

Getting Started



With Startdrive



06/202

www.siemens.com/drives

SIEMENS

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SINAMICS

S120 Getting Started with Startdrive

Getting Started

Valid as of: Firmware Version 5.2 SP3, Startdrive V16 Update 3

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.

\land 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.

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:

M 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 AG. 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

1.1 The SINAMICS converter family

With the SINAMICS converter family, you can solve any individual drive task in the low-voltage, medium-voltage and DC voltage range. From converters to motors and controllers, all Siemens drive components are perfectly matched to each other and can be easily integrated into your existing automation system. With SINAMICS you are prepared for digitization. You benefit from highly efficient engineering with a variety of tools for the entire product development and production process. And you also save space in the control cabinet – thanks to the integrated safety technology.

You can find additional information about SINAMICS at the following address (<u>http://www.siemens.com/sinamics</u>).

1.2 General information about SINAMICS documentation

1.2 General information about SINAMICS documentation

SINAMICS documentation

The SINAMICS documentation is organized in the following categories:

- General documentation/catalogs
- User documentation
- Manufacturer/service documentation

Standard scope

The scope of the functionality described in this document can differ from that of the drive system that is actually supplied.

- Other functions not described in this documentation might be able to be executed in the drive system. However, no claim can be made regarding the availability of these functions when the equipment is first supplied or in the event of service.
- The documentation can also contain descriptions of functions that are not available in a particular product version of the drive system. Please refer to the ordering documentation only for the functionality of the supplied drive system.
- Extensions or changes made by the machine manufacturer must be documented by the machine manufacturer.

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

Target group

This documentation is intended for machine manufacturers, commissioning engineers, and service personnel who use the SINAMICS drive system.

Benefits

This manual provides all of the information, procedures and operator actions required for the particular usage phase.

Siemens MySupport/Documentation

You can find information on how to create your own individual documentation based on Siemens content and adapt it for your own machine documentation at the following address (https://support.industry.siemens.com/My/ww/en/documentation).

Additional information

You can find information on the topics below at the following address (<u>https://support.industry.siemens.com/cs/de/en/view/108993276</u>):

- Ordering documentation/overview of documentation
- Additional links to download documents
- Using documentation online (find and search in manuals/information)

Questions relating to the technical documentation

Please send any questions about the technical documentation (e.g. suggestions for improvement, corrections) to the following email address (mailto:docu.motioncontrol@siemens.com).

FAQs

You can find Frequently Asked Questions about SINAMICS under Product Support (<u>https://support.industry.siemens.com/cs/de/en/ps/faq</u>).

Siemens Support while on the move



With the "Siemens Industry Online Support" app, you can access more than 300,000 documents for Siemens Industry products – any time and from anywhere. The app supports you in the following areas, for example:

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

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

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

The "Siemens Industry Online Support" app is available for Apple iOS and Android.

Data matrix code on the rating plate

The data matrix code on the rating plate contains the specific device data. This code can be readin with any smartphone and technical information for the appropriate device can be displayed via the "Industry Online Support" mobile app.

1.2 General information about SINAMICS documentation

Websites of third-party companies

This document includes hyperlinks to websites of third-party companies. Siemens is not responsible for and shall not be liable for these websites or their content, as Siemens has not checked the information contained in the websites and is not responsible for the content or information they provide. The use of such websites is at the user's own risk.

1.3 Usage phases and their documents/tools

Usage phase	Document/tool		
Orientation	SINAMICS S Sales Documentation		
Planning/configuration	SIZER Engineering Tool		
	Configuration Manuals, Motors		
Deciding/ordering	SINAMICS S120 catalogs		
	• SINAMICS S120 and SIMOTICS (Catalog D 21.4)		
	• SINAMICS Converters for Single-Axis Drives and SIMOTICS Motors (Catalog D 31)		
	• SINAMICS Converters for Single-Axis Drives – Built-In Units (D 31.1)		
	• SINAMICS Converters for Single-Axis Drives – Distributed Converters (D 31.2)		
	• SINAMICS S210 Servo Drive System (D 32)		
	• SINUMERIK 840 Equipment for Machine Tools (Catalog NC 62)		
Installation/assembly	SINAMICS S120 Equipment Manual for Control Units and Supplementary System Components		
	SINAMICS S120 Equipment Manual for Booksize Power Units		
	SINAMICS S120 Equipment Manual for Chassis Power Units		
	SINAMICS S120 Equipment Manual for Chassis Power Units, Liquid-cooled		
	SINAMICS S120 Equipment Manual water-cooled chassis power units for common cooling circuits		
	SINAMICS S120 Equipment Manual for Chassis Power Units, Air-cooled		
	SINAMICS S120 Equipment Manual for AC Drives		
	SINAMICS S120 Equipment Manual Combi		
	SINAMICS S120M Equipment Manual Distributed Drive Technology		
	SINAMICS HLA System Manual Hydraulic Drives		
Commissioning	Startdrive Commissioning Tool		
	SINAMICS S120 Getting Started with Startdrive		
	SINAMICS S120 Commissioning Manual with Startdrive		
	SINAMICS S120 Function Manual Drive Functions		
	SINAMICS S120 Safety Integrated Function Manual		
	SINAMICS S120 Function Manual Communication		
	SINAMICS S120/S150 List Manual		
	SINAMICS HLA System Manual Hydraulic Drives		
Usage/operation	SINAMICS S120 Commissioning Manual with Startdrive		
	SINAMICS S120/S150 List Manual		
	SINAMICS HLA System Manual Hydraulic Drives		
Maintenance/servicing	SINAMICS S120 Commissioning Manual with Startdrive		
	SINAMICS S120/S150 List Manual		
References	SINAMICS S120/S150 List Manual		

1.4 Where can the various topics be found?

1.4 Where can the various topics be found?

Software		Manual
Alarms	Described in order of ascending numbers	SINAMICS S120/S150 List Manual
Parameters	Described in order of ascending numbers	SINAMICS S120/S150 List Manual
Function block di-	Sorted according to topic	SINAMICS S120/S150 List Manual
agrams	Described in order of ascending numbers	
Drive functions		SINAMICS S120 Function Manual Drive Functions
Communication topics		SINAMICS S120 Function Manual Communication ²⁾
Safety Integrated	Basic and Extended Functions	SINAMICS S120 Safety Integrated Function Manual
	Basic Functions	SINAMICS S120 Function Manual Drive Functions
Commissioning	Of a simple SINAMICS S120 drive with STARTER	Getting Started ¹⁾
Commissioning	With STARTER	SINAMICS S120 Commissioning Manual ¹⁾
Commissioning	Of a simple SINAMICS S120 drive with Start- drive	Getting Started with Startdrive ²⁾
Commissioning	With Startdrive	SINAMICS S120 Commissioning Manual with Startdrive ²⁾
Web server		SINAMICS S120 Function Manual Drive Functions

Hardware			Manual
Control Units and expansion components	Control UnitsOption BoardsTerminal Modules	 DRIVE-CLiQ HUB Modules VSM10 Encoder system connection 	SINAMICS S120 Equipment Manual for Control Units and Supplementary System Components
Booksize power units	Line connectionLine ModulesMotor Modules	 DC link components Braking resistors Control cabinet design 	SINAMICS S120 Equipment Manual for Booksize Power Units
Chassis power units			SINAMICS S120 Equipment Manual for Chassis Power Units, air, liquid or water cooled
AC drive components			SINAMICS S120 Equipment Manual for AC Drives
S120 Combi components			SINAMICS S120 Equipment Manual Combi
Diagnostics via	STARTER		SINAMICS S120 Commissioning Manual ¹⁾
LEDs	Startdrive		SINAMICS S120 Commissioning Manual with Startdrive ²⁾
Meaning of the LEDs			Equipment Manuals
High Frequency Drive components			SINAMICS S120 System Manual High Frequency Drives

¹⁾ Up to firmware version 5.1 SP1

²⁾ From firmware version 5.2

1.5 Training and support

Training

You can find information on SITRAIN at the following address (<u>http://www.siemens.com/sitrain</u>). SITRAIN offers training courses for products, systems and solutions in drive and automation technology from Siemens.

Technical Support

To ask a technical question or create a support request, click on "Support Request" at the following address and select "Create Request".

See also

Technical Support (https://support.industry.siemens.com/cs/ww/en/sc)

1.6 Directives, standards, certificates

1.6 Directives, standards, certificates

Relevant directives and standards

You can obtain an up-to-date list of currently certified components on request from your local Siemens office. If you have any questions relating to certifications that have not yet been completed, please ask your Siemens contact person.

Certificates for download

The certificates can be downloaded from the Internet:

Certificates (https://support.industry.siemens.com/cs/ww/de/ps/13206/cert)

EC Declaration of Conformity

You can find the EC Declaration of Conformity for the relevant directives as well as the relevant certificates, prototype test certificates, manufacturers declarations and test certificates for functions relating to functional safety ("Safety Integrated") on the Internet at the following address (<u>https://support.industry.siemens.com/cs/ww/en/ps/13231/cert</u>).

The following directives and standards are relevant for SINAMICS S devices:

European Low Voltage Directive

SINAMICS S devices fulfil the requirements stipulated in the Low-Voltage Directive 2014/35/ EU, insofar as they are covered by the application area of this directive.

• European Machinery Directive

SINAMICS S devices fulfil the requirements stipulated in the Low-Voltage Directive 2006/42/ EU, insofar as they are covered by the application area of this directive.

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

• Directive 2011/65/EU

SINAMICS S devices comply with the requirements of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic devices (RoHS II).

• European EMC Directive SINAMICS S devices comply with the EMC Directive 2014/30/EU.

• EMC requirements for South Korea

SINAMICS S devices with the KC marking on the type plate satisfy the EMC requirements for South Korea.

Eurasian conformity

SINAMICS S comply with the requirements of the Russia/Belarus/Kazakhstan customs union (EAC).





North American market

SINAMICS S devices provided with one of the test symbols displayed fulfill the requirements stipulated for the North American market as a component of drive applications. You can find the relevant certificates on the Internet pages of the certifier (<u>http://</u>database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.html).

- Specification for semiconductor process equipment voltage drop immunity SINAMICS S devices meet the requirements of standard SEMI F47-0706.
- Australia and New Zealand (RCM formerly C-Tick) SINAMICS S devices showing the test symbols fulfill the EMC requirements for Australia and New Zealand.
- Quality systems Siemens AG employs a quality management system that meets the requirements of ISO 9001 and ISO 14001.

Not relevant standards



China Compulsory Certification

SINAMICS S devices do not fall in the area of validity of the China Compulsory Certification (CCC).

EMC limit values in South Korea

이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

For sellers or other users, please bear in mind that this device is an A-grade electromagnetic wave device. This device is intended to be used in areas other than at 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. Further, additional measures may be required, such as using an additional radio interference suppression filter (EMC filter). The measures for EMC-compliant design of the system are described in detail in this manual respectively in the EMC Installation Guideline Configuration Manual.

The final statement regarding compliance with the standard is given by the respective label attached to the individual unit.



1.7 Additional information

1.7 Additional information

Ensuring reliable operation

The manual describes a desired state which, if maintained, ensures the required level of operational reliability and compliance with EMC limit values.

Should there be any deviation from the requirements in the manual, appropriate actions (e.g. measurements) must be taken to check/prove that the required level of operational reliability and compliance with EMC limit values are ensured.

Spare parts

Spare parts are available on the Internet at the following address (<u>https://www.automation.siemens.com/sow?sap-language=EN</u>).

Product maintenance

The components are subject to continuous further development within the scope of product maintenance (improvements to robustness, discontinuations of components, etc).

These further developments are "spare parts-compatible" and do not change the article number.

In the scope of such spare parts-compatible further developments, connector/connection positions are sometimes changed slightly. This does not cause any problems with proper use of the components. Please take this fact into consideration in special installation situations (e.g. allow sufficient clearance for the cable length).

Use of third-party products

This document 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 properties of third-party products.

Ground symbols

Table 1-1	Symbols
	Jynnbolj

lcon	Meaning
	Connection for protective conductor
	Ground (e.g. M 24 V)
, <u> </u>	Connection for function potential bonding

1.8 Using OpenSSL

1.8 Using OpenSSL

Many SINAMICS products include OpenSSL. The following applies to these products:

- This product contains software (<u>https://www.openssl.org/</u>) that has been developed by the OpenSSL project for use in the OpenSSL toolkit.
- This product contains cryptographic software (<u>mailto:eay@cryptsoft.com</u>) created by Eric Young.
- This product contains software (<u>mailto:eay@cryptsoft.com</u>) developed by Eric Young.

1.9 Purpose of the document

This manual is aimed at beginners who want to commission a SINAMICS S120 drive system using the Startdrive engineering tool.

Using the steps described you will be able to carry out quick commissioning for a simple SINAMICS S120 drive train (CU320-2 PN). However, it does not claim to be complete.

Comprehensive information on commissioning an S120 drive system is provided in the SINAMICS S120 Commissioning Manual with Startdrive and in the Startdrive information system.

1.10 General Data Protection Regulation

1.10 General Data Protection Regulation

Compliance with the General Data Protection Regulation

Siemens respects the principles of data privacy, in particular the data minimization rules (privacy by design).

For the SINAMICS Startdrive product – including the installed SINAMICS DCC option package – this means the following:

The product only sends personal data to SIEMENS AG if the user explicitly requests this. This occurs in the following cases:

- If the SINAMICS Startdrive program and the SINAMICS DCC option package end unexpectedly, then the user is given the opportunity to send diagnostics information to SIEMENS AG for analysis. If the user avails themselves of this option, then their email address will be collected, transmitted and saved so that they can be contacted in the event of queries.
- The Totally Integrated Automation UPDATER enables the user to check whether updates are available for SINAMICS Startdrive and the SINAMICS DCC option package and to install them. The user can manually check for available updates or activate the corresponding setting in the TIA UPDATER for automatic updating. If the TIA Automation Update Server is used for verification or installation purposes, the IP address of the device used will be transmitted for technical reasons.

Beyond the previously mentioned information, the product only saves personal data in the project. The user is therefore responsible for ensuring compliance with the statutory data protection provisions. This applies in particular to the transfer of projects.

The following data must be taken into account.

Windows login

In the standard configuration, the product saves the login details of the Windows user together with technical function data (e.g. time stamp) in the project. The specified data is saved in order to trace changes in large configurations.

For SINAMICS Startdrive and the SINAMICS DCC option package, reference to specific persons can be established via the project and all elements contained within it (e.g. devices and diagrams).

The specified data can be viewed in the properties of the project and the elements in SINAMICS Startdrive and the SINAMICS DCC option package ("Author" property) and, with the exception of the most recent change to the project, subsequently modified.

- User names in the user administration
 The product only processes and saves additional personal data when the user explicitly
 enables one of the following functions.
 User names created by the user are saved by the user administration (security settings) to be
 - able to verify them during subsequent authentication.
- For multi-user engineering, various technical function data (e.g. time stamp) are saved together with the login of the Windows user concerned in order to be able to trace project changes.

For the three previously mentioned points, the details relating to the specified functions must be observed in the relevant chapter in the Startdrive information system and the SINAMICS DCC option package.

1.10 General Data Protection Regulation

By generating the login or user name, personal data can be pseudonymized for the functions. Deleting the project will cause all personal data saved within it to be deleted too. The particularities of multi-user engineering should be taken into consideration here (e.g. that the project not only needs to be deleted locally from the user's PC, but also from the server used).

Introduction

1.10 General Data Protection Regulation

Fundamental safety instructions

2.1 General safety instructions



MARNING 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.



\Lambda 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.



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.



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.



M WARNING

Electric shock due to equipment damage

Improper handling may cause damage to equipment. For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

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



Electric shock due to unconnected cable shield

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

• As a minimum, connect cable shields and the conductors of power cables that are not used (e.g. brake cores) 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 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.

- Be sure to only use screwdrivers which exactly match the heads of the screws.
- 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.

NOTICE

Property damage due to loose power connections

Insufficient tightening torques or vibration can result in loose power connections. This can result in damage due to fire, device defects or malfunctions.

- Tighten all power connections to the prescribed torque.
- Check all power connections at regular intervals, particularly after equipment has been transported.

M WARNING

Spread of fire from built-in devices

In the event of fire outbreak, the enclosures of built-in devices cannot prevent the escape of fire and smoke. This can result in serious personal injury or property damage.

- Install built-in units in a suitable metal cabinet in such a way that personnel are protected against fire and smoke, or take other appropriate measures to protect personnel.
- Ensure that smoke can only escape via controlled and monitored paths.

M 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.

MARNING 🔨

Unexpected movement of machines caused by radio devices or mobile phones

Using radio devices or mobile telephones 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 or mobile telephones.
- Use the "SIEMENS Industry Online Support app" only on equipment that has already been switched off.

NOTICE

Damage to motor insulation due to excessive voltages

When operated on systems with grounded line conductor or in the event of a ground fault in the IT system, the motor insulation can be damaged by the higher voltage to 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.

M 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.

MARNING 🔨

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.

M WARNING

Unexpected movement of machines caused by inactive safety functions

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

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

Note

Important safety notices for Safety Integrated functions

If you want to use Safety Integrated functions, you must observe the safety notices in the Safety Integrated manuals.

MARNING 🕅

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.

2.2 Equipment damage due to electric fields or electrostatic discharge

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

2.3 Warranty and liability for application examples

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

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

2.4 Security information

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

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

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

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

https://www.siemens.com/industrialsecurity (https://www.siemens.com/industrialsecurity).

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

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

https://www.siemens.com/industrialsecurity (<u>https://new.siemens.com/global/en/products/</u> services/cert.html#Subscriptions).

Further information is provided on the Internet:

Industrial Security Configuration Manual (<u>https://support.industry.siemens.com/cs/ww/en/view/108862708</u>)

M WARNING

Unsafe operating states resulting from software manipulation

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

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

2.5 Residual risks of power drive systems

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 installer 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 and/or software errors in the sensors, control system, actuators, and cables 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, including open flames, as well as emissions of light, noise, particles, gases, etc., can occur inside and outside the components under fault conditions caused by, for example:
 - Component failure
 - Software errors
 - Operation and/or environmental conditions outside the specification
 - External influences/damage
- 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 communication systems, e.g. ripple-control transmitters or data communication via the network

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

Overview

This manual provides instructions on how to commission a simple SINAMICS S120 drive with the Startdrive engineering tool.

To create a project, the following points are explained:

- 1. Which hardware components are used?
- 2. How do you create a simple project?
- 3. How do you configure a drive?
- 4. How do you put the drive into operation?

Overview
Startdrive engineering tool

4.1 Structure of the user interface

4.1.1 Project view

The following figure shows an example of the most important sections of the project view.

	Siemens - C:\Startdrive Projekte\V16\V1 Project Edit View Insert Online Opti	6 Update 3 _ 디 × ions Tools Window Help Totally Integrated Automation POPTAL	3
()—	Project tree Project tree Project tree Project tree Project tree Project tree Project tree Project tree Project tree Project tree Project tree Project tree Project tree		3
2—		Orive control [S120 CU320-2 PN] Properties Diagnostics General General • General Project information • Module parameters Basic parameterization: • Ethernet commissio Basic parameterization: • Drive unit_1 Orive control	-4

- ① The components and project data are displayed in the "Project tree" window.
- 2 The details of an item selected in the project tree are displayed in the "Details view" window.
- 3 You can put together and parameterize your drive in the "Workspace" window.
- (4) The properties and parameters of an object selected in the workspace are displayed in the "Inspector window".
- Figure 4-1 Example: Layout of the Startdrive user interface

4.1 Structure of the user interface

4.1.2 Project tree

Drives, drive components and project data are displayed in the project tree and can be edited in the working area. After inserting, drives and drive components are displayed as follows:

Name
- 📄 SERVO_01
📫 Add new device
Devices & networks
— 🔻 🚂 Drive unit_1 [\$120 CU320-2 PN]
— Il Device configuration
😡 Online & diagnostics
🕨 🛃 Drive control
Infeed_1
Drive axis_1
— 🕨 🔄 Traces
🕨 🖳 Ungrouped devices
🕨 🔚 Security settings
Unassigned devices
🕨 🙀 Common data
🕨 🛅 Documentation settings
🕨 🐻 Languages & resources
Online access

1 Project name

- 2 Name of the created drive
- ③ Device configuration of the new added drive
- (4) Created drive objects (automatic speed control, infeed unit, drive axis) of a drive
- 5 Trace recording of drive

Figure 4-2 Parts of a project

4.2 User interface - parameterization

4.2.1 Modules in the hardware catalog

Overview

As soon as the device configuration is active, a hardware catalog can be displayed/hidden at the right-hand edge of the program window. The device configuration automatically becomes active as soon as a drive device was inserted. The required SINAMICS modules can be transferred from the hardware catalog into a project and specified.

For instance, you can insert an infeed unit from the hardware catalog (see Chapter "Inserting an infeed unit (placeholder) (Page 83)").

Components in the hardware catalog

The following hardware components are available, depending on the selected Control Unit:

Components	Designation	Types of construction	CU310-2 PN	CU320-2 PN
Line Modules	Active Line Module	Chassis, Booksize	-	х
	Basic Line Module		-	х
	Smart Line Module		-	х
Power Modules	AC Power Module	Chassis	х	х
	PM240-2	Blocksize	-	x ¹⁾
Motor Modules	Single Motor Module	Chassis, Booksize	_	х
	Double Motor Module	Booksize	_	х
Motors ²⁾	DRIVE-CLiQ motors		х	х
	Induction motors		х	х
	Synchronous motors		х	х
	Reluctance motors		х	х
	Third-party motors		х	х
Measuring systems (en-	DRIVE-CLiQ encoder		х	х
coder types)	SIN/COS encoders		х	х
	SSI encoder		Х	х
	SIN/COS and SSI encoders		х	х
	HTL/TTL encoder		х	х
	HTL/TTL and SSI encoders		х	x
	EnDat 2.1 encoder		х	х
	Resolver-encoder		х	х

Components	Designation	Types of construction	CU310-2 PN	CU320-2 PN
Supplementary system	Communication Boards		-	х
components	DRIVE-CLiQ Hub Modules		х	x
	Terminal Boards		-	x
	Terminal Modules		х	х
	Voltage Sensing Modules		х	х

¹⁾ The PM240-2 Power Module is inserted together with a Control Unit Adapter (CUA) in the device configuration. The following types are available: CUA31, CUA32.

²⁾ The motors are sorted according to motor type and article number and are displayed with a generic article number.

4.2.2 Device view

Overview

Configure the drive line-up in the device view. You insert components and edit the DRIVE-CLiQ connections. You can call the device view by double-clicking the "Device configuration" entry in the project tree.

The device view provides a graphical display of all of the configured modules and their interfaces. Withdrawable units for optional modules are also displayed.

Display of configured drives

The following figure shows an example of the most important parts of a configuration that are displayed in the device view.



- 1 Control Unit
- 2 Infeed
- ③ DRIVE-CLiQ interfaces and connections
- (4) Rack unit for optional modules
- 5 Bus interface (e.g. PROFINET)
- 6 Motor Module or Power Module
- ⑦ Motor
- 8 Encoder
- 9 Zoom factor setting
- Figure 4-3 Example: Device view

4.2.3 Parameterizing editor

Overview

The parameterization editor is comprised of 2 tabs in which you can parameterize the drive:

- In the **function view**, you parameterize the drive using a graphic user interface. The individual screen forms are based on the function diagrams and include the parameters required. Different input screens for facilitating the parameterization are displayed depending on the configured drive.
- All parameters of the configured drive are listed in the **parameter view** so that the drive can be completely parameterized there.

With the aid of the secondary navigation, you can navigate between the individual functions that you would like to parameterize in the function or parameter view. The secondary navigation shows all of the functions, sorted by topic, and limits the parameter view to a desired group of parameters.

Structure of the parameterization editor

The following figure shows an example of the structure of the parameterizing editor.



- 2 Function view
- 3 Parameter view
- Figure 4-4 Example: Parameterizing editor

4.2.4 Function view

Overview

You parameterize the drive using a graphical user interface in the "Function view". The individual screen forms are based on the function diagrams – and include the parameters required.

Layout of the function view

The following figure shows an example of a screen form structure in the function view.



- ① Secondary navigation
- 2 Fields for entering parameters or interconnections of BICO signals.
- 3 Display parameters
- (4) Button to display parameterizing dialog boxes or screen forms.

Figure 4-5 Example: Function view

Explanation of icons

lcon	Meaning
	Saving data in a non-volatile fashion
10	Restoring factory settings
	Display invalid BICO wirings

lcon	Meaning
B	Activate Safety processing
I.	Save Safety processing

Default with drive-specific parameters

If you call interconnection screen forms in the function view, then a series of parameters are already preassigned values. For less experienced users, we recommend that they first work with the preassigned values. Experts, who have values for certain parameters that they have gained from experience, can generally make quick and specific changes to the parameterization. Extensive settings can be made in the parameter view which are effective across various screen forms.

4.2.5 Parameter view

Overview

The "Parameter view" shows the parameters for a configured drive in a table.

Structure of the parameter view

project_01 > Drive unit_1 [S120	CU 320-2 PN] > Driv	e axis_1 [SMM] ▶ Param terization					•	-
Parameter list						- Function		Parameter
Display extended parameters	🔹 👁 ± 📑 ± 🔳	h 📽 👔						
All parameters	Number	Parameter text	Value		Unit	Data set	Minimum	Maximum
Interlocking parameters	r2	Drive operating display	[12] Operation	n - RFG frozen, set "RFG				
Commissioning	p5[0]	BOP operating display selection, Parameter num	ber	2			0	65,535
Save & reset	p6	BOP operating display mode		[4] p0005				
System identification	p10	Drive commissioning parameter filter		[0] Ready				
Universal settings	▶ p13[0]	BOP user-defined list		0			0	65,535
Inputs/outputs	p15	Macro drive object	<u>A</u>	[0] No macro				
Communication	r20	Speed setpoint smoothed		0.0	rpm			
Power unit	r21	Actual speed smoothed		0.0	rpm			
Motor	r22	Speed actual value rpm smoothed		0.0	rpm			
 Setpoint channel 	r24	Output frequency smoothed		0.0	Hz			
Drive control	r25	Output voltage smoothed		0.0	Vrms			
Drive functions	r26	DC link voltage smoothed		0.0	V			
 Safety Integrated 	r27	Absolute actual current smoothed		0.00	Arms			
Technology functions	r28	Modulation depth smoothed		0.0	%			
Diagnostics	r29	Current actual value field-generating smoothed		0.00	Arms			
	r30	Current actual value torque-generating smoothe	d	0.00	Arms			
	r31	Actual torque smoothed		0.00	Nm			

The following figure shows an example of the structure of the parameter view.

1 Secondary navigation:

Depending on the selected function, the parameter view shows the corresponding parameter groups. This applies to the following product groups: S120, S150, G150 and G130.

2 Drop-down list:

The following options are available: Display standard parameters, Display extended parameters and Display service parameters.

③ Parameter numbers

- (4) Parameter names
- 5 Parameter values
- 6 Units
- ⑦ Data sets:

Here it is displayed as to which data set (e.g. MDS, DDS) a parameter belongs.

- 8 Minimum values
- 9 Maximum values

Figure 4-6 Example: Parameter list

Explanation of icons

The following table gives an overview of the icons that are displayed in the menu bar of the parameter list.

lcon	Meaning
	Expands or reduces all secondary navigation nodes.
	Expands or reduces all nodes below the selected node.

lcon	Meaning
<u> 이</u> +	Compares the parameters of the drive object with another parameter set.
	• In offline mode, the parameters are compared to the factory settings by default.
	• In online mode, the parameters are compared to the offline settings by default.
	The comparison can also be disabled again.
▶ ² ±	Starts a CSV export. The following options are available:
	Exporting all of the displayed parameters to a CSV file.
	• Exporting the parameters of all of the drive objects to a CSV file.
	Retentively saves the parameters (copy RAM to ROM).
15	Restores the factory settings.
	Shows open BICO interconnections on all drive objects in the offline project.
8	Opens an exception list for know-how protection.

Display of the parameters

The fields of the individual parameters are displayed in the list using the following colors:

Authorization	Offline mode	Online mode
Readable	Gray	Light orange
Readable/changeable	White	Orange

Blocked parameters

Parameters that are marked using a lock icon are locked and cannot be changed.

Offline mode

In the offline mode, parameters can be locked for the following reasons:

• If parameters can only be changed in the online mode. The lock icon disappears as soon as you switch into the online mode.

Note

Blocked parameters

Parameters with lock icon A cannot be modified in offline mode. To enter these parameters in offline mode, you use the appropriate screen forms and dialogs in the hardware configuration, which you find in the device view.

Online mode

In the online mode, parameters can be locked for the following reasons:

- If a parameter was set in the course of the basic parameterization, and a change would subsequently result in a change to the structure.
- For parameters that should not be changed by the user, e.g. because they are parameterized by a controller or another application.
- For parameters that are only to be configured in Startdrive via input screens. In these cases, the display in the parameter view only provides an overview.

4.2.6 Inspector window

Overview

Properties and parameters of the selected object are displayed in the inspector window. You can edit these properties and parameters. As a result, S120 drive objects that are newly inserted into the device view can be specified, for example.

Structure of the inspector window

The information and parameters in the inspector window are subdivided into various information classes, which are displayed as main tab 2 in the inspector window.

The following figure shows an example of the structure of the inspector window:

	1				(2	\mathbf{D}		
Notor Module_1 [Drive axis_]				Roperties	s 🚺 Info	Diag	gnostics	7
General IO tags Syst	em constants	Texts	ר					
General Motor Module - Selection - SMM	Motor Module -	Selection	n - SMM					
Motor Module details	Basic p	parameteriz	zation: 🗾					
	Selected	drive objec	t type: High dynamic ((servo)				-
1								
1	Selection	Format	Article number	Drive object type	Rated power	Rated current	Supply voltage	
•	Selection	Format <filt td="" 🔳<=""><td>Article number <filter></filter></td><td>Drive object type</td><td>Rated power <filter></filter></td><td>Rated current <filter></filter></td><td>Supply voltage</td><td>^</td></filt>	Article number <filter></filter>	Drive object type	Rated power <filter></filter>	Rated current <filter></filter>	Supply voltage	^
4 	Selection	Format <filt 🗐<br="">Booksize</filt>	Article number <filter></filter>	Drive object type <filter> SERVO</filter>	Rated power <filter> I.60kW</filter>	Rated current <filter></filter>	Supply voltage	^
4 	Selection	Format <filt 🔳<br="">Booksize Booksize</filt>	Article number <filter> </filter>	Drive object type <filter> III SERVO SERVO</filter>	Rated power <filter> 1.60kW 2.70kW</filter>	Rated current <filter> III 3.00Arms 5.00Arms</filter>	Supply voltage <pilter> 510 620 VDC 510 620 VDC</pilter>	^

(1) Secondary tabs (General, IO tags, System constants, Texts)

2 Main tabs (Properties, Info, Diagnostics)

Figure 4-7 Example: Inspector window

Showing / hiding the inspector window

To show or hide the inspector window, proceed as follows:

- 1. Use the regular window icons in the header of the window. OR
- 2. In the device view, select an unspecified component and open the "Properties" shortcut menu.

Maximizing / minimizing the inspector window

The inspector window is only partially displayed when called. Display of the inspector window can be maximized or minimized for specification of the components. Double-click on the header of the inspector window to minimize or maximize the displayed inspector window.

Division of the "Properties" tab

Each main tab contains information that is displayed via secondary tabs. The most important information for SINAMICS S120 drives can be found in the "Properties" main tab. The following secondary tabs are displayed in this main tab:

"General"

Display of the properties and settings of a drive unit, drive object or hardware component. Here you can enter the settings on the user interface. The secondary navigation is located in the left-hand part of the inspector window. Information and parameters are arranged there in the groups. To expand a group, click on the arrow icon \blacktriangleright next to the group name. If you select a group or a subgroup, then the appropriate information and parameters are displayed in the right-hand part of the inspector window, where they can be edited. For S120 drives, mainly the drive objects used are specified (e.g., an infeed unit) using this

For S120 drives, mainly the drive objects used are specified (e.g. an infeed unit) using this subarea.

• "I/O variables"

Displaying I/O variables of the PLC. The I/O variables are also listed in the PLC variable table. You can carry out the following actions in this tab:

- Assign names for the tags.
- Assign the tags to the user-defined tag table via a drop-down list.
- Provide the tags with comments.
- "System constants"

Display of the constants required by the system using the hardware identifiers of the modules. The system constants are also listed in the PLC variable table.

• "Texts"

Display of the reference language and the specification of the text source for project texts.

4.2.7 Device configuration detection

Overview

The results of a detection run are listed in the dialog "Detection of the device configuration". The components are assigned as follows:

- Components are assigned to drive objects.
- Drive objects are assigned to drive units.

All components, which could not be assigned to a module, are placed in the "Non-assignable components" folder (see Chapter "Determining the drive configuration (Page 129)").

Structure of the dialog

The following figure shows an example of the structure of the dialog.

_Mc	odule	Drive object type	Component type	Identification	DRIVE-CLiQ connection	Article no
	🛃 Drive unit					
	Non-assignable compone	ents				
	Drive control	SINAMICS S		_		
	Drive unit_1		S120 CU320-2 PN	LED flashing		6SL3040
	 Input/output object_1 	TB30 (Terminal Board)				
	Terminal Board_1		ТВ			6SL3055
	 Drive axis_1 	High dynamic (servo)				
	Motor_Module_2		DMM	LED flashing	X200 -> Drive control/	6SL3120
	▼ ∎ Motor_SMI_9		MOT			1FK7022
	Encoder_8		ENC	—		1FK7022
	■ SMI20_7		SM	LED flashing	X500 -> Drive axis_1/	1FK7022
	Drive axis_2	High dynamic (servo)		—		
	Motor_Module_3		DMM	LED flashing	Internal -> Drive axis	6SL3120
			MOT			XIVDOOOOX-
<	See Measuring system		F DB			*F 1000-0

- 1 Drive object type of the motor controls
- 2 Activation of the parallel connection view. In the parallel connection view, only the parallel connection-capable components are displayed.
- ③ The following information is displayed in the columns:
 - Drive object type
 - Component type
 - Identification via LED. Is controlled on the Control Unit via parameters p9210 and p9211.
 - DRIVE CLiQ connection of the components
 - Article number of the component
- 4 List of the non-assignable components
- 5 List of the main components and assigned components
- 6 Creation information (optional)
- Figure 4-8 Example: Device configuration detection

4.3 User interface - Control panel

4.3 User interface - Control panel

Overview

The control panel is used for the control and monitoring of individual drives. You traverse drives from the control panel by specifying values (e.g. speed setpoint).

Layout of the control panel

The following figure shows as example the various components of the control panel:

	Control panel	ting mode d setpoint input
	Control Speed 0.00 rpm 0 Off Stop Backward Jog backward	Forward 5
7—	Drive status Actual values Ready for switching on Operation enabled Stationary/rotating measurement Motor Fault Missing enables Output fequency Output fequency	Speed 0.0 rpm urrent 0.00 Arms zation 0.0 %
	Active fault Acknowledge faults Output voltage	0.0 Hz 0.0 Vrms

- 1 Activate/deactivate master control
- 2 Switch-on/switch-off infeed
- 3 Set/reset drive enable signals
- (4) Select operating mode
- 5 Control drive (elements vary slightly depending on the set operating mode.)
- 6 Display of the actual values
- Indication of the drive status

Figure 4-9 Example: CU320-2 PN

Restrictions

• The "Switch-on/switch-off infeed" ② option is only available when using a CU320-2 PN without a PM240-2 Power Module.

4.3 User interface - Control panel

Further information

You can find further information in Chapter "Using the control panel (Page 186)".

4.4 Information system

4.4 Information system

Overview

The Startdrive information system opens in a separate window. The following diagram shows an example of the Startdrive information system in the TIA Portal:



Figure 4-10 Example: Configuring drives

The information system is divided into the following sections:

• Search area

In the search area, you can perform a full text search across all help topics.

• Navigation area

You can find the table of contents and favorites in the navigation area.

Content area

The help pages appear in the content area. You can open several tabs to display different help pages at the same time.

The arrows on the window dividers allow you to display/hide the individual sections. You can open both the search area and the navigation area to increase the contents area as needed.

Calling help topics

The information system of Startdrive in the TIA Portal helps you solve your specific tasks and offers the required help topics at each step of the configuration.

4.4 Information system

You receive the following support when working in Startdrive:

• Information system

The Startdrive information system provides background information, step-by-step instructions and examples that are needed for working in Startdrive.

• Tooltips

The tooltips in Startdrive provide information on interface elements. In some instances, tooltips are supplemented by cascades containing more precise information.

• Help for the current context

You can open the help for the current context (e.g. for menu commands) via the <F1> function key.

· Help regarding messages or diagnostics

The help for messages or diagnostics are displayed in the inspector window and can be called there.

Help for parameters and function diagrams

You can call help for parameters and function diagrams by clicking on the particular locations in a help text.



Figure 4-11 Example: Calling help for parameters



Figure 4-12 Example: Calling function diagrams

The most important information regarding the Startdrive information system is provided below.

4.4 Information system

Opening the information system with the menu

To open the Startdrive information system, select the command "Display help" in the "Help" menu.

The start page of the information system opens.

Further information

You can find further information in the Startdrive information system by searching for "Help on information system".

Fundamentals

5.1 Requirements for commissioning

Overview

The following requirements must be fulfilled for commissioning a SINAMICS S drive system:

- A programming device (PG/PC)
- TIA Portal with integrated Startdrive engineering tool
- A communications interface, e.g. PROFINET, Ethernet
- Completely wired-up drive line-up (see SINAMICS S120 manuals)

Configuration example

A configuration example with booksize components and PROFINET communication is shown in the following figure:



Figure 5-1 Example: layout of components

5.2 Safety instructions for commissioning

5.2 Safety instructions for commissioning

MARNING WARNING

Non-observance of the fundamental safety instructions and residual risks

The non-observance of the fundamental safety instructions and residual risks stated in Section 1 can result in accidents with severe injuries or death.

- Adhere to the fundamental safety instructions.
- When assessing the risk, take into account residual risks.

MARNING 🔨

Unexpected movement of the motor during motor data identification

Motor data identification causes movements of the drive, which can result in death, serious injury, or damage to property.

- Ensure that nobody is in the danger zone and that the mechanical parts can move freely.
- Respond to possible malfunctions by applying suitable measures (e.g. EMERGENCY STOP or EMERGENCY OFF).

MARNING 🔨

Non-observance of safety instructions and residual risks

If the safety instructions and residual risks are not observed in the associated hardware documentation, accidents involving severe injuries or death can occur.

- Observe the safety instructions provided in the hardware documentation.
- When assessing the risk, take into account residual risks.

Note

Please observe the installation guidelines and safety instructions in the SINAMICS S120 Manuals.

5.3 BICO interconnections

5.3.1 Binectors and connectors

Overview

Each drive contains a large number of connectable input and output variables and internal control variables.

The BICO technology (Binector Connector Technology) allows the drive to be adapted to a wide variety of conditions.

BICO parameters are identified accordingly in the parameter list or in the function diagrams.

BICO parameters can be parameterized in the Startdrive engineering tool in the following display areas:

- Parameter view
- Function view

Definition: Binectors

A binector is a unitless digital (binary) signal that can assume a value of 0 or 1.

Binectors are subdivided into binector inputs (BI) and binector outputs (BO).

Abbrevia- tion	lcon	Name	Description
BI		Binector Input (signal sink)	Can be connected with a binector output as source.
BO		Binector Output (signal source)	Can be used as a source for a binector input.

Definition: Connectors

A connector is a digital signal, e.g. in the 32-bit format. It can be used to emulate words (16 bits), double words (32 bits), or analog signals.

Connectors are subdivided into connector inputs (CI) and connector outputs (CO).

Abbrevia- tion	lcon	Name	Description
CI		Connector Input (signal sink)	Can be connected with a connector output as source.
СО		Connector Output (signal source)	Can be used as a source for a connector input.

Fundamentals

5.3 BICO interconnections

Multiple BICO interconnections

Icon 🔁 has the following meanings:

- Icon in the toolbar: Determines all open BICO interconnections in the drive objects of the project.
- Icon next to the interconnection: Opens an interconnection dialog in which you can create a bit-by-bit interconnection (multiple interconnections).

Further information

Further information on BICO technology and BICO connections can be found in Section "Basics of the drive system" in the SINAMICS \$120 Drive Functions Function Manual.

5.3.2 Interconnect BICO inputs

Overview

You perform the interconnection of binector or connector inputs in the interconnection dialog.

Procedure

To interconnect a BICO input, proceed as follows:

 Click the binector me or connector symbol me of the signal that you want to connect. A connection dialog for the selection of the possible parameters opens. The drive object for which you want to make an interconnection is displayed automatically in the "Drive object" drop-down list on the right.

р68 S e	32 Central r elected sou	neasuring probe control word signal source		×				
09	%							
Se	elect signal	source:						
Drive object: Drive control								
N	umber	Parameter text	Unit					
	0%			^				
	100%							
	r19	Control word BOP						
•	r565[0]	Probe time stamp						
•	r566[0]	Probe time stamp reference						
	r567	Probe diagnostics word						
►	r686[0]	Central measuring probe measuring time rising edge						
•	r687[0]	Central measuring probe measuring time falling edge						
	r688	Central measuring probe status word display						
	r722	CU digital inputs status						
	r723	CU digital inputs status inverted						
	r898	Control word drive object 1						
	r899	Status word drive object 1						
	r944	Counter for fault buffer changes		2				
•	r2050[0]	IF1 PROFIdrive PZD receive word, PZD 1						
•	r2089[0]	Send binector-connector converter status word, Status word 1						
	r2121	Counter alarm buffer changes						
	r2129	Faults/alarms trigger word						
	r2131	Actual fault code						
	r2132	Actual alarm code						
	r2135	Status word faults/alarms 2						
	r2138	Control word faults/alarms						
	r2139	Status word faults/alarms 1						
	-0110	NAMID message bit has		•				
			ок	Cancel				

The last set signal source is displayed in the "Selected source" field. If a connection was not available previously, the value 0 is displayed.

2. Select the parameter that you want to connect. If connectable bits of the parameter are available, they are displayed in a drop-down list.

5.3 BICO interconnections

Number	Parameter text	Unit
0		
1		
▶ r46	Missing enable sig	
▶ r50	Command Data Set CDS effective	
▼ r51	Drive Data Set DDS effective	
r51.0	DDS eff bit 0	
r51.1	DDS eff bit 1	
r51.2	DDS eff bit 2	
r51.3	DDS eff bit 3	
r51.4	DDS eff bit 4	
▶ r56	Status word, closed-loop control	
▶ r807	Master control active	
▶ r830	Motor changeover status word	

- 3. Select the parameter bit that you want to connect.
- 4. Confirm with OK. The connection dialog closes.

Result

The binector or connector input is connected to the selected parameter (bit).

5.3.3 Interconnect BICO outputs

Overview

You perform the interconnection of binector or connector outputs in the interconnection dialog.

Procedure

To interconnect a BICO output, proceed as follows:

1. Click the binector **m** or connector symbol **m** of the signal that you want to connect. A connection dialog for the selection of the possible parameters opens. The drive object for which you want to make an interconnection is displayed automatically in the "Drive object" drop-down list on the right.

X Drive cont	rol: p15	i69[0] Supplementary torque 3		
Select sign:	al sink	·s:		
)rive object:	Drive	control		
Number		Parameter text	Unit	
▶ p480[0]	Encoder control word Gn_STW signal source, Encoder 1		1
 		Motor temperature signal source		
▶ p608[0]	Motor temperature signal source 2, Motor temperature channel 1		
▶ p609[0]	Motor temperature signal source 3, Motor temperature channel 1		
p1159	5[0]	Speed controller speed setpoint 1		=
p1160	0[0]	Speed controller speed setpoint 2		
p1190)	DSC position deviation XERR		
p1191		DSC position controller gain KPC		
p1430	0[0]	Speed precontrol		
p1459	5[0]	Speed controller P gain adaptation signal		
p1466	5[0]	Speed controller P-gain scaling		
p1478	3[0]	Speed controller integrator setting value		
p1497	7[0]	Moment of inertia scaling signal source		
p1511	[0]	Supplementary torque 1		
p1512	2[0]	Supplementary torque 1 scaling		
p1513	3[0]	Supplementary torque 2		
p1522	2[0]	Torque limit upper/motoring		
p1523	3[0]	Torque limit lower/regenerative		
p1528	3[0]	Torque limit upper/motoring scaling		
p1529	9[0]	Torque limit lower/regenerative scaling		
n1542	101	Travel to fixed stop torque reduction		

The last set signal sink is displayed in the "Selected sinks" field. If a connection was not available previously, the text "No sink selected" is displayed.

2. Activate the check boxes for the parameters that you want to connect. If connectable bits of the parameter are available, they are displayed in a drop-down list. 5.3 BICO interconnections

×D	rive cont	rol: p15	69[0] Supplementary torque 3		
Sele	ect signa	al sink:	s:		
Drive	e object:	Drive	control		
1	Number		Parameter text	Unit	
	• p480[0]	Encoder control word Gn_STW signal source, Encoder 1		^
	p603		Motor temperature signal source		
	• p608		Motor temperature signal source 2		
<	р6	08[0]	Motor temperature channel 1		_
	р6	08[1]	Motor temperature channel 2		
	р6	08[2]	Motor temperature channel 3		
	p6	08[3]	Motor temperature channel 4		
	• p609[0]	Motor temperature signal source 3, Motor temperature channel 1		
	p1155	5[0]	Speed controller speed setpoint 1		
	p1160	0[0]	Speed controller speed setpoint 2		
	p1190)	DSC position deviation XERR		
	p1191		DSC position controller gain KPC		
	p1430	0[0]	Speed precontrol		
	p1455	5[0]	Speed controller P gain adaptation signal		
	p1466	5[0]	Speed controller P-gain scaling		
	p1478	3[0]	Speed controller integrator setting value		
	p1497	7[0]	Moment of inertia scaling signal source		
	p1511	[0]	Supplementary torque 1		
	p1512	2[0]	Supplementary torque 1 scaling		
	p1513	3[0]	Supplementary torque 2		
	n1522	101	Torque limit upper/motoring		~

- 3. Activate the check boxes for the parameter bits that you want to connect.
- 4. Confirm with OK. The connection dialog closes.

Result

The binector or connector output is connected to the selected parameter (bit).

Multiple connections at outputs

Several interconnections can be set simultaneously for a parameter, which for reasons of space however, cannot be displayed in the interconnections field. Clicking the icon interconnection field opens a list, which shows all of the active parameter interconnections.

5.4 Comparing parameters

Overview

Using the comparison function in the parameter view, you can compare the actual value in the parameter set of a drive object (e.g. infeed) with values from the factory settings or from the offline/online mode.

Offline mode

In the offline mode, the actual values are compared to the factory settings by default.

Online mode

In the online mode, the actual values are compared to the offline settings by default. In addition, you can compare the actual values with the factory settings.

Procedure

Proceed as follows to make a comparison:

- 1. Open the parameter view of the drive object whose parameter set you wish to compare.
- Click on the arrow icon ± in the button 4 ±.
 A selection list containing the comparison options opens:

Mode	Options
Offline	Deactivate comparison
	Offline - Factory settings
Online	Deactivate comparison
	Online - Offline
	Online - Factory settings

3. Select a comparison option.

The result of the selected comparison option is displayed using icons in the "Comparison" column 3.

		1		2)		3	4	
Para	meter list	nded parameters 💌 🕮 🖲 💥 🐂 😭						
	Number	Parameter text	Value		Unit	Compari	Factory settings	
	r2	Infeed operating display	[44] Switching on inhibited - conn	nect 24 V to terminal EP (hardwa			[44] Switching on inhibited - connect 24 V to te	erminal EP (hardwa
	▶ p5[0]	BOP operating display selection, Parameter number		2		0		2
	p6	BOP operating display mode	[2] Operation -> p	0005, otherwise p0005 <-> r0020		0		[4] p0005
	p10	Infeed commissioning parameter filter		[2] Power unit commissioning		•	[1] C	Quick commissioning
	▶ p13[0]	BOP user-defined list		0				0
	p15	Macro drive object	8	[0] Kein Makro		•		[0] Kein Makro

- 1 Activate/deactivate the comparison
- 2 Lists of actual values
- 3 Result of the selected comparison option
- 4 List of comparison values

As soon as values are changed, the status display of individual values is automatically refreshed (e.g. in the offline mode from \bigcirc to \bigcirc).

5.4 Comparing parameters

Explanation of icons

The following table gives you an overview of the icons that are displayed in the "Comparison" column.

lcon	Meaning
•	The comparison values are equal and error-free.
•	Offline - Factory setting: The comparison values are different and error-free.
•	Online - Offline: The comparison values are different and error-free.
	Online - Factory setting: The comparison values are different and error-free.
0	The value of at least one subordinate parameter index is different from the factory setting.
0	The value of at least one subordinate parameter index is different from the offline value.
8	At least one of the two comparison values has a technological or syntax error.
	The comparison is not possible. At least one of the two comparison values is not available (e.g. snapshot).

5.5 Saving settings

5.5.1 Saving settings in the project

Overview

In Startdrive, settings are predominantly made via screen forms. The complete project must be saved in order that the settings made are permanently active.

Procedure

Proceed as follows to permanently save the settings in the project:

Click this toolbar icon .
 OR
 Select the "Project > Save" or "Project > Save as" menu.
 As a result, you have permanently saved the settings in your Startdrive project.

5.5.2 Saving settings retentively

Overview

The settings during parameterization are only saved volatile. They are lost when you switch off the converter.

Requirements

• PG/PC and converter are connected with one another via a LAN cable.

Procedure

To save the settings on the memory card of your converter retentively, proceed as follows:

Saving online data

Click the icon in the function view of the active Startdrive project to save the online configuration retentively.

The current project settings are stored retentively on the memory card of the converter.

5.5 Saving settings

Saving offline data

Proceed as follows to save the offline configuration retentively:

- 1. Load the project data into the converter. For information on this, see Chapter "Loading the project data into the converter (Page 184)".
- 2. Click the **___** icon in the function view of the active Startdrive project. The current project settings are stored retentively on the memory card of the converter.

5.6 Restoring factory settings

Overview

In online operation, you can restore the factory settings for the drive control.

Procedure

To restore the factory settings for the drive control, proceed as follows:

- 1. Establish an online connection (Page 118) to your drive unit.
- 2. Click the 🖍 icon in the function view of the active Startdrive project. The factory settings are restored.

5.7 Loading project data from the converter

5.7 Loading project data from the converter

Overview

You can load the saved project data from your drive unit into your current project in Startdrive.

Requirements

- A project is open.
- The hardware configuration and software to be loaded must be compatible with the Startdrive. You can only establish an online connection between the PG/PC and drive device if the PG/PC and the drive device are using the same firmware version. You can find further information about checking the firmware version in the SINAMICS S120 Commissioning Manual with Startdrive.

Procedure

To load the project data from a drive unit into your Startdrive project, proceed as follows:

1. Call the shortcut menu "Load from device (software)" or click on the icon 🛐 (Load from device) in the toolbar.

The "Upload preview" dialog box opens. Startdrive checks whether all prerequisites for loading have been met. In the event of any obstructions, these are displayed as messages in the dialog.

Upload	previ	ew			×
3	Check (preconditions for upload fror	n device		
Status	1	Target	Message	Action	
t <mark>¶</mark>	8	 Antriebsgerät_1 	Loading will not be performed because preconditions are not met		
	8	 Drive parameteriz 	An upload is not possible with the current Startdrive version.		
	8		The drive unit is in the "First commissioning" state.		
	8		Please configure the device offline in Startdrive and perform a download.		
<		•		•	>
				R	efresh
			Upload from	device C	ancel

Figure 5-2 Example: Upload from device

2. Check the alarms in the "Upload preview" dialog, and select the necessary actions in the "Action" column.

As soon as uploading becomes possible, the "Upload from device" button is enabled.

3. Click the "Upload from device" button. The loading operation is performed.

The project data has been loaded from the drive unit into your Startdrive project on the PC.

5.7 Loading project data from the converter

Commissioning

Overview

You perform the commissioning of your SINAMICS S120 drive in the TIA Portal with the integrated Startdrive engineering tool.

Requirements

- TIA Portal is installed on your PG/PC.
- You have all of the required licenses to be able to use the TIA Portal without limitations.

Commissioning workflow

You can commission a SINAMICS S120 drive in the following ways:

- **Creating a project offline in Startdrive.** The components of the drive are combined offline in Startdrive.
- Loading the device configuration into the project. The components of the drive are loaded into the project offline and supplemented as needed.
- Creating a project by reading out a device configuration. The components of the drive are read out online and supplemented offline as needed.

Creating a project offline in Startdrive

The following steps are required when commissioning a drive:

- 1. Create a project with Startdrive.
- 2. Perform the basic parameterization of the drive units (Page 135).
- 3. Establish an online connection to the drive.
- 4. Download the project to the target device (Page 184).
- 5. Commission the drive via the control panel. (Page 186)
- 6. Result: The motor turns.

Loading the configuration of the drive offline into the project

For commissioning a drive by uploading the drive configuration to the project, the following steps are required:

- 1. Create a project with Startdrive.
- 2. Establish an online connection to the drive.
- 3. Load the configuration of the drive into the project (Page 123).

- 4. Edit the determined device configuration in Startdrive. (Page 124)
- 5. Perform the basic parameterization of the drive units. (Page 135)
- 6. Download the project to the target device (Page 184).
- 7. Commission the drive via the control panel. (Page 186)
- 8. Result: The motor turns.

Creating a project by reading out a device configuration

The following steps are necessary for commissioning a drive by reading out a device configuration:

- 1. Create a project with Startdrive.
- 2. Optional: Establish an online connection to the drive.
- 3. Determining the drive configuration (Page 129).
- 4. Edit the determined device configuration in Startdrive. (Page 134)
- 5. Perform the basic parameterization of the drive units. (Page 135)
- 6. Download the project to the target device (Page 184).
- 7. Commission the drive via the control panel. (Page 186)
- 8. Result: The motor turns.
6.1 Calling the TIA portal

To start the TIA Portal, click on the TIA Portal icon of your user interface or call it up via the Start menu of your PG/PC.

6.2 Check lists to commission SINAMICS S

6.2 Check lists to commission SINAMICS S

You will find the checklists that must be observed before the commissioning of SINAMICS S120 drives in the following.

Checklist for commissioning booksize power units

Carefully observe the content of the following checklist, and read the safety instructions in the manuals before starting any work.

Check	ОК
Are the environmental conditions in the permissible range?	
Is the component firmly attached to the fixing points provided?	
Is the specified air flow for cooling the devices ensured?	
Have the ventilation clearances for the components been observed?	
Is the memory card correctly inserted in the Control Unit?	
Are all necessary components of the configured drive line-up available, installed and connected?	
Do the temperature monitoring circuits fulfill the specifications of protective separation?	
Have the rules for the DRIVE-CLiQ topology been observed?	
Have the line-side and motor-side power cables been dimensioned and routed in accord- ance with the environmental and routing conditions?	
Have the maximum permitted cable lengths between the frequency converter and the motor (depending on the type of cables used) been observed?	
Have the power cables been properly connected to the component terminals with the specified torque?	
Have all of the remaining screws been tightened to the specified torque?	
Has all wiring work been successfully completed?	
Are all connectors correctly plugged in and screwed in place?	
Have all the covers for the DC link been closed and latched into place?	
Have the shield supports been correctly connected through a large surface area?	

Checklist for commissioning chassis power units

Carefully observe the content of the following checklist, and read the safety instructions in the manuals before starting any work.

Check	ОК
Are the environmental conditions in the permissible range?	
Are the components correctly installed in the cabinets?	
Is the specified air flow for cooling the devices ensured?	
Is an air short-circuit between the air inlet and outlet for the chassis components pre- vented by the installation arrangements?	
Have the ventilation clearances for the components been observed?	
Is the memory card correctly inserted in the Control Unit?	
Are all necessary components of the configured drive line-up available, installed and connected?	

6.2 Check lists to commission SINAMICS S

Check	ОК
Do the temperature monitoring circuits fulfill the specifications of protective separation?	
Have the rules for the DRIVE-CLiQ topology been observed?	
Have the line-side and motor-side power cables been dimensioned and routed in accord- ance with the environmental and routing conditions?	
Have the maximum permitted cable lengths between the frequency converter and the motor (depending on the type of cables used) been observed?	
Is the ground for the motors directly connected to the ground for the Motor Modules (shortest distance)?	
Are the motors connected with shielded power cables?	
Are the power cable shields connected as closely as possible to the terminal box across a wide area?	
Have the power cables been properly connected to the component terminals with the specified torque?	
Have all of the remaining screws been tightened to the specified torque?	
Has the total power of the DC busbar been dimensioned sufficiently?	
Has the busbar/wiring for the DC connection between the infeed and the Motor Modules been dimensioned sufficiently with regard to the load and installation conditions?	
Are the cables between the low-voltage switchgear and the power unit protected with line fuses? Line protection ¹⁾ must be taken into account.	
Have measures been taken to relieve strain on the cables?	
For external auxiliary infeed: Have the cables for the auxiliary infeed been connected according to the Equipment Manual?	
Have the control cables been connected in accordance with the required interface con- figuration and the shield applied?	
Have the digital and analog signals been routed with separate cables?	
Has the distance from power cables been observed?	
Has the cabinet been properly grounded at the points provided?	
Has the connection voltage for the fans in the chassis components been adapted accord- ingly to the supply voltages?	
For operation on non-grounded supply systems: Has the connection bracket for the in- terference suppression at the Infeed Module or the Power Module been removed?	
Is the period from the date of manufacture to the initial commissioning or the downtime of the power components less than two years ² ?	
Is the drive operated from a higher-level controller/control room?	

¹⁾ We recommend using combined fuses for conductor and semi-conductor protection (VDE 636, Part 10 and Part 40 / EN 60269-4). For information about the relevant fuses, see the catalog.

²⁾ If the downtime period is longer than two years, the DC-link capacitors must be formed (see the "Maintenance and Servicing" chapter in the Equipment Manual). The rating plate can be used to ascertain the date of manufacture.

6.3 Creating a project offline

6.3.1 Creating a new project (in the Portal view)

Requirements

You have opened the Startdrive in the TIA Portal application.

Creating a new project

You can create new projects once the Startdrive application has been opened in the TIA Portal.

1. Click on "Create new project" in the secondary navigation in the Portal view of Startdrive. The entry fields for the basic project data are displayed to the right in the detailed view.

	Create new project	
Open existing project	Project name:	SERVO_01
open existing project	Path:	D:\startdrive
🥚 Create new project	Version:	V15 🗸
Missata assisat	Author:	z000000z
Migrate project	Comment:	<u>^</u>
Close project		
		×
		Create



2. Enter the project data here:

Project name	Startdrive automatically counts each new project.
Path	The simpler the archive path for the project, the faster the project can be loaded.
Author	The login code for the person entering the data is preassigned.
Comment	You can save brief project information here.

3. Click on "Create" to save basic project data.

The new project is created and simultaneously opened. Possible next steps are displayed in the detailed view.



Figure 6-2 Getting Started

6.3.2 Creating a new project (in the Project view)

Requirements

You have opened the application Startdrive in the TIA Portal in the Project view.

Creating a new project

You can create new projects once the Startdrive application has been opened in the TIA Portal.

1. In the Startdrive Project view, select "Project > New". The "Create a new project" dialog box opens.

Create a new project	×
Project name:	SERVO_02
Path:	D:\startdrive\Bernhard
Version:	V15
Author:	z00000z
Comment:	^
	✓
	Create Cancel

Figure 6-3 Creating a new project

2. Enter the project data here:

Project name	Startdrive automatically counts each new project.
Path	The simpler the archive path for the project, the faster the project can be loaded.
Author	The login code for the person entering the data is preassigned.
Comment	You can save brief project information here.

3. Click on "Create" to save basic project data.

A new project is created in the project tree and simultaneously opened.



Figure 6-4 Project created (in the Project view)

You an now insert a new drive.

6.3.3 Inserting the drive offline

Overview

The following describes how to insert a SINAMICS S120 Control Unit into a new project via the project view.

Requirements

- A project has been created, or an existing project is open.
- The online connection to the drive is deactivated.

Procedure

Proceed as follows to insert a Control Unit into the project view:

1. Double-click "Add new device" in the project tree. The appropriate dialog opens.

	Add new device		_	×	
(1)—	Drive unit_1				
2—	Controllers Controllers HMI PC systems Drives	 Drives & starters SINAMICS drives SINAMICS G120 SINAMICS G120C SINAMICS G120D SINAMICS G120P SINAMICS G130 SINAMICS G130 SINAMICS G150 SINAMICS MV SINAMICS S120 Mute Sinamics S120 Mute Sinamics S120 Mute S120 <li< th=""><th>Device: Article no.: Version: Description: Control Unit (Number of D) Digital inputs 12 parameter inputs/output</th><th>CU320-2 PN 65L3040-1MA01-0Axx 5.2 CU320-2 PROFINET. RIVE-CLIQ ports: 4. :: :: :: :: :: :: :: :: :: :</th><th>-4</th></li<>	Device: Article no.: Version: Description: Control Unit (Number of D) Digital inputs 12 parameter inputs/output	CU320-2 PN 65L3040-1MA01-0Axx 5.2 CU320-2 PROFINET. RIVE-CLIQ ports: 4. :: :: :: :: :: :: :: :: :: :	-4
3—	Open device view			OK Cancel	

- ① "Device name" input field (default: Drive unit_x)
- 2 "Drives" button
- 3 Activate/deactivate "Open device view" option
- (d) Drop-down list "Version" (here, select the firmware version of your drive device.)
- 2. Click on "Drives" (2) to display the drives available.

3. Click on the required Control Unit in the "Control Units" list.

Note

Comparing and possibly changing version numbers

The latest firmware version is always suggested when creating a Control Unit. Under certain circumstances, the recommended firmware version does not match the version number on the memory card of your converter. If the version numbers do not match, it will not be possible to go online later. Therefore, please observe the following notes:

- Observe the version number in the "Version" drop-down list and ensure that the displayed version number matches the version number on the memory card of your converter.
- If necessary, change the version number via the "Version" drop-down list.
- 4. Assign a different device name in the input field \bigcirc if required.
- 5. Click "OK".

OR

Double-click on the required Control Unit.

If the "Open device view" option is activated, the Control Unit is displayed in the device view in the next step.

Result



The Control Unit is inserted and can then be configured.

Example: CU320-2 PN inserted

6.3.4 Inserting an infeed unit

6.3.4.1 Overview

As a rule, the infeed unit is inserted directly after the drive in the device configuration and appears as a non-specified component in the device view. You can recognize a non-specified component in the device view by its white field.

Note

Smart Line Modules 5 kW and 10 kW

Smart Line Modules of performance class 5 kW and 10 kW do not have DRIVE-CLiQ interfaces and cannot be configured in the Startdrive engineering tool. The following information must be taken into consideration for the commissioning of SLMs of performance class 5 kW and 10 kW:

- For communicating with the Control Unit, SLMs must be wired with a digital input of the Control Unit via terminals.
- The recommended ON and OFF sequence for activating the SLMs must be adhered to.

You can find further information on the wiring of Smart Line Modules with the Control Unit and for the recommended ON/OFF sequence in the Equipment Manual SINAMICS S120 booksize power units.

The procedure for inserting a drive component into the device view is subsequently shown using an infeed unit as an example and is the same for all of the other components of a device configuration.

Differences between CU310-2 PN and CU320-2 PN

Power unit	Component	CU310-2 PN ¹⁾	CU320-2 PN
Line Module	Active Line Module	-	Х
	Basic Line Module	-	х
	Smart Line Module	-	х
Power Module	AC Power Module	х	х
	PM240-2 ²⁾	-	х
Motor Module	Single Motor Module	-	х
	Double Motor Module	_	Х

The following table provides an overview of the supported power units.

¹⁾ When inserted from the hardware catalog, Power Modules are not automatically connected to the CU via DRIVE-CLiQ. The wiring must be manually established.

²⁾ When inserted from the hardware catalog, the PM240-2 is created together with a Control Unit Adapter (CUA). The components must be individually specified.

6.3.4.2 Inserting an infeed unit (placeholder)

Overview

An inserted infeed unit is a non-specified component (placeholder), which must be specified after insertion (see Chapter "Specifying an infeed unit (Page 84)").

Requirements

- A SINAMICS S120 CU320-2 PN Control Unit is inserted in the device configuration.
- Insert an Active, Basic or Smart Line Module in the device configuration.

Restrictions

• The use of a Line Module excludes the use of a PM 240-2 Power Module in a drive configuration.

Important notes

Carefully observe and comply with the following notes before you insert an infeed unit (placeholder) into the device configuration.

Standard

Generally, the infeed is inserted while configuring directly after the drive in the device view. In this case, the infeed unit is automatically wired to the drive via the default interface X100.

Exception

If you insert the infeed unit at a later point in time (e.g. after the Motor Module), then the infeed unit is not automatically connected to the drive. In this case, the default interface X100 provided for the infeed unit is already assigned. Thus the device configuration must be changed manually.

The following options are available to manually change the device configuration:

- You manually wire the infeed unit to a free interface.
- You change the wiring of the drive object that is currently linked to the X100 interface of the drive to a different interface. This is automatically linked to the X100 interface when the infeed unit is inserted.

Procedure

To insert a non-specified infeed unit, proceed as follows:

- 1. Open "Line Modules" in the hardware catalog.
- 2. Select an infeed unit in the hardware catalog.
- 3. Drag and drop the infeed unit into the device view.

The component is automatically interconnected with the CU via DRIVE-CLiQ.

6.3.4.3 Specifying an infeed unit

Overview

Initially, after creating an infeed unit in the configuration, only one non-specified placeholder is available. Using an article number, this placeholder must be specified in more detail. As a result, you ensure that the component in the device view corresponds to the component that is contained in your drive configuration.

Procedure

To specify an infeed unit, proceed as follows:

- 1. Click in the white field of the non-specified infeed unit.
- 2. Open the inspector window if it is not already open.

3. In the "General" tab, select the entry "Line Module - Selection - xxx". A selection of the available infeed units is displayed.

Line Module_1 [Infeed_1]			Q Properties	🗓 Info 💶 📱 Diagr	nostics 📃 🗖 🗖
General IO tags System	constants Te	xts			
General Line Module - Selection - ALM	ne Module - Select	tion - ALM			
Line Module details	Basic param	eterization: 📐			
	Selected drive	object type: ACTIVE INFEED CO	DNTROL		•
	Select Format	t Article number	Drive object type	Rated power Rated current	t Supply volt
	Karley Karle	> 🔳 <filter></filter>	🔳 <filter> 🔳</filter>	<filter> 🔳 <filter></filter></filter>	Filter>
	Booksi	ize 65L3130-7TE21-6A	ACTIVE INFEED	16.00 kW 27.00 Arms	380 480
	Booksi	ize 65L3130-7TE23-6A	ACTIVE INFEED	36.00 kW 60.00 Arms	380 480
	Booksi	ize 65L3130-7TE25-5A	X ACTIVE INFEED	55.00 kW 92.00 Arms	380 480 😑
	Booksi	ize 6SL3130-7TE28-0Av	ACTIVE INFEED	80.00 kW 133.00 Arms	380 480
	Booksi	ize 65L3130-7TE31-2A	ACTIVE INFEED	120.00 kW 200.00 Arms	380 480
	R Booksi	ize 6SL3131-7TE21-6A	ACTIVE INFEED	16.00 kW 27.00 Arms	380 480
	Booksi	ize 6SL3131-7TE23-6Av	ACTIVE INFEED	36.00 kW 60.00 Arms	380 480
	Booksi	ize 6SL3131-7TE25-5Av	X ACTIVE INFEED	55.00 kW 92.00 Arms	380 480
	Booksi	ize 6SL3131-7TE28-0A	ACTIVE INFEED	80.00 kW 133.00 Arms	380 480
	Booksi	6513131-7TE31-24		120.00 kW 200.00 Arms	380 /80

- 4. Select the required infeed unit based on the article number. The following is automatically set based on your selection:
 - The infeed unit is displayed in the device view as specified (the area now has a dark color). The data are displayed accordingly in the device overview.



- Data of the selected infeed unit is assigned to the unspecified infeed unit.
- The white area turns dark gray.
- As default setting, a DRIVE-CLiQ connection is established between interfaces X100 and X200.

The infeed unit is inserted and specified in accordance with your drive configuration.

Note

If an Active Line Module or a Smart Line Module with the chassis format was inserted, then a Voltage Sensing Module is automatically added and wired.

6.3.4.4 Connecting infeed units in parallel

Overview

In Startdrive, you can interconnect several infeed units (Line Modules) in parallel. During commissioning, power units connected in parallel are treated like a power unit on the line or motor side. The parameter view of the actual values changes only slightly when there is a parallel connection; suitable sum values are formed from the individual values of the power units.

Requirements

- An Active Interface Module (AIM) with integrated line filter is required to operate an Active Line Module (ALM).
- We recommend external line filters to operate a Basic Line Module (BLM) and a Smart Line Module (SLM). Line filters can be set via the basic parameterization.

Procedure

To connect infeed units in parallel with modules that have already been added, proceed as follows:

- 1. Open "Line Modules" in the hardware catalog.
- 2. If you have not yet inserted any infeed unit, drag the desired, non-specified infeed unit into the device view and specify the inserted infeed unit.

3. Drag a non-specified infeed unit from the hardware catalog into the device view in the light gray area of the existing infeed unit.



Then specify the infeed unit connected in parallel.

4. Repeat step 3 to connect additional infeed units in parallel.

Result

The infeed unit connected in parallel is inserted and specified. The white area turns gray. The infeed units are linked with one another via interfaces X201 and X200.

Note

If required, individual infeed units of a parallel connection can be activated or deactivated via the inspector window (Line Module_xx / drop-down list "Component activation").

Disconnect individual infeed units from the line supply (e.g. using a contactor) to deactivate these. Motor supply lines must be opened.

Further information

Further information on rules, requirements, and restrictions for the parallel connection of Line Modules and Motor Modules can be found in the SINAMICS S120 Function Manual Drive Functions.

6.3.4.5 Making detailed settings

Overview

The following detailed settings can be made during commissioning:

- Drive unit line supply voltage for all types of infeed units
- Parameterization of a line filter when using an Active Line Module (ALM)

Important notes

Observe the following information before you make the detailed settings for the infeed unit that is used.

Note

Use of an Active Line Module

Following automatic commissioning, the appropriate filter for the matching Active Interface Module (AIM) is pre-selected as the line filter. If the drive line-up is set up differently, then the line filter type must be adjusted.

Note

Switching on a new/modified network

When first switched on with a new/modified network, an automatic controller setting must be implemented using the line and DC link identification routine (p3410). While the identification routine is running, it is not permissible for other loads to be switched in/switched out.

Procedure

To make detailed settings for an infeed unit, proceed as follows:

- 1. Select the infeed in the device view and open the inspector window.
- 2. Select the "Line Module details > Line Module settings" menu in the inspector window. In the screen form, the following setting options are displayed:

Line Module_1 [Infeed_1]		
General IO tags Sys	stem constants Texts	
General Line Module - Selection - ALM	Line Module settings	
✓ Line Module details Line Module settings	Line data / operating mode: 🔎	
	Line Module - Additional data	
	Line filter: AIM 400 V 16 kW (6SL3100-0BE21-6AB0) Additional line filter: Basic Line Filter booksize 400 V 16 kW (6SL3000-0BE21-6DA0)	•

Figure 6-5 Example: Detailed settings for infeed for ALM

3. In order to parameterize the device supply voltage, click the *licon* next to the "Line data / operating mode" entry.

The "Line data / Operating mode" screen form is opened:

Line data /	operating mode
	Drive unit line supply voltage 400 Vrms 3-p 50/60 Hz
	DC-link voltage setpoint default setting 600.00 V
	Supply/DC-link identification On 💌
0	If the power supply or the DC link of the drive line-up is subsequently changed (removal/adding of devices), then a network identification must be performed again. The determined values will be saved retentively.
4	For device supply voltages > 415 Vrms, the DC-link voltage control is deactivated automatically in order to reduce the voltage. This prevents damage to motors that are not suitable for high DC-link voltages.
	 Unregulated Udc (Smart Mode) Regulated Udc (Active Mode)

Figure 6-6 Example: line data / operating mode for ALM

Set the required device supply voltage here (see Chapter "Line supply data / Operating mode (Page 150)"). Make the other entries depending on the infeed unit type: However, if you are using an ALM, then proceed as follows:

- If you use a Basic Line Module (BLM) or Smart Line Module (SLM), the detailed setting is completed.
- If you use an Active Line Module (ALM), proceed further as follows.
- 4. if you are using a different line filter than the pre-selected line filter, select the desired line filter in the drop-down list with the same name (p0220[0]).
- If you use an Active Interface Module with an integrated line filter for the booksize design, you can additionally activate a specified Basic Line Filter. Activate the "Basic Line Filter Booksize ..." (p0220[1]) option for this.

You have made the detailed settings for the infeed of your device configuration.

6.3.5 Inserting a Motor Module or Power Module

Overview

When creating a Motor Module or Power Module, the "High dynamic (servo)" drive object type becomes active by default. You can change the drive object type if you want to use the "Universal (Vector)" drive object type in your hardware device configuration.

Many of the following settings depend on the set drive object type. The setting of the correct type is therefore prerequisite for all other settings during the commissioning and parameterization of the Motor Module or Power Module.

Important notes

 If you change the drive object type subsequently, there is a danger that the configuration of some components is lost and has to be repeated.
 Therefore, ensure that you first set the drive object type in the device configuration, and only then add and specify the motor, measuring systems or supplementary system components.

Differences between Motor Modules and Power Modules

- Motor Modules are intended for single-axis and multi-axis applications.
- Power Modules are intended for single-axis applications (generally, without an infeed unit).

Inserting and configuring

In the Startdrive engineering tool, Motor Modules and Power Modules are inserted into the device configuration in almost the same way. The device configuration of the drive requires at least one of the specified modules.

6.3.5.1 Differences between servo and vector

Overview

When creating Motor and Power Modules, the drive object types "Highly dynamic (servo)" and "Universal (vector)" can be selected. With SINAMICS, the terms "servo control" and "vector control" are also used.

Servo control features

The motor connected to servo control is simulated in a vector model based on data from the equivalent circuit diagram. This means that the servo control is also a vector control. However, the servo control optimizes the vector model according to other criteria. In favor of achieving a high dynamic performance, a small deterioration in the control accuracy and control quality is accepted.

Special features of the servo control include:

- Maximum computing speed
- Shortest sampling times
- High dynamic response
- Operation with encoder Due to the computing speed required, no model calculation of the actual values is used in the servo control. As a result, only operation with encoders is possible.
- Is used preferably with dynamic, permanent-magnet synchronous motors.

Vector control features

The motor connected to a vector control is simulated in a vector model based on data from the equivalent circuit diagram. The motor module is emulated as precisely as possible to obtain the best results regarding control control accuracy and control quality.

There are 2 types of vector control:

- Vector control without encoder (SLVC) as frequency control
- Vector control with encoder as speed-torque control with speed feedback

The vector control is characterized by the following features:

- Normal computing speed
- Best speed accuracy
- Best speed ripple
- Best torque accuracy
- Best torque ripple
- Operation with / without encoder Vector control operation is possible both with or without an actual speed value encoder.

Differences between CU310-2 PN and CU320-2 PN

The following table provides an overview of the supported power units.

Power unit	Component	CU310-2 PN ¹⁾	CU320-2 PN
Line Module	Active Line Module	-	Х
	Basic Line Module	-	Х
	Smart Line Module	-	Х
Power Module	AC Power Module	х	х
	PM240-2 ²⁾	-	Х
Motor Module	Single Motor Module	-	Х
	Double Motor Module	_	Х

¹⁾ When inserted from the hardware catalog, Power Modules are not automatically connected to the CU via DRIVE-CLiQ. The wiring must be manually established.

²⁾ When inserted from the hardware catalog, the PM240-2 is created together with a Control Unit Adapter (CUA). The components must be individually specified.

6.3.5.2 Inserting and specifying a Motor Module

Overview

You can insert a Motor Module into a device configuration as Single Motor Module (SMM) or as Double Motor Module (DMM).

Commissioning

6.3 Creating a project offline

Requirements

- A SINAMICS S120 CU320-2 PN Control Unit is inserted in the device configuration.
- An infeed unit is inserted. You can also add an infeed unit at a later point in time. In this case, you must manually wire the infeed unit with the other components.

Note

As a rule, when Power Modules are used, you can dispense with an infeed unit.

Procedure

Proceed as follows to specify and insert a Motor Module:

- 1. Open "Motor Modules" in the hardware catalog.
- 2. Select the required component.
- 3. Drag the unspecified Motor Module and drop it into the device view. The Motor Module is automatically interconnected via DRIVE-CLiQ.
- 4. Click the Motor Module in the device view. Ensure that you click in the white area of the component.
- 5. Open the inspector window if it has not been opened yet.
- 6. In the secondary navigation of the inspector window, select "Motor Module Selection xxx". The available Motor Modules are displayed in the selection list. The "High dynamic (servo)" drive object type is preset as default.
- 7. If you wish to change the drive object type, select the required control mode in the "Selected drive object type" drop-down list:



① Options in the "Selected drive object type" drop-down list

Note

Subsequently changing the drive object type

If you change the drive object type after adding additional components (motor, measuring system, etc.), then there is a risk that the configuration of some components is lost and must be repeated.

As a consequence, first set the drive object type and then add the remaining components.

A confirmation prompt is displayed for the current procedure.

- 8. Confirm the procedure with "Yes". The Motor Module selection list is now refreshed.
- Select the Motor Module based on the Article No. The data of the selected Motor Module is assigned to the Motor Module in the device configuration. The Motor Module has therefore been specified. The corresponding component is shown in the device configuration in dark gray.



6.3.5.3 Inserting and specifying an AC Power Module

Overview

Depending on the drive type, when creating an AC Power Module, either drive object type "Highly dynamic (servo)" or "Universal (vector)" is active as default. Many of the following settings depend on the drive object type that has been set.

Requirement

• A SINAMICS S120 Control Unit has been inserted in the device configuration.

Restrictions

• Only chassis format AC Power Modules can be specified in the Startdrive engineering tool.

Procedure

Proceed as follows to insert and specify an AC Power Module in the device configuration:

- 1. Open the "Power Modules" entry in the hardware catalog.
- 2. Select component "AC Power Module".
- 3. Drag the unspecified AC Power Module and drop it into the device view. The Power Module is automatically interconnected with the Control Unit via DRIVE-CLiQ.

Note

No automatic wiring

With an S120 drive system with a CU310-2 PN, the Power Module is not automatically wired via DRIVE-CLiQ. In this case, you must create the DRIVE-CLiQ wiring manually.

- Click on a DRIVE-CLiQ interface of the AC Power Module and establish a DRIVE-CLiQ connection to the target port of the required component (e.g. the CU).
- 4. Click on the Power Module in the device view. Ensure that you click in the white area of the component.
- 5. Select the "Power Module Selection PM" entry in the secondary navigation of the inspector window.

The available Power Modules are displayed in the selection list. The "High dynamic (servo)" drive object type is preset as default.

6. If you wish to change the drive object type, select the required control mode in the "Selected drive object type" drop-down list:

Power Modu	ıle_1					9	Properties 1	Info 🤢 🗓	Diagnostics		
General	IO tags	System co	onstants	Texts							
General			Selected	drive objec	t type: High dynamic	(servo)					
Power Modu	le - Selection - Pl	M	Selection	Format	Article r High dynamic	(servo)					(1
Power Modu	le details		76	<fil td="" 🔳<=""><td><filter></filter></td><td><rinter></rinter></td><td>Critter></td><td><riller></riller></td><td><rinter></rinter></td><td></td><td></td></fil>	<filter></filter>	<rinter></rinter>	Critter>	<riller></riller>	<rinter></rinter>		
			۲	Chassis	6SL3310-1TE32-1AAx	SERVO	110.00kW	210.00Arms	380 480 V 3 AC	i	
		•	0	Chassis	6SL3310-1TE32-6AAx	SERVO	132.00kW	260.00Arms	380 480 V 3 AC	i	
			0	Chassis	6SL3310-1TE33-1AAx	SERVO	160.00kW	310.00Arms	380 480 V 3 AC	i	

① Options in the "Selected drive object type" drop-down list

Note

Subsequently changing the drive object type

If you change the drive object type after adding additional components (motor, measuring system, etc.), then there is a risk that the configuration of some components is lost and must be repeated.

As a consequence, first set the drive object type and then add the remaining components.

A confirmation prompt is displayed for the current procedure.

- 7. Confirm the procedure with "Yes". The Power Module selection list is now refreshed.
- Select the Power Module based on the Article No. The data of the selected Power Module is assigned to the Power Module in the device configuration. The Power Module has therefore been specified. The corresponding component is shown in the device configuration in dark gray.



6.3.5.4 Inserting and specifying a PM240-2

Overview

PM240-2 Power Modules require a Control Unit Adapter (CUA) to establish a connection to a Control Unit. The following adapter types are available:

- CUA31
- CUA32

Depending on the drive type, when creating a PM240-2, either drive object type "Highly dynamic (servo)" or "Universal (vector)" is active as default. Many of the following settings depend on the drive object type that has been set.

Special features

The CUA32 has an integrated encoder evaluation function that can be configured for HTL/TTL or SSI encoders.

Commissioning

6.3 Creating a project offline

Requirement

• A SINAMICS S120 CU320-2 PN Control Unit is inserted in the device configuration.

Restrictions

• Only **blocksize format** PM240-2 can be specified in the Startdrive engineering tool.

Procedure

Proceed as follows to insert and specify a PM240-2 together with a Control Unit Adapter (CUA) in the device configuration:

- 1. Open the "Power Modules" entry in the hardware catalog.
- 2. Select the component "PM240-2".
- Drag the unspecified PM240-2 to the device view. The PM240-2 is inserted together with a CUA into the device configuration. The adapter is automatically interconnected with the CU via a DRIVE-CLiQ connection.
- 4. Click on the Power Module in the device view. Ensure that you click in the white area of the component.
- 5. Select the "Power Module Selection PM" entry in the secondary navigation of the inspector window.

The available Power Modules are displayed in the selection list. The "High dynamic (servo)" drive object type is preset as default.

6. If you wish to change the drive object type, select the required control mode in the "Selected drive object type" drop-down list:

Power Modu	ıle_1					💁 Prope	erties 性	Info 追 🎚	Diagnostics		
General	IO tags	System co	onstants	Texts							
General			Selected	drive objec	t type: High dynamic (s	ervo)					
Power Modu	le - Selection - F	M	Selection	Format	Article r High dynamic (s Universal (vecto	ervo) or)					-(1
P TOWET MODE	ine de tans		6	<fil [≣]<="" td=""><td><filter> (1) <</filter></td><td></td><td>tin ookw</td><td>210.00Arms</td><td>380 480 V 3 4C</td><td></td><td></td></fil>	<filter> (1) <</filter>		tin ookw	210.00Arms	380 480 V 3 4C		
		-	ŏ	Chassis	6SL3310-1TE32-6AAx S	SERVO	132.00kW	260.00Arms	380 480 V 3 AC	i	
			0	Chassis	6SL3310-1TE33-1AAx S	SERVO	160.00kW	310.00Arms	380 480 V 3 AC	i	

(1) Options in the "Selected drive object type" drop-down list

Note

Subsequently changing the drive object type

If you change the drive object type after adding additional components (motor, measuring system, etc.), then there is a risk that the configuration of some components is lost and must be repeated.

As a consequence, first set the drive object type and then add the remaining components.

A confirmation prompt is displayed for the current procedure.

7. Confirm the procedure with "Yes". The Power Module selection list is now refreshed.

- Select the Power Module based on the Article No. The data of the selected Power Module is assigned to the Power Module in the device configuration. The Power Module has therefore been specified. The corresponding component is shown in the device configuration in dark gray.
- 9. To select the adapter in the device view, click on the white area of the "CUA" component.
- 10. Select the "Control Unit Adapter Selection CUA" entry in the secondary navigation of the inspector window.

The available adapters are displayed in the selection list.

11. Select the required adapter type.

The data of the selected adapter type is assigned to the adapter in the device configuration. The adapter has therefore been specified.

The corresponding component is shown in the device configuration in dark gray.

The PM240-2 has been inserted and specified together with the CUA in the device configuration.



6.3.5.5 Making detailed settings

Overview

The following detail settings can be carried out in the inspector window for Motor Modules and Power Modules:

- Settings
 - Allows the modification of the preallocated supply voltage.
 - Indicates the standard for power settings of the converter and motor.
- Supplementary data
 - Allows filter settings for modules of the "Vector" type drive object.

The procedure described below shows the detailed settings using a Power Module as example and is the same for both types of modules.

Procedure

To make the detailed settings for a Power Module, proceed as follows:

- 1. Select the desired Power Module in the device view and open the inspector window.
- 2. Select the menu "Power Module Details > Power Module Settings" in the inspector window. The preallocated supply voltage is displayed in the screen forms:

Power Module_1 [Antrieb	sachse_1]		🗟 Properties 👘	🗓 Info 📋 🗓 Diagnostic	s 🗆 🗆 🗆
General IO tags	System constants	Texts			
General	Power Module s	attings			
Power Module - Selection - Pl	M	setungs			
 Power Module details 					
Power Module settings		Standard:	[0] IEC (50 Hz line,	, SI units)	
Power Module additional		Supply voltage:	400 N		V
			hg -		-

- 3. Enter a new supply voltage as required.
- If you use the "Vector" drive object type, then you can set additional data. Select the menu "Power Module Details > Power Module Additional Data" in the inspector window.

5. Select a desired filter in the "Output filter" drop-down list.

NOTICE

Damage to a sine-wave filter through incorrect parameter assignment

If a sine-wave filter is installed in your hardware configuration, the sine-wave filter can be destroyed if it has not been set in the additional data of the Motor Module or Power Module.

• Set the installed sine-wave filter in the "Output filter" drop-down list and add the required filter parameter data.

Additional display or input fields are now unhidden depending on the respective filter selected.

Power Module_1 [Antriebsachse_1]		Q Properties	🗓 Info 🚺 📱 Diagnostics 👘 🗖 📼
General IO tags System	constants Texts		
General Power Module - Selection - PM	Power Module additional data		
 Power Module details 			
Power Module settings	Output filter: [4] Sine-wave filter third-party	E 🔺	Notice:
Power Module additional data	Power unit motor reactor: 0.200	Am -	If a sine filter is to be used/installed in the component, it must be selected
	Power unit sine filter capacitance: 42.300	μF	here, otherwise the sine filter may be destroyed.
	Number of Power Modules connected in parallel: 1		

6. Now parameterize the associated detailed settings for the selected filter.

You have performed the detail settings for a selected Power Module or Motor Module.

6.3.5.6 Interconnecting Motor Modules in parallel

Overview

Connecting Motor Modules in the booksize format in parallel is possible in the "Vector" control mode.

When commissioning, modules connected in parallel are treated just like a power unit on the line or motor side. The parameter view of the actual values changes only slightly when there is a parallel connection. Suitable summed values are formed from the individual values of the power units.

The procedure described below shows the parallel connection using 2 Single Motor Modules. You can interconnect additional Motor Modules in the same way.

Requirements

- A SINAMICS S120 CU320-2 PN Control Unit is inserted in the device configuration.
- The Motor Module inserted in the device configuration has the following specifications:
 - Format: "Booksize"
 - Control mode: "Vector"

Commissioning

6.3 Creating a project offline

Procedure

To connect several Motor Modules in parallel, proceed as follows:

- 1. Open "Motor Modules" in the hardware catalog.
- 2. Drag & drop a Motor Module into the light gray area of the already existing Motor Module.



Figure 6-7 Example: Connecting Motor Modules in parallel

- 3. Specify the Motor Modules connected in parallel according to the specifications listed above. Further information on specifying a Motor Module is provided in Chapter "Inserting and specifying a Motor Module (Page 91)".
- 4. If necessary, add additional Motor Modules to the parallel connection.

6.3.5.7 Changing the drive object type subsequently

Overview

The drive object type can be changed in the selection list of the Motor Modules or Power Modules.

Requirements

• A Motor Module or a Power Module is created and, if required, specified in Startdrive in the device configuration.

Changing the drive object type

To change a drive object type in the selection list of the Motor Modules or Power Modules, proceed as follows:

- 1. Call the device configuration of the drive via the project tree.
- 2. Select the Motor Module or Power Module in the device configuration.
- 3. In the inspector window, select the "Motor Module Selection xxx" or "Power Module Selection xxx" entry.

A selection list of the relevant module opens:

General									
General	Motor	Madula	Foloction	CNANA					
▼ Motor Module_1 [SMM]	Motor	Module -	Selection	- SIVIIVI					
▶ General									
Motor Module - Selection		Basic p	arameteriz	ation:	7				
Motor Module details									
		Selected	drive object	type:	High dynamic	(servo)			-
		Selection	Format	Article	number	Drive object type	Rated power	Ra	
		16	<filt th="" 🔳<=""><th><filter></filter></th><th>. 🔳</th><th><filter></filter></th><th><filter> 🔳</filter></th><th><fi< th=""><th>^</th></fi<></th></filt>	<filter></filter>	. 🔳	<filter></filter>	<filter> 🔳</filter>	<fi< th=""><th>^</th></fi<>	^
		\bigcirc	Booksize	6SL312	20-1TE13-0Axx	SERVO	1.60 kW	3	
-		0	Booksize	6SL312	20-1TE15-0Axx	SERVO	2.70 kW	5	
		0	Booksize	6SL312	20-1TE21-0Axx	SERVO	4.80 kW	9	
-		0	Booksize	6SL312	20-1TE21-8Axx	SERVO	9.70 kW	18	
		۲	Booksize	6SL312	20-1TE23-0Axx	SERVO	16.10 kW	30	
		0	Booksize	6SL312	20-1TE24-5Axx	SERVO	24.10 kW	45	
		\bigcirc	Booksize	6SL312	20-1TE26-0Axx	SERVO	32.20 kW	60	
		0	Booksize	6SL312	20-1TE28-5Axx	SERVO	45.60 kW	85	
		0	Destruction	601.044	0.17501.04	OF BUO	70.00 LW	10	

Figure 6-8 Example: Motor Module selection list

4. To change the drive object type, select the required control mode in the "Selected drive object type" drop-down list:

P	ower Modu	le_1							Rropert	ties 🎽	Info 追 🛛	Diagnostics		•	
ſ	General	IO tags	System co	nstants	Texts										
,	General			Selected	drive objec	t type:	High dynamic	(servo)					I	~	C
	Power Modul	e - Selection - Pl	M	Selection	Format	Article r	High dynamic	(servo)							-(1)
•	Power Modul	e details		16	<fil< td=""><td><filter></filter></td><td></td><td><rinter></rinter></td><td>(E) <</td><td>ritter> [8</td><td><rinter></rinter></td><td><rinter></rinter></td><td></td><td>=</td><td></td></fil<>	<filter></filter>		<rinter></rinter>	(E) <	ritter> [8	<rinter></rinter>	<rinter></rinter>		=	
				۲	Chassis	6SL3310	-1TE32-1AAx	SERVO	1	10.00kW	210.00Arms	380 480 V 3 AC	i		
			•	0	Chassis	6SL3310	-1TE32-6AAx	SERVO	1	32.00kW	260.00Arms	380 480 V 3 AC	i		
				0	Chassis	6SL3310	-1TE33-1AAx	SERVO	1	60.00kW	310.00Arms	380 480 V 3 AC	i		

① Options in the "Selected drive object type" drop-down list Figure 6-9 Example: Power Module specified

A confirmation prompt appears as to whether you really want to change the drive object type.

5. Click "Yes" to confirm the prompt.

The selection list of the Motor Modules or Power Modules is now refreshed. Only Motor Modules or Power Modules of the selected type are now available for selection.

6. Save the changes in the project (see Chapter "Saving settings in the project (Page 63)").

6.3.6 Inserting a motor

Overview

Startdrive manages the motor data of numerous motors in a motor list. As a result, motors can be quickly specified via the inspector window. Motors that are not included in the motor list are specified by manually entering the motor data (e.g. rating plate values) in the inspector window (see Chapter "Inserting and specifying motors that are missing from the motor list (Page 103)").

Requirements

- A SINAMICS S120 Control Unit has been inserted in the device configuration.
- An infeed unit is inserted. You can also add an infeed unit at a later point in time. In this case, you must manually wire the infeed unit with the other components.
- A Motor Module or a Power Module is inserted.
- Optional: An encoder is inserted.

6.3.6.1 Inserting and specifying motors from the motor list

Overview

You insert motors from the hardware catalog into the device configuration and then specify them in the inspector window. The following motor types are available for selection:

DRIVE-CLiQ motors

Note

For DRIVE-CLiQ motors, when loading the project data (see Chapter "Loading project data from the converter (Page 66)") to the drive device, the motor and encoder data are automatically read from the hardware being used. It is not possible (or necessary) to specify the motor data at this point. However, for consistency reasons, after loading to a drive device and reading from the hardware, ensure that the project data is again transferred to the Startdrive project (see Chapter "Loading the project data into the converter (Page 184)").

- Induction motors
- Synchronous motors
- Reluctance motors
- Motor data input Manual recording of the motor data required (see Chapter "Inserting and specifying motors that are missing from the motor list (Page 103)").

Procedure

Proceed as follows to insert and specify motors in your device configuration:

- 1. Open "Motors" in the hardware catalog.
- 2. Select the desired, unspecified motor in the device overview.
- 3. Drag the desired, unspecified motor to the lower area of the Motor Module.
- 4. Click the unspecified motor in the device view.
- 5. Open the inspector window if it has still not been opened or displayed.
- 6. In the inspector window, select the "Motor Selection xxx" entry.
- Select your motor with the corresponding motor encoder in the selection list based on the article number. Motor data
 - The data of the selected motor are assigned to the unspecified motor. The white area turns dark gray.

Encoder

- If you have selected a motor with encoder, the encoder and the encoder evaluation are also added automatically.

Result

The motor is inserted and specified. If you have selected a motor without encoder, add an encoder and an encoder evaluation in the next step.

6.3.6.2 Inserting and specifying motors that are missing from the motor list

Overview

If you want to insert, specify and manage motors in your device configuration, which are not contained in the motor list, you can enter the most important motor data, such as the rating plate values of the motor, manually in the inspector window.

Procedure

To insert and specify motors that are not listed in the motor list into your device configuration, proceed as follows:

- 1. Open the "Motors" entry in the hardware catalog and then the "Motor data input" subentry. The motors are presorted according to motor type. A range of induction motors, synchronous motors and reluctance motors are available for a general selection.
- 2. Select the desired, unspecified motor in the device overview.
- 3. Drag the desired, unspecified motor to the lower area of the Motor Module.
- 4. Click the unspecified motor in the device view.
- 5. Open the inspector window if it has not been opened yet.

- 6. In the inspector window, select the "Motor details" menu. The expandable menu item "Motor details" ① consists of the following subsections:
 - Rating plate values
 - Optional motor data (can also be activated)
 - Equivalent circuit diagram data (can also be activated)
 - Motor brake
- 7. If you want to record motor data under "Optional motor data" and "Equivalent circuit diagram data", activate the following options in the "Rating plate values" screen form:
 - "Activate display of the optional motor data"
 - "Activate display of the optional equivalent circuit diagram data"

Motor_1 [Drive axis_1]		Properties	Info 🚺 🗓 Diagnostics	P
General IO tags Sys	tem constants Texts			
General Motor details	Rating plate values			
Rating plate values Optional motor data Equivalent circuit diagra	Basic parameterization: 🔎			
Motor brake	The motor data has not been entered completely! Complete the motor data	ð.		
	Rated motor voltage	0	Vrms	
	Rated motor current	0.00	Arms	
	Rated motor power	0.00	kW	
	Rated motor power factor	0.000		
	Rated motor frequency	0.00	Hz	
	Rated motor speed	0.0	rpm	
	Maximum motor speed	0.0	rpm	
	Motor cooling type	[0] Natura	I ventilation	
	Mot_temp_mod 2: sensor alarm threshold	120.0	*C	
	Mot_temp_mod 1/2 sensor threshold and temperature value	145.0	*C	
		Activate	e the display of the optional motor data	

- 1 Motor details (including additional options)
- 2 Mandatory fields (pink background)
- 3 Additional options (deactivated by default)

The additionally activated subareas are displayed in the inspector window under "Motor details" 1.

8. Acquire the required motor data of the inserted motor.

Note

The input fields marked in pink (2) are mandatory fields. If appropriate values are not entered in these fields, then the device configuration cannot be completed.

Note

We recommend entering the values in the inspector window under "Motor details". Individual parameters may be locked in the parameter view and cannot be set.

Result

The motor is specified with the manually acquired motor data. The white area turns dark gray.

If you have selected a motor with encoder, the encoder and the encoder evaluation are also added automatically.

6.3.6.3 Configuring motor details

Overview

You can configure the following motor details for motors during commissioning:

- Basic parameter assignment
- Rating plate values
- Motor brake

Procedure

To configure the motor details, proceed as follows:

- 1. Select the motor in the device view and open the inspector window.
- 2. In the inspector window, select the "Motor details > Rating plate values" menu. In the screen form, the following setting options are displayed:

Motor_1 [Drive axis_1]		Properties 1
General IO tags System	em constants Texts	
General	Rating plate values	
Motor - selection - 1PH2		
✓ Motor details		
Rating plate values	Basic parameterization: 🔀	
Motor brake		
	Number of motors connected in parallel: None	-
	Rated motor voltage: 281 Vrm	5
	Rated motor current: 52.70 Arms	5
4	Rated motor power: 16.50 kV	V
•	Rated motor power factor: 0.750	
	Rated motor frequency: 77.500 H	z
	Rated motor speed: 1,500.00 rpm	1
	Motor cooling type: [2] Liquid cooling	-
	Activate the display of th	e optional motor data
	Activate the display of th	e optional equivalent circu

Figure 6-10 Motor details: configuring rating plate values

 To perform the basic parameter assignment for the motor, click the icon next to the "Basic parameterization" entry.
 The function view of the drive axis is opened: Make the required settings here (see chapter "Performing basic parameterization")

(Page 135)").

- 4. In the inspector window, select the menu "Motor details > Rating plate values" again.
- 5. Make the settings in the white fields. The gray fields are refreshed automatically in accordance with your settings.

6. In the inspector window, select the "Motor details > Motor brake" menu. The current configuration of the motor holding brake is displayed in the screen form.

General IO tags	System constants Texts
 General 	Motor brake
Motor - selection - 1PH2	
 Motor details 	
Rating plate values	Basic parameterization: 🔎
Motor brake	
	Configuration of [0] No motor holding brake available motor holding brake: Brake control:

Figure 6-11 Motor details: configuring a motor brake

7. To change the configuration of the motor holding brake, click the licon next to the "Brake control" entry.

The "Brake control" screen form opens.

ake control		
Configurati	on	
[0] No mot	or holding brake available	•

Figure 6-12 Motor details: configuring brake control

8. Select the desired brake control from the "Configuration" drop-down list and make the required detailed settings. You can find further information about the detailed settings of the brake control in Chapter "Configuring brake control" of the SINAMICS S120 Commissioning Manual with Startdrive.

The selected brake control is displayed in the motor details.

Result

You have made the detailed settings for the selected motor in your device configuration.
6.3.7 Inserting measuring systems (encoders)

Encoder types

In measuring systems, there is a general distinction between two types of encoders:

• Motor encoder

Motor encoders are normally mounted on the motor shaft so that motor motion (angle of rotation, rotor position, etc.) can be directly measured. They provide an actual speed value that is incorporated in the control (speed and current control) so that for fast controllers the actual speed value must also be provided sufficiently quickly. This is the reason that high quality encoders must be used for motor encoders.

- Siemens motors that have already been configured are created in the device view with the matching encoder and the encoder evaluation.
- DRIVE-CLiQ motors are inserted together with an encoder. The drive and encoder parameters are transferred when you then load the configuration to the drive (download). The correct motor and encoder configuration are available offline in the project after an upload.
- Machine encoder

Machine encoders are installed in the machine. Using machine encoders, for example, you synchronize the speed of a belt to another belt, or you determine the position of a workpiece. Basic, mounted encoders can be used in this case as these values are normally not required in a fast speed controller or current controller cycle.

Available encoders in Startdrive

The following encoder types are supported in Startdrive:

- DRIVE-CLiQ encoder
- SIN/COS encoders
- HTL/TTL encoders
- Resolvers
- EnDat 2.1
- SSI encoder
- Distance-coded zero marks

Note

Encoders from the hardware catalog

SIEMENS in-house encoders which are listed in the hardware catalog no longer have to be parameterized as they are already preassigned the appropriate settings.

In contrast, third-party encoders must be parameterized as described below.

6.3 Creating a project offline

6.3.7.1 Inserting an encoder

Overview

You insert encoders from the hardware catalog into the device configuration and then specify them in the inspector window.

Recommended order

In the procedure described below, the encoder is inserted after the motor (see Chapter "Inserting and specifying motors from the motor list (Page 102)").

Requirements

- A SINAMICS S120 Control Unit has been inserted in the device configuration.
- An infeed unit is inserted. You can also add an infeed unit at a later point in time. In this case, you must manually wire the infeed unit with the other components.
- A Motor Module and motor have been inserted and specified.

Procedure

Proceed as follows to insert and specify an encoder in your device configuration:

- 1. Open "Measuring systems" in the hardware catalog.
- 2. Select the desired, unspecified encoder in the device overview.

~	Catalog						
6	earch>					iri)	irit
	Filter	Profile:	<all></all>			-	D
•	Contro	l Units					_
×	🔙 Line M	odules					
•	Rower	Modules					
×	🛃 Motor I	Modules					
►	Motors 🌄						
•	🔙 Measu	ring syste	ms				
	DRIV	VE-CLiQ er	coder				
	SIN/	COS enco	der				
	SSI	encoder					
	SIN/	COS + SSI	encoder				
	€B HTL	/TTL encod	er				
	🐌 HTL	/ⅢL ÷ŠSI (encoder				
	🐌 EnD	at 2.1 end	oder				
	🚛 Res	olver enco	der				
►	🔙 Supple	ementary s	ystem co	mponents	;		

Figure 6-13 Example: HTL/TTL encoder selected

- 3. Drag the desired, unspecified encoder to the lower area of the Motor Module. An encoder and a Sensor Module are created.
- 4. Click the unspecified encoder in the device view.

- 5. Open the inspector window if it has not been opened yet.
- 6. In the inspector window, select the "Measuring system Selection xxx" entry.
- Select the desired encoder in the selection list. The data of the selected encoder are assigned to the unspecified encoder. The white area turns dark gray. Further, a Sensor Module - encoder evaluation is also inserted.

Adding additional encoders

If you require additional encoders for your device configuration, then you can configure these in the same way. These encoders are then normally used as machine encoders.

6.3.7.2 Specifying the encoder evaluation

Overview

Various Sensor Modules are available for the encoder evaluation. Different types are offered for selection depending on the encoder.

Requirements

- You have already specified an encoder.
- The non-specified encoder evaluation is displayed.

Procedure

To specify the encoder evaluation, proceed as follows:

1. Click on the non-specified encoder evaluation. The Sensor Modules that are available are listed in the inspector window.

	🖳 Properties 🚺 Info 🔒 🗓 Di	agnostics
n constants Texts		
Encoder evaluation - Selection		
Basic parameterization: 🔀		
Select Article number	Туре	
Y _L <filter></filter>	Filter>	
6SL3055-0AA00-5Bxx	SMC20 Sensor Module Cabinet	
⊖ ¹ √ 6SL3055-0AA00-5H∞	SME25 Sensor Module External	
65L3055-0AA00-5Kxx	SME125 Sensor Module External	
	n constants Texts Encoder evaluation - Selection Basic parameterization: Select Article number <filter> 65L3055-0AA00-5Bxx 65L3055-0AA00-5Hxx 65L3055-0AA00-5Hxx</filter>	Select Article number Type Image: Select Article number Type Select Select Select Select Select Select Select Select Select Select Select

2. Select your Sensor Module.

Result

The Sensor Module has been specified.

6.3 Creating a project offline

6.3.7.3 Making detailed settings

Overview

You can configure the following encoder details for measuring systems during commissioning:

- Actual value processing
- Encoder details (e.g. encoder type, incremental tracks, gear ratio).

Procedure

To configure the encoder details, proceed as follows:

- 1. Select the encoder in the device view and open the Inspector window.
- 2. In the Inspector window, select the "Measuring system details" menu.
- 3. To configure the actual value processing, click the 🏊 icon next to the "Actual value processing" entry.

The "Actual value processing" screen form opens:

actual value processing	
Fine resolution G1_XIST1 11 Bit G1_XIST2 9 Bit	
Inversion Invert speed actual value Invert position actual value	
Measuring gear position tracking	
 [0] Rotary axis [1] Linear axis 	Virtual multiturn solution 0 Tolerance window 0.00

Figure 6-14 Example: Actual value processing

Make the required settings here (see chapter "Actual value processing (Page 160)").

4. In the Inspector window, select the menu "Measuring system details" again. In the screen form, the following setting options are displayed:

Messsystem_1 [Drive axis_1	1	🔍 Proper
General IO tags	System constants Texts	
 General Measuring system - Selectio 	Measuring system details	
Measuring system details		
Power supply	Actual value processing:	
Incremental tracks	Encoder type HTL/TTL	
Gear ratio / measuring ge		
 Geberauswertung_1 [SM] 	Motor encoder [*] O linear	
	Power supply	
	Power supply: 24 V Remote se	ense
	Incremental tracks	
	Pulses/revolution: 1,024 Level: HTL Signal: Bipolar	nitoring

Figure 6-15 Overview: Encoder details

5. Make the detailed settings for the encoder in the white fields. The gray fields are automatically corrected in accordance with your settings.

Result

You have made the detailed settings for the selected encoder in your device configuration.

6.3.8 Inserting additional system components

The following components can be inserted additionally in the device configuration of your drive:

- DRIVE-CLiQ Hub Module DMC20 / DME20
- Communication Board CBE20
- Terminal Module
- Terminal Board TB30
- Voltage Sensing Module VSM10

Since the procedures for inserting the components into the device configuration are different, they are described individually in the following.

6.3 Creating a project offline

6.3.8.1 Inserting a DRIVE-CLiQ Hub Module

Overview

DRIVE-CLiQ Hub Modules are used to extend and/or multiply DRIVE-CLiQ sockets. The following Hub Modules (star coupler) are available:

- DMC20 (DRIVE-CLiQ Hub Module Cabinet):
 - Expansion module for star-shaped distribution of a DRIVE-CLiQ line. Using the DMC20, you expand an axis grouping by 5 DRIVE-CLiQ sockets for additional subgroups.
 - The DMC20 can be snapped onto a mounting rail according to EN 60715.
- DME20 (DRIVE-CLiQ Hub Module External):
 - Expansion module for star-shaped distribution of a DRIVE-CLiQ line. Using the DME20, you expand an axis grouping by 5 DRIVE-CLiQ sockets for additional subgroups.
 - The DME20 is designed for applications where DRIVE-CLiQ devices are removed in groups without interrupting the DRIVE-CLiQ line and data exchange along the line.
 - The DME20 has degree of protection IP67.

In the Startdrive engineering tool, the "DRIVE-CLiQ HUB Module DMx20" term is generally used for all Hub Modules.

Further information

You can find further information about the Hub Modules in the "Control Units and Additional System Components" Manual. When commissioning the system, take into consideration and comply with the safety instructions there.

Requirement

• A SINAMICS S120 Control Unit (or a SIMATIC Drive Controller) has been inserted in the device configuration.

Restriction

• When using a CU310-2 PN, DRIVE-CLiQ Hub Modules inserted in the device configuration are not automatically wired via DRIVE-CLiQ.

Procedure

Proceed as follows to insert a DRIVE-CLiQ Hub Module in your device configuration:

- 1. Open the "DRIVE-CLiQ Hub Modules" entry in the hardware catalog.
- 2. Drag the "DRIVE-CLiQ HUB Module DMx20" Hub Module and drop it into the device configuration.

The component is automatically interconnected with the Control Unit via DRIVE-CLiQ.



Further information on the inserted Hub Module is provided in the inspector window.

Note

No automatic wiring

With an S120 drive system with a CU310-2 PN, the DRIVE-CLiQ Hub Module is not automatically wired via DRIVE-CLiQ. In this case, you must create the DRIVE-CLiQ wiring manually.

• Click on a DRIVE-CLiQ interface of the Hub Module and establish a DRIVE-CLiQ connection to the target port of the required component (e.g. the CU).

Optional steps

You can perform the following optional steps after inserting a Hub Module:

- Close additional components connected at the Hub Module.
- Change automatically created interconnections.
- In the inspector window, change the name of the inserted Hub Module.

6.3 Creating a project offline

Assigning the DRIVE-CLiQ interfaces

If all DRIVE-CLiQ interfaces at the CU are assigned, then additional components are automatically wired to the inserted Hub Module.

When using a CU310-2 PN, this is only applicable for supplementary system components.

6.3.8.2 Insert CBE20 Communication Board

Overview

The CBE20 Communication Board is a flexible component, which can be operated in Startdrive with the "SINAMICS link" communication profile.

Requirements

- A SINAMICS S120 Control Unit has been inserted in the device configuration.
- No Terminal Board TB30 is contained in the device configuration.

Note

A TB30 Terminal Board and a CBE20 Communication Board cannot be created simultaneously in the device configuration.

Procedure

To insert a CBE20 into the device configuration, proceed as follows:

- 1. Open "Supplementary system components > Communication Boards" in the hardware catalog.
- 2. Select the "CBE20 Communication Board" in the drop-down list.
- 3. Drag the "Communication Board CBE20" into the device view into the light gray border area of the Control Unit.

Result

The CBE20 is inserted in the drive, and does not have to be specified in any more detail.

6.3.8.3 Insert Terminal Module

Overview

With Terminal Modules, you can expand the interfaces of the Control Unit. They are connected to the Control Unit via DRIVE-CLiQ.

Requirement

• A SINAMICS S120 Control Unit has been inserted in the device configuration.

Procedure

To insert a Terminal Module into the device configuration, proceed as follows:

- Open "Additional system components > Terminal Modules" in the hardware catalog. The following Terminal Modules are available for selection: TM15, TM31, TM41, TM120 and TM150.
- 2. Select the desired Terminal Module in the selection list.
- 3. Drag the Terminal Module to the device view. The DRIVE-CLiQ connections are automatically created.

Note

No automatic wiring

With an S120 drive system with a CU310-2 PN, the Terminal Module is not automatically wired via DRIVE-CLiQ. In this case, you must create the DRIVE-CLiQ wiring manually.

• Click on a DRIVE-CLiQ interface of the Terminal Module and establish a DRIVE-CLiQ connection to the target port of the required component (e.g. the CU).

Result

The Terminal Module is inserted in the drive and does not have to be specified in any more detail.

6.3.8.4 Insert TB30 Terminal Board

Overview

Terminal Board TB30 is a terminal module with which it is possible to expand the interfaces of the Control Unit. The Terminal Board is inserted into the option slot of the Control Unit.

Requirements

- A SINAMICS S120 Control Unit has been inserted in the device configuration.
- No Communication Board CBE20 is contained in the device configuration.
 TB30 and CBE20 cannot be created simultaneously in the device configuration.

Note

A TB30 Terminal Board and a CBE20 Communication Board cannot be created simultaneously in the device configuration.

Procedure

To insert a TB30 into the device configuration, proceed as follows:

- 1. Open "Additional system components > Terminal Boards" in the hardware catalog. The "TB30 Terminal Board" entry is displayed.
- 2. Select the TB30 Terminal Board in the device overview.
- 3. Drag the Terminal Board to the device view.

6.3 Creating a project offline

Result

The TB30 is inserted in the drive and does not have to be specified in any more detail.

6.3.8.5 Insert VSM10 Voltage Sensing Module

Overview

Voltage Sensing Modules (VSM) can be used for the following different drive objects:

- Infeed unit
 - Is used for voltage measurement (e.g. for the "mains transformer" function).
 - The VSM10 allows an exact recording of the line voltage curve and supports the fault-free operation of the Line Modules in unfavorable network conditions.
- Motor Modules, type vector
 - Required for the functions "synchronize" and "flying restart".

Requirements

- A SINAMICS S120 Control Unit has been inserted in the device configuration.
- An infeed unit is inserted into the device configuration. OR
- A Motor Module, type vector is available.

Information for inserting Voltage Sensing Modules

Observe the following information before you insert a Voltage Sensing Module into the device configuration.

Note

When Active Line Modules or Smart Line Modules of the Chassis design are inserted, Voltage Sensing Modules are also automatically inserted.

Procedure

To insert a VSM10 into the device configuration, proceed as follows:

- 1. Open "Supplementary system components > Voltage Sensing Modules" in the hardware catalog.
- 2. Select the "Voltage Sensing Module VSM10" in the drop-down list.
- 3. Drag the "Voltage Sensing Module VSM10" to the device view on the infeed unit, or alternatively on a vector-type Motor Module.

Result

The VSM10 is inserted in the selected drive object and does not need to be further specified. The DRIVE-CLiQ connections are automatically created.

Operation of several VSMs per Line Module

Depending on the type and design, a maximum of 3 VSMs (e.g. Active Line Modules in Chassis design) can be added to a Line Module.

Note

Activating the "Line transformer" function module

If you operate several VSMs on one Line Module, you must activate the "Line transformer" function module in the basic parameterization of the Line Module.

Note

Deleting additional Voltage Sensing Modules

If you delete additional VSMs, you must deactivate the "Line transformer" function module in the basic parameterization in order to avoid negatively impacting the computing performance of the Control Unit.

Further information

You can find further information on the system rules for operating multiple VSMs per Line Module in the SINAMICS S120 Function Manual Drive Functions.

6.4 Establishing an online connection to the drive

6.4 Establishing an online connection to the drive

Overview

Most SINAMICS S120 control units (e.g. CU320-2 PN) have 2 interfaces, via which you can connect the drive online.

Industrial security guidelines

Observe the following information and follow the instructions in them when selecting and configuring the interfaces.

Note

Adhere to setup and Industrial Security guidelines - cell protection concept

- Commissioning and Service interface X127: Only local access (point-to-point connection) is permitted for the X127 Ethernet interface.
- PROFINET interface X150
 In accordance with the "Defense in Depth" concept, this interface must be isolated from the remaining plant network. Manual access to cables and open connections must be protected as in a control cabinet.

IP addresses in the delivery condition

SINAMICS S120 Control Units are shipped from the factory with the following IP addresses:

- Commissioning and service interface X127:
 - IP address: 169.254.11.22
 - Subnet mask: 255.255.0.0
- PROFINET interface X150:
 - IP address: 0.0.0.0
 - Subnet mask: 0.0.0.0

IP addresses in the project

A SINAMICS S120 Control Unit is created with the following IP addresses in a project in the TIA Portal:

- Commissioning and service interface X127:
 - IP address: 169.254.11.22
 - Subnet mask: 255.255.0.0

The addresses correspond to the addresses in the delivery condition.

- PROFINET interface X150:
 - IP address: 192.168.1.2
 - Subnet mask: 255.255.255.0

The PROFINET addresses lie in the area of the PROFINET subnet of a SIMATIC S7 controller. No additional settings are required to establish a network.



2 Commissioning and service interface X127

Figure 6-16 Example: CU320-2 PN interfaces

Defining the preferred PG/PC interface

To define the preferred PG/PC interface for the online connection, proceed as follows:

- 1. In your project, select menu "Options > Settings". The settings of the TIA Portal are opened.
- 2. Select entry "Online & Diagnostics".

6.4 Establishing an online connection to the drive

- 3. In display area "Preset connection path for online access", define the interface type and the interface.
- 4. Enable the option "Display dialog for setting the default connection path for the online access".

Default connection path for	online access	
Type of the PG/PC interface:	L bulie	•
PG/PC interface:	Intel(R) Ethernet Connection (7) I219-LM	•
	Display the dialog for setting the default con	nection path for online access.

The defined connection path is used as the default setting in the dialogs for online access.

6.4.1 Using the service interface

Overview

The interface X127 with a default IP address is available for commissioning your drive.

Requirements

New project

- A SINAMICS S120 Control Unit has been inserted in the device configuration.
- You have connected your PG/PC with the drive via the X127 service interface.

Note

You can go directly online as the service interface X127 has already been assigned an IP address.

Existing project

 If you are using an existing project and devices have already been created, in the project, check the IP address of the interface in the inspector window at "Properties > General > Ethernet addresses" and the IP address assigned to the device. The addresses and subnet masks must be identical.

Procedure

To establish an online connection between your PG/PC and the drive, proceed as follows:

- 1. Select the drive unit with which you want to go online in the project tree (or in the device view).
- 2. Click the "Go online" button.

The corresponding dialog is opened.

	Device	Device type	Slot	Interface type	Address	Subnet
	Drive unit 1	CU320-2 PN	CU X150	PN/IE	192.168.0.1	
	-	CU320-2 PN	CU X127	PN/IE	169.254.11.22	
		Type of the PG/PC inter	face:	PN/IE		•
		PG/PC inter	face:	Intel(P) 82570	I M Gigabit Network	Connection 💌 🖲
			haret [Disect at a lat ICU	LW GIGBDIT NETWORK	
	Co	onnection to interface/sul	bnet:	Direct at slot 'Cu	X127	• •
		1st gate	eway:			👻
	Select target device	e:	Interfac	Add	Show devices with t	the same addresses
	Select target device Device Antriebsgerät 1	Device type	Interfac PN/IF	e type Add	Show devices with t Iress 9 254 11 22	he same addresses Target device
ß	Select target device Device Antriebsgerät_1 —	e: Device type \$120 CU320-2 PN 	Interfac PN/IE PN/IE	e type Add 169 Acc	Show devices with t Iress 9.254.11.22 ess address	he same addresses Target device
1	Select target device Device Antriebsgerät_1 —	2: Device type S120 CU320-2 PN 	Interfac PN/IE PN/IE	e type Add 169 Acc	Show devices with t Iress 0.254.11.22 ess address	the same addresses Target device
8	Select target device Device Antriebsgerät_1 —	Device type 5120 CU320-2 PN 	Interfac PN/IE PN/IE	e type Add 169 Acc	Show devices with t Iress 0.254.11.22 ess address	the same addresses Target device
j	Select target device Device Antriebsgerät_1 —	2: Device type S120 CU320-2 PN 	Interfac PN/IE PN/IE	te type Add 169 Acc	Show devices with t Iress 0.254.11.22 ess address	the same addresses
Flash LED	Select target device Device Antriebsgerät_1 —	2: Device type S120 CU320-2 PN 	Interfac PN/IE PN/IE	e type Add	Show devices with t Iress 0.254.11.22 ess address	the same addresses Target device
Flash LED	Select target device Device Antriebsgerät_1 -	e: Device type S120 CU320-2 PN 	Interfac PN/IE PN/IE	e type Ado 169 Acc	Show devices with t Iress 0.254.11.22 ess address	the same addresses Target device
Flash LED	Select target device Device Antriebsgerät_1 -	e: Device type \$120 CU320-2 PN -	Interfac PN/IE PN/IE	e type Add	Show devices with t Iress 0.254.11.22 ess address	the same addresses Target device <u>Start sear</u>
Flash LED	Select target device Device Antriebsgerät_1 -	e: Device type \$120 CU320-2 PN 	Interfac PN/IE PN/IE	e type Add	Show devices with t Iress 0.254.11.22 ess address Display only error	the same addresses Target device <u>Start sear</u> messages
Flash LED ne status information Scan completed. 1 of	Select target device Device Antriebsgerät_1	e: Device type \$120 CU320-2 PN 1 accessible devices fou	NITE PN/IE PN/IE	e type Add 165 Acc	Show devices with t Iress 0.254.11.22 ess address	the same addresses Target device <u>Start sear</u> messages
Flash LED ne status information Scan completed. 1 c Retrieving device inf	Select target device Device Antriebsgerät_1	e: Device type S120 CU320-2 PN 1 accessible devices fou	Interfac PN/IE PN/IE	e type Add	Show devices with t Iress 0.254.11.22 ess address	the same addresses Target device <u>Start sear</u> messages
Flash LED ne status information Scan completed. 1 c Retrieving device inf Scan and informatio	Select target device Device Antriebsgerät_1	e: Device type S120 CU320-2 PN 1 accessible devices fou	Interfac PN/IE PN/IE	e type Add	Show devices with t Iress 0.254.11.22 ess address	the same addresses Target device <u>Start sear</u> messages

- 3. In drop-down list "Type of the PG/PC interface", select option "PN/IE".
- 4. In drop-down list "PG/PC interface", select the interface of your PG/PC.
- 5. In drop-down list "Connection to interface/subnet", select option "Direct at slot 'CU X127".
- 6. Select one of the following search options in the "Select target device" drop-down list:
 - Show devices with the same addresses
 - Show all compatible devices
 - Display accessible devices
- 7. In order to search for the drive unit with the set parameters, click "Start search". The devices that are found are displayed in the table of results.

6.4 Establishing an online connection to the drive

- 8. Select your drive unit from the table.
- 9. To establish an online connection to the drive unit, click "Connect". The online connection between the PG/PC and the drive unit is established.

The settings are used automatically the next time you go online and the "Go online" dialog is no longer displayed.

Quick search via "Online access"

In order to obtain a fast overview, you can start a search in "Online access" at the required interface. If the wiring to your drive is error-free and you have wired the correct drive (LED flashing for checking), the drive is displayed with the appropriate IP address.

💌 🔚 Online access	
🍸 Display/hide interfaces	
• 1 сом	2.
🔻 🛄 Intel(R) 82579LM Gigabit Network Connection	1
🔐 Update accessible devices	
鹶 Display more information 🛛 📉	
Accessible device [169.254.11.22]	
PC internal [Local])

Figure 6-17 Example: Online access

6.5 Alternative 1: Loading the drive configuration into the project

6.5.1 Uploading a device as a new station

Overview

You can also put your drive into operation via the "Upload device as new station" function.

Requirements

- There is a physical LAN connection between the drive and the PG/PC.
- The drive is switched on.
- An IP address has been assigned to the drive.

Procedure

To upload a device as a new station, proceed as follows:

1. In the project tree, click on the arrow icon ▶ next to the "Online access" function. The following options are then displayed:

🕶 🚂 Online access	
🍸 Display/hide interfaces	
• Сторования сом	1.
Intel(R) Ethernet Connection (2) I219-LM	100
PC internal [Local]	
USB [S7USB]	
TeleService (Automatic protocol detection)	100

2. Click on the arrow icon ▶ next to the option "Intel(R) Ethernet Connection (2) I219-LM". The following options are then displayed:



3. If the entry "Accessible device [169.254.11.22]" is not displayed, double-click the function "Update accessible devices".

"Accessible device [169.254.11.22]" is then displayed in the list.

6.5 Alternative 1: Loading the drive configuration into the project

- 4. Select the entry "Accessible device [169.254.11.22]" and right-click in the selected line. The list of possible commands is shown.
- 5. Select the command "Upload device as new station".

X	Cut	Ctrl+X
	Сору	Ctrl+C
<u>í</u>	Paste	Ctrl+V
×	Delete	Del
	Upload device as new	station
4	Display more informat	ion
S	Go online	Ctrl+K
1	Go offline	Ctrl+M
ų,	Online & diagnostics	Ctrl+D
	Global Search Tools	•
4	Search in project	Ctrl+F
×	Cross-references	F11
	GenericBrowser Viewe	r 🕨
Q	Properties	Alt+Enter

The configuration is loaded from the drive into the project.

6.5.2 Post-processing the drive configuration

Overview

In an ideal scenario, all of the drive components are transferred into the drive configuration and specified via the automatic configuration. In this case, the error-free configuration is confirmed in the message display and the configuration does not have to be post-processed.

Error when reading out the drive configuration

If, however, not all drive components could be read out by the automatic configuration, although they do exist physically, the components are created unspecified in the device view. The missing specification must therefore be added in the device configuration.

Specifying unspecified components

To specify non-specified components, proceed as follows:

- 1. Click in the inner white area of the unspecified component envelope. The area is shown as selected.
- 2. Open the inspector window if it has not been opened yet.
- 3. In the secondary navigation of the Inspector window, select "... Selection". A selection of the available components is displayed on the right in "... Selection".
- 4. Select the component.

Result

- The component is displayed in the device view as specified (the area now has a dark color). The data are displayed accordingly in the device overview.
- The data of the selected component unit were assigned to the unspecified component unit.

6.6 Alternative 2: Creating a project with a determined drive configuration

6.6.1 Inserting the drive offline

Overview

The following describes how to insert a SINAMICS S120 Control Unit into a new project via the project view.

Requirements

- A project has been created, or an existing project is open.
- The online connection to the drive is deactivated.

Procedure

Proceed as follows to insert a Control Unit into the project view:

1. Double-click "Add new device" in the project tree. The appropriate dialog opens.

	Add new device			×	
	Device name:				
	Drive weit 1		h		
\bigcirc	Drive unit_1		J		
2-	Controllers Controllers HMI PC systems PC systems Drives	 Drives & starters SINAMICS drives SINAMICS G110M SINAMICS G120 SINAMICS G120C SINAMICS G120D SINAMICS G120P SINAMICS G130 SINAMICS G150 SINAMICS G150 SINAMICS S120 Control Units CU310-2 PN SINAMICS S120 Integrated for SINAMICS S150 SINAMICS S120 SINAMICS S120 	Device: Article no.: Version: Description: Control Unit C Number of D Digital inputs 12 parameter inputs/output	CU320-2 PN 65L3040-1MA01-0Axx 5.2 CU320-2 PROFINET. RIVE-CLIQ ports: 4. :: trizable (floating). izable bidirectional (digital ts).	4
(3)—	Open device view	< <u> </u>		OK Cancel	
Ċ					

- ① "Device name" input field (default: Drive unit_x)
- 2 "Drives" button
- 3 Activate/deactivate "Open device view" option
- (d) Drop-down list "Version" (here, select the firmware version of your drive device.)
- 2. Click on "Drives" (2) to display the drives available.

3. Click on the required Control Unit in the "Control Units" list.

Note

Comparing and possibly changing version numbers

The latest firmware version is always suggested when creating a Control Unit. Under certain circumstances, the recommended firmware version does not match the version number on the memory card of your converter. If the version numbers do not match, it will not be possible to go online later. Therefore, please observe the following notes:

- Observe the version number in the "Version" drop-down list and ensure that the displayed version number matches the version number on the memory card of your converter.
- If necessary, change the version number via the "Version" drop-down list.
- 4. Assign a different device name in the input field (1) if required.
- 5. Click "OK".

OR

Double-click on the required Control Unit.

If the "Open device view" option is activated, the Control Unit is displayed in the device view in the next step.

Result



The Control Unit is inserted and can then be configured.

Example: CU320-2 PN inserted

6.6.2 Determining the drive configuration

Overview

The individual steps for automatically determining the drive configuration via the function "Detection of the device configuration" are described below.

Requirements

- A project has been created.
- A Control Unit has been inserted into the device configuration.
- An online connection has been established to the drive.

Performing device configuration identification

To determine the drive configuration via the function "Detection of the device configuration", proceed as follows:

- 1. Select the desired drive in the project tree or in the device configuration.
- Call the "Device configuration detection" shortcut menu. The "Go online" dialog is displayed if an online connection to the drive has not yet been established.
- 3. Establish an online connection to the drive.

Result

- The topology of the drive is read out. Existing DRIVE-CLiQ interconnections are imported directly from the actual topology of the drive.
- The "Detection of the device configuration" dialog opens.

Detection of the device con	figuration				×
Drive object type for all motor controllers :	O Universal (vector)	💿 High dynam	nic (servo)	Can be selected	
Parallel connection view					
Module	Drive object type	Component type	Identification	DRIVE-CLiQ connection	
🔻 🚂 Drive unit					
Non-assignable comp	oonents				
Drive control	SINAMICS S				
I Drive unit_1		\$120 CU320-2 PN	📃 LED flashing		
🔻 🌄 Drive axis_1	High dynamic (servo)				
🐌 Motor Module_1		DMM	📃 LED flashing	X200 -> Drive control/Drive	unit_1/X1
▼ → Drive axis_2	High dynamic (servo)				
Motor Module_1		DMM	📃 LED flashing	Internal -> Drive axis_1/Mo	tor Module
					_
<		1111			>
				Create	Cancel

Overview of the read-out components

All of the read-out components are displayed in an overview. The list shows all components which can be assigned to a main component (e.g. infeed unit).

Non-assignable components

Components that are not automatically assigned to a main component during device configuration detection are listed at "Non-assignable components". These components can be manually assigned via drag-and-drop or via the shortcut menu of a main component.

Note

All of the components listed in the "Non-assignable components" folder prevent the creation of the read-out actual topology into the drive configuration.

Remedy

If individual non-assigned components cannot be assigned to a main component, delete the corresponding list entries in the "Non-assignable components" folder. As a result, the remaining components can be imported into the drive configuration.

Selecting the drive object type of the motor control (optional)

After the drive configuration has been read out, the drive object type in the header of the dialog box is automatically set to "High dynamic (servo)".

	r :						
Detection of the device configuration							
Drive object type for all motor controllers :	O Universal (vector)	e) High dynamic (servo)	🔿 Car				
Parallel connection view							



If you want to set another motor control, proceed as follows:

- 1. Activate the option of the required drive object type in the dialog header.
 - Universal (vector)
 - Highly dynamic (servo)
 - Selectable

The drive object type can be individually assigned for each detected drive axis.

2. If you selected the "Can be selected" option, select the required drive object type for each drive axis in the column of the same name via a drop-down list.

Result

You have selected the drive object type of the motor control.

Configuring the topology

If all components found in the actual topology have been assigned, no further adaptations must be made in the "Detection of the device configuration" dialog. The "Create" button is then enabled. If the "Create" button is grayed out and not active, further adaptations in the topology are required. The following options are available to you for this:

Changing the assignment of components

To change the assignment of the components, proceed as follows:

- 1. Select a component in the list that you want to assign to a different main component.
- 2. Move this component to the desired main component using drag & drop.

Assigning a non-assigned component to a main component

To assign non-assigned components to a main component, proceed as follows:

- 1. Select a component that is not yet assigned in the "Non-assignable components" folder.
- Call the "Assign to / Main component xy" shortcut menu.
 "Main component xy" stands for all of the main components used in the list. The component is assigned to the desired main component in the list.

Deleting component

To delete individual components, proceed as follows:

- 1. Select the component that you would like to delete.
- 2. Call the "Delete" shortcut menu. The component is deleted.

Renaming the component

To rename individual components, proceed as follows:

- 1. Select the components which are to be renamed.
- 2. Call the "Rename" shortcut menu.
- 3. Enter a new name for the component.

Connecting components in parallel

The parallel connection view supports you in the parallel connection of components.

To activate the "Parallel connection view" option, proceed as follows:

- 1. Activate the "Parallel connection view" option. The "Connect in parallel at" shortcut menu is displayed.
- 2. To interconnect individual components in parallel, you have the following options:
 - Drag & Drop
 To interconnect individual components with one another in parallel, drag and drop components that are capable of parallel connection together.
 - Shortcut menu

Right-click the components to be connected in parallel. All of the drive objects to which the selected component can be connected in parallel are displayed in the shortcut menu under the "Connect in parallel at" menu entry. The "All" item switches the selected power unit parallel to all connectable components.

Cancelling a parallel connection

To eliminate an existing parallel connection, proceed as follows:

- 1. Move individual components to the higher-level drive using the drag-and-drop feature. OR
- 2. Select a component that is connected in parallel and then the shortcut menu "Disconnect parallel connection".

6.6.3 Importing the drive configuration into the project

Overview

After you have checked and, if applicable, corrected the automatically determined topology, you can import this topology into a Startdrive project.

Note

Overwriting existing components

If you have already created components in your Startdrive project before the automatic determination of the drive configuration, then these components are overwritten when the data from the automatic determination is created.

Requirements

• There are no non-assignable components in the drive configuration.

Procedure

To import the determined topology into your Startdrive project, proceed as follows:

 Make sure that there are no non-assignable components in the "Device configuration detection" dialog.
 The "Create" button only becomes active when all of the non-assignable components of the non-assignable components.

The "Create" button only becomes active when all of the non-assignable components are assigned to a main component or are deleted.

2. Click the "Create" button.

Result

The topology is created in the configuration of the selected drive and is displayed in the device view.

6.6.4 Post-processing the drive configuration

Overview

In an ideal scenario, all of the drive components are transferred into the drive configuration and specified via the automatic configuration. In this case, the error-free configuration is confirmed in the message display and the configuration does not have to be post-processed.

Error when reading out the drive configuration

If, however, not all drive components could be read out by the automatic configuration, although they do exist physically, the components are created unspecified in the device view. The missing specification must therefore be added in the device configuration.

Specifying unspecified components

To specify non-specified components, proceed as follows:

- 1. Click in the inner white area of the unspecified component envelope. The area is shown as selected.
- 2. Open the inspector window if it has not been opened yet.
- 3. In the secondary navigation of the Inspector window, select "... Selection". A selection of the available components is displayed on the right in "... Selection".
- 4. Select the component.

Result

- The component is displayed in the device view as specified (the area now has a dark color). The data are displayed accordingly in the device overview.
- The data of the selected component unit were assigned to the unspecified component unit.

6.7 Performing basic parameterization

6.7.1 Control Unit

6.7.1.1 Configuring the web server

Overview

The web server provides information on a SINAMICS S120 device via its web pages. Access is via an Internet browser.

Configuration in Startdrive

You configure the web server in the Startdrive commissioning tool in the "Web server" screen form. Generally you can perform the configuration both in the online and in the offline mode of the Startdrive. We recommend that you carry out the configuration of the web server in offline mode.

eb se	rver
	Activating Only permit access via https
	Enable "SINAMICS" user Specify password
	Enable "Administrator" user Specify password
No	otes:
1. th	All rights are available to the user for access via the Web server during the first commissioning, ereafter restricted access.
Th	e access rights can be changed at any time in Startdrive.
2. fu	Activation of this service reduces the protection against unauthorized external access to the nctions and data of this drive unit via the network.

Figure 6-19 Web server configuration with default settings

The following table provides an overview of the configurations that you can perform offline and/ or online.

Configuration	Offline	Online
Activate / deactivate the web server	х	х
Only permit access via HTTPS	х	х
Activate "SINAMICS" user	х	х
Activate "Administrator" user	х	х
Create password (all users)	х	х
Change password (all users)	-	х
Delete password ("SINAMICS" user)	-	х

Note

Transferring passwords created offline to the drive

Passwords created offline must be transferred to the drive before accessing the web server. To transfer the passwords created offline to the drive unit, proceed as follows:

- 1. Connect to your drive unit online. For information on this, see Chapter "Establishing an online connection to the drive (Page 118)".
- 2. Load the set project data into your drive unit. For information on this, see Chapter "Loading the project data into the converter (Page 184)".

Deactivating the web server

When your converter is supplied, the web server is activated as default setting. When required, you can deactivate the web server as follows:

- 1. In the configuration dialog, deactivate the "Activate" option.
- 2. Then save the project to accept the settings.

Restricting web server access to just secure connections

Using the default configuration of the web server, you can access the SINAMICS S120 converter via an HTTP connection or via an encrypted HTTPS connection. Using the configuration, access can be restricted so that only a secure HTTPS connection is possible. To prevent hacking attacks and data manipulation, we recommend that you restrict access to just the secure HTTPS connection.

NOTICE

Using non-encrypted connections (HTTP)

When using the HTTP protocol, the login data is also sent unencrypted. Using the HTTP protocol facilitates, among other things, hacking attacks and stolen passwords – and can result in data manipulation by unauthorized persons.

• Limit access to secure HTTPS connections so that all data is transferred encrypted.

The configuration option provided to limit connections to just HTTPS can only be changed when the web server is active:

- In the Startdrive configuration dialog
- In the web server prior to commissioning for the first time
- Using parameter p8986

Note

Access to the web server via PROFINET interface X150

In the parameter view, you can configure HTTP or HTTPS access to the web server via a PROFINET interface using parameters p8986.1, p8984 and p8985. To do this, you must activate access to the web server with p8986.0 = 1 or via the screen form "Web Server".

Procedure

To restrict access of the web server to a secure connection, activate the option "Only permit access via HTTPS" in the configuration dialog.

Further information

You can find further information on access to the web server and the functions of the web server in the Chapter "Web server" of the SINAMICS S120 Function Manual Drive Functions.

6.7.1.2 Web server user accounts

Overview

For SINAMICS S120, the rights of both user accounts "SINAMICS" and "Administrator" are permanently predefined and cannot be changed by users. The user "Administrator" has full access rights by default. However, the standard "SINAMICS" user only has restricted access rights.

For web server user accounts, you can make the following settings in Startdrive:

- Enable or disable a "SINAMICS" or "Administrator" user.
- Create a password for a "SINAMICS" or "Administrator" user.
- Change the password of a "SINAMICS" or "Administrator" user.
- Delete the password of a "SINAMICS" user.

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6.7 Performing basic parameterization

Defaults

The web server provides the following default settings for the users "SINAMICS" and "Administrator":

- "SINAMICS" user
 - No password set.

For these users we recommend that a password is assigned. With a password, you prevent an attacker from assigning a password and thereby blocking other commissioning engineers. Also observe the specifications for the creation of secure passwords below.

- "Administrator" user
 - No password set.

A password **must** be assigned for this user. If no password has been assigned, the following alarm appears when attempting to log on "A09000: Web server security: Administrator password not set". Also observe the specifications for the creation of secure passwords below.

Specifications for secure passwords

Observe the following information and notes for the creation of passwords:

Note

The password must include the following elements to provide protection against unauthorized access, e.g. unauthorized persons.

- At least 8 characters
- Uppercase and lowercase letters
- Numbers and special characters (e.g. ?!%+)

The password must not be used elsewhere.

6.7.1.3 Creating a password for the user "SINAMICS" and "Administrator"

Overview

You can use this function for the users "SINAMICS" and "Administrator" in **online or offline mode**. The procedure is the same for both users.

Requirements

• There is an online connection between the Startdrive project and the drive unit. This requirement only applies if you create a password in online mode.

Procedure

To create a password for the user "SINAMICS" or "Administrator", proceed as follows:

- 1. Click on "Specify password".
 - The "Specify password" dialog opens.

Specify password		×
Enter the password.		
New password:		
Confirm password:		
	OK Cancel	_

- 2. Enter the new password in the "New password" input field. Pay attention to upper and lower case.
- 3. Repeat the password in the "Confirm password" field. For security reasons, the password entries displayed in the input fields are encrypted.
- 4. Click "OK" to confirm the input in the password dialog. The input dialog is closed if both password entries match. If both entries do not match, the input dialog box remains open and an error message is displayed. At the same time, the two entries in the input dialog are cleared. In this case, you must re-enter the password into the input fields.
- 5. Save the project to accept the settings.

6.7.1.4 Deleting the password for the "SINAMICS" user

Overview

You can only use this function for the user "SINAMICS" and only in **online mode**.

Requirements

• There is an online connection between the Startdrive project and the drive unit.

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6.7 Performing basic parameterization

Procedure

To delete the password for the "SINAMICS" user, proceed as follows:

- 1. Click the "Delete password" button.
 - The "Delete password" dialog opens.

Delete password			\mathbf{X}
Enter the password.			
·			
			2
		<u> </u>	
	OK	Cancel	

- Enter the password for the "SINAMICS" user. The entry is checked. "Password has been deleted" is displayed if you entered the correct password.
- 3. Save the project to accept the settings.

Note

The "Administrator" user **must** have a password. If this user is to remain enabled for the web server after the old password has been deleted, a new password must be assigned.

6.7.1.5 Changing a password for the user "SINAMICS" and "Administrator"

Overview

You can only use this function for the users "SINAMICS" and "Administrator" in **online mode**. The procedure is the same for both users.

Requirements

- There is an online connection between the Startdrive project and the drive unit.
- The respective user is enabled.

Procedure

To change a password, proceed as follows:

- 1. Click "Change password".
 - The "Change Password" dialog opens.

Change password		×
Old password:		
New password:		<u>_</u>
Confirm password:		
	OK Cancel	

- 2. In the "Old password" input field, enter the user's existing password.
- 3. Enter the new password in the "New password" input field. Pay attention to upper and lower case.
- Repeat the password in the "Confirm password" field. For security reasons, the password entries displayed in the input fields are encrypted. The entry is checked. "Password has been changed" is displayed if you entered the correct password.
- 5. Save the project to accept the settings.

6.7.1.6 Password forgotten?

Overview

A forgotten password results in you no longer being able to access your previously accessible SINAMICS data and functions via the Web server. The procedure is the same for both users.

Procedure

To assign a new password, proceed as follows:

- 1. Back up the actual configuration of the drive device to Startdrive. Load the project data from the drive unit to your PC ("Load from device").
- 2. Reset the drive unit to the factory settings.
- 3. Load the backed-up configuration back to the drive unit ("Load to device").
- 4. Reconfigure the web server login for the user.

6.7.1.7 Configuring digital inputs

Overview

Digital inputs are used for the acquisition of digital signals. For example, drive enable signals can be controlled externally. The interconnection of digital inputs is made via BICO interconnections. For every digital input signal there is the corresponding inverted signal which can also be used for interconnection.

Simulation mode

The selection box for the terminal evaluation / simulation switchover is **only visible online**.

CU310-2 PN

You can change the interconnection of the digital inputs on the CU310-2 PN Control Unit in the "Isolated digital inputs" screen form.

Procedure

Interconnect the signal sources of digital inputs 0 to 3 and 16 to 22 (r0722 and r0723). Several interconnections are possible.

CU320-2 PN

You can change the interconnection of the digital inputs on the CU320-2 PN Control Unit in the "Isolated digital inputs" screen form.

Procedure

Interconnect the signal sources of digital inputs 0 to 7, 16, 17, 20 and 21 (r0722 and r0723). Several interconnections are possible.

6.7.1.8 Bidirectional digital inputs/outputs

Overview

The bidirectional inputs/outputs of terminals X122 and X132 on the CU (DO1) can be used by a drive object as well as by a higher-level controller (resource sharing). The assignment to a terminal is defined by means of BICO interconnections which are either connected to a controller via the DO1 telegram p0922 = 39x or to a drive object.

You can change the interconnection of the bidirectional digital inputs/outputs on the input/ output component.

- You can assign bidirectional digital inputs/outputs in the function. This means that you have the option of parameterizing an input or an output.
- Digital inputs are used for the acquisition of digital signals. For example, drive enable signals can be controlled externally.
- For every digital input signal there is the corresponding inverted signal which can also be used for interconnection.
- Digital outputs are used for the feedback of signals such as enable signals.

Changing the view of the screen form

The view of this screen form can be reduced to the essentials via a checkbox. Changing the function of one of the bidirectional digital inputs/outputs is not possible in the optimized view. The view of the screen form can also be switched to a simulation mode. This switchover only functions in online mode.

- 1. If you want to optimize the view, activate the "Optimize view" option.
- 2. If you want to switch to a simulation from the terminal evaluation, select "Simulation" in the drop-down list of a digital input.

Parameterizing the digital inputs/outputs 8 to 15

Each of the bidirectional digital inputs/outputs can be parameterized as an input or output using the selector.

Selector position	Description
Digital input	Default setting when calling the screen form the first time.
	Digital inputs 8 to 15 can be interconnected with this switch position. Several in- terconnections are possible.
	The selector can be switched by clicking from digital input to digital output.
Digital output	Digital outputs 8 to 15 can be interconnected with this switch position. Several interconnections are possible.
	The selector can be switched by clicking from digital output to digital input.

To parameterize the digital inputs/outputs 8 to 15, proceed as follows:

- 1. Select the digital input/output on the required terminal.
- 2. Interconnect the signal source of the digital input (8 to 15). OR
- 3. Proceed as follows to change the digital input into a digital output:
 - Click the selector.
 - Then connect the signal sink of the digital output (8 to 15).
 - If you want to invert the digital output, click on this icon .
 When inverted, the icon looks like this .
- 4. Repeat steps 2 or 3 for all digital inputs/outputs of the required terminal.

6.7.1.9 Measuring sockets

Overview

The measuring sockets output the analog signals. Any freely interconnectable signal can be output at any measuring socket. A measuring socket can be used, for example, to output the actual speed value (r0063) to a measuring instrument connected to the measuring socket.

Note

Only for commissioning and service

The measuring sockets may only be used for commissioning and service purposes. The measurements may be performed only by appropriately trained skilled personnel.

You can make the following settings:

- Activate the limitation to a characteristic.
- Interconnect signal sources.
- Parameterize a characteristic.
- Define an offset.

Interconnect signal sources

To interconnect signal sources with the available measuring sockets, proceed as follows:

- 1. Select one of the following settings in the "Limitation" drop-down list of a measuring socket:
 - Limitation On
 If signals are output outside the permissible measuring range, the signal is limited to
 4.98 V or to 0 V.
 - Limitation Off
 The output of signals outside the permissible measuring range causes a signal overflow.
 In the event of an overflow, the signal jumps from 0 V to 4.98 V or from 4.98 V to 0 V.
- 2. Select the signal sources (p0771[0...2]) whose signal is to be output via the measuring socket for the respective measuring sockets T0, T1 and T2.

r0060	CO: Speed setpoint before speed setpoint filter
r0063	CO: Actual speed value
r0069[02]	CO: Actual phase currents value
r0075	CO: Field-generating current setpoint
r0076	CO: Actual field-generating current value
r0077	CO: Torque-generating current setpoint
r0078	CO: Actual torque-generating current value

 The scaling specifies the processing of the measured signal. This requires the definition of a straight line with two points. Click the "Scaling" button in the adjustment range of a measuring socket. The "Scaling CU320 measuring socket Tx" dialog opens. You can define the values of a characteristic curve in this dialog.

- 4. In the dialog, select individual values within their defined limits, which are displayed in the relevant tooltips.
 - Characteristic value x2 (p0779)
 - Characteristic value y2 (p0780)
 - Characteristic value y1 (p0778)
 - Characteristic value x1 (p0777)

Example: x1/y1 = 0%/2.49 V x2/y2 = 100%/4.98 V

- 0.0% is mapped to 2.49 V.
- 100.0% is mapped to 4.98 V.
- -100.0% is mapped to 0.00 V.
- 5. Confirm your entries with "OK".
- 6. Enter the required offset value in the "Offset" field for the relevant measuring socket. The offset is applied additively to the signal to be output. The signal to be output can thus be displayed within the measuring range.

Function diagrams (see SINAMICS S120/S150 List Manual)

• 8134 Diagnostics - measuring sockets (T0, T1, T2)

Parameters (see SINAMICS S120/S150 List Manual)

Adjustable parameters

- p0771[0...2] CI: Measuring sockets signal source
- p0777[0...2] Measuring sockets characteristic curve value x1
- p0778[0...2] Measuring sockets characteristic curve value y1
- p0779[0...2] Measuring sockets characteristic curve value x2
- p0780[0...2] Measuring sockets characteristic curve value y2
- p0783[0...2] Measuring sockets offset
- p0784[0...2] Measuring sockets limitation on/off

Display parameters

- r0772[0...2] Measuring sockets signal to be output
- r0774[0...2] Measuring sockets output voltage
- r0786[0...2] Measuring sockets scaling per volt

6.7.1.10 Digital output, isolated (CU310-2 PN)

Overview

The digital output is used for signal feedback (e.g. enable signals). The digital output is interconnected via a BICO interconnection.

Procedure

Proceed as follows to interconnect the digital output:

- 1. Interconnect the signal sink of digital output 16.
- If required, invert this output via the icon. The icon indicates the inversion.

Control via onboard terminals

You can find additional information about controlling via onboard terminals in the Startdrive information system.

6.7.1.11 Analog input (CU310-2 PN)

Overview

The analog input is used to acquire external analog signals. These signals can be voltages or currents, for example. Analog inputs are used, for example, to be able to enter a speed or torque as analog signal.

Making basic settings

Proceed as follows to make the basic settings for the analog input:

- 1. Select the basic configuration of the input signal for the analog input:
 - [0] voltage input unipolar (0 V to +10 V The analog input is configured as voltage input.
 - [2] current input unipolar (0 mA to +20 mA)
 The analog input is configured as current input.
 - [3] current input unipolar monitored (4 mA to +20 mA)
 The analog input is configured as current input. In addition, wire-break monitoring is active (see further below).
 - [4] voltage input bipolar (-10 V to +10 V The analog input is configured as voltage input. The input range is +/-10 V.
 - [5] current input unipolar (-20 mA to +20 mA)
 The analog input is configured as current input. The input range is +/-20 mA.
- Select the offset value for the analog input. The offset value is added to the input signal before the scaling characteristic.

Configure scaling of the analog input

The scaling is used to adapt to the machine or to the existing components. For example, even when the complete input range of the voltage or the current is not utilized, the input value can still be scaled to 100 %.

Procedure

Proceed as follows to configure the scaling:

- 1. Click on "Scaling". The "Scaling TM31 analog input AI 0" dialog opens.
- 2. Enter the x and y values for 2 points of the scaling line:
 - $y_2 = upper scaling value as a percentage. y_2 = 100 \% for x_2 = 10 V means for example, that 10 V at the input corresponds to 100 % at the output.$
 - y1 = lower scaling value as a percentage. y1 = -100 % for x1 = -10 V means, for example, that -10 V at the input corresponds to -100 % at the output.
 - x1 = lower, input value to be scaled
 - x2 = upper, input value to be scaled
- 3. Click on "Close" to confirm the settings.

Define filter for the analog input (optional)

Analog values are always subject to noise and interference. This noise and interference can be suppressed using a filter.

The input signal can also be smoothed to suppress strong fluctuations or short-term peaks.

- 1. Enter the value for smoothing of the input signal in the "Smoothing" field. This value smooths the input signal using a PT1 filter. However, a smoothing value which is excessively high makes the input slow.
- 2. Enter the value for noise suppression in the "Noise suppression" field . This suppresses the input signal noise according to the following function:
 - |y-x| > noise suppression results in y = x
 The output value is set to the actual input value.
 - − $|y-x| \le noise suppression results in y = y_{old}$ The output value retains its value.

Configuring wire-break monitoring (optional)

Wire-break monitoring is used when the basic configuration "[3] Unipolar current input monitored (4 mA to +20 mA)" is set. In this case, the screen form is extended by 2 additional input fields.

- 1. Enter the wire-break monitoring response threshold in the "Threshold" field. If the threshold value is undershot for longer than the delay time, a wire break is detected.
- 2. Enter the delay time for wire-break monitoring in the field to the right of the "Threshold" field. If the wire-break monitoring response threshold is fallen below for longer than the delay time, then a wire break is detected.

Additional functions (optional)

Function	Description
Absolute-value generation	Activate the absolute-value generation in the screen form if the absolute value of the scaled input value is to be generated.
	The activated absolute-value generation is indicated by the ${old V}$ icon.
Inversion	The signal source for inverting the analog input signals can be interconnected via a BICO interconnection. As default setting, inversion is deactivated .
	If you want to make an inversion, interconnect the signal source in the "Inversion" field.
Activate	The signal source for enabling the analog input can be interconnected via a BICO interconnection.
	The enable is activated as default. If required, correct the signal source here.
Analog input 0	Here, interconnect the signal sink for the input value of the analog input. Several interconnections are possible.
Simulation mode	A simulation mode can be activated in the online mode.

6.7.2 Infeed unit

Overview

Infeed units (Line Modules) include the central line infeed for the DC link. Various infeed units are available to address various application scenarios.

Basic parameterization of the infeed unit

You define the following data in the basic parameterization of the infeed unit:

- Function modules
- Line supply data / Operating mode
- Enable logic
- Line contactor control

6.7.2.1 Function modules

Overview

When required, during the basic parameterization you can switch-in various function modules for the selected infeed unit.

Note

You can activate or deactivate function modules only offline.

Note

The display of the function modules that can be activated is dynamic and depends on the selected infeed and the configuration of this infeed.

The following table provides an overview of the function modules that can be used. In addition to the individual function modules, the table includes an explanations of how each function module can be used.

Function module	Explanation
Frequently used function modules	
Master/slave (r0108.19)	Redundant operation of several ALMs connected to one DC link.
External Braking Module (r0108.26)	Control of an external Braking Module in order to be able to absorb braking energy in the event of a power failure.
Additional function modules	
Free function blocks (r0108.18)	Activates the F blocks.
Supplementary closed-loop control (r0108.3)	For applications with asymmetrical line voltages: A negative sequence system current controller is used to balance the line currents and reduce the DC link ripple.
	For applications with resonance effects in the current or the filter volt- age (e.g. in line systems with low short-circuit power ratings). Freely parameterizable band-pass filters for resonance damping.
Dynamic grid support (r0108.7)	For power generation applications in power grids: Functions for grid support with fault ride-through and line monitoring (incl. active anti- islanding) according to the applicable grid codes.
Grid droop control (r0108.12)	Installation, synchronization and operation of island grids: Control of line frequency and line voltage in single operation or together with other generators.
Recorder (r0108.5)	Function to record hardware-related fault events
Line transformer (r0108.4)	For power generation applications: Magnetization of a transformer to limit the inrush current when the line system is connected. Compen- sation of direct current components and voltage drops at the trans- former in conjunction with dynamic grid support or grid droop control.
Supplementary cosinus phi module (r0108.10)	Precise cos(Phi) determination based on fundamental current and voltage components with BICO-interconnectable input variables (in contrast to power factor r0038).

Activating a function module

Proceed as follows to activate a function module:

- Click on the desired function module (e.g. Master/Slave). Repeat this step for all additional function modules that you wish to activate.
- 2. Save the project to back up the settings.

6.7.2.2 Line supply data / Operating mode

Overview

You set the most important parameters for the operation of an infeed in the function view of the "Line data / operating mode" screen form. The corresponding parameters are displayed depending on the infeed type.

Line data /	operating mode
	Drive unit line supply voltage 400 Vrms 3-p 50/60 Hz
	DC-link voltage setpoint default setting 600.00 V
	Supply/DC-link identification On 💌
0	If the power supply or the DC link of the drive line-up is subsequently changed (removal/adding of devices), then a network identification must be performed again.
	The determined values will be saved retentively.
4	For device supply voltages > 415 Vrms, the DC-link voltage control is deactivated automatically in order to reduce the voltage.
	This prevents damage to motors that are not suitable for high DC-link voltages.
	O Unregulated Udc (Smart Mode)
	Regulated Udc (Active Mode)

Figure 6-20 Example: line supply data/operating mode for an Active Line Module

The representation of this screen form is dependent upon the respective Line Module being used:

Setting	ALM	SLM	BLM	Explanation
Device supply voltage	х	х	х	-
DC-link voltage setpoint de- fault setting	х	х	-	The value in this field (p3510) is determined automati- cally from the defined operating voltage.
Supply/DC-link identification	х	х	-	If the line supply / DC-link identification has already been performed once, then the value is preset to "OFF".
Operating mode for ALM	х	-	-	Presetting of the operating mode is dependent upon the operating voltage of the ALM:
				> 415 V _{eff} = Udc Unregulated (Smart Mode) active
				\leq 415 V _{eff} = Udc Regulated (Active Mode) active

Setting the line data and operating mode

The parameters in this screen form are assigned default values when creating the device.

- 1. Enter a value for the device supply voltage in the "Device supply voltage" field (p0210).
- 2. To activate the line/DC link identification, in the drop-down list "Supply/DC link identification", select option "On".

Selecting the operating mode for ALM

The operating mode depends on the motor voltage.

Example: The DC-link voltage must be lower in the USA. For this reason, you can switch the mode of an Active Line Module in order to be able to use it as a Smart Line Module (Smart Mode). You can set the operating mode in this screen form for operating voltages greater than 415 $V_{\rm rms}$ (ALM).

- 1. Set one of the two operating modes:
 - "Udc Unregulated (Smart Mode)"

In Smart Mode, the regenerative capability is maintained, but this results in a lower DC-link voltage compared to Active Mode. The DC-link voltage depends on the current supply voltage.

- "Udc Regulated (Active Mode)" In Active Mode, the DC-link voltage is regulated to a settable setpoint (p3510) to produce a sinusoidal supply current (cos ϕ = 1). The size of the reactive current is also regulated and can be set specifically.

6.7.2.3 Enable logic

Overview

You can connect several signal sources for the enable signals in the function view of the "Enable logic" screen form.

Interconnecting signal sources for the enable signals

To interconnect the signal sources for the enable signals, proceed as follows:

- 1. Interconnect the signal source via "p0840" for "OFF1 (low active)".
- 2. Connect the 1st signal source via "p0844" for "Instantaneous OFF (OFF2) signal source 1".
- 3. Connect the 2nd signal source via "p0845" for "Instantaneous OFF (OFF2) signal source 2".
- 4. Interconnect the signal source via "p0852" for "Enable operation".

6.7.2.4 Line contactor control

Overview

This function allows an external line contactor to be controlled. The closing and opening of the line contactor can be monitored by evaluating the feedback contact of the line contactor.

The line contactor can be controlled with the following drive objects via r0863.1:

- For the infeed drive object
- For servo and vector drive objects

Parameterizing the switch-on delay and the monitoring time

This dialog shows the enable interconnection of the line contactor.

- 1. Enter in the "Power unit / switch-on delay" (p0862) field, the switch-on delay.
- Enter the monitoring time of the network contactor in the "Line contactor / monitoring time" field (p0861). The monitoring time starts with each switching operation of the line contractor (r0863.1).

If no feedback from the line contactor is detected within this time, a message is issued.

- 3. Connect the binector input for "Line contactor feedback" (p0860). Use for activated monitoring (BI: p0860 not equal r0863.1), the BO: r0863.1 signal of the dedicated drive object for controlling the line contactor.
- 4. Connect the binector output for "Control contactor (r0963.1)".

6.7.3 Drive axes (servo)

6.7.3.1 Basic parameterization of the drive axes

Overview

During the basic configuration, not all of the available options are displayed in the drop-down list "Basic parameterization". Options are either not displayed at all (e.g. mechanical options), or are shown grayed out. In this case, options that are grayed out are not available for parameterization.

Note

Dynamic display and selectability of options

The display and/or selectability of certain options is dynamic, and depends on the settings, which are carried out within an option other than the required option.

The following table provides an overview of the maximum number of options of the basic parameterization and lists the conditions under which individual options can be displayed and selected.

Option	"Basic parameterization" list			
	ls displayed	Selectable		
Function modules	Х	x		
Control mode	х	x		
Limits	х	x		
Sampling times/pulse frequency	х	х		
Actual value processing ¹⁾	х	-		
Rotor position synchronization ¹⁾	х	-		
Mechanical system ²⁾	-	-		
Enable logic	Х	X		

 Table 6-1
 Basic parameterization: selectable options

¹⁾ Can be selected if a servo motor with encoder was configured.

²⁾ Is displayed and is selectable if either the "Basic positioner" or the "Position control" function module was activated.

Requirements

• The servo drive axis is offline.

6.7.3.2 Function modules

Overview

When required, during the basic parameterization you can switch-in various function modules for the selected drive axis.

Requirement

• The drive axis is offline.

Note

You can activate or deactivate function modules only offline.

Function description

Note

The display of the function modules that can be activated is dynamic and depends on the selected drive axis and the configuration of this drive axis.

The following table provides an overview of the function modules that are available. In addition to the individual function modules, the table includes an explanations of how each function module can be used.

Function module	Explanation			
Frequently used function modules				
Extended setpoint channel (r0108.8)	Activates the "Setpoint channel" area with 7 configuration screen forms.			
Technology controller (r0108.16)	Activates the "Technology controller" area with 4 configuration screen forms.			
Basic positioner (r0108.4)	In the "Technology functions" area, activates the "Basic positioner" and "Positic control" functions. Supplements the "Basic parameterization" area to include th "Mechanical system" function.			
Extended messages/monitoring functions (r0108.17)	In the "Drive functions" area, supplements the "Messages and monitoring" func- tion to include the "Load torque monitoring" function.			
Extended brake control (r0108.14)	In the "Drive functions" area, adds the "Brake control" function.			
Additional function modules				
Free function blocks (r.0108.18)	Activates the F blocks.			
Moment of inertia estimator / OBT	Activates the moment of inertia estimator.			
Extended torque control (r0108.1)	In the "Technology functions" area, activates the "Extended torque control" func- tion			
Advanced Positioning Control (APC) (r0108.7)	In the "Technology functions" area, activates the "Active oscillation damping (APC)".			
Extended current setpoint filter (r0108.21)	In the "Open-loop/closed-loop control" area, extends the "Current setpoint filter to include an additional 6 filters.			
Recorder	Allows fault events to be recorded.			
Position control (r0108.3)	In the "Technology functions" area, activates the "Position controller" function. Also supplements the "Basic parameterization" area to include the "Mechanical system" function.			
DSC with spline (r0108.6)	In the "Open-loop/closed-loop control" area, extends the interconnection of the "Speed precontrol" function. Adds the "Dynamic Servo Control" secondary screen form.			
Extended stop and retract (r0108.9)	In the "Setpoint channel" area, activates the "Extended stop and retract" function.			
Cogging torque compensation (r0108.22)	In the parameter view, activates all parameters of the "Cogging torque compen- sation" parameter group. Cogging torque compensation can only be parameter- ized via the parameter view.			
	Notes:			
	• Use of this function module requires a license .			
	• The activation of this function module leads to a significant increase in the required computing time per drive axis.			
	• The operation of 6 servo axes on one Control Unit can no longer be guaran- teed in all constellations and should be reduced to 5 axes.			

Activating function modules

Proceed as follows to activate a function module:

 Click on the desired function module (e.g. technology controller). Repeat this step for all additional function modules that you wish to activate.

Note

When the "basic positioner" function module is activated, then the "position control" function module is automatically activated as well.

2. Save the project to back up the settings.

Parameters (see SINAMICS S120/S150 List Manual)

- p0108[0..n] Drive objects function module
- p0124[0...n] Main component detection using LED

6.7.3.3 Control mode

Overview

Closed-loop speed control (with and without encoder) and closed-loop torque control are available for servo drives.

Speed control

The speed control of a variable-speed drive has the task of following the speed according to a specified setpoint (reference variable) as precisely as possible and without overshoot.

Torque control

The torque control has the task of ensuring that the torque actual value tracks the torque setpoint as precisely as possible, i.e. without any delay and with low associated ripple. For this control mode, the torque is the command variable.

Requirements

• You have completely specified and configured the motor used in the device configuration of the drive axis.

Note

This basic parameterization cannot be performed without having completed this full configuration.

Selecting the control mode

To select a control mode, select one of the following control modes from the drop-down list (p1300):

- Speed control with encoder
- Speed control without encoder
- Torque control with encoder

If you selected a control mode with encoder, then the encoder is now shown in the device configuration.

6.7.3.4 Limits

Overview

You define the basic attributes of the drive control using the "Limits" function.

Parameter	Designation	Description
p1121	Ramp-down time	Ramp-down time which the drive requires to decelerate from maxi- mum speed (p1082) to standstill.
p1135	OFF3 ramp-down time	The OFF3 ramp-down time sets the ramp-down time from maximum speed down to standstill for the OFF3 command.

Requirements

• You have completely specified and configured the motor used in the device configuration of the drive axis.

Note

This basic parameterization cannot be performed without having completed this full configuration.

6.7.3.5 Drive settings

Overview

No entries are required on this page for motors with DRIVE-CLiQ interface or motors of the motor database.

Requirements

• You have completely specified and configured the motor used in the device configuration of the drive axis.

Note

This basic parameterization cannot be performed without having completed this full configuration.

Setting the calculation of the drive functions

To set the calculation of the drive functions, proceed as follows:

- 1. Select one of the following applications in the "Technology application" (p0500) drop-down list:
 - [100] Standard drive (servo)
 - [101] Feed drive (limit current limitation)
 - [102] Spindle drive (rated current limitation)
 - [103] Feed drive (maximum power limitation)
- 2. In the "Motor data identification stationary" (p1910) drop-down list, select how the motor data identification is to be performed for a stationary motor:
 - [-3] Accept identified parameters
 - [-2] Encoder inversion actual value (F07993)
 - [-1] Start motor data identification without acceptance
 - [0] Inactive/block
 - [1] Start motor data identification with acceptance

Setting the calculation of the controller data

To set the calculation of the controller data, proceed as follows:

- 1. Select one of the following options for the calculation of the controller data in the "Calculation controller data" (p3940) drop-down list:
 - [0] No calculation
 The motor data is not calculated. This is the default setting.
 - [1] Complete calculation
 The equivalent circuit diagram data is also calculated using the motor data.
 - [2] Calculation without equivalent circuit diagram data
 The equivalent circuit diagram data entered during the parameter assignment of the motor is not changed. The equivalent circuit diagram data is not calculated.
- 2. After the calculation type has been set (exception: "No calculation"), you can confirm the calculation if this has not been done already (red status icon). To do this, click the "Confirm calculation" button. The "Technology application" option is then disabled for the drive functions and the set application can no longer be changed. The disable can be cancelled via the "Enable" button. If you have canceled the disable, then you must subsequently reconfirm the calculation type.

6.7.3.6 Sampling times / pulse frequency

Overview

From a pulse frequency of 800 Hz and higher, we recommend that you enter the sampling times and the pulse frequency for the drive.

Note

You can only activate or deactivate the "Sampling times/pulse frequency" function when you are offline.

Setting the defaults

The sampling times are preset via parameter p0112. To make the presettings, proceed as follows:

- 1. Select one of the following defaults via the drop-down list (p0112):
 - [0] Expert
 - [1] xLow
 - [2] Low
 - [3] Standard
 - [4] High
 - [5] xHigh

The designation of the defaults refer to the desired output frequency and control dynamic response. If a particularly high output frequency or control dynamic response is required, "xHigh" would be the correct default. The selected default affects the following control loops:

- p0115[0]: Sampling times for internal control loops, current controller
- p0115[1]: Sampling times for internal control loops, speed controller
- p0115[2]: Sampling times for internal control loops, flux controller
- p0115[3]: Sampling times for internal control loops, setpoint channel
- p0115[4]: Sampling times for internal control loops, position controller
- p0115[5]: Sampling times for internal control loops, positioning
- p0115[6]: Sampling times for internal control loops, technology controller

The display of the parameter values set for p0115 changes depending on the default setting made.

Note

If the sampling times of the current controller and speed controller are changed (see also p0115), it is recommended that the controller settings are recalculated via p0340 = 4 after the commissioning (p0010 = 0).

Entering the sampling times manually

If you have set "Expert" in p0112, you can manually configure each of the following sampling times for the following control loops (p0115):

- p0115[0]: Sampling times for internal control loops, current controller
- p0115[1]: Sampling times for internal control loops, speed controller
- p0115[2]: Sampling times for internal control loops, flux controller
- p0115[3]: Sampling times for internal control loops, setpoint channel
- p0115[4]: Sampling times for internal control loops, position controller
- p0115[5]: Sampling times for internal control loops, positioning
- p0115[6]: Sampling times for internal control loops, technology controller

Note

You cannot set the values arbitrarily. The rules for setting the sampling times can be found in Chapter "System rules, sampling times and DRIVE-CLiQ wiring" of the SINAMICS S120 Function Manual Drive Functions.

Enter the sampling times for the internal control loops.

Setting the pulse frequency

Set the pulse frequency via p1800.

6.7.3.7 Actual value processing

Overview

The actual value processing is used to determine the cyclic and absolute actual values of the encoder, and to transfer the encoder position from the drive to an open-loop control/position control.

Preparing actual values

To transfer the encoder position from the drive to an open-loop control / position control, the "Cyclical actual value" = Gn_XIST1 and "Absolute actual value" = Gn_XIST2 (n = 1 or 2, number of the encoder) data is used in a telegram. The values can be set only for absolute encoders.

- The incremental position change of the encoder is transferred to the controller in the "Cyclical actual value" Gn_XIST_1. The drive evaluates only the counting pulses of the encoder, which it then uses to form the "Cyclical actual value".
- The cyclical values of the encoder requested by the controller prior to the transfer are not transferred in the "Absolute actual value" = Gn_XIST2.

Gn_XIST_1 and Gn_XIST_2 contain the following information:

- Encoder pulse count (Gn_XIST_1)
- Fine resolution (Gn_XIST_1)
- Multiturn information (Gn_XIST_2)

Fine resolution p0419 (XIST_1)

Encoders with their sampling mechanism provide significantly more precise information than that determined with the pulse counts. They can be evaluated by the drive unit and transferred as fine resolution to the controller. Change the fine resolution, for example, when increased precision is required for machining a workpiece.

Fine resolution for incremental encoders

For incremental encoders, the analog signals of the C and D tracks are evaluated. A position value is determined uniquely via the two analog voltage values in all four quadrants of a revolution. The analog voltage values allow a high fine resolution, e.g. 11 bits = 2048. Together with a resolution of 11-bit (= 2048) encoder pulses per revolution this gives a 22-bit resolution.



Figure 6-21 Incremental encoders

Fine resolution for TTL/HTL encoders

TTL/HTL pulse encoders operate with digital signals whose fine resolution is less-precise than that for incremental encoders. The digital signals permit only a fine resolution of 2 bits = 4, because only the signal edges can be counted here.



Multiturn resolution XIST_2 (p0421)

For multiturn encoders, the number of resolvable revolutions is displayed and set via the resolution. With the number of revolutions, you also specify the measuring range (for example, the travel path for a spindle). Typical values are, for example, 9 bits = 512 revolutions or 12 bits = 4096 revolutions.

The value of p0421 acts on p0483 (actual position value) and is required once only when the encoder position (absolute position) is read at start-up.

Relationship between multiturn resolution and fine resolution

The encoder actual values transferred from the drive to the controller are limited to 32 bits. If, for example, a standard multiturn encoder with a multiturn resolution of 12 bits (4096) and an encoder resolution of 11 bits (2048) is used, the encoder actual value is reduced to only 32-12-11=9 bits (512) for transferring the fine resolution.

If a higher fine resolution needs to be transferred in the encoder actual value, the multiturn resolution of the encoder actual value must be reduced, which although it increases the precision of the encoder, it also decreases the absolute measuring range of the encoder.

- 1. Enter here the fine resolution of the encoder used in bits. The pre-setting is 11 bits and is sufficient for all Siemens motor encoders.
- 2. The multiturn resolution is set to 9 bits for all Siemens motor encoders and does not need to be adjusted.

Should you nevertheless need a higher fine resolution, it is important to note that, in the case of incremental encoders, the position values of the multiturn resolution still lie within one of the quadrants (see graphic above). The following graphic shows the interaction between multiturn information and fine resolution. Increasing the fine resolution moves the value of the multiturn information to the left.





It is important that the multiturn information is still sufficient to record all revolutions which are important for determining the position at start-up. If all values lie outside the quadrants, uncontrolled movements of the axis can occur.

Parameterizing actual value processing

To parameterize the actual value processing, proceed as follows.

Requirements

• The motor used in the device configuration of the drive axis is completely specified and configured.

Note

This basic parameterization cannot be performed without having completed this full configuration.

Extrapolating position values

This parameter is displayed only for pure SSI encoders, namely, for encoders without HTL/TTL or SIN/COS tracks. Because, compared with the speed controller cycle of the SINAMICS, the serial transfer is relatively slow, the data can already be obsolete on arrival at the Sensor Module. If the data transfer is not fast enough, you may need to switch to encoders with a faster data transmission rate.

- 1. Activate "Extrapolate position values" in order to extrapolate the SSI data for the next speed controller cycle.
 - Advantage: The dead time between two speed controller cycles reduces and the closedloop controller becomes more dynamic.
 - Disadvantage: For fluctuating speeds, the extrapolated value accuracy can vary.
- 2. Evaluate the advantages and disadvantages carefully.
- 3. Also check the deployed baud rate. A higher baud rate may allow a sufficiently fast data transmission.

Inverting values

As the mounting direction of the encoder (at the right- or left-hand side) cannot be defined, but depends on the specific motor being used (linear motor, torque motor, etc.), where appropriate, invert the position and the speed in order to reverse the direction.

- 1. Select the "Actual speed value inverted" option (p0410.0)
- 2. Select the "Actual position value inverted" option (p0410.1)

Parameterizing the measuring gearbox position tracking

Position tracking enables the load position to be reproduced when using gearboxes. It can also be used to extend the position range.

- 1. Activate the position tracking for measuring gearboxes.
- 2. Select whether the position tracking should be made for a rotary axis or linear axis (p0411). A rotary axis is considered to be a modulo axis (modulo correction can be activated by a higher-level controller or EPOS). For a linear axis, the position tracking is used principally to extend the position range (see Section "Virtual multiturn resolution" below).

Virtual multiturn resolution

With a rotary absolute encoder (p0404.1 = 1) with activated position tracking (p0411.0 = 1), the virtual multiturn resolution (p0412) can be used to enter a virtual multiturn resolution. This makes it possible to generate a virtual multiturn encoder (r0483) from a singleturn encoder. The virtual encoder range must be able to be represented via r0483.

When no measuring gearboxes (n = 1) are present, the value in p0421 replaces the actual number of stored revolutions of a rotary absolute encoder. Increasing this value extends the position range (see linear axis). When measuring gearboxes are present, this value sets the resolvable motor revolutions represented in r0483.

Tolerance window

After switch on, the difference between the stored position and the current position is determined and initiated depending on the following:

- Difference within the tolerance window: The position is reproduced based on the current encoder actual value.
- Difference outside the tolerance window: Message F07449 is issued.
- The tolerance window is preassigned to the encoder range quadrant, although it can be changed.

6.7.3.8 Rotor position synchronization

Overview

For synchronous motors, the pole position identification (PolID) determines the electrical pole position that is required for the field-oriented control. Normally, the electrical pole position is provided with absolute information by a mechanically adjusted encoder.

Note

The content of the "Rotor position synchronization" screen form depends on the encoder used.

A PolID is not required for the following encoder properties:

- Absolute encoder (e.g. EnDat, DRIVE-CLiQ encoder)
- Encoder with C/D track and number of pole pairs ≤ 8
- Hall sensor
- Resolver with integer ratio from the number of motor pole pairs to the number of encoder pole pairs
- Incremental encoder with an integer ratio from the number of motor pole pairs to the number of encoder pulses

Note

Using the Function Manual

Please also refer to the description of the pole position identification provided in the "SINAMICS S120 Function Manual Drive Functions". The supplementary conditions for using the individual techniques are also described in the appropriate chapter.

Determining the suitable technique for the pole position identification

🔨 warning

Danger to life caused by the movement of the motor when measuring unbraked motors

When carrying out the measurement for motors that are not braked, the current that flows can cause the motor to move, which in turn can lead to death or severe injuries.

• Ensure that nobody is present in the hazardous zone and that the mechanical system can move freely.

	Saturation-based Motion-based		Elasticity-based	
Brake available	Possible	Not possible	Required	
Motor can move freely	Possible	Required	Not possible	
Motor has no iron	Not possible	Possible	Possible	

Parameterizing the pole position identification

The pole position identification (PolID) differs depending on the motor type:

- For Siemens motors
- For motors that are not listed in the motor selection.

Requirements

• You have completely specified and configured the motor used in the device configuration of the drive axis.

Note

This basic parameterization cannot be performed without having completed this full configuration.

Procedure for Siemens motors

When using standard Siemens motors use the automatic default setting for the PolID.

Procedure for motors that are not listed in the motor selection

For these motors, you must parameterize the pole position identification yourself.

- 1. Select a suitable technique for the motor used in the "Technique" (p1980) drop-down list.
 - [0] Saturation-based 1st + 2nd harmonics
 - The saturation-based pole position identification is the preferred technique if it is not possible that the motor moves.

The saturation-based PolID technique only functions for motors with an iron core. As a result of the iron saturation, depending on the rotor position, the motor inductance changes in various space-vector directions.

Danger to life due to uncontrolled motor movement

During the saturation-based pole position identification, if a motor is not braked, it can move in an uncontrolled fashion, which can result in death or serious injury.

- Ensure that nobody is present in the hazardous zone and that the mechanical system can move freely.
- Ensure that this technique is only performed by appropriately trained and experienced technical experts.

Note

Contact the Siemens service organization if you are **not** familiar and trained in using this technique.

- [1] Saturation-based 1st harmonic
- [4] Saturation-based 2-stage
- [10] Motion-based

The motion-based PolID technique is the preferred technique if the motor can move. The motor traverses left and right along a defined path. If both paths are identical, the pole position identification (PolID) was successful.

- [20] Elasticity-based
- [99] No technique selected
- 2. Select the "Pole position identification" option to activate the technique.

Synchronization failed

Why was synchronization not successful?

- The motor provides insufficient or no torque.
- The motor becomes hot too fast.

Fine synchronization

The pole position identification (PolID) technique provides coarse synchronization. If zero marks are present, after traversing the zero mark(s), the pole position is calibrated automatically with the zero mark position (fine synchronization). The zero mark position must be calibrated mechanically or electrically (p0431).

If the encoder system facilitates calibration of the zero mark position, then fine synchronization is recommended (p0404.15 = 1). In this case, fine synchronization avoids measurement scatter and also facilitates an additional check of the determined pole position.

Suitable zero marks are:

- A zero mark in the complete traversing range
- Equidistant zero marks
- Distance-coded zero marks

6.7.3.9 Mechanical system

Overview

In the "Mechanical system" screen form, check the settings of the position control and adjust them if necessary. Depending on the encoder type selected for position control and the motor encoder, various configurations are displayed for the mechanical system.

The "Position tracking" option allows the load position to be reproduced when using gearboxes. This option can also be used to extend the position range. The position tracking of the load gear however, is only relevant for a motor encoder (encoder 1).

Parameterizing encoder selection for position control

An encoder is assigned to the position control during commissioning. This encoder setting is shown in a drop-down list at the top right in the "Mechanical system" screen form. You can change the encoder assignment in this screen form before parameterizing the position control. The following options are available:

- 1. Select the required encoder in the "Encoder system" (p2502) drop-down list.
 - No encoder
 - Encoder 1
 - Encoder 2
 - Encoder 3
- 2. Enter the motor revolutions for the gear ratio between the motor shaft and load shaft in the "Number of motor revolutions" (p2504) field.
- 3. Enter the load revolutions for the gear ratio between the motor shaft and load shaft in the "Number of load revolutions" (p2505) field.
- 4. Enter the neutral length unit LU per load revolution in the "LU per load revolution" (p2506) field.
- 5. Interconnect the "Modulo correction activation" (p2577) signal source for the activation of the modulo correction.
- 6. Correct the default value for axes with modulo correction in the "Modulo correction modulo range" (p2576) field.

Parameterizing the load gearbox position tracking

If you have parameterized encoder 1 for the position control, you can set the position tracking as follows:

- 1. Activate the "Activate load gearbox position tracking" (p2729.0) option.
- 2. Activate the desired axis type (p2720.1). By default, the "Rotary axis" axis type is active.
- 3. If required, correct the number of resolvable revolutions for a rotary absolute encoder in the "Virtual revolutions" (p2721) field.
- 4. If required, correct the value for the tolerance window for the position tracking in the "Position tracking tolerance window" (p2722) field. The value is specified in whole encoder pulses.

Examples of LU configurations

The unit LU is a free dimension, independent of SI units, for the position control of an EPOS axis.

The LU per load revolution upper limit is limited by the encoder resolution (rXXXX). A value above this limit can be selected, but then not all set positions can be approached because they may be between two encoder lines. This could result in an unsmooth axis.

The LU per load revolution should be selected as high as possible. In this way, a better dynamic response can be achieved. If the values for p2506 are too low, this can result in jumps when speed precontrol is activated.

For good repeat accuracy, the LU per load resolution should be selected in the ratio of 1:10 to the encoder resolution, if the encoder supports this resolution at the required dynamic response.

Example 1: Linear axis - spindle (encoder on the motor side)

Leadscrew pitch = 10 mm

Gear ratio i = 1 (p2505 / p2504)

Target variable to be controlled: mm

Encoder resolution = 15,000 LU

10 mm distance are travelled per load revolution. According to the encoder resolution, maximum 15,000 LU/10 mm = 1,500 LU/mm can be defined. We will select 1,000 LU per mm (1 LU = 1 μ m). 10 mm per revolution results in 10,000 per revolution:

• p2506 = 10,000 LU per load revolution

Example 2: Rotary axis (encoder on the motor side)

Gear ratio i = 44.5

- p2504 = 445 motor revolutions
- p2505 = 10 load revolutions

Target variable to be controlled: $^{\circ}$ (degrees)

Encoder resolution = 364,544 LU

360° are travelled per load revolution. According to the encoder resolution, maximum 364,544 LU/360° = 1012 LU/° can be defined. We will select 100 LU per ° (1 LU = 0.01°). 360° per revolution results in 36,000 LU per load revolution.

• p2506 = 36,000 LU per load revolution

Example 3: Modulo axis - chain drive

The chain has 250 chain links and a chain link is 0.0338667344 m long. The output wheel has 40 teeth, i.e. 40 chain links are moved per revolution. The target positions are at a distance of 25 chain links to one another.

Gear ratio i = 114.28 (rounded off)

Ratio of the number of teeth of the gearbox = 106,967/936

- p2504 = 106,967 motor revolutions
- p2505 = 936 load revolutions

Encoder resolution = 468,095 LU

The encoder resolution is too low here to convert the chain links to a linear SI unit without rounding-off errors having an effect on the modulo correction. A chain link must therefore be taken as target variable.

Target variable to be controlled: 1 chain link

40 chain links travelled per load revolution. According to the encoder resolution, maximum 468,095 LU / 40 chain links = 11,702 LU / chain link can be selected. We will therefore select 1,000 LU per chain link (1 LU = 33.8667344 μ m). 40 chain links per revolution results in:

- p2506 = 40,000 LU per load revolution
- p2576 = 250,000 LU modulo range

6.7.3.10 Enable logic

Overview

If, when commissioning, you interconnected telegrams, then these interconnections are displayed in the "Enable logic" screen form. Further specification is not required.

If, when commissioning, you did not specify any telegram types, then you must interconnect the required signal sources in the "Enable logic" screen form.

Interconnecting signal sources

To interconnect a signal sources, proceed as follows:

- 1. Connect the signal source for the "Infeed operation" (p0864) command.
- 2. Interconnect the signal source for command "OFF1 (low active)" (p0840). This command corresponds to control word 1 bit 1 (STW1.1) in the PROFIdrive profile.
- 3. Connect the 1st signal source for the "OFF2 (low active) signal source 1" command (p0844). This command corresponds to control word 1 bit 1 (STW1.1) in the PROFIdrive profile.

- 4. Connect the 2nd signal source for the "OFF2 (low active) signal source 2" command (p0845).
- 5. Connect the 1st signal source for the "OFF3 (low active) signal source 1" command (p0848). This command corresponds to control word 1 bit 2 (STW1.2) in the PROFIdrive profile.
- 6. Connect the 2nd signal source for the "OFF3 (low active) signal source 2" command (p0849). This command corresponds to control word 1 bit 2 (STW1.2) in the PROFIdrive profile.
- 7. Interconnect the signal source for the "Enable operation" command (p0852). This command corresponds to control word 1 bit 3 (STW1.3) in the PROFIdrive profile.

6.7.4 Drive axes (vector)

6.7.4.1 Basic parameterization of the drive axes

Overview

During the basic configuration, not all of the available options are displayed in the drop-down list "Basic parameterization".

Note

Dynamic display of options

The display of certain options is dynamic, and depends on the settings, which are carried out within another option other than the required option. In the "Basic parameterization" list, the "Mechanical system" option is only displayed if the "Basic positioner" function module was activated beforehand.

Requirements

• The vector drive axis is offline.

6.7.4.2 Function modules

Overview

When required, during the basic parameterization you can switch-in various function modules for the selected drive axis.

Requirement

• The drive axis is offline.

Note

The basic parameterization for the selected drive axis can only be carried out offline.

Function description

Note

The display of the function modules that can be activated is dynamic and depends on the selected drive axis and the configuration of this drive axis.

The following table provides an overview of the function modules that can be used. In addition to the individual function modules, the table includes an explanations of how each function module can be used.

Function module	Explanation	S120 Vector	S150	G150	G130		
Frequently used function modules							
Extended messages/monitoring functions (r0108.17)	In the "Drive functions" area, supplements the "Mes- sages and monitoring" function to include the "Load torque monitoring" function.	X	Х	Х	Х		
Technology controller (r0108.16)	Activates the "Technology controller" area with 4 configuration screen forms.	Х	Х	Х	Х		
Speed/torque control (r0108.2)	In the "Drive functions" area, supplements the "Fric- tion characteristic" function to include 2 configura- tion screen forms.	X	Х	Х	Х		
	In the "Open-loop/closed-loop control" area, supple- ments the configuration screen forms to include the following functions.						
	Speed setpoint filter						
	Speed controller						
	Torque setpoints						
	Current setpoint filter						
	Flux setpoint						
	Current controller						
	 Motor encoder Note: The "Motor encoder" configuration screen form is only displayed if the motor was configured with an encoder. 						
	As default setting, the function module is activated.						
Extended brake control (r0108.14)	In the "Drive functions" area, adds the "Brake con- trol" function.	X	Х	Х	Х		
Basic positioner (r0108.4)	In the "Technology functions" area, activates the "Basic positioner" and "Position control" functions. Supplements the "Basic parameterization" area to include the "Mechanical system" function.	Х	Х	-	-		
Additional function modules	1						
Free function blocks (r0108.18)	Activates the F blocks.	Х	-	-	-		
Recorder (r0108.5)	Allows fault events to be recorded.	X	Х	Х	Х		

Function module	Explanation	S120 Vector	S150	G150	G130
Moment of inertia estimator (r0108.10)	In the "Open-loop/closed-loop control" area, adds the "Speed setpoint filter" function. The moment of inertia estimator can now be activated in the "Pre- control" subdialog. The dialog is extended by addi- tional parameters for the moment of inertia estima- tor.	X	×	×	X
Position control (r0108.3)	In the "Technology functions" area, activates the "Position controller" function. Also supplements the "Basic parameterization" area to include the "Me- chanical system" function.	X	Х	_	-

Activating a function module

Proceed as follows to activate a function module:

1. Click on the desired function module (e.g. technology controller). Repeat this step for all additional function modules that you wish to activate.

Note

When the "basic positioner" function module is activated, then the "position control" function module is automatically activated as well.

2. Save the project to back up the settings.

6.7.4.3 Control mode

Overview

The following control modes are available for vector drives:

- U/f control with linear characteristic
- U/f control with linear characteristic and FCC
- U/f control with parabolic characteristic
- U/f control with parameterizable characteristic
- U/f control with linear characteristic and ECO
- U/f control for drive requiring a precise frequency (e.g. textiles)
- U/f control for drive requiring a precise frequency and FCC
- U/f control with parabolic characteristic and ECO
- Operation with braking resistor
- I/f control with fixed current
- U/f control with independent voltage setpoint
- Speed control (without encoder)
- Speed control (with encoder)

- Torque control (without encoder)
- Torque control (with encoder)

Requirements

• The motor used in the device configuration of the drive axis is completely specified and configured.

Note

This basic parameterization cannot be performed without having completed this full configuration.

Selecting the control mode

Select one of the control modes listed above (p1300).

The screen form is structured according to the selected control mode.

Note

If a "U/f control xxx" version is selected as the control mode, other setting screen forms in the secondary navigation of the drive axis, such as current controller or current setpoint filter, are automatically hidden.

6.7.4.4 Limits

Overview

You define the basic attributes of the drive control using the "Limits" function.

Num- ber	Designation	Description	
p0640	Current limit	Determines the limit value of the motor overload current.	
p1080	Minimum speed	Sets the lowest possible speed / velocity. This value is not fallen below in operation.	
p1082	Maximum speed	Sets the highest possible speed / velocity. The value is calculated during the commissioning phase in accordance with the motor and drive unit and can only be equal to or less than the value in p0322 (maximum motor speed).	
p1120	Ramp-up time	Ramp-up/ramp-down time always refers to the time interval from motor standstill to the set	
p1121	Ramp-down time	maximum speed (without using roundings).	
p1135	OFF3 ramp-down time	The OFF3 ramp-down time is effective from the maximum speed down to the motor standstill.	

Commissioning

6.7 Performing basic parameterization

Requirements

• The motor used in the device configuration of the drive axis is completely specified and configured.

Note

This basic parameterization cannot be performed without having completed this full configuration.

6.7.4.5 Optimization runs

Overview

Using the "Optimization run" function, you can calculate motor and controller data for motors in the motor list as well as for non-listed motors.

Requirements

• You have completely specified and configured the motor used in the device configuration of the drive axis.

Note

Specifying third-party (non-listed) motors

When third-party motors are specified, the motor data must be manually entered (see Chapter "Inserting and specifying motors that are missing from the motor list (Page 103)").

Note

This basic parameterization cannot be performed without having completed this full configuration.

Setting the technological application and selection of the motor data identification

- 1. Select one of the following applications in the "Technology application" (p0500) drop-down list:
 - [0] Standard drive (vector)
 - [1] Pumps and fans
 - [2] Encoderless control down to f = 0 (passive loads)
 - [3] Dynamic response in the field-weakening range
 - [4] Approach with high breakaway torque
 - [5] High load inertia
- 2. In the drop-down list "Motor data identification and rotating measurement" (p1900), select how the motor data identification is to be carried out for a stopped motor:
 - [0] Disabled
 - [1] Motor data ident. (standstill) and speed controller opt.
 - [2] Motor data identification (standstill)

Technology application	[0] Standard drive (VECTOR)	
Motor data identification and rotating measurement	[2] Identify motor data (stationary)	
A motor data identification is performed once when the The motor is under current and may align itself up to a g	drive is enabled.	

Motors from the motor list

For motors with DRIVE-CLiQ interface or motors from the motor list (see Chapter "Inserting and specifying motors from the motor list (Page 102)"), no additional entries are required when automatically calculating the motor/controller parameters.

Third-party motors

Motor and controller parameters must first be calculated for third-party motors and motors that are not in the motor list.

Procedure

Proceed as follows to finalize calculating motor and controller parameters:

1. In the "Controller data calculation" field, click on "Finish drive parameterization".

The parame			
8	etenzation of the drive sho	ould be completed via the calculation of the motor and controller pa	rameters.
		Finish drive parameterization	

The automatic calculation of motor and controller parameters is completed and the following message displayed.



6.7.4.6 Actual value processing

Overview

The actual value processing is used to determine the cyclic and absolute actual values of the encoder, and to transfer the encoder position from the drive to an open-loop control/position control.

Preparing actual values

To transfer the encoder position from the drive to an open-loop control / position control, the "Cyclical actual value" = Gn_XIST1 and "Absolute actual value" = Gn_XIST2 (n = 1 or 2, number of the encoder) data is used in a telegram. The values can be set only for absolute encoders.

- The incremental position change of the encoder is transferred to the controller in the "Cyclical actual value" Gn_XIST_1. The drive evaluates only the counting pulses of the encoder, which it then uses to form the "Cyclical actual value".
- The cyclical values of the encoder requested by the controller prior to the transfer are not transferred in the "Absolute actual value" = Gn_XIST2.

Gn_XIST_1 and Gn_XIST_2 contain the following information:

- Encoder pulse count (Gn_XIST_1)
- Fine resolution (Gn_XIST_1)
- Multiturn information (Gn_XIST_2)

Fine resolution p0419 (XIST_1)

Encoders with their sampling mechanism provide significantly more precise information than that determined with the pulse counts. They can be evaluated by the drive unit and transferred as fine resolution to the controller. Change the fine resolution, for example, when increased precision is required for machining a workpiece.

Fine resolution for incremental encoders

For incremental encoders, the analog signals of the C and D tracks are evaluated. A position value is determined uniquely via the two analog voltage values in all four quadrants of a revolution. The analog voltage values allow a high fine resolution, e.g. 11 bits = 2048. Together with a resolution of 11-bit (= 2048) encoder pulses per revolution this gives a 22-bit resolution.



Figure 6-24 Incremental encoders

Fine resolution for TTL/HTL encoders

TTL/HTL pulse encoders operate with digital signals whose fine resolution is less-precise than that for incremental encoders. The digital signals permit only a fine resolution of 2 bits = 4, because only the signal edges can be counted here.



Figure 6-25 TTL/HTL encoders

Multiturn resolution XIST_2 (p0421)

For multiturn encoders, the number of resolvable revolutions is displayed and set via the resolution. With the number of revolutions, you also specify the measuring range (for example, the travel path for a spindle). Typical values are, for example, 9 bits = 512 revolutions or 12 bits = 4096 revolutions.

The value of p0421 acts on p0483 (actual position value) and is required once only when the encoder position (absolute position) is read at start-up.

Relationship between multiturn resolution and fine resolution

The encoder actual values transferred from the drive to the controller are limited to 32 bits. If, for example, a standard multiturn encoder with a multiturn resolution of 12 bits (4096) and an encoder resolution of 11 bits (2048) is used, the encoder actual value is reduced to only 32-12-11=9 bits (512) for transferring the fine resolution.

If a higher fine resolution needs to be transferred in the encoder actual value, the multiturn resolution of the encoder actual value must be reduced, which although it increases the precision of the encoder, it also decreases the absolute measuring range of the encoder.

- 1. Enter here the fine resolution of the encoder used in bits. The pre-setting is 11 bits and is sufficient for all Siemens motor encoders.
- 2. The multiturn resolution is set to 9 bits for all Siemens motor encoders and does not need to be adjusted.

Should you nevertheless need a higher fine resolution, it is important to note that, in the case of incremental encoders, the position values of the multiturn resolution still lie within one of the quadrants (see graphic above). The following graphic shows the interaction between multiturn information and fine resolution. Increasing the fine resolution moves the value of the multiturn information to the left.



Figure 6-26 Encoder actual values X_IST1

It is important that the multiturn information is still sufficient to record all revolutions which are important for determining the position at start-up. If all values lie outside the quadrants, uncontrolled movements of the axis can occur.

Parameterizing actual value processing

To parameterize the actual value processing, proceed as follows.
Requirements

• The motor used in the device configuration of the drive axis is completely specified and configured.

Note

This basic parameterization cannot be performed without having completed this full configuration.

Extrapolating position values

This parameter is displayed only for pure SSI encoders, namely, for encoders without HTL/TTL or SIN/COS tracks. Because, compared with the speed controller cycle of the SINAMICS, the serial transfer is relatively slow, the data can already be obsolete on arrival at the Sensor Module. If the data transfer is not fast enough, you may need to switch to encoders with a faster data transmission rate.

- 1. Activate "Extrapolate position values" in order to extrapolate the SSI data for the next speed controller cycle.
 - Advantage: The dead time between two speed controller cycles reduces and the closedloop controller becomes more dynamic.
 - Disadvantage: For fluctuating speeds, the extrapolated value accuracy can vary.
- 2. Evaluate the advantages and disadvantages carefully.
- 3. Also check the deployed baud rate. A higher baud rate may allow a sufficiently fast data transmission.

Inverting values

As the mounting direction of the encoder (at the right- or left-hand side) cannot be defined, but depends on the specific motor being used (linear motor, torque motor, etc.), where appropriate, invert the position and the speed in order to reverse the direction.

- 1. Select the "Actual speed value inverted" option (p0410.0)
- 2. Select the "Actual position value inverted" option (p0410.1)

Parameterizing the measuring gearbox position tracking

Position tracking enables the load position to be reproduced when using gearboxes. It can also be used to extend the position range.

- 1. Activate the position tracking for measuring gearboxes.
- 2. Select whether the position tracking should be made for a rotary axis or linear axis (p0411). A rotary axis is considered to be a modulo axis (modulo correction can be activated by a higher-level controller or EPOS). For a linear axis, the position tracking is used principally to extend the position range (see Section "Virtual multiturn resolution" below).

Virtual multiturn resolution

With a rotary absolute encoder (p0404.1 = 1) with activated position tracking (p0411.0 = 1), the virtual multiturn resolution (p0412) can be used to enter a virtual multiturn resolution. This

Commissioning

6.7 Performing basic parameterization

makes it possible to generate a virtual multiturn encoder (r0483) from a singleturn encoder. The virtual encoder range must be able to be represented via r0483.

When no measuring gearboxes (n = 1) are present, the value in p0421 replaces the actual number of stored revolutions of a rotary absolute encoder. Increasing this value extends the position range (see linear axis). When measuring gearboxes are present, this value sets the resolvable motor revolutions represented in r0483.

Tolerance window

After switch on, the difference between the stored position and the current position is determined and initiated depending on the following:

- Difference within the tolerance window: The position is reproduced based on the current encoder actual value.
- Difference outside the tolerance window: Message F07449 is issued.
- The tolerance window is preassigned to the encoder range quadrant, although it can be changed.

6.7.4.7 Mechanical system

Overview

In the "Mechanical system" screen form, check the settings of the position control and adjust them if necessary. Depending on the encoder type selected for position control and the motor encoder, various configurations are displayed for the mechanical system.

The "Position tracking" option allows the load position to be reproduced when using gearboxes. This option can also be used to extend the position range. The position tracking of the load gear however, is only relevant for a motor encoder (encoder 1).

Parameterizing encoder selection for position control

An encoder is assigned to the position control during commissioning. This encoder setting is shown in a drop-down list at the top right in the "Mechanical system" screen form. You can change the encoder assignment in this screen form before parameterizing the position control. The following options are available:

- 1. Select the required encoder in the "Encoder system" (p2502) drop-down list.
 - No encoder
 - Encoder 1
 - Encoder 2
 - Encoder 3
- 2. Enter the motor revolutions for the gear ratio between the motor shaft and load shaft in the "Number of motor revolutions" (p2504) field.
- 3. Enter the load revolutions for the gear ratio between the motor shaft and load shaft in the "Number of load revolutions" (p2505) field.

- 4. Enter the neutral length unit LU per load revolution in the "LU per load revolution" (p2506) field.
- 5. Interconnect the "Modulo correction activation" (p2577) signal source for the activation of the modulo correction.
- 6. Correct the default value for axes with modulo correction in the "Modulo correction modulo range" (p2576) field.

Parameterizing the load gearbox position tracking

If you have parameterized encoder 1 for the position control, you can set the position tracking as follows:

- 1. Activate the "Activate load gearbox position tracking" (p2729.0) option.
- Activate the desired axis type (p2720.1).
 By default, the "Rotary axis" axis type is active.
- 3. If required, correct the number of resolvable revolutions for a rotary absolute encoder in the "Virtual revolutions" (p2721) field.
- 4. If required, correct the value for the tolerance window for the position tracking in the "Position tracking tolerance window" (p2722) field. The value is specified in whole encoder pulses.

Examples of LU configurations

The unit LU is a free dimension, independent of SI units, for the position control of an EPOS axis.

The LU per load revolution upper limit is limited by the encoder resolution (rXXXX). A value above this limit can be selected, but then not all set positions can be approached because they may be between two encoder lines. This could result in an unsmooth axis.

The LU per load revolution should be selected as high as possible. In this way, a better dynamic response can be achieved. If the values for p2506 are too low, this can result in jumps when speed precontrol is activated.

For good repeat accuracy, the LU per load resolution should be selected in the ratio of 1:10 to the encoder resolution, if the encoder supports this resolution at the required dynamic response.

Example 1: Linear axis - spindle (encoder on the motor side)

Leadscrew pitch = 10 mm

Gear ratio i = 1 (p2505 / p2504)

Target variable to be controlled: mm

Encoder resolution = 15,000 LU

10 mm distance are travelled per load revolution. According to the encoder resolution, maximum 15,000 LU/10 mm = 1,500 LU/mm can be defined. We will select 1,000 LU per mm (1 LU = 1 μ m). 10 mm per revolution results in 10,000 per revolution:

• p2506 = 10,000 LU per load revolution

6.7 Performing basic parameterization

Example 2: Rotary axis (encoder on the motor side)

Gear ratio i = 44.5

- p2504 = 445 motor revolutions
- p2505 = 10 load revolutions

Target variable to be controlled: ° (degrees)

Encoder resolution = 364,544 LU

360° are travelled per load revolution. According to the encoder resolution, maximum 364,544 LU/360° = 1012 LU/° can be defined. We will select 100 LU per ° (1 LU = 0.01°). 360° per revolution results in 36,000 LU per load revolution.

• p2506 = 36,000 LU per load revolution

Example 3: Modulo axis - chain drive

The chain has 250 chain links and a chain link is 0.0338667344 m long. The output wheel has 40 teeth, i.e. 40 chain links are moved per revolution. The target positions are at a distance of 25 chain links to one another.

Gear ratio i = 114.28 (rounded off)

Ratio of the number of teeth of the gearbox = 106,967/936

- p2504 = 106,967 motor revolutions
- p2505 = 936 load revolutions

Encoder resolution = 468,095 LU

The encoder resolution is too low here to convert the chain links to a linear SI unit without rounding-off errors having an effect on the modulo correction. A chain link must therefore be taken as target variable.

Target variable to be controlled: 1 chain link

40 chain links travelled per load revolution. According to the encoder resolution, maximum 468,095 LU / 40 chain links = 11,702 LU / chain link can be selected. We will therefore select 1,000 LU per chain link (1 LU = 33.8667344 μ m). 40 chain links per revolution results in:

- p2506 = 40,000 LU per load revolution
- p2576 = 250,000 LU modulo range

6.7.4.8 Enable logic

Overview

If, when commissioning, you interconnected telegrams, then these interconnections are displayed in the "Enable logic" screen form. Further specification is not required.

If, when commissioning, you did not specify any telegram types, then you must interconnect the required signal sources in the "Enable logic" screen form.

Interconnecting signal sources

To interconnect a signal sources, proceed as follows:

- 1. Connect the signal source for the "Infeed operation" (p0864) command.
- 2. Connect the signal source for the "OFF1 (low active)" command (p0840). This command corresponds to control word 1 bit 1 (STW1.1) in the PROFIdrive profile.
- 3. Connect the 1st signal source for the "OFF2 (low active) signal source 1" command (p0844). This command corresponds to control word 1 bit 1 (STW1.1) in the PROFIdrive profile.
- 4. Connect the 2nd signal source for the "OFF2 (low active) signal source 2" command (p0845).
- 5. Connect the 1st signal source for the "OFF3 (low active) signal source 1" command (p0848). This command corresponds to control word 1 bit 2 (STW1.2) in the PROFIdrive profile.
- 6. Connect the 2nd signal source for the "OFF3 (low active) signal source 2" command (p0849). This command corresponds to control word 1 bit 2 (STW1.2) in the PROFIdrive profile.
- 7. Interconnect the signal source for the "Enable operation" command (p0852). This command corresponds to control word 1 bit 3 (STW1.3) in the PROFIdrive profile.

6.8 Loading the project data into the converter

6.8 Loading the project data into the converter

Overview

In order to set up your project, you need to load the project data you generated offline on the connected drive units. Project data are generated, for example:

- When configuring the hardware
- When configuring networks and connections

Requirements

- The project data is consistent.
- Each drive unit to be loaded can be accessed online.

Procedure

To download the project data into your drive unit, proceed as follows:

- 1. Select one or more drive units in the project tree.
- 2. Call the shortcut menu "Load into device". OR
- 3. Click on the icon 🔃 "Load to device" in the toolbar.
 - Online connection exists

If an online connection exists between a project and a drive device, the "Load preview" dialog opens. Messages are displayed and necessary actions are suggested in this dialog.

- Online connection does not exist

If there is no established online connection, the "Extended loading" dialog opens and you must first select the interfaces with which the online connection to the device should be established. You have the option of showing all compatible devices by selecting the corresponding option and clicking the "Start search" command.

4. Check the messages in the "Load preview" dialog. Activate the required actions in the "Action" column to perform a secure download.

Load pr	eview			×	
?	Check	before loading			
Status	1	Target	Message	Action	
+₩	1	 Antriebsgerät_1 	Loading will not be performed because preconditions are not met!	Load 'Antriebsgerät_1'	
	Â	 Drive parameteriz 	A download is not recommended due to incomplete configuration.		
	4	Antriebsachse_2	The commissioning of the drive object has not been completed (see p10). Complete the device configuration and the basic commissioning.		
			Load the current configuration unchanged	Load configuration	
	0	 Drive parameteriz 	Please note the following information:		
	0		Save the parameterization retentively after the download	Save parameterization retentively	
				,	
<				>	
				Refresh	
			Finish	.oad Cancel	

As soon as downloading becomes possible, the "Load" button is enabled.

5. Click "Load".

The loading operation is performed.

- Synchronization requirement:

If the engineering tool detects a need for synchronization, the system automatically displays the "Synchronization" dialog. Messages are displayed and necessary actions are suggested in this dialog. You have the option of performing these actions or forcing the download without synchronization by clicking "Force download to device". If you have performed the suggested actions, you will be asked whether you want to continue with the download. The "Load results" dialog then opens. In this dialog, you can check whether the load task was successful and select any further actions.

6. Click "Finish".

Result

The selected project data has been downloaded to the drive units.

6.9 Commissioning a drive

6.9 Commissioning a drive

6.9.1 Using the control panel

Overview

You use the control panel to traverse the drive, thus testing the settings that have already been made (see Chapter "User interface - Control panel (Page 48)").

Non-observance of the safety instructions for the drive control panel

The safety shutdowns from the higher-level controller have no effect with this function. The "Stop with space bar" function is not guaranteed in all operating states. Incorrect operation by untrained personnel – without taking into account the appropriate safety instructions – can therefore result in death or severe injury.

- Make sure that this function is only used for commissioning, diagnostic and service purposes.
- Make sure that this function is only used by trained and authorized skilled personnel.
- Make sure that a hardware device is always available for the EMERGENCY OFF circuit.

Note

Drive reacts 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.

Requirements

• There is an online connection to the drive unit.

Procedure

When an online connection to the drive unit has been established, the bar in the header area of the screen form has a colored background. The control elements are grayed-out – with the exception of the "Activate" button. The remaining control elements become active after you have activated the control panel and set the enable signals.

🍓 Activate 🖓 Deactiv	ate Infeed	\rangle	Drive enables	Operating mode [0] Speed setpoint in	put 💌
ontrol					
Speed (0.00 rpm	O Off	Jog backward	ward Fon	ward
Prive status			Actual values		
Ready for switching on	Operation enab	led		Speed	0.0 rpn
Stationary/rotating measurer	nent			Motor current	0.00 Arm:
Fault	👗 Missing enab	les		Torque utilization	0.0 %
			Output frequency smoothed		0.0 H
Active fault		-			

Figure 6-27 Example: Control panel deactivated

When you activate the control panel, you assume master control of the drive. When you deactivate the control panel, you return the master control. The control panel can always only be activated for one drive.

Activating the control panel

To activate the control panel, proceed as follows:

- 1. Click the "Activate" button at "Master control". The "Activate master control" message window opens.
- 2. Carefully read the warning note and check the value of the monitoring time. The monitoring time specifies the time during which the connection from the PG/PC to the drive is cyclically monitored. The minimum value is 1000 ms.
- 3. Click "Continue" to confirm the monitoring time. The message window closes.

The control panel is active.

Activating the infeed unit

If an infeed unit is available in your drive, then the infeed must also be activated. If it is not activated, no further drive release can be set.

Click the "1" icon at "Infeed" to switch on the infeed.

6.9 Commissioning a drive

Deactivating the control panel

Proceed as follows to return the master control:

- 1. Click the "Off" button to switch off the drive.
- 2. Click the "Deactivate" button at "Master control". The "Deactivate master control" message window opens.
- 3. Click "Yes" to disable the master control.

The master control is deactivated.

Setting drive enable signals

To set the required enable signals for the control panel, proceed as follows:

- Click "Set" at "Drive enable signals". Further areas of the control panel are activated.
- 2. Click "Acknowledge faults" to acknowledge currently pending faults.

Resetting drive enable signals

To reset unneeded drive enable signals, click on the "Reset" button under "Drive enable signals".

Result

- You are able to traverse the drive with the control panel.
- Enable signals and faults are displayed at "Drive status".
- In addition to "Active fault", the currently pending fault is displayed.

6.9.2 Traverse drive

Overview

After you have set the drive enable signals, in the "Control Panel" screen form specify the operating mode and switch on the motor.

Traversing the drive with specified speed

To specify the speed setpoint, proceed as follows:

- 1. In the "Operating Mode" drop-down list, select menu item "Speed setpoint specification".
- 2. Enter a speed setpoint in the "Speed" field with which the motor is to turn. Once you have specified the speed setpoint, the drive is switched on as soon as you click one of the buttons "Start backward", "Start forward", "Jog forward" or "Jog backward" for the first time.

The motor does not accelerate until you click the "Backward" or "Forward" buttons.

- To rotate the motor backwards, click the "Backward" button.
- To rotate the motor forward, click the "Forward" button.
- Click the "Jog forward" button to inch the motor forward.
- Click the "Jog backward" button to inch the motor backward.

Note

Rotation through clicking

The motor continues to rotate while you keep the mouse clicked on the button. Traversing stops when you release the mouse button.

Stopping the drive

Click "Stop" to stop the drive.

Switch off the drive

Click the "Off" button to switch off the drive.

Viewing actual values of the drive

The current values of various parameters are displayed at "Actual values".

Commissioning

6.9 Commissioning a drive

Appendix



A.1 Documentation overview

A.1 Documentation overview

General doc	umentation/cat	talogs	
SINAMICS	G110	D 11	- Converter Chassis Units 0.12 kW up to 3 kW
	G120	D 31	- SINAMICS Converters for Single-Axis Drives and SIMOTICS Motors
	G130, G150	D 11	- Converter Chassis Units - Converter Cabinet Units
	S120, S150	D 21.3	- SINAMICS S120 Chassis Units and Cabinet Modules - SINAMICS S150 Converter Cabinet Units
	S120	D 21.4	- SINAMICS S120 and SIMOTICS
Manufacture	r/service docu	mentation	
SINAMICS	G110		- Getting Started - Operating Instructions - List Manuals
	G120		- Getting Started - Operating Instructions - Installation Manuals - Function Manual Safety Integrated - List Manuals
	G130		- Operating Instructions - List Manual
	G150		- Operating Instructions - List Manual
	GM150, SM120/SM150, GL150, SL150		- Operating Instructions - List Manuals
	S110		- Equipment Manual - Getting Started - Function Manual - List Manual
	S120		 Getting Started Commissioning Manual Function Manual Drive Functions Function Manual Communication (from firmware V5.2) Function Manual Safety Integrated Function Manual DCC List Manual Equipment Manual for Control Units and Supplementary System Components Equipment Manual for Booksize Power Units Equipment Manual for Air-Cooled Chassis Power Units Equipment Manual for Water-Cooled Chassis Power Units Equipment Manual for Water-Cooled Chassis Power Units for Common Cooling Circuits Equipment Manual Combi Equipment Manual for Cabinet Modules Equipment Manual for AC Drives SINAMICS S120M Equipment Manual Hydraulic Drive
	S150		- Operating Instructions - List Manual
Motora	5210		- SINAMILS 5210 Operating Instructions
General			- Configuration Manual, EMC Installation Guideline

A.2 Shortcut menus and icons in Startdrive

A.2.1 Project navigation

Menu item	Icon (button) in the toolbar	Description
Open	-	Opens the drive device view.
Parameters	-	Opens the parameter view in the working area.
Cut	X	Cuts the selected content and copies it to the clipboard.
Сору	ii ii	Copies the content to the clipboard.
Inserting	<u>i</u>	Inserts the clipboard content into the project tree.
Delete	-	Deletes the selected content from the project tree.
Rename	-	Permits a designation to be changed.
Go to topology view	-	Opens the topology view for drives that are networked via PROFINET.
Go to network view	-	Opens the network view.
Download to device		Loads the data from the project into the drive (only when online).
Upload from device (software)	11	Loads the data from the device into the project (only when online).
Compile	-	Compiles existing programs.
Go online	💋 Go online	Establishes an online connection to the drive.
Go offline	🧭 Go offline	Disconnects the online connection - the drive goes offline.
Online & diagnostics	-	Opens the Online & diagnostics editor; if the drive is not online, Start- drive tries to establish an online connection.
Browsing a project	5 44	Opens a search mask You can browse for individual information about the active project using this mask.
Properties	-	Opens the Properties dialog of the drive. There, for example you set bus parameters.

A.2.2 BICO interconnections

The following icons are used for BICO interconnections:

lcon	Meaning
	Allows the BICO interconnection of a binector input. The interconnection dialog is opened by clicking on the icon.
	Allows the BICO interconnection of a binector output. The interconnection dialog is opened by clicking on the icon.
	Allows the BICO interconnection of a connector input. The interconnection dialog is opened by clicking on the icon.
	Allows the BICO interconnection of a connector output. The interconnection dialog is opened by clicking on the icon.

A.2 Shortcut menus and icons in Startdrive

lcon	Meaning
	Clicking on the icon next to the interconnection field allows a list of all of the active interconnections of the parameter to be opened/displayed.
•	Shows that invalid BICO wiring exists in the drive screen forms.

A.2.3 Special elements in the screen forms

User interface elements are used in the Startdrive screen forms, which deviate from a standard Windows operation. A brief list with explanation is provided below:

Element (icon, button, etc.)	Explanation
	Changeover switch in position 1. Position 0 can be selected with a mouse click.
	Changeover switch in position 0. Position 1 can be selected with a mouse click.
	Changeover switch in position x. Position y can be selected with a mouse click.
	Changeover switch in position y. Position x can be selected with a mouse click.
	Switch for the inversion of signals for digital outputs. In this switch position, the signal is not inverted.
• 1	Switch for the inversion of signals for digital outputs. In this switch position, the signal is inverted.

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Additional information

Siemens: www.siemens.com

Industry Online Support (service and support): www.siemens.com/online-support

IndustryMall: www.siemens.com/industrymall

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