SIEMENS

SINUMERIK

SINUMERIK ONE
ONE MCP Part 1: MCP xxxx

Equipment Manual

Valid for:
Control system
SINUMERIK ONE
SINUMERIK 840D sl/840DE sl

Legal information

Warning notice system

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

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

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

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

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

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

Trademarks

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

Disclaimer of Liability

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

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Introduction $\mathbf{1}$

1.1 About SINUMERIK

From simple, standardized CNC machines to premium modular machine designs – the SINUMERIK CNCs offer the right solution for all machine concepts. Whether for individual parts or mass production, simple or complex workpieces – SINUMERIK is the highly dynamic automation solution, integrated for all areas of production. From prototype construction and tool design to mold making, all the way to large-scale series production.

Visit our website for more information SINUMERIK (https://www.siemens.com/sinumerik).

1.2 About this documentation

Validity

This Equipment Manual deals with Part 1 of the ONE MCP machine control panel. This documentation is valid for the systems SINUMERIK ONE and SINUMERIK 840D sl.

Target group

This Equipment Manual addresses planners, installers and configuration engineers in the field of automation technology. The Equipment Manual enables the target group to install, assemble, test, and operate the device professionally and safely.

Structure

The documentation provides information about components and functions of the ONE MCP machine control panel.

- The chapter "Description" contains general information about the device, such as appearance, features and interfaces.

- The chapter "Operator control and display elements" contains information on the operator control and display elements on the front and rear of the device.

- The chapter "Connecting" describes the pin assignment and the connection of the interfaces.

- In addition to the technical specifications of the device, the chapter "Technical specifications" contains information on disposal, as well as on the relevant standards and approvals.

Standard scope

This documentation only describes the functionality of the standard version. This may differ from the scope of the functionality of the system that is actually supplied. Please refer to the ordering documentation only for the functionality of the supplied drive system.

It may be possible to execute other functions in the system which are not described in this documentation. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

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

The machine manufacturer must document any additions or modifications they make to the product themselves.

Websites of third-party companies

This document may contain hyperlinks to third-party websites. Siemens is not responsible for and shall not be liable for these websites and their content. Siemens has no control over the information which appears on these websites and is not responsible for the content and information provided there. The user bears the risk for their use.

1.3 Documentation on the internet

1.3.1 Documentation overview SINUMERIK operator components

Comprehensive documentation about the SINUMERIK operator components is provided in the Documentation overview SINUMERIK operator components (https:// support.industry.siemens.com/cs/document/109783841/technische-dokumentation-zu-sinumerik-bedienkomponenten?dti=0&lc=en-WW).

You can display documents or download them in PDF and HTML5 format.

The documentation is divided into the following categories:

- Operator Panels

- Machine control panels

- Machine Pushbutton Panel

- Handheld Unit/Mini handheld devices

- Further operator components

An overview of the most important documents, entries and links to SINUMERIK is provided at SINUMERIK Overview - Topic Page (https://support.industry.siemens.com/cs/document/109766201/sinumerik-an-overview-of-the-most-important-documents-and-links?dti=0&lc=en-WW).

1.4 Feedback on the technical documentation

If you have any questions, suggestions, or corrections regarding the technical documentation published in the Siemens Industry Online Support, use the link "Give feedback" link which appears at the end of the entry.

1.5   mySupport documentation

With the "mySupport documentation" web-based system you can compile your own individual documentation based on Siemens content, and adapt it for your own machine documentation.

To start the application, click on the "My Documentation" tile on the "mySupport links and tools" (https://support.industry.siemens.com/cs/ww/en/my) portal page:

mySupport Links and Tools

i Support Request >	i My Filters >	i My Favorites >	i My Notifications >	i My Products >
i My Documentation ↗	i CAx download >	i My IBase Registrations ↗		

The configured manual can be exported in RTF, PDF or XML format.

Note

Siemens content that supports the mySupport documentation application can be identified by the presence of the "Configure" link.

1.6   Service and Support

Product support

You can find more information about products on the internet:

Product support (https://support.industry.siemens.com/cs/ww/en/)

The following is provided at this address:

- Up-to-date product information (product announcements)
- FAQs (frequently asked questions)
- Manuals
- Downloads
- Newsletters with the latest information about your products
- Global forum for information and best practice sharing between users and specialists

- Local contact persons via our Contacts at Siemens database (→ "Contact")

- Information about field services, repairs, spare parts, and much more (→ "Field Service")

Technical support

Country-specific telephone numbers for technical support are provided on the internet at address (https://support.industry.siemens.com/cs/ww/en/sc/4868) in the "Contact" area.

If you have any technical questions, please use the online form in the "Support Request" area.

Training

You can find information on SITRAIN at the following address (https://www.siemens.com/sitrain).
SITRAIN offers training courses for automation and drives products, systems and solutions from Siemens.

Siemens support on the go

With the award-winning "Industry Online Support" app, you can access more than 300,000 documents for Siemens Industry products – any time and from anywhere. The app can support you in areas including:

- Resolving problems when implementing a project

- Troubleshooting when faults develop

- Expanding a system or planning a new system

Furthermore, you have access to the Technical Forum and other articles from our experts:

- FAQs

- Application examples

- Manuals

- Certificates

- Product announcements and much more

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

Digital product information as QR code

The ID link according to IEC 61406 provides you with digital information about your product.

The ID link is a globally unique identifier and appears as a QR code on the product.

You can recognize the ID link by the frame with a black corner at the bottom right.

In addition to the digital nameplate you will find the following product information:

- Technical specifications
- FAQs
- Manuals
- Certificates
- Product announcements
- Application examples

1.7 Using OpenSSL

This product can contain the following software:

- Software developed by the OpenSSL project for use in the OpenSSL toolkit
- Cryptographic software created by Eric Young.
- Software developed by Eric Young

You can find more information on the internet:

- OpenSSL (https://www.openssl.org)
- Cryptsoft (https://www.cryptsoft.com)

1.8 Compliance with the General Data Protection Regulation

Siemens observes standard data protection principles, in particular the data minimization rules (privacy by design).

For this product, this means:

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

Fundamental safety instructions

2

2.1 General safety instructions

⚠ **WARNING**
Electric shock and danger to life due to other energy sources
Touching live components can result in death or severe injury.
• Only work on electrical devices when you are qualified for this job.
• Always observe the country-specific safety rules.
Generally, the following steps apply when establishing safety:
1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
3. Wait until the discharge time specified on the warning labels has elapsed.
4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
5. Check whether the existing auxiliary supply circuits are de-energized.
6. Ensure that the motors cannot move.
7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state.
8. Check that the correct drive system is completely locked.
After you have completed the work, restore the operational readiness in the inverse sequence.

⚠ **WARNING**
Electric shock due to connection to an unsuitable power supply
When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage. Contact with hazardous voltage can result in severe injury or death.
• Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV- (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.

⚠ WARNING
Electric shock due to equipment damage
Improper handling may cause damage to equipment. For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.
• Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
• Do not use any damaged devices.

⚠ WARNING
Electric shock due to unconnected cable 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.

⚠ WARNING
Electric shock if there is no ground connection
For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.
• Ground the device in compliance with the applicable regulations.

NOTICE
Damage to equipment due to unsuitable tightening tools.
Unsuitable tightening tools or fastening methods can damage the screws of the equipment.
• Only use screw inserts that exactly match the screw head.
• Tighten the screws with the torque specified in the technical documentation.
• Use a torque wrench or a mechanical precision nut runner with a dynamic torque sensor and speed limitation system.
• Adjust the tools used regularly.

> ⚠️ **WARNING**
>
> **Spread of fire from built-in devices**
>
> Built-in devices can cause a fire and a pressure wave in the event of a fault. Fire and smoke can escape from the control cabinet and cause serious personal injury and property damage.
>
> - Install built-in appliances in a robust metal control cabinet that is suitable for protecting people from fire and smoke.
> - Only operate built-in devices with the control cabinet doors closed.
> - Ensure that smoke can only escape via controlled and monitored paths.

> ⚠️ **CAUTION**
>
> **Symptomatic respiratory and skin reaction to chemicals**
>
> A newly purchased product might contain traces of substances that are identified as sensitizers.
>
> Sensitizers are substances which can cause sensitization in the lungs and skin after exposure to them.
>
> Once sensitized, individuals can have severe reactions to further exposure, even in small amounts. In the most extreme cases, individuals might develop asthma or dermatitis respectively.
>
> - If the product has a strong smell, keep it in a well-ventilated area for 14 days.

> ⚠️ **WARNING**
>
> **Unexpected machine movement caused by radio devices or mobile phones**
>
> Using radio devices, cellphones, or mobile WLAN devices in the immediate vicinity of the components can result in equipment malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.
>
> - Therefore, if you move closer than 20 cm to the components, be sure to switch off radio devices, cellphones or WLAN devices.
> - Use the "SIEMENS Industry Online Support App" or a QR code scanner only on equipment that has already been switched off.

> ⚠️ **WARNING**
>
> **Fire due to inadequate ventilation clearances**
>
> Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.
>
> - Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

NOTICE

Overheating due to inadmissible mounting position

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

- Only operate the device in admissible mounting positions.

⚠️ **WARNING**

Unexpected movement of machines caused by inactive safety functions

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

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

Note

Important Safety instructions for Safety Integrated

If you want to use Safety Integrated functions, you must observe the Safety instructions in the Safety Integrated documentation.

2.2 Equipment damage due to electric fields or electrostatic discharge

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

NOTICE
Equipment damage due to electric fields or electrostatic discharge
Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.
• Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g conductive foam rubber of aluminum foil.
• Only touch components, modules and devices when you are grounded by one of the following methods:
– Wearing an ESD wrist strap
– Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
• Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

2.3 Warranty and liability for application examples

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

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

2.4 Cybersecurity information

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

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

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

For additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/global/en/products/automation/topic-areas/industrial-cybersecurity.html.

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

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://new.siemens.com/global/en/products/services/cert.html.

Further information is provided on the Internet:

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

⚠ WARNING
Unsafe operating states resulting from software manipulation
Software manipulations, e.g. viruses, Trojans, or worms, can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.
• Keep the software up to date.
• Incorporate the automation and drive components into a state-of-the-art, integrated industrial cybersecurity concept for the installation or machine.
• Make sure that you include all installed products in the integrated industrial cybersecurity concept.
• Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
• Carefully check all cybersecurity-related settings once commissioning has been completed.

2.5 Residual risks of power drive systems

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

1. Unintentional movements of driven machine or system components during commissioning, operation, maintenance, and repairs caused by, for example,

    – Hardware faults and/or software errors in the sensors, control system, actuators, and connections

    – Response times of the control system and of the drive

    – Operation and/or environmental conditions outside the specification

    – Condensation/conductive contamination

    – Parameterization, programming, cabling, and installation errors

    – Use of wireless devices/mobile phones in the immediate vicinity of electronic components

    – External influences/damage

    – X-ray, ionizing radiation and cosmic radiation

2. Unusually high temperatures inside and outside the components, including open flames, as well as emissions of light, noise, particles, gases, etc. due to fault conditions, e.g.:

    – Component failure

    – Software errors

    – Operation and/or environmental conditions outside the specification

    – External influences/damage

    – Short circuits or ground faults in the intermediate DC circuit of the converter

3. Hazardous shock voltages caused by, for example:

    – Component failure

    – Influence during electrostatic charging

    – Induction of voltages in moving motors

    – Operation and/or environmental conditions outside the specification

    – Condensation/conductive contamination

    – External influences/damage

4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close

5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly

6. Influence of network-connected and wireless communications systems, e.g. ripple-control transmitters or data communication via the network or mobile radio, WLAN or Bluetooth.

7. Motors for use in potentially explosive areas:
When moving components such as bearings become worn, this can cause enclosure components to exhibit unexpectedly high temperatures during operation, creating a hazard in areas with a potentially explosive atmosphere.

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

Description

3

3.1 Overview

The customer-specific machine control panels permit user-friendly operation of the machine functions at complex machining stations. It is suitable for machine-level operation of milling, turning, grinding and special machines.

The documentation is structured in 2 parts. Part 1 contains general information that applies to all machine control panels. Part 2 covers specifics of the individual machine control panels. Both parts of the documentation must always be observed.

Depending on the design, the keys are designed with replaceable caps for machine-specific adaptations. The key caps can be freely inscribed using a laser. Alternatively, you can use clear key covers.

Validity

The following description applies to the following component:

Designation	Article number
SINUMERIK ONE MCP xxxx	6FC5303-0AP51-yyyy
	6FC5303-0AP0y-yyyy

The safety-related accessories / spare parts are marked in Section "Accessories and spare parts (Page 73)" with an *).

3.2 System features

Customer-specific MCPs (Machine Control Panels) can provide the following functions:

- Communication module for Industrial Ethernet or Profinet
- Keypads with 15, 12, 9, 3 or 2 keys with assigned RGB LEDs
- Up to 3 Powerrides
- Up to 2 electronic overrides with 16/23/29 positions
- Up to 2 handwheels
- Emergency stop button (4-wire), latching, tamper-proof
- SINUMERIK full CNC keyboard with 65 keys
- USB 2.0 hub with 4 interfaces bus powered / self powered
- USB 3.0 hub with 4 interfaces
- USB/RJ45 bushing
- RFID reader
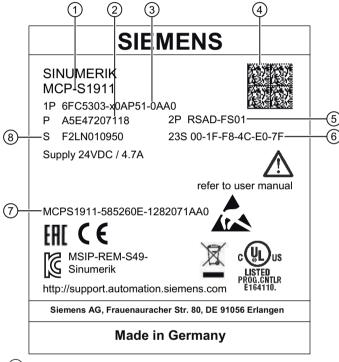
- Keyswitch

- Mounting slots for command devices (diameter 22.3 mm)

You can find the specific design for the respective version in Part 2 of the documentation.

3.3 Rating plate

Rating plate of an MCP-Sxxxx

①   Component name
②   Material number
③   Article number
④   Product code
⑤   Product version
⑥   MAC address
⑦   UL identifier
⑧   Serial number

Figure 3-1   Example graphic of the MCP-Sxxxx rating plate

Note

Different contents of the rating plates

The contents of the individual rating plate fields on the device may differ from those described in this manual (e.g. new product version, approvals and markings not yet issued, etc.).

Note

Product code scanning

The product code contains the article number of the device. Scan the product code with the aid of the Siemens Industry Online Support App to be taken directly to the Internet Webpage for the product, including all of the technical information and graphical data.

The app is available for iOS, iPadOS and Android.

Operator control and display elements

4

4.1 Emergency stop chain

Emergency stop button

Press the red emergency stop button in emergencies when

- people are at risk,

- there is the danger of machines or the workpiece being damaged.

As a rule, when operating the emergency stop button, all drives are brought to a standstill with max. braking torque.

To unlock the emergency stop button, turn it to the right.

When the emergency stop button is activated, the emergency stop chain will ensure personal safety and protect the machine in hazardous situations.

Refer to the machine tool manufacturer's specifications for other responses to an emergency stop.
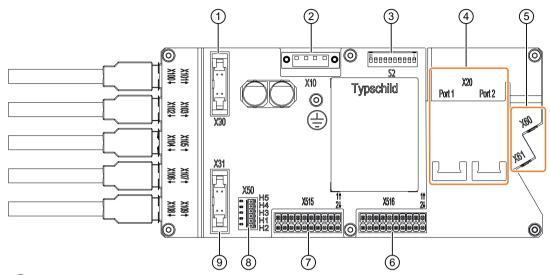
> ⚠ **WARNING**
>
> **Danger of death resulting from the premature emergency stop unlocking**
>
> If you shut down the system to be monitored, you can only release the emergency stop button or put the system to be monitored back into operation if the condition that triggered the emergency stop function has been corrected and a safe restart is ensured.

4.2 Communication module for Industrial Ethernet and PROFINET

① Interface for feedrate override rotary switch
② 24 V power supply interface
③ DIP switch S2
④ Ethernet port 1 / port 2
⑤ Connections for 2 handwheels
⑥ Interfaces for custom made inputs and outputs
⑦ Interfaces for custom made inputs and outputs
⑧ Keyswitch interface
⑨ Interface for spindle override rotary switch

Figure 4-1   View of communications module

4.3 Interfaces

4.3.1 Overview

Interface	Designation	Max. cable length	Type
X10	24 V power supply interface communications module	10 m	Terminal block, 4-pin
X11	24 V power supply interface USB hub 2.0 SF/3.0	10 m	Terminal block, 4-pin
X20 P1 / X20 P2	Ethernet port 1 / port 2	100 m	RJ45
X30	Interface for feedrate override rotary switch	1 m	10-pin male con-nector
X31	Interface for spindle override rotary switch	1 m	10-pin male con-nector

Interface	Designation	Max. cable length	Type
X50	Keyswitch interface	1 m	6-pin male connector, 2.54 mm
X60 / X61	Connections for 2 handwheels	10 m	ix connector
X515 X516	Interfaces for custom made inputs and outputs	2 m	20-pin plug connector
S2	DIP switch		
	Protective conductor connection	As specified in the national specifications, the necessary cross-section must at least be the same as the cross-section of the power supply cord	M5 screw

The following special requirements apply for the connection cables:

- The 24 V DC cable must be approved for temperatures up to 70 °C.

- Select the permitted conductor cross-section in accordance with the national regulations (NEC, VDE, etc.) and the "Power supply connectors" table below. The basis for this can be the output current of the 24 V DC power supply or the overcurrent protection device used in the 24 V circuit. If the 24 V power supply unit that is used has a short-circuit current greater than 50 A, a corresponding overcurrent protection device, which limits to this value, must be used upstream of the product.

- Strip the cables (7 mm) for connection to the 24 V DC connector.

- Flame resistance of the 24 V DC cable in accordance with UL 2556 VW-1 / or tested in accordance with IEC 60332-1-2.

- Observe the permissible bending radius of the cables.

- Route all the cables so that they cannot be crushed or pinched.

- Route all of the cables in such a way that they do not come into contact with chafing edges.

Les câbles de raccordement doivent répondre aux conditions suivantes :

- Le câble 24 V CC doit être autorisé pour des températures jusqu'à 70 °C.

- Choisir la section de conducteur conformément aux prescriptions nationales (NEC, VDE,...) dans le tableau ci-dessous "Power plug". Le courant de sortie de l'alimentation 24 V CC ou le dispositif de protection contre les surintensités du circuit de commande 24 V peuvent servir de base. Si le courant de court-circuit de l'alimentation 24 V CC utilisée est supérieur à 50 A, placer un dispositif de protection contre les surintensité en amont du produit qui limite le courant à cette valeur.

- Dénuder les conducteurs de raccordement au connecteur 24 V CC sur 7 mm.

- Tenir compte de la résistance au feu du câble 24 V CC selon UL 2556 VW-1/ ou satisfaisant aux essais selon CEI 60332-1-2.

- Tenir compte du rayon de courbure admissible des câbles.

• Pose les câbles de manière à ce qu'ils ne pincent pas les câbles.

• Pose les câbles en évitant tout contact avec des arrêtes abrasives.

Note

Warning for areas subject to NEC or CEC

Safety note for connectors with Ethernet marking:

An Ethernet or Ethernet segment with all associated interconnected devices shall be located within a single low voltage distribution network and within a single building.

The Ethernet is assigned accordingly to an "Environment A" according to IEEE802.3 or "Environment 0" according to IEC TR 62102.

Never make a direct electrical connection to TNV lines (telephone network) or WAN (Wide Area Network).

Note

Measures for protecting against viruses in a CNC environment

Take all the necessary measures for virus protection in the CNC environment. This also includes the proper handling of data storage media, USB sticks and network connections, precautionary measures when copying data and during software installations, etc.

Secure the interfaces against unauthorized access using suitable measures. You can physically protect the interfaces using USB port locks. Or you introduce appropriate security measures in the software, e.g. for USB interfaces that are forwarded to an IPC.

Pin assignment

The pin assignments of the interfaces can be found in Chapter "Connecting" > "Interfaces".

Power supply plugs X10/X11

The 24 V DC load current supply required for power supply is wired to screw terminal blocks X10 and X11:

Features	Version
Connection option	Up to 2.5 mm^2
Ampacity	Max. 10 A
Max. cable length	10 m

If you only use one line per connection, an end sleeve is not required.

The following end sleeves are permissible: without insulating collar according to DIN 46228, Form A, long version.

Use flexible cables with a cross-section of 0.25 to 2.5 mm^2 (or AWG 23 to AWG 13) for wiring the power supply according to the maximum current that flows.

Additional components

All possible components are described below. Refer to Part 2 of the documentation for the specific setup of the MCP.

4.3.2   Key modules

4.3.2.1   Key module 3x5

This is a key module with 15 illuminated short-stroke keys with replaceable key caps.

The key module can be installed in both the horizontal and vertical mounting position.

Furthermore, the modules "Key module 1x3" (Page 30) and "Key module 1x2" (Page 30) can be connected.
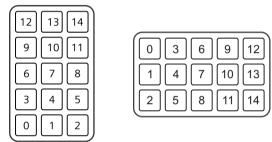
Figure 4-2   Key module 3x5 (vertical and horizontal mounting position)

4.3.2.2   Key module 3x4

This is a key module with 12 illuminated short-stroke keys with replaceable key caps.

The key module can be installed in both the horizontal and vertical mounting position.

Furthermore, the modules "Key module 1x3" (Page 30) and "Key module 1x2" (Page 30) can be connected.
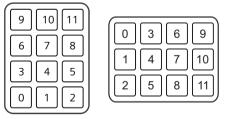
Figure 4-3   Key module 3x4 (vertical and horizontal mounting position)

4.3.2.3   Key module 3x3

This is a key module with 9 illuminated short-stroke keys with replaceable key caps.

The key module can be installed in both the horizontal and vertical mounting position.

Furthermore, the modules "Key module 1x3" (Page 30) and "Key module 1x2" (Page 30) can be connected.
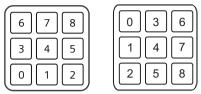
Figure 4-4   Key module 3x3 (vertical and horizontal mounting position)

4.3.2.4   Key module 1x3

This is a key module with 3 illuminated short-stroke keys with replaceable key caps.

The connection to the MCP is made via one of the modules "Key module 3x3" (Page 29), "Key module 3x4" (Page 29) and "Key module 3x5" (Page 29). The key module can be installed in both the horizontal and vertical mounting position.

For the connection of the module, refer to Part 2 of the documentation.
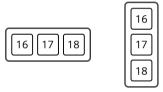
Figure 4-5   Key module x.1 1x3 (horizontal and vertical mounting position)
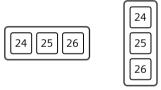
Figure 4-6   Key module x.2 1x3 (horizontal and vertical mounting position)

4.3.2.5   Key module 1x2

This is a key module with 2 illuminated short-stroke keys with replaceable key caps.

The connection to the MCP is made via one of the modules "Key module 3x3" (Page 29), "Key module 3x4" (Page 29) and "Key module 3x5" (Page 29). The key module can be installed in both the horizontal and vertical mounting position.

For the connection of the module, refer to Part 2 of the documentation.
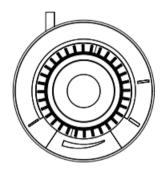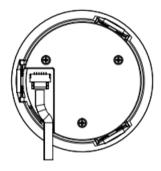
Figure 4-7   Key module x.1 1x2 (horizontal and vertical mounting position)

Figure 4-8   Key module x.2 1x2 (horizontal and vertical mounting position)

4.3.3   Powerride

Features of the Powerride:

• Rotary wheel with integrated momentary contact switch

• 36 notches per revolution, incremental counter

• Scale (2/3 circle with 25 segments) with RGB LEDs

• The scale color can be configured by 3 bits (RGB)

• Key for "Cycle Start" with green LED

• Vibrating motor for haptic feedback signals, with choice of vibration patterns

More information

More information on the function description of the Powerride can be found in the respective PLC Equipment Manuals.

e.g. for SINUMERIK ONE "LBP_PowerRide" function block

4.3.4   Override rotary switch with 16/23/29 positions

• Up to 2 overrides can be used

• 16, 23 or 29 positions

• Gray-code coding

• Central attachment

• Connection via ribbon cable with plug connector
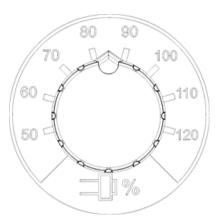
Figure 4-9   Example of spindle override

Note

The connection to the MCP is made via X30/X31.

X30	Feedrate override
X31	Spindle override

4.3.5   Electronic handwheels

Figure 4-10   Handwheel

Electronic handwheels are incremental encoders whose signals correspond to rotation of the wheel actuated manually.

The handwheels are equipped with a magnetic latching mechanism that supports traversing with incremental accuracy. The axis selected via the control can be positioned so that the axes are parallel.

The handwheels have 100 I/U lines.

Up to 2 handwheels can be connected.

X60	Handwheel 1
X61	Handwheel 2

4.3.6 USB devices

4.3.6.1 SINUMERIK full CNC keyboard

The SINUMERIK full CNC keyboard permits user-friendly and convenient input of programs and text. The SINUMERIK full CNC keyboard is equipped with short-stroke keys and is connected via USB (USB2.0 compatible). The SINUMERIK full CNC keyboard can be connected to, for example, SIMATIC ITC V3, SIMATIC IFP or SIMATIC IPC.

Figure 4-11   USB keyboard

The keyboard has 65 keys.
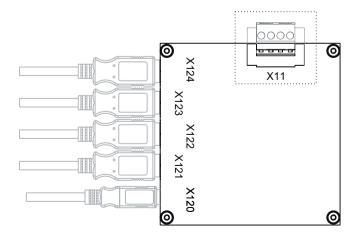
4.3.6.2 USB 2.0 hub

The optional USB 2.0 hubs have four downstream ports with USB 2.0 Hi-Speed. The USB keyboard is usually connected to one of these ports.

The USB 2.0 hub BP (bus powered) is supplied with the supply voltage via the host connection X120.

For requirements with an ampacity of 0.5 A per downstream port, the USB 2.0 hub SF (self powered) version with an integrated power supply can be used.

The X11 interface is only available for the "self powered" version.
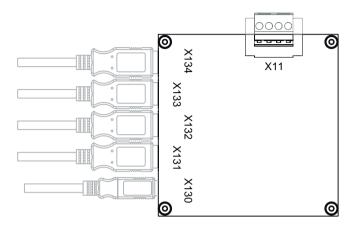
4.3.6.3 USB 3.0 hub

The optional USB3.0 hub has four downstream ports and an integrated power supply.

The USB keyboard can be connected to one of these ports.

4.3.7 Key-operated authorization switch

The key-operated authorization switch allows setting the authorization levels. The delivery kit includes 3 keys with different coding.

The key-operated authorization switch has 4 positions.

4.3.8 Slots for additional components (diameter 22.3 mm)

Additional mounting slots with a diameter of 22.3 mm can be provided for further operator controls.

The following components are provided for installation:

• USB bushing

• RJ45 bushing

• Indicator lights

• Command devices

Mounting 5

Note

Since some of the interfaces do not have a cable strain relief for the cables to be connected, it is recommended to secure the cables to the u-shaped lugs on the supporting plate using cable ties.

⚠️ **WARNING**

Electric shock in the event of an individual error when grounding is insufficient

If the device is installed in an environment with hazardous voltages with inadequate grounding, this may cause an electric shock in the event of an individual error. This can result in death, serious injury and material damage.

Adequately ground the conductive parts of the device in accordance with the nationally applicable regulations. When dimensioning the protective conductor connection, note the fuse ratings of the electrical circuits with hazardous voltages, which would have an effect in possible individual error scenarios.

⚠️ **WARNING**

Electric shock in the event of an individual error when the rear cover is missing

If the rear cover is missing when mounting the device in an environment with hazardous voltage, a conductor with a hazardous voltage can come loose in the event of a normative permissible individual error and touch parts of the printed-circuit board and cause electric shocks. Due to its design, the printed-circuit board cannot trigger the overcurrent protection of the circuit with hazardous voltage.

For this reason, protect areas of the printed-circuit board that are not adequately enclosed by grounded sheet metal parts with a cover, when installed in an environment with hazardous voltages. If this cover is made of conductive material, it must be safely grounded. See "Electric shock in the event of an individual error when grounding is insufficient".
To avoid electric shocks, mount a rear cover on the device when installing it in an environment with hazardous voltage.

⚠️ **WARNING**

Parasitic voltage

If the device is installed with inadequate insulation in an environment with higher/more hazardous voltages, parasitic voltages may occur. This can result in death, serious injury and material damage.

Insulate the cables appropriately for the highest voltage coming into consideration.

NOTICE
Protection of interfaces against unauthorized access
Machine control panels must be integrated and operated in a housing/console/control cabinet so that interfaces can be protected against unauthorized access, as described in the "Connecting" section.

The safety of a system with an integrated MCP with operator panel front is the responsibility of the person setting up the system.

Observe all relevant information from this manual regarding the mounting of the chosen operator panel front.

The mounting at the installation site is performed in accordance with the instructions of the chosen operator panel front.

Panel cutout

Excerpts for installing the respective devices are shown in Part 2 of the documentation.

Connecting

6

Overview

The relevant interfaces for cabling the control desk are located on the rear side of the machine control panel.

Pin assignment of the interfaces

The pins of the component interfaces are assigned as specified in the tables below. Any deviations are indicated at the relevant point.

Signal type	
I	Input
O	Output
B	Bidirectional (inputs/outputs)
V	Power supply
-	N.C. (not connected = not assigned)

6.1 General requirements for the equipotential bonding

Potential differences must be reduced through the use of equipotential-bonding cables to the extent that the affected electronic components function flawlessly. You must therefore observe the following information when setting up the equipotential bonding:

- The lower the impedance of the equipotential-bonding cable or the bigger the cross-section of the equipotential-bonding cable, the greater the equipotential bonding effect.

- If two parts of the system are connected to each other via shielded data cables, with shielding that is connected at both ends to the grounding/protective cable, the impedance of the additionally installed equipotential-bonding cable must not exceed 10% of the shield impedance.

- The cross-section of an equipotential-bonding cable must be dimensioned for the maximum flowing compensating current.
  Equipotential-bonding cables with a minimum cross-section of 16 mm^2 are required between control cabinets.

- Use equipotential-bonding cables made of copper or galvanized steel. Connect the equipotential-bonding cables via a broad surface area to the grounding/protective conductor. Protect the equipotential-bonding cables against corrosion.

- Using suitable cable clamps, connect the shield of the data line at the HMI device tightly to a surface of the equipotential bonding rail.

- Route the equipotential-bonding cables and data cables parallel to each other and with a minimum distance between them.

Note

Cable shields are not suitable for equipotential bonding. Only use the equipotential-bonding cables required for this purpose. Ensure the cross-section of cables is sufficient when setting up PROFINET networks. Otherwise there is a risk that interface blocks can become damaged or destroyed.

6.2 Power supply

Connector designation:	X10/ X11
Connector type:	Terminal block, 4-pin contact strip
Total cable length:	10 m

Table 6-1   Pin assignment of plug X10/ X11

Pin	Name	Type	Meaning
1	P24	V	Power supply 24 V DC (20.4 to 28.8 V)
2	-	NC	
3	M	V	Ground
4	M	V	Ground

The 24 V DC is looped through via the connector. In the plug, pin 1 is bridged with pin 2 and pin 3 with pin 4.

6.3 Ethernet ports X20

Connector designation:	X20 P1, X20 P2*
Connector type:	Standard RJ45 socket
Max. data transmission rate:	10/100/1000 Mbit/s
Max. cable length:	100 m
Connector assignment:	Downlink (switch)

*X20 P2 only available in Industrial Ethernet mode

Table 6-2   PN mode

Pin	Name	Type	Remark
1	RX+	I	Receive +
2	RX-	I	Receive -
3	TX +	O	Transmit +
4	-		Terminating device
5	-		Terminating device
6	TX -	O	Transmit -
7	-		Terminating device
8	-		Terminating device
Shield	-	-	On connector housing

Signal type: O = Output; I = Input

Table 6-3   IE mode

Pin	Name	Type	Remark
1	DA+	B	Bidirectional pair A+
2	DA-		Bidirectional pair A-
3	DB+		Bidirectional pair B+
4	DC+		Bidirectional pair C+
5	DC-		Bidirectional pair C-
6	DB-		Bidirectional pair B-
7	DD+		Bidirectional pair D+
8	DD-		Bidirectional pair D-
Shield	-	-	On connector housing

Signal type: B = Bidirectional

6.4   Axis override switches X30, X31

Feedrate override switch

Connector designation:	X30
Connector type:	2 x 5-pin male connector, according to EN 60603-13 with coding
Max. cable length	1 m

Pin	Signal name	Type	Meaning
1	-		n.c.
2	-		n.c.
3	M	V	Ground
4	-		n.c.
5	P5	V	Supply 5 V, max. 100 mA

Pin	Signal name	Type	Meaning
6	OV_VS16	I	Rotary switch position/value 16
7	OV_VS8	I	Rotary switch position/value 8
8	OV_VS4	I	Rotary switch position/value 4
9	OV_VS2	I	Rotary switch position/value 2
10	OV_VS1	I	Rotary switch position/value 1

Spindle override switch

Connector designation:	X31
Connector type:	2 x 5-pin male connector, according to EN 60603-13 with coding
Max. cable length	1 m

Pin	Signal name	Type	Meaning
1	-		n.c.
2	-		n.c.
3	M	V	Ground
4	-		n.c.
5	P5	V	Supply 5 V, max. 100 mA
6	OV_SP16	I	Rotary switch position/value 16
7	OV_SP8	I	Rotary switch position/value 8
8	OV_SP4	I	Rotary switch position/value 4
9	OV_SP2	I	Rotary switch position/value 2
10	OV_SP1	I	Rotary switch position/value 1

6.5 Universal inputs and outputs X515, X516

Only switches (passive inputs) with the associated LEDs may be connected via the X515 and X516 connectors.

Connector designation:	X515/X516
Connector type:	Male connector, 20-pin
Max. cable length	2 m
Mating connector	6FC5348-0AP00-0AA0

Pin assignment of the interfaces X515/X516

Figure 6-1   Pin assignment X515/X516

Table 6-4   Assignment of connector X515

Pin	Signal name	Type	Meaning
1	KT-IN1	I	Customer key 1
2	KT-IN2	I	Customer key 2
3	KT-IN3	I	Customer key 3
4	KT-IN4	I	Customer key 4
5	KT-IN5	I	Customer key 5
6	KT-IN6	I	Customer key 6
7	KT-IN7	I	Customer key 7
8	KT-IN8	I	Customer key 8
9	M	V	Ground
10	M	V	Ground
11	M	V	Ground
12	M	V	Ground
13	KT-OUT1	O	24 V output 1
14	KT-OUT2	O	24 V output 2
15	KT-OUT3	O	24 V output 3
16	KT-OUT4	O	24 V output 4
17	KT-OUT5	O	24 V output 5
18	KT-OUT6	O	24 V output 6
19	KT-OUT7	O	24 V output 7
20	KT-OUT8	O	24 V output 8

KT-IN: customer keys input; KT-OUT: customer keys output

Table 6-5   Assignment of connector X516

Pin	Signal name	Type	Meaning
1	KT-IN9	I	Customer key 9
2	KT-IN10	I	Customer key 10
3	KT-IN11	I	Customer key 11
4	KT-IN12	I	Customer key 12
5	KT-IN13	I	Customer key 13
6	KT-IN14	I	Customer key 14
7	KT-IN15	I	Customer key 15
8	KT-IN16	I	Customer key 16
9	M	V	Ground
10	M	V	Ground
11	M	V	Ground
12	M	V	Ground
13	KT-OUT9	O	24 V output 9
14	KT-OUT10	O	24 V output 10
15	KT-OUT11	O	24 V output 11
16	KT-OUT12	O	24 V output 12

Pin	Signal name	Type	Meaning
17	KT-OUT13	O	24 V output 13
18	KT-OUT14	O	24 V output 14
19	KT-OUT15	O	24 V output 15
20	KT-OUT16	O	24 V output 16

Universal inputs X515 / X516
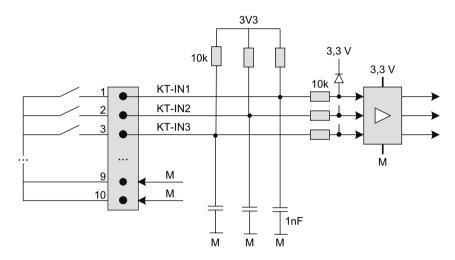
Figure 6-2   Schematic circuit diagram

Table 6-6   Technical data

Parameter	Value
Voltage	Nominal: 0 V to 5 V Permissible: -3 V to 30 V
Typical power consumption	+0.2 mA at 5 V DC -0.3 mA at 0 V DC
Signal level (including ripple)	High: 2.3 V to 5 V Low: 0 to 1.0 V
Electrical isolation	None

Note

When connecting an external 24 V DC power supply to interfaces X515/ X516, this must satisfy the requirements of a protective extra low voltage (PELV) according to UL 61010. A backup fuse must also be used which safely trips within 120 seconds at an ambient temperature of 0 °C for a current of 6.5 A.

Alternatively, a circuit must be used that limits the current to 5 A within 60 seconds during normal operation and in the event of an individual error.

The contact gap of the fuse or the individual error-proof circuit must be ensured with 3.0 mm according to UL 61010 for a primary power supply from OVC III circuits up to 600 V AC (line-to-neutral voltage).

When using an external power supply, make sure that the fuse used has a tripping rating that corresponds to the maximum possible short-term short-circuit current of the power supply unit used.

Universal outputs X515 / X516

The outputs are provided for the activation of LEDs in the keys.
High-side switches that switch the operating voltage to the LEDs and limit the current during short circuits are used as output drivers.
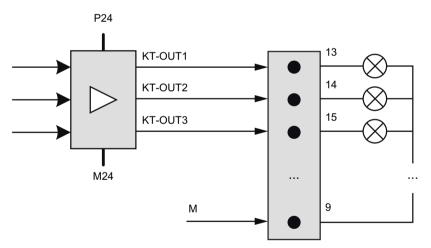
Figure 6-3   Schematic circuit diagram

Table 6-7   Technical data

Parameter	Value
Voltage [1]	24 V (20.4 V … 28.4 V)
Maximum load current per output	0.5 A
Max. load current per connector	1 A

Parameter	Value
Max. load current per output at 100% simultaneity of all 16 outputs	0.15 A
Electrical isolation	None

1) Supplied via plug X10

6.6 USB upstream port X120

The interface for the USB 2.0 hub BP is designed as a "high powered interface" (5 V/500 mA). As a result, the USB 2.0 hub BP can only be connected to USB interfaces which possess their own power supply and whose downstream ports are capable of supplying a current of 500 mA. A standard USB 2.0 Hi-Speed cable of max. 3 m in length (recommended: 1.5 m) is supported.

Connector designation: X120

Connector type: USB-B connector, 4-pin

Table 6-8   Assignment of the USB interface

Type B socket	Pin	Name	Type	Remark
	1	P5V_fused	V	+ 5 V (fused)
	2	Data-		Data -
	3	Data+	B	Data +
	4	GND	V	Ground (reference potential)

6.7 USB interfaces X121-X124

Table 6-9   Cable specification of the interfaces X121, X122, X123 and X124

Connector type	USB socket – type A	
Version	USB 2.0 bus powered	USB 2.0 self powered
Current carrying capacity per interface	0.1 A	0.5 A
Max. cable length	2 m	2 m
Max. power consumption per interface	0.5 W	2.5 W

Note

The 5 V power supply is designed to be short-circuit proof.

Pin assignment

Type A socket	Pin	Name	Type	Remark
	1	P5V_fused	V	+ 5 V (fused)
	2	Data-		Data -
	3	Data+	B	Data +
	4	GND	V	Ground (reference potential)

6.8 USB upstream port X125 Qwerty

Interface X125 is implemented as a "high powered interface" (5 V/ 500 mA). As a consequence, the X125 can only be connected to USB interfaces which have their own power supply and whose downstream ports are capable of supplying a 500 mA current. A standard USB 2.0 Hi-Speed cable of max. 3 m in length (recommended: 1.5 m) is supported.

Connector designation: X125
Connector type: USB-B connector, 4-pin

Table 6-10   Assignment of the USB interface

Type B socket	Pin	Name	Type	Remark
	1	P5V_fused	V	+ 5 V (fused)
	2	Data-		Data -
	3	Data+	B	Data +
	4	GND	V	Ground (reference potential)

6.9 USB upstream port X130

A standard USB 3.0 SuperSpeed cable of max. 3 m in length (recommended: 1.5 m) is supported.

Connector designation: X130
Connector type: USB-B connector, 4-pin

Table 6-11   Assignment of the USB interface

Type B socket	Pin	Name	Type	Remark
	1	VBUS	V	+ 5 V (fused)
	2	Data-	B	Data -
	3	Data+		Data +
	4	GND	V	Ground (reference potential)
	5	SSTX-	B	SuperSpeed data cable (sender)
	6	SSTX+	B	SuperSpeed data cable (sender)
	7	GND	V	Ground (reference potential)
	8	SSTX-	B	SuperSpeed data cable (receiver)
	9	SSTX+	B	SuperSpeed data cable (receiver)

6.10   USB interfaces X131-X134

Table 6-12   Cable specification of the interfaces X131, X132, X133 and X134

Connector type	Socket – Type A
Version	USB 3.0
Current carrying capacity per interface	0.5 A
Max. cable length	5 m
Max. power consumption per interface	2.6 W

Note

The 5 V power supply is designed to be short-circuit proof.

Pin assignment

Type A socket	Pin	Name	Type	Remark
	1	VBUS	V	+ 5 V (fused)
	2	D-	B	Data -
	3	D+		Data +
	4	GND	V	Ground (reference potential)
	5	RX-	B	Data -
	6	RX+		Data +
	7	GND	V	Ground
	8	TX-	B	Data -
	9	TX+		Data +

6.11 Handwheels X60, X61

Handwheels 1 and 2

Connector designation:	X60, X61
Connector type:	10-pole
Max. cable length:	10 m
Mating connector:	Siemens signal connector IX (6FX2003-0DE01)

Pin	Signal name	Type	Meaning
1	P5HW	V	Supply voltage 5 V, max. 100 mA
2	-		n.c.
3	HW1_A	I	Handwheel pulses track A
4	HW1_XA	I	Handwheel pulses track A (negated)
5	M	V	Ground
6	M	V	Ground
7	HW1_B	I	Handwheel pulses track B
8	HW1_XB	I	Handwheel pulses track B (negated)
9	-		n.c.
10	P5HW	V	Supply voltage 5 V, max. 100 mA

6.12 Status LEDs

Information on the states of the status LEDs can be found in Chapter LED displays (Page 65).

6.13 Switch S2

A logical address can be assigned to the MCP for communication via Ethernet using the 10-bit switch S2.

To replace the Powerride, see Chapter "Replacing the Powerride (Page 74)".

Table 6-13   Basic setting of the switch S2

1-8		9	10	Meaning
See Table "Settings of switch S2"		on	on	PN
		off	off	IE (default)

MCP set up as PN

The two switches S2-9 and S2-10 must be set to "on" in order for PN functionality to be supported.

The switches S2-1 to S2-8 define the default device name.
Up to 128 default device names are supported. If these default device names are used, there is no need for initialization of the MCP.

Note

The default device names cannot be reconfigured using the STEP7 "Device initialization" function for example.
If you are connecting the MCP to a SINUMERIK control as a PROFINET component, make sure that this functionality is supported by the control concerned.

DCP mode:
No default device name is available in this mode. The device name must be set by means of an initialization procedure and remains saved on the MCP. It is deleted again if the factory setting is restored, e.g. using STEP 7.

Table 6-14   Settings of switch S2

1	2	3	4	5	6	7	8	9	10	Meaning
								on	on	
on	on	on	on	on	on	on	on			DCP mode
on	on	on	on	on	on	on	off			Default device name: mcp-pn127
off	on	on	on	on	on	on	off			Default device name: mcp-pn126
on	off	on	on	on	on	on	off			Default device name: mcp-pn125
off	off	on	on	on	on	on	off			Default device name: mcp-pn124
on	on	off	on	on	on	on	off			Default device name: mcp-pn123
off	on	off	on	on	on	on	off			Default device name: mcp-pn122
on	off	off	on	on	on	on	off			Default device name: mcp-pn121
off	off	off	on	on	on	on	off			Default device name: mcp-pn120
on	on	on	off	on	on	on	off			Default device name: mcp-pn119
off	on	on	off	on	on	on	off			Default device name: mcp-pn118
on	off	on	off	on	on	on	off			Default device name: mcp-pn117
off	off	on	off	on	on	on	off			Default device name: mcp-pn116
on	on	off	off	on	on	on	off			Default device name: mcp-pn115
off	on	off	off	on	on	on	off			Default device name: mcp-pn114
on	off	off	off	on	on	on	off			Default device name: mcp-pn113
off	off	off	off	on	on	on	off			Default device name: mcp-pn112
x	x	x	x	x	x	x	x			"
on	on	on	on	off	off	off	off			Default device name: mcp-pn15
off	on	on	on	off	off	off	off			Default device name: mcp-pn14
on	off	on	on	off	off	off	off			Default device name: mcp-pn13
off	off	on	on	off	off	off	off			Default device name: mcp-pn12
on	on	off	on	off	off	off	off			Default device name: mcp-pn11

1	2	3	4	5	6	7	8	9	10	Meaning
off	on	off	on	off	off	off	off			Default device name: mcp-pn10
on	off	off	on	off	off	off	off			Default device name: mcp-pn9
off	off	off	on	off	off	off	off			Default device name: mcp-pn8
on	on	on	off	off	off	off	off			Default device name: mcp-pn7
off	on	on	off	off	off	off	off			Default device name: mcp-pn6
on	off	on	off	off	off	off	off			Default device name: mcp-pn5
off	off	on	off	off	off	off	off			Default device name: mcp-pn4
on	on	off	off	off	off	off	off			Default device name: mcp-pn3
off	on	off	off	off	off	off	off			Default device name: mcp-pn2
on	off	off	off	off	off	off	off			Default device name: mcp-pn1
off	off	off	off	off	off	off	off			Default device name: mcp-pn

MCP set up as IE

Table 6-15   Switch S2 is set as delivered

1	2	3	4	5	6	7	8	9	10	Meaning
off	off	off	off	off	off	on	on	off	off	MCP address 192

The two switches S2-9 and S2-10 must remain set to "off" (IE functionality).

The switches S2-1 to S2-8 define the MCP address in the range of 0 to 255.
The addresses from 192 to 223 count as the default range.
The MCP address is used as a reference for addressing an MCP during PLC parameter assignment.

Table 6-16   Settings of switch S2

1	2	3	4	5	6	7	8	9	10	Meaning
								off	off	
on	on	on	on	on	on	on	on			MCP address 255
x	x	x	x	x	x	x	x			"
on	on	on	on	on	off	on	on			MCP address 223
off	on	on	on	on	off	on	on			MCP address 222
on	off	on	on	on	off	on	on			MCP address 221
off	off	on	on	on	off	on	on			MCP address 220
on	on	off	on	on	off	on	on			MCP address 219
off	on	off	on	on	off	on	on			MCP address 218
on	off	off	on	on	off	on	on			MCP address 217
off	off	off	on	on	off	on	on			MCP address 216
on	on	on	off	on	off	on	on			MCP address 215
off	on	on	off	on	off	on	on			MCP address 214

1	2	3	4	5	6	7	8	9	10	Meaning
on	off	on	off	on	off	on	on			MCP address 213
off	off	on	off	on	off	on	on			MCP address 212
on	on	off	off	on	off	on	on			MCP address 211
off	on	off	off	on	off	on	on			MCP address 210
on	off	off	off	on	off	on	on			MCP address 209
off	off	off	off	on	off	on	on			MCP address 208
on	on	on	on	off	off	on	on			MCP address 207
off	on	on	on	off	off	on	on			MCP address 206
on	off	on	on	off	off	on	on			MCP address 205
off	off	on	on	off	off	on	on			MCP address 204
on	on	off	on	off	off	on	on			MCP address 203
off	on	off	on	off	off	on	on			MCP address 202
on	off	off	on	off	off	on	on			MCP address 201
off	off	off	on	off	off	on	on			MCP address 200
on	on	on	off	off	off	on	on			MCP address 199
off	on	on	off	off	off	on	on			MCP address 198
on	off	on	off	off	off	on	on			MCP address 197
off	off	on	off	off	off	on	on			MCP address 196
on	on	off	off	off	off	on	on			MCP address 195
off	on	off	off	off	off	on	on			MCP address 194
on	off	off	off	off	off	on	on			MCP address 193
off	off	off	off	off	off	on	on			MCP address 192
x	x	x	x	x	x	x	x			"
on	off	off	off	off	off	off	off			MCP address 001
off	off	off	off	off	off	off	off			MCP address 000

Setup 7

7.1 Module sequence

The configuration of the MCP module or the input/output images results from the arrangement of the modules in a fixed sequence with variable number.

Fixed sequence of modules:

1. Base: always present, slot 1

2. Key modules 1 to 4: from slot 2

3. Powerrides 1 to 3

4. 2 handwheels: always present

For PROFINET, the modules must be arranged in the correct sequence to match the respective MCP in the hardware configuration.

For Ethernet, the input and output image corresponds to the structure of the respective MCP in the sequence of the installed modules. The corresponding sequence can be found in part 2 of the documentation, in chapter "Operating and display elements" > "Configuration".

Matching structures for the input and output image can be generated by composing module data types (UDT).

Note

To structure the input/output image, use the "Modular MCP data types" supplied in the basic PLC program library:
- 840D sl: Data types "TypeModMcp..." (UDT82..91)
- ONE: Data types "LBP_typeModularMcp..."

Note

The following applies in respect of the process input and output images in the tables: n is the start address of the modules (base, key modules and Powerrides).

7.2 Input images

Base

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Base	EB n + 0	KT-IN8	KT-IN7	KT-IN6	KT-IN5	KT-IN4	KT-IN3	KT-IN2	KT-IN1
		X515.8	X515.7	X515.6	X515.5	X515.4	X515.3	X515.2	X515.1
	EB n + 1	KT-IN16	KT-IN15	KT-IN14	KT-IN13	KT-IN12	KT-IN11	KT-IN10	KT-IN9
		X516.8	X516.7	X516.6	X516.5	X516.4	X516.3	X516.2	X516.1
	EB n + 2				Spindle override				
					$E (2^4)$	$D (2^3)$	$C (2^2)$	$B (2^1)$	$A (2^0)$
	EB n + 3				Feed override				
					$E (2^4)$	$D (2^3)$	$C (2^2)$	$B (2^1)$	$A (2^0)$
	EB n + 4				Keyswitch				
						Position 3	Position 2	Position 1	Position 0
	EB n + 5								

*): The logical address is made up of the offset and the start address from the hardware configuration.

Key modules

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Key module 1	EB n + 0				Key module 1				
		Key7	Key6	Key5	Key4	Key3	Key2	Key1	Key0
	EB n + 1				Key module 1				
		-	Key14	Key13	Key12	Key11	Key10	Key9	Key8
	EB n + 2				Key module 1.1				
		-	-	-	-	-	Key18	Key17	Key16
	EB n + 3				Key module 1.2				
			-	-	-	-	Key26	Key25	Key24

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Key module 2	EB n + 0				Key module 2				
		Key7	Key6	Key5	Key4	Key3	Key2	Key1	Key0
	EB n + 1				Key module 2				
		-	Key14	Key13	Key12	Key11	Key10	Key9	Key8
	EB n + 2				Key module 2.1				
		-	-	-	-	-	Key18	Key17	Key16
	EB n + 3				Key module 2.2				
			-	-	-	-	Key26	Key25	Key24

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Key module 3	EB n + 0	Key module 3							
		Key7	Key6	Key5	Key4	Key3	Key2	Key1	Key0
	EB n + 1	Key module 3							
		-	Key14	Key13	Key12	Key11	Key10	Key9	Key8
	EB n + 2	Key module 3.1							
		-	-	-	-	-	Key18	Key17	Key16
	EB n + 3	Key module 3.2							
		-	-	-	-	-	Key26	Key25	Key24

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Key module 4	EB n + 0	Key module 4							
		Key7	Key6	Key5	Key4	Key3	Key2	Key1	Key0
	EB n + 1	Key module 4							
		-	Key14	Key13	Key12	Key11	Key10	Key9	Key8
	EB n + 2	Key module 4.1							
		-	-	-	-	-	Key18	Key17	Key16
	EB n + 3	Key module 4.2							
		-	-	-	-	-	Key26	Key25	Key24

*): The logical address is made up of the offset and the start address from the hardware configuration.

Powerrides

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Powerride 1	EB n + 0								Start button
			-	-	-	-	-	-	Key0
	EB n + 1	Counter Powerride 1							
		2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Powerride 2	EB n + 0								Start button
			-	-	-	-	-	-	Key0
	EB n + 1	Counter Powerride 2							
		2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Powerride 3	EB n + 0								Start button
			-	-	-	-	-	-	Key0
	EB n + 1	Counter Powerride 3							
		2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0

*): The logical address is made up of the offset and the start address from the hardware configuration.

Handwheels

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Handwheel 1	EB n + 0	Counter handwheel 1							
		2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
	EB n + 1	Counter handwheel 1							
		2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^9	2^8

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Handwheel 2	EB n + 0	Counter handwheel 2							
		2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
	EB n + 1	Counter handwheel 2							
		2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^9	2^8

*): The logical address is made up of the offset and the start address from the hardware configuration.

7.3 Output images

Base

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Base	AB n + 0	KT-OUT8 X515.20	KT-OUT7 X515.19	KT-OUT6 X515.18	KT-OUT5 X515.17	KT-OUT4 X515.16	KT-OUT3 X515.15	KT-OUT2 X515.14	KT-OUT1 X515.13
	AB n + 1	KT-OUT16 X516.20	KT-OUT15 X516.19	KT-OUT14 X516.18	KT-OUT13 X516.17	KT-OUT12 X516.16	KT-OUT11 X516.15	KT-OUT10 X516.14	KT-OUT9 X516.13

*): The logical address is made up of the offset and the start address from the hardware configuration.

Key modules

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Key module 1	AB n + 0				LED key module 1				
		LED7	LED6	LED5	LED4	LED3	LED2	LED1	LED0
	AB n + 1				LED key module 1				
			LED14	LED13	LED12	LED11	LED10	LED9	LED8
	AB n + 2				LED key module 1.1				
							LED18	LED17	LED16
	AB n + 3				LED key module 1.2				
							LED26	LED25	LED24

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Key module 2	AB n + 0				LED key module 2				
		LED7	LED6	LED5	LED4	LED3	LED2	LED1	LED0
	AB n + 1				LED key module 2				
			LED14	LED13	LED12	LED11	LED10	LED9	LED8
	AB n + 2				LED key module 2.1				
							LED18	LED17	LED16
	AB n + 3				LED key module 2.2				
							LED26	LED25	LED24

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Key module 3	AB n + 0				LED key module 3				
		LED7	LED6	LED5	LED4	LED3	LED2	LED1	LED0
	AB n + 1				LED key module 3				
			LED14	LED13	LED12	LED11	LED10	LED9	LED8
	AB n + 2				LED key module 3.1				
							LED18	LED17	LED16
	AB n + 3				LED key module 3.2				
							LED26	LED25	LED24

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Key module 4	AB n + 0				LED key module 4				
		LED7	LED6	LED5	LED4	LED3	LED2	LED1	LED0
	AB n + 1				LED key module 4				
			LED14	LED13	LED12	LED11	LED10	LED9	LED8
	AB n + 2				LED key module 4.1				
							LED18	LED17	LED16
	AB n + 3				LED key module 4.2				
							LED26	LED25	LED24

*): The logical address is made up of the offset and the start address from the hardware configuration.

Powerrides

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Powerride 1	AB n + 0	Powerride 1 LED scale							
									LED 24
	AB n + 1	Powerride 1 LED scale							
		LED23	LED22	LED21	LED20	LED19	LED18	LED17	LED16
	AB n + 2	Powerride 1 LED scale							
		LED15	LED14	LED13	LED12	LED11	LED10	LED9	LED8
	AB n + 3	Powerride 1 LED scale							
		LED7	LED6	LED5	LED4	LED3	LED2	LED1	LED0
	AB n + 4			Powerride 1 start button			Powerride 1 color scale		
					Green		Blue	Green	Red
	AB n + 5						Vibration pattern		
							2^2	2^1	2^0
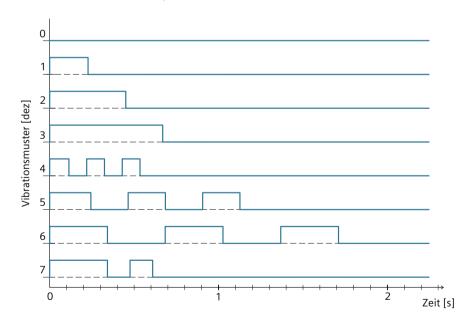
Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Powerride 2	AB n + 0	Powerride 2 LED scale							
									LED 24
	AB n + 1	Powerride 2 LED scale							
		LED23	LED22	LED21	LED20	LED19	LED18	LED17	LED16
	AB n + 2	Powerride 2 LED scale							
		LED15	LED14	LED13	LED12	LED11	LED10	LED9	LED8
	AB n + 3	Powerride 2 LED scale							
		LED7	LED6	LED5	LED4	LED3	LED2	LED1	LED0
	AB n + 4			Powerride 2 start button			Powerride 2 color scale		
					Green		Blue	Green	Red
	AB n + 5						Vibration pattern		
							2^2	2^1	2^0

Slot	Byte *)	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Powerride 3	AB n + 0	Powerride 3 LED scale							
									LED 24
	AB n + 1	Powerride 3 LED scale							
		LED23	LED22	LED21	LED20	LED19	LED18	LED17	LED16
	AB n + 2	Powerride 3 LED scale							
		LED15	LED14	LED13	LED12	LED11	LED10	LED9	LED8
	AB n + 3	Powerride 3 LED scale							
		LED7	LED6	LED5	LED4	LED3	LED2	LED1	LED0
	AB n + 4			Powerride 3 start button			Powerride 3 color scale		
					Green		Blue	Green	Red
	AB n + 5						Vibration pattern		
							2^2	2^1	2^0

*): The logical address is made up of the offset and the start address from the hardware configuration.

7.4 Vibration pattern Powerride

The selectable vibration patterns of the Powerride are shown below:

7.5 Changing the color values of the keys

You can assign colors to the keys of a modular MCP to reflect the status. Possible states are "active" and "inactive".

Changing the color values is done by writing parameter data sets during runtime. The factory parameters of the MCP are not changed, i.e. after a restart of the MCP the factory parameters are valid again.

Color	Intensity
Red	$[0...255_d]$
Green	$[0...255_d]$
Blue	$[0...255_d]$

Factory parameters of the LED

Color	Red $[0...255_d]$	Green $[0...255_d]$	Blue $[0...255_d]$
White dimmed	100	100	86
Red dimmed	35	0	0
Red bright	255	0	0
Green dimmed	0	94	0
Green bright	0	255	0

7.5.1 Configuration via parameter data records

The parameter data sets of the key modules have an identical structure - regardless of whether you are configuring with Industrial Ethernet or PROFINET IO.

PROFINET IO

The parameters are transferred with the instruction WRREC to the key module via the respective data set.

Industrial Ethernet

The parameters are transferred to the key module with the blocks of the basic program library via the respective data set:

- 840D sl: FC27: OpUnitWriteRecord

- ONE: LBP_OpUnitWriteRecord [FB25002]

STATUS output parameter

If errors occur during the transfer of the parameters with the instruction WRREC, then the MCP continues to work with the previous parameterization. However, a corresponding error code is written to the STATUS output parameter.

The description of the WRREC instruction and the error codes is available in the STEP 7 online help.

7.5.2 Structure of the parameter data record 128 for the entire module
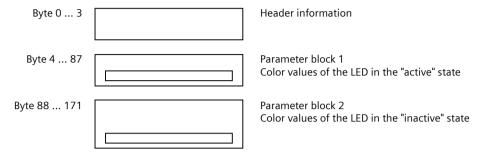
Structure of data record 128

Figure 7-1   Parameter data record 128

Data record 128 consists of the header information, parameter block 1 and parameter block 2.

A data record is used to parameterize a key module (3x3, 3x4, 3x5) in each case, including the modules connected to it (1x2, 1x3).

Note

Use the data type supplied in the basic PLC program library to create data record 128:
- 840D sl: data type "ModularMcpKeypadRecord"
- ONE: data type "LBP_typeModularMcpKeypadRecord"

Header information

In the header information, the version of the data record and the number of color values to be written for the "active" and "inactive" states are specified.

It is possible to write several color values at once or only the color values for an individual LED.
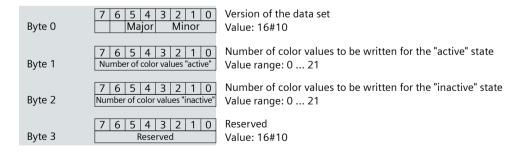
Figure 7-2   Header information

Parameter block 1: Color values for LED in the "active" state

Parameter block 1 starts from offset 4.

Only the color values corresponding to the number specified in byte 1 are written, other values are ignored.

The corresponding LED is addressed with "LED index", see Chapter "Key modules (Page 29)".

Byte 4		LED index	Value range: 0..14;16..18;24..26
Byte 5	Color values "active"[0]	Color value red	Value range: 0..255
Byte 6		Color value green	Value range: 0..255
Byte 7		Color value blue	Value range: 0..255

Byte 8		LED index	
Byte 9	Color values "active"[1]	Color value red	
Byte 10		Color value green	
Byte 11		Color value blue	

...

Byte 84		LED index	
Byte 85	Color values "active"[20]	Color value red	
Byte 86		Color value green	
Byte 87		Color value blue	

Figure 7-3   Parameter block 1

Parameter block 2: Color values for LED in the "inactive" state

Parameter block 2 always starts from offset 88, regardless of the number of attributes of parameter block 1 to be written.

Only the color values corresponding to the number specified in byte 2 are written, other values are ignored.

Byte 88		LED index	Value range: 0..14;16..18;24..26
Byte 89	Color values "inactive"[0]	Color value red	Value range: 0..255
Byte 90		Color value green	Value range: 0..255
Byte 91		Color value blue	Value range: 0..255

Byte 92		LED index	
Byte 93	Color values "inactive"[1]	Color value red	
Byte 94		Color value green	
Byte 95		Color value blue	

...

Byte 168		LED index	
Byte 169	Color values "inactive"[20]	Color value red	
Byte 170		Color value green	
Byte 171		Color value blue	

Figure 7-4   Parameter block 2

Error while transferring the data record

The MCP always checks all values of the transferring data record. Only if all values have been transferred without error does the MCP take over the values from the data record.

The WRREC instruction for writing data records returns corresponding error codes when errors occur in the STATUS parameter.

The following table shows the MCP-specific error codes and their meaning for parameter data record 128.

Error code in STATUS parameter (hexadecimal)				Meaning	Solution
Byte 0	Byte 1	Byte 2	Byte 3		
0	0	0	0	No error	-
DF	0x80	0xE1	0...31	Invalid key addressed	Address only existing keys
DF	0x80	0xE1	0xFF	General error or wrong version of the data set	Check data set

Service and maintenance

<div style="text-align: right; font-size: 2em;">8</div>

Cleaning the device

Use a soft cloth moistened either with water or a mild cleaning agent to clean the housing and operator controls of the device.

Note

Switch the device off for cleaning

Clean the device only when it is switched off. This way, you ensure that you cannot unintentionally trigger any functions by touching the keys.

Procedure

Spray the cleaning agent on to a cleaning cloth. Never use caustic solvents or abrasive cleaners.

Note

Avoid damage

Do not clean the device using compressed air or steam jets because they can damage it.

Checking the device

In order to prevent foreign bodies or liquids entering the device, regularly check the device for the following:

- Ensure that all the housing screws are in place and tight
- For damage to the housing
- For damage to the cable cover or cable entry

Protect the device from environmental effects

Protect the device against the following environmental factors:

- Direct sunshine and heat sources
- Mechanical vibration and shock
- Dust
- Humidity
- Strong magnetic fields

Checking the emergency stop button

Check the emergency stop button regularly to ensure that it functions correctly.

Suspected malfunction

If you suspect a malfunction due to unusual product reactions, isolate the device from power. Immediately inform qualified personnel to check the function and ensure that the product functions correctly.

The following signs can indicate a malfunction:

- Unusual or no functioning
- Unusual heat generation
- Smoke development

Repair

Send the device back to the manufacturer for repair. The device must only be repaired there.

Diagnostics

9

9.1   LED displays

LED states in PROFINET mode

	State	H1 SYNC	H2 FAULT	H3 PWR	H4 PN	H5 IE	PER *)
0	Device is switched off	Off □	Off □	Off □	Off □	Off □	Off □
1	Device is switched on and the internal voltage is in the setpoint range	Off □	Off □	On ■	Off □	Off □	N/A
2	Boot loader is started	Off □	On ■	On ■	Off □	Off □	N/A
3	Linux is started	On ■	On ■	On ■	Off □	Off □	N/A
4	MCP software is running, no PN communication	Off □	Off □	On ■	On ■	Off □	1 Hz ☼
5	MCP software is running, PN communication established, STOP state	On ■	Off □	On ■	On ■	Off □	N/A
6	MCP software is running, PN communication established, RUN state	0.5 Hz ☼	Off □	On ■	On ■	Off □	N/A
7	Error, e.g. incorrect configuration or damaged USB peripheral	4 Hz ☼	4 Hz ☼	On ■	On ■	Off □	4 Hz ☼
8	New component registration successful	Off □	Off □	On ■	On ■	On ■	On ■

*) LEDs in peripheral devices, e.g. key modules and Powerride. The user keys connected to the digital outputs do not display status information.

LED states in IE mode

	State	H1 SYNC	H2 FAULT	H3 PWR	H4 PN	H5 IE	PER *)
0	Device is switched off	Off □	Off □	Off □	Off □	Off □	Off □
1	Device is switched on and the internal voltage is in the setpoint range	Off □	Off □	On ■	Off □	Off □	N/A
2	Boot loader is started	Off □	On ■	On ■	Off □	Off □	N/A

	State	H1 SYNC	H2 FAULT	H3 PWR	H4 PN	H5 IE	PER *)
3	Linux is started	On ■	On ■	On ■	Off □	Off □	N/A
4	MCP software is running, no IE communication	Off □	Off □	On ■	On ■	Off □	1 Hz ☼
5	MCP software is running, IE communication established	0.5 Hz ☼	Off □	On ■	Off □	On ■	N/A
6	Error, e.g. incorrect configuration or damaged USB peripheral	4 Hz ☼	4 Hz ☼	On ■	Off □	On ■	4 Hz ☼
7	New component registration successful	Off □	Off □	On ■	On ■	On ■	On ■

*) LEDs in peripheral devices, e.g. key modules and Powerride. The user keys connected to the digital outputs do not display status information.

Technical data

<div style="text-align: right; font-size: 2em; font-weight: bold;">10</div>

10.1 Supplementary electrical conditions

10.1.1 Power supply

Requirements for DC power supplies

> ⚠️ **WARNING**
>
> **Electric shock due to connection of an unsuitable power supply**
>
> When equipment is connected to an unsuitable power supply and/or insufficiently grounded or rear cover (Page 35), exposed components may carry a hazardous voltage that might result in serious injury or death.
>
> - Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) output voltages acc. to UL 61010 for all connections and terminals of the electronics modules.

> ⚠️ **WARNING**
>
> **Inadequately fused supply cables can be life-threatening**
>
> In the case of supply lines >30 m, protectors must be installed at the device input to protect against lightning (surge).
>
> The DC power supply must be connected to the ground/shield of the NC for EMC and/or functional reasons. For EMC reasons, this connection should only be made at one point. As a rule, the connection is provided as standard in the S7-300 I/Os. In exceptional circumstances when this is not the case, the ground connection should be made on the grounding rail of the NC cabinet (also refer to /EMC/EMC Installation Guide.)

Table 10-1   Requirements of the DC power supply

Rated voltage	According to EN 61131-2 Voltage range (mean value) Voltage ripple, peak/peak Ramp-up time when switched on	24 VDC 20.4 VDC to 28.8 VDC 5% (unsmoothed 6-pulse rectification) any
Non-periodic overvoltages	 Period of overvoltage Recover time Events per hour	≤ 35 V ≤ 500 ms ≥ 50 s ≤ 10
Transient voltage interruptions	Downtime Recovery time Events per hour	≤ 3 ms ≥ 10 s ≤ 10

10.1.2   Grounding concept

Components

The SINUMERIK 840D sl/ SINUMERIK ONE system consists of several individual components that have been designed so that the system complies with the appropriate EMC and safety standards. The individual system components are:

- Numerical Control Unit (NCU)

- Machine Control Panel (MCP), Machine Pushbutton Panel (MPP)

- Keyboard

- Operator panels (operator panel front + TCU / SIMATIC IPC for SINUMERIK)

- Distributor box and handheld unit

- S7-1500 I/O devices

Grounding measures

The individual modules are attached to a metal cabinet panel. Insulating paints on the mounting points (e.g. tension jacks) must be removed.

It is permissible to have a cluster of operator components for ground connection/ equipotential bonding.
Example: The control panel on the swivel arm.
It is sufficient in this instance to connect the ground connections of, for example, the SIMATIC IPC for SINUMERIK, TCU and operator panel front using a cable and to route a shared grounding conductor to the central ground connection in the control cabinet.

Please note that interruption of the grounding during maintenance work is not permissible.

More information

More information about the EMC installation guideline can be found under:

- Configuration Manual, EMC installation guideline (https://support.industry.siemens.com/cs/document/60612658/emc-design-guidelines-configuration-manual-01-2012?dti=0&lc=en-WW)

10.1.3 RI suppression measures

In addition to the protective grounding of system components, special precautions must be taken to ensure safe, fault-free operation of the system. These measures include shielded signal lines, special equipotential bonding connections, and isolation and shielding measures.

Shielded signal cables

- Use the specified cables for safe and fault-free operation of the system.
- Connect the shield conductively at both ends to the housing for digital signal transmission.

Cable definition

Definition:

- Signal cables (example)
  - Data cables (Ethernet, PROFINET, sensor cables, etc.)
  - Digital I/Os
  - Cables for safety functions (emergency stop, enabling)
- Power cables (example)
  - Low-voltage supply lines (230 VAC, +24 VDC, etc.)
  - Motor cables

Rules for routing cables

In order to achieve the greatest possible EMC compatibility for the complete system (control, power unit, machine), the following EMC measures must be carefully observed:

- If necessary, signal and power cables may cross one another (if possible at an angle of 90°), but must never be laid close or parallel to one another.
- Only use cables approved by SIEMENS for the signal lines from and to the Control Unit.
- Signal cables must not be routed close to strong external magnetic fields (e.g. motors and transformers).
- If signal lines cannot be routed a sufficient distance away from other cables, they must be installed in grounded cable ducts (metal).
- The operator panel fronts, MCPs, MPPs, and full keyboards must be installed in metallically enclosed EMC-compatible housings.

Further information on RFI suppression measures and the connection of shielded cables can be found in the EMC Installation Guidelines.

10.1.4 EMF assessments for 24 V components

The 24 V components, e.g. control systems (NCU, MCU, PPU), IPCs, ITCs, IFPs, handheld units and machine control panels do not generate any appreciable electromagnetic fields.

No minimum clearance has to be maintained for 24 V components.

10.1.5 EMC limiting values in South Korea

EMC limit values in South Korea

이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
For sellers or other users, please bear in mind that this device is an A-grade electromagnetic wave device. This device is intended to be used in areas other than at home.

The EMC limit values to be complied with for South Korea correspond to the limit values of the EMC product standard for variable-speed electric drives EN 61800-3, Category C2, or limit value class A, Group 1 according to EN 55011. By applying suitable supplementary measures, the limit values according to Category C2 or according to limit value class A, Group 1, are maintained. Further, additional measures may be required, for instance, using an additional radio interference suppression filter (EMC filter).

The measures for EMC-compliant design of the system are described in detail in this manual respectively in the Installation Guideline EMC.

Please note that the final statement on compliance with the standard is given by the respective label attached to the individual unit.

10.2 Standards and approvals

Figure 10-1   CE marking

The operator panels and the safety-relevant accessories satisfy the requirements and protection objectives of the following EC directives. The operator panels and the safety-

relevant accessories comply with the harmonized European standards (EN), promulgated in the Official Journals of the European Community:

- 2014/30/EU "Electromagnetic Compatibility" (EMC Directive)

- Directive 2011/65/EC on the restriction of the use of certain hazardous substances in electrical and electronic devices (RoHS II)

China RoHs

The products comply with the China RoHs regulation.
Further information can be found on the Internet at the following link: SIOS (https://support.industry.siemens.com/cs/document/109773373/ccc-fm?dti=0&lc=en-US)

10.3   Recycling and disposal

For environmentally friendly recycling and disposal of your old equipment, please contact a company certified for the disposal of waste electrical and electronic equipment and dispose of the equipment in accordance with the regulations in your country.

Spare parts/accessories

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11.1   Overview
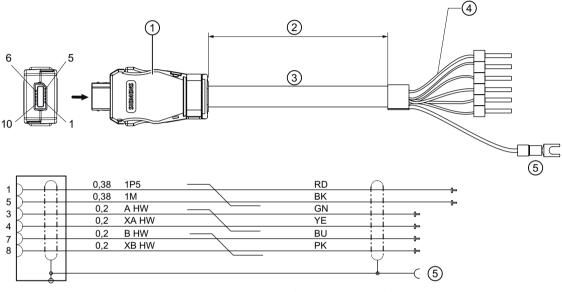
Name	Description	Article number
Ethernet cable	For universal use	6XV1840-2AH10
	trailable	6XV1840-3AH10
Ethernet connector	Industrial Ethernet FastConnect RJ45 plug 90 2x 2 180° cable outlet	6GK1901-1BB10-2AA0
Ethernet connector	Industrial Ethernet FastConnect RJ45 plug 90 2x 2 90° cable outlet	6GK1901-1BB20-2AA0
Emergency stop button*)	22 mm actuating element, 40 mm mushroom pushbutton, snap action with tamper protection, latching, red, with holder, non-illuminated	3SU1000-1HB20-0AA0
	Contact block, 1 NC contact	3SU1400-1AA10-3CA0
Key	10 key sets, each with 3 keys for the keyswitch settings 1, 2, 3	6FC5148-0AA03-0AA0
Tension jacks	Tension jack set (9 items) for supplementary operator components with 2.5 mm profile, length: 20 mm	6FC5248-0AF14-0AA0
Override spindle / rapid traverse	Electronic rotary switch 1x16G, T=24, cap, button, pointer, spindle dials and rapid traverse	6FC5247-0AF12-1AA0
Override feed / rapid traverse	Electronic rotary switch 1x23G, T=32, cap, button, pointer, feed and rapid-traverse dials	6FC5247-0AF13-1AA0
Powerride	Set comprising Powerride + 0.5 m connecting cable + 5x cable ties Replacement see Changing the Powerride (Page 74)	6FC5348-0AP00-2AA0
Rapid traverse dial	1 set with 20 units for 16-position rotary switch	6FC5248-0AF30-0AA0
Key caps	Square, for insert labels, 1 set of 90, clear	6FC5248-0AF21-0AA0
Key caps	Square, can be laser-labeled, 1 set with 90 pcs., Fe gray	6FC5303-0AF27-1AA0
Signal cable, handwheel	Connection cable for the handwheel, max. length: 5 m xy is the length code: x (m) = A (0) ...F (5); y (dm) = 0 ... 8 For details, see Handwheel connection (Page 74).	6FX8002-2CP01-....
Connector kit X10/X11	Spare part for 24 V-connector	6FC5317-4AA00-0AA0
Connector kit X515/X516	Connector set for X515 and X516 for connecting additional command devices	6FC5348-0AP00-0AA0

*) Safety-related

11.2 Handwheel connection

The handwheels are connected according to the display.

① Connection plug: e.g. Siemens signal connector IX (6FX2003-0DE01)
② Length as required
③ Cable: 6FX8008-2DC00
④ Strip cable sheath 45 + 2 mm
⑤ Shield

Figure 11-1   Connecting cable for handwheel

See also

11.3 Changing the Powerride

Description

You can change the rotary encoders described in this chapter if spare parts have to be replaced.

The Powerride is connected to the communications module of the device via a USB plug-in connection. Make sure that the replacement Powerride is connected to the same USB port as the previous Powerride.

Validity

The description applies to the following articles, which include cables and accessories:

Powerride	6FC5348-0AP00-2AA0	

1. Disassembly

1. Switch off the supply voltage of the MCP

2. Remove the strain relief through cable ties and disconnect the USB cable from the communications module

3. Press the three spring clips together and pull out the Powerride with the USB cable.
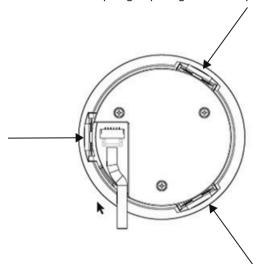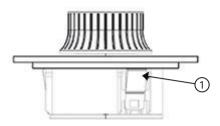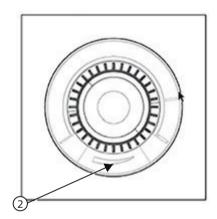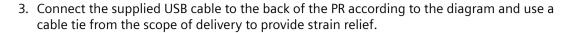

Figure 11-2   Removing the Powerride

2. Assembly

1. Check the sealing surface in the installation opening for any unevenness. In addition, check the edge and gasket for any damage on the Powerride and ensure that the gasket is correctly seated.

2. Insert the Powerride into the prepared cutout according to the following diagram and use your thumb to press down on the dial to engage the three spring clips
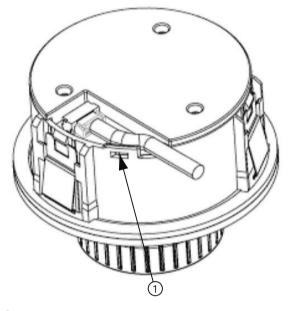
① 3x click when inserting into the front panel
② Position coded

Figure 11-3 Assembling the Powerride Part 1

3. Connect the supplied USB cable to the back of the PR according to the diagram and use a cable tie from the scope of delivery to provide strain relief.

①   Strain relief: cable with cable tie (not shown)

Figure 11-4   Assembling the Powerride Part 2

4. Connect the other end of the USB cable to the originally used port on the communications module. Then provide strain relief using a cable tie.

5. Registering the Powerride on the communications module

Registering the Powerride on the communications module

To be able to use the new Powerride, it must be registered on the communications module. To do this, proceed as follows:

1. -Set the S2 coding switch as follows:
   – S2-1 to S2-8 to ON
   – S2-9 to OFF
   – S2-10 to ON

2. Switch on the machine control panel
   When all connected Powerrides and keys of the key modules or H3-H5 on the communications module light up green, the registration process has been successfully completed

3. Switch off the machine control panel and set S2 back to the original configuration

Safety symbols

<div style="text-align: right">

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Icon	Explanation
Direct current	The equipment is only suitable for direct current. Used for marking corresponding terminals.
Protective conductor connection	For marking the connection for an external protective conductor for protecting against electrical shock in the event of an error or for a connecting terminal of the external protective conductor.
Ground	For marking the ground connection.
General warning symbol	The documentation must be consulted in any scenario where the symbol is affixed in order to find out the type of potential hazard and the actions required to avoid the risk.
	Caution ESD (components sensitive to electrostatic discharge)

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