SIEMENS

SINUMERIK

SINUMERIK ONE
PPU 1740

Equipment Manual

Valid for:
SINUMERIK ONE PPU 1740 - 1500
SINUMERIK ONE PPU 1740 - 1900

07/2021
A5E47615272B AC

Legal information

Warning notice system

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

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

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

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

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

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

Trademarks

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

Disclaimer of Liability

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

Table of contents

Introduction

<div style="text-align: right; font-size: 3em; font-weight: bold;">1</div>

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

SINUMERIK documentation

The SINUMERIK documentation is organized into the following categories:

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

Target group

This publication is intended for Project engineers, technologists (of machine manufacturers), commissioning engineers (of systems or machines), programmers.

Benefits

The Function Manual describes the functions so that the target group knows the functions and can select them. It enables the target group to put the functions into operation.

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 ONE

Comprehensive documentation about the functions provided in SINUMERIK ONE Version 6.13 and higher is provided in the Documentation overview SINUMERIK ONE (https://support.industry.siemens.com/cs/ww/en/view/109768483).

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

The documentation is divided into the following categories:

- User: Operating
- User: Programming
- Manufacturer/Service: Functions
- Manufacturer/Service: Hardware
- Manufacturer/Service: Configuration/Setup
- Manufacturer/Service: Safety Integrated
- Information and training
- Manufacturer/Service: SINAMICS

1.4 Feedback on the technical documentation

If you have any questions, suggestions or corrections regarding the technical documentation which is published in the Siemens Industry Online Support, use the link "Provide feedback" 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 homepage (https://support.industry.siemens.com/cs/ww/en/my):

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

Data matrix code on the nameplate

The data matrix code on the nameplate contains the specific device data. This code can be read with a smartphone and technical information about the device displayed via the "Industry Online Support" mobile app.

1.7 Important product information

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)

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

<div align="right">

2

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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.
• Be sure to only use screwdrivers which exactly match the heads of the screws.
• 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.

> ⚠ **WARNING**
>
> **Spread of fire from built-in devices**
>
> In the event of fire outbreak, the enclosures of built-in devices cannot prevent the escape of fire and smoke. This can result in serious personal injury or property damage.
>
> - Install built-in units in a suitable metal cabinet in such a way that personnel are protected against fire and smoke, or take other appropriate measures to protect personnel.
> - Ensure that smoke can only escape via controlled and monitored paths.

> ⚠ **WARNING**
>
> **Unexpected movement of machines caused by radio devices or mobile phones**
>
> Using radio devices or mobile telephones 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 or mobile telephones.
> - Use the "SIEMENS Industry Online Support app" 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 notices for Safety Integrated functions

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

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   Security information

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

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions 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 security measures that may be implemented, please visit
https://www.siemens.com/industrialsecurity (https://www.siemens.com/industrialsecurity).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they 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 Security RSS Feed under
https://www.siemens.com/industrialsecurity (https://new.siemens.com/global/en/products/services/cert.html#Subscriptions).

Further information is provided on the Internet:

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

⚠ **WARNING**

Unsafe operating states resulting from software manipulation

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

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

2.5 Residual risks of power drive systems

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

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

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

   – Response times of the control system and of the drive

   – Operation and/or environmental conditions outside the specification

   – Condensation/conductive contamination

   – Parameterization, programming, cabling, and installation errors

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

   – External influences/damage

   – X-ray, ionizing radiation and cosmic radiation

2. Unusually high temperatures, including open flames, as well as emissions of light, noise, particles, gases, etc., can occur inside and outside the components under fault conditions caused by, for example:

   – Component failure

   – Software errors

   – Operation and/or environmental conditions outside the specification

   – External influences/damage

3. Hazardous shock voltages caused by, for example:

   – Component failure

   – Influence during electrostatic charging

   – Induction of voltages in moving motors

   – Operation and/or environmental conditions outside the specification

   – Condensation/conductive contamination

   – External influences/damage

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

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

6. Influence of network-connected communication systems, e.g. ripple-control transmitters or data communication via the network

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

System overview 3

3.1 Application

SINUMERIK ONE is available in the following Panel Processing Unit (PPU) hardware variants:

- SINUMERIK ONE PPU 1740-1500
- SINUMERIK ONE PPU 1740-1900.

Overview

SINUMERIK ONE offers modularity, openness, flexibility, and uniform structures for operation, programming and visualization. It provides a system platform with trend-setting functions for almost all technologies.

SINUMERIK ONE with the integrated SINAMICS S120 drive system and the SIMATIC S7-1500 automation system constitutes a complete digital system that is best-suited for medium and high performance ranges. The deployment of the SINAMICS S120 Motor Module drive system is also possible.

SINUMERIK ONE is characterized with:

- A high degree of flexibility.
- Excellent dynamic response and precision.
- Optimum integration into networks.

Benefits

- Outstanding performance and flexibility for multi-axis systems of medium to high complexity thanks to scalable hardware and software.
- Universal openness of the user interface, the PLC and the NC kernel to allow integration of your specialist know-how.
- Integrated safety functions for man and machine: SINUMERIK Safety Integrated.
- Comprehensive range of products for integrating machine tools into communication, engineering and production processes.
- Universal engineering in all configuring phases of a plant by integration in the Totally Integrated Automation Portal (TIA Portal).
- Compact and maintenance free design gives additional freedom for machine design and concepts.

Fields of application

The SINUMERIK ONE can be used for turning, drilling, milling, grinding, laser machining, nibbling, punching, in tool and mold making, for high-speed cutting applications, for wood and glass processing, for handling operations, in transfer lines and rotary indexing machines, for mass production and Job Shop production.

3.2 System configuration

The SINUMERIK ONE combines CNC, HMI, PLC, closed-loop control and communication tasks within a single PPU.

Components

For operation, programming, and visualization purposes, the corresponding operating software is already integrated into the CNC software for the PPU and therefore runs on the high-performance PPU module.

The following components can be connected to PPU:

- Distributed PLC I/O

  - SIMATIC I/O
    e.g. ET200SP and ET200MP

- SINAMICS S120 drive system

- Feed motors, main spindle motors and direct-drive motors in synchronous and asynchronous design:

  - Servomotors: 1FT, 1FK

  - Main spindle motors: 1PH, 1FE, 2SP1

  - Direct-drive motors: 1FN3, 1FW6

- Handwheels
  A maximum of three handwheels can be connected:

  - Two handwheels via X143

  - 1 using MCP and connection box.

- Increasing the number of axes

  - NX10.3 / NX15.3
    You can increase the number of axes connected to the NC using NX modules. Each NX10.3 component can control up to 3 additional servo axes and each NX15.3 component can control up to 6 additional axes.

PROFINET	
PROFINET I/O for PLC peripherals	x
PROFINET I/O for NCK peripherals (isochronous)	x
PLC isochronous drives	x
NCK isochronous drives (also with Safety Integrated)	x
PROFIsafe V2	x

Precondition: TIA Portal as of V15 or later

Figure 3-1   Topology example 1
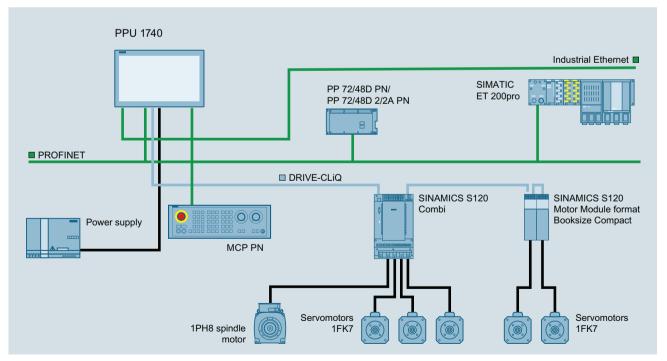
Figure 3-2   Topology example 2

SINAMICS S120 drive system

Only the SINAMICS S120 Line Modules and Motor Modules are used for drive control. Motor Modules can be used to connect **servomotors** as type 1FK7, 1FT7, and 1PH8 feed and main spindle motors. Type 1FW6 **torque motors** can also be connected.

Networking

The SINUMERIK ONE offers Industrial Ethernet and integrated PROFINET functionality.

PROFINET IO is supported:

- As part of PROFINET, PROFINET IO is a communication concept that is used to implement modular, distributed applications. PROFINET IO is based on Industrial Ethernet and allows distributed field and I/O equipment to be connected to the central processing unit.

- 128 PROFINET IO devices can be operated on the PPU (on X160) as an IO controller.

- Up to 255 PROFINET IO devices can be operated on the PPU (X150, from V6.15) as an IO controller.

PPU 1740 supports OPC-UA via Industrial Ethernet.

System characteristics

4

4.1 PPU variants

The scalability of the hardware and software – both from a CNC perspective and in terms of operation, the SINUMERIK ONE can be used in many sectors. The possibilities range from simple positioning tasks up to complex multi-axis systems.

Characteristics of PPU

The following are the key characteristics of PPU 1740:

- Operator panels and CNC systems in a compact housing.
- Size of the operator panel, 15" and 19", with multitouch functionality.
- Maximum resolution:
  - PPU 1740 -1500: 1366x768px (HD-ready)
  - PPU 1740 -1900: 1920x1080px (Full-HD)
- Total number of NC axes: up to 12
- Contains PLC SIMATIC S7-1500F (for fail safe function with safety integrated).

Front of the PPU 1740

Figure 4-1   PPU 1740 front panel

Rear of the PPU 1740
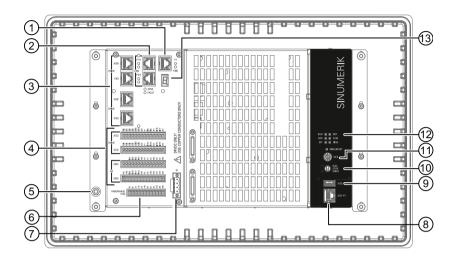
Figure 4-2   PPU 1740 connections (rear)
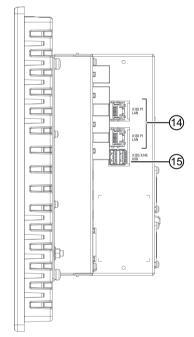
Figure 4-3   PPU 1740 connections (side view)

1	X160 / P1	PROFINET
2	X150 / P1R, P2R	Two PROFINET ports
3	X100... X103	DRIVE-CLiQ
4	X122, X132: Drive	Digital IO (isolated)
	X242, X252: NC	

5		PE connection using 5mm cable lug, mounted using an M5 nut (pre-installed). Tightening torque 3.0 Nm.
6	X143	Handwheel inputs
7	X1	24V supply (4pin)
8	X127 / P1	LAN
9	X125	Front-USB 3.0
10		PLC mode selector switch
11		NCK commissioning switch
12		LED display
13		7-segment display
14	X120 P1, X130 P1	LAN
15	X135, X145	USB 3.0

PPU 1740 - 1500 specifications

	PPU 1740 -1500
Dimension	398x257x138 mm
Cut-out for assembly	382+1 x 241+1 mm
Weight	6.1 kg
IP protection	IP65 (front) IP20 (rear)
Mounting	via fixing clamp
Color	Front: Black (Frame RAL 9017) Back glass : Black (RAL 9005)
Front marking	black
Temperature	0 to 40 ℃ (front) 0 to 45 ℃ (rear)
Air ventilation	passive cooling without fan
Display/Front	Touch sensor with Coverglass
Display/Touch	Multitouch
Resolution	1366x768

PPU 1740 - 1900 specifications

	PPU 1740 -1900
Dimension	464x294x138 mm
Cut-out for assembly	448+1 x 278+1 mm
Weight	7.3 kg
IP protection	IP65 (front) IP20 (rear)
Mounting	via fixing clamp
Color	Front: Black (Frame RAL 9017) Back glass : Black (RAL 9005)
Front marking	black

	PPU 1740 -1900
Temperature	0 to 40 °C (front)
	0 to 45 °C (rear)
Air ventilation	passive cooling without fan
Display/Front	Touch sensor with Coverglass
Display/Touch	Multitouch
Resolution	1920x1080

Type plate

The PPU type plate is located on the rear. All the information required to clearly identify the PPU is available on the type plate.

Note

The contents of the individual type plate fields on the current control may differ from those described in this manual, e.g. updated product status, approvals and identifications not yet issued.
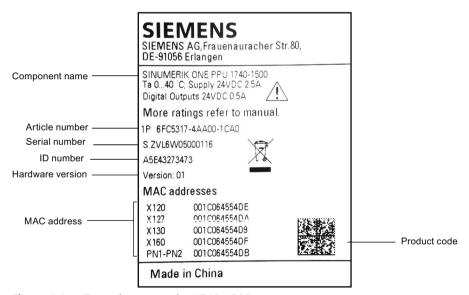
Figure 4-4   Type plate example- 1740-1500

Note

MAC addresses

The MAC addresses printed on the type plate of the PPU are required for configuring the PLC I/O Interface communications networks based on PROFINET and Industrial Ethernet. There is a similar situation for the machine control panels and the I/O modules.

4.2 Operator controls and display elements

4.2.1 Overview of operating and display elements

Only appropriately trained personnel may use the operating elements provided in the service area.

NOTICE
Electrostatic discharge if there is no ground connection
If there is no ground connection or a faulty ground connection, then the electronic components in the devices can be damaged as a result of electrostatic discharge (ESD).
• Before handling the equipment, discharge yourself at the cabinet or at the ground terminal.

1	LED display
2	DIAG/RESET button
3	NCK commissioning switch
4	PLC mode selector switch
	7-segment display (Refer to item 13 Chapter 3.1 PPU versions , Figure 3.5) (Page 30)

Figure 4-5   Position of operator control and display elements

4.2.2   LED display
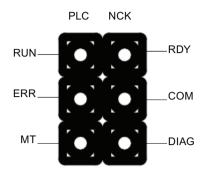
Figure 4-6   LED display

Meaning of the RUN/STOP, ERROR and MAINT PLC-LEDs

RUN/STOP LED	ERROR LED	MAINT LED	Meaning
LED off	LED off	LED off	Supply voltage at the CPU not present or too low.
LED off	LED flashes red	LED off	An error has occurred.
LED lights up green	LED off	LED off	The CPU is in the RUN operating state.
LED lights up green	LED flashes red	LED off	Diagnostic event pending.
LED lights up green	LED off	LED lights up yellow	A plant maintenance request is pending. The affected hardware must be validated/replaced within a short interval.
			Active force job
			PROFIenergy pause
LED lights up green	LED off	LED flashes yellow	A plant maintenance requirement is pending. The affected hardware must be validated/replaced within a foreseeable interval.
			Configuration faulty
LED lights up yellow	LED off	LED flashes yellow	Firmware update completed successfully.
LED lights up yellow	LED off	LED off	CPU is in STOP operating state.
LED lights up yellow	LED flashes red	LED flashes yellow	The program on the SIMATIC Memory Card causes a fault.
			CPU defective

RUN/STOP LED	ERROR LED	MAINT LED	Meaning
LED flashes yellow	LED off	LED off	CPU performs internal activities during STOP, e.g. ramp-up after STOP.
			Downloading the user program from the SIMATIC Memory Card
LED flashes yellow/green	LED off	LED off	Startup (transition from RUN → STOP)
LED flashes yellow/green	LED flashes red	LED flashes yellow	Startup (booting the CPU)
			Test the LEDs during startup, insert a module.
			LED flash test

Meaning of the RDY, COM, DIAG and SD Activity PPU LEDs

Name	Function	Status	Meaning
RDY	Ready	LED lights up red	There is at least one fault (e.g. RESET, watchdog monitoring etc.) or the PPU is ramping up.
		LED flashes red (2 Hz)	Not assigned (SINAMICS boot error).
		LED lights up yellow	Ramping up the PPU.
		LED flashes yellow (0.5 Hz)	Firmware update of the connected DRIVE-CLiQ components
		LED flashes yellow (2 Hz)	Firmware update is complete for components. Wait for POWER ON for the components in question.
		LED lights up green	NC ramped up and everything in cyclic mode
		LED flashes green/orange or red/orange (1 Hz)	LED-supported detection of connected DRIVE-CLiQ component is activated: (p0124[0] = 1).

Name	Function	Status	Meaning
COM	Communi-cation	□ LED off	CP not ramped up / started
		■ LED lights up green	Communication via CP possible (RUN operating state)
		☀ LED flashes green	Communication possible (no configuration)
		■ LED lights up yellow	CP was stopped via PLC/TIA. No communication.
		☀ LED flashes yellow	Configuration received and transition to the RUN operating state.
		☀ LED flashes red	Error status (FATAL error)
DIAG	Diagnostics	■ LED lights up green	Everything OK.
		■ LED lights up yellow	Software-related fault is pending. Generate the diagnostic data with the Diag button and so contact the Hotline.
		☀ LED flashes yellow (0.5 Hz)	The data backup operation initiated with the Diag button is running.
		■ LED lights up red	HW-related tests fail, e.g. memory test during switch on. If no change occurs after multiple switch off/on, replace the device.
SD Activity LED (directly on the card slot)		□ LED off	No SD card inserted.
		☀ LED flashes yellow	Active access to SD card

Important LED states

- If all the LEDs are flashing, the PLC must be reset (general reset) via the mode selector switch.

- While the PPU is ramping up, all LEDs briefly light up orange. You can carry out a detailed diagnosis using a PG/PC and the operating software.

Additional references

- For information on drive faults and alarms, see also:
  SINAMICS S120/S150 List Manual (LH1)

4.2.3 7-segment display

Figure 4-7   7-segment display

Displaying messages

- It serves to output status information during commissioning, ramp-up and cyclical operation. The 7-segment display is visible on the rear side of the PPU.

- During normal operation, "6" appears here and the dot flashes.

Load BIOS

7-segment display	Meaning
00	Before loading the Master Boot Record (MBR)
01	Before starting the Master Boot Record (MBR) code
02	Master Boot Record (MBR) code has started
03	Second stage of the boot loader has started, before reading the configuration file
04	Before loading the kernel
05	Before starting the kernel

Booting the basic system

7-segment display	Meaning
1 (begin)	Basis initializations
2 (prepfs)	Cleaning up and preparing the file system
3 (hostname, loopback)	The name is set and the loopback interface configured.
4 (syslog)	Starting the system logging Starting the CFS class 1, provide the network interfaces.
5 (network)	Initializing the network interfaces and the firewall
6 (PPU:rtai, TCU:tcuconfig))	Starting the time server (ntpd)
7 (lsh)	Starting the SSH server (generate a host key if one is still not available).
8 (PPU:ftpd, TCU:mtouch)	Starting the FTP server
9 (PPU:tcuservices, TCU:usbexport)	Starting the TCU services (TFTP, VNC)

NCK outputs

7-segment display	Meaning
1	Not applicable.
2	Not applicable.
3	Debugger was initialized.
4	NCK operating system was successfully activated.
5	NCK operating system has booted, initial task is being processed (→ the application boots).
6	Initialization was successfully performed; the control is in cyclic operation.
6.	With flashing point: The control is in cyclic operation and the cycles are active.
F	Internal error: Can only be read via additional diagnostics.
1 or 2	SINUMERIK system software and NVRAM data do not match. To resolve this problem, a general reset is required by booting with switch position 1 or 2.
Lxx=yyy	Internal error when starting NCK, "xx" is the line number in the mcsystem.ini, "yyy" is a unique error code for the code position.

System error

7-segment display	Meaning
C	"crash": The operating system crashes (this approximately corresponds to a Blue Screen for Windows); details can be found in the system log file.
P	"partition": Error when repartitioning
E	"error": A read or write error has occurred on the SD card (an additional point is displayed for a write error). It is possible that the SD card is defective and should be replaced.
F	"full": The SD card is too full, so it is probable that not all of the services will be able to be successfully started.
	When booting, this error is displayed for 1 minute; the system then continues to boot, however, it can be assumed that problems will occur.

4.2.4 DIAG\RESET button

Arrangement

The DIAG/RESET button is situated on the rear of the PPU above the NCK commissioning switch.

Performing the operation

DIAG/RESET button has two functions:

- RESET: Press the button for more than 10 seconds to restart the PPU.

- DIAG: Press the button for less than 8 seconds to start the DiDac function. This function collects all the available log files of the operating software and stores them in the following directory: /card/user/sinumerik/didac/out_<Date-Time>.7z.

user			
common		04.10.19	07:35:27
sinamics		04.10.19	07:35:27
sinumerik		15.10.19	07:22:54
cm		11.09.19	06:55:16
com_server		11.09.19	06:48:29
cos		11.09.19	06:48:29
cp		11.09.19	06:48:32
cycles		04.10.19	07:35:27
data		15.10.19	07:22:54
diag_server		11.09.19	06:48:13
didac		24.10.19	05:54:15
out_2019-10-24T05_54_12	7z 1477327	24.10.19	05:54:15
SlHmiDiDaC	log 2593	24.10.19	05:54:15
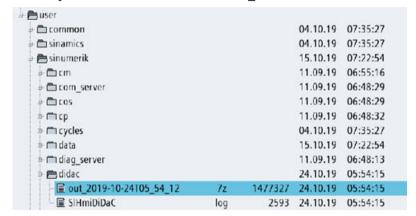
Figure 4-8   DIAG functionality

This function is available with CNC software version 6.13.

4.2.5   Start-up and mode selector switch

The PPU provides an NCK rotary coding switch and a PLC mode selector switch as a toggle switch with three switch settings:

- The NCK commissioning switch: Setting during normal operation: "0"

Figure 4-9   NCK commissioning switch

- The PLC mode selector switch: Setting during normal operation: "Run"

RUN   Places the PLC in the RUN operating state.

STOP   Places the PLC in the STOP operating state.

MRES   Initiates the PLC reset.

Figure 4-10   PLC mode selector switch

4.2.6 Operation when wearing gloves

Recommended gloves

The following gloves are recommended when using the PPU 1740:

• BM Polyco: Reusable gloves, white, cotton	Article number: RS 562-952)
• Carex (leather)	(Article number: 1505/k)
• Comasec PU900	(Article number: 4342)
• KCL Man at work	(Article number: 301)
• KCL Camapur Comfort	(Article number: 619)
• KCL Camapur Comfort antistatic	(Article number: 625)
• KCL Camatril Velours	(Article number: 730)
• KCL Dermatril L	(Article number: 741)
• KCL Thermoplus	(Article number: 955)
• UVEX profi ENB 20A ergo	(Article number: 60148)

Do not wear thick gloves when operating the touch-sensitive glass user interface.

Wear thin gloves made of cotton or gloves for touch-sensitive glass user interfaces with capacitive touch function.
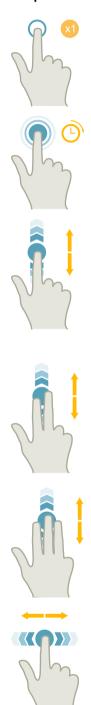
Note

Operating with thicker gloves

To operate the touch panel with thicker work gloves, apply somewhat more pressure.

4.2.7 Operating with gestures

Finger gestures to operate the touch display

Tap
• Select window
• Select an object
• Activate entry field

Tapping and holding
• Open object to be changed

Vertical swipe with 1 finger (flick)
• Scrolling in lists
• Scrolling in files

Vertical swipe with 2 fingers (flick)
• Laterally scrolling in lists
• Laterally scrolling in files

Vertical swipe with 3 fingers (flick)
• Scrolling to the beginning or end of lists
• Scrolling to the beginning or end of files

Note:

The distance between the fingers must be at least 10 mm so that the 3 fingers are reliably identified.

Horizontal swipe with 1 finger (flick)
• Scrolling in lists with lots of columns

Pan with 1 finger

- Moving content of graphics
- Moving content of lists

Pan with 2 fingers

- Rotating content of graphics

Tap with 2 fingers

- Calling a context menu

Spread

- Increasing the size of the content of graphics

Pinch

- Decreasing the size of the content of graphics

4.3 Sidescreen camera display

PPU 1740 supports one camera in the sidescreen or the Display Manager screen for the NCU 710 in keeping with its hardware power.

4.4 Memory card interface

4.4.1 SD card system

Overview

PPU 1740 has an SD card interface provided on the backside of the panel. It is necessary to run the PPU.

SD card with system software

The SD card is not supplied along with the PPU. It must be ordered as a separate component.

NOTICE
Inserting or withdrawing with the power connected can destroy the SD card
The SD card may be inserted or removed only when the system is de-energized.

Data

The SD card is required for the operating system (SINUMERIK system software) of the PPU and license key, when ordered.

The SINUMERIK system software is delivered on the SD card.

The SD card also contains:

- User data (folders like /user and /oem are available)
- Version info (serial number, version, type designation)
- License key
- OEM data (manufacturer settings).

This means that the SD card can be inserted into another PPU without having to change the licenses.

4.4.2   Inserting the system SD card

Inserting the system SD card

Slot and mounting position:
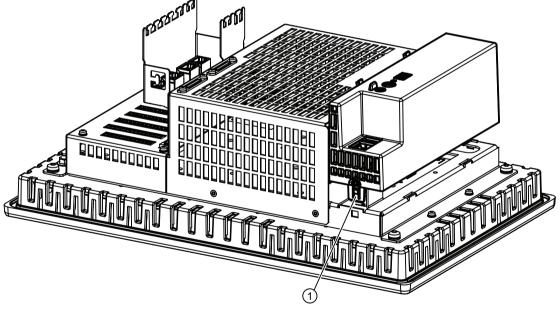
⚠ CAUTION
Electrostatic Device (ESD)
Before you touch a SD card, discharge yourself at the cabinet or at the ground terminal.
The SD cards should only be inserted or removed when the control unit is disconnected from the power supply.

Procedure:

1. Switch off the power supply.

2. Open the plastic cover.

 1   Hook snapped in

Figure 4-11   SD card slot and plastic cover

3. Gently insert the new SD card into slot until it clicks into place. The SD card has a long edge as indicated in the image below. This edge must always be on the right when inserting the card.

| 1 | SD card slot |

Figure 4-12   SD card slot

NOTICE
Plugging in the SD card
Ensure that the SD card is inserted with care to avoid damage.

4. Switch the power supply on again.

4.5 System design

Configuration with four axes

The following configuration shows a typical example with SINAMICS S120 booksize:
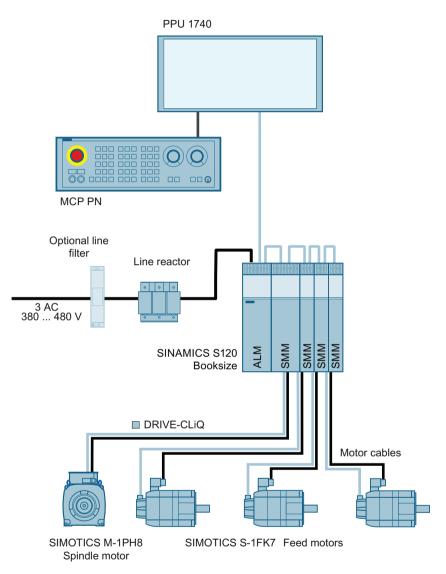
Figure 4-13   Configuration example 1: Configuration with four axes

Configuration with 4 axes and 2 auxiliary axes

The following configuration shows an example with 2 auxiliary axes:
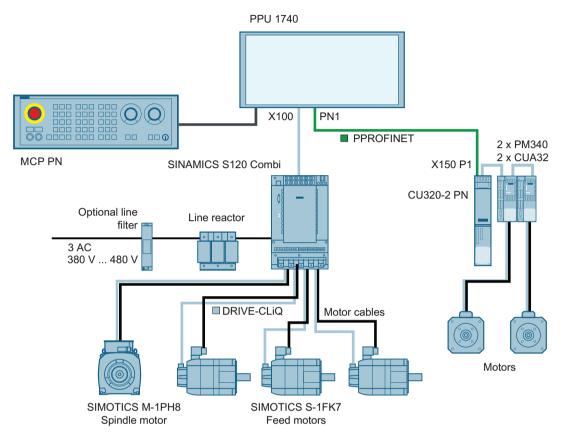
Figure 4-14   Configuration example 2: Basic expansion stage with 4 axes and 2 auxiliary axes

Configuration with 6 axes and Safety Integrated

The following configuration shows the expansion stage with SINAMICS S120 Combi:
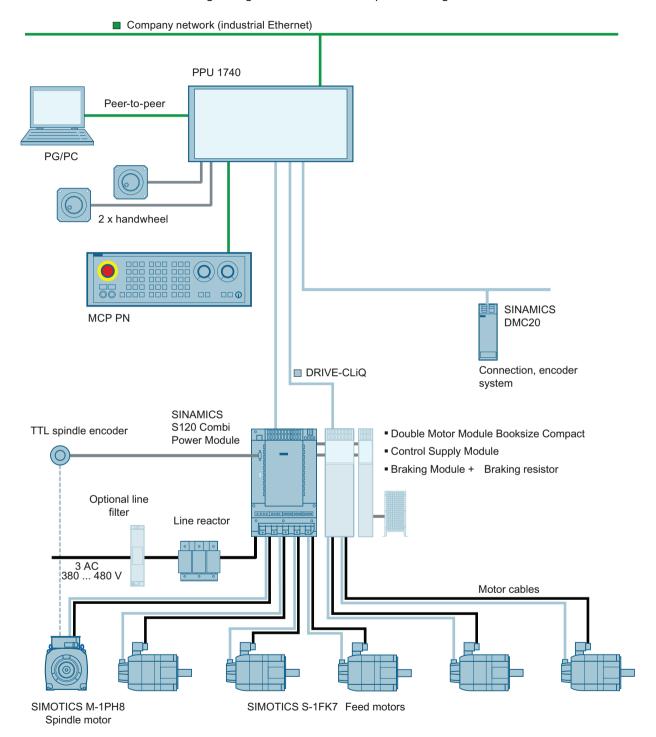
Figure 4-15   Configuration example 3: Expansion stage with 6 axes and with Safety Integrated

Application planning

<div style="text-align: right; font-size: 3em;">5</div>

5.1 Grounding concept

Components

The SINUMERIK ONE system consists of a number of individual components which have been designed so that the system complies with the appropriate EMC and safety standards. The individual system components are:

- Panel Processing Unit
- PROFINET I/O devices
- SINAMICS S120 drive components

Grounding measures

The PPU and machine control panel are attached with tension jacks to a metal mounting panel on the operator panel. Both have a protective conductor connection for grounding (grounding screw) at the rear of the device, which must be connected to the grounding bar of the control cabinet or the operator panel housing.

The PLC I/O modules are installed in the control cabinet and grounded via a grounding screw.

The SINAMICS S120 drive system is installed in the control cabinet. The electronic grounds of the modules are connected to each other via DRIVE-CLiQ. The modules are grounded either via the galvanized mounting plate or via the grounding lugs on the front of the modules.

Requirements of the cable cross-section

The following rules apply for external cable cross-sections:

- PA cross-section ≥ 10 mm^2
- The cable cross-section of the external protective conductor is calculated from the cable cross-section of the line connection as follows:

Line connection S [mm²]	External protective conductor min. [mm²]
S ≤ 16	S
16 ≤ S ≤ 35	16
S ≥ 35	S/2

5.2 EMC compatibility

Shielded signal cables

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 cables, special equipotential bonding, isolation, and shielding measures.

- For safe and fault-free operation of the system, the specified cables must be used.

- For digital signal transmission, the shield must have a conductive connection at both sides of the housing.
  Exception:
  Standard shielded cables grounded on only one side can be used for devices from other manufacturers (printers, programming devices, etc.). However, these devices must not be connected to the control during normal operation. If the system cannot operate without them, then the cable shields must be connected at both ends. Furthermore, the non-Siemens device must be connected to the control via an equipotential bonding cable.

Cable definitions

The following cables are permissible:

- Signal cables:

  - Data cables (Ethernet, PROFINET, DRIVE-CLiQ, sensor cables, etc.)

  - Ribbon cables for digital inputs/outputs

  - Emergency Stop cables

- Power cables:

  - Low-voltage supply cables (230 VAC, 24 VDC, etc.)

  - Supply cables to contactors (primary and secondary circuit)

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:

- Signal cables and power cables must be routed at the greatest possible distance from one another.

- 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.

- Signal cables may not be routed close to strong external magnetic fields (e.g. motors and transformers).

- Pulse-loaded HC/HV lines must always be laid completely separately from all other lines.

- If signal lines cannot be routed a sufficient distance away from other cables, they must be installed in grounded cable ducts (metal).

- The clearance (interference injection area) between the following lines must be kept to a minimum:

  - Signal line and electrical circuit signal line (twisted)

  - Signal line and associated equipotential bonding conductor

  - Equipotential bonding conductor and protective conductor (routed together)

EMC-compatible installation of the components

The PPU and operator components must be installed in metallically enclosed EMC-compatible housings.

References

Additional specifications on interference suppression measures can be found in the following references:

- EMC Installation Guideline Configuration Manual / Basic system requirements

- SINAMICS S120 Combi Manual

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.

5.3 Climatic and mechanical environmental conditions

5.3.1 Ambient conditions

The components of the SINUMERIK ONE system exceed the requirements according to EN 61800-2 with regard to shipping and storage conditions.

The following data applies under the following conditions:

- Long-term storage in the transport and product packaging:
  At weather-protected locations that have continuous contact with outside air through openings.

- Transport in the transport packaging:

  - In unventilated containers under conditions not protected from weather effects.

  - In the "cold" in accordance with outside air.

  - Air transport in the air-conditioned cargo hold.

Table 5-1   Ambient conditions during storage and transport

Type of condition	Permissible range/class		
	Transport	**Storage**	
Classification	EN 60721-3-2	EN 60721-3-1	
Climate class	2K4	1K4	
Ambient temperature	From -40° C to +70° C	From -25° C to +55° C	
Biological environmental conditions	2B1 [1]	1B1 [1]	
Chemically active environmental conditions	2C2 [2]	1C2 [2]	
Maximum permissible temperature change	Direct interaction in air/air: -40°/+30° C at 95% relative humidity	30 K/h	
Relative humidity	5 to 95%		
Precipitation, rain	6 mm/min [1]	Not permitted	
Water other than rain	1 m/s and wet loading surfaces [3]	Not permissible [4]	1 m/s and wet loading surfaces [3]
Condensation, splash water, icing, salt spray	Permissible	Not permissible [4]	Permissible [3]

[1]   Mold growth, slime, rodents, termites and other animal vermin are not permissible.

[2]   In marine- and weather-resistant transport packaging (container).

[3]   For storage in the transport packaging.

[4]   For storage in the product packaging.

Note

Remove the transport protective foil and packaging material before installing the components.

5.3.2 Transport and Storage Conditions

Components in original packaging

The following specifications apply to components in transport packaging:

	Transport	Storage
Standard / class	EN 60721-3-2	EN 60721-3-1
Temperature range	-20 ... + 60 °C	-25 ... + 55 °C
Temperature change	-40 °C/+30 °C and +70 °C/+15 °C *)	< 0.5 K / min (≙ 30 K / h) averaged over 5 minutes
Relative humidity	5 ... ~95%	10 ... 100 %
Permissible change of the relative humidity	max. 0.1% / min (≙ 6% / h)	

*) A direct change between the specified temperatures in the air is assumed

Table 5-2   Transport values for PPU

Vibratory load: • **Operation (3M1)** • **Package (1M2)**	9 - 29 Hz: 0.3 mm; 29 - 200 Hz: 1g 5 - 9 Hz: 3.5 mm, 9 - 200 Hz: 1 g
Shock load: • **Operation (3M1)**	5 g, 30 ms
Product packaging	1M2

5.3.3 Operating Conditions

Note

Before commissioning components with display, remove the foil which is used to protect the components during transport.

Climatic environmental conditions of PPU 1740-1500 and PPU 1740-1900

Parameters	Values
Limit temperatures at 100% load	0 ... 40 °C (front) 0 ... 45 °C (rear)
Temperature change	< 0.5 K / min (≙ 30 K / h) averaged over 5 minutes
Humidity	Relative: 5 ... 90 %
Permissible change of the relative humidity	max. 0.1% min (≙ 6% / h)

Parameters	Values
Moisture condensation and ice formation	Not permissible
Dripping water, spray, splash water, water jets	Permissible
Supply air	Without aggressive gases, dusts and oils
Air pressure	106 ... 92 kPa or 0 ... 1000 m above sea level
Derating	At altitudes over 1,000 to 4,000 m above sea level, the upper temperature limit must be reduced by 3.5 °C / 500 m.
Active environmental conditions	Chemical: Class 3C2 Mechanical: Class 3M1 Biological: Class 3B1
EMC limit value	Category: C2
Type of enclosure	rear: open type, front: enclosure type.

Note

You must consider the radio interference for the complete system. Particular attention should be paid to cabling. Please contact your sales representative for assistance and support.

If compliance with limit value class C2 is required, please contact your local Siemens sales partner.

Function-impairing dust

When working in areas where gases, dust and oils may be hazardous to functionality, the control system must be operated in an enclosure with a heat exchanger or with suitable supply air. Dust deposits must be removed at regular intervals.

Maximum permissible amount of dust in the ambient air:

Suspended component	0.2 mg/m³
Deposits	1.5 mg/m²h

Limit values for radio interference suppression in industrial environments

	Limit class according to EN 61800-3
Conducted radio interference	C3
Radio interference	C3

Note

The user must consider interference radiation for the complete system. Particular attention should be paid to cabling. Please contact your sales representative for assistance and support.
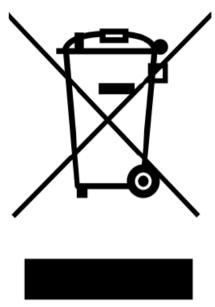
5.4　　　Recycling and disposal

Figure 5-1　　Recycle

Products should be disposed of corresponding to the relevant national regulations.
The products described in this manual can be mostly recycled due to the fact that they contain very few damaging substances. To recycle and dispose of your old device in an environmentally friendly way, please contact an appropriate disposal company.

Installing 6

The PPU 1740 package contains the following elements:

- PPU 1740
- Bag of clamps
- Accessory bag (I/O and power supply connectors)
- Wiring diagram
- Safety instructions

Installation notes

The PPU modules and components may only be installed in housings, cabinets or in isolated electrical operating areas. Housings, cabinets, or isolated electrical operating areas may only be accessed by trained or authorized personnel.

> ⚠ **DANGER**
>
> **Risk of electric shock**
>
> The entire system must be voltage-free when mounting or wiring the SINUMERIK ONE PPU 1740.

Note

If the equipment is not used in a manner specified by the manufacturer, the protection provided by the equipment can be impaired.

Components in the control cabinet

The SINAMICS components and the axis expansion modules are installed in a control cabinet.

References

Notes for mounting components of the SINAMICS S120 product family are contained in the following manuals:
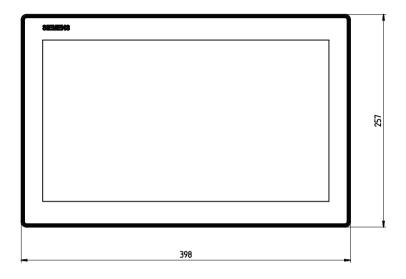
- SINAMICS S120 Booksize Power Units Manual
- SINAMICS S120 Combi Manual
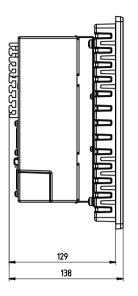
For further details on the control cabinet installation, refer to:
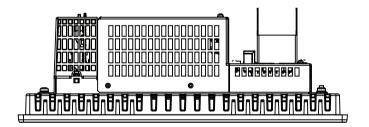
- "Control Cabinet Integration, SINAMICS S120 Booksize / SIMODRIVE" System Manual

6.1 Dimension drawings for PPU 1740 -1500

PPU 1740 - 1500
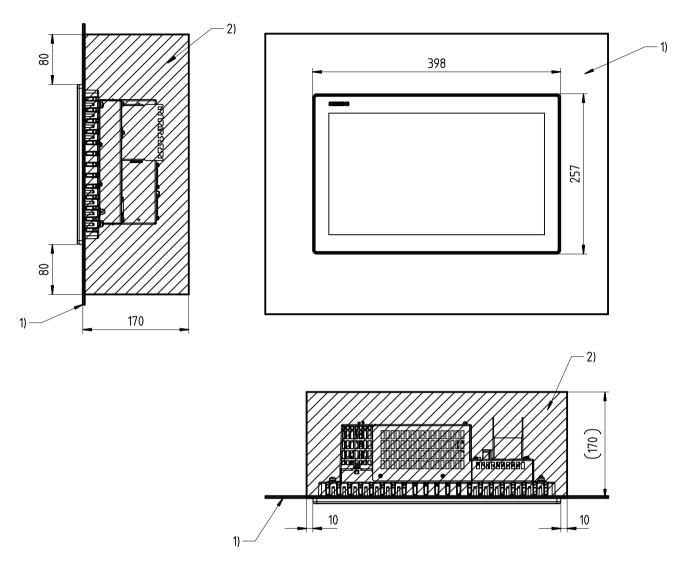
installation cutout:
382 x 241 mm²

Figure 6-1   PPU 1740 -1500 dimensions

1) Mounting frame
   Panel cutout 382 x 241 mm²

2) Free space for cables and ventilation

Figure 6-2   Cabinet for ventilation in PPU 1740 -1500

6.2 Dimension drawings for PPU 1740-1900

PPU 1740 - 1900
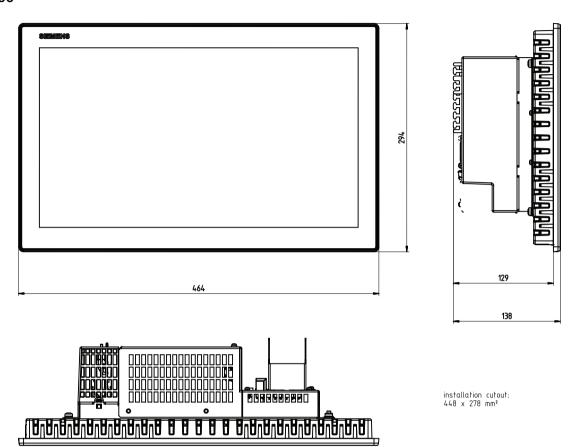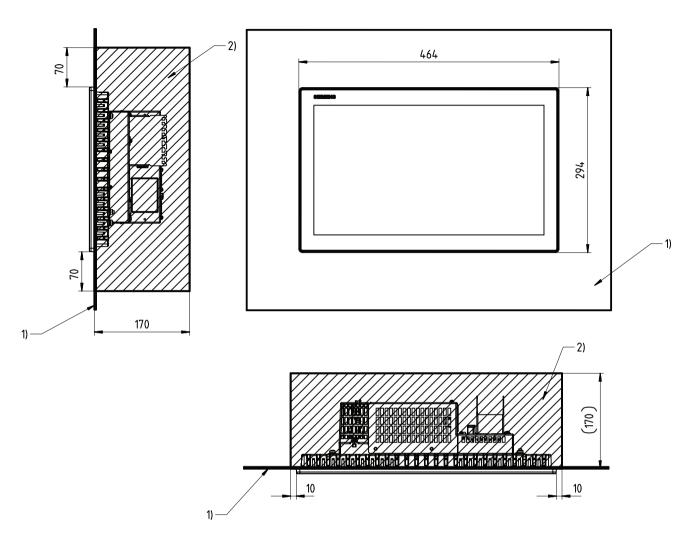
Figure 6-3   PPU 1740-1900 dimensions

installation cutout:
448 x 278 mm²

1) Mounting frame
   Panel cutout 448 x 278 mm²

2) Free space for cables and ventilation

Figure 6-4   Cabinet for ventilation in PPU 1740 -1900

6.3 Installing the PPU

Prerequisite

The PPU is attached to the operator panel housing by means of fixing clamps. Some of the prerequsites for installing the PPU are:
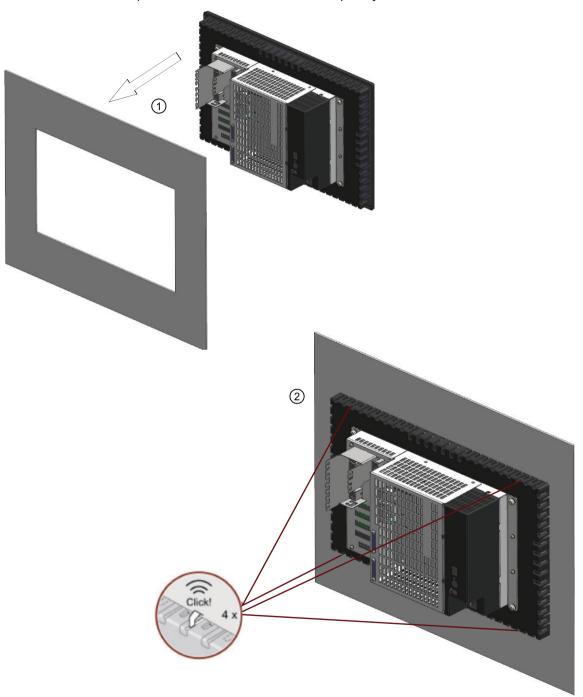
- Remove the foil which is used to protect the components during transport.

- The fixing clamps from the enclosure must be kept ready for installation.

- Flat-head screwdriver, blade 0.5 x 3 mm

Procedure

Note

The device protection is not guaranteed if the mounting seal is damaged.
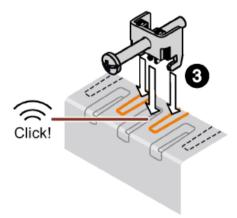
1. Insert the PPU into the installation cutout from the front.

2. Ensure all the 4 spring retainers on the top and bottom of the unit are fully engaged.
   If the unit is not fully engaged, then carefully push the unit into the mounting cutout at the position where it is not locked completely.
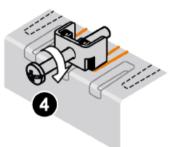
3. Insert fixing clamps in its respective position on the device.
   For more details refer "Position of mounting clips for IP65 installation (Page 67)" .

4. Fix the fixing clamps by tightening the setscrew with flat-head screwdriver, torque 0.5 Nm.

5. Repeat steps 3 and 4 to attach all the fixing clamps in their respective positions.

6. Check for the mounting seal.

Note

Due to cooling effect, PPU 1740 can only be assembled horizontally.

6.4 Position of mounting clips for IP65 installation
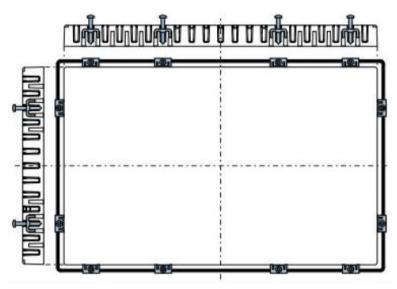
Figure 6-5   PPU 1740-1500
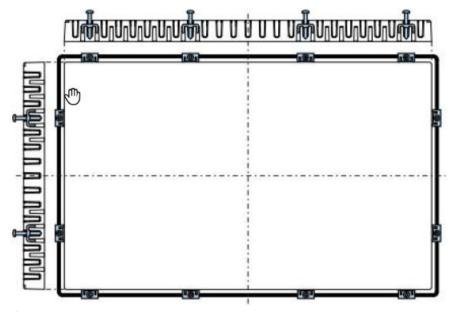
Figure 6-6   PPU 1740-1900

Service and maintenance

7

Cleaning the device

The device is designed for low-maintenance operation. Nevertheless, you must regularly clean the device.

Note
Switch the device off for cleaning

Clean the device only when it is switched off.

Clean only the front panel surface with e.g. soft cloth moistened with water or mild cleaning agent. Use dry cloth to clean the backside of the module.

Note
Avoid damage

Do not clean the backside of the module using a cleaning agent.

Cleaning 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

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, with details of the malfunction. The device must only be repaired there.

Topology rules for S120 drive system

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

For more information on the permitted topology rules for the S120 drive system refer 828D PPU and components, chapter 5 Rules for permitted topologies.

Interface description

9

9.1 Interface overview

Requirement

> ⚠ **DANGER**
>
> **Risk of electric shock**
>
> Before you mount the SINUMERIK ONE or cable it, the complete system must be in a no-voltage condition.

Definition

The abbreviations used in "Signal type" column in the tables showing the pin assignment have the following meaning:

B	Bidirectional
GND	Grounding
I	Input
O	Output
VI	Voltage input (supply voltage)
VO	Voltage output (supply voltage)

Note

If your axis grouping contains a Smart Line Module without DRIVE-CLiQ (5 kW or 10 kW), you must assign the Smart Line Module enabling signal to the X122.1 digital input on the PPU.

Connection options

The following overview shows the interfaces and their connection options:

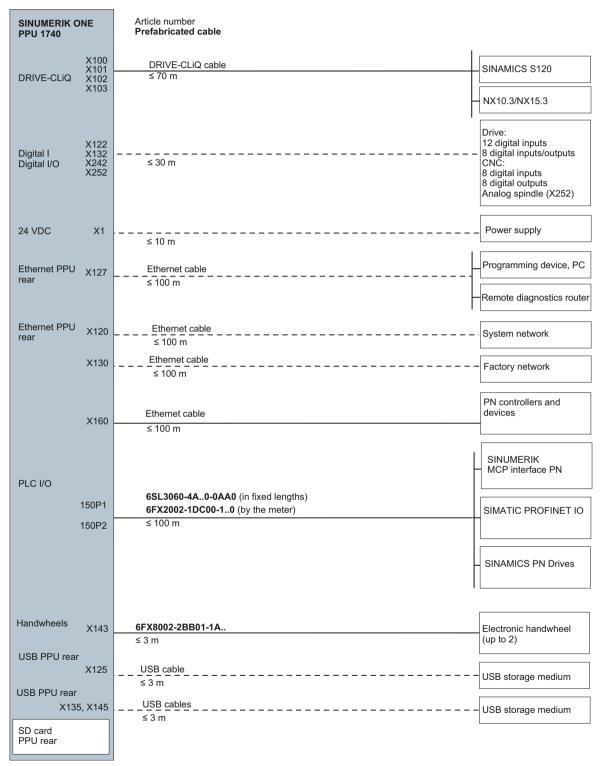| SINUMERIK ONE PPU 1740		Article number **Prefabricated cable**	
DRIVE-CLiQ	X100 X101 X102 X103	DRIVE-CLiQ cable ≤ 70 m	SINAMICS S120
			NX10.3/NX15.3
Digital I Digital I/O	X122 X132 X242 X252	≤ 30 m	Drive: 12 digital inputs 8 digital inputs/outputs CNC: 8 digital inputs 8 digital outputs Analog spindle (X252)
24 VDC	X1	≤ 10 m	Power supply
Ethernet PPU rear	X127	Ethernet cable ≤ 100 m	Programming device, PC
			Remote diagnostics router
Ethernet PPU rear	X120	Ethernet cable ≤ 100 m	System network
	X130	Ethernet cable ≤ 100 m	Factory network
	X160	Ethernet cable ≤ 100 m	PN controllers and devices
PLC I/O			SINUMERIK MCP interface PN
	150P1	**6SL3060-4A..0-0AA0** (in fixed lengths) **6FX2002-1DC00-1..0** (by the meter)	SIMATIC PROFINET IO
	150P2	≤ 100 m	
			SINAMICS PN Drives
Handwheels	X143	**6FX8002-2BB01-1A..** ≤ 3 m	Electronic handwheel (up to 2)
USB PPU rear	X125	USB cable ≤ 3 m	USB storage medium
USB PPU rear	X135, X145	USB cables ≤ 3 m	USB storage medium
SD card PPU rear			

Figure 9-1   Interface connections

9.2 Power supply connection

9.2.1 Requirements for the power supply

Pin assignment 4-pin screw-type connector

Pin	Signal name	Signal type	Meaning
+/-	P24	VI	24 VDC power supply (bridged)
+/-	P24	VI	
M	M	VO	Protective ground (bridged)
M	M	VO	

Signal: VI - voltage input; VO - voltage output

Requirements of DC power supplies

Interface X1 is intended exclusively for the connection of the external 24 V power supply, e.g.

- SITOP (stabilized 24 V power supplies)
- CSM (Control Supply Module)

The following power consumption values for the PPU provide a configuration basis for calculating the 24 VDC power supply.

Parameter	Values
Typical current consumption (PPU only: Processor, memory)	2.4 A
Max. current consumption (PPU with full load, e.g. USB, handwheels)	8 A
Maximum switch-on current	8 A

⚠ **DANGER**

Risk of lightning strike

In the case of supply lines > 10 m, protectors must be installed at the device input in order to protect against lightning (surge).

The DC power supply must be connected to the ground/shield of the Control Unit for EMC 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 PLC I/Os. If this is not the case in exceptional circumstances, the ground connection should be made on the grounding rail of the control cabinet.

See also: "EMC Installation Guideline (https://support.industry.siemens.com/cs/de/de/view/60612658/en)" Configuration Manual.

Table 9-1   Technical data of the DC power supply

Rated voltage	According to EN 61131-2	
	Voltage range (mean value)	
	Voltage range (dynamic)	
	Voltage ripple peak-to-peak	
	Booting time at POWER ON	
Non-periodic overvoltages		
	Duration of overvoltage	
	Recovery time	
	Events per hour	
Transient voltage interruptions	Idle time	
	Recovery time	
	Events per hour	

9.2.2   Connecting the power supply

Cable specification

⚠ DANGER
Protective separation
The 24 V direct voltage must be configured as PELV.

⚠ WARNING
Temperature specification
Use cables rated temperature as at least 80°C for power supply.

The supply for the 24 V DC load power supply is wired to screw terminal block X1:

Features	Version
Connection option	Up to 2.5 mm^2
Current carrying capacity	max. 10 A
Max. cable length	10 m

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

The following conductor end sleeves are permissible: Without an insulating collar in accordance with 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.

9.3 DRIVE-CLiQ

9.3.1 DRIVE-CLiQ interface

X100 - X103 pin assignment

PIN	Signal name	Signal type	Meaning
1	TXP	O	Transmit data +
2	TXN	O	Transmit data -
3	RXP	I	Receive data +
4	--	--	Reserved
5	--	--	Reserved
6	RXN	I	Receive data -
7	--	--	Reserved
8	--	--	Reserved
A	--	--	Reserved
B	--	--	Reserved

Use

DRIVE-CLiQ interfaces are used to connect SINAMICS S120 components to the PPU.
It has the following properties:

- Components can be independently expanded

- Automatic detection of components by the PPU

- Standardized interfaces to all components

- Uniform diagnostics down to the components

- Complete service down to the components

Cable specification for X100 - X103

Feature	Version
Connector type	RJ45 socket with 180° cable outlet
Cable type	MOTION-CONNECT
Article number	
Max. cable length	70 m

Note

Interfaces X100 to X103

The interfaces X100 to X103 provide power supply voltage 24V/450mA to connect encoder/measuring systems like SME.
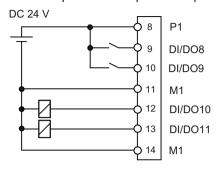
9.4 Digital inputs/outputs

X122 pin assignment

Pin		Signal name	Meaning
1	DI0	DI0	Digital input 0
2	DI1	DI1	Digital input 1
3	DI2	DI2	Digital input 2
4	DI3	DI3	Digital input 3
5	DI16	DI16	Digital input 16
6	DI17	DI17	Digital input 17
7	M2	MEXT2	Ground for pins 1...6
8	P1	P24EXT1	+24 V power supply
9	IO8	DI/DO8	Digital input/output 8
10	IO9	DI/DO9	Digital input/output 9
11	M1	MEXT1	Ground for pins 9, 10, 12, 13
12	IO10	DI/DO10	Digital input/output 10
13	IO11	DI/DO11	Digital input/output 11
14	M1	MEXT1	Ground for pins 9, 10, 12, 13

X132 pin assignment
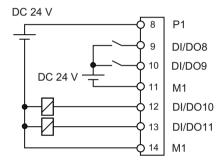
Pin		Signal name	Meaning
1	DI4	DI4	Digital input 4
2	DI5	DI5	Digital input 5
3	DI6	DI6	Digital input 6
4	DI7	DI7	Digital input 7
5	DI20	DI20	Digital input 20
6	DI21	DI21	Digital input 21
7	M2	MEXT2	Ground for pins 1...6
8	P1	P24EXT1	+24 V power supply
9	IO12	DI/DO12	Digital input/output 12
10	IO13	DI/DO13	Digital input/output 13
11	M1	MEXT1	Ground for pins 9, 10, 12, 13
12	IO14	DI/DO14	Digital input/output 14
13	IO15	DI/DO15	Digital input/output 15
14	M1	MEXT1	Ground for pins 9, 10, 12, 13

Connecting the inputs and outputs:

- **Recommended connection: Inputs and outputs connected to the same supply**
  If both inputs and outputs are operated with the same 24 V supply.

  DC 24 V

Pin	Signal
8	P1
9	DI/DO8
10	DI/DO9
11	M1
12	DI/DO10
13	DI/DO11
14	M1

- Not recommended connection: Inputs and outputs on different supplies

  DC 24 V

Pin	Signal
8	P1
9	DI/DO8
10	DI/DO9
11	M1
12	DI/DO10
13	DI/DO11
14	M1

  DC 24 V

NOTICE

Exceeding the permissible input current

If the inputs and outputs are supplied separately with power, the input current can exceed the permissible value of 15 mA according to EN61131-2, and the signal source can be overloaded.

X242 pin assignment

Pin	Signal name		NC variable	Meaning
1	Not connected			
2	Not connected			
3	IN1	DIN1	$A_IN[1]	Digital NC input 1
4	IN2	DIN2	$A_IN[2]	Digital NC input 2
5	IN3	DIN3	$A_IN[3]	Digital NC input 3
6	IN4	DIN4	$A_IN[4]	Digital NC input 4
7	M4	MEXT4		Ground for pins 3...6
8	P3	P24EXT3		+24 V power supply
9	O1	DOUT1	$A_OUT[1]	Digital NC output 1
10	O2	DOUT2	$A_OUT[2]	Digital NC output 2
11	M3	MEXT3		Ground for pins 9, 10, 12, 13

Pin		Signal name	NC variable	Meaning
12	O3	DOUT3	$A_OUT[3]	Digital NC output 3
13	O4	DOUT4	$A_OUT[4]	Digital NC output 4
14	M3	MEXT3		Ground for pins 9, 10, 12, 13

X252 pin assignment

Pin		Signal name	NC variable	Meaning
1	AO	AOUT		Analog output (voltage for analog axis/spindle)
2	AM	AGND		Analog ground
3	IN9	DIN9	$A_IN[9]	Digital NC input 9
4	IN10	DIN10	$A_IN[10]	Digital NC input 10
5	IN11	DIN11	$A_IN[11]	Digital NC input 11
6	IN12	DIN12	$A_IN[12]	Digital NC input 12
7	M4	MEXT4		Ground for pins 3...6
8	P3	P24EXT3		+24 V power supply
9	O9	DOUT9	$A_OUT[9]	Digital NC output 9
10	O10	DOUT10	$A_OUT[10]	Digital NC output 10
11	M3	MEXT3		Ground for pins 9, 10, 12, 13
12	O11	DOUT11	--	• Without analog axis/spindle: Digital NC output 11 • With analog axis/spindle: Controller enable in accordance with MD30134 $MA_IS_UNIPOLAR_OUTPUT
13	O12	DOUT12	--	• Without analog axis/spindle: Digital NC output 12 • With analog axis/spindle: Traversing direction in accordance with MD30134 $MA_IS_UNIPOLAR_OUTPUT
14	M3	MEXT3		Ground for pins 9, 10, 12, 13

NOTICE
Shielded signal cables for analog signals
To ensure safe, fault-free operation of the system, shielded cables with shield connection should be used for the wiring of the analog outputs.

Use

The following assignment applies to the terminals:

• Ten signals can each be assigned to X122 and X132:

  – Six digital inputs

  – Four bidirectional digital inputs/outputs

The following twelve inputs and eight inputs/outputs are used for drive control:

- At terminal X242, four inputs and four outputs are available for the NC.

- At terminal X252, four inputs and two outputs are available for the NC.

Note

Terminals MEXT1 ... MEXT4 must be connected for the digital inputs/outputs to function.

- Connect the incorporated ground reference of the digital inputs.
- Connect a jumper to terminal M on plug connector X1.

P24EXT (P1, P3) must also be connected so that the outputs function. An external supply can also be connected here, or a jumper can be connected to terminal P at X1. This removes the galvanic isolation for these digital inputs.

An open input is interpreted as "low".

Cable specification at X122, X132, X242 and X252

Please note the following:

- Use flexible cables with a cable cross-section of at least 0.25 mm^2

- Ferrules are not required.

- You can use ferrules without an insulating collar in accordance with DIN 46228, Form A long version.

- You can connect two cables each with a cross section of 0.25 mm^2 in one ferrule.

Features	Version
Connection option	Up to 0.5 mm^2
Current carrying capacity	4 A max. 4 A
Max. cable length	30 m

Wiring the digital inputs/outputs

Tools required: 3.5-mm screwdriver or power screwdriver

Procedure:

1. Strip off 6 mm of cable insulation and, if necessary, press on a ferrule.

2. Wire the digital inputs of the interface for connection of the sensors.

3. Wire the digital outputs of the interface for connection of the actuators.

4. Insert the cable into the corresponding screw terminal.

9.4.1 Technical data

Digital inputs

Parameter	Value
Voltage	-3 V to 30 V
Typical power consumption	2.5 mA at 24 VDC
Signal level (including ripple)	High: 15 V to 30 V Low: -3 V to 5 V
Maximum signal propagation times	L → H: 50 µs H → L: 150 µs
Galvanic isolation	Yes: The reference potential is terminal 2M at X122/X132. The reference potential is terminal 4M at X242/X252.

Digital outputs

Parameter	Value
Voltage	24 V
Load current per output, maximum	500 mA continuously short-circuit proof
Output delay (typ./max.) 1)	L → H: 150 µs / 400 µs H → L: 75 µs / 100 µs
Input delay (typ.) of inputs / "rapid inputs"	L → H: 50 µs H → L: 300 µs for 10 kΩ load
Switching frequency	for resistive load: max. 100 Hz for inductive load: max. 2 Hz for lamp load: max. 11 Hz
max. lamp load	5W

Bidirectional digital inputs/outputs

Parameter	Value
As input:	
Voltage	-3 V to 30 V
Typical power consumption	2.5 mA at 24 VDC
Signal level (including ripple)	High: 15 V to 30 V Low: -3 V to 5 V
Maximum signal propagation times (fast inputs)	L → H: 10 µs H → L: 150 µs
Galvanic isolation	Yes: The reference potential is terminal 1M.
As output:	
Voltage	18 V to 30 V
Maximum output current for one load (resistive)	0.5 A

Parameter	Value
Maximum output current for one connector (resistive)	1 A
Maximum signal propagation times	L → H: 50 µs H → L: 300 µs for 10 kΩ load

9.5 Ethernet

The CPU-board of PPU 1740 provides ethernet controllers for three GbE interfaces. The connectors for the interfaces X130 and X120 are located on the CPU-Board and the interface X127 is located on the backside of the panel.

X130, X120, X127 pin assignment and use

The interfaces are designed for operation in full-duplex mode; in other words, the ports can be used for the sending as well as for the receiving of data packets. The ports are connected as an Ethernet terminal with up to 1000 Mbit (1 Gbit):

- X130 is pre-configured as DHCP client and connects the PPU to the company network and for example remote diagnostics via teleservice adapter IE.

- X120 is pre-configured as DHCP server and provides the link to the system network (e.g. Ethernet MCP, HT2, HT10, Thin Client Units or SINUMERIK Edge).

- X127 is used for commissioning. It is preconfigured as DHCP server for a peer-to-peer connection with permanently set IP address 192.168.215.1 (e.g. for access with Access MyMachine /P2P via PG/PC).

You can find further details in the following manuals:

- SINUMERIK ONE Base Software and Operating Software Commissioning Manual

- SIMATIC TS Adapter IE Manual.

Cable specification for X130, X120 and X127

Feature	Version
Connector type	RJ45 socket
Cable type	Industrial Ethernet cable (as of CAT5)
Max. cable length	100 m

Pin assignment

For diagnostic purposes, the RJ45 sockets are each equipped with a green and an orange LED. This allows the following status information about the respective Ethernet port to be displayed:

Table 9-2   Assignment of the Ethernet interfaces X120, X130 and X127 in 10/100 Mbit/s mode

Connector	Pin	Name	Type	Remark
LED 8 LED 1	1	TxD+	O	Transmit data
	2	TxD-		
	3	RxD+	I	Receive data
	4/5	GND	-	(terminated internally with 75 Ω; not required for data transmission)
	6	RD-	I	Receive data
	7/8	GND	-	(terminated internally with 75 Ω; not required for data transmission)
	Shield	-	-	On connector housing
	-	LED green (Link)	-	Lights up green: 10 or 100 Mbit/s Off: No or faulty connection
	-	LED orange (Activity)	-	Flashes: Data exchange Off: No data exchange

Signal type: O = Output; I = Input

Table 9-3   Assignment of the Ethernet interfaces X120, X130 and X127 in 1 Gbit/s mode

Connector	Pin	Name	Type	Remark
LED 8 LED 1	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
	-	LED orange (Link)	-	Lights up orange: 1000 Mbit/s Off: No or faulty connection
	-	LED orange (Activity)	-	Flashes: Data exchange Off: No data exchange

Signal type: B = Bidirectional

Note

Connection only on LAN, not on telecommunication networks!

Note

The Ethernet interfaces have what is called autocrossing functionality, i.e. when required, transmit and receive lines are switched over.

Application

Via the PROFINET interface, you can establish PROFINET IO communications networks between the PLC of the control and the field devices.

- X150 supports RT and IRT

- X160 supports RT

Properties

The PROFINET interfaces X150 and X160 are separate interfaces.

The PROFINET interface X150 is equipped with an integrated 2-port switch and a TCP/IP address for the 2 ports.

Pin assignment

For diagnostic purposes, the RJ45 sockets are each equipped with a green and an orange LED. This allows the following status information about the respective PROFINET port to be displayed:

Table 9-4   Assignment of PROFINET interfaces X150, ports 1, 2 in the 10/100 MBit/s mode

Connector	Pin	Name	Type	Remark
	1	TxD+	O	Transmit data
	2	TxD-		
	3	RxD+	I	Receive data
	4/5	GND	-	(terminated internally with 75 Ω; not required for data transmission)
	6	RD-	I	Receive data
	7/8	GND	-	(terminated internally with 75 Ω; not required for data transmission)
	Shield	-	-	On connector housing
	-	LED green (Link)	-	Lit: 10 or 100 Mbit/s Off: No or faulty connection
	-	LED orange (Activity)	-	Flashes: Data exchange Off: No data exchange

Signal type: O = Output; I = Input

Table 9-5   Assignment of PROFINET interface X160 in the 10/100 MBit/s mode

Connector	Pin	Name	Type	Remark
	1	TxD+	O	Transmit data
	2	TxD-		
	3	RxD+	I	Receive data
	4/5	GND	-	(terminated internally with 75 Ω; not required for data transmission)
	6	RD-	I	Receive data
	7/8	GND	-	(terminated internally with 75 Ω; not required for data transmission)
	Shield	-	-	On connector housing
	-	LED green (Link)	-	Lights up green: 1000 Mbit/s Off: No or faulty connection
	-	LED orange (Activity)	-	Flashes: Data exchange Off: No data exchange

Signal type: O = Output; I = Input

Note

The PROFINET interface has what is known as autocrossing functionality, i.e. when required, transmit and receive lines are switched over. Thus, no crossover cables are necessary.

Cable specification

For PROFINET, you always require a data transmission rate of 100 Mbit/s (Fast Ethernet) in full duplex mode. For data transfer purposes, you can use twisted-pair copper cables (4-wire, 100Base-T).

Table 9-6   Cable specification for X150 ports 1, 2

Characteristic	Version
Connector type	RJ45 socket
Cable type	Industrial Ethernet cable (as of CAT5)
Max. cable length	100 m

9.6 Handwheel

X143 pin assignment

Pin		Signal name	Meaning
1	P5	P5	5 VDC power supply
2	M	M	Ground
3	1A	1A	Handwheel pulses track A, channel 1
4	-1A	1/A	Handwheel pulses track A (negated), channel 1
5	1B	1B	Handwheel pulses track B, channel 1
6	-1B	1/B	Handwheel pulses track B (negated), channel 1
7	P5	P5	5 VDC power supply
8	M	M	Ground
9	2A	2A	Handwheel pulses track A, channel 2
10	-2A	2/A	Handwheel pulses track A (negated), channel 2
11	2B	2B	Handwheel pulses track B, channel 2
12	-2B	2/B	Handwheel pulses track B (negated), channel 2

Signal transfer

Max. two electronic handwheels can be connected to connector X143 on the rear of the PPU.

The signals can be transferred using the following technique:
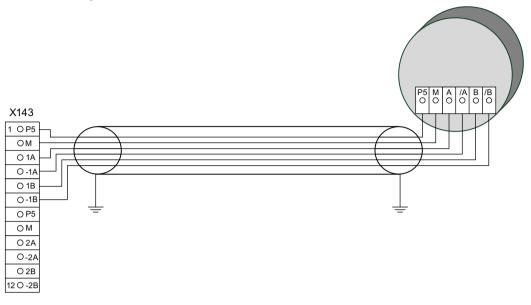
- Differential signal transfer (RS422): One signal and a negated signal for each track.

- Asymmetrical signal transfer: One 5 V TTL signal for each track.

The following applies to both techniques:

- Max. output frequency: 500 kHz

- Phase shift of Track A to Track B: 90° ±30°

- Supply: 5 V, max. 250 mA

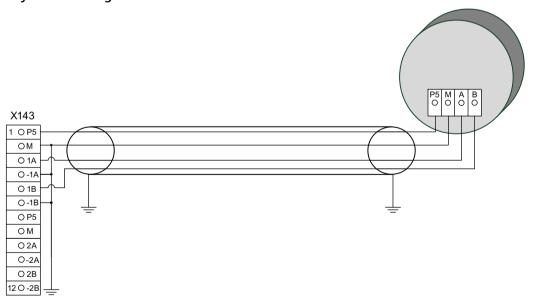The following diagrams indicate the different data transfer types:

- **Differential signal transfer:**

Note

Differential signal transfer is the preferred technique, as it is insensitive to electromagnetic disturbances.

- **Asymmetrical signal transfer:**

Cable specification

Feature	Version
Connector type:	12-pin screw terminal
Cable type:	Twisted pair, shielded
Max. cable length	3 m

9.7 USB

The USB interfaces correspond to the norm and are, therefore, not described in detail here.

- The X125 USB interface can be used to connect a USB-FlashDrive for transferring user and commissioning data.

- USB ports X135 and X145 (rear) is enabled for USB devices and for service.

Cable specification

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

Features	Variants
Connector type	Single USB socket - type A X125
	Double USB socket - type A X135, X145
Version	USB 3.0
Current carrying capacity	0.9 A per channel
Maximum data transfer rate	5 Gbit/s
Maximum cable length	<=3 m
Power supply	5 V

Connectable components

10

10.1   NX10.3 / NX15.3

10.1.1   Description

Properties

You can connect maximum of two NX10.3 and NX15.3 modules to PPU 1740 using X102 and X103 ports.

Using the NX10.3 and NX15.3 modules, you can expand the performance of an axis group of a SINUMERIK ONE CNC automation system. Each NX10.3 can control up to 3 additional axes and each NX15.3 can control up to 6 additional axes.
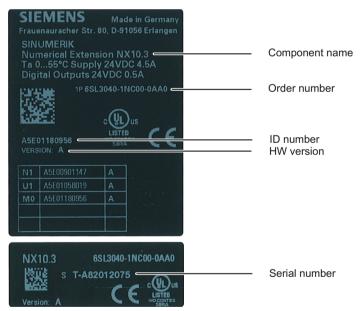
Type plate

The NX module type plate contains the following information:

Figure 10-1   Type plate using the NX10.3 as example

Note

You might need to access the information provided on the side-mounted type plate after the equipment has been mounted. Since the type plate is located on the right-hand side of the housing, which is the side typically used to connect to the SINAMICS S120 module, we recommend that you make a note of the NX module serial number prior to assembly.

Display

The NX module has the following interfaces:

- 4 DRIVE-CLiQ (X100 – X103)
- 6 digital inputs and 4 digital inputs/outputs (X122)
- Power supply (X124)
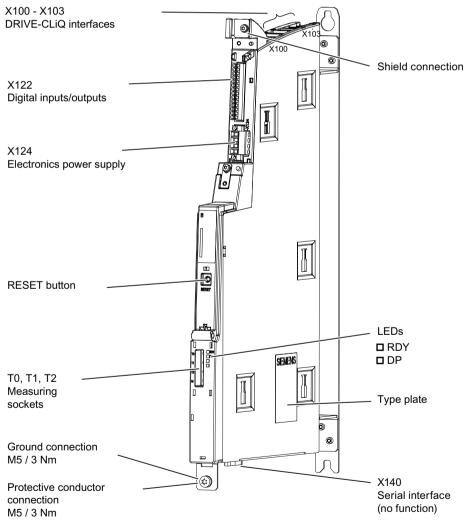
Figure 10-2   Display of the NX module (without cover)

10.1.2   NX10.3 / NX15.3 status displays

LEDs for status display

The following status displays on the NX modules provide information about its state:

LEDs	Color	Status	Description
RDY	Off		Electronic power supply outside permissible tolerance range
	Green	Continuous light	The NX10.3 / NX15.3 is ready.
		Flashing 2 Hz	Writing to SD card of the PPU.
	Red	Continuous light	The NX10.3 / NX15.3 is presently powering up and at least one fault is active (e.g. RESET, watchdog monitoring, basic system fault).
		Flashing 0.5 Hz	Boot error (e.g. firmware cannot be loaded into the RAM)
	Yellow	Continuous light	Firmware is being loaded into the RAM.
		Flashing 0.5 Hz	Firmware cannot be loaded into the RAM.
		Flashing 2 Hz	Firmware CRC fault
DP	Off		Electronics power supply outside permissible tolerance range: The NX10.3 / NX15.3 is not ready.
	Green	Continuous light	CU_LINK is ready for communication and cyclic communication is running.
		Flashing 0.5 Hz	CU_LINK is ready for communication and cyclic communication is not running.
	Red	Continuous light	At least one CU_LINK fault is present.
			CU_LINK is not ready for operation (e.g. after switching on).

RESET button

The RESET button is on the front of the module under the cover.

Note

When the pushbutton is actuated, the locally connected drive systems are brought to a standstill with no feedback to the control. In other words, the drive and control run asynchronously once the drive has been successfully powered up.

10.1.3 Mounting

Designs

The NX10.3 / NX15.3 is integrated into the SINAMICS drive line-up. For the preferred installation sequence, the NX module should be mounted at the side of the Line Module.

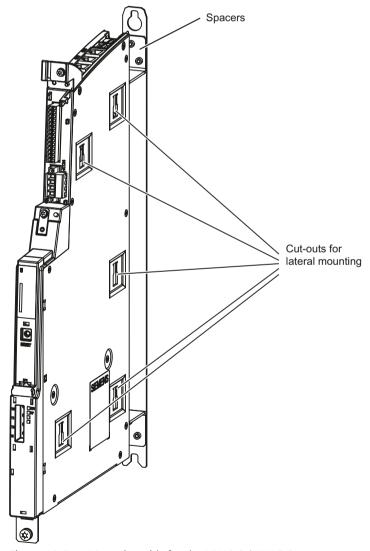| NOTICE |
| --- |
| **Protection against overheating** |
| The 80 mm ventilation spaces above and below the components must be observed. |

Mounting aids

Figure 10-3   Mounting aids for the NX10.3 / NX15.3

Mounting an NX10.3 / NX15.3 onto an Active Line Module

Procedure:

1. Remove the spacers from the NX.

2. Position the NX on the left-hand side of the Line Module. The mounting fixtures fit exactly in the five cutouts on the NX.

3. Push the two units together.

4. Press down on the NX until it engages and is securely connected to the Line Module.
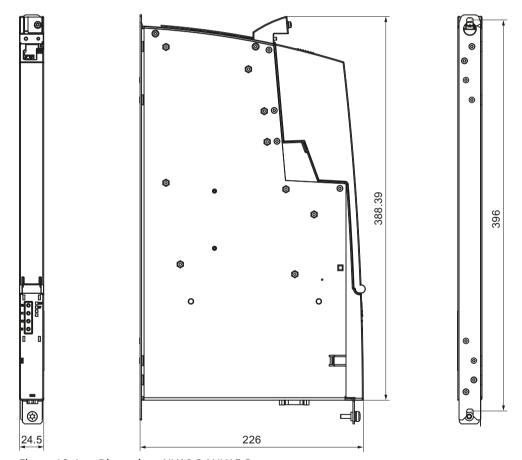
10.1.4   Dimension drawing

Dimension drawing

Figure 10-4   Dimensions NX10.3 / NX15.3

10.1.5 Connecting

X124 power supply pin assignment

Connector designation:	**X124**
Connector type:	Screw terminal 2
Max. connectable cross-section:	2.5 mm^2

Pin	Signal name		Meaning
1	+	(Voltage input)	Electronics power supply
2	+	(Voltage input)	Electronics power supply
3	M	(Voltage output)	Ground
4	M	(Voltage output)	Ground

Note

The two terminals "+" and "M" are jumpered in the connector and not in the device. This ensures that the supply voltage is looped through.

Parameter	Value
Voltage	24 VDC (20.4 V - 28.8 V)
Current consumption	Max. 0.8 A (without load)
Max. current via the jumper in the connector	20 A at 55° C

Note

Current consumption

The current consumption increases by the current consumption of DRIVE-CLiQ and the digital outputs.

X122 digital inputs/outputs pin assignment

Connector designation:	**X122**
Connector type:	Spring-loaded terminal 1
Max. connectable cross-section:	0.5 mm^2

Pin	Signal name	Meaning
1	DI0	Digital input 0
2	DI1	Digital input 1
3	DI2	Digital input 2
4	DI3	Digital input 3

Pin	Signal name	Meaning
5	DI16	Digital input 16
6	DI17	Digital input 17
7	M1	Reference potential for terminals 1 to 6
8	M	Ground
9	DI/DO8	Digital input/output 8 (rapid input)
10	DI/DO9	Digital input/output 9 (rapid input)
11	M	Ground
12	DI/DO10	Digital input/output 10 (rapid input)
13	DI/DO11	Digital input/output 11 (rapid input)
14	M	Ground

An open input is interpreted as "low".

Note
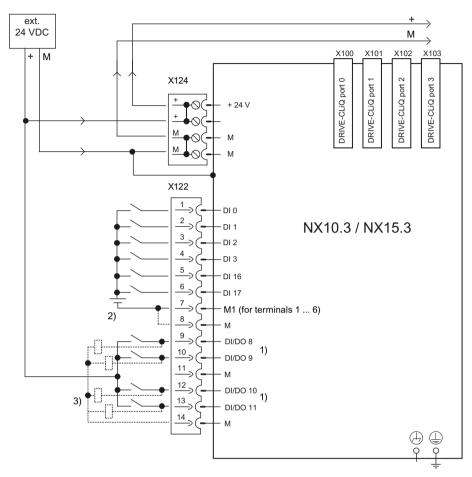
Terminal M1 must be connected for the digital inputs (DI) 0 to 3 and 16/17 to function. This can be done as follows:

- Connect the ground reference of the digital inputs.
- Jumper to terminal M: This removes the electrical isolation for these digital inputs.

Parameter	Value
Current consumption	Typical: 10 mA at 24 VDC
Galvanic isolation	The reference potential is terminal M1
As an input	
Voltage	-3 V to 30 V
Current consumption	Typical: 10 mA at 24 VDC
Signal level (including ripple)	High signal level: 15 V to 30 V Low signal level: -3 V to 5 V
Signal propagation times	Inputs / "fast inputs": L → H: Approx. 50 µs/5 µs H → L: Approx. 100 µs/50 µs
As an output	
Voltage	24 VDC
Max. load current	Per output: 500 mA continuous short-circuit proof

Connection example

The digital inputs/outputs are connected appropriately during commissioning.

1)   Rapid inputs must be shielded.

2)   Jumper open, electrical isolation for digital inputs (DI)

3)   Can be parameterized as either input or output

Figure 10-5   Connection example for the NX10.3 / NX15.3

See also

For the pin assignment of the DRIVE-CLiQ interfaces X100 - X103, please refer to Section "DRIVE-CLiQ (Page 77)".

For further information on DC voltage and standards, please refer to Section "Power supply connection (Page 75)".

10.1.6 Technical Data

Technical data of the NX10.3 / NX15.3

Parameter	Value
Input voltage	24 V DC
Permissible range	20.4 V - 28.8 V DC
Current (without DRIVE-CLiQ and digital outputs)	0.8 A
Inrush current	1.6 A
PE/ground connection	At the housing with screw M5/3 Nm
Number of axes, maximum	
• NX10.3:	3
• NX15.3:	6
Digital inputs	6
Digital inputs/outputs parameterizable	4
Cooling	Open-circuit ventilation
Pollution degree in acc. with EN 61800-5-1	2
Protection class in acc. with EN 61800-5-1	III (DVC A, PELV)
Degree of protection in acc. with EN 60529	IP20
Approvals	CE, cULus
Relative humidity:	
• Storage	5 ... 95 %
• Transport	5 ... 95 %
• Operation	5 ... 95 %
Ambient temperature:	
• Storage	-25 ... +55 °C
• Transport	-40 ... +70 °C
• Operation	0 ... +55 °C
Dimensions:	
• Width	25 mm
• Height	414 mm
• Depth	272 mm
Weight, approx.	2.58 kg

Technical data

<div style="text-align: right; font-size: 2em; font-weight: bold;">11</div>

PPU 1740-1500

Parameter	PPU 1740-1500
Input voltage	24 VDC + 20% / - 15% (20,4V...28.8V)
Rated current	24V 3.9A
Inrush current	24V 6A
Power consumption, max. (Pmax)	94W
Power loss	32W
Digital output	24V 0.5A*
Cooling	Open-circuit ventilation
Degree of protection according to EN 60529	IP65 (front) IP20 (rear)
Protection class according to EN 61800-5-1	III (DVC A, PELV)
Pollution degree according to EN 61800-5-1	2
Display: Size Resolution (pixel)	15 inch 1366x768 (HD -ready)
Dimensions: • Width • Height • Depth	398 mm 257 mm 138 mm
Weight, approx.	6.1 kg
Color	Front: Black (Frame RAL 9017) Back glass : Black (RAL 9005)

*max current for each connector 1A

PPU 1740-1900

Parameter	PPU 1740-1900
Input voltage	24 VDC + 20% / - 15% (20,4V...28.8V)
Rated current	24V 4.1A
Inrush current	24V 6A
Power consumption, max.	98W

Parameter	PPU 1740-1900
Power loss	36W
Digital output	24V 0.5A*
Cooling	Open-circuit ventilation
Degree of protection according to EN 60529	IP65 (front)
	IP20 (rear)
Protection class according to EN 61800-5-1	III (DVC A, PELV)
Pollution degree according to EN 61800-5-1	2
Display:	
Size	19 inch
Resolution (pixel)	1920x1080 (full HD)
Dimensions:	
• Width	464 mm
• Height	294 mm
• Depth	138 mm
Weight, approx.	7.3 kg
Color	Front: Black (Frame RAL 9017)
	Back glass : Black (RAL 9005)

*max current for each connector 1A

11.1   Relevant directives and standards

Certificates

You can obtain an up-to-date list of currently certified components on request from your local Siemens office. If you have any questions relating to certifications that have not yet been completed, please ask your Siemens contact person. The certificates can be downloaded from the Internet: Certificates (https://support.industry.siemens.com/cs/ww/en/ps/14590/cert)

EC Declaration of Conformity

ϵ ϵ You can find the EC Declaration of Conformity for the relevant directives as well as the relevant certificates, prototype test certificates, manufacturers declarations and test certificates for functions relating to functional safety ("Safety Integrated") on the Internet at the following Address_SI (https://support.industry.siemens.com/cs/de/en/view/109747434).

Relevant directives and standards

The following directives and standards are relevant for SINUMERIK ONE devices:

*   **European Machinery Directive**
    SINUMERIK ONE devices fulfil the requirements stipulated in the European Machinery Directive 2006/42/EU, insofar as they are covered by the application area of this directive. However, the use of the SINUMERIK ONE devices in a typical machine application has been fully assessed for compliance with the main regulations in this directive concerning health and safety.

*   **Directive 2011/65/EU**
    SINUMERIK ONE devices comply with the requirements of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic devices (RoHS II).

*   **European EMC Directive**
    SINUMERIK ONE devices comply with the EMC Directive 2014/30/EU.

*   **EMC requirements for South Korea**

    SINUMERIK ONE devices with the KC marking on the type plate satisfy the EMC requirements for South Korea.

*   **Eurasian conformity**

    SINUMERIK ONE comply with the requirements of the Russia/Belarus/Kazakhstan customs union (EAC).

- **North American market**

SINUMERIK ONE devices provided with one of the test symbols displayed fulfill the requirements stipulated for the North American market as a component of drive applications. You can find the relevant certificates on the Internet pages of the Certifier (https://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.html).

- **Australia and New Zealand (RCM formerly C-Tick)**

SIUMERIK ONE devices showing the test symbols fulfill the EMC requirements for Australia and New Zealand.

- **Quality systems**
  Siemens AG employs a quality management system that meets the requirements of ISO 9001 and ISO 14001.

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

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

EMC limit values in South Korea

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

The EMC limit values to be observed for Korea correspond to the limit values of the EMC product standard for variable-speed electric drives EN 61800-3 of category C2 or the limit value class A, Group 1 to KN11. By implementing appropriate additional measures, the limit values according to category C2 or limit value class A, Group 1, are observed. Further, additional measures may be required, such as using an additional radio interference suppression filter (EMC filter). The measures for EMC-compliant design of the system are described in detail in this manual respectively in the EMC (https://support.industry.siemens.com/cs/de/en/view/60612658).

The final statement regarding compliance with the standard is given by the respective label attached to the individual unit.

Ground symbols

Icon	Meaning
⊥	Ground (e.g. M 24 V)
⏚	Connection for function potential bonding
⊕	Connection for protective conductor

Spare parts and accessories

12

Ordering data

SINUMERIK ONE is generally marketed in sales packages with drives, motors and accessories. For orders, please contact your local Siemens sales representative.

Designation	Article number
Panel Processing Unit without system software	
• PPU 1740-1500	6FC5317-4AA00-1CA0
• PPU 1740-1900	6FC5317-4AA00-1DA0

Components

Designation	Article number
Handheld electronic handwheel	
With front panel 120 mm × 120 mm,with setting wheel, 5 V DC, RS422	6FC9320-5DB01
With front panel 76.2 mm × 76.2 mm,with setting wheel 5 V DC, RS422	6FC9320-5DC01
Without front panel,with small setting wheel5 V DC, RS422	6FC9320-5DM00
Without front panel,without setting wheel,for installation, 5 V DC, RS422	6FC9320-5DF01
Portable in housing,with setting wheel,5 V DC, RS422spiral cable, length 2.5 m	6FC9320-5DE02
Increased number of axes:	
• Numeric Control Extension NX10.3	6SL3040-1NC00-0AA0
• Numeric Control Extension NX15.3	6SL3040-1NB00-0AA0

Accessories

Designation	Article number
Bag of fixing clamps	6AV6881-6AD10-0AA0
SINUMERIK ONE Terminal Kit: 1x 24V Connector 4x I/O Connector 4x Drive-CLiQ dummy plug for dust protection 1x Handwheel connector	6SL3064-4CB00-0AA0
Plastic cover of PPU 1740	6FC5348-0AA30-4AA0

Appendix

13

13.1 Abbreviations

PPU	Panel Processing Unit
ALM	Active Line Module
ASIC	Application Specific Integrated Circuit
AWG	American Wire Gauge
BERO	Proximity limit switch
CAT5	Quality class (category) for shielded twisted pair network cables. Class 5 states that these cables have a particularly low damping factor, making them suitable for 100 Mbit/s-FastEthernet networks.
CE	The CE marking (Conformité Européenne, which means "compliance with EU directives") for products is a marking according to EU law in relation to product safety.
CNC	Computerized Numerical Control Computerized numerical control
CRC	Cyclic redundancy check: Checksummenprüfung
cULus	Approval (see CE) for Canada and USA (UL = Underwriters Laboratories)
DIN	Deutsche Industrie Norm (German Industry Standard)
DIP	Dual In–Line Package: Dual in-line arrangement
DMC	DRIVE-CLiQ Hub Module
DP	Distributed I/O
DRAM	Dynamic Random Access Memory
DRIVE-CLiQ	Drive Component Link with IQ
EMC	Electromagnetic compatibility
EN	European standard
ESD	Electro-Static Discharge: elektrostatische Entladung
GSM	Global System for Mobile Communications: Worldwide standard for wireless transmission of voice, data, fax and text messages (SMS).
LEDs	Light-emitting diode light-emitting-diode display
MAC	Media Access Control
MCP	Machine control panel: Machine control panel
MLFB	Machine-Readable Product Code
MPI	Multi-Point Interface Multi-point interface
N.C.	Not connected: Connection unassigned
NCK	Numerical Control Kernel: NC kernel with block preparation, traversing range, etc.
NX	Numerical eXtension (axis extension module)
OLP	Optical Link Plug: Fiber-optic bus connector
OP	Operator Panel : Operator panel front
PCU	PC Unit: Computer unit
PG	Programming device
PLC	Programmable Logic Control: Programmable logic control (component of the CNC controller)
PN	PROFINET

QWERTY	keyboard assignment: American keyboard layout, the first six letters in the top row of letters, read from left to right.
RAM	Random Access Memory: Program memory which can be read and written into
SI	Safety Integrated
SLM	Smart Line Module
SMC	Cabinet-mounted sensor modules
SME	Sensor Module External
S/R	Steps per revolution: Pulses per revolution
SRAM	Static Random Access Memory: Static memory (battery-backed)
NVRAM	Non-Volatile Random Access Memory: Non-volatile memory
NV SRAM	Non-Volatile Static Random Access Memory: Non-volatile memory
USB	Universal Serial Bus: Bus system for connecting additional devices to a computer
VDE	Association of Electrical Engineering, Electronics and Information Technology (Germany)

Index