

**SIEMENS**

Application Manual

**SINAMICS**

**S120 Motor Modules Booksize  
Parallel connection**

Edition

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[www.siemens.com/drives](http://www.siemens.com/drives)



# SIEMENS

## SINAMICS

### S120 Motor Modules Booksize parallel connection

Application Manual

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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.

 <b>DANGER</b>
---

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

 <b>WARNING</b>
--

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

 <b>CAUTION</b>
--

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

<b>NOTICE</b>
---------------

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

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:

 <b>WARNING</b>
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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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### Trademarks

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

### Disclaimer of Liability

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

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# Introduction

## 1.1 Service and support

### Target group

This documentation addresses original equipment manufacturers (OEMs), commissioning engineers, and service personnel.

### Benefits

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

### Additional information

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

- 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 email address (<mailto:docu.motioncontrol@siemens.com>).

### Siemens MySupport/Documentation

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

### SINAMICS

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

### Technical support

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

## 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 at Product Support (<https://support.industry.siemens.com/cs/de/en/ps/faq>).

## Industry Online Support app

With the "Siemens Industry Online Support" app, you can obtain optimum support, even when you are on the move. The app is available for Apple iOS, Android and Windows Phone.

You can find the app under this address (<https://support.industry.siemens.com/cs/ww/en/sc/2067>).

## Spare parts

You can find a list of spare parts under the following address (<https://www.automation.siemens.com/sow?sap-language=EN>)



## 1.2 General Data Protection Regulation

Siemens observes standard data protection principles, in particular the principle of privacy by design.

For this product, this means:

The product does not process or store any person-related data, only technical function data (e.g. time stamps). If the user links this data with other data (e.g. shift plans) or if he/she stores person-related data on the same data medium (e.g. hard disk), thus personalizing this data, he/she has to ensure compliance with the applicable data protection stipulations.



## Fundamental safety instructions

### 2.1 General safety instructions



#### WARNING

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

Touching live components can result in death or severe injury.

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

Generally, the following 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

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

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

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



**⚠ WARNING**

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

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

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



**⚠ WARNING**

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

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

- Ground the device in compliance with the applicable regulations.



**⚠ WARNING**

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

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

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



**⚠ WARNING**

**Electric shock due to 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**

**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**

**Active implant malfunctions due to electromagnetic fields**

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

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

 **WARNING**

**Unexpected movement of machines caused by radio devices or mobile phones**

When radio devices or mobile phones with a transmission power  $> 1\text{ W}$  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.

**NOTICE**

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

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

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

 **WARNING**

**Fire due to inadequate ventilation clearances**

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

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

**NOTICE****Overheating due to inadmissible mounting position**

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

- Only operate the device in admissible mounting positions.

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

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

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

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

Incorrect voltage/insulation tests can damage the device.

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

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

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

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

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**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.

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

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



### NOTICE

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

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

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

## **2.3 Warranty and liability for application examples**

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

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

## 2.4 Industrial security

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### 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. Products and solutions from Siemens constitute one element of such a concept.

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

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

Industrial security (<https://www.siemens.com/industrialsecurity>)

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

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

Industrial security (<https://www.siemens.com/industrialsecurity>)

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Further information is provided on the Internet:

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



**WARNING**

**Unsafe operating states resulting from software manipulation**

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

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

## 2.5 Residual risks of power drive systems

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

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

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



## Application description

### 3.1 Introduction

SINAMICS S120 has a modular design, and addresses complex drive tasks in the widest range of industrial applications. A user can select a solution that best corresponds to his specific requirements from a wide variety of components and functions that are harmonized and coordinated with one another.

SINAMICS S120 Motor Modules Booksize are space-saving and thus well suited for applications involving minimal available space.

This application description documents the parallel connection of air-cooled SINAMICS S120 Motor Modules Booksize to a shared DC link.

Only 2 Motor Modules Booksize with the same rated current of 132 A (71 kW) or 200 A (107 kW) are used. The parallel connection makes it possible to cover the needed output of > 200 A (> 107 kW).

## 3.2 Preconditions

The parallel connection is limited to a maximum of 2 air-cooled SINAMICS S120 Motor Modules Booksize.

These Motor Modules must fulfill the following requirements:

- Same frame size:
  - 132 A (71 kW) / MLFB: 6SL3120-1TE31-3AAx
  - OR -
  - 200 A (107 kW) / MLFB: 6SL3120-1TE32-0AAx
- Same firmware version ( $\geq$  V5.2)
- Same hardware version (acc. to nameplate)

---

### Note

#### Replacement in the event of a fault

- Always replace both Motor Modules Booksize when a replacement part is needed.
  - Take the hardware version into consideration when replacing a faulty Motor Module Booksize. Both Motor Modules must have the same hardware version following replacement.
-



# Hardware

## 4.1 Technical requirements

The hardware configuration of the parallel connection depends on the technical specifications. These specifications are binding and must be adhered to.

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**Note****No UL certification**

The parallel connection of the SINAMICS S120 Motor Modules Booksize in accordance with this application description is not UL-certified.

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**Note****EMC Directive**

The system integrator is responsible for adhering to the EMC Directive when using the parallel connection of Motor Modules Booksize.

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**Note****Power supply of the Motor Modules Booksize**

Motor Modules connected in parallel require a corresponding infeed power.

If the power is supplied via the parallel connection of SINAMICS Active Line Modules, you can find further information in the application description "Active Line Modules Booksize, parallel connection (<https://support.industry.siemens.com/cs/ww/en/view/109759667>)".

## Symmetrical layout

**Input side**

The voltage source must be identical for the Motor Modules Booksize that are connected in parallel.

When using the DC link bars of the Motor Modules Booksize, the current load must not exceed the maximum of 200 A.

These requirements necessitate the symmetrical setup of the modules:

- Symmetrical arrangement of the two Motor Modules Booksize connected in parallel
- The Active Line Modules infeed modules are positioned based on the maximum current carrying capacity of the DC link bars.

You can find further information in the application description "Active Line Modules Booksize, parallel connection (<https://support.industry.siemens.com/cs/ww/en/view/109759667>)".

**NOTICE**

**Component damage caused by excessively low current carrying capacity of the DC link busbars**

The DC link busbars of the individual components have different current carrying capacities. If more current flows through a DC link busbar than is specified for it, the component will heat up strongly and may sustain damage as a result of overheating.

- When configuring the drive lineup, carefully observe the current carrying capacities of the individual components.
- If required, replace the DC link jumper or reduce the load.

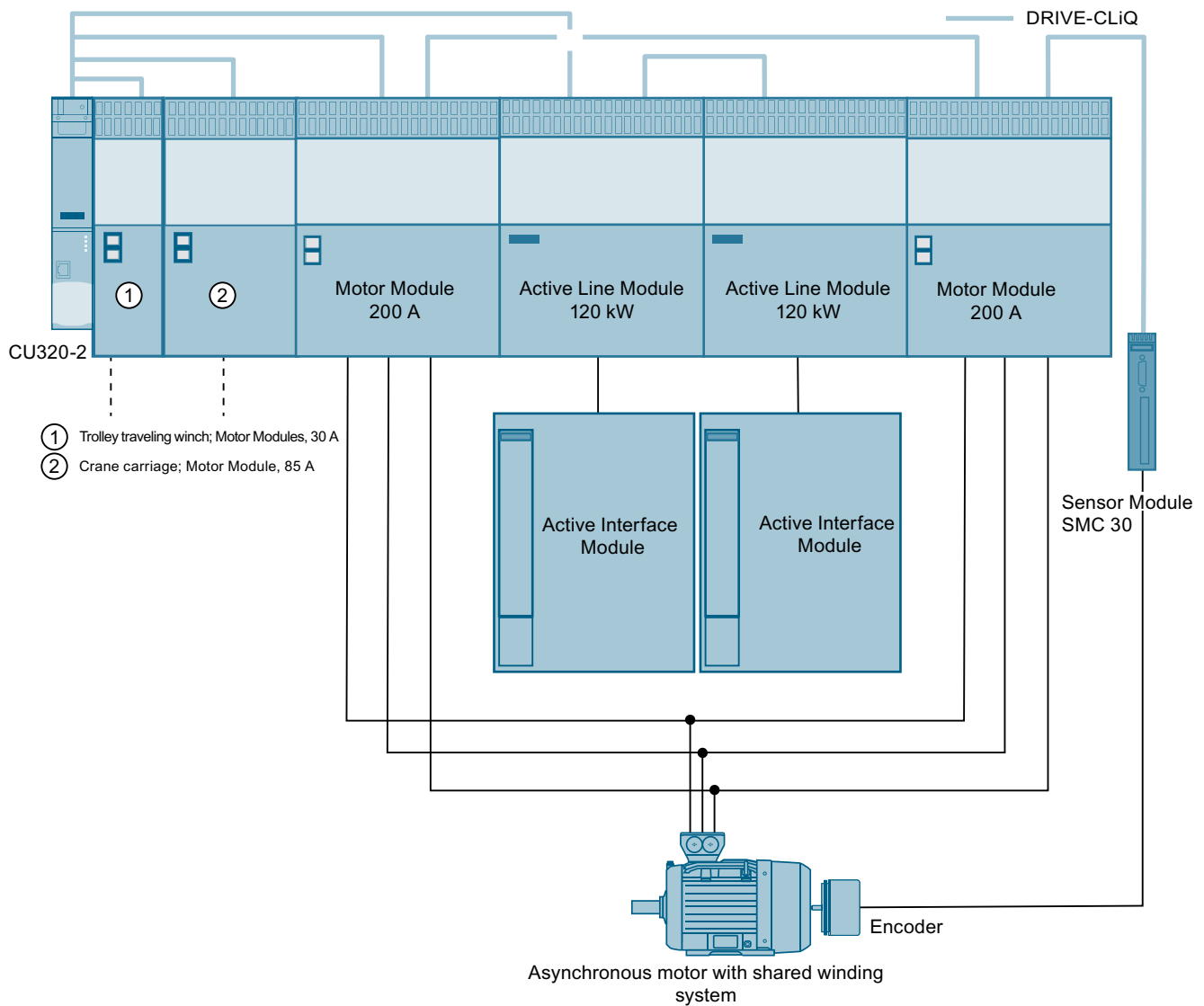


Figure 4-1 Example hardware layout for crane systems with SINAMICS S120 Motor Modules Booksize 200 A

**Output side**

The following symmetrical layout must be adhered to on the output side:

- Symmetrical connection setup between Motor Modules Booksize and asynchronous motor
- Identical motor cables
  - Same output type and same cross-section
  - Same motor cable lengths
  - Adherence to the required minimum cable lengths; see Chapter: Decoupling Motor Modules (Page 30)

**Control mode**

Only vector control with and without encoder feedback may be used as the control mode.

**Limiting circulating currents**

To limit possible circulating currents between the Motor Modules Booksize connected in parallel, a minimum inductance per converter output is required.

Additional information is provided in Chapter: Decoupling Motor Modules (Page 30).

**Current reduction**

For a parallel connection, the current reduction in relation to the rated currents for the individual Motor Modules is 5%.

**Asynchronous motors**

Asynchronous motors with a common winding system (one-winding system) can be used. All of the parallel windings within the motor must be connected in such a way that from the outside they look like a single winding system.

---

**Note****No group drive**

Connecting several asynchronous motors of the same type to one Motor Module is not permitted when using the parallel connection of Motor Modules Booksize.

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**Note****Motor protection**

The motor is protected by the thermal model of the firmware. Alternatively, the motor temperature can also be monitored using corresponding motor sensors.

---

#### 4.1 Technical requirements

##### **One-sided overload response**

P290 must be assigned to "1" (= no reduction and shutdown when overload threshold is reached) to prevent one-sided overload responses of the power supply units.

##### **Pulse enable**

The "Pulse enable" inputs of the parallel Motor Modules Booksize must be wired in parallel to achieve simultaneous release of both Motor Modules Booksize.

##### **Safety Integrated**

The Safety Integrated functions for the Motor Modules Booksize connected in parallel are not enabled.

## 4.2 Design

### Components

The following components are required for the parallel connection:

- 1 SINAMICS Control Unit CU320-2
- 2 SINAMICS S120 Motor Modules Booksize
- Line Modules, e.g. SINAMICS S120 Active Line Modules
- SINAMICS S120 Sensor Module SMC30 (optional)
- Asynchronous motor
- SINAMICS motor reactors (optional)
  - 6SE7031-8ES87-1FE0 (for Motor Module 132 A)
  - 6SE7032-6ES87-1FE0 (for Motor Module 200 A)

### Layout of the parallel connection

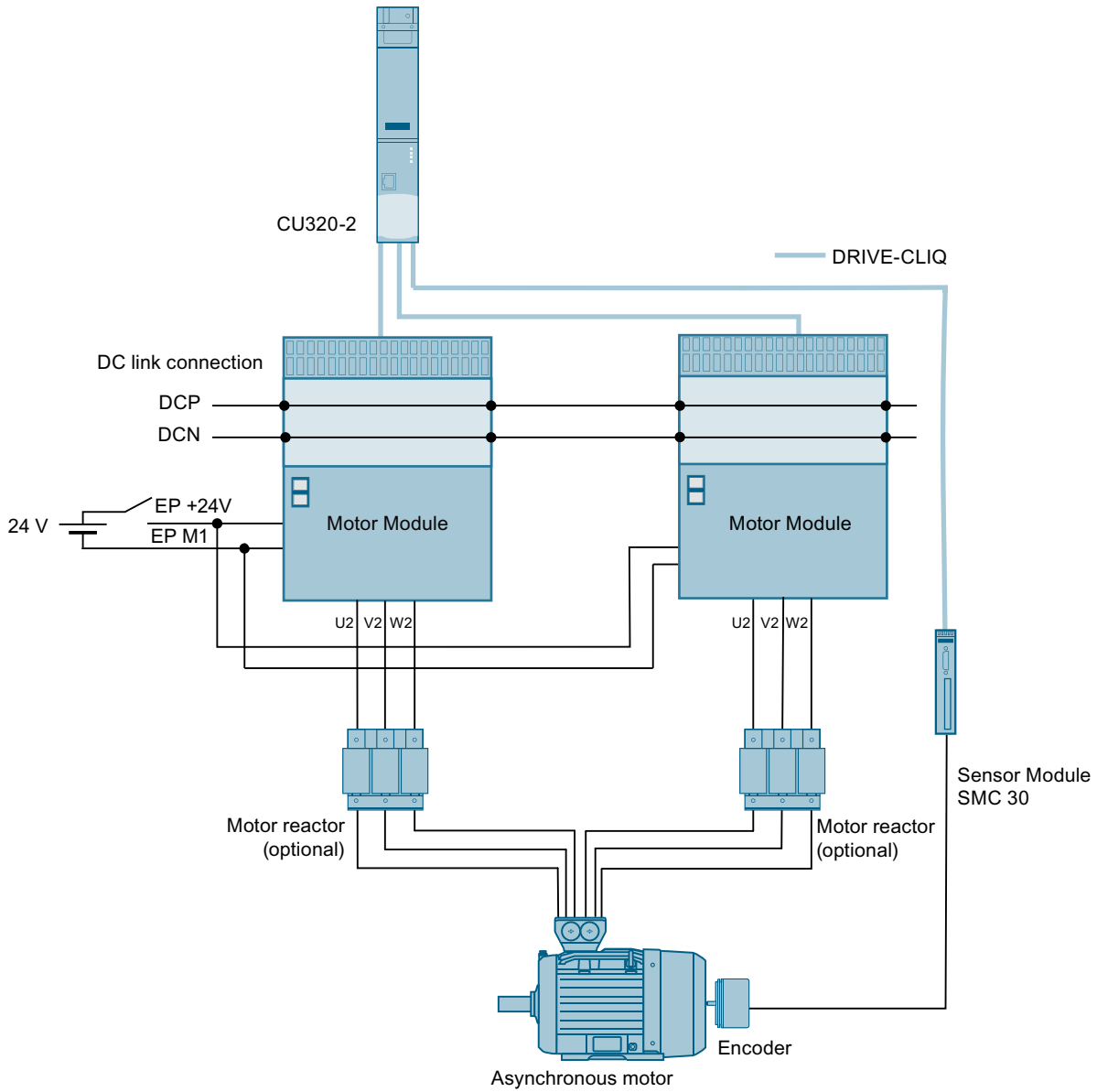


Figure 4-2 Example layout of the parallel connection of Motor Modules Booksize

## Further information

### Parallel connection of SINAMICS S120 Motor Modules Booksize

The components needed for connecting Motor Modules Booksize in parallel belong to the SINAMICS S120 series.

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#### Note

#### SINAMICS Equipment Manuals

The parallel connection of Motor Modules Booksize falls under the scope of the SINAMICS S120 Equipment Manuals.

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- You will find exhaustive descriptions of the devices and their interconnections in these SINAMICS S120 Equipment Manuals:
  - Booksize power units (<https://support.industry.siemens.com/cs/ww/en/view/109766188>)
  - Control Units and supplementary system components (<https://support.industry.siemens.com/cs/ww/en/view/109763286>)

### Parallel connection of SINAMICS S120 Active Line Modules Booksize

Descriptions of the parallel connection of Active Line Modules Booksize with an infeed power up to 228 kW can be found in this SINAMICS S120 application description:

- Parallel connection of Active Line Modules (<https://support.industry.siemens.com/cs/ww/en/view/109759667>)

### 4.3 Decoupling Motor Modules

To limit possible circulating currents between each Motor Module of the parallel connection and the asynchronous motor, a minimum inductance per converter output is required.

You can achieve the minimum inductance in 2 different ways:

- Adherence to the minimum cable lengths between the Motor Modules connected in parallel and the asynchronous motor  
- OR -
- Adherence to the minimum cable lengths with the additional use of motor reactors at the output of each Motor Module

---

**Note**

**Same motor cable lengths**

The minimum cable lengths must be the same length within the setup.

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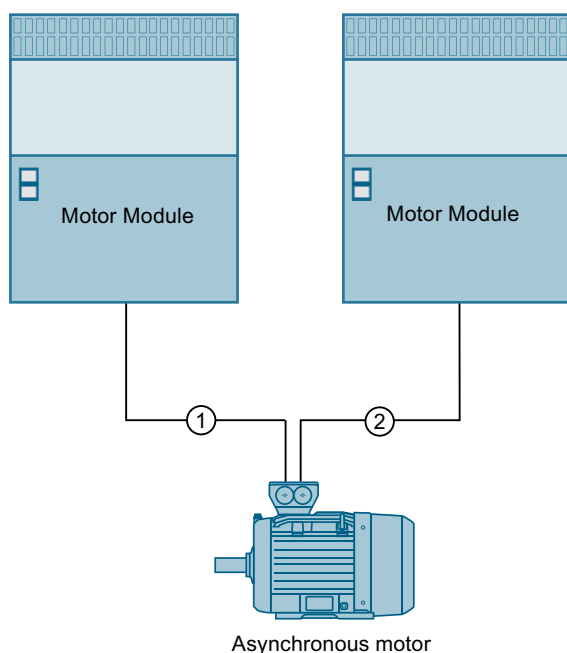
#### Minimum cable lengths without motor reactors

When the length of the motor cable is specified in the table, it is assumed that 1 m of motor cable typically has an inductance of 1 µH.

Table 4-1 Inductance - Minimum cable length

Description	6SL3120-1TE31-3AA3	6SL3120-1TE32-0AA4
Power [kW]	71	107
Rated current [A]	132	200
Required inductance per Motor Module [µH]	40	26
<b>Motor cable lengths</b>		
Minimum cable length [m] per line/without motor reactor	40	26





① ② Motor cables

Figure 4-3 Symmetrical layout without motor reactor

### Minimum cable lengths with motor reactors

You can reduce the required minimum cable length through the use of SINAMICS motor reactors.

#### Note

##### Use of motor reactors

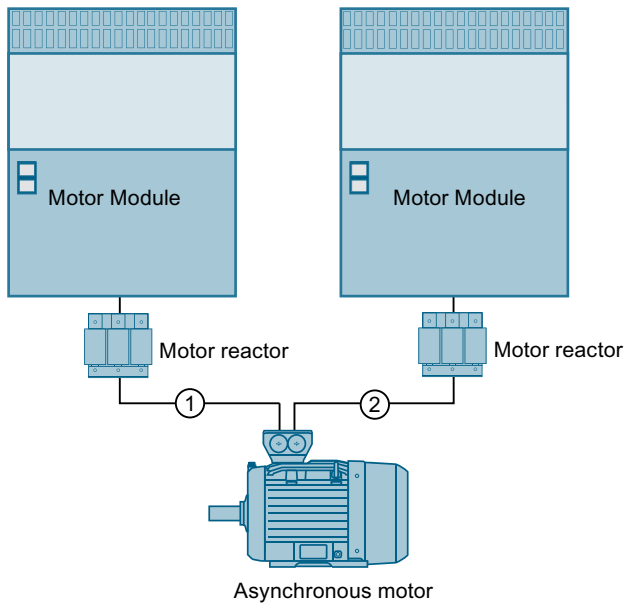
To shorten the cable lengths, a maximum of 2 motor reactors can be used per Motor Module.

Table 4-2 Inductance - Minimum cable lengths when using motor reactors

Description	6SL3120-1TE31-3AA3	6SL3120-1TE32-0AA4
Power [kW]	71	107
Rated current [A]	132	200
Required inductance per Motor Module [ $\mu$ H]	40	26
<b>Cable lengths*</b>		
Min. cable length [m] per cable/with motor reactor	17	10
<b>Associated motor reactor</b>		
Article number	6SE7031-8ES87-1FE0	6SE7032-6ES87-1FE0
Inductance of the motor reactor [ $\mu$ H]	23	16

\* Specifications when using 1 motor reactor

4.3 Decoupling Motor Modules



①② Motor cables

Figure 4-4 Symmetrical layout with motor reactor

---

**Note**

**Pulse frequency**

The motor reactors are designed for a pulse frequency of 4 kHz. Higher pulse frequencies are not permissible.

---

**Note**

**Mounting**

Mount the motor reactor as close as possible to the output of the Motor Module.

---

# Commissioning

## 5.1 Introduction

The commissioning of a drive system with Motor Modules Booksize connected in parallel is done using the STARTER commissioning tool.

STARTER supports you in creating the required drive object for the Motor Modules Booksize connected in parallel.

---

**Note****Online parameterization**

You can only create the drive object via the online parameterization.

---

### Procedure

- Before commissioning, ensure that the requirements (Page 34) are adhered to.
- To create the drive object, perform the following work steps in succession:
  - Step 1: Restoring the factory settings (Page 35)
  - Step 2: Creating a drive object (Page 37)
  - Step 3: Parameterizing the drive object (Page 39)

### Further information

You can find further information in the SINAMICS S120 Getting Started with STARTER (<https://support.industry.siemens.com/cs/ww/en/view/109754314>) manual.

## 5.2 Preconditions

Only carry out the commissioning if the following requirements have been fulfilled:

- The technical specifications for the hardware layout have been adhered to, see Chapter: Technical requirements (Page 23).
- The DRIVE-CLiQ connections are implemented in accordance with the system requirement between the Motor Modules Booksize connected in parallel and the following components:
  - Encoder modules, any existing DRIVE-CLiQ encoders
  - Control Unit CU320-2 with CF card, Firmware V5.2

---

### Note

#### Commissioning of the parallel connection

- Remove other Motor Modules from the DRIVE-CLiQ group before commissioning the parallel connection.
  - Always create the project for the Motor Modules Booksize connected in parallel first.
- 
- The supply voltage is connected.
  - The STARTER commissioning tool is started on the commissioning PC/PG.
  - The connection between the Control Unit and the commissioning PC/PG is established.

## 5.3 Step 1: Restoring the factory settings

### Procedure

1. Go to the menu items "Project > Connect to selected target devices" to switch to online mode.

The window "Target Device Selection" opens and lists the configured drive units.

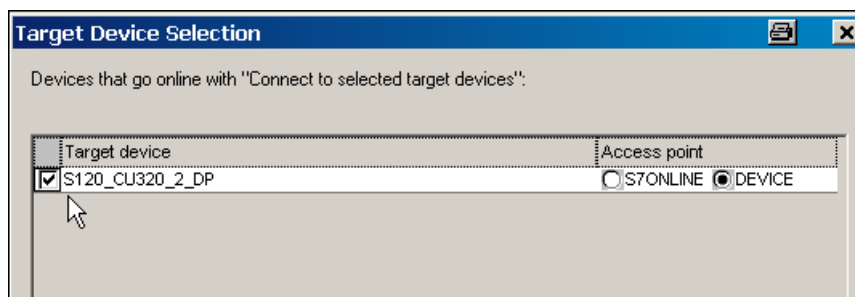


Figure 5-1 Access point control

2. Activate the "DEVICE" option.
3. Activate the check box " S120\_CU320\_2\_DP" and click on "OK".  
The PG/PC establishes the link to the Control Unit.  
The PG/PC performs an "online/offline comparison".  
The result is displayed in the following dialog "Online/offline comparison".  
Example:

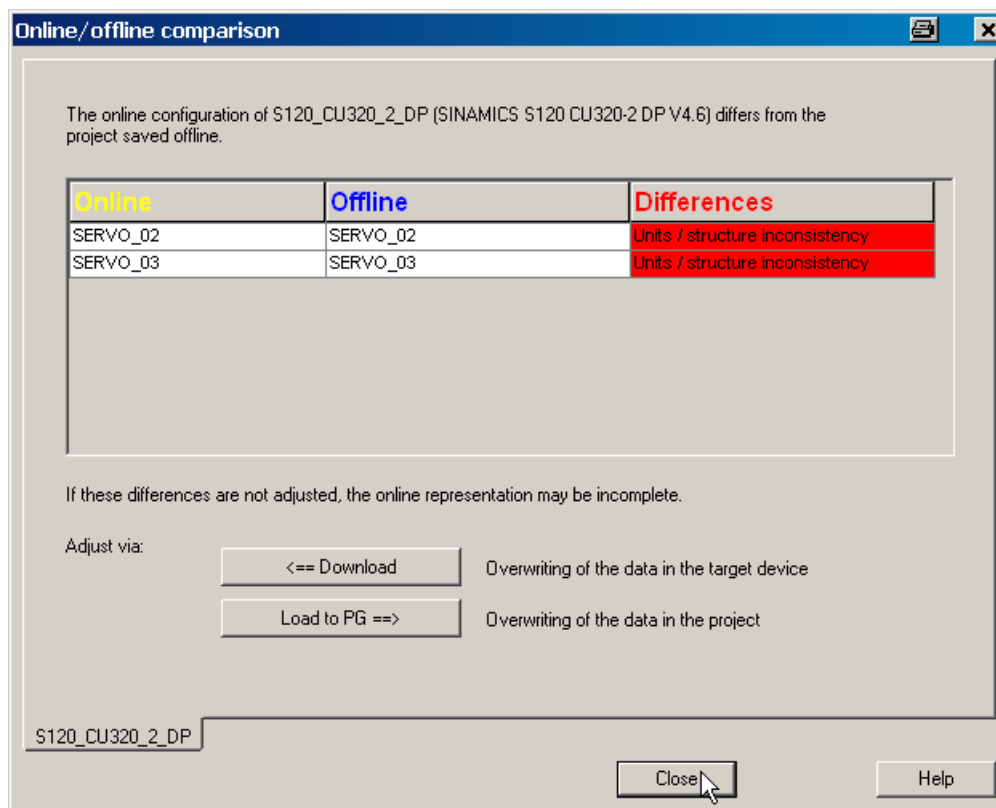


Figure 5-2 Online/offline comparison

5.3 Step 1: Restoring the factory settings

4. Click "Close".
5. Select the drive object "S120\_CU320\_2\_DP" in the project navigator.
6. With the right mouse button, select the shortcut menu "Target device > Restore factory settings".
7. Confirm the query with "OK".  
The PG/PC sets the drive parameters to their factory settings.  
The new status is automatically transferred to the Control Unit memory card using the function "Copy RAM to ROM".
8. Select the drive unit in the project navigator and call the shortcut menu "Target device > Copy RAM to ROM".

The factory settings have now been restored: The drive is in a defined basic state.


## 5.4 Step 2: Creating a drive object

### Procedure

1. Open the expert list in the drive object of the Control Unit.
  - In the project navigator, click on the "+" symbol before the entry "S120\_CU320\_2\_DP".
  - In the project navigator, click on the "+" symbol before drive "SERVO\_02".
  - Double-click on the entry "Expert list".

Param...	Data	Parameter text	Online value	Unit
324 p839		Motor changeover contactor control delay time	0	ms
325 p840[0]	C	Bit: ON / OFF (OFF1)	0	
326 p844[0]	C	Bit: No coast-down / coast-down (OFF2) signal source 1	1	
327 p845[0]	C	Bit: No coast-down / coast-down (OFF2) signal source 2	1	
328 p848[0]	C	Bit: No Quick Stop / Quick Stop (OFF3) signal source 1	1	
329 p849[0]	C	Bit: No Quick Stop / Quick Stop (OFF3) signal source 2	1	
330 p852[0]	C	Bit: Enable operation/inhibit operation	1	
331 p854[0]	C	Bit: Control by PLC/no control by PLC	1	
332 p855[0]	C	Bit: Unconditionally release holding brake	0	
333 p856[0]	C	Bit: Speed controller enable	1	
334 p857		Power unit monitoring time	6000.0	ms
335 p858[0]	C	Bit: Unconditionally close holding brake	SERVO_02 : r9719.13	
336 p860		Bit: Line cont. fdbk sig	SERVO_02 : r863.1	
337 p861		Line contactor monitoring time	100	ms
338 p862		Power unit ON delay	0	ms
339 r863		CO/BO: Drive coupling status word/control word	0H	
340 p864		Bit: Infeed operation	0	
341 p868		Power unit DC switch debounce time	65000	ms
342 p895[0]	P	Bit: Activate/de-activate power unit components	1	
343 r896		BO: Parking axis_status word	0H	

Figure 5-3 Expert list

2. Set the parameter p0009 Device commissioning parameter filter / Dev comm par\_filt to 1 to put the Control Unit into the "Device configuration" state.
3. Set the parameter p0097 Select drive object type / Select DO type to 12 to create a drive object of the type vector parallel connection.
4. Set the parameter p0009 Device commissioning parameter filter / Dev comm par\_filt to 0 to start the internal first device commissioning.  
The Control Unit then reboots automatically.  
You can track the status of the reboot in parameter r0002 Control Unit operating display / CU op\_display. At r0002 = 0 the reboot is complete
5. Back up the current configuration by saving it on the memory card (ROM) as follows:  
Click the icon  "Copy RAM to ROM"  
- OR -  
Call the "Target device > Copy RAM to ROM" shortcut menu.
6. The message that the Control Unit CU320-2 must be restarted appears.  
Proceed as follows:
  - Switch off the 24 V of the Control Unit CU320-2.
  - Wait for 3 seconds.
  - Switch on the 24 V of the Control Unit CU320-2 again.

7. A new drive object, e.g. Vector\_03 appears in the project navigator.  
This is the drive object for the Motor Modules Booksize connected in parallel.

---

**Note**

**Drive object**

The two Motor Modules Booksize are represented by a drive object for Motor Modules Booksize connected in parallel.

---

8. In the project navigator, double-click "Configuration" under the drive object.  
Check the configuration of the new drive object for the following information:
  - The power unit type must contain the entry "Parallel connection".
  - The rated current of the power unit must correspond to this value: 2·0.95·rated current of the type of the Motor Modules Booksize connected in parallel
  - The rated power of the power unit must correspond to this value: 2·0.95·rated power of the type of the Motor Modules Booksize connected in parallel

If you do not get these values, repeat the commissioning from Step 1: Restoring the factory settings (Page 35).



## 5.5 Step 3: Parameterizing the drive object

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### Note

#### DDS configurator

The DDS configurator in STARTER cannot be used for activating function modules in the drive object of the Motor Modules Booksize connected in parallel.

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### Note

#### Loss of the parallel connection

Use of the DDS configurator in STARTER for activating function modules in the drive object of the Motor Modules Booksize connected in parallel resets the type of the drive object to a "Vector" drive object. The parallel connection is lost and the drive configuration is no longer consistent with the existing drive configuration with Motor Modules Booksize connected in parallel.

- Only parameterize the drive object of the Motor Module Booksize connected in parallel by using the expert list.
  - Perform the commissioning again from Step 1: Restoring the factory settings (Page 35).
- 

## Procedure

1. Call up the expert list in the drive object of the Motor Modules Booksize connected in parallel. You will find more information about calling up the expert list in Chapter Step 2: Creating a drive object (Page 37), item 1
2. Set the parameter p0010 "Drive commissioning parameter filter / Drv comm. par\_filt" to 1 to filter out the parameters for quick commissioning

5.5 Step 3: Parameterizing the drive object

- Set the following parameters for parameterizing the Motor Data Set [MDS] to the values of the motor you connected to the Motor Modules Booksize connected in parallel:


Parameter	Description
p0100	IEC/NEMA mot stds / IEC/NEMA mot stds 0: IEC motor (SI units, e.g. kW) 1: NEMA motor (US units, e.g. hp)
p0300[0]	Motor type selection
<b>When using a Siemens motor (p0300 ≥ 100)</b>	
p0301[0]	Motor code number selection
<b>When using a third-party motor (p0300 &lt; 100)</b>	
p0304[0]	Rated motor voltage [MDS]
p0305[0]	Rated motor current [MDS]
p0307[0]	Rated motor output [MDS]
p0308[0]	Rated motor power factor [MDS] (Only for p0100=0)
p0309[0]	Rated motor efficiency [MDS] (Only for p0100=1)
p0310[0]	Rated motor frequency [MDS]
p0311[0]	Rated motor speed [MDS]
p0335[0]	Motor cooling method [MDS] 0: Natural cooling 1: Forced ventilation 2: Water cooling

- Parameterize the encoder used by you by setting the parameter p0400 "Encoder type selection".

The TTL and HTL encoders cited in the following table are examples.

3001	1024 HTL A/B R
3002	1024 TTL A/B R
3003	2048 HTL A/B R
3005	1024 HTL A/B
3006	1024 TTL A/B
3007	2048 HTL A/B
3008	2048 TTL A/B
3009	1024 HTL A/B unipolar
3011	2048 HTL A/B unipolar
3020	2048 TTL A/B R, with sense

- Set the parameter p0230 "Drive filter type" to 1 on the motor side if you are using the optional motor reactors for adhering to the output-side minimum inductance. Parameter p0235 "Motor reactor in series number" displays the number of motor reactors per Motor Module Booksize. The required value of 1 is already the factory setting.
- Call up the expert list in the drive object of the Motor Modules Booksize connected in parallel.

7. Set the parameter p0290 "Power unit overload response" to 1 to prevent different responses of the Motor Module Booksize connected in parallel in the event of an overload.
8. Set the parameter p3900 "Completion of quick commissioning" to 3 to complete the quick commissioning with the calculation of the motor, open loop control and closed loop control parameters.
9. Back up the created configuration by saving it on the memory card (ROM) as follows:  
Click the icon  "Copy RAM to ROM"  
- OR -  
Call the "Target device > Copy RAM to ROM" shortcut menu.
10. Make additional application-specific settings of the parameterization of the corresponding drive parameters by using the expert list.
11. We recommend optimizing the drive parameters by identifying the drive during the system commissioning.  
To do this, perform a standstill measurement (p1910) and, if possible, a rotating measurement (p1960).





## Further information

Siemens:

[www.siemens.com](http://www.siemens.com)

Industry Online Support (Service and Support):

[www.siemens.com/online-support](http://www.siemens.com/online-support)

IndustryMall:

[www.siemens.com/industrymall](http://www.siemens.com/industrymall)

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