, 1 --> PROFIdrive message class 15: line filter faulted
Bits 20, 19, 18, 17, 16 = 1, 0, 0, 0, 0 --> PROFIdrive message class 16: external measured value/signal state outside the permissible range
Bits 20, 19, 18, 17, 16 = 1, 0, 0, 0, 1 --> PROFIdrive message class 17: application/technology function faulted
Bits 20, 19, 18, 17, 16 = 1, 0, 0, 1, 0 --> PROFIdrive message class 18: error in the parameterization/configuration/commissioning sequence
Bits 20, 19, 18, 17, 16 = 1, 0, 0, 1, 1 --> PROFIdrive message class 19: general drive fault
Bits 20, 19, 18, 17, 16 = 0, 1, 1, 0, 0 --> PROFIdrive message class 20: auxiliary unit faulted

r9753[0...63] SI message value for float values

S200 PTI

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: -

Description: Displays additional information about the safety message that has occurred for float values.
Dependency: See also: r9754, r9755, r9756, r60044, r60045, r60048, r60049, p60052

r9754[0...63] SI message time received in days

S200 PTI

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: -

Description: Displays the relative system runtime in days when the safety message occurred.
Dependency: See also: r9753, r9755, r9756, r60044, r60045, r60048, r60049, p60052

r9755[0...63] SI message time removed in milliseconds

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: ms

Description: Displays the relative system runtime in milliseconds when the safety message was removed.

Dependency: See also: r9753, r9754, r9756, r60044, r60045, r60048, r60049, p60052

r9756[0...63] SI message time removed in days

S200 PTI

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: -

Description: Displays the relative system runtime in days when the safety message was removed.

Dependency: See also: r9753, r9754, r9755, r60044, r60045, r60048, r60049, p60052

r9776.0...4 SI diagnostics

S200 PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Safety Integrated
Unit: -

Description: Displays the 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
04	Safety commissioning mode active	Yes	No

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 has been replaced. Retentively save (save all parameters, p0977 = 1)
For bit 04 = 1:
The safety commissioning mode is selected.

r9780[0...1] SI checksum to check changes

S200 PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Safety Integrated
Unit: -

Description: Displays the 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

S200 PTI

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Safety Integrated
Unit: -

Description: Displays the 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)
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

S200 PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Safety Integrated
Unit: ms

Description: Displays the 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)
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

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Basic functions
Unit: -

Description: Displays the checksum over the parameters to enable the safety functions (actual checksum).
Dependency: See also: p9795

p9795 SI reference checksum safety enable

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Basic functions
Unit: -

Min:	Max:	Factory setting:
0000 hex	FFFF FFFF hex	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

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Basic functions
Unit: -

Description: Displays the checksum over the checksum-checked parameters to configure the drive (actual checksum).
Dependency: See also: p9799

p9799 SI reference checksum over the configuration of the drive

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Basic functions
Unit: -

Min:	Max:	Factory setting:
0000 hex	FFFF FFFF hex	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

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: -

Description: Displays the checksum over the checksum-checked parameters to configure safety functions (actual checksum) channel B.
Dependency: See also: p9829

p9829 SI reference checksum configuration of safety functions chan. B

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Unit: -

Min:	Max:	Factory setting:
0000 hex	FFFF FFFF hex	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

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group:
Unit: -

Description: Displays the checksum over the parameters to enable the safety functions (actual checksum) channel B.
Dependency: See also: p9895

p9895 SI reference checksum safety enable channel B

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group:
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

r9898 SI actual checksum configuration of the drive, channel B

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Basic functions
Unit: -

Description: Displays the checksum over the checksum-checked parameters to configure the drive (actual checksum) channel B.
Dependency: See also: p9899

p9899 SI reference checksum over the drive configuration, channel B

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Basic functions
Unit: -

Min:	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

p10000.0 SI F-DI enable

S200 PTI

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (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.

p10002 SI F-DI changeover discrepancy time

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: 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.

p10017[0...2] SI digital inputs input filter

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Safety Integrated
Unit: ms

Min:	Max:	Factory setting:
1.00 [ms]	100.00 [ms]	4.00 [ms]

Description:
Setting of the input filter for the digital inputs.
The input filter is rounded off to whole milliseconds and accepted.
The input filter acts on the following digital inputs:
- Failsafe digital inputs (F-DI).

Example:
Input filter = 1 ms: Fault pulses of 1 ms are filtered; only pulses longer than 2 ms are processed.
Input filter = 3 ms: Fault pulses of 3 ms are filtered; only pulses longer than 4 ms are processed.
The input filtering result can be read in r10051 and r10151.
The set input filter impacts the response time of the safety function.

Index:
[0] = F-DI 0
[1] = Reserved
[2] = Reserved

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+

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: 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

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: 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

S200 PTI

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

p10040.0 SI F-DI input mode

S200 PTI

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (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

S200 PTI

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: 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

S200 PTI

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Safety Integrated
Unit: -

Description: Display and signal source 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:
With 24 V at the input, NC contacts have a logical "1" level, for 0 V at the input, a logical "0" level.
This means that an NC/NC contact parameterization for 0 V at both inputs of the F-DI leads to a status of the F-DI equal to "0" (safety function selected), for 24 V at both inputs of the F-DI, to a status of the F-DI equal to "1" (safety function deselected).
F-DI: Failsafe Digital Input

NC contact:
24V at the input -> logical "1"
0V at the input -> logical "0"

r10071.0 SI F-DI status

S200 PTI

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Safety Integrated
Unit: -

Description: Display for the status of the failsafe digital inputs.

Bit 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

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group:
Unit: -

Description: Status signals (channel A) for safety-relevant motion monitoring functions integrated in the drive.

Bit array:

Bit	Signal name	1 signal	0 signal
00	STO or safe pulse cancellation active	Yes	No
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

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Basic functions
Unit: -

Description: Displays the checksum over the checksum-checked parameters for the device-specific parameters of the drive system (actual checksum).

Dependency: See also: p10099

p10099 SI reference checksum across device-specific parameters

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Basic functions
Unit: -

Min:	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

S200 PTI

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:
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:
With 24 V at the input, NC contacts have a logical "1" level, for 0 V at the input, a logical "0" level.
This means that an NC/NC contact parameterization of 0 V at both inputs of the F-DI leads to a status of the F-DI equal to "0" (safety function selected), for 24 V at both inputs of the F-DI, to a status of the F-DI equal to "1" (safety function deselected).
With 24 V at the input, NO contacts have a logical "0" level, for 0 V at the input, a logical "1" level. This means that for an NC/NO contact parameterization, the level 0 V/24 V leads to a status of the F-DI equal to "0" (safety function selected), the level 24 V/0 V leads to status of the F-DI equal to "1" (safety function deselected).
F-DI: Failsafe Digital Input

r10171.0 SI F-DI status channel B

S200 PTI

Data type: Unsigned8 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Safety Integrated
Unit: -

Description: Display for the status of the failsafe digital inputs.

Bit 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

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group:
Unit: -

Description: Status signals (channel 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
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

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Basic functions
Unit: -

Description: Displays the checksum over the checksum-checked parameters for the device-specific parameters of the drive system (actual checksum) channel B.

Dependency: See also: p10199

p10199 SI reference checksum across device-specific parameters chan B

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Basic functions
Unit: -

Min:	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

S200 PTI

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Safety Integrated
Unit: -

Description: Reason that STO (Safe Torque Off) function was selected.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
04	Safety commissioning mode active	High	Low
12	Stop response	High	Low
14	Response to parameterizing error	High	Low
15	Response to internal software error	High	Low

r10452.0...15 SI STO select cause channel B

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Safety Integrated
Unit: -

Description: Reason for the selection of function 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
12	Stop response	High	Low
14	Response to parameterizing error	High	Low
15	Response to internal software error	High	Low

p29003 Control mode

S200 PTI

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: Technology Extensions, Quick commissioning
Unit: -

Min:	Max:	Factory setting:
0	7	0

Description: Sets a control mode.
0: Fast PTI mode
2: Speed control (S)
3: Torque control (T)
7: Control change mode: S/T

Value:
0: FAST_PTI
2: S
3: T
7: S_T

Note
The compound control mode can be controlled by the digital input signal C-MODE. In compound control mode, when DI10 (C-MODE) is 0, the first control mode is selected; otherwise, the second one is selected.

p29008 Modbus control source

S200 PTI

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: Technology Extensions, Quick commissioning
Unit: -

Min:	Max:	Factory setting:
1	2	2

Description: Selects the Modbus control source.

Value:
1: Setpoint and control word from Modbus PZD
2: No setpoint and control word from Modbus PZD

p29043 Fixed torque setpoint

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Torque setpoints, Technology Extensions
Unit: %

Min:	Max:	Factory setting:
-350.0 [%]	350.0 [%]	0.0 [%]

Description: Sets the internal torque setpoint.
You can select the internal parameters or the analog input as the source of the torque setpoint by configuring the digital input signal Torque setpoint source.

c29045 **Torque setpoint**

S200 PTI

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: Technology Extensions
Unit: -

Description: AI channel for torque setpoint

c29046 **Torque limit**

S200 PTI

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: Technology Extensions
Unit: %

Description: AI channel for torque limitation

c29047 **Torque setpoint source**

S200 PTI

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 setpoints, Technology Extensions
Unit: -

Description: Signal for the torque setpoint.

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, Technology Extensions
Unit: -

Description: Signal of bit 0 for the torque limit.

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, Technology Extensions
Unit: -

Description: Signal of bit 1 for the torque limit.

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
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions
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
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions
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

p29054 Overload threshold for output signal triggering

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Torque limiting, Technology Extensions
Unit: %

Min:	Max:	Factory setting:
10.0 [%]	300.0 [%]	100.0 [%]

Description: Sets the overload threshold for the output torque.

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, Technology Extensions
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, Technology Extensions
Unit: -

Description: Signal of bit 1 for the speed limit.

c29066 Speed limit

S200 PTI

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: Technology Extensions
Unit: %

Description: AI channel for speed limitaion

c29067 Speed setpoint

S200 PTI

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: Technology Extensions
Unit: %

Description: AI channel for speed setpoint

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
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions
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
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions
Unit: rpm

Min:	Max:	Factory setting:
-210000.00 [rpm]	0.00 [rpm]	-210000.00 [rpm]

Description: 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.

c29074 Zero speed clamp active

S200 PTI

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, Technology Extensions
Unit: -

Description: Signal for the active zero speed clamp.

p29075 Speed clamp threshold

S200 PTI

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Speed limiting, Technology Extensions
Unit: rpm

Min:	Max:	Factory setting:
0.0 [rpm]	200.0 [rpm]	200.0 [rpm]

Description: Sets the threshold for the zero speed clamp.
If the function of zero speed clamp has been enabled in speed control mode, the motor speed is clamped to 0 when both the setpoint speed and the actual speed are below this threshold.

p29078 Threshold for speed reached

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Speed limiting, Technology Extensions
Unit: rpm

Min:	Max:	Factory setting:
0.0 [rpm]	100.0 [rpm]	10.0 [rpm]

Description: Sets the threshold for triggering the output signal SPDR.

p29101 Protective speed limit source selection

S200 PTI

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Speed limiting, Technology Extensions
Unit: -

Min:	Max:	Factory setting:
0	2	0

Description: Selects a protective speed limit source.
0: Inhibit protective speed limit.
1: Set protective speed limit with the fixed value in p29102
2: Set protective speed limit with analog input 0.

Value:
0: PSL disable
1: PSL fixed speed
2: PSL AI speed

p29102[0...1] Positive/negative protective speed limit fixed value

S200 PTI

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed limiting, Technology Extensions
Unit: rpm

Min:	Max:	Factory setting:
0.00 [rpm]	210000.00 [rpm]	500.00 [rpm]

Description: Sets the protective speed limit fixed value in positive/negative direction.
p29102[0]: protective speed limit fixed value in positive direction
p29102[1]: protective speed limit fixed value in negative direction

c29103[0...1] Protective speed limit

S200 PTI

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: Technology Extensions
Unit: -

Description: AI channel for protective speed limit

r29104.0...3 Protective speed limit status

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Speed limiting, Technology Extensions
Unit: -

Description: Displays the protective speed limit status.

Bit 0=1, if
protective speed limit reached

Bit 1=1, if
positive protective speed limit reached

Bit 2=1, if
negative protective speed limit reached

Bit 3=1, if
torque control is in protective speed limit

Bit array:

Bit	Signal name	1 signal	0 signal
00	protective speed limit reached	YES	NO
01	positive protective speed limit reached	YES	NO
02	negative protective speed limit reached	YES	NO
03	torque control in protective speed limit	YES	NO

p29108 Protective speed controller P gain

S200 PTI

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed limiting, Technology Extensions
Unit: Nms/rad

Min:	Max:	Factory setting:
0.000 [Nms/rad]	999999.000 [Nms/rad]	0.300 [Nms/rad]

Description: Sets the protective speed controller gain.

This parameter will be automatically set after motor commissioning.
The calculated value depends on motor inertia in r0341.

Note
If protective speed control parameter setting is not appropriate in p29108 and p29109, the servo system vibrates.

p29109 Protective speed controller filter time

S200 PTI

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Speed limiting, Technology Extensions
Unit: ms

Min:	Max:	Factory setting:
0.00 [ms]	100000.00 [ms]	20.00 [ms]

Description: Sets the protective speed controller filter time constant.

p29110[0...1] Position loop gain scaling

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Position controller, Technology Extensions
Unit: %

Min:	Max:	Factory setting:
0.000 [%]	10000.000 [%]	100.000 [%]

Description: Sets the scaling factors for the proportional gain of the position controller (p2538) and the fast position controller (p29178).

The effective position loop gain value is p2538*p29110 under the PTI mode and p29178*p29110 under the fast PTI mode.

Two scaling factors for position loop gain are available. You can switch between the two factors by configuring the digital input signal in c29149 or setting relevant condition parameters.

Index:
[0]: Scaling factor 1
[1]: Scaling factor 2

Note
p29110[0...1] is only valid when the gain switching mode is enabled. If the gain switching mode is disabled, the scaling factor output is 100% as default.

p29120[0...1] Speed loop gain scaling

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Rotating measurement/speed controller optimization
Unit: %

Min:	Max:	Factory setting:
0.0000 [%]	10000.0000 [%]	100.0000 [%]

Description: Sets the scaling factors for speed loop gain. The effective speed loop gain value is p1460*p29120.

Two speed loop gain scaling factors are available. You can switch between two gain scaling factors by configuring the digital input signal in c29149 or setting relevant condition parameters.

Index:
[0]: Scaling factor 1
[1]: Scaling factor 2

Note
p29120[0...1] is only valid when the gain switching mode is enabled. If the gain switching mode is disabled, the scaling factor output is 100% as default.

p29121[0...1] Speed loop integral time scaling

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Rotating measurement/speed controller optimization
Unit: %

Min:	Max:	Factory setting:
0.1 [%]	6500.0 [%]	100.0 [%]

Description: Sets the scaling factors for speed loop integral time. The effective speed loop integral time is p1462/p29121.

Two speed loop integral time scaling factors are available. You can switch between two time scaling factors by configuring the digital input signal in c29149 or setting relevant condition parameters.

Index:
[0]: Scaling factor 1
[1]: Scaling factor 2

Note
p29121[0...1] is only valid when the gain switching mode is enabled. If the gain switching mode is disabled, the scaling factor output is 100% as default.

p29130 Gain switching mode selection

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions, Rotating measurement/speed controller optimization
Unit: -

Min:	Max:	Factory setting:
0	4	0

Description: Selects the gain switching mode.
0: Disabled
1: Switch through the signal in c29149
2: Position deviation as switching condition
3: Pulse input frequency as switching condition
4: Actual speed as switching condition

Value:
0: Disable
1: DI G-CHANGE
2: Position deviation
3: Pulse input frequency
4: Actual speed

Note
Gain switching function is used only when the autotuning function is disabled (p5300 = 0).

p29131 Gain switching condition: Pulse deviation

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions, Rotating measurement/speed controller optimization
Unit: -

Min:	Max:	Factory setting:
0.0000	2.1474826e+09	100.0000

Description: Sets the position deviation threshold for automatically triggering gain switching.

If the gain switching function is enabled and this condition is selected:
- Switch from scaling factor 1 to scaling factor 2 when the position deviation is greater than the threshold.
- Switch from scaling factor 2 to scaling factor 1 when the position deviation is less than the threshold.

Note
In the fast PTI mode, it is dimension-less unit. In other mode, unit depends on actual physical unit setting.

p29132 Gain switching condition: Position setpoint frequency

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions, Rotating measurement/speed controller optimization
Unit: -

Min:	Max:	Factory setting:
0.0000	210000.0000	100.0000

Description: Sets the pulse input speed (PTI) threshold or internal position speed (EPOS) threshold for triggering gain switching.
If the gain switching function is enabled and this condition is selected:
1. PTI
- Switch from scaling factor 1 to scaling factor 2 when the pulse train input speed is greater than the threshold.
- Switch from scaling factor 2 to scaling factor 1 when the pulse train input speed is less than the threshold.
2. EPOS
- Switch from scaling factor 1 to scaling factor 2 when the speed is greater than the threshold.
- Switch from scaling factor 2 to scaling factor 1 when the speed is less than the threshold.

Note
In the fast PTI mode, unit is Hz. In other mode, unit depends on actual physical unit setting.

p29133 Gain switching condition: Actual speed

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions, Rotating measurement/speed controller optimization
Unit: rpm

Min:	Max:	Factory setting:
0 [rpm]	210000 [rpm]	100 [rpm]

Description: Sets the speed threshold for triggering gain switching.
If the gain switching function is enabled and this condition is selected:
- Switch from scaling factor 1 to scaling factor 2 when the actual motor speed is greater than the threshold.
- Switch from scaling factor 2 to scaling factor 1 when the actual motor speed is less than the threshold.

p29139 Gain switching 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
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions, Rotating measurement/speed controller optimization
Unit: ms

Min:	Max:	Factory setting:
8 [ms]	1000 [ms]	20 [ms]

Description: Sets the time constant for gain switching to avoid reduction of system reliability due to frequent gain switching.

p29140 PI/P switching mode selection

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions, Rotating measurement/speed controller optimization
Unit: -

Min:	Max:	Factory setting:
0	5	0

Description: Selects a condition for the switching from PI control to P control under the speed loop.
0: Disabled
1: Torque is higher than a parameterizable setting value.
2: Using the digital input signal in c29149.
3: Speed is higher than a parameterizable setting value.
4: Acceleration is higher than a parameterizable setting value.
5: Pulse deviation is higher than a parameterizable setting value.

Value:

0:	Disable
1:	Torque
2:	DI G-CHANGE
3:	Speed
4:	Acceleration
5:	Pulse deviation

Note
Only when the autotuning function (p5300=0) and gain switching function(p29130=0) are both disabled, PI/P switching function can be used.

p29141 PI/P switching condition: Torque

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions, Rotating measurement/speed controller optimization
Unit: %

Min:	Max:	Factory setting:
0 [%]	300 [%]	200 [%]

Description: Sets the torque threshold for PI/P switching. If the PI/P switching function is enabled and this condition is selected:
- Switch from the PI control to the P control when the actual torque is greater than the threshold.
- Switch from the P control to the PI control when the actual torque is less than the threshold.

p29142 PI/P switching condition: Actual speed

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions, Rotating measurement/speed controller optimization
Unit: rpm

Min:	Max:	Factory setting:
0 [rpm]	210000 [rpm]	2000 [rpm]

Description: Sets the speed threshold for PI/P switching. If the PI/P switching function is enabled and this condition is selected:
- Switch from the PI control to the P control when the actual speed is greater than the threshold.
- Switch from the P control to the PI control when the actual speed is less than the threshold.

p29143 PI/P switching condition: Acceleration

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions, Rotating measurement/speed controller optimization
Unit: rev/s²

Min:	Max:	Factory setting:
0 [rev/s²]	30000 [rev/s²]	20 [rev/s²]

Description: Sets the acceleration threshold for PI/P switching. If the PI/P switching function is enabled and this condition is selected:
- Switch from the PI control to the P control when the actual acceleration is greater than the threshold.
- Switch from the P control to the PI control when the actual acceleration is less than the threshold.

p29144 PI/P switching condition: Pulse deviation

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Technology Extensions, Rotating measurement/speed controller optimization
Unit: -

Min:	Max:	Factory setting:
0.0000	2.1474826e+09	30000.0000

Description: Sets the pulse deviation threshold for PI/P switching. If the PI/P switching function is enabled and this condition is selected:

- Switch from the PI control to the P control when the actual pulse deviation is greater than the threshold.
- Switch from the P control to the PI control when the actual pulse deviation is less than the threshold.

Note
In the fast PTI mode, it is dimension-less unit. In other mode, unit depends on actual physical unit setting.

c29149 Gain switching or PI/P switching

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: Technology Extensions, Rotating measurement/speed controller optimization
Unit: -

Description: Signal for gain switching or PI/P switching.

p29174 FPC speed precontrol factor

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Fast position controller
Unit: %

Min:	Max:	Factory setting:
0.00 [%]	200.00 [%]	100.00 [%]

Description: Sets the speed precontrol factor for the fast position controller (FPC).
When p29174 = 0%, the precontrol is deactivated.

p29175 FPC speed precontrol filter PT1

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Fast position controller
Unit: ms

Min:	Max:	Factory setting:
0.00 [ms]	10.00 [ms]	0.00 [ms]

Description: Sets the time constant for the speed precontrol filter (PT1).

p29176 FPC precontrol symmetrizing 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
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Fast position controller
Unit: ms

Min:	Max:	Factory setting:
0.00 [ms]	100.00 [ms]	1.50 [ms]

Description: Sets the PT1 filter to emulate the timing behavior of the closed-speed control loop.

p29178 FPC proportional gain

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Fast 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 of the fast position controller.

p29180 FPC output speed limit

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Fast position controller
Unit: rpm

Min:	Max:	Factory setting:
0.000 [rpm]	210000.000 [rpm]	210000.000 [rpm]

Description: Sets the speed limit of the fast position controller output.

r29182 FPC total speed setpoint

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: Technology Extensions, Fast position controller
Unit: rpm

Description: Displays the total speed setpoint.

r29185.1...6 **FPC status 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: Technology Extensions, Fast position controller
Unit: -

Description: Displays the status word of the fast position controller.

Bit array:

Bit	Signal name	1 signal	0 signal
01	Fast position controller active	Yes	No
06	Fast position controller output limited	Yes	No

r29187 **FPC deviation of position**

Data type: Integer32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Technology Extensions, Fast position controller
Unit: -

Description: Displays the deviation between the setpoint and the actual position at the controller input.

c29265 **Inhibit pulse train setpoint**

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: Technology Extensions, Processing
Unit: -

Description: Signal for inhibiting pulse train setpoint.
Value = 1 signal:
The pulse input is ignored and the position setpoint is frozen.

p29266 **Droop pulse clearing mode selection**

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: Technology Extensions, Processing
Unit: -

Min:	Max:	Factory setting:
0	2	0

Description: Selects a mode to clear droop pulses.

Value:
0: Clear droop pulses before servo-on
1: Clear droop pulses before servo-on or with CLR high level
2: Clear droop pulses before servo-on or with CLR rising edge

c29267 Clear droop pulses

S200 Basic PTI

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: Technology Extensions, Processing
Unit: -

Description:
Signal for clearing droop pulses (CLR).
The droop pulse clearing is executed depending on the clearing mode selected via p29266.
- p29266 = 0: Clear droop pulses before enabling the servo-on signal.
- p29266 = 1: Clear droop pulses before enabling the servo-on signal or with CLR high level (c29267 = 1).
- p29266 = 2: Clear droop pulses before enabling the servo-on signal or with CLR rising edge (c29267 = 0 -> 1).

c29267 Clear droop pulses

S200 PTI

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: Technology Extensions, Processing
Unit: -

Description:
Signal for clearing droop pulses (CLR).
The droop pulse clearing is executed depending on the clearing mode selected via p29266.
- p29266 = 0: Clear droop pulses before enabling the servo-on signal.
- p29266 = 1: Clear droop pulses before enabling the servo-on signal or with CLR high level (c29267 = 1).
- p29266 = 2: Clear droop pulses before enabling the servo-on signal or with CLR rising edge (c29267 = 0 -> 1).

p29271 Number of setpoint pulses per revolution

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Processing
Unit: -

Min:	Max:	Factory setting:
0	2147483647	0

Description:
Sets the number of setpoint pulses per motor revolution. The servo motor rotates for one revolution when the number of the setpoint pulses reaches this value.

Dependency:
See also: p29272, p29273

Note
When p29271 = 0, the number of required setpoint pulses is decided by the electronic gear ratio (p29272/p29273).

p29272[0...3] Numerator of electronic gear

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Processing
Unit: -

Min:	Max:	Factory setting:
1	2147483647	1

Description: Sets the numerator of the electronic gear ratio for the setpoint pulses.
Four numerators in total are available. You can select one of the numerators by configuring the digital input signal EGEAR.
For detailed information about the calculation of a numerator, refer to the Operating Instructions to calculate.

Index: [0] = Electronic gear numerator 0
[1] = Electronic gear numerator 1
[2] = Electronic gear numerator 2
[3] = Electronic gear numerator 3

Dependency: See also: p29271, p29273, c29275, c29276

Note
This setting value is only effective when p29271 = 0.

p29273 Denominator of electronic gear

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Processing
Unit: -

Min:	Max:	Factory setting:
1	2147483647	1

Description: Sets the denominator of the electronic gear ratio for the setpoint pulses.

Dependency: See also: p29271, p29272

Note
This setting value is only effective when p29271 = 0.

c29275 Electronic gear selection bit 0

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: Technology Extensions, Processing
Unit: -

Description: Signal of bit 0 for the electronic gear selection.

c29276 Electronic gear selection bit 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: Technology Extensions, Processing
Unit: -

Description: Signal of bit 1 for the electronic gear selection.

p29283[0...1] Pulse setpoint moving average time

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Processing
Unit: ms

Min:	Max:	Factory setting:
0.00 [ms]	128.00 [ms]	[0] 1.00 [ms] [1] 0.00 [ms]

Description: Sets the smoothing time for moving average filters.
Index:
[0]: Smoothing time for moving average filter 1
[1]: Smoothing time for moving average filter 2

Note
There is additional delay on position setpoint with this smoothing function. It may be used for:
- Reducing the noise and jitter with high ratio of electronic gear
- Jerk limiting

p29284 Pulse setpoint PT1 filter time constant

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Processing
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 filter increases the effective response time. This allows a softer control behavior with improved tolerance with respect to noise/disturbances.

r29288 Pulse setpoint after smoothing

Data type: Integer32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Technology Extensions, Processing
Unit: -

Description: Displays the position setpoint after smoothing.

Note
This is the input of the position controller by default.

r29289.0...15 Pulse setpoint status word

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Technology Extensions, Processing
Unit: -

Description: Displays the status word for the pulse setpoint processing.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Setpoint inhibited active	Yes	No
01	E-gear switch bit 0 active	Yes	No
02	E-gear switch bit 1 active	Yes	No
03	E-gear active	Yes	No
04	Droop clear active	Yes	No
08	Following error within tolerance	Yes	No
10	In-position	Yes	No
15	New setpoint active	Yes	No

Note
For bit 00 = 1:
- Inhibiting setpoint activated.
For bit 02:01 = x:
- "x" is the index of actual e-gear factor in p29272[0...3].
- The values are valid only when e-gear function is activated (bit 03 = 1).
For bit 03 = 1:
- E-gear function is activated (p29271 = 0).
For bit 04 = 1:
- Clearing pulse droop activated.
For bit 08 = 1:
- The following error between position setpoint and actual in tolerance (p29294).
For bit 10 = 1:
- The actual position reached the target position (p29290, p29291, p29292, p29293).
For bit 15 = 1:
- There is new position setpoint in setting time (p29293).

p29290 In-position monitoring mode

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: Technology Extensions, Position monitoring
Unit: -

Min:	Max:	Factory setting:
0	2	0

Description: Sets the mode for the in-position monitoring.
Value = 0:
The deviation between setpoint and actual position remains within the positioning window (p29291).
Value = 1:
The condition of "Value = 0" is met, and there is no new setpoint (r29289.15=0) within the new setpoint monitoring time (p29293).
Value = 2:
The condition of "Value = 1" is met, and the actual speed stays close to zero.

If the condition of a monitoring mode is constantly met within the in-position monitoring time (p29292), the value of r29289.10 is set to 1.

Value:
0: Monitoring the deviation of position only
1: Monitoring the deviation and setpoint of position
2: Monitoring the actual speed, deviation and setpoint of position

Note
The monitoring is deactivated when p29291=0.

p29291 In-position window range

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Position monitoring
Unit: -

Min:	Max:	Factory setting:
0	2147483647	2194

Description: Sets the positioning window for the in-position monitoring function.
In-position monitoring starts when the deviation between setpoint and actual position lies within the window. The output of in-position state depends on the monitoring mode set by p29290.

Note
When p29291 = 0, the in-position monitoring function is deactivated.

p29292 In-position monitoring time

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Position monitoring
Unit: ms

Min:	Max:	Factory setting:
0.00 [ms]	30000.00 [ms]	0.00 [ms]

Description: Sets the monitoring time for the in-position monitoring.
If the condition of the selected in-position monitoring mode (p29290) is constantly met within the in-position monitoring time (p29292), the in-position state is set.

p29293 New setpoint monitoring time

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Position monitoring
Unit: ms

Min:	Max:	Factory setting:
0.00 [ms]	1000.00 [ms]	1.00 [ms]

Description: Sets the monitoring time for the new pulse setpoint.
The new setpoint state is set (r29289.15 = 1), if there is new pulse input in the monitoring time.

p29294 Following error monitoring threshold

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Technology Extensions, Position monitoring
Unit: -

Min:	Max:	Factory setting:
0	2147483647	104857

Description: Sets the tolerance for the fast following error monitoring.
If the following error exceeds the selected tolerance, a fault is output.

Note
When p29294 = 0, the following error monitoring is deactivated.

c29300 Servo-on

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: Technology Extensions, Drive enable signals
Unit: -

Description: Signal for servo-on.

c29301 Clockwise over-travel limit

S200 Basic PTI

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: Technology Extensions, Limit
Unit: -

Description: Signal for the active clockwise over-travel limit.

c29301 **Clockwise over-travel limit**

S200 PTI

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: Technology Extensions, Limit
Unit: -

Description: Signal for the active clockwise over-travel limit.

c29302 **Counterclockwise over-travel limit**

S200 Basic PTI

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: Technology Extensions, Limit
Unit: -

Description: Signal for the active counterclockwise over-travel limit.

c29302 **Counterclockwise over-travel limit**

S200 PTI

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: Technology Extensions, Limit
Unit: -

Description: Signal for the active counterclockwise over-travel limit.

c29303 **Clockwise rotation**

S200 PTI

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: Technology Extensions, Drive enable signals
Unit: -

Description: Signal for clockwise rotation.

c29304 **Counterclockwise rotation**

S200 PTI

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: Technology Extensions, Drive enable signals
Unit: -

Description: Signal for counterclockwise rotation.

c29305 **Control mode switching**

S200 PTI

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: Technology Extensions, Quick commissioning
Unit: -

Description: Signal for control mode switching.

p29340 Warning 1 assigned to digital output

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:	Technology Extensions, I/O configuration	
Unit: -		
Min:	**Max:**	**Factory setting:**
1	5	1

Description: Defines conditions for WARNING1.
1: Motor overload protection warning: 85% of motor overload threshold has been reached.
2: Fan warning: The predicted lifespan of the fan has expired. Replacement is needed.
3: Encoder error
4: Motor overtemperature warning.
5: Capacitor warning: The service life of the capacitor has expired. Replacement is needed.

Value:
1: Motor overload protection
2: Fan life time
3: Encoder error
4: Motor overtemperature
5: Capacitor life time

p29341 Warning 2 assigned to digital output

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:	Technology Extensions, I/O configuration	
Unit: -		
Min:	**Max:**	**Factory setting:**
1	5	3

Description: Defines conditions for WARNING2.
1: Motor overload protection warning: 85% of motor overload threshold has been reached.
2: Fan warning: The predicted lifespan of the fan has expired. Replacement is needed.
3: Encoder error
4: Motor overtemperature warning.
5: Capacitor warning: The service life of the capacitor has expired. Replacement is needed.

Value:
1: Motor overload protection
2: Fan life time
3: Encoder error
4: Motor overtemperature
5: Capacitor life time

p29342 Reference frequency assigned to pulse input frequency

S200 PTI

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: Technology Extensions, Position monitoring
Unit: -

Min:	Max:	Factory setting:
1	4	1

Description: Sets the reference frequency of the pulse input frequency.
1: reference 1k
2: reference 10k
3: reference 100k
4: reference 1000k

Value:
1: Pulse input frequency (reference 1k)
2: Pulse input frequency (reference 10k)
3: Pulse input frequency (reference 100k)
4: Pulse input frequency (reference 1000k)

p29343 Reference frequency assigned to remaining number of pulses

S200 PTI

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: Technology Extensions, Position monitoring
Unit: -

Min:	Max:	Factory setting:
1	4	1

Description: Sets the reference frequency of the remaining number of pulses.
1: reference 1k
2: reference 10k
3: reference 100k
4: reference 1000k

Value:
1: Remaining number of pulse (reference 1k)
2: Remaining number of pulses (reference 10k)
3: Remaining number of pulses (reference 100k)
4: Remaining number of pulses (reference 1000k)

r29350 Pulse input frequency

S200 PTI

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: Technology Extensions, Position monitoring
Unit: -

Description: Displays the pulse input frequency.

r29351 **Remaining number of pulses**

S200 PTI

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: Technology Extensions, Position monitoring
Unit: -

Description: Displays the remaining number of pulses.

r29404.0...5 **DO status 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: Technology Extensions
Unit: -

Description: Displays the status word of the digital outputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	ready for servo on		
01	current control mode		
02	overload level reached		
03	speed reached		
04	warnning1		
05	warnning2		

r60044 **SI message buffer counter changes**

S200 PTI

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: -

Description: Displays the changes of the safety message buffer.
This counter is incremented every time that the safety message buffer changes.

Recommendation: This is used to check whether the safety message buffer has been read out consistently.

Dependency: See also: r9753, r9754, r9755, r9756, r60045, r60048, r60049, p60052

r60045[0...63] **SI message code**

S200 PTI

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: -

Description: Displays the numbers of safety messages that have occurred.

Dependency: See also: r9753, r9754, r9755, r9756, r60044, r60048, r60049, p60052

Note
The messages type "safety message" (Cxxxxx) are entered in the message fault buffer.
Message buffer structure (principle):
r60045[0], r60048[0], r60049[0], r9753[0], r9754[0], r9755[0], r9756[0] --> safety message 1 (oldest active message) of the actual message case.
...
r60045[7], r60048[7], r60049[7], r9753[7], r9754[7], r9755[7], r9756[7] --> safety message 8 (latest active message) of the actual message case,

Safety messages that have gone are automatically acknowledged.
History of acknowledged messages:
r60045[8], r60048[8], r60049[8], r9753[8], r9754[8], r9755[8], r9756[8] --> safety message 1 of the 1st acknowledged message case,
...
r60045[16], r60048[16], r60049[16], r9753[16], r9754[16], r9755[16], r9756[16] --> safety message 1 of the 2nd acknowledged message case,
...
r60045[56], r60048[56], r60049[56], r9753[56], r9754[56], r9755[56], r9756[56] --> safety message 1 of the 7th acknowledged message case,
...
r60045[63], r60048[63], r60049[63], r9753[63], r9754[63], r9755[63], r9756[63] --> safety message 8 (oldest gone message) of the 7th acknowledged message case,

r60047[0...63] SI message number

S200 PTI

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: -

Description: Displays the numbers of safety messages that have occurred.

Dependency: See also: r9753, r9754, r9755, r9756, r60044, r60048, r60049, p60052

Note
The messages type "safety message" (Cxxxxx) are entered in the message fault buffer.
Message buffer structure (principle):
r60045[0], r60048[0], r60049[0], r9753[0], r9754[0], r9755[0], r9756[0] --> safety message 1 (oldest active message) of the actual message case.
...
r60045[7], r60048[7], r60049[7], r9753[7], r9754[7], r9755[7], r9756[7] --> safety message 8 (latest active message) of the actual message case,

Safety messages that have gone are automatically acknowledged.
History of acknowledged messages:
r60045[8], r60048[8], r60049[8], r9753[8], r9754[8], r9755[8], r9756[8] --> safety message 1 of the 1st acknowledged message case,
...
r60045[16], r60048[16], r60049[16], r9753[16], r9754[16], r9755[16], r9756[16] --> safety message 1 of the 2nd acknowledged message case,
...
r60045[56], r60048[56], r60049[56], r9753[56], r9754[56], r9755[56], r9756[56] --> safety message 1 of the 7th acknowledged message case,
...
r60045[63], r60048[63], r60049[63], r9753[63], r9754[63], r9755[63], r9756[63] --> safety message 8 (oldest gone message) of the 7th acknowledged message case,

r60048[0...63] **SI message time received in milliseconds**

S200 PTI

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: ms

Description: Displays the relative system runtime in milliseconds when the safety message occurred.

Dependency: See also: r9753, r9754, r9755, r9756, r60044, r60045, r60049, p60052

r60049[0...63] **SI message value**

S200 PTI

Data type: Integer32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Extended functions
Unit: -

Description: Displays the additional information about the safety message that occurred (as integer number).

Dependency: See also: r9753, r9754, r9755, r9756, r60044, r60045, r60048, p60052

p60052 **SI message cases counter**

S200 PTI

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Extended functions
Unit: -

Min:	Max:	Factory setting:
0	65535	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

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.

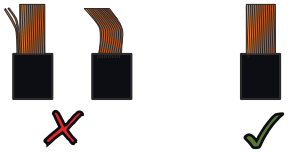
Siemens recommends that you use Siemens cable assemblies and connectors. All Siemens cable assemblies and connectors are tested and compliant with CE standards and EMC requirements. If you use non-Siemens cable assemblies, for example, cables made by yourself or third-party cables, Siemens does not guarantee 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 S200 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 and EMC requirements.

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 124)".

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:

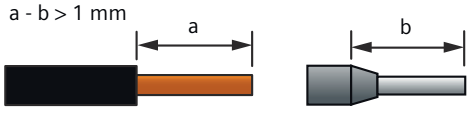
- Mains supply cable
- 24 V DC power supply cable
- Motor holding brake cable
- Motor power cable
- External braking resistor cable
- STO connection cable

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 124)".



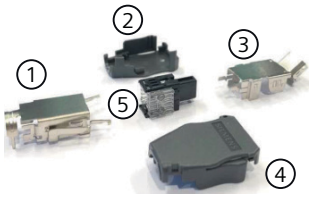
3. Insert the stripped end into the cable end sleeve.

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		

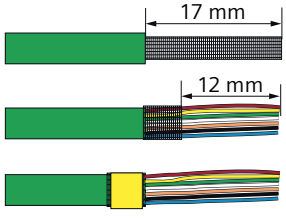
Figure A-1 IX-C connector

Requirement

You have prepared appropriate tools, a raw cable, and the Siemens IX-C connector.

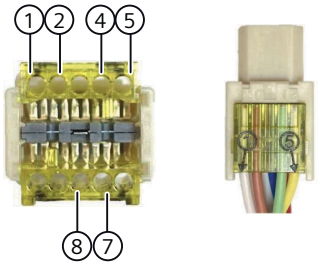
Procedure

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.



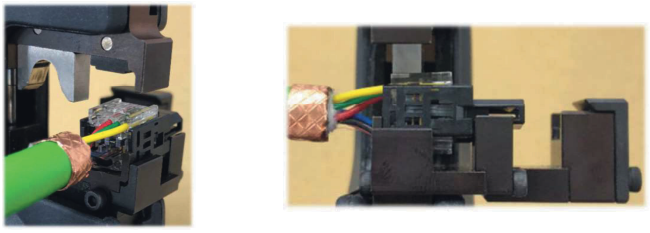
2. Arrange the conductors as shown below.

3. Insert the conductors into the connector with the correct order, pushing through until the conductor ends reach the end of the connector.

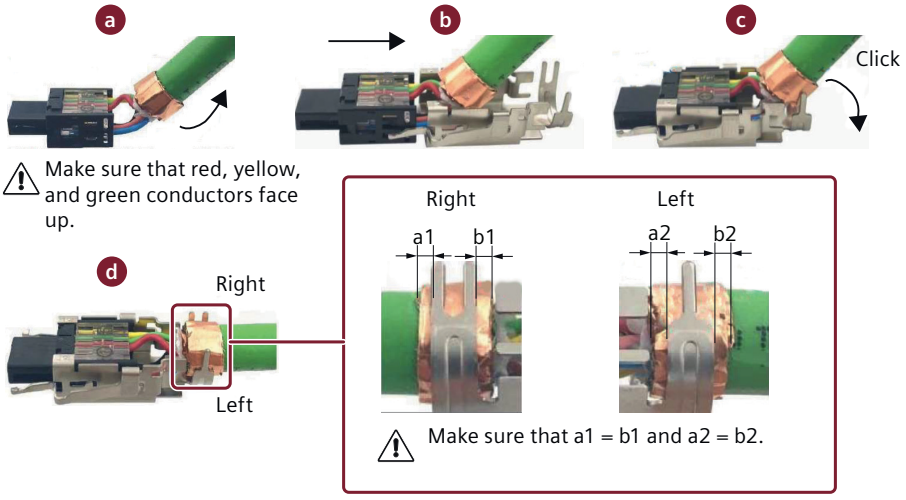


Pin	Conductor color	Pin	Conductor color
1	White	5	Yellow
2	Red	7	Pink
4	Green	8	Blue

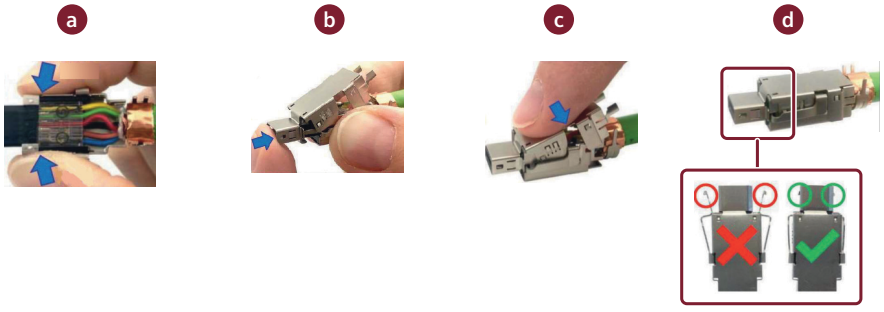
4. Insert the connector into the IDC slot in the crimping tool and crimp the connector. Make sure that red, yellow, and green conductors face up.



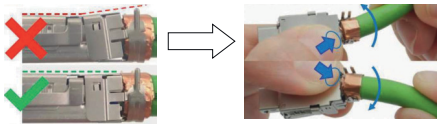
5. Assemble the shielding A.



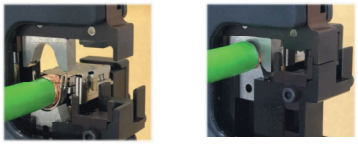
6. Assemble the shielding B.



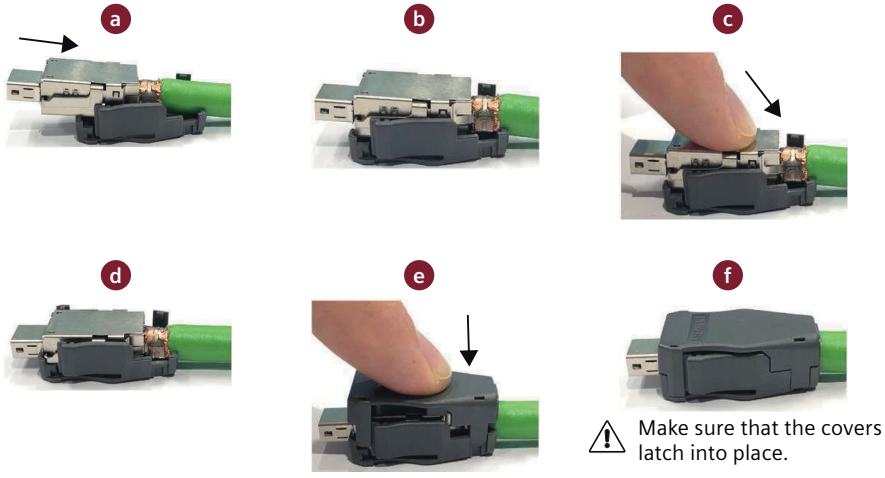
Make sure that the installed shielding B is level. If it tilts upward, adjust as follows.



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 setpoint connector

Requirement

You have prepared appropriate tools, raw cables, and the Siemens 50-pin MDR connector.

Procedure

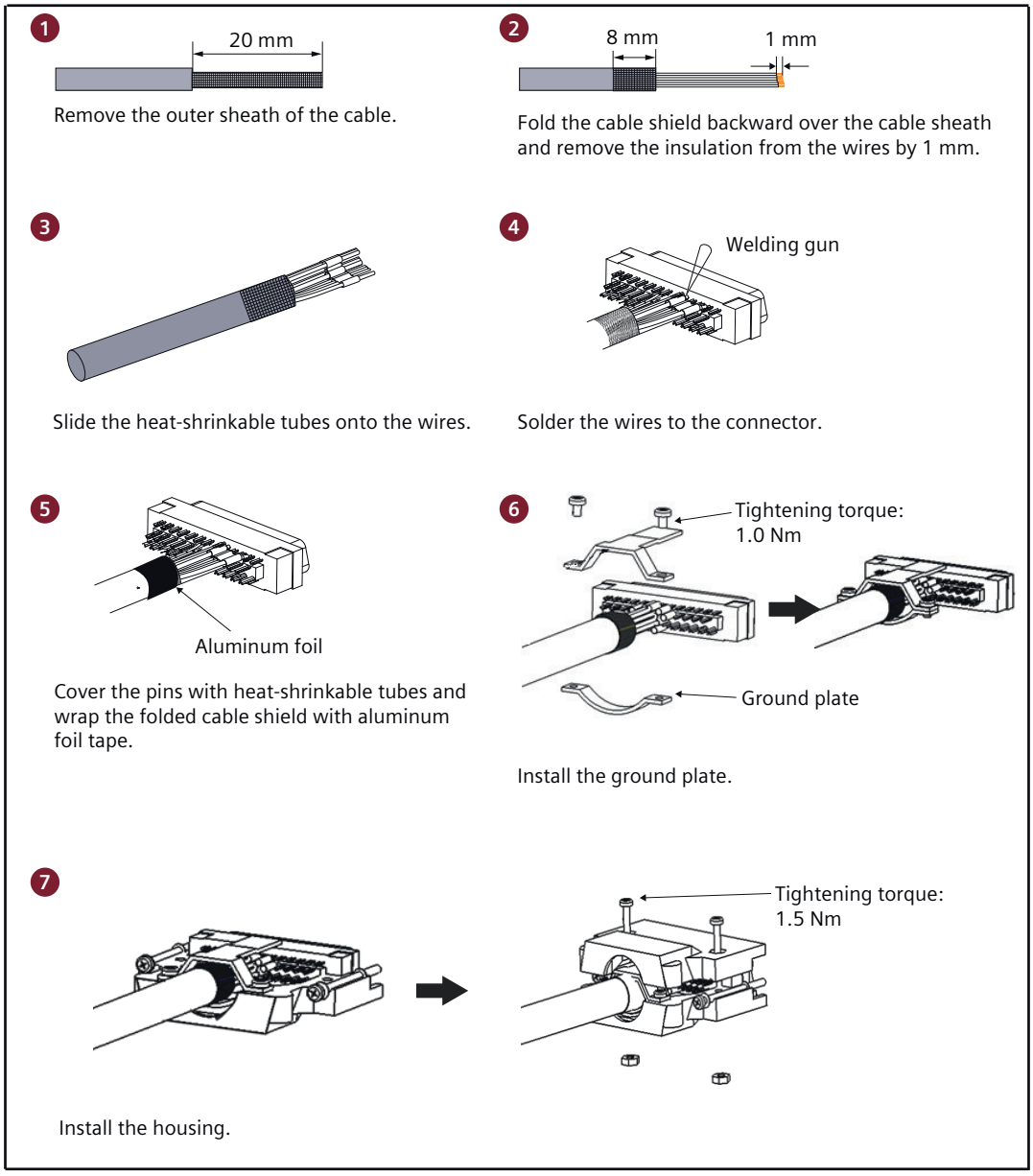


Figure A-2 Assembling the setpoint cable

Note

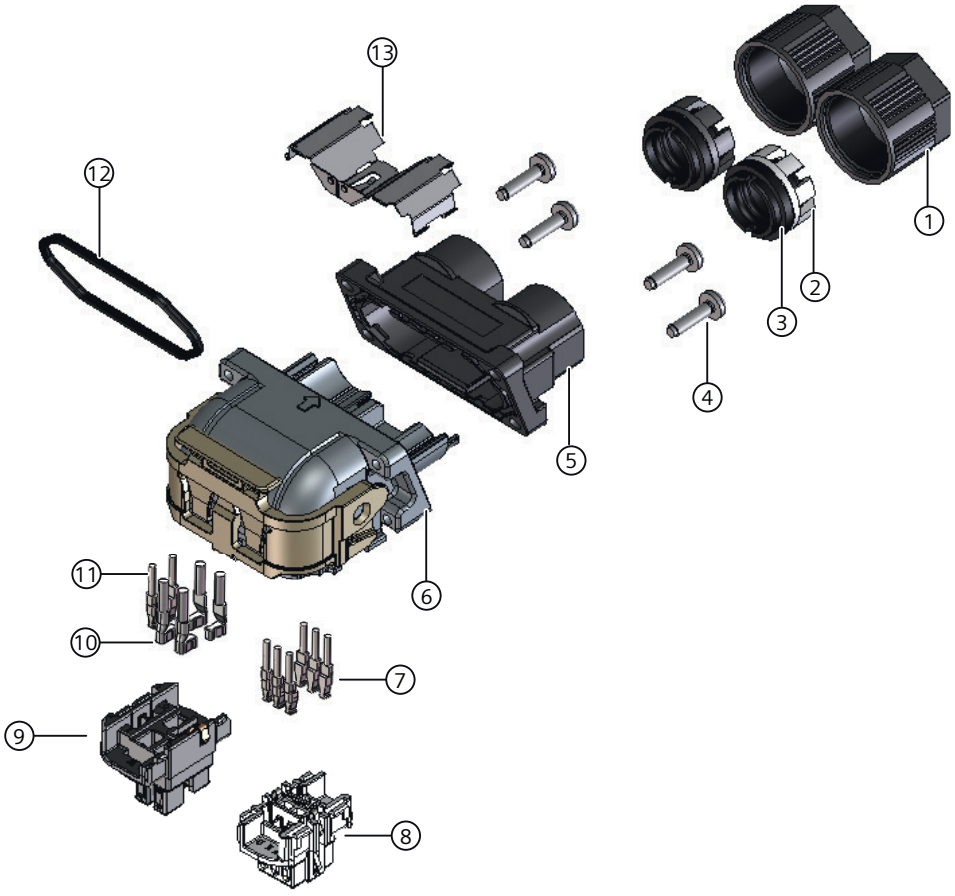
For better EMC performance, Siemens recommends that you solder the cable shield to the metal housing of the connector.

A.4.2 Assembling connectors on the motor side

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:



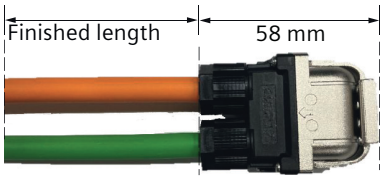
①	Cap	⑧	Signal unit case
②	Clamp	⑨	Power unit case
③	Gasket	⑩	Hybrid power contact
④	M2 screw	⑪	Hybrid brake contact
⑤	Seal case	⑫	Sealing ring
⑥	Housing	⑬	Shield holding plate
⑦	Hybrid signal contact		

Figure A-3 Hybrid plug overview

Requirement

You have prepared the following items:

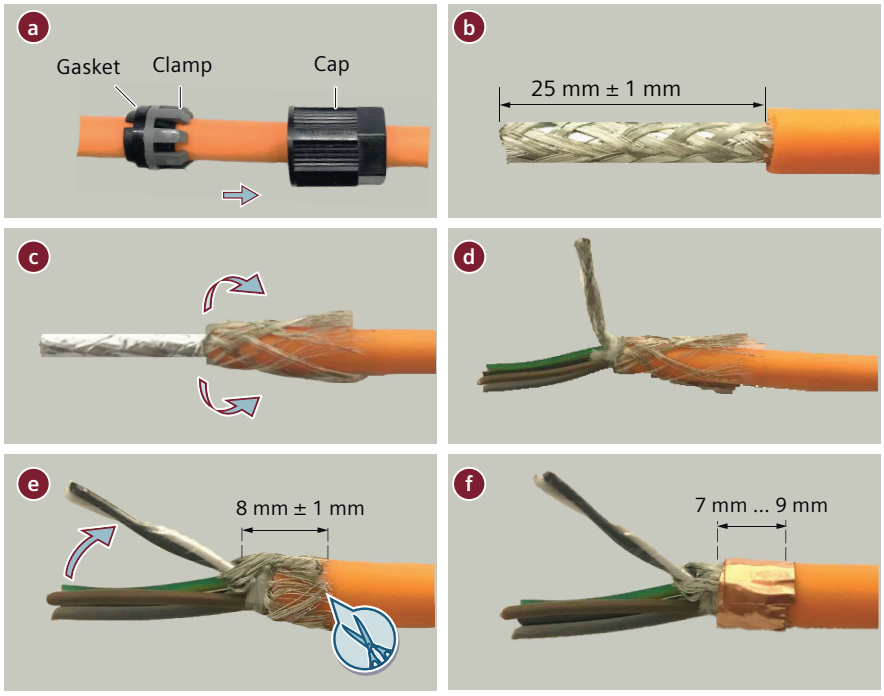
- Raw cables
  Reserve 58 mm at the ends of the cables for termination into the hybrid connector.



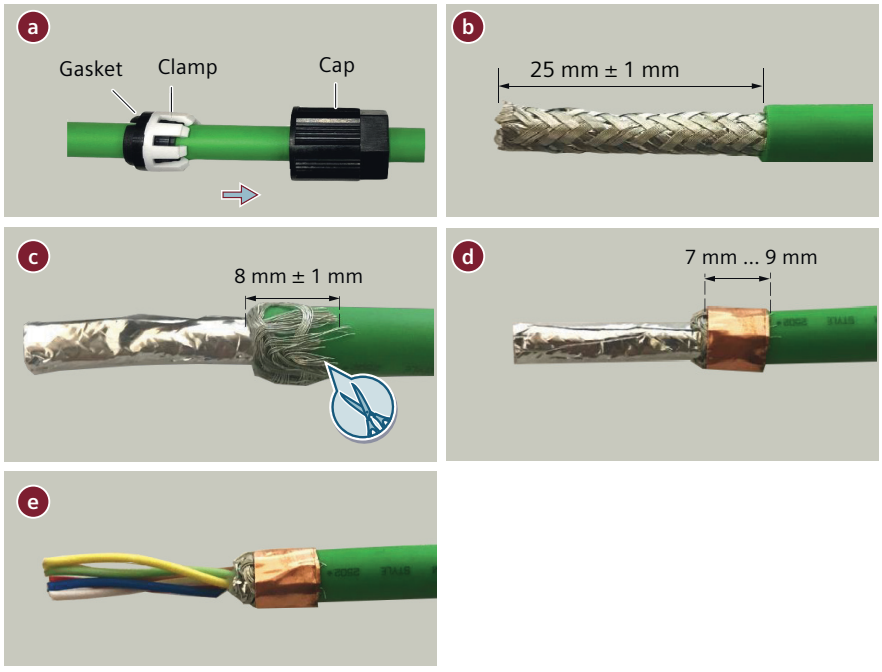
- Siemens hybrid plug
- Copper tapes
- Scissor
- Screwdriver
- Crimping tool

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 mm ± 1 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 mm ± 1 mm. Remove the debris to ensure cable insulation.
   - Wrap around the shield 1.5 to 2 times with copper tapes.



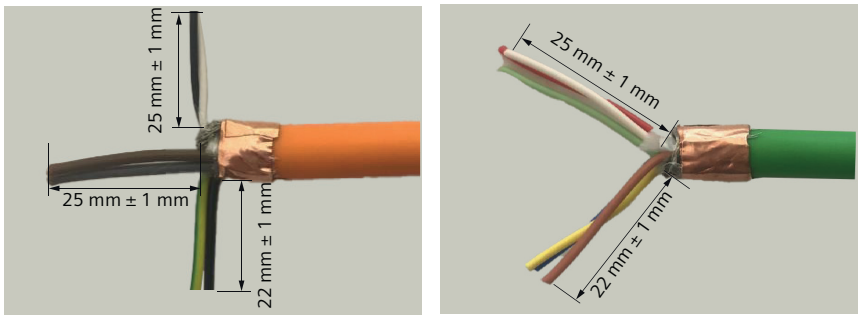
2. Prepare the encoder cable.
   - Slide the cap, the clamp, and the gasket onto the encoder cable.
   - Remove the outer sheath of the cables by 25 mm ± 1 mm.
   - Loosen the braided shield of the cable and fold the shield backward over the cable sheath. Cut the folded shield to make sure that the length of the folded shield is 8 mm ± 1 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.

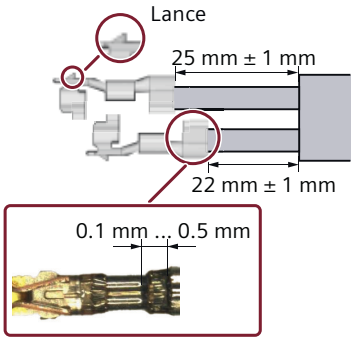
Conductor	Conductor length requirement (mm)	
	Drive-end variant	Non-drive end variant
Power conductor U	25 ± 1	22 ± 1
Power conductor V	22 ± 1	25 ± 1
Power conductor W	25 ± 1	22 ± 1
PE conductor	22 ± 1	25 ± 1
Brake conductor +	25 ± 1	25 ± 1
Brake conductor -	25 ± 1	25 ± 1
Signal conductors A, B, and C	22 ± 1	25 ± 1
Signal conductors D, E, and F	25 ± 1	22 ± 1

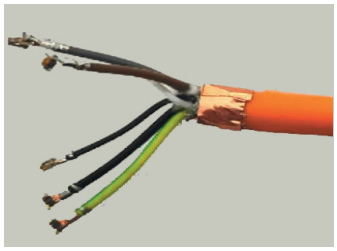
The following images show the conductor length requirement of the drive-end hybrid plug.

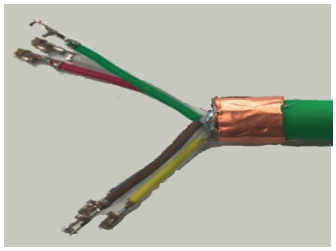


4. Strip the power and PE conductors by 2.4 mm ± 0.5 mm, and encoder and brake conductors by 2.2 mm ± 0.5 mm.

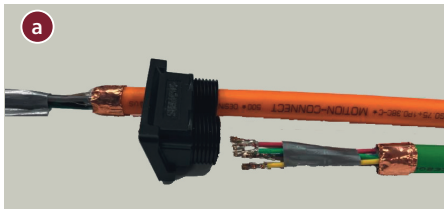
5. Crimp the contacts onto the conductors. Make sure that the lance side of the contacts face outwards.

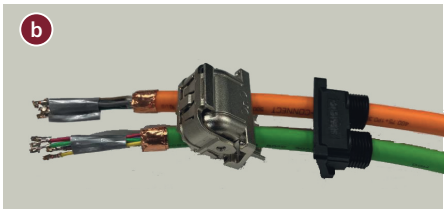




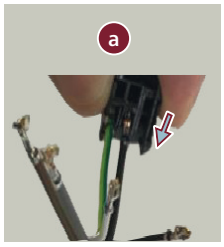


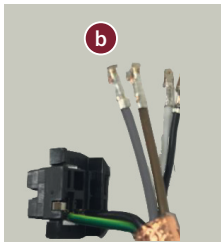
6. Slide the power and signal cables through the seal case and the housing.
Avoid deforming the contact tips. Siemens recommends that you protect the conductors with a tape during the process.

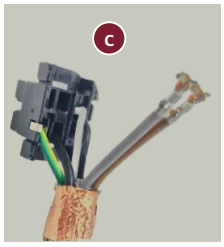


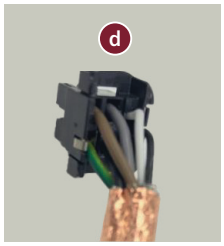


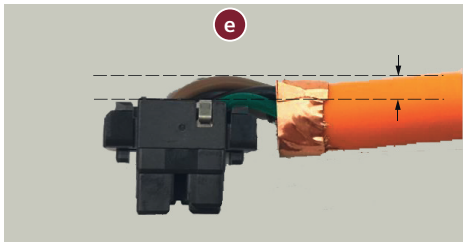
7. Insert the power and brake contacts into the power unit case and adjust the conductors to make sure that the cable does not rise up.



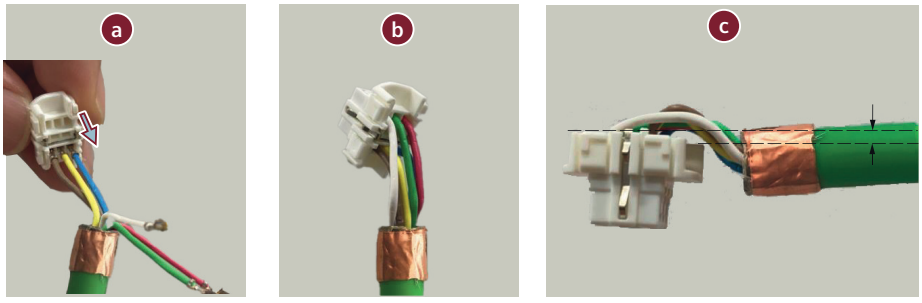




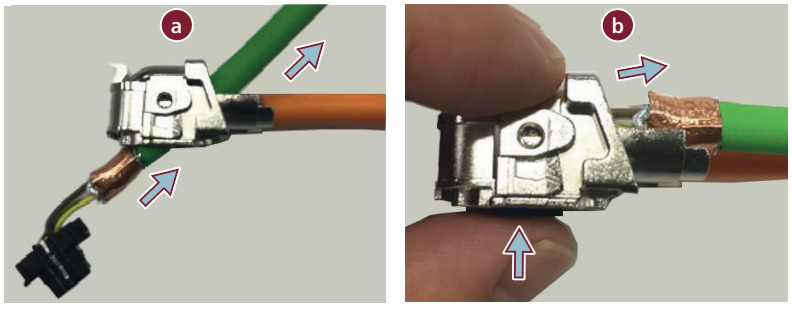




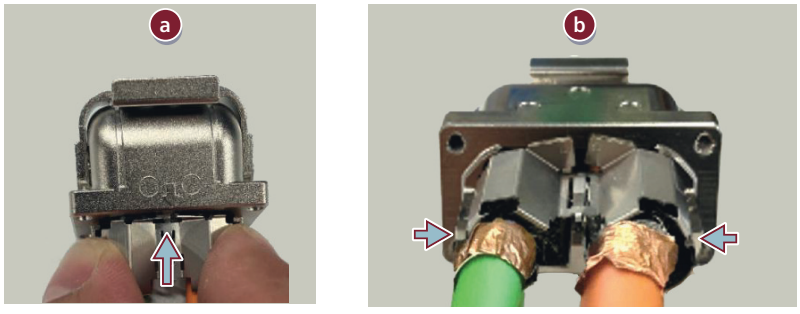
8. Insert the signal contacts into the signal unit case and adjust the conductors to make sure that the cable does not rise up.



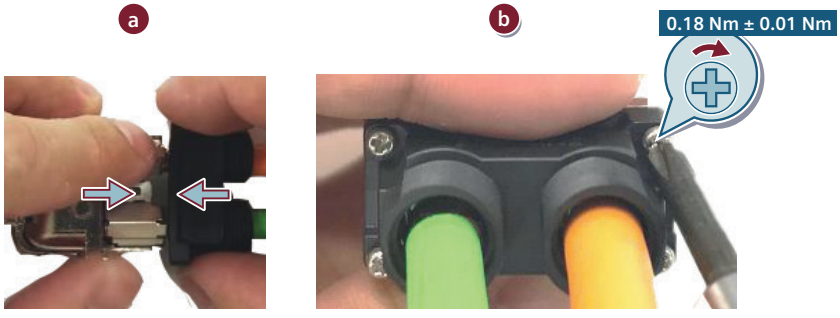
9. Insert the signal and the power unit cases into the housing by pulling the cables back. Make sure that the signal and the power unit cases are latched to the housing.



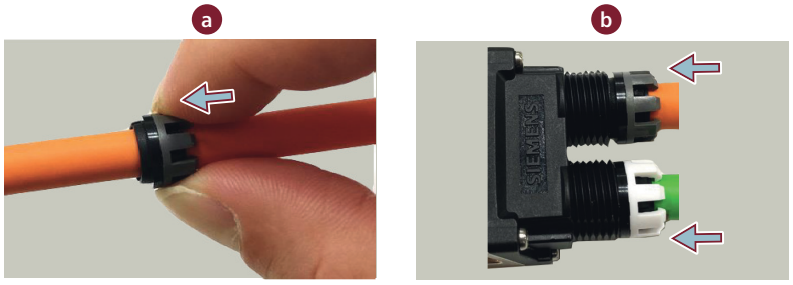
10. Insert the shield holding plate into the housing.



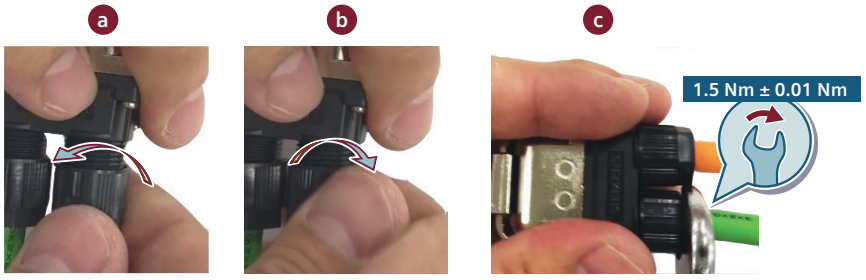
11. Assemble the housing and the seal case.
    - Hold the shield holding plate and slide the seal case to the housing.
    - Tighten the M2 screws with a tightening torque of 0.18 Nm ± 0.01 Nm.



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 Nm ± 0.01 Nm.



More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 129)".

A.4.2.2 Disassembling the hybrid plug for 1FL2 motors, shaft heights 20, 30, and 40

Requirement

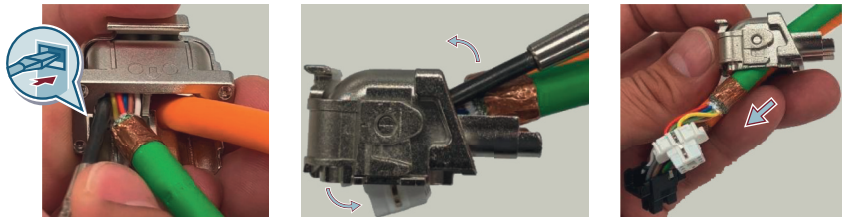
You have prepared the following items:

- Assembled Siemens hybrid plug
- Pin removal tool
- Screwdriver

Procedure

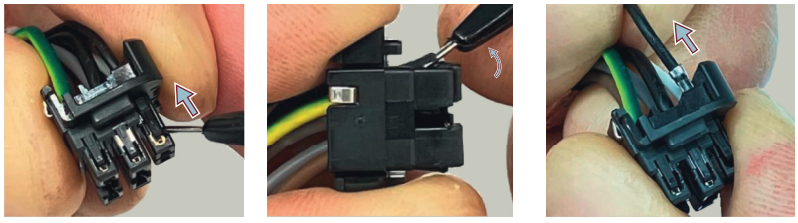
1. Remove the signal and the power unit cases from the housing.
   - Insert the screwdriver into the unit cases from the side of the cable outlet.
   - Press down the tip of the screwdriver to remove the unit cases from the housing.

a b c



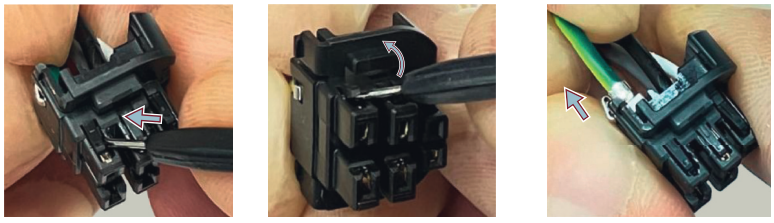
2. Remove the hybrid brake contacts from the power unit case.
   - Insert the tip of the pin removal tool into the gap between the contact and its latch.
   - Lift up the latch and pull out the contact.

a b c



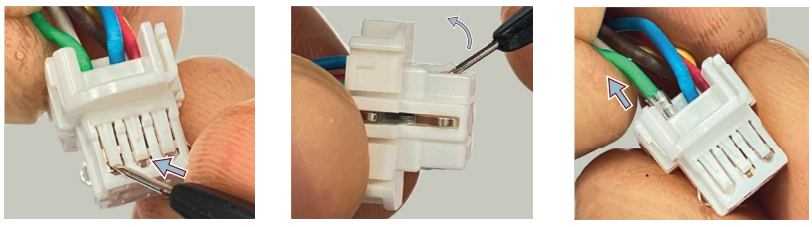
3. Repeat Step 2 to remove the hybrid power contacts from the power unit case.

a b c



4. Repeat Step 2 to remove the hybrid signal contacts from the signal unit case.

a b c



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

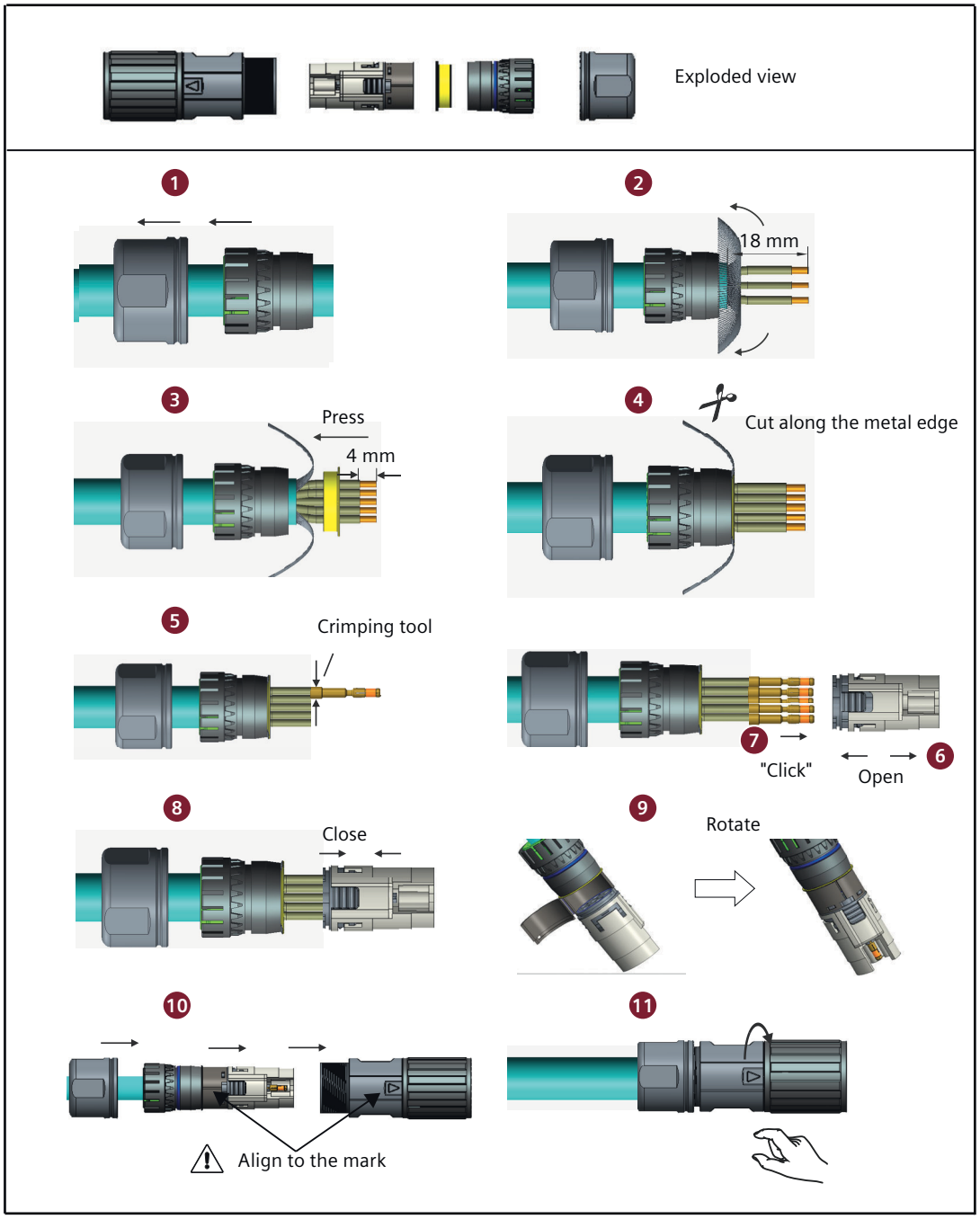


Figure A-4 Assembling the power or encoder cable of the 1FL2 motor shaft height 48 or 52

More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 129)".

A.4.2.4 Assembling connectors for 1FL2 motors, shaft heights 45, 65, and 90

Assembling the power connector

Requirement

You have prepared appropriate tools, raw cables, and the Siemens M23 connector.

Procedure

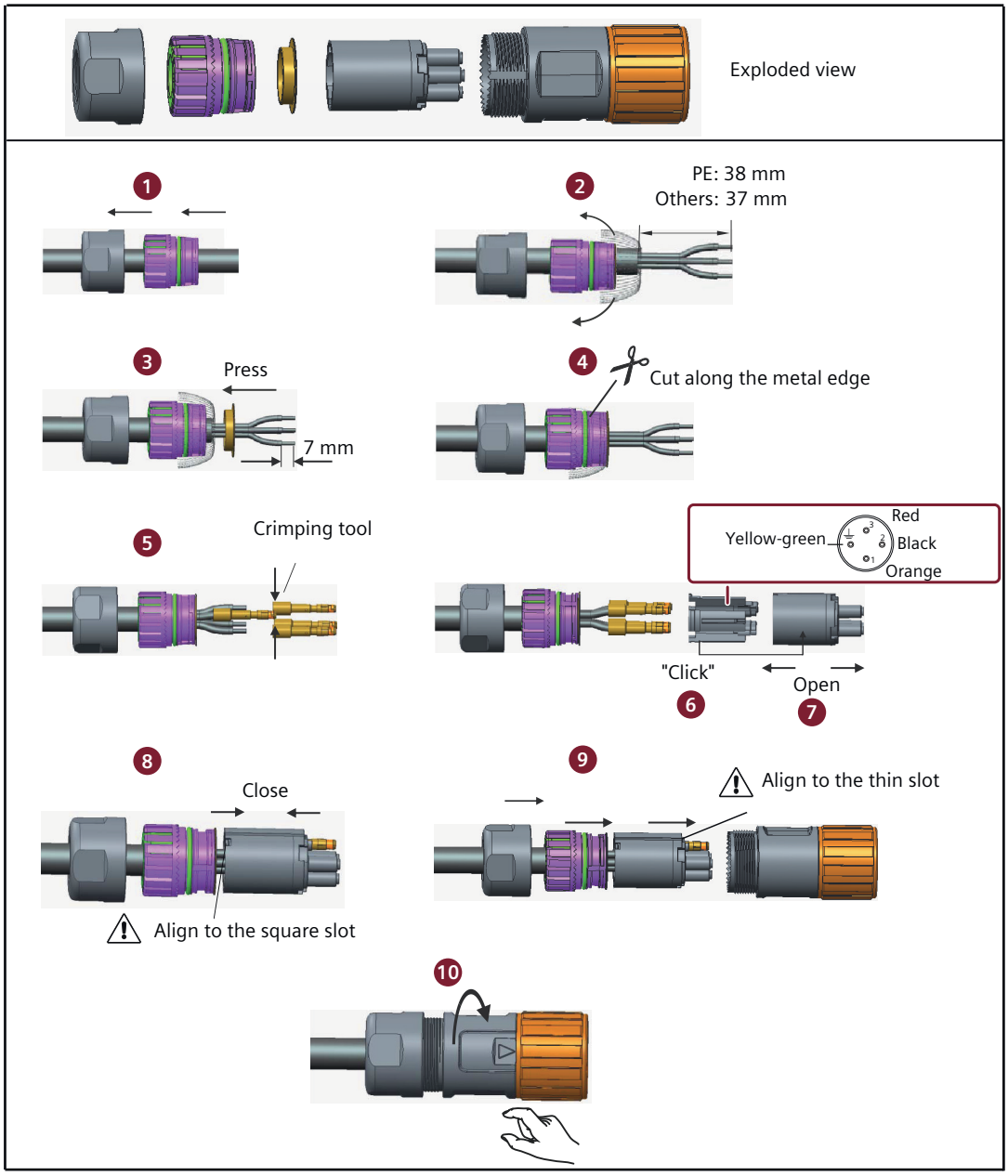


Figure A-5 Assembling the power cable of the 1FL2 motor shaft height 45, 65, or 90

More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 129)".

Assembling the encoder connector

Requirement

You have prepared appropriate tools, raw cables, and the Siemens M17 connector.

Procedure

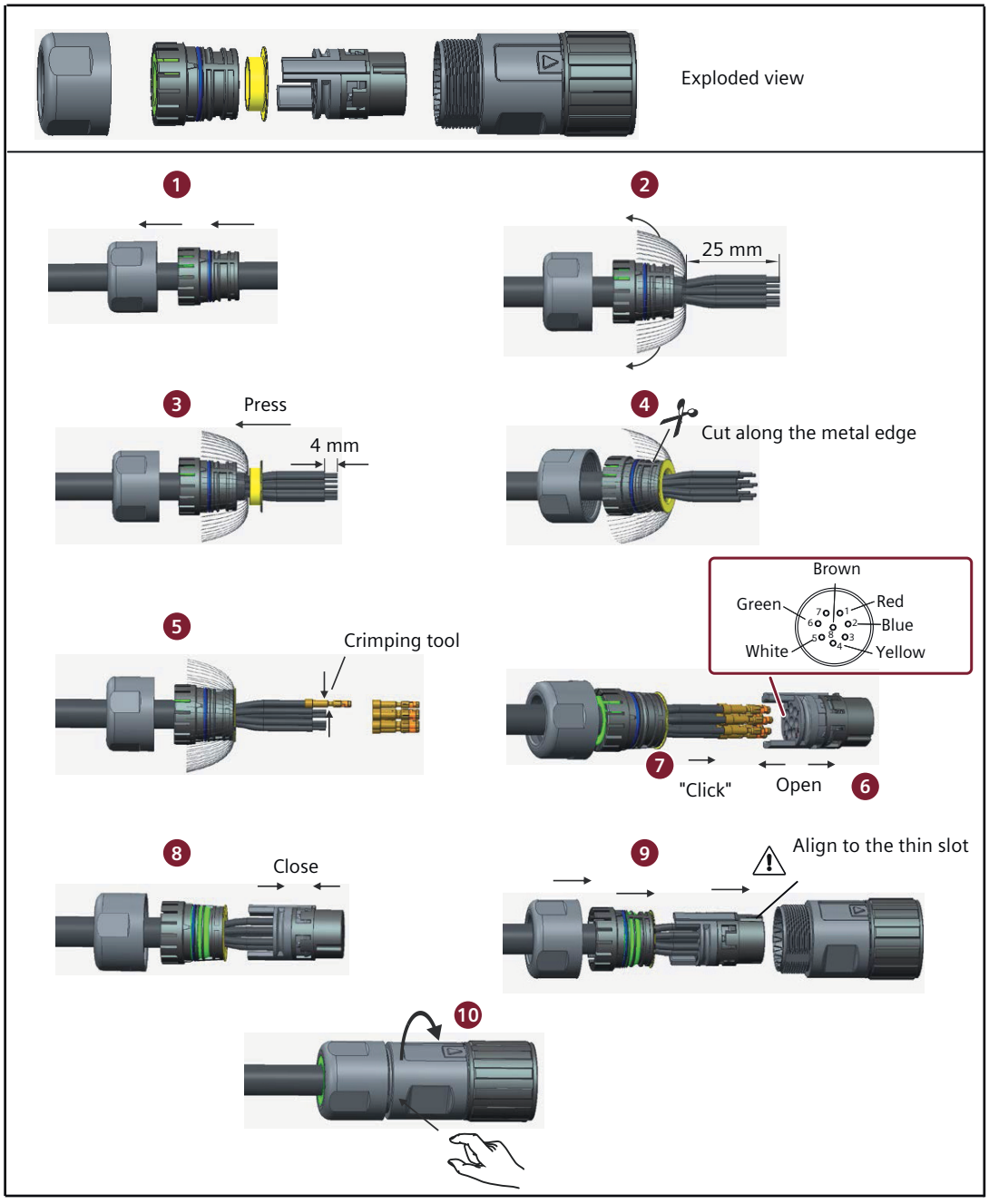


Figure A-6 Assembling the encoder cable of the 1FL2 motor shaft height 45, 65, or 90

More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 129)".

Assembling the motor holding brake connector

Requirement

You have prepared appropriate tools, raw cables, and the Siemens M17 connector.

Procedure

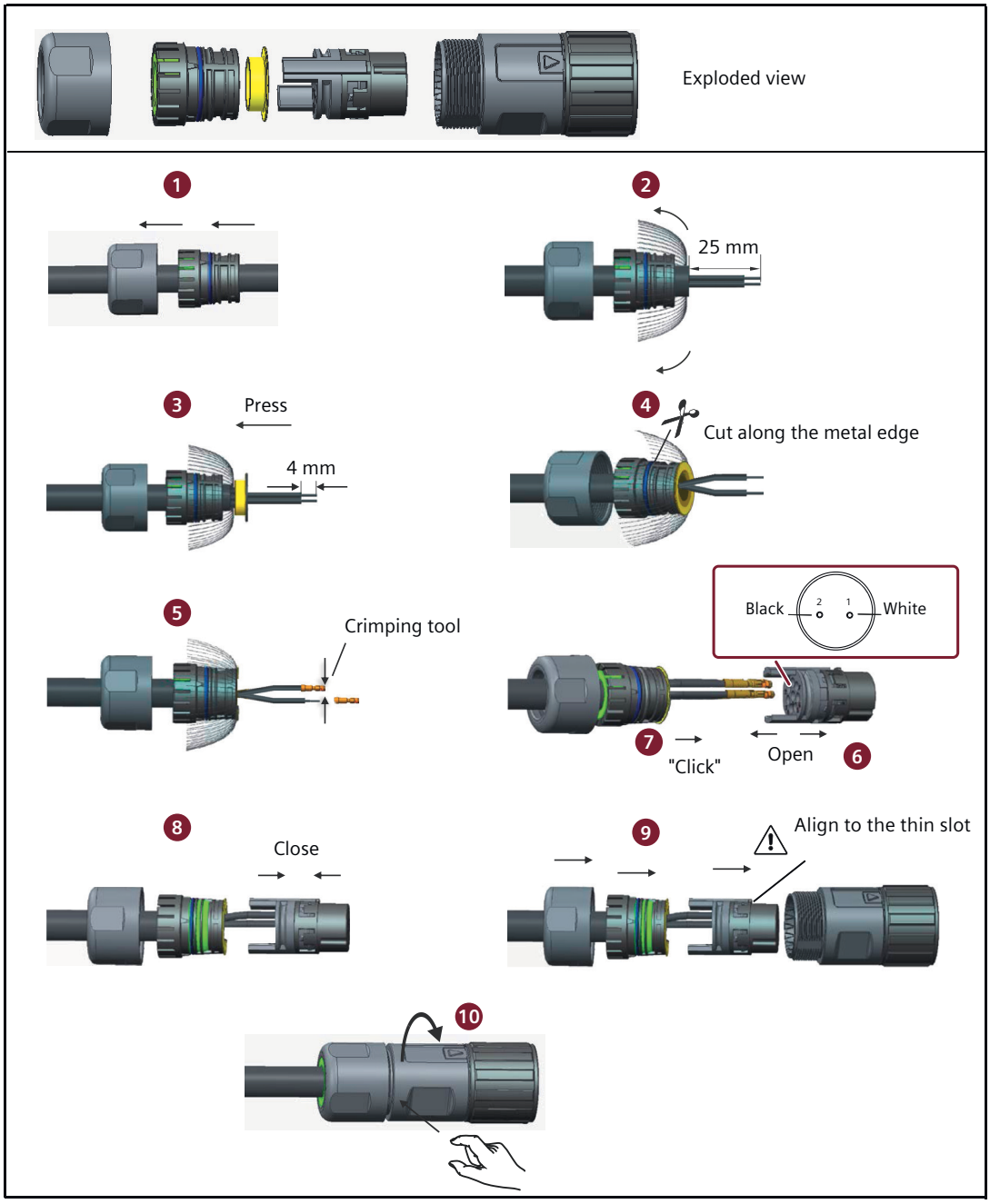


Figure A-7 Assembling the holding brake cable the 1FL2 motor shaft height 45, 65, or 90

More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 129)".

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.

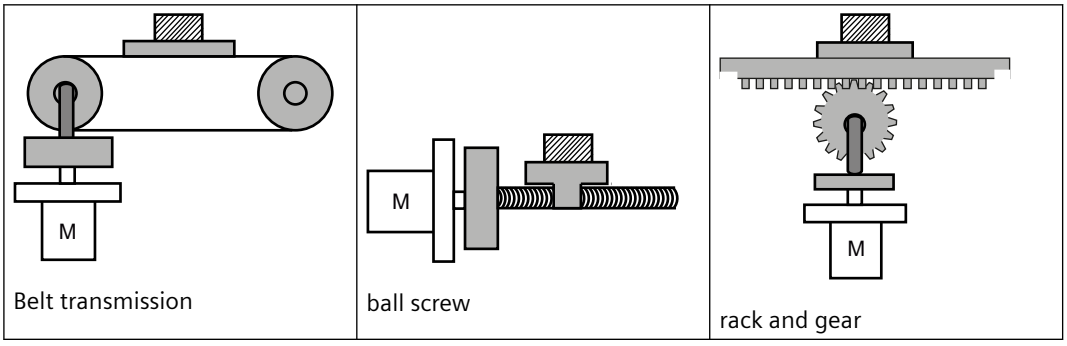
Requirement

None

Procedure

Proceed as follows to select a motor:

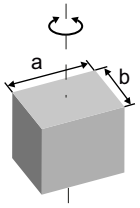
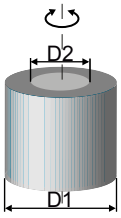
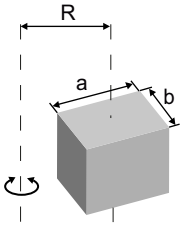
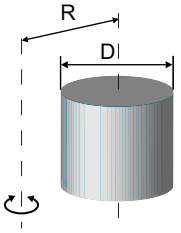
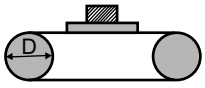
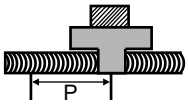
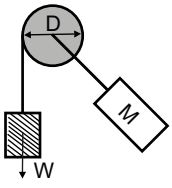
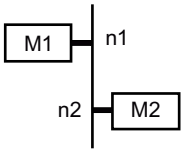
1. Determine the mechanism type as well as the detailed data of the related mechanical parts, such as ball screw lead, diameter, lead, and gear diameter. Three mechanism types are shown below:



Belt transmission | ball screw | rack and gear

2. Determine the operation pattern including such parameters as acceleration time (ta), constant motion time (tu), deceleration time (td), stopping time (ts), cycle time (tc), 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 x 10^{-4} kg·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
 Axis of rotation on center	$J = \frac{W}{12}(a^2 + b^2)$ W: Mass (kg) a: Length (m) b: Width (m)	 Axis of rotation on center	$J = \frac{W}{8}(D_1^2 + D_2^2)$ W: Mass (kg) D_1: External diameter (m) D_2: Internal diameter (m)
 Axis of rotation off center	$J = W \cdot \left(\frac{a^2 + b^2}{3} + R^2\right)$ W: Mass (kg) a: Length (m) b: Width (m) R: Rotational diameter (m)	 Axis of rotation off center	$J = \frac{W}{8}(D^2 + 8R^2)$ W: Mass (kg) D: Workpiece diameter (m) R: Rotational diameter (m)
 Conveyor	$J = \frac{W \cdot D^2}{4}$ W: Mass (kg) D: Pulley wheel diameter (m)	 Ball screw	$J = \frac{W \cdot P^2}{4\pi^2} + J_b$ W: Mass (kg) P: Lead (m) J_b: Ball screw inertia (kg·m²)
 Object hung with pulley	$J = W \cdot \left(\frac{D}{2}\right)^2 + J_p$ W: Mass (kg) D: Pulley wheel diameter (m) J_p: Pulley inertia (kg·m²)	 Reducer	$J = J_1 \cdot \frac{n_1^2}{n_2^2} \cdot J_2$ W: Mass (kg) n_1/n_2: Speed of each motor (rpm) J_1 /J_2: Inertia of each motor (kg·m²)

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	40 kg
Material density of the ball screw	ρ	7.9×10^3 kg/m³

Ball screw length	B_l	2 m
Ball screw diameter	B_d	0.04 m
Ball screw pitch	B_p	0.04 m
Mechanical efficiency	B_η	0.9
Coupler inertia (refer to the supplier's product catalog)	J_c	20×10^{-6} kgm^2
Acceleration time	t_a	0.15 s
Constant motion time	t_u	0.7 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:

$$V_{\max} = \frac{2 \cdot L}{t_a + 2 \cdot t_u + t_d} = \frac{2 \times 0.5}{0.15 + 2 \times 0.7 + 0.15} = 0.588 m/s$$

Calculating forces, pitch angle and friction angle

Frictional force:

$$F_R = \mu \cdot W \cdot g = 0.025 \times 40 \times 9.81 = 9.81 N$$

Accelerating force/decelerating force:

$$F_a = F_d = W \cdot \frac{V_{\max}}{t_a} = 40 \times \frac{0.588}{0.15} = 156.8 N$$

Pitch angle of the ball screw:

$$\alpha_B = \arctan \frac{B_p}{\pi \cdot B_d} = \arctan \frac{0.04}{3.14 \times 0.04} = 0.308 rad$$

Friction angle of the ball screw:

$$\beta = \arctan \frac{B_p}{\pi \cdot B_d \cdot B_\eta} - \alpha_B = \arctan \frac{0.04}{3.14 \times 0.04 \times 0.9} - 0.308 = 0.0321 rad$$

Calculating torques for the ball screw and the coupling when accelerating and decelerating

Angular velocity of the ball screw at V_{max}:

$$\omega_{\max B} = \frac{2 \cdot \pi \cdot V_{\max}}{B_p} = \frac{2 \times 3.14 \times 0.588}{0.04} = 92.316 s^{-1}$$

Maximum rotating velocity:

$$n_{motor\max} = \frac{\omega_{\max B} \cdot 60}{2 \cdot \pi} = \frac{92.316 \times 60}{2 \times 3.14} = 882 rpm$$

Angular acceleration of the ball screw:

$$\alpha_{aB} = \frac{\omega_{max\,B}}{t_a} = \frac{92.316}{0.15} = 615.44 s^{-2}$$

Ball screw weight:

$$B_W = \rho \cdot \pi \cdot \left(\frac{B_d}{2}\right)^2 \cdot B_l = 7.9 \times 10^3 \times 3.14 \times \left(\frac{0.04}{2}\right)^2 \times 2 = 19.84 kg$$

Moment of inertia of the ball screw:

$$J_B = \frac{B_W}{8} \cdot B_d{}^2 = \frac{19.84}{8} \times 0.04^2 = 0.00397 kgm^2$$

Moment of inertia of the ball screw + coupling:

$$J_{B+c} = J_B + J_c = 0.00397 + 0.00002 = 0.00399 kgm^2$$

Accelerating torque and decelerating torque for the ball screw + coupling:

$$M_{aB+c} = M_{dB+c} = J_{B+c} \cdot \alpha_{aB} = 0.00399 \times 615.44 = 2.46 Nm$$

Preselecting the motor

Based on the calculated torques, if we select the 1FL2306-2AC motor:

n_n = 2000 rpm, M_n = 4.78 Nm, J_{motor} = 1.326 × 10^{-3} kgm^2

Then the inertia ratio:

$$\frac{J_{load}}{J_{motor}} = \frac{J_{B+c} + J_W}{J_{motor}} = \frac{0.00399 + 0.0016}{1.326 \times 10^{-3}} = 4.22$$

Wherein, J_W is the moment of inertia of the workpiece:

$$J_W = W \cdot \frac{B_p^2}{4 \cdot \pi^2} = 40 \times \frac{0.04}{4 \times 3.14^2} = 0.0016 kgm^2$$

Calculating the motor torques during the constant motion phase

$$M_{motor} = F_R \cdot \frac{B_d}{2} \cdot \tan(\alpha_B + \beta) = 9.81 \times \frac{0.04}{2} \times \tan(0.308 + 0.0318) = 0.069 Nm$$

Calculating the motor torques when accelerating and decelerating

Accelerating torque and decelerating torque for the motor:

$$M_{amotor} = M_{dmotor} = J_{motor} \cdot \alpha_{aB} = 1.326 \times 10^{-3} \times 615.44 = 0.82Nm$$

Motor torque when accelerating:

$$M_{motor} = M_{amotor} + M_{aB+c} + (F_a + F_R) \cdot \frac{B_d}{2} \cdot \tan(\alpha_B + \beta)$$
$$= 0.82 + 2.46 + (156.8 + 9.81) \times \frac{0.04}{2} \times \tan(0.308 + 0.0318) = 4.458Nm$$

Motor torque when decelerating:

$$M_{motor} = -M_{dmotor} - M_{dB+c} + (-F_a + F_R)^* \cdot \frac{B_d}{2} \cdot \tan\left(\alpha_B + \beta \cdot sign(+)^*\right)$$
$$= -0.82 - 2.46 + (-156.8 + 9.81) \times \frac{0.04}{2} \times \tan(0.308 - 0.0318) = -4.113Nm$$

* 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, 1FL2306-2AC motor is suitable.

Further information

SINAMICS:
www.siemens.com/sinamics

SIMOTICS:
www.siemens.com/simotics

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