

**sinamics**

**SINAMICS V60**  
**Controlled Power Module (CPM60.1)**

**SIEMENS**

# Table of contents

## General information

1.1 System overview .....	EN-3
1.2 Safety notes.....	EN-4
1.3 Identification.....	EN-6
1.4 Technical data.....	EN-8

## Installation

2.1 Mechanical installation.....	EN-10
2.1.1 Mounting the drive.....	EN-10
2.1.2 Mounting the motor.....	EN-12
2.2 Electrical installation.....	EN-12
2.3 Interface definition.....	EN-16
2.4 Signal sequence example.....	EN-18

## Commissioning

3.1 Commissioning.....	EN-19
3.1.1 Main menu.....	EN-19
3.1.2 Function menu.....	EN-20
3.1.3 Setpoints from NC.....	EN-22
3.1.4 First commissioning.....	EN-23
3.1.5 System commissioning.....	EN-24
3.2 Parameter list.....	EN-25

## Troubleshooting

4.1 LED status indicators.....	EN-29
4.2 Alarms.....	EN-29
4.3 Errors during drive self-test.....	EN-32
4.4 Other faults.....	EN-32

中文版请见第 CHS-1 至 CHS-34 页。

For the Chinese version, see pages CHS-1 to CHS-34.

CPM 的固件(软件)已更新为 V1.7。当前驱动器在缺省状态下较旧版具有更强的动态性。如需回到旧版工作状态,可将当前缺省值重设为第二缺省值(见 3.1.2 节)。

The firmware (software) in the CPM is already updated to V1.7. Now the performance of the drive in the default status is more dynamic than that of the old version. If you want the drive to work in the old status, you can change the current default value to the second default value (see section 3.1.2).

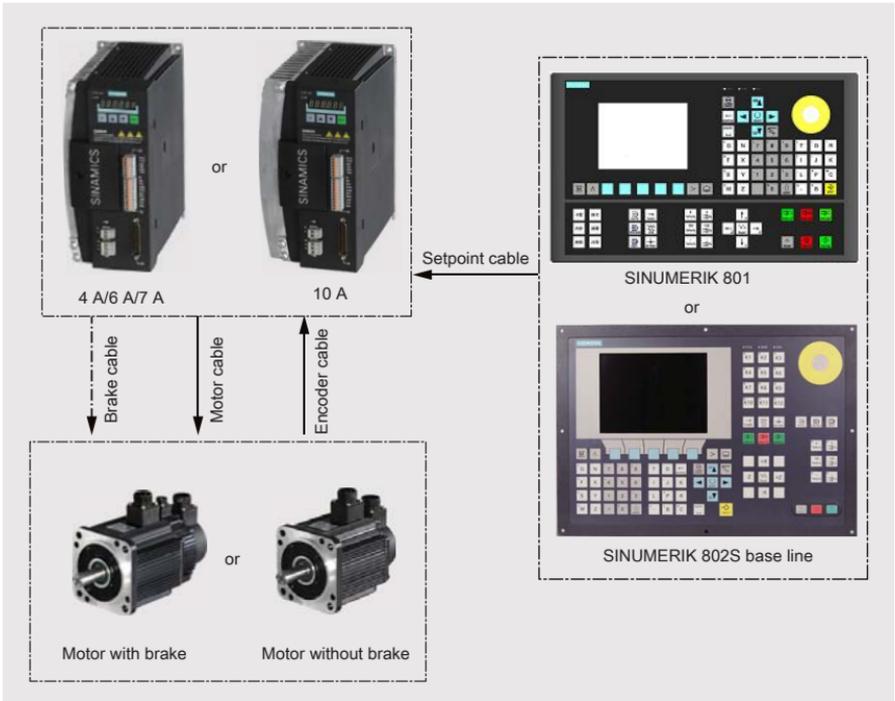


# General Information

## 1.1 System Overview

The SINAMICS V60 servo drive system is a new drive system developed by Siemens. It's designed for use with a Siemens SINUMERIK 801 or SINUMERIK 802S base line numerical controller to control the operation of a CNC turning or milling machine, and it can also be connected with a Siemens SIMATIC PLC. Siemens delivers to each customer the whole system instead of only one drive device, which includes: a drive module (CPM60.1, available in 4 A, 6 A, 7 A or 10 A version), an AC servo motor (type 1FL5, with or without a built-in brake and with or without a key ) and all necessary cables (for power, encoder and brake, with a length of 5m or 10m).

The following picture illustrates possible system configuration



## 1.2 Safety Notes

### General

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

### Identification

 <b>WARNING</b>
<p>Deliverables received must be complete and intact. Exercise caution to ensure that you do not put a damaged device into service. Make sure that the drive, the motor and the cables received correspond with the specific drive package you ordered from Siemens.</p>

### Transport & Storage

 <b>CAUTION</b>
<p>Transport and storage must meet specified environmental conditions. Do not handle the motor by gripping the connecting cable (motor cable, brake cable or encoder cable) or the motor shaft.</p>

### Mechanical installation

 <b>WARNING</b>
<p>Risk of fire or electric shock. Use caution to ensure that you do not install the drive and the motor in an area which is subject to inflammables or combustibles, water or corrosion hazards. Do install the drive in a distribution cabinet with an adequate protection level.</p>

 <b>CAUTION</b>
<p>Do not install the drive and the motor in a location where it is likely to be exposed to constant vibrations or physical shocks. Risk of fire. Make sure that no any foreign body (such as chips of wood or metal, dust, paper scraps, etc.) falls into the drive or lies on its heatsink. Keep sufficient clearance between drives, one drive and another device/inner wall of the cabinet.</p>

<b>NOTICE</b>
<p>Siemens recommends that you tighten the screw on the terminal door of the drive, after you have completed the installation work.</p>

**⚠ WARNING**

The drive must have been disconnected from the power supply for at least five minutes before you perform any wiring to it.  
 Make sure that all connections are correct and reliable, and the drive and motor are always properly grounded.  
 Do suppress radio interference according to EN61800, category C3 (for industrial environment only).  
 SINAMICS V60 is an open-loop drive system, so it has no protection against wire breaks.

**⚠ CAUTION**

The drive must connect to the motor directly with no capacitor, inductor or filter, etc. installed between them.  
 The mains supply voltage must fall in the range of voltage limits.  
 It is strictly prohibited to wire the mains input cable to motor terminals U, V, W or to wire a motor cable to the line input terminals L1, L2, L3.  
 It is strictly prohibited to wire motor terminals U, V, W on the drive in an incorrect phase sequence.  
 If the whole system has to be qualified with CE mark, please use shielded cables for motor cable, mains input cable and brake cable.  
 Always install a 380 V three-phase AC isolating transformer at a mains supply network for protective separation.  
 Route signal cables separately from power cables and lay them in different cable conduits.  
 Keep the signal cables a minimum of 10 cm away from the power cables.  
 Keep cables already connected away from rotating mechanical parts.

## Commissioning/Operation

**⚠ WARNING**

Before switching the power on, make sure that the drive system has been reliably installed and connected, and the mains voltage falls in the permitted voltage limits.  
 Do not touch the motor shaft when the motor is running. Failure to comply may cause personal injury.  
 Ensure that all connections to the SINAMICS V60 drive module have been disconnected before you perform any voltage test (according to EN60201-1 (VDE0112-1), Article 20.4) for an electrical device on the machine tool. The drive had passed the insulation test before its delivery to the customer and doesn't require a second test (for avoiding additional voltage stress).  
 The motor brake is only used for brake control over motor start/stop. Unless absolutely necessary, do not apply it as an emergency stop mechanism.

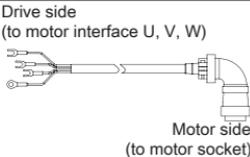
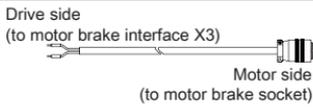
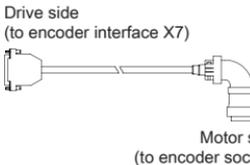
**⚠ CAUTION**

Only after you have successfully carried out commissioning of the drive system while the motor operates under dry-run conditions, can you perform commissioning of the drive system while the motor operates under loaded conditions.  
 Do not touch the heatsink of the drive, the motor or other high-temperature parts during equipment running or within a certain period since power disconnection. Failure to comply may cause personal injury.  
 Ensure that you do not switch on/off the power frequently. This may cause damage to the drive system.  
 The motor rotation direction is determined according to your view from the motor shaft end. Viewing from the motor shaft end, counterclockwise (CCW) rotation is defined as forward rotation while clockwise (CW) rotation is defined as reverse rotation.

## 1.3 Identification

### Scope of delivery

The drive will be always delivered with a complete axis package, including one drive unit CPM60.1, one motor unit 1FL5. and some necessary cables.

Component	Illustration	Remark					
<b>Components included in the drive unit package</b>							
Controlled Power Module CPM60.1	4 A		Dimension (W x H x D; in mm): 106 x 226 x 200				
	6 A						
	7 A						
	10 A		Dimension (W x H x D; in mm): 123 x 226 x 200				
Getting started		--					
Cable clamps (2 pieces)		Applicable to both shielded and non-shielded cables					
Warranty card		--					
<b>Components included in the motor unit package</b>							
1FL5 motor	 With the brake	<table border="1"> <tr><td>4 Nm</td></tr> <tr><td>6 Nm</td></tr> <tr><td>7.7 Nm</td></tr> <tr><td>10 Nm</td></tr> </table>	4 Nm	6 Nm	7.7 Nm	10 Nm	Refer to the rating plate on the motor housing for motor-specific electrical data
	4 Nm						
6 Nm							
7.7 Nm							
10 Nm							
 Without the brake	<table border="1"> <tr><td>4 Nm</td></tr> <tr><td>6 Nm</td></tr> <tr><td>7.7 Nm</td></tr> <tr><td>10 Nm</td></tr> </table>	4 Nm	6 Nm	7.7 Nm	10 Nm	1FL5 motors have two main types - with key and without key. Each type involves motors with brakes and without brakes.	
4 Nm							
6 Nm							
7.7 Nm							
10 Nm							
Datasheet for 1FL5 motor		--					
<b>Cables individually packaged</b>							
Motor cable (unshielded)	<p>Drive side (to motor interface U, V, W)</p>  <p>Motor side (to motor socket)</p>	For each cable, two lengths are available for your selection: - 5 m - 10 m					
Brake cable (unshielded)	<p>Drive side (to motor brake interface X3)</p>  <p>Motor side (to motor brake socket)</p>						
Encoder cable (shielded)	<p>Drive side (to encoder interface X7)</p>  <p>Motor side (to encoder socket)</p>						

## Drive rating plate (example)

**SIEMENS**

**SINAMICS V60 CPM60.1**  
**Input 3AC 220-240V 12.8A 50/60Hz**  
**Output 3AC 0-200V 10A**

████████████████████

**1P 6SL3210-5CC21-0UA0**

████████████████████

**S ZVW3YYN123456**

████████████████████

**SNC-A5E01042169**

████████████████████ **VERSION: B**

**Made in China**

Product name

Rated input voltage, current and frequency

Rated output voltage & current

Bar code

MLFB (order number)

Bar code

Product serial number

Bar code

Siemens part number

Hardware version

Bar code

Drive rating plate

6 SL 3 2 1 0 - 5 C C 2 1 - 0 U A 0

SINAMICS AC Drive,  
blocksize, with internal  
air cooling

3 AC 220 ... 240 V rated

Multiplier for output current:  
1: x 0.1  
2: x 1

Version

Standard

Unfiltered

Rated output current:  
4 - 0: 4 A  
6 - 0: 6 A  
7 - 0: 7 A  
1 - 0: 10 A

Drive variant/ Rated output current	Order number
4 A	6SL3210-5CC14-0UA0
6 A	6SL3210-5CC16-0UA0
7 A	6SL3210-5CC17-0UA0
10 A	6SL3210-5CC21-0UA0

## Motor rating plate (example)

SIEMENS

3~Motor 1FL5066-0AC21-0AH0

S 10025AA13LFBZ0001

Mn 10Nm	In 10A	Nmax 2200RPM Nn 2000RPM
TH.Cl.130(B)	Uin 77.5V	IPxx
Encoder 250PPR		
Brake 24VDC, I=0.6A		

CE Made in China

MLFB (order number)

Product serial number

Protection class

2D-code  
(for MLFB and  
serial number)

Rated resolution

Brake requirements

Motor (with brake)  
rating plate

1 FL 5 0 6 0 - 0 AC 2 1 - 0 A H 0

Rated torque:

0: 4.0 Nm

2: 6.0 Nm

4: 7.7 Nm

6: 10.0 Nm

G: Without key, without brake

H: Without key, with brake

A: With key, without brake

B: With key, with brake



### Technical data for transformer

Recommended transformer type	380 V/220 V SG series 3AC isolating transformer	
Supply voltage	3 AC 380 / 220 V 50/60 Hz	
Connection group	Y/Y-12	
Impedance voltage (U <sub>k</sub> %)	4	
No-load current (%)	For a transformer = < 1.0 kVA, the no-load current < 18%; For a transformer > 1.0 kVA, the no-load current < 14%.	
Power selection (for standard turning/milling machines)	Possible motor combination	Transformer power (apparent power)
	4 Nm	1.0 kVA
	6 Nm	1.5 kVA
	7.7 Nm	2.0 kVA
	10 Nm	2.5 kVA
	4 Nm + 4 Nm	1.5 kVA
	4 Nm + 6 Nm	1.5 kVA
	4 Nm + 7.7 Nm	1.5 kVA
	4 Nm + 10 Nm	2.0 kVA
	6 Nm + 6 Nm	2.0 kVA
	6 Nm + 7.7 Nm	2.0 kVA
	6 Nm + 10 Nm	2.5 kVA
	7.7 Nm + 7.7 Nm	2.0 kVA
	7.7 Nm + 10 Nm	2.5 kVA
	10 Nm + 10 Nm	3.0 kVA
	4 Nm + 4 Nm + 4 Nm	1.5 kVA
	4 Nm + 4 Nm + 6 Nm	1.5 kVA
	4 Nm + 4 Nm + 7.7 Nm	2.1 kVA
	4 Nm + 4 Nm + 10 Nm	2.0 kVA
	4 Nm + 6 Nm + 6 Nm	2.0 kVA
	4 Nm + 6 Nm + 7.7 Nm	2.0 kVA
	4 Nm + 6 Nm + 10 Nm	2.5 kVA
	4 Nm + 7.7 Nm + 7.7 Nm	2.5 kVA
	4 Nm + 7.7 Nm + 10 Nm	2.5 kVA
	4 Nm + 10 Nm + 10 Nm	3.0 kVA
	6 Nm + 6 Nm + 6 Nm	2.0 kVA
	6 Nm + 6 Nm + 7.7 Nm	2.0 kVA
6 Nm + 6 Nm + 10 Nm	2.5 kVA	
6 Nm + 7.7 Nm + 7.7 Nm	2.5 kVA	
6 Nm + 7.7 Nm + 10 Nm	2.5 kVA	
6 Nm + 10 Nm + 10 Nm	3.0 kVA	
7.7 Nm + 7.7 Nm + 7.7 Nm	2.5 kVA	
7.7 Nm + 7.7 Nm + 10 Nm	3.0 kVA	
7.7 Nm + 10 Nm + 10 Nm	3.0 kVA	
10 Nm + 10 Nm + 10 Nm	3.5 kVA	

#### CAUTION

To reduce the risk of electric shock, interference from power supply and electromagnetic field, an isolating transformer is necessary for the 3AC 380V mains system.

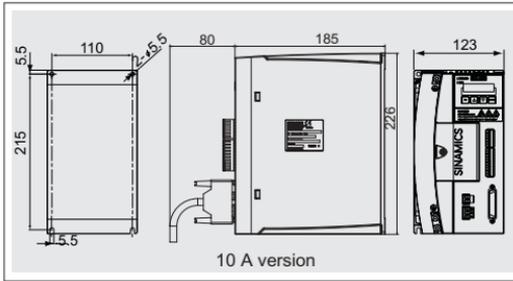
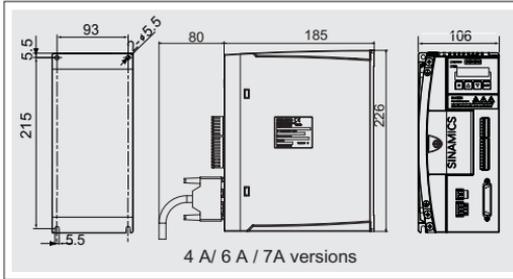
The customer may select the right transformer with reference to the table above  
(Determine the right transformer power based on desired motor combinations)

# Installation

## 2.1 Mechanical Installation

### 2.1.1 Mounting the drive

Drill pattern and outline dimensions

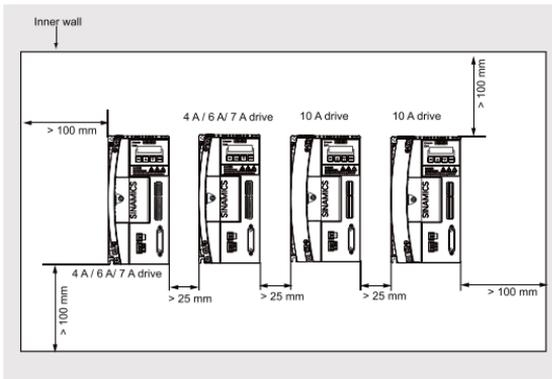


#### Mounting method

You mount the drive with four M5 screws to the inner wall of the cabinet. Note that the drive must be mounted vertically to the cabinet wall, with the ventilation openings of the drive pointing upwards. The screw tightening torque of the drive must be no more than 2.0 Nm.

#### Minimum mounting clearance

To ensure sufficient heat dissipation, please observe the requirements for minimum clearance between drives, one drive and another device/inner wall of the cabinet, as illustrated in the picture below:

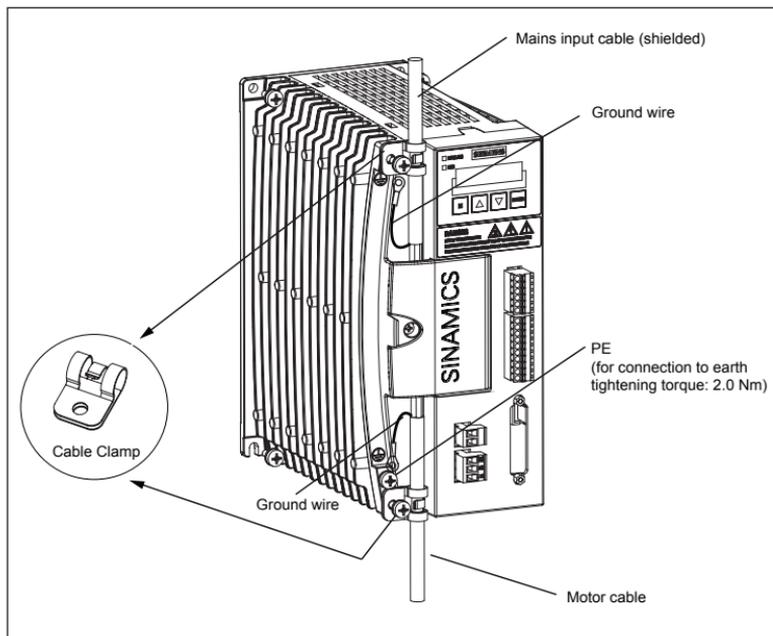


### The use of supplied cable clamps

If the CE marking requirements for cables are mandatory, the mains input cable and the motor cable used must all be shielded type of cables. In that case, you can use the cable clamps as a ground connection between the cable shielding layer and a common ground point.

Clamps can also be helpful in better fixing cables (the unshielded motor cable and the mains input cable) in place.

The illustration below shows you how to use the clamps to fix both cables and to make a shielding connection with the cable.



#### Caution

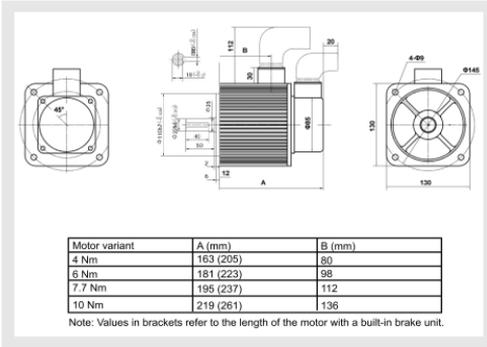
Make sure that the clamp for fixing the shielded motor cable is in close contact with the shielding layer of the cable.

#### Note

After the installation, it is recommended that the screws on the terminal covers should be screwed down to ensure the safety. Siemens does not provide the shielded motor cable. Please prepare the shielded motor cable by yourselves for CE certification.

## 2.1.2 Mounting the motor

### Motor mounting dimensions



#### Note

For motors with keys, the flat key size is as shown in the above figure.

For the key way size, refer to the national standard GB/T 1095-2003

For the flat key size, refer to the national standard GB/T 1096-2003 (key C 8X7X40)

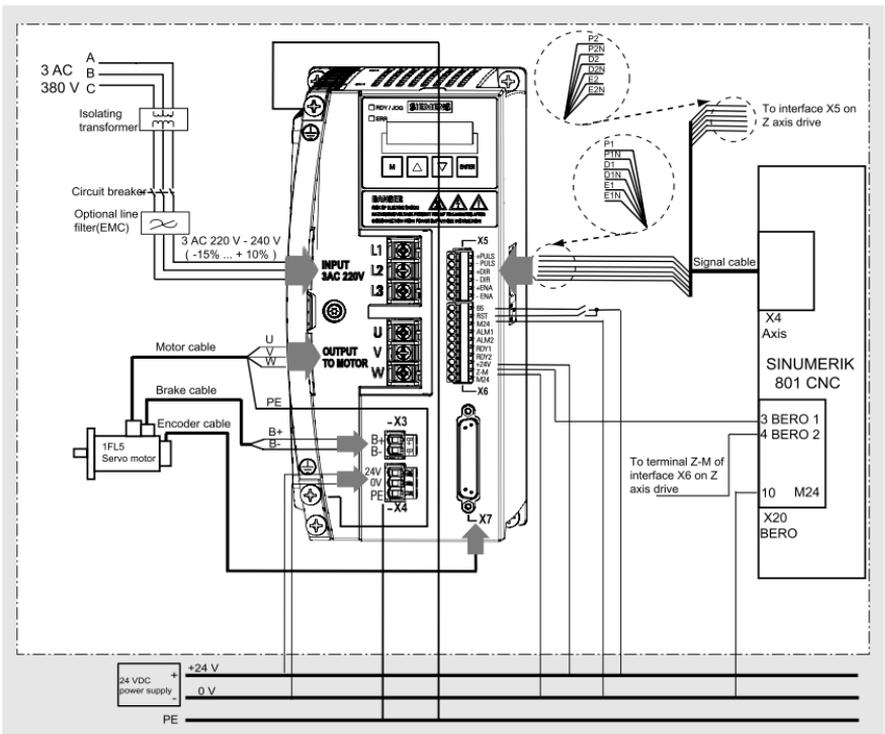
### Mounting orientation and ingress protection requirements

You can mount a motor vertically or horizontally. Make sure that no fluid (water, oil, etc.) can penetrate into the motor while installation or motor operation. Keep the cable outlet pointing downwards if a motor is mounted horizontally, in order to protect the motor from ingress of oil or water.

## 2.2 Electrical Installation

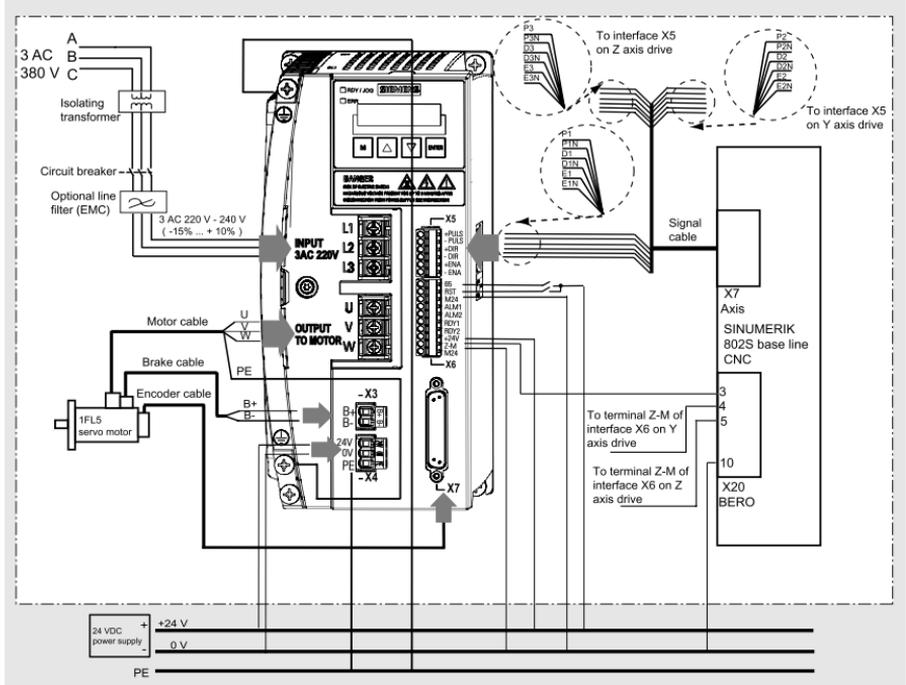
### Connecting to the drive with SINUMERIK 801 CNC Controller

One SINUMERIK 801 controller can control up to two axes, as the case may require. The connection diagram below shows you a system connection example when a SINUMERIK 801 controller is used to control two drives.



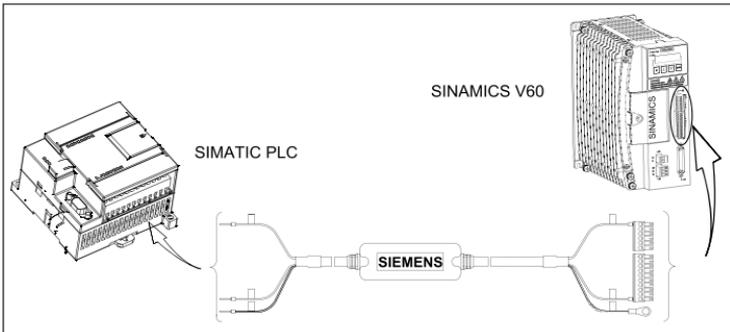
## Connecting the drive with SINUMERIK 802S base line CNC Controller

One SINUMERIK 802S base line controller can control up to three axes, as the case may require. The connection diagram below shows you a system connection example when the 802S base line is used to control three drives.



Installation

## Connecting the drive with SIMATIC PLC

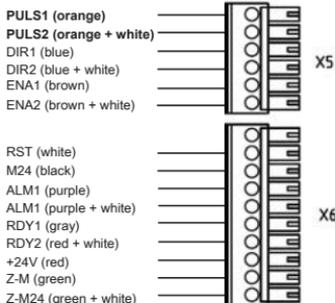
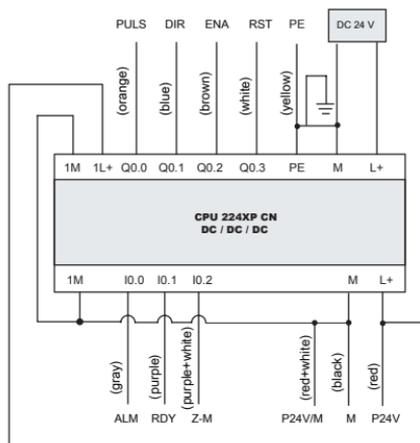


### NOTE

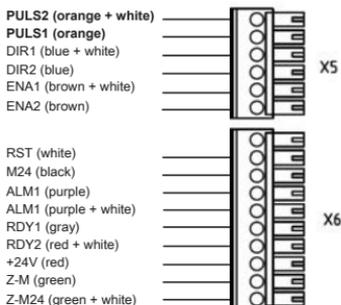
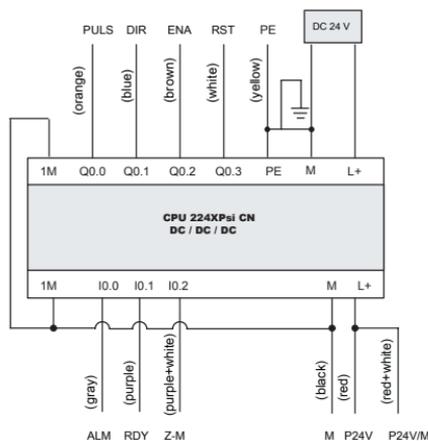
When using the drive together with the SIMATIC PLC, you are recommended to use a standard 24 V DC power supply for the SIMATIC PLC and use a Siemens cable (6ES7298-2DS23-0XA0) to connect the two ones.

► If SIMATIC PLC is S7-200 series, please see following wiring diagrams:

- For PNP types (example)



- For NPN types (example)



**NOTE**

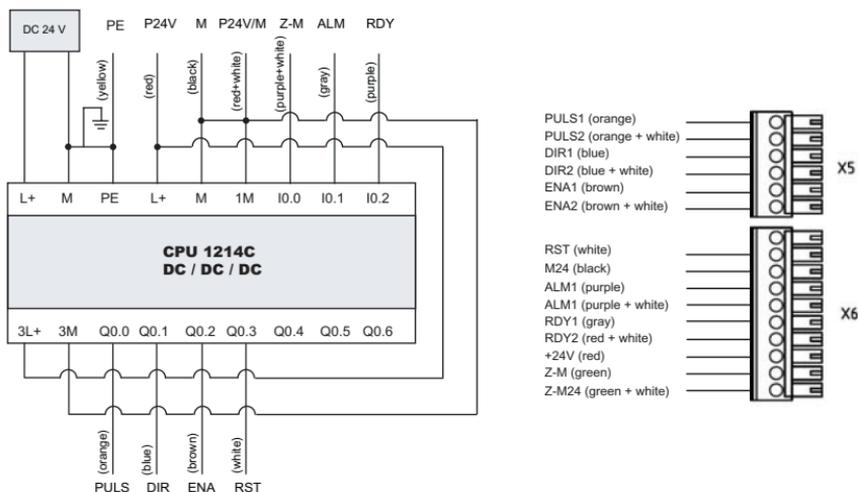
As 65 signal from SINAMICS V60 drive is recommended for emergency stop, it is not used in SIMATIC PLC/SINAMICS V60 signal cable.

For a SIMATIC PLC (S7-200 series), signal PULS can only be connected to output terminal Q0.0 or Q0.1, and terminal Q0.2 or Q0.3 is used for direction output.

For PNP and NPN types, connectors on X5 are differently arranged. So, be sure to connect to X5 correctly according to the actual situation.

Based on contact colors, connect the contacts on the PLC (left) and those on the V60 (right) respectively, as shown on page EN-13. The contact colors on the PLC, however, do not match those on the V60.

➤ If SIMATIC PLC is S7-1200 series, please see the following wiring diagram (example):



## NOTE

As 65 signal from SINAMICS V60 drive is recommended for emergency stop, it is not used in SIMATIC PLC/SINAMICS V60 signal cable.

For a SIMATIC PLC (S7-1200 series), signal PULS can only be connected to output terminal Q0.0 or Q0.2, and terminal Q0.1 or Q0.3 is used for direction output.

## External 24 V DC Power Supply

The CPM60.1 drive unit should be connected to an external 24 V DC power supply (rated input current 2 A), which enables the drive to normally work under the voltage range of 24 V (- 15% to +20%). Since the excellent quality of a DC power supply is critical to the stable operation of a drive system, Siemens recommends you to select a SIEMENS DC 24 V stabilized power supply (order number: 6EP1333-3BA00). If there is no SIEMENS DC 24 V power supply available, you can use a non-SIEMENS high-quality power supply instead.

## 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 filter recommended by SIEMENS has an order number of 6SN1111-0AA01-1BA1.

## Circuit breaker

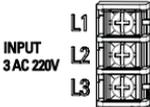
You can install a mains linear breaker (rated current: 15 A for 7 A or 10 A version of the drive and 10 A for 4 A or 6 A version of the drive; rated voltage: 250 VAC) to protect the system.

## SIMATIC PLC/SINAMICS V60 signal cable

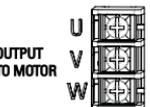
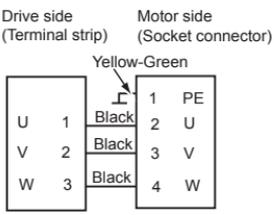
It is recommended to use SIEMENS-designed SIMATIC PLC/SINAMICS V60 signal cable (length: 3m) to connect SIMATIC PLC and SINAMICS V60. This signal cable can be ordered with MLFB of 6ES7298-2DS23-0XA0.

## 2.3 Interface Definition

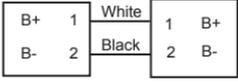
### Line supply connection L1, L2, L3

Interface	Signal name	Description
	L1	Line phase L1
	L2	Line phase L2
	L3	Line phase L3
	Maximum conductor cross-section: 2.5 mm <sup>2</sup>	

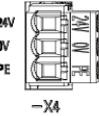
### Motor output connection U, V, W

Interface	Signal name	Description	Schematic connection diagram
	U	Motor phase U	
	V	Motor phase V	
	W	Motor phase W	
	Maximum conductor cross-section: 2.5 mm <sup>2</sup>		

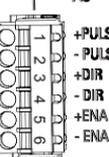
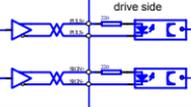
### Motor brake connection X3

Interface	Signal name	Description	Schematic connection diagram
	B+	+ 24 V, motor brake voltage positive	
	B-	0 V, motor brake voltage negative	
Maximum conductor cross-section: 1.5 mm <sup>2</sup>			

### DC 24 V power supply connection X4

Interface	Signal name	Description	Remark
	24 V	DC 24 V	Voltage 24 V DC (20.4 - 28.8 V) Current consumption: • Max. 0.8 A without brake power supply • Max. 1.4 A with brake power supply
	0 V	0 V	
	PE	Protective earth	--
	Maximum conductor cross-section: 1.5 mm <sup>2</sup>		

### Setpoint interface X5

Interface	Pin	Signal name	Description	I/O type	Remark
	1	+PULS	Pulse input setpoint +	I	It's recommended that the differential drive mode is used here so that the pulse data can be transmitted correctly. 
	2	-PULS	Pulse input setpoint -	I	
	3	+DIR	Direction of motor setpoint +	I	
	4	-DIR	Direction of motor setpoint -	I	
	5	+ENA	Pulse enable +	I	
	6	-ENA	Pulse enable -	I	
5V differential signal Too high input voltage may cause a damage to the device. Max. conductor cross section: 0.5 mm <sup>2</sup> If the drive is connected with a SIMATIC PLC, please make sure that the time delay between PULS and DIR signals should be more than 16µs. Please ensure that the terminals of interface X5 should be firmly wired, otherwise, it is forbidden to start the machine.					

## Digital I/O interface X6

Interface	Pin	Signal name	Description	I/O type	Remark	
	1	65	Servo enable	I	+24 V = drive enable 0 V = drive disable	
	2	RST	Alarm cancel	I	+24 V = high active <sup>1)</sup>	
	3	M24	Servo enable and alarm cancel reference ground, 0 V	I		
	4	ALM1	Alarm relay contact 1 terminal	-		ALM1 ALM2 Internal relay terminals Relay picks up in case of an alarm NC can receive this alarm from drive
	5	ALM2	Alarm relay contact 2 terminal	-		
	6	RDY1	Servo ready contact 1 terminal	-		RDY1 RDY2 Internal relay terminals Relay picks up when drive is ready for operation
	7	RDY2	Servo ready contact 2 terminal	-		
	8	+24V	Zero mark power supply	I		
	9	Z-M	Zero mark output	O	Pulse width: 2 ~ 3 ms H = +24 V, L = 0 V	
	10	M24	Zero mark reference ground 0 V	I		
Maximum conductor cross section: 1.5 mm <sup>2</sup>						

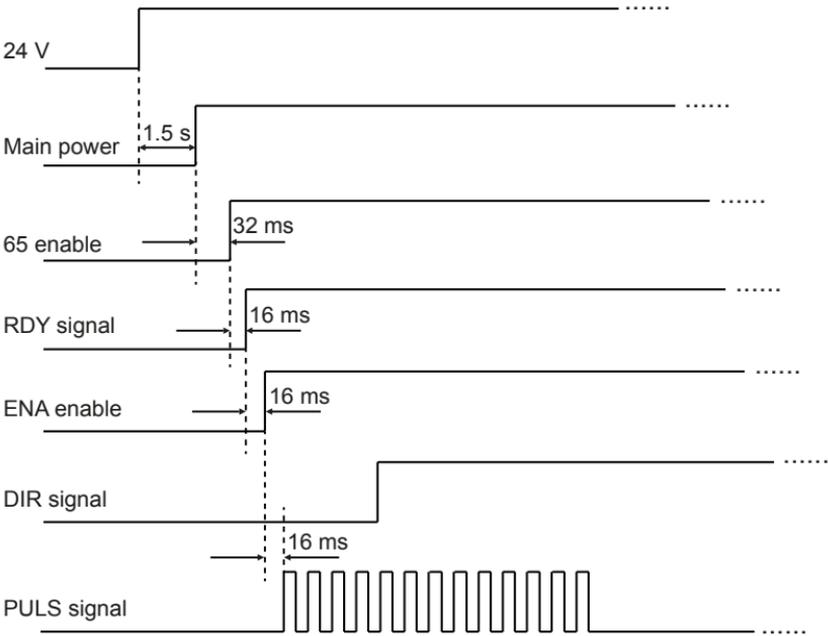
<sup>1)</sup> To cancel an active alarm, apply a high level (+24V) at this terminal.

## Encoder interface X7

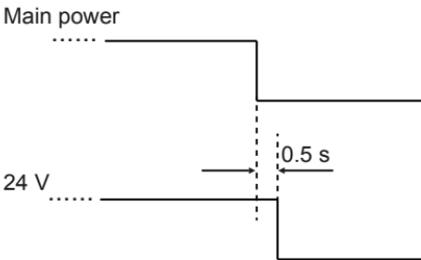
Interface	Pin	Signal name	Description																																																																				
	24	A+	TTL encoder A phase signal																																																																				
	12	A-																																																																					
	23	B+	TTL encoder B phase signal																																																																				
	11	B-																																																																					
	22	Z+	TTL encoder Z phase signal																																																																				
	10	Z-																																																																					
	21	U+	TTL encoder U phase signal																																																																				
	9	U-																																																																					
	20	V+	TTL encoder V phase signal																																																																				
	8	V-																																																																					
	19	W+	TTL encoder W phase signal																																																																				
	7	W-																																																																					
	13	NC	Not connected																																																																				
	25	NC	(reserved)																																																																				
	5/6/17/18	EP5	Encoder power supply + 5 V																																																																				
1/2/3/4	EM	Encoder power supply GND																																																																					
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Drive side (25-pin socket connector X7)</th> <th colspan="2">Motor side (15-pin socket connector)</th> </tr> </thead> <tbody> <tr><td>A+</td><td>24</td><td>4</td><td>A+</td></tr> <tr><td>A-</td><td>12</td><td>7</td><td>A-</td></tr> <tr><td>B+</td><td>23</td><td>5</td><td>B+</td></tr> <tr><td>B-</td><td>11</td><td>8</td><td>B-</td></tr> <tr><td>Z+</td><td>22</td><td>6</td><td>Z+</td></tr> <tr><td>Z-</td><td>10</td><td>9</td><td>Z-</td></tr> <tr><td>U+</td><td>21</td><td>10</td><td>U+</td></tr> <tr><td>U-</td><td>9</td><td>13</td><td>U-</td></tr> <tr><td>V+</td><td>20</td><td>11</td><td>V+</td></tr> <tr><td>V-</td><td>8</td><td>14</td><td>V-</td></tr> <tr><td>W+</td><td>19</td><td>12</td><td>W+</td></tr> <tr><td>W-</td><td>7</td><td>15</td><td>W-</td></tr> <tr><td>EP5</td><td>5/6/17/18</td><td>2</td><td>EP5</td></tr> <tr><td>EM</td><td>1/2/3/4</td><td>3</td><td>EM</td></tr> <tr><td>N.C.</td><td>13</td><td>1</td><td>PE</td></tr> <tr><td>N.C.</td><td>25</td><td></td><td></td></tr> </tbody> </table> <p>Screw type: UNC 4-40 (plug-in terminal block) Tightening torque: 0.5 - 0.6 Nm</p>				Drive side (25-pin socket connector X7)		Motor side (15-pin socket connector)		A+	24	4	A+	A-	12	7	A-	B+	23	5	B+	B-	11	8	B-	Z+	22	6	Z+	Z-	10	9	Z-	U+	21	10	U+	U-	9	13	U-	V+	20	11	V+	V-	8	14	V-	W+	19	12	W+	W-	7	15	W-	EP5	5/6/17/18	2	EP5	EM	1/2/3/4	3	EM	N.C.	13	1	PE	N.C.	25		
Drive side (25-pin socket connector X7)		Motor side (15-pin socket connector)																																																																					
A+	24	4	A+																																																																				
A-	12	7	A-																																																																				
B+	23	5	B+																																																																				
B-	11	8	B-																																																																				
Z+	22	6	Z+																																																																				
Z-	10	9	Z-																																																																				
U+	21	10	U+																																																																				
U-	9	13	U-																																																																				
V+	20	11	V+																																																																				
V-	8	14	V-																																																																				
W+	19	12	W+																																																																				
W-	7	15	W-																																																																				
EP5	5/6/17/18	2	EP5																																																																				
EM	1/2/3/4	3	EM																																																																				
N.C.	13	1	PE																																																																				
N.C.	25																																																																						

## 2.4 Signal Sequence Example

### Power-on sequence



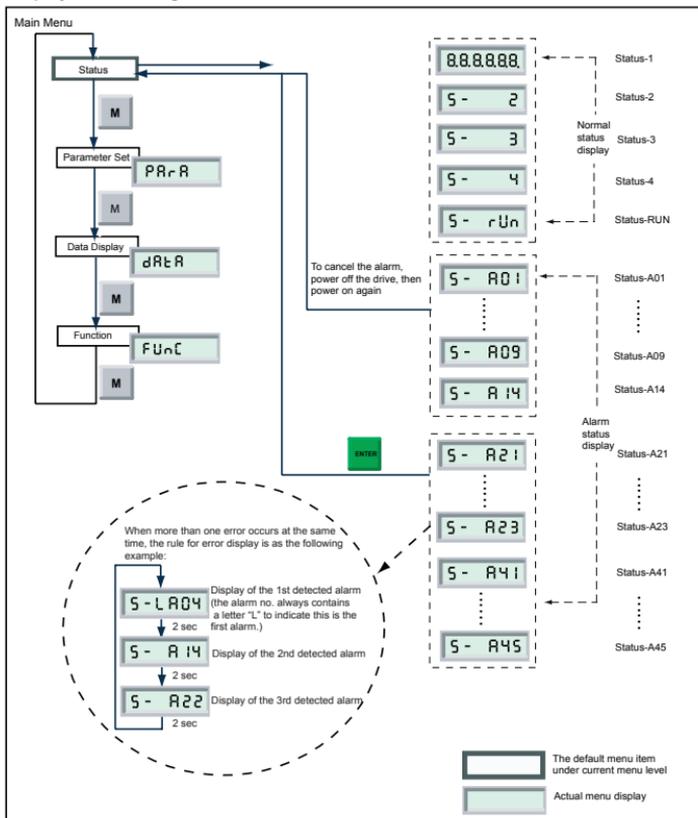
### Power-off sequence



## 3.1 Commissioning

### 3.1.1 Main Menu

#### Displays and settings



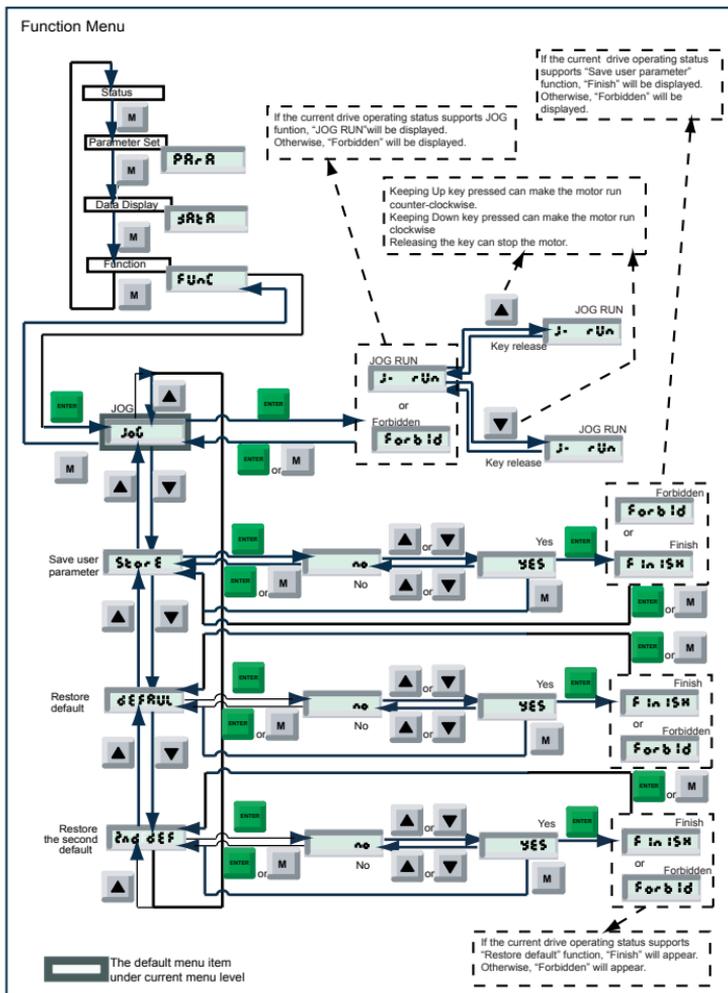
#### The status menu items

Menu Item	Definition	Preconditions for display of normal status
<b>Normal status</b>		
8.8.8.8.8.8.	Initializing the drive (drive self-testing at power-on). "8.8.8.8.8.8." will stay for about 1 second during the process.	<ul style="list-style-type: none"> <li>No error code appears</li> <li>No power supply (24 V DC) fault</li> </ul>
S-2	Precharging the drive (waiting for the 220 V mains power)	<ul style="list-style-type: none"> <li>No power supply (24 V DC) fault</li> <li>No alarm code appears</li> <li>No error code appears</li> </ul>
S-3	Waiting for drive enable from terminal 65 at X6	<ul style="list-style-type: none"> <li>No power supply (24 V DC or 3AC 220 - 240 V) fault</li> <li>No alarm code appears</li> </ul>
S-4	Waiting for pulse enable from terminals ENA+ and ENA- at X5	<ul style="list-style-type: none"> <li>No power supply (24 V DC or 3AC 220-240 V) fault</li> <li>No alarm code appears</li> <li>Terminal 65 has been enabled</li> </ul>
S-RUN	Drive is running properly	<ul style="list-style-type: none"> <li>No power supply (24 V DC or 3AC 220-240 V) fault</li> <li>No alarm code appears</li> <li>Terminals 65 has been enabled via an external 24 V DC power supply</li> <li>Terminals ENA+ and ENA- have been enabled</li> </ul>
<b>Alarm status</b>		
S-A01 ... S-A45	Displays an alarm code associated with a fault existent in the drive system	

## Descriptions of main keys:

Key	Definition	Function
M	Mode selection	Switch between 4 main menu items (Status, Parameter Set , Data Display and Function) or return current display to next higher-level.
ENTER	Enter	Go to next lower-level menu item or back to higher-level item, confirm value (save modified value into RAM) or cancel an alarm.

### 3.1.2 Function Menu



#### NOTICE

Accessibility to "JOG" mode or "Save user parameter" mode (see the picture above) depends on the current display status of the drive:

- When drive is in "S-4" (waiting for pulse enable) state, access to JOG mode is possible; alternatively, when the drive is in "S-3" (waiting for 65 enable) state and P05 = 1, access to JOG mode is possible.
- Access to "Save user parameter" is possible as long as the drive is not in "S-RUN" state or in "JOG-RUN" mode.
- Please save modified parameters via the Store function in the function menu, otherwise, the parameter changes will be lost if the drive is powered off. It must be noted that signal of servo enable (terminal X6-"65") or signal of pulse enable (terminal X5-"ENA"/"-ENA") should be cut off if you try to save the parameters; otherwise, "Forbid" (the saving action is forbidden) will be displayed on the drive.
- The 2nd default values are the default values of FW V1.6 and the lower.



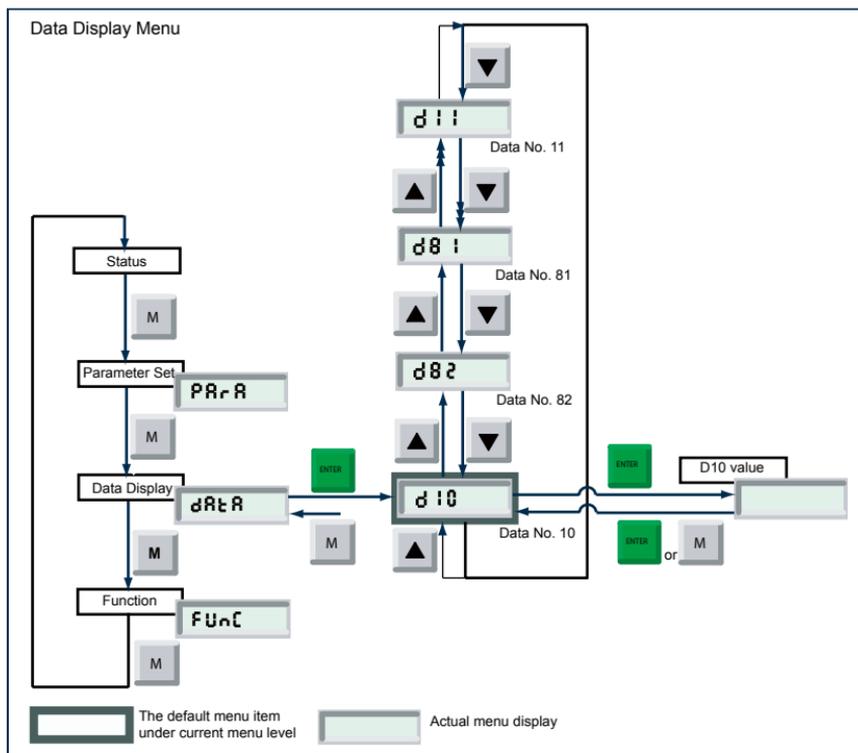


Figure 6-4 "Data Display" menu

**Note**

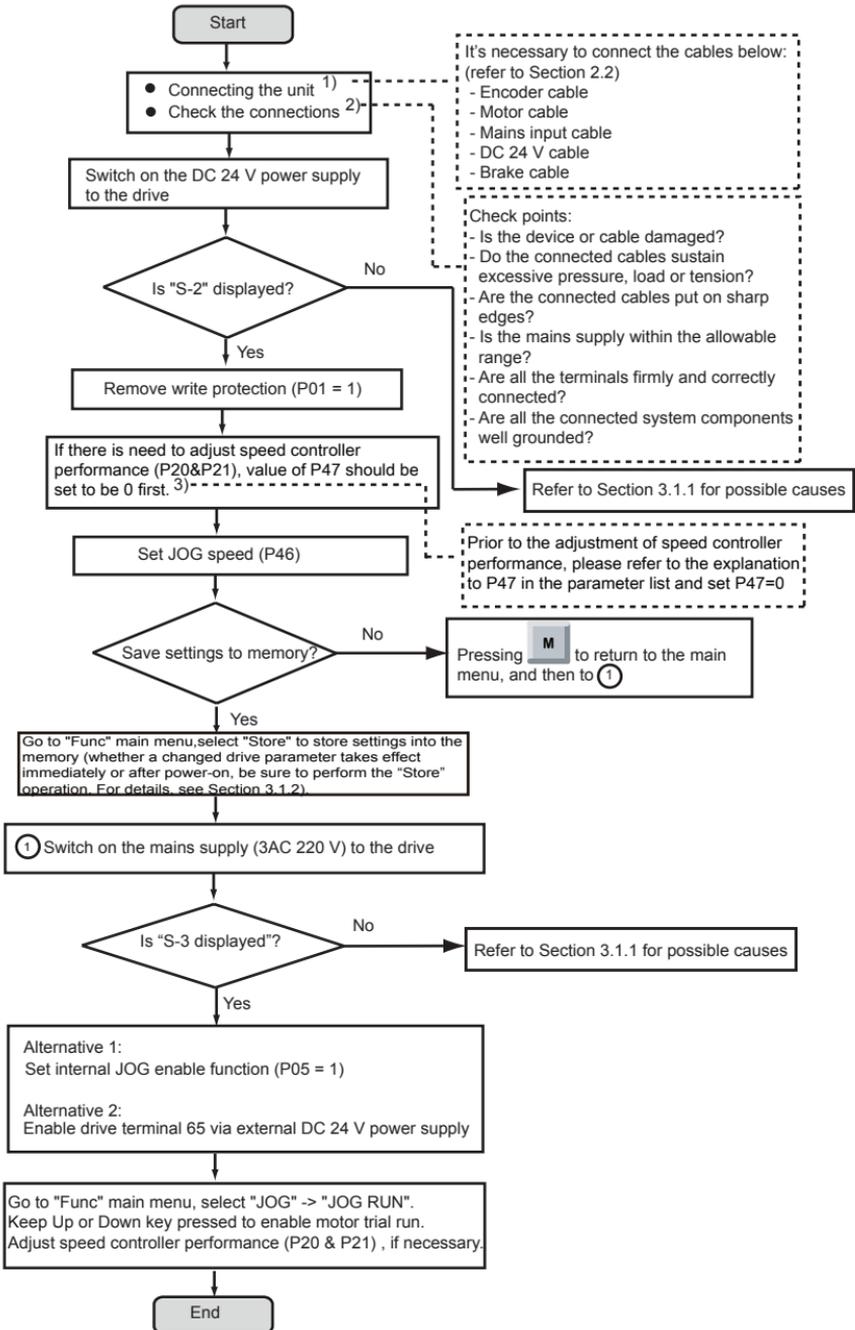
Detailed description of individual display data can be found in Section 6.5 "Display data list (Page 49)".

**3.1.3 Setpoints from NC**

Machine Data	Designation	Unit	Axis	Setpoint	Description
31020	ENC_RESOL	PPR	X, Z (for 801) X, Y, Z (for 802S base line)	10,000	Encoder revolution (2,500) x Multiplier (4)
31400	STEP_RESOL	IPR	X, Z (for 801) X, Y, Z (for 802S base line)	10,000	Steps per servo motor revolution

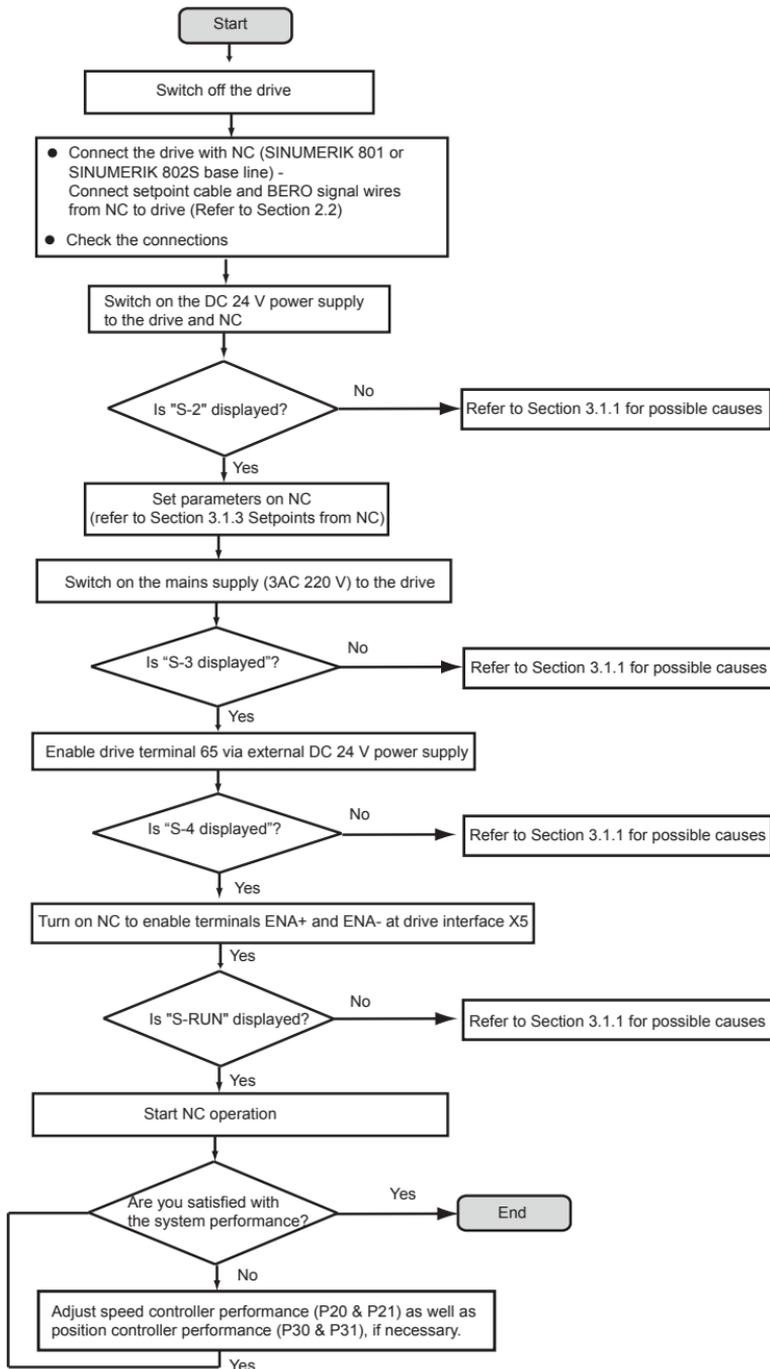
### 3.1.4 First commissioning

Follow the procedure below to complete the first commissioning of the drive and motor:



### 3.1.5 System Commissioning

Follow the procedure to complete the system commissioning:



## 3.2 Parameter List

Par. No.	Name	Range	Default	Increment	Unit	Effective
P01	<b>Parameter write protection</b>	0-1	0	1	-	Immediately
	0: Sets all parameters other than P01 as read-only parameters. 1: Sets all parameters to be both readable and writable. <b>P01 automatically resets to 0 after power-on!</b>					
P05	<b>Internal enable</b>	0-1	0	1	-	Immediately
	0: JOG mode can be enabled externally. 1: JOG mode can be enabled internally. <b>P05 automatically resets to 0 after power-on!</b>					
P16	<b>Maximum motor current</b>	0-100	100	1	%	Power On
	Specifies the maximum motor current (2 x rated motor current) of your choice.					
P20	<b>Speed loop proportional gain</b>	0.01-5.00	Depends on drive version	0.01	Nm*s/rad	Immediately
	<b>Factory defaults:</b> 4 Nm: 0.81(0.54); 6 Nm: 1.19(0.79); 7.7 Nm: 1.50(1.00); 10 Nm: 2.10(1.40)					
	<b>Note:</b> Default value varies with software version.  This parameter specifies the proportional gain (Kp, proportional component) of speed control loop. The bigger the value, the higher the gain and rigidity. The setting depends on specific drive and load. Generally, the bigger the load inertia, the bigger the value is to set. If however, there is no oscillation occurred in the system, you can set the value as big as possible.					
P21	<b>Speed loop integral time constant</b>	0.1-300.0	Depends on drive version	0.1	ms	Immediately
	<b>Factory defaults:</b> 4 Nm: 17.7(44.2); 6 Nm: 17.7(44.2); 7.7 Nm: 17.7(44.2); 10 Nm: 18.0(45.0)					
	<b>Note:</b> Default value varies with software version.  This parameter specifies the integral action time (Tn, integral component) of speed control loop. The smaller the value, the higher the gain and rigidity. The setting depends on specific drive and load.					
P26	<b>Maximum motor speed</b>	0-2,200	2,200	20	rpm	Power On
	Sets the maximum possible motor speed.					
P30	<b>Position loop proportional gain</b>	0.1-3.2	3.0(2.0)	0.1	1,000/min	Immediately
	1. This parameter specifies the proportional gain of position loop. 2. The bigger the value, the higher both the gain and rigidity, and at the same pulse command frequency the smaller the position hysteresis. However, excessively high value setting may cause system oscillation or overshooting. 3. The setting depends on specific drive and load.					

Par. No.	Name	Range	Default	Increment	Unit	Effective
P31	<b>Position loop feedforward gain</b>	0 - 100	85(0)	1	%	Immediately
	<ol style="list-style-type: none"> <li>1. This parameter specifies the feedforward gain of position loop.</li> <li>2. Setting the value to 100 % means position hysteresis is always 0 at any pulse command frequency.</li> <li>3. Increasing the feedforward gain of position loop improves the high-speed response characteristics of the control system, but meanwhile causes the system's position loop unstable and liable to oscillation.</li> <li>4. Unless very high response characteristics are necessary, set the feedforward gain of position loop to 0</li> </ol>					
P34	<b>Maximum following error</b>	20 - 999	500	1	100 pulses	Immediately
	This parameter specifies the maximum possible following error. When the actual following error is larger than the setpoint, the drive sends an over-position alarm (A43)					
P36	<b>Input pulse multiplier</b>	1, 2, 4, 5, 8, 10, 16, 20, 100, 1,000	1	-	-	Power On
	This parameter specifies the input pulse multiplier. For example, when P36 = 100, input frequency = 1 kHz, output frequency = 1 kHz x 100 = 100 kHz.					
	<b>Note:</b>					
	Pulse frequency setpoint = Actual pulse frequency x input pulse multiplier;					
	This parameter is applicable only when the software version is V01.06 or later;					
	When P36 = 100 or 1,000, speed stability will decrease with higher multiplication factor.					
P41	<b>Brake open delay</b>	20 - 2,000	100	10	ms	Power On
	When the drive is enabled, the drive brake will be opened after a delay which is set by P41. Drive can be enabled under the following conditions:					
	<b>A:</b> When the following three conditions are all met:					
	1. Terminal 65 (external enable) has been enabled;					
	2. The drive has received an enable signal from NC;					
	3. No alarm is detected by the drive.					
	<b>B:</b> When the following two conditions are both met:					
	1. Terminal 65 (control enable) has been activated;					
	2. Motor operates in "JOG-RUN" mode (enabled from function menu )					
	<b>C:</b> When the following two conditions are both met:					
	1. P05 = 1 (The JOG mode can be enabled internally);					
	2. Motor operates in "JOG-RUN" mode (enabled from function menu )					
P42	<b>Brake close time while motor operation</b>	20 - 2,000	100	10	ms	Power On
	When motor speed exceeds 30 rpm and the drive generates an alarm, if, within the specified brake close time (P42), actual motor speed remains bigger than brake close speed setpoint (P43), brake is closed after the specified brake close time (P42) expires.					
P43	<b>Brake close speed while motor operation</b>	20 - 2,000	100	20	r/min	Power On
	When motor speed exceeds 30 rpm and the drive generates an alarm, if, within the specified brake close time (P42), the actual motor speed becomes smaller than the P43 setpoint, brake is closed when the actual speed reaches the speed P43 sets.					
P44	<b>Drive enable time after the brake close</b>	20 - 2,000	600	10	ms	Power On
	When motor speed is lower than 30 rpm, the drive remains enabled within the time period set by P44 after brake close.					
P46	<b>JOG speed</b>	0 - 2,000	200	10	rpm	Immediately
	This parameter specifies the motor speed in JOG mode.					
P47	<b>Ramp-up/down time constant</b>	0.0 - 10.0	4.0	0.1	s	Power On
	This parameter defines the time period when the motor ramps up from 0 rpm to 2,000 rpm or ramps down from 2,000 rpm to 0 rpm.					
P99	<b>Reserved for Siemens internal use only</b>					

Note:

The default values in brackets are the second default values.

### 3.3 Display data list

Data no.	Name	Data format	Unit	Data group
D10*	Torque setpoint	Decimal	Nm	Current
D11*	Actual value of the torque	(See table below)	Nm	
D12*	Actual value of the phase current		A	
D20	Motor speed setpoint	Integer	RPM	Speed
D21	Actual motor speed		RPM	
D30	Position revolution setpoint		Motor revolutions	Position
D31	Position angle setpoint		Increments (10000/r)	
D32	Actual position revolutions		Motor revolutions	
D33	Actual position angle		Increments (10000/r)	
D34	Position deviation angle		Increments (10000/r)	
D50*	Digital input signal	Bit (See table below)	Bits in hex	I/O
D51*	Digital output signal		Bits in hex	
D80*	Firmware version	(See table below)		HW, FW
D81	Power Board rated current	Integer		
D82*	Parameter version number	(See table below)		

\* The data type of D10, D11, D12, D80, D82 is all decimal format. The display value for D50 and D51 respectively varies as the case may require.

Display data format D10, D11 and D12  
(Example)



The point is lit. This point stands for the decimal number.  
In this example, the value is "1804.1"

Display data format D80  
(Example)



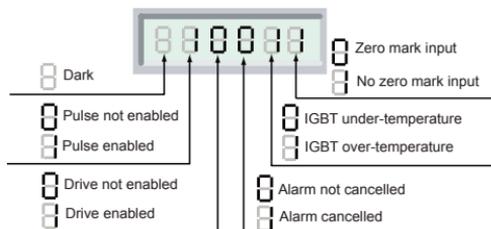
The point is lit. This point stands for the decimal number.  
In this example, the value means that the firmware version number is "01.01".

Display data format D82  
(Example)



The point is lit. This point stands for the decimal number.  
In this example, the value means that the parameter version number is "01.01".

Drive status displays (D50)



Drive status displays (D51)

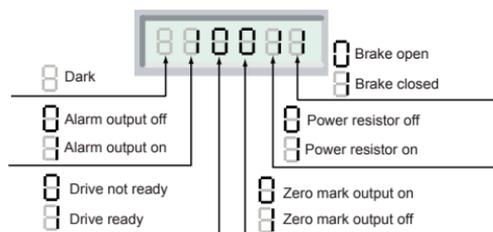
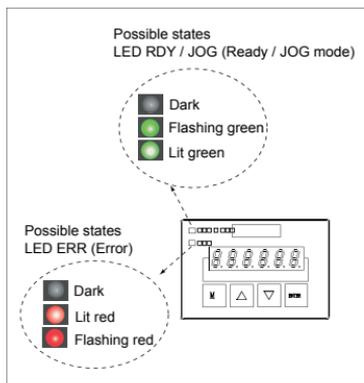


Figure 6-11 Special data displays (D10, D11, D12, D80, D82)

# Troubleshooting

## 4.1 LED status indicators



Descriptions of LED status indicators

H1	H2	Description	7-segment LED display description
RDY/JOG Green LED	ERR red LED		
Dark	Dark	No 24 V DC input or drive defect	Dark
Dark	Flash light with 1 Hz	Drive not ready	Current status
Green	Dark	Drive ready	Depends on current menu operation
Dark	Red	Drive error	Alarm code
Green	Red	Initialization	Display "8.8.8.8.8.8."
Flash light with 1 Hz	Dark	JOG mode	Display "J-run"

## 4.2 Alarms

Overview of alarms

Alarm code	Alarm name	Description
A01	Power board ID number error	Unable to identify the power board
A02	Parameter error	Parameter validation error (CRC error, encoder type or parameter header invalid)
A03	Memory-write failure	Unable to write data to memory
A04	Control voltage error	Control voltage is lower than 3.5 V
A05	IGBT overcurrent	IGBT is detected overcurrent
A06	Internal chip overcurrent	Internal chip is detected overcurrent
A07	Grounding short circuit	Grounding short circuit occurs during drive initialization
A08	Encoder UVW signals error	Signals from encoder phases U, V, W are detected all the same (all high or all low)
A09	Encoder TTL signals error	TTL pulse error
A14	Internal error	Software failure
A21	DC link voltage overvoltage	DC link voltage is higher than 405 V
A22	IT protection	IGBT current exceeds the upper limit for 300 ms
A23	DC link voltage undervoltage	DC link voltage is lower than 200 V
A41	Overspeed	Actual motor speeds is higher than 2,300 rpm
A42	IGBT overtemperature	IGBT becomes overheating
A43	Following error too big	Following error exceeds the limit
A44	I <sup>2</sup> t protection	Motor load exceeds nominal motor torque
A45	Emergency stop	Enable signal from Terminal 65 is lost during normal drive running

## Alarm list

Alarm code	Background	Possible Cause	Remedy	Result	Acknowledgement
A01		Power board is broken	Replace the drive with a new one	Free stop	Power on
A02		The memory is damaged due to unexpected power-off during data saving	Restore default parameters	Free stop	Power on
A03		Memory is damaged	Replace the drive with a new one	Free stop	Power on
A04		The 24 V DC supply is abnormal	Check the 24 V DC supply	Free stop	Power on
		The drive is defective	Replace the drive with a new one		
A05	This alarm may occur when the DC link is connected	<ol style="list-style-type: none"> <li>There is a short-circuit between terminals U, V, W and PE on the drive</li> <li>bad grounding</li> <li>motor insulation is broken</li> <li>the drive is broken</li> </ol>	<ol style="list-style-type: none"> <li>check the wiring</li> <li>make a correct grounding</li> <li>replace the motor with a new one</li> <li>replace the drive with a new one</li> </ol>	Free stop	Power on
	This alarm may occur when the motor is running				
A06	This alarm may occur when the DC link is connected	<ol style="list-style-type: none"> <li>There is a short-circuit between terminals U, V, W and PE on the drive</li> <li>bad grounding</li> <li>motor insulation is broken</li> <li>the drive is broken</li> </ol>	<ol style="list-style-type: none"> <li>check the wiring or whether the connection to U, V or W is broken</li> <li>make a correct grounding</li> <li>replace the motor with a new one</li> <li>replace the drive with a new one</li> </ol>	Free stop	Power on
	This alarm may occur when the motor is running				
A07	This alarm may occur when the DC link is connected	<ol style="list-style-type: none"> <li>IGBT module is broken</li> <li>There is a short-circuit between U, V or W and PE</li> </ol>	<ol style="list-style-type: none"> <li>replace the drive with a new one</li> <li>Check the wiring</li> </ol>	Free stop	Power on
	This alarm may occur when the motor is running				
A08		<ol style="list-style-type: none"> <li>UVW signals of the encoder are bad</li> <li>bad cable</li> <li>bad cable shielding</li> <li>bad wiring of the shielded ground cable</li> <li>there is a failure in the interface circuit of the encoder</li> </ol>	<ol style="list-style-type: none"> <li>replace the drive with a new one</li> <li>Check the interface circuit of the encoder</li> </ol>	Free stop	Power on
A09		<ol style="list-style-type: none"> <li>connection failure of encoder ABZ</li> <li>bad cable</li> <li>bad cable shielding</li> <li>bad wiring of the shielded grounded cable</li> <li>there is a failure in the interface circuit of the encoder</li> </ol>	<ol style="list-style-type: none"> <li>check the wiring of encoder cable</li> <li>Check the interface circuit of the encoder</li> </ol>	Free stop	Power on
A14		There is failure at the internal software	Reset by power-on	Free stop	Power on
		A short-circuit occurs to the encoder	Check the wiring of encoder		
A21	This alarm may occur when the 24 V DC supply is connected	There is a failure at the circuit board	Replace the drive with a new one	Free stop	Press Enter key on the operator panel or terminal RST of X6 interface
	This alarm may occur when the DC link is connected	<ol style="list-style-type: none"> <li>the mains supply voltage is too high</li> <li>the waveform of mains supply voltage is abnormal</li> </ol>	Check the power supply		
	This alarm may occur when the motor is running	<ol style="list-style-type: none"> <li>disconnection of the internal brake resistor</li> <li>the internal brake resistor is broken</li> </ol>	Replace the drive with a new one		
		Brake loop has no enough space	<ol style="list-style-type: none"> <li>lower the start-stop frequency</li> <li>minish the limit value of current</li> <li>minish load inertia</li> <li>use another drive and motor with higher power</li> </ol>		
A22		The motor is mechanically blocked	Check the mechanical load	Free stop	Press Enter key on the operator panel or terminal RST of X6 interface
		Overload	<ol style="list-style-type: none"> <li>lighten the load</li> <li>use another drive and motor with bigger power</li> </ol>		

Alarm code	Background	Possible Cause	Remedy	Result	Acknowledgement
A23		1. circuit board fails 2. fuse of the power is burnt out 3. rectifier is broken	Replace the drive with a new one	Free stop	Press Enter key on the operator panel or terminal RST of X6 interface
		1. low supply voltage 2. insufficient supply power capacity 3. transient power failure	Check the power supply		
A41	This alarm may occur when the 24 V DC supply is connected	Circuit board fails	Replace the drive with a new one	Emergency stop (the motor will stop with the maximum energy or torque)	Press Enter key on the operator panel or terminal RST of X6 interface
		The encoder fails	Replace the drive with a new one		
	This alarm may occur when the motor is running	The encoder fails	Replace the drive with a new one		
		The encoder cable is badly connected	Replace the drive with a new one		
This alarm may occur when the motor starts running	1. terminas U, V and W on the motor are wrongly connected 2. the encoder is wrongly wired	Check the wiring			
A42		Ambient temperature is too high	Check the ambient temperature	Emergency stop (the motor will stop with the maximum energy or torque)	Press Enter key on the operator panel or terminal RST of X6 interface
		The drive is overloaded	Check the drive load		
			Replace the drive with a new one		
A43	This alarm may occur when the 24 V DC supply is connected	Circuit board fails	Replace the drive with a new one	Emergency stop (the motor will stop with the maximum energy or torque)	Press Enter key on the operator panel or terminal RST of X6 interface
		The motor does not rotate or reversely rotate if the command pulse is input after DC-link and mains line are connected	1. terminas U, V and W on the motor are wrongly connected 2. encoder cable is wrongly connected		
	This alarm may occur when the motor is running	Encoder fails	Replace the motor with a new one		
		The maximumly-permitted following error is too small	Set a wider value range for the detection of following error (P34)		
		The position loop gain is too small	Give more gains		
		No enough torque	Check the limit value of current (P16)		
			Reduce the load Use a drive and motor with bigger power		
		Low speed	Check the maximum speed limitation (refer to parameter P26)		
Command pulse frequency is too high	1. Lower the frequency 2. Check whether P36 has the right value				
A44	This alarm may occur when the 24 V DC supply is connected	Circuit board fails	Replace the drive with a new one	Emergency stop (the motor will stop with the maximum energy or torque)	Press Enter key on the operator panel or terminal RST of X6 interface
		The rated torque is exceeded	1. check the load 2. lower the start/Stop frequency 3. use drive and motor with more power		
	The brake is not open	Check whether the brake is open or not			
	The motor is not stable	1. modify the gain value 2. lessen load inertia			
		The encoder is wrongly wired	Check the wiring		
A45		The 65 enable signal is lost when the motor is running	Check the 65 enable terminal	Emergency stop (the motor will stop with the maximum energy or torque)	Press Enter key on the operator panel or terminal RST of X6 interface

**NOTICE**

Alarms with alarm code < A21 can be cancelled by power-on, while alarms with alarm code ≥ A21 can be cancelled by RST terminal.

## 4.3 Errors during drive self-test

The drive module always conducts a self-test at every power-on. If any error occurs during this period, the drive screen form will shown one of the following error codes:

### Drive error list

Drive display	Description	Cause	Remedy
E 1	Error 1	RAM damaged	Replace the drive
E 2	Error 2	Flash damaged	Replace the drive
E 3	Error 3	Program copy error	Replace the drive

## 4.4 Other faults

### 1. Brake not open

- Description: The brake is not open when the drive is in "S-Run" state.
- Cause: A short circuit has occurred in the brake cable.
- Remedy: Check brake cable connection.

### 2. Axis position incorrect or axis does not move

- Description: When status display on SINAMICS V60 is "S-run", the axis position is incorrect or the axis does not move .
- Cause: Pin +PULS or -PULS is not well connected.
- Remedy: Check the cable connection on the pin +PULS or -PULS.

### 3. Axis does not move

- Description: When status display on SINAMICS V60 is "S-4", the axis does not move even the CNC controller has sent out pulse signals.
- Cause: Pin +ENA or -ENA is not well connected.
- Remedy: Check the cable connection on the pin +ENA or -ENA.

### 4. Axis keeps running in a single direction

- Description: When status display on SINAMICS V60 is "S-run", the axis corresponding keeps running in a single direction no matter positive signals or negative signals are given.
- Cause: Pin +DIR or -DIR is not well connected.
- Remedy: Check the cable connection on the pin +DIR or -DIR.

## A.1 Order numbers

 Spare parts

Description	Order number
SINAMICS V60 PM60.1 - 4A	6S 3210-5CC14-0UA0
SINAMICS V60 CPM60.1 - 6A	6S 3210-5CC16-0UA0
SINAMICS V60 CPM60.1 - 7A	6SL 210-5CC17-0UA0
SINAMICS V60 CPM60.1 - 10A	6SL3210-5CC21-0UA0
Servomotor 1FL5 - 4Nm - without key, without brake	1FL5060-0AC21-0AG0
Servomotor 1FL5 - 4Nm - without key, with brake	1FL5060-0AC21-0AH0
Servomotor 1FL5 - 6Nm - without key, without brake	1FL5062-0AC21-0AG0
Servomotor 1FL5 - 6Nm - without key, with brake	1FL5062-0AC21-0AH0
Servomotor 1FL5 - 7.7Nm - without key, without brake	1FL5064-0AC21-0AG0
Servomotor 1FL5 - 7.7Nm - without key, with brake	1FL5064-0AC21-0AH0
Servomotor 1FL5 - 10Nm - without key, without brake	1FL5066-0AC21-0AG0
Servomotor 1FL5 - 10Nm - without key, with brake	1FL5066-0AC21-0AH0
Servomotor 1FL5 - 4Nm - with key, without brake	1FL5060-0AC21-0AA0
Servomotor 1FL5 - 4Nm - with key, with brake	1FL5060-0AC21-0AA0
Servomotor 1FL5 - 6Nm - with key, without brake	1FL5062-0AC21-0AA0
Servomotor 1FL5 - 6Nm - with key, with brake	1FL5062-0AC21-0AB0
Servomotor 1FL5 - 7.7Nm - with key, without brake	1FL5064-0AC21-0AA0
Servomotor 1FL5 - 7.7Nm - with key, with brake	1FL5064-0AC21-0AB0
Servomotor 1FL5 - 10Nm - with key, without brake	1FL5066-0AC21-0AA0
Servomotor 1FL5 - 10Nm - with key, with brake	1FL5066-0AC21-0AB0
Encoder cable for 1FL5 Servomotors - 5m	6FX6002-2LE00-1AF0
Encoder cable for 1FL5 Servomotors - 10m	6FX6002-2LE00-1BA0
Power cable for 1FL5 Servomotors - 5m	6FX6002-5LE00-1AF0
Power cable for 1FL5 Servomotors - 10m	6FX6002-5LE00-1BA0
Brake cable for 1FL5 Servomotors - 5m	6FX6002-2BR00-1AF0
Brake cable for 1FL5 Servomotors - 10m	6FX6002-2BR00-1BA0

## A.2 Technical support

If you have any question (any suggestion or amendment) about this product or this document, please call SIEMENS technical support or visit SIEMENS internet:

### For Chinese customers:



Telephone

00 86 10 6471 9990 or 400 810 4288



Fax

00 86 10 6471 9991



400 810 4288@siemens.com

### For customers outside China:



Telephone

0911 895 7222



Fax

0911 895 7223

**New Support Request:** <http://www.siemens.com/automation/support-request>

**Internet:** <http://www.siemens.de/automation/service&support>

**FAQ:** [http://www.siemens.de/automation/csi\\_en/product](http://www.siemens.de/automation/csi_en/product)

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SIEMENS Limited China (SLC)  
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Order Number: **A5E03975175**

