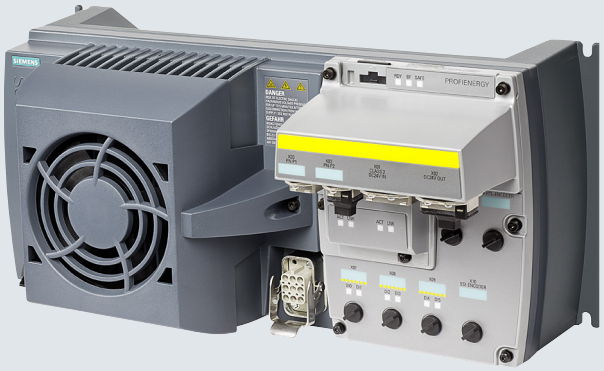
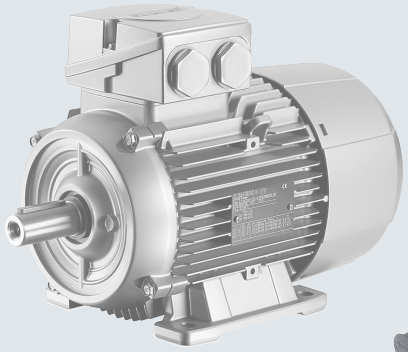
SIEMENS





Getting Started

SINAMICS

SINAMICS G120D

Distributed converter
Control Units CU240D-2 and CU250D-2
with encoder evaluation

Edition 04/2018

www.siemens.com/drives

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SINAMICS

SINAMICS G120D
SINAMICS G120D converter

Getting Started

Edition 04/2018, firmware V4.7 SP10

04/2018, FW V4.7 SP10

A5E38556189B AC

Legal information

Warning notice system

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

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

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

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

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

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

Trademarks

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

Disclaimer of Liability

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

Siemens AG
Division Digital Factory
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A5E38556189B AC
℗ 04/2018 Subject to change

Table of contents

About this manual

1

This manual describes how you install the CU230P-2 Control Unit of the SINAMICS G120P inverter and commission it.

What is the meaning of the symbols in the manual?

 Reference to further information in the manual

 Download from the Internet

 DVD that can be ordered

End of a handling instruction.
❒

Firmware upgrade and downgrade

Options for upgrading and downgrading the firmware can be found in the Internet:

 http://support.automation.siemens.com/WW/view/de/67364620
(http://support.automation.siemens.com/WW/news/en/67364620)

Transferring OSS license terms to a PC

Procedure

To transfer OSS license terms to a PC, proceed as follows:

1. Switch off the inverter power supply.
2. Insert an empty memory card into the card slot of the inverter.

    Overview of the interfaces (Page 26)
3. Switch on the inverter power supply.
4. The inverter writes file "Read_OSS.ZIP" to the memory card within approximately 30 seconds.
5. Switch off the inverter power supply.
6. Withdraw the memory card from the inverter.
7. Insert the memory card into the card reader of a PC.
8. Please read the license terms.

 You have transferred the OSS license terms to a PC.

Fundamental safety instructions

2

2.1 General safety instructions

⚠WARNING

Electric shock and danger to life due to other energy sources

Touching live components can result in death or severe injury.

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

Generally, the following six steps apply when establishing safety:

1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
3. Wait until the discharge time specified on the warning labels has elapsed.
4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
5. Check whether the existing auxiliary supply circuits are de-energized.
6. Ensure that the motors cannot move.
7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state.
8. Check that the correct drive system is completely locked.

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

⚠WARNING

Risk of electric shock and fire from supply networks with an excessively high impedance

Excessively low short-circuit currents can lead to the protective devices not tripping or tripping too late, and thus causing electric shock or a fire.

- In the case of a conductor-conductor or conductor-ground short-circuit, ensure that the short-circuit current at the point where the inverter is connected to the line supply at least meets the minimum requirements for the response of the protective device used.
- You must use an additional residual-current device (RCD) if a conductor-ground short circuit does not reach the short-circuit current required for the protective device to respond. The required short-circuit current can be too low, especially for TT supply systems.

⚠WARNING

Risk of electric shock and fire from supply networks with an excessively low impedance

Excessively high short-circuit currents can lead to the protective devices not being able to interrupt these short-circuit currents and being destroyed, and thus causing electric shock or a fire.

- Ensure that the prospective short-circuit current at the line terminal of the inverter does not exceed the breaking capacity (SCCR or Icc) of the protective device used.

⚠WARNING

Electric shock if there is no ground connection

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

- Ground the device in compliance with the applicable regulations.

⚠WARNING

Electric shock due to connection to an unsuitable power supply

When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage that might result in serious injury or death.

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

⚠WARNING

Electric shock due to equipment damage

Improper handling may cause damage to equipment. For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

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

⚠WARNING

Electric shock due to unconnected cable shield

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

- As a minimum, connect cable shields and the conductors of power cables that are not used (e.g. brake cores) at one end at the grounded housing potential.

⚠WARNING

Arcing when a plug connection is opened during operation

Opening a plug connection when a system is operation can result in arcing that may cause serious injury or death.

- Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.

⚠WARNING

Electric shock due to residual charges in power components

Because of the capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off. Contact with live parts can result in death or serious injury.

- Wait for 5 minutes before you check that the unit really is in a no-voltage condition and start work.

NOTICE

Property damage due to loose power connections

Insufficient tightening torques or vibration can result in loose power connections. This can result in damage due to fire, device defects or malfunctions.

- Tighten all power connections to the prescribed torque.
- Check all power connections at regular intervals, particularly after equipment has been transported.

⚠WARNING

Spread of fire from built-in devices

In the event of fire outbreak, the enclosures of built-in devices cannot prevent the escape of fire and smoke. This can result in serious personal injury or property damage.

- Install built-in units in a suitable metal cabinet in such a way that personnel are protected against fire and smoke, or take other appropriate measures to protect personnel.
- Ensure that smoke can only escape via controlled and monitored paths.

⚠WARNING

Active implant malfunctions due to electromagnetic fields

Inverters generate electromagnetic fields (EMF) in operation. People with active implants in the immediate vicinity of this equipment are at particular risk.

- As the operator of an EMF-emitting installation, assess the individual risks of persons with active implants. The following clearances are usually adequate:
  - No clearance to closed control cabinets and shielded MOTION-CONNECT supply cables
  - Forearm length (approx. 35 cm clearance) to distributed drive systems and open control cabinets

⚠WARNING

Unexpected movement of machines caused by radio devices or mobile phones

When radio devices or mobile phones with a transmission power > 1 W are used in the immediate vicinity of components, they may cause the equipment to malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.

- If you come closer than around 2 m to such components, switch off any radios or mobile phones.
- Use the "SIEMENS Industry Online Support app" only on equipment that has already been switched off.

NOTICE

Damage to motor insulation due to excessive voltages

When operated on systems with grounded line conductor or in the event of a ground fault in the IT system, the motor insulation can be damaged by the higher voltage to ground. If you use motors that have insulation that is not designed for operation with grounded line conductors, you must perform the following measures:

- IT system: Use a ground fault monitor and eliminate the fault as quickly as possible.
- TN or TT systems with grounded line conductor: Use an isolating transformer on the line side.

⚠WARNING

Fire due to inadequate ventilation clearances

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

⚠WARNING

Unrecognized dangers due to missing or illegible warning labels

Dangers might not be recognized if warning labels are missing or illegible. Unrecognized dangers may cause accidents resulting in serious injury or death.

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

NOTICE

Device damage caused by incorrect voltage/insulation tests

Incorrect voltage/insulation tests can damage the device.

- Before carrying out a voltage/insulation check of the system/machine, disconnect the devices as all converters and motors have been subject to a high voltage test by the manufacturer, and therefore it is not necessary to perform an additional test within the system/machine.

⚠WARNING

Unexpected movement of machines caused by inactive safety functions

Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in serious injury or death.

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

Note

Important safety notices for Safety Integrated functions

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

⚠WARNING

Malfunctions of the machine as a result of incorrect or changed parameter settings

As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.

- Protect the parameterization (parameter assignments) against unauthorized access.
- Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off.

2.2 Equipment damage due to electric fields or electrostatic discharge

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

NOTICE

Equipment damage due to electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g conductive foam rubber of aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
  - Wearing an ESD wrist strap
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

2.3 Warranty and liability for application examples

Application examples are not binding and do not claim to be complete regarding configuration, equipment or any eventuality which may arise. Application examples do not represent specific customer solutions, but are only intended to provide support for typical tasks.

As the user you yourself are responsible for ensuring that the products described are operated correctly. Application examples do not relieve you of your responsibility for safe handling when using, installing, operating and maintaining the equipment.

2.4 Industrial security

Note

Industrial security

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

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the Internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit:

Industrial security (http://www.siemens.com/industrialsecurity)

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed at:

Industrial security (http://www.siemens.com/industrialsecurity)

Further information is provided on the Internet:

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

⚠WARNING

Unsafe operating states resulting from software manipulation

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

- Keep the software up to date.
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.
- Make sure that you include all installed products into the holistic industrial security concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
- Protect the drive against unauthorized changes by activating the "know-how protection" drive function.

2.5 Residual risks of power drive systems

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

1. Unintentional movements of driven machine or system components during commissioning, operation, maintenance, and repairs caused by, for example,
   - Hardware and/or software errors in the sensors, control system, actuators, and cables and connections
   - Response times of the control system and of the drive
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of wireless devices/mobile phones in the immediate vicinity of electronic components
   - External influences/damage
   - X-ray, ionizing radiation and cosmic radiation
2. Unusually high temperatures, including open flames, as well as emissions of light, noise, particles, gases, etc., can occur inside and outside the components under fault conditions caused by, for example:
   - Component failure
   - Software errors
   - Operation and/or environmental conditions outside the specification
   - External influences/damage
3. Hazardous shock voltages caused by, for example:
   - Component failure
   - Influence during electrostatic charging
   - Induction of voltages in moving motors
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly
6. Influence of network-connected communication systems, e.g. ripple-control transmitters or data communication via the network

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

Introduction

3

3.1 SINAMICS G120D converter

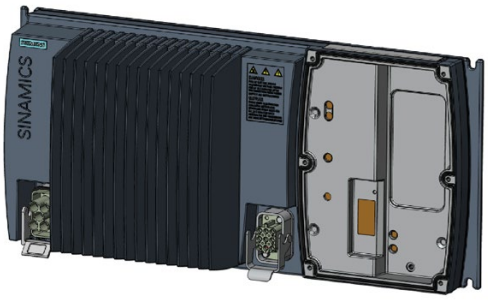
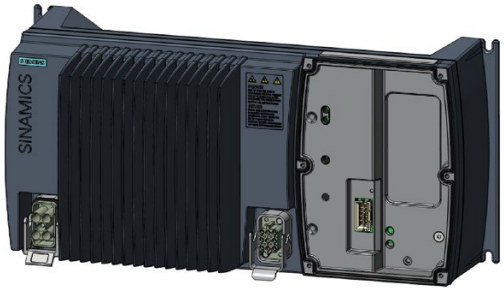
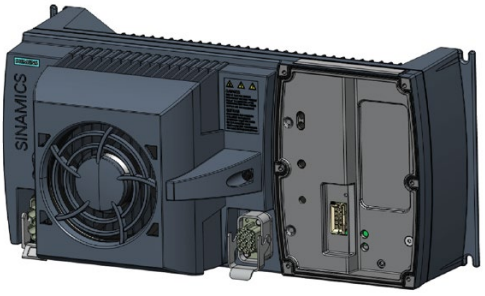
Overview

The SINAMICS G120D is a range of converters for controlling the speed of three-phase motors. The converter consists of two parts, the Control Unit and the Power Module.

Table 3- 1 Control Units of the SINAMICS G120D converter

	Designation	Article number	Encoder type	Field bus
	CU240D-2 DP	6SL3544-0FB20-1PA0	HTL Encoder	PROFIBUS
	CU240D-2 DP-F	6SL3544-0FB21-1PA0		
	CU250D-2 DP-F	6SL3546-0FB21-1PA0	HTL Encoder SSI Absolute Encoder	
	CU240D-2 PN	6SL3544-0FB20-1FA0	HTL Encoder	PROFINET, Ether-Net/IP
	CU240D-2 PN-F	6SL3544-0FB21-1FA0		
	CU250D-2 PN-F	6SL3546-0FB21-1FA0	HTL Encoder SSI Absolute Encoder	
	CU240D-2 PN-F PP Push-Pull connections	6SL3544-0FB21-1FB0	HTL Encoder	
	CU240D-2 PN-F FO Fibre optic connections	6SL3544-0FB21-1FC0		
	CU250D-2 PN-F PP Push-Pull connections	6SL3546-0FB21-1FB0	HTL Encoder SSI Absolute Encoder	
	CU250D-2 PN-F FO Fibre optic connections	6SL3546-0FB21-1FC0		

Table 3- 2 PM250D Power Modules for the SINAMICS G120D converter

	Frame size	Rated output power	Rated output current	Article number
		based on High Overload (HO)		
	FSA	0.75 kW	2.2 A	6SL3525-0PE17-5AA1
		1.5 kW	4.1 A	6SL3525-0PE21-5AA1
	FSB	3.0 kW	7.7 A	6SL3525-0PE23-0AA1
	FSC	4.0 kW	10.2 A	6SL3525-0PE24-0AA1
		5.5 kW	13.2 A	6SL3525-0PE25-5AA1
		7.5 kW	19.0 A	6SL3525-0PE27-5AA1

3.2 Commissioning tools

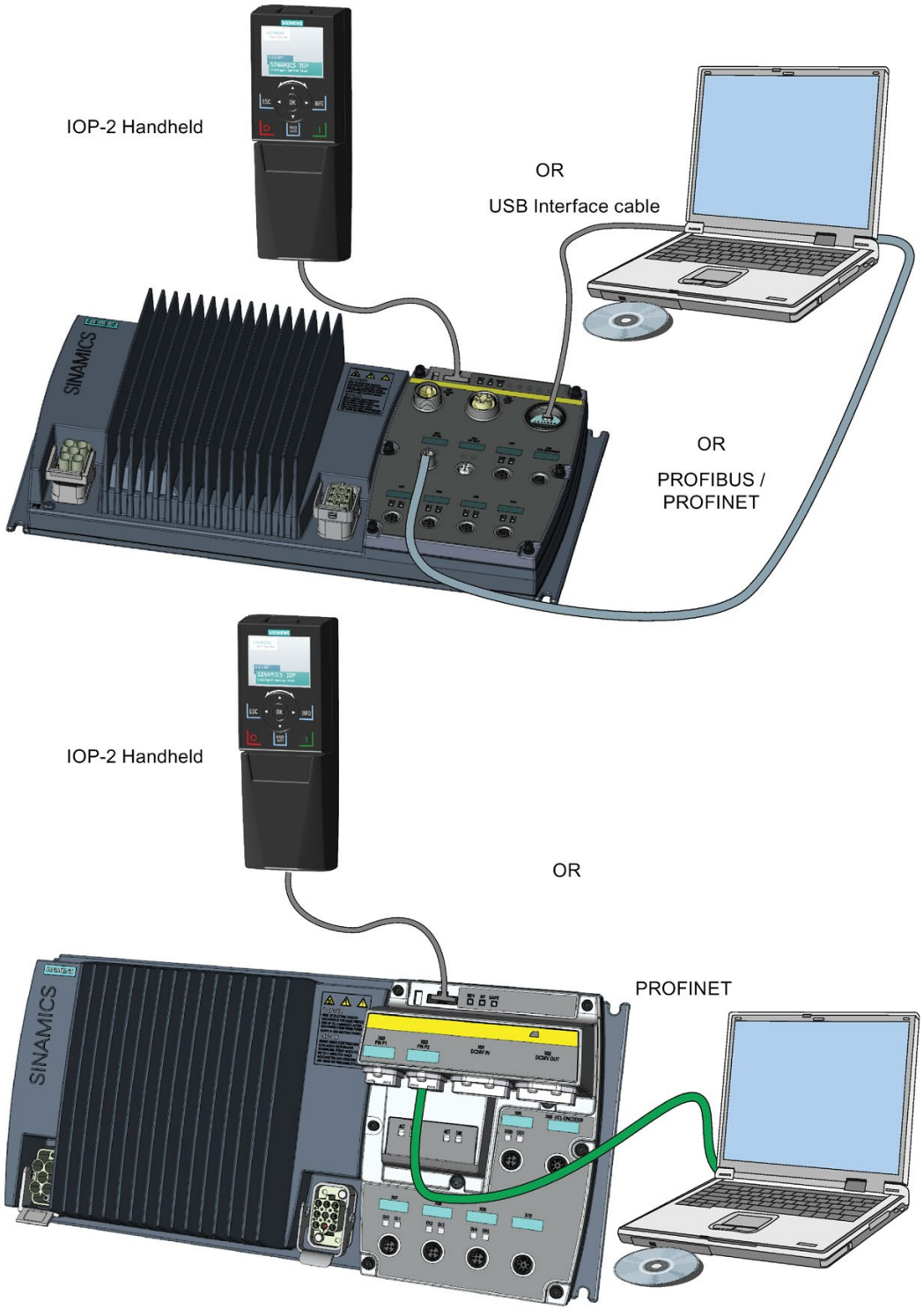


Figure 3-1 Commissioning tools - PC or IOP-2 Handheld Kit

IOP-2 Handheld: Article number 6SL3255-0AA00-4HA1

Connection cable (3 m) between PC and converter: Article number 6SL3255-0AA00-2CA0

You obtain STARTER and Startdrive on a DVD:

- STARTER: Article number 6SL3072-0AA00-0AG0
- Startdrive: Article number 6SL3072-4CA02-1XG0

STARTER and Startdrive download:

- STARTER Download (http://support.automation.siemens.com/WW/view/en/26233208)
- Startdrive (http://support.automation.siemens.com/WW/view/en/68034568)

Help regarding operation:

- STARTER videos (http://www.automation.siemens.com/mcms/mc-drives/en/low-voltage-inverter/sinamics-g120/videos/Pages/videos.aspx)
- Startdrive tutorial (http://support.automation.siemens.com/WW/view/en/73598459)

Installation

4

4.1 Fitting the CU to the PM

Fitting the Control Unit to the Power Module

The inverter is delivered as two separate components - the Power Module (PM) and the Control Unit (CU). The CU must be fitted to the PM prior to any further commissioning taking place.

NOTICE
Damage due to incorrectly fitted seal If the seal is not fitted correctly, the drive will not reach IP65 rating. In this case the converter is not protected against water or dust. This may damage the converter. • Fit the seal correctly when assembling the Power Module and the Control Unit.

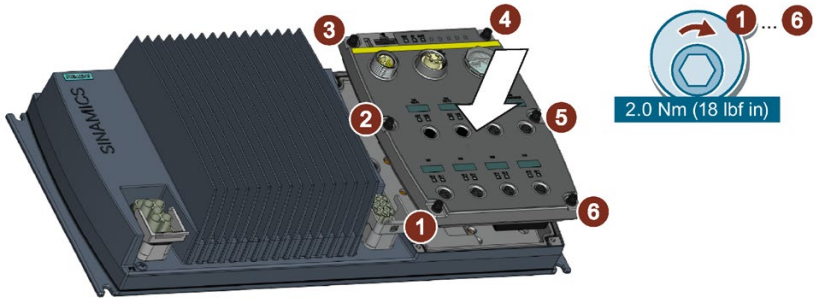


Figure 4-1 Fitting the Control Unit to the Power Module

4.2 Drill pattern SINAMICS G120D

Drill pattern and dimensions

The inverter has an identical drill pattern for all frame sizes. The drill pattern, depth and tightening torques are shown in the diagram below.

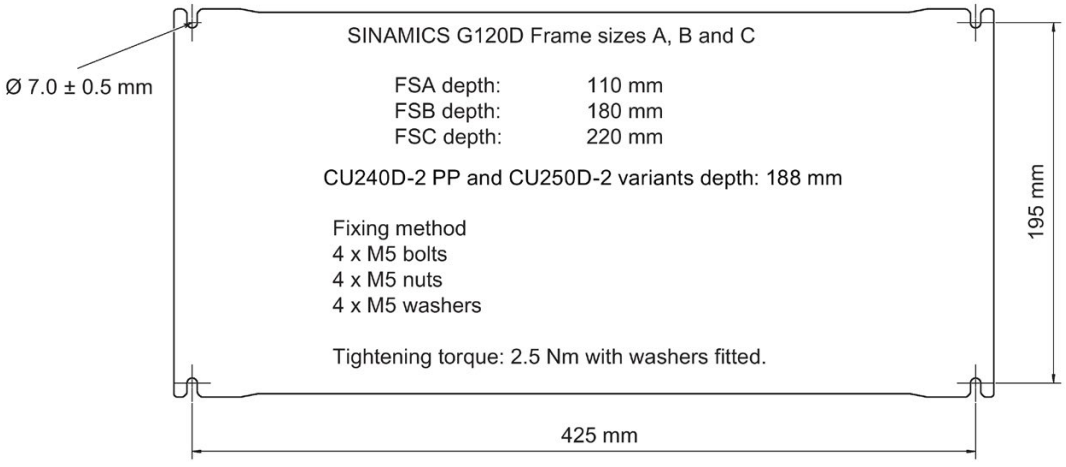


Figure 4-2 SINAMICS G120D drill pattern

Mounting orientation

Mount the converter on a table or on a wall. The minimum clearance distances are as follows:

- Side-by-side - no clearance distance is required
- Above and below the inverter 150 mm (5.9 inches).

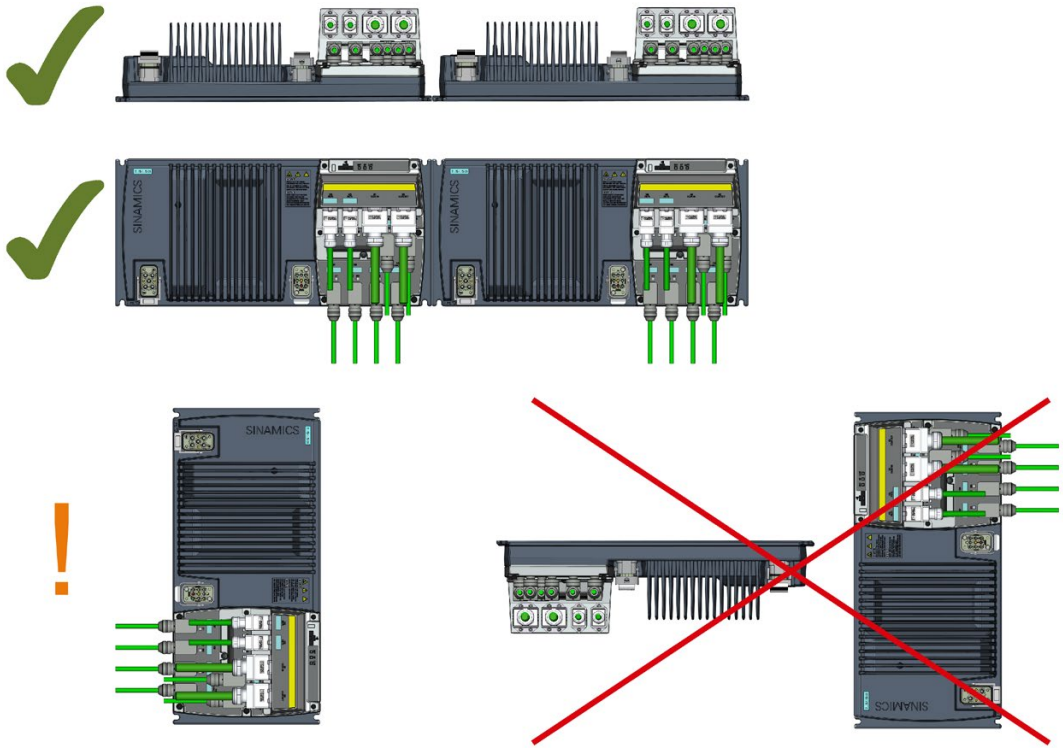


Figure 4-3 Mounting orientation: correct (✓), impermissible (X), permissible with restrictions (!)

Restrictions due to vertical mounting

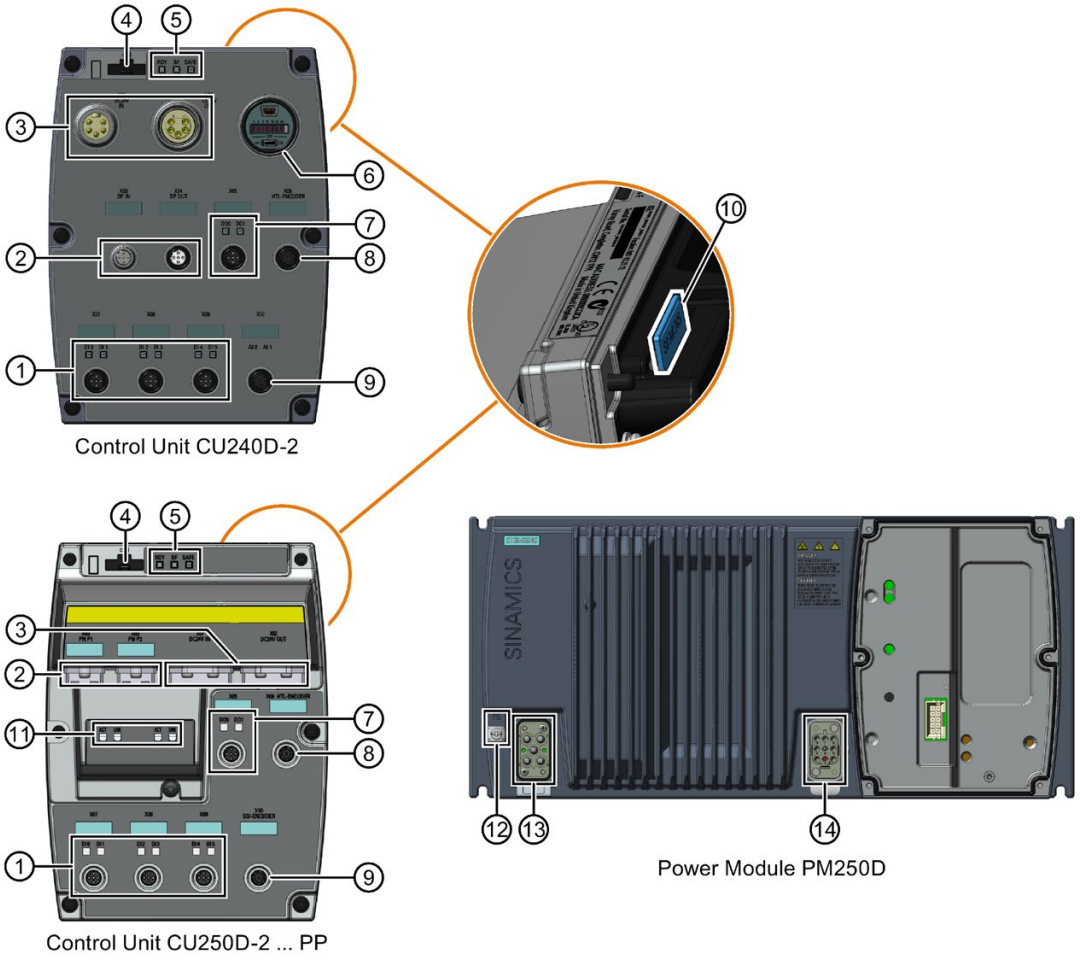
If the converter is mounted in the vertical position, the maximum ambient temperature is 40°C.

Additionally you have to reduce the converter output current to 80 % of rated converter current.

If the output current derating adversely affects the application, you have to use an converter of the next highest power rating.

4.3 Overview of the interfaces

Interfaces of the converter



① Digital inputs 0 … 5 with status LED
② Fieldbus IN and OUT (PROFINET or PROFIBUS)
③ 24 V DC supply IN and OUT
④ Optical interface for operator panel IOP handheld
⑤ Converter status LED
⑥ USB PC connection, address and bus termination switch for PROFIBUS
⑦ Digital outputs 0 and 1 with status LED
⑧ HTL Encoder connection
⑨ CU250D-2: SSI encoder connector
CU240D-2: Analog inputs 0 and 1
⑩ Slot for a memory card at rear of the Control Unit
⑪ PROFINET status LED
⑫ PE grounding terminal
⑬ Mains supply connection
⑭ Motor, brake and temperature sensor connections

Figure 4-4 Interfaces on the converter variants

4.4 Protective conductor

WARNING

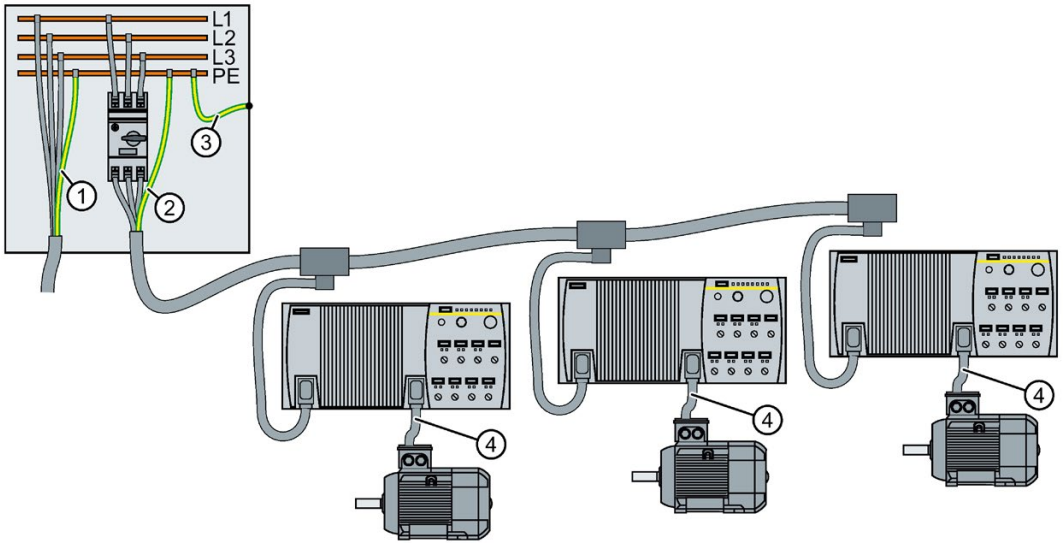
Electric shock due to interrupted protective conductor

The drive components conduct a high leakage current via the protective conductor. Touching conductive parts when the protective conductor is interrupted can result in death or serious injury.

- Dimension the protective conductor as stipulated in the appropriate regulations.

Dimensioning the protective conductor

Observe the local regulations for protective conductors subject to an increased leakage current at the installation site.



① Protective conductor for line feeder cables
② Protective conductor for inverter line feeder cables
③ Protective conductor between PE and the electrical cabinet
④ Protective conductor for motor feeder cables

The minimum cross-section of the protective conductor ① … ④ depends on the cross-section of the line or motor feeder cable:

- Line or motor feeder cable ≤ 16 mm²

  ⇒ Minimum cross-section of the protective conductor = cross-section of the line or motor feeder cable

- Line feeder cable = 16 mm² … 35 mm²

  ⇒ Minimum cross-section of the protective conductor = 16 mm²

- Line feeder cable> 35 mm²

  ⇒ Minimum cross-section of the protective conductor = ½ cross-section of the line or motor feeder cable

Additional requirements placed on the protective conductor ①:

- For permanent connection, the protective conductor must fulfill at least one of the following conditions:
  - The protective conductor is routed so that it is protected against damage along its complete length.
    Cables routed inside electrical cabinets or enclosed machine housings are considered to be adequately protected against mechanical damage.
  - As a conductor of a multi-conductor cable, the protective conductor has a cross-section ≥ 2.5 mm² Cu.
  - For an individual conductor, the protective conductor has a cross-section ≥ 10 mm² Cu.
  - The protective conductor consists of two conductors with the same cross-section.
- When connecting a multi-conductor cable using an industrial plug connector according to EN 60309, the protective conductor must have a cross-section of ≥ 2.5 mm² Cu.

4.5 Grounding converter and motor

Grounding the converter

- Ground the converter via the PE connection in the mains supply connector.
- Ground the connectors as shown in the diagram below.

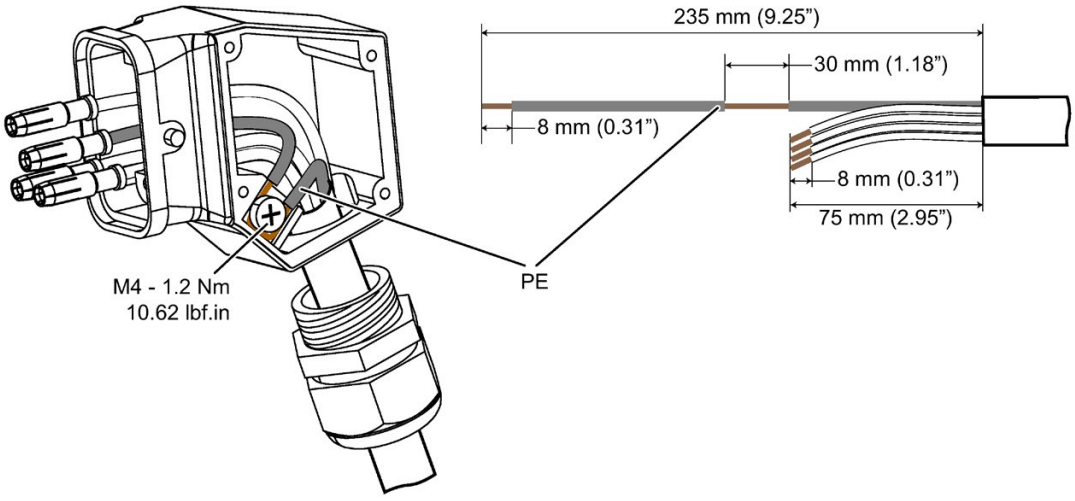
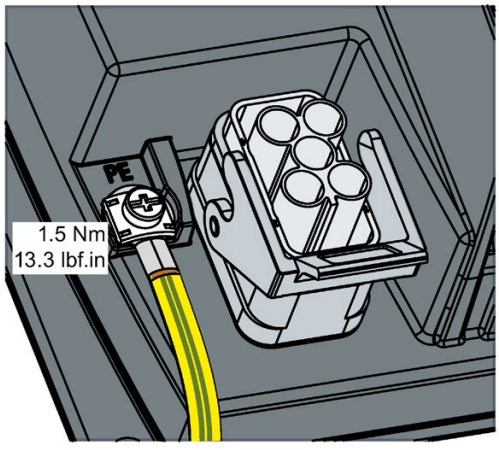


Figure 4-5 Grounding the line supply and motor connectors

- Connect the PE terminal on the left-hand side of the converter to the metal frame it is mounted on.
- Recommended cable cross section: 10 mm²
- Use a short wire connection preferably.
- Clean the connection to the steel construction from paint or dirt.
- Use a ring clamp to ensure a good physical connection which is resistant to accidental disconnection.



Grounding the motor

- Ground the motor via the PE connection in the motor connector.
- Ground the connector as shown in the diagram above (grounding the converter). Although the line and motor connectors are of a different type, the principle of grounding them is the same.
- If possible, ground the motor housing.

EMC cable glands

Where cable glands are used within the installation of the system, it is recommended that EMC glands are used.

The cable gland provides protection to the IP68 standard when fitted correctly.

Figure 4-6 Example of a Blueglobe EMC cable gland

Table 4- 1 Brass-nickel plated EMC cable gland with metric thread as per EN50262.

Connection thread/length			Clamping range without inlet max/min [mm]	Clamping range max/min [mm]	Spanner width SW * E	Article No.
A	D [mm]	C [mm]				
M16 x 1.5	6.0	29	11 … 7	9 … 7	20 x 22.2	bg216mstri
M20 x 1.5	6.5	29	14 … 9	12 … 7	24 x 26.5	bg220mstri
M25 x 1.5	7.5	29	20 … 13	16… 10	30 x 33	bg255mstri
M32 x 1.5	8.0	32	25 … 20	20 … 13	36 x 39.5	bg232mstri

4.6 Basic EMC Rules

Measures to limit Electromagnetic Interference (EMI)

Listed below are the necessary measures that must be taken to ensure the correct installation of the Inverter within a system, which will minimize the effect of EMI.

Cables

- Keep all cable lengths to the minimum possible length; avoid excessive cable lengths.
- Route always signal and data cables, as well as their associated equipotential bonding cables, in parallel and with as short a distance as possible.

- Don't route signal and data cables and line supply cables in parallel to motor cables.
- Signal and data cables and line supply cables should not cross motor cables; if crossing is necessary, they should cross at an angle of 90 °.
- Shield signal and data cables.
- Route particularly sensitive signal cables, such as setpoint and actual value cables, with optimum shield bonding at both ends and without any interruptions of the shield.
- Ground spare wires for signal and data cables at both ends.
- Route all power cables (line supply cables, as well as motor cables) separately from signal and data cables. The minimum distance should be approximately 25 cm. Exception: hybrid motor cables with integrated shielded temperature sensor and brake control wires are allowed.
- Shield the power cable between inverter and motor. We recommend shielded cables with symmetrical three-phase conductors (L1, L2, and L3) and an integrated, 3-wire, and symmetrically arranged PE conductor.

Cable shields

- Use shielded cables with finely stranded braided shields. Foil shields are not suitable since they are much less effective.
- Connect shields to the grounded housings at both ends with excellent electrical conductivity and a large contact area.
- Bond the cable shields to the plug connectors of the inverter.
- Don't interrupt cable shields by intermediate terminals.
- In the case of both, the power cables and the signal and data cables, the cable shields should be connected by means of suitable EMC shield clips or via electrically conductive PG glands. These must connect the shields to the shield bonding options for cables and the unit housing respectively with excellent electrical conductivity and a large contact area.
- Use only metallic or metallized connector housings for shielded data cables (e. g. PROFIBUS cables).

4.7 Connections and interference suppression

All connections should be made so that they are permanent. Screwed connections on painted or anodized metal components must be made either by means of special contact washers, which penetrate the isolating surface and establish a metallically conductive contact, or by removing the isolating surface on the contact points.

Contactor coils, relays and the solenoid valves must have interference suppressors to reduce high-frequency radiation when the contacts are opened (RC elements or varistors for AC currentoperated coils, and freewheeling diodes for DC current-operated coils). The interference suppressors must be connected directly on each coil.

No external suppression device is required for the motor holding brake.

4.8 Equipotential bonding

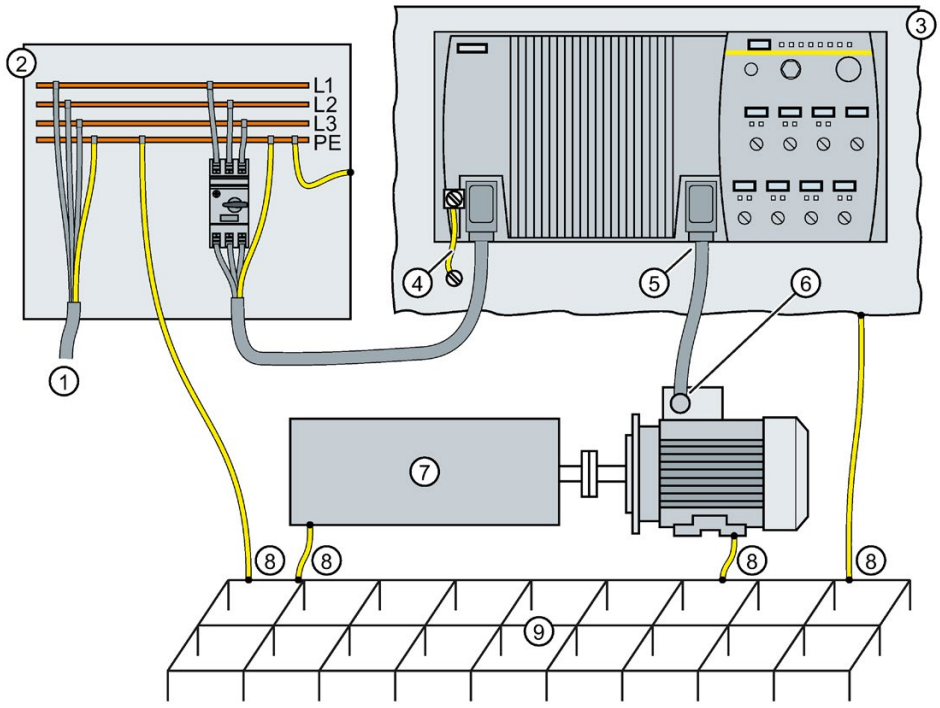
Grounding and high-frequency equipotential bonding measures

All electrical and mechanical drive components (transformer, motor and driven machine) must be connected to the grounding system. These connections are established by means of standard heavy-power PE cables, which do not need to have any special high-frequency properties.

In addition to these connections, the inverter (as the source of the high-frequency interference) and the motor must be interconnected with respect to the high-frequency point of view:

- Use a shielded motor cable.
- Connect the cable shield both to the motor connector on the inverter and to the motor terminal box.
- Use a short grounding connection from the PE terminal on the inverter to the metal frame.

The following figure illustrates all grounding and high-frequency equipotential bonding measures using an example.



① From the transformer
② Second level distribution with PE equipotential bonding
③ Metal frame
④ Short connection from the PE terminal to the metal frame.
⑤ Electrical connection of motor cable shield and connector body.
⑥ Electrical connection of motor cable shield and motor terminal box via electrically conductive PG gland.
⑦ Driven machine
⑧ Conventional grounding system.
- Standard, heavy-power PE conductors without special high-frequency properties.
- Ensures low frequency equipotential bonding as well as protection against injury.

⑨ Foundation ground

Figure 4-7 Grounding and high-frequency equipotential bonding measures in the drive system and in the plant

You find further information on the rules for EMC compliant installation on the Internet:

http://support.automation.siemens.com/WW/view/de/60612658
(http://support.automation.siemens.com/WW/view/en/60612658)

4.9 Branch circuit protection of individual inverters

When you install a dedicated 400 V branch for each inverter, then you must individually fuse/protect each branch.

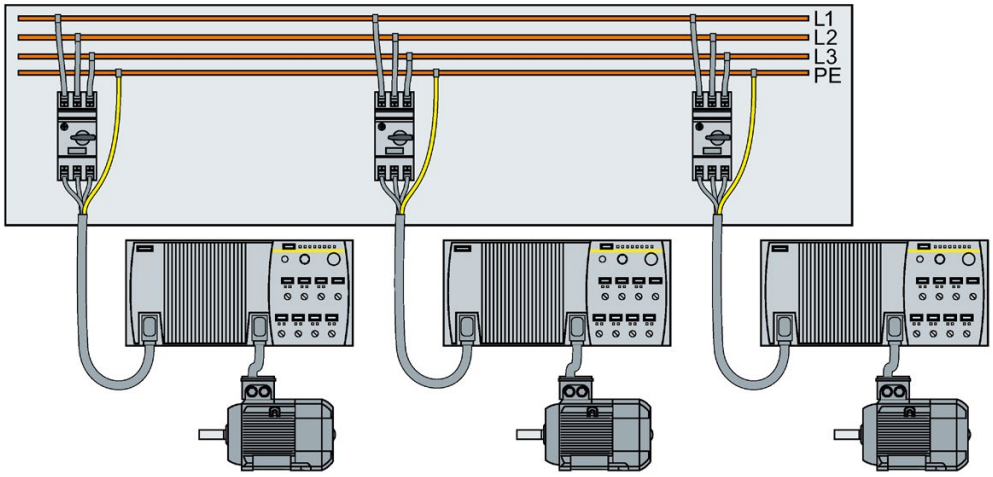


Figure 4-8 Power supply to inverters through their own dedicated 400 V branch

Branch circuit protection according to the IEC standard

Table 4- 2 Branch circuit protection according to the IEC standard

Rated power	Power Module	Frame size	Article No.		Max. rated current of the protection device
			Fuse	Circuit-breaker	
0.75 kW	6SL3525-0PE17-5AA1	FSA	3NA3803	3RV2011-1JA10	10 A
1.5 kW	6SL3525-0PE21-5AA1				
3 kW	6SL3525-0PE23-0AA1	FSB	3NA3805	3RV2011-4AA10	16 A
4 kW	6SL3525-0PE24-0AA1	FSC	3NA3807	3RV2021-4BA10	20 A
5.5 kW	6SL3525-0PE25-5AA1				
7.5 kW	6SL3525-0PE27-5AA1		3NA3812	3RV2021-4PA10	32 A

Branch circuit protection according to the UL standard

Use in the American market requires protection devices that meet UL standards as detailed in the following tables.

Table 4- 3 Overview of the approved protection devices/fuses according to UL standards

Protection device	UL category
Fuses of any manufacturer with faster tripping characteristic than class RK5, e.g. class J, T, CC, G, or CF	JDDZ
SIEMENS circuit breaker	DIVQ
Type E combination motor controller (designation according to the UL standard - is available as SIEMENS circuit breaker)	NKJH

Table 4- 4 Branch circuit protection with non-semiconductor fuses of Classes J, T, CC, G or CF (UL Category JDDZ)

Rated power	Power Module	Frame size	Max. rated current of the fuse	Short circuit current rating SCCR
0.75 kW	6SL3525-0PE17-5AA1	FSA	10 A	100 kA, 480 V 3 AC
1.5 kW	6SL3525-0PE21-5AA1		15 A	100 kA, 480 V 3 AC
3 kW	6SL3525-0PE23-0AA1	FSB	25 A	100 kA, 480 V 3 AC
4 kW	6SL3525-0PE24-0AA1	FSC	35 A	100 kA, 480 V 3 AC
5.5 kW	6SL3525-0PE25-5AA1		45 A	100 kA, 480 V 3 AC
7.5 kW	6SL3525-0PE27-5AA1		60 A	100 kA, 480 V 3 AC

Table 4- 5 Branch circuit protection according to UL Categories DIVQ and NKJH

Rated power	Power Module	Frame size	Article No.	UL cat.	Max. rated current of the circuit breaker	Short circuit current rating SCCR
0.75 kW	6SL3525-0PE17-5AA1	FSA	3RV2711…	DIVQ	15 A	65 kA, 480Y/277 V AC
			3RV1742…, LGG… or CED6…	DIVQ	15 A	65 kA, 480 V 3 AC
			3RV2021-1JA…	NKJH	10 A	65 kA, 480Y/277 V AC
1.5 kW	6SL3525-0PE21-5AA1	FSA	3RV2711…	DIVQ	15 A	65 kA, 480Y/277 V AC
			3RV1742…, LGG… or CED6…	DIVQ	15 A	65 kA, 480 V 3 AC
			3RV2021-1JA…	NKJH	10 A	65 kA, 480Y/277 V AC
3 kW	6SL3525-0PE23-0AA1	FSB	3RV1742…, LGG…, or CED6…	DIVQ	25 A	65 kA, 480 V 3 AC
			3RV2721…	DIVQ	22 A	50 kA, 480Y/277 V AC

Rated power	Power Module	Frame size	Article No.	UL cat.	Max. rated current of the circuit breaker	Short circuit current rating SCCR
			3RV2021-4AA…	NKJH	16 A	65 kA, 480Y/277 V AC
			3RV1031-4AA… or 3RV2031-4AA…	NKJH	16 A	65 kA, 480Y/277 V AC
4 kW	6SL3525-0PE24-0AA1	FSC	3RV1742…	DIVQ	35 A	65 kA, 480Y/277 V AC
			LGG… or CED6…	DIVQ	35 A	65 kA, 480 V 3 AC
			3RV2021-4BA…	NKJH	20 A	65 kA, 480Y/277 V AC
			3RV1031-4BA… or 3RV2031-4BA…	NKJH	20 A	65 kA, 480Y/277 V AC
5.5 kW	6SL3525-0PE25-5AA1	FSC	3RV1742…	DIVQ	45 A	65 kA, 480Y/277 V AC
			LGG… or CED6…	DIVQ	45 A	65 kA, 480 V 3 AC
			3RV2021-4DA…	NKJH	25 A	65 kA, 480Y/277 V AC
			3RV1031-4DA… or 3RV2031-4DA…	NKJH	25 A	65 kA, 480Y/277 V AC
7.5 kW	6SL3525-0PE27-5AA1	FSC	3RV1742…	DIVQ	60 A	65 kA, 480Y/277 V AC
			LGG… or CED6…	DIVQ	60 A	65 kA, 480 V 3AC
			3RV1031-4EA…	NKJH	32 A	65 kA, 480Y/277 V AC
			3RV2031-4EA…	NKJH	32 A	65 kA, 480Y/277 V AC

4.10 Branch circuit protection of multiple inverters

For installations with more than one inverter, the inverters are normally powered from a 400-V power bus with a T distributor.

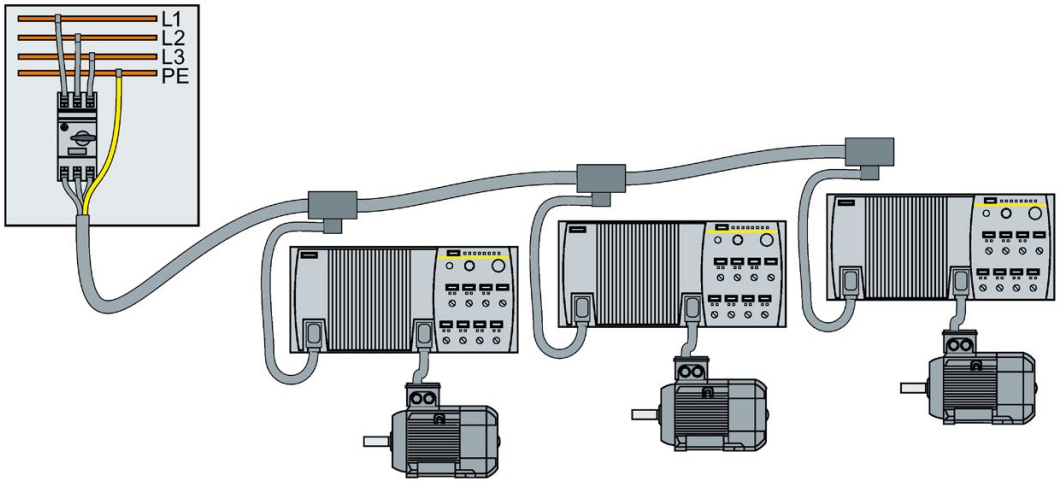


Figure 4-9 Power supply to an inverter group via a shared 400-V branch circuit

Calculation of the branch circuit protection according to IEC and UL standards

Calculation of the branch circuit protection:

- Add together the rated input currents of the inverter group.
- The sum of all rated input currents must be ≤ 24 A.
- Use one of the following protection devices for the inverter group:
  - Fuse or circuit breaker with a rated current of 30 A
  - Intrinsically safe circuit breaker with a rated current of 25 A

The branch circuit protection also depends on the following conditions:

- Type of cable routing
- Limit values of the cables and system components, e.g. the T distributor.
- Country-specific regulations

If it is precluded that all of the inverters of a group operate simultaneously, it is permissible to form larger inverter groups on one 400-V branch circuit. The sum of the input currents of all inverters must always be less than 24 A.

Branch circuit protection according to IEC

Table 4- 6 Branch circuit protection according to IEC

Max. rated current of the protection device	Article No. of the fuse	Article No. of the circuit breaker
25 A	3NA3810	3RV2021…, 3RV1031…, 3RV2031…
30 A	-	3RV1742

Branch circuit protection according to UL standards

Use in North America requires protection devices that meet UL standards as detailed in the following tables.

Table 4- 7 Overview of the approved protection devices according to UL standards

Protection device	UL category
Fuses of any manufacturer with faster tripping characteristic than class RK5, e.g. class J, T, CC, G, or CF	JDDZ
SIEMENS circuit breaker	DIVQ
Intrinsically safe SIEMENS circuit breaker	NKJH

Table 4- 8 Branch circuit protection with non-semiconductor fuses of Classes J, T, CC, G or CF (UL Category Code JDDZ)

Max. rated current of the fuse	Short circuit current rating SCCR
30 A	65 kA, 480 V 3 AC

Table 4- 9 Branch circuit protection with circuit breaker, UL categories DIVQ and NKJH

Max. rated current of the circuit breaker	Article No.	UL cat.	Short circuit current rating SCCR
30 A	3RV2711…	DIVQ	65 kA, 480Y/277 V AC
	3RV1742…, LGG… or CED6…	DIVQ	65 kA, 480 V 3 AC
25 A	3RV2021-4DA…	NKJH	65 kA, 480Y/277 V AC
	3RV1031-4DA… or 3RV2031-4DA…	NKJH	65 kA, 480Y/277 V AC
22 A	3RV2721…	DIVQ	50 kA, 480Y/277 V AC

NOTICE

Material damage from inappropriate supply system V_t > 1%

Operating the converter on an inappropriate supply system can cause damage to the converter and other loads.

- Only operate the converter on supply systems with $V_t \leq 1\%$.

4.11 Connections and cables

Connectors

"Switched" and "unswitched" 24 V power supply

The unswitched 24 V power supply (1L+) is required for the device to function.

- Use a power supply with PELV (Protective Extra Low Voltage).
- For applications in USA and Canada: Use a power supply NEC Class 2.
- The 0 V of the power supply must be connected with low resistance to the PE of the system.

The switched 24 V (2L+) supplies the two digital outputs. Switching brings all of the actuators connected to the digital outputs into the no-voltage state.

If you don't need the switching of 2L+ power supply, then both the switched as well as the non-switched 24 V may come from the same supply.

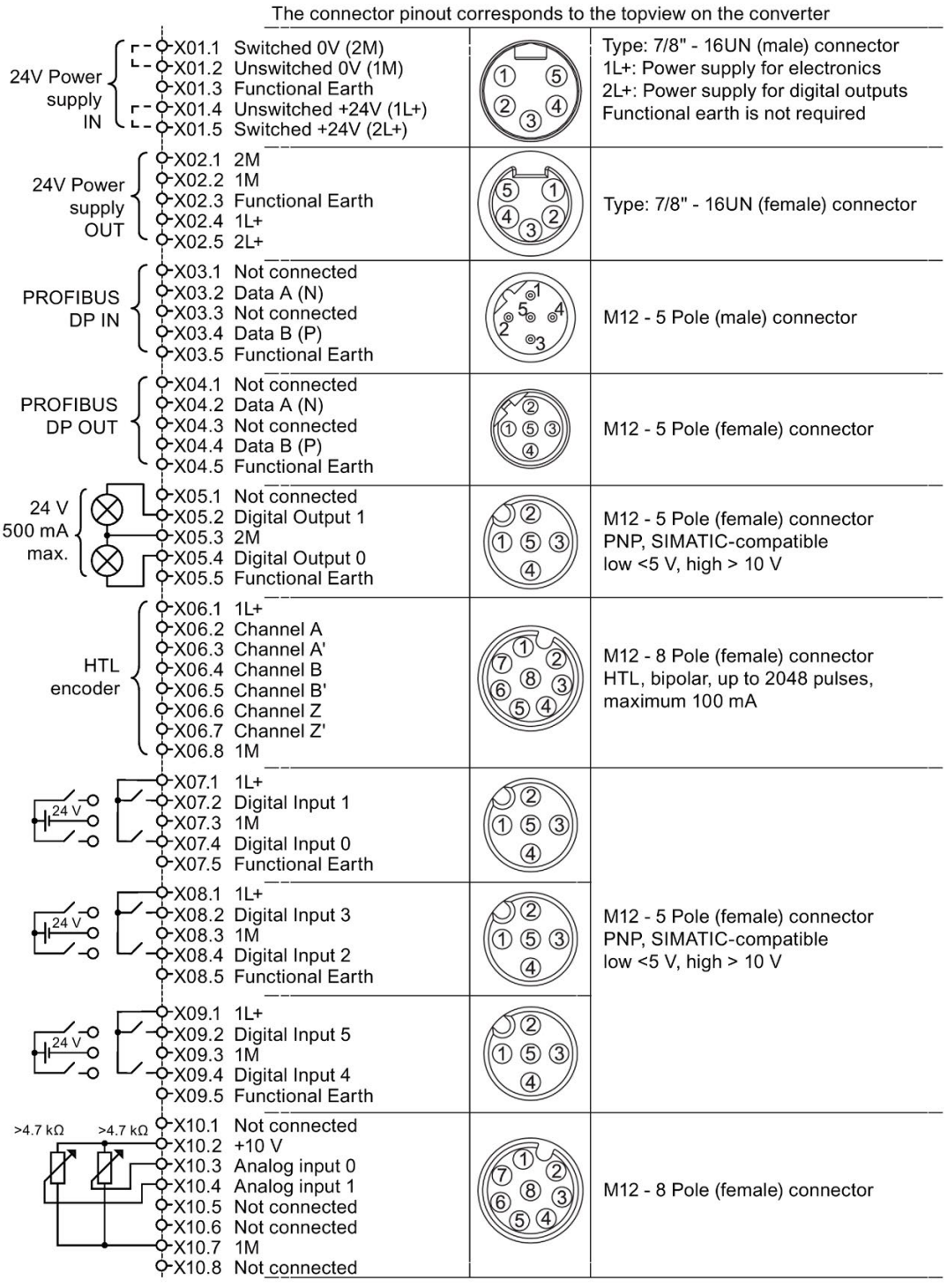


Figure 4-10 CU240D-2 PROFIBUS connectors

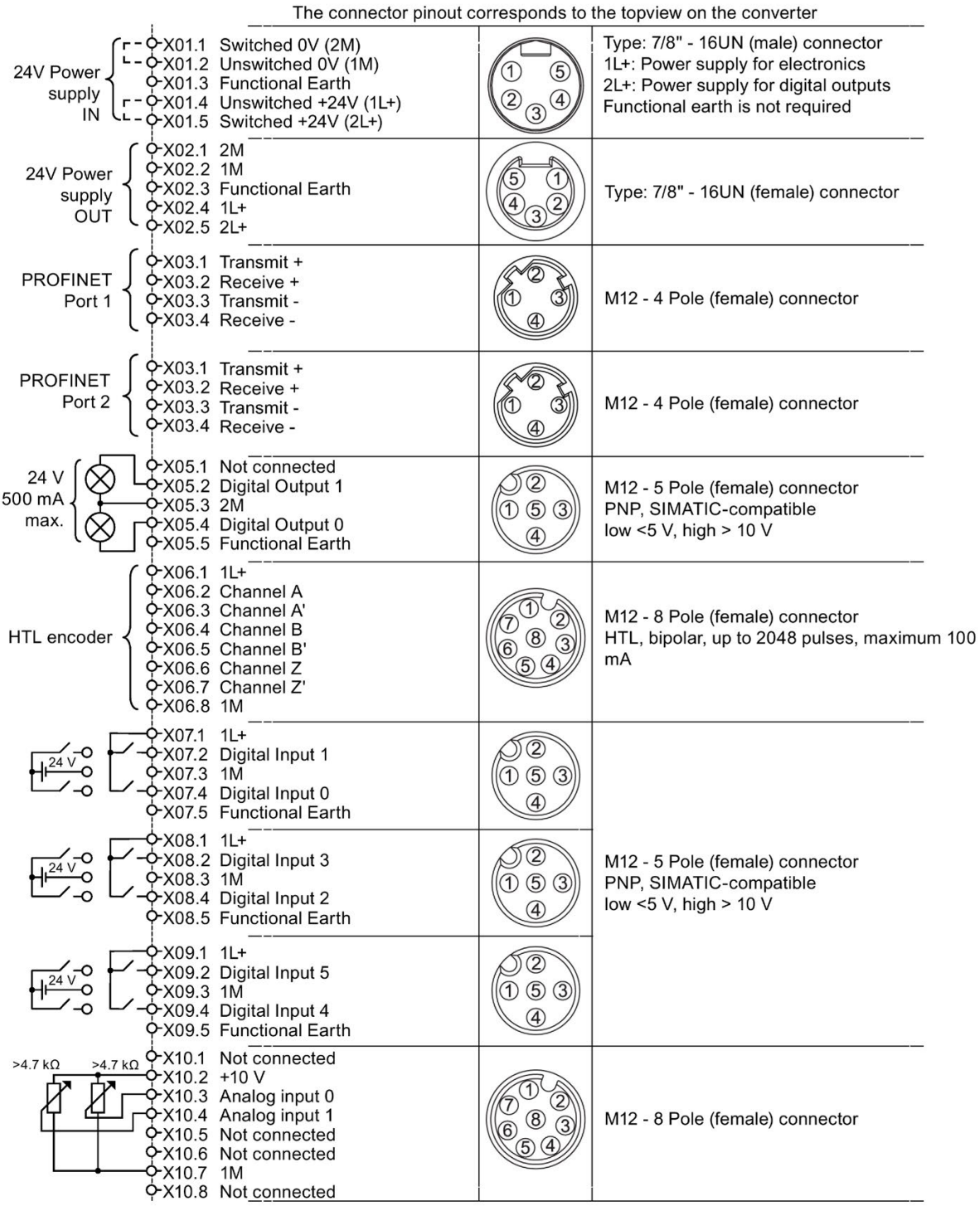


Figure 4-11 CU240D-2 PROFINET connectors

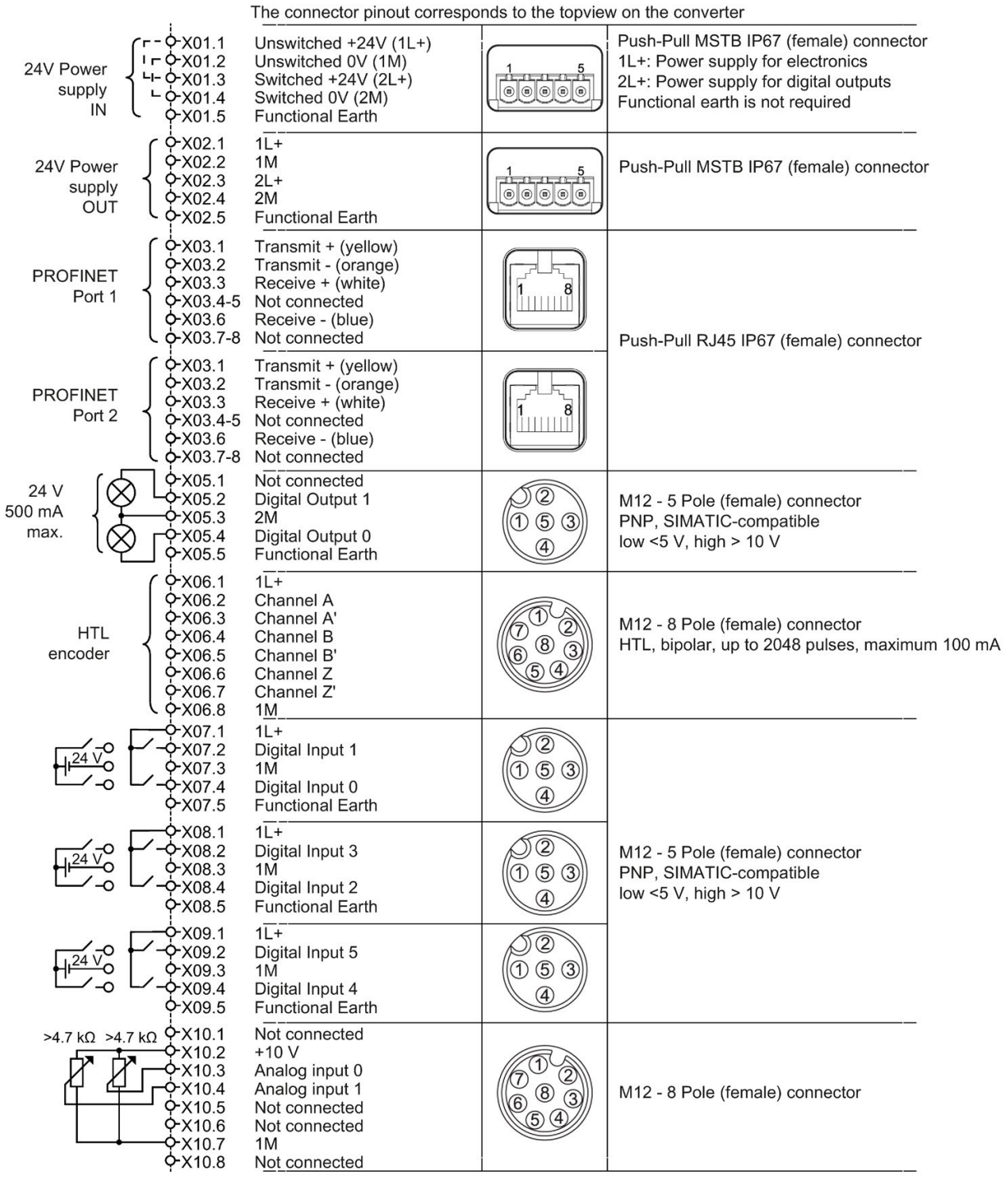


Figure 4-12 CU240D-2 PROFINET Push-Pull connectors

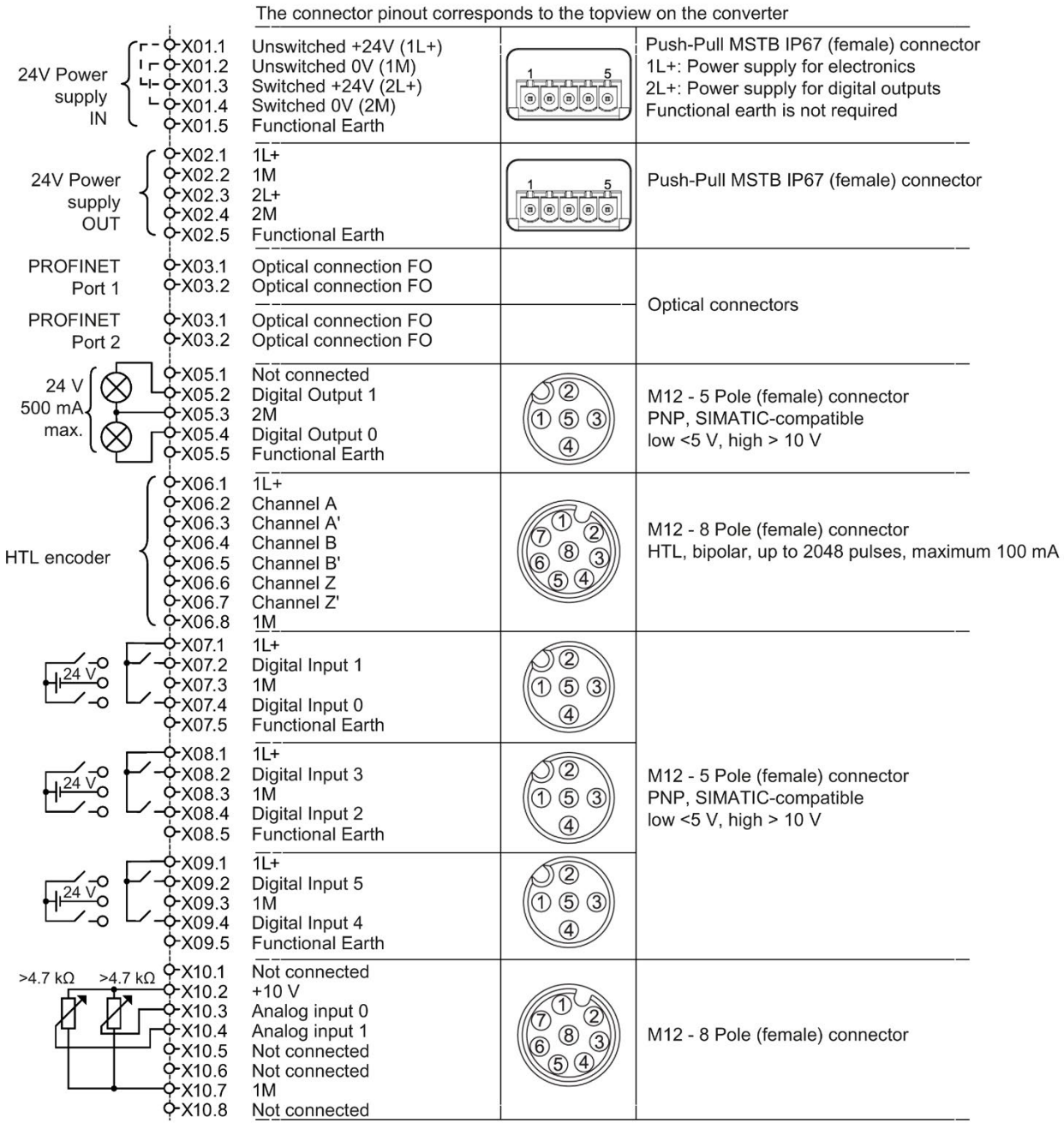


Figure 4-13 CU240D-2 PROFINET FO connectors

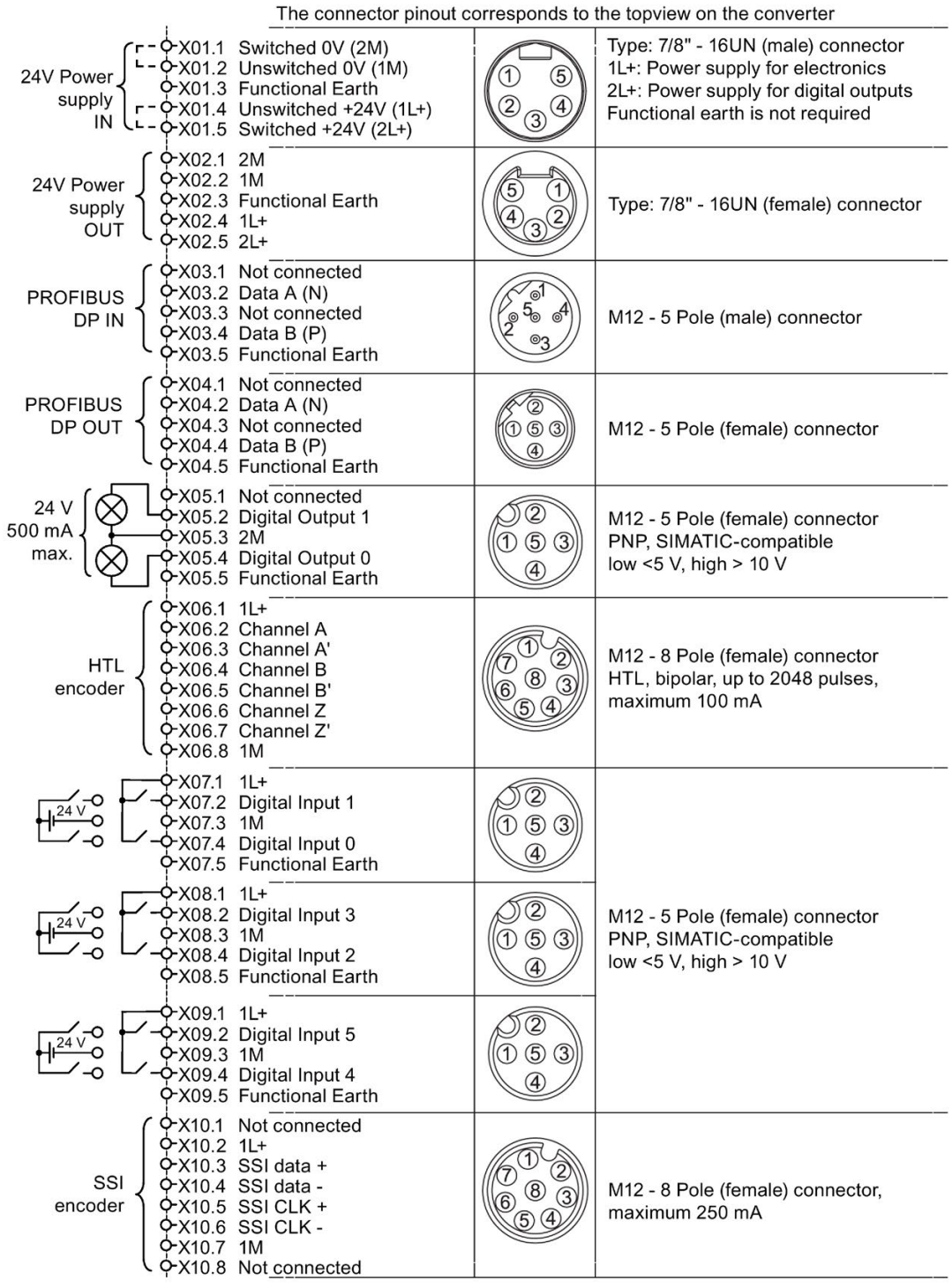


Figure 4-14 CU250D-2 PROFIBUS connectors

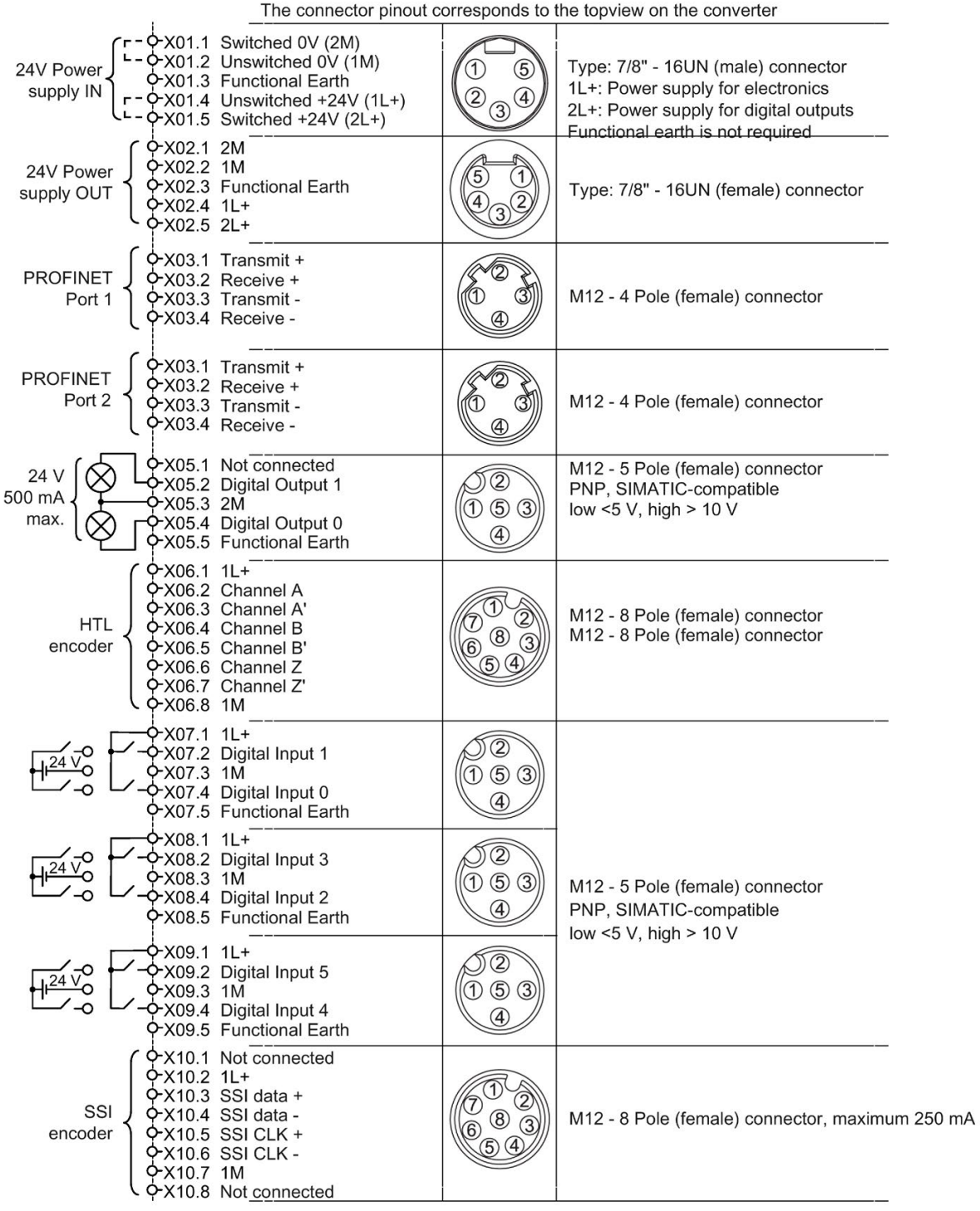


Figure 4-15 CU250D-2 PROFINET connectors

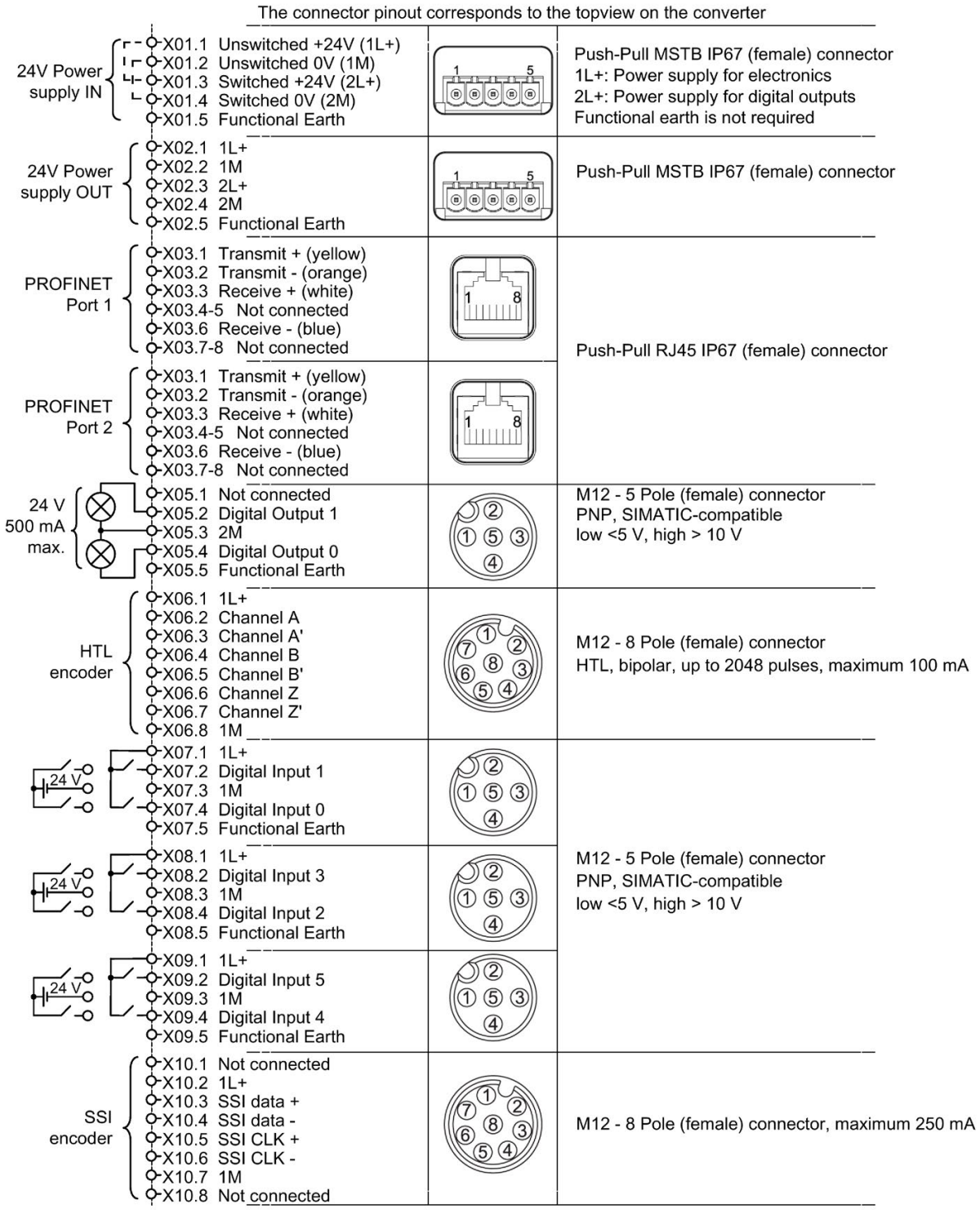


Figure 4-16 CU250D-2 PROFINET Push-Pull connectors

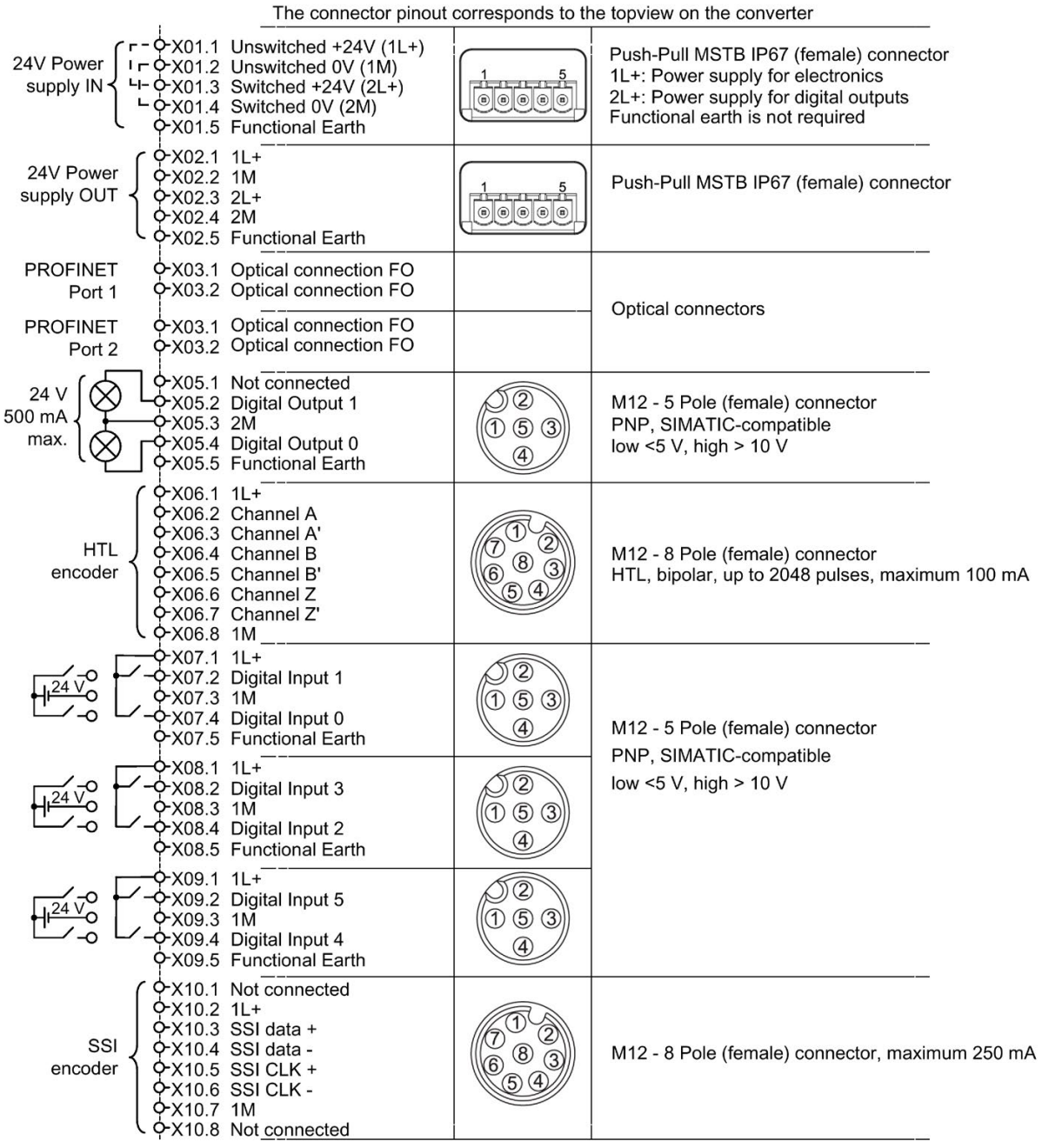


Figure 4-17 G120D CU250D-2 PROFINET FO connectors

⚠WARNING

Electrical shock when live parts are touched in the motor terminal box

Hazardous voltage can be present on the pins for temperature sensor and motor holding brake. Touching live parts on the motor cable and in the motor terminal box can lead to death due electrical shock.

- Keep the motor terminal box closed whenever the mains is applied to the converter.
- Insulate the cables that are not used.
- Use appropriate insulation on the cables.

NOTICE

Damage of the converter by disconnecting the motor during operation

The disconnection of the motor cable by a switch or contactor during operation may damage the converter.

- Disconnect converter and motor during operation only if it is necessary in terms of personal security or machine protection.

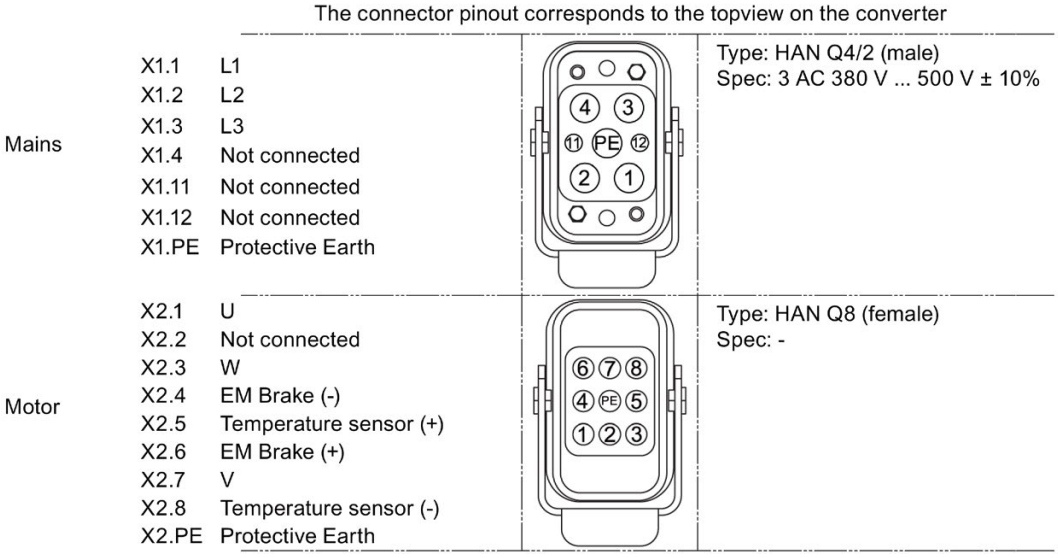


Figure 4-18 PM250D connectors

Cable, connectors and tools specifications

The detailed specifications for the cables, connectors and tools required to manufacture the necessary cables for the SINAMICS G120D are listed in the following tables. The connections that are detailed in this section relate to the physical connections that exist on the Inverter. Information for the preparation and construction of the individual connectors have separate detailed instructions delivered with the ordered parts, direct from the manufacturers. Use 75° C copper wire only.

Note

NFPA compatibility

These devices are intended only for installation on industrial machines in accordance with the "Electrical Standard for Industrial Machinery" (NFPA79). Due to the nature of these devices they may not be suitable for installation accordance with the "National Electrical Code" (NFPA70).

Table 4- 10 Tools

	Order number
Crimp tool (Q8/0 and Q4/2)	3RK1902-0AH00
Removal tool (Q8/0)	3RK1902-0AJ00
Removal tool (Q4/2)	Harting part number 0999-000-0305
No special tools are required for the Control Unit connectors	

Table 4- 11 Control unit connectors

Connector	**Order number**	
	Straight connector	**Right-angle connector**
24 V DC power supply In (7/8")	6GK1905-0FB00	3RK1902-3DA00
24 V DC power supply Out (7/8")	6GK1905-0FA00	3RK1902-3BA00
PROFIBUS In (M12)	6GK1905-0EB00	3RK1902-1DA00
PROFIBUS Out (M12)	6GK1905-0EA00	3RK1902-1BA00
PROFINET Port 1 and Port 2 (M12)	6GK1901-0DB20-6AA0	3RK1902-2DA00
Encoder (M12)	Via KnorrTec	
Digital input and output, analog input (M12)	3RK1902-4BA00-5AA0	3RK1902-4DA00-5AA0

You find information about KnorrTec in the internet:

Knorrtec (http://www.knorrtec.de/index.php/en/company-profile/siemens-solution-partner)

Table 4- 12 Push-Pull variant PROFINET and 24 V DC connectors

Connector	Order number
24 V DC power supply	6GK1907-0AB10-6AA0
RJ45 PROFINET	6GK1901-1BB10-6AA0

Table 4- 13 Fibre optic connectors

Connector	Order number
IE SC RJ POF PLUG PRO	6GK1900-0MB00-6AA0
IE SC RJ PCF PLUG PRO	6GK1900-0NB00-6AA0

Table 4- 14 Mains connector

Power rating	cable size	Order number
0.75 kW … 1.50 kW	2.5 mm^2 (14 AWG)	3RK1911-2BE50
3.00 kW … 4.00 kW	4 mm^2 (12 or 10 AWG)	3RK1911-2BE10
5.50 kW … 7.50 kW	6 mm^2 (10 AWG)	3RK1911-2BE30

Order motor connector including temperature sensor and motor holding brake via solution partner:

Solution partner (https://www.automation.siemens.com/solutionpartner/partnerfinder/Partner-Finder.aspx?lang=en)

Cable lengths

Table 4- 15 Maximum cable lengths

Cable	Screening	Max. length
Motor [1]	Screened	15 m (49 ft)
	Unscreened	30 m (98 ft)
Temperature sensor [1]	Screened	15 m (49 ft)
	Unscreened	30 m (98 ft)
Motor holding brake [1]	Screened	15 m (49 ft)
	Unscreened	30 m (98 ft)
Digital inputs	Screened	30 m (98 ft)
Digital outputs	Screened	30 m (98 ft)

Cable	Screening	Max. length
Analog input	Screened	30 m (98 ft)
Encoder	Screened	30 m (98 ft)

1) The motor, temperature sensor and motor holding brake are connected through a hybrid cable to the inverter using a Harting connector.

Factory settings of the inputs and outputs of the control unit CU240D-2

In the factory settings, the fieldbus interface of the inverter is not active.

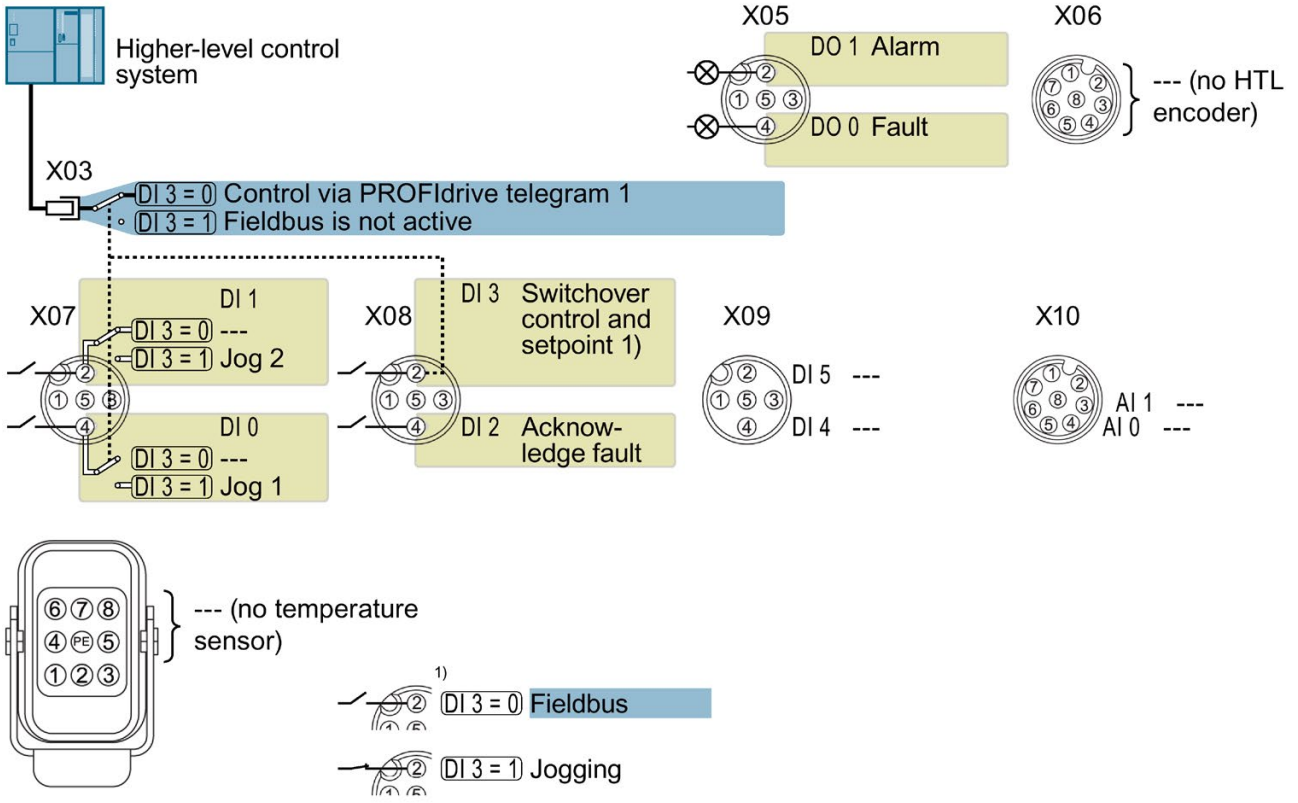


Figure 4-19 Factory settings of the control units CU240D-2

Factory settings of the inputs and outputs of the CU250D-2 control unit

In the factory settings, the fieldbus interface of the inverter is not active.

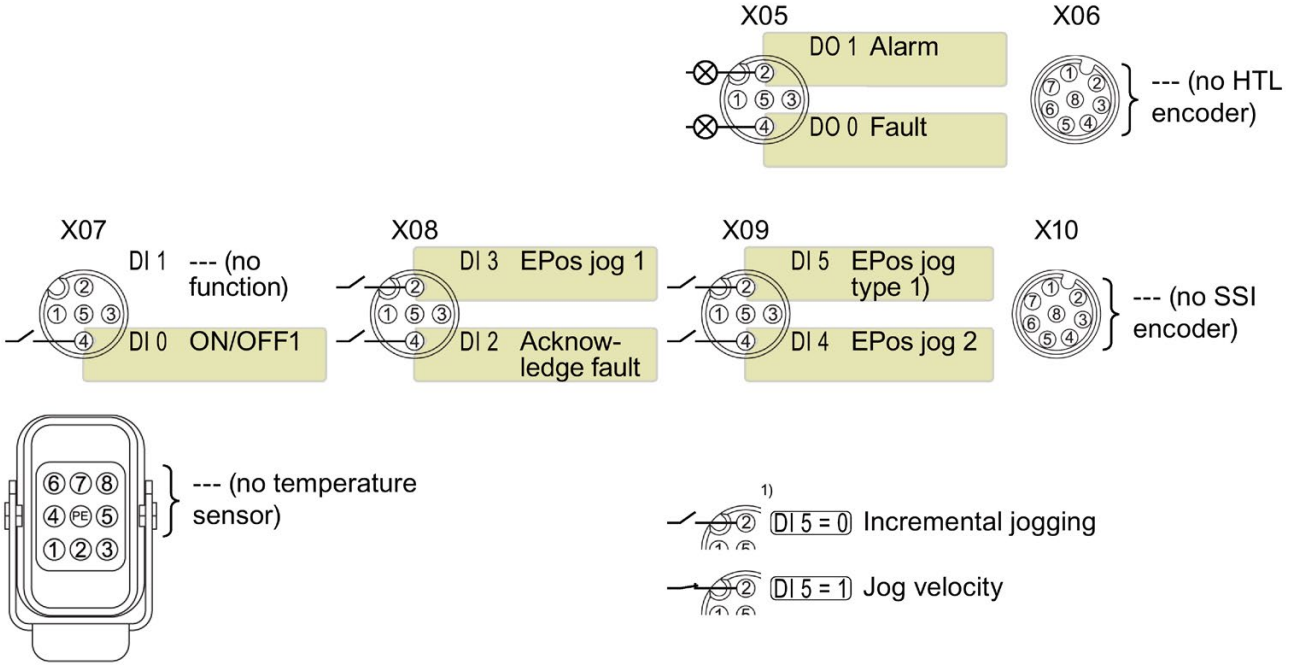


Figure 4-20 Factory settings of the CU250D-2 control units

Changing the function of the inputs and outputs

The function of each color-identified input and output can be set.

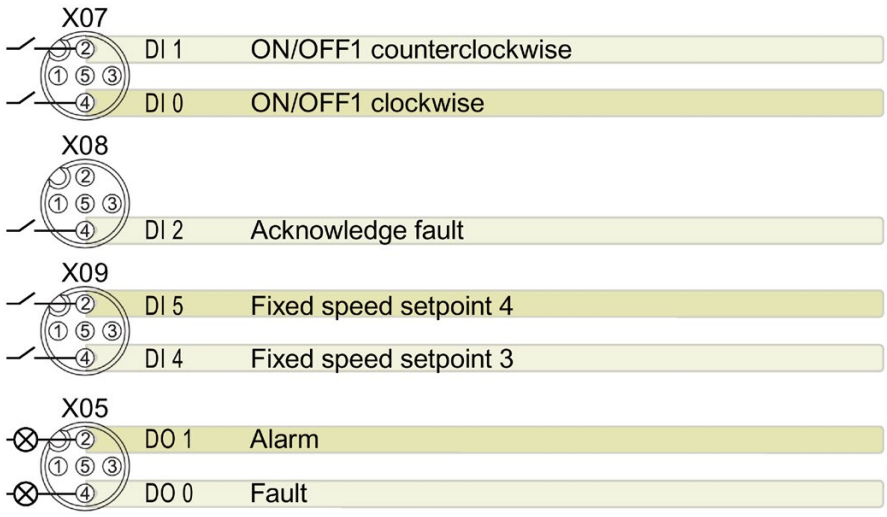
To avoid having to change each input individually, you can set multiple inputs and outputs together using default settings.

The factory setting of the inputs and outputs described above corresponds to the default setting 7 (switchover between fieldbus and a jog using DI 3).

Default settings of inputs and outputs (CU240D-2) (Page 53)

4.12 Default settings of inputs and outputs (CU240D-2)

Default setting 1: "Conveyor system with 2 fixed frequencies"



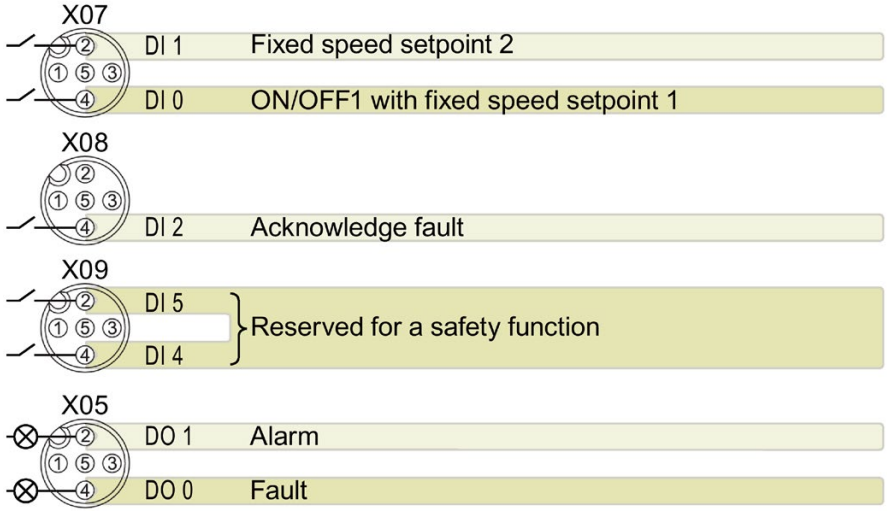
DO 0: p0730, DO 1: p0731 DI 0: r0722.0, …, DI 5: r0722.5

Fixed speed setpoint 3: p1003, fixed speed setpoint 4: p1004, fixed speed setpoint active: r1024

Speed setpoint (main setpoint): p1070[0] = 1024

DI 4 and DI 5 = high: the inverter adds the two fixed speed setpoints

Default setting 2: "Conveyor system with Basic Safety"



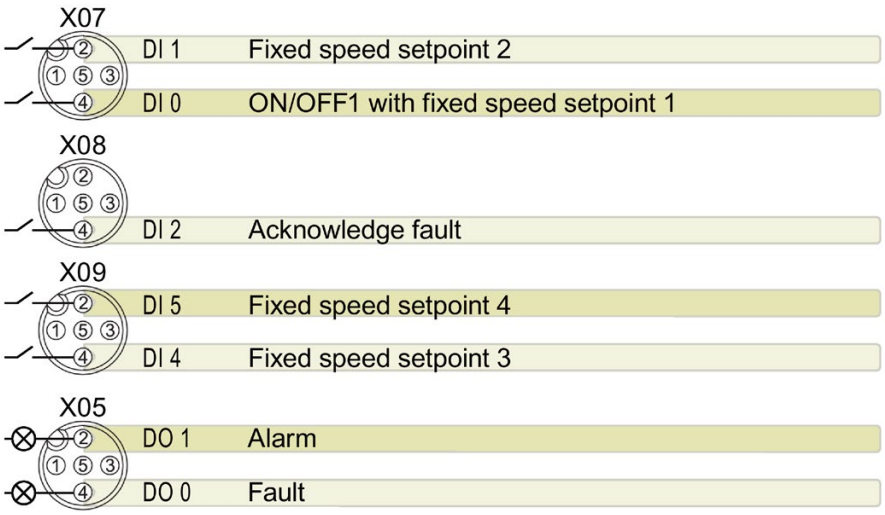
DO 0: p0730, DO 1: p0731 DI 0: r0722.0, …, DI 5: r0722.5

Fixed speed setpoint 1: p1001, fixed speed setpoint 2: p1002, fixed speed setpoint active: r1024

Speed setpoint (main setpoint): p1070[0] = 1024

DI 0 and DI 1 = high: the inverter adds the two fixed speed setpoints.

Default setting 3: "Conveyor system with 4 fixed frequencies"



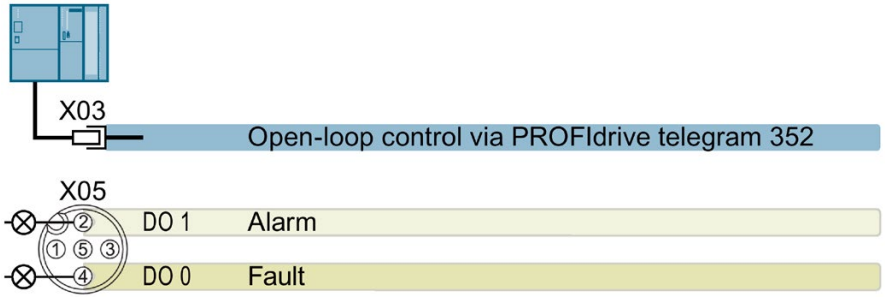
DO 0: p0730, DO 1: p0731 DI 0: r0722.0, …, DI 5: r0722.5

Fixed speed setpoint 1: p1001, … fixed speed setpoint 4: p1004, fixed speed setpoint active: r1024

Speed setpoint (main setpoint): p1070[0] = 1024

Several of the DI 0, DI 1, DI 4, and DI 5 = high: the inverter adds the corresponding fixed speed setpoints.

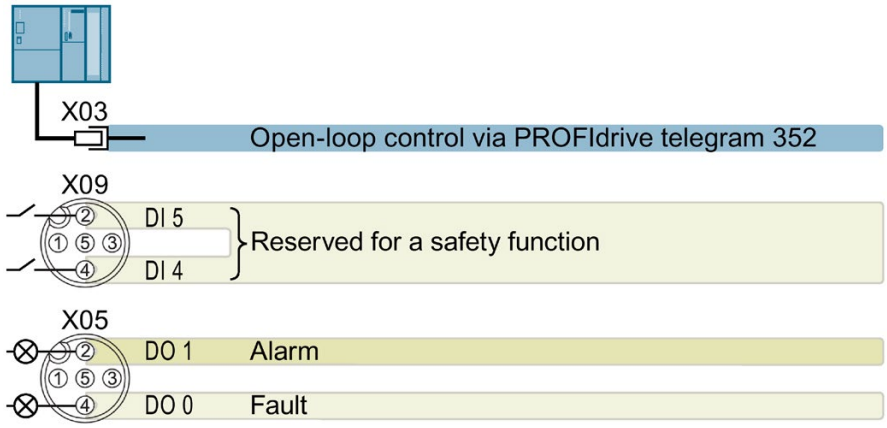
Default setting 4: "Conveyor system with fieldbus"



DO 0: p0730, DO 1: p0731

Speed setpoint (main setpoint): p1070[0] = 2050[1]

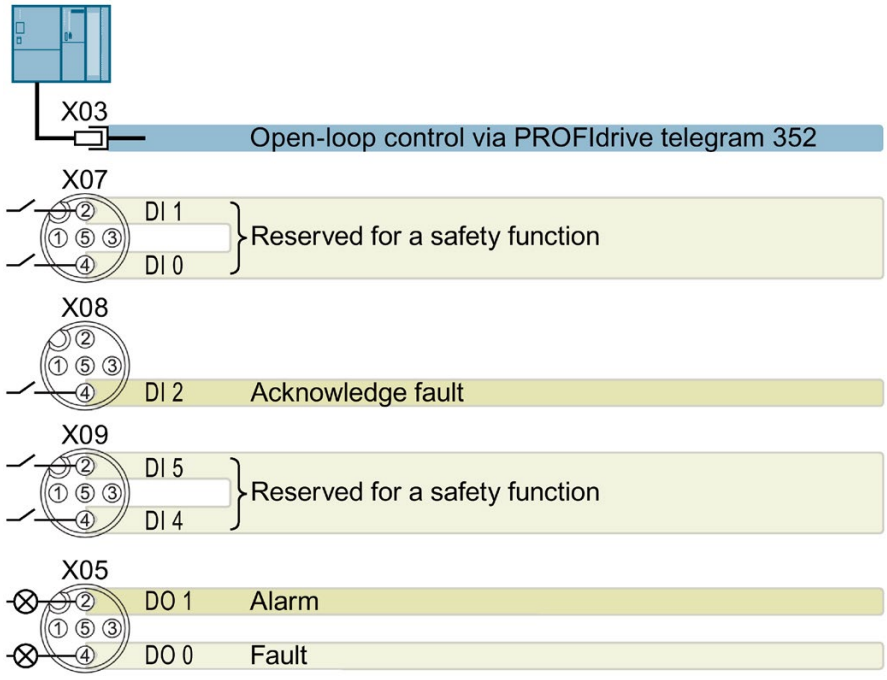
Default setting 5: "Conveyor system with fieldbus and Basic Safety"



DO 0: p0730, DO 1: p0731 DI 4: r0722.4, DI 5: r0722.5

Speed setpoint (main setpoint): p1070[0] = 2050[1]

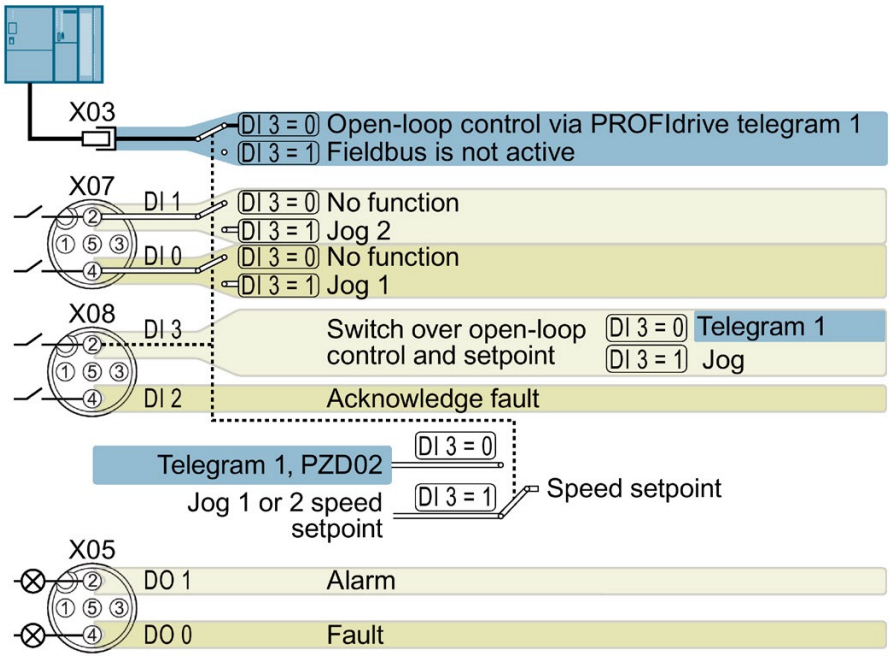
Default setting 6: "Fieldbus with Extended Safety"



DO 0: p0730, DO 1: p0731 DI 0: r0722.0, …, DI 5: r0722.5

Speed setpoint (main setpoint): p1070[0] = 2050[1]

Default setting 7: "Fieldbus with data set switchover"



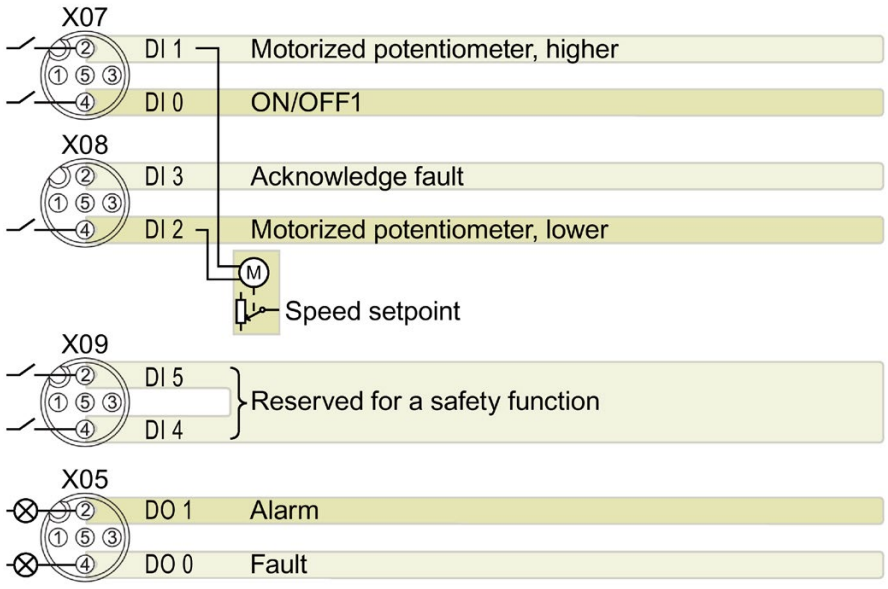
DO 0: p0730, DO 1: p0731 DI 0: r0722.0, …, DI 3: r0722.3

Speed setpoint (main setpoint): p1070[0] = 2050[1]

Jog 1 speed setpoint: p1058, factory setting: 150 rpm

Jog 2 speed setpoint: p1059, factory setting: -150 rpm

Default setting 8: "MOP with Basic Safety"

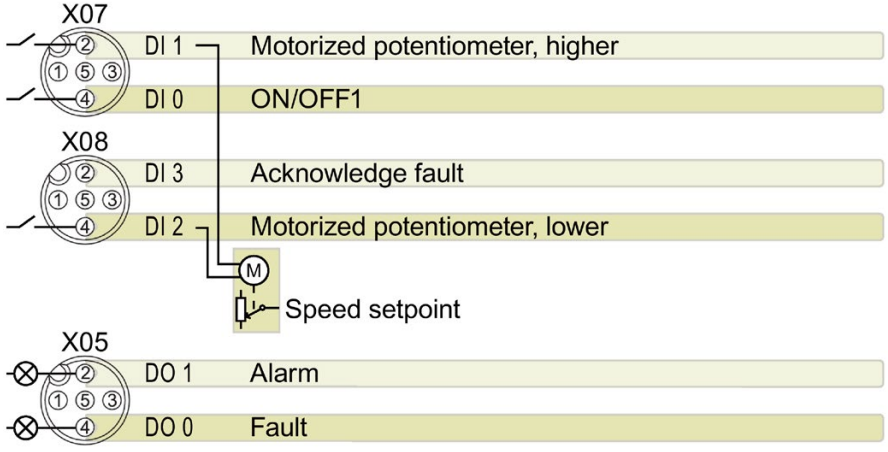


DO 0: p0730, DO 1: p0731 DI 0: r0722.0, …, DI 5: r0722.5

Motorized potentiometer, setpoint after the ramp-function generator r1050

Speed setpoint (main setpoint): p1070[0] = 1050

Default setting 9: "Standard I/O with MOP"

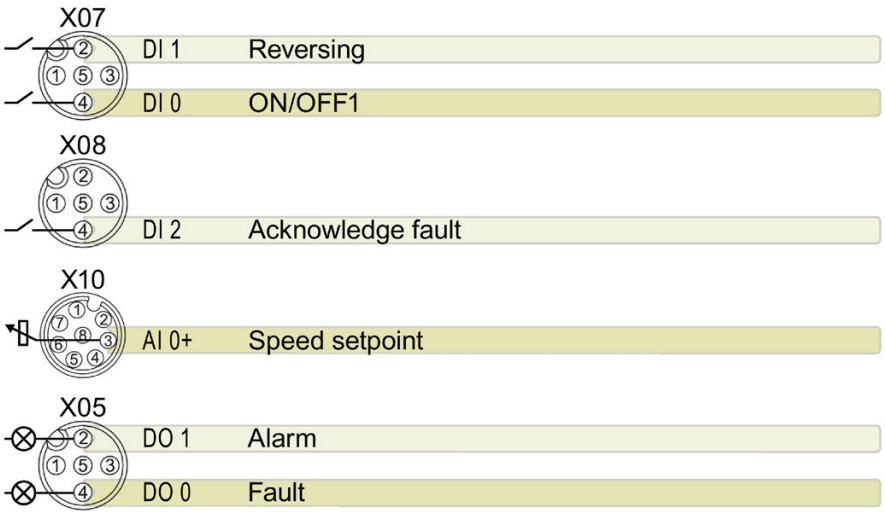


DO 0: p0730, DO 1: p0731 DI 0: r0722.0, …, DI 3: r0722.3

Motorized potentiometer, setpoint after the ramp-function generator r1050

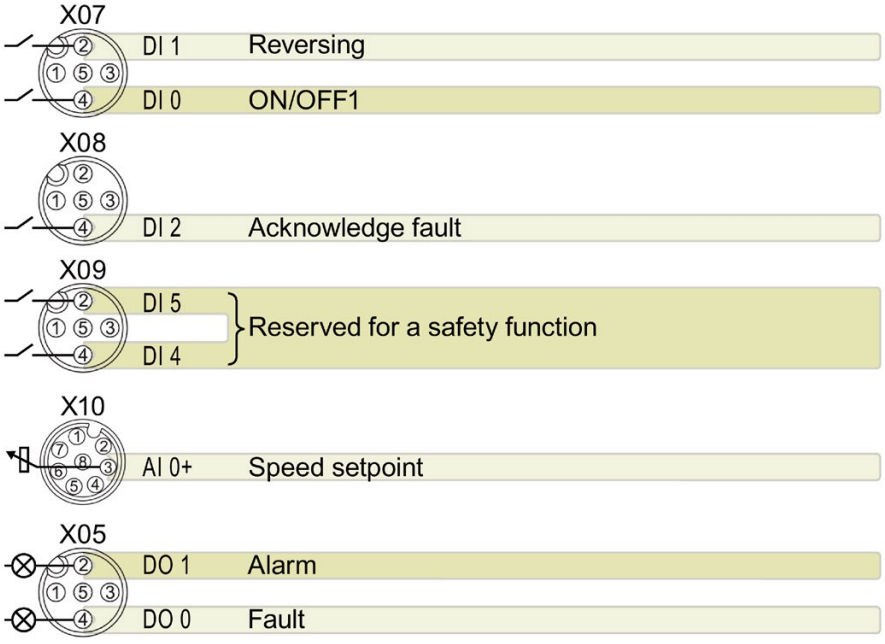
Speed setpoint (main setpoint): p1070[0] = 1050

Default setting 12: "Standard I/O with analog setpoint"



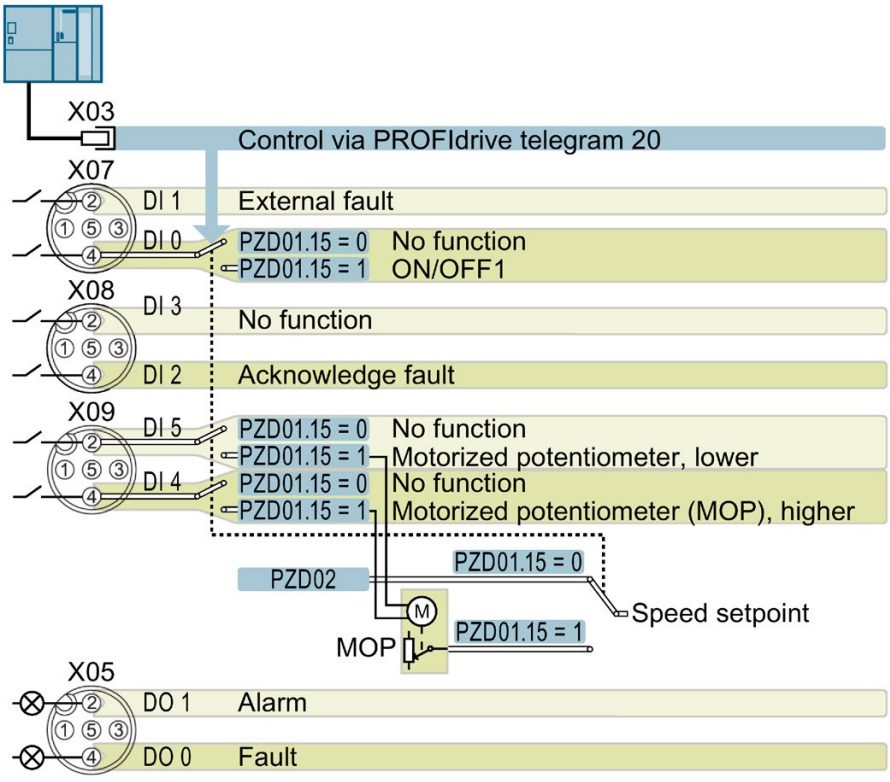
DO 0: p0730, DO 1: p0731 DI 0: r0722.0, …, DI 2: r0722.2 AI 0: r0755[0]
Speed setpoint (main setpoint): p1070[0] = 755[0]

Default setting 13: "Standard I/O with analog setpoint and safety"



DO 0: p0730, DO 1: p0731 DI 0: r0722.0, …, DI 5: r0722.5 AI 0: r0755[0]
Speed setpoint (main setpoint): p1070[0] = 755[0]

Default setting 14: "Process industry with fieldbus"



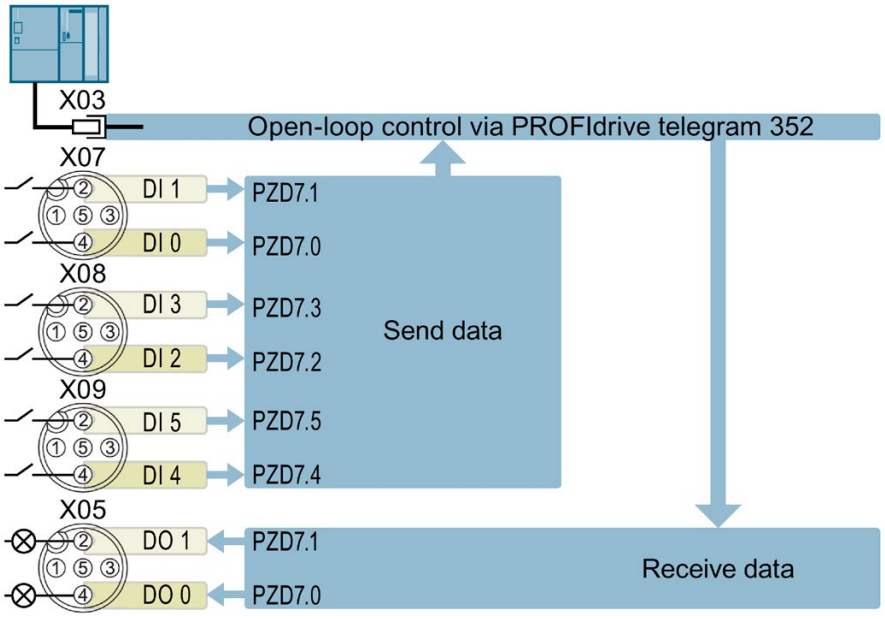
DO 0: p0730, DO 1: p0731 DI 0: r0722.0, …, DI 5: r0722.5

Motorized potentiometer, setpoint after the ramp-function generator r1050

Speed setpoint (main setpoint): p1070[0] = 2050[1], p1070[1] = 1050

Switch controller via PZD01, bit 15: p0810 = r2090.15

Default setting 24: "Distributed conveyor systems with fieldbus"



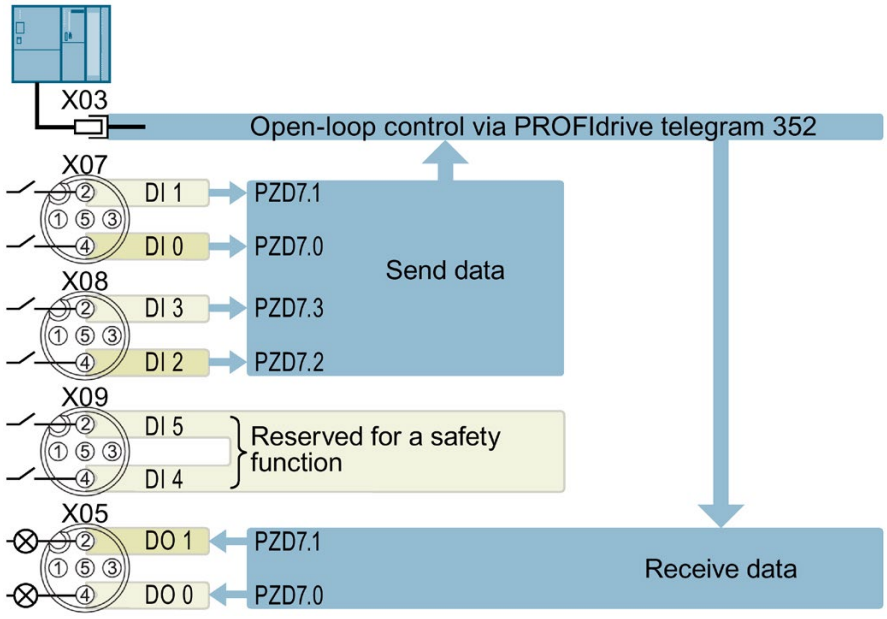
DO 0: p0730, DO 1: p0731 DI 0: r0722.0, …, DI 5: r0722.5

p2081[0] = r0722.0, …, p2081[5] = r0722.5

p0730 = r2094.0, p0731 = r2094.1

Speed setpoint (main setpoint): p1070[0] = 2050[1]

Default setting 25: "Distributed conveyor systems with fieldbus, safety"



DO 0: p0730, DO 1: p0731 DI 0: r0722.0, …, DI 5: r0722.5

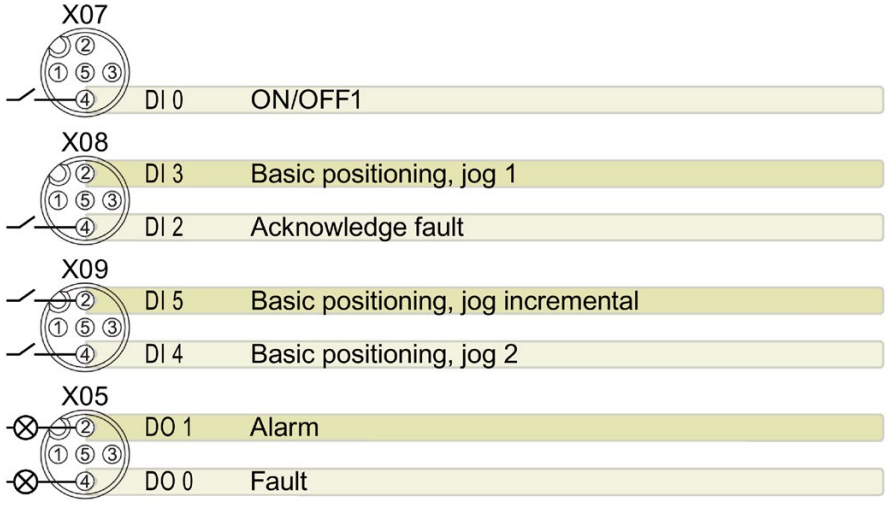
p2081[0] = r0722.0, …, p2081[3] = r0722.3

p0730 = r2094.0, p0731 = r2094.1

Speed setpoint (main setpoint): p1070[0] = 2050[1]

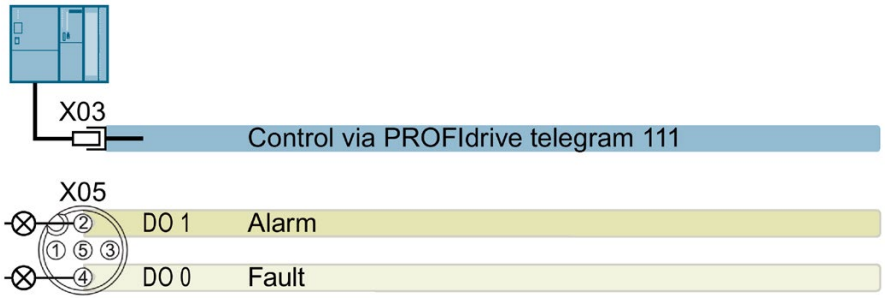
Default setting 26: "EPOS without fieldbus"

Factory setting



DO 0: p0730, DO 1: p0731 DI 0: r0722.0, …, DI 5: r0722.5

Default setting 27: "EPOS with fieldbus"



DO 0: p0730, DO 1: p0731

4.13 Settings PROFIBUS DP address with DIP switches

Setting the PROFIBUS DP address

Prior to using the PROFIBUS DP interface, the address of the node (Inverter) must be set using the seven PROFIBUS DP address DIP switches on the Control Unit.

The PROFIBUS DP address can be set between 1 and 126.

Note

The address is taken from P0918 if all PROFIBUS DP address DIP switches are in the OFF position, otherwise the DIP switch setting is valid.

NOTICE
External 24 V power supply must be disconnected The external 24 V power supply must be switched off before the DIP switch settings are changed. DIP switch setting changes do not take effect until the Control Unit has been powered-up again.

Setting the PROFIBUS DP address via DIP switches

The PROFIBUS DP address can be set via DIP switch, as shown in the table below.

Table 4- 16 Example address for the PROFIBUS DP interface

DIP switch	1	2	3	4	5	6	7
Add to address	1	2	4	8	16	32	64
Example 1: Address = 3 = 1 + 2							
Example 2: Address = 88 = 8 + 16 + 64							

4.14 Connecting the PROFINET interface

Industrial Ethernet Cables and cable length

Listed in the table below are the recommended Ethernet cables.

Table 4- 17 Recommended PROFINET cables

Cable type	Max. length between devices	Article Number
Industrial Ethernet FC TP Standard Cable GP 2 x 2	100 m (328 ft)	6XV1840-2AH10
Industrial Ethernet FC TP Flexible Cable GP 2 x 2	85 m (278 ft)	6XV1870–2B
Industrial Ethernet FC Trailing Cable GP 2 x 2	85 m (278 ft)	6XV1870–2D
Industrial Ethernet FC Trailing Cable 2 x 2	85 m (278 ft)	6XV1840–3AH10
Industrial Ethernet FC Marine Cable 2 x 2	85 m (278 ft)	6XV1840–4AH10

Cable screening

The screen of the PROFINET cable must be connected with the protective earth. The solid copper core must not be scored when the insulation is removed from the core ends.

Commissioning

5

5.1 Default settings for the SINAMICS G120D

Factory default settings

The inverter system is shipped from the factory as a Control Unit and a Power Module. Without any parameterization or after a factory reset, the inverter can be operated without additional parameterization if the inverter default settings (which depend on the inverter type and size) match the following data of a 4-pole motor:

Default line supply frequency	50 Hz
Rated motor voltage	P0304
Rated motor current	P0305
Rated motor power	P0307
Rated motor frequency	P0310
Rated motor speed	P0311
(A Siemens standard motor is recommended.)	
Further, the following conditions must be fulfilled:	
Control (ON/OFF command) using digital inputs	See pre-assigned inputs below.
Asyncronous motor	P0300 = 1
Self-cooled motor	P0335 = 0
Motor overload factor	P0640 = 150 %
Min. frequency	P1080 = 0 Hz
Max. frequency	P1082 = 50 Hz
Ramp-up time	P1120 = 10 s
Ramp-down time	P1121 = 10 s
Linear V/f characteristic	P1300 = 0

The Control Unit is intended to be control and operate the inverter utilizing the PROFIBUS or PROFINET interface. The PROFIBUS or PROFINET interface may be used to further configure and control the inverter as required.

5.2 Commissioning with the IOP-2

Commission the Inverter

The Intelligent Operator Panel 2 (IOP-2) has been designed to enhance the interface and communications capabilities of the SINAMICS Inverters.

The IOP-2 is connected to the Inverter using an Optical RS232 cable. It will automatically recognise the specific Control Unit to which it is connected, and displays only the parameters and funtionality of the connected Control Unit.

What do you need?

The IOP-2 Handheld Kit is a completed package that contains the necessary items to commission and configure the Inverter utilizing the Optical Interface. The cable that is delivered with the IOP-2 Handheld kit is not compatible with the Optical Interface on the G120D Inverters; the order details of the necessary cable is given below.

- The IOP-2 Handheld Kit - order number: 6SL3255-0AA00-4HA1.
- Optical Cable - order number: 3RK1922-2BP00

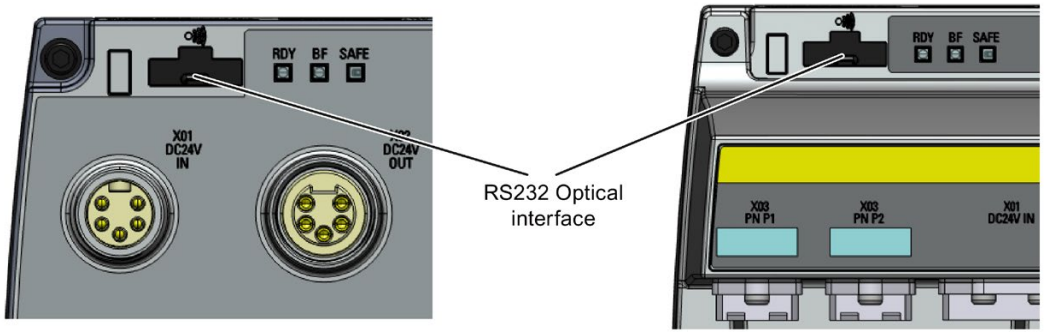


Figure 5-1 CU240D-2 and CU250D-2 Optical Interfaces

5.2.1 Commissioning a decentralized drive with the IOP-2

Overview

To perform the basic commissioning of a decentralized drive it is necessary to use the IOP-2 Handheld Kit (HHK).

The details of the HHK and the associated cables are given in the Commissioning tools section of this manual.

See Commissioning with the IOP-2 (Page 65).

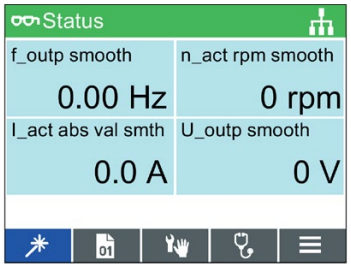
Note

Screens and sequence may vary

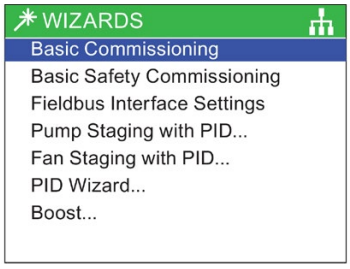
The sequence of the commissioning process and the actual screens may vary according to the following influences:

- The firmware version of the Intelligent Operator Panel 2 (IOP-2)
- The firmware version of the device being commissioned
- The specific type of device being commissioned.

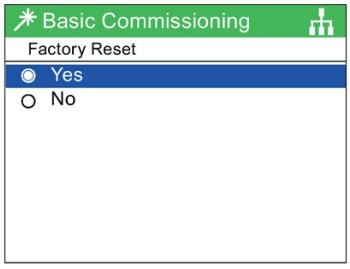
In all the scenarios, the IOP-2 will always display the appropriate commissioning screens and sequence for the device to which it is connected.



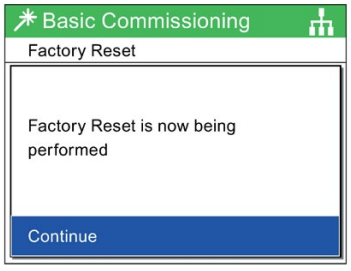
Select Wizards



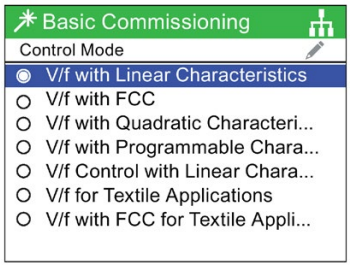
Select Basic Commissioning wizard



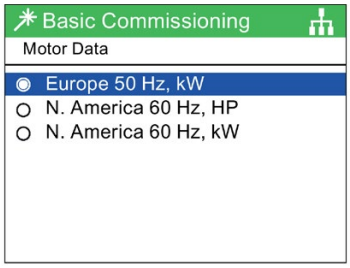
Select Factory Reset (yes or no)



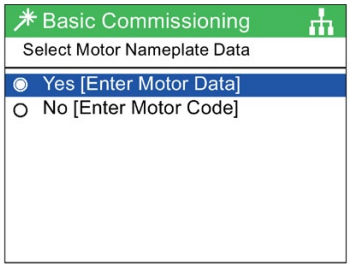
Select Continue



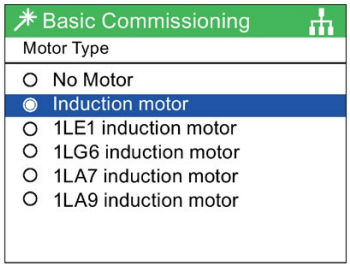
Select Control Mode



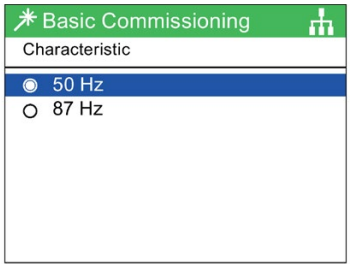
Select Motor Data



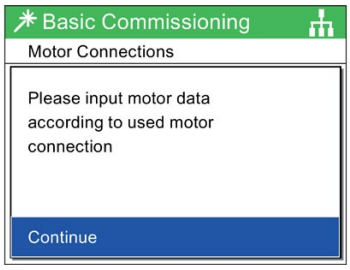
Select Enter Motor Data



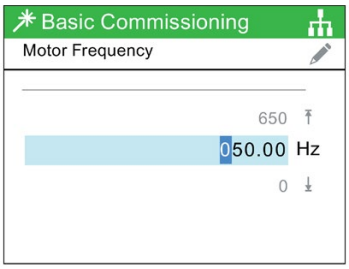
Select Motor Type



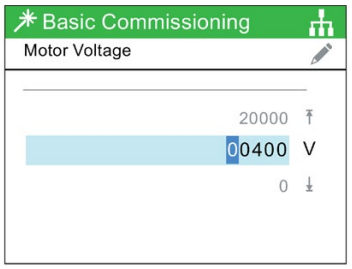
Select Characteristic



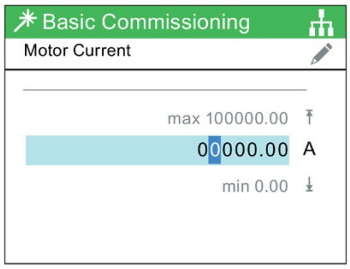
Select Continue



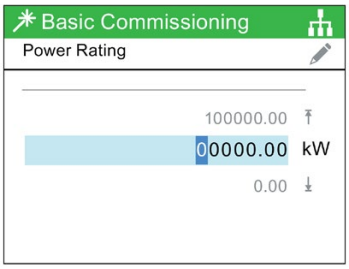
Input Motor Frequency



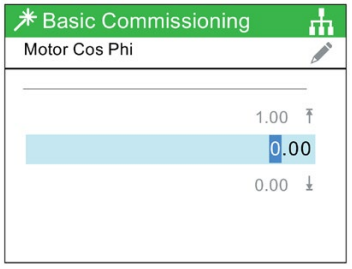
Input Motor Voltage



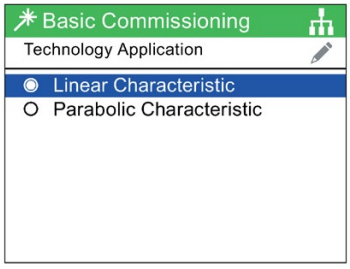
Input Motor Current



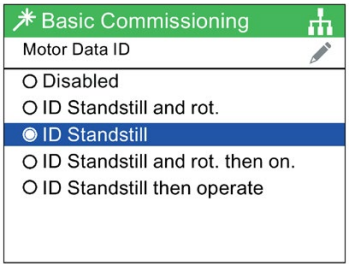
Input Power Rating



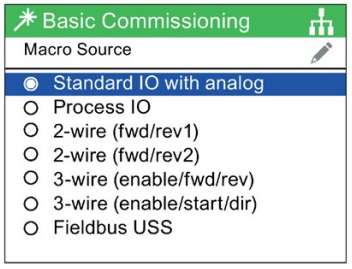
Input Motor Speed



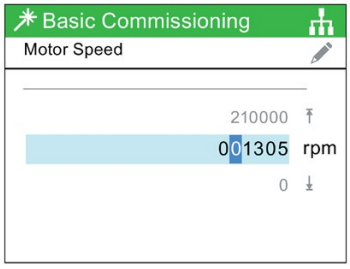
Select Technology Application



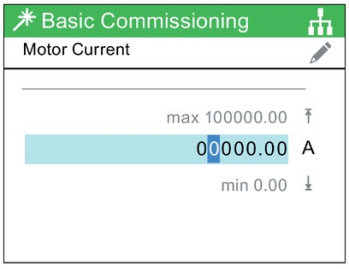
Select required Motor Data ID function



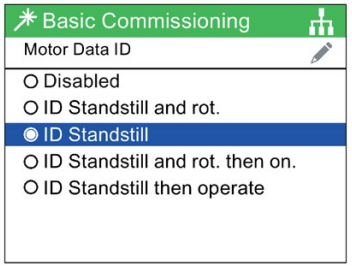
Select Macro Source



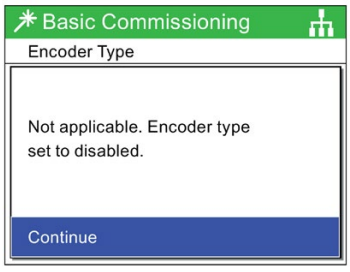
Input the Motor Speed



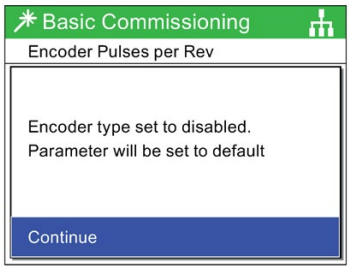
Input Current Limit



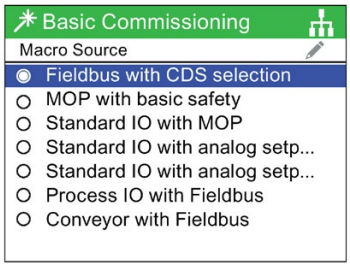
Select Motor Data ID option



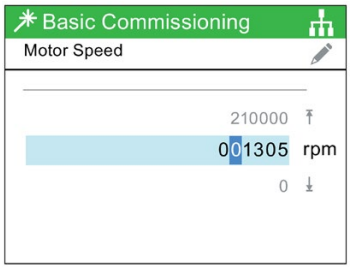
Input Encoder Type



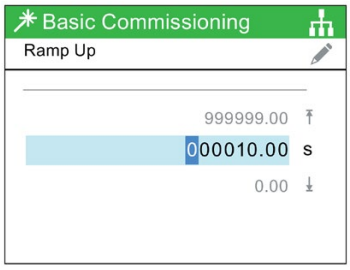
Input Encoder Pulses per rev



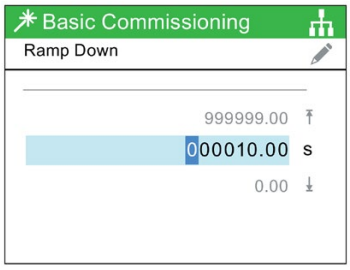
Select Macro Source



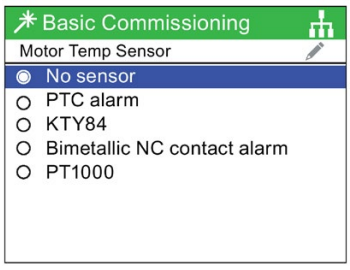
Input Maximum Speed



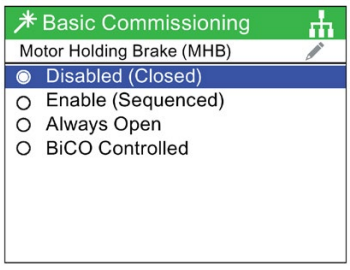
Input Ramp-up time



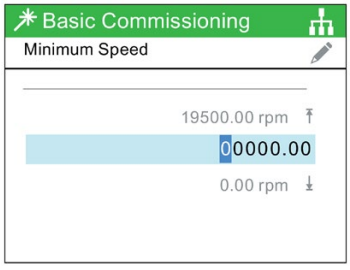
Input Ramp-down time



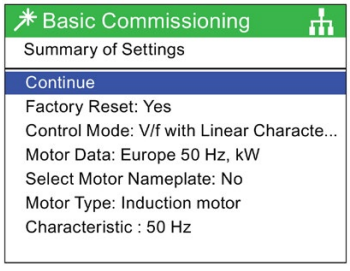
Select Motor Temperature Sensor



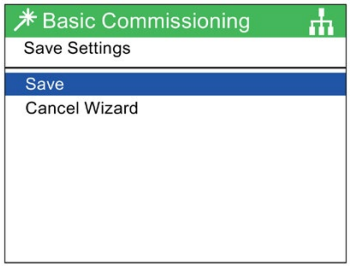
Select Motor Holding Brake option



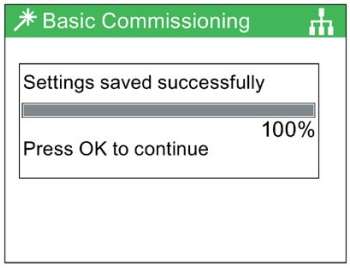
Input Minimum Motor Spped



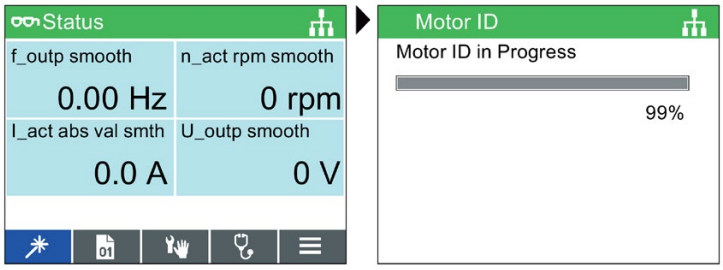
Summary of settings - Select Continue



Save Settings



Settings saved



Status Screen displayed

On first ON command - Motor ID is performed

5.3 Commissioning the application

Commissioning the applications

The Intelligent Operator Panel (IOP) allows the commissioning of a variety of applications utilizing a step-by-step wizard that presents the user with the questions relevant to the application being commissioned. When used in conjunction with the various wiring diagrams contained within the IOP Operating Instructions, the application can be quickly and easily commissioned.

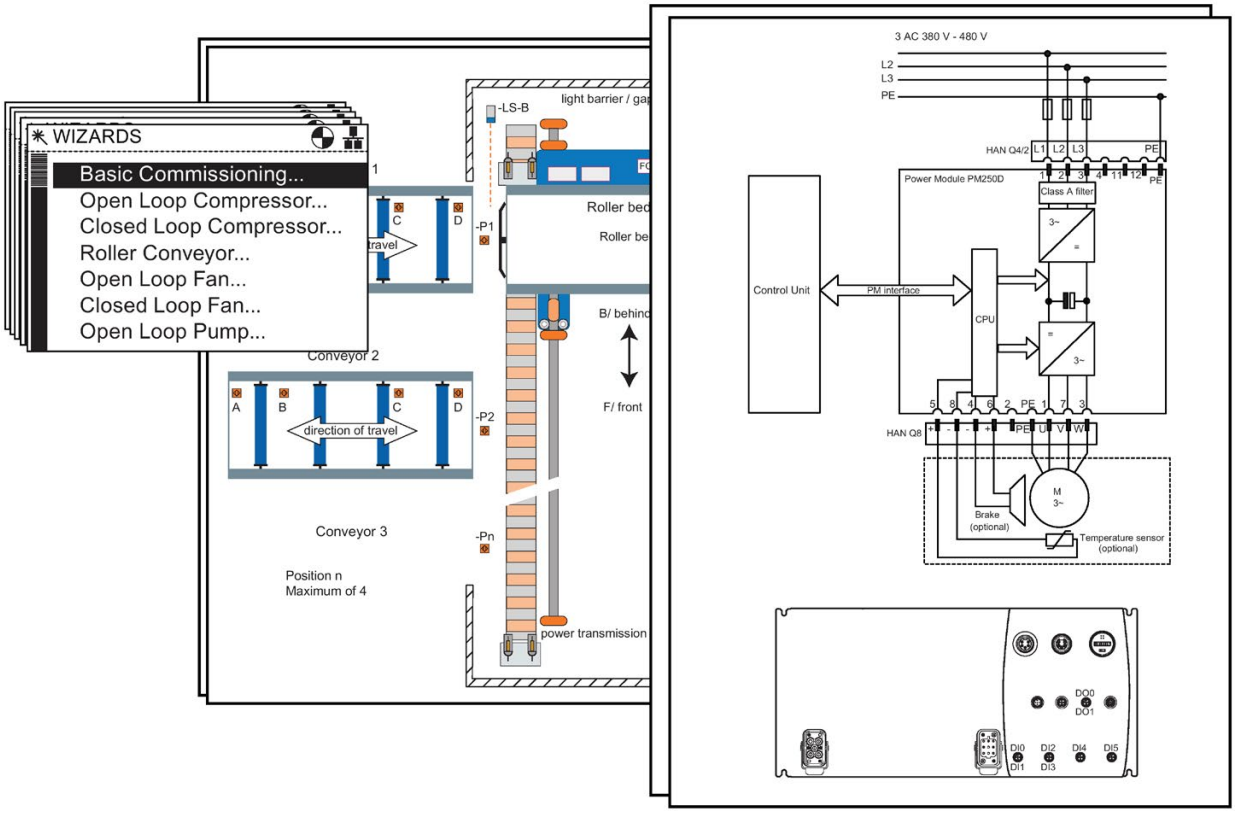


Figure 5-2 Example of IOP Wizards and Inverter wiring diagrams

5.4 Reset Parameters to Factory Settings

Overview

With a factory reset via P0970 the initial state of the all the inverter parameters can be re-established.

The factory setting values are designated as "Factory setting" in the Parameter Manual.

For further information, refer to the section "Factory Settings of the Control Unit" in this manual.

Note

When resetting the parameters to the factory setting, the communications memory is re-initialized. This means that communications are interrupted for the time it takes to perform the reset.

⚠WARNING

Parameter reset in case of CUs with fail-safe functions

Parameters that don't relate to fail-safe functions are reset with P0970 = 1.

To reset parameters that relate to fail-safe functions an additional parameter reset with P0970 = 5 must be performed. This parameter reset is password protected.

In case of a parameter reset with P0970 = 5 an acceptance test necessary.

Troubleshooting and further information

6

6.1 Operating states indicated on LEDs

LED status indicators

The Control Unit has number of dual-colour LEDs which are designed to indicate the operational state of the Inverter. The LEDs are used to indicate the status of the following states:

- General fault conditions
- Communication status
- Input and Output status
- Safety-Integrated status

The location of the various LEDs on the Control Unit are shown in the figure below.

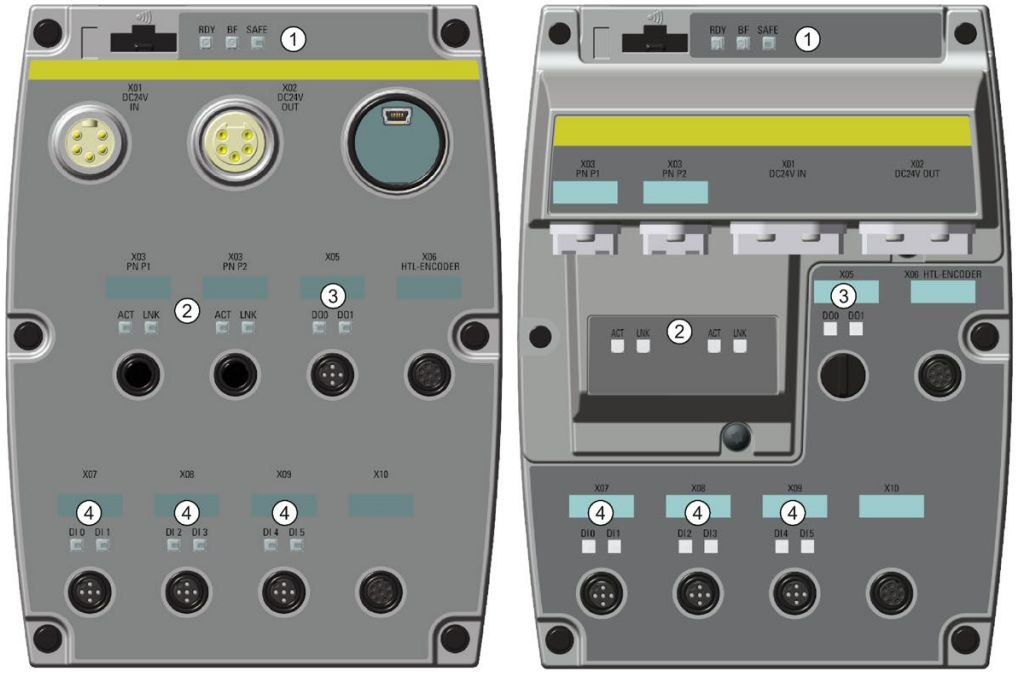
Status LEDs

① General

② PROFINET

③ Digital Output

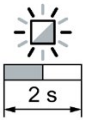
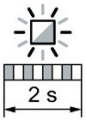
④ Digital Inputs



CU240D-2 (PROFINET) CU250D-2 (PROFINET)

Figure 6-1 Status LED locations

Table 6- 1 Explanation of symbols for the following tables

	LED is ON
	LED is OFF
	LED flashes slowly
	LED flashes quickly
	LED flashes with variable frequency

Please contact Technical Support for LED states that are not described in the following.

Table 6- 2 Basic states

RDY	Explanation
	Temporary state after the supply voltage is switched on.
	The inverter is free of faults
	Commissioning or reset to factory settings
	A fault is active
	Firmware update is active
	Inverter waits until the power supply is switched off and switched on again after a firmware update

6.2 LED DI/DO

Table 6- 3 Digital input and digital output

DI/DO	Explanation
	The associated digital input or digital output has the "high" state.
☐	The associated digital input or digital output has the "low" state.

Table 6- 4 Integrated safety functions

SAFE	Explanation
	One or more safety functions are enabled, but not active.
	One or more safety functions are active and error-free.
	The inverter has detected a safety function fault and initiated a stop response.

6.3 LED ACT/LNK

Table 6- 5 PROFINET fieldbus

ACT	LNK	Explanation
		Communication via PROFINET is error-free. Inverter and open-loop control exchange actual data.
☐		Communication via PROFINET has been set up.
☐	☐	Communication via PROFINET is not active.

Table 6- 6 PROFINET and PROFIBUS fieldbuses

BF	Explanation	
	Data exchange between the inverter and control system is active	
	Fieldbus interface is not being used	
	The fieldbus is improperly configured.	
	RDY 	In conjunction with a synchronously flashing LED RDY: Inverter waits until the power supply is switched off and switched on again after a firmware update
	No communication with higher-level controller	
	RDY 	In conjunction with an asynchronously flashing LED RDY: Incorrect memory card
	Firmware update failed	
	Firmware update is active	

6.4 List of alarms and faults

Axxxxx Alarm

Fyyyyy: Fault

Table 6- 7 The most important alarms and faults

Number	Cause	Remedy
F01000	Software error in the CU	Replace CU.
F01001	Floating point exception	Switch off CU and switch on again.
F01015	Software error in the CU	Upgrade firmware or contact technical support.
F01018	Power-up aborted more than once	1. Switch the module off and on again. 2. After this fault has been output, the module is booted with the factory settings. 3. Recommission the inverter.
A01028	Configuration error	Explanation: The parameter assignments on the memory card were created with a different type of module (Article no.). Check the module parameters and recommission if necessary.
F01033	Unit switchover: Reference parameter value invalid	Set the value of the reference parameter not equal to 0.0 (p0304, p0305, p0310, p0596, p2000, p2001, p2002, p2003, r2004).
F01034	Unit switchover: Calculation of the parameter values after reference value change unsuccessful	Select the value of the reference parameter so that the parameters involved can be calculated in the per unit notation (p0304, p0305, p0310, p0596, p2000, p2001, p2002, p2003, r2004).
F01040	Parameters must be saved	Save parameters (p0971). Switch CU off and on again.
F01044	Error loading data from memory card	Replace memory card or CU.
A01101	Memory card not available	Insert a memory card or deactivate the warning A01101. Figure 4-4 Interfaces on the converter variants (Page 26)
F01105	CU: Insufficient memory	Reduce number of data sets.
F01122	Frequency at the probe input too high	Reduce the frequency of the pulses at the probe input.
F01205	CU: Time slice overflow	Contact technical support.
F01250	CU hardware fault	Replace CU.
F01512	An attempt has been made to establish a conversion factor for scaling which does not exist	Create scaling or check transfer value.
A01590	Motor maintenance interval lapsed	Carry out maintenance and reset the maintenance interval (p0651).
F01600	STOP A initiated	Select the STO safety function and then deselect again.
F01650	Acceptance test required	Carry out an acceptance test and create test certificate. Switch off the Control Unit and switch on again.
F01659	Write task for parameter rejected	Cause: The inverter should be reset to the factory setting. However, it is not permissible to reset the safety functions as the safety functions are currently enabled. Remedy with operator panel:
		p0010 = 30 — Parameter reset
		p9761 = … — Enter password for the safety functions.
		p0970 = 5 — Reset start safety parameter. The inverter sets p0970 = 5 once it has reset the parameters.
		Then reset the inverter to the factory setting again.

Number	Cause	Remedy
F01662	CU hardware fault	Switch CU off and on again, upgrade firmware or contact technical support.
A01666	Static 1 signal at the F-DI for safe acknowledgment	Set fail-safe digital input F-DI to a logical 0 signal.
A01698	Commissioning mode active for safety functions	This message is withdrawn after the Safety commissioning has ended.
A01699	Switch-off signal path test required	After the next time that the "STO" function is deselected, the message is withdrawn and the monitoring time is reset.
A01900	PROFIBUS: Configuration telegram faulty	Explanation: A PROFIBUS master is attempting to establish a connection with a faulty configuration telegram. Check the bus configuration on the master and slave side.
A01910 F01910	Setpoint timeout	The alarm is generated when p2040 ≠ 0 ms and one of the following causes is present: • The bus connection is interrupted • The MODBUS master is switched off • Communications error (CRC, parity bit, logical error) • An excessively low value for the fieldbus monitoring time (p2040)
A01920	PROFIBUS: Cyclic connection interrupt	Explanation: The cyclic connection to PROFIBUS master is interrupted. Establish the PROFIBUS connection and activate the PROFIBUS master with cyclic operation.
A03520	Temperature sensor fault	Check that the sensor is connected correctly.
A05000 A05001 A05002 A05004 A05006	Power Module overtemperature	Check the following: - Is the ambient temperature within the defined limit values? - Are the load conditions and duty cycle configured accordingly? - Has the cooling failed?
F06310	Supply voltage (p0210) incorrectly parameterized	Check the parameterized supply voltage and if required change (p0210). Check the line voltage.
F07011	Motor overtemperature	Reduce the motor load. Check ambient temperature. Check the wiring and connection of the sensor.
A07012	I2t Motor Module overtemperature	Check and if necessary reduce the motor load. Check the motor's ambient temperature. Check thermal time constant p0611. Check overtemperature fault threshold p0605.
A07015	Motor temperature sensor alarm	Check that the sensor is connected correctly. Check the parameter assignment (p0601).
F07016	Motor temperature sensor fault	Make sure that the sensor is connected correctly. Check the parameterization (p0601). Deactivate the temperature sensor fault (p0607 = 0).
F07086 F07088	Unit switchover: Parameter limit violation	Check the adapted parameter values and if required correct.

Number	Cause	Remedy
F07320	Automatic restart aborted	Increase the number of restart attempts (p1211). The actual number of start attempts is shown in r1214. Increase the wait time in p1212 and/or monitoring time in p1213. Connect an ON command (p0840). Increase the monitoring time of the power unit or switch off (p0857). Reduce the wait time for resetting the fault counter p1213[1] so that fewer faults are registered in the time interval.
A07321	Automatic restart active	Explanation: The automatic restart (AR) is active. During voltage recovery and/or when remedying the causes of pending faults, the drive is automatically switched back on.
F07330	Search current measured too low	Increase search current (p1202), check motor connection.
A07400	V_{DC_max} controller active	If it is not desirable that the controller intervenes: • Increase the ramp-down times. • Deactivate the V_{DC_max} controller (p1240 = 0 for vector control, p1280 = 0 for U/f control).
A07409	U/f control, current limiting controller active	The alarm automatically disappears after one of the following measures: • Increase the current limit (p0640). • Reduce the load. • Slow down the up ramp for the setpoint speed.
A07441	Backup the position offset of the absolute encoder adjustment	This alarm automatically disappears after the offset has been saved.
F07443	Reference point coordinate not in the permissible range	Set the reference point coordinate to a lower value than specified in the fault value r0949 (interpret decimal).
F07450	Standstill monitoring has responded	After the standstill monitoring time (p2543) has expired, the drive has left the standstill window (p2542). Check whether the following is set correctly: • Position actual value inversion (p0410) • Standstill window too small (p2542)? • Standstill monitoring time too short (p2543)? • Position loop gain too low (p2538)? • Position loop gain too high (instability/oscillatory behavior, p2538)? • Mechanical overload? Other possible causes: • Connecting cable, motor/drive inverter incorrect (phase missing, interchanged). • When selecting motor identification, select tracking mode (BI: p2655[0] = 1 signal).

Number	Cause	Remedy
F07451	Position monitoring has responded	When the positioning monitoring time expired (p2545), the drive had still not reached the positioning window (p2544). Check whether the following is set correctly: • Positioning window too small (p2544)? • Positioning monitoring time too short (p2545)? • Position loop gain too low (p2538)? • Position loop gain too high (instability/oscillatory behavior, p2538)? Another possible cause: Mechanical clamping.
F07452	Following error too high	The difference between the position setpoint and the actual position value (following error dynamic model, r2563) is higher than the tolerance (p2546). Possible causes: • The drive torque or accelerating capacity has been exceeded. • Position measuring system fault. • Position control sense is not correct. • Mechanical system locked. • Excessively high traversing velocity or excessively high position set-point differences.
F07453	Position actual value processing error	Check the encoder for the actual position value processing.
A07454	Position actual value processing does not have a valid encoder	Check whether one of the following causes exists: • An encoder is not assigned for the position actual value processing (p2502 = 0). • An encoder is assigned, but no encoder data set has been assigned (p0187 = 99 or p0188 = 99 or p0189 = 99). • An encoder and an encoder data set have been assigned, however, the encoder data set does not contain any encoder data (p0400 = 0) or invalid data (e.g. p0408 = 0).
A07455	Maximum velocity limited	The maximum velocity (p2571) is too high to correctly calculate the modulo correction. Remedy: • Reduce the maximum velocity (p2571). • Increase the sampling time for positioning (p0115[5]).
A07456	Setpoint velocity limited	The actual setpoint velocity is greater than the parameterized maximum velocity (p2571), and is therefore limited. Remedy: • Check the entered setpoint velocity. • Reduce the velocity override (CI: p2646). • Increase the maximum velocity (p2571).

Number	Cause	Remedy
A07457	Combination of input signals is not permissible	An illegal combination of input signals, which are simultaneously set was detected, e.g.: • Jog 1 and jog 2 (p2589, p2590). • Jog 1 or jog 2 and direct setpoint input/MDI (p2589, p2590, p2647). • Jog 1 or jog 2 and start referencing (p2589, p2590, p2595). • Jog 1 or jog 2 and activate traversing task (p2589, p2590, p2631). • Direct setpoint input/MDI and start referencing (p2647, p2595). • Direct setpoint input/MDI and activate traversing task (p2647, p2631). • Start referencing and activate traversing task (p2595, p2631).
F07458	Reference cam not found	After starting the reference point approach, the axis has traversed through the maximum permissible distance to search for the reference cam without finding the reference cam. Remedy: • Check the "reference cam" binector input (BI: p2612). • Check the maximum permissible distance to the reference cam (p2606). • If axis does not have a reference cam, then set p2607 to 0.
F07459	No zero mark available	After leaving the reference cam, the axis traversed through the maximum permissible distance between the reference cam and zero mark without finding the zero mark. Remedy: • Check the encoder regarding the zero mark. • Check the maximum permissible distance between the reference cam and zero mark (p2609). • Use an external encoder zero mark (p0494).
F07460	End of reference cam not found	During the reference point approach, the axis, when approaching the zero mark, has reached the end of the traversing range without identifying an edge at the binector input "Reference cam" (BI: p2612). Remedy: • Check the "reference cam" binector input (BI: p2612).
A07461	Reference point not set	Reference the system
A07462	Selected traversing block number does not exist	Correct the traversing program.
A07463	External block change not requested in the traversing block	Resolve the reason why the edge is missing at binector input (BI: p2632).
F07464	Traversing block is inconsistent	Check the traversing block and, if necessary, take into consideration any alarms that are present.
A07465	Traversing block does not have a subsequent block	• Parameterize this traversing block with the step enabling condition END. • Parameterize additional traversing blocks with a higher block number and for the last block, parameterize the step enabling condition END.
A07466	Traversing block number assigned a multiple number of times	Correct the traversing blocks.
A07467	Traversing block has illegal task parameters	Correct the task parameter in the traversing block.
A07468	Traversing block jump target does not exist	• Correct the traversing block. • Add the missing traversing block.

Number	Cause	Remedy
A07469	Traversing block target position < software limit switch minus	• Correct the traversing block. • Change the software limit switch minus (CI: p2578, p2580). • Change the software limit switch plus (CI: p2579, p2581).
A07470	Traversing block target position > software limit switch plus	
A07471	Traversing block target position outside the modulo range	• Correct the target position in the traversing block. • Change the modulo range (p2576).
A07472	Traversing block ABS_POS/ABS_NEG not possible	Correct the traversing block.
A07473	Beginning of traversing range reached	Move away in the positive direction.
A07474	End of traversing range reached	Move away in the negative direction.
F07475	Target position < start of traversing range	Correct the target position.
F07476	Target position > end of traversing range	
A07477	Target position < software limit switch minus	• Correct the target position. • Change the software limit switch minus (CI: p2578, p2580). • Change the software limit switch plus (CI: p2579, p2581).
A07478	Target position > software limit switch plus	
A07479	Software limit switch, minus actuated	• Correct the target position. • Change the software limit switch minus (CI: p2578, p2580). • Change the software limit switch plus (CI: p2579, p2581).
A07480	Software limit switch, plus actuated	
F07481	Axis position < software limit switch minus	• Correct the target position. • Change the software limit switch minus (CI: p2578, p2580). • Change the software limit switch plus (CI: p2579, p2581).
F07482	Axis position > software limit switch plus	
A07483	Travel to fixed stop, clamping torque not reached	• Check the maximum torque-generating current (r1533). • Check the torque limits (p1520, p1521). • Check the power limits (p1530, p1531).
F07484	Fixed stop outside the monitoring window	In the "Fixed stop reached" state, the axis has moved outside the defined monitoring window (p2635). Remedy: • Check the monitoring window (p2635). • Check the mechanical system.
F07485	Fixed stop is not reached	In a traversing block with the FIXED STOP task the end position was reached without detecting a fixed stop. Remedy: • Check the traversing block and locate the target position further into the workpiece. • Check the "fixed stop reached" control signal (p2637). • Reduce the maximum following error window to detect the fixed stop (p2634).
A07486	Intermediate stop missing	Connect a "1" signal at the binector input "no intermediate stop/intermediate stop" (BI: p2640) and re-start motion.
A07487	Reject traversing task missing	Connect a "1" signal at the binector input "do not reject traversing task/reject traversing task" (BI: p2641) and re-start motion.

Number	Cause	Remedy
F07488	Relative positioning not possible	In the mode "direct setpoint input/MDI", for the continuous transfer (p2649 = 1), relative positioning was selected (BI: p2648 = 0 signal). Correct the selection.
A07489	Reference point offset outside window	For the function "flying referencing", the difference between the measured position at the measuring probe and the reference point coordinate is outside the parameterized window. Remedy: • Check the mechanical system. • Check the parameterization of the window (p2602).
F07490	Enable signal withdrawn while traversing	Set the enable signals.
F07491	STOP cam, minus actuated	Leave the STOP cam minus in the positive traversing direction and retract the axis to the valid traversing range.
F07492	STOP cam, plus actuated	Leave the STOP cam plus in the negative traversing direction and retract the axis to the valid traversing range.
F07493	Overflow of the value range for the position actual value	The value range (-2147483648 ... 2147483647) for representing the position actual value was exceeded. Remedy: If necessary reduce the traversing range or position resolution (p2506).
A07495	Reference function interrupted	An activated reference function (reference mark search or measuring probe evaluation) was interrupted. Possible causes: • Encoder fault • Reference mark search and measuring probe evaluation simultaneously activated (BI: p2508 and BI: p2509 = 1 signal). • Activated reference function (reference mark search or measuring probe evaluation) was de-activated (BI: p2508 and BI: p2509 = 0 signal).
A07496	Enable is not possible	It is not possible to enable the basic positioner as at least one signal is missing. Causes: • EPOS enable missing (BI: p2656). • Position actual value, valid feedback signal missing (BI: p2658).
F07499	Reversing cam approached with the incorrect traversing direction	Check the wiring of the reversing cam (BI: p2613, BI: p2614).
F07503	STOP cam approached with the incorrect traversing direction	Check the wiring of the STOP cam (BI: p2569, BI: p2570).
A07505	Fixed stop task for U/f/SLVC operation not possible	Change the open-loop/closed-loop control mode (p1300).
A07557 A07558	Reference point coordinate not in the permissible range	The received reference point coordinate when adjusting the encoder via connector input CI: p2599 lies outside half of the encoder range and cannot be set as actual axis position. Remedy: Correct reference point coordinate.
A07577 A07578	Measuring probe evaluation not possible	• Set the input terminal for the measuring probe (p0488, p0489 or p2517, p2518). • Reduce the frequency of the measuring pulses at the measuring probe.
A07581 A07582	Position actual value processing error	Check the encoder for the actual position value processing.

Number	Cause	Remedy
A07584 A07585	Position setting value activated	The alarm automatically disappears with BI: p2514 = 0 signal.
A07587 A07588	Position actual value processing does not have a valid encoder	An encoder data set has been assigned, however, the encoder data set does not contain any encoder data (p0400 = 0) or invalid data (e.g. p0408 = 0). Remedy: Check the drive data sets and encoder data sets.
A07593 A07594	Value range for position actual value exceeded	The value range (-2147483648 ... 2147483647) for representing the position actual value was exceeded. Remedy: Reduce the traversing range or position resolution. If necessary reduce the traversing range or position resolution.
A07596 A07597	Reference function interrupted	An activated reference function (reference mark search or measuring probe evaluation) was interrupted. Possible causes: • Encoder fault • Reference mark search and measuring probe evaluation simultaneously activated (BI: p2508 and BI: p2509 = 1 signal). • Activated reference function (reference mark search or measuring probe evaluation) was de-activated (BI: p2508 and BI: p2509 = 0 signal).
F07599 F07600	Adjustment not possible	The maximum encoder value times the factor to convert the absolute position (r0483 and/or r2723) from increments to length units (LU) has exceeded the value range (-2147483648 ... 2147483647) for representing the position actual value.
F07801	Motor overcurrent	Check current limits (p0640). Vector control: Check current controller (p1715, p1717). U/f control: Check the current limiting controller (p1340 … p1346). Increase acceleration ramp (p1120) or reduce load. Check motor and motor cables for short circuit and ground fault. Check motor for star-delta connection and rating plate parameterization. Check power unit / motor combination. Select flying restart function (p1200) if switched to rotating motor.
A07805	Drive: Power unit overload I2t	• Reduce the continuous load. • Adapt the load cycle. • Check the assignment of rated currents of the motor and power unit.
F07806	Regenerative power limit exceeded	Increase deceleration ramp. Reduce driving load. Use power unit with higher energy recovery capability. For vector control, the regenerative power limit in p1531 can be reduced until the fault is no longer activated.
F07807	Short circuit detected	• Check the inverter connection on the motor side for any phase-phase short-circuit. • Rule out that line and motor cables have been interchanged.
A07850 A07851 A07852	External alarm 1 … 3	The signal for "external alarm 1" has been triggered. Parameters p2112, p2116 and p2117 determine the signal sources for the external alarm 1… 3. Remedy: Rectify the cause of these alarms.

Number	Cause	Remedy
F07860 F07861 F07862	External fault 1 … 3	Remove the external causes for these faults.
F07900	Motor blocked	Check that the motor can run freely. Check the torque limits (r1538 and r1539). Check the parameters of the "Motor blocked" message (p2175, p2177).
F07901	Motor overspeed	Activate precontrol of the speed limiting controller (p1401 bit 7 = 1). Increase hysteresis for overspeed signal p2162.
F07902	Motor stalled	Check whether the motor data has been parameterized correctly and perform motor identification. Check the current limits (p0640, r0067, r0289). If the current limits are too low, the drive cannot be magnetized. Check whether motor cables are disconnected during operation.
A07903	Motor speed deviation	Increase p2163 and/or p2166. Increase the torque, current and power limits.
A07910	Motor overtemperature	Check the motor load. Check the motor's ambient temperature. Check the KTY84 or PT1000 sensor. Check the overtemperatures of the thermal model (p0626 ... p0628).
A07920	Torque/speed too low	The torque deviates from the torque/speed envelope curve. • Check the connection between the motor and the load. • Adapt the parameterization corresponding to the load.
A07921	Torque/speed too high	
A07922	Torque/speed out of tolerance	
F07923	Torque/speed too low	• Check the connection between the motor and the load. • Adapt the parameterization corresponding to the load.
F07924	Torque/speed too high	
A07927	DC braking active	Not required
A07975	Traverse to the zero mark - set-point input expected	The alarm disappears when the zero mark is detected.
A07980	Rotary measurement activated	Not required
A07981	No enabling for rotary measure-ment	Acknowledge pending faults. Establish missing enables (see r00002, r0046).
A07991	Motor data identification activated	Switch on the motor and identify the motor data.
F08501	Setpoint timeout	• Check the PROFINET connection. • Set the controller to RUN mode. • If the error occurs repeatedly, check the monitoring time set (p2044).
F08502	Monitoring time, sign-of-life expired	• Check the PROFINET connection.
F08510	Send configuration data not valid	• Check the PROFINET configuration
A08511	Receive configuration data not valid	
A08526	No cyclic connection	• Activate the controller with cyclic operation. • Check the parameters "Name of Station" and "IP of Station" (r61000, r61001).

Number	Cause	Remedy
A08565	Consistency error for adjustable parameters	Check the following: • IP address, subnet mask or default gateway is not correct. • IP address or station name used twice in the network. • Station name contains invalid characters.
F08700	Communications error	A CAN communications error has occurred. Check the following: • Bus cable. • Baud rate (p8622). • Bit timing (p8623). • Master Start the CAN controller manually with p8608 = 1 after the cause of the fault has been resolved!
F13100	Know-how protection: Copy protection error	The know-how protection and the copy protection for the memory card are active. An error occurred when checking the memory card. • Insert a suitable memory card and switch the inverter supply voltage temporarily off and then on again (POWER ON). • Deactivate the copy protection (p7765).
F13101	Know-how protection: Copy protection cannot be activated	Insert a valid memory card.
F30001	Overcurrent	Check the following: • Motor data, if required, carry out commissioning • Motor connection method (Y / Δ) • U/f operation: Assignment of rated currents of motor and Power Module • Line quality • Make sure that the line commutating reactor is connected properly • Power cable connections • Power cables for short-circuit or ground fault • Power cable length • Line phases If this doesn't help: • U/f operation: Increase the acceleration ramp • Reduce the load • Replace the power unit
F30002	DC-link voltage overvoltage	Increase the ramp-down time (p1121). Set the rounding times (p1130, p1136). Activate the DC link voltage controller (p1240, p1280). Check the line voltage (p0210). Check the line phases.
F30003	DC-link voltage undervoltage	Check the line voltage (p0210).

Number	Cause	Remedy
F30004	Inverter overtemperature	Check whether the inverter fan is running. Check whether the ambient temperature is in the permissible range. Check whether the motor is overloaded. Reduce the pulse frequency.
F30005	I2t inverter overload	Check the rated currents of the motor and Power Module. Reduce current limit p0640. When operating with U/f characteristic: Reduce p1341.
F30011	Line phase failure	Check the inverter's input fuses. Check the motor cables.
F30015	Motor cable phase failure	Check the motor cables. Increase the ramp-up or ramp-down time (p1120).
F30021	Ground fault	• Check the power cable connections. • Check the motor. • Check the current transformer. • Check the cables and contacts of the brake connection (a wire might be broken).
F30022	Power Module: Monitoring U_{CE}	Check or replace Power Module.
F30027	Time monitoring for DC link pre-charging	Check the supply voltage at the input terminals. Check the line voltage setting (p0210).
F30035	Overtemperature, intake air	• Check whether the fan is running. • Check the fan filter elements. • Check whether the ambient temperature is in the permissible range.
F30036	Overtemperature, inside area	
F30037	Rectifier overtemperature	See F30035 and, in addition: • Check the motor load. • Check the line phases
A30049	Internal fan defective	Check the internal fan and if required replace.
F30052	Incorrect Power Module data	Replace Power Module or upgrade CU firmware.
F30053	Error in FPGA data	Replace the Power Module.
F30059	Internal fan defective	Check the internal fan and if required replace.
F30074	Communications error between Control Unit and Power Module	There is a communications fault between the Control Unit and the Power Module. Possible causes: • The Control Unit may have been removed or inserted incorrectly. • The external 24 V Control Unit power supply has dipped to ≤95% of the rated voltage for ≤3 ms
A30502	DC link overvoltage	• Check the unit supply voltage (p0210). • Check the dimensioning of the line reactor.
F30600	STOP A initiated	Select the STO safety function and then deselect again.
F30662	CU hardware fault	Switch CU off and on again, upgrade firmware or contact technical support.
F30664	CU power up aborted	Switch CU off and on again, upgrade firmware or contact technical support.
F30850	Software fault in the Power Module	Replace Power Module or contact technical support.

Number	Cause	Remedy
A30920	Temperature sensor fault	Check that the sensor is connected correctly.
F31100	Zero mark distance error	The measured zero mark distance does not correspond to the parameterized zero mark distance. Remedy: • Check that the encoder cables are routed in compliance with EMC. • Check the cable connections. • Check the encoder type (encoder with equidistant zero marks). • Adapt the parameters for the distance between zero marks (p0424, p0425). • For a signal output above a speed threshold, reduce the filter time (p0438).
F31101	Zero mark failed	
F31118	Speed difference outside tolerance	For an HTL/TTL encoder, the speed difference has exceeded the value in p0492 over several sampling cycles. • Check tachometer feeder cable for interruptions. • Check the grounding of the tachometer shielding. • Increase the maximum speed difference per sampling cycle (p0492).
A31418	Speed difference per sampling rate exceeded	
F31905	Parameterizing error	Check whether the connected encoder type matches the encoder that has been parameterized.
A31915	Configuration error	When the fine resolution Gx_XIST2 is configured, the encoder identifies a maximum possible absolute position actual value (r0483) that can no longer be represented within 32 bits. Remedy: Check the encoder data.
F32110	Serial communications error	The transfer of the serial communication protocol between the encoder and inverter is faulty. Remedy: Check the hardware and the associated settings in the inverter.
F32111 F32112	Absolute encoder internal error	• Check the power supply of the encoder. • Replace the encoder.
A32410	Serial communication	• Check that the encoder cables are routed in compliance with EMC. • Check the cable connections. • Replace the encoder.
A32411	Absolute encoder outputs alarms	Replace the encoder.
A32412	Error bit set in the serial protocol	• Carry out a power on reset (power off/on) for all components. • Check that the encoder cables are routed in compliance with EMC. • Check the plug connections. • Replace the encoder
A32442	Battery voltage pre-alarm	Replace the battery in the encoder.
F32905	Parameterizing error	• Check whether the connected encoder type matches the encoder that has been parameterized. • Correct the parameter specified by the fault value (r0949) and p0187.
A32915	Configuration error	When the fine resolution Gx_XIST2 is configured, the encoder identifies a maximum possible absolute position actual value (r0483) that can no longer be represented within 32 bits. Remedy: Check the encoder data.

For further information, please refer to the List Manual.

Manuals for the converter (Page 89)

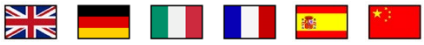
6.5 Manuals for the converter

Handbücher mit weiterführender Information zum Download:

- Getting Started SINAMICS G120D
  (https://support.industry.siemens.com/cs/ww/en/view/109477364)
  Installing and commissioning the inverter.

- Operating instructions SINAMICS G120D with CU240D-2
  (https://support.industry.siemens.com/cs/ww/en/view/109477366)
  Installing, commissioning and operating the inverter. Advanced commissioning. Technical data.

- Operating instructions SINAMICS G120D with CU250D-2
  (https://support.industry.siemens.com/cs/ww/en/view/109477365)
  Installing, commissioning and operating the inverter. Advanced commissioning. Technical data.

- List manual SINAMICS G120D
  (https://support.industry.siemens.com/cs/ww/en/view/109477255)

  List of parameters, alarms and faults. Graphic function block diagrams.

- Operating instructions IOP
  (https://support.industry.siemens.com/cs/ww/en/view/109478559)

  Description of operator panel

6.6 Technical support

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 +44 161 446 5545

 +39 (02) 24362000

 +34 902 237 238

 +33 (0) 821 801 122

You can find additional telephone numbers for Technical Support in the Internet:

Product support (https://support.industry.siemens.com/cs/ww/en/)

Further information

SINAMICS converters:
www.siemens.com/sinamics

Safety Integrated:
www.siemens.com/safety-integrated

PROFINET:
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For additional information on SINAMICS G120D, scan the QR code.