SIEMENS

SINAMICS

**SINAMICS G120
CU250S-2 Control Units**

Compact Operating Instructions

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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.

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.

Table of contents

This manual describes how you install a SINAMICS G120 converter with CU250S-2 Control Unit and commission it.

What is the meaning of the symbols in the manual?

Reference to further information in the manual

1
2   An operating instruction starts here.

This concludes the operating instruction.

Download from the Internet

DVD that can be ordered

1 Fundamental safety instructions

1.1 General safety instructions

⚠ WARNING
Risk of death if the safety instructions and remaining risks are not carefully observed
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 given in the hardware documentation. • Consider the residual risks for the risk evaluation.

⚠ WARNING
Danger to life or malfunctions of the machine as a result of incorrect or changed parameterization
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. • Respond to possible malfunctions by applying suitable measures (e.g. EMERGENCY STOP or EMERGENCY OFF).

1.2 Industrial security

Note

Industrial security

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit this address (http://www.siemens.com/industrialsecurity).

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit this address (http://support.automation.siemens.com).

⚠ **WARNING**

Danger as a result of unsafe operating states resulting from software manipulation

Software manipulation (e.g. by viruses, Trojan horses, malware, worms) can cause unsafe operating states to develop in your installation which can result in death, severe injuries and/or material damage.

- Keep the software up to date.
  You will find relevant information and newsletters at this address (http://support.automation.siemens.com).
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.
  You will find further information at this address (http://www.siemens.com/industrialsecurity).
- Make sure that you include all installed products into the holistic industrial security concept.

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2 Scope of delivery

Scope of delivery

The delivery comprises at least the following components:

- A CU250S-2 Control Unit ready for operation with installed firmware.

Options for upgrading and downgrading the firmware can be found on the Internet:
Firmware (http://support.automation.siemens.com/WW/news/en/67364620)

The fieldbus interface of the Control Unit depends on the order number.

The order number, the designation and the version of the hardware (e.g. 02) and firmware (e.g. 4.6) can be found on the rating plate ① of the Control Unit.

Designation	Order number	Fieldbus
CU250S-2	6SL3246-0BA22-1BA0	USS, Modbus RTU
CU250S-2 DP	6SL3246-0BA22-1PA0	PROFIBUS
CU250S-2 PN	6SL3246-0BA22-1FA0	PROFINET, EtherNet/IP
CU250S-2 CAN	6SL3246-0BA22-1CA0	CANopen

- Compact Operating Instructions in German and English
- The inverter contains open-source software (OSS). The OSS license terms are saved in the inverter.

Reading the OSS license terms

The inverter contains open-source software (OSS). OSS comprises open source text and satisfies special license terms. If you wish to read the license terms, you must transfer them from the inverter to a PC.

Procedure

To transfer the OSS license terms from the inverter to a PC, proceed as follows:

1. Switch off the inverter power supply.
2. Insert an empty memory card into the card slot of the inverter.

   ⇨ Overview of the interfaces (Page 8)

3. Switch on the inverter power supply.
4. When you have switched on the power supply, wait 30 seconds.

   During this time, the inverter writes the "Read_OSS.ZIP" file onto the memory card.

5. Switch off the inverter power supply.
6. Withdraw the memory card from the inverter.
7. Use a card reader and load the file to a PC.

You have then transferred the OSS license terms from the inverter to a PC, and you can now read the license terms.

Installing

<div style="text-align: right; font-size: large;">3</div>

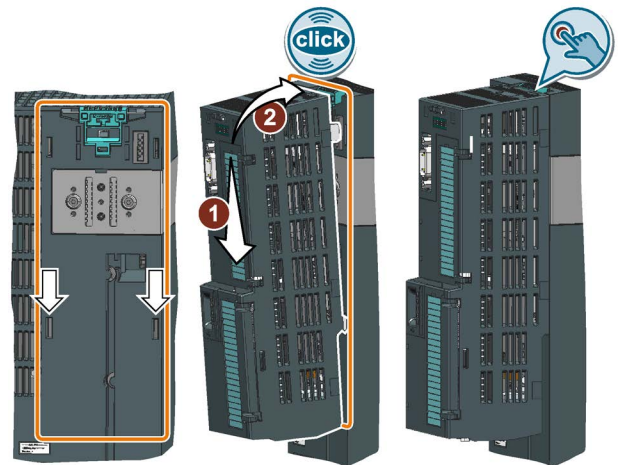## 3.1 Installing the Control Unit

Installing the Control Unit - General

Each Power Module has an appropriate holder for the Control Unit and a release mechanism.

Inserting the Control Unit

1
2   Proceed as follows to plug the Control Unit onto a Power Module:

1. Place the two catches of the Control Unit in the matching grooves of the Power Module.
2. Press the Control Unit onto the Power Module until you hear that it latches.

You have now plugged the Control Unit onto the Power Module.

Removing the Control Unit

Remove the Control Unit from the Power Module by pressing the release mechanism.

Special features for the PM240 FSGX Power Module

To insert or detach the Control Unit, you must release the two screws at the front cover, slightly shift the front cover upwards and remove towards the front.

Reattach the front cover before you commission the device.
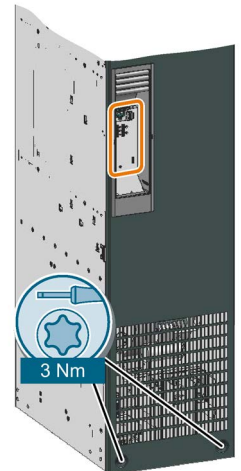
Permissible Power Modules

You may operate the Control Unit with the following Power Modules:

- PM240
- PM250
- PM260
- PM340 1AC
- PM240-2

3.2 Overview of the interfaces

To access the interfaces at the front of the Control Unit, you must unplug the Operator Panel (if one is being used) and open the front doors.

① Terminal strips

② Fieldbus interface

Selecting the fieldbus address:

- PROFIBUS
- USS
- Modbus RTU
- CanOpen

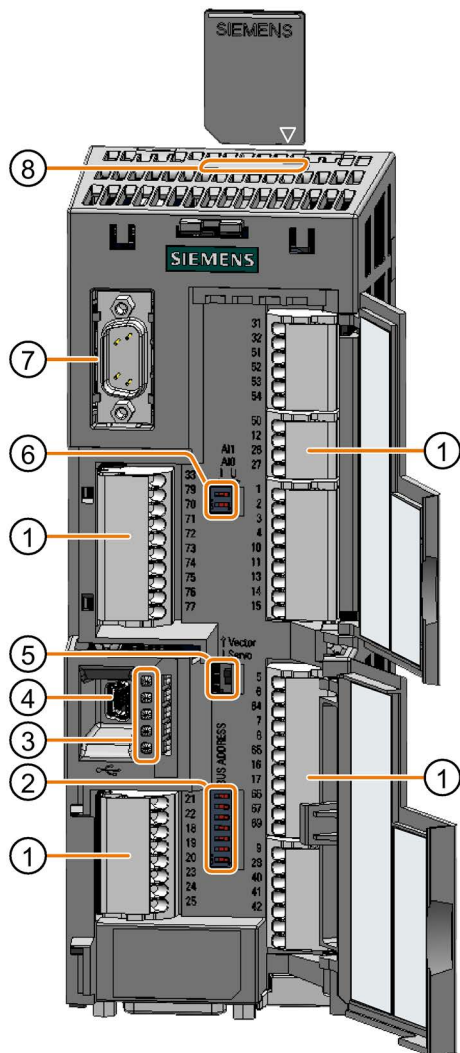|	
Bit 6 (64)	■
Bit 5 (32)	■
Bit 4 (16)	■
Bit 3 (8)	■
Bit 2 (4)	■
Bit 1 (2)	■
Bit 0 (1)	■
On	Off

③ Status LED

RDY
BF
SAFE
LNK1, only for PROFINET
LNK2, only for PROFINET

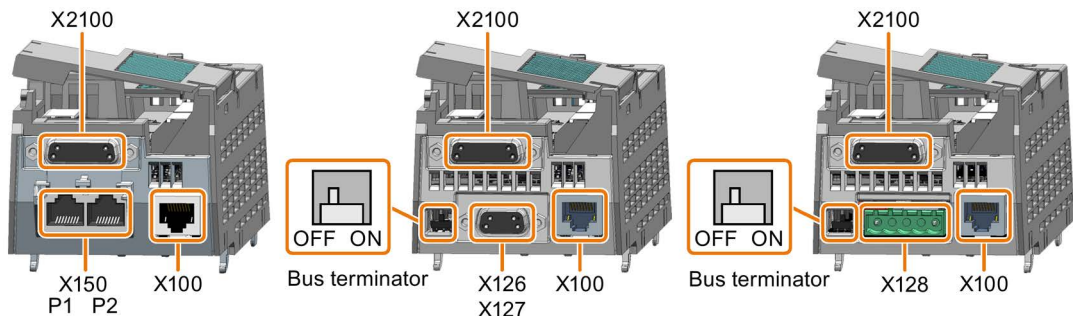④ USB interface for connection to a PC

⑤ No function. Keep the switch in the "Vector" position.

⑥ Switch for analog inputs

I   0/4 mA … 20 mA

U   -10/0 V … 10 V
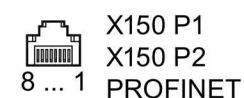
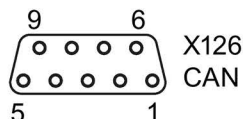|	
AI 1	■
AI 0	■
	I U

⑦ Connection to the operator panel

⑧ Memory card slot

X2100

X150   X100
P1 P2

X2100

OFF   ON
Bus terminator   X126   X100
X127

X2100

OFF   ON
Bus terminator   X128   X100

Interfaces at the lower side of the Control Unit

X150 P1
X150 P2
PROFINET
8 ... 1

1 RX+ Receive data +
2 RX- Receive data -
3 TX+ Transmit data +
4 ---
5 ---
6 TX- Transmit data -
7 ---
8 ---

X126 CAN
9   6
5   1

1 ---
2 CAN_L CAN signal (dominant low)
3 CAN_GND, CAN ground
4 ---
5 (CAN _SHLD), Optional shield
6 (GND), optional ground
7 CAN_H, CAN signal (dominant high)
8 ---
9 ---

X127 PROFIBUS
6   9
1   5

1 ---
2 M, reference potential for P24_Serv
3 RxD/TxD-P, transmit and send (B/B')
4 CNTR-P control signal
5 GND reference potential für data (C/C')
6 + 5 V power supply
7 P24_Serv
8 RxD/TxD-N, receive and transmit (A/A')
9 ---

X128 RS485
1   5
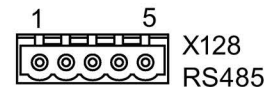
1 0 V, reference potential
2 RS485P, receive and transmit (+)
3 RS485N, receive and transmit (-)
4 Cable shield
5 ---

X2100 Encoders
9   15
1   8
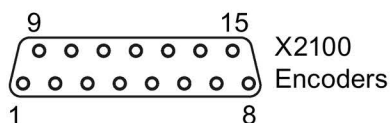
	KTY84, PT1000, PTC or temperature switch	HTL	TTL	SSI (RS422 standard)
1 Motor temperature sensing +	Temp +	---	---	---
2 SSI clock	---	---	---	Clock +
3 Inverse SSI clock	---	---	---	Clock -
4 Encoder power supply [1]	---	24 V	5 V	24 V
5 Encoder power supply [1]	---	24 V	5 V	24 V
6 Sense signal from the encoder	---	---	Sense+	---
7 Reference for encoder power supply	---	0 V	0 V	0 V
8 Motor temperature sensing -	Temp -	---	---	---
9 Reference for sense signal	---	---	Sense-	---
10 Zero signal+	---	R +	R +	---
11 Zero signal-	---	R -	R -	---
12 Channel B-	---	B -	B -	---
13 Channel B+	---	B +	B +	---
14 Channel- / SSI data	---	A -	A -	Data -
15 Channel A+ / SSI data	---	A +	A +	Data +

[1] Optional connection of the power supply at pin 4 or pin 5

X100 DRIVE-CLiQ Encoders
1 ... 8
A   B
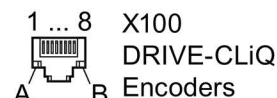
Encoder mit DRIVE-CLiQ interface or encoder via Sensor Module

1 Transmit data +
2 Transmit data -
3 Receive data +
4 ---
5 ---
6 Receive data -
7 ---
8 ---
A + 24 V power supply
B 0 V, reference for power supply

Table 3- 1   Permissible encoders on the DRIVE-CLiQ interface X100

	DRIVE-CLiQ encoder	Resolver	HTL encoder	TTL encoder	SSI encoder	Endat 2.1	sin/cos encoder
Direct connection	✓	---	---	---	---	---	---
Connection via Sensor Module SMC10, SMC20, SMC30, SME20 or SME25	---	✓	✓	✓	✓	✓	✓

The permissible combinations of encoders for speed control and position control are listed in the "Basic Positioner" Function Manual:

3.3   Terminal strips behind the upper front door

31	+24 V IN	Optional external power supply 20.4V ... 28.8V
32	GND IN	Reference for terminal 31:
51	DI 24	
	DO 24	
52	DI 25	
	DO 25	Digital inputs or outputs
53	DI 26	Switchable via p0728
	DO 26	
54	DI 27	
	DO 27	
50	GND	Reference for terminals 1, 9, 12, 26, 33, 51 ... 54
12	AO 0	Analog outputs (0 V … 10 V, 0 mA … 20 mA)
26	AO 1	
27	GND	Reference for terminals 1, 9, 12, 26, 33, 51 ... 54
1	+10 V OUT	Internal power supply, max. 10 mA
2	GND	Reference for terminals 1, 9, 12, 26, 33, 51 ... 54
3	AI 0+	Analog input (-10 V ... 10 V, 0/4 mA ... 20 mA)
4	AI 0-	
10	AI 1+	Analog input (-10 V ... 10 V, 0/4 mA ... 20 mA)
11	AI 1-	
13	GND	Reference for terminals 1, 9, 12, 26, 33, 51 ... 54
14	T1 MOTOR	Temperature sensor (PTC, PT1000, KTY84, bimetallic)
15	T2 MOTOR	

+24 V_ext, GND_ext, > 4.7 kΩ, +10 V, 0 V

33	ENC+ OUT	⏻	Power supply
79	GND		Reference terminal 1, 9, 12, 26, 33, 51 ... 54
70	AP /	⏻	Channel A+ /
	S2	⊗	Sinusoidal signal+
71	AN /	⏻	Channel A- /
	S4	⊗	Sinusoidal signal-
72	BP /	⏻	Channel B+ /
	S1	⊗	Cosine signal+
73	BN /	⏻	Channel B- /
	S3	⊗	Cosine signal-
74	ZP	⏻	Zero signal+
75	ZN	⏻	Zero signal-
76	R1	⊗	Excitation+
77	R2	⊗	Excitation-

HTL encoder

Resolver

GND	All terminals with reference potential "GND" are connected with one another in the inverter.

Terminals 31, 32   Connection of the optional 24 V supply has the following advantages:
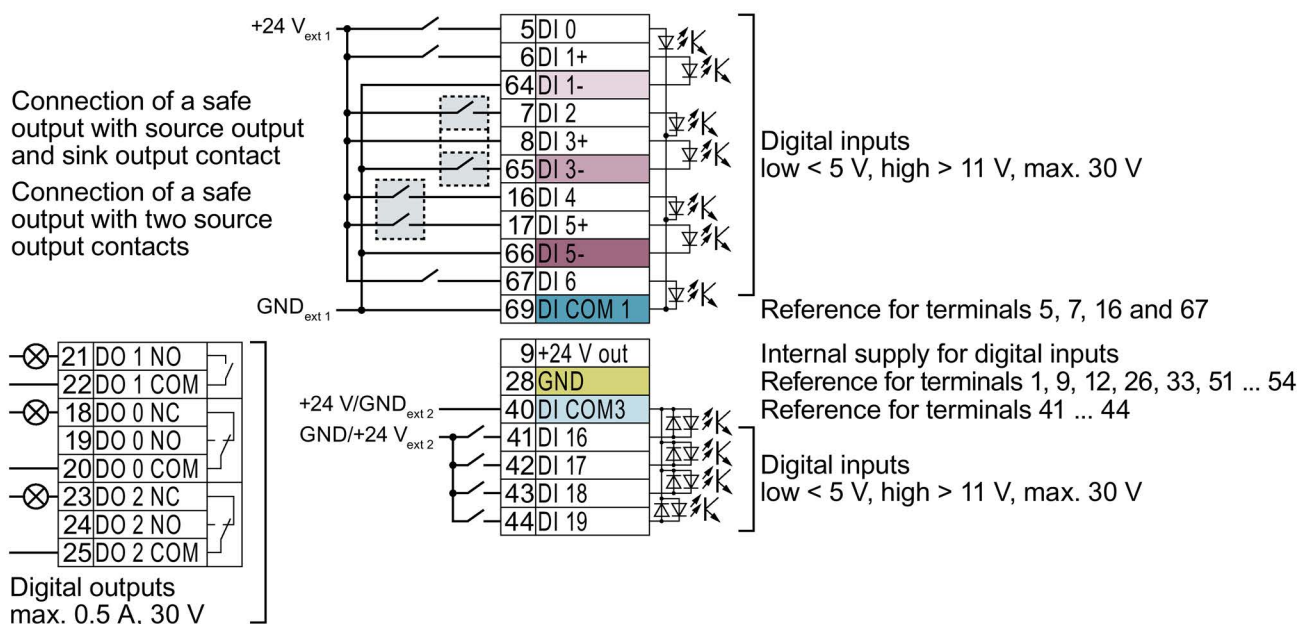
GND IN

- The Control Unit remains in operation after disconnection of the Power Module from the line supply. The Control Unit thus maintains the fieldbus communication, for example.
- You can use terminals 51 … 54 as digital outputs.

Power supplies in conformance with SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) are permissible.

If you use a common external power supply for terminals 31, 32 and the digital inputs, you must connect GND and the reference potential of the digital input ("DI COM1/2/3") with each other.

Terminals 3, 4 and 10, 11:   You may use the internal 10 V supply or an external power supply for the analog inputs. For an internal 10 V supply: Connect AI 0, respectively AI 1- with GND.

Image 3-1   Interconnection example of the digital inputs with external 24 V power supply

+24 V_ext 1

Connection of a safe
output with source output
and sink output contact

Connection of a safe
output with two source
output contacts

GND_ext 1

5	DI 0
6	DI 1+
64	DI 1-
7	DI 2
8	DI 3+
65	DI 3-
16	DI 4
17	DI 5+
66	DI 5-
67	DI 6
69	DI COM 1

Digital inputs
low < 5 V, high > 11 V, max. 30 V

Reference for terminals 5, 7, 16 and 67

21	DO 1 NO
22	DO 1 COM
18	DO 0 NC
19	DO 0 NO
20	DO 0 COM
23	DO 2 NC
24	DO 2 NO
25	DO 2 COM

Digital outputs
max. 0.5 A, 30 V

+24 V/GND_ext 2
GND/+24 V_ext 2

9	+24 V out
28	GND
40	DI COM3
41	DI 16
42	DI 17
43	DI 18
44	DI 19

Internal supply for digital inputs
Reference for terminals 1, 9, 12, 26, 33, 51 ... 54
Reference for terminals 41 ... 44

Digital inputs
low < 5 V, high > 11 V, max. 30 V

GND	All terminals with reference potential "GND" are connected with one another in the inverter.
DI X-	Reference potentials for DI 1, DI 3 und DI 5, electrically isolated from "GND"
DI COM1	Reference potential for DI 0, DI 2, DI 4 and DI 6, electrically isolated from "GND"
DI COM3	Reference potential for DI 16 … DI 19, electrically isolated from "GND"

Image 3-2   Interconnection example of the digital inputs with external 24 V power supplies

Interconnecting the reference potential of the digital inputs

Table 3- 2   Supply options for the digital inputs

Supply	Reference potential interconnection
You are using an external 24 V supply	As shown above, connect the reference potential of the external 24-V supply to the reference potential of the corresponding digital input.
You are using the internal 24 V supply at terminal 9	Connect the appropriate reference potential of the digital input to GND.

Factory setting of the terminal strips

The factory setting of the terminals depends on the Control Unit.

Control Units with USS or CANopen interface
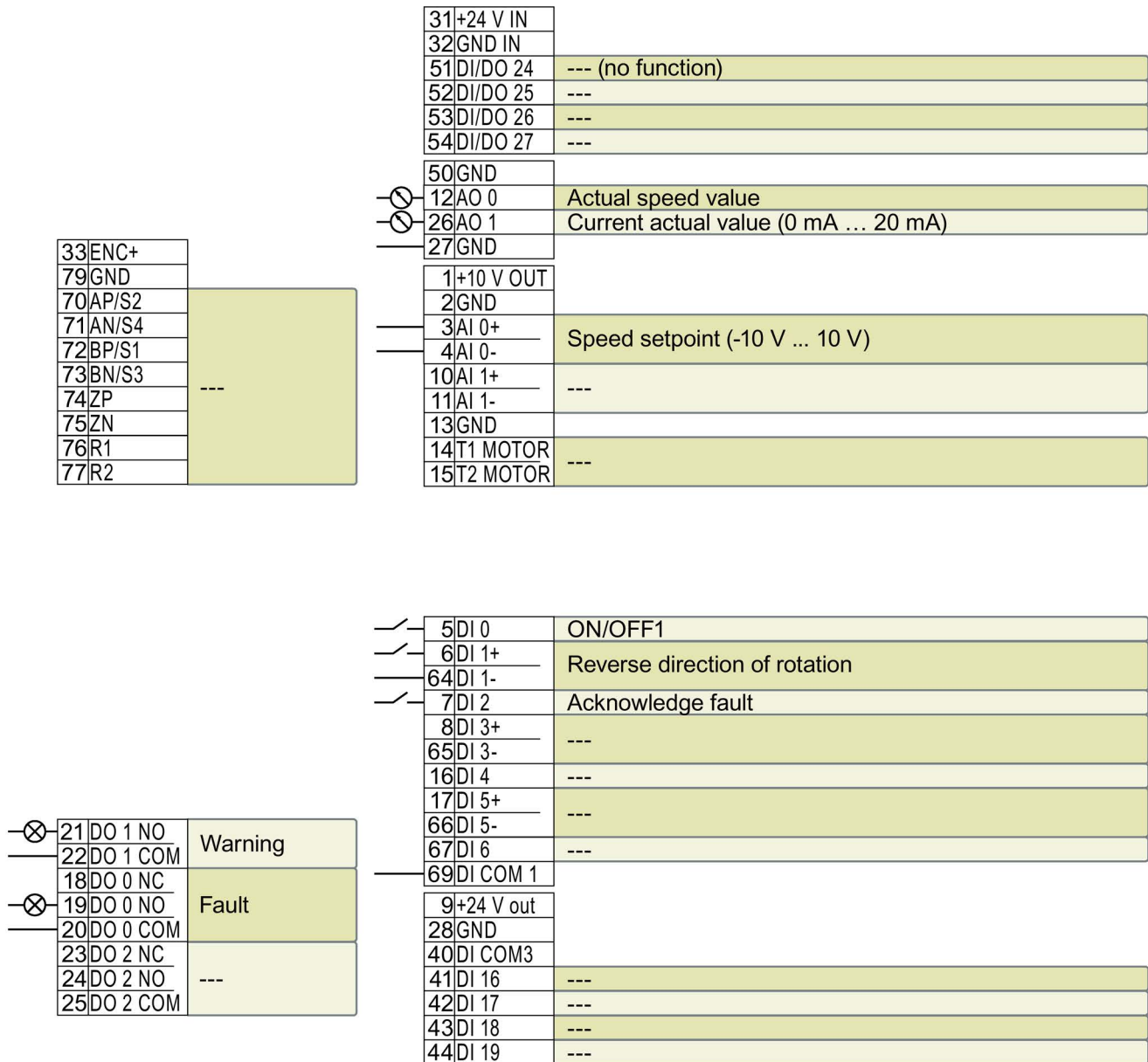
The fieldbus interface is not active.

31	+24 V IN	
32	GND IN	
51	DI/DO 24	--- (no function)
52	DI/DO 25	---
53	DI/DO 26	---
54	DI/DO 27	---
50	GND	
12	AO 0	Actual speed value
26	AO 1	Current actual value (0 mA … 20 mA)
27	GND	
1	+10 V OUT	
2	GND	
3	AI 0+	Speed setpoint (-10 V ... 10 V)
4	AI 0-	
10	AI 1+	---
11	AI 1-	
13	GND	
14	T1 MOTOR	---
15	T2 MOTOR	

33	ENC+
79	GND
70	AP/S2
71	AN/S4
72	BP/S1
73	BN/S3
74	ZP
75	ZN
76	R1
77	R2

5	DI 0	ON/OFF1
6	DI 1+	Reverse direction of rotation
64	DI 1-	
7	DI 2	Acknowledge fault
8	DI 3+	---
65	DI 3-	
16	DI 4	---
17	DI 5+	---
66	DI 5-	
67	DI 6	---
69	DI COM 1	
9	+24 V out	
28	GND	
40	DI COM3	
41	DI 16	---
42	DI 17	---
43	DI 18	---
44	DI 19	---

21	DO 1 NO	Warning
22	DO 1 COM	
18	DO 0 NC	Fault
19	DO 0 NO	
20	DO 0 COM	
23	DO 2 NC	---
24	DO 2 NO	
25	DO 2 COM	

Image 3-3   Factory setting of the CU250S-2 and CU250S-2 CAN Control Units

Control Units with PROFIBUS or PROFINET interface

The function of the fieldbus interface depends on DI 3.
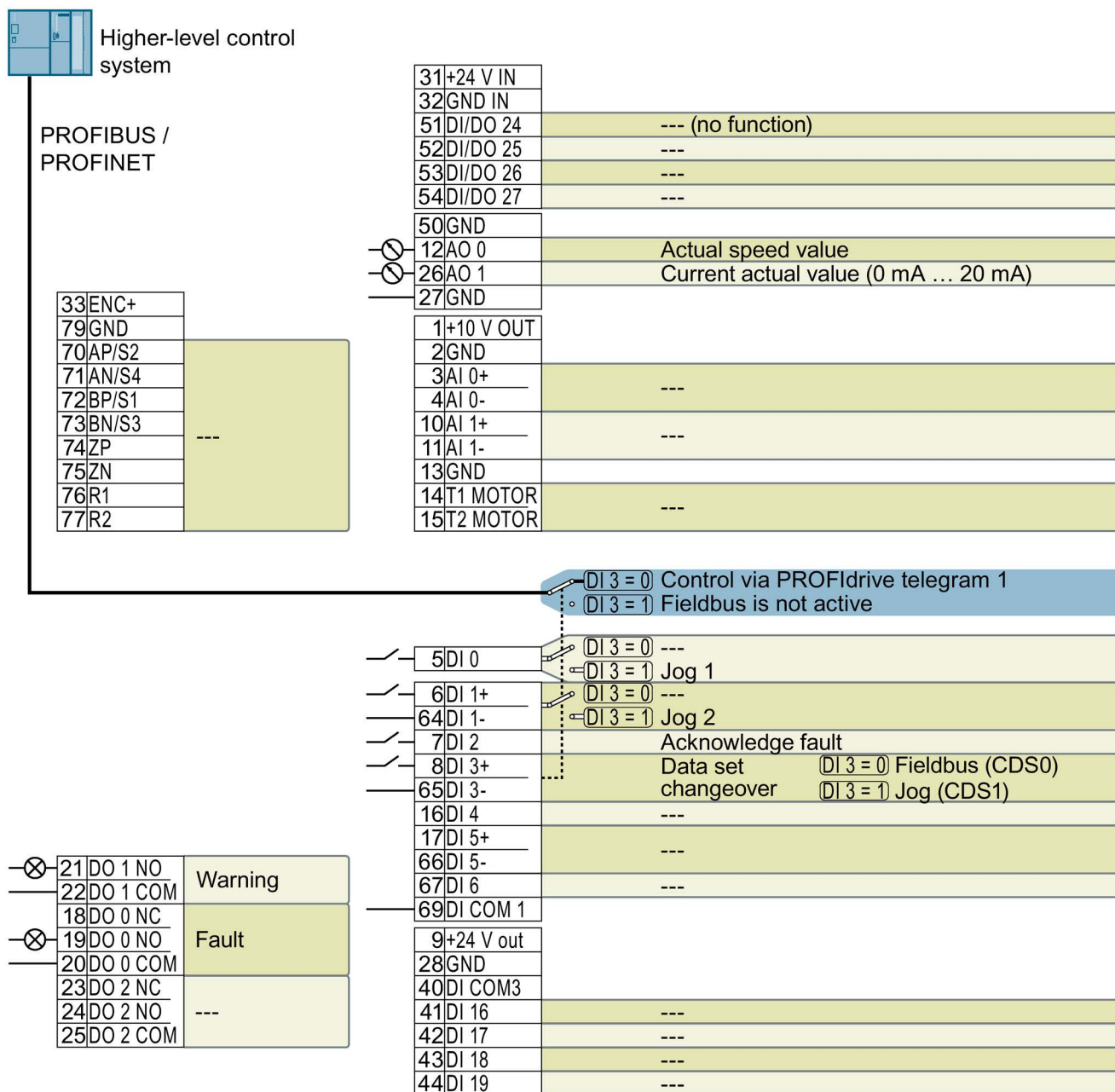
Image 3-4   Factory setting of the CU250S-2 DP and CU250S-2 PN Control Units

Changing the function of the terminals

The function of the terminals marked in color in the two figures above, can be set.

In order that you do not have to successively change terminal for terminal, several terminals can be jointly set using default settings ("p0015 Macro drive unit").

The factory settings of the terminals for USS/CANopen and PROFIBUS/PROFINET described above correspond to the following default settings:

- p0015 = 12 (setting in STARTER or Startdrive: "Standard I/O with analog setpoint")

- p0015 = 7 (setting in STARTER or Startdrive: "Fieldbus with data set switchover")

Further default settings can be found in the Operating Instructions:

Manuals for the Control Unit
(http://support.automation.siemens.com/WW/view/en/30563628/133300)

Wiring the terminal strip in compliance with EMC

1. If you use shielded cables, then you must connect the shield to the mounting plate of the control cabinet or with the shield support of the inverter through a good electrical connection and a large surface area.

   Further information is provided in the Internet:

   EMC installation guideline
   (http://support.automation.siemens.com/WW/view/en/60612658)

2. Use the shield connection plate (order number 6SL3264-1EA00-0LA0) of the Control Unit as strain relief.

3.4 Operator panels

Operator panel

An operator panel is used to commission, troubleshoot and control the inverter, as well as to back up and transfer the inverter settings.

The Intelligent Operator Panel (IOP) is available for snapping on to the Control Unit or as handheld with a connection cable to the Control Unit. The graphics-capable plain text display of the IOP enables intuitive operation and diagnostics of the inverter.

The IOP is available in two versions:

- With European languages

- With Chinese, English and German

Additional information about the compatibility of the IOP and Control Units is available in the Internet:

Compatibility of the IOP and Control Units
(http://support.automation.siemens.com/WW/view/en/67273266)

The BOP-2 is an operator panel for snapping on to the Control Unit. The BOP-2 has a two-line display for operation and diagnostics of the inverter.

Operating Instructions of the BOP-2 and IOP operator panels:

Overview of the manuals (Page 29)

Commissioning

<div style="text-align: right; font-size: 48px;">4</div>
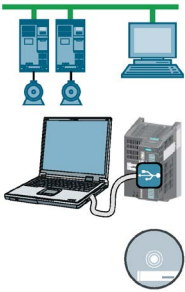
STARTER and Startdrive PC tools

STARTER and Startdrive are PC tools that are used to commission, troubleshoot and control the inverter, as well as to back up and transfer the inverter settings. You can connect the PC with the inverter via USB or via the PROFIBUS / PROFINET fieldbus.

Connecting cable (3 m) between PC and inverter: Article number 6SL3255-0AA00-2CA0

DVD article number

STARTER: 6SL3072-0AA00-0AG0

Startdrive: 6SL3072-4CA02-1XG0

System requirements and download:

STARTER (http://support.automation.siemens.com/WW/view/en/26233208)

Startdrive (http://support.automation.siemens.com/WW/view/en/68034568)

Help regarding operation:

STARTER videos (http://www.automation.siemens.com/mcms/mc-drives/en/low-voltage-inverter/sinamics-g120/videos/Pages/videos.aspx)

Startdrive tutorial (http://support.automation.siemens.com/WW/view/en/73598459)

4.1 Commissioning with STARTER or Startdrive

Creating a new project

Procedure

To create a new project, proceed as follows:

1. In the menu, select "Project" → "New…".

2. Specify a name of your choice for the project.

You have created a new project.

Integrating the inverter into the project

Procedure

Proceed as follows to transfer an inverter connected via USB to your project:

1. Switch on the inverter supply voltage.

2. First insert a USB cable into your PC and then into the inverter.

3. The PC operating system installs the USB driver when you are connecting the inverter and PC together for the first time.

   – Windows 7 installs the driver automatically.

   – For Windows XP you must acknowledge several system messages.

4. Start the commissioning software.

5. Press the "Accessible nodes" button.
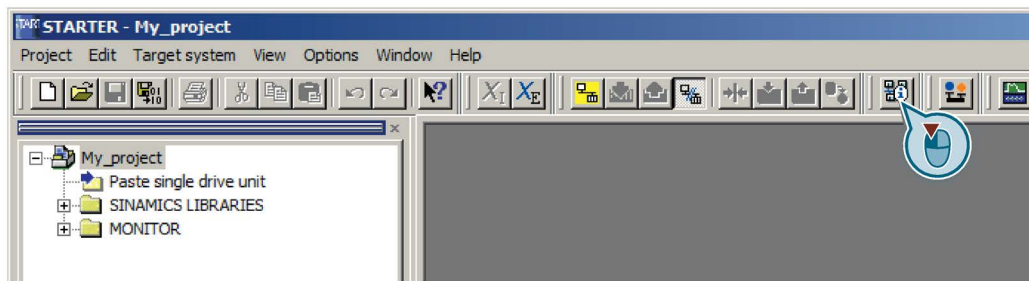
Image 4-1   "Accessible nodes" in STARTER
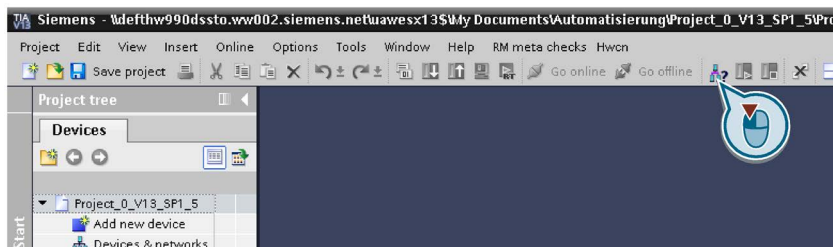
Image 4-2   "Accessible nodes" in Startdrive

6. When the USB interface is appropriately set, then the "Accessible nodes" screen form shows the inverters that can be accessed.
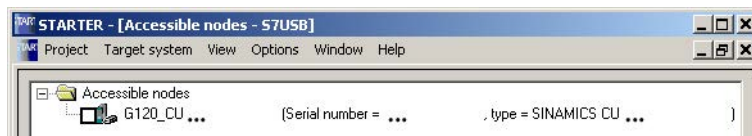
Image 4-3   Inverters found in STARTER
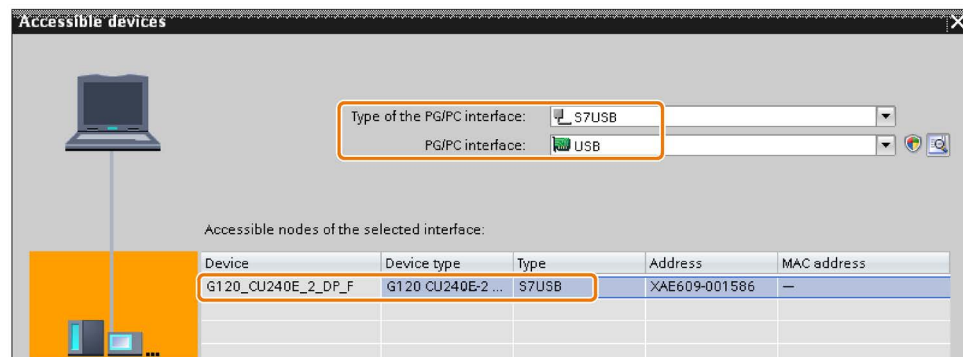
Image 4-4   Inverters found in Startdrive

If you have not correctly set the USB interface, then the following "No additional nodes found" message is displayed. In this case, follow the description below.

7. Proceed as follows:

With STARTER	With Startdrive
• Select the inverter ☑. • Press the "Accept" button.	Transfer the inverter into the project using the menu: "Online - Upload device as new station (hardware and software)".

☐   You have transferred an inverter accessible via the USB interface into your project.

Setting the USB interface in STARTER

Procedure

Proceed as follows to set the USB interface in STARTER:

1. Set the "Access point" to "DEVICE (STARTER, Scout)" and the "PG/PC interface" to "S7USB".

2. Press the "Update" button.
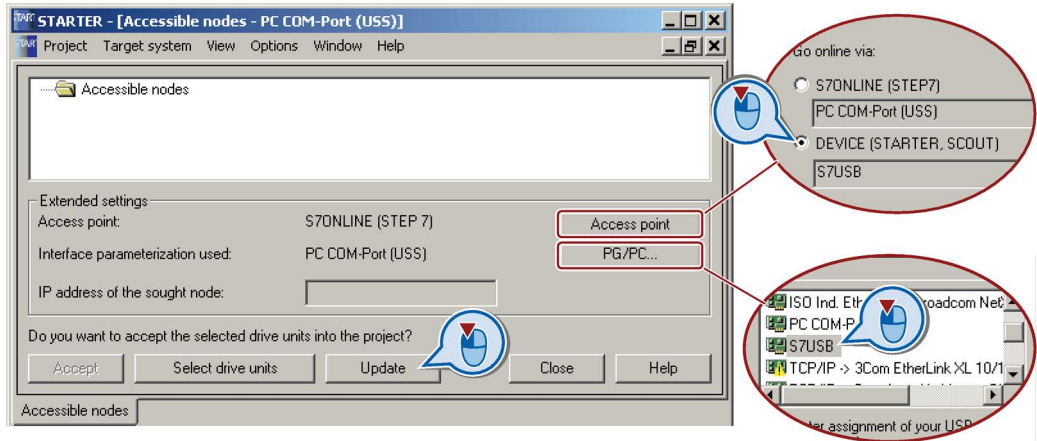
You have set the USB interface.

STARTER now shows the inverters connected via USB.

Starting the configuration

Procedure

1
2

To start the configuration, proceed as follows:

1. In STARTER select the drive you wish to commission.

2. Start the wizard for the device configuration:
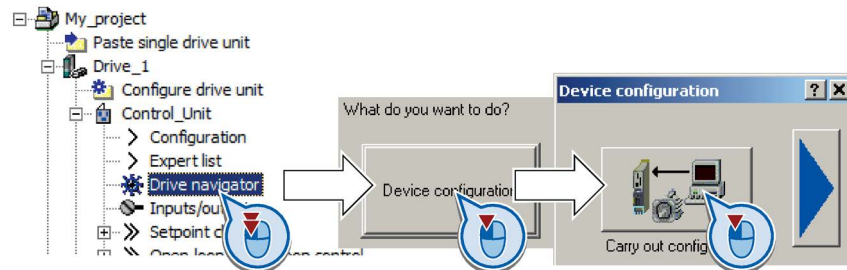
Image 4-5   Start the configuration in STARTER
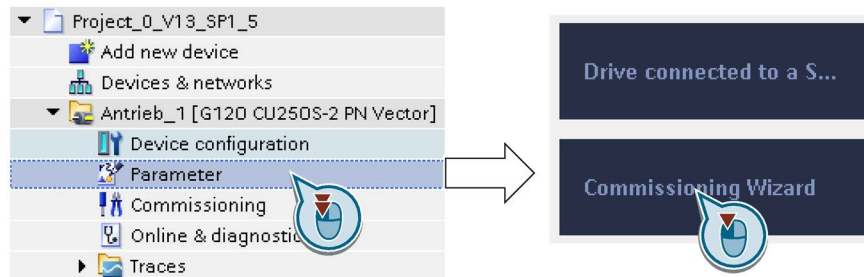
Image 4-6   Start the configuration in Startdrive

You have started the configuration.

Performing the configuration

Follow the steps of the configuration wizard and enter the data of your application.

Loading the configured data into the drive

Procedure with STARTER

Proceed as follows to load the configured data into the drive:

1. Select your drive.

2. Go online: ▣.

   STARTER compares your configuration with the real inverter. STARTER signals any differences in the "Online/offline comparison".

   Acknowledge the message by pressing the "Load HW configuration to PG" button.

3. Open "Drive Navigator".
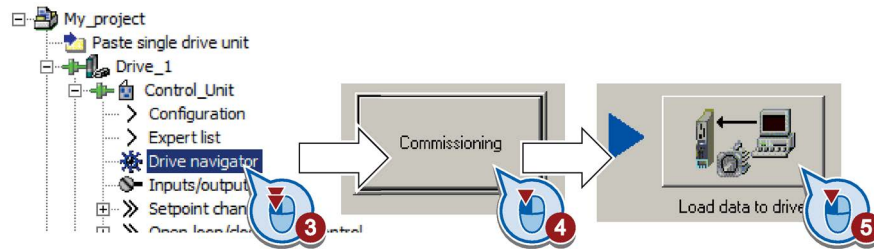
4. Select the "Commissioning" button.

5. Click on "Load data to the drive".

6. ☑ In the following screen form, select "After loading copy RAM to ROM".

7. Load your configuration into the inverter.

8. Wait until loading has been completed.

9. Close the "Commissioning" screen form.

You have loaded your configuration into the drive and therefore commissioned the system.

Procedure with Startdrive

Proceed as follows to load the configured data into the drive:

1. Select your drive.

2. Press the "Load to device" button. ▣.

3. ☑ In the following screen form, select "Back up parameter assignment in the EEPROM".

4. Load your configuration into the inverter.

5. Wait until loading has been completed.

You have loaded your configuration into the drive and therefore commissioned the system.

Identify motor data

> ⚠ **WARNING**
>
> **Danger to life from machine movements while motor data identification is in progress**
>
> The stationary measurement can turn the motor a number of revolutions. The rotating measurement accelerates the motor up to the rated speed. Secure dangerous machine parts before starting motor data identification:
>
> • Before switching on, ensure that nobody is working on the machine or located within its working area.
> • Secure the machine's working area against unintended access.
> • Lower suspended loads to the floor.

Preconditions

● You selected a method of motor data identification during quick commissioning, e.g. measurement of the motor data while the motor is stationary.

When quick commissioning is complete, the inverter issues alarm A07991.

● The motor has cooled down to the ambient temperature.

An excessively high motor temperature distorts the results of motor data identification.

Procedure with STARTER

To initiate motor data identification and optimize the motor control, proceed as follows:
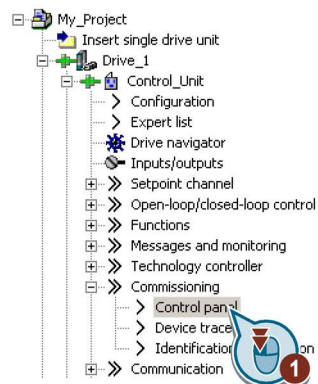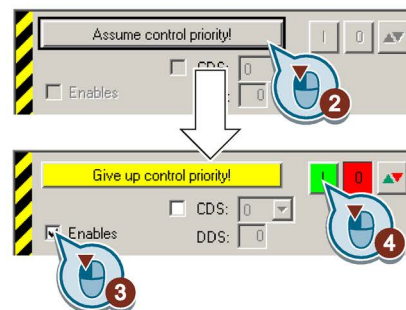
1. Open the control panel.

Image 4-7   Control panel

2. Assume master control for the inverter.

3. Set the "Enable signals"

4. Switch on the motor.

   The inverter starts the motor data identification. This measurement can take several minutes.

   Depending on the setting, after motor data identification has been completed, the inverter switches off the motor - or it accelerates it to the currently set setpoint.

5. If required, switch off the motor.

6. Relinquish the master control after the motor data identification.
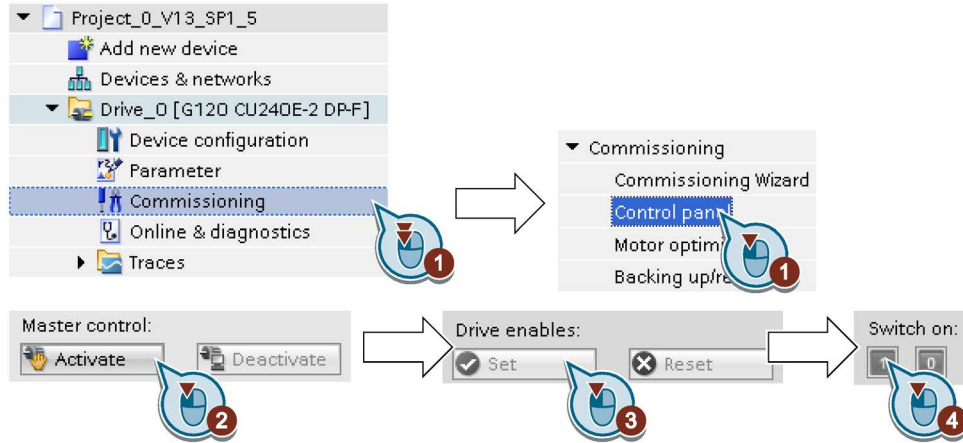
7. Press button (RAM to ROM).

   You have completed the motor data identification.

Procedure with Startdrive

To initiate motor data identification and optimize the motor control, proceed as follows:

1. Open the control panel.

2. Assume master control for the inverter.

3. Set the "Drive enables"
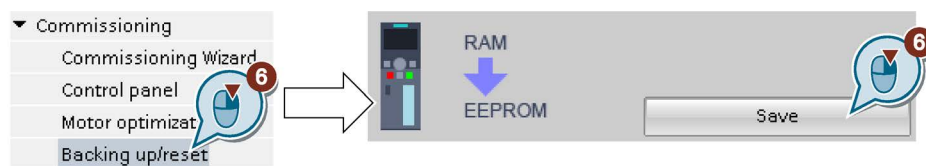
4. Switch on the motor.

   The inverter starts the motor data identification. This measurement can take several minutes.

   Depending on the setting, after motor data identification has been completed, the inverter switches off the motor - or it accelerates it to the currently set setpoint.

5. If required, switch off the motor.

6. Relinquish the master control after the motor data identification.

7. Save the settings in the inverter (RAM → EEPROM):

☐ You have completed the motor data identification.

Self-optimization of the speed control

If you have selected not only motor data identification but also rotating measurement with self-optimization of the speed control, you must switch on the motor again as described above and wait for the optimization run to finish.

4.2 Connecting the inverter to the fieldbus

Where can I find instructions for the fieldbus connection of the inverter?

Instructions for connecting to a fieldbus can be downloaded from the Internet:

- Application examples (http://support.automation.siemens.com/WW/view/en/60733299)
- Operating Instructions: CU250S-2 operating instructions (https://support.industry.siemens.com/cs/ww/en/view/109478829)
- "Fieldbuses" function manual: Manuals for the Control Unit (http://support.automation.siemens.com/WW/view/en/30563628/133300)

Example telegram

Telegram 1		Abbreviation	Explanation
		STW1	Control word 1
		ZSW1	Status word 1
		PZD01/02	Process data 16-bit
PZD01 PZD02		NSOLL_A	Speed setpoint 16-bit
STW1 NSOLL_A		NIST_A	Actual speed value 16-bit
ZSW1 NIST_A			

Further information is provided in the Internet:

- Operating Instructions: Inverter telegrams without configured basic positioner
- "Basic positioner" function manual: Telegrams with configured basic positioner

Manuals for the Control Unit (http://support.automation.siemens.com/WW/view/en/30563628/133300).

Control word 1 (STW1), PZD receive word 1 (word: r2050[0], bits: r2090.00 … r2090.15)

Bit	Meaning	Explanation
0	0 = OFF1	The motor brakes with the ramp-down time p1121 of the ramp-function generator. The inverter switches off the motor at standstill.
	0 → 1 = ON	The inverter goes into the "ready" state. If, in addition bit 3 = 1, then the inverter switches on the motor.
1	0 = OFF2	Switch off the motor immediately, the motor then coasts down to a standstill.
	1 = No OFF2	Precondition in order to be able to switch on the motor using bit 0 (ON command).
2	0 = Quick stop (OFF3)	The motor brakes with the OFF3 ramp-down time p1135 down to standstill.
	1 = No quick stop (OFF3)	Precondition in order to be able to switch on the motor using bit 0 (ON command).
3	0 = Inhibit operation	Switch off the motor immediately → motor coasts down to a standstill.
	1 = Enable operation	Precondition in order to be able to switch on the motor using bit 0 (ON command).

Bit	Meaning	Explanation
4	0 = Disable RFG	The inverter immediately sets its ramp-function generator output to 0.
	1 = Do not disable RFG	The ramp-function generator can be enabled.
5	0 = Stop RFG	The output of the ramp-function generator stops at the actual value.
	1 = Enable RFG	The output of the ramp-function generator follows the setpoint.
6	0 = Inhibit setpoint	The inverter brakes the motor with the ramp-down time p1121 of the ramp-function generator.
	1 = Enable setpoint	Motor accelerates with the ramp-up time p1120 to the setpoint.
7	0 → 1 = Acknowledge faults	Acknowledge fault. If the ON command is still active (bit 0 = 1), the inverter switches to "closing lockout" state.
8, 9	Reserved	
10	0 = No control via PLC	The inverter ignores the process data from the fieldbus.
	1 = Control via PLC	Control via fieldbus, the inverter accepts the process data from the fieldbus.
11	1 = Direction reversal	Invert setpoint in the inverter.
12	Not used	
13	1 = MOP up	Increase the setpoint saved in the motorized potentiometer.
14	1 = MOP down	Reduce the setpoint saved in the motorized potentiometer.
15	Reserved	Changes over between settings for different operation interfaces (command data sets).

Status word 1 (ZSW1), PZD send word 1 (word: p2051[0], bits: p2080[0] … p2080[15])

Bit	Meaning	Comments
0	1 = Ready to start	Power supply switched on; electronics initialized; pulses locked.
1	1 = Ready	Motor is switched on (ON/OFF1 = 1), no fault is active. With the command "Enable operation" (STW1.3), the inverter switches on the motor.
2	1 = Operation enabled	Motor follows setpoint. See control word 1, bit 3.
3	1 = Fault active	The inverter has a fault. Acknowledge fault using STW1.7.
4	1 = OFF2 inactive	Coast down to standstill is not active.
5	1 = OFF3 inactive	Quick stop is not active.
6	1 = Closing lockout active	It is only possible to switch on the motor after an OFF1 followed by ON.
7	1 = Alarm active	Motor remains switched on; no acknowledgement is necessary.
8	1 = Speed deviation within the tolerance range	Setpoint / actual value deviation within the tolerance range.
9	1 = Master control requested	The automation system is requested to accept the inverter control.
10	1 = Comparison speed reached or exceeded	Speed is greater than or equal to the corresponding maximum speed.
11	1 = torque limit reached	Comparison value for current or torque has been reached or exceeded.
12	1 = Holding brake open	Signal to open and close a motor holding brake.
13	0 = Alarm, motor overtemperature	--
14	1 = Motor rotates clockwise	Internal inverter actual value > 0
	0 = Motor rotates counterclockwise	Internal inverter actual value < 0
15	0 = Alarm, inverter thermal overload	

Description files for fieldbuses

The description files are electronic device data sheets which contain all the required information of a higher-level controller. You can configure and operate the inverter on a fieldbus with the appropriate description file.

Description file	Download	Alternative to download
Generic Station Description (GSD) for PROFIBUS	Internet: (http://support.automation.siemens.com/WW/view/en/23450835)	GSD and GSDML are saved in the inverter. The inverter writes its GSD or GSDML to the memory card once you insert this card in the inverter and set p0804 = 12. You can then transfer the file to your programming device or PC using the memory card.
GSD Markup Language (GSDML) for PROFINET	Internet: (http://support.automation.siemens.com/WW/view/en/26641490)	
Electronic Data Sheet (EDS) for CANopen	Internet: (http://support.automation.siemens.com/WW/view/en/48351511)	---
EDS for Ethernet/IP	Internet: (http://support.automation.siemens.com/WW/view/en/78026217)	---

4.3 Frequently required parameters

Parameter	Explanation		
p0015	**Macro drive unit** Set defaults for inputs and outputs via a macro.		
r0018	**Control Unit firmware version**		
p0096	**Application class**	0: Expert 1: Standard Drive Control 2: Dynamic Drive Control	
p0100	**IEC/NEMA mot stds**	0: Europe 50 [Hz] 1: NEMA motor (60 Hz, US units) 2: NEMA motor (60 Hz, SI units)	
p0304	**Rated motor voltage** [V]		
p0305	**Rated motor current** [A]		
p0307	**Rated motor power** [kW] or [hp]		
p0310	**Rated motor frequency** [Hz]		
p0311	**Rated motor speed** [rpm]		
p0601	**Motor temperature sensor type**		
	Terminal 14	T1 motor (+)	0: No sensor (factory setting) 1: PTC (→ P0604)	2: KTY84 (→ P0604) 4: Bimetal
	Terminal 15	T2 motor (-)		
p0625	**Motor ambient temperature during commissioning** [° C]		
p0640	**Current limit** [A]		

Parameter				Explanation	
r0722				**Status of digital inputs**	
	.0	Terminal 5	DI 0	Selection of possible settings:	
	.1	Terminals 6, 64	DI 1	p0840 ON/OFF (OFF1)	p1110 inhibit negative direction
	.2	Terminal 7	DI 2	p0844 no coast down (OFF2)	p1111 inhibit positive direction
	.3	Terminals 8, 65	DI 3	p0848 no quick stop (OFF3)	p1113 setpoint inversion
	.4	Terminal 16	DI 4	p0855 unconditionally release holding brake	p1122 bypass ramp-function generator
	.5	Terminals 17, 66	DI 5	p1020 fixed speed setpoint selection bit 0	p1140 enable/inhibit ramp-function generator
	.6	Terminal 67	DI 6	p1021 fixed speed setpoint selection bit 1	p1141 continue/freeze ramp-function generator
	.11	Terminals 3, 4	AI 0	p1022 fixed speed setpoint selection bit 2 p1023 fixed speed setpoint selection bit 3	p1142 enable/inhibit setpoint
	.12	Terminals 10, 11	AI 1	p1035 motorized potentiometer raise setpoint	p1230 DC braking activation
	.16	Terminal 41	DI 16	p1036 motorized potentiometer lower setpoint	p2103 acknowledge faults
	.17	Terminal 42	DI 17	p2103 acknowledge faults	p2106 external fault 1
	.18	Terminal 43	DI 18	p1055 jog bit 0	p2112 external alarm 1
	.19	Terminal 44	DI 19	p1056 jog bit 1	p2200 technology controller enable
	.24	Terminal 51	DI 24		
	.25	Terminal 52	DI 25		
	.26	Terminal 53	DI 26		
	.27	Terminal 54	DI 27		
p0730		**Signal source for terminal DO 0**		Selection of possible settings:	
		Terminals 19, 20 (NO contact) Terminals 18, 20 (NC contact)		52.0 ready for switching on 52.1 ready for operation	53.2 n_act ≤ p1080 (n_min) 53.3 I_act > p2170
p0731		**Signal source for terminal DO 1**		52.2 operation enabled	53.4 n_act > p2155
		Terminals 21, 22 (NO contact)		52.3 fault present 52.4 coast down active (OFF2)	53.5 n_act ≤ p2155 53.6 n_act ≥ n_set
p0732		**Signal source for terminal DO 2**		52.5 quick stop active (OFF3) 52.14 motor rotates forward	53.10 Technology controller output at the lower limit
		Terminals 24, 25 (NO contact) Terminals 23, 25 (NC contact)		53.0 DC braking active 53.1 n_act > p2167 (n_off)	53.11 Technology controller output at the upper limit
r0755		**Analog inputs actual value [%]**			
	[0]	Terminals 3, 4	AI 0		
	[1]	Terminals 10, 11	AI 1		
p0756		**Analog inputs type**		0: Unipolar voltage input (0 V …+10 V)	
	[0]	AI 0		1: Unipolar voltage input monitored (+2 V... +10 V) 2: Unipolar current input (0 mA …+20 mA)	
	[1]	AI 1		3: Unipolar current input monitored (+4 mA …+20 mA) 4: Bipolar voltage input (-10 V...+10 V)	
p0771		**Analog outputs signal source**		Selection of possible settings:	
	[0]	Terminals 12, 13	AO 0	0: Analog output locked 21: Speed actual value	25: Output voltage, smoothed 26: DC link voltage, smoothed
	[1]	Terminals 26, 27	AO 1	24: Output frequency, smoothed	27: Actual current value (smoothed absolute value)
p0776		**Analog outputs type**		0: Current output (0 mA … +20 mA)	
	[0]	AO 0		1: Voltage output (0 V … +10 V) 2: Current output (+4 mA ... +20 mA)	
	[1]	AO 1			
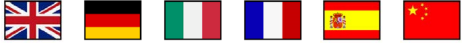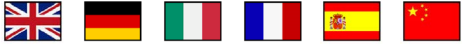
Parameter	Explanation		
p0922	**PROFIdrive telegram selection**		
p1001	**Fixed speed setpoint 1**		
p1002	**Fixed speed setpoint 2**		
p1003	**Fixed speed setpoint 3**		
p1004	**Fixed speed setpoint 4**		
p1058	**Jog 1 speed setpoint**		
p1059	**Jog 2 speed setpoint**		
p1070	**Main setpoint**	Selection of possible settings:	
		0: Main setpoint = 0 755[0]: Analog input 0 1024: Fixed setpoint	1050: Motorized potentiometer 2050[1]: PZD 2 from the fieldbus
p1080	**Minimum speed [rpm]**		
p1082	**Maximum speed [rpm]**		
p1120	**Ramp-function generator ramp-up time [s]**		
p1121	**Ramp-function generator ramp-down time [s]**		
p1300	**Open-loop/closed-loop control mode**	Selection of possible settings:	
		0: U/f control with linear characteristic 1: U/f control with linear characteristic and FCC 2: U/f control with parabolic characteristic	20: Speed control (without encoder) 22: Torque control (without encoder)
p1310	**Starting current (voltage boost for U/f control) permanent**		
p1800	**Pulse frequency setpoint**		
p1900	**Motor data identification and rotating measurement**		
	0: Locked 1: Identify motor data and optimize the speed controller 2: Identify motor data (at standstill) 3: Optimize the speed controller (rotating in operation) 11: Ident. motor data and opt. speed controller, change to operation (not available with PM250 Power Module) 12: Identify motor data (at standstill), change to operation (not available with PM250 Power Module)		
p2030	**Fieldbus interface protocol selection**	The possible settings depend on the Control Unit:	
		0: No protocol 1: USS 2: Modbus RTU 3: PROFIBUS 4: CANopen	5: BacNet 7: PROFINET 8: P1 10: EtherNet/IP
r2050	**Words received by fieldbus (16 bit)** r2050[0]: PZD01 … r2050[11]: PZD12		
p2051	**Words sent via fieldbus (16 bit)** p2051[0]: PZD01 … p2051[16]: PZD17		
p2080	**Binector-connector converter status word 1** p2080[0]: Bit 0 … p2080[15]: Bit 15		
r2090	**PROFIdrive PZD1 receive bit-by-bit (control word 1)** r2090.00: Bit 0 … r2090.15: Bit 15		

More information

5

5.1 Overview of the manuals

Manuals with additional information that can be downloaded:

- CU250S-2 Compact Operating Instructions
  (https://support.industry.siemens.com/cs/ww/en/view/99730303)
  Commissioning the inverter (this manual).

- CU250S-2 operating instructions
  (https://support.industry.siemens.com/cs/ww/en/view/109478829)
  Installing, commissioning and maintaining the inverter. Advanced commissioning.

- EMC installation guideline
  (http://support.automation.siemens.com/WW/view/en/60612658)
  EMC-compliant control cabinet design, potential equalization and cable routing.

- CU250S-2 List Manual (https://support.industry.siemens.com/cs/ww/en/view/109477253)
  Parameter list, alarms and faults. Graphic function diagrams.

- "Fieldbus" function manual
  (https://support.industry.siemens.com/cs/ww/en/view/109477369)
  Configuring fieldbuses.

- "Safety Integrated" function manual
  (https://support.industry.siemens.com/cs/ww/en/view/109477367)
  Commissioning and using safety functions.

- "Basic positioner" function manual
  (https://support.industry.siemens.com/cs/ww/en/view/109477922)
  Commissioning and using the basic positioner.

- BOP-2 operating instructions
  (https://support.industry.siemens.com/cs/ww/en/view/42185248)
  Using the operator panel.

- IOP operating instructions
  (https://support.industry.siemens.com/cs/ww/en/view/109478559)
  Using the operator panel, mounting the door mounting kit for IOP.

- Power Module Installation Manual
  (https://support.industry.siemens.com/cs/ww/en/ps/13224/man)
  Installing Power Modules, reactors and filters. Technical data, maintenance.

- Accessories manual (https://support.industry.siemens.com/cs/ww/en/ps/13225/man)
  Installation descriptions for inverter components, e.g. line reactors and line filters. The printed installation descriptions are supplied together with the components.

5.2 Technical support

+49 (0)911 895 7222

+44 161 446 5545
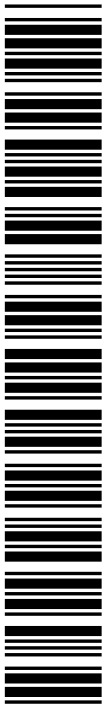
+39 (02) 24362000

+34 902 237 238

+33 (0) 821 801 122

You can find additional telephone numbers for Technical Support in the Internet:

Product support (http://www.siemens.com/automation/service&support)

SINAMICS G120, CU250S-2
DOCUMENTATION PACK

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Printed in the United Kingdom

Additional information

SINAMICS inverters:
www.siemens.com/sinamics

Safety Integrated:
www.siemens.com/safety-integrated

PROFINET:
www.siemens.com/profinet

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www.siemens.com/drives