SIEMENS

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SINUMERIK

SINUMERIK 828D Software and hardware

Service Manual

Valid for: SINUMERIK 828D SINUMERIK 828D BASIC

CNC software V4.7 SP2



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.

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

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

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

NOTICE

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

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.



Preface

SINUMERIK documentation

The SINUMERIK documentation is organized in the following categories:

- General documentation
- User documentation
- Manufacturer/service documentation

Additional information

You can find information on the following topics at: www.siemens.com/automation/support (<u>http://www.siemens.com/sinumerik/support</u>)

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

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

mySupport-documentation

In the Siemens Industry Online Support, you can find information to compile your own individual documentation based on Siemens content: www.siemens.com/sinumerik/docu (<u>http://www.siemens.com/sinumerik/docu</u>)

Training

For information about the range of training courses, refer to:

- SITRAIN (<u>http://www.siemens.com/sitrain</u>) training courses from Siemens for automation products, systems and solutions
- SinuTrain (<u>http://www.siemens.com/sinutrain</u>) training software for SINUMERIK

FAQs

You can find Frequently Asked Questions in the Service&Support pages under Product Support. www.siemens.com/sinumerik/support (<u>http://www.siemens.com/sinumerik/support</u>)



SINUMERIK You can find information on the SINUMERIK product under the following link: www.siemens.com/sinumerik (http://www.siemens.com/sinumerik) Target group This document addresses maintenance and service personnel. **Benefits** Based on the Service Manual, the target group can correctly and safely perform service and maintenance work. Utilization phase: Maintenance and service phase Standard version This documentation only describes the functionality of the standard version. Extensions or changes made by the machine manufacturer are documented by the machine manufacturer. Other functions not described in this documentation might be executable in the control. This does not, however, represent an obligation to supply such functions with a new control or when servicina. Further, for the sake of simplicity, this documentation does not contain all detailed information about all types of the product and cannot cover every conceivable case of installation, operation or maintenance.

Technical support

Country-specific telephone numbers for technical support are provided in the Internet at: www.siemens.com/sinumerik/contact (<u>http://www.siemens.com/sinumerik/contact</u>)

EC Declaration of Conformity

The EC Declaration of Conformity for the EMC Directive can be found in the Internet under the following link: Certificates (<u>http://support.automation.siemens.com/WW/view/de/10805517/134200</u>)



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5 A

Fundamental safety instructions

1.1 General safety instructions



Danger to life due to live parts and other energy sources

Death or serious injury can result when live parts are touched.

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

Generally, six steps apply when establishing safety:

- 1. Prepare for shutdown and notify all those who will be affected by the procedure.
- 2. Disconnect the machine from the supply.
 - Switch off the machine.
 - Wait until the discharge time specified on the warning labels has elapsed.
 - Check that it really is in a no-voltage condition, from phase conductor to phase conductor and phase conductor to protective conductor.
 - Check whether the existing auxiliary supply circuits are de-energized.
 - Ensure that the motors cannot move.
- 3. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water.
- 4. Isolate or neutralize all hazardous energy sources by closing switches, grounding or shortcircuiting or closing valves, for example.
- 5. Secure the energy sources against switching on again.
- 6. Ensure that the correct machine is completely interlocked.

After you have completed the work, restore the operational readiness in the inverse sequence.



Danger to life through a hazardous voltage when connecting an unsuitable power supply

Touching live components can result in death or severe injury.

 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.



1.1 General safety instructions



Danger to life when live parts are touched on damaged devices

Improper handling of devices can cause damage.

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.



Danger to life through electric shock due to unconnected cable shields

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

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



Danger to life due to electric shock when not grounded

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.

Danger to life due to fire spreading if housing is inadequate

Fire and smoke development can cause severe personal injury or material damage.

- Install devices without a protective housing in a metal control cabinet (or protect the device by another equivalent measure) in such a way that contact with fire is prevented.
- Ensure that smoke can only escape via controlled and monitored paths.



Danger to life through unexpected movement of machines when using mobile wireless devices or mobile phones

Using mobile wireless devices or mobile phones with a transmit power > 1 W closer than approx. 2 m to the components may cause the devices to malfunction, influence the functional safety of machines therefore putting people at risk or causing material damage.

• Switch the wireless devices or mobile phones off in the immediate vicinity of the components.

Danger to life due to fire if overheating occurs because of insufficient 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.

Danger to life when safety functions are inactive

Safety functions that are inactive or that have not been adjusted accordingly can cause operational faults on machines that could lead to 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.



1.1 General safety instructions

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 Handling electrostatic sensitive devices (ESD)

1.2 Handling electrostatic sensitive devices (ESD)

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



NOTICE

Damage through 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 Industrial security

1.3 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 Hotspot-Text (<u>http://www.siemens.com/industrialsecurity</u>).

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

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 (<u>http://support.automation.siemens.com</u>).
- 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 (<u>http://www.siemens.com/</u>industrialsecurity).
- Make sure that you include all installed products into the holistic industrial security concept.



1.4 Residual risks of power drive systems

1.4 Residual risks of power drive systems

The control and drive components of a drive system are approved for industrial and commercial use in industrial line supplies. Their use in public line supplies requires a different configuration and/or additional measures.

These components may only be operated in closed housings or in higher-level control cabinets with protective covers that are closed, and when all of the protective devices are used.

These components may only be handled by qualified and trained technical personnel who are knowledgeable and observe all of the safety instructions on the components and in the associated technical user documentation.

When assessing the machine's risk in accordance with the respective local regulations (e.g., EC Machinery Directive), the machine manufacturer 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 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 the control system
 - External influences/damage
- 2. In the event of a fault, exceptionally high temperatures, including an open fire, as well as emissions of light, noise, particles, gases, etc. can occur inside and outside the inverter, e.g.:
 - Component failure
 - Software errors
 - Operation and/or environmental conditions outside the specification
 - External influences/damage

Inverters of the Open Type/IP20 degree of protection must be installed in a metal control cabinet (or protected by another equivalent measure) such that contact with fire inside and outside the inverter is not possible.

- 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



1.4 Residual risks of power drive systems

- 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

Note

The components must be protected against conductive contamination (e.g. by installing them in a control cabinet with degree of protection IP54 according to IEC 60529 or NEMA 12).

Assuming that conductive contamination at the installation site can definitely be excluded, a lower degree of cabinet protection may be permitted.

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



System description

2.1 System overview

Configuration with four axes (basic configuration)

The following configuration shows a typical example with SINAMICS S120 booksize:

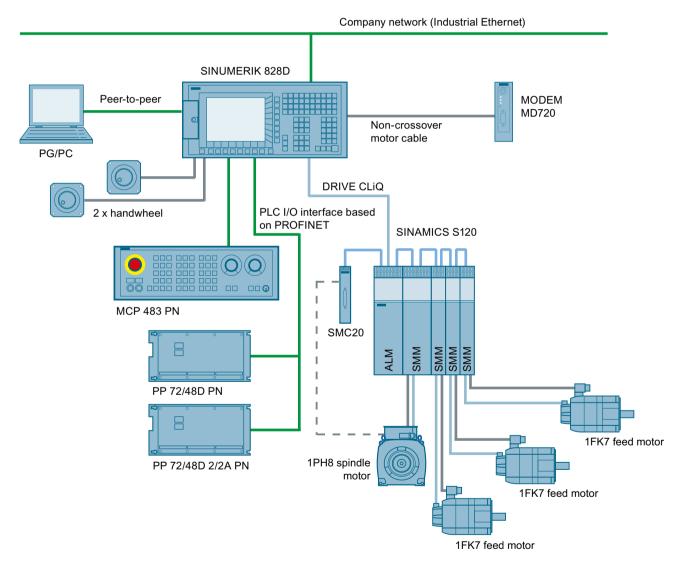


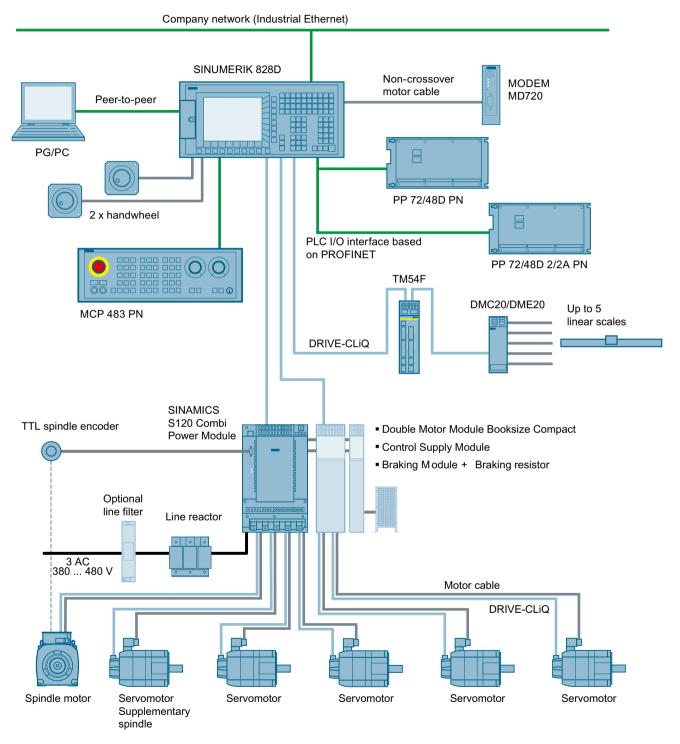
Image 2-1 Configuration example 1: Basic configuration with four axes

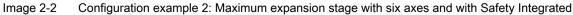


2.1 System overview

Configuration with S120 Combi and six axes

The following configuration shows the maximum expansion stage with SINAMICS S120 Combi:

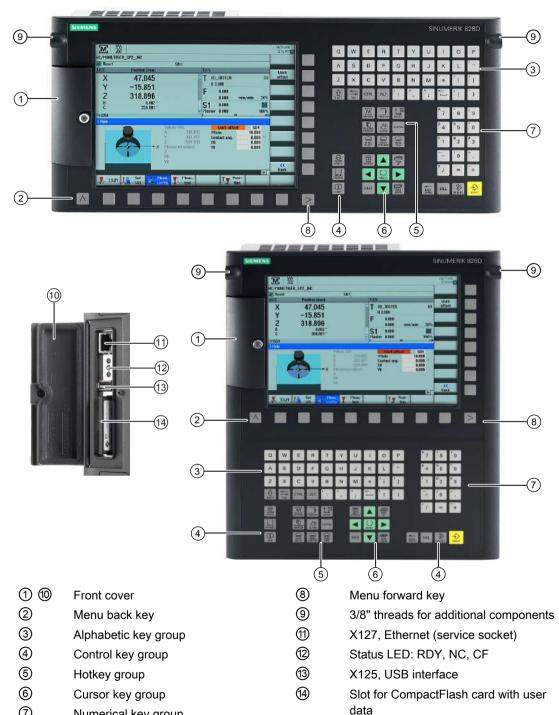






2.2 **PPU** versions

Front of the PPU

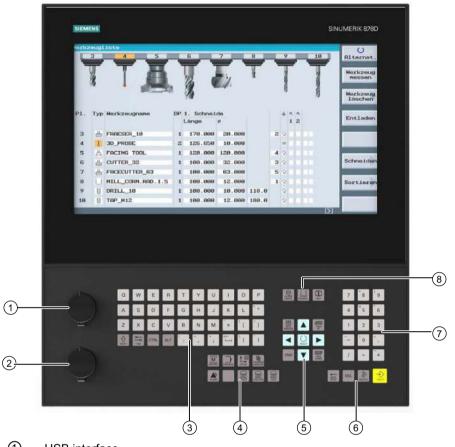


- 7 Numerical key group
- Software and hardware Service Manual, 03/2016, 6FC5397-5DP40-5BA3



2.2 PPU versions

Front of PPU version 290.3



- ① USB interface
- 2 X127 Ethernet interface (service connection)
- ③ Qwerty keyboard
- ④ Control keys
- ⑤ Cursor keys
- 6 Keys to quickly select the operating area
- ⑦ Control keys
- 8 Numerical keys



Rear of the PPU



12	X122, X132	Digital inputs/outputs, drive
34	X242, X252	Digital inputs/outputs for NC; control of the analog spindle (X252)
5	X143	Handwheels
6	M, T2, T1, T0	Measuring sockets
\bigcirc	X1	Power supply
8	X135	USB interface: for MCP 310 USB, MCP 483 USB and for service
9	X130	Ethernet LAN
10	PN 1, PN 2	PLC I/O Interface
11	SYNC, FAULT	Status LED
12	X100, X101, X102	DRIVE-CLiQ interfaces
13	X140	Serial interface RS232

Image 2-3 Interfaces at the rear of the PPU



System description

2.2 PPU versions



Service cases - software

Introduction

The current versions of the software tools should be used for the subsequently described service activities and for backing up the system and user data; these tools are supplied in the SINUMERIK 828D toolbox DVD:

- SINUMERIK 828D boot system → configuration data
- SINUMERIK Integrate Access MyMachine /P2P
- SINUMERIK Integrate Lock MyCycles
- SINUMERIK Commissioning from CNC software V4.7
- PLC programming tool

Backing up log files

If system problems occur, then it is necessary to backup all of the existing log files in order to provide these to the hotline for diagnostics. There is a special shortcut key for this function:

CTRL + ALT + D

This function generates a directory on the user CF card or on the front USB. If both are available, then the directory is created in both storage media.

The directory name has the following structure: LOG_date_time

Example:

LOG_091102_083615 stands for a directory generated on 02.11.2009 at 8:36:15.

This therefore ensures that a directory is not overwritten by pressing CTRL + ALT + D several times. The directory contains all of the logbook and debug information available in the system.



3.1 Backing up user data

3.1 Backing up user data

3.1.1 This is how you backup user data

Application

A backup of the NC data memory is generated with the "Save data" function.

This data backup must be performed for every control that has been commissioned in order to be able to quickly restore the control system in the case of data loss. If the "Create software backup" function is used, then it is essential to backup the memory data. With the data backup, a copy of the limited buffered memory is stored in the permanent memory. Backup of selected data (e.g. only machine data and no workpiece programs) is not possible. Data can be backed up without a password: i.e. always!

NOTICE

Data backup

The following procedure is recommended in order to avoid losing data.

- After making important changes, immediately backup data, e.g. after the 1st commissioning and the 2nd commissioning.
- While the data is being backed up, the control system must neither be operated, nor turned off.

Backing up data

Preconditions:

- The control system has powered up.
- The power supply voltage is guaranteed during the data backup.

Proceed as follows to generate the internal data backup:

1. Press the <MENU SELECT> key.



2. Select the "Start-up" operating area.



3. Press the "Save data" softkey.

Save data



achine configurat	1011		_		
1achine Axis		Drive	Motor		
ndex Name	Type No.	Identifier	Туре	Channel	
1 MX1	Linear			CHAN1	
2 MZ1	Linear			CHAN1	
3 MSP1		Query		CHAN1	
4 MSP2				CHAN1	
5 MB1	Do y	ou want to save the data?		CHAN1	
6 MSP3				CHAN1	
7 MQ1				CHAN1	
					Can
urrent access leve	el: Manufacturer				Ő

4. This is followed by the "Query" to backup data:



3.1 Backing up user data

5. Press the "OK" softkey to backup the data.

ок

- A progress indicator indicate the status of the data backup.
- After the data backup has been successfully completed, the following message is output:

×	→ AUTO						04/21/09 11:10 AM	
Machin	e configuration	I						
	ne Axis Name	Туре	No.	Drive Identifier	Motor Type	Channel		
1	MX1	Linear	110.		Typo	CHAN1		
2	MZ1	Linear				CHAN1		
3	MSP1			Save data		CHAN1		
4	MSP2					CHAN1		
5	MB1	The da	ata hav	e been backed up successfully.		CHAN1		
6	MSP3					CHAN1		
7	MQ1					CHAN1		
Current	Current access level: Manufacturer							

6. Confirm this message with "OK".



3.1.2 This is how you load the user data backup

Note

If this function is activated, the actual system data is replaced by the data backup.



Procedure

Proceed as follows to load the internal data backup:

1. The following display is shown when booting after power-on:

O Press SELECT key to enter setup menu

2. To start the Startup menu press the <SELECT> key.



You now go to the Startup menu:

	Startup menu	
Normal s		
O Reload s	aved user data	
O Delete us	er files	
		,
al system startup		



3.1 Backing up user data

3. Using the arrow key, select the menu item "Reload saved user data".



Setup menu	
 Normal startup Reload saved user data Delete user files 	

4. Confirm that the backup is loaded by pressing the key <INPUT>.



5. Confirm the confirmation prompt by pressing the <INPUT> key. Are you sure you want to reload saved user data?"



Note

Booting

If data is lost from the buffer memory, the data saved in the permanent memory will automatically be reloaded to the memory at POWER ON.

If the control boots with the backed-up data, the following message is displayed:

"4062 Data backup copy has been loaded".



3.2 Generating a commissioning archive

Overview

A commissioning archive is used to completely backup all of the data required for the machine function.

A commissioning archive can be generated on an external data carrier, e.g. USB-FlashDrive or CompactFlash card at the front panel of the control as well as on the system CompactFlash Card.

Note

Data must always be backed up before a machine is delivered. Only then can it be ensured that in the case of service, the delivery condition of the machine can be restored.

In addition, it may be necessary to generate a commissioning archive before service activities are started. This means that it can be guaranteed that the actual state of the machine can be restored after the activities have been completed.

3.2.1 This is how you generate a setup archive on an external data storage medium

Generating an archive on an external data carrier

Procedure:

1. Select the "Startup" operating area.



2. Press the menu forward key.



3. Press the "Setup archive" softkey.





4. Activate "Create setup archive".

The "Create setup archive" window opens.

				03/23/11 11:42 AM
Create setup archive				
Use Easy Archive data class archives				
Data classes				
© All				
O Selection				
Control components				
✓NC data				_
✓PLC data				
☑Drive data				
⊙ ACX format (binary)	O ASCII format			
HMI data				
Comment				
				× Cancel
				Galicel
Created by				
			>	ОК
archive		Swivel data		

5. Select the desired control components.

Note

Easy Archive

- Select all of the components, unless it is known that individual components do not deviate from the Siemens standard.
- Select all data classes, unless only certain data (e.g. INDIVIDUAL) are to be backed up.
- 6. Press the "OK" softkey to create the archive.



The "Create Archive: Select Archive" window opens.

- 7. Select the storage location of the archive:
 - USER USB: USB-FlashDrive in slot X125 at the front
 - User CF: CompactFlash Card in the slot at the front
- 8. Select a directory. Example: User CF
 - OR -



9. Press the "New directory" softkey to generate a new directory.

New directory

The "New Directory" window opens.

10.Enter the required name and confirm with "OK."



The directory is created subordinate to the selected folder.

11.Press the "OK" softkey.



The "Create archive: Name" window opens.

12. Enter the required name and confirm with "OK."



A file with format type *.ard is saved in the selected directory:

					03/23/11 11:43 AM
Create setup archi	ve				
Use Easy Archive Data classes O All	data class archi	ves Generate arc	shive: name		
O Selection Control componer INC data IPLC data IDrive data	Name TA_TES		archive ARD	[¥]	
⊡HMI data	nat (binary)	(O ASCII format	t	
Comment Created by					Cancel
					ОК



3.2.2 This is how you read a setup archive from an external data storage medium

Reading in an archive from an external data carrier

Procedure:

1. Select the "Startup" operating area.



2. Press the menu forward key.



3. Press the "Setup archive" softkey.



4. Press "OK".



The "Startup" window opens.

- 5. Activate "Read in setup archive".
- 6. Press "OK".



The "Select Setup archive" window opens and the data tree is displayed.



7. Select the required setup archive (ARD). **Example:** User CF

2	→ AUTO					03/23/11 11:43 AM
Setup O Crea O Real	44	Read in da	ta class archiv	ie i		—
	Path: Name: Created on:	User CF TA_TEST.ar 03/23/11	d 11:37:17 AM	Data classes:		
	Created by: Version: Comment:			Manufactu Individual User	IRER	
				Components: NCK PLC Drives		×
		_		⊡HMI		Cancel

8. Press "OK".



A query is displayed, here you can see the most important data of the selected archive to be certain that it is OK.

9. Data is read in when pressing "OK".



10. In the case of errors or problems, import can be terminated by pressing the "Cancel" softkey.





3.2.3 This is how you generate a setup archive on the system CompactFlash card

Generating an archive on the system CompactFlash Card

Procedure:

1. Select the "Startup" operating area.



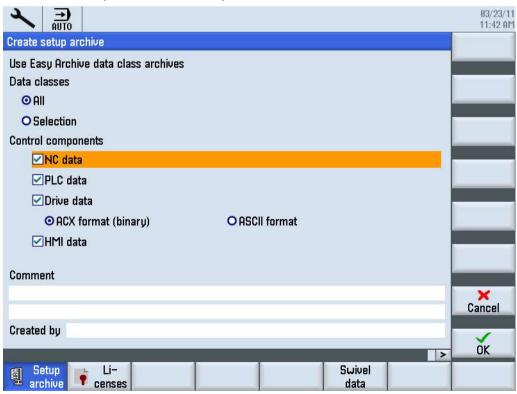
2. Press the menu forward key.



3. Press the "Setup archive" softkey.



4. Activate "Create setup archive". The "Create setup archive" window opens.





5. Select the desired control components.

Note

Easy Archive

- Select all of the components, unless it is known that individual components do not deviate from the Siemens standard.
- Select all data classes, unless only certain data (e.g. INDIVIDUAL) are to be backed up.
- 6. Press the "OK" softkey to create an archive.



The "Create archive: Select Archive" window opens.

- Select the storage location of the archive: "Archives": Internal memory on the CompactFlash Card system
- Select a directory.
 Example: "Archives" → "Manufacturer"
 OR -
- 9. Press the "New directory" softkey to generate a new directory.

New directory

The "New Directory" window opens.

10.Enter the required name and confirm with "OK."



The directory is created subordinate to the selected folder.

11.Press the "OK" softkey.



The "Create archive: Name" window opens.

12. Enter the required name and confirm with "OK."



A file with the ARD format type is saved in the selected directory.

3.2.4 This is how you read in a setup archive from the system CompactFlash card

Reading in an archive from the system CompactFlash Card

A description is provided here how you read in a series setup archive in order to be able to restore the previous state of the machine.



Procedure:

1. Select the "Startup" operating area.

مر Setup

2. Press the menu forward key.



3. Press the "Setup archive" softkey.



4. Press "OK".



The "Create setup archive" window opens.

- 5. Activate "Read in setup archive".
- 6. Press "OK".



The "Select Setup archive" window opens and the data tree is displayed.



3.2 Generating a commissioning archive

7. Select the required setup archive (ARD). **Example:** "Archives" → "Manufacturer"

p				
2				03/23/11 11:43 AM
Setup				
	4a aakin anakina	Read in data class arc		
	Path:	Archives/Manufacture	ſ	
	Name:	TA_TEST.ard		
	Created on:	03/23/11 11:37:17 A	1 Data classes:	
	Created by:			
	Version:			
	Comment:		USER	
			Components:	
			PLC	
			Drives	
				× Cancel
				Valicei
				 ОК

8. Press "OK".



A window with the data of the selected archive is displayed.

9. Data is read in when pressing "OK".



10. In the case of errors or problems, import can be terminated by pressing the "Cancel" softkey.





3.3 Software backup

3.3.1 This is how you generate a software backup

Overview

With "Create software backup", a function is provided to generate a backup of the system software including all of the user data saved on the system card. This backup represents the "Backup" of the machine.

Note

Memory size: At least 2 GB

The backup does not contain a license key, in order to guarantee use for series production.

To generate the backup of the system software ("clone"), a storage medium (CompactFlash card or USB flash drive) with a minimum memory size of 2 GB is required. Other data carriers are not permissible.

Generating the system software backup ("clone")

Procedure:

- 1. Switch the control on.
- 2. Perform an internal data backup (see also:This is how you backup user data (Page 24)). A correct, complete backup is only generated using the internal data backup.
- 3. Switch the control off.
- 4. Switch-on the control again, as the backup can only be generated when the control boots. After the control has been switched-on, the following display appears:

O Press SELECT key to enter setup menu



- 1. Press the <SELECT> key, "Normal startup" is the default setting.
- 2. To call the "Startup menu", press the following keys in succession:



Menu reset key, HSK2 (horizontal SK2), VSK2 (vertical SK2)

Note

PPU with touch operation

To call the startup menu when powering up, there is an additional shortcut for all PPUs: "8" \rightarrow "2" \rightarrow "8"

3. The Startup menu is displayed:

	Startup menu	
	Normal startup	
	○ Reload saved user data	
	○ Install software update/backup	
	O Create software backup	
	O NCK default data	
	O Drive default data	
	O PLC default data	
	O HMI default data	
	O Factory settings	
	O Delete OEM files	
	O Delete user files	
	O PLC-Stop	
nal system s	tartun	1

- 4. Using the cursor keys, select the menu item "Create software backup".
- 5. Press the <INPUT> key to confirm your selection:



6. Insert a storage medium into the slot on the front panel.



Startup menu
O Normal startup
O Reload saved user data
O Install software update/backup
Creating SW backup archive
Please insert user CF card or USB stick to save backup file. To continue press INPUT <mark>⊗</mark>
O Factory settings
O Delete OEM files
O Delete user files
O PLC-Stop

1. Press the <INPUT> key to start the backup.



The software first checks whether a backup was already generated on the card and outputs a message. The backup can now be overwritten or the process interrupted by making the appropriate operator action.

2. When starting to generate a backup, the following message is output:

Startup menu	
O Normal startup	
O Reload saved user data	
Creating SW backup archiv	ve
Creating system card image	(35 MB)
O HMI default data	
○ Factory settings	
○ Delete OEM data	
O PLC-Stop	



3. Wait until the following message is displayed:

Startup menu	
Normal startup Reload saved user data Jestell software undets (backup)	
Creating SW backup archive	
HMI default data Factory settings	
O Delete OEM data O PLC-Stop	

- 4. Withdraw the storage medium from the slot at the front panel of the control.
- 5. Switch the control off.
- 6. Switch the control on.
- 7. The control boots normally.

Note

Note that when the system software is transferred, no license key for the software of the CNC options is transferred.

3.3.2 This is how you install a software backup

Overview

A backup previously generated is loaded into the control using the function "Install software update/backup". All system and user data are overwritten with the software backup image.

Note

Licenses

The backup does not include a license key, and is not installed with the software update.

As an alternative, the license key for an already licensed card can be obtained through the Internet: see also This is how you display the actual license key (Page 62)

When replacing a defective system CompactFlash Card, the license key must be requested again: see also Licensing after replacing the system CompactFlash Card (Page 56)



Installing the software backup

Procedure:

1. Switch-on the control again, as the backup can only be generated when the control boots. After the control has been switched-on, the following is displayed:

O Press SELECT key to enter setup menu

- 1. Press the <SELECT> key, "Normal startup" is the default setting.
- 2. To call the "Startup menu", press the following keys in succession:



Menu reset key, HSK2 (horizontal SK2), VSK2 (vertical SK2)

Note

PPU with touch operation

To call the startup menu when powering up, there is an additional shortcut for all PPUs: "8" \rightarrow "2" \rightarrow "8"

3. The Startup menu is displayed:

	Normal startup
	O Reload saved user data
	🔿 Install software update/backup
	🔿 Create software backup
	O NCK default data
L	○ Drive default data
L	○ PLC default data
	🔾 HMI default data
	O Factory settings
L	O Delete OEM files
l	O Delete user files
l	O PLC-Stop



4. Using the cursor keys, select the menu item "Install software update/backup".



5. Press the <INPUT> key to confirm your selection:



6. Insert the storage medium with the backup in the slot and confirm with "Yes" by using the cursor keys to make the selection:

Startup menu	
O Normal startup	
O Reload saved user data	
Install software update/backup	
Install software update	
O Factory settings	
O Delete OEM files	



7. Select the valid backup using the cursor keys.

Software images:	
828d_image.tgz	
Press SELECT to refresh list of software images	
	mage

- 8. Press the <Input> key to confirm your selection.
- 9. The following message briefly appears: "Starting software update" Then the screen goes dark for several seconds.
- 10. If a valid backup has been found, the following message is output:



If a valid backup was not selected, then the upgrade is canceled with the following message: "Image file is corrupt!"

In this case, switch-off the control, withdraw the data carrier and repeat the procedure by selecting a valid backup image.

11.Wait until the following message appears:

Message	
Restoring complete. Switch off and remove data medium!	

- 12.Switch the control off.
- 13. Withdraw the storage medium from the slot at the front panel of the control.



14.Switch the control on.

15. The control boots normally.

Note

If the procedure is interrupted, then it must be restarted.

If the system CompactFlash Card is no longer identified as a bootable CompactFlash Card, then a boot system must be generated on this card. (see also: This is how you create a boot system (Page 50))

In this case, the license key of the system CompactFlash Card should be transferred to the control.



3.4 Updating the software

3.4 Updating the software

Data backup

If a system update is necessary, then the system data must be backed up so that no data is lost in the case of a problem.

In this case, we recommend to perform two types of data backup.

- Generate an image of the system CompactFlash Card ("clone", see also:This is how you generate a software backup (Page 38)).
 A backup is generated just in case an error occurs during the update. This means that it is then possible to restore the "old system".
- Generate an archive for series startup (see This is how you generate a setup archive on an external data storage medium (Page 29)), in order to restore the machine-specific data. The control is booted using a *.tgz file on the storage medium (CompactFlash Card or USB-FlashDrive) in the slot at the front panel of the control.

Note

Backup and archive the data of the control system to an external data carrier before booting. Observe the information in the update instructions.

Updating the control

Preconditions:

- The control system is switched off.
- The image for the update is saved on the CompactFlash card.
- The CompactFlash card is inserted in the slot on the front panel of the control.

Procedure:

1. Switch-on the control again, as the image can only be generated when booting. After the control has been switched-on, the following display appears:

O Press SELECT key to enter setup menu



- 1. Press the <SELECT> key, "Normal startup" is the default setting.
- 2. To call the "Startup menu", press the following keys in succession:



Menu reset key, HSK2 (horizontal SK2), VSK2 (vertical SK2)

Note

PPU with touch operation

To call the startup menu when powering up, there is an additional shortcut for all PPUs: "8" \rightarrow "2" \rightarrow "8"

3. The Startup menu is displayed:

Normal startup	
○ Reload saved user data	
🔿 Install software update/backup	
O Create software backup	
O NCK default data	
🔿 Drive default data	
○ PLC default data	
⊖ HMI default data	
○ Factory settings	
○ Delete OEM files	
O Delete user files	
O PLC-Stop	

- 4. Using the cursor keys, select the menu item "Install software update/backup".
- 5. Press the <INPUT> key to confirm your selection.





3.4 Updating the software

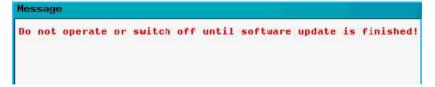
6. Use the cursor keys to select "Yes".

Startup menu	
 Normal startup Reload saved user data Install software update/backup 	
Install software update	
Yes No O Factory settings O Delete OEM files	
O Delete user files O PLC-Stop	

7. Select the update image (*.tgz) on the storage medium and confirm with <INPUT>.

Software images:		
828d_image.tgz		
O Press SELECT to refresh li	st of software images	
↔ Press INPUT to continue ⊾	ith selected software imag	10

8. The software update is started: The following message appears while the update is running:





9. Wait until the following message is output:



- 10. Withdraw the storage medium from the slot.
- 11.Switch the control off.
- 12.Switch the control on.
- 13. The control boots normally.

Note

If the update is interrupted, then it must be restarted.

If the system CompactFlash Card is no longer identified as bootable system, then a boot system must be generated on this card (see also: This is how you create a boot system (Page 50)).

In this case, the license key of the system CompactFlash Card should be transferred to the control.



3.5 Generating a boot system on the CompactFlash card

Application

If the system CompactFlash Card hardware is defective, then it must be replaced. The replacement card is an empty CompactFlash Card without any system software and without any user software and cannot be used as system CompactFlash Card as it is without any additional preparation.

Mini boot system image

"Configuration data" is supplied on the toolbox CD of the SINUMERIK 828D, which in the scope of delivery includes a boot system image:

Toolbox 828D V04.07.02.01	
Programs Programs to be installed	
Contig Data 9280 PLC Programming Tool Access MyMachine SINUMERIK Commissioning Start-up tool for drives	Support files Version 04.07.02.01 for commissioning of SINUMERIK 828D.
I Target directory: C:\\Siemens\Toolbox 828D\V04070201	Browse
Help	< <u>B</u> ack <u>N</u> ext > Cancel

Image 3-1 Toolbox selection

This program must be installed in order that the image of the boot system is installed on the PC/PG.

3.5.1 This is how you create a boot system

Precondition

The default path to install the boot system is: C:\Program Files (x86)\Siemens\Toolbox 828D\V04070xx00\RecoverySys The file name of the boot system is: minsys.img



With SINUMERIK Integrate Access MyMachine /P2P, the minsys.img file is copied to an empty replacement card.

Precondition to write:

- SINUMERIK Integrate Access MyMachine /P2P is installed.
- SW package: Configuration data from the Toolbox has been installed.
- CompactFlash card is a replacement card.

Installing the boot system on an empty card

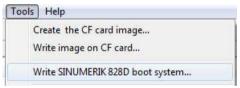
Procedure:

- 1. Insert the CompactFlash Card into the card reader.
- 2. Start the program via "Start" → "Programs" → "SINUMERIK" → "Tools" → "Access MyMachine P2P".
- 3. Press "Cancel" if you are prompted to establish the connection.

Note

An online connection to the control is not required to generate the boot system.

4. In the ""Options" menu, select the menu item "Write SINUMERIK 828D boot system ... ":



5. If several versions of the toolbox are installed on the PC, you obtain the following selection:

Available versions:		
/04.05.02.00 /04.07.00.00 /04.07.02.01		



6. All of the identified interchangeable drives are displayed, here in the example, the CompactFlash Card is identified as drive F:\.

Selecting memory medium	? ×
Please select here the memory medium from which you v CF card image or you would like to write a CF card image	
Please select memory medium	
	OK Cancel

7. Confirm the selection of the target drive with "OK". By pressing the "Write" button, the image is transferred to the target drive.

Create SINUMERIK 828D bo	ot system		? ×
Please select the memory med be written for an 828D.	ium to which the SINU	MERIK boot syst	em image is to
Memory medium (CF card):	F()		[]
		Write	Cancel

Note

While the data is being transferred, do not switch-off the PC and do not remove the CompactFlash Card.

Data transfer is displayed using a progress bar:

Create SINUMERIK 828D boot	system	?×
Please select the memory mediur be written for an 828D.	n to which the SINUMERIK boot system image	e is to
Memory medium (CF card):	F:\	· · · · ·
	(Write Can	icel

8. The following message is output if data transfer was successfully completed:

RCS Com	mander X
į	Writing Boot system image to medium (CF card) successful.
	OK

9. In order to ensure that there are no read and write access operations to the CompactFlash Card, when you remove the CompactFlash Card from the interchangeable drive, select the Windows function "Safely remove hardware".



3.5.2 This is how you install a software backup using the boot system

Overview

If a CompactFlash Card with a boot system is used as system CompactFlash Card, the system software or a previously generated software backup must still be transferred.

Note

Licenses

The boot system does not contain a license key; a valid license key must be transferred to the control. When replacing a system CompactFlash Card, this must be requested again (see also: This is how you license a CNC option (Page 56)).

All system data and user data are overwritten with the system image.

Updating the software

After you have inserted the CompactFlash Card with the boot system as new system CompactFlash card (see Replacing the system CompactFlash Card (Page 82)) proceed as follows:

1. Switch the control on. When booting, the following display appears:

Startup menu	
● Install software update/backup	
]

2. Press the <INPUT> key to confirm your selection.





3. Confirm the question with "Yes".

Setup menu	
Install software update/backup	
Install software update	
Yes No	

4. Insert the CompactFlash Card or a USB-FlashDrive with the image into the slot on the front panel of the control.

Software images:				
828d_image.tgz				
		5 - 12 5		
O Press SELECT to	refresh list of sof	tware images		
Press INPUT to c	ontinue with sele	cted software in	nage	

5. Confirm the selection with the <INPUT> key.



6. The following message briefly appears: "Starting software update" Then the screen goes dark for several seconds.



7. If a valid image has been found, the following message is output:



8. Wait until the following message is displayed:

Message
Restoring complete. Switch off and remove data medium!

- 9. Switch the control off.
- 10.Switch the control system back on again: The control boots normally.

Note

If the system was booted using a boot system, there is no valid license key on the system CompactFlash Card. This must be transferred again.

Result

The following cases are possible:

- The control boots and is ready for operation if, when generating the system image, the internal data backup and also a startup (commissioning) file were generated.
- If a valid image is not found, the update is interrupted with the following message: Image file is corrupt!
 In this case, switch off the control, withdraw the data corrier and corrupt out the precedulation.

In this case, switch-off the control, withdraw the data carrier and carry out the procedure again by selecting a valid file.



3.6 Licensing

3.6.1 Licensing after replacing the system CompactFlash Card

Application

The license key of the SINUMERIK 828D is linked with the system CompactFlash Card. If the system CompactFlash Card is replaced for a SINUMERIK 828D, the license key loses its validity and the system is only ready with some significant restrictions.

This situation can occur for a defective hardware of the system CompactFlash Card.

Validity of the license key

The following data are required in order to obtain a valid license key after replacing the system CompactFlash Card: the serial number of the defective and the new CompactFlash card.

Note

Only empty CompactFlash cards that have been released as replacement part can be used. Only these CompactFlash cards are known in the licensing database.

In order to obtain a valid license key for the new, empty CompactFlash Card, contact the SINUMERIK Hotline specifying the serial numbers of the two CompactFlash cards. The hotline will immediately provide you with a new license key.

3.6.2 This is how you license a CNC option

Precondition

You require at least one authorization to set or reset a CNC option:

Access level 1 (password: Manufacturer).

Licensing CNC options

If an additional CNC option is to be activated at a SINUMERIK 828D, then this CNC option must be licensed at the machine and is only valid for this CompactFlash Card.



Proceed as follows to access the "licenses" dialog box:

1. Select the "Startup" operating area.



2. Press the menu forward key.



3. Press the "Licenses" softkey.



The "Licensing" window opens. Using the vertical softkeys, you can execute the following actions:

- Display a serial number: "Overview"
- "Display all options"
- Display "Missing licenses"
- "Exp. license requirement"
- "Read in the license key"



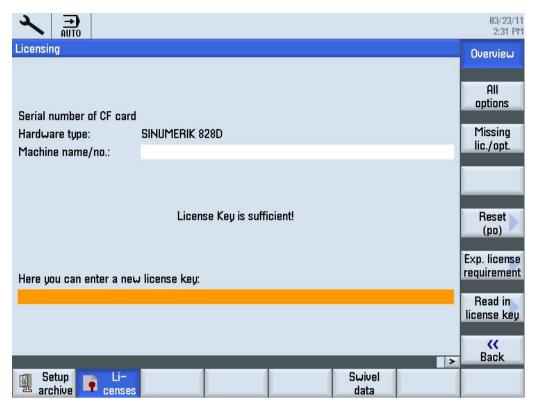


Image 3-2 Licensing

Web License Manager

Licenses that are purchased are assigned via the Internet.

By using the Web License Manager, you can assign licenses to hardware in a standard Web browser. To conclude the assignment, the license key must be entered at the control via the user interface.

See also

The license database administered by Siemens can only be accessed using the Web License Manager (<u>http://www.siemens.com/automation/license</u>).

Note

The NC start function is suppressed if a CNC option, for which no valid license key has been entered, is additionally activated. This means that the machine can only operate on a severely restricted basis if an attempt is made to use an unlicensed CNC option.



3.6.3 This is how you determine missing licenses/options

Determining the license requirement

Procedure:

- 1. Press the "All options" softkey to list all the options that can be selected for this control.
- 2. Activate or deactivate the required options in the "Set" column:
 - Mark the checkbox
 - Enter the number of options
- 3. Press the "Missing lic./opt." softkey in order to display all options that are licensed. In the "Set" column, you can deselect the options that you do not require.

			06/15/11 2:03 PM
Licensing: All options			Overview
Option	Set	Licensed 🗅	
Additional 1 axis/spindle 6FC5800-0AC20-0YB0	2	2	All
Additional 1 positioning axis/auxiliary spindle 6FC5800-0AC30-0YB0	0	0	options
drive based SI-axis/spindle add. 1 axis/spindle 6FC5800-0AC50-0YB0	0	0	Missing lic./opt.
Travel to a fixed stop with force control 6FC5800-0AM01-0YB0			Search
Contour handwheel 6FC5800-0AM08-0YB0			Courdin
TRANSMIT and peripheral surface transformation 6FC5800-0AM27-0YB0			Reset (po)
Bidirectional compensation 6FC5800-0AM54-0YB0			Exp. license
Sag compensation, multi-dimensional 6FC5800-0AM55-0YB0			requirement
Generic Coupling 'CP-STATIC' 6FC5800-0AM75-0YB0			Set option acc. lic.
Replacement tools for tool management 6FC5800-0AM78-0YB0			
Network drive management		>	K Back
archive Li− archive censes		ivel ata	

Image 3-3 Licensing (example)

- 4. Press the softkey "Set option according to license", to activate all of the options contained in the license key. Confirm the following confirmation prompt with "OK".
- 5. To activate new selected options, press the "Reset (po)" softkey. A safety prompt appears.
- Press the "OK" softkey to trigger a warm restart.
 OR -
- 2. Press the "Cancel" softkey to cancel the process.



3.6.4 This is how you generated a new license key

Assigning the license to hardware

In order to simplify licensing for the technician, licenses are assigned to the hardware in a Standard Web Browser using the Web License Manager .

To conclude the assignment, the license key must be entered manually on the control via the user interface.

As a consequence, a valid license key can be generated at any time worldwide for options that have been additionally purchased.

Preconditions

The following preconditions must be met in order to assign a license to a piece of hardware via direct access and user interface:

- Hardware serial number
- A PC/PG with Internet connection and browser is available.
- The login data for direct access (e.g. per CoL (Certificate of License)) is available:
 - License number
 - Delivery note number

Note

Hardware serial number

Ensure that the serial number of the hardware displayed is the one you want to make the assignment for. The assignment of a license to a piece of hardware cannot be reversed via the Web License Manager .

Generating a license key

Procedure:

1. Select the "Start-up" operating area.



2. Press the menu forward key.



3. Press the "Licenses" softkey.





4. Press the "Overview" softkey and note down the serial number of the system CompactFlash Card.

Overview

- 5. At your PG/PC, establish a connection to the Web License Manager (<u>http://www.siemens.com/automation/license</u>)
- Log on via "Direct access".
 Follow additional instructions in the Web License Manager:



7. After completing the assignment process, enter the license key displayed in the Web License Manager into the "Licensing" dialog box in SINUMERIK Operate.

Note

License key via e-mail

If you have an e-mail address, you have the option (checkbox) of receiving the license key by e-mail.

Entering the license key

The newly purchased license key is entered into the control.





Procedure:

1. Select the "Start-up" operating area.

مر Setup

2. Press the menu forward key.



3. Press the "Licenses" softkey.



4. Press the "Overview" softkey.

Overview

If you receive the license key via the Web License Manager, enter the license key manually in the field "You can enter a new license key here".

5. Press the <INPUT> key.



If the license key is valid, the message "License key set" is displayed.

3.6.5 This is how you display the actual license key

Overview

The following options are available to display the actual license of the control:

- Directly at the SINUMERIK control
- Without control, in the Internet You require the serial number of the system CompactFlash Card in order to display the actual key in the Internet. This is displayed at the control in the "Licenses" dialog box - or can be read from the system CompactFlash Card.



Displaying the actual license key at the control

Proceed as follows to display the license key at the control:

1. Select the "Start-up" operating area.



2. Press the menu forward key.



3. Press the "Licenses" softkey to display the control licenses.



Displaying the actual license key in the Internet

In order to view the actual license key of the control, using the serial number, it is possible display the license key via the Internet. The serial number is on the system CompactFlash Card - or can be displayed at the control as described above.

1. Go to the Internet page of the Web License Manager:



2. Press the menu item "Display license key".



3. A window with the license key opens:

Show License Key

Pressing the button will show you the current License Key. At least one license must have been assigned yet.

	Please select	•
Please enter a search string!		
	Get License Key	
		<u>.</u>

4. In the menu, select "Hardware serial number" and enter the serial number of the system CompactFlash Card.

Show License Key	
Pressing the button will show you the license must have been assigned yet.	
Please enter a search string!	Please select 20060613009E2DC6 Get License Key
	up _



- 5. Press the "Display license key" softkey.
- 6. The actual license key is displayed as follows:

Show License Key

Pressing the button will show you the current License Key. At least one license must have been assigned yet.

Hardware serial number	
20060613009E2DC6	
Get License Key	

Current License Key VT5X-SATL-AF

Additionally you can get a License Report by email summarizing all assigned licenses.

Email address	

Request for License Report

The license key can be saved in a file:

Save license key as textfile (for usage with the SINUMERIK-Controller)

(Note: The "Save as..." - Dialog is shown after doing a right click on the above hyperlinks)

up≞



3.7 Machine registration

Overview

The machine registration contains:

- Notification of the startup date (e.g. start of production)
- Notification of where the machine is located (final destination)
- Notification regarding the Siemens components and software versions installed
- Name of the machine OEM, the machine type and the machine number

This is how you register a machine:

- Create a machine logbook
- Create a new entry in the logbook
- Save the machine identity
- Send the machine identity

On-site service (OSS)

SINUMERIK 828D and the associated drive, motor and accessories from Siemens include an on-site service (local service) for 24 months. The on-site service time is extended to 36 months by registering the machine.

You can obtain additional information about the on-site service here Internet page (<u>www.siemens.com/automation/oss</u>).

Precondition

To change the end user final destination data, the following access rights must be available:

- Softkey "Manufacturer" : Access level 1 (password: Manufacturer)
- Softkey "Dealer" : Access level 2 (password: Service)
- Softkey "End user": Access level 3 (password: User)

3.7.1 This is how you generate the machine logbook

Machine data

The following data are saved in the control in the "Machine logbook":

- Contact data of the manufacturer (OEM)
- Contact data of the dealer (if available)
- Contact data of the end customer
- Log of the service and diagnostic procedures that have already been carried out.



During a service call, the data should be checked as to whether it is correct.

Open the "Machine identity" dialog box

Procedure:

1. Select the "Diagnostics" operating area using the following key:



2. Press the "Version" softkey to open the "Version data" dialog box.



3. Press the "Details" softkey.

Details

The data associated with the machine are displayed in the "Machine logbook":

\sum	→ AUTO			12/14/09 1:23 PM
Machine	logbook			Change
No.	Date Time	Name Company/department	Error diagnostics/measure	
Machine	name/no.	MILLING 300		New
Machine		TYP 4711		entry 🔨
Manufac	turer			
Dealer				
End user				
				Startup complete
				Machine installed
<		m	······································	« Back
	Δ		C/PLC REMOTE	Vig Version



- 4. Press the "Change" softkey to open the "Machine identity" dialog box.
- 5. Select, for example, the "End user" softkey to check and complete the contact data of the end user.

		12/14/09 2:42 PM
Machine identity	Serial number of CF card:	Import data
Machine name/no.	MILLING 300	
Machine type	TYP 4711	
Customer number		Manu-
Manufacturer's name Street		facturer
Post code / zip code		
Town		Dealer
Country	Please select:	
State/county		End user
Contact		Liiu usei
Phone		
Fax		× Cancel
Email		Cancer
WEB address		\checkmark
		OK
Alarm Mes- list sages log		Vig Version

Note

Contact data

Using the "Import data" softkey, templates with contact data can be imported to simplify data entry; these templates are available through Siemens sales partners.

3.7.2 This is how you make a new entry in the logbook

Generating a new logbook entry

In order to log service and diagnostic procedures at the machine, make an entry in the machine logbook. The activities performed should be documented here after each service call.



To make a logbook entry, proceed as follows:

1. Select the "Diagnostics" operating area using the following key:



2. Press the "Version" softkey.

Via Version

3. Press the "Logbook" softkey.

Logbook

4. Press the "New entry" softkey in order to make an entry in the logbook.

Neuer Eintrag

Complete the fields for the new logbook entry:

	03/23/ 4:13 I	09 M
New logbook entry		
Name		
Company/department		1
Error diagnostics/measure		
		1
		1
		1
		1
	×	1
	Cancel	
	ОК	

5. Press the "OK" softkey to save an entry in the logbook.



For the following activities, two additional softkeys are available, which generate preconfigured logbook entries:



Startup
complete1st Commissioning completed (commissioning at the machine OEM's fa-
cility)Machine
installed2nd commissioning completed (commissioning at the company operating
the machine/end user)

Note

Once saved, data can no longer be changed.

3.7.3 This is how you save the machine identity

Saving the machine identity

Note

Ensure that the machine identity that has been entered is correct before saving in order that no incorrect information is saved.

In order to save the machine identity (address data, version data and logbook) externally on a data carrier, proceed as follows:

1. Select the "Diagnostics" operating area using the following key:



2. Press the "Version" softkey.



3. Press the "Save" softkey.



The "Save version information: Select Archive" window opens. Select a directory.



4. Press the "OK" softkey.



The data are pre-assigned so that a change is not necessary.

	11:37 AM
Version data	
SINUMERIK 828D - 828D-TE82	_
Name Actual version Nominal version	
NCU system software U02.06.00.00	
OEM applications Save version information: name	
Hardware	
Name:	
Comment:	
✓ Version data (.TXT)	
Configuration data (.XML)	
	X Cancel
	OK

The "Name" text field is pre-assigned as follows: **Machine name/Number>+<Number of the CompactFlash Card>** You now have the opportunity of changing this name. You can enter a comment in the "Comments" text field. Select the following options:

- "Version data (.TXT)": Output of the version data in the text format
- "Configuration data (.XML)": All information about the machine identity
- 5. Press the "OK" softkey to start saving the data.





3.7.4 This is how you send the machine identity

Overview

To complete, transfer the configuration file (address data, logbook data, version data) of the control to the final destination database via an Internet connection.

This means that the service organization has the possibility of obtaining a profile about the history of the control without having to go to the machine. Therefore, service can be more effectively carried-out as all of the relevant information is available.

Note

On-site service

The machine is registered by sending the machine identity. Only then is the full on-site service period effective.

Send the machine identity

Preconditions:

- The commissioning status is saved in the logbook.
- The addresses data are entered/updated in the machine.
- The machine identity was saved and is available on the PC/PG.
- The PC/PG is connected with the Internet.

Please proceed as follows:

- 1. Open the Internet Browser on your PC/PG.
- 2. Go to the Internet page for the registration (http://www.siemens.com/sinumerik/register).

You can find instructions on how to transfer data on this Internet page. Follow these instructions.

Note

Contact persons worldwide

If it was not possible to transfer the file, then please contact your local Siemens contact person (<u>http://www.automation.siemens.com/partner</u>) in sales.



Service cases - hardware

Components in the control cabinet

The sequence in the chapter of the hardware components corresponds to the following systematics:

- Components at the machine
- Components in the control cabinet



SINAMICS S120 Combi 3-axis module 4-axis module



DMC20

DME20

System components

TM54F

TM120

Motor Modules Single Motor Modules Double Motor Modules









Image 4-1 Components in the control cabinet





Image 4-2 Supplementary components in the electrical cabinet

References

Information about the cause of faults and how they can be resolved can be found in the following references:

- SINUMERIK 828D/SINAMICS S120 Diagnostics Manual "Alarms"
- SINUMERIK 828D/SINAMICS S120 List Manual "Parameter description"
- "EMC Installation Guideline" Configuration Manual.
- "Industrial security" Configuration Manual



4.1 Safety instructions for the hardware

4.1 Safety instructions for the hardware

4.1.1 Safety instructions for the hardware

Danger to life if the fundamental safety instructions and remaining risks are not carefully observed

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

- · Comply with the fundamental safety instructions.
- When assessing the risk, take into account residual risks.



Danger to life through electric shock due to the residual charge of the DC link capacitors

As a result of the DC link capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off.

Contact with live parts results in death or serious injury.

- Do not open the protective cover of the device until 5 minutes have elapsed.
- Before starting any work, check that the system is in a completely no-voltage condition by measuring all poles/phases, also to ground.
- Ensure that the associated warning plate in the appropriate language is attached.



Danger to life through electric shock due to incorrectly installed DC link clips

Incorrectly installed DC link clips at the left-hand end of the drive line-up can cause an electric shock.

- For all 50 mm wide modules (exception: Smart Line Module) remove the DC link clips, including the bolts. Do not tighten the screws without the DC link clips.
- For all components that are 75 mm wide or wider, it is not permissible that the DC link clips are moved to the left or removed.



Danger to life through electric shock due to missing DC link side covers

There is a danger of an electric shock through contact when the side covers of the DC link are missing.

- Mount the side covers that are provided on the first and last component in the drive lineup.
- Order any missing side covers (order number: 6SL3162-5AA00-0AA0).



4.1 Safety instructions for the hardware

NOTICE



Damage through 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).

NOTICE

Damage caused by loose plug connections and screw connections

Loose plug connections and screw connections can release themselves in operation.

• Ensure that all of the connectors and screws are correctly tightened or latched and inserted.

NOTICE

Damage caused by excessively low cooling clearances

Higher temperatures can occur if heat-generating components have excessively low cooling clearances. This can damage the hardware.

• Ensure that the specified cooling clearances are complied with.



4.2.1 PPU status displays

Status displays front side

On the front side of the PPU, the following status displays provide information about the module state:

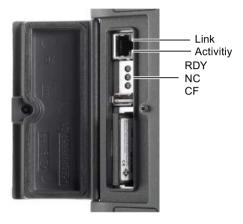


Image 4-3 Vertical flap (detail)

LEDs and the slots for the CompactFlash card are not available on the front of the PPU 290.3.

The three LEDs located behind the front flap at the front of the PPU have the following significance:

Name	Color	State	Meaning			
RDY	Green	ls lit	NC Ready and PLC in run mode.			
	Yellow	Is lit	PLC in stop mode			
		Flashing	Booting			
	Red	Is lit	NC in stop mode:			
			When booting, if NC Ready is not yet available			
			Critical fault (power off/on necessary)			
NC	Yellow	Cyclic flashing	NC operation			
CF	Yellow	Is lit	User CompactFlash Card being accessed			

NOTICE

Damage to the CompactFlash card when it is withdrawn in operation

The CompactFlash card can be destroyed if it is withdrawn or inserted in operation.

Therefore, do not withdraw the CompactFlash card if an LED is lit.

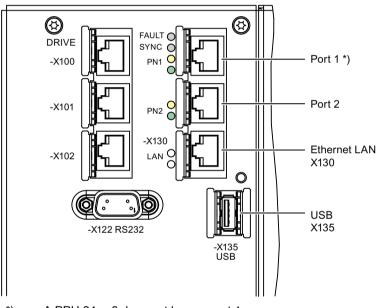


The RJ45 socket is equipped with one green and one yellow LED. As a consequence, the following information of the PLC I/O interface is displayed based on PROFINET:

Name	Color	State	Meaning	
Link	Green	ON	100 MBit link available	
		OFF	Missing or faulty link	
Activity	Yellow	ON	Sending or receiving data	
		OFF	No activity	

Status displays, rear

At the rear of the PPU, the following status displays provide information about the module state:



*) A PPU 24xy.3 does not have a port 1.

Image 4-4 Rear of the PPU

For diagnostic purposes, the RJ45 sockets, port 1 and port 2 are each equipped with a green and a yellow LED. As a consequence, the following connection information of the PLC I/O interface is displayed based on PROFINET:

Name	Color	State	Meaning	
Link	Green	ON	100 MBit link available	
		OFF	Missing or faulty link	
Activity	Yellow	ON	Sending or receiving	
		OFF	No activity	

There are 2 additional LEDs "FAULT" and "SYNC" next to port 1, which apply to both ports:



Name	Color	State	Meaning
FAULT	Red	OFF	For the maximum expansion level of the PLC I/O: The data ex- change to all configured IO devices runs without errors.
		Is lit	Bus fault:
			No physical connection to a subnet/switch
			Incorrect transmission rate
			Full duplex transmission is not activated.
		Flashing (2 Hz)	If the PN fault LED flashes red, there is no fault. The maximum expansion level of the PLC I/O is not being used.
SYNC *)	Green	OFF	Task system of the SINUMERIK 828D is not synchronized to the send clock of the PLC I/O interface based on PROFINET IO. An internal substitute clock of the same size as the send clock will be generated.
		Is lit	Task system of the SINUMERIK 828D has synchronized to the clock of the PLC I/O interface based on PROFINET IO, data is being exchanged.
		Flashing (0.5 Hz)	Task system of the SINUMERIK 828D has synchronized to the clock of the PLC I/O interface based on PROFINET IO, data is being cyclically exchanged.

See also

Additional connections at the rear of the PPU (Page 19).

4.2.2 This is how you remove the PPU

Precondition

For this description, it is assumed that the PPU has been completely connected.

Removing

This description applies to both versions (vertical/horizontal).

- 1. Switch off the complete system, carefully checked that it is in a no-voltage condition and lock it out so that it cannot be switched on without the appropriate authorization.
- 2. Access the control panel/control cabinet where the PPU is installed.
- 3. Use a multimeter to check that the system really is in a no-voltage condition (isolated from the supply).
- 4. Label all connectors/cables that are inserted in the module. Only then, can it be ensured that the cables are not interchanged.
- 5. Withdraw the power supply X1.
- 6. Withdraw the digital input/output terminals X122, X132, X142.



- 7. Withdraw the handwheel terminal X143.
- 8. Withdraw the RS232 cable, X140.
- 9. Withdraw the connected DRIVE-CLiQ cables X100 X102.
- 10. Withdraw the connected Ethernet cable X130.
- 11. Withdraw the connected PROFINET cables PN1, PN2.
- 12. Remove the ground connection by releasing the grounding screw.
- 13.If required, release the strain relief.
- 14. Release the clips to remove the PPU from the operator panel. For the PPU 290.3, also release the upper snap mechanism. Please note that when removing the last upper clip, the PPU must be held from the front so that it doesn't fall out of the mounting cutout!
- 15.Remove the system CompactFlash card from the control. (refer to Chapter This is how you remove the system CompactFlash Card (Page 82))

4.2.3 This is how you install the PPU

Boundary condition

When replacing the PPU, then the MAC address of Ethernet interface X130 changes: Tell the customer or the system administrator the new MAC address.

Installing

N	OTICE
In	stalling the PPU
Tł	he following points must be carefully observed to correctly install the PPU:
•	The maximum permissible tightening torque for the tensioning screws is 0.5 Nm - and must not be exceeded.
•	It is important that the seal is not damaged when installing so that the maximum degree of protection that can be achieved is fulfilled. Therefore, center the PPU in the installation cutout.
•	Do not use suction grippers to lift the glass front to avoid damaging the glass front (only for PPU 290.3).



Procedure:

- Now, install the system CompactFlash Card into the new PPU. (refer to Chapter This is how you insert the system CompactFlash Card (Page 83))
- 2. Insert the PPU into the installation cutout from the front.



3. Tilt the PPU and press the snap mechanism to fit the device into the cutout (only for PPU 290.3)



Make sure that the PPU sits firmly in the installation cutout and cannot fall out before you secure the PPU at the rear using the tension jacks.

- 4. Fix the PPU in the installation cutout from the rear using the tension jacks by tightening the setscrews:
- 5. Connect the ground connections and tighten.
- 6. Insert the PN1, PN2 interfaces that were withdrawn.
- 7. Insert the Ethernet cable that was withdrawn at X130.
- 8. Insert the DRIVE-CLiQ cable that was withdrawn at X100 X102
- 9. Insert the handwheel terminal that was withdrawn at X143.
- 10.Insert the digital input/output terminals that were withdrawn at X122, X132, X142.
- 11.Reconnect power supply X1.
- 12.Retighten the strain relief assemblies.
- 13.Close the cabinet and switch-on the system again.
- 14.Read-in the available data backup.



4.3 Replacing the system CompactFlash Card

4.3 Replacing the system CompactFlash Card

4.3.1 This is how you remove the system CompactFlash Card

Overview

If service is required, it may be necessary to replace the system CompactFlash Card of the control. This is the case if, e.g. the system CompactFlash Card or the PPU is defective. For a PPU as replacement part (spare part), a system CompactFlash Card is not supplied.

NOTICE

Damage to the CompactFlash card when it is withdrawn or inserted under voltage

The system CompactFlash card can be damaged if it is withdrawn or inserted under voltage.

- Switch-off the control power supply before inserting or removing the CompactFlash card.
- Before you touch the CompactFlash card, discharge yourself at the cabinet or at the ground terminal.

Removing the system CompactFlash Card

Note

When removing the system CompactFlash Card, carefully ensure that neither the screw nor the system CompactFlash Card falls into the PPU housing or the machine.

- 1. Switch-off the power supply of the control and the control cabinet.
- 2. Release the screw (M3).





4.3 Replacing the system CompactFlash Card

3. Move the metal cover to the side and remove it.



4. Remove the system CompactFlash Card from the side.



5. First, guide the metal cover at the rear into the rabbet and fix to the housing using the screw.

4.3.2 This is how you insert the system CompactFlash Card

Precondition

The control cabinet and the PPU are in a no-voltage condition or the PPU has already been removed.

NOTICE

Damage to the CompactFlash card when it is withdrawn or inserted under voltage

The system CompactFlash card can be damaged if it is withdrawn or inserted under voltage.

- Switch-off the control power supply before inserting or removing the CompactFlash card.
- Before you touch the CompactFlash card, discharge yourself at the cabinet or at the ground terminal.



4.3 Replacing the system CompactFlash Card

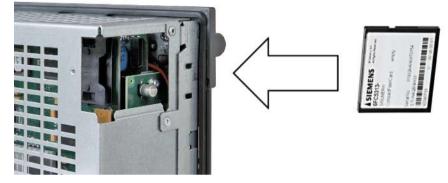
Inserting the system CompactFlash Card

Note

When inserting the system CompactFlash Card, carefully ensure that neither the screw nor the system CompactFlash Card falls into the PPU or the machine.

Procedure:

- 1. Release the screw (M3), and swing the metal cover to the side to remove it.
- 2. Gently insert the system CompactFlash Card into the slot until it clicks into place.



3. First, guide the metal cover at the rear into the rabbet and then tilt it into the end position.



4. Attach the metal cover to the housing using the screw.





4.4 Replacing the front cover

4.4 Replacing the front cover

4.4.1 This is how you remove the front cover

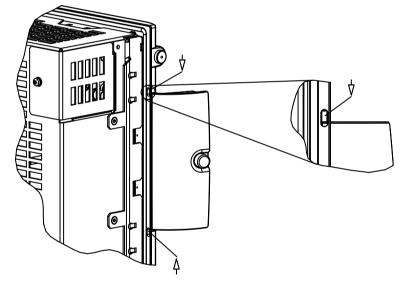
Precondition

You must first remove the PPU before you remove the front cover, see This is how you remove the PPU (Page 79).

Removing the front cover

Procedure:

- 1. Open the front cover.
- 2. Press the holding pins of the front cover through the openings at the rear. The tool that you use may have a maximum width of 2 mm.



3. Remove the front cover.



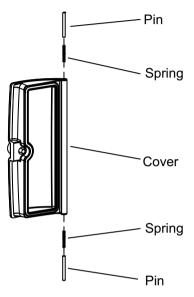
4.4 Replacing the front cover

4.4.2 This is how you install the front cover

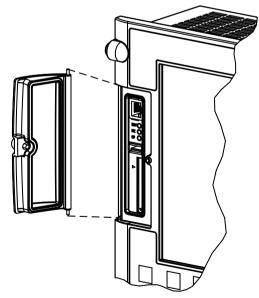
Installing the front cover

Procedure:

1. Insert the springs and pins into the front cover.



2. Press in the pins and mount the front cover. The pins must snap into the PPU housing.



After you have installed the front cover, you can also possibly reinstall the PPU, see This is how you install the PPU (Page 80).



4.5.1 This is how you remove MCP 483 USB/MCP 310 USB

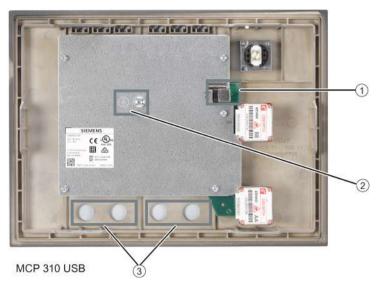
Removing

If the machine control panel has a hardware defect, then it must be replaced by an identical replacement part.

Precondition: The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.

- 1. Switch-off the control: Completely switch off the system. Check that the system is in a novoltage condition and is locked-out so that it cannot be switched on again without the appropriate authorization.
- 2. Access the operator panel/control cabinet in which the machine control panel is located.
- 3. Use a multimeter to check that the system really is in a no-voltage condition (isolated from the supply).
- 4. If it has not already been done, label all connectors that lead to the module now. Only then, can it be ensured that the cables are not interchanged.
- 5. Remove the USB cable: ①
- 6. Release other cables (e.g. the Emergency Stop cable or from other command devices), if available.
- 7. Remove the ground connection by releasing the grounding screw: ②
- 8. Release the tension jacks of the machine control panel to remove it from the control panel.





- ① USB connection for communication with the PPU
- ② Ground connection
- ③ Slots for control devices (d = 16 mm)

Image 4-5 MCP 310 USB interfaces

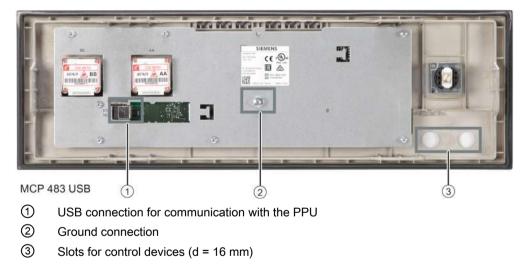


Image 4-6 MCP 483 USB interfaces

4.5.2 This is how you install the MCP 483 USB/MCP 310 USB

Installing

- 1. Attach the tension jacks to fix the machine control panel and tighten them.
- 2. Connect the ground connection: 2



- 3. Reconnect other cables (e.g. the Emergency Stop cable or from other command devices), if available.
- 4. Reinsert the USB cable into the USB port: ①
- 5. Close the cabinet and switch-on the system again.

4.5.3 Status display MCP interface PN

LEDs for status display

For the MCP interface PN, the following LEDs provide information about the module status:

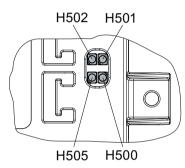


Image 4-7 Status display

Meaning of the LED	H500 (green) PowerOK	H501 (green) PN Sync	H502 (red) PN fault	H505 (red) OVTemp
Power OFF	OFF	OFF	OFF	OFF
Power ON (voltage is stable)	ON	OFF	OFF	OFF
Boot software runs and the system software is loaded	ON	ON	ON	OFF
The system software is booting	ON	OFF	OFF	OFF
The system software is running, no commu- nication to the controller	ON	OFF	OFF	OFF
STOP state: The system software is run- ning, communication to the controller	ON	ON	OFF	OFF
RUN state: The system software is running, communication to the controller	ON	Flashes at 0.5 Hz	OFF	OFF
Overtemperature alarm				ON

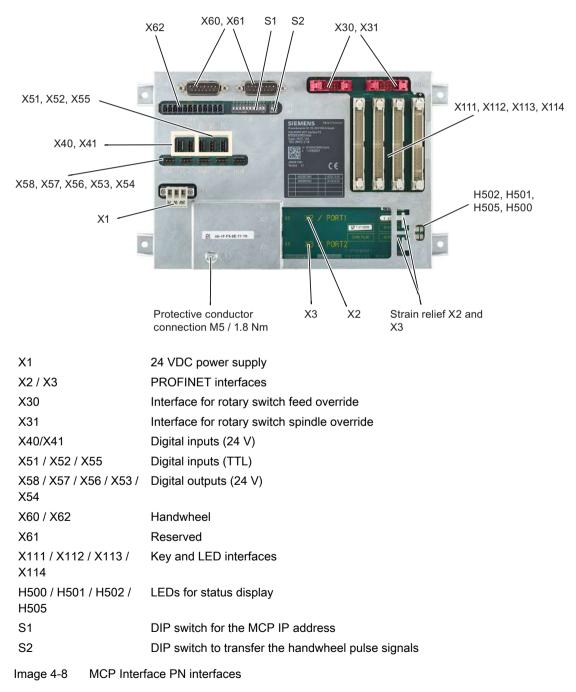


4.5.4 This is how you remove the MCP interface PN

Removing

If the module has a hardware defect, then it must be replaced by an identical part.

Precondition: The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.





Procedure:

- 1. Switch-off the control: Completely switch off the system. Check that the system is in a novoltage condition and is locked-out so that it cannot be switched on again without the appropriate authorization.
- 2. Access the operator panel or control cabinet in which the machine control panel is located.
- 3. If it has not already been done, label all connectors that are inserted in the module now. Only then, can it be ensured that the cables are not interchanged.
- 4. Release the screw connection for power supply X1 and remove this.
- 5. Release the strain relief of the Ethernet cables.
- 6. Remove the Ethernet cables from interface X2/X3 (port 1/port 2).
- 7. Release other cables (e.g. rotary switch cable or cables for digital inputs and outputs), if available.
- 8. Remove the ground connection by releasing the grounding screw.
- 9. Release the machine control panel by removing the 4 standard Torx screws T20/M4.
- 10.Note the set address of DIL switch S1.
- 11.Note the settings of the handwheel pulses at DIL switch S2.

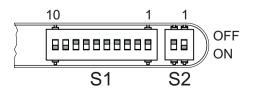
4.5.5 This is how you install the MCP interface PN

Installing

Procedure:

- 1. Set DIL switches S1 and S2 of the new module to what you previously noted down.
- 2. Mount the new machine control panel using the 4 standard Torx screws T20/M4.
- 3. Connect the ground connection to the grounding screw.
- 4. Reconnect other cables (e.g. for the rotary switch and for the digital inputs and outputs).
- 5. Reinsert the Ethernet cables at interface X2/X3 (port 1/port 2)
- 6. Re-establish the strain relief for the Ethernet cables.
- 7. Reconnect power supply X1.
- 8. Close the cabinet and switch-on the system again.

Switches S1, S2





The switches S1-1 to S1-8 define the PROFINET address of the machine control panel. In SINUMERIK 828D, the address "64" must always be assigned to the MCP.

1	2	3	4	5	6	7	8	9	10	Meaning
						ON		ON	ON	
OFF	OFF	OFF	OFF	OFF	OFF		OFF			PROFINET address "64"

The handwheel signal transfer type is set using switch S2-1.

S2-1	Meaning
ON	Differential connection
OFF	TTL interface

Note

Switch S2-2 is reserved for test purposes.

4.5.6 Status displays, MCP 483C PN

LED status displays

For the MCP 483C PN there are 3 LEDs in a row (H1 - H3), which provide information about the module state:

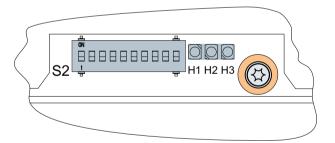


Image 4-9 Status displays

LED	H1 (green) PowerOK	H2 (green) PN Sync	H3 (red) PN Fault
Power OFF	OFF	OFF	OFF
Power ON (voltage is stable)	ON	OFF	OFF
Boot software runs and loads the system software.	ON	ON	ON
System software runs.	ON	OFF	OFF
System software runs, no communication to the con- troller.	ON	OFF	OFF



LED	H1 (green) PowerOK	H2 (green) PN Sync	H3 (red) PN Fault
System software runs, communication to the con- troller, STOP state	ON	ON	OFF
System software runs, communication to the con- troller, RUN state	ON	Flashes at 0.5 Hz	OFF

4.5.7 This is how you remove the MCP 483C PN

Overview

The activities that must be taken into account when replacing a machine control panel are subsequently described.

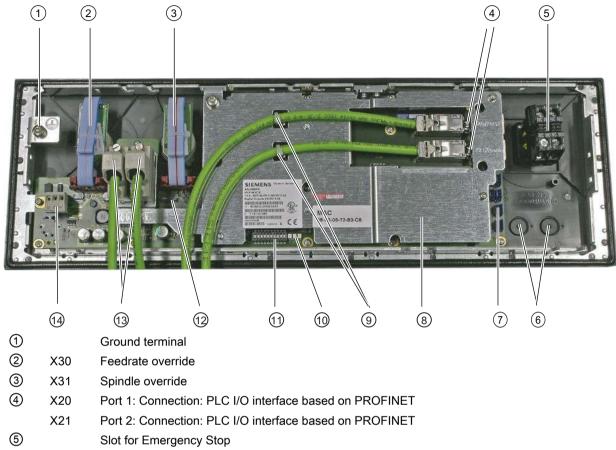
If the machine control panel has a hardware defect, then it must be replaced by an identical replacement part.

Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.



Removing



- 6 Mounting slots for additional command devices
- ⑦ Customer-specific inputs and outputs
- 8 Cover plate
- 9 Ethernet cable strain relief
- 10 LED
- 1 S2 Switch for setting the MCP address
- ② S1 Switch for setting the handwheel signal type
- (13 X60 Handwheel connection
- X61 Reserved
- (4) X10 Power supply interface
- Image 4-10 MCP 483C PN rear side

- 1. Switch-off the control: Completely switch off the system. Check that the system is in a novoltage condition and is locked-out so that it cannot be switched on again without the appropriate authorization.
- 2. Access the operator panel/control cabinet in which the machine control panel is located.



- 3. Using a multimeter, check the X10 power supply to ensure that the system really is in a novoltage condition.
- 4. If it has not already been done, label all connectors that lead to the module now. Only then, can it be ensured that the cables are not interchanged.
- 5. Withdraw the power supply X10 (4).
- 6. Release the strain relief of the Ethernet cable (⑨)
- 7. Remove the Ethernet cables from the X20 / X21 interface (port 1 / port 2) (④)
- 8. Release other cables (e.g. the Emergency Stop cable or the button from the mini handheld unit or from other command devices), if available.
- 9. Remove the ground connection by releasing the grounding screw (1).
- 10. Release the machine control panel from the control panel by releasing the clips.
- 11.Note down the address set with DIP switch S1 (12) on the defective module.
- 12.Note down the setting of DIP switch S2 (1) on the defective module.

4.5.8 This is how you install the MCP 483C PN

Installing

- 1. Set switch S1 (0) on the new module as you previously noted down.
- 2. Set DIL switch S2 (1) of the new module to what you previously noted down.
- 3. Installing a new machine control panel.
- 4. Secure the clips to retain the machine control panel and tighten them.
- 5. Connect the ground connection (1).
- 6. Reconnect the other cables (e.g. the Emergency Stop cable or the button from the mini handheld unit or from other command devices), if available.
- 7. Reinsert the Ethernet cables at the X20/X21 interface (port 1/port 2) (④).
- 8. Re-establish the strain relief for the Ethernet cables ((9)).
- 9. Reconnect the power supply X10 ((4)).
- 10.Close the cabinet and switch-on the system again.



Switch S2

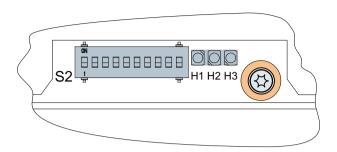


Image 4-11 Switch S2

Switch S2 defines the IP address of the machine control panel:

1	2	3	4	5	6	7	8	9	10	Device name
						ON		ON	ON	
OFF	OFF	OFF	OFF	OFF	OFF		OFF			PROFINET address "64"

For SINUMERIK 828D, the IP address = 192.168.214.64 must always be assigned to the MCP.

4.5.9 Status displays MCP 310C PN

LEDs for status display

For the MCP 310C PN there are 3 LEDs in a row (H1-H3), which provide information about the module state:

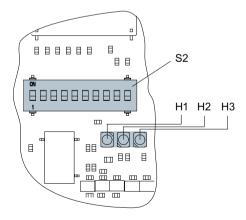


Image 4-12 Status displays



LED	H1 (green)	H2 (green)	H3 (red)
	PowerOK	PN Sync	PN Fault
Power OFF	OFF	OFF	OFF
Power ON (voltage is stable)	ON	OFF	OFF
Boot software runs and loads the system software	ON	ON	ON
System software starts	ON	OFF	OFF
System software runs, no communication to the con- troller	ON	OFF	OFF
System software runs, communication to the control- ler, STOP state	ON	ON	OFF
System software runs, communication to the control- ler, RUN state	ON	Flashes at 0.5 Hz	OFF

4.5.10 This is how you remove the MCP 310C PN

Overview

The activities that must be taken into account when replacing a machine control panel are subsequently described.

If the machine control panel has a hardware defect, then it must be replaced by an identical replacement part.

Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.



Removing

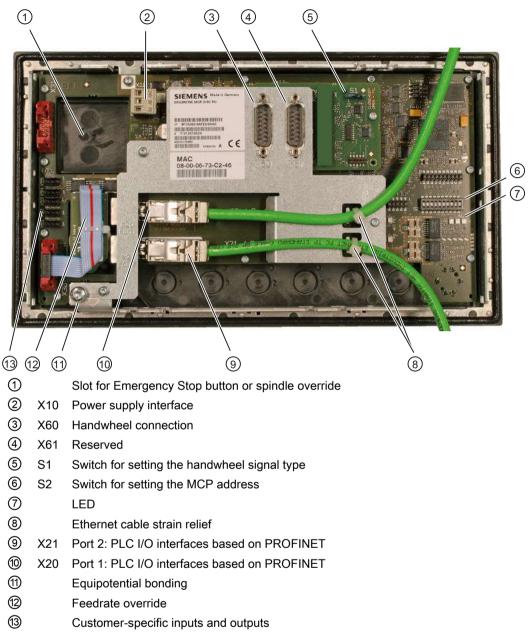


Image 4-13 MCP 310C PN rear side

- 1. Switch-off the control: Completely switch off the system. Check that the system is in a novoltage condition and is locked-out so that it cannot be switched on again without the appropriate authorization.
- 2. Access the operator panel or control cabinet in which the machine control panel is located.
- 3. Using a multimeter, check the X10 power supply to ensure that the system really is in a novoltage condition.



- 4. If it has not already been done, label all connectors that lead to the module now. Only then, can it be ensured that the cables are not interchanged.
- 5. Withdraw the power supply X10 (②).
- 6. Release the strain relief of the Ethernet cable (B)
- 7. Remove the Ethernet cables from the X20/X21 interface (port 1/port 2) ((9, (0)).
- 8. Release other cables (e.g. the Emergency Stop cable or the button from the mini handheld unit or from other command devices), if available.
- 9. Remove the ground connection by releasing the grounding screw (1).
- 10. Release the machine control panel from the control panel by releasing the clips.
- 11.Note down the address set with DIP switch S1 (5) on the defective module.
- 12.Note down the setting of DIP switch S2 (6) on the defective module.

4.5.11 This is how you install the MCP 310C PN

Installing

- 1. Set switch S1 on the new module as you previously noted down.
- 2. Set DIL switch S2 of the new module to what you previously noted down.
- 3. Install the new machine control panel.
- 4. Secure the clips to retain the machine control panel and tighten them.
- 5. Connect the ground connection (1).
- 6. Reconnect the other cables (e.g. the Emergency Stop cable or the button from the mini handheld unit or from other command devices), if available.
- 7. Reinsert the Ethernet cables at the X20/X21 interface (port 1/port 2) ((9, 10)).
- 8. Re-establish the strain relief for the Ethernet cables ((3)).
- 9. Reconnect the power supply X10 (2).
- 10.Close the cabinet and switch-on the system again.



Switch S2

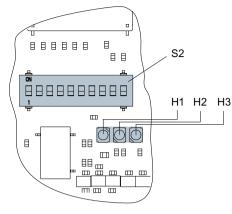


Image 4-14 Switch S2

Switch S2 defines the IP address of the machine control panel:

1	2	3	4	5	6	7	8	9	10	Device name
						ON		ON	ON	
OFF	OFF	OFF	OFF	OFF	OFF		OFF			PROFINET address "64"

For SINUMERIK 828D, the IP address = 192.168.214.64 must always be assigned to the MCP.

4.5.12 This is how you replace the rotary switch

Overview

For MCP 310C PN and MCP 483C PN machine control panels, you can replace a defective rotary switch by a new one. The following rotary switches are installed in the machine control panels:

- Rotary switch for the spindle control, rotary switch with 16 positions
- Rotary switch for the feedrate control, rotary switch with 23 positions

The activities that must be taken into account when replacing a rotary switch are subsequently described.

Preconditions when replacing a rotary switch:

- The rotary switch is defective and must be replaced.
- The system is in a no voltage condition.

Note

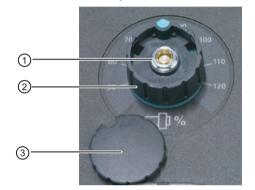
For the machine control panel, use only electronic rotary switches.

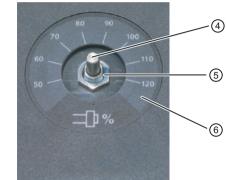


Removing a rotary switch

Procedure:

- 1. Pry off the cap 3 from the knob 2 (snap on connection!).
- 2. Remove the nut of collet ① with a wrench (size 10).
- 3. Remove the complete knob ②.
- 4. Remove the lock nut (5) on the shaft of the rotary switch (4) with a wrench (size 14).
- 5. Remove the connector at the end of the rotary switch cable from the socket.
- 6. Remove the rotary switch.





- ① Nut of the collet
- ② Knob
- ③ Cap
- ④ Rotary switch shaft
- 5 Fastening nut
- 6 Scale

Image 4-15 Removing a rotary switch

Installing a rotary switch

- 1. Push the O-ring ① onto the shaft of the new rotary switch as a seal.
- 2. Insert the rotary switch into the front cutout so that pressure is applied to the O-ring.
- 3. Screw the lock nut ④ onto the rotary switch shaft from the front with a wrench (size 14) (tightening torque: 3 Nm).
- 4. Connect the arrow ring ③ and knob ⑤.
- 5. Slide both parts onto the shaft of the rotary switch.
- 6. Align the arrow point on the ring with position "0" on the scale.
- 7. Tighten the collet nut of the knob by hand and using a torque wrench tighten to a torque of 2 Nm.



- 8. Place the cap ② on the knob and snap it into position.
- 9. Fold and fasten the connecting cable \bigcirc as shown in the diagram on the right.

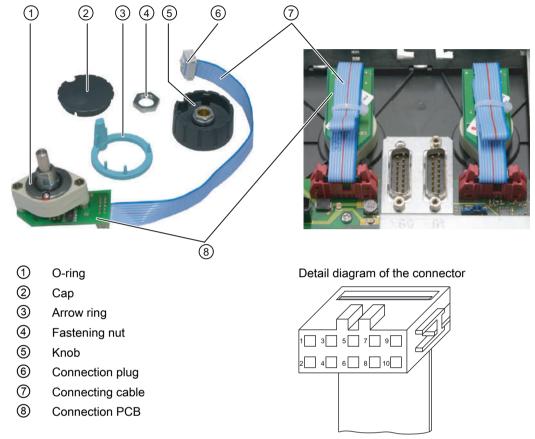


Image 4-16 Installing a rotary switch

Note

It is essential that the specified tightening torques are complied with.



4.6.1 Status displays PP 72/48D PN

LEDs for status display

The following LEDs on the I/O module provide information about the module state:



Image 4-17 Switch S1 and LEDs H1 to H6

	H1 (green) PowerOK	H2 (green) PN Sync	H3 (red) PN Fault	H4 (green) Diag1	H5 (green) Diag2	H6 OVTemp
Power OFF	OFF	OFF	OFF	OFF	OFF	OFF
Power ON (voltage is stable)	ON	OFF	OFF	OFF	OFF	OFF
Boot software runs and loads the system software.	ON	ON	ON	ON	ON	OFF
System software starts	ON	OFF	OFF	OFF	OFF	OFF
System software runs, no communication to the controller.	ON	OFF	OFF	OFF	OFF	OFF
System software runs, communication to the controller, STOP state	ON	ON	OFF	OFF	OFF	OFF
System software runs, communication to the controller, RUN state	ON	Flashes at 0.5 Hz	OFF	OFF	OFF	OFF
Overtemperature alarm						ON



LEDs at port 1 and port 2

There are 2 LEDs at port 1 and port 2 for diagnostics of the PLC I/O interfaces based on PROFINET.

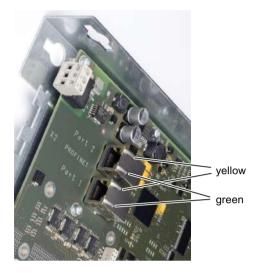


Image 4-18 Port 1 and port 2

LED for communication at the RJ45 connector.

Name	Color	State	Meaning
Link	Green	ON	100 MBit link available
		OFF	Missing or faulty link
Activity	Yellow	ON	Sending or receiving
		OFF	No activity

4.6.2 This is how you remove the PP 72/48D PN

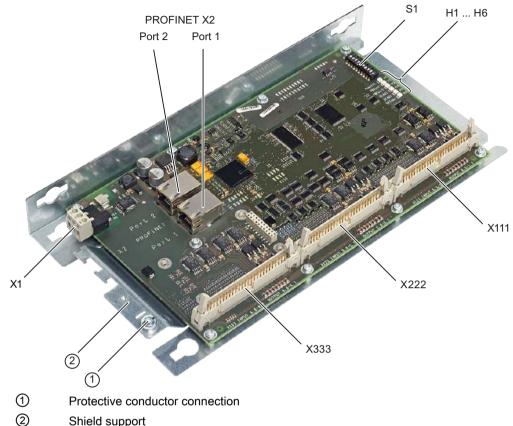
Overview

The activities necessary to replace the PP72/48D PN I/O module are described in the following. If the PP 72/48D PN has a hardware defect, then this must be replaced by an identical module. Preconditions:

- The I/O module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.



Removing



Shield support

PP 72/48D PN interfaces Image 4-19

- 1. Switch-off the control: Completely switch off the system. Check that the system is in a novoltage condition and is locked-out so that it cannot be switched on again without the appropriate authorization.
- 2. Access the control cabinet where the module is located.
- 3. Using a multimeter, check the X1 power supply to ensure that the system really is in a novoltage condition.
- 4. If it has not already been done, label all connectors that lead to the module now. Only then, can it be ensured that the cables are not interchanged.
- 5. Withdraw the power supply X1.
- 6. Release the connectors of the ribbon cables (X111, X222, X333) on the module that are used to connect the digital inputs and outputs.
- 7. Remove the strain relief of the PROFINET cables of interfaces X2.
- 8. Remove the PROFINET cables from interface X2 (port 1 and port 2).
- 9. Remove the shield support 2, if available.
- 10.Release the grounding screw ①, to remove the protective conductor.



- 11.To remove the I/O module, release the fixing screws.
- 12.Note down the address set with DIP switch S1 on the defective module.

4.6.3 This is how you install the PP 72/48D PN

Installing

Procedure:

- 1. Set DIP switch S1 of the new module as you previously noted down.
- 2. Install the new I/O module.
- 3. Connect the ground connection.
- 4. Connect the communication cables at interface X2 (port 1 and port 2).
- 5. Re-establish the strain relief for the communication cables.
- 6. Re-insert the connectors of the ribbon cables (X111, X222, X333) on the module that are used to connect the digital inputs and outputs.
- 7. Reconnect power supply X1.
- 8. Close the cabinet and switch-on the system again.

DIP switch S1

Setting of switch S1:

1	2	3	4	5	6	7	8	9	10	Device name
								ON	ON	
ON	OFF	OFF	ON	OFF	OFF	OFF	OFF			pp72x48pn9
OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF			pp72x48pn8
ON	ON	ON	OFF	OFF	OFF	OFF	OFF			pp72x48pn7
OFF	ON	ON	OFF	OFF	OFF	OFF	OFF			pp72x48pn6
ON	OFF	ON	OFF	OFF	OFF	OFF	OFF			pp72x48pn5

The switch positions 9 and 10 guarantee the PROFINET functionality of the module and must always be switched "ON".

Note

A new address only becomes effective after voltage OFF → ON.



4.6.4 Status displays PP 72/48D 2/2A PN

LEDs for status display

The following LEDs on the I/O module provide information about the module state:



Image 4-20 Switch S1 and LEDs H1 to H6

	H1 (green)	H2 (green)	H3 (red)	H4 (green)	H5 (green)	H6
	PowerOK	PN Sync	PN Fault	Diag1	Diag2	OVTemp
Power OFF	OFF	OFF	OFF	OFF	OFF	OFF
Power ON (voltage is stable)	ON	OFF	OFF	OFF	OFF	OFF
Boot software runs and loads the system software.	ON	ON	ON	ON	ON	OFF
System software starts	ON	OFF	OFF	OFF	OFF	OFF
System software runs, no communication to the controller.	ON	OFF	OFF	OFF	OFF	OFF
System software runs, communication to the controller, STOP state	ON	ON	OFF	OFF	OFF	OFF
System software runs, communication to the controller, RUN state	ON	Flashes at 0.5 Hz	OFF	OFF	OFF	OFF
Overtemperature alarm						ON



LEDs at port 1 and port 2

There are 2 LEDs at port 1 and port 2 for diagnostics of the PLC I/O interfaces based on PROFINET.

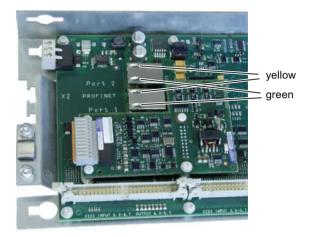


Image 4-21 Port 1 and port 2

LED for communication at the RJ45 connector.

Name	Color	State	Meaning
Link	Green	ON	100 MBit link available
		OFF	Missing or faulty link
Activity	Yellow	ON	Sending or receiving
		OFF	No activity

4.6.5 This is how you remove the PP 72/48D 2/2A PN

Overview

The activities necessary when replacing the PP 72/48D 2/2A PN I/O module are described in the following.

If the PP 72/48D 2/2A PN has a hardware defect, then it must be replaced by an identical module.

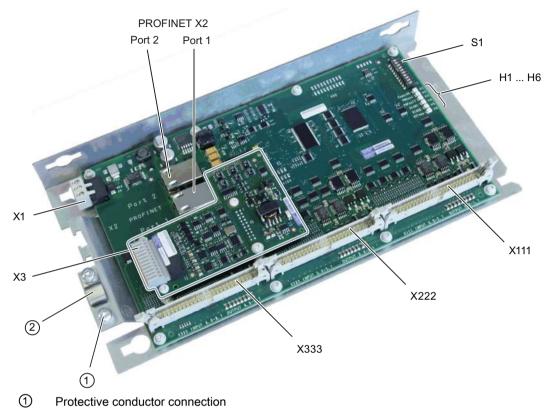
Preconditions:

- The I/O module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.



4.6 I/O modules

Removing



2 Shield support

Image 4-22 PP 72/48D 2/2A PN interfaces

- 1. Switch-off the control: Completely switch off the system. Check that the system is in a novoltage condition and is locked-out so that it cannot be switched on again without the appropriate authorization.
- 2. Access the control cabinet where the module is located.
- 3. Using a multimeter, check the X1 power supply to ensure that the system really is in a novoltage condition.
- 4. If it has not already been done, label all connectors that lead to the module now. Only then, can it be ensured that the cables are not interchanged.
- 5. Withdraw the power supply X1.
- 6. Insert connector X3 for the analog inputs/outputs.
- 7. Release the connectors of the ribbon cables (X111, X222, X333) on the module that are used to connect the digital inputs and outputs.
- 8. Remove the strain relief of the PROFINET cables of interfaces X2.
- 9. Remove the PROFINET cables from interface X2 (port 1 and port 2).



4.6 I/O modules

- 10. Remove the shield support ②, if available.
- 11. Release the grounding screw ①, to remove the protective conductor.
- 12. To remove the I/O module, release the fixing screws.
- 13.Note down the address set with DIP switch S1 on the defective module.

4.6.6 This is how you install the PP 72/48D 2/2A PN

Installing

Procedure:

- 1. Set DIP switch S1 of the new module as you previously noted down.
- 2. Install the new I/O module.
- 3. Connect the ground connection.
- 4. Connect the communication cables at interface X2 (port 1 and port 2).
- 5. Re-establish the strain relief for the communication cables.
- 6. Re-insert the connectors of the ribbon cables (X111, X222, X333) on the module that are used to connect the digital inputs and outputs.
- 7. Reconnect power supply X1.
- 8. Close the cabinet and switch-on the system again.

DIP switch S1

Setting of switch S1:

1	2	3	4	5	6	7	8	9	10	Device name
								ON	ON	
ON	OFF	OFF	ON	OFF	OFF	OFF	OFF			pp72x48pn9
OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF			pp72x48pn8
ON	ON	ON	OFF	OFF	OFF	OFF	OFF			pp72x48pn7
OFF	ON	ON	OFF	OFF	OFF	OFF	OFF			pp72x48pn6
ON	OFF	ON	OFF	OFF	OFF	OFF	OFF			pp72x48pn5

The switch positions 9 and 10 guarantee the PROFINET functionality of the module and must always be switched "ON".

Note

A new address only becomes effective after voltage OFF \rightarrow ON.



4.7 Expansion modules NX10.3 / NX15.3

4.7.1 NX10.3 / NX15.3 status displays

Status displays

The following status displays on the NX10.3 / NX15.3 provide information about the module state:

LED	Color	State	Description
RDY, H1	-	OFF	Electronics power supply outside the permissible tolerance range.
	Green	Continuous light	Component is ready.
		Flashing light 2 Hz	Writing to CompactFlash Card.
	Red	Continuous light	There is at least one fault (e.g., RESET, watchdog monitoring, basic system fault).
			NX10.3 / NX15.3 is presently booting.
		Flashing light 0.5 Hz	Error when booting: e.g. the firmware cannot be loaded into the RAM.
	Yellow	Continuous light	Firmware is being loaded into the RAM
		Flashing light 0.5 Hz	Firmware cannot be loaded into the RAM.
		Flashing light 2 Hz	Firmware CRC error.
DP1,	-	OFF	Electronics power supply outside the permissible tolerance range.
CU_LINK,			NX10.3 / NX15.3 is not ready for operation.
H2	Green	Continuous light	CU_LINK is ready for communication and cyclic communication is running.
		Flashing light 0.5 Hz	CU_LINK is ready for communication and no cyclic communication is running.
	Red	Continuous light	At least one CU_LINK fault is present.
			CU_LINK is not ready for operation (e.g., after switching on).



4.7.2 NX10.3 / NX15.3 connections

Connections

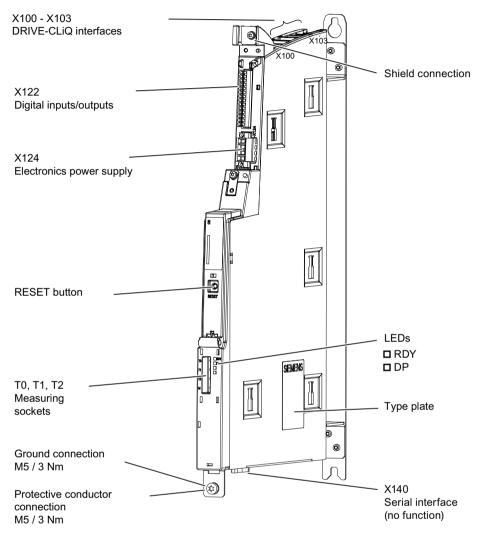


Image 4-23 NX10.3 / NX15.3 connections

4.7.3 This is how you remove the NX10.3 / NX15.3

Preconditions

The activities that are required when replacing an NX10.3 / NX15.3 are subsequently described.

If the NX10.3 / NX15.3 has a hardware defect, then it must be replaced by an identical module.



Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.

Removing

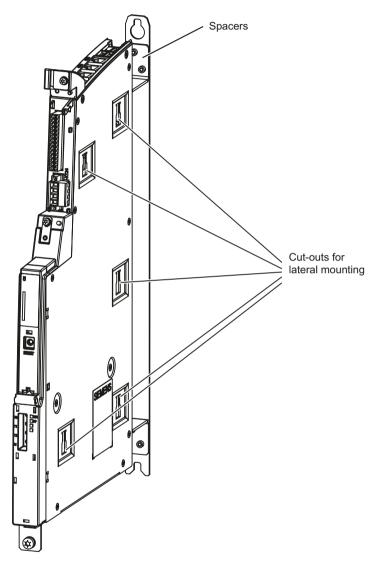


Image 4-24 Mounting aids

- 1. Switch off the complete system, carefully checked that it is in a no-voltage condition and lock it out so that it cannot be switched on without the appropriate authorization.
- 2. Access the control cabinet where the NX10.3 / NX15.3 is located.
- 3. Use a multimeter to check that the NX module really is in a no-voltage condition.
- 4. Open the cover of the NX module.



- 5. If it has not already been done, label all connectors and cables that lead to the module now. Only then, can it be ensured that the cables are not interchanged.
- 6. Withdraw the electronics power supply X124.
- 7. Withdraw the digital input/output terminal X122.
- 8. Withdraw any connected DRIVE-CLiQ cables X100 X103.
- 9. Remove the protective conductor connection of the NX10.3 / NX15.3.
- 10.Release the screws attaching the NX10.3 / NX15.3 to the mounting plate. OR -
- 11. If the module is located to the left of the infeed, remove the module by first pulling it upwards and then removing it towards the left.

4.7.4 This is how you install the NX10.3 / NX15.3

Installing

- 1. Screw the new NX10.3 / NX15.3 to the mounting plate. - OR -
- 2. If the module was located to the left of the infeed, re-attach it here by first introducing the NX10.3 / NX15.3 into the holder to the right and then press it down slightly to retain it.
- 3. Reconnect the protective conductor connection of the NX10.3 / NX15.3.
- 4. Insert the DRIVE-CLiQ cables that were previously withdrawn into sockets X100-X103.
- 5. Insert the digital input/output terminal X122 into the NX10.3 / NX15.3.
- 6. Reconnect the electronics power supply X124.
- 7. Now check that all of the cables have been reconnected.
- 8. Now close the cover of the NX10.3 / NX15.3.
- 9. Close the cabinet and switch-on the system again.

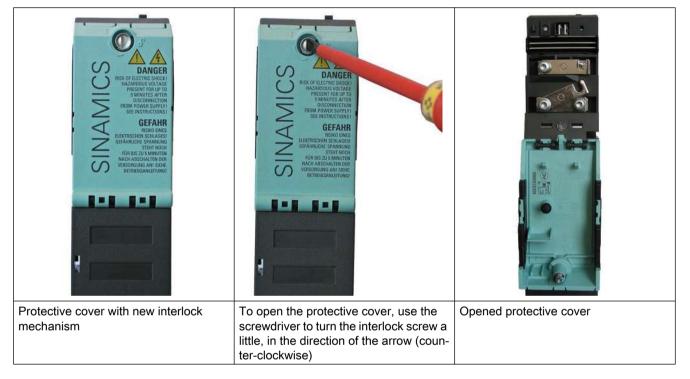


4.8 Installing SINAMICS components

4.8.1 Releasing with a screwdriver

The new protective covers for the DC link on the SINAMICS S120 components feature a new interlock mechanism, which is really easy to operate using a slot-head screwdriver (1 x 5.5).

Table 4-1 Opening the protective cover for the DC link using a screwdriver



To lock, press the protective cover back on until you hear the interlock engage.

4.8.2 Protective conductor connection and shield support

Shield support and protective conductor connection

It is always advisable to use shielded wiring for the digital inputs and outputs.

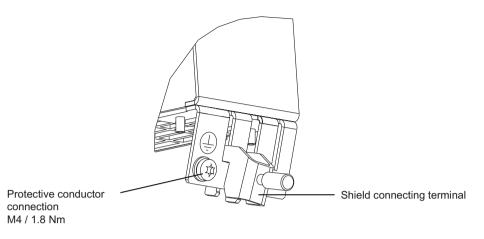
🔨 WARNING

Incorrect machine operation as a result of incorrect shielding or inadmissible cable lengths

If the shielding procedures described and the specified cable lengths are not observed, the machine may not operate properly.



4.8 Installing SINAMICS components



A typical shield connecting terminal for the shield support is shown in the following diagram:

Image 4-25 Shield support and protective conductor connection

Shield connecting terminal from Weidmüller (http://catalog.weidmueller.com/catalog/Start.do)

Type: KLBLUE CO 1

Article number: 17533 11001

Note

Only use screws with a permissible insertion length of 4-6 mm.



4.9 Control Unit CU320-2 PN and CU310-2 PN

4.9.1 CU320-2 PN status displays

Module status displays

Three LEDs at the front of the CU320-2 PN provide information about the state of the module. They indicate the states when powering up and in operation:

- If an error occurs, the power-up is terminated and the LEDs indicate the cause of the error.
- At the end of an error-free power-up, all LEDs are switched off briefly.
- After power-up, the LEDs are controlled via the loaded software.

Response of the LEDs when powering up - loading software

	LED		State	Remark
RDY	PN	OPT		
Red	Orange	Orange	Reset	Hardware reset RDY LED lights up red, all other LEDs light up orange
Red	Red	Off	BIOS loaded	-
Red flash- ing light 2 Hz	Red	Off	BIOS error	 An error occurred while loading the BIOS
Red flash- ing light 2 Hz	Red Flashing light 2 Hz	Off	File error	 Memory card not inserted or faulty Software on memory card not present or corrupted
Red	Orange flashing light	Off	FW loading	RDY LED lights up red, PN LED flashes orange without fixed frequency
Red	Off	Off	FW loaded	-
Off	Red	Off	FW checked (no CRC error)	-
Red flash- ing light 0.5 Hz	Red flash- ing light 0.5 Hz	Off	FW checked (CRC error)	CRC error

Response of the LEDs when powering up - firmware

	LED		State	Remark
RDY	PN	OPT		
Orange	nge Off Off		Initializing	-
Alternating			Running	See the table below



Response of the LEDs in operation

LED	Color	State	Description, cause	Remedy
RDY (READY)	-	OFF	Electronics power supply is missing or outside per- missible tolerance range.	Check power supply
	Green	Continu- ous light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.	-
		Flashing light 0.5 Hz	Commissioning/reset	-
		Flashing light 2 Hz	Writing to the memory card	-
	Red	Flashing light 2 Hz	General error	Check parameterization/con- figuration
	Red/ green	Flashing light 0.5 Hz	Control Unit is ready for operation. However, there are no software licenses.	Obtain licenses
	Orange	Flashing light 0.5 Hz	Updating the firmware of the connected DRIVE- CLiQ components	-
		Flashing light 2 Hz	DRIVE-CLiQ component firmware update com- plete. Wait for POWER ON for the components in question.	Perform a POWER ON of the affected component
	Green/ Orange or Red/	Flashing light 2 Hz	Component detection via LED is activated (p0124[0]). Note:	-
	Orange		Both options depend on the LED status when com- ponent recognition is activated via p0124[0] = 1.	
PN PROFIdrive cyclic opera-	-	Off	Cyclic communication has not (yet) taken place. Note:	-
tion			PROFIdrive is ready for communication when the Control Unit is ready (see LED RDY).	
	Green	Continu- ous light	Cyclic communication is taking place.	-
		Flashing light 0.5 Hz	Full cyclic communication is not yet taking place.Possible causes:The controller is not transferring any setpoints.	-
			 The controller is not transferring any setpoints. During isochronous operation, no global control (GC) or a faulty global control (GC) is transferred by the controller. 	
			• "Shared Device" is selected (p8929=2) and only one controller connected.	
	Red	Flashing light 0.5 Hz	Bus fault, incorrect parameter assignment/configuration.	Adapt configuration between controller and devices
		Flashing light 2 Hz	Cyclic bus communication has been interrupted or could not be established.	Correct the fault



LED	Color	State	Description, cause	Remedy
OPT (OPTION)	-	Off	Electronics power supply is missing or outside per- missible tolerance range.	Check power supply and/or component
			Component is not ready.	
			Option board not installed or no associated drive object has been created.	
	Green	Continu- ous light	Option Board is ready.	_
		Flashing light 0.5 Hz	Depends on the option board used.	-
	Red	Flashing light 2 Hz	At least one fault is present on this component. Option Board not ready (e.g. after switch-on).	Remove the fault and ac- knowledge
RDY and PN	Red	Flashing light 2 Hz	Bus fault – communication has been interrupted	Correct the fault
RDY and OPT	Orange	Flashing light 0.5 Hz	Firmware update in progress for connected Option Board CBE20.	-

Status displays of Ethernet interfaces

The RJ45 sockets are equipped with one green and one yellow LED. As a consequence, the following information of the PLC I/O interface is displayed based on PROFINET and the LAN interface:

Name	Color	State	Meaning
Link	Green	Continuous light	10 or 100 Mbit link available
		Off	Missing or faulty link
Activity	Yellow	Flashing light	Sending or receiving data
		Off	No activity



4.9.2 CU320-2 PN connections

Connections

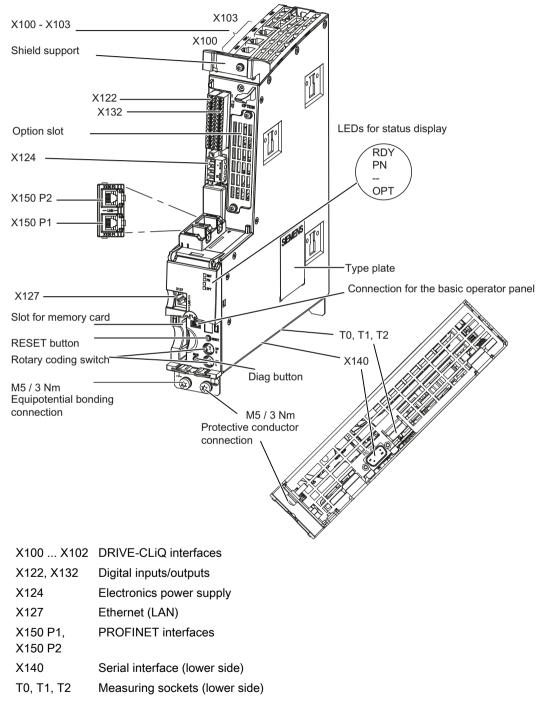
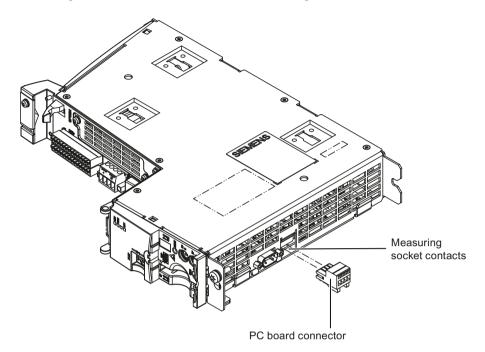


Image 4-26 CU320-2 PN interface overview



PC board connector



Mounting a PC board connector in the measuring socket:

The PC board connector can be purchased from: Phoenix Contact (<u>https://www.phoenixcontact.com/online/portal/pc</u>)

4.9.3 This is how you remove the CU320-2 PN

Overview

The activities that are required when replacing a CU320-2 PN are subsequently described. If the CU320-2 PN has a hardware defect, then it must be replaced by an identical module. Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.

Removing

- 1. Switch off the complete system, carefully checked that it is in a no-voltage condition and lock it out so that it cannot be switched on without the appropriate authorization.
- 2. Access the control cabinet where the CU320-2 PN is located.
- 3. Open the cover of the CU320-2 PN.



- 4. Use a multimeter to check that the CU320-2 PN really is in a no-voltage condition.
- 5. If it has not already been done, label all connectors and cables that lead to the module now. Only then, can it be ensured that the cables are not interchanged.
- 6. Withdraw the electronics power supply X124.
- 7. Withdraw the DRIVE-CLiQ cables X100 X103.
- 8. Withdraw the Profinet cable.
- 9. Withdraw all other cables, if available.
- 10. Remove the protective conductor connection of the CU320-2 PN.
- 11. Release the screws attaching the CU320-2 PN to the mounting plate.
- 12.Remove the CompactFlash card.

4.9.4 This is how you install the CU320-2 PN

Installing

Procedure:

- 1. Screw the new CU320-2 PN onto the mounting plate.
- 2. Reconnect the protective conductor connection of the CU320-2 PN.
- 3. First insert the PROFINET cable that was previously withdrawn.
- 4. Insert the DRIVE-CLiQ cables that were previously withdrawn into sockets X100-X103.
- 5. Insert all other cables, if available.
- 6. Reconnect the electronics power supply X124.
- 7. Now check that all of the cables have been reconnected.
- 8. Insert the CompactFlash card.
- 9. Close the cover of the CU320-2 PN.
- 10. Close the cabinet and switch-on the system again.

4.9.5 CU310-2 PN status displays

Module status displays

Four LEDs at the front of the CU310-2 PN provide information about the state of the module. They indicate the states when powering up and in operation:

- If an error occurs, the power-up is terminated and the LEDs indicate the cause of the error.
- At the end of an error-free power-up, all LEDs are switched off briefly.
- After power-up, the LEDs are controlled via the loaded software.



Response of the LEDs when powering up - loading software

	LE	D		State	Remark
RDY	СОМ	OUT>5V	MOD		
Orange	Orange	Orange	Orange	POWER ON	All LEDs light up for approx. 1 s
Red	Red	Off	Off	Hardware reset	After pressing the RESET button the LEDs light up for approx. 1 s
Red	Red	Off	Off	BIOS loaded	-
Red Flashing light 2 Hz	Red	Off	Off	BIOS error	An error occurred while loading the BIOS
Red	Red	Off	Off	File error	Memory card not inserted or faulty
Flashing light 2 Hz	Flashing light 2 Hz				Software on memory card not present or corrupted

Response of the LEDs when powering up - firmware

	LE	D		State	Remark
RDY	СОМ	OUT>5V	MOD		
Red	Orange	Off	Off	Firmware load- ing	COM-LED flashing without fixed flashing frequency
Red	Off	Off	Off	Firmware loa- ded	-
Off	Red	Off	Off	Firmware check (no CRC error)	-
Red Flashing light 0.5 Hz	Red Flashing light 0.5 Hz	Off	Off	Firmware check (CRC error)	CRC is incorrect
Orange	Off	Off	Off	Firmware initi- alization	-



Response of the LEDs in operation

LED	Color	State	Description / cause	Remedy
RDY (READY)	-	Off	Electronics power supply is missing or outside permissible tolerance range.	Check the power sup- ply
	Green	Continuous light	The unit is ready for operation. Cyclic DRIVE-CLiQ communication is in progress.	-
		Flashing light 0.5 Hz	Commissioning/reset	-
		Flashing light 2 Hz	Writing to the memory card.	-
	Red	Flashing light 2 Hz	General error	Check parameter as- signment/configuration
	Red/green	Flashing light 0.5 Hz	The Control Unit is ready for operation, but there are no software licenses.	Install the missing li- censes.
	Orange	Flashing light 0.5 Hz	Updating the firmware of the DRIVE-CLiQ components.	-
		Flashing light 2 Hz	lashing light DRIVE-CLiQ component firmware update com-	
	Green/Or- ange or Red/Or-	Flashing light 2 Hz	Recognition of the component via LED is activa- ted (see SINAMICS S120/S150 List Manual.) Note: Both options depend on the LED status when	-
	ange		component recognition is activated.	
COM	-	Off	Cyclic communication has not (yet) taken place. Note:	-
			PROFIdrive is ready for communication when the Control Unit is ready (see LED: RDY).	
		Continuous light	Cyclic communication is taking place.	-
	Green	Flashing light 0.5 Hz	Full cyclic communication is not yet taking place. Possible causes:	-
			• The controller is not transferring any setpoints.	
			• During isochronous operation, no GC (Global Control) or a faulty GC is transferred by the controller.	
	Red	Flashing light 0.5 Hz	The PROFIBUS master is sending a faulty parameter assignment or the configuration file is corrupted.	Modify the configura- tion between master/ controller and Control Unit.
		Flashing light 2 Hz	Cyclic bus communication has been interrupted or could not be established.	Rectify the bus com- munication fault.
MOD	-	Off	-	-
OUT > 5 V	-	Off	-	-
	Orange	Continuous light	The voltage of the electronics power supply for the measuring system is 24 V. $^{1\!\mathrm{)}}$	

¹⁾ Make sure that the encoder connected is designed for a 24 V supply. Connecting a 5 V encoder to a 24 V supply can destroy the encoder electronics.



Status displays of PROFINET interfaces

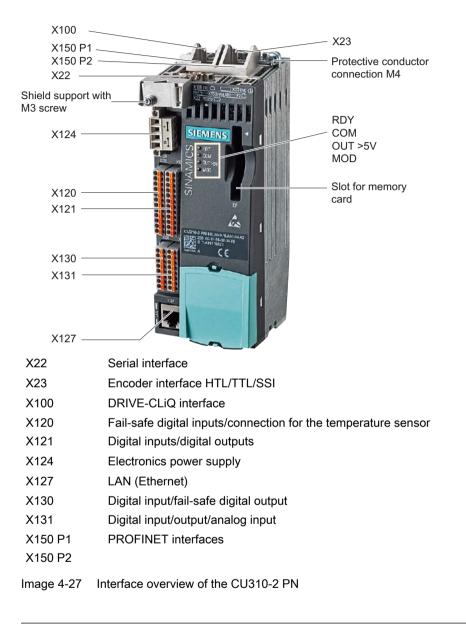
The RJ45 sockets are equipped with one green and one yellow LED. As a consequence, the following information of the PLC I/O interfaces is displayed based on PROFINET:

Name	Color	State	Meaning
Link	Green	Continuous light	10 or 100 Mbit link available
		Off	Missing or faulty link
Activity	Yellow	Flashing light	Sending or receiving data
		Off	No activity



4.9.6 CU310-2 PN connections

Connections



Note

The PROFIBUS address switch on the CU310-2 PN has no function.



4.9.7 This is how you remove the CU310-2 PN

Overview

The activities that are required when replacing a CU310-2 PN are subsequently described. If the CU310-2 PN has a hardware defect, then it must be replaced by an identical module. Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.

Removing

- 1. Switch off the complete system, carefully checked that it is in a no-voltage condition and lock it out so that it cannot be switched on without the appropriate authorization.
- 2. Access the control cabinet where the CU310-2 PN is located.
- 3. Use a multimeter to check that the CU310-2 PN really is in a no-voltage condition.
- 4. If it has not already been done, label all connectors and cables that lead to the module now. Only then, can it be ensured that the cables are not interchanged.
- 5. Withdraw the electronics power supply X124.
- 6. Withdraw the DRIVE-CLiQ cable X100.
- 7. Withdraw all other cables, if available.
- 8. Remove the protective conductor connection of the CU310-2 PN.



- 9. Press the blue locking latch downward (see arrow).

Image 4-28 Removing the CU310-2 PN from the PM340

- 10. Remove the Control Unit toward the front.
- 11.Remove the CompactFlash card.



4.9.8 This is how you install the CU310-2 PN

Installing

Procedure:

1. Place the Control Unit on the PM340.

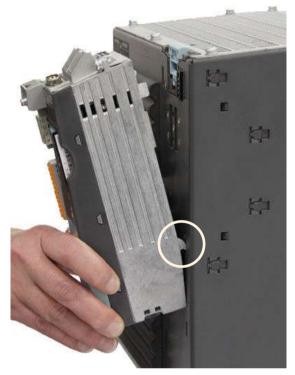


Image 4-29 Mounting the CU310-2 PN on the PM340

- 2. Push the Control Unit back until it latches in the blue locking latch.
- 3. Reconnect the protective conductor connection of the CU310-2 PN.
- 4. Insert the DRIVE-CLiQ cable that was previously withdrawn into socket X100.
- 5. Insert all other cables, if available.
- 6. Reconnect the electronics power supply X124.
- 7. Now check that all of the cables have been reconnected.
- 8. Insert the CompactFlash card.
- 9. Close the cabinet and switch-on the system again.



4.10 SINAMICS S120 Combi

4.10.1 S120 Combi status displays

Status displays

The SINAMICS S120 Combi has two LEDs to display the status of the components. The software assigns a priority to the status signals from the individual components. The most important and most informative status is output for the complete S120 Combi.

The status is immediately output if any component develops a fault. The ready to run indication is only issued if all of the components have signaled that they are ready to run.

The LED statuses for the S120 Combi are described in the following table. Th	ne status display
always refers to the entire module.	

State		Description, cause	Remedy
RDY	DC LINK		
Off	Off	Electronics power supply is missing or outside permissible tolerance range.	Connect/test the electronics pow- er supply
Green	Off	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	-
	Orange	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	-
		The DC link voltage is present.	
	Red	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	Check the line supply voltage.
		The DC link voltage is too high.	
Orange	Orange	DRIVE-CLiQ communication is being established.	-
Red	-	This component has at least one fault. Note : The LED is controlled irrespective of the corresponding messages being reconfigured.	Remove the fault and acknowl- edge
Green/Red (0.5 Hz)	-	Firmware is being downloaded.	
Green/Red (2 Hz)	-	Firmware has been downloaded. Wait for POWER ON.	Carry out a POWER ON
Green/Or- ange or Red/Orange	-	Component recognition using LED is activated (p0124) Note :	-
		Both options depend on the LED status when module recognition is activated via p0124 = 1.	





Danger to life through electric shock due to the residual charge of the DC link capacitors

Hazardous DC link voltages may be present at any time regardless of the state of the "DC LINK" LED. The warning information on the components must be carefully observed!



4.10.2 Connections, 3-axis module

Connections

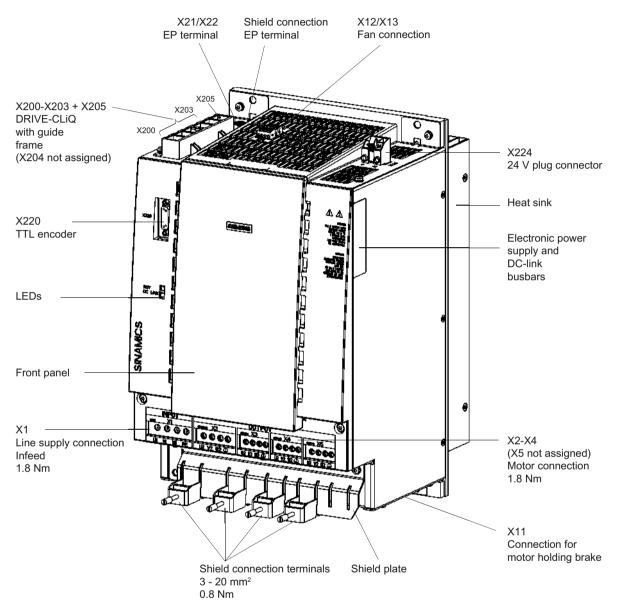
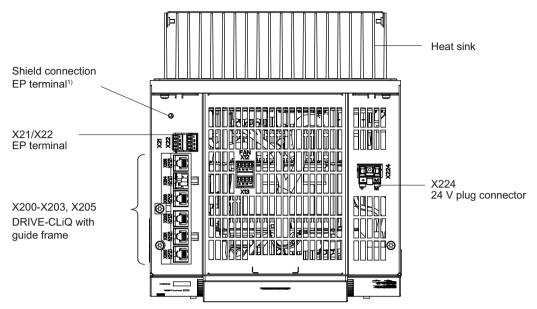


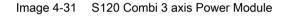
Image 4-30 S120 Combi 3 axis Power Module



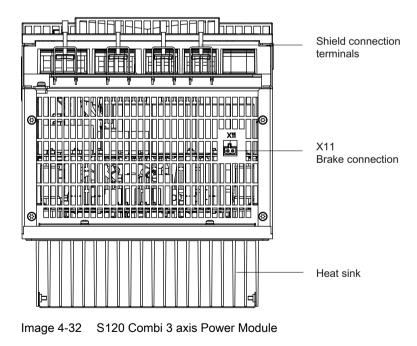
View from the top



1) The shield connection terminal is included in the accessories pack (Weidmüller, type KLBÜ 3-8 SC).



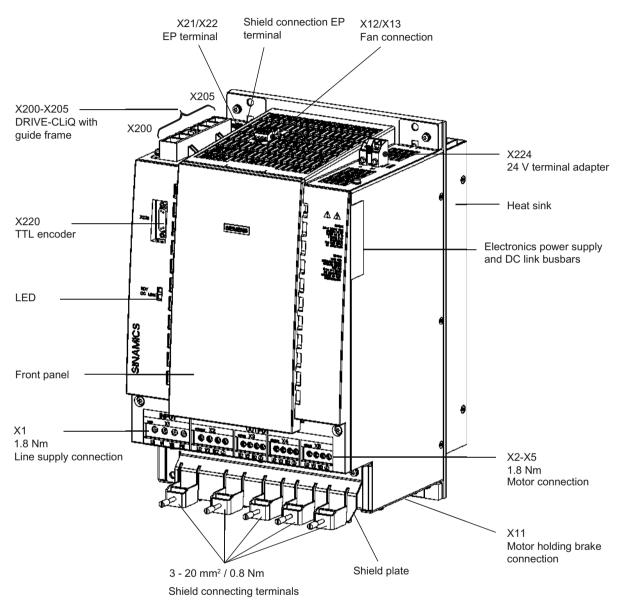
View from below





4.10.3 Connections, 4-axis module

Connections, S120 Combi with 4 axes



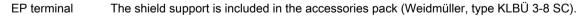
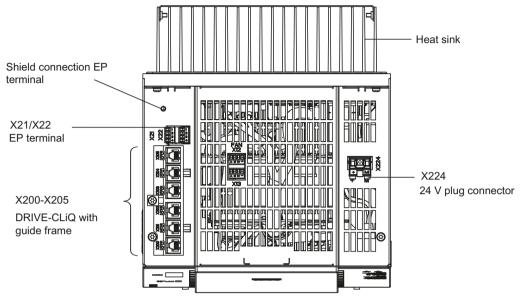


Image 4-33 S120 Combi 4 axis Power Module

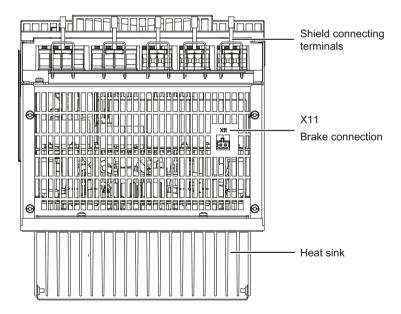


View from the top



EP terminal The shield support is included in the accessories pack (Weidmüller, type KLBÜ 3-8 SC).

View from below



4.10.4 How to mount an S120 Combi Power Module

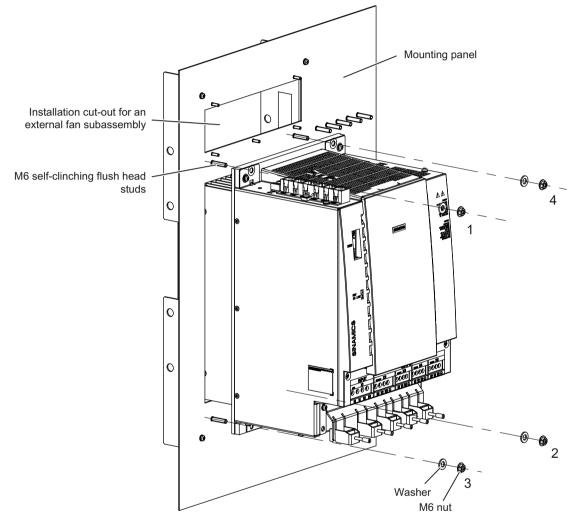
Precondition

The reinforcement plates are installed in order to mount an S120 Combi Power Module.



Mounting

- 1. Mount the self-clinching flush head studs M6.
- 2. Position the S120 Combi Power Module and initially tighten the M6 nuts by hand with 0.5 Nm.
- 3. Then tighten the nuts in the specified sequence 1 to 4 with 10 Nm.



- Image 4-34 Installing an S120 Combi Power Module
 - 4. Connect the protective conductor. See also: Protective conductor connection and shield support (Page 115)
 - Connect the following connections with the associated screw-type terminals: X1: Line supply connection X2 to X4: Motor connection for the S120 Combi with 3 axes X2 to X5: Motor connection for the S120 Combi with 4 axes



4.10.5 This is how you attach the drip protection

Attaching the drip protection

To prevent liquids from dripping into the module from the top, a drip protection assembly is available; this is provided as standard in the scope of supply for the 4-axis version. For the other S120 Combi Power Modules, drip protection assembly can be ordered as spare part (Page 231).

Attach the drip protection assembly to the top of the S120 Combi Power Module:

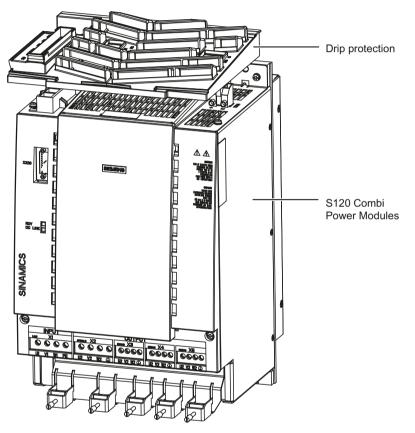


Image 4-35 S120 Combi Power Modules with drip protection



4.10.6 This is how you remove the front panel

Removing the front plate of the S120 Combi

To electrically connect additional components, the front cover of the S120 Combi must be removed.



Danger to life through electric shock

A hazardous voltage is still present for up to 5 minutes after the power supply has been switched off.

• Remove the front plate only after 5 minutes have passed.

- 1. Use a Torx T20 or slotted 1.2 x 6 screwdriver as tool.
- 2. Remove the two Torx-slotted screws at the front.





3. Release the front cover by slightly pressing upwards



4. Remove the front plate.



4.10.7 This is how you open the DC link cover

Opening the DC link cover

To electrically connect additional components, the front cover of the S120 Combi must already have been removed.



The DC link busbars are located under the DC link cover.



Danger to life through electric shock due to the residual charge of the DC link capacitors

As a result of the DC link capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off.

Contact with live parts results in death or serious injury.

- Do not open the protective cover of the device until 5 minutes have elapsed.
- Before starting any work, check that the system is in a completely no-voltage condition by measuring all poles/phases, also to ground.
- Ensure that the associated warning plate in the appropriate language is attached.



Procedure:

1. Remove the Torx-slotted screw of the DC link cover.

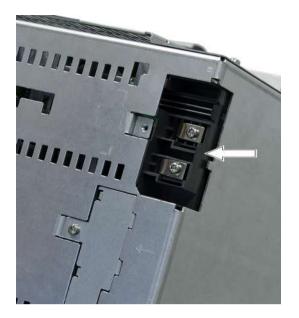


2. Remove the DC link cover.



3. Remove the DC link side cover.





4.10.8 This is how you connect the DC link busbars and 24 V busbars

Connecting additional components

The following steps are necessary to connect a component to the DC link and the 24 V busbars of the S120 Combi.

Note

When commissioning a drive line-up the following must be observed

The following points must be complied with before commissioning the drive line-up:

- The outer DC link side cover is inserted at the connected component.
- The protective cover of the connected component is closed.
- The front cover of the S120 Combi has been reinstalled.

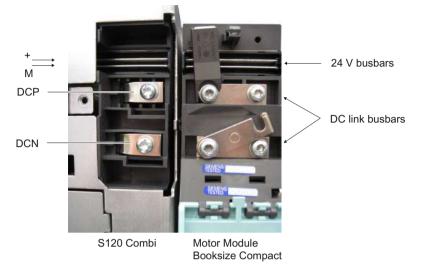
Note

Attach the touch protection for the DC link busbars

After removing the additional components, before recommissioning the system, the touch protection of the DC link busbars on the S120 Combi power module must be reinstalled. The touch protection can be ordered as a spare part.



- 1. Use a suitable tool to open the protective cover of the component to be connected
- 2. Remove the DC link side cover at the connection location.



- Use the following tool to install the DC link busbar: Screwdriver: Torx T20 or slotted 1.2 x 6 Tightening torque: 1.8 Nm
- 4. Install the lower DC link busbar as shown in the following diagram:

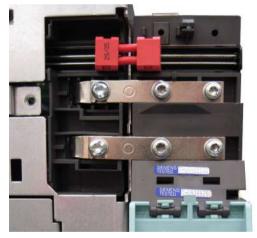




- Release the screws
- Remove the plastic cap on the DC link bridge
- Turn over the DC link bridge.
- Observe the sequence when tightening the screws!

5. Install the upper DC link busbar as shown in the following diagram:

6. Install the red 24 V connectors in accordance with the supplied description of the component to be connected.



- 7. Close the protective cover of the connected component.
- 8. Mount the front plate on the S120 Combi.



4.10.9 To connect the second component

Connecting a second component

A second component is connected as follows to the DC link busbars and the 24 V busbars:

Note

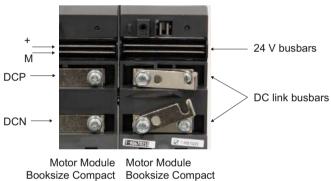
Before commissioning a drive line-up the following must be observed

The following points must be complied with before commissioning the drive line-up:

- The DC link side cover is inserted at the outer component (touch protection).
- The protective covers of the connected components are closed.

Procedure:

- 1. Use a suitable tool to open the protective cover of the component to be connected
- 2. Remove the DC link side covers of both components at the connection location



 To connect the DC link busbars you will need the following tool: Screwdriver: Torx T20 Tightening torque: 1.8 Nm



- 4. Install the lower DC link busbar:

- Release the screws
- Turn over the DC link bridge.
- Observe the sequence when tightening the screws
- 5. Install the upper DC link busbar:



- Release the screws
- Turn over the DC link bridge.
- Observe the sequence when tightening the screws



- to be connected.
- 6. Install the red 24 V connectors in accordance with the supplied description of the component to be connected.

7. Close the protective covers of both components.

4.10.10 This is how you remove the internal fan

Removing the internal fan

Note

When replacing the fan, you must observe the ESD regulations.

Only qualified personnel are permitted to install spare parts!



Danger to life through live parts and components

Death or serious injury can result when live parts are touched.

- Switch off the power supply before replacing the fan (400 V AC). A hazardous voltage is still present for up to 5 minutes after the power supply has been switched off.
- Before removing the component, carefully ensure that it is in a no-voltage condition.



Procedure:

- 1. Remove the S120 Combi front cover (see also: This is how you remove the front panel (Page 138)).
- 2. Remove the Torx-slotted screw of the fan cover.



3. Remove the fan cover,







4. Remove the cable connector by gently pressing the interlock and connector together.

Opened fan compartment:



5. Withdraw the fan.





4.10.11 This is how you install the internal fan

Installing a new internal fan

Procedure:

1. Before installing the fan, note the direction of the airflow: The arrows on the fan must match the following diagram!



The arrows on the fan show the direction of the airflow.

- 2. Insert the fan: The connecting cables must not be crushed!
- 3. Insert the plug connector: The connector must audibly click into place.
- 4. Close the fan cover.



- 5. Attach the Torx-slotted screw to the fan cover.
- Install the front panel and tighten the front screws. (see Chapter: This is how you remove the front panel (Page 138))

4.10.12 This is how you install the external fan

Preparation

The external fan unit is always installed above the S120 Combi in the control cabinet.

Make an installation cut-out in the control cabinet panel. The position depends on the installation cut-out for the S120 Combi (see Chapter:How to mount an S120 Combi Power Module (Page 135)).

Mounting accessories

Number	Designation	Specification
5	Self-clinching flush head studs	M4, steel, strength class 8.8, zinc-plated, length: 15 mm
5	Nut	M4, steel, strength class 8, zinc-plated



Installing

Procedure:

1. Mount the self-clinching flush head studs - position 1) in the following part of the diagram: The zero line shown runs at the height of the upper bolts used to mount the S120 Combi.

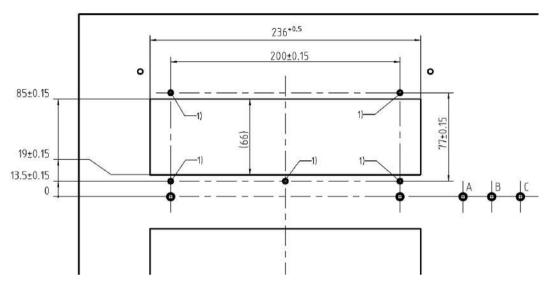


Image 4-36 Section from the drilling pattern and installation cut-out for the external fan unit

- 2. Connect the power supply cables of the fan unit to the S120 Combi Power Module.
 - Cable A to terminal X12
 - Cable B to terminal X13



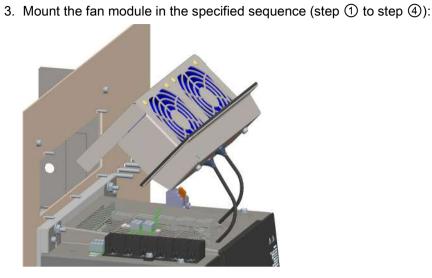


Image 4-37 Step ①

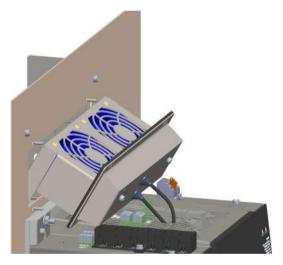


Image 4-38 Step 2



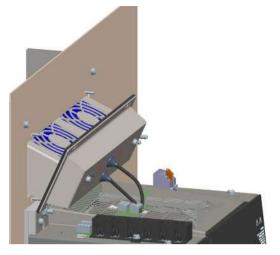


Image 4-39 Step ③

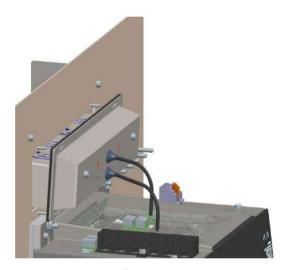
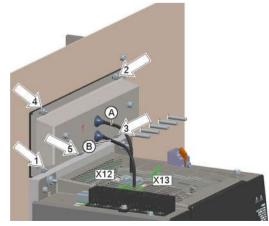


Image 4-40 Step ④

- 4. Initially tighten the nuts by hand with 0.5 Nm.
- 5. Then tighten the nuts with a tightening torque of 1.8 Nm in the specified sequence (arrow 1 to arrow 5):





Boundary condition

It is important that the reinforcement plates must always be installed when operating the S120 Combi with the external fan unit:



WRONG:

CORRECT:

S120 Combi and external fan unit without reinforcement plates S120 Combi and external fan unit with installed reinforcement plates

Note

Shutdown as a result of excessively high temperature if the reinforcement plates are missing

Operation without the reinforcement plates is not permissible.

If the reinforcement plates are incorrectly fixed, this can result in an excessively high heat sink temperature and cause the S120 Combi to prematurely trip.

4.10.13 This is how you clean the heat sink of the S120 Combi

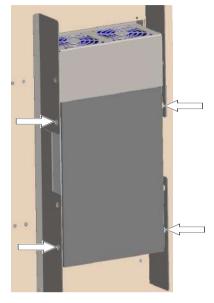
Cleaning the heat sink

The S120 Combi heat sink should be cleaned at regular intervals using either compressed air or high-pressure water jets. To clean the heat sink, the air baffle plate at the rear of the S120 Combi must be removed.

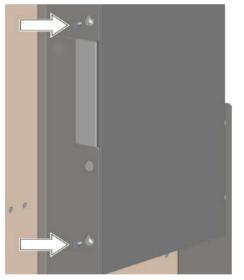


Procedure:

1. The screws are accessible from the rear.



2. To remove the air baffle plate on the S120 Combi, release the fixing screws through the holes in the reinforcement plates.



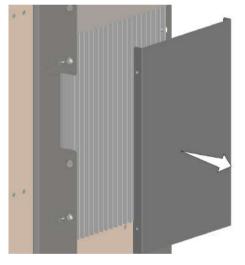
Screws: Slotted or cross slot M4 x 10, DIN EN ISO 7046-1/2



3. Remove the air baffle plate in the direction of the arrow.

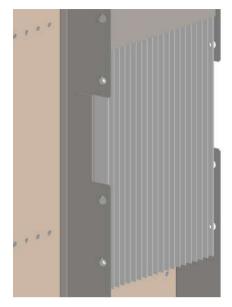


The air baffle plate has been removed.



The heat sink can now be cleaned:





4. After cleaning the heat sink, the air baffle plate is reinstalled in the reverse sequence. **Tightening torque** for the screws: 1.8 Nm.



4.11 Motor Module Booksize Compact format

4.11.1 Motor Module Booksize Compact status displays

Status displays

The Motor Module has the following status displays, which provide information about the module state:

LED state		Description, cause	Remedy
RDY	DC LINK		
OFF	OFF	Electronics power supply is missing or outside permissible tolerance range.	
Green		The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	
	Orange	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	
		The DC link voltage is present.	
	Red	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	Check the line supply voltage.
		The DC link voltage is too high.	
Orange	Orange	DRIVE-CLiQ communication is being established.	
Red		This component has at least one fault.	Remove the fault and ac- knowledge
		Note:	Knowledge
		The LED is controlled irrespective of the corresponding messages being reconfigured.	
Green / Red (0.5 Hz)		Firmware is being downloaded.	
Green / Red (2 Hz)		Firmware download has been completed. Wait for POW- ER ON.	Carry out a POWER ON
Green/Orange or Red/Orange		Component recognition via LED is activated (p0124).	
		Note:	
		Both options depend on the LED status when module recognition is activated via p0124 = 1.	



Danger to life through electric shock due to the residual charge of the DC link capacitors

Hazardous DC link voltages may be present at any time regardless of the state of the "DC LINK" LED. The warning information on the components must be carefully observed!



4.11.2 Motor Module connections

Single Motor Module connections

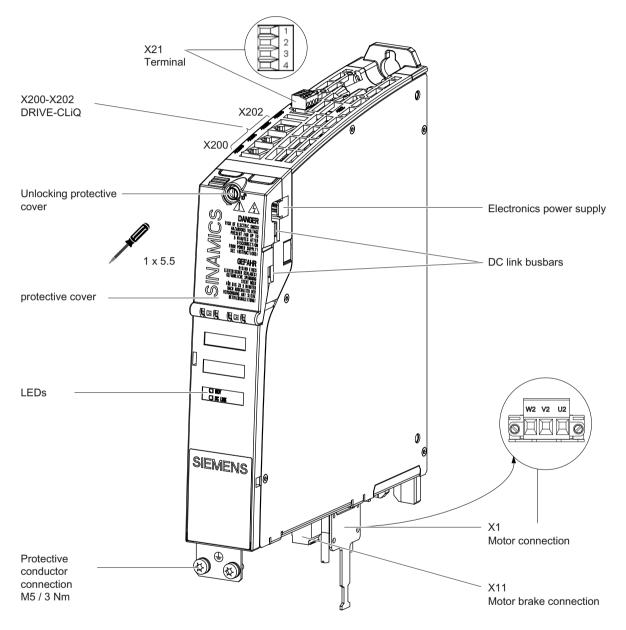
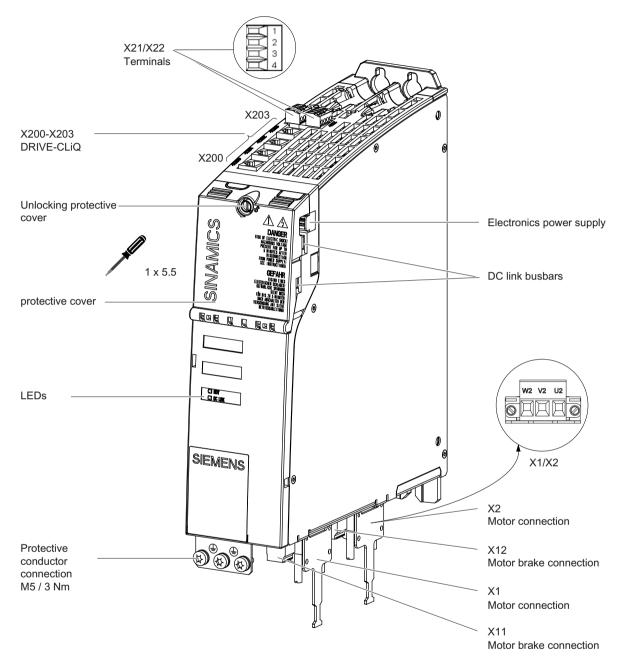


Image 4-41 SMM Booksize Compact format (example 5 A)





Double Motor Module connections

Image 4-42 DMM Booksize Compact format (example 2 x 5 A)



4.11.3 This is how you mount a Motor Module Booksize Compact

Installing

Note the **tightening torques** for hexagonal combination screws or hexagon screws with spring lock washer and flat washer.

Procedure:

- 1. Initially tighten the screws by hand with 0.5 Nm.
- 2. Tighten the screws in the specified sequence 1 to 4 with 6 Nm.

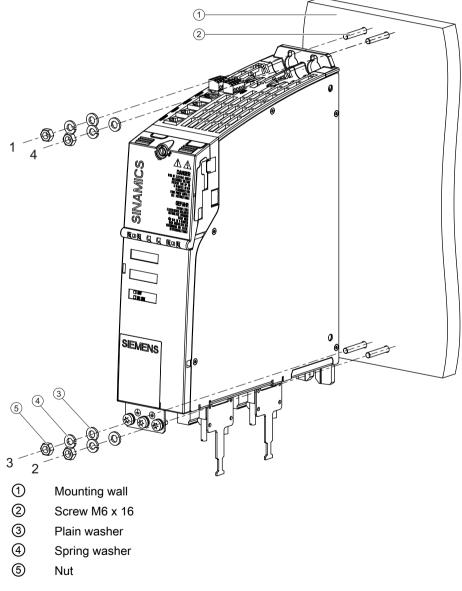


Image 4-43 Motor Module Booksize Compact



4.11.4 This is how you replace the fan on a Motor Module Booksize Compact

Removing the fan

The instructions are valid for a module width of 50 mm.

Note

When replacing the fan, you must observe the ESD regulations.

Only qualified personnel are permitted to install spare parts!



Danger to life through live parts and components

Death or serious injury can result when live parts are touched.

- Switch off the power supply before replacing the fan (400 V AC). A hazardous voltage is still present for up to 5 minutes after the power supply has been switched off.
- Before removing the component, carefully ensure that it is in a no-voltage condition.



Procedure:

1. Remove the Motor Module from the drive line-up.

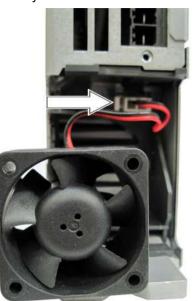


2. Remove the fan cover at the lower side of the Motor Module by releasing the snap hooks.





3. Carefully withdraw the fan.



4. Release the connector before you withdraw it.

Installing the fan

Procedure:

1. Before installing the fan, observe the direction of the airflow: The arrow on the fan must point toward the cooling ribs.



2. Insert the cable connector until it latches into place.



- Install the fan. Notice! Do not crush the connection cables!
- 4. Attach the fan cover.



4.12 Single Motor Modules

4.12.1 SMM status displays

Status displays

The Motor Module has the following status displays, which provide information about the module state:

LED state		Description, cause	Remedy
RDY	DC LINK		
OFF	OFF	The electronics power supply is missing or outside the permissible tolerance range.	-
Green	OFF	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	-
	Orange	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	-
		The DC link voltage is present.	
	Red	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	Check the line supply voltage.
		The DC link voltage is too high.	
Orange	Orange	DRIVE-CLiQ communication is being established.	-
Red	-	This component has at least one fault. Note: The LED is controlled irrespective of the corresponding	Remove the fault and ac- knowledge.
		messages being reconfigured.	
Green/red (0.5 Hz)	-	Firmware is being downloaded.	-
Green/red (2 Hz)	-	Firmware download has been completed. Wait for POW-ER ON.	Carry out a POWER ON.
Green/orange or red/orange	-	Component recognition via LED is activated (p0124). Note:	-
		Both options depend on the LED status when module recognition is activated via p0124 = 1.	



Danger to life through electric shock due to the residual charge of the DC link capacitors

Hazardous DC link voltages may be present at any time regardless of the state of the "DC Link" LED. The warning information on the components must be carefully observed!



4.12 Single Motor Modules

4.12.2 SMM connections

Connections

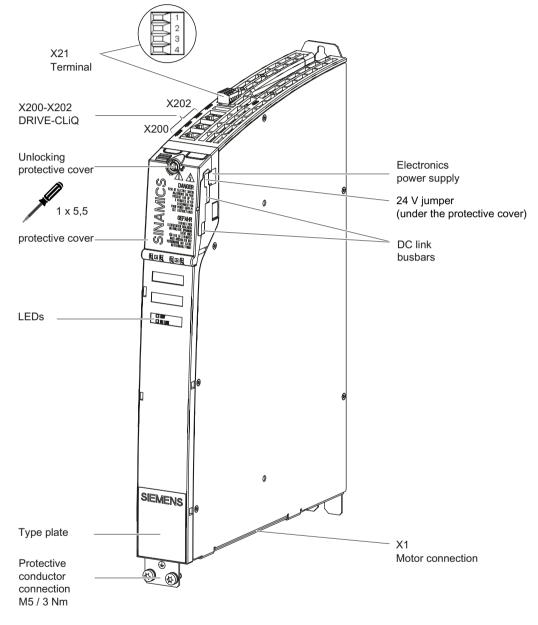


Image 4-44 Sing

Single Motor Module (SMM)



4.12.3 This is how you remove a Motor Module

Overview

The activities required when replacing a Motor Module are subsequently described.

If a Motor Module has a hardware defect, then it must be replaced by an identical module. Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.

Removing

Procedure:

- 1. Switch-off the control: Completely switch off the system. Check that the system is in a novoltage condition and is locked-out so that it cannot be switched on again without the appropriate authorization.
- 2. Access the control cabinet where the infeed module is located.
- 3. If it has not already been done, label all connectors and cables that lead to the module now. Only then, can it be ensured that the cables are not interchanged.
- 4. Withdraw the enable terminals X21 (and X22 if available).
- 5. Withdraw the connected DRIVE-CLiQ cables X200 X202.
- 6. Release the fixing screw (Torx) and remove the motor connection X1 (and X2 if available).



Danger to life through electric shock due to the residual charge of the DC link capacitors

As a result of the DC link capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off.

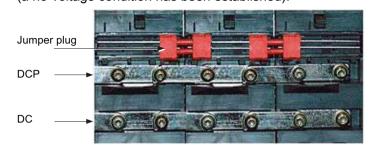
Contact with live parts results in death or serious injury.

- Do not open the protective cover of the device until 5 minutes have elapsed.
- Before starting any work, check that the system is in a completely no-voltage condition by measuring all poles/phases, also to ground.
- Ensure that the associated warning plate in the appropriate language is attached.
- 1. Open the protective cover of the DC link voltage of the defective module as well as the adjacent module if available using a suitable tool (e.g. a screwdriver).
- 2. Withdraw the 24 V terminal adapter.

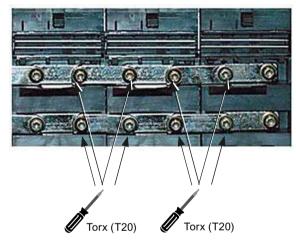


4.12 Single Motor Modules

 Using a multimeter (set the measuring range to 1000 V DC) at the points DCP/DCN, check that the DC link voltage is in a no-voltage condition. Only continue with the work when it has been absolutely ensured that no voltage is present (a no-voltage condition has been established).



- 4. Withdraw the red 24 V jumper plug.
- 5. Release the Torx screws of the DC link.





6. Open the DC link busbars of the two modules.



- 7. Release the screws that are used to retain the motor module to the mounting plate.
- 8. Remove the protective conductor connection of the Motor Module.
- 9. Remove the Motor Module from the control cabinet.

4.12.4 This is how you install a Motor Module

Installing



Danger to life through electric shock due to the residual charge of the DC link capacitors

As a result of the DC link capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off.

Contact with live parts results in death or serious injury.

- Do not open the protective cover of the device until 5 minutes have elapsed.
- Before starting any work, check that the system is in a completely no-voltage condition by measuring all poles/phases, also to ground.
- Ensure that the associated warning plate in the appropriate language is attached.

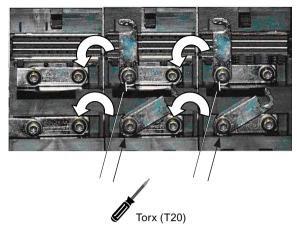
Procedure:

- 1. Screw the new Motor Module to the mounting plate.
- 2. Reconnect the protective conductor connection of the Motor Module.
- 3. Open the protective cover of the DC link voltage using a suitable tool (e.g. a screwdriver).

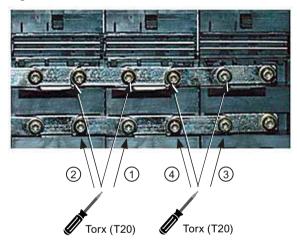


4.12 Single Motor Modules

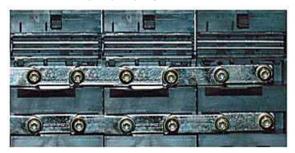
4. Release the Torx screws and connect the DC link busbar.



5. Tighten the Torx screws of the DC link busbars, observe the correct sequence.



6. Place the red jumper plug on the electronics busbar until it clicks into place.



- 7. Place the 24 V terminal adapter on the electronics power supply busbar until it clicks into place.
- 8. Close the protective cover of the DC link voltage.
- 9. Reconnect motor connections X1 and X2 if available to the module.
- 10. Insert the DRIVE-CLiQ cables that were previously withdrawn into sockets X200 X202.



11.Reinsert the enable terminals X21 and X22 - if available - into the module.

12. Check whether all of the cables have been re-connected.

13.Close the cabinet and switch-on the system again.



4.13 Double Motor Modules

4.13.1 DMM status displays

Status displays

The Motor Module has the following status displays, which provide information about the module state:

LED state		Description, cause	Remedy
RDY	DC LINK		
OFF	OFF	The electronics power supply is missing or outside the permissible tolerance range.	-
Green	OFF	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	-
	Orange	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	-
		The DC link voltage is present.	
	Red	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	Check the line supply voltage.
		The DC link voltage is too high.	
Orange	Orange	DRIVE-CLiQ communication is being established.	-
Red	-	This component has at least one fault. Note: The LED is controlled irrespective of the corresponding	Remove the fault and ac- knowledge
		messages being reconfigured.	
Green/red (0.5 Hz)	-	Firmware is being downloaded.	-
Green/red (2 Hz)	-	Firmware download has been completed. Wait for POW-ER ON.	Carry out a POWER ON.
Green/orange or red/orange	-	Component recognition via LED is activated (p0124). Note:	-
		Both options depend on the LED status when module recognition is activated via p0124 = 1.	



Danger to life through electric shock due to the residual charge of the DC link capacitors

Hazardous DC link voltages may be present at any time regardless of the state of the "DC Link" LED. The warning information on the components must be carefully observed!



4.13.2 DMM connections

Connections

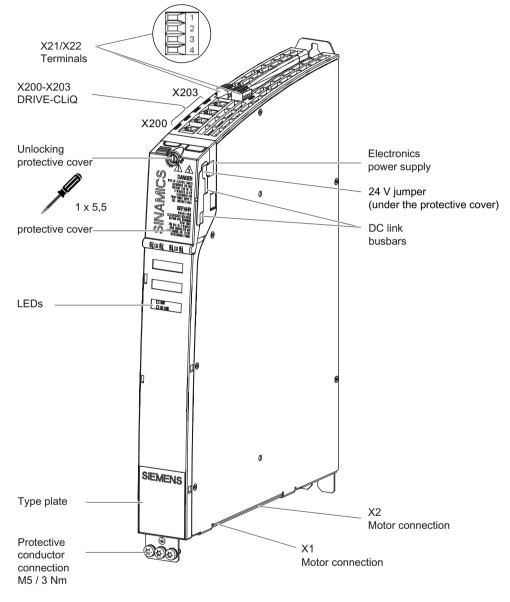


Image 4-45 Double Motor Module (DMM)



4.13.3 This is how you remove a Motor Module

Overview

The activities required when replacing a Motor Module are subsequently described.

If a Motor Module has a hardware defect, then it must be replaced by an identical module. Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.

Removing

Procedure:

- 1. Switch-off the control: Completely switch off the system. Check that the system is in a novoltage condition and is locked-out so that it cannot be switched on again without the appropriate authorization.
- 2. Access the control cabinet where the infeed module is located.
- 3. If it has not already been done, label all connectors and cables that lead to the module now. Only then, can it be ensured that the cables are not interchanged.
- 4. Withdraw the enable terminals X21 (and X22 if available).
- 5. Withdraw the connected DRIVE-CLiQ cables X200 X202.
- 6. Release the fixing screw (Torx) and remove the motor connection X1 (and X2 if available).



Danger to life through electric shock due to the residual charge of the DC link capacitors

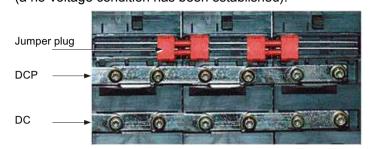
As a result of the DC link capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off.

Contact with live parts results in death or serious injury.

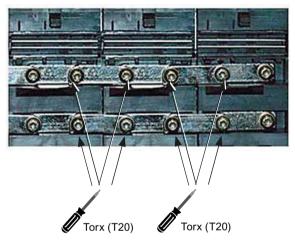
- Do not open the protective cover of the device until 5 minutes have elapsed.
- Before starting any work, check that the system is in a completely no-voltage condition by measuring all poles/phases, also to ground.
- Ensure that the associated warning plate in the appropriate language is attached.
- 1. Open the protective cover of the DC link voltage of the defective module as well as the adjacent module if available using a suitable tool (e.g. a screwdriver).
- 2. Withdraw the 24 V terminal adapter.



 Using a multimeter (set the measuring range to 1000 V DC) at the points DCP/DCN, check that the DC link voltage is in a no-voltage condition. Only continue with the work when it has been absolutely ensured that no voltage is present (a no-voltage condition has been established).

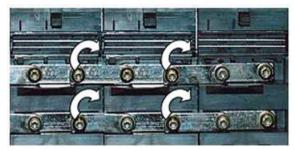


- 4. Withdraw the red 24 V jumper plug.
- 5. Release the Torx screws of the DC link.





6. Open the DC link busbars of the two modules.





- 7. Release the screws that are used to retain the motor module to the mounting plate.
- 8. Remove the protective conductor connection of the Motor Module.
- 9. Remove the Motor Module from the control cabinet.

4.13.4 This is how you install a Motor Module

Installing



Danger to life through electric shock due to the residual charge of the DC link capacitors

As a result of the DC link capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off.

Contact with live parts results in death or serious injury.

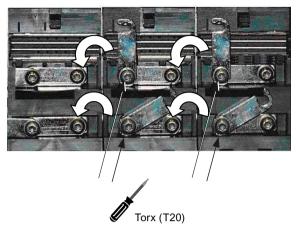
- Do not open the protective cover of the device until 5 minutes have elapsed.
- Before starting any work, check that the system is in a completely no-voltage condition by measuring all poles/phases, also to ground.
- Ensure that the associated warning plate in the appropriate language is attached.

Procedure:

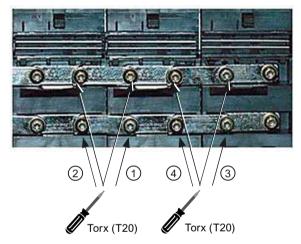
- 1. Screw the new Motor Module to the mounting plate.
- 2. Reconnect the protective conductor connection of the Motor Module.
- 3. Open the protective cover of the DC link voltage using a suitable tool (e.g. a screwdriver).



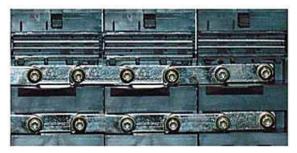
4. Release the Torx screws and connect the DC link busbar.



5. Tighten the Torx screws of the DC link busbars, observe the correct sequence.



6. Place the red jumper plug on the electronics busbar until it clicks into place.



- 7. Place the 24 V terminal adapter on the electronics power supply busbar until it clicks into place.
- 8. Close the protective cover of the DC link voltage.
- 9. Reconnect motor connections X1 and X2 if available to the module.
- 10.Insert the DRIVE-CLiQ cables that were previously withdrawn into sockets X200 X202.



- 11.Reinsert the enable terminals X21 and X22 if available into the module.
- 12. Check whether all of the cables have been re-connected.
- 13.Close the cabinet and switch-on the system again.



4.14 Smart Line Modules

4.14.1 SLM (< 16 kW) status displays

Status displays

The 5 kW and 10 kW Smart Line Modules have the following status displays, which provide information about the module state:

LED state		Description, cause	Remedy
RDY	DY DC LINK		
	OFF	Electronics power supply is missing or outside per- missible tolerance range.	
Continuous green light		Component is ready.	
Continuous		Precharging not yet complete.	
yellow light		Bypass relay has dropped-out.	
		EP terminals are not supplied with 24 V DC.	
Continuous red light		Overcurrent trip due to overtemperature.	Diagnose fault via output terminals and acknowledge via input termi- nal:
	Continuous yellow light	DC link voltage in the permissible tolerance range.	
	Continuous red light	Line supply faults: DC link voltage outside the permissible tolerance range.	Check the line supply voltage.



Danger to life through electric shock due to the residual charge of the DC link capacitors

Hazardous DC link voltages may be present at any time regardless of the state of the "DC LINK" LED. The warning information on the components must be carefully observed!



4.14 Smart Line Modules

4.14.2 SLM (< 16 kW) connections

Connections

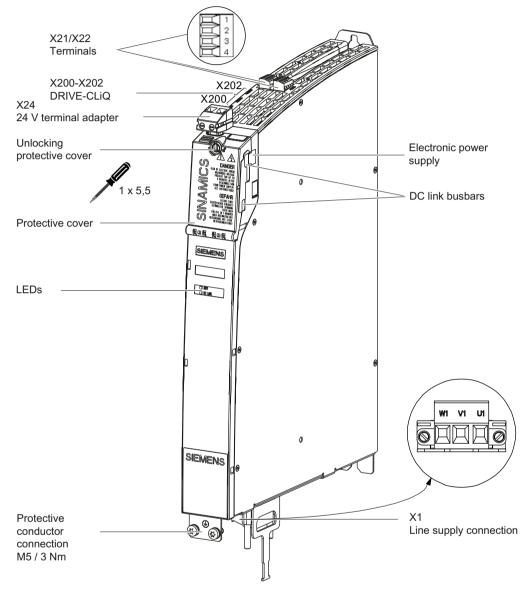


Image 4-46 SLM connections



4.14.3 SLM (16 kW and higher) status displays

Status displays

The Smart Line Modules \geq 16 kW have the following status displays, which provide information about the module state:

LED state		Description, cause	Remedy	
RDY	DC LINK			
OFF	OFF	Electronics power supply is missing or outside permis- sible tolerance range.	-	
Green	OFF	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	-	
	Orange	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	_	
		The DC link voltage is present.		
	Red	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	Check the line supply voltage.	
		The DC link voltage is too high.		
Orange	Orange	DRIVE-CLiQ communication is being established.	-	
Red	-	This component has at least one fault.	Remove the fault and	
		Note:	acknowledge	
		The LED is controlled irrespective of the corresponding messages being reconfigured.		
Green/red (0.5 Hz)	-	Firmware is being downloaded.	-	
Green/red (2 Hz)	-	Firmware download has been completed. Wait for POW-ER ON.	Carry out a POWER ON	
Green/orange	-	Component recognition via LED is activated (p0124).	-	
or		Note:		
Red/orange		Both options depend on the LED status when module recognition is activated via $p0124 = 1$.		



Danger to life through electric shock due to the residual charge of the DC link capacitors

Hazardous DC link voltages may be present at any time regardless of the state of the "DC LINK" LED. The warning information on the components must be carefully observed!



4.14 Smart Line Modules

4.14.4 SLM (16 kW and higher) connections

Connections

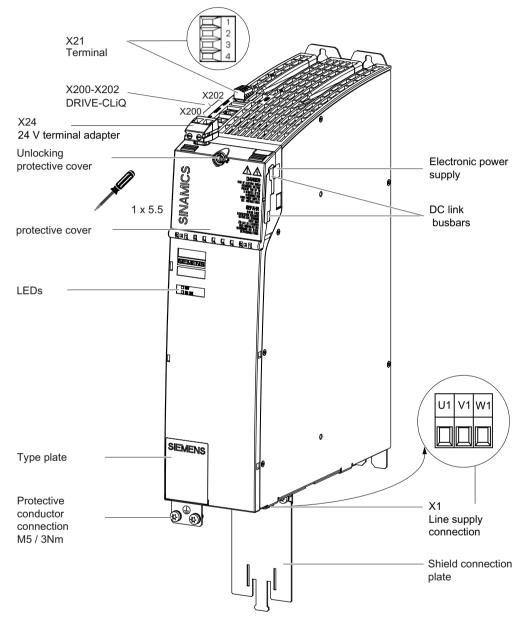


Image 4-47 Connections,SLM ≥ 16 kW



4.14.5 This is how you remove an SLM

Overview

The activities that must be taken into account when replacing a Smart Line Module (SLM) are subsequently described.

If a module has a hardware defect, then it must be replaced by an identical module.

Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.

Removing

Procedure:

- 1. Switch-off the control: Completely switch off the system. Check that the system is in a novoltage condition and is locked-out so that it cannot be switched on again without the appropriate authorization.
- 2. Access the control cabinet where the infeed module is located.
- 3. If it has not already been done, label all connectors/cables that lead to the module now. Only then, can it be ensured that the cables are not interchanged.
- 4. Withdraw the enable terminals X21.
- 5. Withdraw the connected DRIVE-CLiQ cables X200 X202.
- 6. Withdraw the line supply connection X1.



Danger to life through electric shock due to the residual charge of the DC link capacitors

As a result of the DC link capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off.

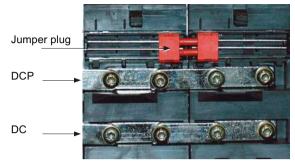
Contact with live parts results in death or serious injury.

- Do not open the protective cover of the device until 5 minutes have elapsed.
- Before starting any work, check that the system is in a completely no-voltage condition by measuring all poles/phases, also to ground.
- Ensure that the associated warning plate in the appropriate language is attached.
- 1. Open the protective cover of the DC link voltage using a suitable tool (e.g. a screwdriver).
- 2. Withdraw the 24 V terminal adapter.

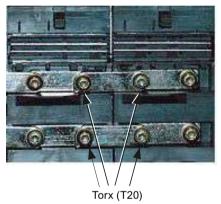


4.14 Smart Line Modules

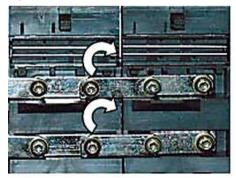
3. Using a multimeter (set the measuring range to 1000 V DC) at the points DCP/DCN, check that the DC link voltage is in a no-voltage condition. Only continue with the work when it has been absolutely ensured that no voltage is present (no-voltage condition has been established).



- 4. Withdraw the red 24 V jumper plug.
- 5. Release the Torx screws of the DC link.



6. Open the DC link busbars of the two modules.



- 7. Release the screws that are used to retain the module to the mounting plate.
- 8. Remove the protective conductor connection of the module.
- 9. Remove the module from the control cabinet.



4.14.6 This is how you install an SLM

Installing



Danger to life through electric shock due to the residual charge of the DC link capacitors

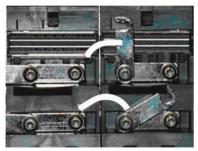
As a result of the DC link capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off.

Contact with live parts results in death or serious injury.

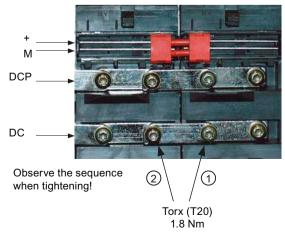
- Do not open the protective cover of the device until 5 minutes have elapsed.
- Before starting any work, check that the system is in a completely no-voltage condition by measuring all poles/phases, also to ground.
- Ensure that the associated warning plate in the appropriate language is attached.

Procedure:

- 1. Screw the new module to the mounting plate.
- 2. Reconnect the protective conductor connection of the module.
- 3. Open the protective cover of the DC link voltage using a suitable tool (e.g. a screwdriver).
- 4. Release the Torx screws and connect the DC link busbar.



- 5. Tighten the Torx screws of the DC link busbars, observe the correct sequence.
- 6. Place the red jumper plug on the electronics busbar until it clicks into place.





4.14 Smart Line Modules

- 7. Place the 24 V terminal adapter on the electronics power supply busbar until it clicks into place.
- 8. Close the protective cover of the DC link voltage.
- 9. Reconnect the line supply connection X1 at the module.
- 10.Insert the DRIVE-CLiQ cables that were previously withdrawn into sockets X200 X202.
- 11. Reinsert the enable terminals X21 at the module.
- 12. Check whether all of the cables have been re-connected.
- 13.Close the cabinet and switch-on the system again.



4.15 Active Line Modules

4.15.1 ALM status displays

Status displays

The Active Line Module (ALM) has the following status displays, which provide information about the module status:

LED state		Description, cause	Remedy
RDY	DC LINK		
OFF	OFF	Electronics power supply is missing or outside permissible tolerance range.	-
Green	OFF	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	-
	Orange	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	-
		The DC link voltage is present.	
	Red	The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	Check the line supply voltage.
		The DC link voltage is too high.	
Orange	Orange	DRIVE-CLiQ communication is being established.	-
Red	-	This component has at least one fault.	Remove the fault and
		Note:	acknowledge.
		The LED is controlled irrespective of the corresponding messages being reconfigured.	
Green/red (0.5 Hz)	-	Firmware is being downloaded.	-
Green/red (2 Hz)	-	Firmware download has been completed. Wait for POW- ER ON.	Carry out a POWER ON.
Green/orange or	-	Component recognition via LED is activated (p0124).	-
red/orange		Note:	
		Both options depend on the LED status when module rec- ognition is activated via p0124 = 1.	



Danger to life through electric shock due to the residual charge of the DC link capacitors

Hazardous DC link voltages may be present at any time regardless of the state of the "DC LINK" LED. The warning information on the components must be carefully observed!



4.15 Active Line Modules

4.15.2 ALM connections

Connections

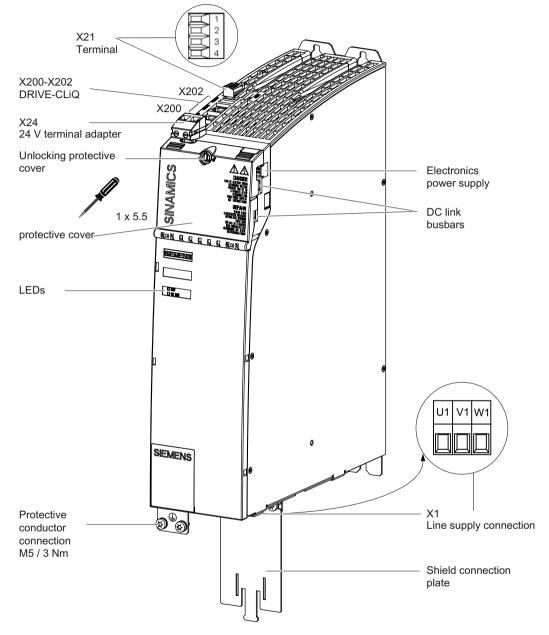


Image 4-48 ALM connections



4.15.3 This is how you remove an ALM

Overview

The activities that must be taken into account when replacing an Active Line Module (ALM) are subsequently described.

If a module has a hardware defect, then it must be replaced by an identical module.

Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.

Removing

Procedure:

- 1. Switch-off the control: Completely switch off the system. Check that the system is in a novoltage condition and is locked-out so that it cannot be switched on again without the appropriate authorization.
- 2. Access the control cabinet where the infeed module is located.
- 3. If it has not already been done, label all connectors/cables that lead to the module now. Only then, can it be ensured that the cables are not interchanged.
- 4. Withdraw the enable terminals X21.
- 5. Withdraw the connected DRIVE-CLiQ cables X200 X202.
- 6. Withdraw the line supply connection X1.



Danger to life through electric shock due to the residual charge of the DC link capacitors

As a result of the DC link capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off.

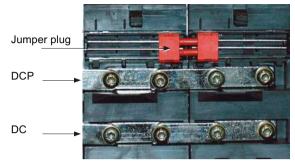
Contact with live parts results in death or serious injury.

- Do not open the protective cover of the device until 5 minutes have elapsed.
- Before starting any work, check that the system is in a completely no-voltage condition by measuring all poles/phases, also to ground.
- Ensure that the associated warning plate in the appropriate language is attached.
- 1. Open the protective cover of the DC link voltage using a suitable tool (e.g. a screwdriver).
- 2. Withdraw the 24 V terminal adapter.

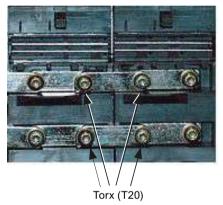


4.15 Active Line Modules

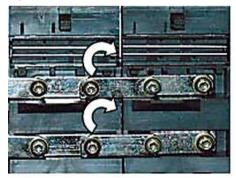
3. Using a multimeter (set the measuring range to 1000 V DC) at the points DCP/DCN, check that the DC link voltage is in a no-voltage condition. Only continue with the work when it has been absolutely ensured that no voltage is present (no-voltage condition has been established).



- 4. Withdraw the red 24 V jumper plug.
- 5. Release the Torx screws of the DC link.



6. Open the DC link busbars of the two modules.



- 7. Release the screws that are used to retain the module to the mounting plate.
- 8. Remove the protective conductor connection of the module.
- 9. Remove the module from the control cabinet.



4.15.4 This is how you install an ALM

Installing



Danger to life through electric shock due to the residual charge of the DC link capacitors

As a result of the DC link capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off.

Contact with live parts results in death or serious injury.

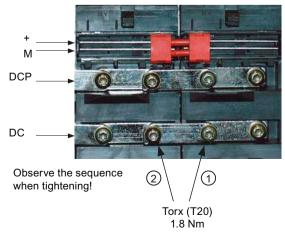
- Do not open the protective cover of the device until 5 minutes have elapsed.
- Before starting any work, check that the system is in a completely no-voltage condition by measuring all poles/phases, also to ground.
- Ensure that the associated warning plate in the appropriate language is attached.

Procedure:

- 1. Screw the new module to the mounting plate.
- 2. Reconnect the protective conductor connection of the module.
- 3. Open the protective cover of the DC link voltage using a suitable tool (e.g. a screwdriver).
- 4. Release the Torx screws and connect the DC link busbar.



- 5. Tighten the Torx screws of the DC link busbars, observe the correct sequence.
- 6. Place the red jumper plug on the electronics busbar until it clicks into place.





4.15 Active Line Modules

- 7. Place the 24 V terminal adapter on the electronics power supply busbar until it clicks into place.
- 8. Close the protective cover of the DC link voltage.
- 9. Reconnect the line supply connection X1 at the module.
- 10.Insert the DRIVE-CLiQ cables that were previously withdrawn into sockets X200 X202.
- 11. Reinsert the enable terminals X21 at the module.
- 12. Check whether all of the cables have been re-connected.
- 13.Close the cabinet and switch-on the system again.



4.16 Sensor Modules Cabinet

4.16.1 SMC10/SMC20 status displays

Status displays

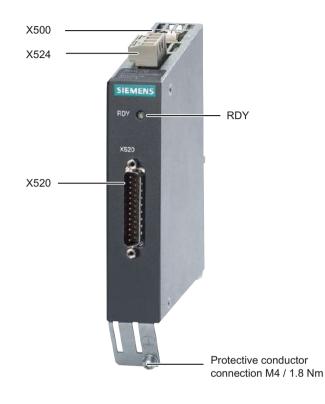
Sensor Modules Cabinet-Mounted SMC10 and SMC20 have the following status displays, which provide information about the module state:

LED	Color	State	Description, cause	Remedy
RDY	-	OFF	Electronics power supply is missing or outside permissible tolerance range.	-
	Green	Continuous light	The component is ready for operation and cy- clic DRIVE-CLiQ communication is taking place.	-
	Orange	Continuous light	DRIVE-CLiQ communication is being estab- lished.	-
	Red	Continuous light	This component has at least one fault.	Remove and acknowl-
			Note:	edge fault.
			The LED is controlled irrespective of the corre- sponding messages being reconfigured.	
	Green/red	Flashes at 0.5 Hz	Firmware is being downloaded.	-
		Flashes at 2 Hz	Firmware download has been completed.	Carry out a POWER ON.
			Wait for POWER ON	
	Green/orange or red/orange	a	Component recognition via LED is activated (p0144)	-
			Note:	
			Both options depend on the LED status when module recognition is activated via p0144 = 1.	



4.16.2 SMC10/SMC20 connections

Connections



- X500 DRIVE-CLiQ
- X520 Encoder system interface
- X524 Electronics power supply

Image 4-49 SMC10/SMC20 connections

4.16.3 This is how you remove an SMC10/SMC20

Overview

The activities that must be taken into account when replacing an SMC10 or SMC20 are subsequently described.

If the SMC10 or SMC20 has a hardware defect, then it must be replaced by an identical module.

Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.



Removing

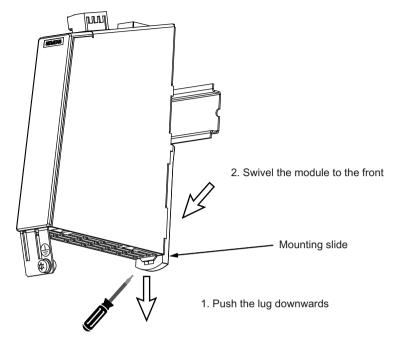


Image 4-50 Removing the SMC10/SMC20

Procedure:

- 1. Withdraw the electronics power supply connector X524 and label.
- Unscrew the encoder connecting cable at X520 or X521 / X531, if required, also the shield connection.
- 3. Withdraw the DRIVE-CLiQ cable X500 and write the slot designation on the cable.
- 4. Release the protective conductor connection and write the position designation on the cable.
- 5. Push the lug downwards.
- 6. Swivel the module to the front.

Note

The 50 mm ventilation clearances above and below the components must be observed.



4.16.4 This is how you install an SMC10/SMC20

Installing

Procedure:

- 1. Place the component on the mounting rail.
- 2. Then, swivel the component on the mounting rail so that the mounting catches click into place at the rear.
- 3. Slide the component along the mounting rail to either the left or right up to its final position.
- 4. Screw on the protective conductor connection.
- 5. Screw on the encoder connecting cable to X520 and X521 / X531, if required, also the shield connection.
- 6. Insert the DRIVE-CLiQ cable at X500.
- 7. Insert connector X524 for the electronics power supply.

Note

The 50 mm ventilation clearances above and below the components must be observed.



4.16.5 SMC30 status displays

Status displays

The Sensor Module Cabinet-Mounted SMC30 has the following status displays, which provide information about the module state:

LED	Color	State	Description, cause	Remedy
RDY	-	OFF	Electronics power supply is missing or outside permissible tolerance range.	-
	Green	Continuous light	The component is ready and cyclic DRIVE-CLiQ communication is taking place.	-
	Orange	Continuous light	DRIVE-CLiQ communication is being establish- ed.	-
	Red	Continuous light	This component has at least one fault.	Remove and acknowl-
			Note:	edge fault.
			The LED is controlled irrespective of the corre- sponding messages being reconfigured.	
	Green/red	Flashes at 0.5 Hz	Firmware is being downloaded.	_
		Flashes at 2 Hz	Firmware download has been completed.	Carry out a POWER
			Wait for POWER ON	ON.
	Green/orange or red/orange	Flashing	Component recognition via LED is activated (p0144)	-
			Note:	
			Both options depend on the LED status when module recognition is activated via p0144 = 1.	
OUT > 5 V	-	OFF	Electronics power supply is missing or outside permissible tolerance range.	-
			Power supply ≤ 5 V	
	Orange	Continuous light	Electronics power supply for measuring system available.	-
			Power supply >5 V.	
			Notice:	
			It must be ensured that it is permissible to oper- ate the connected encoder with a 24 V power supply. If an encoder that is designed for a 5 V supply is operated with a 24 V supply, this can destroy the encoder electronics.	



4.16.6 SMC30 connections

Connections

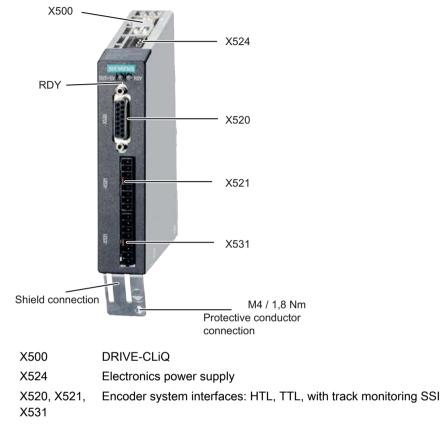


Image 4-51 Connections SMC30

4.16.7 This is how you remove an SMC30

Overview

The activities that must be taken into account when replacing an SMC30 are subsequently described.

If an SMC30 has a hardware defect, then it must be replaced by an identical module.

Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.



Removing

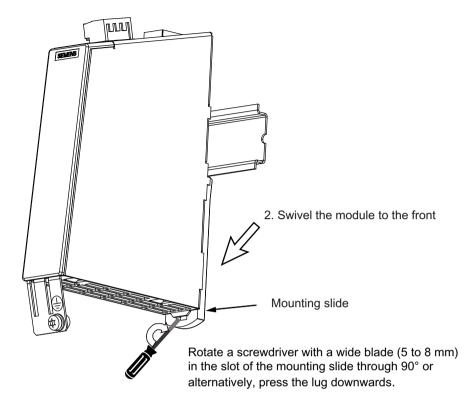


Image 4-52 SMC30 removal

Procedure:

- 1. Before withdrawing it, label the connector X524 for the electronics power supply.
- 2. Screw on the encoder connecting cable to X520 or X521 / X531, if required, also the shield connection.
- 3. Release the protective conductor connection and write the position designation on the cable.
- 4. Slide the lug downwards.
- 5. Swivel the module to the front to remove it.

Note

The 50 mm ventilation clearances above and below the components must be observed.



4.16.8 This is how you install an SMC30

Installing

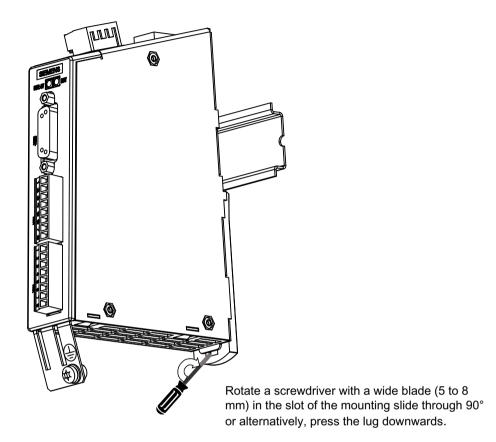


Image 4-53 Installing SMC30

Procedure:

- 1. Place the component on the mounting rail.
- 2. Then, swivel the component on the mounting rail so that the mounting catches click into place at the rear.
- 3. Slide the component along the mounting rail to either the left or right up to its final position.
- 4. Screw on the protective conductor connection.
- 5. Screw on the encoder connecting cable to X520 or X521 / X531, if required, also the shield connection.
- 6. Insert the DRIVE-CLiQ cable at X500.
- 7. Insert connector X524 for the electronics power supply.

Note

The 50 mm ventilation clearances above and below the components must be observed.



4.16.9 SMC40 status displays

Status displays

The Sensor Module Cabinet-Mounted SMC40 has the following status displays, which provide information about the module state:

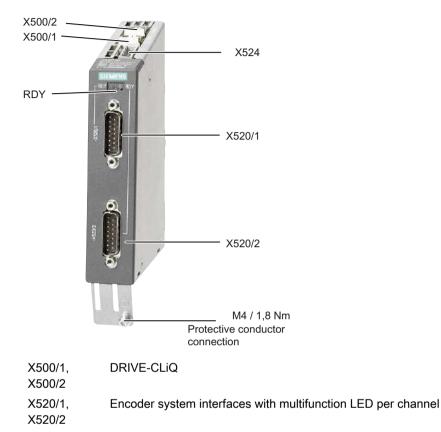
LED	Color	State	Description, cause	Remedy
RDY READY	-	Off	Electronics power supply is missing or outside permissible tolerance range.	-
	Green	Continu- ous light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.	-
	Orange	Continu- ous light	DRIVE-CLiQ communication is being established.	_
	Red	Continu- ous light	At least one fault is present in this component. Note: The LED is controlled irrespective of the corresponding mes- sages being reconfigured.	Remedy and acknowl- edge fault
	Green/red	Flashing light 2 Hz	Firmware download has been completed. Wait for POWER ON.	Carry out a POWER ON
	Green/ orange	Flashing light	Component recognition via LED is activated (p0144) Note:	-
	or Red/ orange		Both options depend on the LED status when module recog- nition is activated via p0144 = 1.	

Each channel has a multifunction LED.



4.16.10 SMC40 connections

Connections



X524 Electronics power supply

Image 4-54 Connections SMC40

4.16.11 This is how you remove an SMC40

Overview

The activities that must be taken into account when replacing an SMC40 are subsequently described.

If an SMC40 has a hardware defect, then it must be replaced by an identical module.

Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.



Removing

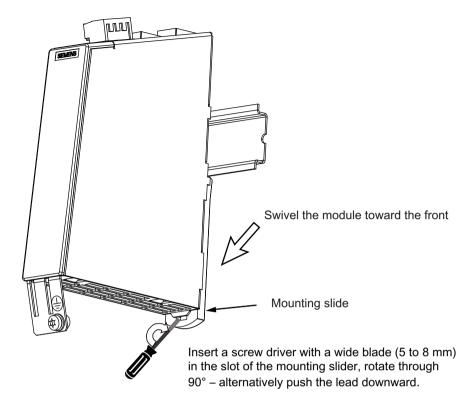


Image 4-55 SMC40 removal

Procedure:

- 1. Before withdrawing it, label the connector X524 for the electronics power supply.
- 2. Unscrew the encoder connecting cables X520/x.
- 3. Label the DRIVE-CLiQ cables X500/x and withdraw them.
- 4. Release the protective conductor connection and write the position designation on the cable.
- 5. Slide the lug downwards.
- 6. Swivel the module to the front to remove it.

Note

The 50 mm ventilation clearances above and below the components must be observed.



4.16.12 This is how you install an SMC40

Installing

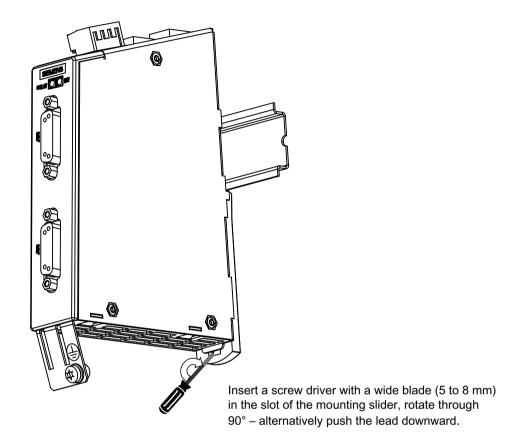


Image 4-56 SMC40 installation

Procedure:

- 1. Place the component on the mounting rail.
- 2. Then, swivel the component on the mounting rail so that the mounting catches click into place at the rear.
- 3. Slide the component along the mounting rail to either the left or right up to its final position.
- 4. Screw on the protective conductor connection.
- 5. Screw on the encoder connecting cables X520/x.
- 6. Insert the DRIVE-CLiQ cables at X500/x.
- 7. Insert connector X524 for the electronics power supply.

Note

The 50 mm ventilation clearances above and below the components must be observed.



4.17 Sensor Modules External

4.17.1 SME20 connections

Connections

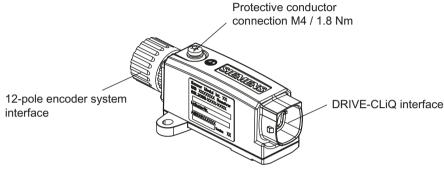


Image 4-57 Connections SME20

4.17.2 This is how you remove an SME20 and install it again

Overview

The activities that must be taken into account when replacing an SME20 are subsequently described.

If an SME20 has a hardware defect, then it must be replaced by an identical module.

Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.

Removing

Procedure:

- 1. Release the encoder connecting cable of the SME20.
- 2. Withdraw the DRIVE-CLiQ cable from the SME20.
- 3. Release the protective conductor connection of the SME20.
- 4. Remove the defective SME20.



Installing

Procedure:

- 1. Now install the new SME20.
- 2. Screw on the protective conductor connection.
- 3. Reconnect the encoder connecting cable.
- 4. Connect the DRIVE-CLiQ cable.

Note

Connections/cables

Only measuring systems where the measuring system power supply is not grounded may be connected.

The maximum DRIVE-CLiQ cable length is 100 m.

The maximum encoder cable length is 3 m.

In order to guarantee the degree of protection, all of the plug connectors must be correctly screwed into place or snapped into place.

4.17.3 SME25 connections

Connections

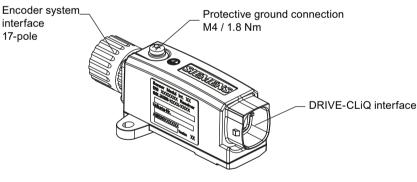


Image 4-58 Connections SME25

4.17.4 This is how you remove an SME25 and install it again

Overview

The activities that must be taken into account when replacing an SME25 are subsequently described.



If an SME25 has a hardware defect, then it must be replaced by an identical module. Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.

Removing

Procedure:

- 1. Release the encoder connecting cable of the SME25.
- 2. Withdraw the DRIVE-CLiQ cable from the SME25.
- 3. Release the protective conductor connection of the SME25.
- 4. Remove the defective SME25.

Installing

Procedure:

- 1. Now install the new SME25.
- 2. Screw on the protective conductor connection.
- 3. Reconnect the encoder connecting cable.
- 4. Connect the DRIVE-CLiQ cable.

Note

Connections/cables

The maximum DRIVE-CLiQ cable length is 100 m.

The maximum encoder cable length is 3 m.

In order to guarantee the degree of protection, all of the plug connectors must be correctly screwed into place or snapped into place.



4.17.5 SME120 connections

Connections

Requirements: The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.



X500 DRIVE-CLiQ

Image 4-59 SME120 connections

4.17.6 This is how you remove an SME120 and install it again

Removing

Procedure:

- 1. Release the encoder connecting cable X100 of the SME120.
- 2. Withdraw the DRIVE-CLiQ cable from X500 of the SME120.
- 3. Release the Hall sensor input X300 of the SME120.
- 4. Release the temperature sensor input X200 of the SME120.
- 5. Release the protective conductor connection of the SME120.
- 6. Remove the defective SME120 module.

Installing

Procedure:

- 1. Now install the new SME120 module.
- 2. Screw on the protective conductor connection.
- 3. Reconnect the temperature sensor at X200.



- 4. Reconnect the Hall sensor at X300.
- 5. Reconnect the encoder connecting cable.
- 6. Connect the DRIVE-CLiQ cable.

Note

Connections/cables

The maximum DRIVE-CLiQ cable length is 100 m.

The maximum encoder cable length is 3 m.

In order to guarantee the degree of protection, all of the plug connectors must be correctly screwed and snapped into place.

4.17.7 SME125 connections

Connections

Requirements: The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.



- X500 DRIVE-CLiQ
- Image 4-60 SME125 connections



4.17.8 This is how you remove an SME125 and install it again

Removing

Procedure:

- 1. Release the encoder connecting cable X100 of the SME125
- 2. Withdraw the DRIVE-CLiQ cable from X500 of the SME125.
- 3. Release the temperature sensor input X200 of the SME125.
- 4. Release the protective conductor connection of the SME125.
- 5. Remove the defective SME125 module.

Installing

Procedure:

- 1. Now install the new SME125 module.
- 2. Screw on the protective conductor connection.
- 3. Reconnect the temperature sensor at X200.
- 4. Reconnect the encoder connecting cable.
- 5. Connect the DRIVE-CLiQ cable.

Note

Connections/cables

The maximum DRIVE-CLiQ cable length is 100 m.

The maximum encoder cable length is 3 m.

In order to guarantee the degree of protection, all of the plug connectors must be correctly screwed and snapped into place.



4.18 Terminal Modules

4.18.1 TM54F status displays

Status displays

The Terminal Module TM54F has the following status displays, which provide information about the module state:

State			Description, cause	Remedy
RDY	L1+, L2+	L3+		
Off			Electronics power supply is missing or outside permissible tolerance range.	-
Continuous green light			The component is ready for operation and cyclic DRIVE- CLiQ communication is taking place.	
Orange con- tinuous light			DRIVE-CLiQ communication is being established.	
Continuous red light			At least one fault is present in this component. Note:	Remove and ac- knowledge fault.
			The LED is controlled irrespective of the corresponding messages being reconfigured.	
Green / red flashing light 0.5 Hz			Firmware is being downloaded.	
Flashing light 2 Hz			Firmware download has been completed. Wait for POWER ON	Carry out a POWER ON.
Green/or- ange			Component recognition via LED is activated (p0154). Note:	
Flashing light - OR -			Both options depend on the LED status when activated via $p0154 = 1$.	
Red/orange				
Flashing light				
	On		The sensor power supply that can be dynamized is func- tioning fault-free.	
	Continuous red light		There is a fault in the sensor power supply that can be dynamized.	
		On	The sensor power supply is operating fault-free.	
		Continuous red light	There is a fault in the sensor power supply.	



4.18 Terminal Modules

Fail-safe inputs / double inputs

LED state			Description, cause	Remedy
F_DI z				
(Input x, (x+1)+, (x+1)-)				
	LED x	LED x+1	NC contact / NC contact ¹): (z = 09, x = 0, 2,18)	
Continuous light –	-	Red -	Different signal states at inputs x and x+1 No signal at input x and no signal at input x+1	
Continuous light –	-	Red -	NC contact / NO contact ¹): ($z = 09$, $x = 0, 2,18$) Identical signal states at inputs x and x+1 No signal at input x and a signal at input x+1	
	LED x	LED x+1	NC contact / NC contact ¹): (z = 09, x = 0, 2,18)	
Continuous	Green	Green	One signal at input x and one signal at input x+1	
light Continuous light	Green	Green	NC contact / NO contact ¹ : ($z = 09$, $x = 0, 2,18$) A signal at input x and no signal at input x+1	

¹⁾ Inputs x+1 (DI 1+, 3+, .. 19+) can be set individually via parameter p10040 (TM54F).

p10040 (TM54F) = 0: Input x+1 is an NC contact.

p10040 (TM54F) = 1: Input x+1 is an NO contact.

Factory setting: p10040 (TM54F) = 0 for all inputs x+1.

Single digital inputs, not fail-safe

LED state		Description, cause	Remedy
DI x			
-	Off	No signal at digital input x (x = 2023)	-
Green	Continuous light	Signal at digital input x	-

Fail-safe digital outputs with associated readback channel

LED state		Description, cause	Remedy		
F_DO y (0+3+, 03-)					
Green	Continuous light	Output y (y=0 3) has a signal	-		
Read back input	DI 2y for output F	_DO y (y = 03) for test stop.			
The state of the	LEDs depends on	the type of external circuit.			
DI 2y					
 Off One of the two output lines y+ or y- or both lines of output y have a signal 			_		
Green	Continuous light	Both output lines y+ and y- have no signal	_		



4.18.2 TM54F connections

Connections

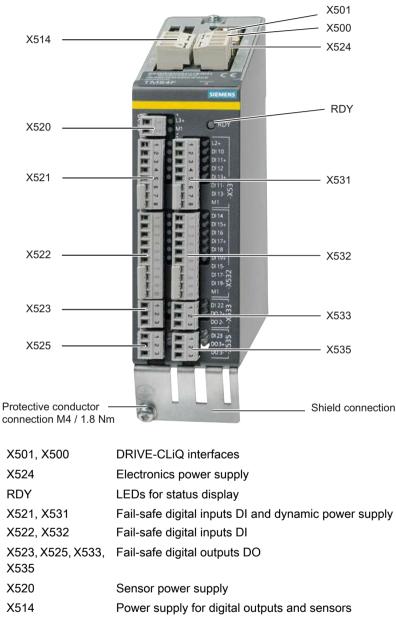


Image 4-61 TM54F connections



4.18 Terminal Modules

4.18.3 This is how you remove an TM54F

Overview

The activities that must be taken into account when replacing an TM54F are subsequently described.

If a TM54F has a hardware defect, then it must be replaced by an identical module.

Preconditions:

- The module is defective and must be replaced.
- The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.

Removing

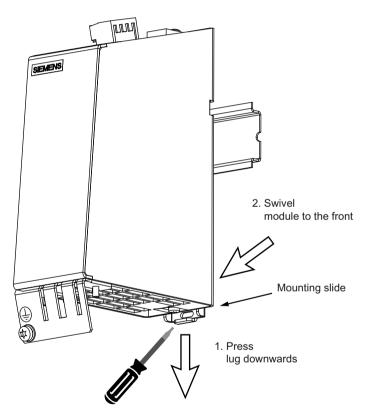


Image 4-62 TM54F removal

Procedure:

- 1. Label connectors X514 and X524 for the sensor and electronics power supply prior to withdrawing them.
- 2. Withdraw the connected DRIVE-CLiQ cables X500 and X501 and write the slot designation on the cable.
- 3. Label the connected connectors X520 X535 for digital inputs and outputs prior to withdrawing them.



4.18 Terminal Modules

- 4. Release the protective conductor connection and write the position designation on the cable.
- 5. If necessary, unscrew the shield connection.
- 6. Slide the lug downwards.
- 7. Swivel the module to the front to remove it.

Note

The 50 mm ventilation clearances above and below the components must be observed.

4.18.4 This is how you install a TM54F

Installing

Procedure:

- 1. Place the component on the mounting rail.
- 2. Then, swivel the component on the mounting rail so that the mounting catches click into place at the rear.
- 3. Slide the component along the mounting rail to either the left or right up to its final position.
- 4. Screw on the protective conductor connection.
- 5. If necessary, screw on the shield connection.
- 6. Insert the connectors for the digital inputs and outputs at X520 X535.
- 7. Insert the DRIVE-CLiQ cables at X500 and X501.
- 8. Insert the connectors for the sensor and electronics power supply at X514 and X524.

Note

The 50 mm ventilation clearances above and below the components must be observed.

4.18.5 TM120 status displays

Status displays

The Terminal Module TM120 has the following status displays, which provide information about the module state:

State		Description, cause	Remedy
RDY			
-	Off	Electronics power supply is missing or outside permissible toler- ance range.	Check the power sup- ply.
Green	Continuous light	The component is ready for operation and cyclic DRIVE-CLiQ com- munication is taking place.	



Service cases - hardware

4.18 Terminal Modules

State RDY		Description, cause	Remedy	
Orange	Continuous light	DRIVE-CLiQ communication is being established.		
Red	Red Continuous light At least one fault is present in this component. Note: The LED is controlled irrespective of the corresponding messages being reconfigured.		Remove and acknowl- edge fault.	
Green/red	Flashing light 0.5 Hz	Firmware is being downloaded.		
	Flashing light 2 Hz	Firmware download has been completed. Wait for POWER ON	Carry out a POWER ON.	
Green/ orange or red/ orangeFlashing light 2 HzComponent recognition via LED is activated (p0154).Note: Both options depend on the LED status when activated vi = 1.		Note: Both options depend on the LED status when activated via p0154		

4.18.6 TM120 safety instructions

Note

The 50 mm ventilation clearances above and below the components must be observed.

Note

Shielding

Connecting cables to temperature sensors must always be installed with shielding. The cable shield must be connected to the ground potential at both ends over a large surface area. Temperature sensor cables that are routed together with the motor cable must be twisted in pairs and shielded separately.

Note

If sensors other than those specified are connected, this may result in incorrect measured values.



4.18.7 TM120 connections

Connections

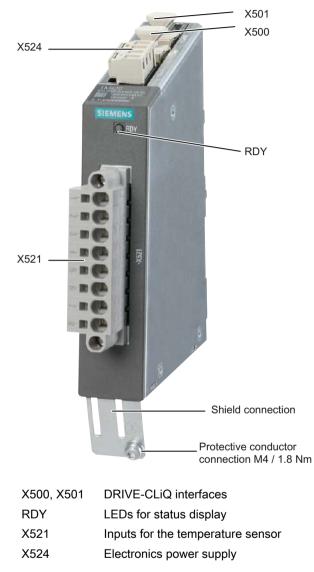


Image 4-63 TM120 connections



4.18 Terminal Modules

4.18.8 This is how you remove a TM120 and install it again

Removing

Procedure:

- 1. First shift the mounting slide downward at the lug to release the interlocking with the mounting rail.
- 2. Then swivel the component toward the front so that you can remove it upward from the mounting rail.

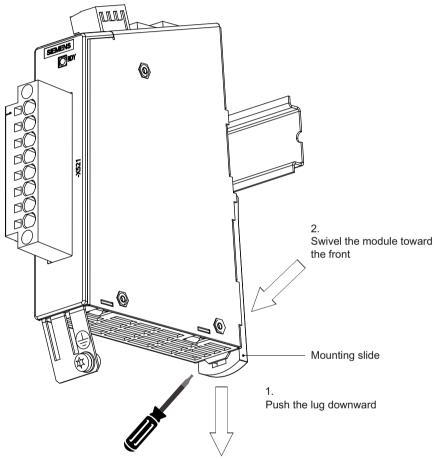


Image 4-64 Removing the TM120

Installing

Procedure:

- 1. Slightly tilt the component backward and attach it to the mounting rail using the catch.
- 2. Swivel the component on the mounting rail until you hear the mounting slide at the rear latch into position.
- 3. Slide the component along the mounting rail to either the left or right up to its final position.



4.19 Hub Modules

4.19.1 DMC20 status displays

Status displays

The DRIVE-CLiQ Hub Module DMC20 has the following status displays, which provide information about the module state:

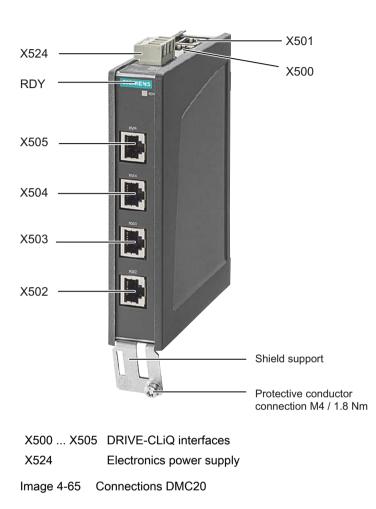
LED	Color	State	Description, cause	Remedy
RDY	-	Off	Electronics power supply is missing or outside permissible tolerance range.	-
	Green	Continuous light	The component is ready for operation and cy- clic DRIVE-CLiQ communication is taking place.	-
	Orange	Continuous light	DRIVE-CLiQ communication is being established.	-
	Red	Continuous light	This component has at least one fault.	Remove and acknowl-
		Note:	edge fault.	
			The LED is controlled irrespective of the corre- sponding messages being reconfigured.	
	Green/red	Flashes at 0.5 Hz	Firmware is being downloaded.	-
		Flashes at 2 Hz	Firmware download has been completed. Wait for POWER ON	Carry out a POWER ON.
	Green/orange or red/orange	Flashing	Component recognition via LED is activated (p0154).	-
			Note:	
			Both options depend on the LED status when activated via $p0154 = 1$.	



4.19 Hub Modules

4.19.2 DMC20 connections

Connections



4.19.3 This is how you remove a DMC20

Removing

Precondition: The control cabinet is in a no-voltage condition, all of the connectors and cables are labeled.

Procedure:

- 1. Before withdrawing it, label the connector X524 for the electronics power supply.
- Withdraw the connected DRIVE-CLiQ cables X500 X505 and write the slot designation on the cable.
- 3. Release the protective conductor connection and write the position designation on the cable.



4. First shift the mounting slide downwards at the lug ① to release the interlocking with the mounting rail.

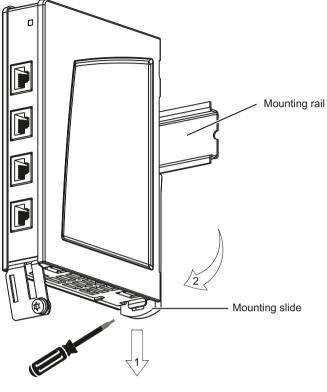


Image 4-66 Removing the DMC20

5. Swivel the module to the front to remove it from the mounting rail ②.

4.19.4 This is how you install a DMC20

Installing

Note

The 50 mm clearances above and below the components must be maintained.

Procedure:

- 1. Place the component on the mounting rail.
- 2. Then, swivel the component on the mounting rail so that the mounting catches click into place at the rear.
- 3. Slide the component along the mounting rail to either the left or right up to its final position.
- 4. Screw on the protective conductor connection.
- 5. Screw on the encoder connecting cable to X520.



4.19 Hub Modules

- 6. Insert the DRIVE-CLiQ cable at X500 X505.
- 7. Insert connector X524 for the electronics power supply.

4.19.5 DME20 connections

Connections

The component has degree of protection IP67 and is especially suitable for applications which require DRIVE-CLiQ nodes to be removed in groups, without interrupting the DRIVE-CLiQ line and therefore the data exchange.



Image 4-67 DME20 connections



4.19.6 This is how you mount a DME20

Mounting

Procedure:

1. Place the drilling pattern on the mounting surface. The mounting surfaces must be bare metal.

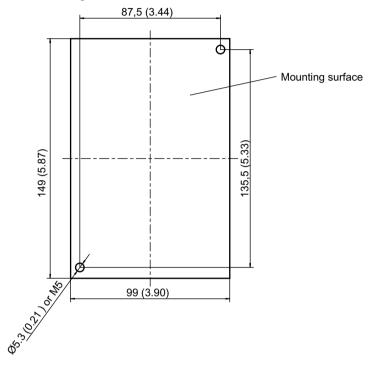


Image 4-68 DME20 dimensions

- 2. Drill the holes with Ø5.3 or M5 threads.
- 3. Tighten the component with a tightening torque of 6.0 Nm.



4.19 Hub Modules

4.19.7 Connection to X524 electronics power supply

Secondary conditions for DMC20 with UL approval

	Pin	Designation	Technical specifications
2 0 3 5 1	1 (brown)	Electronics power supply	The supply voltage of 20.4 V – 28.8
	2 (white)	Electronics power supply	V refers to the terminal voltage at th DMF20.
$\left(\left(\begin{array}{ccc}3&5&1\\0&0&0\end{array}\right)\right)$	3 (black)	Electronics ground	
40	4 (blue)	Electronics ground	The cable cross-section and the power supply cable length should b
	5 (gray)	Not connected	observed:
			• Pins 1 and 2 are internally jumpered.
			• Pins 3 and 4 are internally jumpered.

Pin assignment of the cable for connection to X524:

Address where the cables can be sourced

The following cables can be sourced through: Phoenix Contact (<u>https://www.phoenixcontact.com/online/portal/pc</u>)

Pre-assembled cables	Cables to be assembled by the user	
Pre-assembled cables Sensor/actuator cable, 5-pole, free cable end at the M12-SPEEDCON straight socket Length of cable: 2, 5, 10, 15 m (up to 100 m on request) SAC-5P-xxx-186/FS SCO	Cable ring, PUR/PVC black, 5-pole Conductor colors: brown/white/blue/black/gray Cable length: 100 m Conductor cross-section: 5 x 0.75 mm ² SAC-5P-100.0-186/0.75 Article number: 1535590 Connector: Sensor/actuator connector, socket, straight, 5-pin, M12, A-coded Screw connection, metal knurl, Pg9 cable gland SACC-M12FS-5CON-PG9-M	



4.20 MODEM MD720

4.20.1 Status displays MODEM MD720

LED status

The modem has three LEDs, which provide information about the operating state:

MODEM MD720	LED	State	Meaning
SIEMENS X2 STATUS OJALITY CONVECT	All in common	Flash on and off in a fast se- quence Slow flashing in synchronism Flash on and off in a slow se- quence Fast flashing in synchronism	Device starts Service mode Loading a firmware file Error
SET	STATUS	Slow flashing Fast flashing	Waiting for PIN input PIN error/ SIM error
TOTAL OF A	QUALITY	Slow flashing Flashes 1 time with interval Flashes 2 times with interval Flashes 3 times with interval ON OFF	Logging into a GSM network Field strength inadequate Field strength adequate Field strength good Field strength very good Waiting for PIN
	CONNECT	Flashing	Terminal mode activated

Reference

You can find information about the MODEM MD720 (Article number: 6NH9720-3AA01-0XX0) at: MODEM MD720 (<u>https://support.industry.siemens.com/cs/document/73513752</u>)

4.20.2 Replace SIM card

Removing the modem

To remove the module, proceed as follows:

- 1. Ensure that the module has been disconnected from the power supply.
- 2. Remove the MODEM MD720 from the mounting rail.



4.20 MODEM MD720

Replace SIM card

Use a mini SIM card, 15 x 25 mm.

Proceed as follows to replace the SIM card:

1. Release the slide for the SIM card at the rear of the MODEM MD720 by gently pressing the release button.

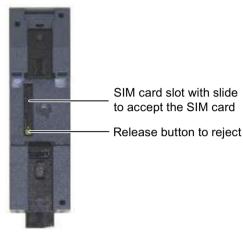


Image 4-69 MODEM MD720, rear side

- 2. Withdraw the slide from the housing and remove the SIM card.
- 3. Insert the new SIM card into the slide.
- 4. Move the slide into the housing until it gently latches into place.
- 5. Mount the MODEM MD720 on the mounting rail.

Note

Replacing the SIM card and PIN

When changing the SIM card, do not forget to change the PIN in your control.

If you are using a lot of SIM cards, it may make sense to set all SIM cards, e.g. with one cellular phone to the same PIN.

The device also operates with SIM cards, where the PIN prompt is deactivated. In this case, when establishing a connection, the prompt to enter a PIN is skipped.

4.20.3 This is how you load the factory settings

Restoring the factory settings

If you press the SET key for longer than 4 seconds until the LED "CONNECT" lights up, then the MODEM MD720 configuration is reset to the default values set in the factory.



When resetting, the consequences are as follows:

- An established connection is interrupted.
- The MODEM MD720 is restarted.
- The SIM card PIN is cleared. It is no longer possible to read out the logbook.

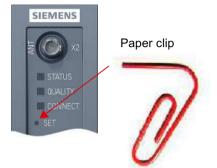


Image 4-70 MODEM MD720: SET key



Service cases - hardware

4.20 MODEM MD720



Spare parts and accessories

Order data for accessories

The following accessories are available:

Component	Article number
USB flash drive 16 GB, bootable USB 3.0	6ES7648-0DC60-0AA0
CompactFlash card 8 GB, empty as user memory	6FC5313-6AG00-0AA0
CompactFlash Card 2 GB, empty	6FC5313-5AG00-0AA2

Compatibility of CompactFlash cards

For SINUMERIK 828D, only the memory card (2 GB) with Article number 6FC5313-5AG00-0AA2 is permitted.

SINUMERIK control system supports the file systems FAT16 and FAT32 for CompactFlash cards. You may need to format the memory card if you want to ensure the compatibility of the memory card with the SINUMERIK, or if you wish to use a memory card from another device. Formatting the memory card will permanently delete all data on it.

- If you cannot use a memory card with SINUMERIK, then it possibly involves a memory card that has not been formatted for this control system (e.g. Ext3 Linux file system), or a memory card with a defective file system or an incorrect memory card type.
- Insert the memory card carefully and the right way round into the memory card slot (observe indicators such as arrow or similar). This way you avoid mechanical damage to the memory card or the device.
- Do not remove the memory card while it is being accessed. This can damage the memory card and the SINUMERIK as well as the data on the memory card.

Only use memory cards that have been approved by Siemens for use with SINUMERIK. Even though SINUMERIK follows general industry standards for memory cards, it is possible that memory cards from some manufacturers will not function perfectly in this device or are not completely compatible with it (you can obtain information on compatibility from the memory card manufacturer or supplier).



Ordering data for S120 Combi spare/replacement parts

An overview of the available S120 Combi spare parts is provided in the table below:

Component	Article number
S120 Combi front cover	6SL3161-3GP00-0AA0
S120 Combi guide frame for DRIVE-CLiQ cables	6SL3161-3EP00-0AA0
S120 Combi DC link lateral cover	6SL3161-3AP00-0AA0
S120 Combi internal fan with holder and data sheet	6SL3161-0JP00-0AA0
S120 Combi external fan module	6SL3161-0EP00-0AA0
S120 Combi drip protection	6SL3161-3DP00-0AA0
For the S120 Combi with 4 axes, this is provided in the pack of accessories when shipped from the factory; for all other S120 Combi versions this must be ordered and retrofitted.	
S120 Combi set of connecting terminals /Terminal Kit	6SL3161-8AP00-0AA0
24 V plug connector	
Terminal for the motor holding brake	
4 DRIVE-CLiQ blanking covers	
• 2 terminals (4-pole) for X12/X13	
• 2 terminals (4-pole) for X21/X22	
5 shield connecting terminals for motor cables	
Shield connection terminal for EP signal cables	

Ordering address

You can find accessories and spare parts for the components in the Internet at: Siemens Spares on Web (<u>https://b2b-extern.automation.siemens.com/spares_on_web</u>)



Appendix

A.1 Information about third-party software used

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QLocale's data is based on Common Locale Data Repository v1.6.1.

Note

You can find additional information on the product DVD in the Readme_OSS file about the third-party software used.



A.2 List of abbreviations

Abbreviation	Meaning	Explanation
ALM	Active Line Module	
ASCII	American Standard Code for Information Inter- change	American coding standard for the exchange of in- formation
AUTO	"Automatic" operating mode	
BAG	Mode group	
OPI	Operator Panel Interface	
BERO	Proximity limit switch with feedback oscillator	
BICO	Binector Connector	Interconnection technology for the drive
CEC	Cross Error Compensation	
CNC	Computerized Numerical Control	Computerized numerical control
dbSI	drive based Safety Integrated	Safety functions integrated in the drive
DB	Data Block in the PLC	
DBB	Data Block Byte in the PLC	
DBW	Data Block Word in the PLC	
DBX	Data Block Bit in the PLC	
DDE	Dynamic Data Exchange	Dynamic Data Exchange
DDS	Drive Data Set	Drive Data Set
DIN	Deutsche Industrie Norm	
DO	Drive object	Drive Object
DRAM	Dynamic Random Access Memory	Dynamic memory block
DRF	Differential Resolver Function	Differential resolver function (handwheel)
DRY	DRY run	DRY run feedrate
EDS	Encoder Data Set	Encoder data set
ESR	Extended Stop and Retract	
FIFO	First In - First Out	Method of storing and retrieving data in a memory
GUD	Global User Data	Global user data
HD	Hard Disk	Hard disk
Hardware	Hardware	
HSC	High-Speed Cutting	
IME	Input Method Editor	Entering Asian characters
INC	Increment	Increment
INI	Initializing Data	Initializing data
IGBT	Insulated Gate Bipolar Transistor	
IPO	Interpolator	
IRT	Isochronous Real Time	Isochronous communication
ISO	International Standardization Organisation	International Standards Organization
JOG	"Jogging" operating mode	Jogging via the direction keys
LEC	Leadscrew Error Compensation	Leadscrew error compensation
LED	Light Emitting Diode	Light-emitting diode
LUD	Local User Data	Local user data
MB	Megabyte	



Appendix

A.2 List of abbreviations

Abbreviation	Meaning	Explanation
MCP	Machine Control Panel	Machine control panel
MD	Machine data	
MDA	"Manual Data Automatic" operating mode	Manual input
MDS	Motor Data Set	Motor data set
MCS	Machine Coordinate System	
MLFB	Machine-Readable Product Code	
MPF	Main Program File	Main program (NC part program)
MAIN	Main program	Main program (OB1, PLC)
MPI	Multi Point Interface	Multi-Point Interface
NCK	Numerical Control Kernel	Numerical control kernel
NCU	Numerical Control Unit	NCK hardware unit
WO	Work Offset	
OEM	Original Equipment Manufacturer	
PCU	Programmable Control Unit	
PI	Program Instance	
PG	Programming device	
PLC	Programmable Logic Control	Programmable logic controller
POU	Program organization unit	in the PLC user program
PPU	Panel Processing Unit	Panel-based control
PZD	Process data for drives	
QEC	Quadrant Error Compensation	Quadrant error compensation
REF POINT	"Reference point approach" in JOG mode	
REPOS	"Repositioning" in JOG mode	
RPA	R-Parameter Active	Memory area on the NCK for R parameter numbers
RTC	Real Time Clock	Real-time clock
SBL	Single Block	Single block
SBR	Subroutine	Subroutine (PLC)
SD	Setting Data	
SDB	System Data Block	
SEA	Setting Data Active	Identifier (file type) for setting data
SK	Softkey	
SLM	Smart Line Module	
SPF	Subprogram file	Subprogram (NC)
SRAM	Static Random Access Memory	Static memory block
SW	Software	
TEA	Testing Data Aktive	Identifier for machine data
ТО	Tool Offset	Tool offset
ΤΟΑ	Tool Offset Active	Identifier (file type) for tool offsets
VPM	Voltage Protection Module	
VSM	Voltage Sensing Module	
WCS	Workpiece Coordinate System	
TMMG	Tool Magazine Management	



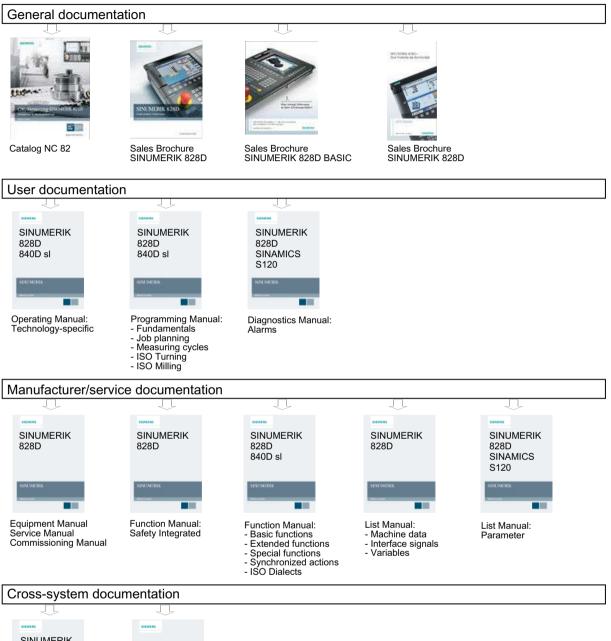
A.2 List of abbreviations

Abbreviation	Meaning	Explanation
ТМ	Tool Management	
ZOA	Zero Offset Active	Identifier (file type) for work offset data



A.3 Documentation overview

Documentation overview A.3





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