SIEMENS

Getting Started

SINAMICS

S120

With Startdrive

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SINAMICS

S120
Getting Started with Startdrive

Getting Started

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Legal information

Warning notice system

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

⚠DANGER
indicates that death or severe personal injury **will** result if proper precautions are not taken.

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

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

NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

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

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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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Preface

SINAMICS documentation

The SINAMICS documentation is organized in the following categories:

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

Additional information

You can find information on the following topics at the following address (http://w3.siemens.com/mcms/mc-solutions/en/motion-control/support/technical-documentation/Pages/technical-documentation.aspx):

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

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

Siemens MySupport/Documentation

At the following address (http://www.siemens.com/mdm), you can find information on how to create your own individual documentation based on Siemens' content, and adapt it for your own machine documentation.

Training

At the following address (http://www.siemens.com/sitrain), you can find information about SITRAIN (Siemens training on products, systems and solutions for automation and drives).

FAQs

You can find Frequently Asked Questions in the Service&Support pages under Product Support (https://support.industry.siemens.com/cs/de/en/ps/faq).

SINAMICS

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

Usage phases and their documents/tools (as an example)

Table 1 Usage phases and the available 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) • SINUMERIK 840 Equipment for Machine Tools (Catalog NC 62)
Installation/assembly	• SINAMICS S120 Manual for Control Units and Additional System Components • SINAMICS S120 Manual for Booksize Power Units • SINAMICS S120 Manual for Booksize Power Units C/D Type • SINAMICS S120 Manual for Chassis Power Units, Air-cooled • SINAMICS S120 Manual for Chassis Power Units, Liquid-cooled • SINAMICS S120 Manual for AC Drives • SINAMICS S120 Manual Combi • SINAMICS S120M Manual Distributed Drive Technology • SINAMICS HLA System Manual Hydraulic Drive
Commissioning	• STARTER Commissioning Tool • Startdrive commissioning tool • SINAMICS S120 Getting Started with STARTER • SINAMICS S120 Getting Started with Startdrive • SINAMICS S120 Commissioning Manual with STARTER • SINAMICS S120 Commissioning Manual with Startdrive • SINAMICS S120 CANopen Commissioning Manual • SINAMICS S120 Function Manual Drive Functions • SINAMICS S120 Safety Integrated Function Manual • SINAMICS S120/S150 List Manual • SINAMICS HLA System Manual Hydraulic Drive
Usage/operation	• SINAMICS S120 Commissioning Manual with STARTER • SINAMICS S120 Commissioning Manual with Startdrive • SINAMICS S120/S150 List Manual • SINAMICS HLA System Manual Hydraulic Drive
Maintenance/servicing	• SINAMICS S120 Commissioning Manual with STARTER • SINAMICS S120 Commissioning Manual with Startdrive • SINAMICS S120/S150 List Manual
References	• SINAMICS S120/S150 List Manual

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.

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. The functionality of the supplied drive system should only be taken from the ordering documentation.
- 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.

Technical Support

Country-specific telephone numbers for technical support are provided in the Internet at the following address (https://support.industry.siemens.com/sc/ww/en/sc/2090) in the "Contact" area.

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 (https://support.industry.siemens.com/cs/ww/en/ps/13231/cert).

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 (http://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.

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 (https://www.automation.siemens.com/sow?sap-language=EN).

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 2 Symbols

Symbol	Meaning
	Connection for protective conductor
	Ground (e.g. M 24 V)
	Connection for function potential bonding

Notation

The following notation and abbreviations are used in this documentation:

Notation for faults and alarms (examples):

- F12345 Fault 12345
- A67890 Alarm 67890
- C23456 Safety message

Notation for parameters (examples):

- p0918 Adjustable parameter 918
- r1024 Display parameter 1024
- p1070[1] Adjustable parameter 1070, index 1
- p2098[1].3 Adjustable parameter 2098, index 1 bit 3
- p0099[0...3] Adjustable parameter 99, indices 0 to 3
- r0945[2](3) Display parameter 945, index 2 of drive object 3
- p0795.4 Adjustable parameter 795, bit 4

Purpose of the document

This documentation is aimed at beginners who want to find out more about the SINAMICS S120 drive system. The document offers a brief guide to commissioning a sample project with a simple SINAMICS S120 drive train (CU320-2 PN). By following the instructions in this document, a beginner will need only a few minutes to engineer and configure the sample project and start up the motor.

Use of OpenSSL

This product contains software (https://www.openssl.org/) that has been developed by the OpenSSL project for use in the OpenSSL toolkit.

This product contains cryptographic software (mailto:eay@cryptsoft.com) created by Eric Young.

This product contains software (mailto:eay@cryptsoft.com) developed by Eric Young.

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Fundamental safety instructions

1

1.1 General safety instructions



⚠WARNING

Electric shock and danger to life due to other energy sources

Touching live components can result in death or severe injury.

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

Generally, the following six 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

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 that might result in serious injury or death.

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



⚠WARNING

Electric shock due to 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.



⚠WARNING

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

Electric shock if there is no ground connection

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

- Ground the device in compliance with the applicable regulations.



⚠WARNING

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

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.

⚠ 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.

⚠ WARNING

Failure of pacemakers or implant malfunctions due to electromagnetic fields

Electromagnetic fields (EMF) are generated by the operation of electrical power equipment, such as transformers, converters, or motors. People with pacemakers or implants in the immediate vicinity of this equipment are at particular risk.

- If you have a heart pacemaker or implant, maintain a minimum distance of 2 m from electrical power equipment.

⚠ WARNING

Unexpected movement of machines caused by radio devices or mobile phones

When radio devices or mobile phones with a transmission power > 1 W are used in the immediate vicinity of components, they may cause the equipment to malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.

- If you come closer than around 2 m to such components, switch off any radios or mobile phones.
- Use the "SIEMENS Industry Online Support App" only on equipment that has already been switched off.

⚠WARNING

Motor fire in the event of insulation overload

There is higher stress on the motor insulation through a ground fault in an IT system. If the insulation fails, it is possible that death or severe injury can occur as a result of smoke and fire.

- Use a monitoring device that signals an insulation fault.
- Correct the fault as quickly as possible so the motor insulation is not overloaded.

⚠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.

⚠WARNING

Unrecognized dangers due to missing or illegible warning labels

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

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

NOTICE

Device damage caused by incorrect voltage/insulation tests

Incorrect voltage/insulation tests can damage the device.

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

⚠WARNING

Unexpected movement of machines caused by inactive safety functions

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

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

Note

Important safety notices for Safety Integrated functions

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

⚠WARNING

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

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

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

1.2 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).

1.3 Warranty and liability for application examples

The application examples are not binding and do not claim to be complete regarding configuration, equipment or any eventuality which may arise. The application examples do not represent specific customer solutions, but are only intended to provide support for typical tasks. You are responsible for the proper operation of the described products. These application examples do not relieve you of your responsibility for safe handling when using, installing, operating and maintaining the equipment.

1.4 Industrial security

Note

Industrial security

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 only represent one component of such a concept.

The customer is responsible for preventing unauthorized access to its plants, systems, machines and networks. Systems, machines and components should only be connected to the enterprise network or the internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place.

Additionally, Siemens' guidance on appropriate security measures should be taken into account. For more information about industrial security, please visit:

Industrial security (http://www.siemens.com/industrialsecurity).

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

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

Industrial security (http://www.siemens.com/industrialsecurity).

⚠WARNING

Unsafe operating states resulting from software manipulation

Software manipulations (e.g. viruses, trojans, malware 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.

1.5 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

2

This manual provides instructions on how to commission a simple SINAMICS S120.

To create a sample project the following points are explained:

1. Which hardware components do you need for the sample project?
2. How do you create a simple project in the Startdrive commissioning tool?
3. How do you configure a drive?
4. How do you put the drive into operation?

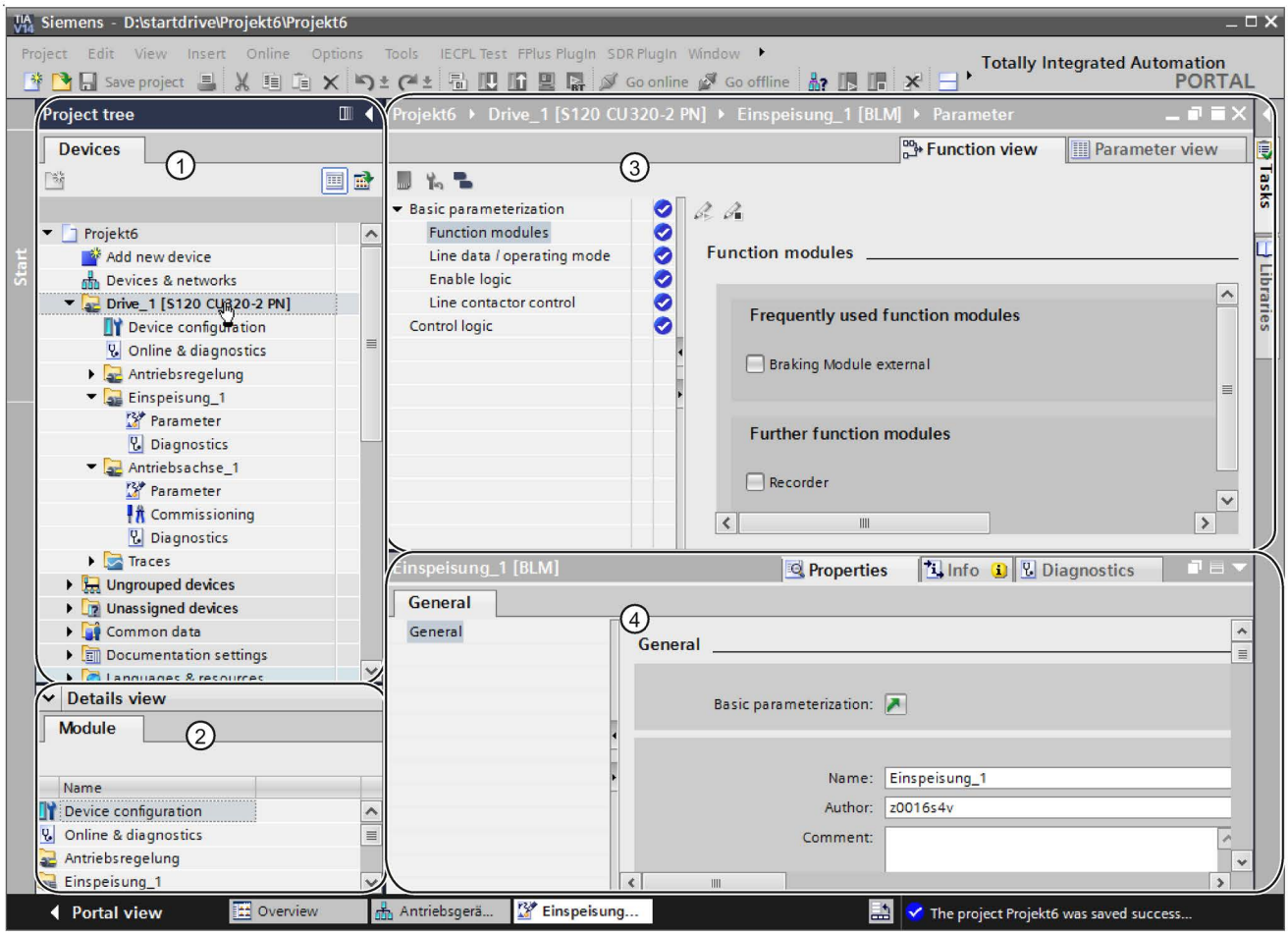
Startdrive commissioning tool

3

3.1 Structure of the user interface

3.1.1 Project view for parameterizing the drive

The following figure shows an example of the components of the project view:



① **Project tree** Used to display and edit components and project data.

② **Details view** Shows the details of an element selected in the project tree.

③ **Working area:** Used to configure and parameterize a drive.

④ **Inspector window:** Shows properties and parameters of an object selected in the working area.

Figure 3-1 Overview of Startdrive user interface

3.1.2 Project navigation

Description

The project tree is used to display and edit components and project data.

After they have been inserted, drives are hierarchically displayed as follows in the project tree:

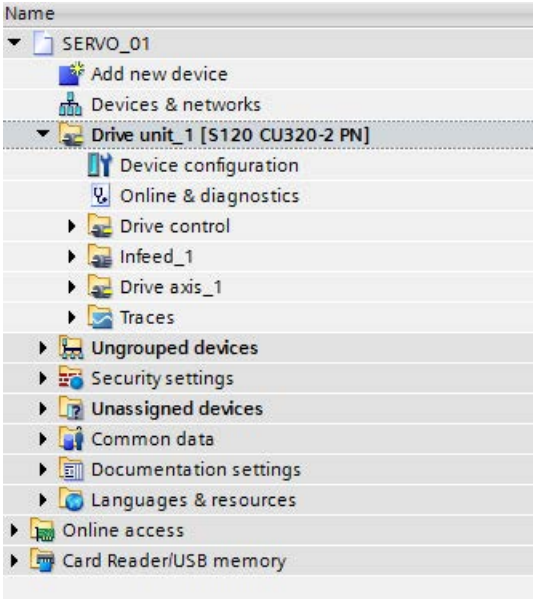


Figure 3-2 Example: Project tree

The most important information of a project:

- Project name
- Name of the new added drive
- Device configuration of the new added drive
- The created drive objects of a drive (automatic speed control, infeed, drive axis...)
- Trace recording of drive

See also

Parameterization editor (Page 34)

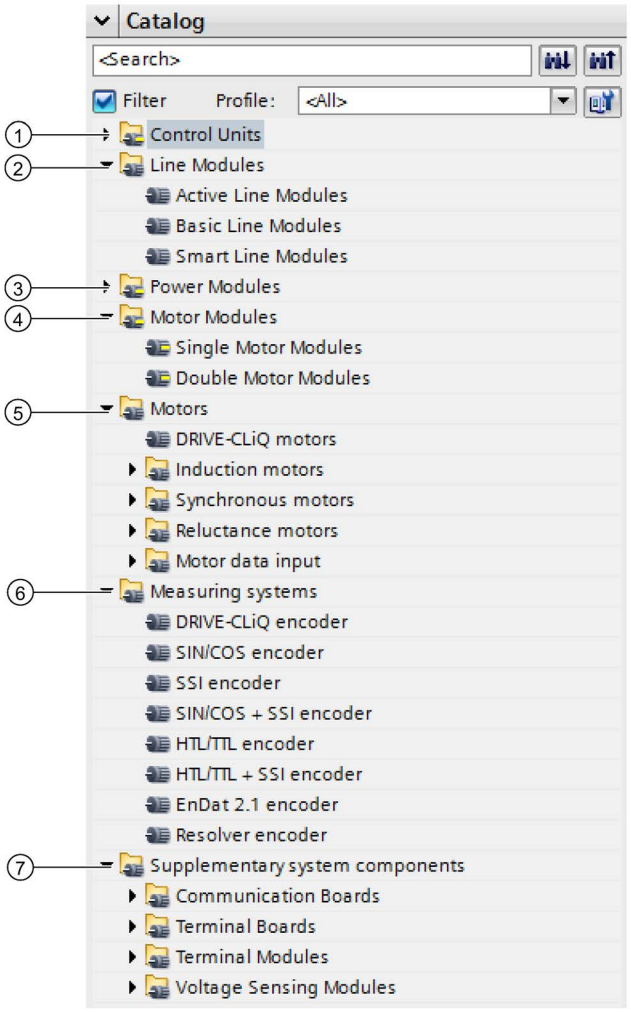
3.2 User interface - parameterization

3.2.1 Modules in the hardware catalog

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 (Page 75)").

The SINAMICS modules are arranged as follows in the hardware catalog:



① Available Control Units of type SINAMICS CU320-2
② Active, Basic and Smart Line Modules
③ Power Modules (chassis format)
④ Single Motor Modules and Double Motor Modules
⑤ The motors are sorted according to motor type and article number, and are displayed with a core article number.
Drive-CLiQ motors, Induction motors, Synchronous motors, Reluctance motors, Motor data input
⑥ Measuring systems (various encoders)
⑦ Supplementary system components (CB, TB, TM, VSM, etc.)

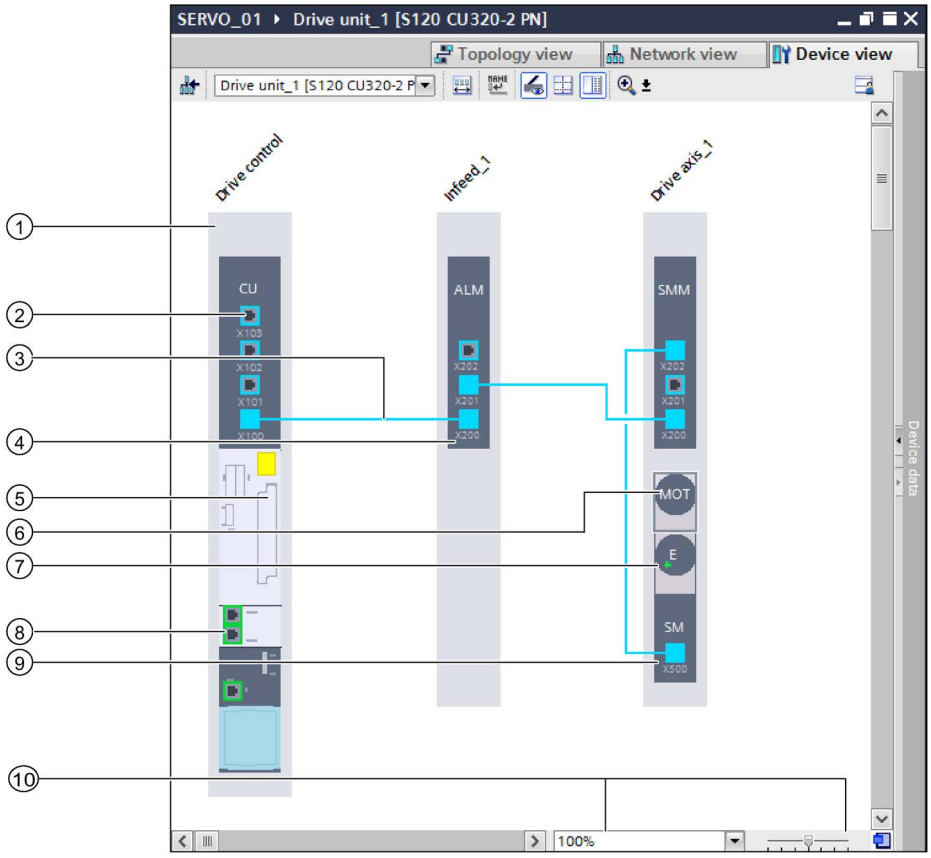
Figure 3-3 SINAMICS hardware components

3.2.2 Device view

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 overview provides a tabular overview of all configured components and their data.

The following figure shows an overview of the device view.



① Control Unit
② DRIVE-CLiQ interface
③ DRIVE-CLiQ connection
④ Infeed
⑤ Slot for option modules
⑥ Motor
⑦ Encoder
⑧ Bus interface, PROFINET in this case
⑨ Motor Modules, Power Modules
⑩ Zoom, enlarge and reduce the graphic display

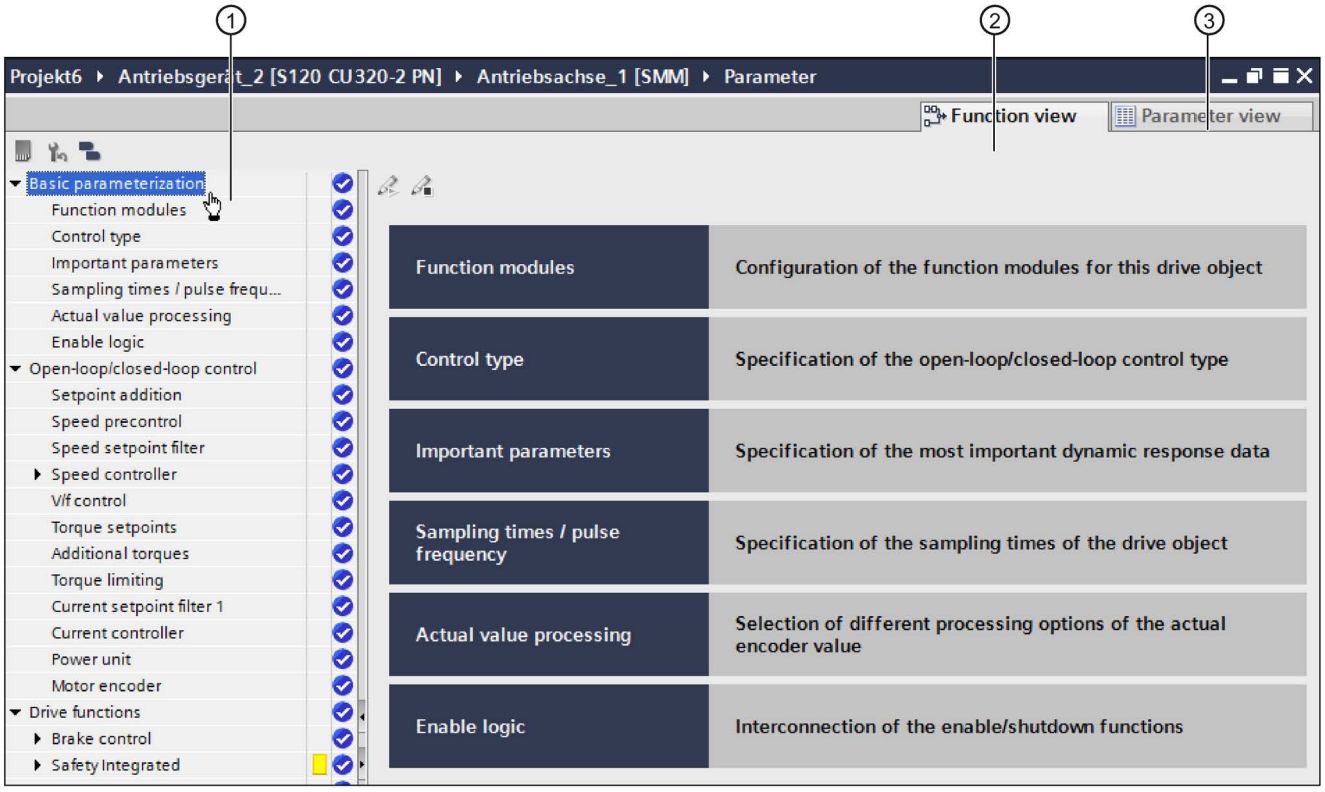
Figure 3-4 Device view

3.2.3 Parameterization editor

The parameterizing editor comprises 2 tabs, under 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.
- All the drive parameters are listed in the parameter view, so that the drive can be completely parameterized there.

The following figure shows the structure of the parameterizing editor:



① **Secondary navigation**
For the selected tab, you navigate here through the individual thematically sorted topics.

② Tab **Function view**
Here, you parameterize the drive on a graphical user interface. Various drive-specific screen forms are displayed which facilitate parameterization.

③ Tab **Parameter view**
The drive can be parameterized here directly using the parameters from the parameter list.

Figure 3-5 Parameterizing editor

3.2.4 Function view

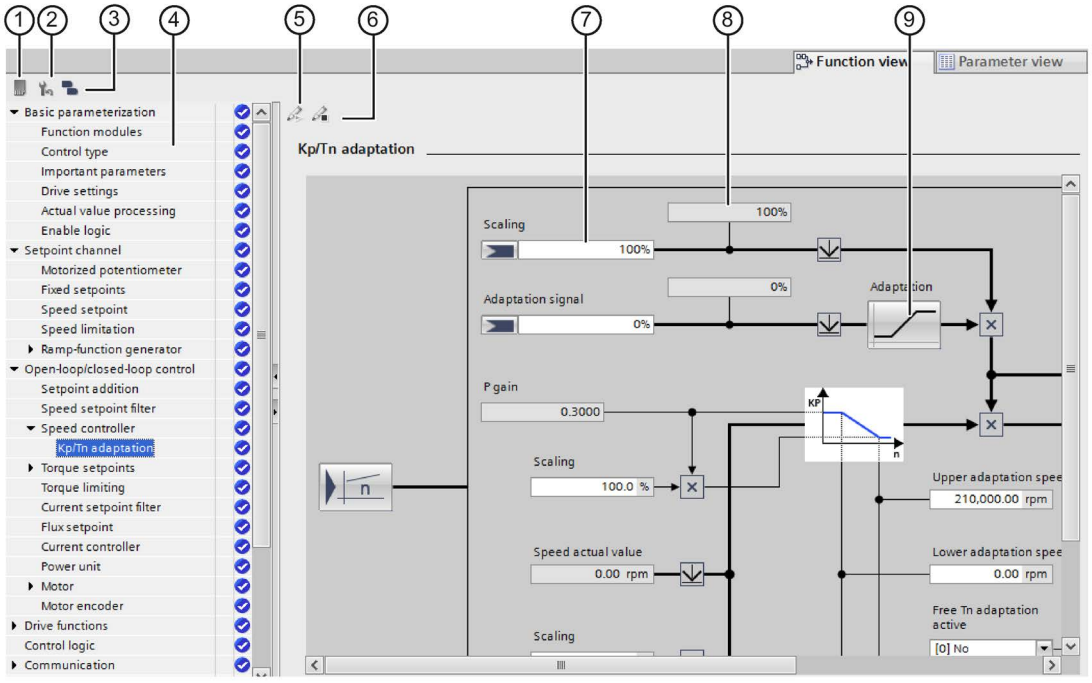
You parameterize the drive using a graphical user interface in the "Function view". The individual screen forms are based on function diagrams and contain the required parameters.

Note

All parameters

You can find all parameters of the drive in the "Parameter view (Page 36)". Experts can then comprehensively parameterize the drive.

The following figure shows an example of a screen form structure:



① Icon to save data to the nonvolatile memory
② Icon to restore the factory settings
③ Icon to display invalid BICO interconnections.
④ Secondary navigation
⑤ Icon to activate safety processing
⑥ Icon to save safety processing
⑦ Fields for entering parameters / interconnecting BICO signals
⑧ Display parameters
⑨ Button to display parameterizing dialog boxes or screen forms.

Figure 3-6 Function view

3.2.5 Parameter view

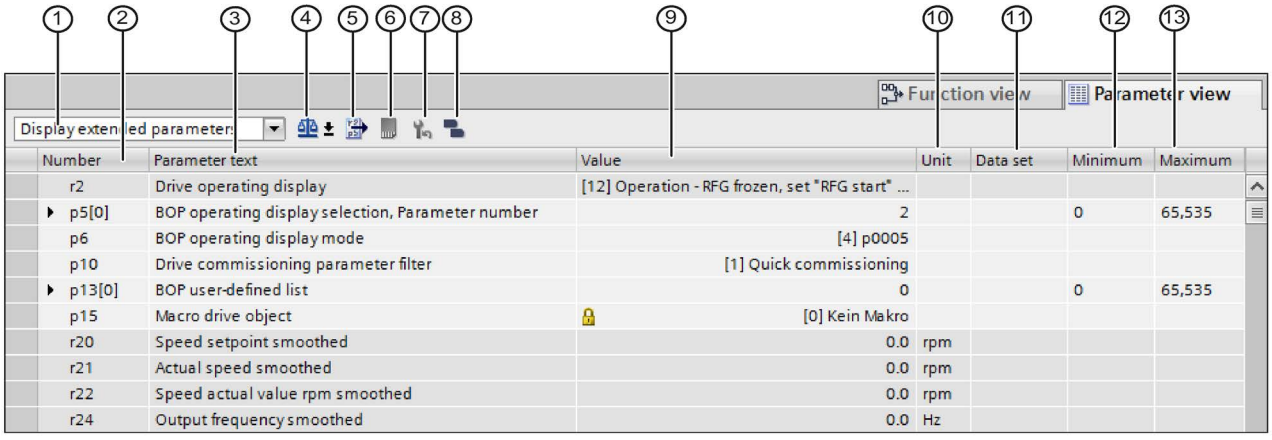
The "Parameter view" (expert list) provides a clearly organized display of the parameters available for the device.

Note

Locked parameters

None of the parameters with the padlock icon can be changed OFFLINE. To enter these parameters offline, use the appropriate screen forms and dialogs in the hardware configuration that you find in the device view.

The following figure shows the structure of the parameter view:



① Drop-down list to restrict the parameter views: Standard, Extended, Service
② Parameter number
③ Parameter name
④ Button for comparing the parameters of the drive object to another parameter set. "Online", "Offline", and "Factory setting" can be compared.
⑤ Icon for starting a CSV export.
⑥ Icon to retentively save the parameters (Copy RAM to ROM)
⑦ Icon to restore the factory settings.
⑧ Icon to display invalid BICO interconnections.
⑨ Value of the parameter
⑩ Unit
⑪ Data set:
Indicates the data set (MDS, DDS, etc.) to which the parameter belongs.
⑫ Minimum value
⑬ Maximum value

Figure 3-7 Parameter list

Parameter display

The fields of the individual parameters are displayed in the list in color as follows:

Editing level	Offline color	Online color
Read only	Gray	Pale orange
Read/write	White	Orange

3.2.6 Inspector window

Properties and parameters of the selected object are displayed in the inspector window. You can edit these properties and parameters. For example, you can specify non-specified S120 drive objects inserted in the device view.

Structure

The information and parameters in the inspector window are subdivided into various information types, which are displayed as main tab ① in the inspector window:

- Properties
- Info
- Diagnostics

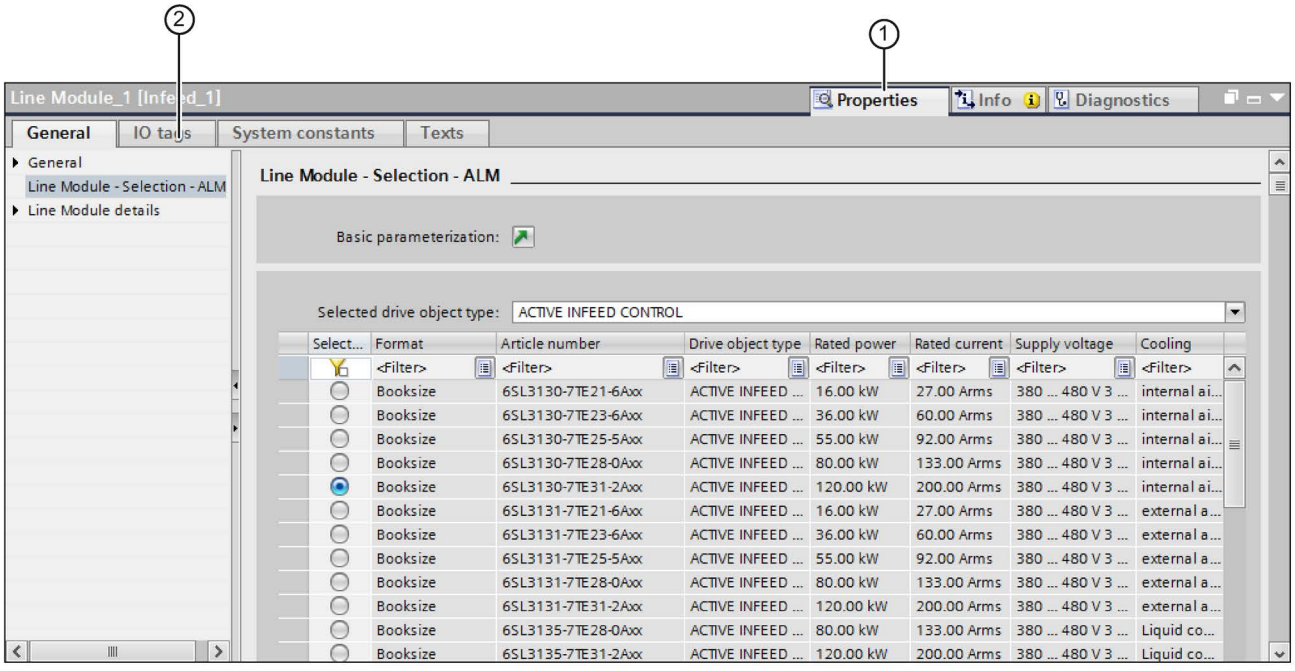


Figure 3-8 Inspector window

Showing or enlarging the inspector window

There are several options available for showing (hiding) the inspector window:

- Use the regular window icons (top right-hand side in the header of the window).

  - or -

- Select a non-specified component in the device view and open the "Properties" shortcut menu.

The inspector window is displayed only partially in the Startdrive when called, due to lack of space. Display of the inspector window can be maximized (minimized) for specification of the components:

- To do so, double click on the header of the inspector window (gray bar).

Subdivision of the "Properties" area

For each information type, there are additional subareas that can be displayed via secondary tabs ②.

The most important information type for SINAMICS S120 drives is the "Properties" area. The following secondary tabs are displayed in this area:

- General

  Display of the properties and settings of the drive device, drive object, or the 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. When you click on the arrow icon at the left next to the group names, if subgroups exist then you can open the group. 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 also be edited.

  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. You can assign names to the variables, assign the variables user-defined variable tables from a drop-down list - and allocate comments to variables. The I/O variables are also listed in the PLC variable table.

- 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.

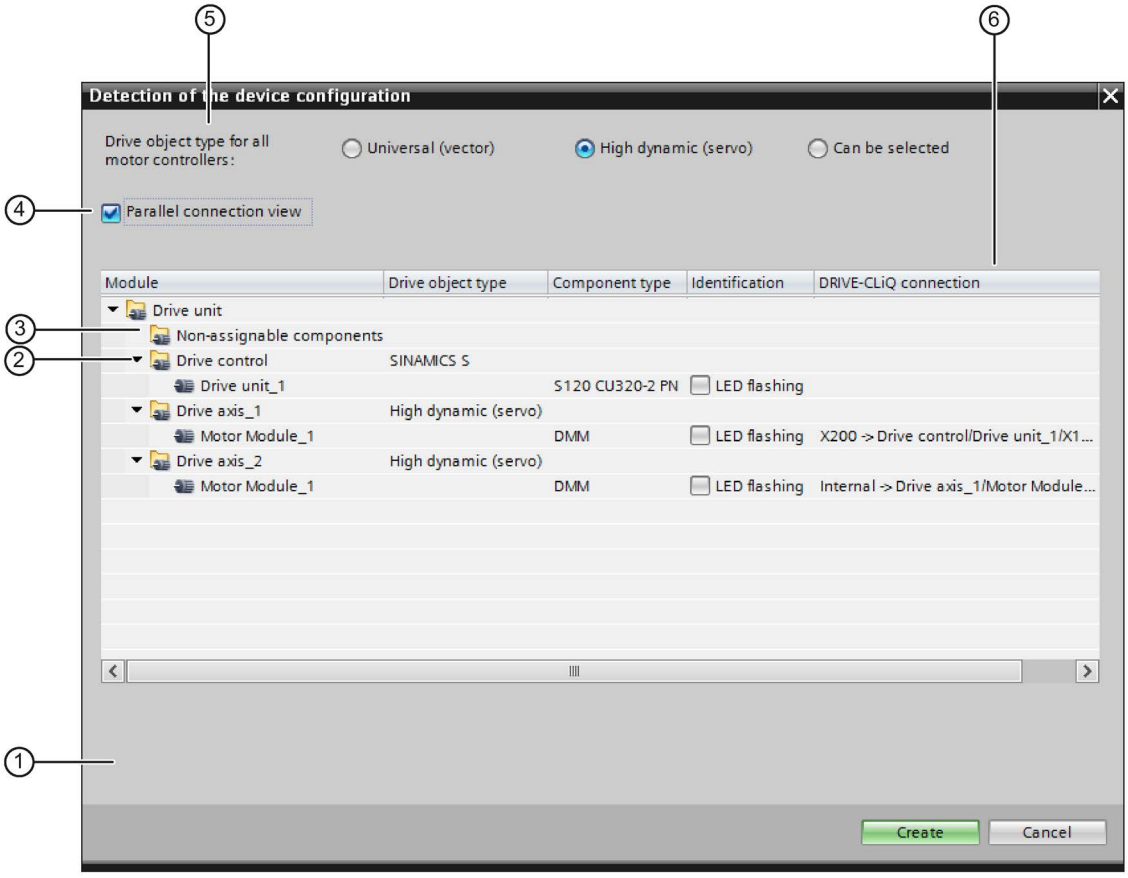
3.2.7 Device configuration detection

The results of a detection run (of the device configuration) are listed in the dialog "Detection of the device configuration". All assignable components are listed in the table and 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 deposited in the folder "Non-assignable components" (refer to Chapter "Deriving the hardware device configuration (Page 115)").

The dialog has the following structure:



① Creation information (optional)
② The components assigned to the modules or main components
③ Non-assignable components
④ Activates the parallel connection view.
In the parallel connection view, only the parallel connection-capable components are displayed.
⑤ Drive object type of the motor controls
⑥ Columns of results table:

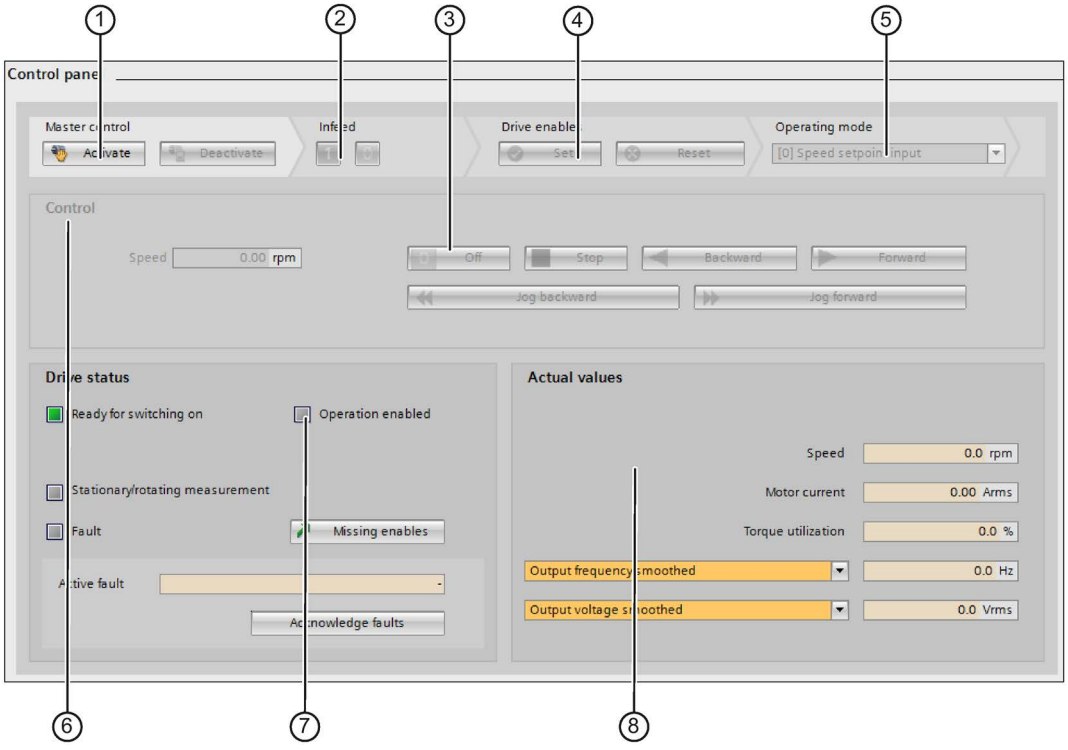
- Type of the drive unit
- Component type
- Identification via LED. Is controlled on the Control Unit via parameters p9210 and p9211.
- DRIVE-CLiQ connection of the component
- Article number of the component

Figure 3-9 Device configuration detection

3.3 User interface - Control panel

The drive control panel (see Chapter "Using the control panel (Page 159)") is used to control and monitor individual drives. You traverse drives with the control panel by specifying values. Depending on the operating mode, these are, for example, speed setpoints.

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



① Activate/deactivate master control
② Switch infeed on and off
③ Drive Off (OFF)
④ Set drive enable
⑤ Select operating mode
⑥ Control drive
⑦ Drive status
⑧ Actual values

Figure 3-10 Control panel

3.4 Information system - online help

3.4.1 General remarks on the information system

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

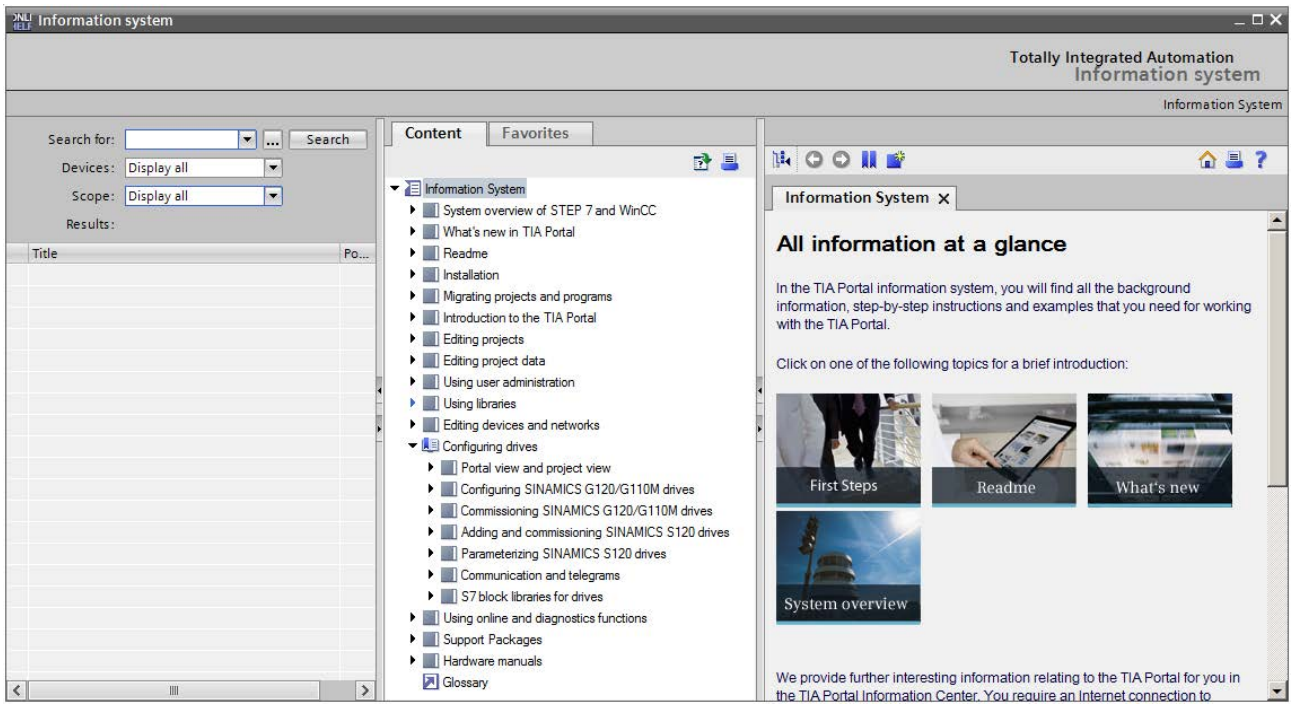
While working with the program, you receive the following support:

- Information system with all background information, step-by-step instructions and examples required to work with Startdrive.
- Tooltips for information on elements of the user interface, for example text boxes, buttons and icons. Some of the tooltips are supplemented by cascades containing more precise information.
- Help on the current context, for example on menu commands when you press the <F1> key.
- Help regarding messages or diagnostics.

The most important information regarding the Startdrive information system is provided below. Additional information can be obtained directly in the Startdrive online help by entering the search term "Help on information system".

Information system

The information system opens in a separate window. The following figure shows the information system for Startdrive in the TIA Portal:



The information system is divided into the following areas:

- 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 multiple tabs to view various help pages at the same time.

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

Icons in the navigation area

The following icons are available in the navigation area of the information system:

Symbol	Function
	Search for updates Starts the search for hardware manuals, which are available as an update.
	Print Prints out pages or sections of the information system.

Icons in the contents area

The following icons are available in the contents area of the information system:

Symbol	Function
	Synchronize Displays the position of the open help topic in the table of contents.
	Forward / backward Navigates through the history of the help topics previously opened in this tab.
	Favorites Adds the current help topic to the favorites.
	New tab Opens a new, empty tab.
	Home page Displays the start page of the information system.
	Printing Prints the current help topic.
	Help Displays help on the information system.

Identification of the topics according to the information type

The information system provides you with a wide range of information. The help topics are identified by different symbols depending on the type of information they contain. Symbols tell you at a glance what kind of information you have just opened.

Symbol	Information type	Explanation
	Operating instructions	Describes the steps to follow in order to carry out a particular task.
	Example	Contains a practical application example that explains how to solve an automation task.
	Factual information	Includes background information regarding functions of the Startdrive and provides basic knowledge.
	Reference	Provides detailed reference information about instructions and objects for reference.

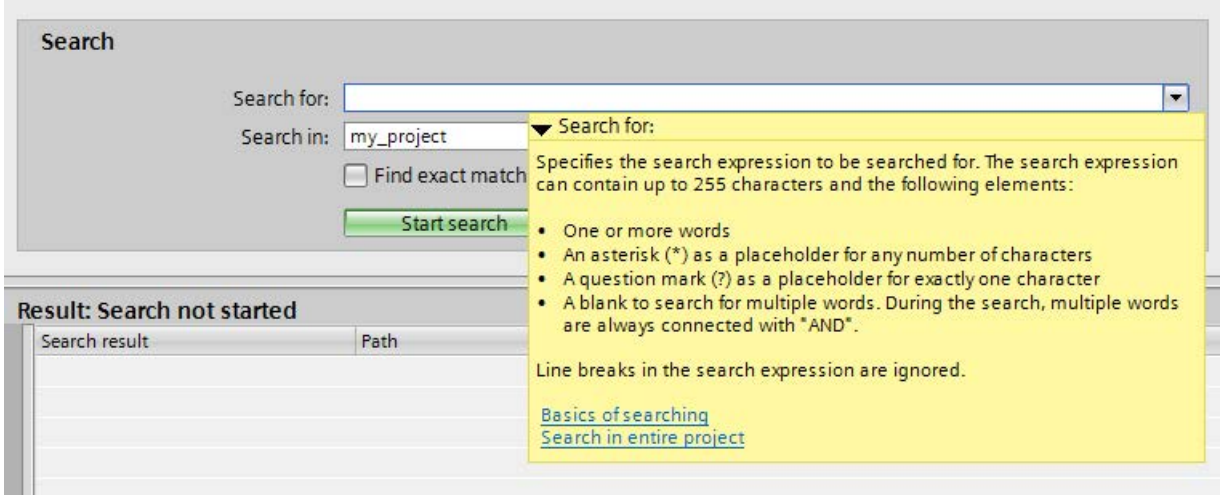
Tooltip

User interface elements offer brief information in the form of a tooltip.

Tooltips, which have an arrow icon on the left, contain additional information in tooltip cascades. If you position the mouse pointer briefly over the tooltip or click the arrow icon, this information is displayed. The automatic display of tooltip cascades can be disabled.

If additional information is available, a link to the corresponding help topic appears in the cascade. If you click on the link, the corresponding topic opens in the information system.

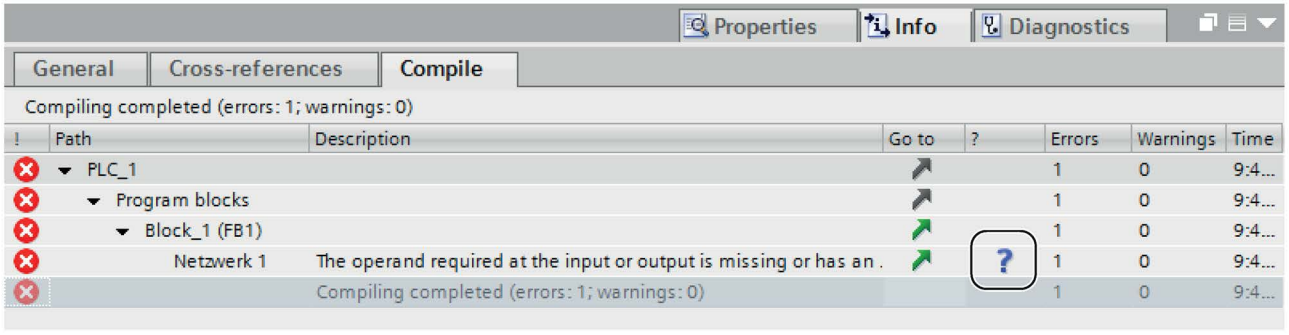
The following figure shows a tooltip with opened cascade:



Help for messages and diagnostics

Numerous actions in the Startdrive are supported with messages in the inspector window. The messages give information about whether or not an action was successful. In addition, you see which changes have been made in the project. Further help is available for some messages. If further help is available for an message, you access the help by clicking the question mark symbol.

The following figure shows the "Info" tab in the Inspector window with several messages and a question mark symbol:



In the same manner, additional support for listed messages can be called in the "Diagnostics" tab.

3.4.2 Opening the information system

Opening the information system with the menu

To access the information system on the home page, follow these steps:

1. Select "Display help" command from the "Help" menu.

   The start page of the information system opens.

Opening the information system with <F1>

To access the information system and help for the current context, proceed as follows:

1. Select an object for which you want to view the help, for example, a menu command or a program element.
2. Press <F1>.

   The information system opens. If information on the current context is available, the appropriate topic appears. If no information on the current context is available, the home page of the information system is displayed.

Opening the information system via tooltip cascades

To open the information system from a tooltip cascade, proceed as follows:

1. Move the mouse pointer over an object with a tooltip cascade.

   The tooltip cascade opens. If additional information is available, the tooltip cascade contains links to the corresponding help topics.

2. Click on a link.

   The information system opens and the additional help topic appears.

Opening help for error messages

Numerous actions in the Startdrive are supported with messages in the inspector window. If help on such a message is available, a blue question mark appears behind the message.

To view the help for a message, follow these steps:

1. Display the Inspector window.
2. Click on the blue question mark behind a message.

   The information system opens and the help error message appears. It contains an exact description of cause of the error and how to remedy it.

Fundamentals

4

4.1 Requirements for commissioning

The following are necessary for commissioning a SINAMICS S drive system:

- A programming device (PG/PC)
- Startdrive commissioning tool
- A communication interface, e.g. PROFINET, Ethernet
- Completely wired-up drive line-up (see SINAMICS S120 manuals)

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

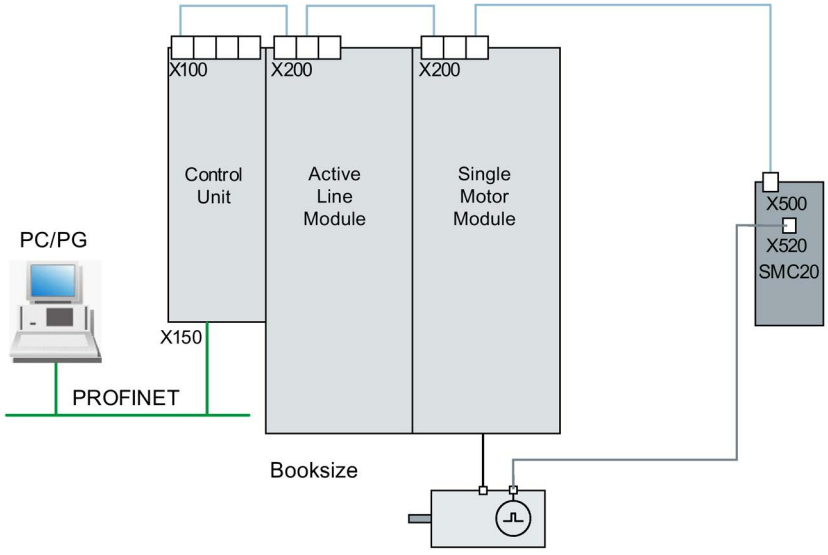


Figure 4-1 Component configuration (example)

4.2 Safety instructions for commissioning

⚠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.

⚠WARNING

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).

⚠WARNING

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.

4.3 BICO interconnections

4.3.1 Binectors, Connectors

Description

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

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

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

Note

Further information

Detailed information on BICO technology and BICO connections can be found in Section "Basics of the drive system" in the SINAMICS S120 Drive Functions Function Manual.

In Startdrive for S120, the parameterization is possible via:

- Parameter view
- Function view of a screen form

Binectors, BI: Binector input, BO: Binector output

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

Binectors are subdivided into binector inputs (signal sink) and binector outputs (signal source).

Binectors

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

Connectors, CI: Connector input, CO: Connector output

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 (signal sink) and connector outputs (signal source).

Connectors

Abbreviation	Symbol	Name	Description
CI		Connector input Connector Input (signal sink)	Can be connected with a connector output as source.
CO		Connector output Connector Output (signal source)	Can be used as a source for a connector input.

Invalid BICO interconnections

If you click the icon , the message "Invalid BICO wiring" is displayed, which informs you that there is invalid BICO wiring in the drive screen forms. You can call this symbol from the symbol bar of the function view and the parameter view.

4.3.2 Interconnect BICO inputs

Use a connection dialog to connect binector or connector inputs.

Connecting a signal

To make a connection, proceed as follows:

1. Click the binector or connector icon of the signal that you want to connect (or).

   A connection dialog for the selection of the possible parameters opens. The drive object for which you want to make a connection is displayed automatically in the "Drive object" drop-down list on the right.

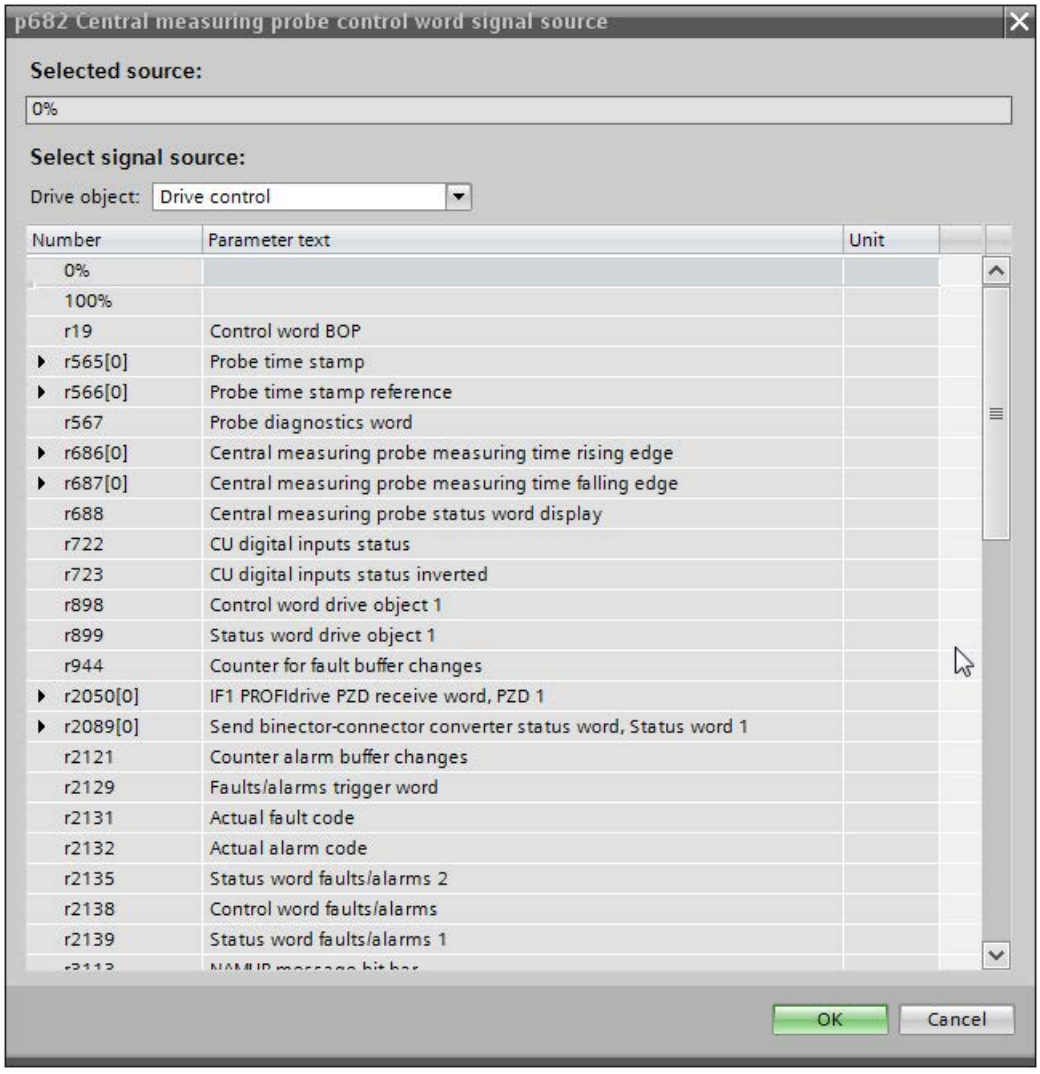


Figure 4-2 BICO dialog input

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.

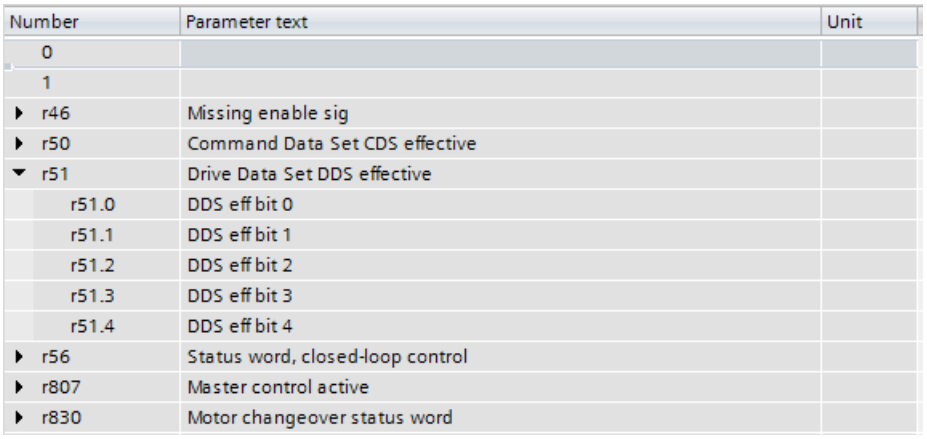


Figure 4-3 BICO dialog input: Parameter bits opened

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).

4.3.3 Interconnecting BICO outputs

Use the connection dialog to connect binector or connector outputs.

Connecting a signal

To make a connection, proceed as follows:

1. Click the binector or connector icon of the signal that you want to connect (or).

   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.

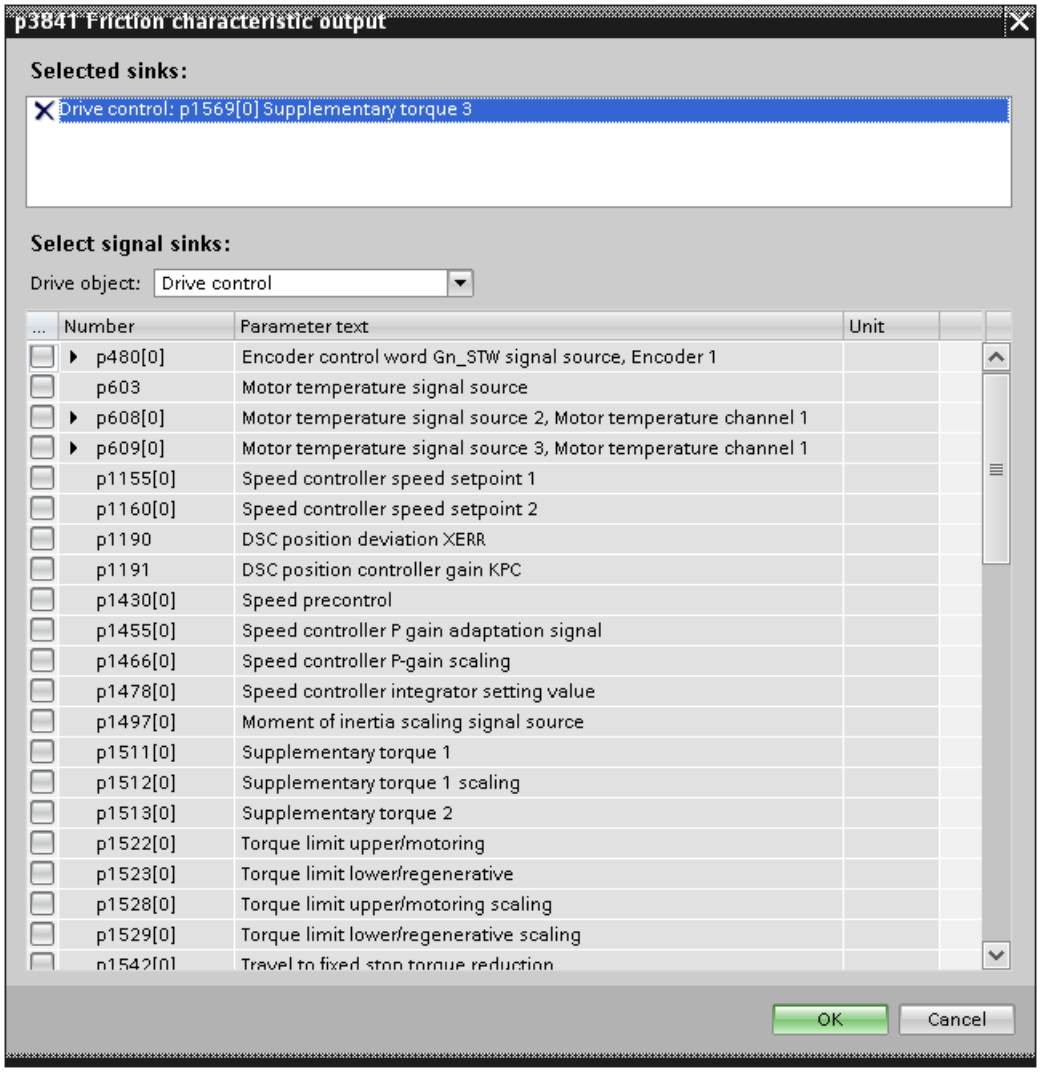


Figure 4-4 BICO dialog output

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.

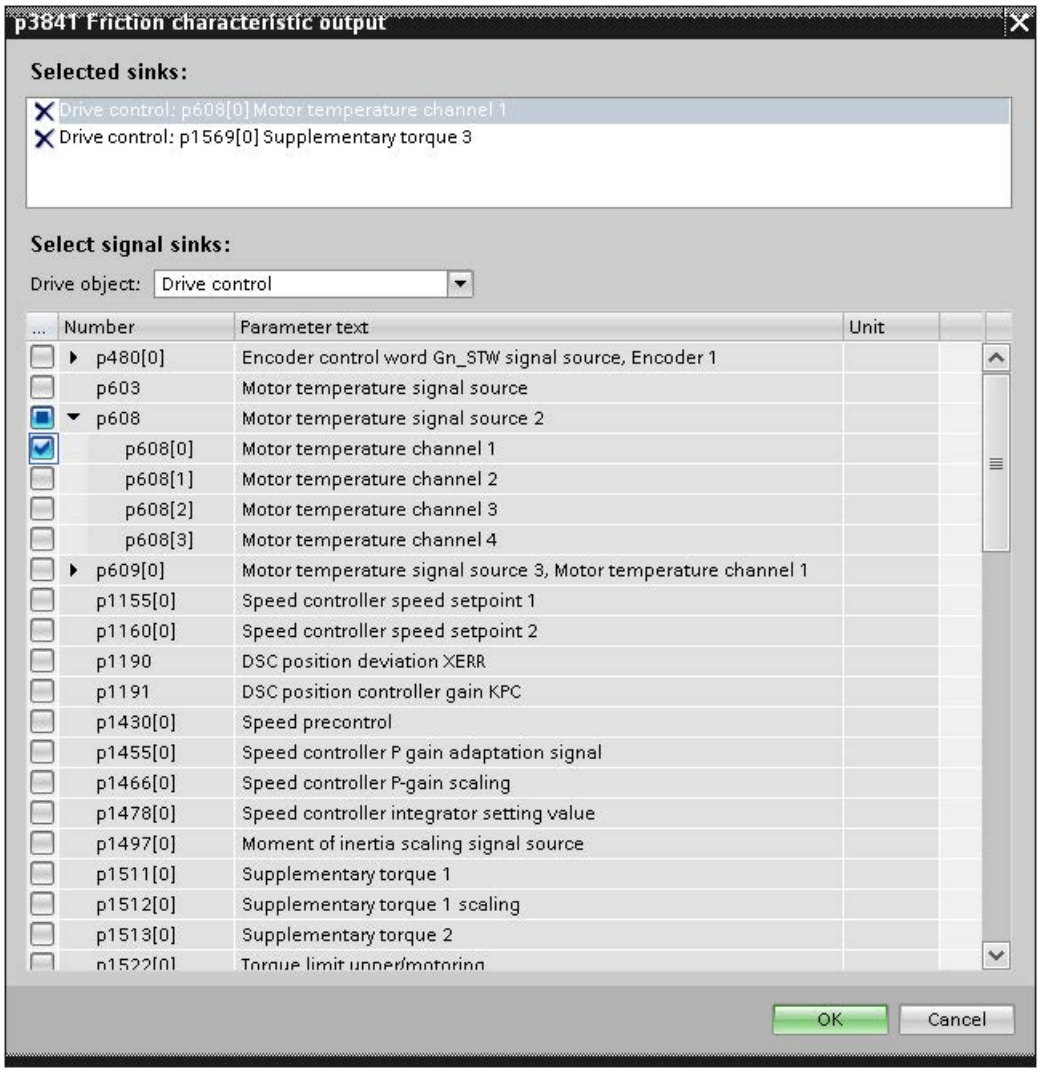


Figure 4-5 BICO dialog output: Parameter bits opened

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  next to the interconnection field opens a list, which shows all of the active parameter interconnections.

4.4 Comparing parameter settings

The current parameter values of a drive object can be compared with another parameter set using the comparison function in the parameter view. The following comparisons are possible:

- Offline - Factory setting
- Online - Offline
- Online - Factory setting

Comparing parameters

To compare the parameters of the drive object with another parameter set, proceed as follows:

1. Open the parameter view for the device whose parameters you want to compare.
2. Click the black arrow icon of the "Compare current parameters of this drive object with another data set" button.

   A selection list containing the comparison options opens:

   – Offline - Factory setting (default setting in offline mode)

   – Online - Offline (default setting in online mode)

   – Online - Factory setting
3. Select a comparison option.

   The selected comparison option is executed as follows:

   – The "Comparison" column is displayed.

   – The comparison result of the selected comparison option is displayed by icons in the "Comparison" column.

Quick compare depends on parameterization mode:

1. Click the scales icon on the button.

   Result:

   – Offline mode: By default, the parameters are compared with the factory settings.

   – Online mode: By default, the parameters are compared with the offline settings.

Icons in the "Comparison" column

Icon	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.
	The value of at least one subordinate parameter index is different from the factory setting.
	The value of at least one subordinate parameter index is different from the offline value.
	At least one of the two comparison values has a technological or syntax error.
	The comparison cannot be performed. At least one of the two comparison values is not available (e.g. snapshot).

4.5 Permanently save the settings

Saving configurations in the project

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

1. Click "Save project" in the toolbar.

   - Or -

2. Select the "Project > Save" or "Project > Save as" menu.

Non-volatile saving to memory card

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

Saving online data:

Click the icon in the function view of the active Startdrive project.

The current project settings are stored non-volatile on the memory card of the drive unit.

Saving offline data:

For storing in a power-independent manner, it is important that the settings made are not only saved in the project on the PC, but are also stored permanently on the memory card of the drive unit (also known as "Copy RAM to ROM"). An online connection must be established to the drive unit for this purpose.

1. Establish an online connection (Page 110) to your drive unit.
2. Load the project data in your drive unit(s).

   Proceed as described in Chapter "Loading the project to the target device (Page 157)" for this purpose.

3. Click the icon in the function view of the active Startdrive project.

   The current project settings are stored non-volatile on the memory card of the drive unit.

4.6 Restoring factory settings

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

1. Establish an online connection (Page 110) to your drive unit.
2. Click the  icon in the function view of the active Startdrive project.

   The factory settings are restored.

4.7 Loading project data from a drive unit

Requirement

- A project is open.
- The hardware configuration and software to be loaded must be compatible with the Startdrive. If the data on the device was created with a previous program version or with a different configuration software, please make sure they are compatible.

Uploading project data of a device

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

1. Establish an online connection to the drive unit from which you want to download the project data.

   See also Chapter "Establishing an online connection to the drive unit (Page 110) ".

2. 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 impediments, these are displayed as messages in the dialog.

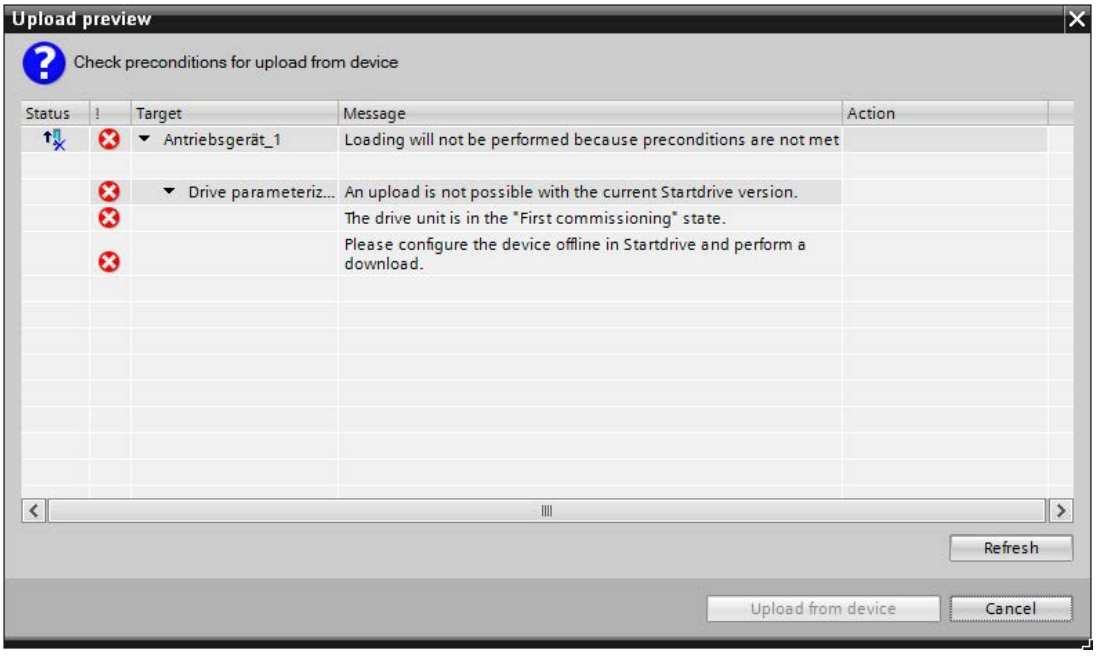


Figure 4-6 Example: Upload from device

3. 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.

4. Click the "Upload from device" button.

   The loading operation is performed.

Result

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

Commissioning 5

5.1 Call Startdrive

Note

The following procedure is based on the Windows 7 operating system. Operation can deviate slightly for other operating systems

Call the Startdrive application

1. Click on the Startdrive icon  of your user interface.

   - or -

2. Call the Startdrive via the Start menu on your PC.

   Startdrive opens.

5.2 Commissioning workflow

A drive can be commissioned in two ways:

- Create a project offline in Startdrive
  The components of the drive are combined offline in Startdrive.
- Create a project by reading out a device configuration
  The components of the drive are read-out online and supplemented offline when required.

Creating a project offline in Startdrive

The following steps are required when commissioning a drive:

1. Create a project with Startdrive (Page 70).
2. Establish an online connection between Startdrive and the target device (Page 110).
3. Perform the basic parameterization of the drive units (Page 123).
4. Download the project to the target device (Page 157).
5. Commission the drive via the control panel (Page 159)
6. 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 (Page 70).
2. Optional: Establish an online connection between Startdrive and the target device (Page 110).
3. Determine the device configuration via an automatic configuration from the target device (Page 115).
4. Revise the determined device configuration in Startdrive (Page 119).
5. Perform the basic parameterization of the drive units (Page 123).
6. Download the project to the target device (Page 157).
7. Commission the drive via the control panel (Page 159)
8. Result: The motor turns.

5.3 Check lists to commission SINAMICS S

Checklist for commissioning booksize power units

The following checklist must be carefully observed. Read the safety instructions in the manuals before starting any work.

Table 5- 1 Checklist for commissioning (booksize)

Check	OK
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 DRIVE-CLiQ topology rules been observed?	
Have the line-side and motor-side power cables been dimensioned and routed in accordance 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

The following checklist must be carefully observed. Read the safety instructions in the manuals before starting any work.

Table 5- 2 Checklist for commissioning (chassis)

Activity	OK
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 prevented 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?	
Do the temperature monitoring circuits fulfill the specifications of protective separation?	
Have the DRIVE-CLiQ topology rules been observed?	
Have the line-side and motor-side power cables been dimensioned and routed in accordance 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 configuration and the shield applied?	
Have the digital and analog signals been routed with separate cables?	

Activity	OK
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 accordingly to the supply voltages?	
For operation on non-grounded supply systems: Has the connection bracket for the interference 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) Combined fuses are recommended 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.

5.4 Creating a project offline in Startdrive

5.4.1 Creating a new project

5.4.1.1 Creating a new project (in the Portal view)

Precondition

You have opened the Startdrive in the TIA Portal (Page 65) 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.

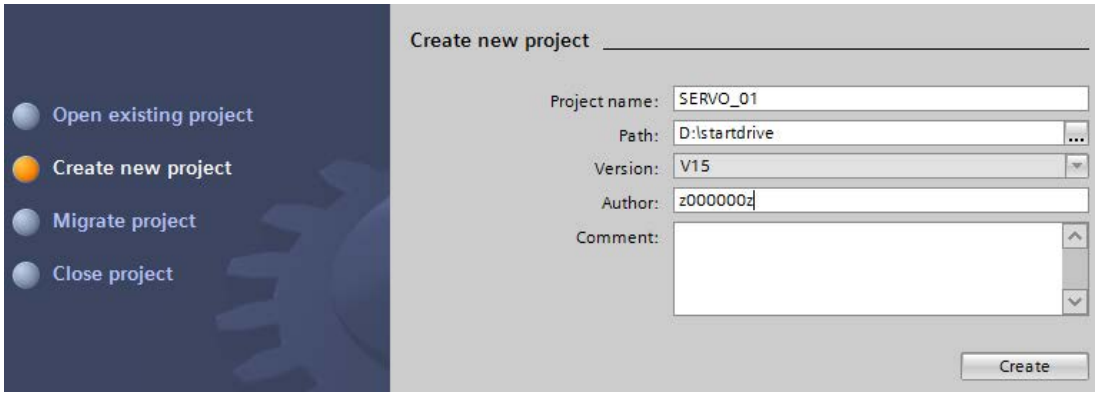


Figure 5-1 Entering project data

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.

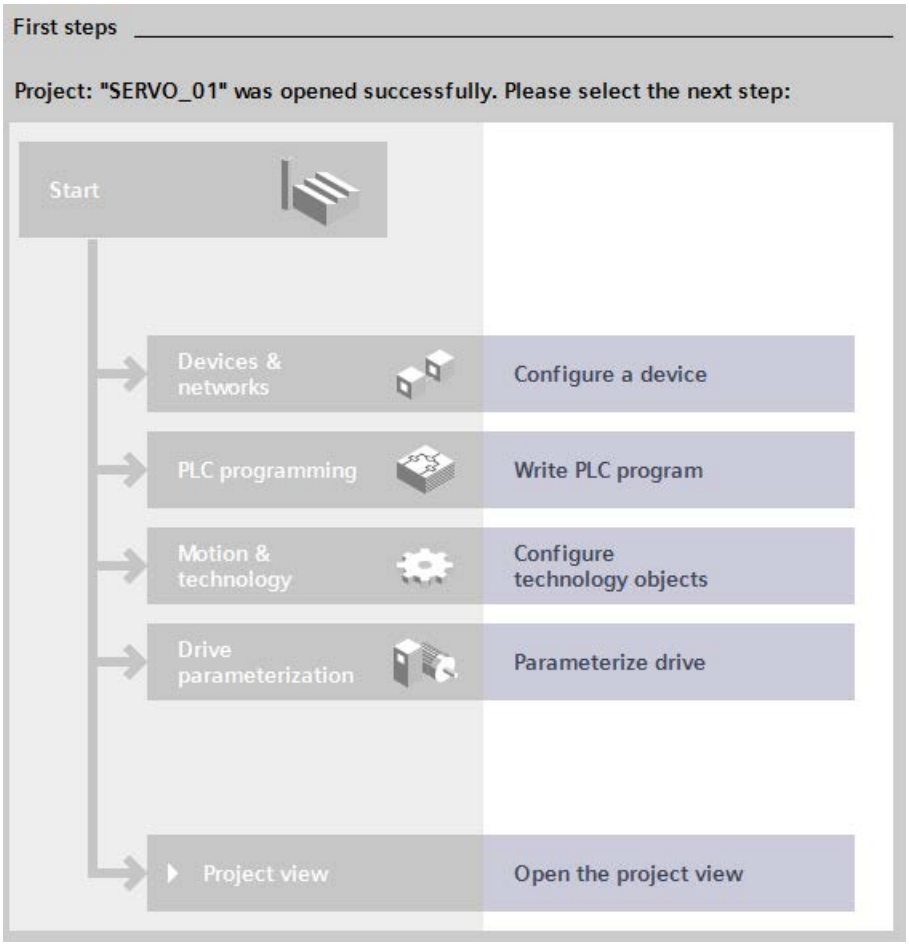


Figure 5-2 Getting Started

5.4.1.2 Creating a new project (in the Project view)

Precondition

You have opened the application Startdrive in the TIA Portal (Page 65) 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.

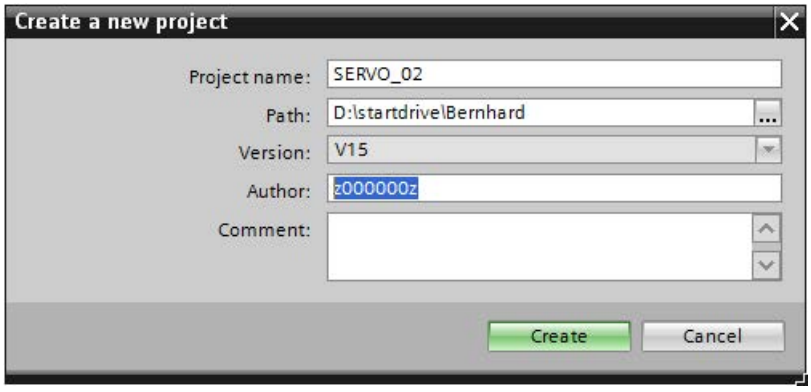


Figure 5-3 Creating a new project

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.

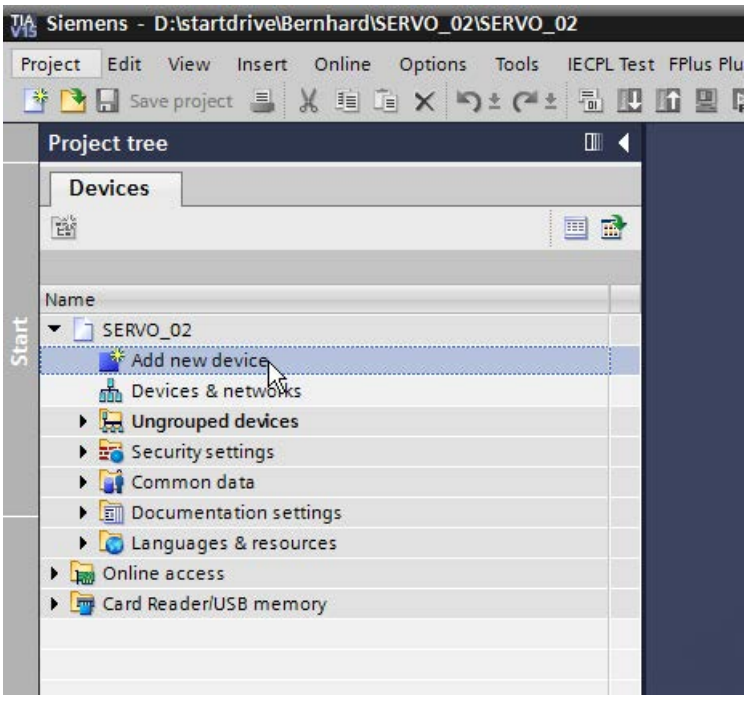


Figure 5-4 Project created (in the Project view)

You an now insert a new drive.

5.4.2 Inserting the drive unit offline

Requirement

You have created a project (Page 72) or have opened an existing project.

Inserting a drive unit via the project view

Proceed as follows to insert new drive units in the project view:

1. Double-click "Add new device" in the project navigation.
   The dialog with the same name opens.
2. Click "Drives" to display the drives available.
3. Select the desired S120 drive unit in the list.

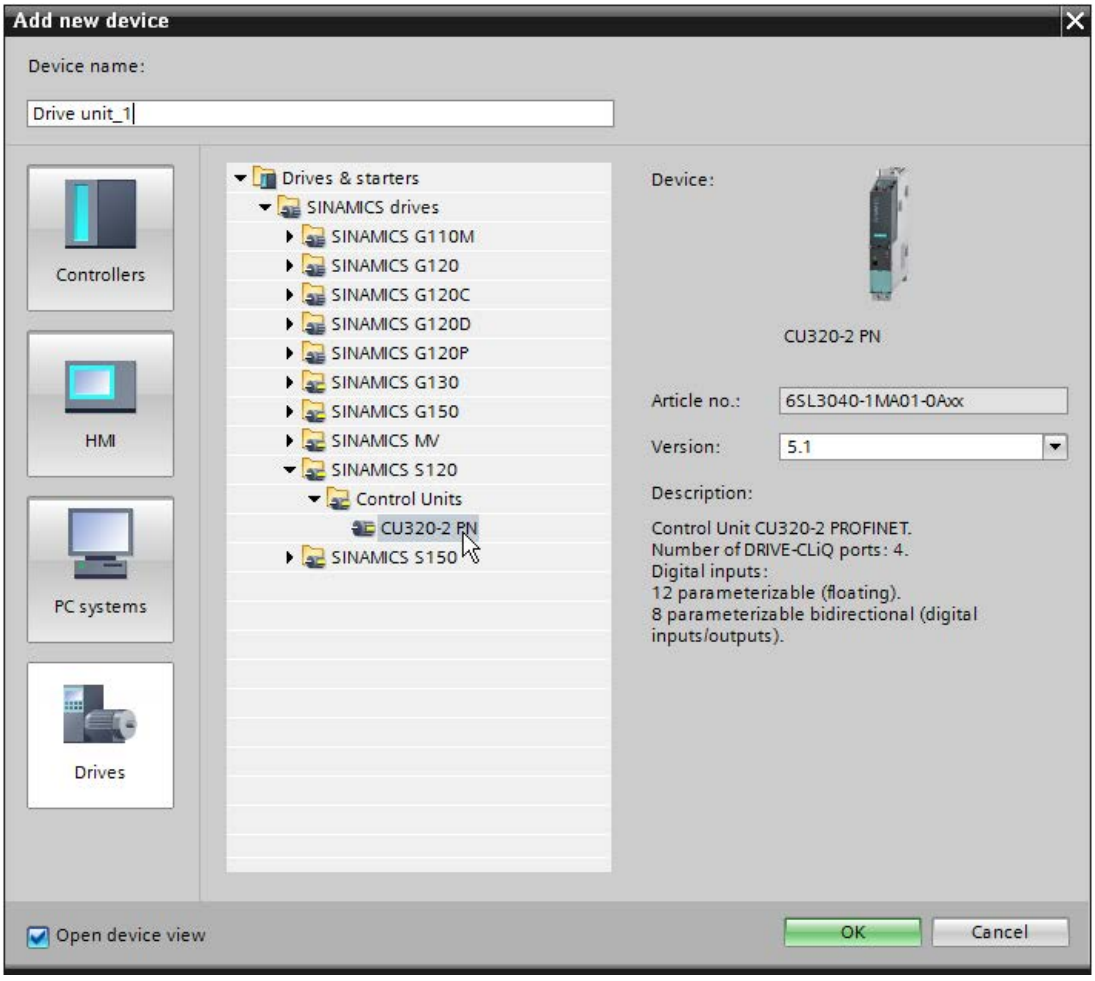


Figure 5-5 Dialog: Adding a new drive unit

Ensure that the version number indicated on the right in the dialog correlates with the version number of your memory card on the drive unit. If the version numbers do not match, it will not be possible to go online later. On creation, the current firmware version is always suggested. If required, you can change the version number via the "Version" drop-down list.

4. When required, enter a different device name in the input field at the top left, and then click "OK".

   If the "Open device view" checkbox is activated, the device view is opened automatically in Startdrive when creating the drive.

Result

The drive unit is inserted.

5.4.3 Inserting an infeed

Requirement

You have created a project and inserted a drive.

Note

Sequence

Generally, the infeed is inserted in the configuration immediately after the drive in the device view. In this case, the infeed is also automatically wired to the drive (X100).

You can also insert an infeed at a later point in time (for example, after the Motor Module). The infeed is then no longer automatically wired because the standard interface X100 intended for the infeed is already occupied (e.g. with the Motor Module).

In this case, the device configuration must be changed manually. You can wire the infeed manually to a free interface. You can also change the wiring of the drive object that is currently linked to X100 of the drive, to a different interface. X100 would then be free again and when the infeed is inserted, it is automatically linked to X100.

Inserting an infeed

You can add an infeed via the hardware catalog.

1. Open the "Line Modules" entry in the hardware catalog.

   Active Line Modules, Basic Line Modules and Smart Line Modules can be selected.

2. Select the unspecified infeed in the hardware catalog.

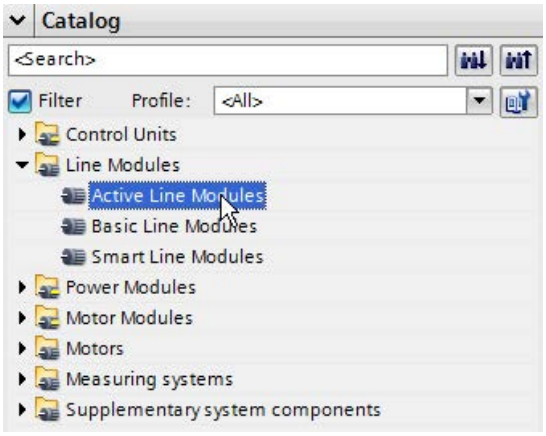


Figure 5-6 Selecting an infeed

3. Drag the unspecified infeed to the device view.

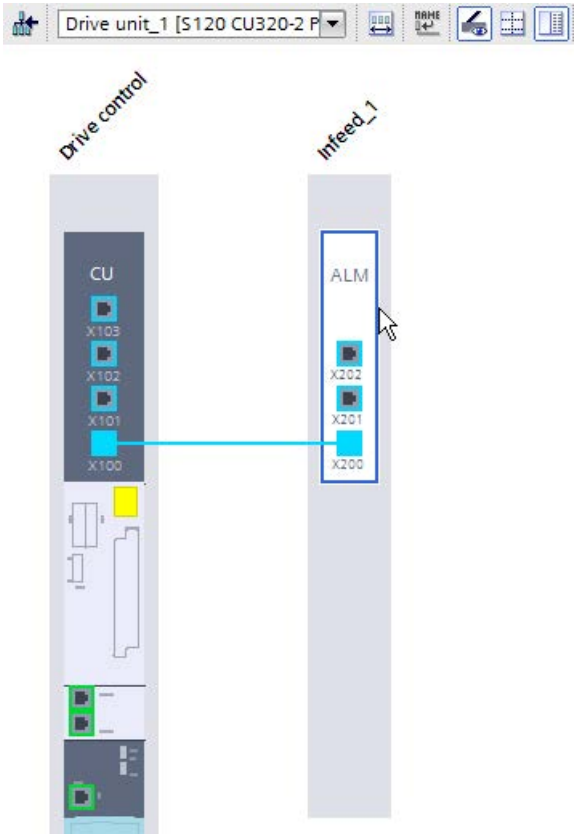


Figure 5-7 Infeed inserted

Generally, the DRIVE-CLiQ connection is automatically established. The unspecified infeed must now be specified in more detail.

4. Click the infeed in the DRIVE-CLiQ editor. Make sure that you click in the white area of the infeed.

5. In the secondary navigation of the inspector window, select "Line Module - Selection – ALM"
6. Select your infeed in the list based on the article number.

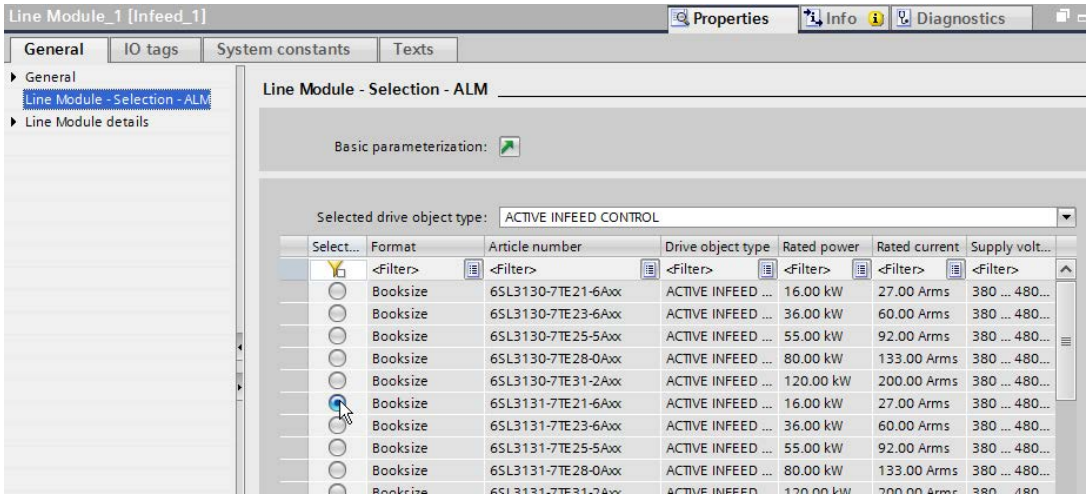


Figure 5-8 Line Module - Selection

The unspecified infeed is assigned the data of the selected infeed.

The white area turns dark gray.

The DRIVE-CLiQ-connection between the interfaces X100 and X200 is drawn as default setting.

Result:

The infeed unit is inserted and specified.

Connecting infeed units in parallel

To connect infeed units (Line Modules) in parallel with already added modules, 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 this infeed unit.
3. Drag a non-specified infeed unit into the DRIVE-CLiQ editor in the light gray area of the existing infeed unit.

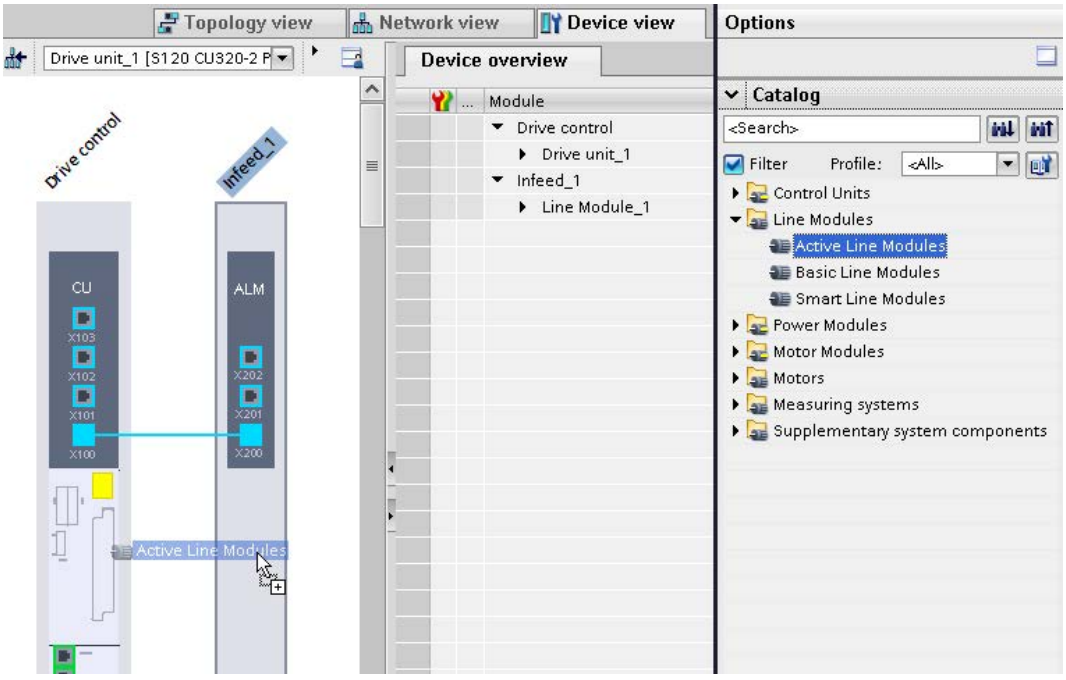


Figure 5-9 Connect the infeed in parallel

Then also specify the infeed unit connected in parallel.

You can connect further infeed units in parallel in the same manner.

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

For deactivation, the respective infeed unit must be disconnected from the network (using a contactor, for example). Motor supply cables must be opened.

5.4.4 Inserting a Motor Module or Power Module

When you create a Power Module or Motor Module, the "SERVO" drive object type (high dynamic drives) is active by default. However, if you are using the "VECTOR" drive object type (universal drives) in your hardware device configuration, you can change the type of the module in Startdrive. Many of the following settings depend on the set drive object type. Setting the correct type is therefore a prerequisite for all further settings during commissioning and further parameterization of the Power Module or Motor Module.

Note

Revision of the device configuration for a subsequent change of the drive object type

Make sure 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.

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.

Preconditions

- A project has been created.
- The Control Unit is inserted in the device configuration.
- An infeed is inserted.

  In case of doubt, you can also add the infeed at a later point in time. However, in this case, you must manually wire the "infeed" component with the other components.

  Note

  When you use Power Modules, it is usually possible to dispense with an infeed.

General

The procedure for creating and configuring a device in the device configuration of Startdrive is almost identical for Motor Modules and Power Modules. The drive device configuration requires at least one of these modules.

These module types differ mainly by their applications:

- Motor Module:
  Single-axis and multiple-axis applications
- Power Module:
  Single-axis applications

5.4.4.1 Inserting and specifying a Motor Module

Using the hardware catalog, you insert a Motor Module in an unspecified form.

1. Open "Motor Modules" in the hardware catalog.

   A selection can be made from the following Motor Modules:

   – Single Motor Modules
   – Double Motor Modules

2. Select the required, unspecified Motor Module in the device overview.

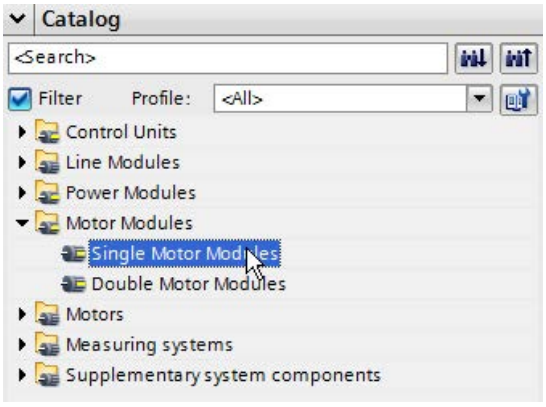


Figure 5-10 Motor Module selected

3. Drag the unspecified Motor Module into the device view.

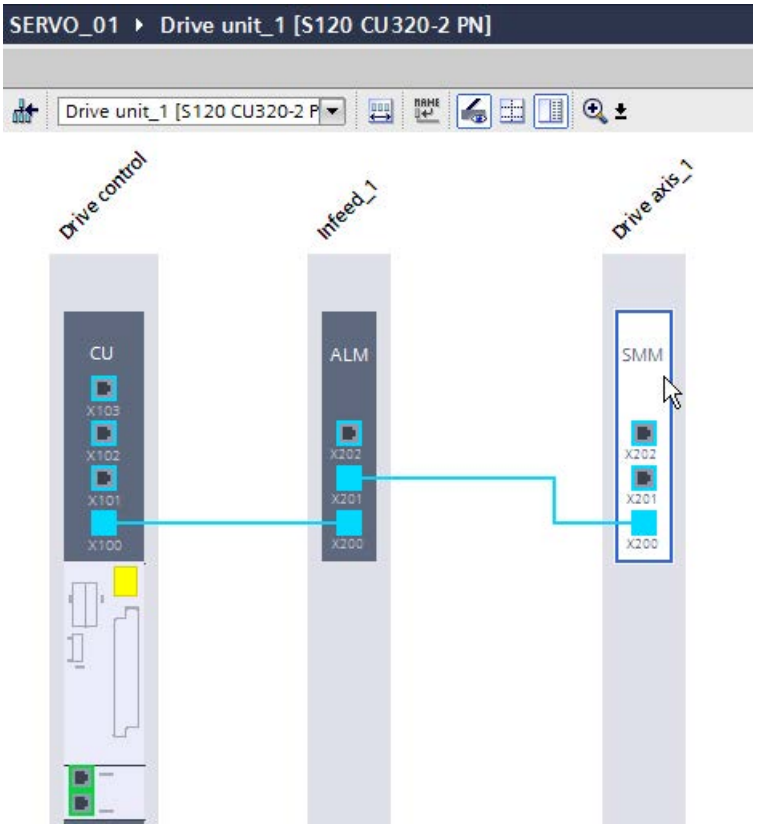


Figure 5-11 Motor Module inserted

The DRIVE-CLiQ connection is automatically established.

4. Click the Motor Module in the device view. Ensure that you click in the white area of the Motor Module.
5. Open the Inspector window if it has still not been opened or displayed.

6. In the secondary navigation of the inspector window, select "Motor Module - Selection - xxx".

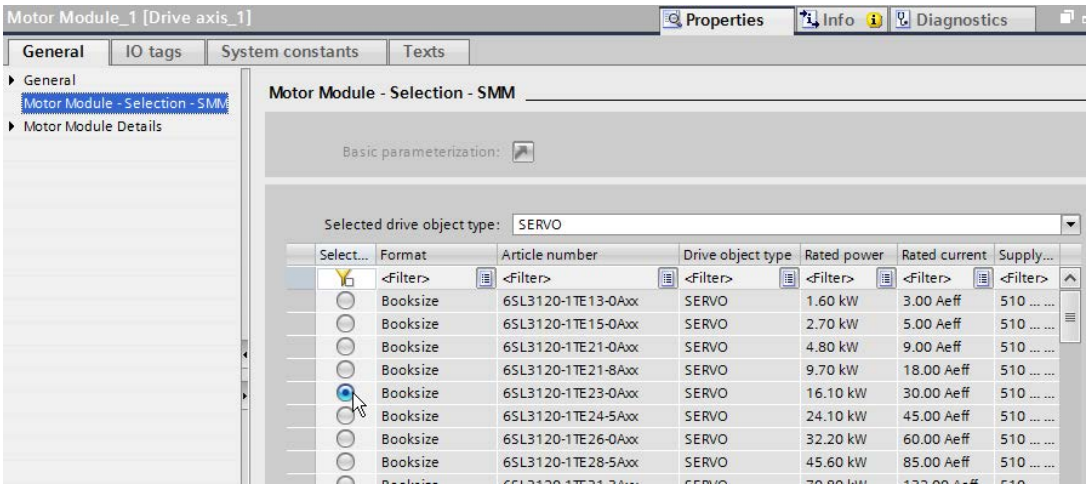


Figure 5-12 Motor Module specified

All Motor Modules for the "SERVO" drive object type (default setting for first call) are displayed in the list. If you want to use drive objects of type "VECTOR", you must change the display of the list.

7. If you are using drive objects of type "VECTOR", select the "VECTOR" option in the "Selected drive object type" drop-down list.

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

8. Click "Yes" to confirm the prompt.

   The list of Motor Modules is now refreshed. Only Motor Modules of type "VECTOR" are now available for selection. In the same way, the list can be changed back to modules of type "SERVO".

9. Select your Motor Module in the list based on the article number.

   The data of the selected Motor Module are assigned to the unspecified Motor Module. The white area turns dark gray.

Result

The Motor Module is inserted and specified.

5.4.4.2 Inserting and specifying a Power Module

You can add a Power Module in unspecified form via the hardware catalog.

1. Open the "Power Modules" item in the hardware catalog.

   The following Power Modules are available for selection:

   – AC Power Module

2. Select the required, unspecified Power Module in the device overview.

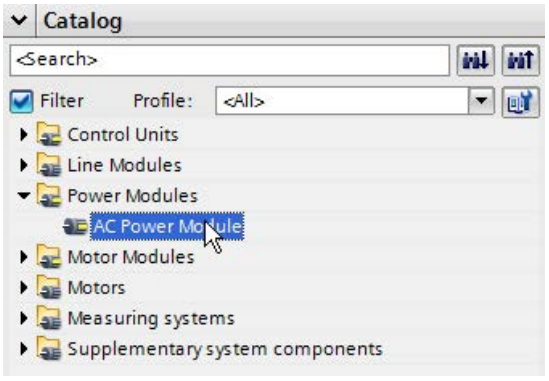


Figure 5-13 Power Module selected

3. Drag the unspecified Power Module into the device view.

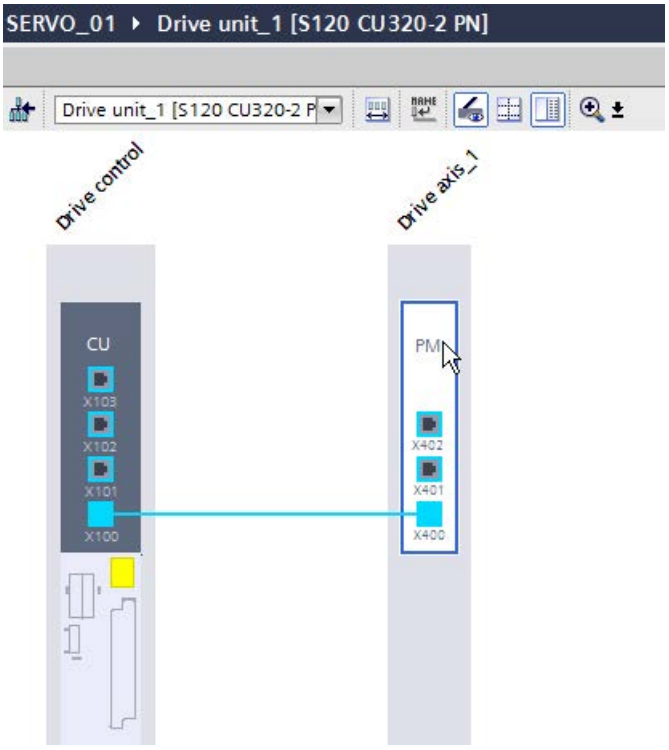


Figure 5-14 Power Module inserted

The DRIVE-CLiQ connection is automatically established.

4. In the device view, click the Power Module. Make sure that you click on the white area of the Power Module.
5. Open the Inspector window if it has still not been opened or displayed.
6. In the secondary navigation of the inspector window, select "Power Module - Selection - xx"

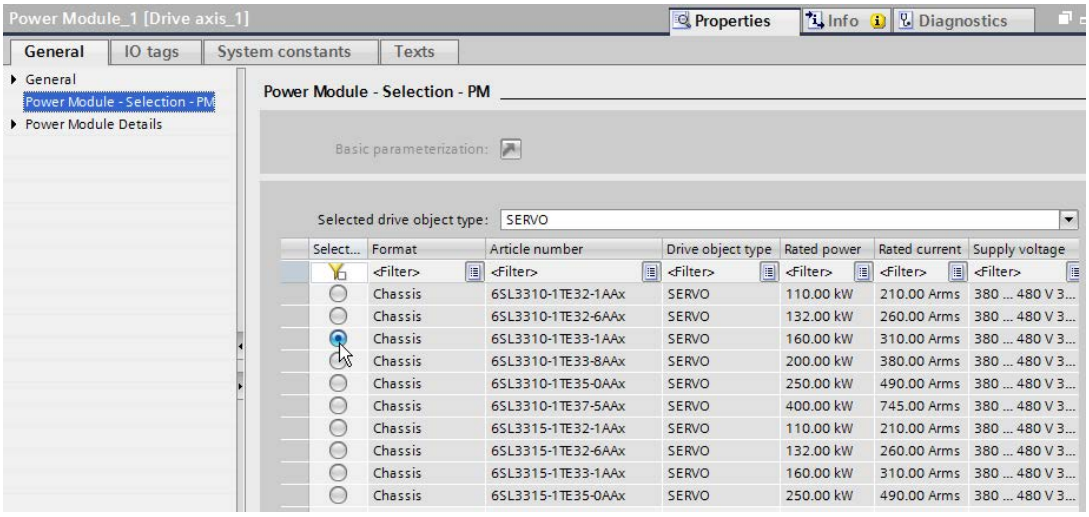


Figure 5-15 Power Module specified

All Power Modules for the "SERVO" drive object type (default setting for first call) are displayed in the list. If you want to use drive objects of type "VECTOR", you must change the display of the list.

7. If you are using drive objects of type "VECTOR", select the "VECTOR" option in the "Selected drive object type" drop-down list.

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

8. Click "Yes" to confirm the prompt.

   The list of Power Modules is now refreshed. Now only Power Modules of type "VECTOR" are available for selection. In the same way, the list can be changed back to modules of type "SERVO".

9. Select your Power Module in the list by its article number.

   The data of the selected Power Module are assigned to the unspecified Power Module. The white area turns dark gray.

Result

The Power Module has been inserted and specified.

5.4.4.3 Making detailed settings

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

- Motor Module settings/Power Module settings

  Allows the modification of the preallocated supply voltage.

  Indicates the standard for power settings of converter and motor.

- Motor Module additional data/Power Module additional

  Allows filter settings for modules of the VECTOR-type drive object.

The procedure for detail settings is identical for Motor Modules and Power Modules.

Procedure

Parallel connection using a Power Module as an example is explained below.

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:

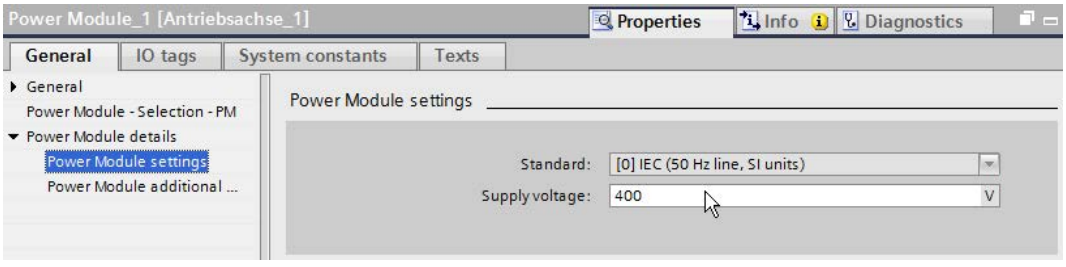


Figure 5-16 Example: Power Module Settings

3. Enter a new supply voltage as required.

4. If a drive object type is set for the "VECTOR" module, it is possible to set further 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.

   Additional display or entry fields are now overlaid in accordance with the respective filter selected.

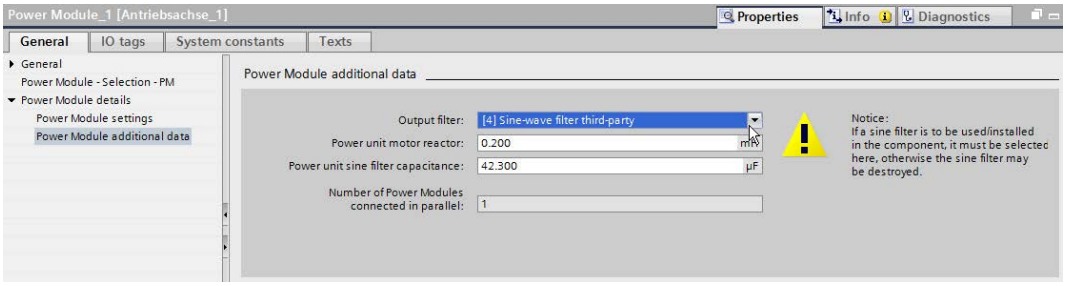


Figure 5-17 Example: Power Module Additional Data

Now record the respective detail settings for the selected filter.

Result

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

5.4.4.4 Connecting several modules in parallel

In Startdrive, several Power Modules or several Motor Modules respectively can be connected in parallel in vector control. During commissioning, power units connected in parallel are treated like a power unit on the line or motor side. With parallel connection, the parameter display for the actual values changes only slightly. Suitable "total values" are derived from the individual values of the power units.

Functionality of the parallel connection is identical for Motor Modules and Power Modules.

Connecting Motor Modules or Power Modules in parallel

Parallel connection using a Motor Module as an example is explained below.

1. Open "Motor Modules" in the hardware catalog.
2. If you have not yet inserted any Motor Module in the device configuration, drag the desired, non-specified Motor Module into the device view and specify it (see Chapter "Inserting and specifying a Motor Module (Page 81)").
3. Drag a non-specified Motor Module into the DRIVE-CLiQ editor into the light gray area of the existing Motor Module.

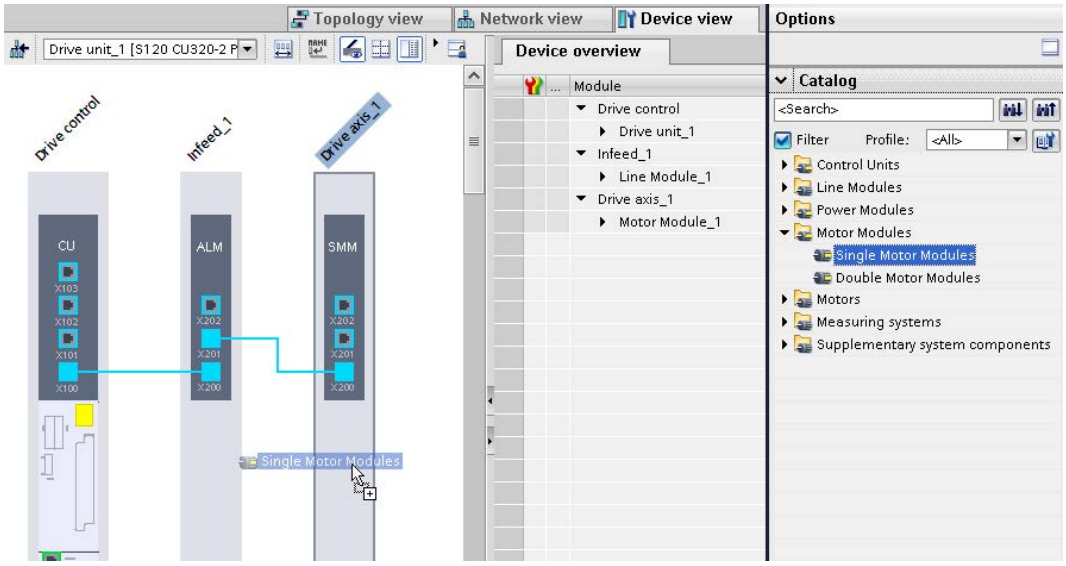


Figure 5-18 Connecting Motor Modules in parallel

Then also specify the Motor Module connected in parallel (refer to Chapter "Inserting and specifying a Motor Module (Page 81)").

Additional Motor Modules can be connected in parallel in the same manner.

Result

The Motor Module connected in parallel is inserted and specified. The white area turns gray. The Motor Modules are linked with one another via interfaces X401 and X400.

Note

If required, parallel connection can be activated or deactivated for individual Motor Modules via the inspector window (Motor Module_xx/drop-down list "Component activation").

For deactivation, the respective Motor Module must be disconnected from the network (using a contactor, for example). Motor supply cables must be opened.

5.4.4.5 Changing the drive object type

The drive object type can be changed in the Motor Modules drop-down list or in the Power Modules drop-down list as well as in the project information of the drive axis.

Requirement

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

Setting the drive object type in the Motor Modules or Power Modules list

1. If the device configuration is not active in your Startdrive project, call it via the project tree.
2. Select the desired drive axis in the device configuration.
3. Open the Inspector window if it has still not been opened or displayed.
4. In the secondary navigation of the inspector window, select "Motor Module - Selection - xx" or "Power Module - Selection - xxx".

   A list of relevant modules opens:

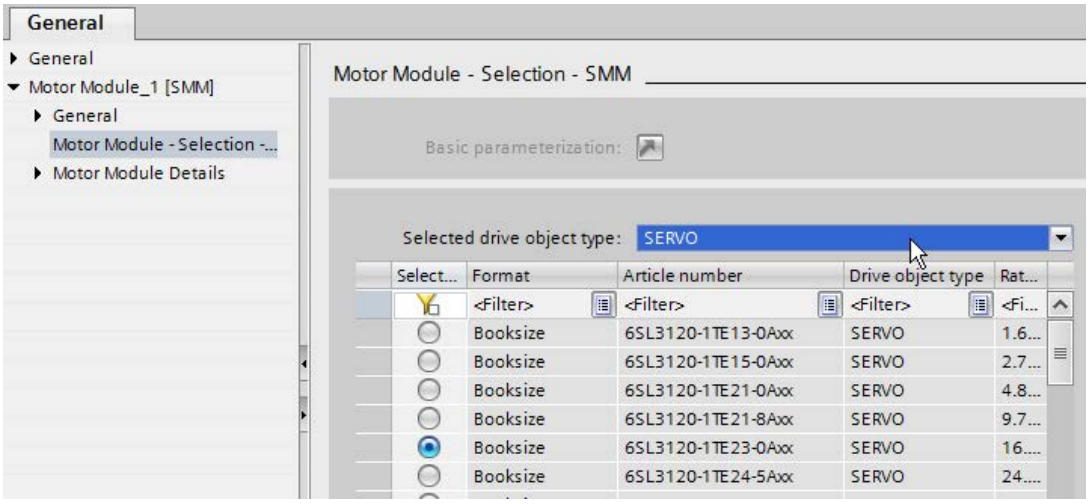


Figure 5-19 Changing the drive object type in the module list

5. Select the required type ("SERVO" or "VECTOR") in the "Selected drive object type" drop-down list.

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

6. Click "Yes" to confirm the prompt.

   The Motor/Power Module drop-down list is now refreshed. Only Motor/Power Modules of the selected type are now available for selection.

7. Save the changes in the project.

Setting the drive object type in the project information

1. If the device configuration is not active in your Startdrive project, call it via the project tree.
2. Select the desired drive axis in the device configuration.
3. Open the Inspector window if it has still not been opened or displayed.
4. In the secondary navigation of the Inspector window, select "General".

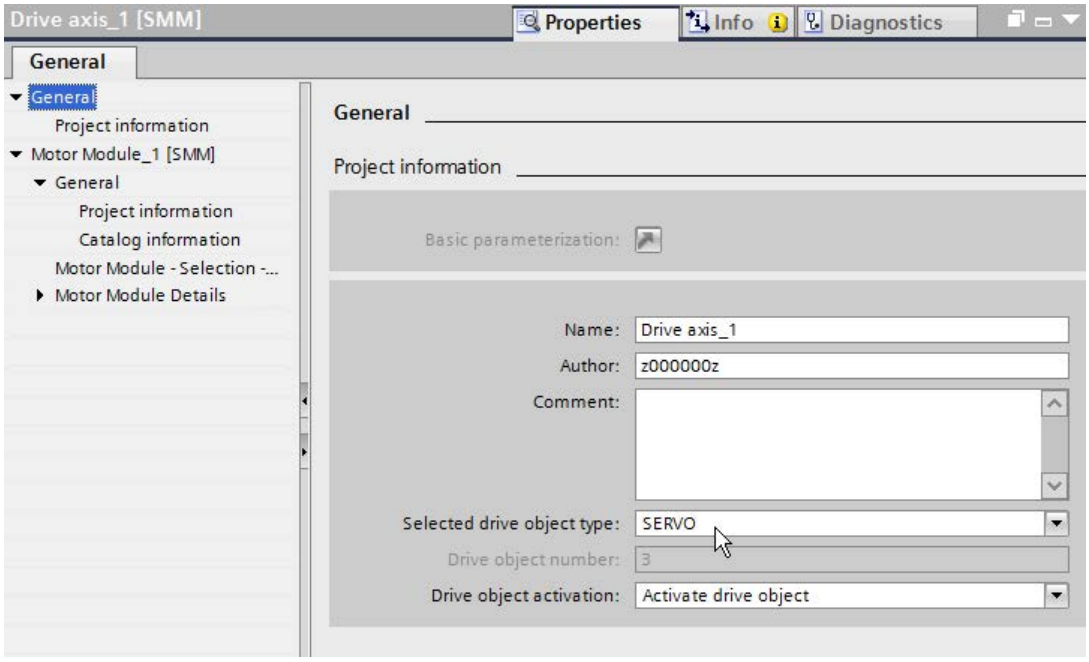


Figure 5-20 Changing the drive object type; Motor Module example

5. Select the desired type from the "Drive object type" drop-down list (generally "VECTOR" because "SERVO" is set per default via the Motor Module).

   A confirmation prompt appears as to whether you really want to change the drive object type.
6. Click "Yes" to confirm the prompt.

   The desired drive object type is set.
7. Save the changes in the project.

5.4.5 Inserting a motor

5.4.5.1 Inserting and specifying motors from the motor list

Inserting and specifying a motor

You can insert motors in unspecified form using the hardware catalog.

1. Open "Motors" in the hardware catalog.

   The following motor types are available for selection:

   – DRIVE-CLiQ motors
   – Induction motors
   – Synchronous motors
   – Reluctance motors
   – Motor data input (motor data must be entered manually, see Chapter "Inserting and specifying motors that are missing from the motor list (Page 94)").

2. Select the unspecified motor in the device overview.

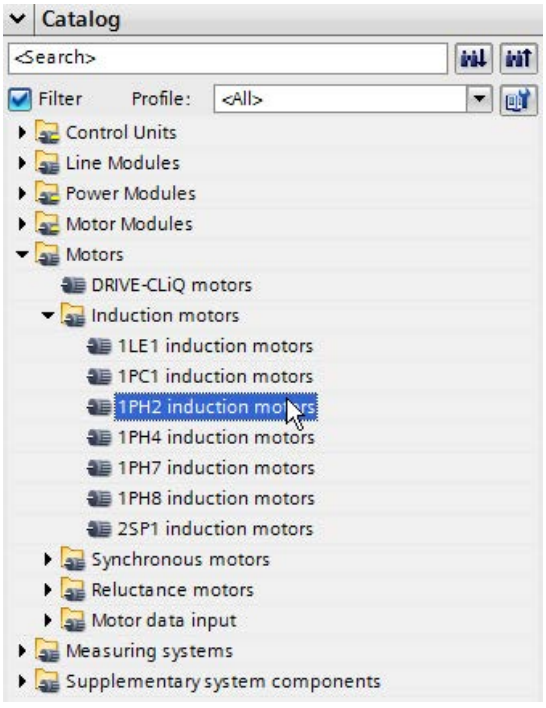


Figure 5-21 Motor selected

3. Drag the unspecified motor to the lower area of the Motor Module.

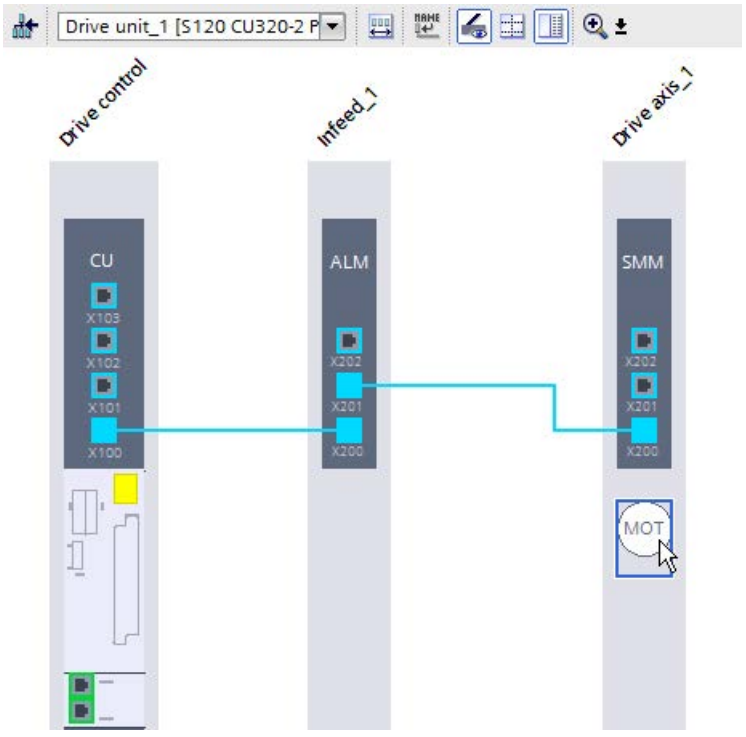


Figure 5-22 Motor inserted

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 secondary navigation of the Inspector window, select "Motor - Selection - ...".
7. Based on the article number, select a motor with the appropriate motor encoder from the list.

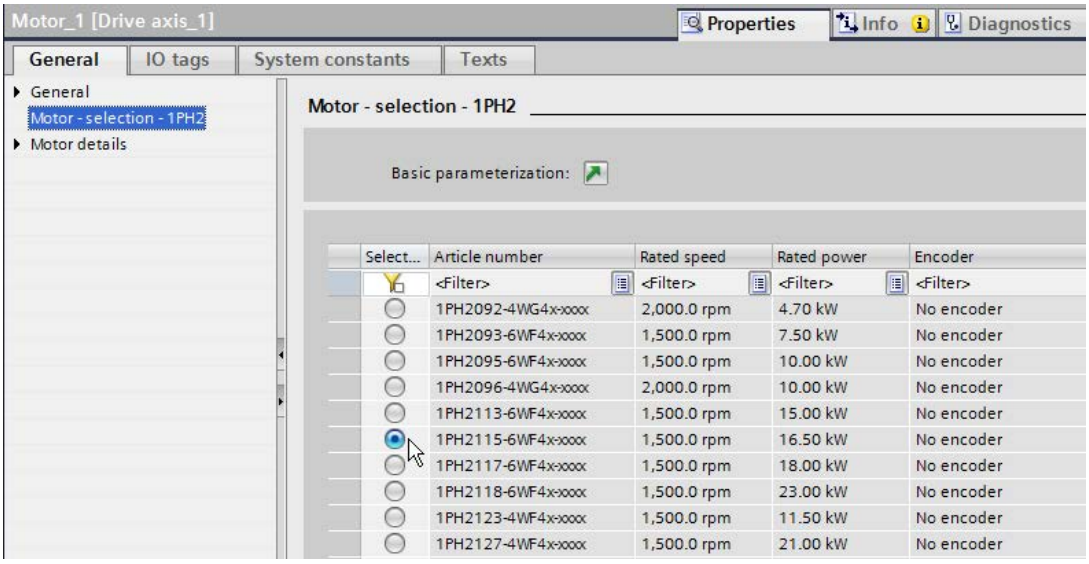


Figure 5-23 Motor specified

The data of the selected motor are assigned to the unspecified motor. The white area turns dark gray.

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.

Motor holding brake

The Inspector window also shows whether a motor holding brake has been parameterized for this motor. If you want to change this parameterization, click the link next to "Brake control" to call the masks for the brake control.

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

The mandatory fields for entering motor data manually are pink.

Inserting and specifying a motor via motor data entry

You can insert motors in unspecified form using the hardware catalog.

1. Open the "Motors" item in the hardware catalog and then the subitem "Motor data input".

   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 unspecified motor in the device overview.

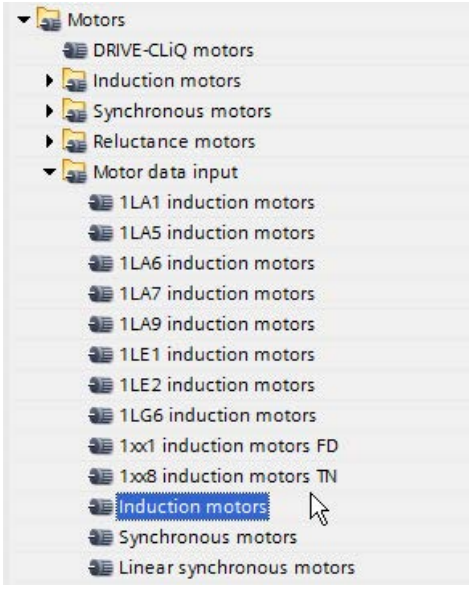


Figure 5-24 Motor selected

3. Drag the unspecified motor to the lower area of the Motor Module.

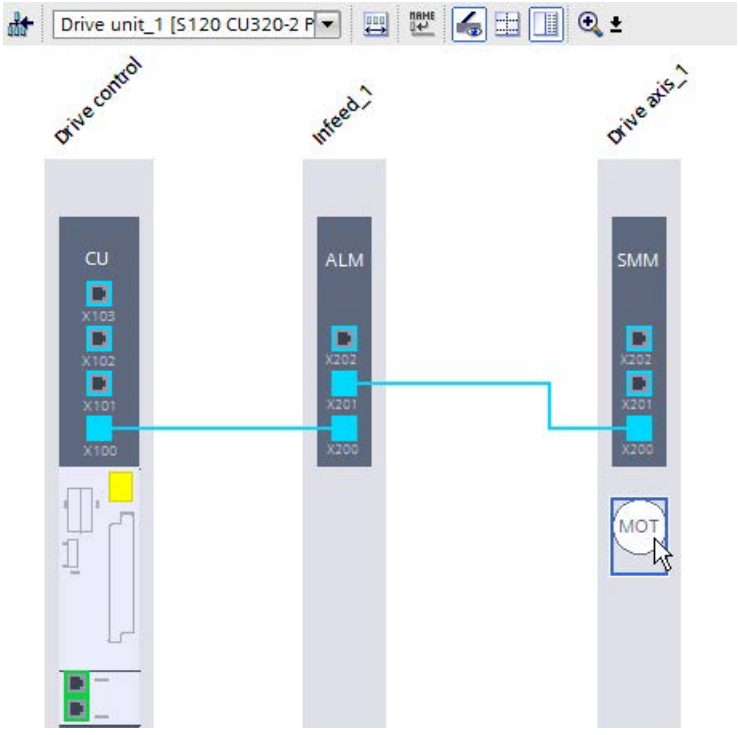


Figure 5-25 Motor inserted

4. Click the unspecified motor in the device view.
5. Open the Inspector window if it has still not been opened or displayed.
6. Select the "Motor details" item in the secondary navigation of the Inspector window.

   The "Motor details" input screen form is divided into the sections:

   – Rating plate values
   – Motor brake (see Chapter "Adding a standard motor (Page 91)")
   – Optional motor data (can also be activated)
   – Equivalent circuit diagram data (can also be activated)

7. If you also want to acquire the optional motor data and circuit diagram data, activate the "Activate the display of the ..." options in the "Rating plate values" screen form.

   The additionally activated subareas are displayed in the secondary navigation under "Motor details".

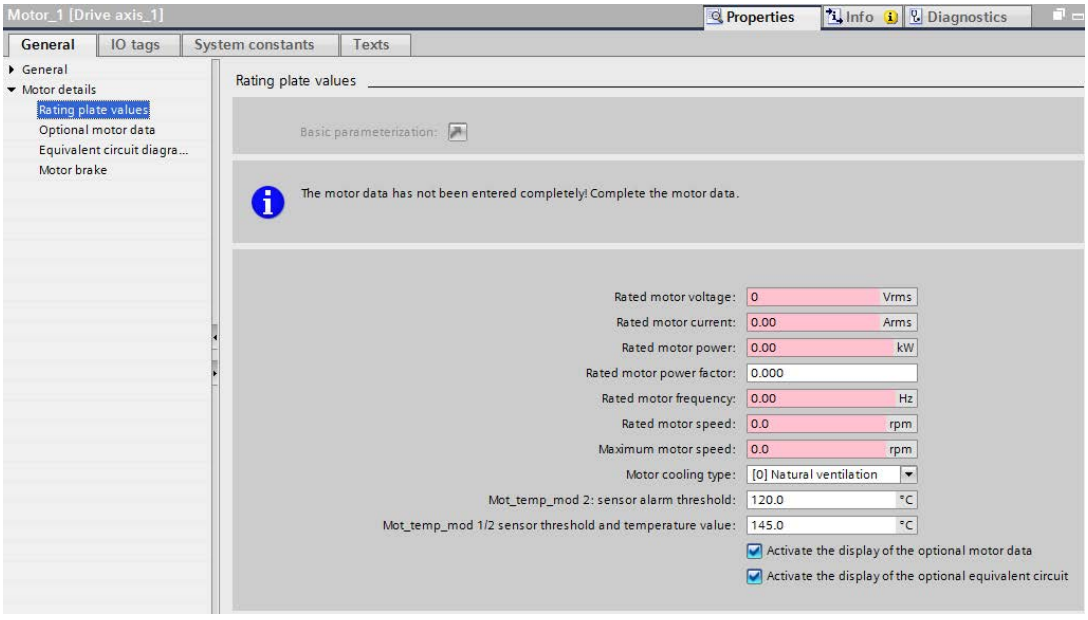


Figure 5-26 Motor specified

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

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

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.

5.4.6 Inserting measuring systems

5.4.6.1 Overview

Definition

For encoders, a distinction is made between two basic measuring system types:

- **Motor encoders** are normally mounted on the motor shaft so that motor motion (angle of rotation, rotor position, etc.) can be directly measured. Motor encoders supply the speed actual value that is incorporated in the closed-loop control (closed-loop speed and current control), so that for fast controllers, the actual speed value must also be supplied fast enough. 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 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 measuring systems (encoder)

The following encoder types are supported in Startdrive:

- DRIVE-CLiQ encoder

  These encoders are parameterized when downloading - and after an upload, are correctly displayed.

- SIN/COS encoders

  Incremental encoders that supply a sinusoidal/cosinusoidal type signal are also available with SSI protocol.

- HTL/TTL encoders

  Incremental encoders, which supply a square wave pattern, are also available with SSI protocol.

- Resolvers

  Rotary position encoders.

- EnDat 2.1

  Absolute encoders, which are controlled via the ENDAT 2.1 protocol.

- SSI encoder

  Absolute encoders, which are controlled via the SSI protocol.

- Distance-coded zero marks
  Zero marks are used when homing is not possible or accepted.

Note

Encoders from the hardware catalog

All of the encoders, which are listed in the hardware catalog, no longer have to be parameterized, as they are already preassigned the appropriate settings.

For user-defined encoders (third-party encoders), the parameters must be entered as subsequently described.

5.4.6.2 Inserting an encoder

Requirement

- A project has been created.
- The Control Unit is inserted in the device configuration.
- An infeed is inserted.

  In case of doubt, you can also add the infeed at a later point in time. However, in this case, you must manually wire the "infeed" component with the other components.

- A Motor Module is inserted.
- A motor is inserted (optional).

Utilizing this procedure, you insert the encoder after the motor (see Chapter "Inserting and specifying motors from the motor list (Page 91)").

Inserting and specifying an encoder

Using the hardware catalog, you insert an encoder in an unspecified form.

1. Open "Measuring systems" in the hardware catalog.

   One of the following measuring systems can be selected:

   – DRIVE-CLiQ encoder
   – SIN/COS encoders
   – SSI encoder
   – SIN/COS + SSI encoder
   – HTL/TTL encoder
   – HTL/TTL + SSI encoder
   – EnDat 2.1 encoder
   – Resolver encoder

2. Select the unspecified encoder in the device overview.

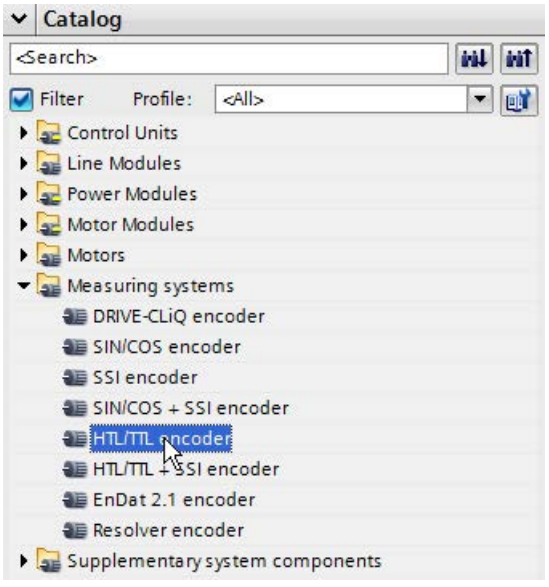


Figure 5-27 Encoder selected

3. Drag the unspecified encoder to the lower area of the Motor Module.

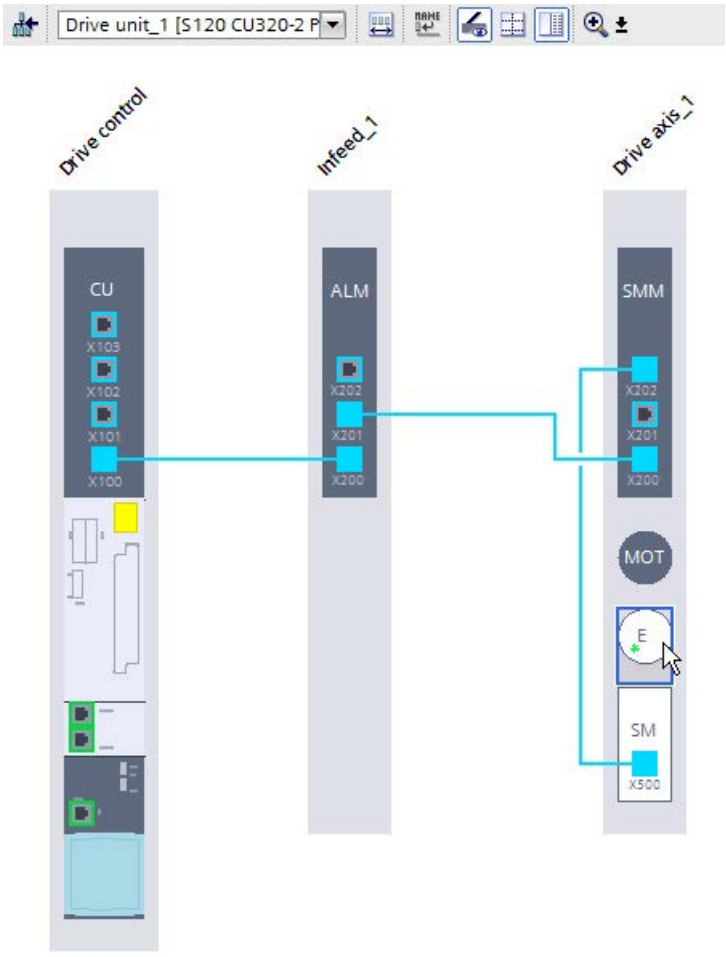


Figure 5-28 Encoder inserted

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 still not been opened or displayed.

6. In the secondary navigation of the Inspector window, select "Measuring system - Selection - ...".

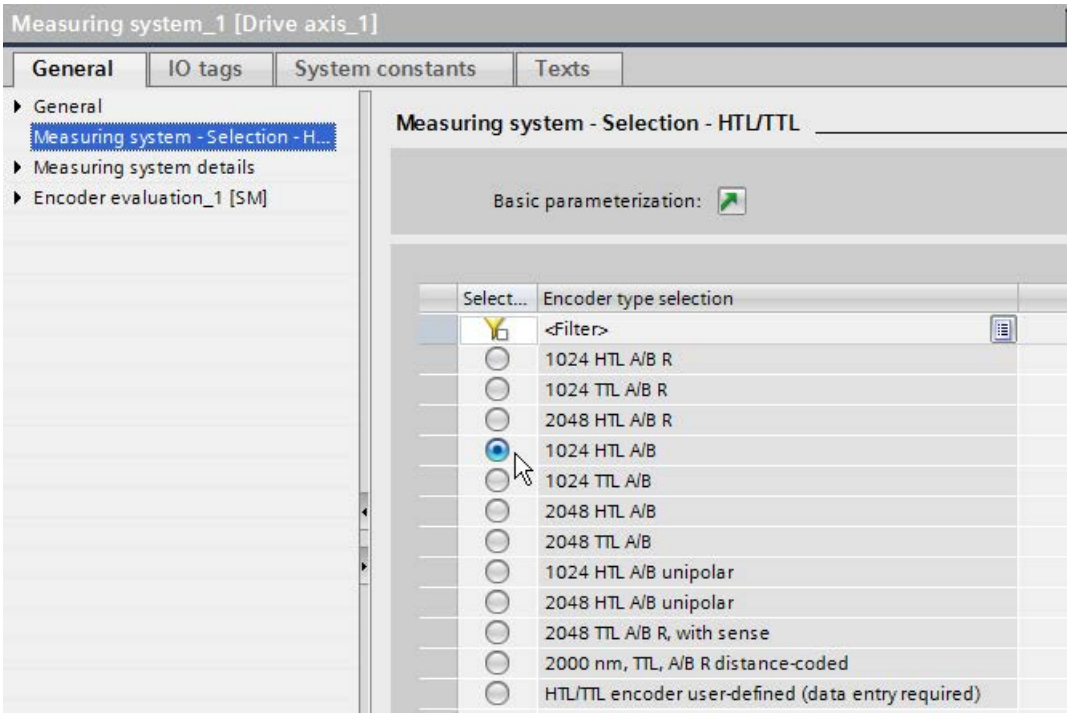


Figure 5-29 Encoder specified

7. Select the required encoder in the "Measuring system - 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 inserted

Result

The encoder is inserted and specified.

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.

5.4.7 Inserting additional system components

Various system components can be inserted (additionally) in the device configuration of your drive:

- CBE20 Communication Board
- Terminal Module
- Terminal Board
- VSM10 Voltage Sensing Module

Since the handling of these system components differs when inserting, the insertion procedure is described separately in the following for each system component.

5.4.7.1 Adding a CBE20 Communication Board

Requirement

- A project has been created.
- A Control Unit is contained in the device configuration.
- No Terminal Board TB30 is contained in the device configuration.

  TB30 and CBE20 cannot be created simultaneously in the device configuration.

Inserting the CBE20 in the Control Unit

The CBE20 is a versatile Communication Board that can be used in Startdrive with the "SINAMICS-Link" communication profile.

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

   The CBE20 is inserted in the drive.

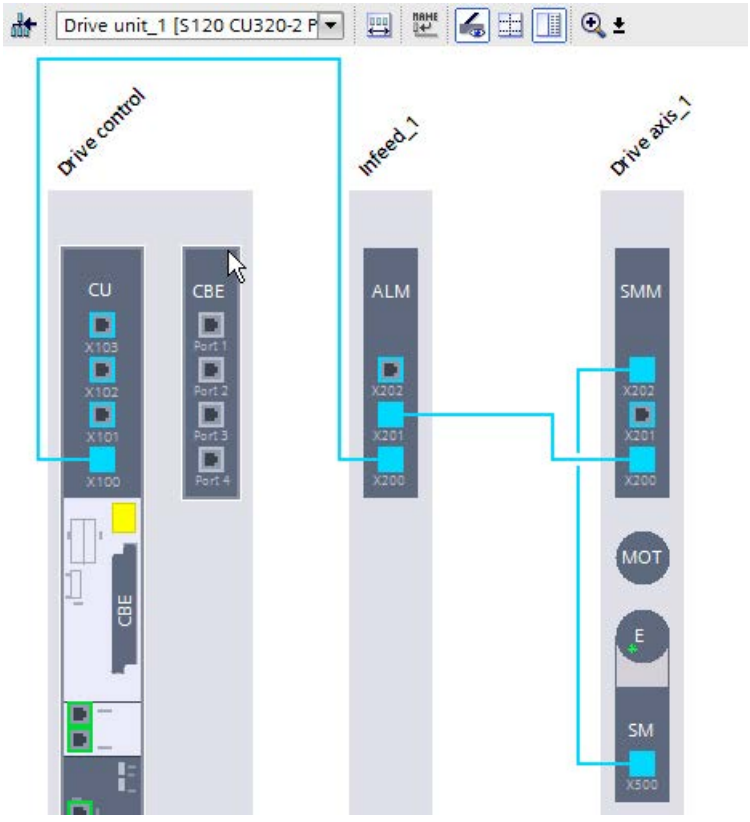


Figure 5-30 CBE20 Communication Board

The CBE20 does not have to be specified any further.

5.4.7.2 Adding a Terminal Module

Requirement

- A project has been created.
- A Control Unit is contained in the device configuration.

Adding Terminal Modules

With Terminal Modules, you can expand the interfaces of the Control Unit. They are connected to the Control Unit via DRIVE-CLiQ. Terminal Modules do not have to be specified any further.

1. Open "Additional system components > Terminal Modules" in the hardware catalog.

   The following Terminal Modules can be selected:

   – Terminal Module TM15
   – Terminal Module TM31
   – Terminal Module TM41
   – TM120 Terminal Module
   – TM150 Terminal Module

2. Select the Terminal Module in the device overview.

3. Drag the Terminal Module to the device view.

   The DRIVE-CLiQ connections are drawn automatically.

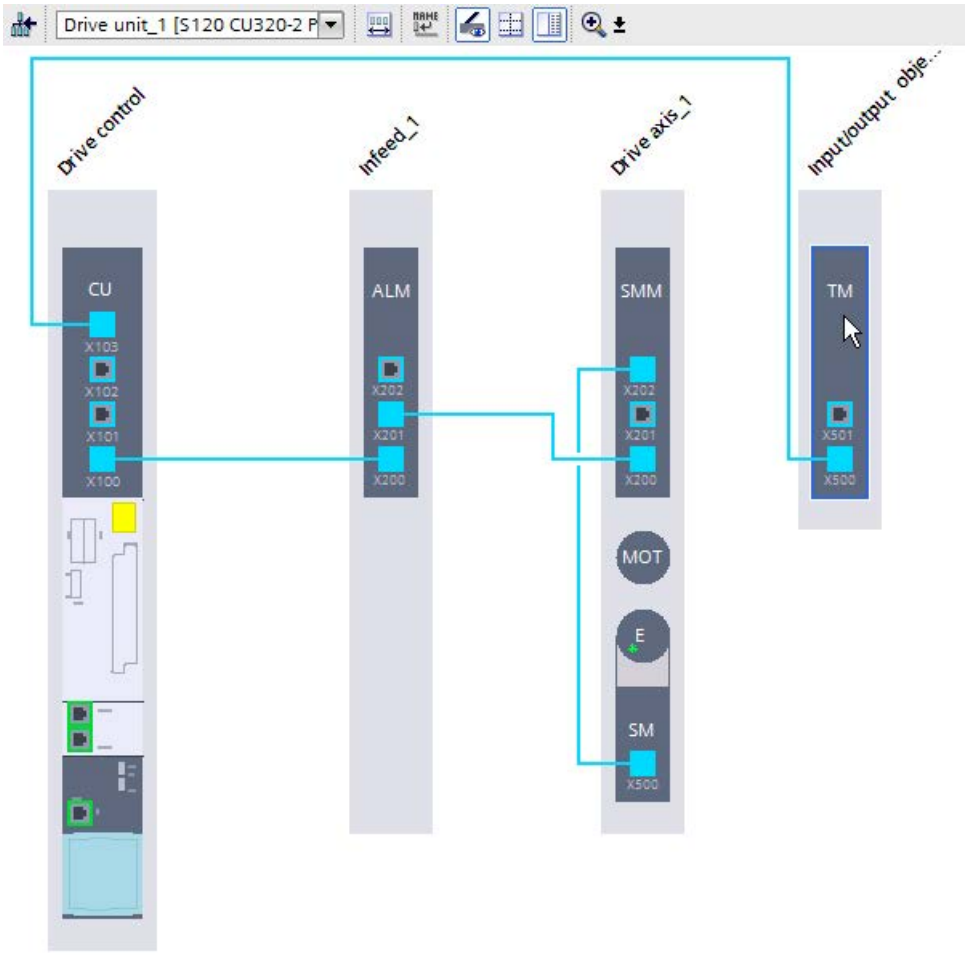


Figure 5-31 Terminal Module

5.4.7.3 Adding a Terminal Board

Requirement

- A project has been created.
- A Control Unit is contained 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.

Adding a Terminal Board

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. The Terminal Board does not have to be specified any further.

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.

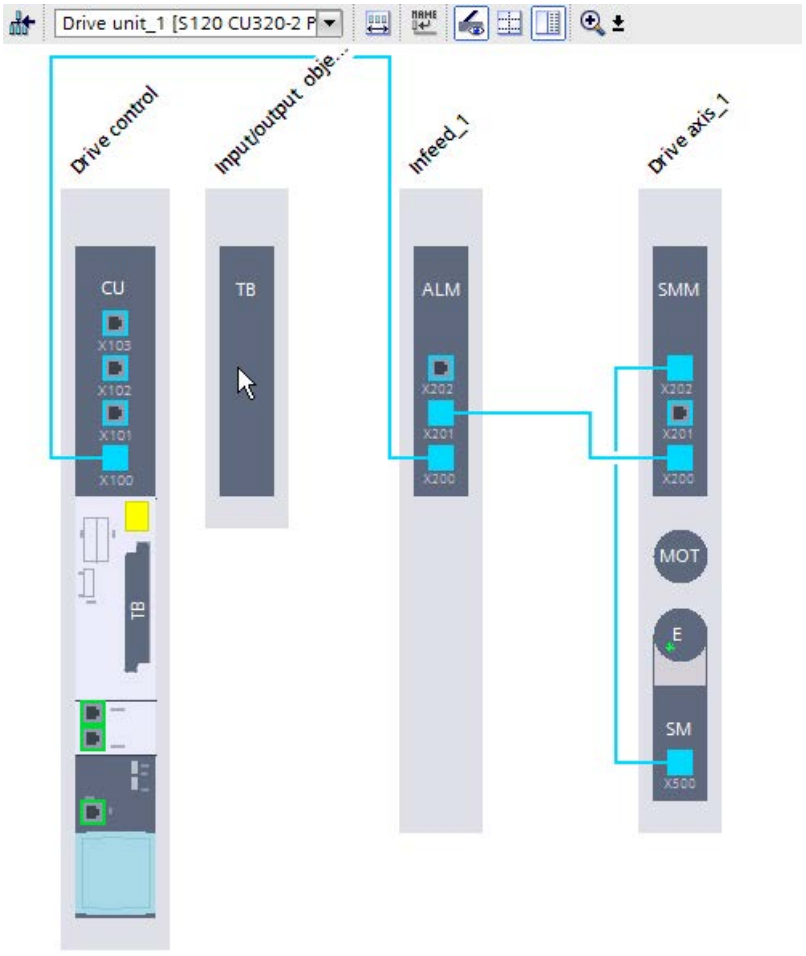


Figure 5-32 Terminal Board

5.4.7.4 Adding the VSM10 Voltage Sensing Module

Voltage Sensing Modules (VSM) can be used for 2 different drive objects:

- Infeed unit

  Is used for voltage measurement, e.g. for the "mains transformer" function.

  A 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 of the VECTOR type

  Required for the functions "synchronize" and "flying restart".

Note

Voltage Sensing Modules are inserted automatically with Active Line Modules of chassis format.

Requirement

- A project has been created.
- The Control Unit is inserted in the device configuration.
- An infeed is available.

  Alternatively: A Motor Module of drive object type VECTOR is available.

Inserting a VSM in a drive object

1. Open "Supplementary system components > Voltage Sensing Modules" in the hardware catalog.
2. Select the "VSM10 Voltage Sensing Module" in the device overview.
3. Drag the "Voltage Sensing Module VSM10" into 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. The required DRIVE-CLiQ connections are drawn automatically.

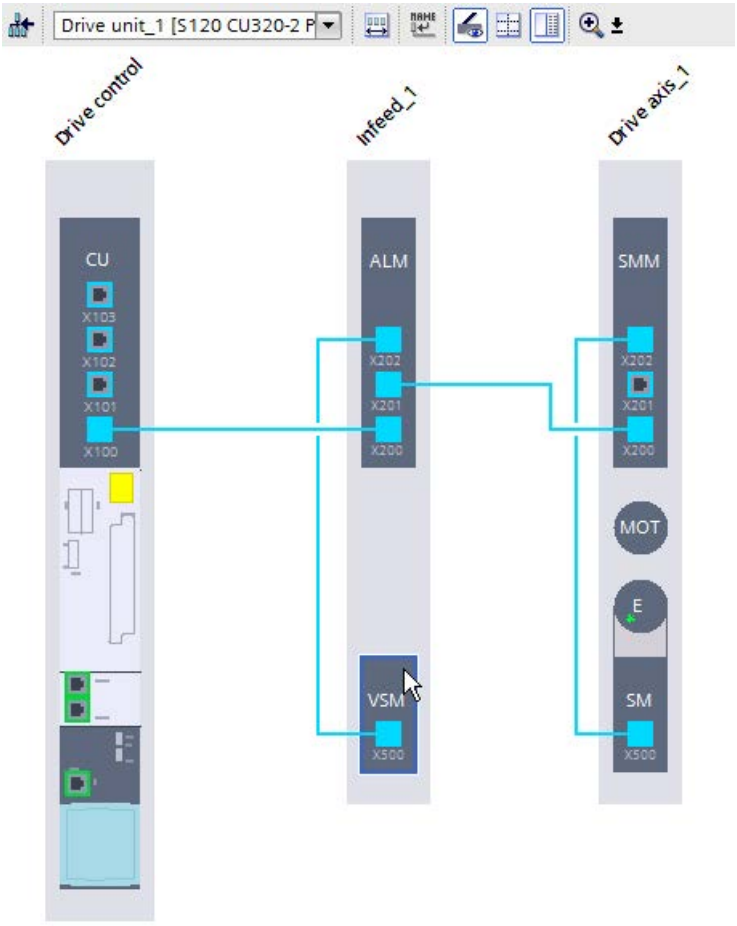


Figure 5-33 Example: Voltage Sensing Module VSM10 inserted in infeed unit

The VSM10 does not have to be specified any further.

Operation of several VSMs per Line Module

You can add a total of up to three VSMs to each Line Module using drag and drop.

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. Otherwise the computing power of the Control Unit may be adversely affected.

5.5 Establishing an online connection to the drive unit

5.5.1 Overview

Interfaces for the online connection

2 interfaces are available for CU320-2 PN Control Units, via which you can go online with the drive:

- Ethernet commissioning interface X127
- PROFINET interface X150

The example given in this Getting Started section relates to interface X127.

First you connect your PC to the appropriate Control Unit interface.

IP addresses of the CU (hardware)

For X127, an IP address and a subnet mask have already been assigned on the Control Unit in the factory:

- IP address: 169.254.11.22
- Subnet mask: 255.255.0.0

IP addresses in the project

A CU320-2 PN is created with the following IP addresses in a project in TIA Portal:

The addresses correspond to the addresses that have already been assigned in the drive.

- IP address: 169.254.11.22
- Subnet mask: 255.255.0.0

The PROFINET addresses are in the range of the PROFINET subnet of a SIMATIC S7 controller so that you can network the drive with a controller without having to adapt the subnet mask and the IP address.

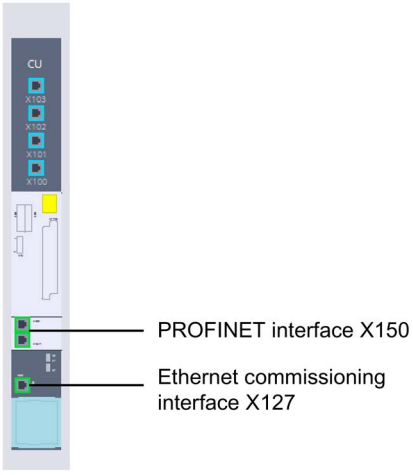


Figure 5-34 CU320-2 PN interfaces

Selecting the preferred PG/PC interface

If you prefer to use a specific network interface of your PG/PC to establish an online connection, you can preset this interface.

1. Select the "Options > Settings" menu.

   The settings of the TIA Portal are displayed.

2. Select the "Online and diagnostics" entry in the area navigation.
3. In the "Preset connection path for online access" area, specify the type of the PG/PC interface as well as the interface itself.
4. Activate the "Use preset connection path for online access" option.

5.5.2 Using an online connection via the Ethernet interface

Requirement

You have created a project in Startdrive and inserted a CU320-2 PN. The devices are connected via the Ethernet commissioning interface X127.

As the Ethernet commissioning interface has already been assigned an IP address, you can go online directly.

If you are not using a new 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.

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.

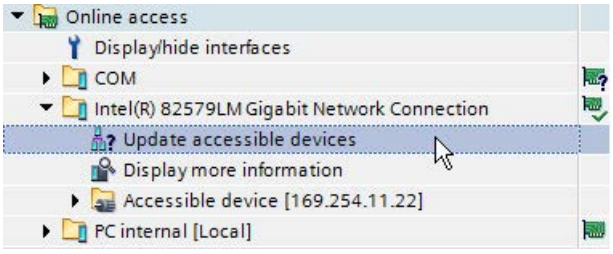


Figure 5-35 Online access

Going online

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

   The "Go online" dialog opens.

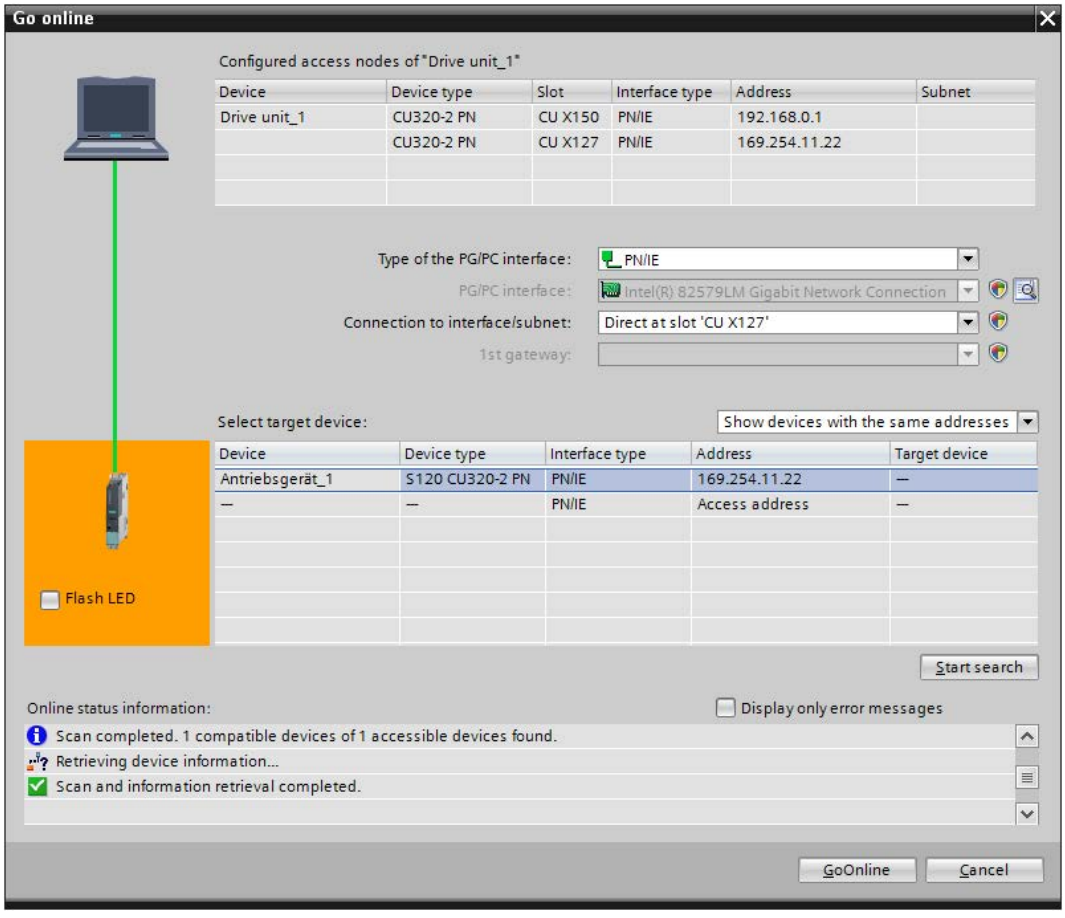


Figure 5-36 Go online

3. If a correctly configured interface has still not been set, then select "Type of the PG/PC interface" in the drop-down list.
4. If no interface has yet been preset, select the "PG/PC interface" for your PC in the drop-down list.
5. Select the required "Connection to interface/subnet" from the drop-down list.
   For Ethernet/IE, this is X127 of the CU320-2 PN.
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 nodes
   - Displaying accessible nodes

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.
8. Select your drive unit from the table.
9. To establish an online connection to the drive unit, click "Connect".

Result

An online connection has been established between the PG/PC and the drive unit. The settings are used automatically the next time you go online and the "Go online" dialog is no longer displayed.

5.6 Alternatively: Creating a project with a device configuration derived from the hardware

5.6.1 Deriving the hardware device configuration

Requirement

- A project has been created.
- The Control Unit (S120 drive) is inserted in the device configuration.
- There is a connection to the drive and it has been switched on.
- Optional: An online connection to the target device has been established.

Performing device configuration identification

1. Select the required drive unit in the project tree or in the device configuration.
2. Call the "Device configuration detection" shortcut menu.
   The "Go online" dialog is displayed if an online connection to the target device has not been established yet. An online connection is required for the automatic configuration.
3. If there is no online connection yet, establish an online connection (see Section "Establishing an online connection to the drive unit (Page 110)").

Result

The topology of the drive unit is read out. Existing DRIVE-CLiQ interconnections are transferred directly from the actual topology of the drive unit.
The "Device configuration detection" dialog opens.

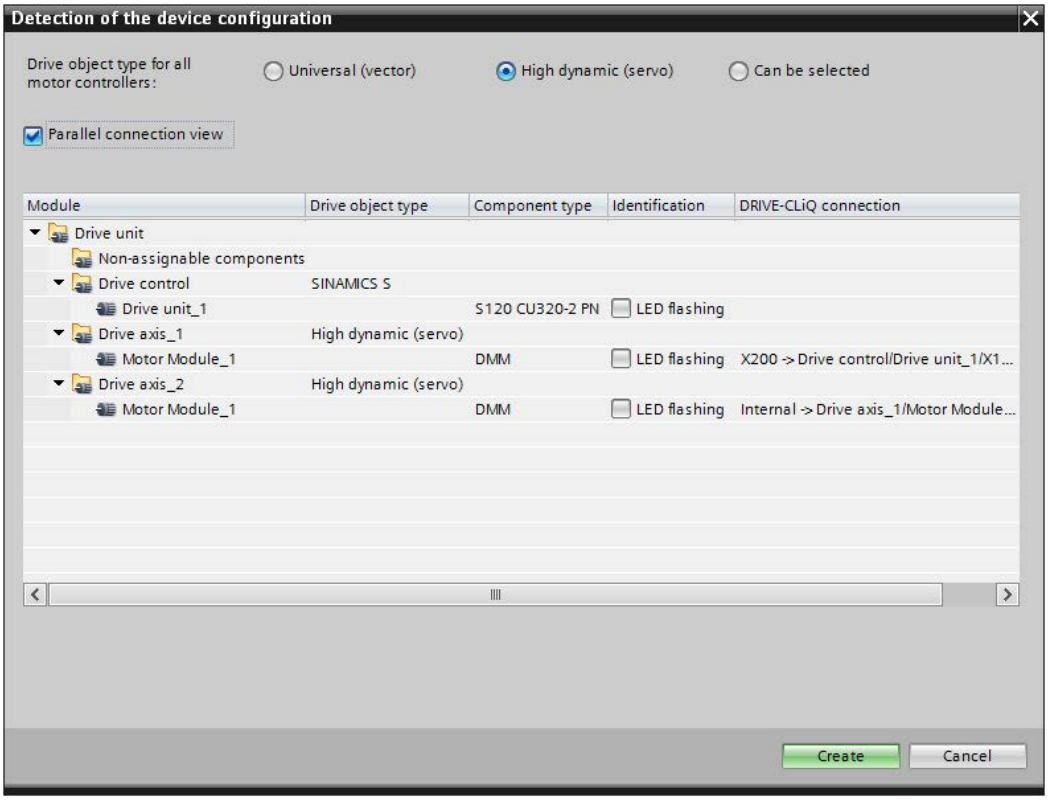


Figure 5-37 Example: Device configuration detection - all components assigned

All components found in the actual topology of the drive unit are displayed in an overview (for details, see Section "Device configuration detection (Page 40)"). The list shows all components which could be assigned to a main component (e.g. infeed unit).

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.

Selecting the drive object type of the motor controls

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

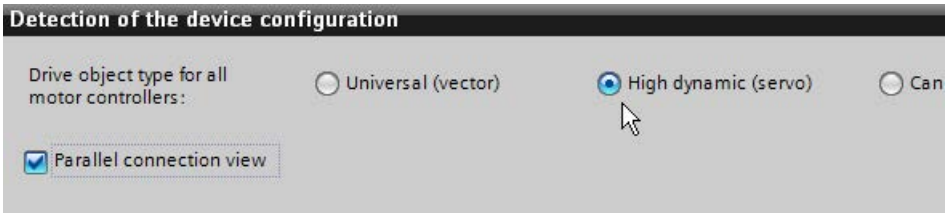


Figure 5-38 Default: Drive object type

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) = VECTOR drive object type
   - High dynamic (servo) = SERVO drive object type
   - Can be selected = drive object type for each detected drive axis in the table can be assigned individually
2. If you have selected the "Can be selected" option, select the required drive object type separately for each drive axis in the column of the same name via a drop-down list.

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 can then be selected.
If the "Create" button cannot be selected (i.e. is grayed out), the topology of the components still has to be adapted:

Changing the assignment of components

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 and drop.

Assigning a non-assigned component to a main component

1. Select a component which has not yet been assigned in the "Non-assignable components" folder.
2. 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 a component

1. Select the components which are to be deleted.
2. Call the "Delete" shortcut menu.
   The component is deleted.

Note

All components in the "Non-assignable components" folder prevent the creation of this read-out actual topology of the drive unit in the device configuration.

If individual components which have not yet been assigned cannot be assigned to a main component, delete the corresponding list entries in the "Non-assignable components" folder, in order that the remaining components can be adopted in the device configuration.

Renaming the component

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.

1. Activate the "Parallel connection view" option.

   The "Connect in parallel at" shortcut menu is now available (see Step 2).
2. The following options are available for connecting components in parallel:
   - Drag and drop
     Drag the components that can be connected in parallel using drag and drop to connect them in parallel.
   - Shortcut menu:
     Right-click the components to be connected in parallel. In the shortcut menu, the "Connect in parallel" menu item shows all the drive objects to which the selected component can be connected in parallel.
     The "All" item switches the selected power unit parallel to all connectable components.

Cancelling a parallel connection

You can cancel an existing parallel connection as follows:

1. Drag components to the higher-level drive unit using drag and drop.
   - Or -
2. Select a component connected in parallel and select the "Disconnect parallel connection" shortcut menu.

5.6.2 Transferring the determined device configuration to Startdrive

Note

Overwriting existing data in the device configuration

If components already exist in the device configuration of the drive unit from which you started discovery of the device configuration, they will be deleted or overwritten when data are created by the automatic configuration.

Creating the component topology in Startdrive

After you have checked and, if required, corrected the topology determined in the configuration, you can transfer this topology to a Startdrive project.

1. Make sure that there are no non-assignable components in the "Device configuration detection" dialog.

   Only when there are no non-assignable components is the "Create" button active.

2. Click the "Create" button.

Result

The topology is created in the device configuration of the selected drive unit.

The original status of the online connection is re-established, as it was upon implementation of "Detection of the device configuration".

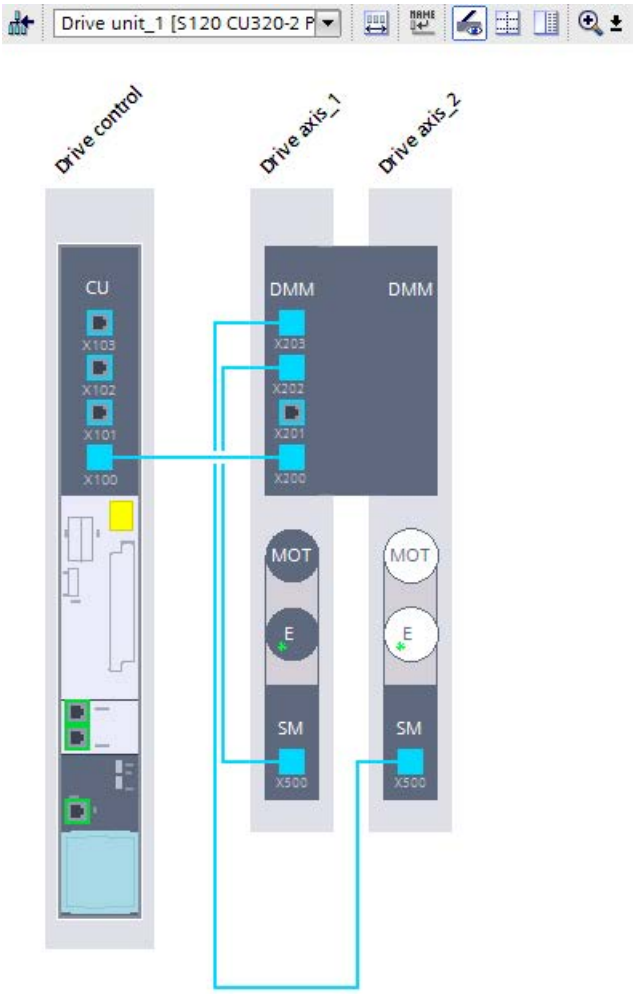


Figure 5-39 Example: Apply hardware device configuration to Startdrive configuration

5.6.3 Revising the configuration

Optimally, all components are transferred specified to the device configuration during an automatic configuration and do not have to be subsequently specified or supplemented. If this is the case, a message is shown in the message display that the automatic device configuration has been performed without error.

If, however, not all components of the drive 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, 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 still not been opened or displayed.
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.

Performing basic parameterization 6

6.1 Control Unit

6.1.1 Web server

6.1.1.1 Activating and configuring the web server

The web server provides information on a SINAMICS device via its web pages. Access is via an Internet browser. The information on the web pages is shown in German or English. For information about message texts, drive object states and parameter names, there is a language selection which allows the display to be switched over to the required language (German, English, Chinese, Italian, French, Spanish).

You configure the web server using a screen form.

Calling up the web server configuration

1. In the project navigation, select menu "Drive control > Parameter".

   The corresponding detailed view is displayed at the right.

2. In the secondary navigation, call menu "Basic parameterization > Web server".

   The detailed view is updated. The settings become active for the web server.

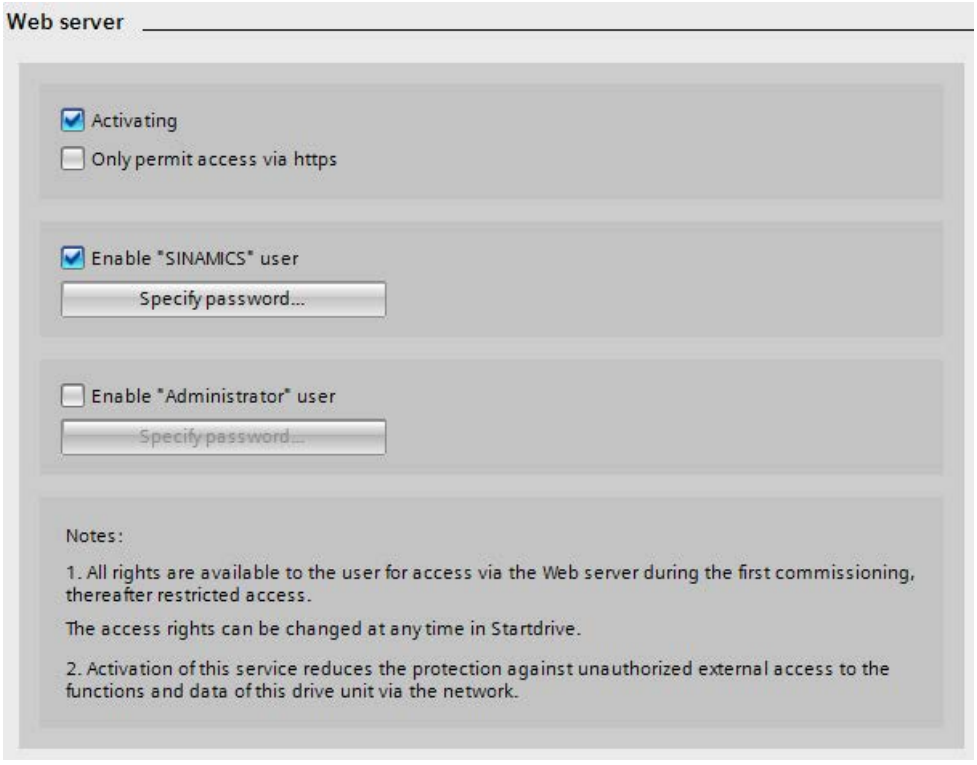


Figure 6-1 Web server configuration

Deactivating the web server

The web server is activated as default setting in the configuration. 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 frequency converter via an HTTP connection or via the encrypted HTTPS connection. Using the configuration, access can be restricted so that only a secure HTTPS connection is possible.

NOTICE
Using non-encrypted connections (HTTP) When using the HTTP protocol, the login data is also sent unencrypted. This facilitates password theft attacks, for example, and can lead to data manipulation by unauthorized parties and thus ultimately to damages. • Limit access to secure connections so that all data is transferred encrypted.

The configuration option provided to limit connections to 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
- via parameter p8986

Note

Access to the web server via PROFINET interface X150

In the parameter view, you can configure HTTP/HTTPS access to the web server via a PROFINET interface with 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:

1. In the configuration dialog, activate option "Only permit access via https".

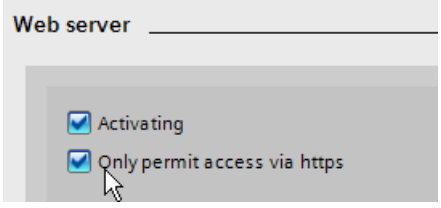


Figure 6-2 HTTPS access

6.1.1.2 Setting or changing web server user accounts

For SINAMICS S120, the rights of both user accounts "SINAMICS" and "Administrator" are permanently defined and cannot be changed by users.

The user "Administrator" has full rights by default. However, the standard "SINAMICS" user only has restricted access rights.

You can make the following settings in Startdrive for the web server user accounts:

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

Default password settings after first commissioning

- SINAMICS: No password set

  It is recommended that you assign a password. This must comprise at least 8 characters.
- Administrator: No password set

  A password must be assigned for this user. This must comprise at least 8 characters.

Note

Secure passwords

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

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

The password must not be used elsewhere.

Enabling users

The "SINAMICS" user and the "Administrator" user can be enabled with their own specific rights. You can also set whether password protection will be active for the "SINAMICS" user.

To enable a user and activate a password, proceed as follows:

1. Activate the "Enable SINAMICS user" option.

   And/Or

2. Activate the "Enable administrator user" option.

Defining a password for a user

You can create a password for both users "SINAMICS" and "Administrator" as follows:

1. Click on "Specify password".

   The "Specify password" dialog opens.



Figure 6-3 Specifying the password

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.

   If both password entries were identical, the input dialog box is closed. 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 enter the password again in the two input fields.

   The password is queried once when the corresponding web page is subsequently called.
5. Then save the project to accept the settings.

Deleting the password for user "SINAMICS"

You can delete the password of user "SINAMICS" as follows:

1. Click the "Delete password" button.

   The "Delete password" dialog opens.

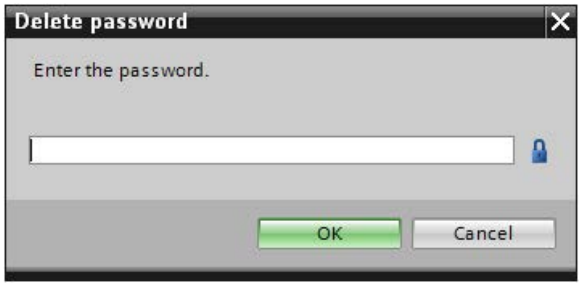


Figure 6-4 Deleting the password

2. Enter the password for "SINAMICS".

   The entry is checked. If you have entered the correct password, the message "Password has been deleted" appears.

3. Then save the project to accept the settings.

Note

The user "Administrator" 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.

Changing and existing password

Existing passwords for the users "SINAMICS" and "Administrator" can be changed as long as the user in question is enabled.

1. Click "Change password".

   The "Change Password" dialog box opens.



Figure 6-5 Changing the password

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.

4. 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. If the entry is correct, the message "Password has been changed" is displayed.

5. Then save the project to accept the settings.

6.1.2 Configuring inputs/outputs of the Control Unit

6.1.2.1 Isolated digital inputs

You can change the interconnection of the digital inputs 0 ... 7, 16, 17 and 20, 21 on the CU320-2 Control Unit in the "Isolated digital inputs" mask.

- Digital inputs are used for the acquisition of digital signals. For example, drive enables 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.

Interconnecting digital inputs 0 … 7, 16, 17 and 20, 21 (r0722 and r0723)

1. Interconnect the signal sources of the digital inputs 0 ... 7, 16, 17 and 20, 21.

   Several interconnections are possible.

6.1.2.2 Bidirectional digital inputs/outputs

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 they can be parameterized either as an input or an output.
- Digital inputs are used for the acquisition of digital signals. For example, drive enables 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 enables.

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 digital inputs 8 … 15 or digital outputs 8 … 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 ... 15 can be interconnected with this switch position. Several interconnections are possible. The selector can be switched by clicking from digital input to digital output.
Digital output 	Digital outputs 8 ... 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.

1. Select the digital input/output on the required terminal.
2. Connect the signal source of the digital input (8 ... 15).
   - Or -
3. To change the digital input to a digital output, proceed as follows:
   – Click the selector.
   – Then connect the signal sink of the digital output (8 ... 15).
   – Invert the digital output when required.
4. Repeat steps 2 or 3 for all digital inputs/outputs of the required terminal.

6.1.2.3 Measuring sockets

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.

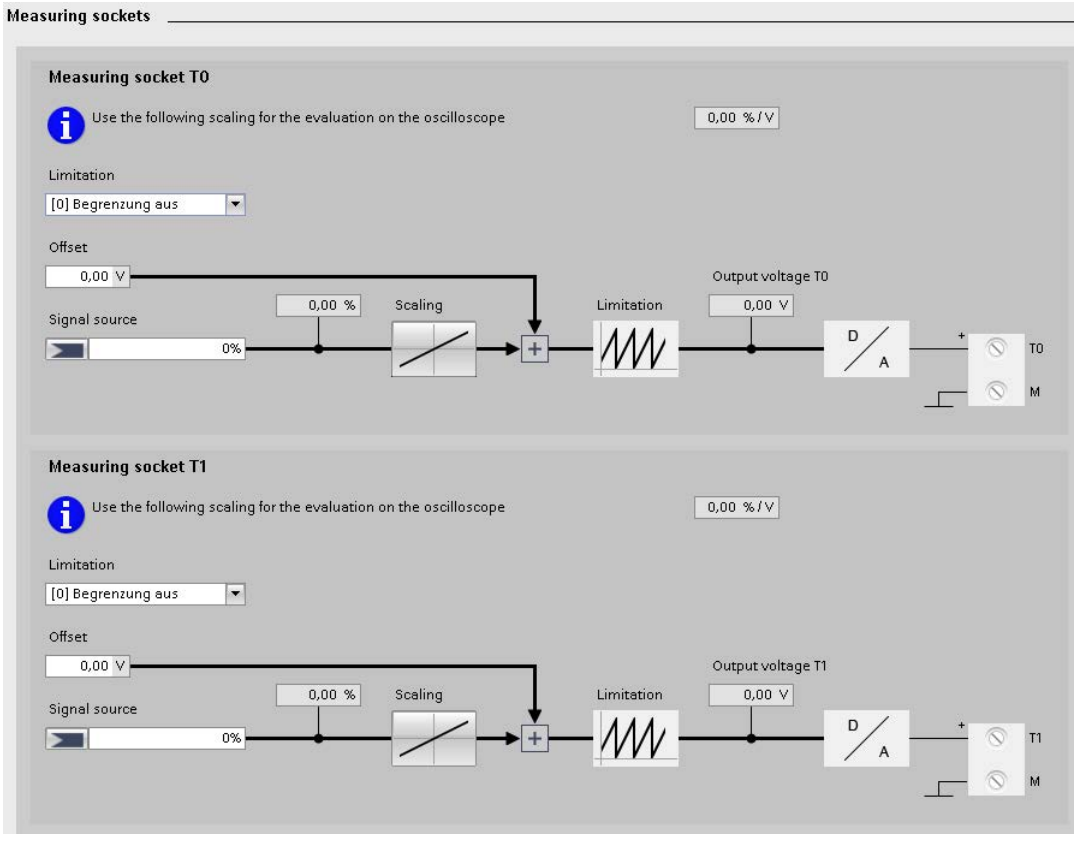


Figure 6-6 Measuring socket

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.

Limitation on/off (p0784)

With the "Limitation" drop-down list, select whether the output value of the measuring socket is to be restricted to the limit values of the characteristic curve for the required measuring socket.

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 to 0 V.

Select signal source for T0, T1 and T2

The signal to be output via a measuring socket is specified by interconnecting a signal source p0771[0...2].

Table 6- 1 Important measuring signals (examples):

r0060	CO: Speed setpoint before speed setpoint filter
r0063	CO: Actual speed value
r0069[0...2]	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

1. Select the signal sources whose signal is to be output via the measuring socket for the respective measuring sockets T0, T1 and T2.

Define characteristic curve

The scaling specifies the processing of the measured signal. This requires the definition of a straight line with two points.

1. 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.

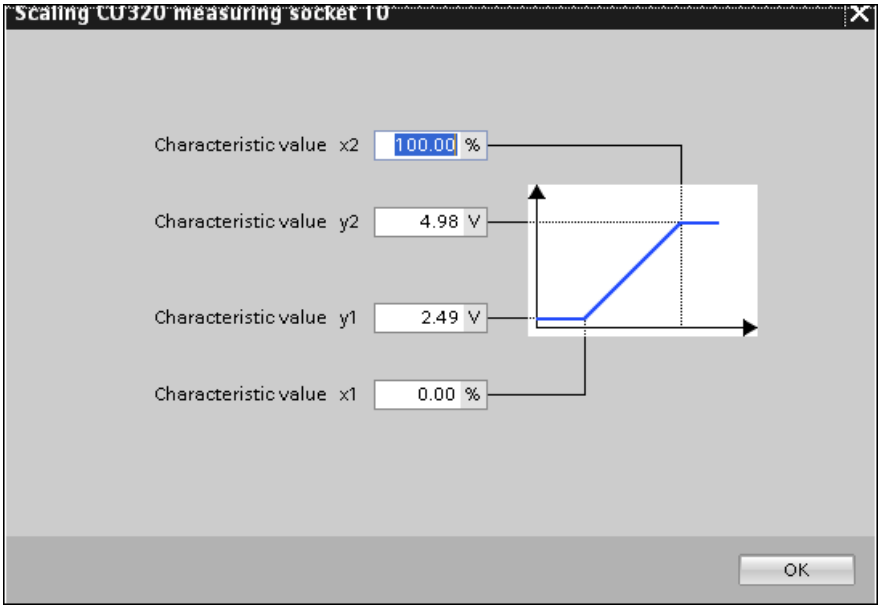


Figure 6-7 Scaling the measuring socket

2. In the dialog, select individual values within their defined limits, which are displayed in the relevant tooltips.
   - Value X1 (p0777)
   - Value X2 (p0779)
   - Value Y1 (p0778)
   - Value Y2 (p0780)

   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
3. Confirm your entries with "OK".

Define the offset (p0783)

The offset is applied additively to the signal to be output. The signal to be output can thus be displayed within the measuring range.

1. Enter the required offset value in the "Offset" field for the relevant measuring socket.

Function diagrams (see SINAMICS S120/S150 List Manual)

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

Overview of important 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

6.2 Infeed unit

6.2.1 Overview

Infeed units (Line Modules)

Line Modules contain the central line infeed for the DC link. Various Line Modules can be selected to address the various application profiles:

- Basic Line Modules (BLM)
- Smart Line Modules (SLM)
- Active Line Modules (ALM)

Basic parameterization of the infeed unit

Define the following data in the basic parameterization of the infeed unit:

- Function modules
- Line data/operating mode
- Enable logic
- Line contactor control

Calling the screen form

1. In the project navigation, select menu "Infeed_x > Parameter".

   The corresponding detailed view is displayed at the right.

2. In the secondary navigation, call menu "Basic parameterization > xxx" (xxx stands for the name of the particular detailed screen form).

   The detailed view is updated.

6.2.2 Function modules

For the infeed, you can activate function modules offline as required. The function modules that can be activated are listed in the "Function modules" screen form.

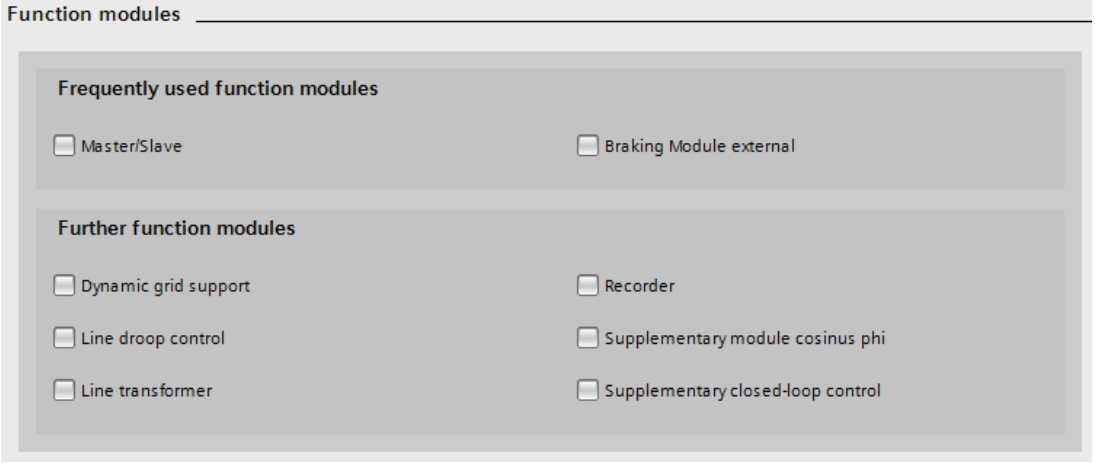


Figure 6-8 Example: Function modules for an ALM

Note

Function modules which can be activated are dependent upon the configuration selected for the infeed unit.

The function modules that can be used are presorted in two areas:

- Frequently used function modules
  - Master/slave

    Redundant operation of several ALMs on one DC link.
  - External Braking Module

    Control of an external Braking Module in order to be able to collect braking energy in the event of a power failure.
- Additional function modules
  - Fault ride-through

    For power generation applications in an interconnected system: Functions for fault ride-through and line monitoring (incl. active anti-islanding) according to power system guidelines.
  - Line droop control; installation, synchronization and operation of stand-alone systems: Control of line frequency and line voltage in single operation or together with other generators.
  - Line transformer

    For power generation applications: Magnetization of a transformer to limit the inrush current when the line system is connected.

    Compensation for direct current components and voltage drops on the transformer in conjunction with fault ride-through or line droop control.
  - Recorder

    Recording fault events
  - Cosine Phi add-on module

    Precise cos(Phi) determination based on fundamental current and voltage components with BICO-connectable input variables (in contrast to power factor r0038).
  - Additional control

    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 voltage (e.g. in systems with low short-circuit power rating): Freely parameterizable band-pass filters for resonance damping

Activating function modules

1. Activate the required function module by clicking the option.

   Repeat this for all additional function modules that you wish to activate.
2. Save the project to backup the settings.

6.2.3 Line data / operating mode

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.

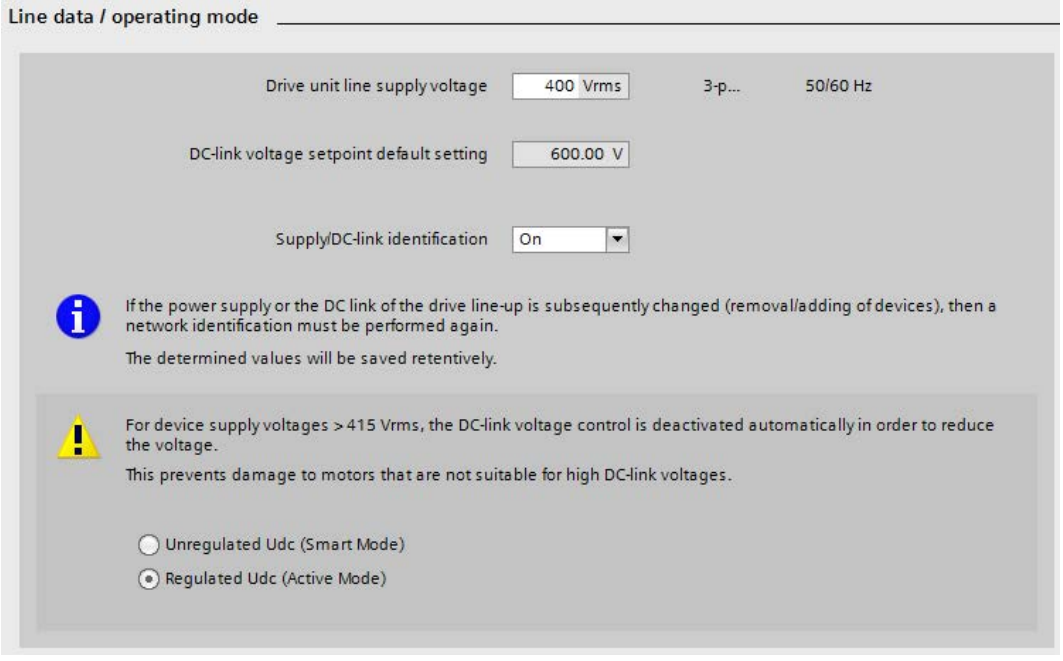


Figure 6-9 Example: Network data/operating mode for Active Line Module

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

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

1. Set one of the two operating modes:
   - "Vdc non-regulated (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.
   - "Vdc 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.

6.2.4 Enable logic

You can connect several signal sources for the enables in the function view of the "Enable logic" mask.

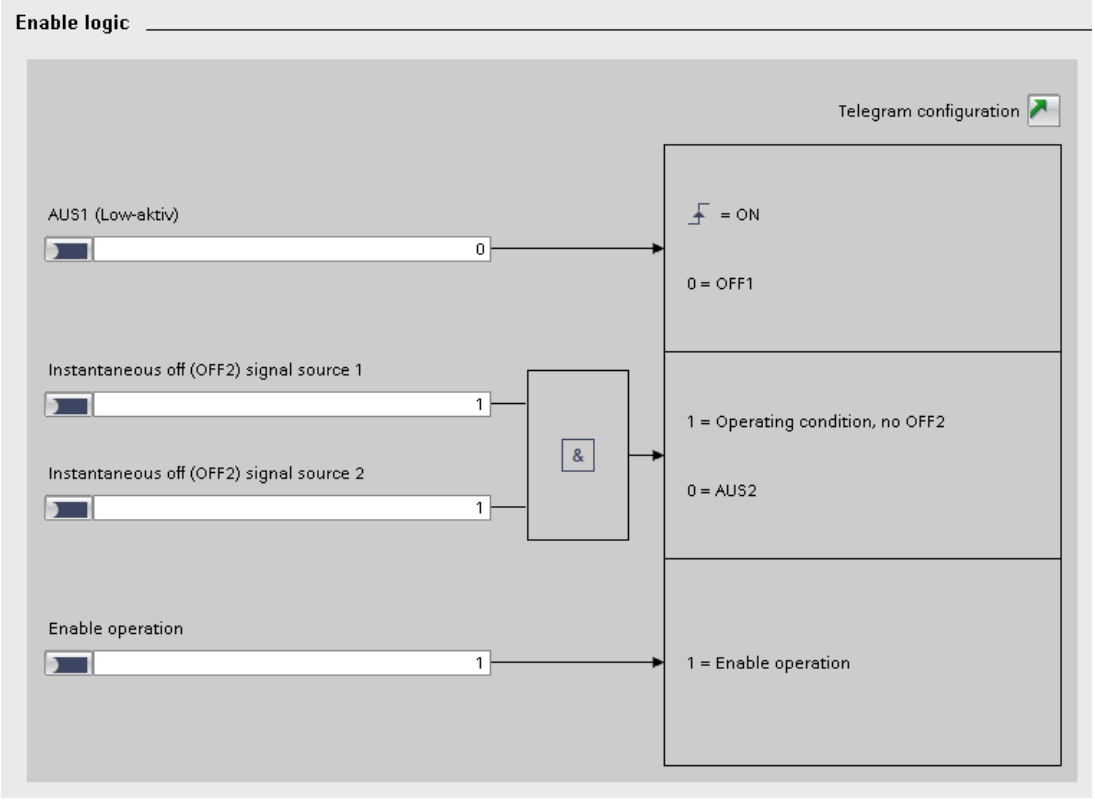


Figure 6-10 Enable logic

Procedure

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

6.2.5 Line contactor control

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.

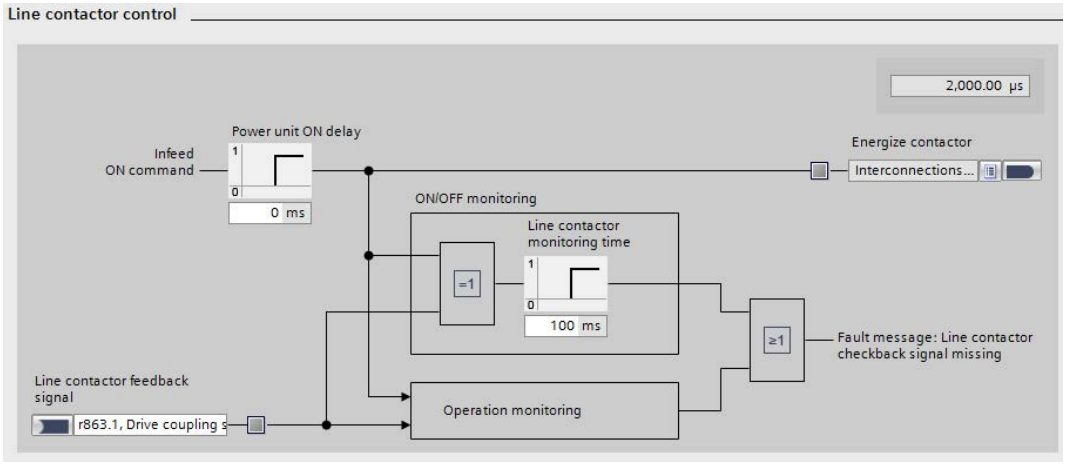


Figure 6-11 Infeed: Line contactor control

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

- for the infeed drive object
- for the 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.
2. Enter in the "Line contactor / monitoring time" (p0861) field, the monitoring time of the line contactor.
   The monitoring time starts for each switching operation of the line contactor (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)".

6.3 Drive axes

6.3.1 Servo drives

6.3.1.1 Overview

Basic parameterization of the drive axes

You can carry out basic parameterization for the following data of the drive axis/axes:

- Function modules
- Control mode
- Important parameters
- Sampling times/pulse frequency
- Enable logic

Calling the screen form

1. In the project navigation, select menu "Drive axis_x > Parameter".

   The corresponding detailed view is displayed at the right.

2. In the secondary navigation, call menu "Basic parameterization > xxx" (xxx stands for the name of the particular detailed screen form).

   The detailed view is updated.

6.3.1.2 Function modules

For the drive axis used, you can activate function modules offline as required. The function modules that can be activated are listed in the "Function modules" screen form.

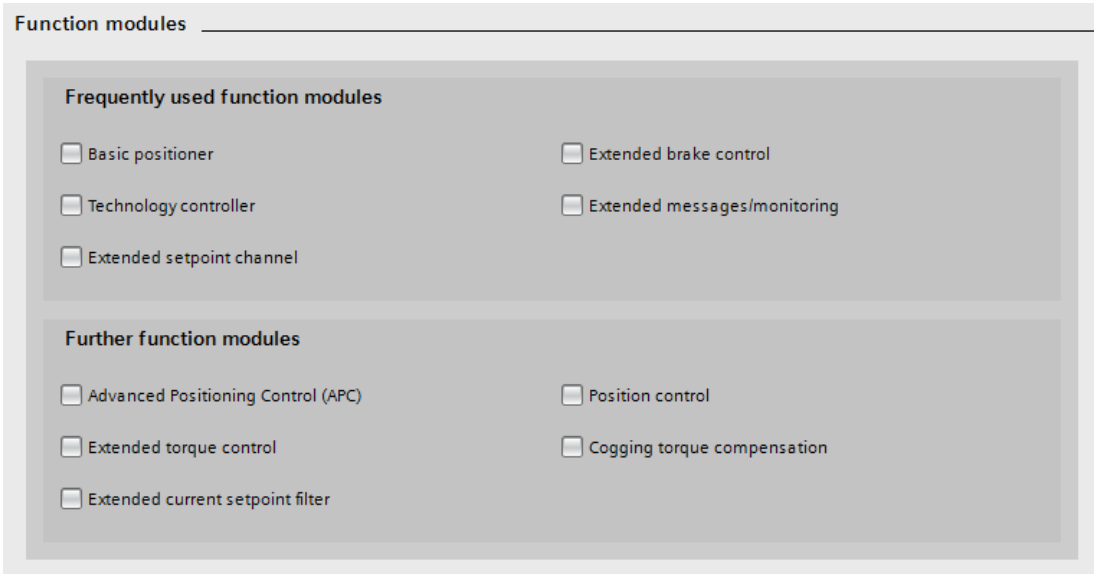


Figure 6-12 Example: Function modules - for drive axes

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 function modules that can be used are presorted in two areas:

- Frequently used function modules
- Additional function modules

Activating function modules

1. Activate the required function module by clicking the option.

   Repeat this 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 backup the settings.

6.3.1.3 Control mode

Control types

Speed control (with and without encoder) and torque control are available for SERVO drives.

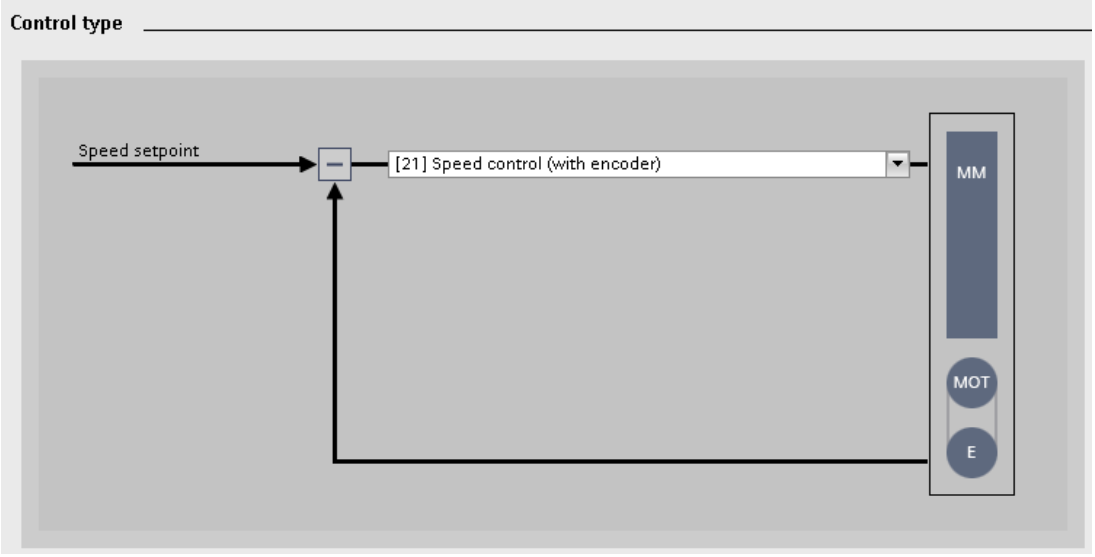


Figure 6-13 Control mode

- 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

  With torque control, the torque is the reference value and the actual torque value should follow the torque setpoint with as little ripple as possible and without delay.

Selecting the control type

1. Select one of the following control types (p1300) in the drop-down list:
   – Speed control with encoder
   – Speed control without encoder
   – Torque control with encoder

   If you have selected a control type with encoder, this encoder is now shown in the diagram.

6.3.1.4 Important parameters

Description

You define the basic properties of the drive control using the important parameters.

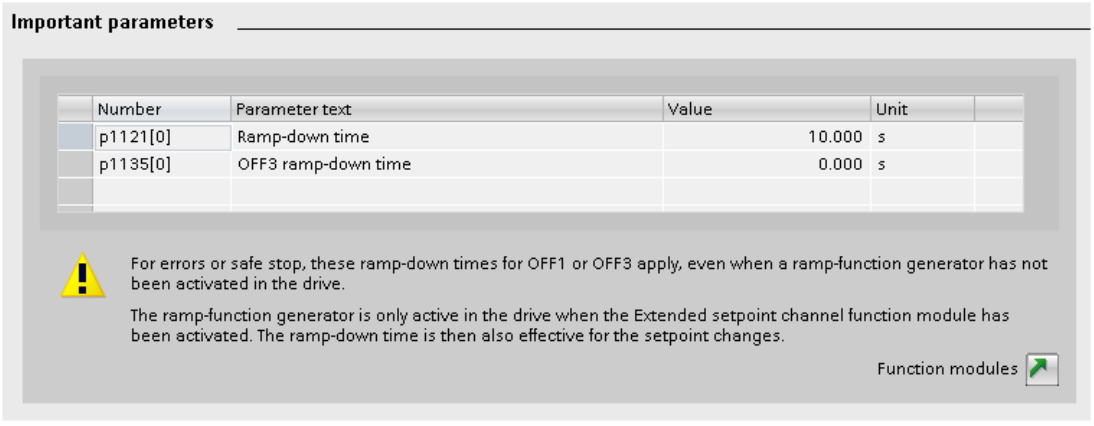


Figure 6-14 Important parameters

Parameters	Designation	Description
p1121	Ramp-down time	Ramp-down time which the drive requires to decelerate from maximum 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.

6.3.1.5 Enable logic

If telegrams were connected during commissioning, these interconnections are displayed here and an additional specification is not required.

If no telegrams were specified previously, then you must connect the required signal sources via the enable logic.

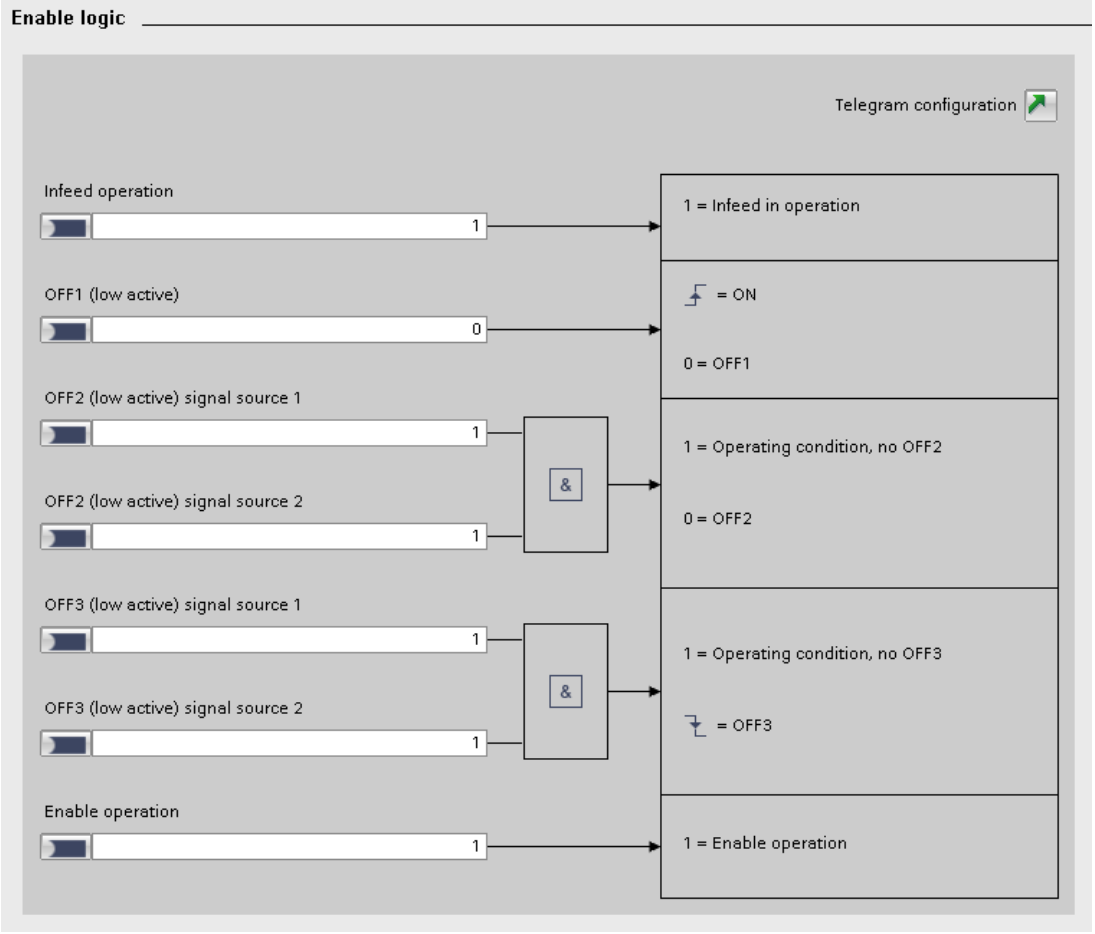


Figure 6-15 Enable logic

Connecting signal sources

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.

6.3.2 Vector drives

6.3.2.1 Overview

Basic parameterization of the drive axes

You can carry out basic parameterization for the following data of the drive axis/axes:

- Function modules
- Control mode
- Important parameters
- Drive settings
- Enable logic

Calling the screen form

1. In the project navigation, select menu "Drive axis_x > Parameter".

   The corresponding detailed view is displayed at the right.

2. In the secondary navigation, call menu "Basic parameterization > xxx" (xxx stands for the name of the particular detailed screen form).

   The detailed view is updated.

6.3.2.2 Function modules

You can connect various function modules for the associated deployed drive axis or for the deployed infeed. The function modules that can be activated are listed in the "Function modules" screen form.

Note

You can only activate or deactivate function modules offline.

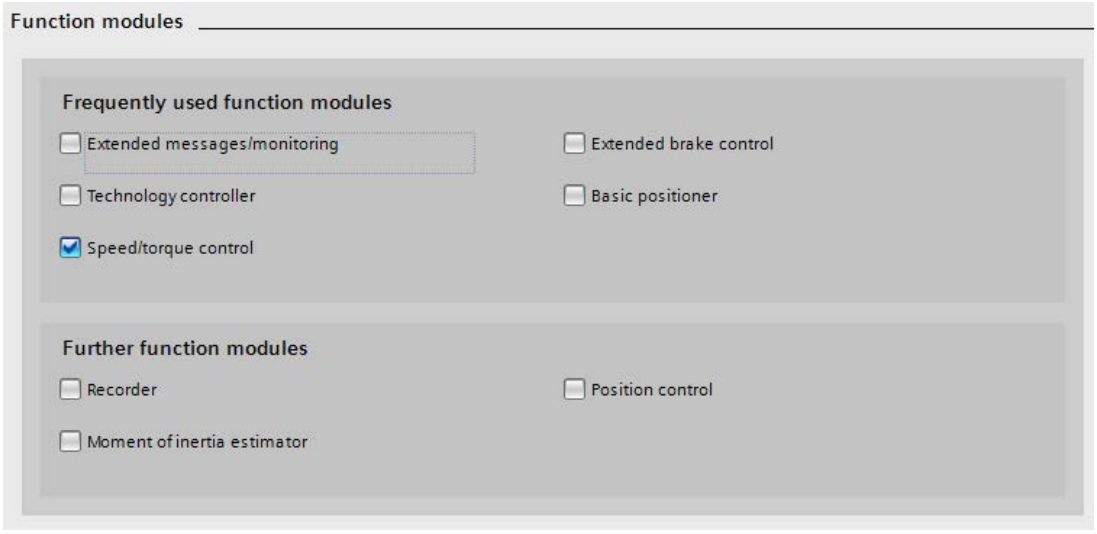


Figure 6-16 Function modules

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 function modules that can be used are presorted in two areas:

- Frequently used function modules
- Other function modules

Activating a function module

1. Activate the required function module by clicking the option.

   Repeat this 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 save the settings.

6.3.2.3 Control mode

Control types

The following control types 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
- V/f control with independent voltage setpoint
- Speed control (without encoder)
- Speed control (with encoder)
- Torque control (without encoder)
- Torque control (with encoder)

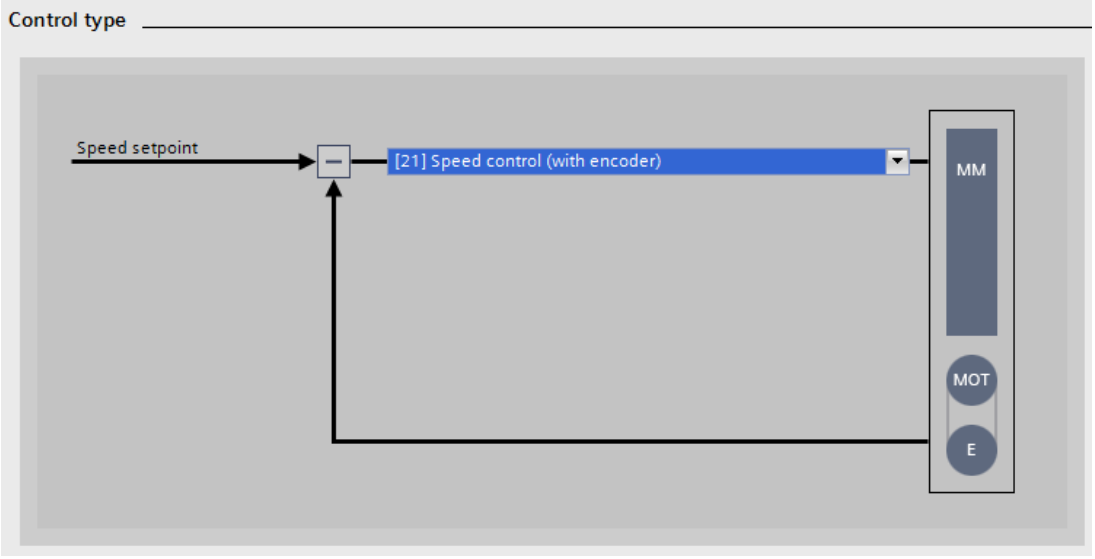


Figure 6-17 Control mode

Selecting the control type

1. Select one of the control modes listed above (p1300).

   The screen form is structured according to the selected control mode.

Terminology for the use of linear motors

When linear motors are used, a linear motion is executed instead of a rotary motion. The terms change accordingly:

- Speed corresponds to velocity
- Torque corresponds to force

6.3.2.4 Important parameters

Description

You define the basic properties of the drive control using the important parameters.

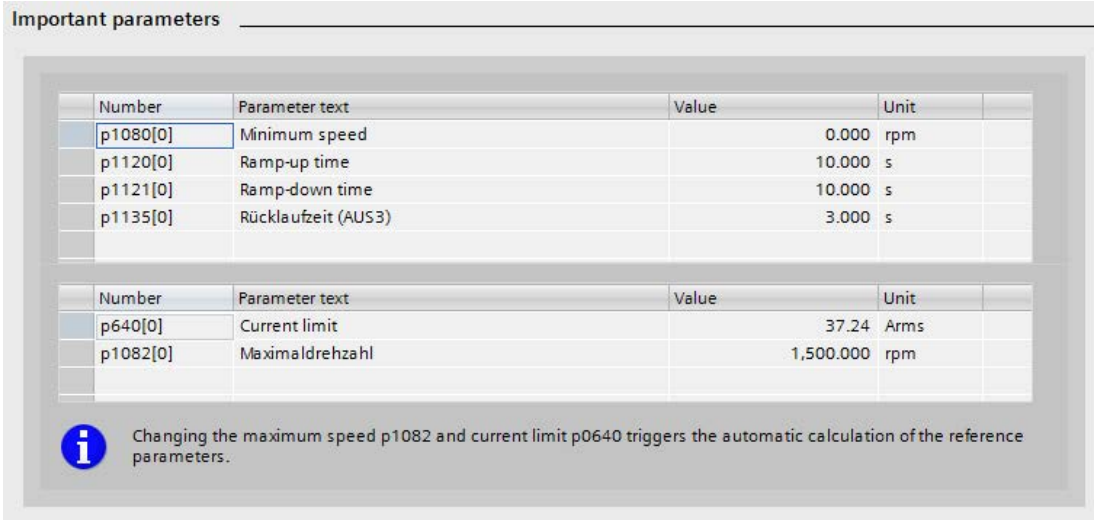


Figure 6-18 Important parameters

Number	Designation	Description
p0640	Current limit	Determines the limit value of the motor overload current.
p1080	Minimum speed	Setting of the lowest possible speed/velocity. This value is not fallen below in operation.
p1082	Maximum speed	Setting of 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 maximum speed (without using roundings).
p1121	Ramp-down time	
p1135	OFF3 ramp-down time	The OFF3 ramp-down time is effective from the maximum speed down to the motor standstill.

6.3.2.5 Drive settings

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

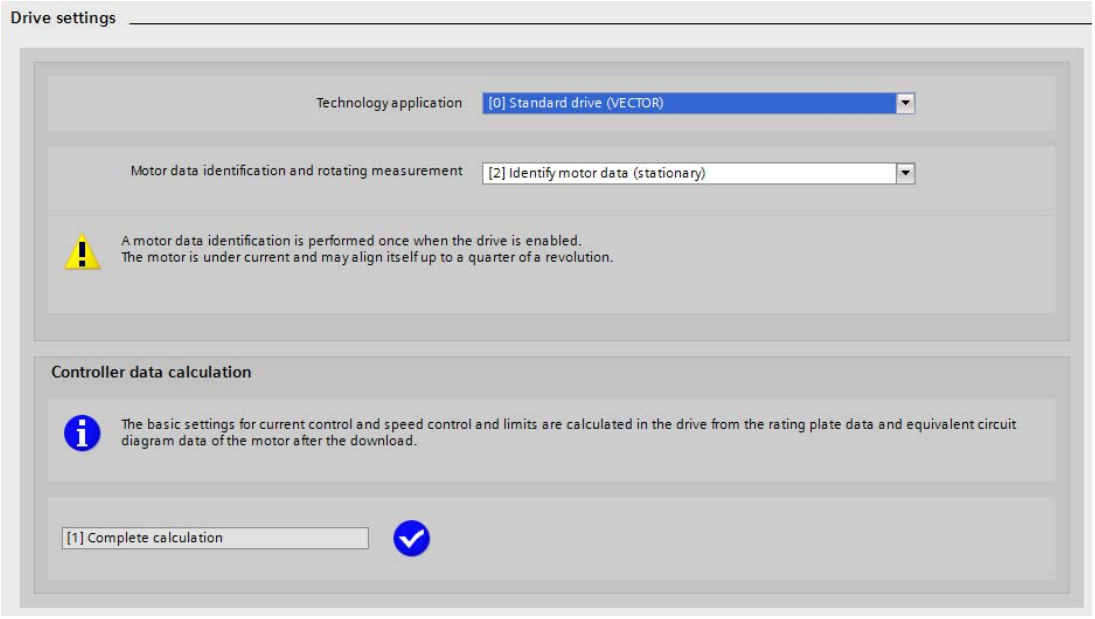


Figure 6-19 Drive settings

Setting the automatic calculation of motor/control parameters

1. Select one of the following applications in the "Technology application" (p0500) drop-down list:
   - Standard drive (VECTOR)
   - Pumps and fans
   - Encoderless control down to f = 0 (passive loads)
   - Dynamic response in the field weakening range
   - Approach with high break loose torque
   - 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:
   - Inhibited
   - Motor data ident. (standstill) and speed controller opt.

     With this setting, the drive is run up to speed upon 2nd actuation.
   - Identify motor data (standstill)
   - Optimize the speed controller (rotating)

Setting the calculation of the controller data

1. Select one of the following options for the calculation of the controller data in the "Calculation controller data" (p0340) drop-down list:
   - No calculation

     The motor data is not calculated. This is the default setting.
   - Complete calculation

     The equivalent circuit diagram data is also calculated using the motor data.
   - 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 symbol).
   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. However, the calculation type must then be confirmed again.

6.3.2.6 Enable logic

If telegrams were connected during commissioning, these interconnections are displayed here and an additional specification is not required.

If no telegrams were specified previously, then you must connect the required signal sources via the enable logic.

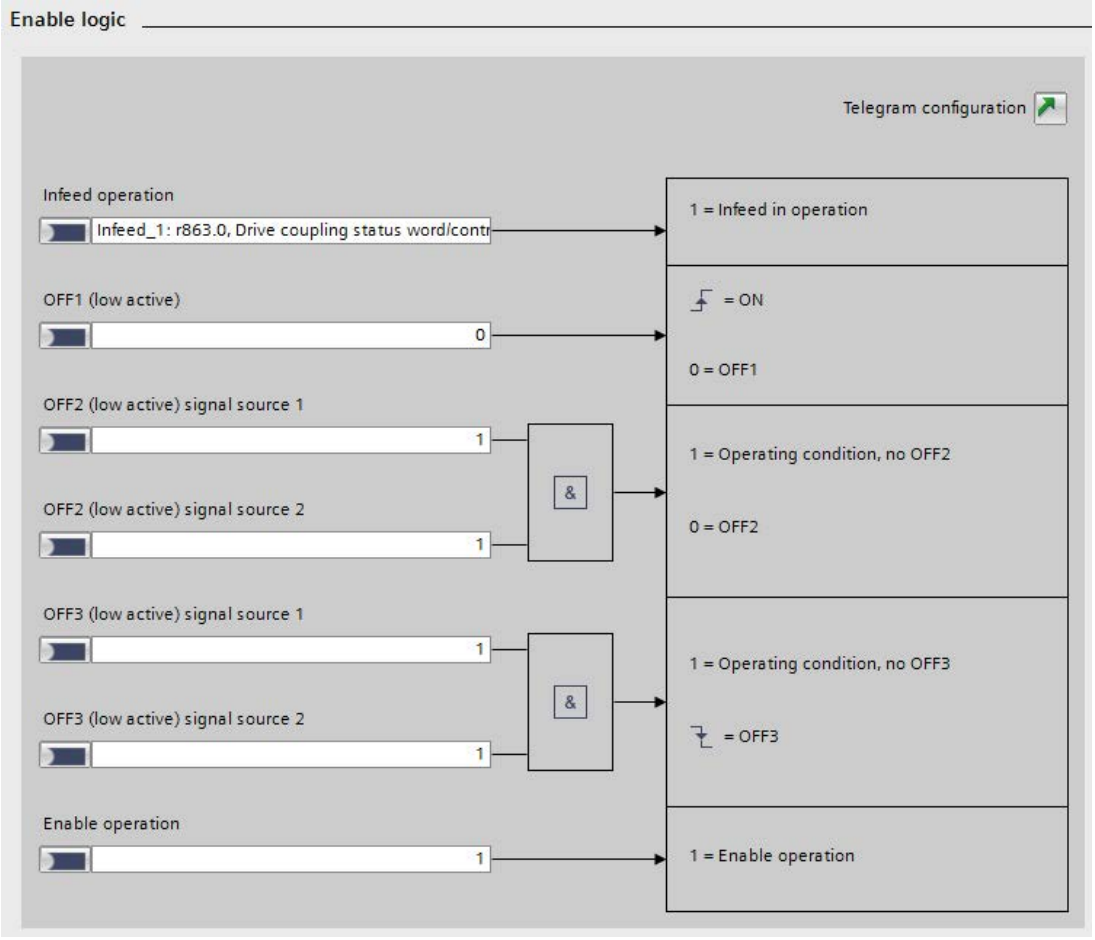


Figure 6-20 Enable logic

Interconnecting signal sources

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.

Loading the project to the target device

7

In order to set up your project, you need to load the project data you generated offline on the connected drive units. This project data is generated, for example when configuring hardware, networks, and connections or when programming the user program or when creating recipes.

Precondition

- The project data is consistent.
- Each drive unit to be loaded can be accessed online.

Perform download

In order to execute this function in the online mode, the following operator actions are alternatively available:

1. Select one or more drive units in the project tree.
2. Open the shortcut menu "Load to device" or click on the icon (Load to device) in the toolbar.
   - If you have already established an online connection, the "Load preview" dialog opens. This dialog displays alarms and proposes actions necessary for loading.
   - If you have not yet established any 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.

     See also Section "Establishing an online connection to the drive unit (Page 110) "

3. Check the messages in the "Load preview" dialog. Activate the required actions in the "Action" column to perform a secure download.

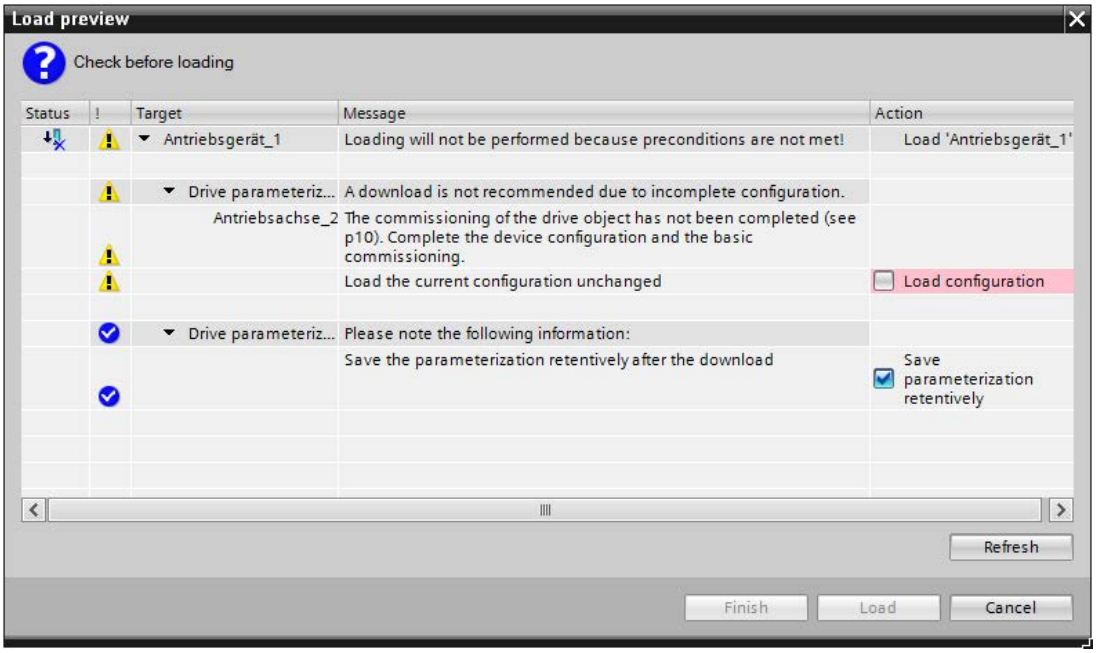


Figure 7-1 Example: Load preview

As soon as downloading becomes possible, the "Load" button is enabled.

4. Click "Load".

   The loading operation is performed. If there is a need for synchronization, the system automatically displays the "Synchronization" dialog. This dialog displays messages and suggests actions that are needed for the synchronization. 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.

5. Click "Finish".

Result

The selected project data has been downloaded to the drive units.

Note

Upload from device

Conversely, the project data of a selected drive unit can also be uploaded into your Startdrive project on your PC. Proceed as described in Chapter "Loading project data from a drive unit (Page 62)" for this purpose.

Commissioning a drive 8

8.1 Using the control panel

Traverse the drive and test the settings that have already been made with the control panel (see also the overview in Section "Drive control panel (Page 42)").

⚠WARNING

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 enables are removed before returning the master control, the setpoints and commands still come from the original parameterized sources after the master control is returned.

Requirement

- Startdrive is in the online mode (Page 110).

Calling the control panel

1. In the project tree, select the "Drive unit_x > Drive axis_x > Commissioning" menu.
2. In the commissioning secondary navigation, select the "Control panel" menu.

   When an online connection has been established, the bar in the header area is shown in color. The control elements are grayed-out apart from the "Activate" button. The remaining control elements become active after you have activated the control panel and set the enables.

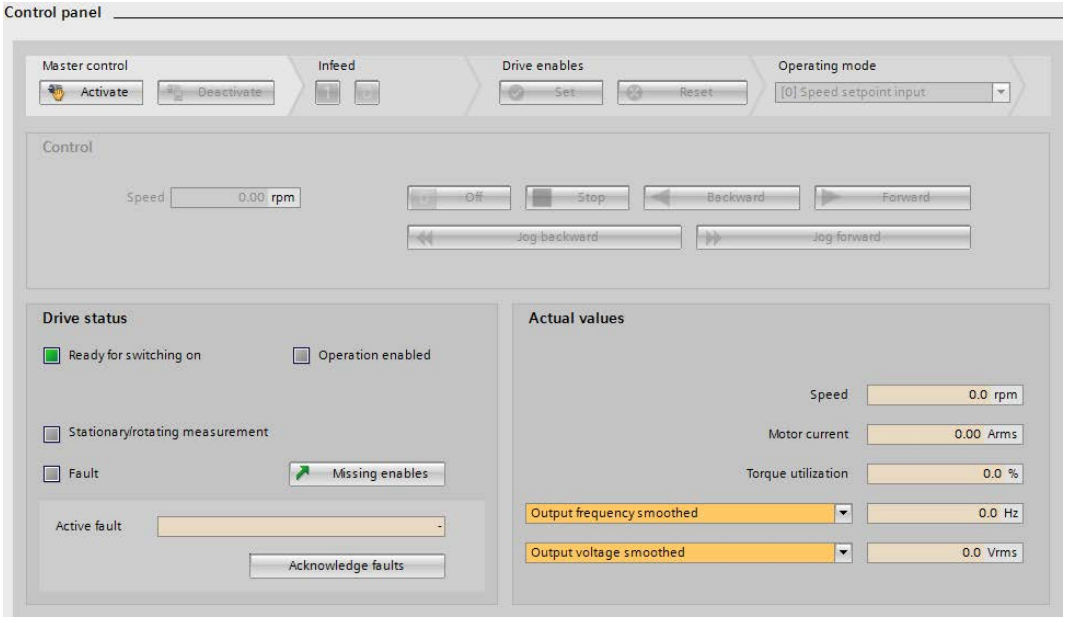


Figure 8-1 Control panel

Activating the control panel

When you activate the control panel, you assume master control of the drive. The control panel can always only be activated for one drive.

To activate the control panel, proceed as follows:

1. Click "Activate" at "Master control".

   The "Activate master control" message window opens.
2. Read the warning carefully and check the value for the monitoring time.

   The monitoring time specifies the time during which the connection from the PG/PC to the drive is monitored. The minimum value is 1000 ms.
3. Click "Continue" to confirm the monitoring time.

   The message window closes. The control panel is then active.

Activating the infeed

If an infeed is available in your drive, then the infeed must also be activated. If it is not activated, no further drive release can be set.

1. Click the "1" icon at "Infeed" to switch on the infeed.

Deactivating the control panel

When you deactivate the control panel, you return the master control.

To deactivate the control panel, proceed as follows:

1. Click the "Off" button to switch off the drive.

   This is a basic requirement for deactivating the control panel.

2. Click "Deactivate" at "Master control".

   The grayed-out user interface of the control panel shows that the master control has been deactivated.

Setting the enable

To set the required enable for the control panel, proceed as follows.

1. Click "Set" at "Drive enables".

   Further areas of the control panel are activated.

2. Click "Acknowledge faults" to acknowledge the currently pending faults.
3. If you no longer require the enables, click "Reset" at "Drive enables".

Result

You can now traverse the drive with the control panel. Enables and faults are displayed at "Drive status". In addition to "Active fault", the currently pending fault is displayed.

8.2 Traversing the drive with speed specification

After you have set the drive enables, in the "Control Panel" screen form specify the operating mode and switch on the motor.

Specifying the setpoint

To specify the 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

1. Click "Stop" to stop the drive.
2. Click the "Stop" button to switch off the drive.

Viewing actual values of the drive

The current values of various parameters are displayed at "Actual values".

Appendix A

A.1 List of abbreviations

Note

The following list of abbreviations includes all abbreviations and their meanings used in the entire SINAMICS family of drives.

Abbreviation	Source of abbreviation	Meaning
A		
A…	Alarm	Warning
AC	Alternating Current	Alternating current
ADC	Analog Digital Converter	Analog digital converter
AI	Analog Input	Analog input
AIM	Active Interface Module	Active Interface Module
ALM	Active Line Module	Active Line Module
AO	Analog Output	Analog output
AOP	Advanced Operator Panel	Advanced Operator Panel
APC	Advanced Positioning Control	Advanced Positioning Control
AR	Automatic Restart	Automatic restart
ASC	Armature Short-Circuit	Armature short-circuit
ASCII	American Standard Code for Information Interchange	American coding standard for the exchange of information
AS-i	AS-Interface (Actuator Sensor Interface)	AS-Interface (open bus system in automation technology)
ASM	Asynchronmotor	Induction motor
AVS	Active Vibration Suppression	Active load vibration damping
B		
BB	Betriebsbedingung	Operation condition
BERO	-	Contactless proximity switch
BI	Binector Input	Binector input
BIA	Berufsgenossenschaftliches Institut für Arbeitssicherheit	BG Institute for Occupational Safety and Health
BICO	Binector Connector Technology	Binector connector technology
BLM	Basic Line Module	Basic Line Module
BO	Binector Output	Binector output
BOP	Basic Operator Panel	Basic operator panel

C		
C	Capacitance	Capacitance
C…	-	Safety message
CAN	Controller Area Network	Serial bus system
CBC	Communication Board CAN	Communication Board CAN
CBE	Communication Board Ethernet	PROFINET communication module (Ethernet)
CD	Compact Disc	Compact disc
CDS	Command Data Set	Command data set
CF Card	CompactFlash Card	CompactFlash card
CI	Connector Input	Connector input
CLC	Clearance Control	Clearance control
CNC	Computerized Numerical Control	Computer-supported numerical control
CO	Connector Output	Connector output
CO/BO	Connector Output/Binector Output	Connector/binector output
COB-ID	CAN Object-Identification	CAN Object Identification
CoL	Certificate of License	Certificate of License
COM	Common contact of a change-over relay	Center contact of a change-over contact
COMM	Commissioning	Startup
CP	Communication Processor	Communications processor
CPU	Central Processing Unit	Central processing unit
CRC	Cyclic Redundancy Check	Cyclic redundancy check
CSM	Control Supply Module	Control Supply Module
CU	Control Unit	Control Unit
CUA	Control Unit Adapter	Control Unit Adapter
CUD	Control Unit DC	Control Unit DC
D		
DAC	Digital Analog Converter	Digital analog converter
DC	Direct Current	Direct current
DCB	Drive Control Block	Drive Control Block
DCBRK	DC Brake	DC braking
DCC	Drive Control Chart	Drive Control Chart
DCN	Direct Current Negative	Direct current negative
DCP	Direct Current Positive	Direct current positive
DDC	Dynamic Drive Control	Dynamic Drive Control
DDS	Drive Data Set	Drive Data Set
DI	Digital Input	Digital input
DI/DO	Digital Input/Digital Output	Digital input/output, bidirectional
DMC	DRIVE-CLiQ Hub Module Cabinet	DRIVE-CLiQ Hub Module Cabinet
DME	DRIVE-CLiQ Hub Module External	DRIVE-CLiQ Hub Module External
DMM	Double Motor Module	Double Motor Module
DO	Digital Output	Digital output
DO	Drive Object	Drive object
DP	Decentralized Peripherals	Distributed I/O

DPRAM	Dual Ported Random Access Memory	Dual-Port Random Access Memory
DQ	DRIVE-CLiQ	DRIVE-CLiQ
DRAM	Dynamic Random Access Memory	Dynamic Random Access Memory
DRIVE-CLiQ	Drive Component Link with IQ	Drive Component Link with IQ
DSC	Dynamic Servo Control	Dynamic Servo Control
DSM	Doppelsubmodul	Double submodule
DTC	Digital Time Clock	Timer
E		
EASC	External Armature Short-Circuit	External armature short-circuit
EDS	Encoder Data Set	Encoder data set
EEPROM	Electrically Erasable Programmable Read-Only Memory	Electrically Erasable Programmable Read-Only Memory
EGB	Elektrostatisch gefährdete Baugruppen	Electrostatic sensitive devices
ELCB	Earth Leakage Circuit Breaker	Residual current operated circuit breaker
ELP	Earth Leakage Protection	Ground-fault monitoring
EMC	Electromagnetic Compatibility	Electromagnetic compatibility
EMF	Electromotive Force	Electromotive force
EMK	Elektromotorische Kraft	Electromotive force
EMV	Elektromagnetische Verträglichkeit	Electromagnetic compatibility
EN	Europäische Norm	European standard
EnDat	Encoder-Data-Interface	Encoder interface
EP	Enable Pulses	Pulse enable
EPOS	Einfachpositionierer	Basic positioner
ES	Engineering System	Engineering system
ESB	Ersatzschaltbild	Equivalent circuit diagram
ESD	Electrostatic Sensitive Devices	Electrostatic sensitive devices
ESM	Essential Service Mode	Essential service mode
ESR	Extended Stop and Retract	Extended stop and retract
F		
F…	Fault	Fault
FAQ	Frequently Asked Questions	Frequently Asked Questions
FBLOCKS	Free Blocks	Free function blocks
FCC	Function Control Chart	Function control chart
FCC	Flux Current Control	Flux current control
FD	Function Diagram	Function diagram
F-DI	Failsafe Digital Input	Fail-safe digital input
F-DO	Failsafe Digital Output	Fail-safe digital output
FEPROM	Flash-EPROM	Non-volatile write and read memory
FG	Function Generator	Function generator
FI	-	Fault current
FOC	Fiber-Optic Cable	Fiber-optic cable
FP	Funktionsplan	Function diagram
FPGA	Field Programmable Gate Array	Field Programmable Gate Array

FW	Firmware	Firmware
G		
GB	Gigabyte	Gigabyte
GC	Global Control	Global control telegram (broadcast telegram)
GND	Ground	Reference potential for all signal and operating voltages, usually defined as 0 V (also referred to as M)
GSD	Gerätestammdatei	Generic Station Description: Describes the features of a PROFIBUS slave
GSV	Gate Supply Voltage	Gate supply voltage
GUID	Globally Unique Identifier	Globally Unique Identifier
H		
HF	High frequency	High frequency
HFD	Hochfrequenzdrossel	Radio frequency reactor
HLA	Hydraulic Linear Actuator	Hydraulic linear actuator
HLG	Hochlaufgeber	Ramp-function generator
HM	Hydraulic Module	Hydraulic Module
HMI	Human Machine Interface	Human Machine Interface
HTL	High-Threshold Logic	Logic with high interference threshold
HW	Hardware	Hardware
I		
i. V.	In Vorbereitung	Under development: This property is currently not available
I/O	Input/Output	Input/output
I2C	Inter-Integrated Circuit	Internal serial data bus
IASC	Internal Armature Short-Circuit	Internal armature short-circuit
IBN	Inbetriebnahme	Startup
ID	Identifier	Identification
IE	Industrial Ethernet	Industrial Ethernet
IEC	International Electrotechnical Commission	International Electrotechnical Commission
IF	Interface	Interface
IGBT	Insulated Gate Bipolar Transistor	Insulated gate bipolar transistor
IGCT	Integrated Gate-Controlled Thyristor	Semiconductor power switch with integrated control electrode
IL	Impulslöschung	Pulse suppression
IP	Internet Protocol	Internet Protocol
IPO	Interpolator	Interpolator
IT	Isolé Terre	Non-grounded three-phase line supply
IVP	Internal Voltage Protection	Internal voltage protection
J		
JOG	Jogging	Jogging
K		
KDV	Kreuzweiser Datenvergleich	Data cross-check
KHP	Know-how protection	Know-how protection

KIP	Kinetische Pufferung	Kinetic buffering
Kp	-	Proportional gain
KTY84	-	Temperature sensor
L		
L	-	Symbol for inductance
LED	Light Emitting Diode	Light emitting diode
LIN	Linearmotor	Linear motor
LR	Lageregler	Position controller
LSB	Least Significant Bit	Least significant bit
LSC	Line-Side Converter	Line-side converter
LSS	Line-Side Switch	Line-side switch
LU	Length Unit	Length unit
LWL	Lichtwellenleiter	Fiber-optic cable
M		
M	-	Symbol for torque
M	Masse	Reference potential for all signal and operating voltages, usually defined as 0 V (also referred to as GND)
MB	Megabyte	Megabyte
MCC	Motion Control Chart	Motion Control Chart
MDI	Manual Data Input	Manual data input
MDS	Motor Data Set	Motor data set
MLFB	Maschinenlesbare Fabrikatebezeichnung	Machine-readable product code
MM	Motor Module	Motor Module
MMC	Man-Machine Communication	Man-machine communication
MMC	Micro Memory Card	Micro memory card
MSB	Most Significant Bit	Most significant bit
MSC	Motor-Side Converter	Motor-side converter
MSCY_C1	Master Slave Cycle Class 1	Cyclic communication between master (class 1) and slave
MSR	Motorstromrichter	Motor-side converter
MT	Messtaster	Probe
N		
N. C.	Not Connected	Not connected
N…	No Report	No report or internal message
NAMUR	Normenarbeitsgemeinschaft für Mess- und Regel-technik in der chemischen Industrie	Standardization association for measurement and control in chemical industries
NC	Normally Closed (contact)	NC contact
NC	Numerical Control	Numerical control
NEMA	National Electrical Manufacturers Association	Standardization association in USA (United States of America)
NM	Nullmarke	Zero mark
NO	Normally Open (contact)	NO contact
NSR	Netzstromrichter	Line-side converter

NTP	Network Time Protocol	Standard for synchronization of the time of day
NVRAM	Non-Volatile Random Access Memory	Non-volatile read/write memory
O		
OA	Open Architecture	Software component which provides additional functions for the SINAMICS drive system
OAIF	Open Architecture Interface	Version of the SINAMICS firmware as of which the OA application can be used
OASP	Open Architecture Support Package	Expands the STARTER commissioning tool by the corresponding OA application
OC	Operating Condition	Operation condition
OCC	One Cable Connection	One-cable technology
OEM	Original Equipment Manufacturer	Original equipment manufacturer
OLP	Optical Link Plug	Bus connector for fiber-optic cable
OMI	Option Module Interface	Option Module Interface
P		
p…	-	Adjustable parameters
P1	Processor 1	CPU 1
P2	Processor 2	CPU 2
PB	PROFIBUS	PROFIBUS
PcCtrl	PC Control	Master control
PD	PROFIdrive	PROFIdrive
PDC	Precision Drive Control	Precision Drive Control
PDS	Power unit Data Set	Power unit data set
PDS	Power Drive System	Drive system
PE	Protective Earth	Protective ground
PELV	Protective Extra Low Voltage	Safety extra-low voltage
PFH	Probability of dangerous failure per hour	Probability of dangerous failure per hour
PG	Programmiergerät	Programming device
PI	Proportional Integral	Proportional integral
PID	Proportional Integral Differential	Proportional integral differential
PLC	Programmable Logical Controller	Programmable logic controller
PLL	Phase-Locked Loop	Phase-locked loop
PM	Power Module	Power Module
PMSM	Permanent-magnet synchronous motor	Permanent-magnet synchronous motor
PN	PROFINET	PROFINET
PNO	PROFIBUS Nutzerorganisation	PROFIBUS user organization
PPI	Point to Point Interface	Point-to-point interface
PRBS	Pseudo Random Binary Signal	White noise
PROFIBUS	Process Field Bus	Serial data bus
PS	Power Supply	Power supply
PSA	Power Stack Adapter	Power Stack Adapter
PT1000	-	Temperature sensor
PTC	Positive Temperature Coefficient	Positive temperature coefficient
PTP	Point To Point	Point-to-point

PWM	Pulse Width Modulation	Pulse width modulation
PZD	Prozessdaten	Process data
Q		
R		
r…	-	Display parameters (read-only)
RAM	Random Access Memory	Memory for reading and writing
RCCB	Residual Current Circuit Breaker	Residual current operated circuit breaker
RCD	Residual Current Device	Residual current device
RCM	Residual Current Monitor	Residual current monitor
REL	Reluctance motor textile	Reluctance motor textile
RESM	Reluctance synchronous motor	Synchronous reluctance motor
RFG	Ramp-Function Generator	Ramp-function generator
RJ45	Registered Jack 45	Term for an 8-pin socket system for data transmission with shielded or non-shielded multi-wire copper cables
RKA	Rückkühlanlage	Cooling unit
RLM	Renewable Line Module	Renewable Line Module
RO	Read Only	Read only
ROM	Read-Only Memory	Read-only memory
RPDO	Receive Process Data Object	Receive Process Data Object
RS232	Recommended Standard 232	Interface standard for cable-connected serial data transmission between a sender and receiver (also known as EIA232)
RS485	Recommended Standard 485	Interface standard for a cable-connected differential, parallel, and/or serial bus system (data transmission between a number of senders and receivers, also known as EIA485)
RTC	Real Time Clock	Real-time clock
RZA	Raumzeigerapproximation	Space-vector approximation
S		
S1	-	Continuous operation
S3	-	Intermittent duty
SAM	Safe Acceleration Monitor	Safe acceleration monitoring
SBC	Safe Brake Control	Safe brake control
SBH	Sicherer Betriebshalt	Safe operating stop
SBR	Safe Brake Ramp	Safe brake ramp monitoring
SBT	Safe Brake Test	Safe brake test
SCA	Safe Cam	Safe cam
SCC	Safety Control Channel	Safety Control Channel
SCSE	Single Channel Safety Encoder	Single-channel safety encoder
SD Card	SecureDigital Card	Secure digital memory card
SDC	Standard Drive Control	Standard Drive Control
SDI	Safe Direction	Safe motion direction
SE	Sicherer Software-Endschalter	Safe software limit switch
SESM	Separately-excited synchronous motor	Separately excited synchronous motor

SG	Sicher reduzierte Geschwindigkeit	Safely limited speed
SGA	Sicherheitsgerichteter Ausgang	Safety-related output
SGE	Sicherheitsgerichteter Eingang	Safety-related input
SH	Sicherer Halt	Safe stop
SI	Safety Integrated	Safety Integrated
SIC	Safety Info Channel	Safety Info Channel
SIL	Safety Integrity Level	Safety Integrity Level
SITOP	-	Siemens power supply system
SLA	Safely-Limited Acceleration	Safety limited acceleration
SLM	Smart Line Module	Smart Line Module
SLP	Safely-Limited Position	Safely Limited Position
SLS	Safely-Limited Speed	Safely limited speed
SLVC	Sensorless Vector Control	Sensorless vector control
SM	Sensor Module	Sensor Module
SMC	Sensor Module Cabinet	Sensor Module Cabinet
SME	Sensor Module External	Sensor Module External
SMI	SINAMICS Sensor Module Integrated	SINAMICS Sensor Module Integrated
SMM	Single Motor Module	Single Motor Module
SN	Sicherer Software-Nocken	Safe software cam
SOS	Safe Operating Stop	Safe operating stop
SP	Service Pack	Service pack
SP	Safe Position	Safe position
SPC	Setpoint Channel	Setpoint channel
SPI	Serial Peripheral Interface	Serial peripheral interface
SPS	Speicherprogrammierbare Steuerung	Programmable logic controller
SS1	Safe Stop 1	Safe Stop 1 (time-monitored, ramp-monitored)
SS1E	Safe Stop 1 External	Safe Stop 1 with external stop
SS2	Safe Stop 2	Safe Stop 2
SS2E	Safe Stop 2 External	Safe Stop 2 with external stop
SSI	Synchronous Serial Interface	Synchronous serial interface
SSL	Secure Sockets Layer	Encryption protocol for secure data transfer (new TLS)
SSM	Safe Speed Monitor	Safe feedback from speed monitor
SSP	SINAMICS Support Package	SINAMICS support package
STO	Safe Torque Off	Safe torque off
STW	Steuerwort	Control word
T		
TB	Terminal Board	Terminal Board
TEC	Technology Extension	Software component which is installed as an additional technology package and which expands the functionality of SINAMICS (previously OA application)
TIA	Totally Integrated Automation	Totally Integrated Automation

TLS	Transport Layer Security	Encryption protocol for secure data transfer (previously SSL)
TM	Terminal Module	Terminal Module
TN	Terre Neutre	Grounded three-phase line supply
Tn	-	Integral time
TPDO	Transmit Process Data Object	Transmit Process Data Object
TSN	Time-Sensitive Networking	Time-Sensitive Networking
TT	Terre Terre	Grounded three-phase line supply
TTL	Transistor-Transistor-Logic	Transistor-transistor logic
Tv	-	Rate time
U		
UL	Underwriters Laboratories Inc.	Underwriters Laboratories Inc.
UPS	Uninterruptible Power Supply	Uninterruptible power supply
USV	Unterbrechungsfreie Stromversorgung	Uninterruptible power supply
UTC	Universal Time Coordinated	Universal time coordinated
V		
VC	Vector Control	Vector control
Vdc	-	DC link voltage
VdcN	-	Partial DC link voltage negative
VdcP	-	Partial DC link voltage positive
VDE	Verband Deutscher Elektrotechniker	Verband Deutscher Elektrotechniker [Association of German Electrical Engineers]
VDI	Verein Deutscher Ingenieure	Verein Deutscher Ingenieure [Association of German Engineers]
VPM	Voltage Protection Module	Voltage Protection Module
Vpp	Volt peak to peak	Volt peak to peak
VSM	Voltage Sensing Module	Voltage Sensing Module
W		
WEA	Wiedereinschaltautomatik	Automatic restart
WZM	Werkzeugmaschine	Machine tool
X		
XML	Extensible Markup Language	Extensible markup language (standard language for Web publishing and document management)
Y		
Z		
ZK	Zwischenkreis	DC link
ZM	Zero Mark	Zero mark
ZSW	Zustandswort	Status word

A.2 Documentation overview

General documentation/catalogs			
SINAMICS	G110	D 11	- Converter built-in 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 built-in units - Converter cabinet units
	S120, S150	D 21	- SINAMICS S120 built-in units in the chassis format and Cabinet Modules - SINAMICS S150 Converter Cabinet Units
	S120	D 21.4	- SINAMICS S120 and SIMOTICS
Manufacturer/service documentation			
SINAMICS	G110		- Getting Started - Operating instructions - List Manuals
	G120		- Getting Started - Operating instructions - Hardware 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		- Manual - Getting Started - Function Manual - List Manual
	S120		- Getting Started with STARTER - Commissioning Manual with STARTER - Getting Started with Startdrive - Commissioning Manual with Startdrive - Commissioning Manual CANopen - Function Manual Drive Functions - Function Manual Safety Integrated - Function Manual DCC - List Manual - Manual Control Unit and supplementary system components - Manual Power Unit Booksize - Manual Power Unit Booksize C/D Type - Manual Power Unit Chassis air-cooled - Manual Power Unit Chassis liquid-cooled - Combi Manual - Manual Cabinet Modules - Manual AC Drive - SINAMICS S120M Manual Distributed Drive Technology - SINAMICS HLA System Manual Hydraulic Drive
	S150		- Operating instructions - List Manual
Motors			- Configuration Manuals, Motors
General			- Configuration Manual, EMC Guidelines

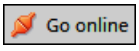
A.3 Shortcut menus and icons in Startdrive

A.3.1 Function calls project view

A.3.1.1 Project navigation

Shortcut menu

The shortcut menu of a drive in the project navigator contains the following entries:

Menu item	Icon (button) in the toolbar	Description
Open	-	Opens the drive device view.
Parameters	-	Opens the parameter view in the working area.
Cut		Cuts the selected content and copies it to the clipboard.
Copy		Copies the content to the clipboard.
Paste		Inserts the clipboard content into the project navigation.
Delete	-	Deletes the selected content from the project navigation.
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)		Loads the data from the device into the project (only when online).
Compile	-	Compiles existing programs.
Go online		Establishes an online connection to the drive.
Go offline		Disconnects the online connection - the drive goes offline.
Online & diagnostics	-	Opens the Online & diagnostics editor; if the drive is not online, Startdrive tries to establish an online connection.
Browsing a project		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.3.2 BICO interconnections

The following icons are used for BICO interconnections:

Icon	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.
	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.3.3 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.

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Further 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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