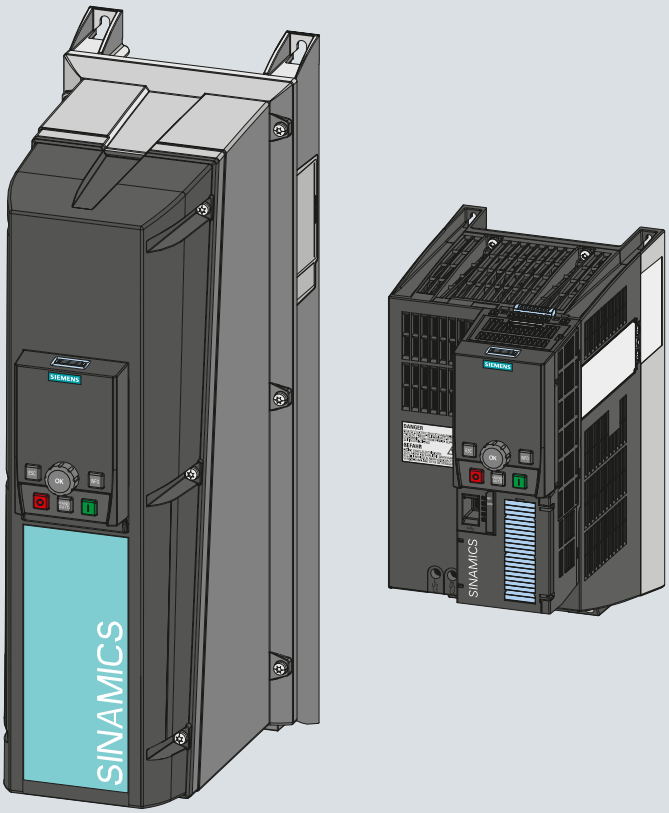
SINAMICS G120

Converters with the Control Units
CU230P-2
CU240B-2
CU240E-2

Getting Started · 01/2013



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SINAMICS G120

Converter with Control Units CU230P-2 CU240B-2 CU240E-2

Getting Started

Edition 01/2013, Firmware V4.6

01/2013, FW V4.6

A5E02792536E AB

Legal information

Warning notice system

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

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

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

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

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

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

Trademarks

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Disclaimer of Liability

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

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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

1

Use for the intended purpose

The frequency converter described in this manual is a device for controlling an asynchronous low-voltage motor. The converter is designed for installation in electrical installations or machines.

It has been approved for industrial and commercial use on industrial networks. Its use in public line supplies requires a different configuration and/or additional measures.

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

⚠DANGER

Danger to life when live parts are touched

Touching live parts can result in death or severe injury.

Note the following:

- Only work on electrical equipment if you are qualified to do so.
- When carrying out any work, always comply with the country-specific safety rules.

Follow the six steps to ensure safety:

1. Prepare for shutdown and inform team members who will be affected by the procedure.
2. Switch off the machine so that it is in a no-voltage state:
   - 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 that all auxiliary circuits are also in a no-voltage state.
   - Ensure that the motor cannot move.
3. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems or water.
4. Isolate or neutralize all hazardous energy sources by closing switches, grounding or short-circuiting or closing valves, for example.
5. Lock out all energy sources to prevent reclosing.
6. Make sure that the machine is completely locked out ... and that you have the right machine!

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

⚠ WARNING

Danger to life when live parts are touched on damaged devices

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

- Ensure compliance with the limit values specified in the technical specifications during transport, storage and operation.
- Do not use any damaged devices.
- The components must be protected against conductive contamination (e.g. by installing them in a cabinet with degree of protection IP54B to EN 60529).

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

⚠ WARNING

Danger of fire spreading due to inadequate housing

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.

⚠ WARNING

Danger of fire through overheating due to insufficient ventilation clearances

Insufficient ventilation clearances increase the probability of failure and reduce the service life of devices. In the worst-case scenario, devices overheating can put persons at risk through smoke development and fire.

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

⚠ WARNING

Danger to life due to unexpected movement of machines when using mobile wireless devices or mobile phones

Using mobile radios or mobile phones with a transmit power > 1 W closer than approx. 2 m to the frequency converter may cause the devices to malfunction, affecting the functional safety of machines and, therefore, putting people at risk or causing material damage.

- Switch off mobile radios and mobile telephones when you are close to the converter.

NOTICE

Damage due to electric fields or electrostatic discharge

Electric fields or electrostatic discharge can result in malfunctions as a result of damaged individual components, integrated circuits, modules or devices.

- Package, store, transport and send the electronic components, modules or devices only in the original product packaging or in other suitable materials, e.g. conductive foam rubber or aluminum foil.
- Only touch components, modules and devices if you are grounded by means of one of the following measures:
  - Wearing an ESD armband or
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container, for example).

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 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 EN 60529).

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

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

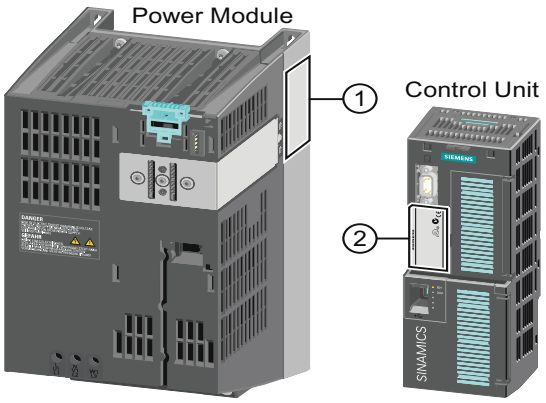
2

2.1 Identifying the converter

Main components of the converter

Each SINAMICS G120 converter 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, current and power
- 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… Functions	CU230P-2 HVAC	CU230P-2 CAN	CU230P-2 DP	CU230P-2 PN
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	**AI0 and AI1**: Voltage or current; **AI2:** Current or temperature sensor (LG-Ni1000/PT1000); **AI3:** Temperature sensor (Ni1000/PT1000);			
Digital outputs	**DO 1** NO contact, **DO0** and **DO2** change-over contact to activate larger loads, AC and DC			
Analog outputs	2			

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

CU240E-2… Functions	CU240E-2	CU240E-2 F	CU240E-2 DP	CU240E-2 DP-F	CU240E-2 PN	CU240E-2 PN-F
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?

Table 2- 1 Permitted combinations of Control Unit and Power Module

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

PM230, 3 AC 400 V - Pumps and fans application area

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 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	FSB	FSC	FSD	FSE	FSF	FSGX
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 …

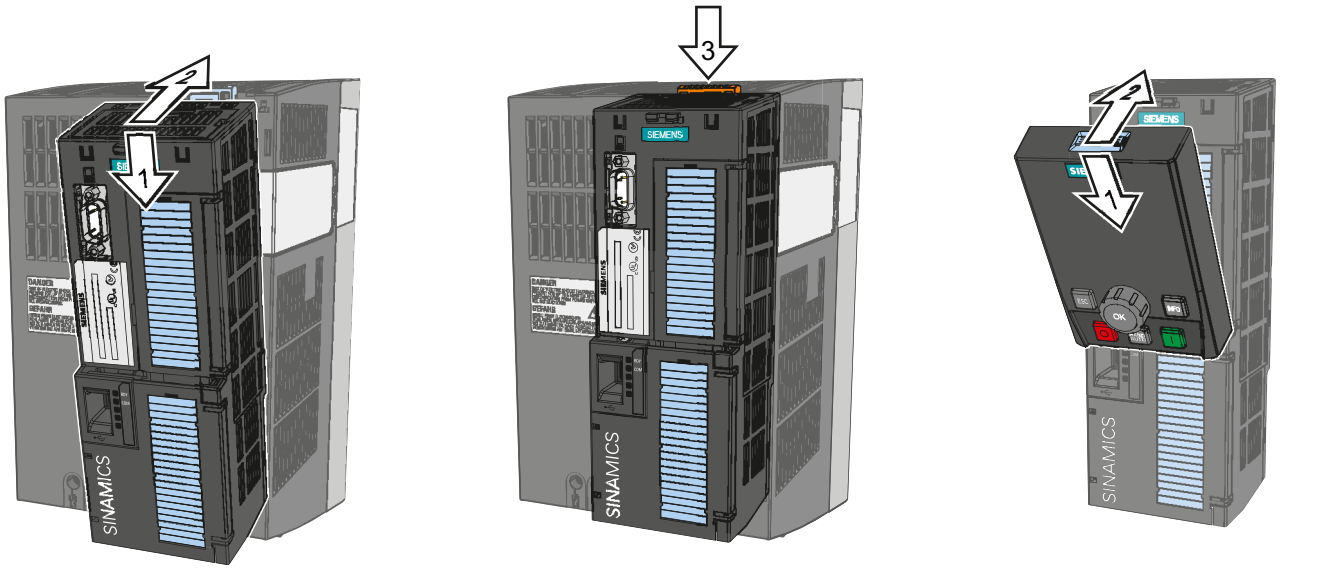
Frame size	FSA	FSB	FSC	FSD	FSE	FSF	FSGX
Power range (kW)	---	---	7,5 … 15	18,5 … 30	37 … 45	55 … 90	---

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	FSA	FSB	FSC	FSD	FSE	FSF	FSGX
Power range (kW)	---	---	---	11 … 18.5	---	30 … 55	---



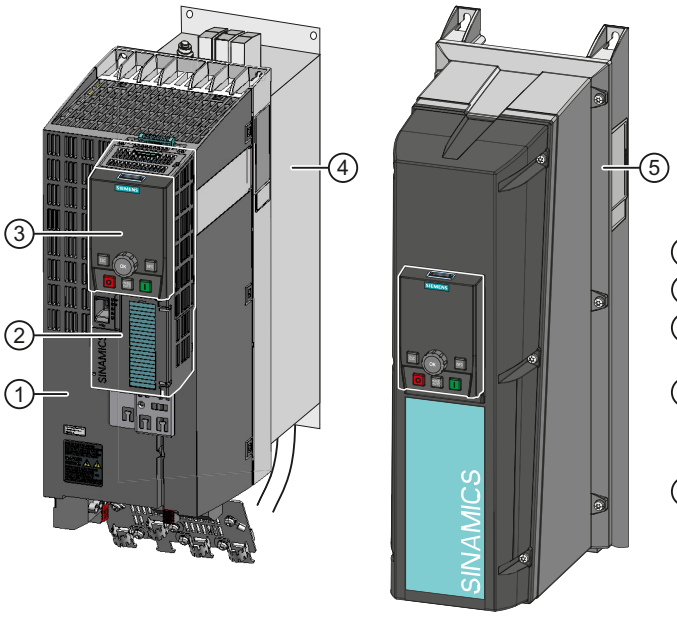
Attaching the CU | Removing the CU | Attaching the Operator Panel

Figure 2-1 Assembling components

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.



① Power Module PM (IP20)
② Control Unit CU
③ Intelligent Operator Panel IOP
④ Base component: filter, reactor or braking resistor
⑤ Power Module PM230 (IP54/UL Type 12) with attached IOP

Figure 2-2 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 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

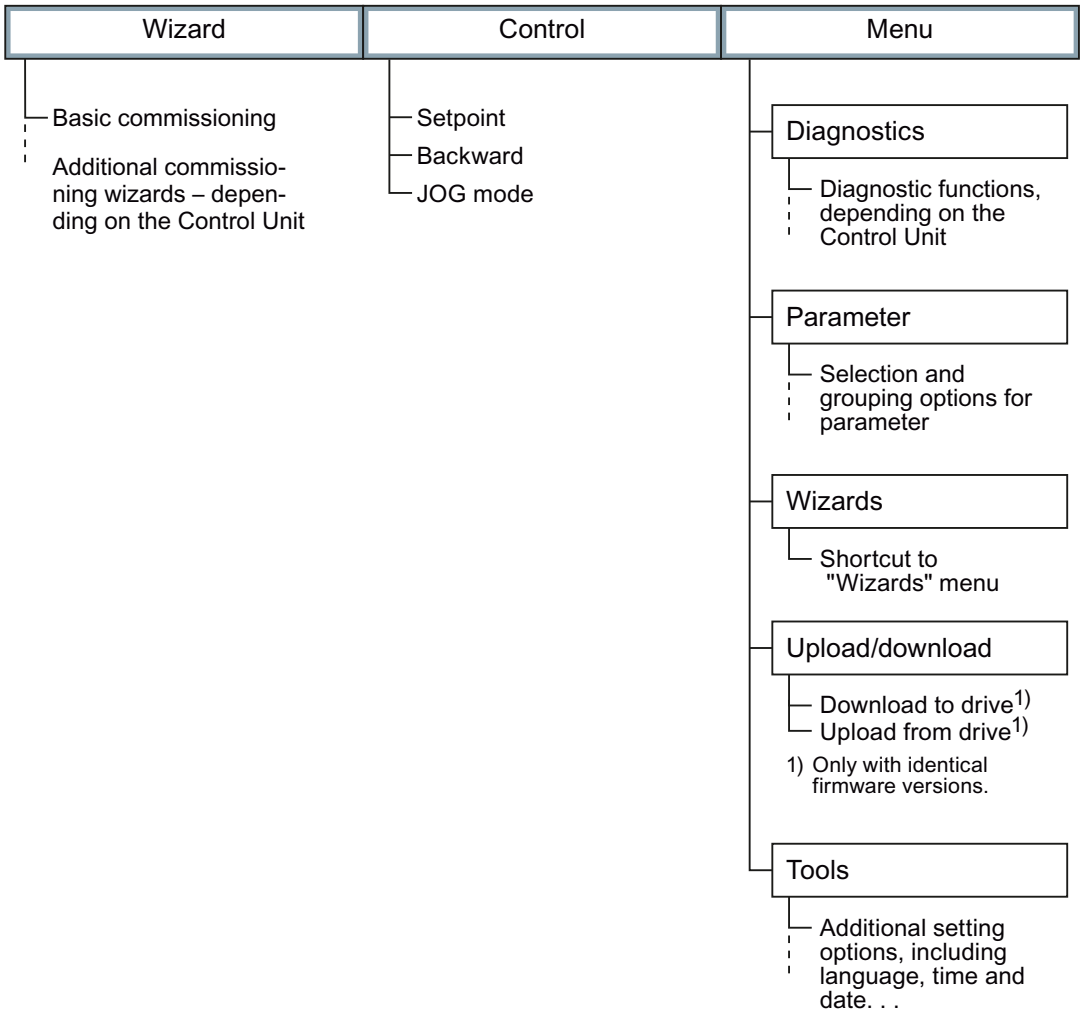
Handling the IOP

OK	• You can select a menu by turning the navigation wheel, e.g. WIZARD • You confirm your selection by pressing on the navigation wheel (OK).
HAND AUTO	By pressing, you can toggle between external command sources and the IOP as command source. • MANUAL means: Manual control using the IOP buttons • AUTO means: The frequency converter responds to the external control commands (e.g. fieldbus or terminals)
I	• In the AUTO mode: without function • In the MANUAL mode: Pressing starts the frequency converter
O	• In the AUTO mode: without function • In the MANUAL mode: – Press briefly: OFF1 - the motor comes to a standstill along the selected down ramp (P1121) – Pressing longer than 3 seconds: OFF2 - the motor coasts down to standstill
INFO	• Pressing supplies information about the actual display • You return to the display by pressing again
ESC	• Press briefly: Return to the previous display • Pressing longer than 3 seconds: The IOP returns to the status screen

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

⚠DANGER

Electric shock due to absence of grounding

If there is no grounding, parts of the inverter can carry hazardous voltage. Touching live parts can result in death or severe injury.

- Connect the PE of the inverter to the protective conductor of the line supply.

⚠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 ≥ 10 mm² Cu.
  - In a multi-core cable the protective conductor has a cross-section of ≥ 2.5 mm² 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.

⚠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 boards, only use power supplies that provide PELV (Protective Extra Low Voltage) or SELV (Safety Extra Low Voltage) output voltages.

3.1 Connection examples of the power modules

Connecting the Power Module to the motor and power supply

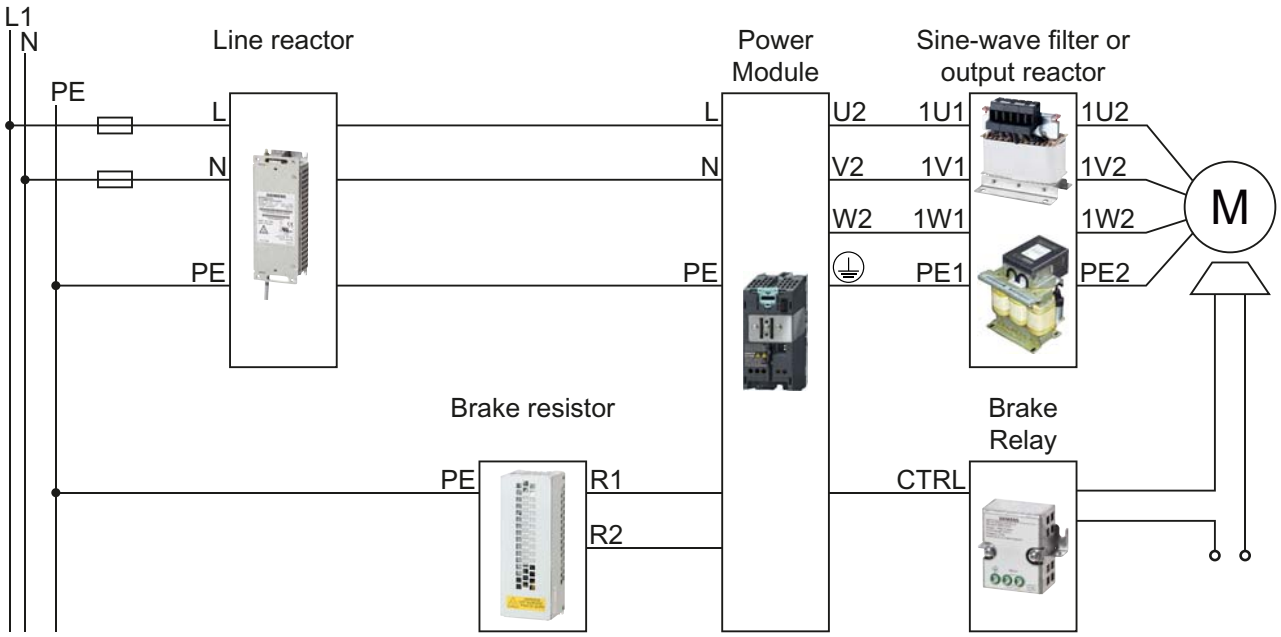


Figure 3-1 Connecting the PM340 1AC Power Module

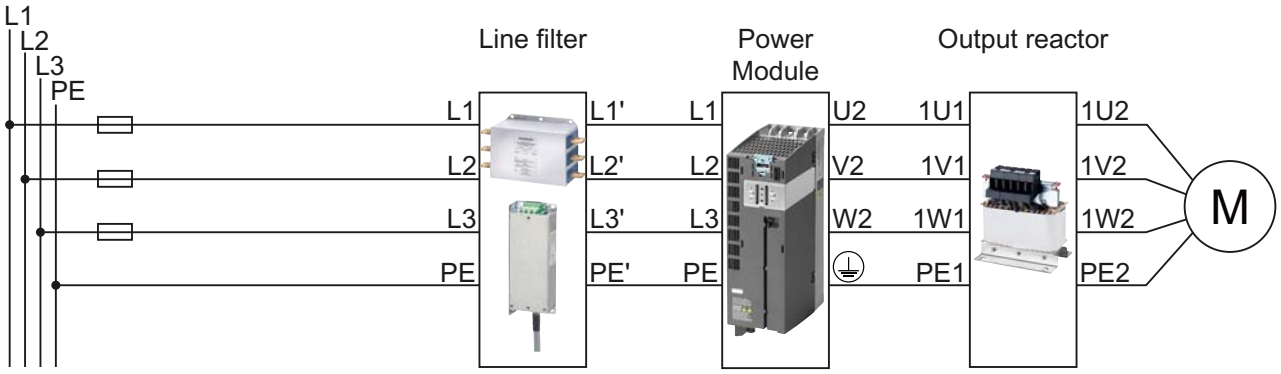


Figure 3-2 Connecting the PM230 IP20 and push-through Power Module

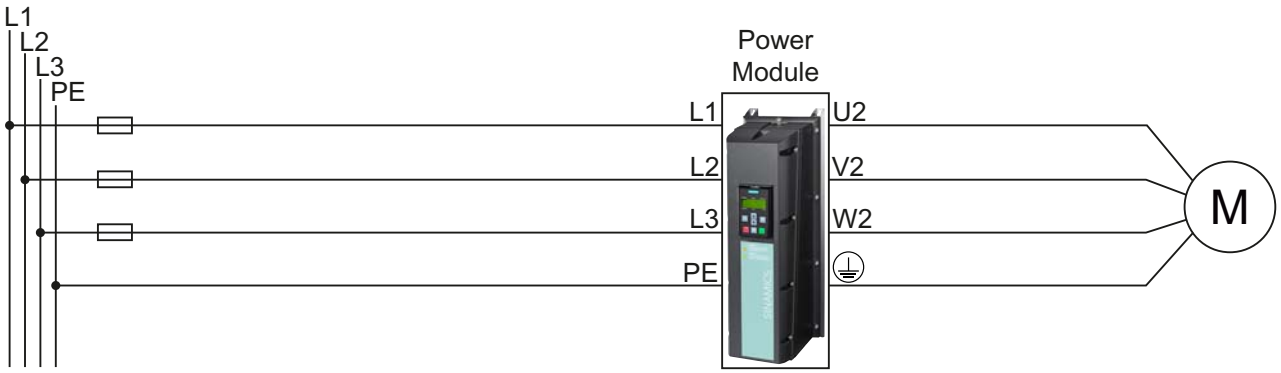


Figure 3-3 Connecting the PM230 IP55 Power Module

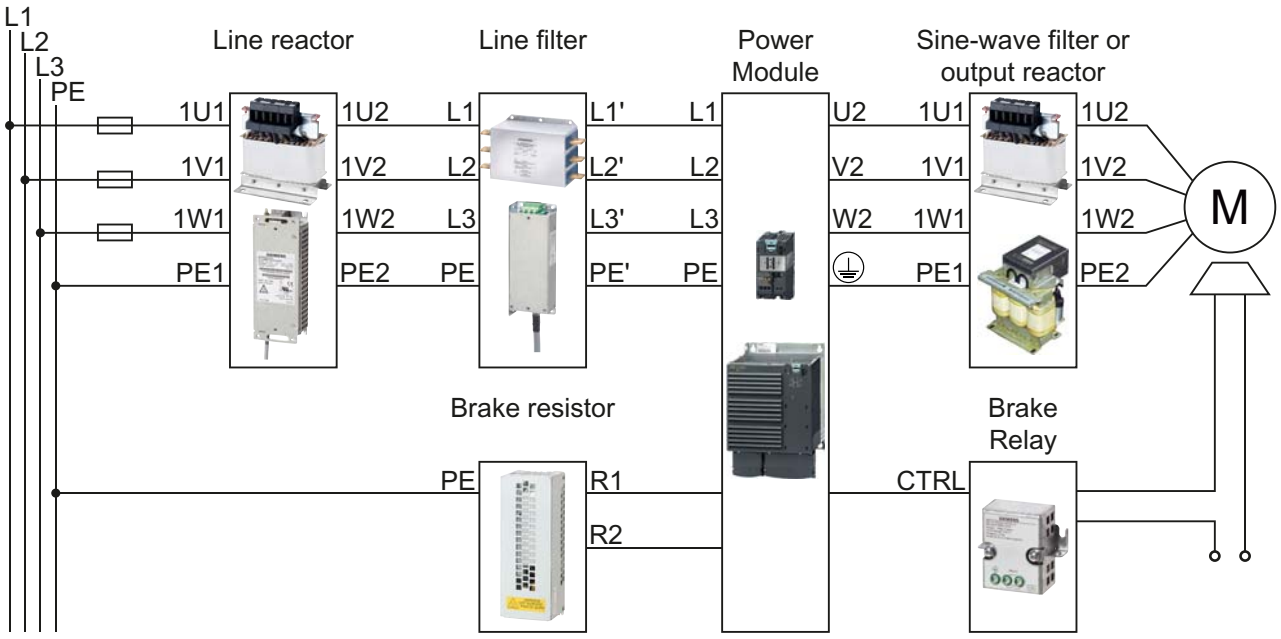


Figure 3-4 Connecting the PM240, PM240-2 IP20 and push-through Power Module

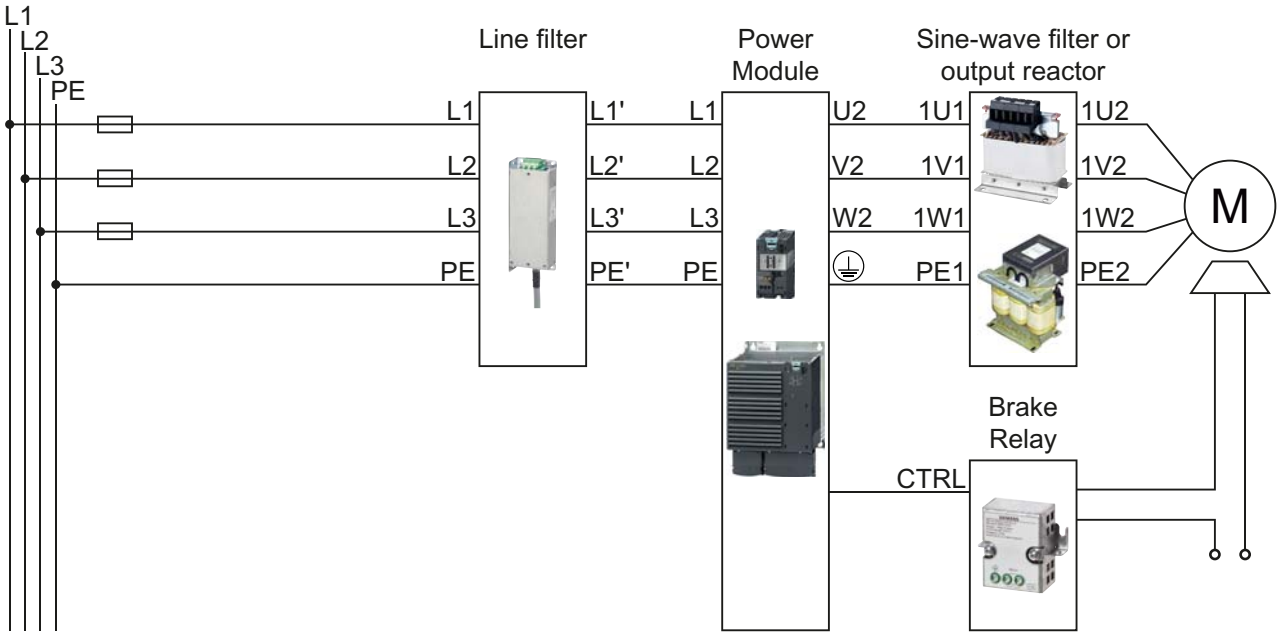


Figure 3-5 Connecting the PM250 Power Module

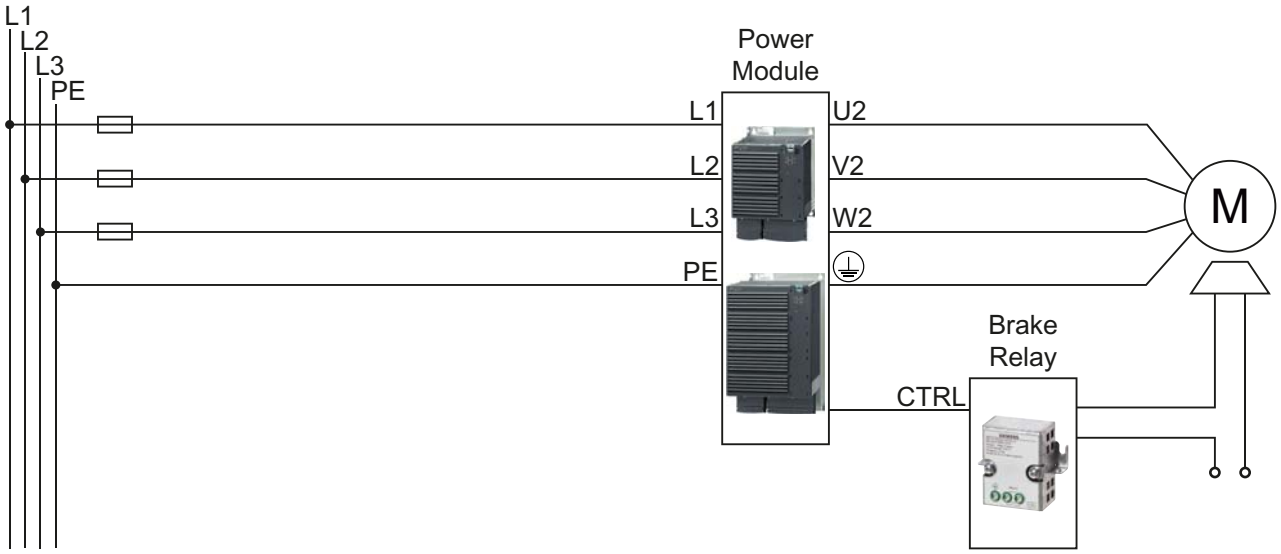


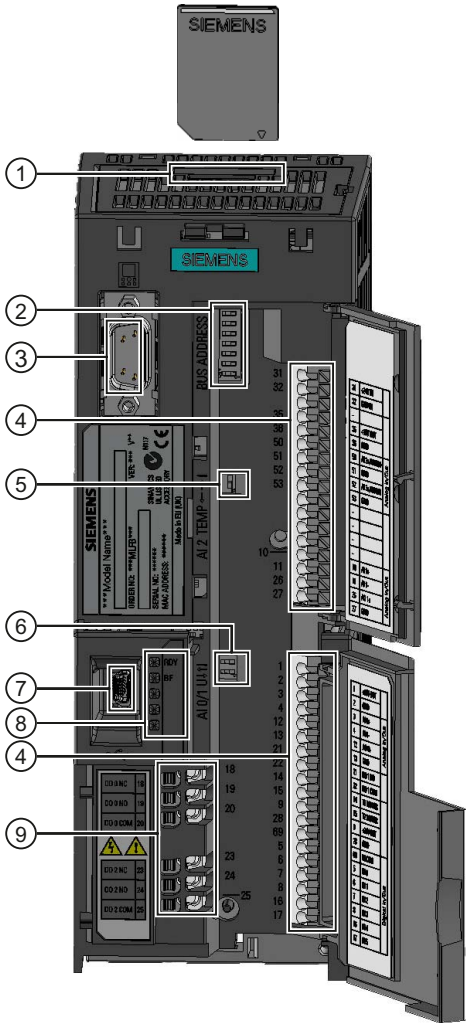
Figure 3-6 Connecting the PM260 Power Module

3.2 Interfaces of the Control Units

3.2.1 Interfaces of the CU230P-2

Interfaces at the front of the Control Unit

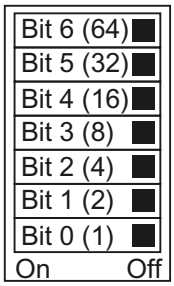
To access the interfaces at the front of the Control Unit, you must lift the Operator Panel (if one is being used) and open the front doors.



① Memory card slot

② Selecting the fieldbus address:

- PROFIBUS
- USS
- Modbus RTU
- CanOpen



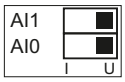
③ Connection to the Operator Panel

④ Terminal strips

⑤ Switch for AI2 (current/temperature)

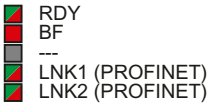
⑥ Switch for AI0 and AI1 (U/I)

- I 0/4 mA … 20 mA
- U -10/0 V … 10 V



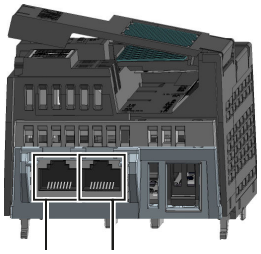
⑦ USB interface for connection to a PC

⑧ Status LED

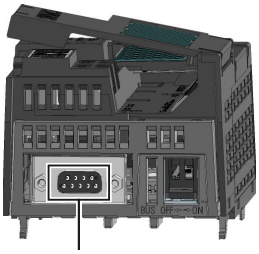


⑨ Terminal strips for the digital outputs

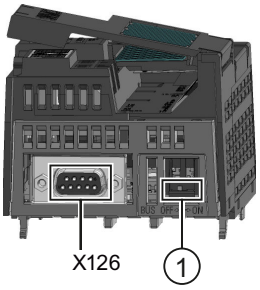
Interfaces on the lower side of the Control Unit



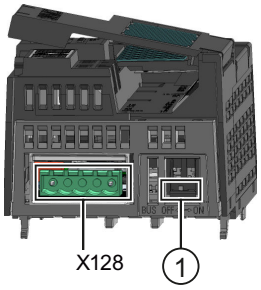
Pin
1 Shield, ground connection
2 Not assigned
3 RxD/TxD-P, receive and transmit (B/B')
4 CNTR-P, control signal
5 DGND, reference potential for data (C/C')
6 VP, supply voltage
7 Not assigned
8 RxD/TxD-N, receive and transmit (A/A')
9 Not assigned



Pin
1 Not assigned
2 CAN_L, CAN signal (dominant low)
3 CAN_GND, CAN ground
4 Not assigned
5 (CAN _SHLD), optional shield
6 (GND), optional ground
7 CAN_H, CAN signal (dominant high)
8 Not assigned
9 Not assigned



Pin
1 RX+, receive data +
2 RX-, receive data -
3 TX+. Transmit data +
4 Not assigned
5 Not assigned
6 TX-, transmit data -
7 Not assigned
8 Not assigned



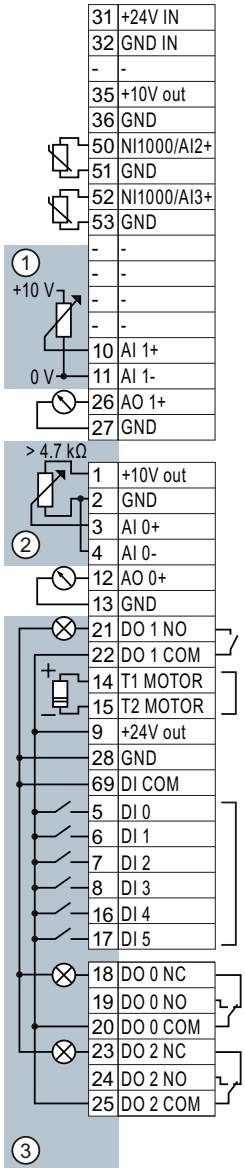
Pin
1 0 V, reference potential
2 RS485P, receive and transmit (+)
3 RS485N, receive and transmit (-)
4 Cable shield
5 Not connected

PROFINET:	X150 P1, X150 P2
RS485:	X128
CANopen:	x126, connector
PROFIBUS:	x126, socket

① Switch for bus terminating resistor

OFF ON

3.2.2 Terminal strips of the CU230P-2



18 V ... 30 V optional voltage supply
Reference potential for terminal 31

10 V output referred to GND, max. 10 mA
Common reference potential
Temperature sensor Pt1000/LG-Ni1000 or analog input
Common reference potential
Temperature sensor Pt1000/LG-Ni1000 or analog input
Common reference potential

Analog input (-10 V ... 10 V, 0/4/-20 mA ... 20 mA)
Reference potential for terminal 10
Analog output (0 V … 10 V, 0 mA … 20 mA)
Common reference potential

10 V output referred to GND, max. 10 mA
Common reference potential
Analog input (-10 V ... 10 V, 0/4/-20 mA ... 20 mA)
Reference potential for terminal 3
Analog output (0 V … 10 V, 0 mA … 20 mA)
Common reference potential

Digital output, max. 0.5 A 30 V DC

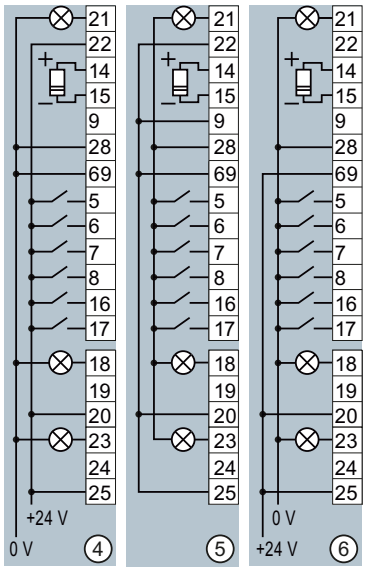
Temperature sensor (PTC, KTY84, bimetal)

24 V output referred to GND, max. 100 mA
Common reference potential
Reference potential for terminals 5 ... 8, 16 and 17

Digital inputs, electrically isolated

Digital output
max. 5 A 30 V DC / 2 A 250 V AC *)

Digital output
max. 5 A 30 V DC / 2 A 250 V AC *)



*) 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.

3.2.3 Interfaces of the CU240B-2 and CU240E-2

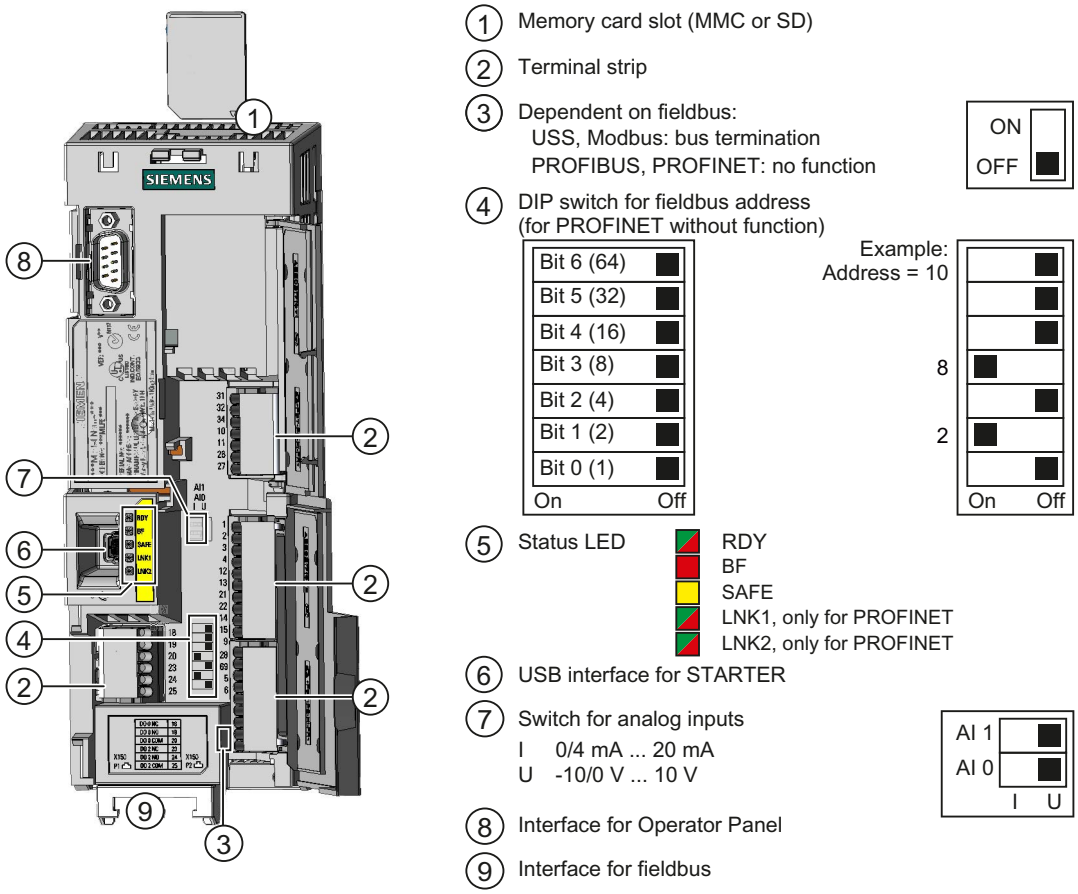
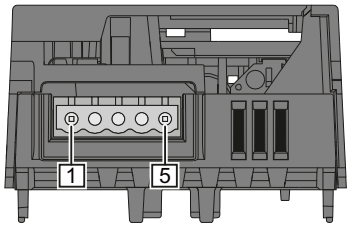


Figure 3-7 Design of the Control Unit using the example of the CU240E-2

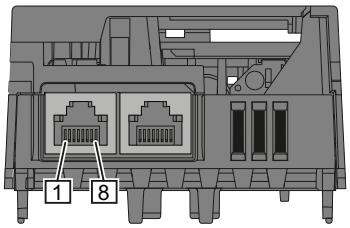
The converter's fieldbus interface is on the bottom of the Control Unit.

RS485 plug for
USS and Modbus RTU (X128)



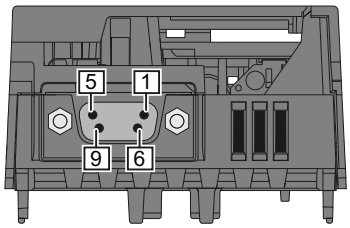
Pin
1 0 V, reference potential
2 RS485P, receive and transmit (+)
3 RS485N, receive and transmit (-)
4 Cable shield
5 Not connected

RJ45 connector socket for PROFINET
IO (X150 P1, X150 P2)



Pin
1 RX+, receive data +
2 RX-, receive data -
3 TX+. Transmit data +
4 Not assigned
5 Not assigned
6 TX-, transmit data -
7 Not assigned
8 Not assigned

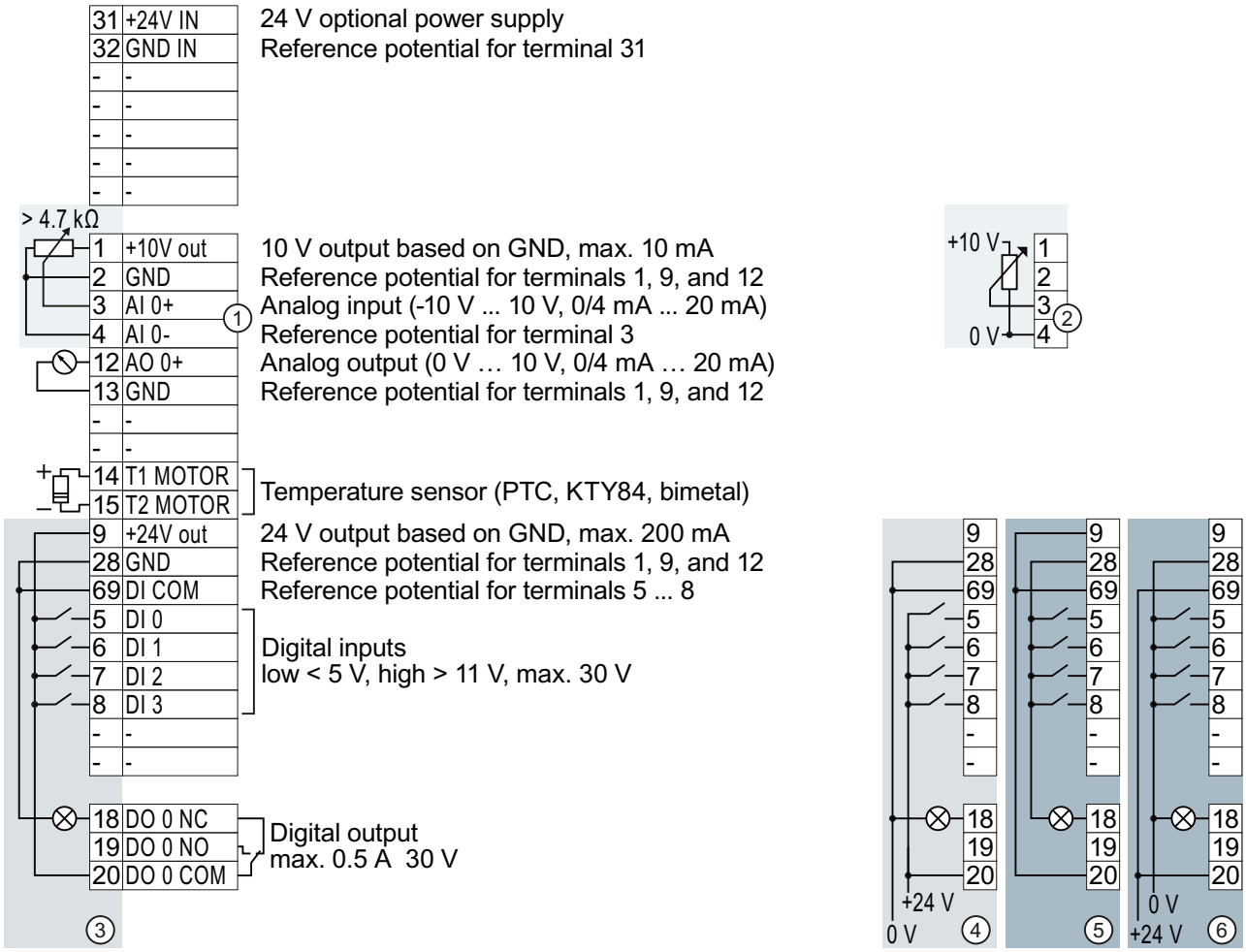
SUB-D socket for PROFIBUS DP
(X126)



Pin
1 Shield, grounding connection
2 Not assigned
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 Not assigned
8 RxD/TxD-N, receive and transmit (A/A')
9 Not assigned

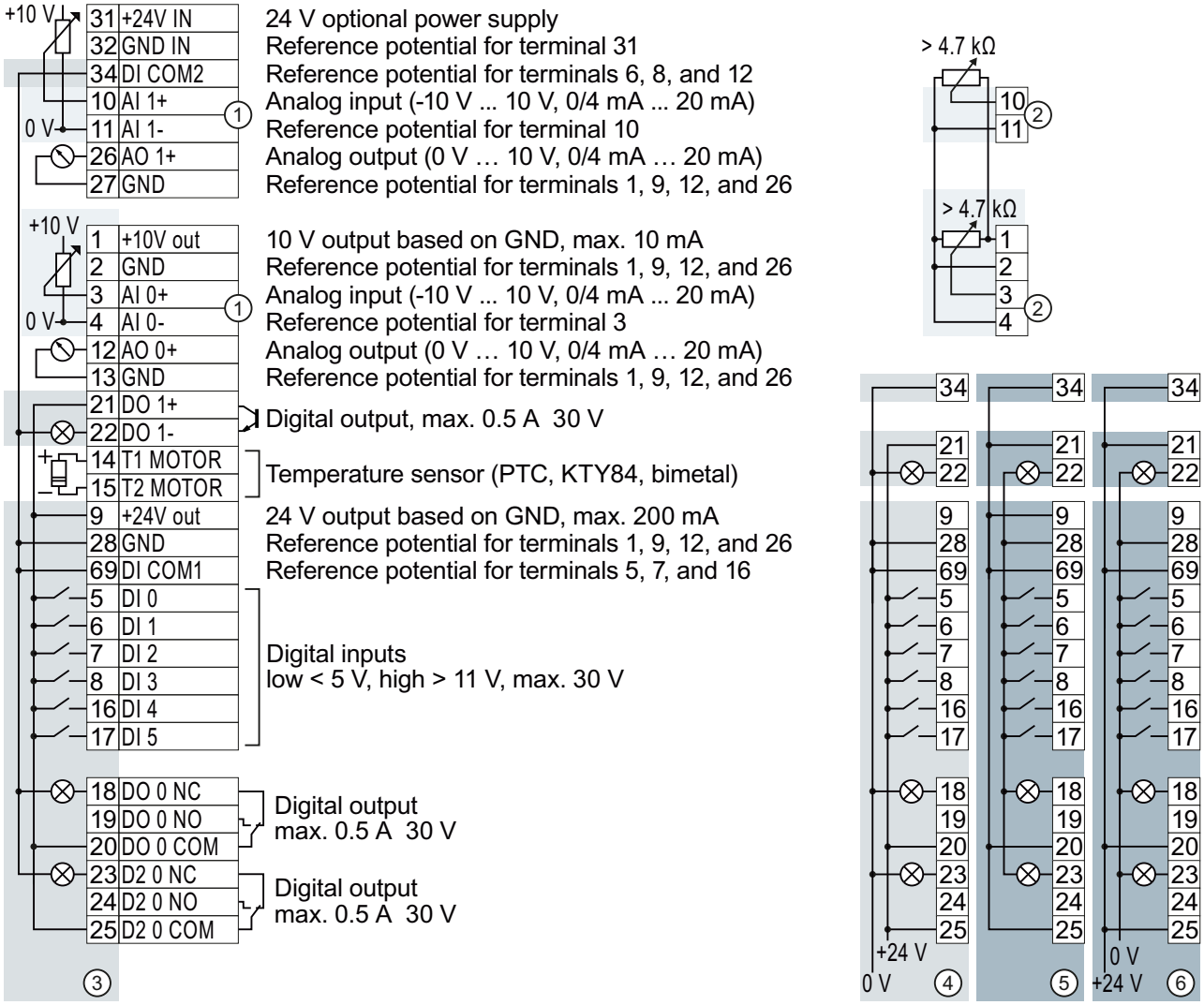
Figure 3-8 Fieldbus interface allocation

3.2.4 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.

3.2.5 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.

3.3 Finding a suitable setting for the interfaces

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

1
2

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.

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**
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 DI 4 and DI 5 = high: the converter adds both fixed speeds.	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 17 DI 5] safety function 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	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 Several DIs = high: the converter adds the corresponding fixed speeds.

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**
PROFIdrive telegram 352 5 DI 0 --- 6 DI 1 --- 7 DI 2 Acknowledge 8 DI 3 --- 16 DI 4 --- 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	PROFIdrive telegram 1 5 DI 0 --- 6 DI 1 --- 7 DI 2 Acknowledge 8 DI 3 --- 16 DI 4] Reserved for 17 DI 5] safety function 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	PROFIdrive telegram 1 Only with Control Units CU240E-2 F, CU240E-2 DP-F, and CU240E-2 PN-F. 5 DI 0] Reserved for 6 DI 1] Safety function 1 7 DI 2 --- 8 DI 3 Acknowledge 16 DI 4] Reserved for 17 DI 5] Safety function 2 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

Macro 7: Switch over between fieldbus and jogging via DI 3 **Control Units CU240B-2** **Factory setting for converters with PROFIBUS interface**		
PROFIdrive telegram 1 5 DI 0 --- 6 DI 1 --- 7 DI 2 Acknowledge 8 DI 3 LOW 3 AI 0 --- 4 18 DO 0 Fault 19 20 12 AO 0 Speed 13 0 V ... 10 V	 5 DI 0 Jog 1 6 DI 1 Jog 2 7 DI 2 Acknowledge 8 DI 3 HIGH 3 AI 0 --- 4 18 DO 0 Fault 19 20 12 AO 0 Speed 13 0 V ... 10 V	

Macro 7: Switch over between fieldbus and jogging via DI 3 **Control Units CU230P-2 and CU240E-2** **Factory setting for converters with PROFIBUS or PROFINET interface**		**Macro 8: Motorized potentiometer (MOP) with safety function** **Control Units CU240E-2**
PROFIdrive telegram 1 5 DI 0 --- 6 DI 1 --- 7 DI 2 Acknowledge 8 DI 3 LOW 16 DI 4 --- 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	 5 DI 0 Jog 1 6 DI 1 Jog 2 7 DI 2 Acknowledge 8 DI 3 HIGH 16 DI 4 --- 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	 5 DI 0 ON/OFF1 6 DI 1 MOP raise 7 DI 2 MOP lower 8 DI 3 Acknowledge 16 DI 4] Reserved for 17 DI 5] safety function 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

Macro 9: Motorized potentiometer (MOP) **Control Units CU240B-2**	**Macro 9: Motorized potentiometer (MOP)** **Control Units CU230P-2 and CU240E-2**	**Macro 12: Two-wire control with method 1** **Control Units CU240B-2** **Factory setting for converters with RS485 interface**
5 DI 0 ON/OFF1 6 DI 1 MOP raise 7 DI 2 MOP lower 8 DI 3 Acknowledge 3 AI 0 --- 4 18 DO 0 Fault 19 20 12 AO 0 Speed 13 0 V ... 10 V	5 DI 0 ON/OFF1 6 DI 1 MOP raise 7 DI 2 MOP lower 8 DI 3 Acknowledge 16 DI 4 --- 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	5 DI 0 ON/OFF1 6 DI 1 Reversing 7 DI 2 Acknowledge 8 DI 3 --- 3 AI 0 Setpoint 4 I⊏■U -10 V ... 10 V 18 DO 0 Fault 19 20 12 AO 0 Speed 13 0 V ... 10 V

Macro 12: Two-wire control with method 1 **Control Units CU230P-2 and CU240E-2** **Factory setting for converters with RS485 interface**	**Macro 13: Setpoint via analog input with safety function** **Control Units CU240E-2**	
5 DI 0 ON/OFF1 6 DI 1 Reversing 7 DI 2 Acknowledge 8 DI 3 --- 16 DI 4 --- 17 DI 5 --- 3 AI 0 Setpoint 4 I⊏■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	5 DI 0 ON/OFF1 6 DI 1 Reversing 7 DI 2 Acknowledge 8 DI 3 --- 16 DI 4] Reserved for 17 DI 5] safety function 3 AI 0 Setpoint 4 I⊏■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	

Macro 14: Switch over between fieldbus and motorized potentiometer (MOP) via DI 3

Control Units CU230P-2 and CU240E-2

PROFIdrive telegram 1

5	DI 0	---
6	DI 1	External fault
7	DI 2	Acknowledge
8	DI 3	LOW
16	DI 4	---
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

5	DI 0	ON/OFF1
6	DI 1	External fault
7	DI 2	Acknowledge
8	DI 3	HIGH
16	DI 4	MOP raise
17	DI 5	MOP lower
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

Macro 15: Switch over between analog setpoint and motorized potentiometer (MOP) via DI 3

Control Units CU230P-2 and CU240E-2

5	DI 0	ON/OFF1
6	DI 1	External fault
7	DI 2	Acknowledge
8	DI 3	LOW
16	DI 4	---
17	DI 5	---
3	AI 0	Setpoint
4		I 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

5	DI 0	ON/OFF1
6	DI 1	External fault
7	DI 2	Acknowledge
8	DI 3	HIGH
16	DI 4	MOP raise
17	DI 5	MOP lower
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

Macro 17: Two-wire control with method 2

Macro 18: Two-wire control with method 3

Control Units CU240B-2

5	DI 0	ON/OFF1 right
6	DI 1	ON/OFF1 left
7	DI 2	Acknowledge
8	DI 3	---
3	AI 0	Setpoint
4		I U -10 V ... 10 V
18	DO 0	Fault
19		
20		
12	AO 0	Speed
13		0 V ... 10 V

Macro 17: Two-wire control with method 2 **Macro 18: Two-wire control with method 3** **Control Units CU230P-2 and CU240E2**	**Macro 19: Three-wire control with method 1** **Control Units CU240B-2**	**Macro 19: Three-wire control with method 1** **Control Units CU230P-2 and CU240E2**
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 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	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 U -10 V ... 10 V 18 DO 0 Fault 19 20 12 AO 0 Speed 13 0 V ... 10 V	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 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

Macro 20: Three-wire control with method 2 **Control Units CU240B-2**	**Macro 20: Three-wire control with method 2** **Control Units CU230P-2 and CU240E2**	**Macro 21: Fieldbus USS** **Control Units CU240B-2**
5 DI 0 Enable/OFF1 6 DI 1 ON 7 DI 2 Reversing 8 DI 3 Acknowledge 3 AI 0 Setpoint 4 I U -10 V ... 10 V 18 DO 0 Fault 19 20 12 AO 0 Speed 13 0 V ... 10 V	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 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	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

Macro 21: Fieldbus USS
Control Units CU230P-2 and CU240E2

USS setting: 38,400 baud, 2 PZD, PKW variable

5	DI 0	---
6	DI 1	---
7	DI 2	Acknowledge
8	DI 3	---
16	DI 4	---
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

Macro 22: Fieldbus CANopen
Control Units CU230P-2

CANopen setting: 20 kBaud

5	DI 0	---
6	DI 1	---
7	DI 2	Acknowledge
8	DI 3	---
16	DI 4	---
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

Macro 101: Universal applications
Control Units CU230P-2

5	DI 0	ON/OFF1
6	DI 1	External error
7	DI 2	Activate ESM
8	DI 3	Fixed speed 1
16	DI 4	Fixed speed 2
17	DI 5	Fixed speed 3
3	AI 0	Setpoint
4		I⊏■U -10 V ... 10 V
52	AI 3	---
53		
18	DO 0	Fault
19		
20		
21	DO 1	Activate
22		converter 2
23	DO 2	Operation
24		
25		
12	AO 0	Speed
13		0 V ... 10 V
26	AO 1	Current
27		0 V ... 10 V

Macro 103: Pump pressure control
Control Units CU230P-2

5	DI 0	ON/OFF1
6	DI 1	---
7	DI 2	---
8	DI 3	---
16	DI 4	---
17	DI 5	---
3	AI 0	Setpoint
4		I⊏■U -10 V ... 10 V
52	AI 3	---
53		
18	DO 0	Fault
19		
20		
21	DO 1	---
22		
23	DO 2	Operation
24		
25		
12	AO 0	Speed
13		0 V ... 10 V
26	AO 1	Current
27		0 V ... 10 V

Macro 104: ESM stairwell pressure control
Control Units CU230P-2

5	DI 0	Activate ESM
6	DI 1	---
7	DI 2	---
8	DI 3	---
16	DI 4	---
17	DI 5	---
3	AI 0	Setpoint
4		I⊏■U -10 V ... 10 V
52	AI 3	---
53		
18	DO 0	Fault
19		
20		
21	DO 1	Alarm
22		
23	DO 2	Operation
24		
25		
12	AO 0	Speed
13		0 V ... 10 V
26	AO 1	Current
27		0 V ... 10 V

Macro 105: Fan pressure control + ESM with fixed setpoint Control Units CU230P-2	Macro 106: Cooling tower with active sensor + hibernation Control Units CU230P-2	Macro 107: Cooling tower with LG-Ni1000 sensor + hibernation Control Units CU230P-2
5 DI 0 ON/OFF1 6 DI 1 Activate ESM 7 DI 2 --- 8 DI 3 --- 16 DI 4 --- 17 DI 5 ---	5 DI 0 ON/OFF1 6 DI 1 --- 7 DI 2 --- 8 DI 3 --- 16 DI 4 --- 17 DI 5 ---	5 DI 0 ON/OFF1 6 DI 1 --- 7 DI 2 --- 8 DI 3 --- 16 DI 4 --- 17 DI 5 ---
3 AI 0 Setpoint 4 I U -10 V ... 10 V 52 AI 3 --- 53	3 AI 0 Setpoint 4 I U -10 V ... 10 V 52 AI 3 --- 53	3 AI 0 --- 4 52 AI 3 Setpoint 53
18 DO 0 Fault 19 20 21 DO 1 Alarm 22 23 DO 2 Operation 24 25	18 DO 0 Fault 19 20 21 DO 1 Alarm 22 23 DO 2 Operation 24 25	18 DO 0 Fault 19 20 21 DO 1 Alarm 22 23 DO 2 Operation 24 25
12 AO 0 Speed 13 0 V ... 10 V 26 AO 1 Current 27 0 V ... 10 V	12 AO 0 Speed 13 0 V ... 10 V 26 AO 1 Current 27 0 V ... 10 V	12 AO 0 Speed 13 0 V ... 10 V 26 AO 1 Current 27 0 V ... 10 V

Macro 111: Setpoints via fixed frequencies Control Units CU230P-2	Macro 112: CO2 sensor with additional setpoint Control Units CU230P-2	
5 DI 0 Fixed frequency 1 6 DI 1 Fixed frequency 2 7 DI 2 Fixed frequency 3 8 DI 3 Fixed frequency 4 16 DI 4 --- 17 DI 5 ---	5 DI 0 ON/OFF1 6 DI 1 External error 7 DI 2 Boost 8 DI 3 --- 16 DI 4 --- 17 DI 5 ---	
3 AI 0 --- 4 52 AI 3 --- 53	3 AI 0 Setpoint 4 I U -10 V ... 10 V 52 AI 3 --- 53	
18 DO 0 Fault 19 20 21 DO 1 Alarm 22 23 DO 2 Operation 24 25	18 DO 0 Fault 19 20 21 DO 1 Alarm 22 23 DO 2 Operation 24 25	
12 AO 0 Speed 13 0 V ... 10 V 26 AO 1 Current 27 0 V ... 10 V	12 AO 0 Speed 13 0 V ... 10 V 26 AO 1 Current 27 0 V ... 10 V	

3.4 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. Overvoltage 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.

Prerequisites

- Use suitable cables:
  - Solid or flexible cables.
  - Suitable cable cross-section: 0.5 mm² (21 AWG) to 1.5 mm² (16 AWG).

    When completely connecting up the unit, we recommend cables with a cross-section of 1 mm² (18 AWG).
- Do not use wire end ferrules.
- You have found an appropriate pre-assignment for the terminal strips, which you can now use to wire the inverter.

  See also Section: Finding a suitable setting for the interfaces (Page 29).
- You have the appropriate tools:
  - Small screwdriver to open the spring-loaded terminals
  - Tool for stripping the cables

Procedure

To wire 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. Wire all the required terminals on the 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 a cable grip.

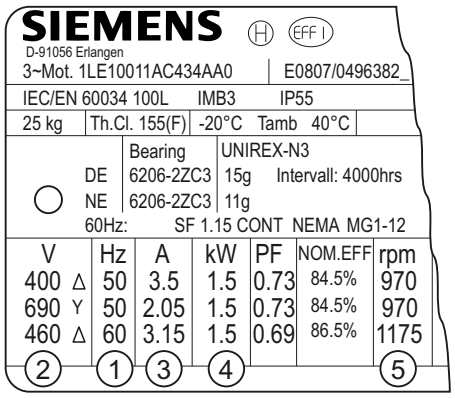
☐ You have now wired the inverter's terminal strips.

Commissioning

4

Commissioning is carried out with the IOP using one of the "basic commissioning wizards (Page 17)". 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 "Finding a suitable setting for the interfaces (Page 29)".



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 43)").
- 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 (Section "Data backup on the memory card (Page 48)").

4.1 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[1)] 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: Finding a suitable setting for the interfaces (Page 29)	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 = …

No.	Input screen of the IOP	Selected setting on the IOP	Parameter
2621	Overview of the settings	Check list + select **< Continue >**	Confirm with OK
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.

⚠ CAUTION

Motor data identification for dangerous loads

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.

☐ You have completed the converter's basic commissioning.

4.2 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.

NOTICE

STO via terminal

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.

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

1
2 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.

4.3 The most important parameters at a glance

Table 4- 1 **Defining the interfaces of the frequency converter**

Parameter	Possible settings
p0015	**Macro drive unit** Define the pre-assignment for the inputs and outputs using one of the macros 1 to 22 Auto-Hotspot.

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	**Set the baud rate**			
	Value	Baud rate	Value	Baud rate
	4	2400	9	57600
	5	4800	10	76800
	6	9600	11	93750
	7	19200	12	115200
	8	38400	13	187500
p2022	**Fieldbus interface USS PZD number** Sets the number of 16-bit words in the PZD part of the USS telegram Setting range: 0… 8 (0 … 8 words)			
p2023	**Fieldbus interface USS PKW number** Sets the number of 16-bit words in the PKW part of the USS telegram Setting range: • 0, 3, 4: 0, 3 or 4 words • 127: variable length			

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	**Setting the open-loop and closed-loop control mode of a drive** 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	**Motor standard IEC/NEMA** 0: Europe 50 [Hz]
p0300	**Motor type selection** 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

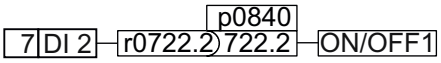
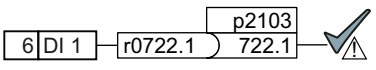
Changing the function	Examples
1. Select the required function marked using a "BI" parameter. 2. Set this parameter to the value of the status parameter r0722.x of the required digital input.	*Function*: Switch on motor via DI 2. *Setting*: p0840 = 722.2 
	Function: Acknowledge fault using DI 1. *Setting*: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

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

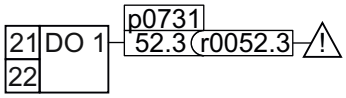
Changing the function	Example
1. Select the required function marked using a "BO" parameter. 2. Set the parameter p073x of the required digital output to the value of the "BO" parameter.	*Function*: Signal "Fault" on DO 1. *Setting*: p0731 = 52.3 

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

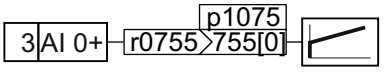
Changing the function	Examples
1. Select the required function marked using a "CI" parameter. 2. Set this parameter to the value of status parameter r0755.x of the analog input.	*Function*: AI 0 provides the setpoint for the PID controller. *Setting*: p2253 = 55[0] 
Use parameter p0756[0] and the I/U 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

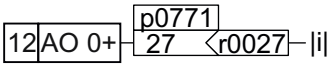
Changing the function	Examples
1. Select the required function marked using a "CO" parameter. 2. Set parameter p0771 of the analog output to the value of the "CO" parameter.	*Function*: Signal "Current" at AO 0. *Setting*: p0771 = 27 
Use parameter p0776[0] to configure the analog input as voltage or 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		

4.4 Data backup on the memory card

To save the settings of the frequency converter you require an empty memory card. Proceed as follows:

- Switch off the frequency converter power supply
- Wait until the frequency converter is in a completely no-voltage condition and no LED on the Control Unit is lit.
- Insert the empty memory card into the card slot on the Control Unit.
- Then switch-on the frequency converter power supply again.

After the power supply has been switched on, the frequency converter copies its settings to the memory card.

Note

If the memory card already contains settings of another frequency converter, then the frequency converter does not write its settings to the memory card, but takes the settings from the memory card.

4.5 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: (http://support.automation.siemens.com/WW/view/en/23450835)	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: (http://support.automation.siemens.com/WW/view/en/26641490)	
EDS for CANopen	Internet: (http://support.automation.siemens.com/WW/view/en/48351511)	---
EDS for Ethernet/IP	---	Further information can be found in the operating instructions

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