

# SIEMENS

## SINUMERIK

### SINUMERIK 808D Electrical Installation Manual

Operating Instructions

Preface

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Safety instructions

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Valid for:  
SINUMERIK 808D Turning (software version: V4.4.2)  
SINUMERIK 808D Milling (software version: V4.4.2)

Target group:  
Electrical engineers and electrical assembly workers

01/2015

6FC5397-2EP10-0BA0

## 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

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### Disclaimer of Liability

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

# Preface

## SINUMERIK 808D documentation

The SINUMERIK 808D documentation consists of the following components:

- Operating Instructions
  - Mechanical Installation Manual
  - Electrical Installation Manual
  - PLC Subroutines Manual
  - Function Manual
  - Parameter Manual
- Diagnostics Manual
- Commissioning Manual
- Programming and Operating Manual (Turning)
- Programming and Operating Manual (Milling)
- Manual Machine Plus (Turning)
- Online Help for Programming and Operating (Turning)
- Online Help for Programming and Operating (Milling)
- Online Help for Manual Machine Plus (Turning)

## My Documentation Manager (MDM)

Under the following link you will find information to individually compile your documentation based on the Siemens content:

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

## Target group

This manual is intended for use by electrical engineers and electrical assembly workers.

## Benefits

This manual enables the intended target groups to properly and safely connect up the SINUMERIK 808D system.

### Technical support

<b>Hotline:</b>	+86 400-810-4288
<b>Service and Support</b>	<ul style="list-style-type: none"><li>• China: <a href="http://www.siemens.com.cn/808D">www.siemens.com.cn/808D</a></li><li>• Worldwide: <a href="http://support.automation.siemens.com">http://support.automation.siemens.com</a></li></ul>

### EC Declaration of Conformity

The EC Declaration of Conformity for the EMC Directive can be found on the Internet at <http://www.siemens.com/automation/service&support>.

Here, enter the number **67385845** as the search term or contact your local Siemens office.

### Licensing provisions

The SINUMERIK 808D software is protected by national and international copyright laws and agreements. Unauthorized reproduction and distribution of this software or parts thereof is liable to prosecution. It will be prosecuted both according to criminal and civil law and may result in severe penalties or claims for compensation.

In the SINUMERIK 808D software, open source software is used. The licensing provisions for this software are included on the Toolbox DVD and are to be observed accordingly.

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## Safety instructions

### General

 <b>WARNING</b>
<p><b>Death or serious injury may occur.</b></p> <p>Only qualified personnel should be allowed to work on this control system, and only after becoming acquainted with all the safety notices regarding installing as set out in this manual.</p> <p>Failure to observe these notices contained in this manual can result in death, severe personal injury or considerable damage to property.</p> <p>Without prior authorization, you are not allowed to perform any modification on the machine.</p>

### Identification

<b>NOTICE</b>
<p><b>Property loss</b></p> <p>Deliverables received should be complete and intact. Exercise caution to ensure that you do not put a damaged device into service.</p> <p>Otherwise, you may suffer property loss.</p> <p>Make sure that the PPU, the MCP and the cables received correspond with the specific package you ordered from Siemens.</p>

### Transport and storage

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**Note**

Transport and storage should meet specified environmental conditions.

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## Mechanical installation

 **DANGER**

**Death or serious injury from electric shock**

The equipment which is not disconnected from the mains or properly protected contains hazardous voltage.

Such a voltage may lead to death or serious injury.

Before installing or removing the components of the control system, make sure that the system is disconnected from the mains. In addition, do install the control system in a distribution cabinet with an adequate protection level.

 **DANGER**

**Death or serious injury from fire or electric shock**

If the equipment operates in an area subject to inflammables or combustibles, water or corrosion hazards, it contains high risk of fire or electric shock.

The fire or electric shock may lead to death or serious injury.

Do install the control system in an area free of inflammables or combustibles, water or corrosion hazards.

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**Note**

When dimensioning the control cabinet, make sure that the installed components do not exceed the permissible ambient temperature, even if the outside temperature is high.

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## Electrical installation

 **CAUTION**

**Damage to the control system**

The high-voltage components have strong interference in 24 V DC power supply.

If the 24 V DC power supply is not isolated from high-voltage components, the control system may be damaged.

The 24 V DC protective extra-low voltage **must** be generated as a protective extra-low voltage with safe electrical isolation (to IEC 204-1, Section 6.4, PELV), and grounded by with a PELV M signal connection to the central grounding point of the system.

**! DANGER****Death or serious injury from electric shock**

The equipment which is not disconnected from the mains contains hazardous voltage.

Such a voltage may lead to death or serious injury.

Before connecting the modules, first disconnect the equipment from the mains!

**NOTICE****EMC requirements will not be met.**

The unshielded or ungrounded FAST I/O cable is very sensitive to ambient electromagnetic interference.

In this case, relevant EMC requirements will be not be met.

In order to meet IEC/CISPR requirements, the FAST I/O cable must be shielded and grounded.

## Commissioning

**Note**

Do not forget to back up data after completing the commissioning work.

**Note**

Clear the manufacturer password before the machine is delivered; otherwise, end users can start the controller with the standard data, which can initialize the SINUMERIK 808D control system. As a consequence, the machine will not run.

## Carrying out of repairs

**! DANGER****Carrying out of repairs**

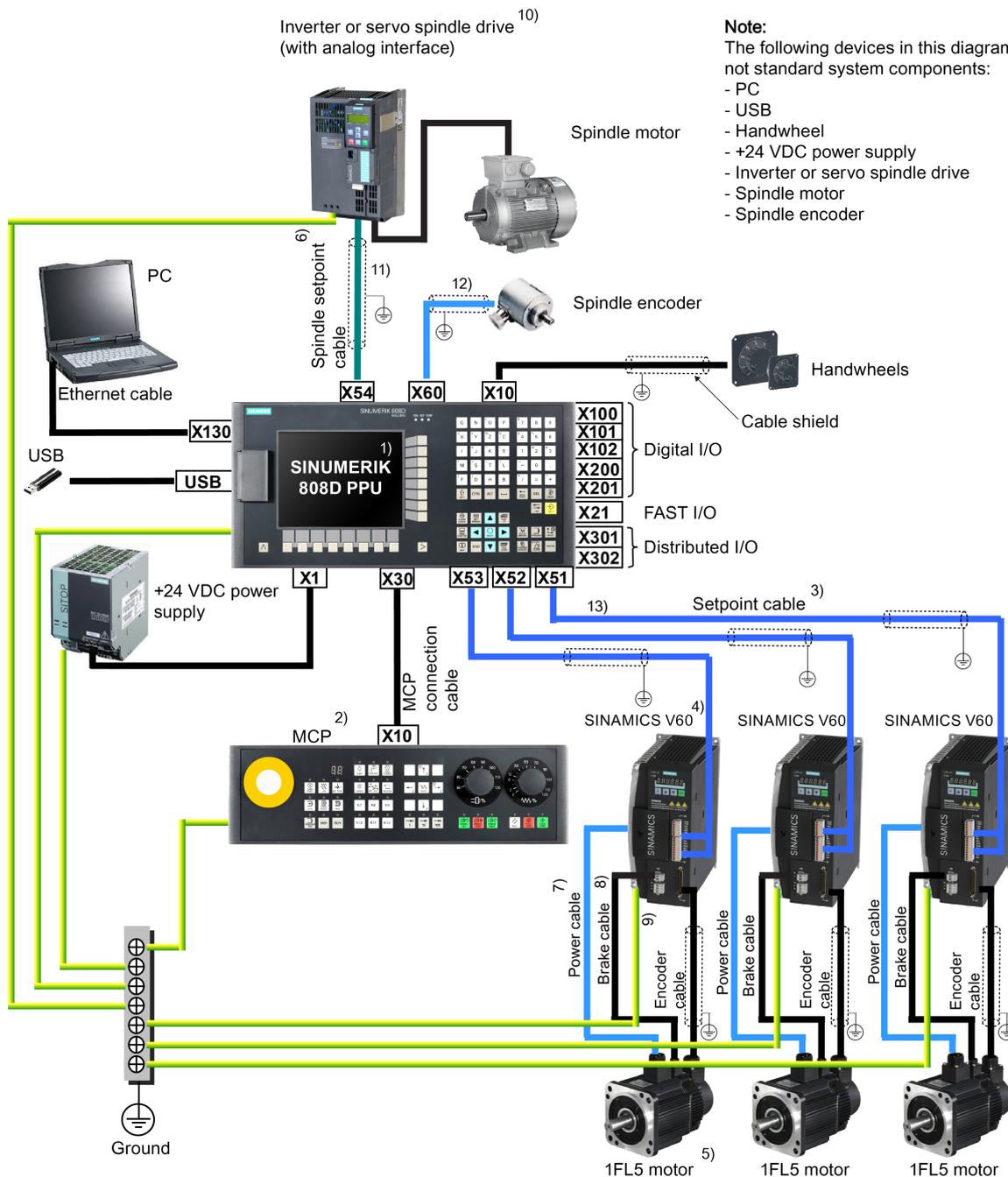
Anywhere in the automation equipment where faults might cause physical injury or major material damage, in other words, where faults could be dangerous, additional external precautions must be taken, or facilities must be provided, that guarantee or enforce a safe operational state, even when there is a fault (e.g. using an independent limit value switch, mechanical locking mechanisms, EMERGENCY STOP/EMERGENCY OFF devices).



## System overview

### System overview

The SINUMERIK 808D is an economical CNC solution for milling and turning machines. The turning variant of the control system can control up to two feed axes and one spindle. If configured with a software option for the "additional axis" function, it can additionally control an axis that serves as either a rotary axis or a linear axis. The milling variant of the control system can control up to three feed axes and one spindle. The following diagram shows a system configuration example for the SINUMERIK 808D control system:



11), 12): For detailed information on cable shield connection, refer to Section "Analog spindle interface - X54 (Page 33)".

13): For detailed information on cable shield connection, refer to Section "Pulse drive interfaces - X51, X52, X53 (Page 30)".

**NOTICE**

Using a copper protective earth conductor with a cross section of 10 mm<sup>2</sup> to connect the PE terminal of V60 to the protective earth. For the NC and 24 VDC power supply, there are no special requirements of the cross section of the copper protective earth conductor. For the inverter or servo spindle drive, it is recommend to refer to the relevant specifications to confirm the cross section of the copper protective earth conductor.

Legend	Name	Order number
1)	PPU141.1, turning	6FC5370-1AT00-0AA0 (English) 6FC5370-1AT00-0CA0 (Chinese)
	PPU141.1, milling	6FC5370-1AM00-0AA0 (English) 6FC5370-1AM00-0CA0 (Chinese)
2)	MCP	6FC5303-0AF35-0AA0 (English) 6FC5303-0AF35-0CA0 (Chinese)
3)	Setpoint cable (PPU141.1 to CPM60.1)	6FC5548-0BA00-1AF0 (5 m)
		6FC5548-0BA00-1AH0 (7 m)
		6FC5548-0BA00-1BA0 (10 m)
4)	SINAMICS V60 Controlled Power Module (CPM60.1)	6SL3210-5CC14-0UA0 (4 A)
		6SL3210-5CC16-0UA0 (6 A)
		6SL3210-5CC17-0UA0 (7 A)
		6SL3210-5CC21-0UA0 (10 A)
5)	1FL5 motor	1FL5060-0AC21-0AA0 (4 Nm, with key, without brake)
		1FL5060-0AC21-0AG0 (4 Nm, without key, without brake)
		1FL5062-0AC21-0AA0 (6 Nm, with key, without brake)
		1FL5062-0AC21-0AG0 (6 Nm, without key, without brake)
		1FL5064-0AC21-0AA0 (7.7 Nm, with key, without brake)
		1FL5064-0AC21-0AG0 (7.7 Nm, without key, without brake)
		1FL5066-0AC21-0AA0 (10 Nm, with key, without brake)
		1FL5066-0AC21-0AG0 (10 Nm, without key, without brake)
		1FL5060-0AC21-0AB0 (4 Nm, with key, with brake)
		1FL5060-0AC21-0AH0 (4 Nm, without key, with brake)
		1FL5062-0AC21-0AB0 (6 Nm, with key, with brake)
		1FL5062-0AC21-0AH0 (6 Nm, without key, with brake)
		1FL5064-0AC21-0AB0 (7.7 Nm, with key, with brake)

Legend	Name	Order number
		1FL5064-0AC21-0AH0 (7.7 Nm, without key, with brake)
		1FL5066-0AC21-0AB0 (10 Nm, with key, with brake)
		1FL5066-0AC21-0AH0 (10 Nm, without key, with brake)
6)	Setpoint cable (PPU141.1 to inverter or servo spindle drive)	6FC5548-0BA05-1AD0 (3 m)
		6FC5548-0BA05-1AF0 (5 m)
		6FC5548-0BA05-1AH0 (7 m)
		6FC5548-0BA05-1BA0 (10 m)
		6FC5548-0BA05-1CA0 (20 m)
7)	Power cable (unshielded)	6FX6002-5LE00-1AD0 (3 m)
		6FX6002-5LE00-1AF0 (5 m)
		6FX6002-5LE00-1AH0 (7 m)
		6FX6002-5LE00-1BA0 (10 m)
8)	Brake cable (unshielded)	6FX6002-2BR00-1AD0 (3 m)
		6FX6002-2BR00-1AF0 (5 m)
		6FX6002-2BR00-1AH0 (7 m)
		6FX6002-2BR00-1BA0 (10 m)
9)	Encoder cable (shielded)	6FX6002-2LE00-1AD0 (3 m)
		6FX6002-2LE00-1AF0 (5 m)
		6FX6002-2LE00-1AH0 (7 m)
		6FX6002-2LE00-1BA0 (10 m)
10)	Inverter or servo spindle drive (with analog interface)	From Siemens or a third-party manufacturer

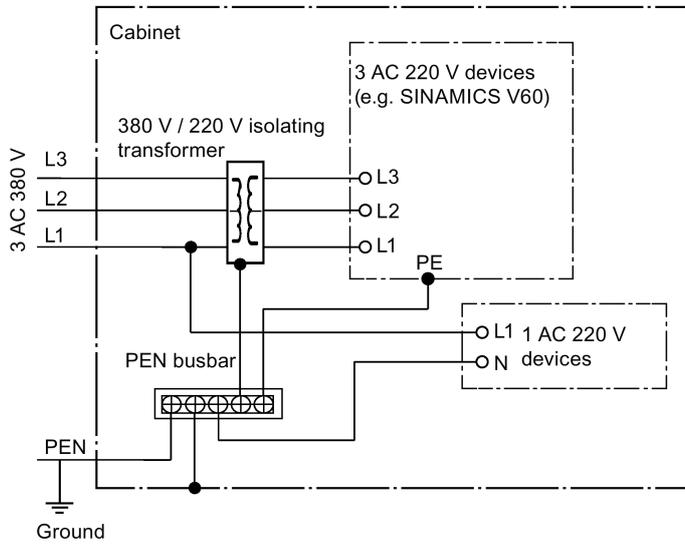
## System structure

The structure of the SINUMERIK 808D control system is shown as follows:

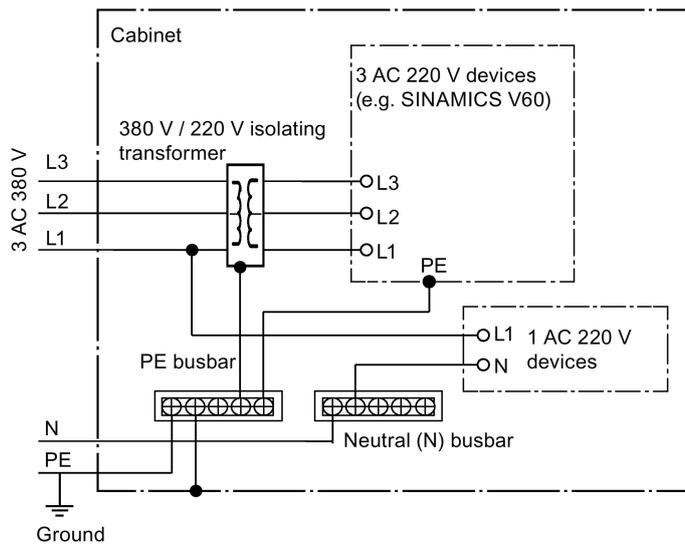
- **CNC Unit**
  - Panel Processing Unit (PPU)
  - Machine Control Panel (MCP)
  - Setpoint cable to SINAMICS V60
  - Setpoint cable to the spindle
- **Drive unit**
  - SINAMICS V60 (for controlling feed axes)
  - 1FL5 motor
  - Power cable
  - Encoder cable
  - Brake cable (for motors with brake)
  - Inverter or servo spindle drive (for controlling the spindle)
  - Spindle motor
  - Spindle encoder
- **Electronic handwheels**
  - A maximum of two handwheels can be connected

### Cabinet grounding guide

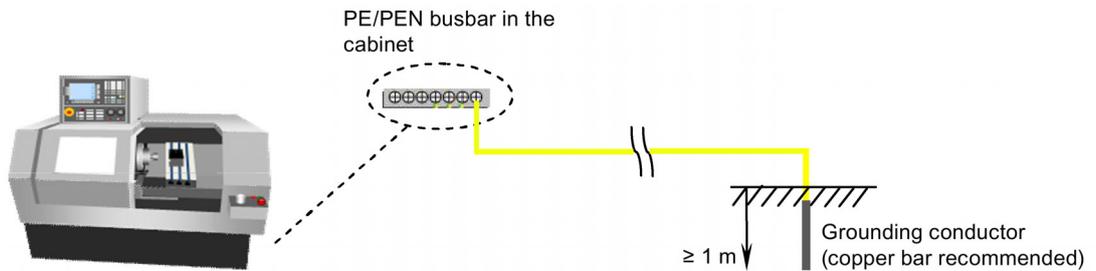
TN-C grounding system



TN-S grounding system



Note that the PE/PEN busbar in the cabinet must connect to the ground through a grounding cable with a cross section  $\geq 10 \text{ mm}^2$  as illustrated below.



## Connecting

### 3.1 Interface overview

#### Interface overview on the Panel Processing Unit (PPU)

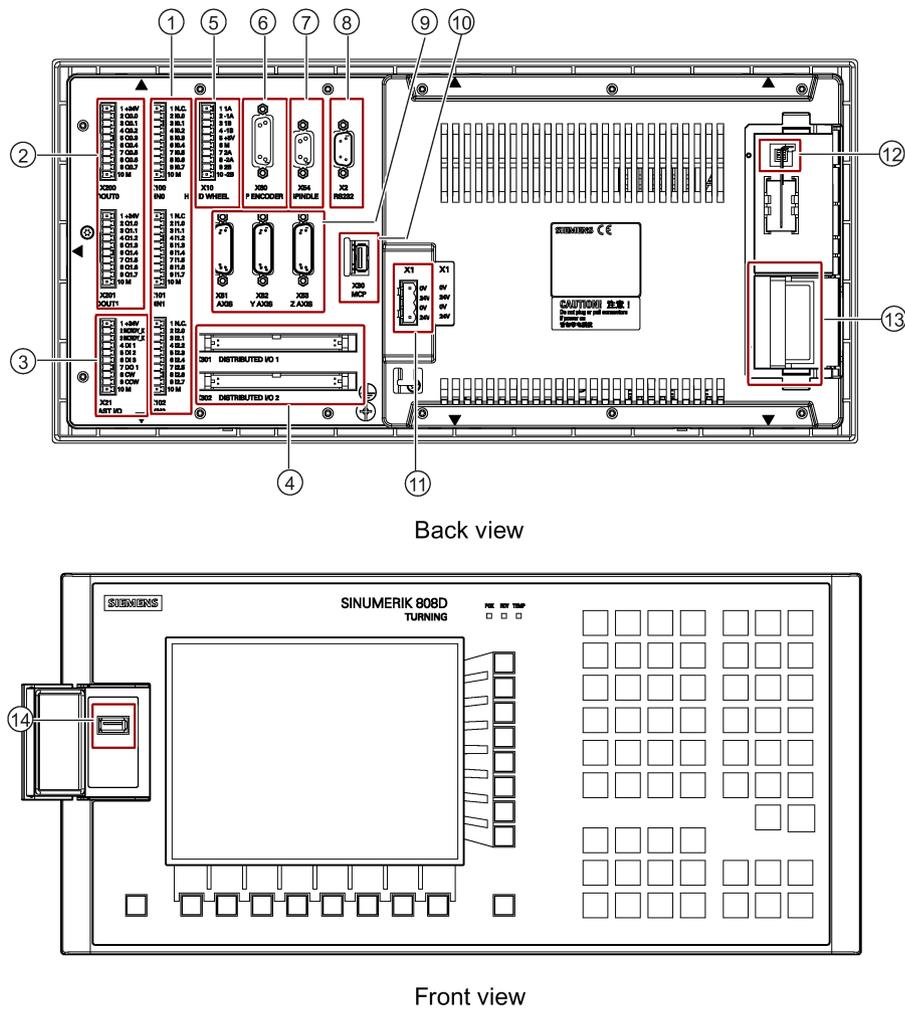


Figure 3-1 Interface layout

Legend	Interface	Comment
<b>Rear</b>		
①	X100, X101, X102	Digital inputs
②	X200, X201	Digital outputs

Legend	Interface	Comment
③	X21	FAST I/O
④	X301, X302	Distributed I/O
⑤	X10	Handwheel inputs
⑥	X60	Spindle encoder interface
⑦	X54	Analog spindle interface
⑧	X2	RS232 interface
⑨	X51, X52, X53	Pulse drive interfaces
⑩	X30	USB interface, for connection with the MCP
⑪	X1	Power supply interface, +24V DC power supply
⑫	-	Battery interface
⑬	-	Slot for the System CompactFlash Card (CF card)
<b>Front</b>		
⑭	-	USB interface

**Note**

The rated output current of all the digital outputs is 250 mA.

**Interface overview on the Machine Control Panel (MCP)**

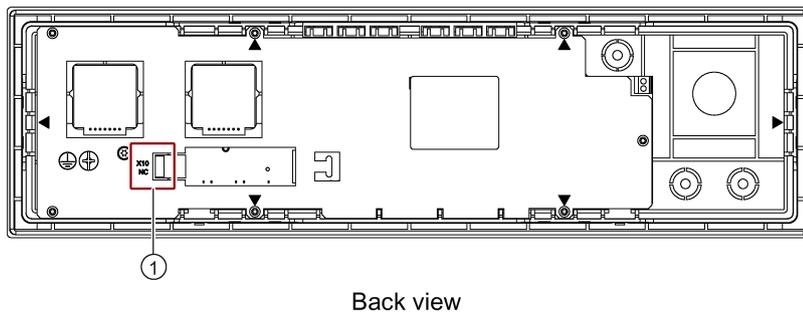
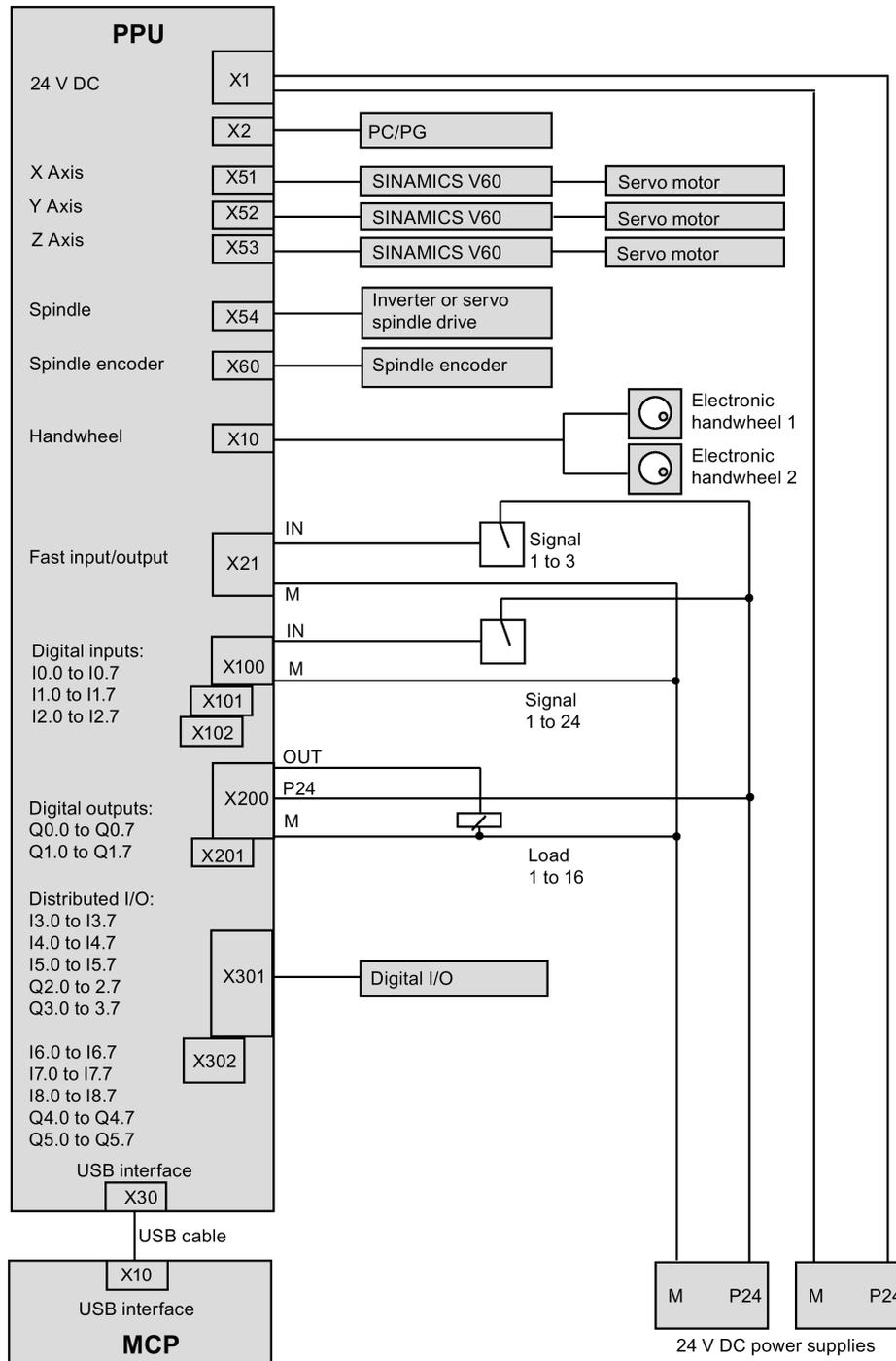


Figure 3-2 Interface layout

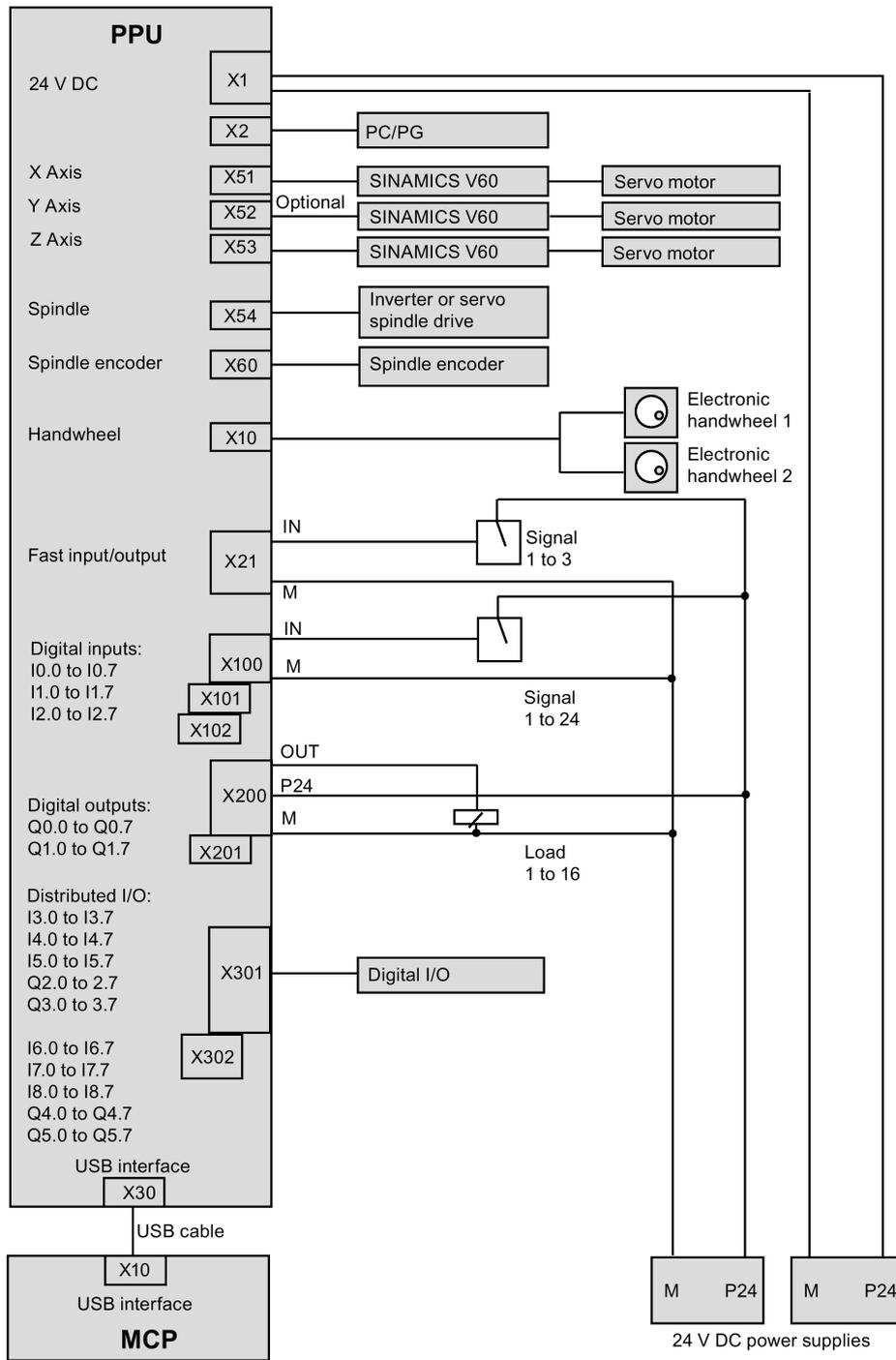
Legend	Interface	Comment
<b>Rear</b>		
①	X10	USB interface, for connection with the PPU

### 3.2 Connection Overview for SINUMERIK 808D

#### Connection overview (milling)



**Connection overview (turning)**



**Note**

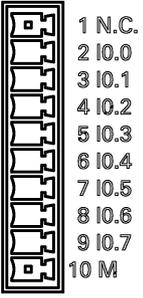
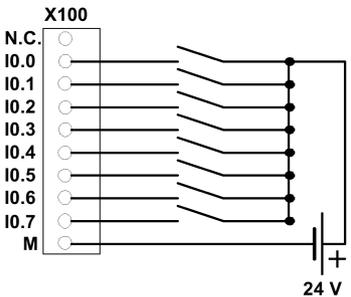
- The 24 V signal of X200 must be connected; otherwise, the communication between the PPU and the drives does not function as it should.
- For the turning variant, connection to X52 is optional and depends upon whether you use the software option "additional axis". If you desire to configure the control system to control a rotary axis or an additional linear axis, connect X52 to a SINAMICS V60 which connects to a servo motor.

## 3.3 Connecting the interfaces on the PPU

### 3.3.1 Digital input interfaces - X100, X101, X102

Type	Mini Combicon 10-pin
Cable	Max. length: 10 m Max. cross-section: One cable per connection: $\geq 0.5 \text{ mm}^2$
Inputs	Permissible level (including ripple) High level: 18 V - 30 V Low level: -3 V - +5 V

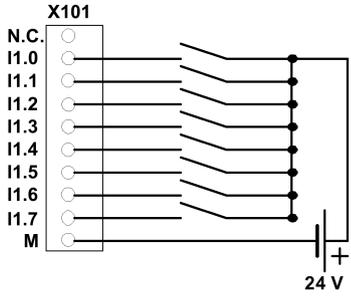
Table 3- 1 Pin assignment of X100 (DIN0)

Illustration	Pin	Signal	Comment
 <p>X100 DIN0</p>	1	N.C.	Not assigned
	2	IO.0	Digital input
	3	IO.1	Digital input
	4	IO.2	Digital input
	5	IO.3	Digital input
	6	IO.4	Digital input
	7	IO.5	Digital input
	8	IO.6	Digital input
	9	IO.7	Digital input
	10	M	External ground
			

3.3 Connecting the interfaces on the PPU

Table 3-2 Pin assignment of X101 (DIN1)

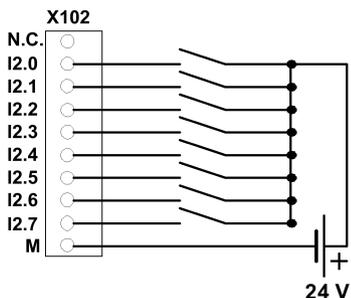
Interface	Pin	Signal	Comment
 <p>X101 DIN1</p>	1	N.C.	Not assigned
	2	I1.0	Digital input
	3	I1.1	Digital input
	4	I1.2	Digital input
	5	I1.3	Digital input
	6	I1.4	Digital input
	7	I1.5	Digital input
	8	I1.6	Digital input
	9	I1.7	Digital input
	10	M	External ground

The diagram shows a 10-pin connector labeled X101. Pin 1 is N.C. Pins 2 through 9 are connected to a 24V source. Pin 10 is connected to ground.

Table 3-3 Pin assignment of X102 (DIN2)

Interface	Pin	Signal	Comment
 <p>X102 DIN2</p>	1	N.C.	Not assigned
	2	I2.0	Digital input
	3	I2.1	Digital input
	4	I2.2	Digital input
	5	I2.3	Digital input
	6	I2.4	Digital input
	7	I2.5	Digital input
	8	I2.6	Digital input
	9	I2.7	Digital input
	10	M	External ground

The diagram shows a 10-pin connector labeled X102. Pin 1 is N.C. Pins 2 through 9 are connected to a 24V source. Pin 10 is connected to ground.

## Connecting

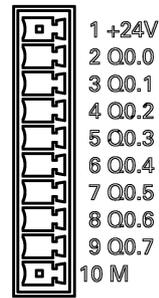
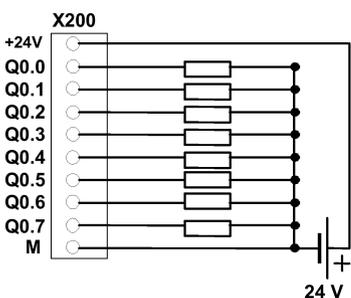
End sleeves are necessary if you use two cables per connection.

Fasten the cables to the screw terminals and plug the terminals into interfaces X100, X101 and X102 correctly.

### 3.3.2 Digital output interfaces - X200, X201

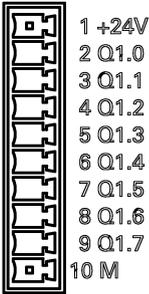
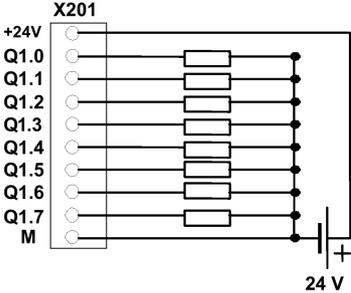
Type	Mini Combicon 10-pin
Cable	Max. length: 10 m Max. cross-section: One cable per connection: $\geq 0.5 \text{ mm}^2$
Outputs	Rated digital output current: 250 mA

Table 3- 4 Pin assignment of X200 (DOUT0)

Illustration	Pin	Signal	Comment
 <p>X200 DOUT0</p>	1	+24V	+24V input (20.4 - 28.8 V); must be connected
	2	Q0.0	Digital output
	3	Q0.1	Digital output
	4	Q0.2	Digital output
	5	Q0.3	Digital output
	6	Q0.4	Digital output
	7	Q0.5	Digital output
	8	Q0.6	Digital output
	9	Q0.7	Digital output
	10	M	External ground; must be connected
 <p><b>Note:</b></p> <p>The +24 V power supply <b>must</b> be connected even if X200 is not used; otherwise, the communication between the PPU and the drives does not function as it should.</p>			

3.3 Connecting the interfaces on the PPU

Table 3- 5 Pin assignment of X201 (DOUT1)

Illustration	Pin	Signal	Comment
 <p>X201 DOUT1</p>	1	+24V	+24V input (20.4 - 28.8 V)
	2	Q1.0	Digital output
	3	Q1.1	Digital output
	4	Q1.2	Digital output
	5	Q1.3	Digital output
	6	Q1.4	Digital output
	7	Q1.5	Digital output
	8	Q1.6	Digital output
	9	Q1.7	Digital output
	10	M	External ground
			

Connecting

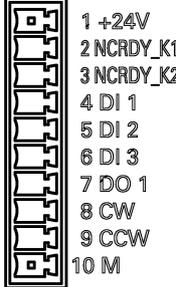
End sleeves are necessary if you use two cables per connection.

Fasten the cables to the screw terminals and plug the terminals into interfaces X200 and X201 correctly.

3.3.3 Fast input/output - X21

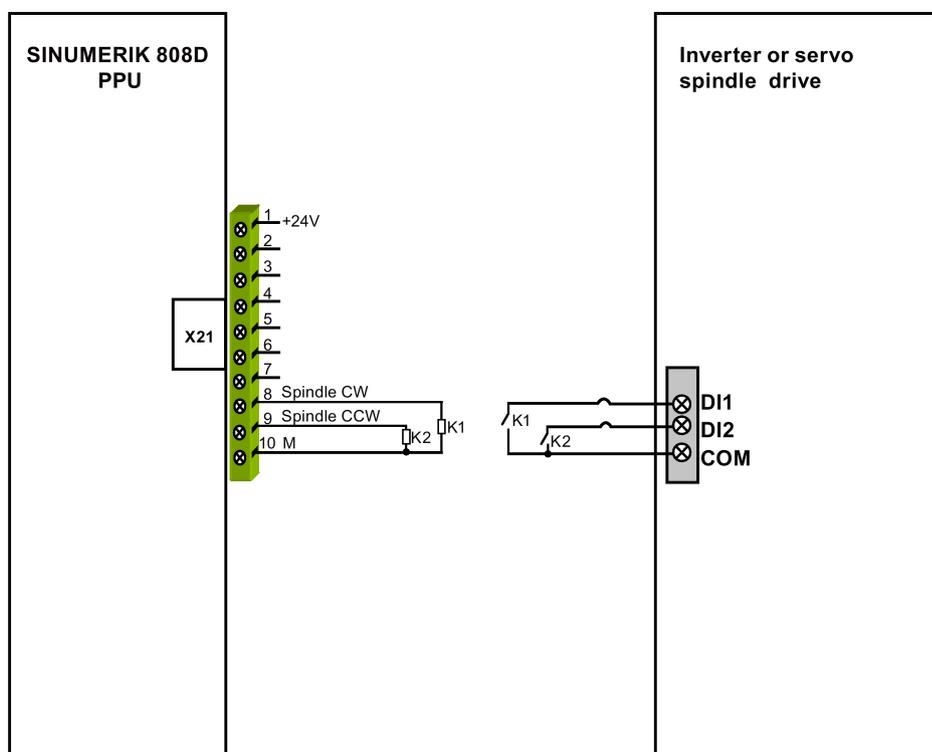
Type	Mini Combicon 10-pin
Cable	Shielded cable Max. length: 10 m Max. cross-section:
Inputs	One cable per connection: $\geq 0.5\text{mm}^2$ Permissible level (including ripple) High level: 18 V - 30 V Low level: -3 V - +5 V

Table 3- 6 Pin assignment of X21 (FAST I/O)

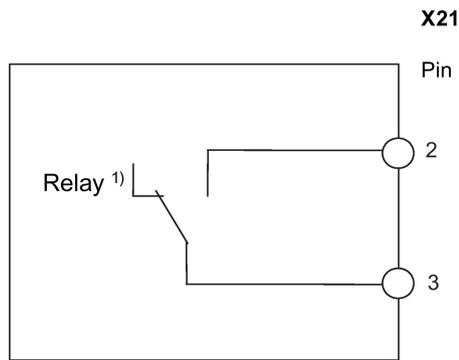
Illustration	Pin	Signal	Comment
 <p>X21 FAST I/O</p>	1	+24 V	+24 V input (20.4 - 28.8 V)
	2	NCRDY_1	NCRDY contact 1
	3	NCRDY_2	NCRDY contact 2
	4	DI1	Digital input
	5	DI2	Digital input
	6	BERO_SPINDLE or DI3	Spindle bero or digital input
	7	DO1	Fast output
	8	CW	Spindle rotating clockwise
	9	CCW	Spindle rotating counter-clockwise
	10	M	Ground

## Connecting

You can connect the FAST I/O to the inverter to control the spindle rotating direction (unipolar):



NC readiness is in the form of a relay contact (NO). It must be integrated into an EMERGENCY STOP circuit. The connection diagram is shown as follows:



1) When the NC is not ready, the contact is open; otherwise, the contact is closed.

### Connection cables

End sleeves are necessary if you use two cables per connection.

Fasten the cables to the screw terminals and plug the terminal into the interface X21.

You can buy the shielded cables from a third-party manufacturer.

### 3.3.4 Distributed I/O - X301, X302

#### Pin assignment

Type	50-pin socket
Inputs	Permissible level (including ripple) High level: 18 V - 30 V Low level: -3 V - +5 V
Outputs	Rated digital output current: 250 mA

Table 3- 7 Pin assignment of X301 (DISTRIBUTED I/O 1)

Pin	Signal	Comment	Pin	Signal	Comment
					
<b>X301 DISTRIBUTED I/O 1</b>					
1	MEXT	External ground	26	I5.7	Digital input
2	+24V	+24V output <sup>1)</sup>	27	-	Not assigned
3	I3.0	Digital input	28	-	Not assigned
4	I3.1	Digital input	29	-	Not assigned
5	I3.2	Digital input	30	-	Not assigned
6	I3.3	Digital input	31	Q2.0	Digital output
7	I3.4	Digital input	32	Q2.1	Digital output
8	I3.5	Digital input	33	Q2.2	Digital output
9	I3.6	Digital input	34	Q2.3	Digital output
10	I3.7	Digital input	35	Q2.4	Digital output
11	I4.0	Digital input	36	Q2.5	Digital output
12	I4.1	Digital input	37	Q2.6	Digital output
13	I4.2	Digital input	38	Q2.7	Digital output
14	I4.3	Digital input	39	Q3.0	Digital output
15	I4.4	Digital input	40	Q3.1	Digital output
16	I4.5	Digital input	41	Q3.2	Digital output
17	I4.6	Digital input	42	Q3.3	Digital output
18	I4.7	Digital input	43	Q3.4	Digital output
19	I5.0	Digital input	44	Q3.5	Digital output
20	I5.1	Digital input	45	Q3.6	Digital output
21	I5.2	Digital input	46	Q3.7	Digital output
22	I5.3	Digital input	47	+24V	+24V Input
23	I5.4	Digital input	48	+24V	+24V Input
24	I5.5	Digital input	49	+24V	+24V Input
25	I5.6	Digital input	50	+24V	+24V Input

3.3 Connecting the interfaces on the PPU

Table 3- 8 Pin assignment of X302 (DISTRIBUTED I/O 2)

Pin	Signal	Comment	Pin	Signal	Comment
 <p>X302 DISTRIBUTED I/O 2</p>					
1	MEXT	External ground	26	I8.7	Digital input
2	+24V	+24V output <sup>1)</sup>	27	-	Not assigned
3	I6.0	Digital input	28	-	Not assigned
4	I6.1	Digital input	29	-	Not assigned
5	I6.2	Digital input	30	-	Not assigned
6	I6.3	Digital input	31	Q4.0	Digital output
7	I6.4	Digital input	32	Q4.1	Digital output
8	I6.5	Digital input	33	Q4.2	Digital output
9	I6.6	Digital input	34	Q4.3	Digital output
10	I6.7	Digital input	35	Q4.4	Digital output
11	I7.0	Digital input	36	Q4.5	Digital output
12	I7.1	Digital input	37	Q4.6	Digital output
13	I7.2	Digital input	38	Q4.7	Digital output
14	I7.3	Digital input	39	Q5.0	Digital output
15	I7.4	Digital input	40	Q5.1	Digital output
16	I7.5	Digital input	41	Q5.2	Digital output
17	I7.6	Digital input	42	Q5.3	Digital output
18	I7.7	Digital input	43	Q5.4	Digital output
19	I8.0	Digital input	44	Q5.5	Digital output
20	I8.1	Digital input	45	Q5.6	Digital output
21	I8.2	Digital input	46	Q5.7	Digital output
22	I8.3	Digital input	47	+24V	+24V Input
23	I8.4	Digital input	48	+24V	+24V Input
24	I8.5	Digital input	49	+24V	+24V Input
25	I8.6	Digital input	50	+24V	+24V Input

<sup>1)</sup> Make sure that the current at pin 2 of X301 or X302 does not exceed the maximum current  $I_{out} = 0.25 \text{ A}$ ; otherwise, the controller could be destroyed.

Connecting

 **DANGER**

The 24 V power supply must be protective extra low voltage in accordance with EN60204-1, Section 6.4, PELV (with M ground).

**CAUTION**

Be sure not to connect the pin 2 of X301/302 to ground; otherwise, the CNC controller or the power supply could be damaged!

**Note**

The 24 V output of X301/302 pin 2 comes from pins 47 to 50.

**Note****Addressing ranges**

X301: IB3, IB4, IB5, QB2, QB3

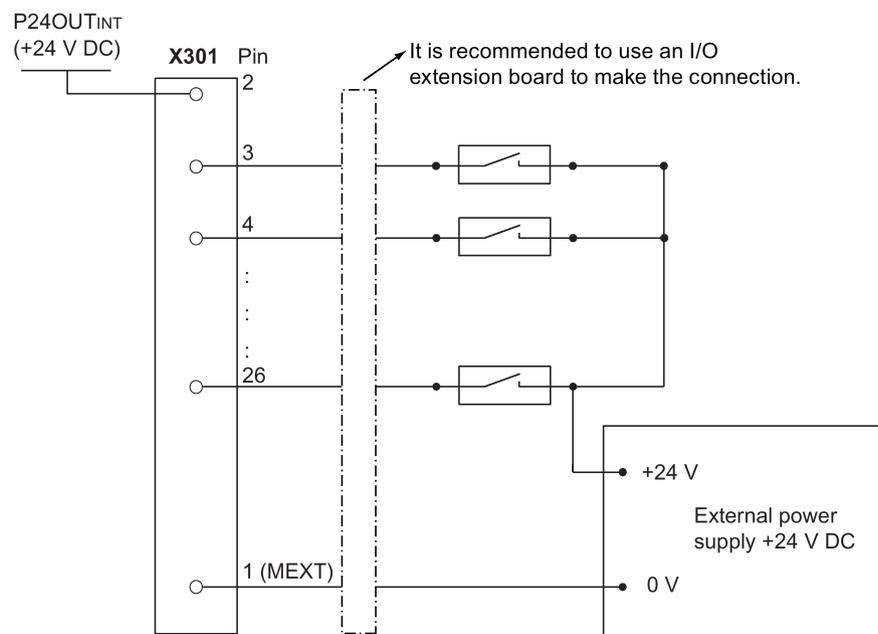
X302: IB6, IB7, IB8, QB4, QB5

**Note**

The connecting cable between the power source, load current supply connection, and associated reference potential M must **not** exceed the maximum permissible length of 10 m.

**Digital inputs**

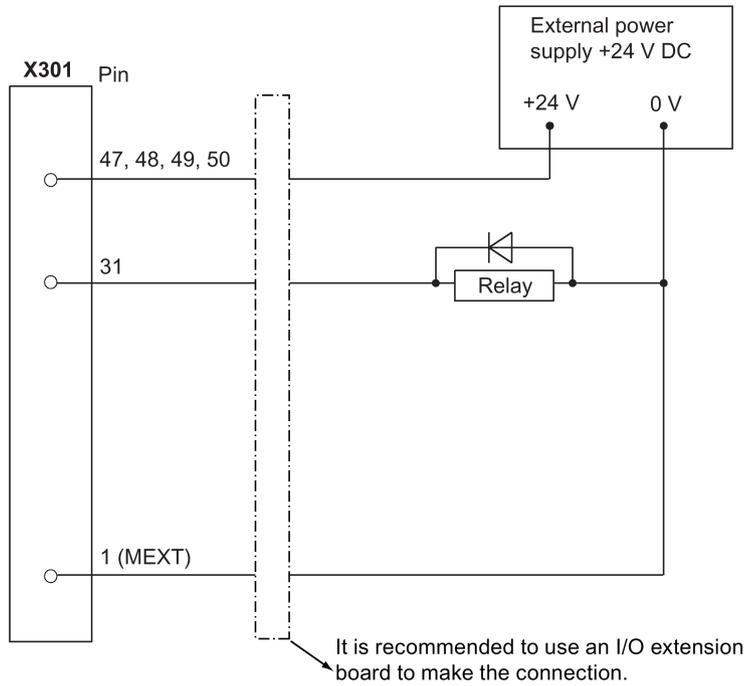
The diagram below shows you how to connect the connector pins of the digital inputs at interface X301 (example). You can connect connector X302 in the same way.

**Note**

When using an external power supply, you must connect the 24V (permissible range: 20.4 - 28.8 V) power supply for the digital outputs to **all the four power input pins** (X301, X302: **pins 47, 48, 49, 50**).

### Digital outputs

The diagram below shows you how to connect the connector pins of the digital outputs at interface X301 (example). You can connect connector X302 in the same way.



To supply the digital outputs, you must connect an external 24 V DC power supply (X301, X302: pins 47, 48, 49, 50).

You must also connect the reference ground of the external power supply to X301, X302: Pin 1 (MEXT).

<b>⚠ CAUTION</b>
You must ensure that the max. current consumption at pin 47, pin 48, pin 49, or pin 50 does <b>not</b> exceed 1 A.

#### Note

You must connect the 24 V power supply for the digital outputs to **all the four power input pins** (X301, X302: **pins 47, 48, 49, 50**).

### External power supply

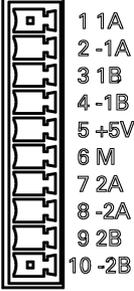
When using an external power supply for the digital inputs, you must connect the reference ground to X301, X302: Pin 1 (MEXT).

### 3.3.5 Handwheel inputs - X10

#### Pin assignment

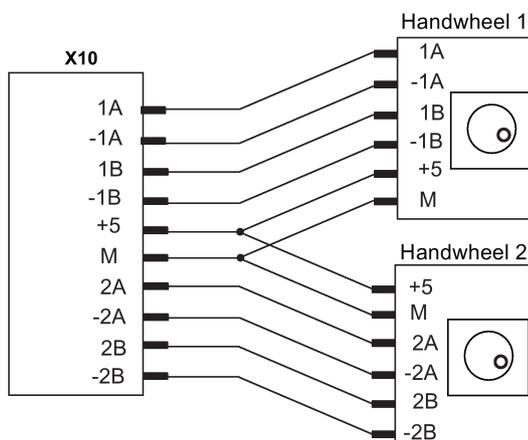
Type Mini Combicon 10-pin  
Cable Max. length: 3m

Table 3-9 Pin assignment of X10

Illustration	Pin	Signal	Comment
 <p>X10 HAND WHEEL</p>	1	A1	TRACK A, handwheel 1
	2	A1_N	NEGATIVE TRACK A, handwheel 1
	3	B1	TRACK B, handwheel 1
	4	B1_N	NEGATIVE TRACK B, handwheel 1
	5	+5V	+5V power output
	6	M	Ground
	7	A2	TRACK A2, handwheel 2
	8	A2_N	NEGATIVE TRACK A2, handwheel 2
	9	B2	TRACK B2, handwheel 2
	10	B2_N	NEGATIVE TRACK B2, handwheel 2

#### Connecting

You are allowed to connect at most 2 electronic handwheels at connector X10 on the PPU.



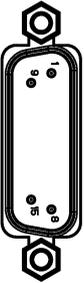
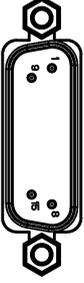
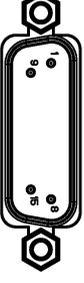
The handwheels must meet the following requirements:

Transmission procedure	5V square wave signals (TTL level or RS422)
Signals	Track A as a true and negative signal ( $U_{a1}U_{a1}$ ) Track B as a true and negative signal ( $U_{a2}U_{a2}$ )
Max. input frequency	500 kHz
Phase shift between Track A to Track B	$90^\circ \pm 30^\circ$
Supply	5V, max. 250 mA

### 3.3.6 Pulse drive interfaces - X51, X52, X53

#### Pin assignment

Type Sub-D, 15-pin, male  
 Cable Type: drive cable  
 Max. length: 10m

Illustration	Pin	Signal	Comment
 <p>X51 X AXIS</p>	1	PULSE+	PULSE, to drive side
	2	DIR+	DIRECTION, to drive side
	3	ENA+	ENABLE, to drive side
	4	BERO	Zero mark, from drive side
	5	+24V	POWER from the pin 1 of X200, +24V output
	6	RST	ALARM RESET, to drive side
	7	M24	Ground
	8	+24V	POWER from the pin 1 of X200, +24V output
	9	PULSE-	NEGATIVE PULSE, to drive side
	10	DIR-	NEGATIVE DIRECTION, to drive side
 <p>X52 Y AXIS</p>	11	ENA-	NEGATIVE ENABLE, to drive side
	12	+24V	POWER from the pin 1 of X200, +24V output
	13	M24	Ground
	14	RDY	DRIVE READY, from drive side
	15	ALM	ALARM, from drive side
 <p>X53 Z AXIS</p>	<p><b>Note:</b>                      The +24V and M24 signals at the pulse drive interfaces can only be used when the +24V and M24 pins are connected at the interface X200.</p>		

## Connecting

**⚠ CAUTION****Damage to controller or power supply**

Pin 5, pin 8 or pin 12 of X51/52/53 are used for +24V power output.

Incorrect connection of them will lead to damage to the CNC controller or the power supply.

Do not connect pin 5, pin 8 or pin 12 of X51/52/53 to ground.

**Note**

X51/52/53 does not support hot plugging.

**Note****Filter**

A line filter (rated current: 16 A, protection level: IP20) is required so that the system can pass the CE certification (radiated emission test or conducted emission test). The order number of Siemens recommended filter is **6SN1111-0AA01-1BA1**.

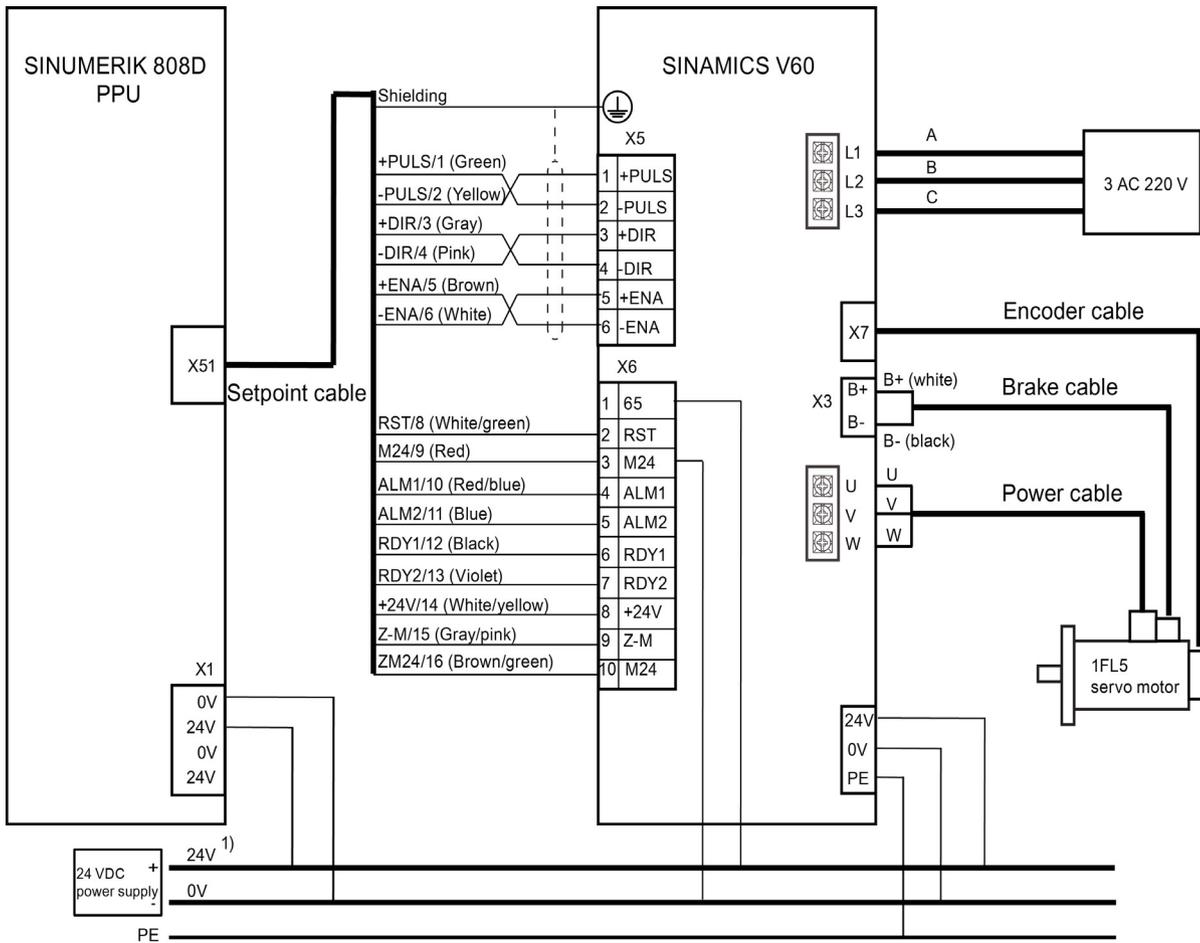
**Note****Circuit breaker**

You can install a mains linear breaker (rated current: 15 A for 7 A or 10 A version of the drive and 10 A for 4 A or 6 A version of the drive; rated voltage: 250 VAC) to protect the system.

As mentioned before, the SINUMERIK 808D control system can control three axes (X axis, Y axis and Z axis). To do so, you need to connect the control system via the three pulse drive interfaces (X51: X axis, X52: Y axis and X53: Z axis) separately to three SINAMICS V60 drives.

The connection diagram between the SINUMERIK 808D (X51: the X axis) and the SINAMICS V60 is shown as follows. You can connect X52 (the Y axis) and X53 (the Z axis) in the same way.

3.3 Connecting the interfaces on the PPU



1): If necessary, you can also serially connect an emergency stop switch between the 65 enable signal and the 24V signal.

The connected motors are SIEMENS 1FL5 servo motors.

For further information about SINAMICS V60 and 1FL5 servo motors, refer to *SINUMERIK 808D Mechanical Installation*, *SINAMICS V60 Getting Started* or *1FL5 Motor Data sheet*.

See also

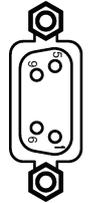
Analog spindle interface - X54 (Page 33)

### 3.3.7 Analog spindle interface - X54

Interface X54 is for connecting the CNC controller to the inverter or servo spindle drive.

Type 9-pin, Sub-D, female  
Cable Max. length: 10m

Table 3- 10 Pin assignment of connector X54 (SPINDLE)

Illustration	Pin	Signal	Comment
 X54 SPINDLE	1	AO	Analog voltage
	2	-	not assigned
	3	-	not assigned
	4	-	not assigned
	5	SE1	Analog drive enable (contact: electrically isolated n.o. contact)
	6	SE2	Analog drive enable (contact: electrically isolated n.o. contact)
	7	-	not assigned
	8	-	not assigned
	9	AGND	Ground

### Connecting

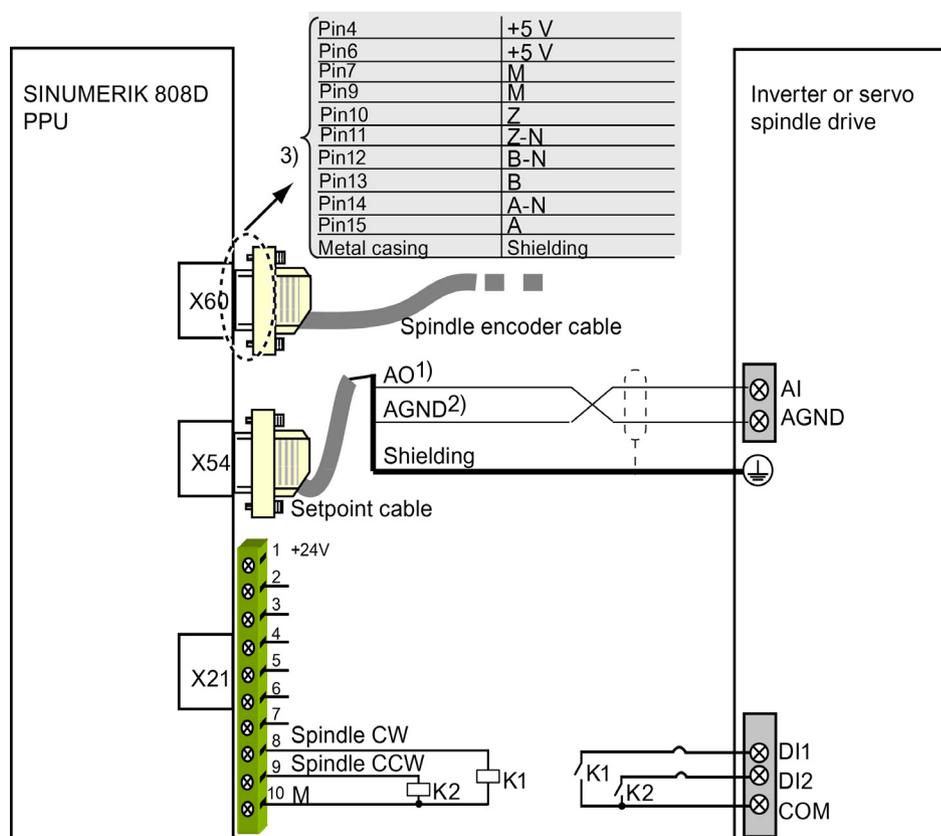


Figure 3-3 Connecting the inverter or the servo spindle drive (unipolar)

- 1) 10 V analog voltage
- 2) 0 V signal
- 3) Use twisted pair cables for signals A/A\_N, B/B\_N, Z/Z\_N, and +5 V/M.

3.3 Connecting the interfaces on the PPU

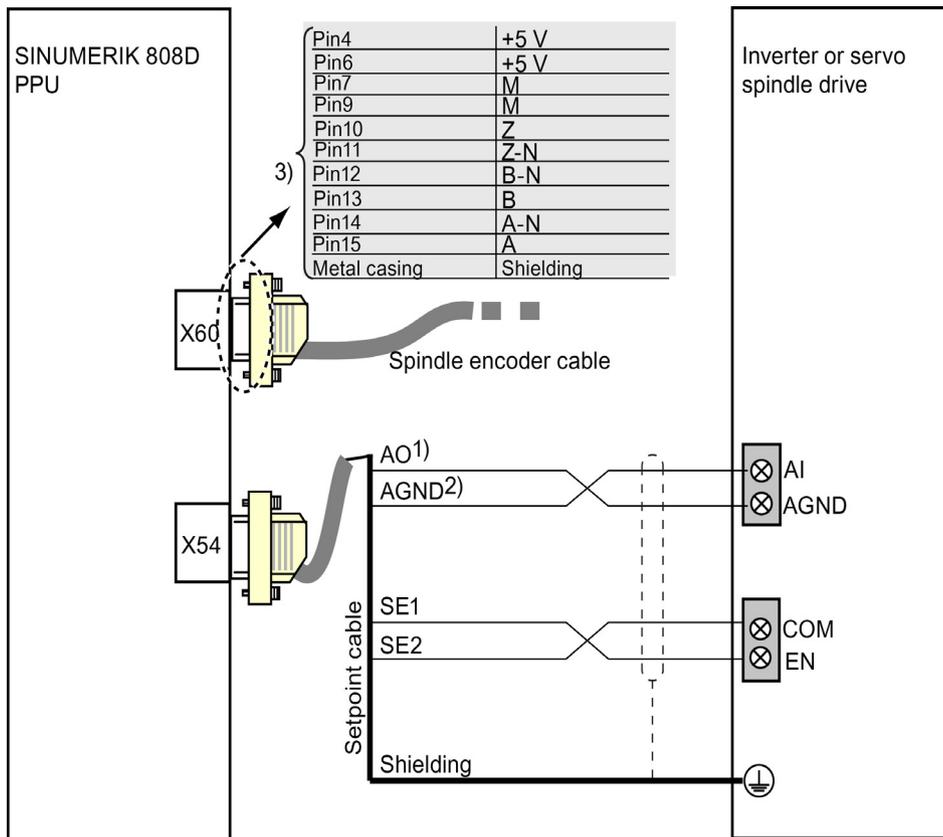


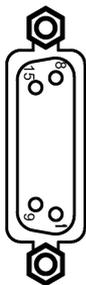
Figure 3-4 Connecting the inverter or the servo spindle drive (bipolar)

- 1) +/- 10 V analog voltage
- 2) 0 V signal
- 3) Use twisted pair cables for signals A/A\_N, B/B\_N, Z/Z\_N, and +5 V/M.

### 3.3.8 Spindle encoder interface - X60

Type Sub-D, 15-pin, female  
 Cable Type: encoder cable  
 Max. length: 10m

Table 3- 11 Pin assignment of X60 (SP ENCODER)

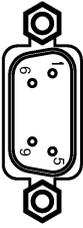
Illustration	Pin	Signal	Comment
 <p>X60 SP ENCODER</p>	1	-	Not assigned
	2	-	Not assigned
	3	-	Not assigned
	4	+5V	+5 V power supply
	5	-	Not assigned
	6	+5V	+5 V power supply
	7	M	Ground
	8	-	Not assigned
	9	M	Ground
	10	Z	Zero mark
	11	Z_N	Zero mark, negative
	12	B_N	Track B, negative
	13	B	Track B
	14	A_N	Track A, negative
	15	A	Track A

### 3.3.9 RS232 interface - X2

You can connect a PC to the SINUMERIK 808D via an RS232 port for communication purposes.

Type Sub-D, 9-pin, male  
 Cable Type: RS232  
 Max. length: 10m

Table 3- 12 Pin assignment of X2 (RS232)

Illustration	Pin	Signal name	Signal type	Comment
 <p>X2 RS232</p>	1	-	-	Not assigned
	2	RxD	I	Receive Data
	3	TxD	O	Transmit Data
	4	DTR	O	Data Terminal Ready
	5	M	VO	Ground
	6	DSR	I	Request Set Ready
	7	RTS	O	Request To Send
	8	CTS	I	Clear To Send
	9	-	-	Not assigned

PPU (9-pin D-Sub)	PG/PC (9-pin D-Sub)
2 RxD	2 RxD
3 TxD	3 TxD
4 DTR	4 DTR
5 M	5 M
6 DSR	6 DSR
7 RTS	7 RTS
8 CTS	8 CTS
Shielding	Shielding

PPU (9-pin D-Sub)	PG/PC (25-pin D-Sub) Field PG P3 (6ES7710-xx...)
2 RxD	2 TxD
3 TxD	3 RxD
4 DTR	20 DTR
5 M	7 M
6 DSR	6 DSR
7 RTS	4 RTS
8 CTS	5 CTS
Shielding	Shielding

## Connecting

Insert the Sub-D sockets into the RS232 interface X2 on the PPU and into the connector on the PC. Lock the connector into position using the knurled screws.

### Note

Use only shielded cables twisted in pairs; the shield must be connected to the metal or metalized connector casing on the side of the control system.

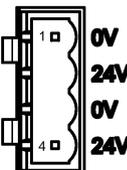
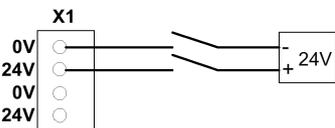
The cable set offered as accessories provides maximum interference immunity.

### 3.3.10 Power supply interface - X1

The SINUMERIK 808D uses a DC 24 V power supply. You can connect the DC 24V power supply via interface X1.

Type                    Combicon 4-pin  
Cable                    Max. length: 10m

Table 3- 13    Pin assignment of X1

Illustration	Pin1	Signal	Name	Comment
	1	0 V	M24	0 V
	2	24 V	P24	+24 V
	3	0 V	M24	0 V
	4	24 V	P24	+24 V
	<p><b>Note:</b></p> <p>The 0V terminals as well as the 24 V terminals are internally connected in parallel. This means that you can connect the 24 V power supply to either of the terminal pairs.</p>			

### 3.3.11 USB interface on the front cover of the PPU

Type USB socket, type A  
 Cable Type: USB1.1 cable  
 Max. length: 3m

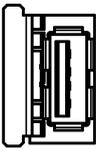
Illustration	Pin	Signal name	Signal type	Comment
	1	P5_USB0	VO	5V power supply
	2	DM_USB0	I/O	USB data-
	3	DP_USB0	I/O	USB data+
	4	M	VO	Ground

### 3.3.12 USB interface - X30

There is a USB interface at the back cover of the PPU. This USB interface is used for connection with the MCP.

Type USB socket, type A Combicon 7-pin  
 Cable Type: USB cable  
 Max. length: 0.5 m

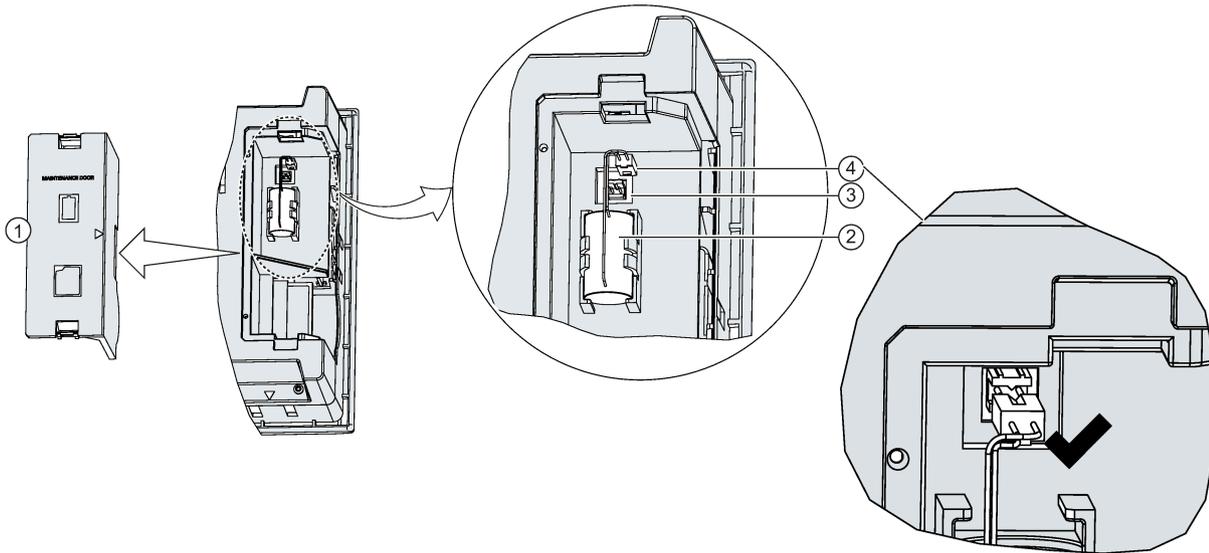
Table 3- 14 Pin assignment of X30 (MCP)

Illustration	Pin	Signal name	Signal type	Comment
 X30 MCP	1	P5_USB0	VO	5V power supply
	2	DM_USB0	I/O	USB data-
	3	DP_USB0	I/O	USB data+
	4	M	VO	Ground

### 3.3.13 Battery interface

A battery has been pre-assembled on the back cover of the PPU.

The battery is not connected when delivered. You **must** plug the battery connector into the battery interface by yourself before switching the controller on. You can access it after removing the maintenance door:



① Maintenance door

② Battery

③ Battery interface

④ Battery connector

---

#### Note

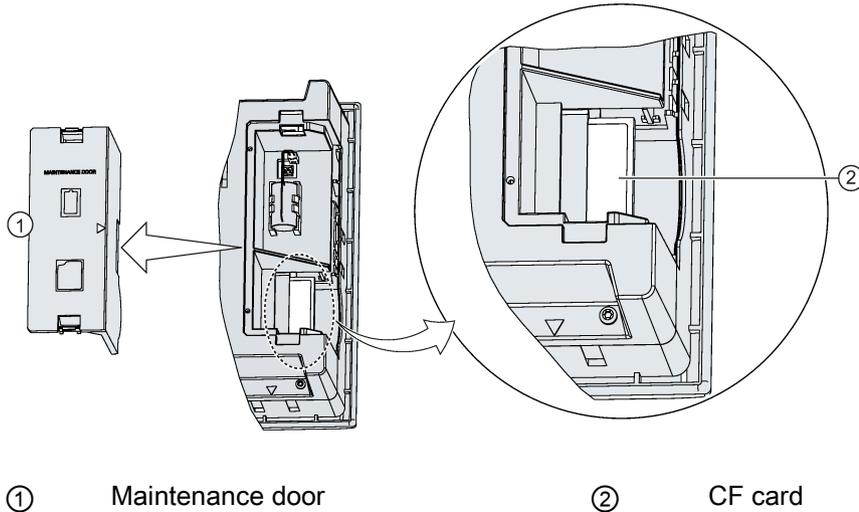
When connecting the battery, ensure that the tab on the connector faces the battery; otherwise, the alarm "NCK battery alarm" will be output after you switch on the controller, and you could lose your data after an unexpected power failure if you do not insert the battery connector correctly.

---

### 3.3.14 Slot for the system CompactFlash Card (CF card)

#### CompactFlash card

The system CompactFlash Card (CF card) has been pre-assembled on the back cover of the PPU.



#### Note

Do not touch or remove the system CompactFlash Card (CF card) under any conditions!

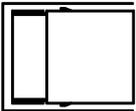
## 3.4 Connecting the USB interface on the MCP

The machine control panel MCP is connected to the operator panel PPU via a USB cable. You can find the USB cable in the MCP package.

#### Pin assignment

Designation X10  
 Type USB socket, type B Combicon 4-pin  
 Cable Max. length: 0.3m

Table 3- 15 Pin assignment of X10 (NC)

Illustration	Pin	Signal name	Signal type	Comment
X10 NC 	1	P5_USB0	VO	5V power supply
	2	DM_USB0	I/O	USB data-
	3	DP_USB0	I/O	USB data+
	4	M	VO	Ground

## Technical specifications

	PPU	MCP
<b>Design data</b>		
Dimensions (W x H x D) (in mm)	420 x 200 x 104	420 x 120 x 58
Weight (in kg)	3.06	0.86
Cooling method	Self-cooling	Self-cooling
Degree of protection	Front side: IP54 Back side: IP20	Front side: IP54 Back side: IP00
<b>Electrical data</b>		
Supply voltage	24 V DC (permissible range: 20.4...28.8 V)	Powered by PPU
Ripple	3.6 Vpp	-
Current consumption from 24 V	Basic configuration typically 1.5 A (inputs/outputs open)	-
Non-periodic overvoltage	35 V (500 ms duration, 50 s recovery time)	-
Total starting current	1 A	-
Rated input current	2 A	0.5 A
Power loss	max. 50 W	max. 5 W
Interference immunity in accordance with EN 61800-3	≥ 20 μs	≥ 20 μs
Overvoltage category	3	3
Degree of pollution	2	2
<b>Transport and storage conditions</b>		
Temperature	-20 °C to +60 °C	-20 °C to +60 °C
Vibration resistance (transport)	5 Hz~9 Hz: 3.5 mm 9 Hz~200 Hz: 1g	5 Hz~9 Hz: 3.5 mm 9 Hz~200 Hz: 1g
Shock resistance (transport)	10 g peak value, 6 ms duration 100 shocks in each of the 3 axes vertical to one another	
Free fall	< 1m	<1m
Relative humidity	5% to 95%, without condensation	5% to 95%, without condensation
Atmospheric pressure	1060 hPa to 700 hPa (corresponds to an altitude of 3,000 m)	
<b>Ambient operating conditions</b>		
Temperature	0 °C to 45 °C	
Atmospheric pressure	From 1080 hPa to 795 hPa	From 1080 hPa to 795 hPa
Vibration resistance (in operation)	10 Hz~58 Hz: 0.35 mm 58 Hz~200 Hz: 1g	10 Hz~58 Hz: 0.35 mm 58 Hz~200 Hz: 1g

4.1 Radio interference

	PPU	MCP
Shock resistance (in operation)	10 g peak value, 6 ms duration 6 shocks in each of the 3 axes vertical to each other	
<b>Lithium battery</b>		
Rated output voltage	3 V	-
Maximum capacity	950 mAh	-
Life time	3 years	-
<b>Certificate</b>	CE	CE

## 4.1 Radio interference

Table 4- 1 Limit values for radio interference suppression in industrial environments

	Limit class according to EN61800-3
Conducted radio interference	C3
Radio interference	C3

**Note**

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

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

## Appendix

### A.1 ESD Directive

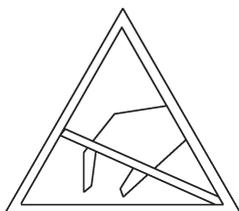
#### A.1.1 What does ESD mean?

##### Definition

All electronic modules are equipped with highly integrated modules or components. Based on their design, these electronic components are highly sensitive to overvoltage and thus to discharge of static electricity.

These **E**lectrostatic **S**ensitive **D**evelopments/**M**odules are commonly abbreviated **ESD**. The common international designation **ESD** stands for **E**lectrostatic **S**ensitive **D**evice.

Electrostatic sensitive modules are identified by the following symbol:



##### CAUTION

Electrostatic sensitive devices may be destroyed by voltages that are undetectable to a human. Voltages of this kind occur as soon as a component or an assembly is touched by a person who is not grounded against static electricity. The damage to a module as a result of overvoltage cannot usually be detected immediately. It may only become apparent after a long period of operation.

## A.1.2 Electrostatic Discharge to Persons

### Charge

Any person with a non-conductive connection to the electrical potential of his or her surroundings may be exposed to electrostatic charge.

The following figure shows the maximum electrostatic voltage which can build up on a person coming into contact with the materials indicated. These values correspond with specifications to IEC 801-2.

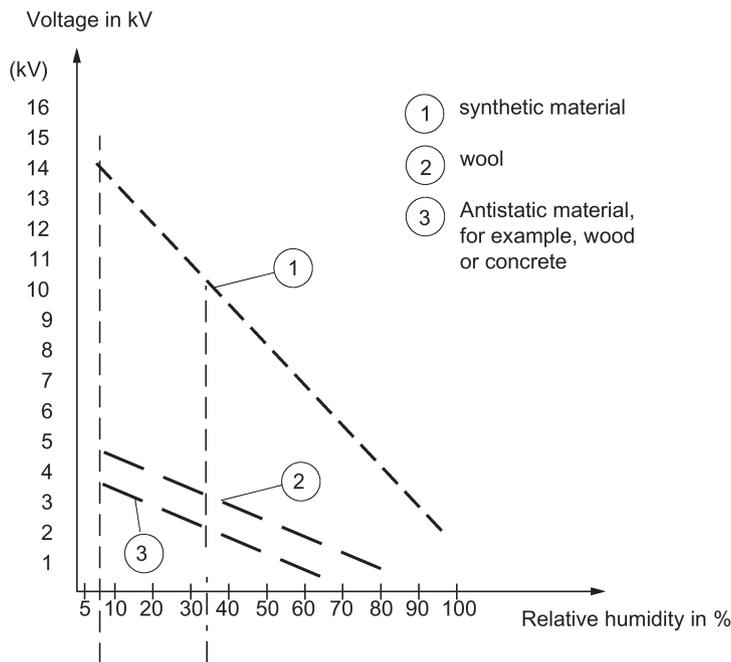


Figure A-1 Electrostatic voltages which can build up on a person

## A.1.3 Basic protective measures against discharge of static electricity

### Make sure the grounding is good

When working with electrostatically sensitive devices, make sure that the person, the workstation and the packaging are properly grounded, which helps you avoid static charge.

### Avoid direct contact

You should only touch ESD components if this is unavoidable (for example, during maintenance work). When you touch modules, make sure that you do not touch either the pins on the modules or the printed conductors. This prevents any discharge of static electricity to sensitive component and thus avoids damage.

Discharge your body before beginning work on a module. To do so, touch a grounded metallic object. Use only grounded measuring and test equipment.

## A.2 Order numbers

Product		Order number	
<b>Hardware</b>			
PPU141.1, turning variant		6FC5370-1AT00-0AA0 (English) 6FC5370-1AT00-0CA0 (Chinese)	
PPU141.1, milling variant		6FC5370-1AM00-0AA0 (English) 6FC5370-1AM00-0CA0 (Chinese)	
MCP		6FC5303-0AF35-0AA0 (English) 6FC5303-0AF35-0CA0 (Chinese)	
<b>Accessories</b>			
Setpoint cable (PPU141.1 connected to CPM60.1)	5 m	6FC5548-0BA00-1AF0	
	7 m	6FC5548-0BA00-1AH0	
	10 m	6FC5548-0BA00-1BA0	
Setpoint cable (PPU141.1 connected to inverter or servo spindle drive)	3 m	6FC5548-0BA05-1AD0	
	5 m	6FC5548-0BA05-1AF0	
	7 m	6FC5548-0BA05-1AH0	
	10 m	6FC5548-0BA05-1BA0	
	20 m	6FC5548-0BA05-1CA0	
<b>Spare parts</b>			
Battery		6FC5247-0AA18-0AA0	
<b>Options</b>			
Software	MM+ (for turning only)		6FC5800-0AP07-0YB0
	Additional axis (for turning only)		6FC5800-0AK70-0YB0
	Toolbox		6FC5811-0CY00-0YA8
Documentation	<i>Operating Instructions</i>	English	6FC5397-2EP10-0BA0
		Chinese	6FC5397-2EP10-0RA0
	<i>Diagnostics Manual</i>	English	6FC5398-6DP10-0BA0
		Chinese	6FC5398-6DP10-0RA0
	<i>Commissioning Manual</i>	English	6FC5397-4EP10-0BA0
		Chinese	6FC5397-4EP10-0RA0
	<i>Programming and Operating Manual (Turning)</i>	English	6FC5398-5DP10-0BA0
		Chinese	6FC5398-5DP10-0RA0
		Russian	6FC5398-5DP10-0PA0
		Portuguese	6FC5398-5DP10-0KA0
	<i>Programming and Operating Manual (Milling)</i>	English	6FC5398-4DP10-0BA0
		Chinese	6FC5398-4DP10-0RA0
		Russian	6FC5398-4DP10-0PA0
		Portuguese	6FC5398-4DP10-0KA0
	<i>Manual Machine Plus (Turning)</i>	English	6FC5398-3DP10-0BA0
Chinese		6FC5398-3DP10-0RA0	

## A.3 FAQs

**FAQ 1** There is no output at the digital output interfaces

- Answer**
- Check whether you have connected the 24 V DC power supply or not.
  - Check PLC signals

**FAQ 2** Black screen

- Answer**
- Check whether you have correctly connected the 24 V DC power supply or not.
  - Check whether you have correctly plugged the battery connector or not.
  - Check whether the CF card looses or not.

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