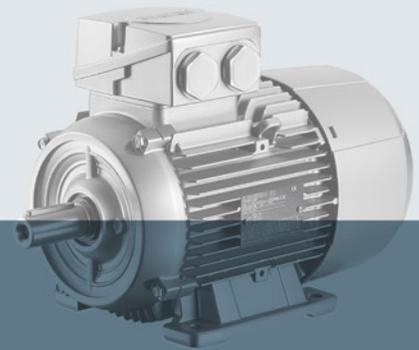


**SIEMENS**



# SINAMICS

## SINAMICS G120 inverter

Control Units CU230P-2, CU240B-2 and CU240E-2

Getting Started

Auxiliary

11/2013

Answers for industry.



# SIEMENS

## SINAMICS G120

### Converter with Control Units

CU230P-2

CU240B-2

CU240E-2

Getting Started

Safety information

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Design of the frequency  
converter

2

Installing

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Commissioning

4

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Edition 11/2013, Firmware V4.6

11/2013

A5E32885834B AA

## 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.

 <b>DANGER</b>
indicates that death or severe personal injury <b>will</b> result if proper precautions are not taken.
 <b>WARNING</b>
indicates that death or severe personal injury <b>may</b> result if proper precautions are not taken.
 <b>CAUTION</b>
indicates that minor personal injury can result if proper precautions are not taken.
<b>NOTICE</b>
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:

 <b>WARNING</b>
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.

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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.

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## Objective of these instructions

This Getting Started describes how you commission and operate a SINAMICS G120 frequency converter using the Application Wizards of the IOP. For special frequency converter functions, e.g. the automatic restart or flying restart function, please use the **Operating Instructions** and the **List Manual** of the corresponding Control Unit.

The functions and properties of the IOP are described in detail in the "SINAMICS IOP" operating instructions and are only explained here to an extent that is necessary to understand the described functions.

### Additional information on SINAMICS G120

All manuals for SINAMICS G120 frequency converters can be downloaded from the Internet: Manuals (<http://support.automation.siemens.com/WW/view/en/22339653/133300>)

and are additionally available on DVD:  
SINAMICS Manual Collection – all of the manuals on low-voltage motors, geared motors, and low-voltage frequency converters, 5 languages

Order number: 6SL3097-4CA00-0YG0

## What is the meaning of the symbols in the manual?



An operating instruction starts here.



This concludes the operating instruction.

## Firmware upgrade and downgrade

Options for upgrading and downgrading the firmware can be found on the Internet at <http://support.automation.siemens.com/WW/view/de/67364620> (<http://support.automation.siemens.com/WW/news/en/67364620>).

# Safety information

## Use for the intended purpose

The inverter described in this manual is a device for controlling an induction motor. The inverter is designed for installation in electrical installations or machines.

It has been approved for industrial and commercial use on industrial networks. Additional measures have to be taken when connected to public grids.

The technical specifications and information about connection conditions are indicated on the rating plate and in the operating instructions.

## 1.1 General safety instructions



### DANGER

#### **Danger to life due to live parts and other energy sources**

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

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

Generally, six steps apply when establishing safety:

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

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



**! WARNING**

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

Death or serious injury can result when live parts are touched in the event of a fault.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV- (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.



**! WARNING**

**Danger to life when live parts are touched on damaged devices**

Improper handling of devices can cause damage.

Hazardous voltages can be present at the housing or exposed components on damaged devices.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged devices.



**! WARNING**

**Danger to life through electric shock due to unconnected cable shields**

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

- Connect cable shields and unused conductors of power cables (e.g., brake conductors) at least on one side to the grounded housing potential.



**! WARNING**

**Danger to life due to electric shock when not grounded**

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.



**! WARNING**

**Danger to life due to electric shock when opening plug connections in operation**

When opening plug connections in operation, arcs can result in severe injury or death.

- Only open plug connections when the equipment is in a no-voltage state, unless it has been explicitly stated that they can be opened in operation.

 **WARNING****Danger to life due to fire spreading if housing is inadequate**

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

- Install devices without a protective housing in a metal control cabinet (or protect the device by another equivalent measure) in such a way that contact with fire inside and outside the device is prevented.
- Additionally, select the installation site so that an uncontrolled spreading of smoke can be avoided in the case of a fire.
- Ensure that smoke can escape via designated paths.

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

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

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

 **WARNING****Danger to life due to the motor catching fire in the event of insulation overload**

There is a greater load on the motor insulation through a ground fault in an IT system. A possible result is the failure of the insulation with a risk for personnel through smoke development and fire.

- Use a monitoring device that signals an insulation fault.
- Correct the fault as quickly as possible so the motor insulation is not overloaded.

 **WARNING****Danger to life due to fire if overheating occurs because of insufficient ventilation clearances**

Inadequate ventilation clearances can cause overheating with a risk for personnel through smoke development and fire. This can also result in increased downtime and reduced service lives for devices / systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component. They can be found in the dimension drawings or in the "Product-specific safety instructions" at the start of the respective section.

 **WARNING**

**Danger of an accident occurring due to missing or illegible warning labels**

Missing or illegible warning labels can result in death or serious injury.

- Check the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, in the national language if necessary.
- Replace illegible warning labels.

 **WARNING**

**Danger to life when safety functions are inactive**

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

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

---

**Note**

**Important safety notices for safety functions**

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

---

## 1.2 Safety instructions for electromagnetic fields (EMF)



 <b>WARNING</b>
<p><b>Danger to life from electromagnetic fields</b></p> <p>Electromagnetic fields (EMF) are generated by the operation of electrical power equipment such as transformers, converters or motors.</p> <p>People with pacemakers or implants are at a special risk in the immediate vicinity of these devices/systems.</p> <ul style="list-style-type: none"> <li>• If affected by this, keep a distance of at least 2 m.</li> </ul>

## 1.3 Handling electrostatic sensitive devices (ESD)

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



<b>NOTICE</b>
<p><b>Damage through electric fields or electrostatic discharge</b></p> <p>Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.</p> <ul style="list-style-type: none"> <li>• Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g. conductive foam rubber or aluminum foil.</li> <li>• Only touch components, modules and devices when you are grounded by one of the following methods: <ul style="list-style-type: none"> <li>– Wearing an ESD wrist strap</li> <li>– Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring</li> </ul> </li> <li>• Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).</li> </ul>

## 1.4 Residual risks of power drive systems

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

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

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

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

1. Unintentional movements of driven machine components during commissioning, operation, maintenance, and repairs caused by, for example:
  - Hardware defects and/or software errors in the sensors, controllers, actuators, and connection technology
  - Response times of the controller and drive
  - Operating and/or ambient conditions outside of the specification
  - Condensation / conductive contamination
  - Parameterization, programming, cabling, and installation errors
  - Use of radio devices / cellular phones in the immediate vicinity of the controller
  - External influences / damage
2. In the event of a fault, exceptionally high temperatures, including an open fire, as well as emissions of light, noise, particles, gases, etc. can occur inside and outside the inverter, e.g.:
  - Component malfunctions
  - Software errors
  - Operating and/or ambient conditions outside of the specification
  - External influences / damage

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

3. Hazardous shock voltages caused by, for example:
  - Component malfunctions
  - Influence of electrostatic charging
  - Induction of voltages in moving motors
  - Operating and/or ambient conditions outside of the specification
  - Condensation / conductive contamination
  - External influences / damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc. if they are too close.
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly.

---

**Note**

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

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

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



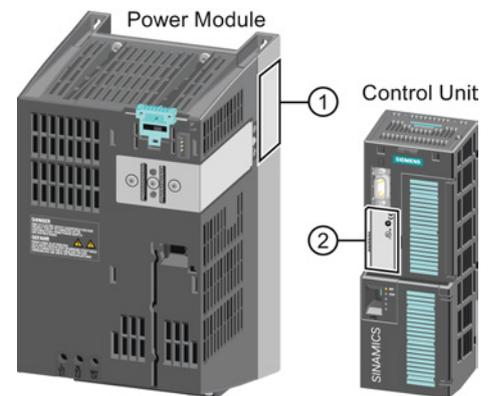
## Design of the frequency converter

### 2.1 Identifying the converter

#### Main components of the inverter

Each SINAMICS G120 inverter comprises a Control Unit and a Power Module.

- The Control Unit controls and monitors the Power Module and the connected motor.
- The Power Modules are available for motors with a power range of between 0.37 kW and 250 kW.



The following data is provided on the Power Module type plate (①):

- Designation: e.g. Power Module 240
- Technical data: Voltage and current
- Order number: e.g. 6SL3224-0BE13-7UA0
- Version: e.g. A02

The following data can be found on the Control Unit type plate (②):

- Designation: e.g. Control Unit CU240E-2 DP-F
- Order number: e.g. 6SL3244-0BB13-1PA0
- Version: e.g. A02 (hardware)

## 2.2 Control Units

### Different Control Unit versions

The Control Units differ by the following main factors:

- Fieldbus interface type
- Type and scope of the functions
  - e.g. for CU230P-2... through additional specific technology functions for pumps, fans and compressors
  - e.g. for CU240E-2... through additional integrated safety functions
- Type and number of available inputs and outputs

CU230P-2...	CU230P-2 HVAC	CU230P-2 CAN	CU230P-2 DP	CU230P-2 PN
Functions				
Fieldbus	USS / Modbus RTU / Bacnet MS/TP / P1	CANopen	PROFIBUS DP	PROFINET
Technology functions	For instance: Energy-saving mode, cascade control, extended emergency operation, multi-zone controller, bypass			
Digital inputs	6			
Analog inputs	<b>AI0 and AI1:</b> Voltage or current; <b>AI2:</b> Current or temperature sensor (LG-Ni1000/PT1000); <b>AI3:</b> Temperature sensor (Ni1000/PT1000);			
Digital outputs	<b>DO 1</b> NO contact, <b>DO0</b> and <b>DO2</b> change-over contact to activate larger loads, AC and DC			
Analog outputs	2			

CU240B-2...	CU240B-2	CU240B-2 DP
Functions		
Fieldbus	USS or Modbus RTU	PROFIBUS DP
Digital inputs	4	
Analog inputs	1	
Digital outputs	1	
Analog outputs	1	

CU240E-2...	CU240E-2	CU240E-2 F	CU240E-2 DP	CU240E-2 DP-F	CU240E-2 PN	CU240E-2 PN-F
Functions						
Fieldbus	USS or Modbus RTU	USS or Modbus RTU	PROFIBUS DP	PROFIBUS DP with PROFIsafe	PROFINET	PROFINET with PROFIsafe
Integrated safety functions	STO	STO, SS1, SLS	STO	STO, SS1, SLS	STO	STO, SS1, SLS
Digital inputs	6					
Fail-safe digital inputs*	1	3	1	3	1	3
Analog inputs	2					
Digital outputs	3					
Analog outputs	2					

\*) A fail-safe digital input is created by combining two "standard" digital inputs

## 2.3 Power Module

Which Power Module can I use with the Control Unit?

Control Unit	Power Module							
	PM340 1AC	PM230 IP20 and push-through	PM230 IP55	PM240	PM240-2 IP20	PM250 IP20	PM260 IP20	PM330 IP20
CU230P-2	---	✓	✓	✓	✓	✓	✓	✓
CU240B-2	---	✓	---	✓	✓	✓	✓	---
CU240E-2	✓	✓	---	✓	✓	✓	✓	---

### PM230, 3 AC 400 V - Pump and fan applications

The PM230 Power Module with degree of protection IP20 and push-through is available without a filter or with an integrated class A line filter.

The PM230 Power Module with degree of protection IP55 is available with an integrated class A or class B line filter.

Order number range	• IP55:	6SL3223-0DE...
	• IP20:	6SL3210-1NE...
	• Push-through	6SL3211-1NE...

Frame size	FSA	FSB	FSC	FSD	FSE	FSF	FSGX
Power range (kW): IP20	0.37 ... 3	4 ... 7.5	11 ... 18.5	22 ... 37	45 ... 55	75 ... 90	---
Power range (kW): PT	3	7.5	18.5	---	---	---	---
Power range (kW): IP55	0,37 ... 3	4 ... 7,5	11 ... 18,5	18,5 ... 30	37 ... 45	55 ... 90	---

### PM340, 1 AC 200 V - Standard areas of application

The PM340 Power Module is available without a filter or with an integrated class A line filter with degree of protection IP20. The PM340 allows dynamic braking via an external braking resistor.

Order number range: 6SL3210-1SB1...

Frame size	FSA	FSB	FSC	FSD	FSE	FSF	FSGX
Power range (kW)	0.12 ... 0.75	--	--	--	--	--	---

### PM240, 3 AC 400 V - Standard areas of application

The PM240 Power Module is available without a filter or with an integrated class A line filter with degree of protection IP20. The PM240 allows dynamic braking via an external braking resistor.

Order number range: 6SL3224-0BE... and 6SL3224-0XE...

Frame size	FSA	FSB	FSC	FSD	FSE	FSF	FSGX
Power range (kW)	0.37 ... 1.5	2.2 ... 4	7.5 ... 15	18.5 ... 30	37 ... 45	55 ... 132	160 ... 250

**PM240-2, 3 AC 400 V - standard areas of application, 2nd generation**

The PM240-2 Power Module is available without a filter or with an integrated class A line filter. The PM240-2 permits dynamic braking via an external braking resistor.

- Range of order numbers:
- IP20: 6SL3210-1PE...
  - Push-through 6SL3211-1PE...

Frame size	FSA						
Power range (kW), IP20	0.55 ... 3						
Power range (kW), PT	2.2 ... 3						

**PM250, 3 AC 400 V - Application areas with line regeneration**

The PM250 Power Module is available without a filter or with an integrated class A line filter with degree of protection IP20. The PM250 permits dynamic braking with energy feedback into the line supply.

Order number range, IP20: 6SL3225-0BE ...

Frame size	FSC	FSD	FSE	FSF			
Power range (kW)	7.5 ... 15	18.5 ... 30	37 ... 45	55 ... 90			

**PM260, 3 AC 690 V - Application areas with line regeneration**

The PM260 Power Module is available without a filter or with an integrated class A line filter with degree of protection IP20. A sine-wave filter is fitted to the motor. The PM260 permits dynamic braking with energy feedback into the line supply.

Order number range, IP20: 6SL3225-0BH...

Frame size	FSD	FSF					
Power range (kW)	11 ... 18.5	30 ... 55					

**PM330, 3 AC 400 V - Pump, fan and compressor applications**

The PM330 Power Module is available as unfiltered device with IP20 degree of protection. External line filters are available as option.

Range of order numbers: 6SL3310-1PE...

Frame size	GX						
Power range (kW)	160 ... 200						

## Components of the converter

The following accessories are available for the converter:

- Operator Panel for commissioning and diagnostics (Basic Operator Panel BOP-2 or Intelligent Operator Panel IOP).
- Memory card for backing up the settings of the converter on a replaceable medium.
- Shield connection kit for optimum shield support of the connected cables. For further information, see Overview of the shield connection kits (<http://support.automation.siemens.com/WW/news/en/67225884>)
- Line filter for achieving a higher radio interference suppression class.
- Line reactor for protecting the converter in harsh industrial networks.
- Output reactor for protecting the converter when motor cables > 50 m (shielded) or > 100 m (unshielded) are used.
- Sine-wave filter for protecting motors which are not suitable for converter operation and for motor cables up to 300 m.
- Braking resistor for dynamic braking of the motor.
- Brake Relay for controlling a motor holding brake.

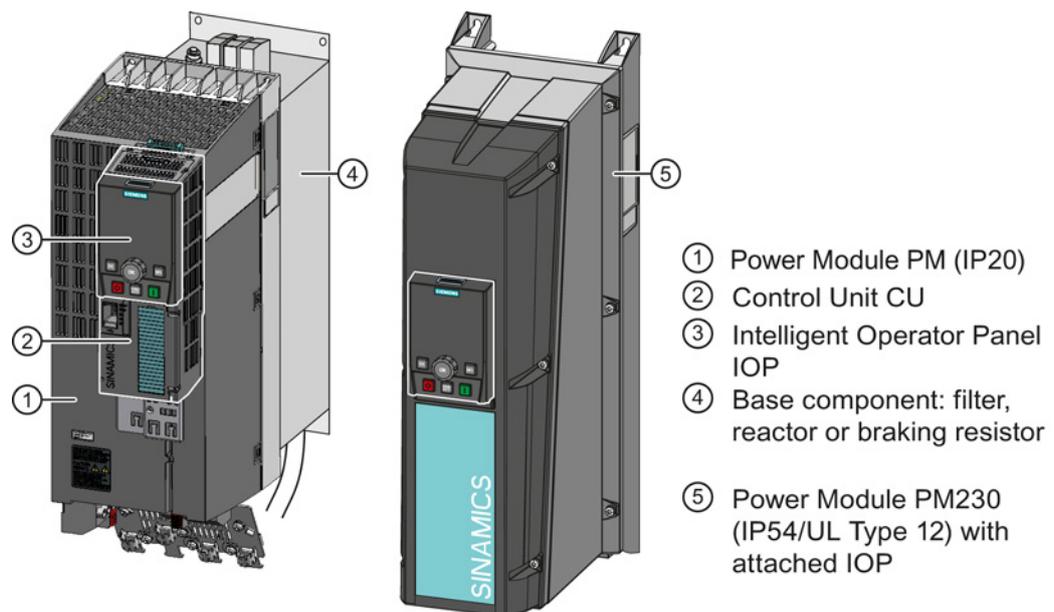


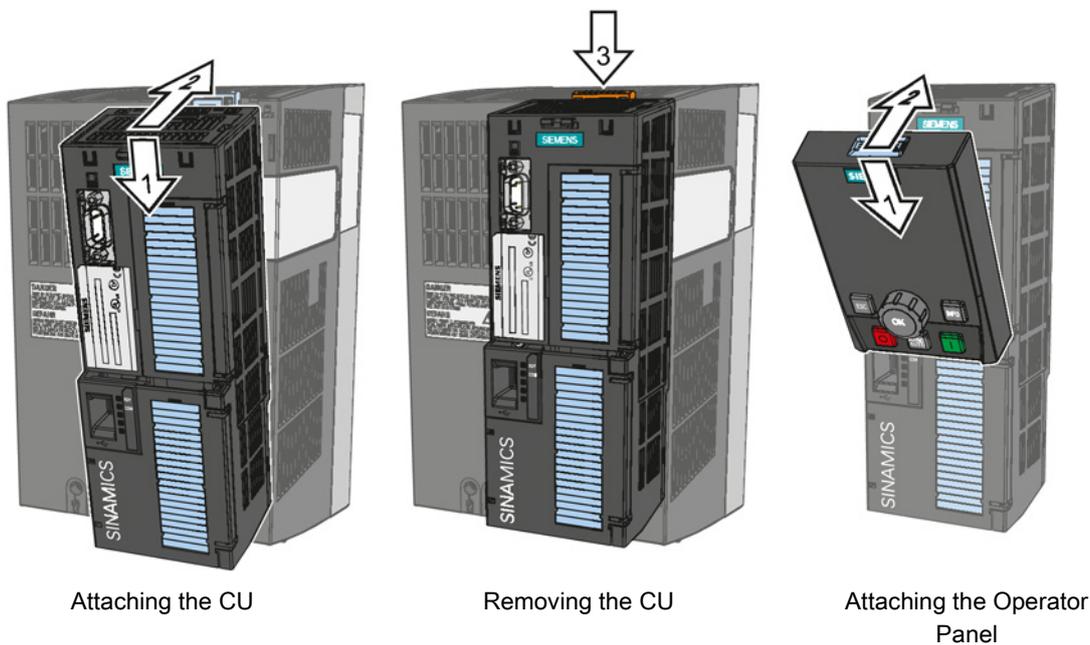
Figure 2-1 Design of the converter (example)

### Note

#### Converters with IP55 degree of protection

In order to comply with degree of protection IP55, the converter has to be operated either with an Operator Panel (IOP or BOP-2) or with dummy cover 6SL3256-1BA00-0AA0.

## 2.4 Assembling frequency converter components



## 2.5 IOP Intelligent Operator Panel

The IOP is an operator device with which you can commission the frequency converter locally, enter parameters and monitor operation.

The display is subdivided into various areas

- Status and diagnostics display
- Status message
- Selection menu

- ① Status and diagnostics display
- ② Status message, here: Output voltage
- ③ Status message here: Output frequency
- ④ Selection menu: Wizard / Control / Menu



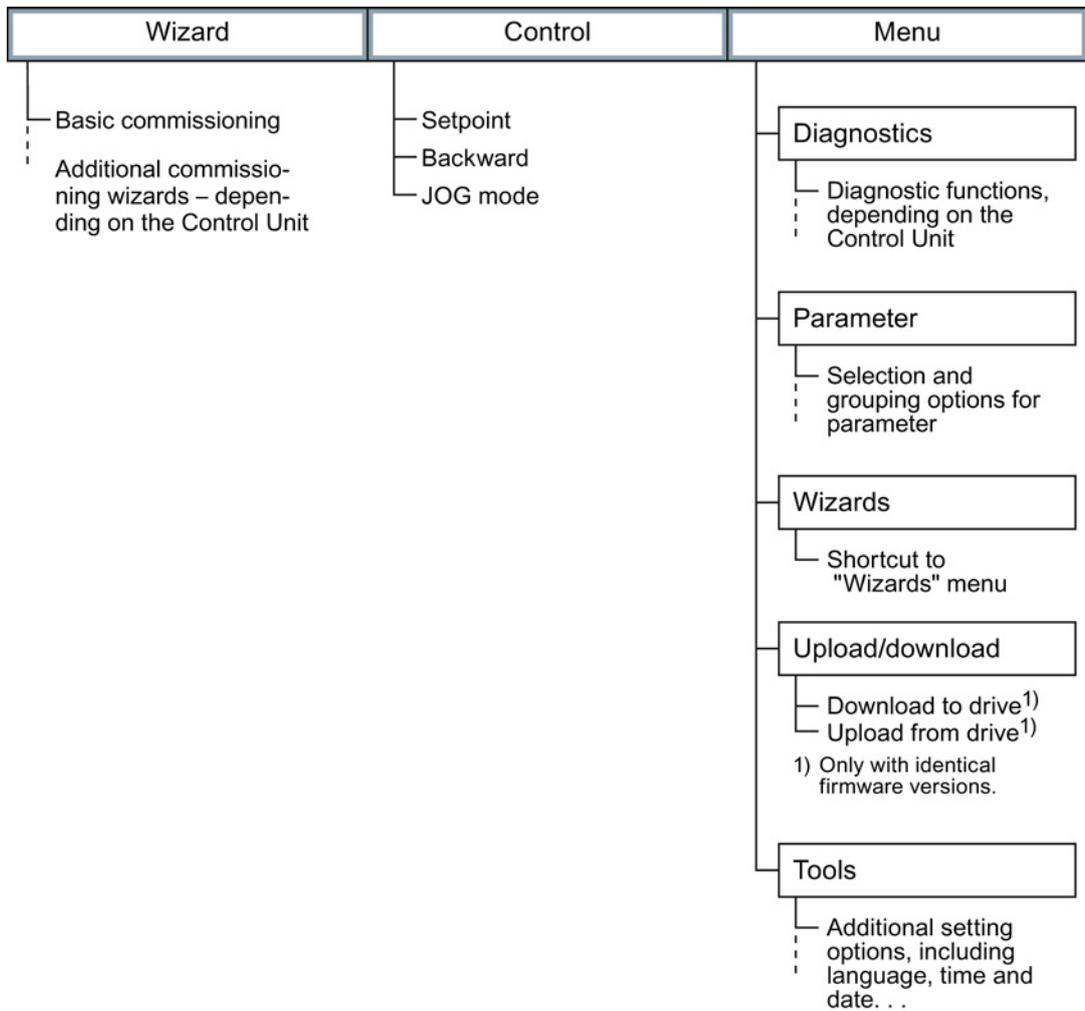
### Handling the IOP

	<ul style="list-style-type: none"> <li>• You can select a menu by turning the navigation wheel, e.g. WIZARD</li> <li>• You confirm your selection by pressing on the navigation wheel (OK).</li> </ul>
	<p>By pressing, you can toggle between external command sources and the IOP as command source.</p> <ul style="list-style-type: none"> <li>• MANUAL means: Manual control using the IOP buttons</li> <li>• AUTO means: The frequency converter responds to the external control commands (e.g. fieldbus or terminals)</li> </ul>
	<ul style="list-style-type: none"> <li>• In the AUTO mode: without function</li> <li>• In the MANUAL mode: Pressing starts the frequency converter</li> </ul>
	<ul style="list-style-type: none"> <li>• In the AUTO mode: without function</li> <li>• In the MANUAL mode: <ul style="list-style-type: none"> <li>– Press briefly: OFF1 - the motor comes to a standstill along the selected down ramp (P1121)</li> <li>– Pressing longer than 3 seconds: OFF2 - the motor coasts down to standstill</li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>• Pressing supplies information about the actual display</li> <li>• You return to the display by pressing again</li> </ul>
	<ul style="list-style-type: none"> <li>• Press briefly: Return to the previous display</li> <li>• Pressing longer than 3 seconds: The IOP returns to the status screen</li> </ul>

**Menu structure**

The menu depicted here shows the basic structure. There are different sub-structures, depending on the software version and the Control Unit.

Instead of using the application Wizards, you can also use individual parameters to directly change all of the settings.



## Installing

### 3.1 Installing the Power Module

**⚠ WARNING**

**Danger of death caused by high leakage currents when the external protective conductor is interrupted**

The inverter conducts high leakage currents > 3.5 mA via the protective conductor. When the protective conductor is interrupted, touching live components can result in electric shock, which can lead to death or serious injuries.

- Connect a protective conductor, which satisfies at least one of the following conditions, to the inverter:
  - The protective conductor is routed so that it is protected against mechanical damage. Cables routed in control cabinets or enclosed machine enclosures are considered to be adequately protected.
  - The protective conductor routed as an individual conductor has a cross-section of  $\geq 10 \text{ mm}^2 \text{ Cu}$ .
  - In a multi-core cable the protective conductor has a cross-section of  $\geq 2.5 \text{ mm}^2 \text{ Cu}$ .
  - Two parallel protective conductors with the same cross-section are installed.
  - The protective conductor corresponds to the local regulations for equipment with increased leakage current.

#### Connecting the Power Module to the motor and power supply

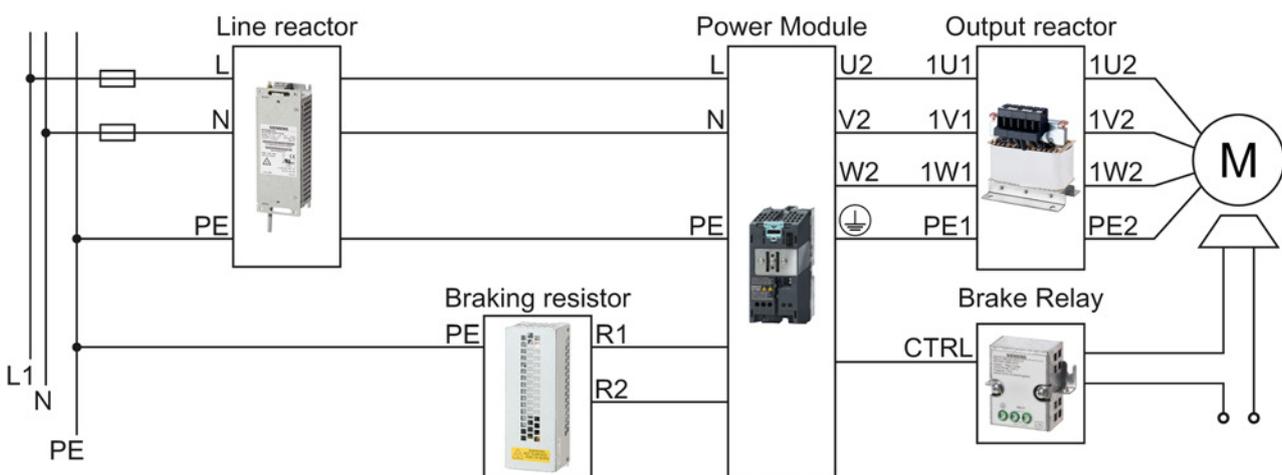


Figure 3-1 Connecting the PM340 1AC Power Module

3.1 Installing the Power Module

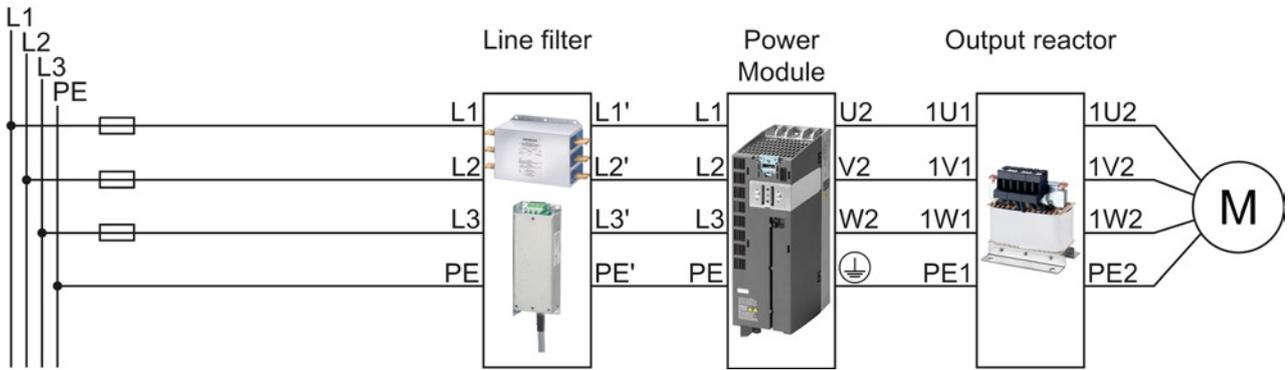


Figure 3-2 Connecting the PM230 IP20 and push-through Power Module

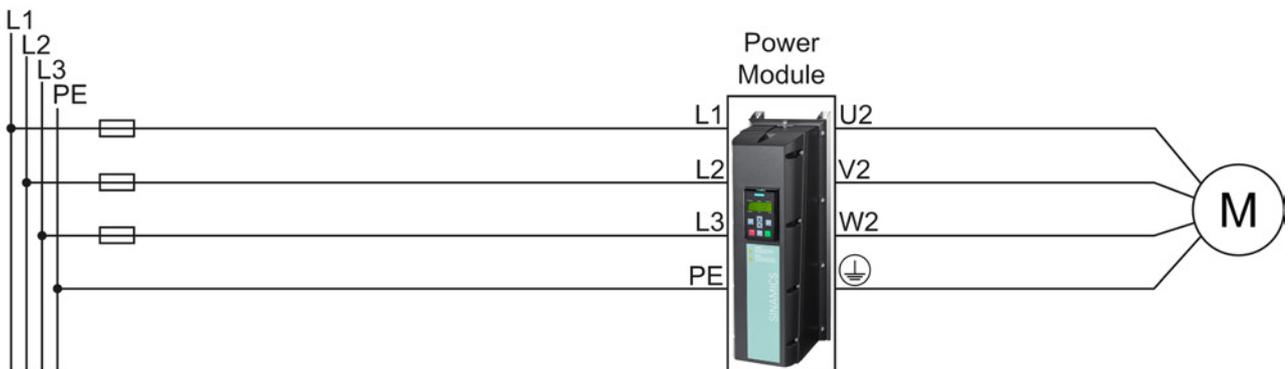


Figure 3-3 Connecting the PM230 IP55 Power Module

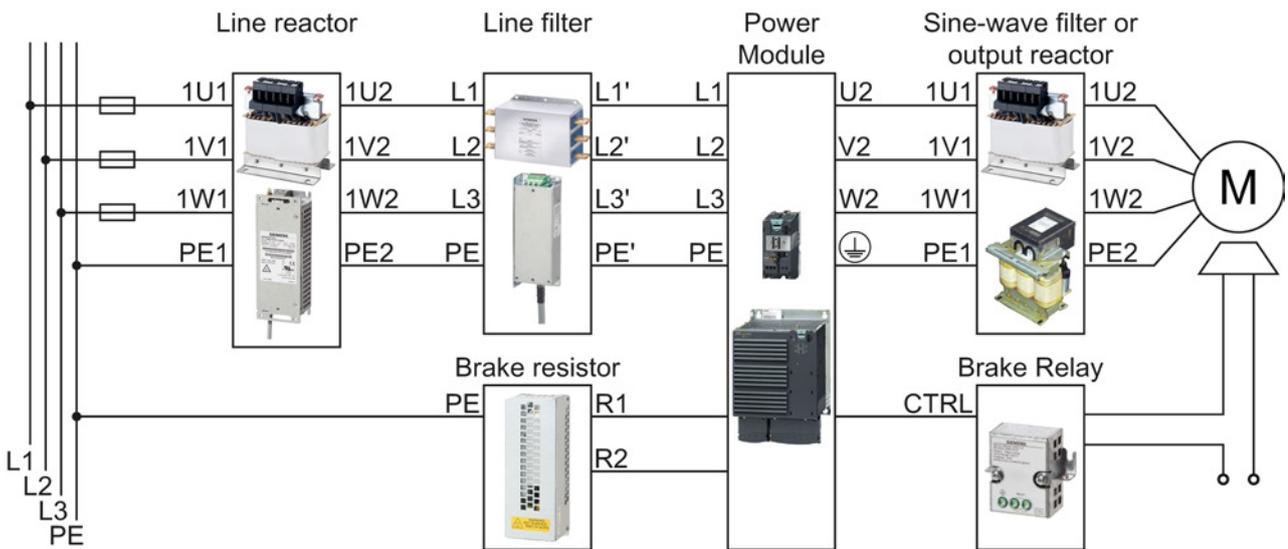


Figure 3-4 Connecting the PM240, PM240-2 IP20 and push-through Power Module

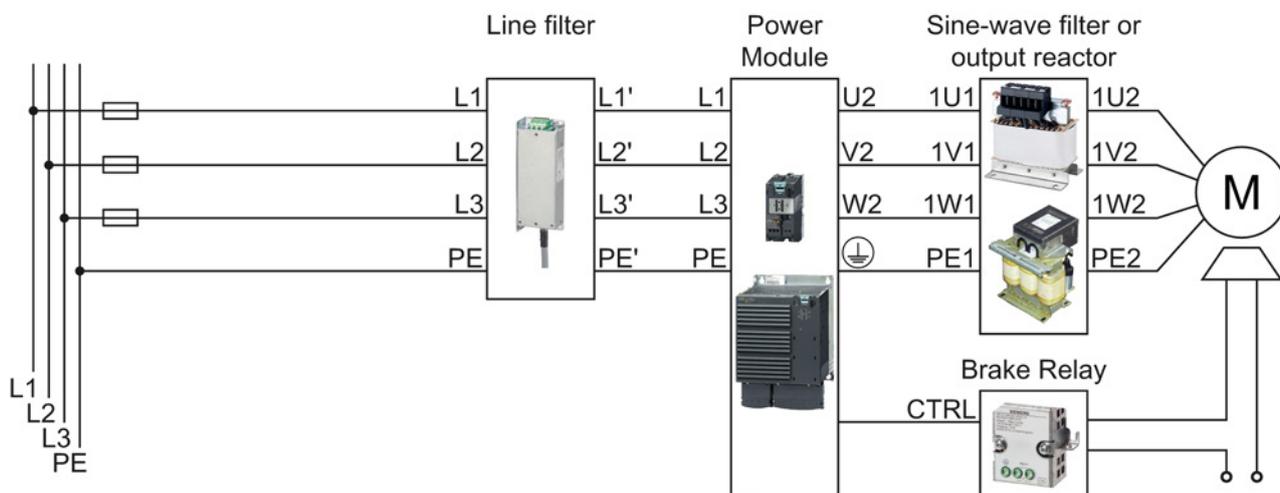


Figure 3-5 Connecting the PM250 Power Module

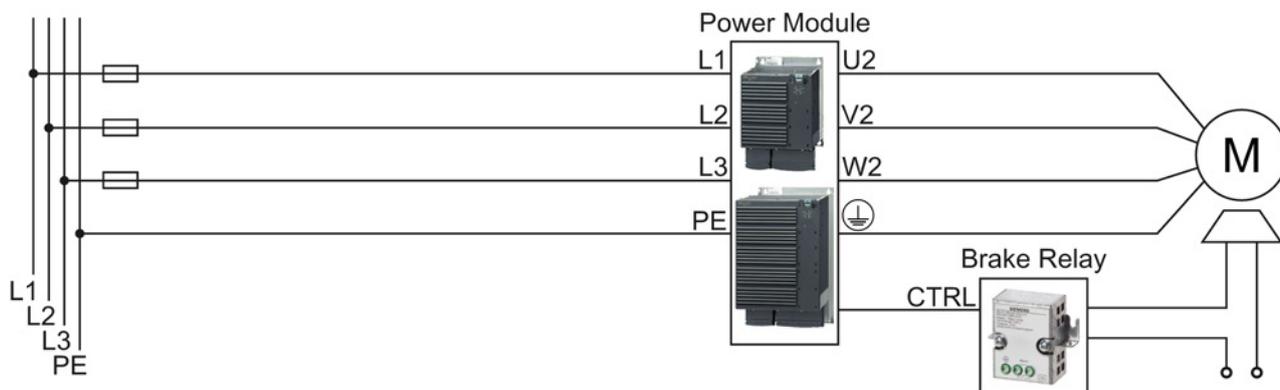


Figure 3-6 Connecting the PM260 Power Module

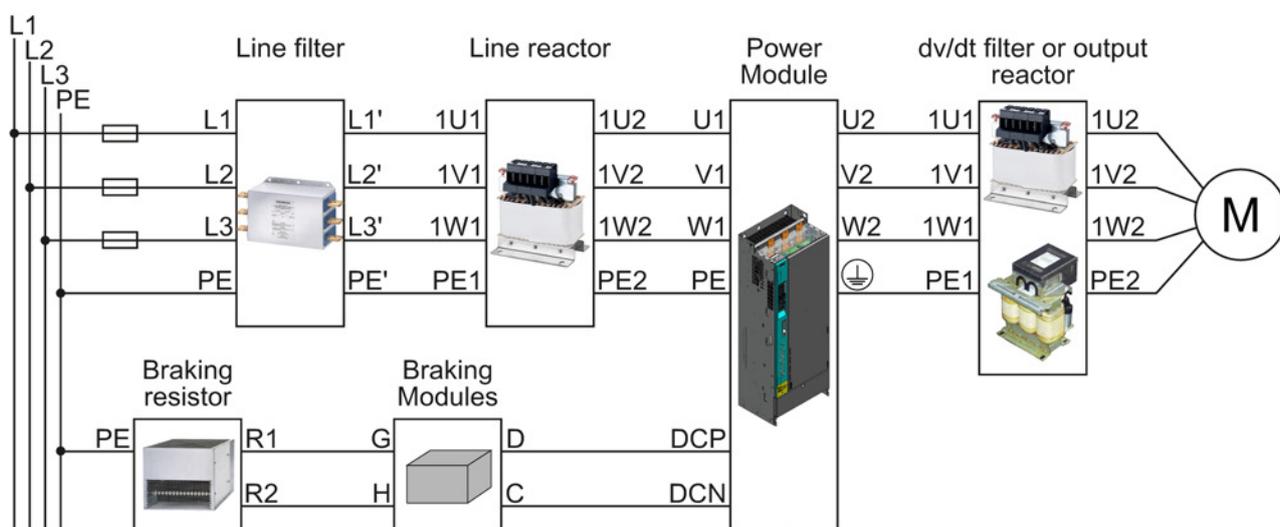


Figure 3-7 Connecting the PM330 Power Module

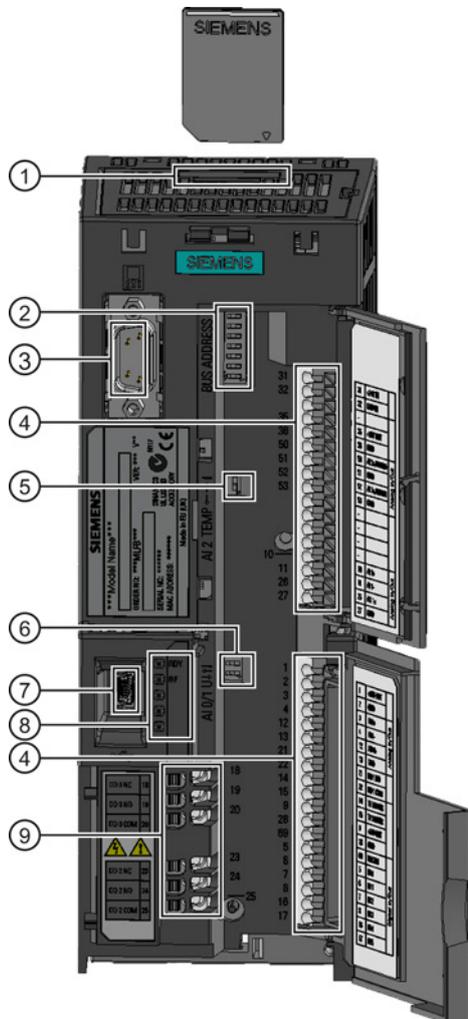
## 3.2 Installing Control Unit

### 3.2.1 CU230P-2 control unit

#### 3.2.1.1 Interfaces of the CU230P-2

#### Interfaces at the front of the Control Unit

To access the interfaces at the front of the Control Unit, you must lift the Operator Panel (if one is being used) and open the front doors.



① Memory card slot

② Select the fieldbus address:

- CU230P-2 DP
- CU230P-2 CAN
- CU230P-2 HVAC
- CU230P-2 BT

Bit 6 (64)	■
Bit 5 (32)	■
Bit 4 (16)	■
Bit 3 (8)	■
Bit 2 (4)	■
Bit 1 (2)	■
Bit 0 (1)	■
On	Off

③ Connection to the Operator Panel

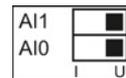
④ Terminal strips

⑤ Switch for AI2  
(current/temperature)



⑥ Switch for AI0 and AI1 (U/I)

- I 0/4 mA ... 20 mA
- U -10/0 V ... 10 V



⑦ USB interface for connection to a PC

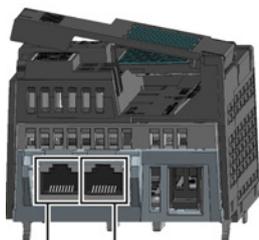
⑧ Status LED

<span style="color: green;">■</span>	RDY
<span style="color: red;">■</span>	BF
---	---
<span style="color: green;">■</span>	LNK1 (PROFINET)
<span style="color: red;">■</span>	LNK2 (PROFINET)

⑨ Terminal strips for the digital outputs

Interfaces on the lower side of the Control Unit

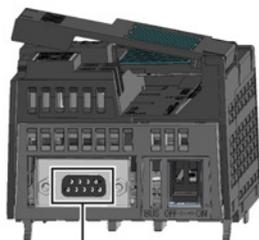
CU230P-2 PN



X150 P1 X150 P2

- Pin
- 1 RX+, receive data +
  - 2 RX-, receive data -
  - 3 TX+. Transmit data +
  - 4 ---
  - 5 ---
  - 6 TX-, transmit data -
  - 7 ---
  - 8 ---

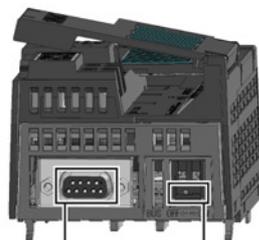
CU230P-2 DP



X126 Socket

- Pin
- 1 Shield, ground connection
  - 2 ---
  - 3 RxD/TxD-P, receive and transmit (B/B')
  - 4 CNTR-P, control signal
  - 5 DGND, reference potential for data (C/C')
  - 6 VP, supply voltage
  - 7 ---
  - 8 RxD/TxD-N, receive and transmit (A/A')
  - 9 ---

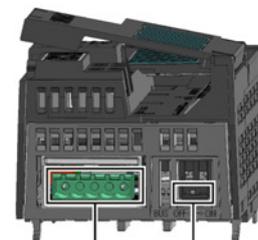
CU230P-2 CAN



X126 Connector OFF ON Bus terminator

- Pin
- 1 ---
  - 2 CAN\_L, CAN signal (dominant low)
  - 3 CAN\_GND, CAN ground
  - 4 ---
  - 5 (CAN\_SHLD), optional shield
  - 6 (GND), optional ground
  - 7 CAN\_H, CAN signal (dominant high)
  - 8 ---
  - 9 ---

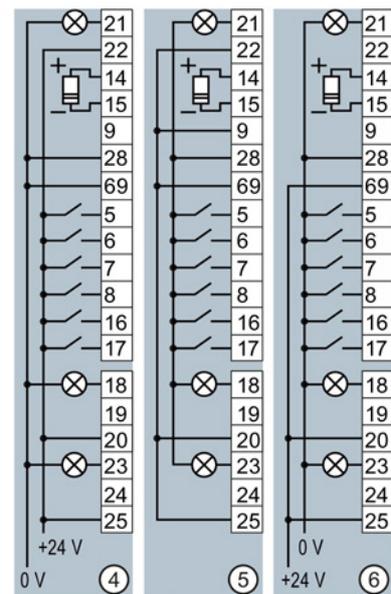
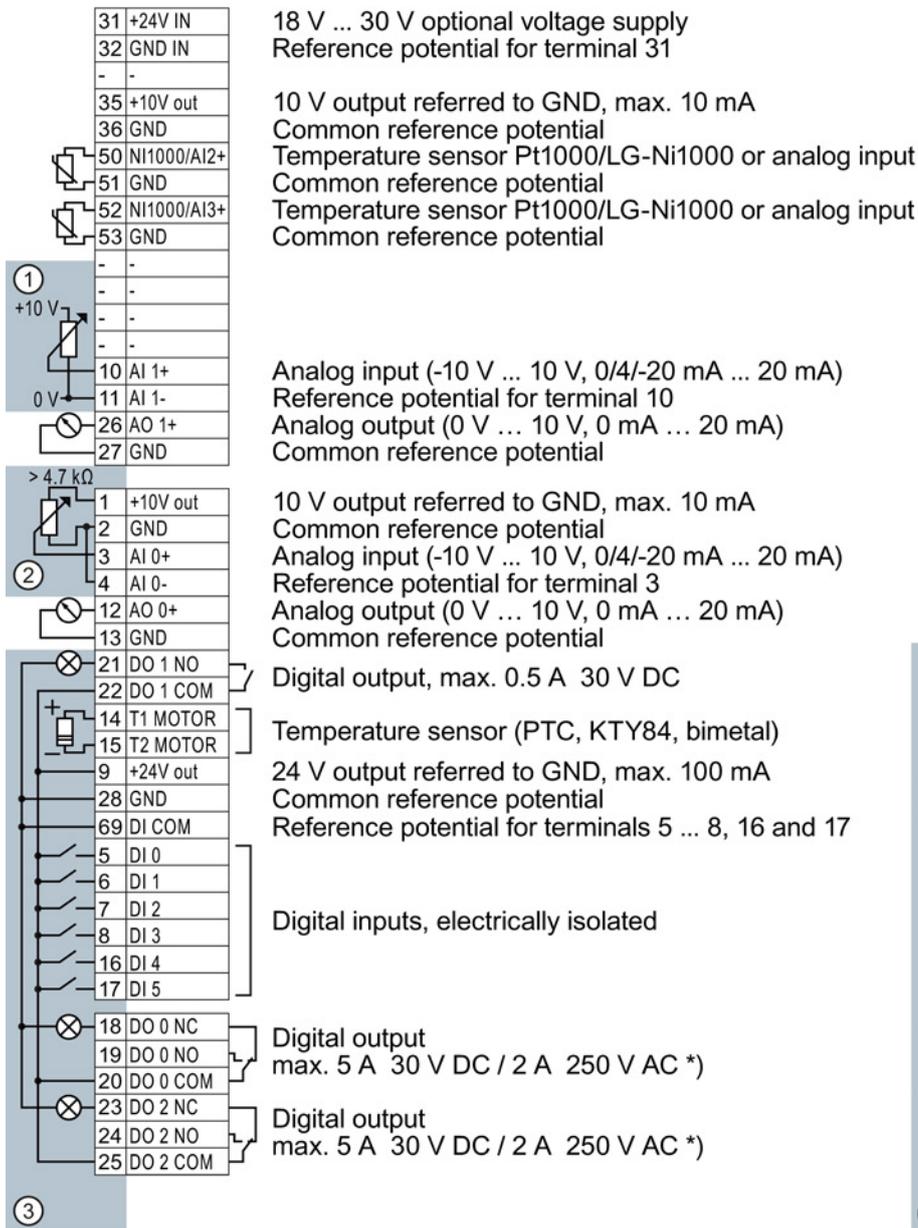
CU230P-2 HVAC



X128 OFF ON Bus terminator

- Pin
- 1 0 V, reference potential
  - 2 RS485P, receive and transmit (+)
  - 3 RS485N, receive and transmit (-)
  - 4 Cable shield
  - 5 ---

3.2.1.2 Terminal strips of the CU230P-2



\*) The following applies to systems complying with UL: A maximum of 3 A 30 V DC or 2 A 250 V AC may be connected via terminals 18 / 20 (DO 0 NC) and 23 / 25 (DO 2 NC).

- ① The analog input is supplied from an external 10 V voltage.
- ② The analog input is supplied from the internal 10 V voltage.
- ③ Wiring when using the internal power supplies. Connecting a current sourcing contact.
- ④ Wiring when using external power supplies. Connecting a current sourcing contact.
- ⑤ Wiring when using the internal power supplies. Connecting a current sinking contact.
- ⑥ Wiring when using external power supplies. Connecting a current sinking contact.

**Note**

When a current sinking contact is connected, a ground fault at the digital input can lead to unintentional setting of the input.

### 3.2.2 CU240B / CU240E Control Unit

#### 3.2.2.1 Interfaces of the CU240B-2 and CU240E-2

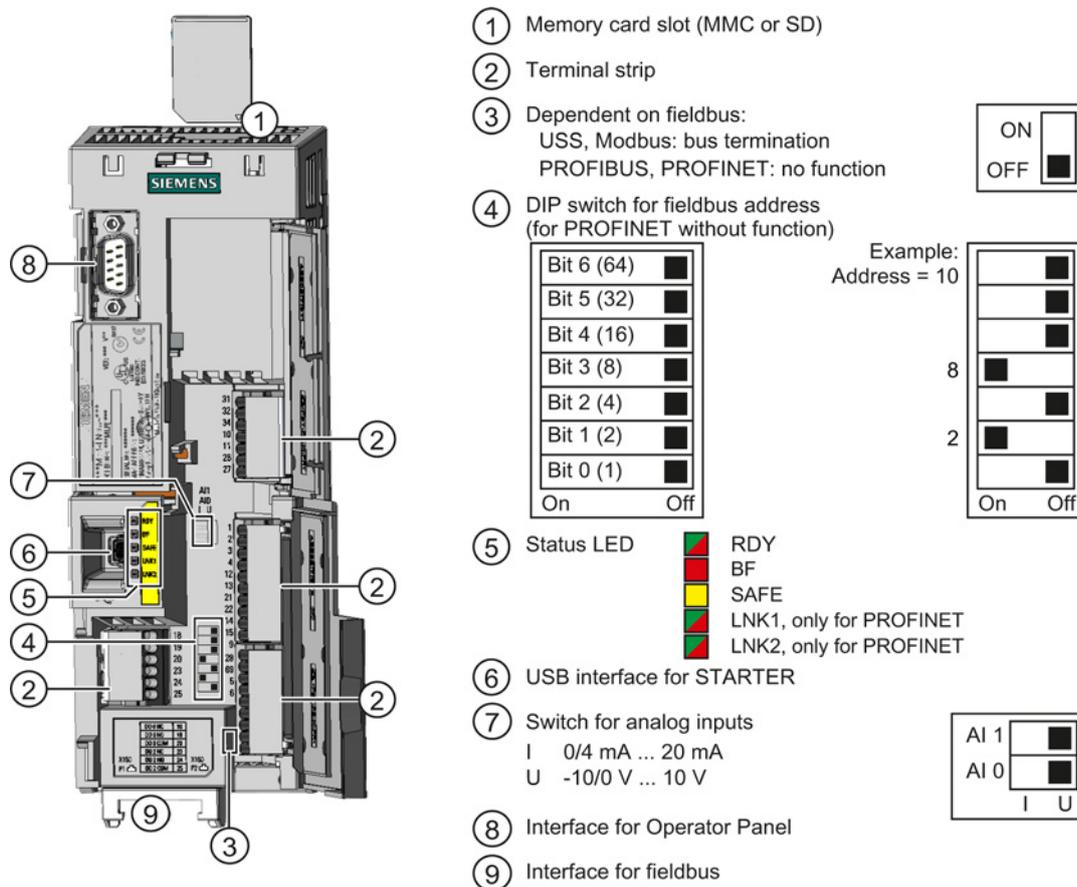


Figure 3-8 Design of the Control Unit using the example of the CU240E-2

3.2 Installing Control Unit

The converter's fieldbus interface is on the bottom of the Control Unit.

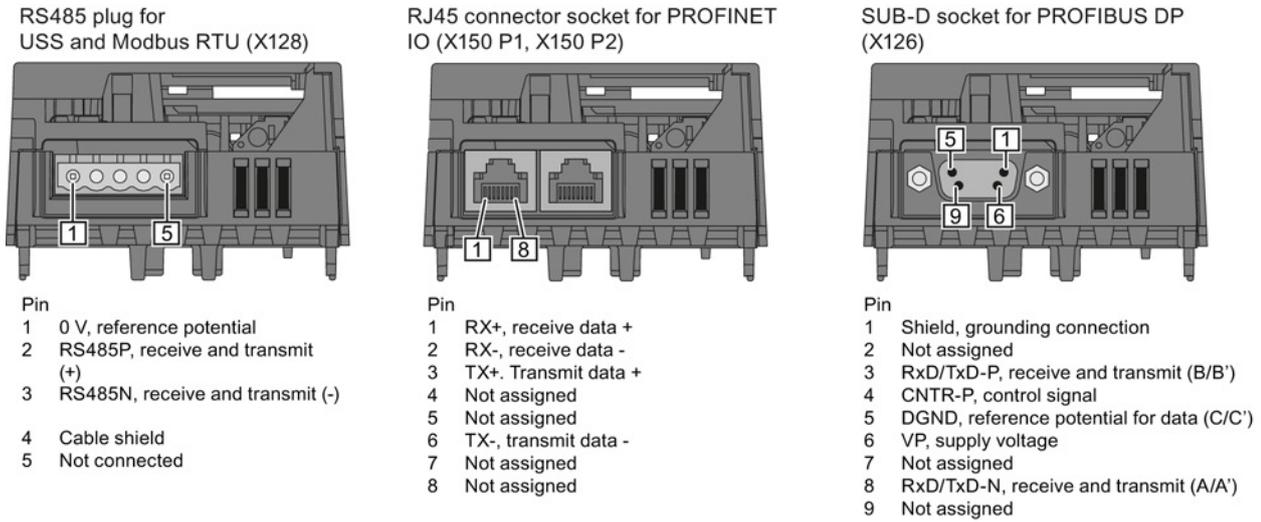
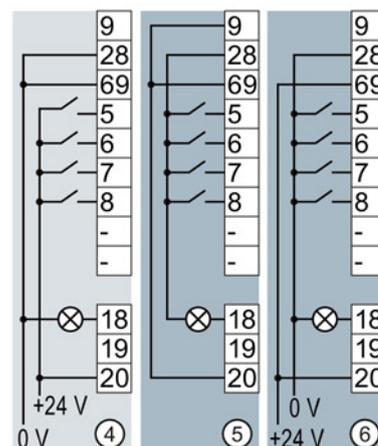
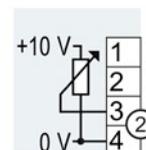
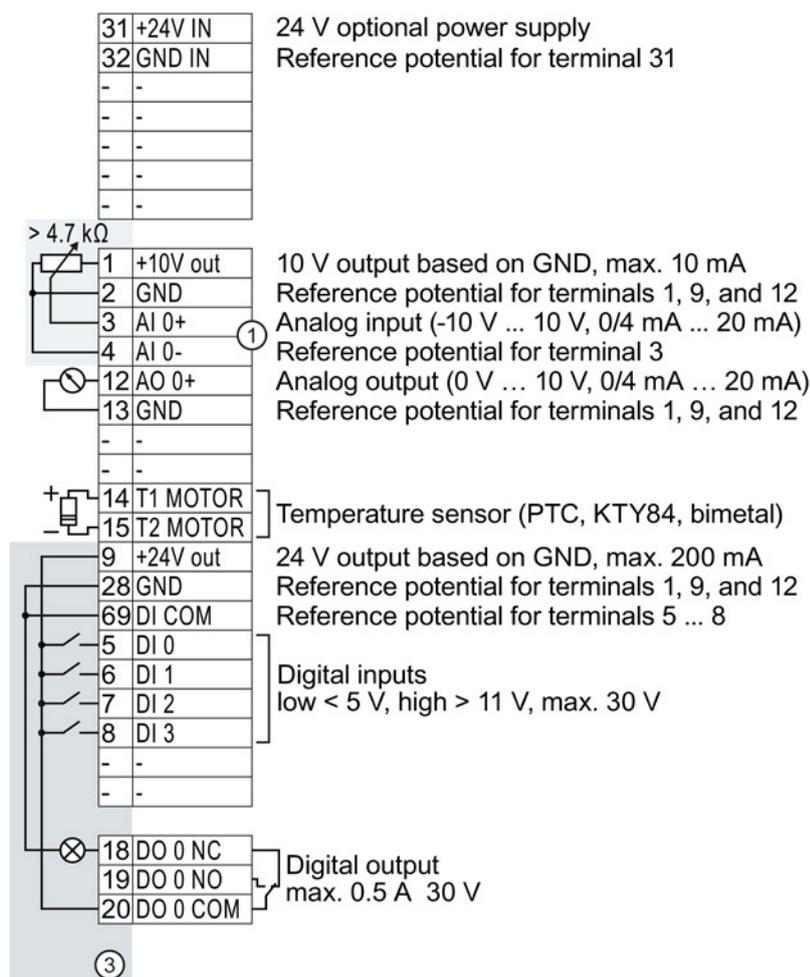


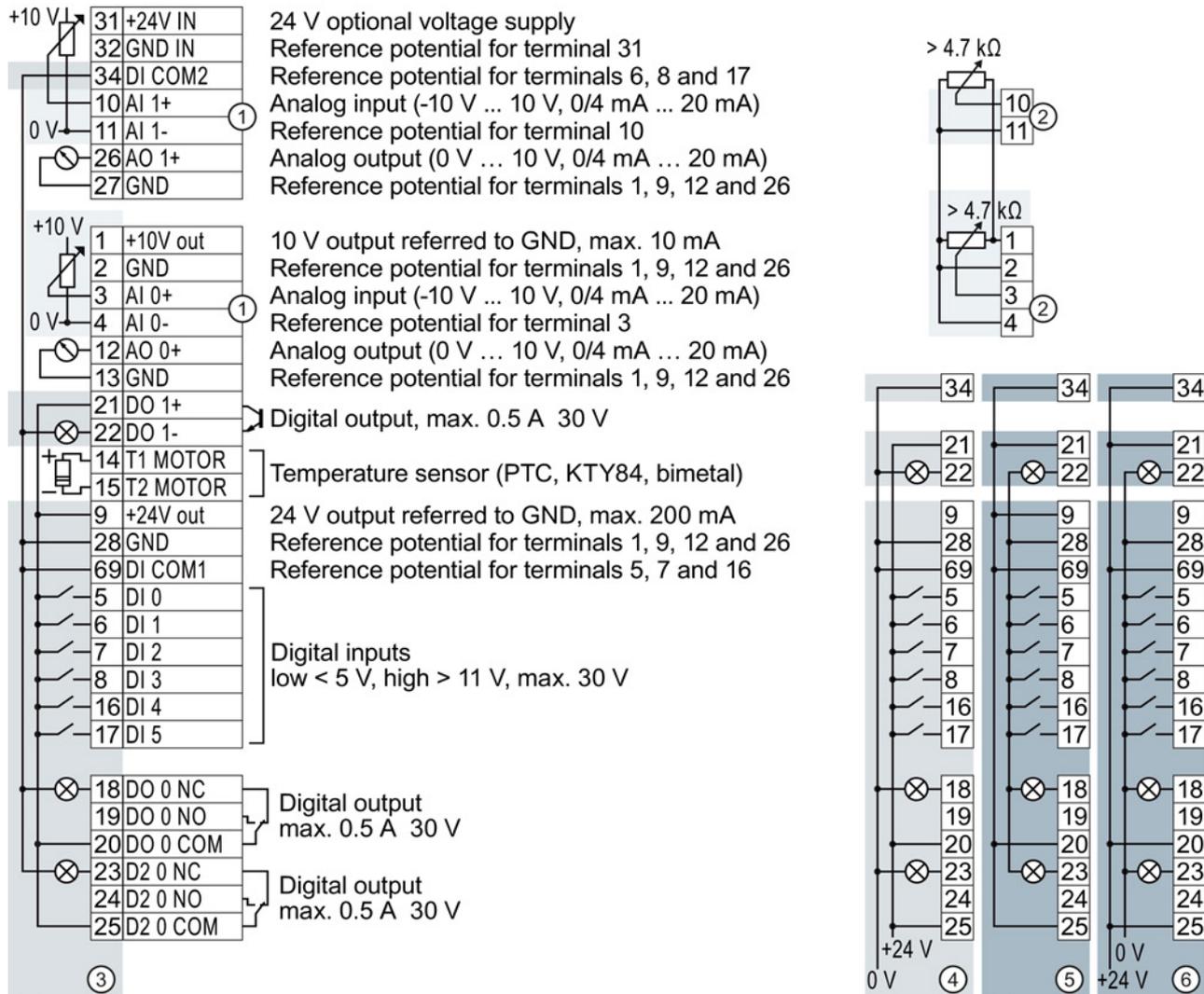
Figure 3-9 Fieldbus interface allocation

### 3.2.2.2 Terminal strips on CU240B-2 Control Units



- ① The analog input is supplied from the internal 10 V voltage.
- ② The analog input is supplied from an external 10 V voltage.
- ③ Wiring when using the internal power supplies. Connection of a contact switching to P potential.
- ④ Wiring when using external power supplies. Connection of a contact switching to P potential.
- ⑤ Wiring when using the internal power supplies. Connection of a contact switching to M potential.
- ⑥ Wiring when using external power supplies. Connection of a contact switching to M potential.

3.2.2.3 Terminal strips on CU240E-2 Control Units



- ① The analog inputs are supplied from an external 10 V source.
- ② The analog inputs are supplied from the internal 10 V voltage.
- ③ Wiring when using the internal power supplies. Connection of a contact switching to P potential.
- ④ Wiring when using external power supplies. Connection of a contact switching to P potential.
- ⑤ Wiring when using the internal power supplies. Connection of a contact switching to M potential.
- ⑥ Wiring when using external power supplies. Connection of a contact switching to M potential.

**NOTICE****Damage to the CU240E-2 PN and CU240E-2 PN-F Control Units in the event of a short-circuit of the 24 V output**

It is possible that the Control Units are defective if the following conditions occur simultaneously:

1. A short-circuit to the 24 V output occurs at terminal 9 when the converter is operating.
2. The ambient temperature is at the upper permitted limit.
3. You have connected an external 24 V supply to terminals 31 and 32 and the voltage at terminal 31 is at the upper permitted limit.

In order to rule out damage to the Control Units, you have to prevent all three conditions occurring simultaneously.

### 3.2.3 Selecting the pre-assignment for the terminal strip

The inputs and outputs of the frequency inverter and the fieldbus interface have specific functions when set to the factory settings.

When you put the frequency inverter into operation, you can change the function of each of its inputs and outputs and the setting of the fieldbus interface.

To make the setting process easier, the inverter has various predefined assignments (macros).

Only the inputs and outputs whose functions change by selecting a specific assignment, are shown on the following pages.

**Procedure**

To select one of the inverter's pre-assigned settings, proceed as follows:

1. Think about which of the input and output functions you are using in the application.
2. Find the I/O configuration (macro) that best suits your application.
3. Note the macro number of the corresponding default setting.

You must set this macro number when putting the frequency inverter into operation.

You have found the appropriate inverter pre-assignment.



3.2 Installing Control Unit

Macro 1: Two fixed speeds Control Units CU240E-2	Macro 2: Two fixed speeds with safety function Control Units CU240E-2	Macro 3: Four fixed speeds Control Units CU240E-2																																																																																																																																																														
<table border="1"> <tr><td>5</td><td>DI 0</td><td>ON/OFF1 right</td></tr> <tr><td>6</td><td>DI 1</td><td>ON/OFF1 left</td></tr> <tr><td>7</td><td>DI 2</td><td>Acknowledge</td></tr> <tr><td>8</td><td>DI 3</td><td>---</td></tr> <tr><td>16</td><td>DI 4</td><td>Fixed speed 3</td></tr> <tr><td>17</td><td>DI 5</td><td>Fixed speed 4</td></tr> <tr><td>3</td><td>AI 0</td><td>---</td></tr> <tr><td>4</td><td></td><td></td></tr> <tr><td>18</td><td>DO 0</td><td>Fault</td></tr> <tr><td>19</td><td></td><td></td></tr> <tr><td>20</td><td></td><td></td></tr> <tr><td>21</td><td>DO 1</td><td>Alarm</td></tr> <tr><td>22</td><td></td><td></td></tr> <tr><td>12</td><td>AO 0</td><td>Speed</td></tr> <tr><td>13</td><td></td><td>0 V ... 10 V</td></tr> <tr><td>26</td><td>AO 1</td><td>Current</td></tr> <tr><td>27</td><td></td><td>0 V ... 10 V</td></tr> </table> <p>DI 4 and DI 5 = high: the converter adds both fixed speeds.</p>	5	DI 0	ON/OFF1 right	6	DI 1	ON/OFF1 left	7	DI 2	Acknowledge	8	DI 3	---	16	DI 4	Fixed speed 3	17	DI 5	Fixed speed 4	3	AI 0	---	4			18	DO 0	Fault	19			20			21	DO 1	Alarm	22			12	AO 0	Speed	13		0 V ... 10 V	26	AO 1	Current	27		0 V ... 10 V	<table border="1"> <tr><td>5</td><td>DI 0</td><td>ON/OFF1</td></tr> <tr><td></td><td></td><td>Fixed speed 1</td></tr> <tr><td>6</td><td>DI 1</td><td>Fixed speed 2</td></tr> <tr><td>7</td><td>DI 2</td><td>Acknowledge</td></tr> <tr><td>8</td><td>DI 3</td><td>---</td></tr> <tr><td>16</td><td>DI 4</td><td rowspan="2">Reserved for safety function</td></tr> <tr><td>17</td><td>DI 5</td></tr> <tr><td>3</td><td>AI 0</td><td>---</td></tr> <tr><td>4</td><td></td><td></td></tr> <tr><td>18</td><td>DO 0</td><td>Fault</td></tr> <tr><td>19</td><td></td><td></td></tr> <tr><td>20</td><td></td><td></td></tr> <tr><td>21</td><td>DO 1</td><td>Alarm</td></tr> <tr><td>22</td><td></td><td></td></tr> <tr><td>12</td><td>AO 0</td><td>Speed</td></tr> <tr><td>13</td><td></td><td>0 V ... 10 V</td></tr> <tr><td>26</td><td>AO 1</td><td>Current</td></tr> <tr><td>27</td><td></td><td>0 V ... 10 V</td></tr> </table>	5	DI 0	ON/OFF1			Fixed speed 1	6	DI 1	Fixed speed 2	7	DI 2	Acknowledge	8	DI 3	---	16	DI 4	Reserved for safety function	17	DI 5	3	AI 0	---	4			18	DO 0	Fault	19			20			21	DO 1	Alarm	22			12	AO 0	Speed	13		0 V ... 10 V	26	AO 1	Current	27		0 V ... 10 V	<table border="1"> <tr><td>5</td><td>DI 0</td><td>ON/OFF1</td></tr> <tr><td></td><td></td><td>Fixed speed 1</td></tr> <tr><td>6</td><td>DI 1</td><td>Fixed speed 2</td></tr> <tr><td>7</td><td>DI 2</td><td>Acknowledge</td></tr> <tr><td>8</td><td>DI 3</td><td>---</td></tr> <tr><td>16</td><td>DI 4</td><td>Fixed speed 3</td></tr> <tr><td>17</td><td>DI 5</td><td>Fixed speed 4</td></tr> <tr><td>3</td><td>AI 0</td><td>---</td></tr> <tr><td>4</td><td></td><td></td></tr> <tr><td>18</td><td>DO 0</td><td>Fault</td></tr> <tr><td>19</td><td></td><td></td></tr> <tr><td>20</td><td></td><td></td></tr> <tr><td>21</td><td>DO 1</td><td>Alarm</td></tr> <tr><td>22</td><td></td><td></td></tr> <tr><td>12</td><td>AO 0</td><td>Speed</td></tr> <tr><td>13</td><td></td><td>0 V ... 10 V</td></tr> <tr><td>26</td><td>AO 1</td><td>Current</td></tr> <tr><td>27</td><td></td><td>0 V ... 10 V</td></tr> </table> <p>Several DIs = high: the converter adds the corresponding fixed speeds.</p>	5	DI 0	ON/OFF1			Fixed speed 1	6	DI 1	Fixed speed 2	7	DI 2	Acknowledge	8	DI 3	---	16	DI 4	Fixed speed 3	17	DI 5	Fixed speed 4	3	AI 0	---	4			18	DO 0	Fault	19			20			21	DO 1	Alarm	22			12	AO 0	Speed	13		0 V ... 10 V	26	AO 1	Current	27		0 V ... 10 V
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Macro 4: PROFIBUS or PROFINET Control Units CU240E-2	Macro 5: PROFIBUS or PROFINET with safety function Control Units CU240E-2	Macro 6: PROFIBUS or PROFINET with two safety functions Control Units CU240E-2																																																																																																																																																						
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3.2 Installing Control Unit

<p><b>Macro 9: Motorized potentiometer (MOP)</b> Control Units CU240B-2</p>	<p><b>Macro 9: Motorized potentiometer (MOP)</b> Control Units CU230P-2 and CU240E-2</p>	<p><b>Macro 12: Two-wire control with method 1</b> Control Units CU240B-2 Factory setting for converters with RS485 interface</p>																																																																														
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3.2 Installing Control Unit

<p><b>Macro 17: Two-wire control with method 2</b>  <b>Macro 18: Two-wire control with method 3</b>  <b>Control Units CU230P-2 and CU240E2</b></p>	<p><b>Macro 19: Three-wire control with method 1</b>  <b>Control Units CU240B-2</b></p>	<p><b>Macro 19: Three-wire control with method 1</b>  <b>Control Units CU230P-2 and CU240E2</b></p>
<p>5 DI 0 ON/OFF1 right          6 DI 1 ON/OFF1 left          7 DI 2 Acknowledge          8 DI 3 ---          16 DI 4 ---          17 DI 5 ---          3 AI 0 Setpoint          4 I<math>\square</math>U -10 V ... 10 V          18 DO 0 Fault          19          20          21 DO 1 Alarm          22          12 AO 0 Speed          13 0 V ... 10 V          26 AO 1 Current          27 0 V ... 10 V</p>	<p>5 DI 0 Enable/OFF1          6 DI 1 ON right          7 DI 2 ON left          8 DI 3 Acknowledge          3 AI 0 Setpoint          4 I<math>\square</math>U -10 V ... 10 V          18 DO 0 Fault          19          20          12 AO 0 Speed          13 0 V ... 10 V</p>	<p>5 DI 0 Enable/OFF1          6 DI 1 ON right          7 DI 2 ON left          8 DI 3 Acknowledge          16 DI 4 ---          17 DI 5 ---          3 AI 0 Setpoint          4 I<math>\square</math>U -10 V ... 10 V          18 DO 0 Fault          19          20          21 DO 1 Alarm          22          12 AO 0 Speed          13 0 V ... 10 V          26 AO 1 Current          27 0 V ... 10 V</p>
<p><b>Macro 20: Three-wire control with method 2</b>  <b>Control Units CU240B-2</b></p>	<p><b>Macro 20: Three-wire control with method 2</b>  <b>Control Units CU230P-2 and CU240E2</b></p>	<p><b>Macro 21: Fieldbus USS</b>  <b>Control Units CU240B-2</b></p>
<p>5 DI 0 Enable/OFF1          6 DI 1 ON          7 DI 2 Reversing          8 DI 3 Acknowledge          3 AI 0 Setpoint          4 I<math>\square</math>U -10 V ... 10 V          18 DO 0 Fault          19          20          12 AO 0 Speed          13 0 V ... 10 V</p>	<p>5 DI 0 Enable/OFF1          6 DI 1 ON          7 DI 2 Reversing          8 DI 3 Acknowledge          16 DI 4 ---          17 DI 5 ---          3 AI 0 Setpoint          4 I<math>\square</math>U -10 V ... 10 V          18 DO 0 Fault          19          20          21 DO 1 Alarm          22          12 AO 0 Speed          13 0 V ... 10 V          26 AO 1 Current          27 0 V ... 10 V</p>	<p>USS setting: 38,400 baud, 2 PZD, PKW variable          5 DI 0 ---          6 DI 1 ---          7 DI 2 Acknowledge          8 DI 3 ---          3 AI 0 ---          4          18 DO 0 Fault          19          20          12 AO 0 Speed          13 0 V ... 10 V</p>

Macro 21: Fieldbus USS Control Units CU230P-2 and CU240E2	Macro 22: Fieldbus CANopen Control Units CU230P-2																																																																																																							
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Macro 101: Universal applications Control Units CU230P-2	Macro 103: Pump pressure control Control Units CU230P-2	Macro 104: ESM stairwell pressure control Control Units CU230P-2																																																																																																																																																																																																						
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3.2 Installing Control Unit

<b>Macro 105: Fan pressure control + ESM with fixed setpoint</b> <b>Control Units CU230P-2</b>	<b>Macro 106: Cooling tower with active sensor + hibernation</b> <b>Control Units CU230P-2</b>	<b>Macro 107: Cooling tower with LG-Ni1000 sensor + hibernation</b> <b>Control Units CU230P-2</b>																																																																																																																																																																																																																																	
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### 3.2.4 Wiring the terminal strip

#### NOTICE

##### Damage to the inverter when using long signal cables

Using long cables at the inverter's digital inputs and 24 V power supply can lead to overvoltage during switching operations. Overvoltages can damage the inverter.

- If you use cables of more than 30 m at the digital inputs and 24 V power supply, connect an overvoltage protection element between the terminal and the associated reference potential.  
We recommend using the Weidmüller overvoltage protection terminal with designation MCZ OVP TAZ DIODE 24VDC.



#### ⚠ WARNING

##### Danger to life as a result of hazardous voltages when connecting an unsuitable power supply

Death or serious injury can result when live parts are touched in the event of a fault.

- For all connections and terminals of the electronic modules, only use power supplies with protective extra low voltage (PELV), Class 2.

#### Requirements

- Use suitable cables:
  - Solid or flexible cables.
  - Suitable cable cross-section: 0.5 mm<sup>2</sup> (21 AWG) to 1.5 mm<sup>2</sup> (16 AWG).  
When completely connecting up the unit, we recommend cables with a cross-section of 1 mm<sup>2</sup> (18 AWG).
- Do not use end sleeves.
- You have found an appropriate pre-assignment for the terminal strips, which you can now use to wire the inverter.  
See also Section Selecting the pre-assignment for the terminal strip (Page 33).
- You have the appropriate tools:
  - Small screwdriver to open the spring-loaded terminals
  - Tool for stripping the cables

**Procedure**



To connect up the inverter's terminal strip, proceed as follows:

1. Remove the last 10 mm (approx.) of the cable insulation.
2. Using the screwdriver, press on the orange operator control of the spring-loaded terminal hard enough to open the terminal.
3. Insert the cable into the terminal as far as it will go and remove the screwdriver.
4. Ensure that the cable is securely connected by pulling on it lightly.
5. Connect up all of the required terminals on the terminal strip in this way.
6. Route the signal cables in such a way that you can completely close the front doors after wiring the terminal strip.
7. If you use shielded cables, then you must connect the shield to the mounting plate of the control cabinet or with the shield support of the inverter through a good electrical connection and a large surface area.  
See also: EMC installation guideline  
(<http://support.automation.siemens.com/WW/view/en/60612658>)
8. Use strain relief.



You have now connected up the inverter's terminal strips.

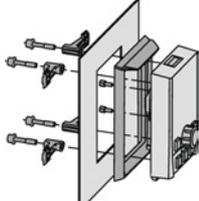
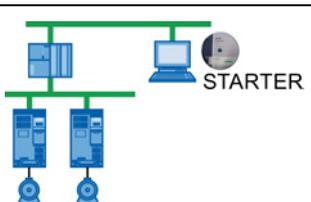
### 3.3 Description files for fieldbuses

The description files contain the information required to configure and operate the converter on a fieldbus under a higher-level control.

Description file	Download	Alternative to download
GSD for PROFIBUS	Internet: ( <a href="http://support.automation.siemens.com/WW/view/en/23450835">http://support.automation.siemens.com/WW/view/en/23450835</a> )	GSD and GSDML are saved in the converter. The converter writes its GSD or GSDML to the memory card once you insert this card in the converter and set p0804 to 12. You can then transfer the file to your programming device or PC using the memory card.
GSDML for PROFINET	Internet: ( <a href="http://support.automation.siemens.com/WW/view/en/26641490">http://support.automation.siemens.com/WW/view/en/26641490</a> )	
EDS for CANopen	Internet: ( <a href="http://support.automation.siemens.com/WW/view/en/48351511">http://support.automation.siemens.com/WW/view/en/48351511</a> )	---
EDS for Ethernet/IP	---	Further information can be found in the operating instructions

## Commissioning

### 4.1 Tools to commission the converter

Operator panels for commissioning, diagnostics and controlling inverters		Order number
	<p>BOP-2 (Basic Operator Panel) - for snapping onto the inverter</p> <ul style="list-style-type: none"> <li>• Two-line display</li> <li>• Guided basic commissioning</li> <li>• Backing up and transferring the inverter settings</li> </ul>	6SL3255-0AA00-4CA1
	<p>IOP (Intelligent Operator Panel) - for snapping onto the inverter</p> <ul style="list-style-type: none"> <li>• Plain text display</li> <li>• Menu-based operation and application wizards</li> <li>• Backing up and transferring the inverter settings</li> </ul>	6SL3255-0AA00-4JA0
	<p>Door mounting kit for IOP/BOP-2</p> <ul style="list-style-type: none"> <li>• For installation of the BOP-2 or IOP in a control cabinet door.</li> <li>• Degree of protection with IOP: IP54 or UL Type 12</li> <li>• Degree of protection with BOP-2: IP55</li> </ul>	6SL3256-0AP00-0JA0
	<p>For mobile use of the IOP: IOP handheld with IOP housing, power supply unit and rechargeable batteries as well as RS232 connecting cable If you are using your own connecting cable, carefully note the maximum permissible length of 5 m.</p>	6SL3255-0AA00-4HA0
PC tools for commissioning, diagnostics and controlling the converter		
	<p>PC Connection Kit Includes a STARTER DVD and USB port.</p>	6SL3255-0AA00-2CA0
	<p>STARTER Commissioning tool (PC software) Connection to the inverter via USB port, PROFIBUS or PROFINET Downloading: <a href="http://support.automation.siemens.com/WW/view/en/10804985/133200">http://support.automation.siemens.com/WW/view/en/10804985/133200</a></p>	STARTER on DVD: 6SL3072-0AA00-0AG0
	<p>Drive ES Basic As an option to STEP 7 with routing function via network limits for PROFIBUS and PROFINET</p>	6SW1700-5JA00-5AA0

## 4.2 Commissioning

Commissioning is carried out with the IOP using one of the "basic commissioning wizards (Page 21)". If the IOP does not contain the actual frequency converter software, a message is displayed "Update is required". You can find the required information on the Internet at "http://support.automation.siemens.com/WW/view/de/67273266 (<http://support.automation.siemens.com/WW/view/en/67273266>)".

In the basic commissioning, select the control mode for the motor, enter the motor data and define the pre-assignment of the frequency converter interfaces. You can find the corresponding wiring in section "Selecting the pre-assignment for the terminal strip (Page 33)".

<b>SIEMENS</b>						
D-91056 Erlangen						
3-Mot. 1LE10011AC434AA0				E0807/0496382		
IEC/EN 60034 100L		IMB3		IP55		
25 kg	Th.Cl. 155(F)		-20°C		Tamb 40°C	
	Bearing		UNIREX-N3			
DE	6206-2ZC3		15g	Intervall: 4000hrs		
NE	6206-2ZC3		11g			
60Hz:	SF 1.15 CONT NEMA MG1-12					
V	Hz	A	kW	PF	NOM.EFF	rpm
400 Δ	50	3.5	1.5	0.73	84.5%	970
690 Y	50	2.05	1.5	0.73	84.5%	970
460 Δ	60	3.15	1.5	0.69	86.5%	1175
②	①	③	④	⑤		

- ② Motor voltage (p0304)
- )
- ① Motor frequency (P0310)
- ③ Motor current (P0305)
- ④ Motor power (P0307)
- ⑤ Rated motor speed (P0311)

### Overview of the commissioning

- When commissioning with wizards, the first step is to RESET to the factory settings. This ensures that the frequency converter is in a defined basic setting.  
After the basic commissioning, the wizard that you selected guides you through application-specific settings.
- Before the frequency converter accepts your commissioning data, you must check these and confirm them. You do this using the last but one menu item OVERVIEW OF THE SETTINGS. In this screen, scroll down to CONTINUE and acknowledge it with OK.
- The last step is the prompt SAVE or INTERRUPT WIZARD? Select SAVE! Commissioning using the wizards has now been completed.
- You can subsequently change your converter settings (Section "The most important parameters at a glance (Page 48)").
- Once you have completed commissioning, you should back up the settings of your converter e.g. on the IOP, so that they are not lost if the converter develops a defect.

## 4.2.1 Settings in the basic commissioning menu

### Basic commissioning

The "Basic Commissioning" wizard guides you through commissioning in a maximum of 28 steps. Depending the modules and software version you are using, you can skip individual steps.

**Proceed as follows for the basic commissioning of the converter:**



Start the menu: WIZARD/BASIC COMMISSIONING and make the following settings:

No.	Input screen of the IOP	Selected setting on the IOP	Parameter
01/21	Restore factory settings	[1] yes	p0970 = ...
02/21	Control mode	[0] V/f with linear characteristic	p1300 = ...
03/28	Motor data	[0] Europe 50 Hz, kW	p0100 = ...
04/28	Motor type	[1] Induction motor	p0300 =
05/28	Motor code	The motor data is pre-assigned using the motor code.	p0301
06/28	Characteristic	50 Hz / 87 Hz	Select characteristic
07/28	Motor connections	Observe the motor connection (star / delta)!	Confirm with OK
08/21	Motor data	Enter motor data for 50 Hz (refer to 06/23)	Confirm with OK
09/28	Motor voltage	Enter [V] according to the motor rating plate	p0304 =
10/28	Motor current	Enter [A] according to the motor rating plate	p0305 =
11/28	Rated power	Enter [kW] (or [hp]) according to the motor rating plate	p0307 =
12/28	cos φ		p0308 =
13/28	Motor speed	Enter [rpm] according to the motor rating plate	p0311 =
14/28	Current limit	[A] maximum 4* p305	p0640 = ...
13/28	Motor data ID	[1] Stationary and rotating measurement <sup>1)</sup> If the motor cannot freely rotate, e.g. if travel is mechanically limited, select the setting [2] "MotID only stationary".	p1900 = ...
16/28	Encoder type	[0] Not activated	p0400 = ...
17/28	Encoder pulses	Encoder type not activated P0408 is set as default	Confirm with OK
18/28	Macro device	Select a pre-defined setting, see Section: Selecting the pre-assignment for the terminal strip (Page 33)	p0015 = ...
19/28	Minimum speed	Enter the minimum speed [rpm], above which the motor should operate.	p1080 = ...
20/28	Ramp-up	Time [s] in which the motor should accelerated from standstill up to the maximum speed (P1082).	p1120 = ...
21/28	Ramp-down	Time [s] in which the motor should be decelerated from the maximum speed (P1082) down to standstill.	P1121 = ...
22/28	Motor temperature sensor	Enter type of temperature sensor	p0610 = ...
23/28	Motor holding brake	Enter configuration	p1215 = ...
24/28	MHB opening time	Set opening time	p1216 = ...
25/21	MHB closing time	Set closing time	p1217 = ...
2621	Overview of the settings	Check list + select < Continue >	Confirm with OK

No.	Input screen of the IOP	Selected setting on the IOP	Parameter
27/21	Save settings	Save	Confirm with OK
28/28	Saving, please wait		Confirm with OK

1) If the IOP Assistant does not offer this setting, after completing the basic commissioning, set parameter p1900 to a value of 1 using the parameter menu.

**Identifying motor data**

Alarm A07991 is output for as long as the converter has still not identified the motor data. You must switch on the motor (e.g. from the IOP) to identify the motor data. The frequency converter switches-off the motor after the motor data identification has been completed.

 <b>CAUTION</b>
<p><b>Motor data identification for dangerous loads</b></p> <p>Secure dangerous plant and system parts before starting the motor data identification, e.g. by fencing off the dangerous location or lowering a suspended load to the floor.</p>



You have completed the converter's basic commissioning.

**4.2.2 Enable "Safe Torque Off" safety function**

**Requirements:**

- Commission a CU240E-2 Control Unit.
- In the basic commissioning, you selected a setting for the interfaces in which two terminals are reserved for a safety function.

The "Basic Safety" wizard guides you through the enabling of the "Safe Torque Off (Basic Safety)" safety function in a maximum of 18 steps. Depending on the sources for "Safe Torque Off", you can skip individual steps.

<p><b>NOTICE</b></p>
<p><b>STO via terminal</b></p> <p>If you implement the "Safe Torque Off" via digital inputs, DI4 and DI5 are brought together to form a fail-safe digital input (FDI). You may not use these digital inputs for other commands.</p>

**Proceed as follows in order to implement the "Safe Torque Off" safety function:**



Start the menu: "Basic Safety" commissioning

1/18	Enter the password for fail-safe function (factory setting = 0)	Confirm with OK
2/18	If you have entered the correct password, the message "Password correct" is displayed; acknowledge with "Continue". If you have entered the wrong password, you can return with the button "ESC" and re-enter the password or cancel the commissioning.	Confirm with OK
3/18	Change the Safety password? Yes/No	Confirm with OK
4/18	Enter a new password (0 ... FFFF FFFF) (only if you selected "Yes" in 3/18)	Confirm with OK
5/18	Reset "Basic Safety" to factory setting? Yes/No	Confirm with OK
6/18	STO via terminal? Yes/No	Confirm with OK
7/18	DI4 and DI5 are wired internally as sources for the FDI.	Confirm with OK
10/18	Set the debounce time for the FDI	Confirm with OK
11/18	Set the switch gate tolerance for the FDI.	Confirm with OK
12/18	STO via PROFIsafe? Yes/No	Confirm with OK
13/18	Enter PROFIsafe address	Confirm with OK
14/18	Select a PROFIsafe telegram	Confirm with OK
15/18	Set the monitoring time for the forced checking procedure. You have to select an STO after the end of the monitoring time at the latest to ensure that the converter checks its safety-related circuits.	Confirm with OK
16/18	Overview of the settings, check list + select < Continue >	Confirm with OK
17/18	Save settings	Confirm with OK
18/18	Saving, please wait	

You have enabled the STO safety function in the converter and can select the STO via terminals 16 and 17.

### 4.2.3 The most important parameters at a glance

Table 4- 1 Defining the interfaces of the frequency converter

Parameter	Possible settings
p0015	<b>Macro drive unit</b> Define the pre-assignment for the inputs and outputs using one of the macros 1 to 22 (Section “Selecting the pre-assignment for the terminal strip (page 33”)”).

Table 4- 2 Set fixed speeds

Parameter	Description
p1001	Fixed speed 1
p1002	Fixed speed 2
p1003	Fixed speed 3
p1004	Fixed speed 4

Table 4- 3 Set jogging

Parameter	Description
p1058	Jog 1
p1059	Jog 2

Table 4- 4 Selecting the fieldbus protocol

Parameter	Possible settings (selection options, depend on the CU type)
p2030	0: No protocol (this means: Control via digital inputs/connecting terminals) 1: USS 2: Modbus 3: PROFIBUS DP 4: CAN 5: BACnet 7: PROFINET 8: P1

Table 4- 5 Set the USS interface

Parameter	Description					
p2020	<b>Set the baud rate</b>					
	Value	Baud rate	Value	Baud rate	Value	Baud rate
	4	2400	8	38400	12	115200
	5	4800	9	57600	13	187500
	6	9600	10	76800		
	7	19200	11	93750		
p2022	<b>Fieldbus interface USS PZD number</b> Sets the number of 16-bit words in the PZD part of the USS telegram Setting range: 0... 8 (0 ... 8 words)					
p2023	<b>Fieldbus interface USS PKW number</b> Sets the number of 16-bit words in the PKW part of the USS telegram Setting range: <ul style="list-style-type: none"> <li>• 0, 3, 4: 0, 3 or 4 words</li> <li>• 127: variable length</li> </ul>					

Table 4- 6 Setting the ramp-function generator

Parameter	Description
p1080	Minimum speed in [rpm]
p1082	Maximum speed in [rpm]
p1120	Ramp-up time of the motor after switching on in [s]
p1121	Ramp-down time of the motor after switching off in [s]

Table 4- 7 Setting the control mode

Parameter	Possible settings
p1300	<b>Setting the open-loop and closed-loop control mode of a drive</b> 0: V/f control with linear characteristic 1: Linear V/f characteristic with Flux Current Control (FCC) 2: V/f control with square-law characteristic 3: Freely selectable V/f characteristic 4: Linear V/f characteristic ECO 5: Linear V/f characteristic for applications requiring a precise frequency in textile systems 6: Linear V/f characteristic with FCC for applications requiring a precise frequency in textile systems 7: Square-law V/f characteristic with ECO 19: V/f control without characteristic 20: Vector control without speed encoder 22: Torque control without speed encoder

Table 4- 8 Motor data according to the rating plate

Parameter	Description
p0100	<b>Motor standard IEC/NEMA</b> 0: Europe 50 [Hz]
p0300	<b>Motor type selection</b> 0: No motor 1: Induction motor 2: Synchronous motor
p0304	Motor voltage in [V]
p0305	Motor current in [A]
p0307	Motor frequency in [kW] or [hp]
p0310	Motor frequency in [Hz]
p0311	Motor speed in [rpm]
p0625	Ambient temperature of the motor in [°C]
p0640	Current limit of the motor in [A]

### Changing the function of a terminal

Table 4- 9 Digital inputs

Parameter	Terminals CU240B-2	Terminals CU240E-2	Terminals CU230P-2	Signal	Command sources of important functions
p0722.0	5 / 69	5 / 69	5 / 69	DI 0	p0840 - ON/OFF (OFF1) p2103 - acknowledge faults p1055/p1056 - jog mode p1035/p1036 - motorized potentiometer p1020 ... p1023 - fixed speed setpoint p1230 - activate DC braking p2200 - enable technology controller
p0722.1	6 / 69	6 / 69	6 / 69	DI 1	
p0722.2	7 / 69	7 / 69	7 / 69	DI 2	
p0722.3	8 / 69	8 / 34	8 / 69	DI 3	
p0722.4	-	9 / 34	9 / 69	DI 4	
p0722.5	-	10 / 34	10 / 69	DI 5	

Table 4- 10 Changing the function of a digital input

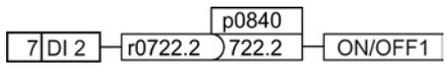
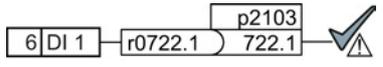
Changing the function	Examples
1. Select the required function marked using a "BI" parameter. 2. Set this parameter to the value of the status parameter r0722.x of the required digital input.	<p><i>Function:</i> Switch on motor via DI 2.  <i>Setting:</i> p0840 = 722.2</p>  <p><i>Function:</i> Acknowledge fault using DI 1.  <i>Setting:</i> p3981 = 722.1</p> 

Table 4- 11 Digital outputs (relay outputs)

Parameter	Terminals CU240B-2	Terminals CU240E-2	Terminals CU230P-2	Signal	Important status signals
p0730	18 / 19 / 20	18 / 19 / 20	18 / 19 / 20	DO 0	r52.2 - operation enabled (motor running) r52.3 - fault active r52.7 - alarm active
p0731	-	21 / 22	21 / 22	DO 1	
p0732	-	23 / 24 / 25	23 / 24 / 25	DO 2	

Table 4- 12 Changing the function of a digital output

Changing the function	Example
<ol style="list-style-type: none"> <li>Select the required function marked using a "BO" parameter.</li> <li>Set the parameter p073x of the required digital output to the value of the "BO" parameter.</li> </ol>	<p><i>Function:</i> Signal "Fault" on DO 1. <i>Setting:</i> p0731 = 52.3</p>

Table 4- 13 Analog inputs and temperature sensors

Parameter	Terminals CU240B-2	Terminals CU240E-2	Terminals CU230P-2	Signal	Possible settings
p0756 [0]	3 / 4	3 / 4	3 / 4	AI 0	0: Unipolar voltage input (0 V ...+10 V) 1: Unipolar voltage input monitored (+2 V... +10 V) 2: Unipolar current input (0 mA ...+20 mA) 3: Unipolar current input monitored (+4 mA ...+20 mA) 4: Bipolar voltage input (-10 V ...+10 V) 6: Ni1000 temperature sensor (-50°C ... +150°C) 7: PT1000 temperature sensor (-50 ...+250°C) 8: No sensor connected
p0756 [1]	-	10 / 11	10 / 11	AI 1	
p0756 [2]	-	-	50 / 51	AI 2	
p0756 [3]	-	-	52 / 53	AI 3	
p0755 [0...3]	Analog inputs, actual value in percent				

Table 4- 14 Changing the function of an analog input

Changing the function	Examples
<ol style="list-style-type: none"> <li>Select the required function marked using a "CI" parameter.</li> <li>Set this parameter to the value of status parameter r0755.x of the analog input.</li> </ol>	<p><i>Function:</i> AI 0 provides the setpoint for the PID controller. <i>Setting:</i> p2253 = 55[0]</p>
Use parameter p0756[0] and the I/U switch on the front of the frequency converter to configure the analog input as voltage or current input.	

Table 4- 15 Analog outputs

Parameter	Terminals CU240B-2	Terminals CU240E-2	Terminals CU230P-2	Signal	Setting
p0771[0]	12 / 13	12 / 13	12 / 13	AO 0	Important status signals: 0: Analog output locked 21: Speed actual value 24: Output frequency smoothed 25: Output voltage smoothed 26: DC link voltage smoothed 27: Actual current value (smoothed absolute value)
p0771[1]	-	26 / 27	26 / 27	AO 1	
p0776[0, 1]	Analog outputs, type				0: Current output (0 mA ... +20 mA) 1: Voltage output (0 V ... +10 V) 2: Current output (+4 mA ... +20 mA)

Table 4- 16 Changing the function of an analog output

Changing the function	Examples
<ol style="list-style-type: none"> <li>Select the required function marked using a "CO" parameter.</li> <li>Set parameter p0771 of the analog output to the value of the "CO" parameter.</li> </ol>	<p><i>Function:</i> Signal "Current" at AO 0. <i>Setting:</i> p0771 = 27</p> <p>The diagram shows a box labeled 'p0771' containing the value '27'. This box is connected to a box labeled '12 AO 0+' and another box labeled '&lt;r0027'. The connection to '&lt;r0027' is shown with a double-headed arrow and the label '  '.</p>
Use parameter p0776[0] to configure the analog input as voltage or current input.	

Table 4- 17 Motor temperature sensor interface

Parameter	Terminal	Abbreviation	Possible setting
p0601	14	T1 motor (+)	0: No sensor (factory setting) 1: PTC thermistor (→ P0604) 2: KTY84 (→ P0604) 4: ThermoClick sensor
	15	T2 motor (-)	
p0604	Motor temperature alarm threshold		

## More information

### 5.1 Manuals for your inverter

Table 5- 1 Manuals for your inverter

Depth of the information	Manual	Contents	Languages	Download or order number
++	<b>Getting Started Guide</b> for the SINAMICS G120 inverter with the CU230P-2; CU240B-2 and CU240E-2 Control Units	(this manual)	English, German, Italian, French, Spanish, Chinese	Download manuals <a href="http://support.automation.siemens.com/WW/view/en/30563628/133300">http://support.automation.siemens.com/WW/view/en/30563628/133300</a> <b>SINAMICS Manual Collection</b> Documentation on DVD, order number 6SL3097-4CA00-0YGO
+++	<b>Operating instructions</b>	Installing, commissioning and operating the inverter. Setting the inverter functions. Technical data.		
+++	<b>Function Manual Safety Integrated</b> for the SINAMICS G120 inverters with CU240E Control Units	Configuring PROFIsafe. Installing, commissioning and operating fail-safe functions of the inverter.	English, German, Chinese	
+++	<b>List Manual</b> for the SINAMICS G120 inverter with Control Units CU230P-2 and Control Units CU240B-2; CU240E-2	Graphic function block diagrams. List of all parameters, alarms and faults.	English, German, Chinese	
+	<b>Getting Started Guide</b> for the following SINAMICS G120 Power Modules: <ul style="list-style-type: none"> <li>• PM240, PM250 and PM260</li> <li>• PM240-2</li> <li>• PM230</li> <li>• PM330</li> </ul>	Installing the Power Module	English	
+	<b>Installation Instructions</b> for reactors, filters and braking resistors	Installing components		

Depth of the information	Manual	Contents	Languages	Download or order number
+++	<b>Hardware Installation Manual</b> for the following SINAMICS G120 Power Modules: <ul style="list-style-type: none"> <li>• PM230 IP20</li> <li>• PM230 IP55</li> <li>• PM240</li> <li>• PM240-2</li> <li>• PM250</li> <li>• PM260</li> <li>• PM330</li> </ul>	Installing power modules, reactors and filters.  Maintaining power modules.	German, English	
+++	<b>Operating Instructions</b> for the following Operator Panels: <ul style="list-style-type: none"> <li>• BOP-2</li> <li>• IOP</li> </ul>	Operating Operator Panels, door mounting kit for mounting of IOP.		

## 5.2 Product support

Table 5- 2 Technical support

France	Germany	Italy	Spain	Great Britain
+33 (0) 821 801 122	+49 (0)911 895 7222	+39 (02) 24362000	+34 902 237 238	+44 161 446 5545
Other service telephone numbers: ( <a href="http://support.automation.siemens.com/WW/view/en/4000024">http://support.automation.siemens.com/WW/view/en/4000024</a> )				



## Additional information

SINAMICS converters:  
[www.siemens.com/sinamics](http://www.siemens.com/sinamics)

Safety Integrated:  
[www.siemens.com/safety-integrated](http://www.siemens.com/safety-integrated)

PROFINET:  
[www.siemens.com/profinet](http://www.siemens.com/profinet)

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