SINAMICS G120D

Control Units: SINAMICS CU240D-2
SINAMICS CU250D-2

Power Modules: SINAMICS PM250D

Getting Started Guide · 01/2013

SINAMICS

Answers for industry.

SIEMENS

SIEMENS

SINAMICS

SINAMICS G120D Converter with Control Units CU240D-2 CU250D-2

Getting Started

Edition 01/2013, Firmware V4.6

01/12013, FW V4.6

A5E03404762B AB

Legal information

Warning notice system

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

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

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

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

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

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

Trademarks

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
Industry Sector
Postfach 48 48
90026 NÜRNBERG
GERMANY

A5E03404762B AB
℗ 01/2013 Technical data subject to change

Table of contents

Objective of these instructions

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

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

Additional information on SINAMICS G120

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

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

Order number: 6SL3097-4CA00-0YG0

What is the meaning of the symbols in the manual?

An operating instruction starts here.

This concludes the operating instruction.

Firmware upgrade and downgrade

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

Safety notes

1

Use for the intended purpose

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

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

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

⚠DANGER

Danger to life when live parts are touched

Touching live parts can result in death or severe injury.

Note the following:

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

Follow the six steps to ensure safety:

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

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

⚠WARNING

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

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

- For all connections and terminals of the electronic boards, only use power supplies that provide PELV (Protective Extra Low Voltage) or SELV (Safety Extra Low Voltage) output voltages.

⚠WARNING

Danger to life when live parts are touched on damaged devices

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

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

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

⚠WARNING

Fire hazard for the motor due to overload of the insulation

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

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

⚠WARNING

Danger of fire through overheating due to insufficient ventilation clearances

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

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

⚠ WARNING

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

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

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

NOTICE

Damage due to electric fields or electrostatic discharge

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

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

⚠ CAUTION

Risk of burns due to touching hot surfaces

During operation and for a short time after the frequency converter shuts down, the surface of the device can reach a high temperature. Touching the surface of the converter can cause burns.

- Do not touch the device during operation.
- After shutting down the converter, wait for the device to cool down before touching it.

Residual risks of power drive systems

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

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

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

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

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

   Inverters of the Open Type / IP20 degree of protection must be installed in a metal control cabinet (or protected by another equivalent measure) such that the contact with fire inside and outside the inverter is not possible.
3. Hazardous shock voltages caused by, for example:
   - Component malfunctions
   - Influence of electrostatic charging
   - Induction of voltages in moving motors
   - Operating and/or ambient conditions outside of the specification
   - Condensation / conductive contamination
   - External influences / damage

4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc. if they are too close.
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly.

Note

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

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

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

Introduction

2

This Getting Started Guide describes how to perform the installation and basic commissioning of the Inverter.

2.1 SINAMICS G120D Inverter

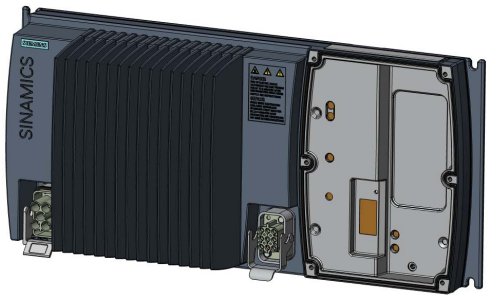
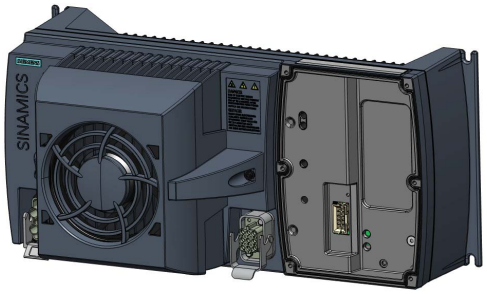
Overview

The SINAMIC G120D is a range of Inverters for controlling the speed of three-phase motors. The Inverter consists of two parts, the Control Unit (CU) and the Power Module (PM). In the table below is listed the various CUs and PMs that comprise the SINAMICS G120D system.

Table 2- 1 Control Units of the SINAMICS G120D Inverter

	Designation	Interface	Encoder type	Order number
	CU240D-2 DP	PROFIBUS	HTL Encoder	6SL3544-0FB20-1PA0
	CU240D-2 DP-F	PROFIBUS PROFISAFE	HTL Encoder	6SL3544-0FB21-1PA0
	CU250D-2 DP-F	PROFIBUS PROFISAFE Positioning	HTL Encoder SSI Absolute Encoder	6SL3546-0FB21-1PA0
	CU240D-2 PN	PROFINET	HTL Encoder	6SL3544-0FB20-1FA0
	CU240D-2 PN-F	PROFINET PROFISAFE	HTL Encoder	6SL3544-0FB21-1FA0
	CU250D-2 PN-F	PROFINET PROFISAFE Positioning	HTL Encoder SSI Absolute Encoder	6SL3546-0FB21-1FA0
	CU240D-2 PN-F [PP]	PROFINET PROFISAFE Push-Pull connections	HTL Encoder	6SL3544-0FB21-1FB0
	CU250D-2 PN-F [PP]	PROFINET PROFISAFE Positioning Push-Pull connections	HTL Encoder SSI Absolute Encoder	6SL3546-0FB21-1FB0

Table 2- 2 PM250D Power Modules for the SINAMICS G120D Inverter

	Frame size	Rated output power	Rated output current	Order 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

2.2 Commissioning tools

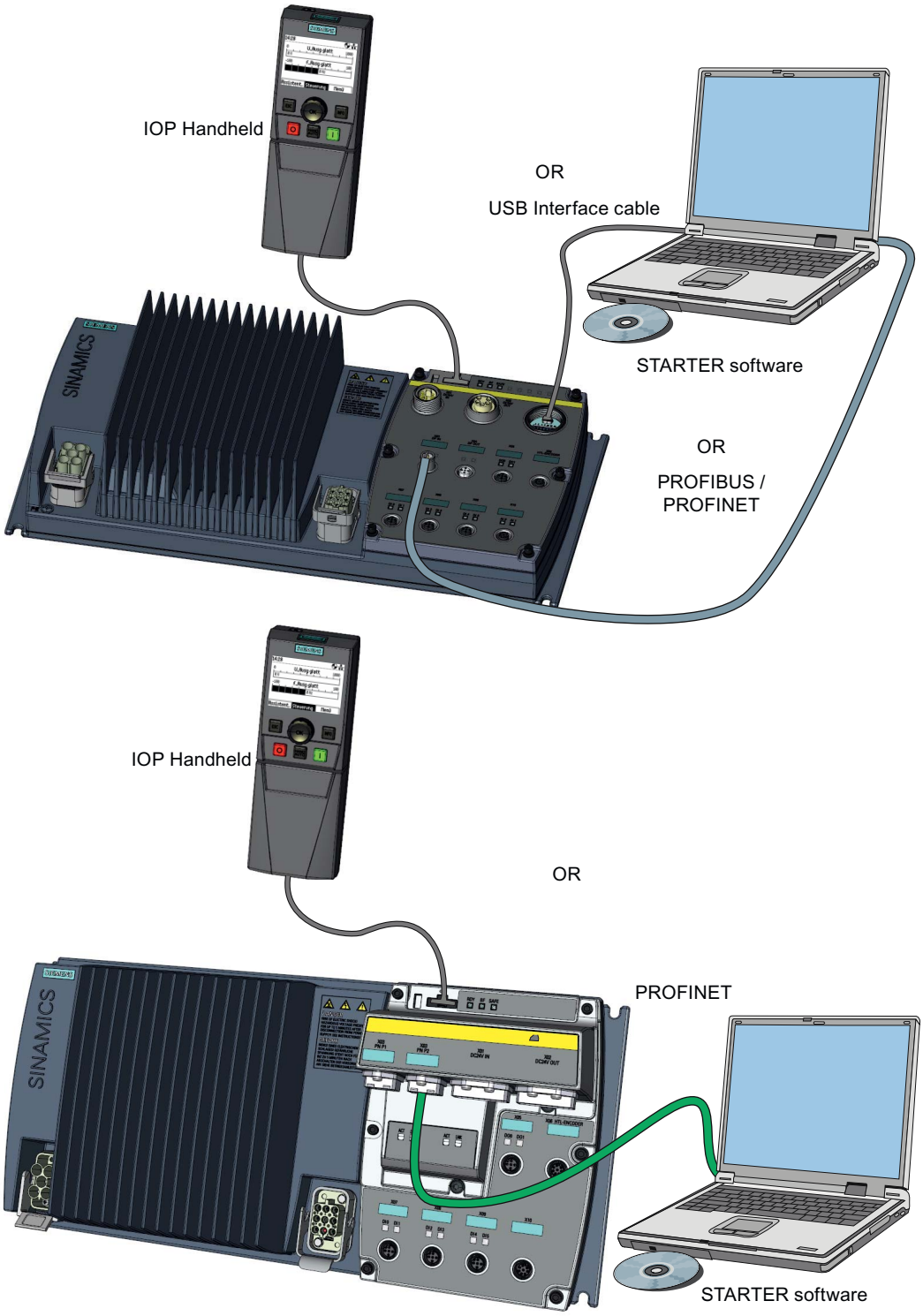


Figure 2-1 Commissioning tools - PC or IOP Handheld Kit

Table 2- 3 Components and tools for commissioning and data backup

Component or tool			Order number
Operator Panel	IOP Handheld		6SL3255-0AA00-4HA0
STARTER	Commissioning tool (PC software)		You obtain STARTER on a DVD (Order number: 6SL3072-0AA00-0AG0) and it can be downloaded: STARTER Download (http://support.automation.siemens.com/WW/view/en/26233208)
PC Connection Kit	Comprising STARTER DVD and USB cable.		6SL3255-0AA00-2CA0
	Optional memory card for storing and transferring the inverter settings	SD card	6ES7954-8LB00-0AA0
		MMC card	6SL3254-0AM00-0AA0

Installation

3

3.1 General layout SINAMICS G120D

General layout of SINAMICS G120D

The locations and description of the various interface connections on the Control Units (CU) - CU240D-2 and CU250D-2 including the Power Module (PM) PM250D are detailed in the diagram and table below.

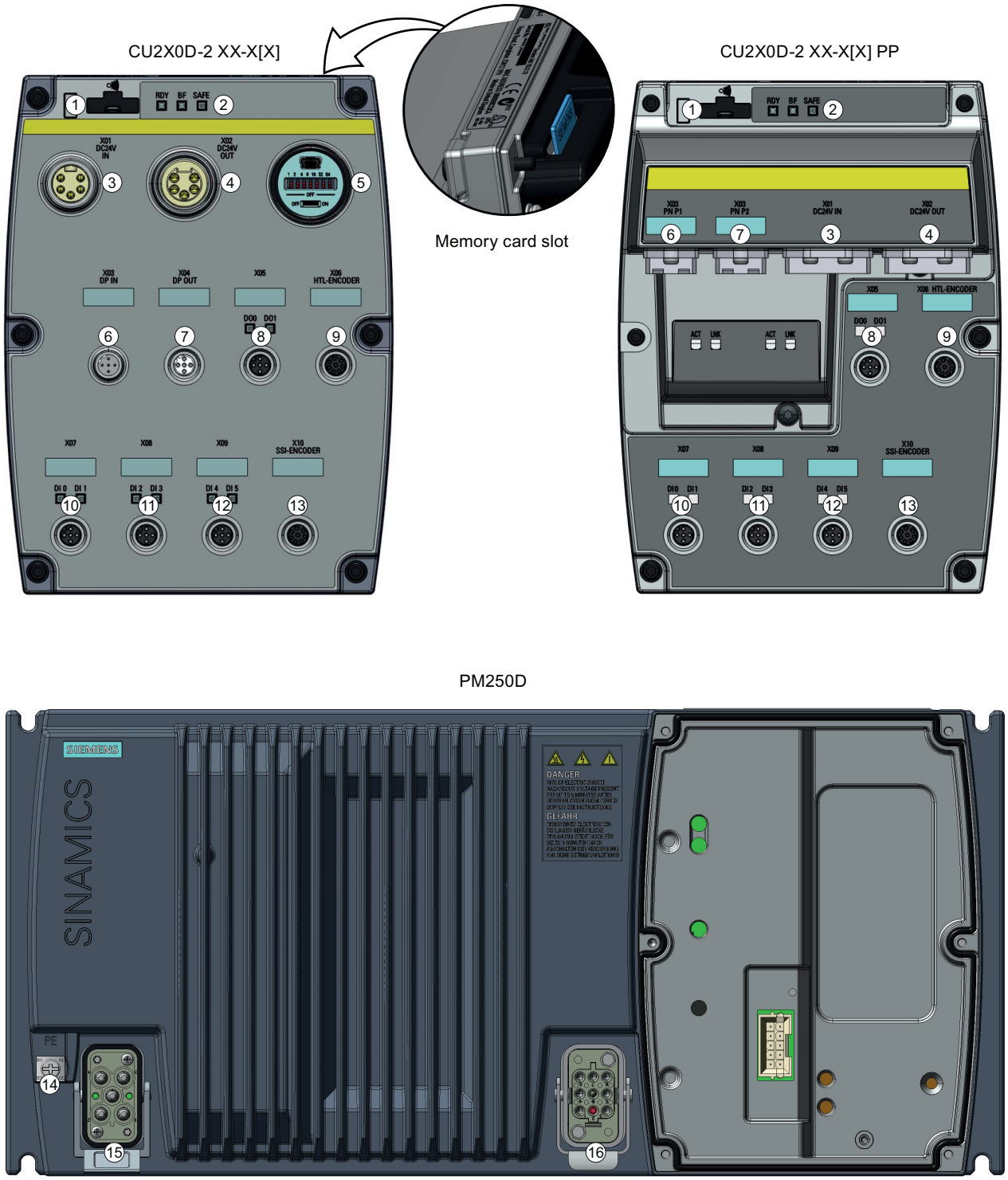


Figure 3-1 SINAMICS G120D CU240D-2, CU250D-2 and PM250D layout

Table 3- 1 Description of interfaces

No.	Description	No.	Description
①	Optical PC connection	⑨	HTL Encoder connection
②	Status LEDs	⑩	Digital Inputs 0 and 1
③	24 V DC supply IN	⑪	Digital Inputs 2 and 3
④	24 V DC supply OUT	⑫	Digital Inputs 4 and 5
⑤	USB connection, Address DIP-switch (PROIFBUS) and Bus termination switch	⑬	SSI Encoder or Analog Inputs 0 and 1 (depending on type of CU)
⑥	PROFIBUS IN or PROFINET P1	⑭	PE grounding terminal
⑦	PROFIBUS OUT or PROFINET P2	⑮	Mains supply connection
⑧	Digital Outputs 0 and 1	⑯	Motor, brake and temperature sensor connections

3.2 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.

⚠ CAUTION

Seals fitted correctly

It is important that when assembling the Power Module and the Control Unit that all the seals are fitted correctly to ensure IP65 rating.

TN and TT mains supplies

The SINAMICS PM250D Power Module with the Class A integrated mains filter is only suitable for operation on TN and TT mains supplies.

The CU is fitted to the PM as shown in the diagram below.

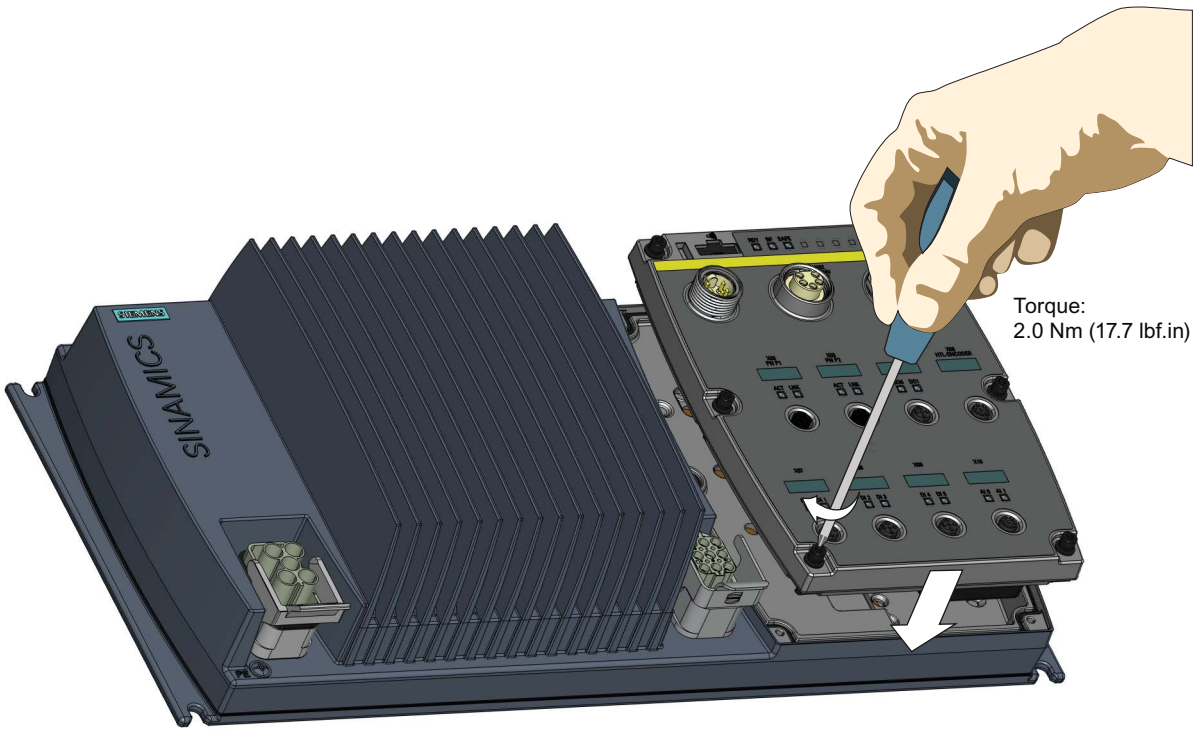


Figure 3-2 Fitting the Control Unit to the Power Module

3.3 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.

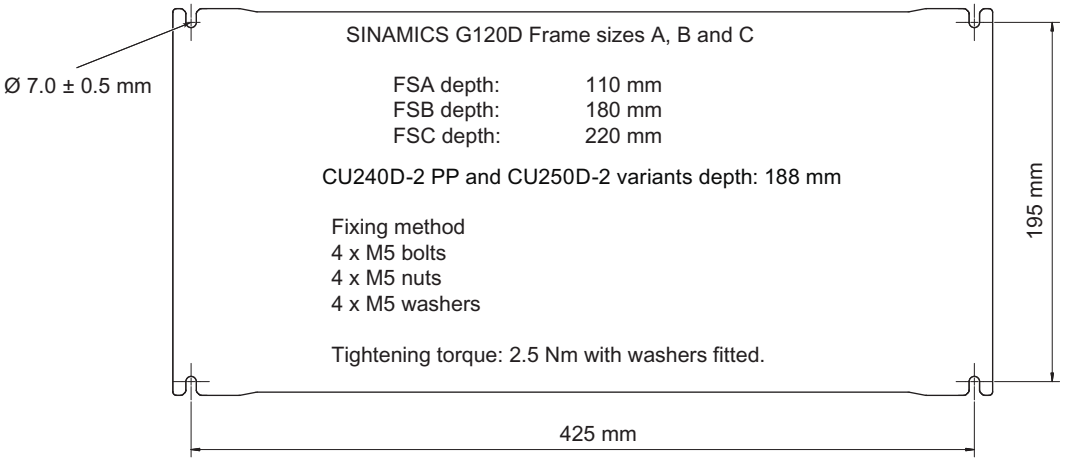


Figure 3-3 SINAMICS G120D drill pattern

Mounting orientation

The inverter has been designed to be table-mounted or side-mounted, it cannot be mounted upside-down. 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).

Wall mounting

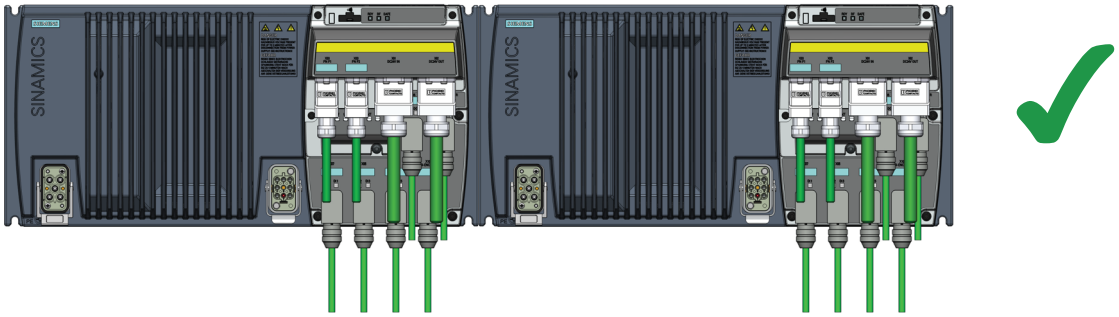
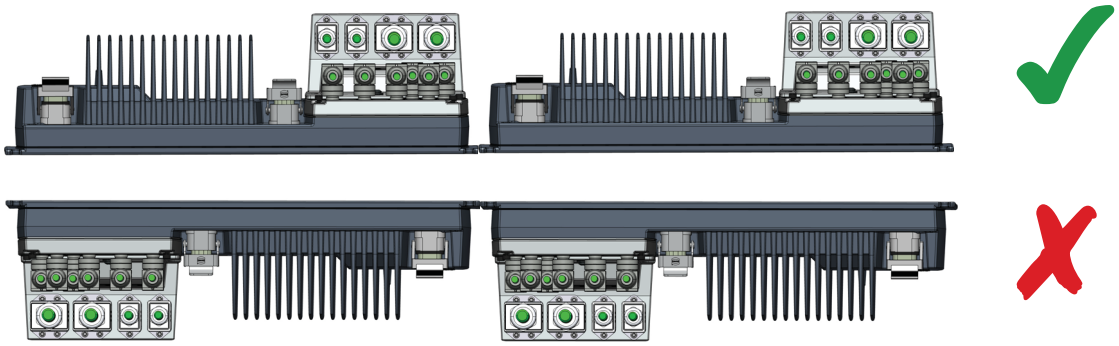


Table mounting



Vertical mounting

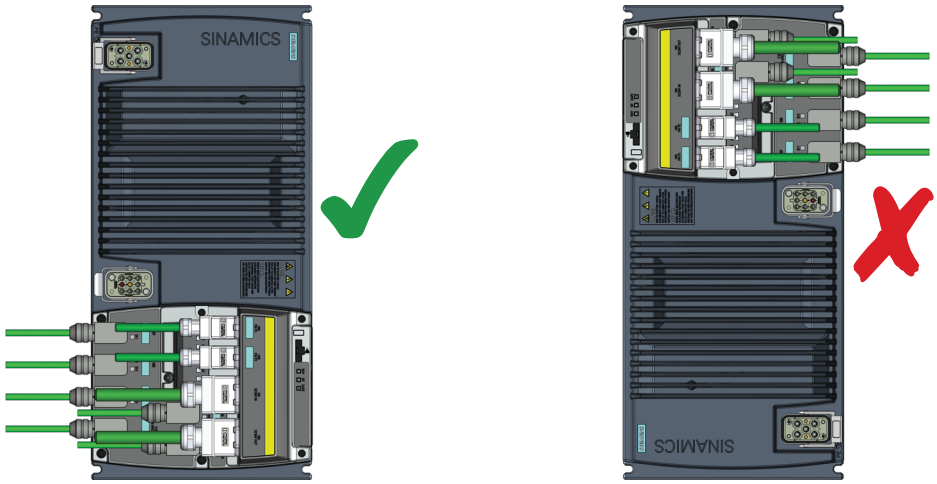


Figure 3-4 Correct Inverter orientation

Vertical mounting

In some applications it may be advantageous to mount the Inverter vertically as shown in the figure above. If the Inverter is mounted in the vertical position, the output current of the Inverter must be reduced to prevent overheating of the Inverter, this is known as derating the Inverter. There are two methods that can be used to prevent overheating of the Inverter, they are:

Reduce output current

If you are using the same size of Inverter and Motor, that is, for example, a 1.5 kW Inverter and a 1.5 kW motor, the output current from the Inverter must be reduced. This is accomplished using the parameter P0640. The parameter P0640 defines the motor overload current limit, as a percentage of the rated motor current. The output current needs to be reduced by 20%. setting P0640 to 80 limits the output current from the Inverter to a maximum of 80% of the rated motor current.

Oversize the Inverter

If you are using, for example, a 3.0 kW motor and a 3.0 kW Inverter and the derating by 20% adversely affects the application; then oversizing the Inverter will provided a solution to the problem. The motor will remain a 3.0 kW motor but an Inverter of the next highest power rating is used; in this case, a 4.0 kW Inverter.

The Inverter is derated using parameter P0640 = 80, but the increased power rating of the Inverter will allow the application to run as required.

Ambient temperature

When using the Inverter in the vertical position, including the derating, the ambient temperature limit of 40°C must under no circumstances be exceeded.

3.4 SINAMICS G120D Electrical data

Power Module specifications - 3AC 380 V ... 500 V ± 10 %

Table 3- 2 Rated Output, Input and Fuses

Product	Frame size	Rated output		HO		Fuse	
				Rated output current	Rated input current		3NA3…
6SL3525-…		kW	hp	A	A	A	Type
0PE17-5AA1	A	0.75	1	2.2	2.1	10	803 -
0PE21-5AA1	A	1.5	1.5	4.1	3.8	10	803 -
0PE23-0AA1	B	3	4	7.7	7.2	16	805 -
0PE24-0AA1	C	4	5	10.2	9.5	20	807 -
0PE25-5AA1	C	5.5	7.5	13.2	12.2	20	807 -
0PE27-5AA1	C	7.5	10	19	17.7	32	812 -

Standby current

The PM250D Power Module has a unique standby current characteristic which needs to be taken into account when calculating the requirements of the line supply.

The standby current is the current that the Power Module requires when the Inverter is in the ready-to-run mode. This means that the Inverter is powered-up but the motor is not running. The phenomenon of capacitive reactive current standby occurs in all Power Modules and Inverters with filter capacitors on the line side.

In applications were a number of Inverters are connected to one line supply and where only a small proportion of the Inverters will be running at any one time, the standby currents in the non-running Inverters must be considered when calculating the size of the conductors and selecting the correct protective devices on the line supply of the system.

The following table gives examples of the current drawn by the different Power Modules at different line supply voltages and frequencies.

Table 3- 3 Standby currents for the PM250D Power Modules

Power Module (PM250D)	Standby current (A)					
	50 Hz			60 Hz		
	380 V	400 V	415 V	380 V	440 V	480 V
0.75 - 1.5 kW	0.6	0.63	0.66	0.7	0.8	0.91
3.0 - 4.0 kW	2.2	2.32	2.40	2.7	3.2	3.33
5.5 - 7.5 kW	2.9	3.05	3.15	3.5	4.0	4.40

For more comprehensive information on the standby current, please read the following FAQ:

PM250D Standby Current Information
(http://support.automation.siemens.com/WW/view/en/34189181)

3.5 EMC installation guidelines

3.5.1 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, solenoid valves, and motor holding brakes 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.

3.5.2 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).

3.5.3 Equipotential bonding G120D-2

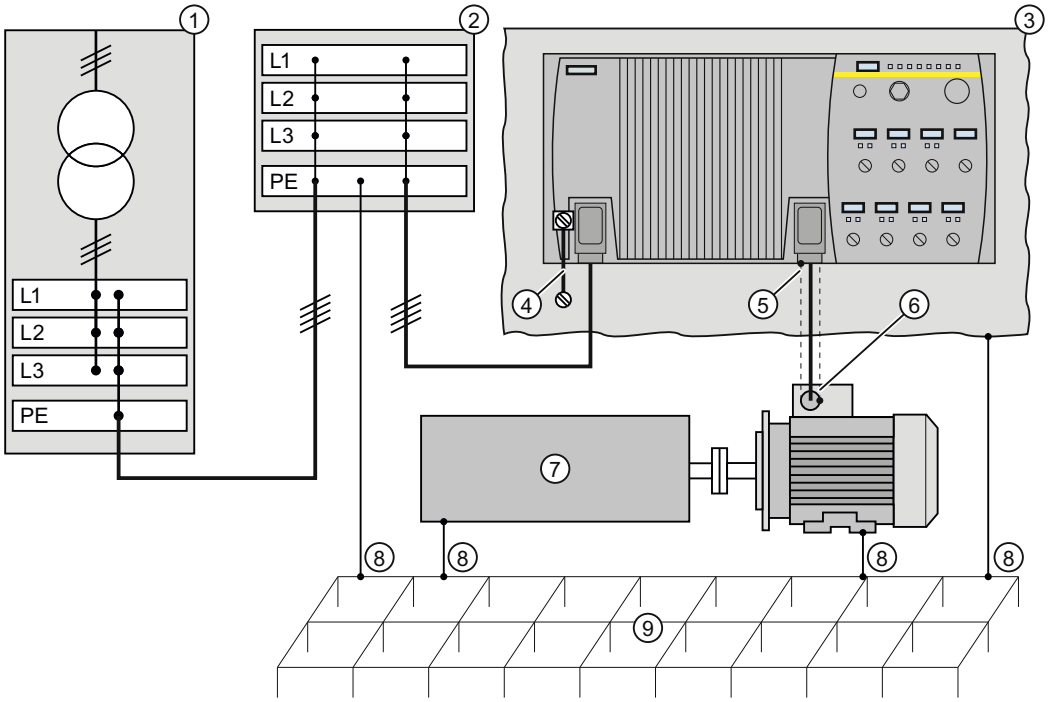
Grounding and high-frequency equipotential bonding measures

Equipotential bonding within the drive system has to be established by connecting all electrical and mechanical drive components (transformer, motor and driven machine) 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:

1. Use a shielded motor cable.
2. Connect the cable shield both to the motor connector on the inverter and to the motor terminal box.
3. 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 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 3-5 Grounding and high-frequency equipotential bonding measures in the drive system and in the plant

For general rules for EMC compliant installation see also:
http://support.automation.siemens.com/WW/view/de/60612658
(http://support.automation.siemens.com/WW/view/en/60612658)

3.5.4 Grounding the inverter

It is essential that the inverter is grounded correctly to avoid sporadic trips and unpredictable EMC problems occurring during the operation of the inverter.

Grounding measures

Grounding the inverter and the connectors

- Ground the inverter via the PE connection in the mains supply connector.
- Ground the connectors as shown in the diagram below.
  Although the line supply and motor cable connectors are of a different type, the principle of grounding them is the same.

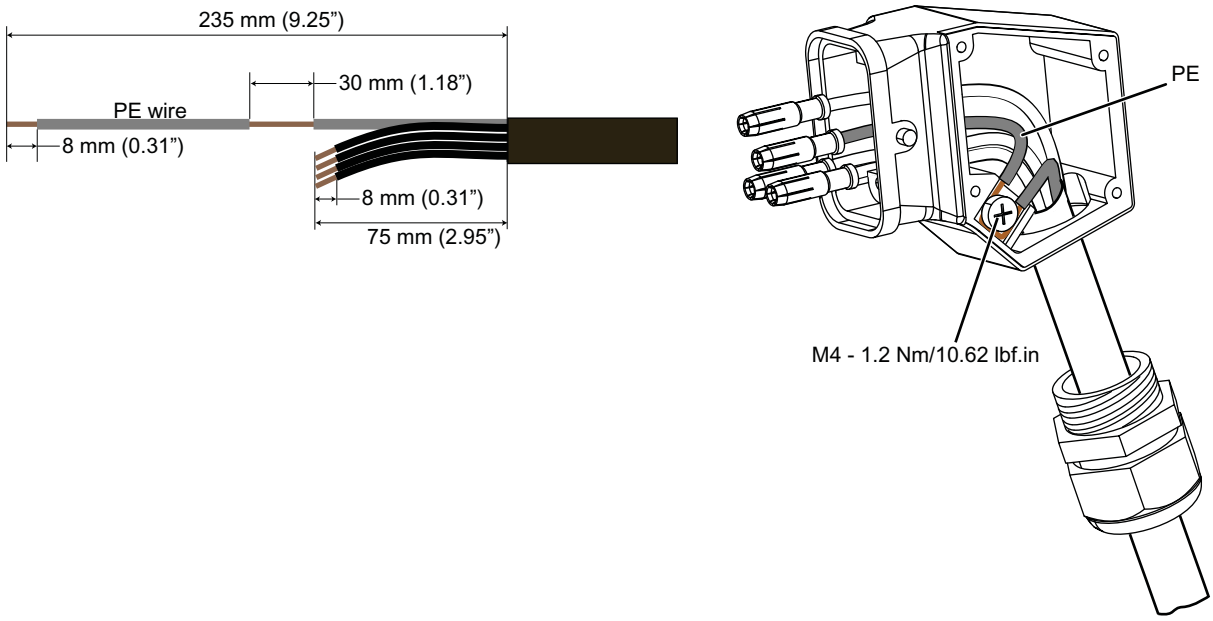


Figure 3-6 Grounding the line supply and motor connectors

Grounding the inverter housing

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

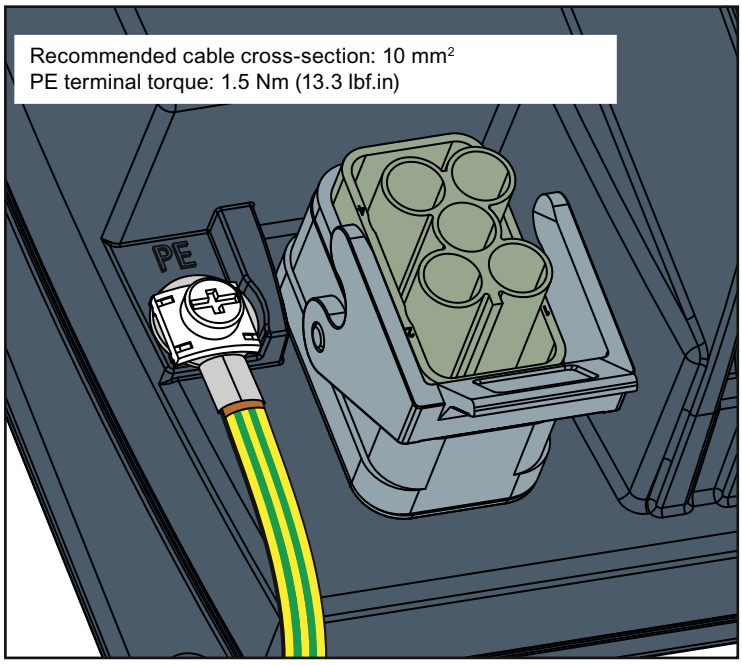


Figure 3-7 Grounding the inverter housing

EMC cable glands

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

An example of an EMC cable gland is given in the figure below. The cable gland also provides protection to the IP68 standard when fitted correctly.

Figure 3-8 Example of a Blueglobe EMC cable gland

Brass-nickel plated EMC cable gland with metric thread as per EN50262. IP68 protection with up to 15 bar pressure.

Connection thread/length			Clamping range without inlet max/min [mm]	Clamping range max/min [mm]	Spanner width SW * E	Order 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

3.6 Connections and cable for the SINAMICS G120D

Connections and cables

⚠WARNING

Switches and contactors

Under no circumstances shall any kind of switch or contactor be placed in the circuits between the Inverter and the motor. For maintenance, ensure that the motor cable is unplugged at the Inverter.

Temperature sensor and brake module connections

The temperature sensor and brake module connections are at DC link negative potential. Appropriate precautions against touching these connections and appropriate insulation on the cables must be used. The motor terminal box must be kept closed whenever the mains is applied to the Inverter. Cables that are not used should be individually insulated and not earthed.

The following block diagram and tables describe the details and limitations of the connections of the inverter.

Cable lengths

The maximum cable lengths for all the inverters are shown in the table below.

Table 3- 4 Maximum cable lengths

Cable	Screening	Max. length
Motor*	Screened	15 m (49 ft)
	Unscreened	30 m (98 ft)
Temperature sensor*	Screened	15 m (49 ft)
	Unscreened	30 m (98 ft)
Brake*	Screened	15 m (49 ft)
	Unscreened	30 m (98 ft)
Digital inputs	Unscreened	30 m (98 ft)
Digital outputs	Unscreened	30 m (98 ft)
Analog input	Unscreened	30 m (98 ft)
Encoder (SSI and HTL)	Screened	30 m (98 ft)

*The motor, temperature sensor and brake connections are all carried in a single cable which is connected to the Power Module using a Harting connector.

Outline block diagram

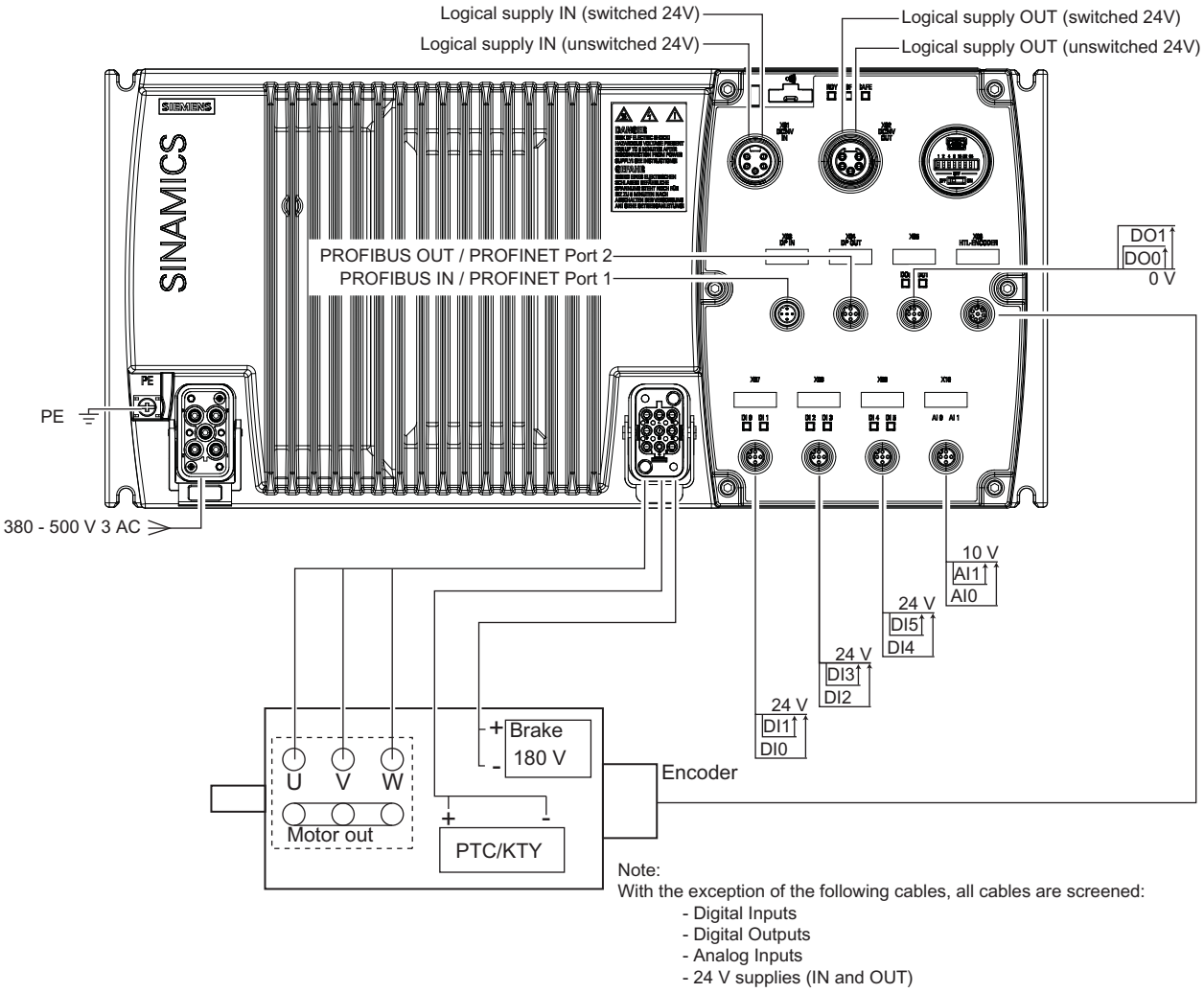


Figure 3-9 Outline block diagram SINAMICS CU240D-2 and PM250D

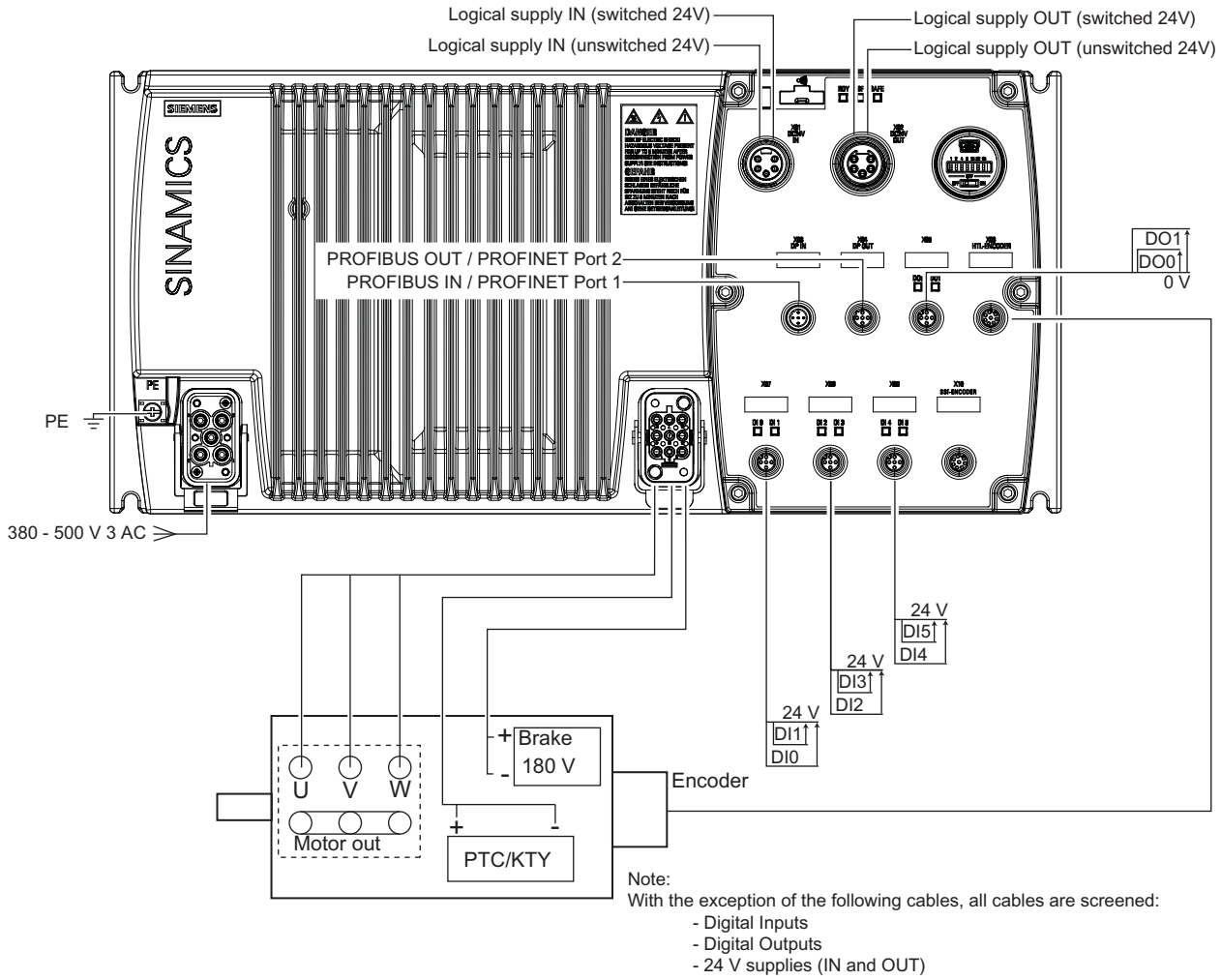


Figure 3-10 Outline block diagram SINAMICS CU250D-2 and PM250D

⚠ WARNING

High voltage - temperature and brake connections

The temperature and brake connections on the motor output from the Inverter carry very high voltages. If these connections are not used then the connections and wiring must be correctly terminated and insolated to ensure there is no risk of electrical shock to individuals or electrical overload to the system.

Note

Brake voltage

The brake output of the Inverter is designed to be connected directly to the coil of the brake within the motor, that is, no rectifier module is required within the motor. For operation on a 400 V AC supply the brake should be rated for approximately 180 V DC (400 V AC with rectifier). The UL approved current rating for the brake output is 600 mA.

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 3- 5 Tools

	Harting part number
Crimp tool (Q8/0 and Q4/2)	0999-000-0110
Removal tool (Q8/0)	0999-000-0319
Removal tool (Q4/2)	0999-000-0305
No special tools are required for the Control Unit connectors	

Table 3- 6 Control Unit connectors

Connector	Binder part numbers	
	Straight connector	Right-angle connector
Power input (7/8")	99-2444-12-05	99-2444-52-05
Power Output (7/8")	99-2445-12-05	99-2445-52-05
PROFIBUS In (M12)	99-1436-810-05	99-1436-820-05
PROFIBUS Out (M12)	99-1437-810-05	99-1437-820-05
PROFINET Port 1 and Port 2 (M12)	99-3729-810-04	99-3729-820-04
Encoder (M12)	99-1487-812-08	99-1487-822-08
Digital input and output (M12)	99-0437-14-05	99-0437-24-05

Table 3- 7 Push-Pull variant PROFINET and POWER connectors

Connector	Phoenix Contact part numbers	
	Identification number	Order number
MSTB Power (Qty 2)	VS-PPC-C2-MSTB-MNNA-P13-A5-SP	1608704
RJ45 PROFINET (Qty 2)	VS-PPC-C1-RJ45-MNNA-PG9-8Q5	1608016

Table 3- 8 Mains supply connector

Power rating	cable size	cable type	All connector parts are Harting Q4/2				
			Shell	Crimp size	Crimp number	Hood	Gland/Seal
0.75 kW 1.50 kW	1.5 mm² 16 AWG	(3+E) YY Unscreened	Harting Q4/2 0912 006 3141	1.5 mm² 16 AWG	0932 000 6204	0912 008 0527	0900 000 5059
3.00 kW 4.00 kW	2.5 mm² 14 AWG	(3+E) YY Unscreened		2.5 mm² 14 AWG	0932 000 6205	1912 008 0526	1900 000 5190
5.50 kW 7.50 kW	4 mm² 12 or 10 AWG	(3+E) YY Unscreened		4 mm² 12 or 10 AWG	0932 000 6207		
4 x crimps are required for each inverter							

Table 3- 9 Motor connector

Power rating	cable size	Belcom "DESINA" Cable No.	All connector parts are Harting Q8/0				
			Shell	Crimp size	Crimp number	Hood	Gland/Seal
0.75 kW 1.50 kW	1 mm² 18 AWG	13EBN17Z08P	Harting Q8/0 0912 008 3001	1 mm² 18 AWG	0933 000 6105	1912 008 0502	1912 000 5057
3.00 kW 4.00 kW	2.5 mm² 14 AWG	13EBN13Z08P		2.5 mm² 14 AWG	0933 000 6102	1912 008 0528	LUTZE 600173 (NOT Harting)
5.50 kW 7.50 kW	4 mm² 12 or 10 AWG	13EBN11Z08P		4 mm² 12 or 10 AWG	0933 000 6107		
4 x crimps are required for each inverter for the motor connections							

Table 3- 10 Temperature sensor and EM brake

Power rating	cable size	Belcom "DESINA" Cable No.	Temperature sensor pair		EM Brake pair	
			Crimp size	Crimp number	Crimp size	Crimp number
0.75 kW	1 mm^2 18 AWG	13EBN17Z08P	0.75 mm^2 20 AWG	0933 000 6114	0.75 mm^2 20 AWG	0933 000 6114
1.50 kW						
3.00 kW	2.5 mm^2 14 AWG	13EBN13Z08P	1 mm^2 18 AWG	0933 000 6105	1 mm^2 18 AWG	0933 000 6105
4.00 kW						
5.50 kW	4 mm^2 12 or 10 AWG	13EBN11Z08P	1 mm^2 18 AWG	0933 000 6105	1 mm^2 18 AWG	0933 000 6104
7.50 kW						
2 x crimps are required for each auxiliary signal pair						

Connection and terminal diagrams

⚠ CAUTION

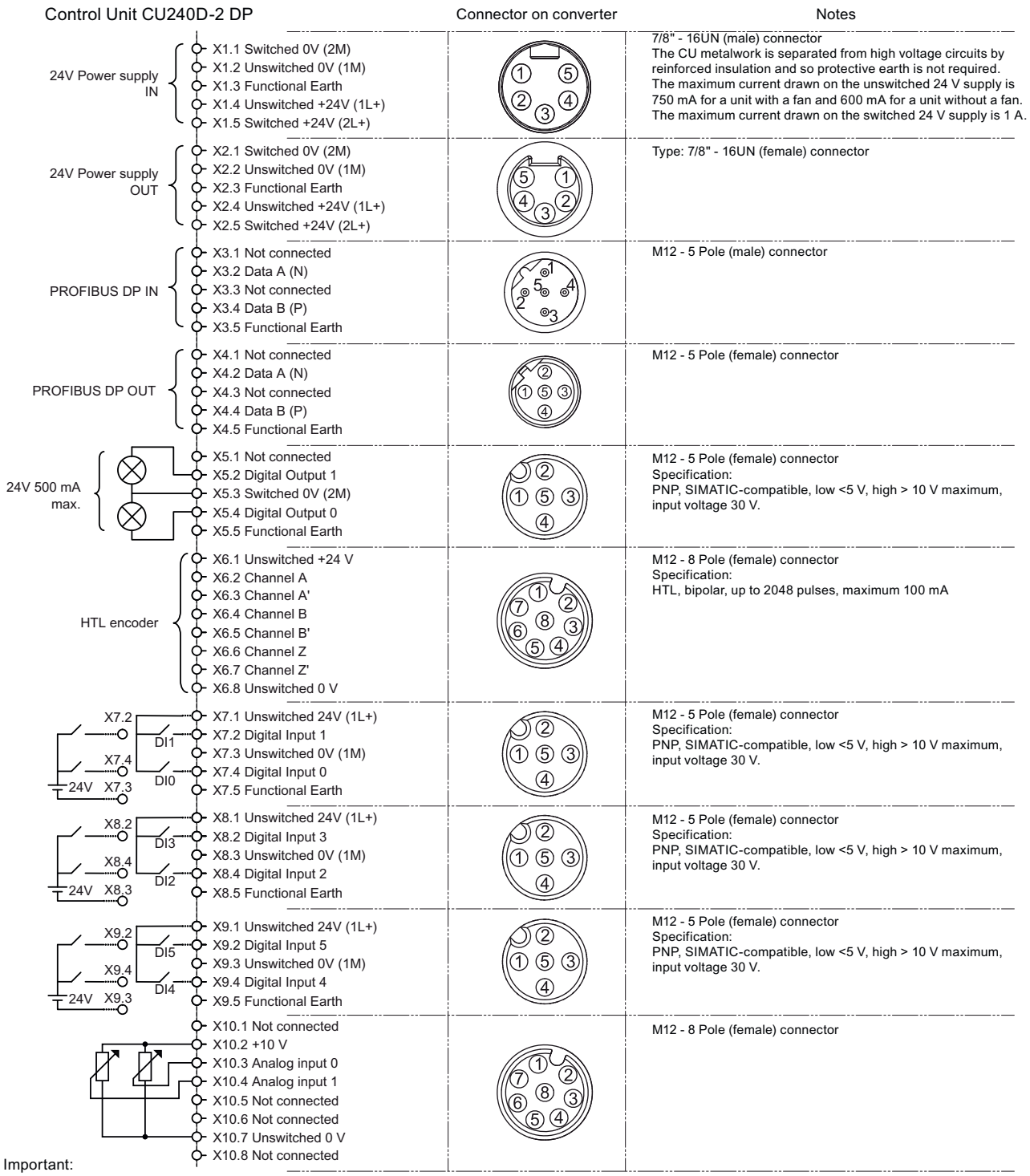
Digital output current levels

On the PROFINET variants the digital outputs at high ambient temperatures above 50 degree celsius must share a maximum current of 500 mA between the paired digital outputs. However, below 50 degrees celsius a maximum current of 500 mA is acceptable for both digital output pairs.

Orientation of Connectors

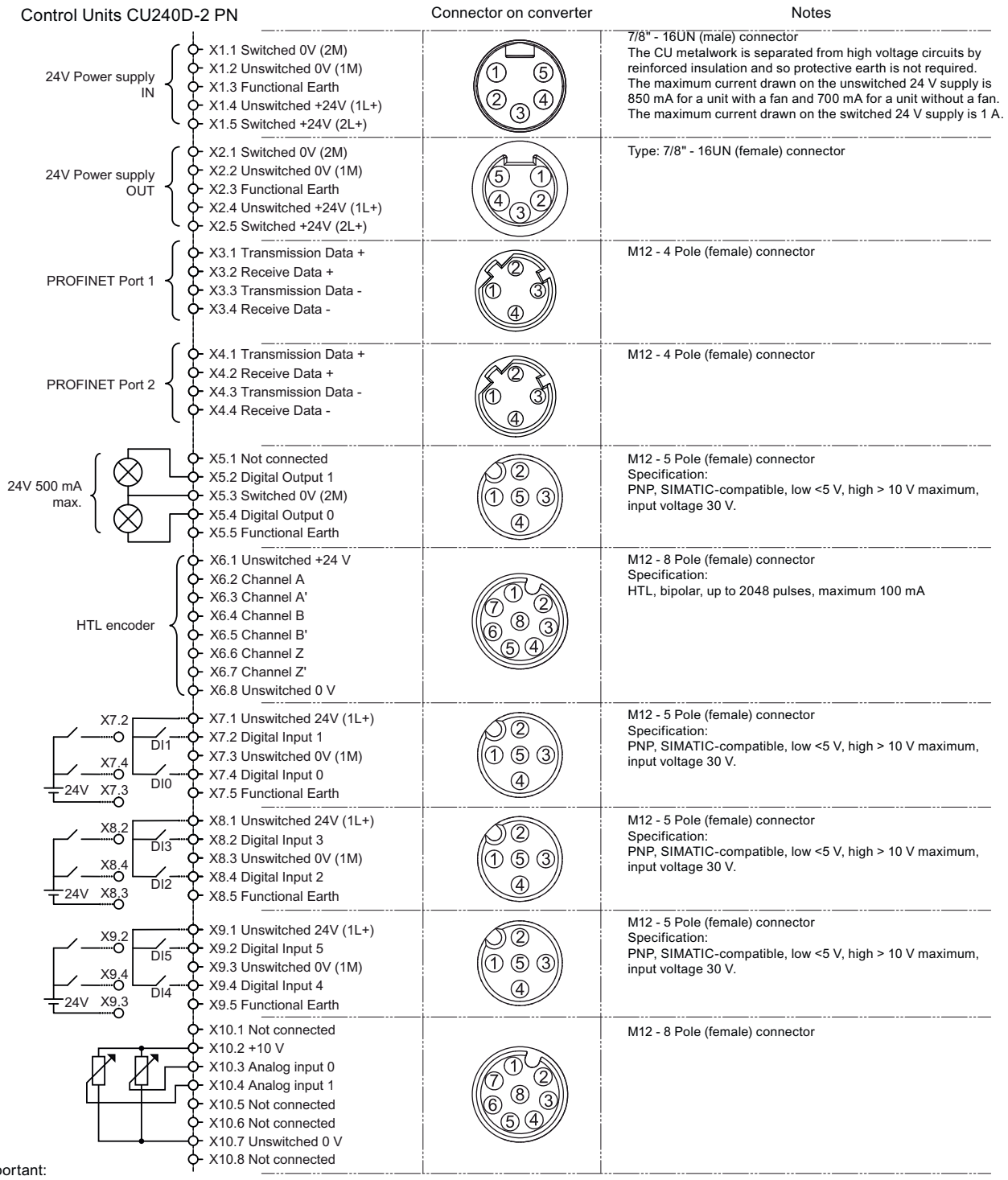
The connection diagrams given in this manual show the actual physical connections on the Control Unit. Different manufacturers of mating connectors may have differing pinout arrangements and it is essential that when making-up the necessary cables and connectors that the connections match those given in the connection diagrams.

For example, the orientation of the key-notch on the control Unit connector may not match the key-notch on the mating cable connector being constructed, in this instance the pin numbers on the connector being made needs to be ignored to allow the correct orientation and wiring of the connector to ensure a proper match to the connector on the Control Unit.



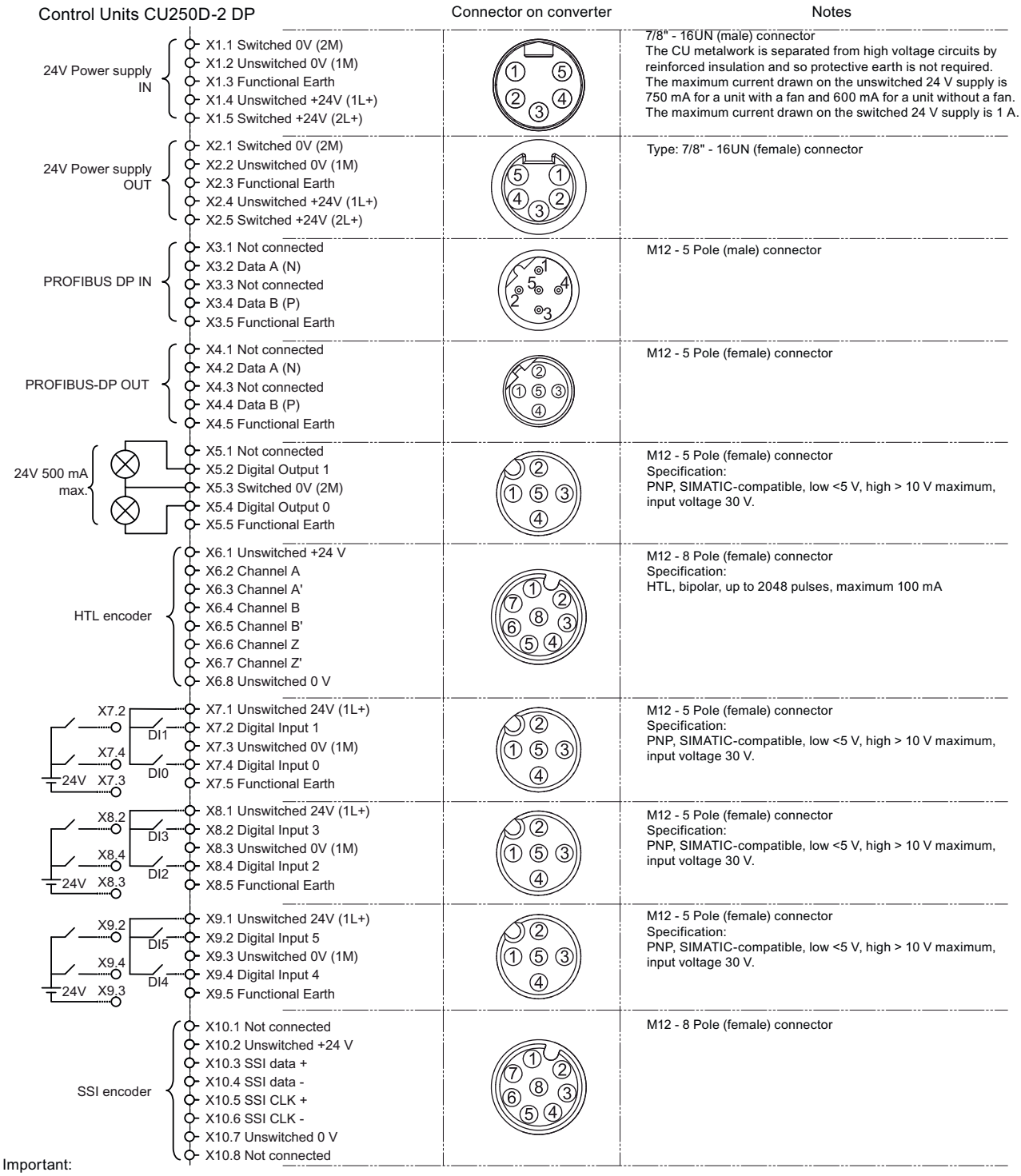
Important:
1. The connection pinouts refer to the actual connectors on the Control Unit.
2. The 24 Vdc supply must be Class 2 or limited in voltage/current to ensure no excessive voltage/current can be drawn by the CU.

Figure 3-11 G120D CU240D-2 PROFIBUS terminal diagram



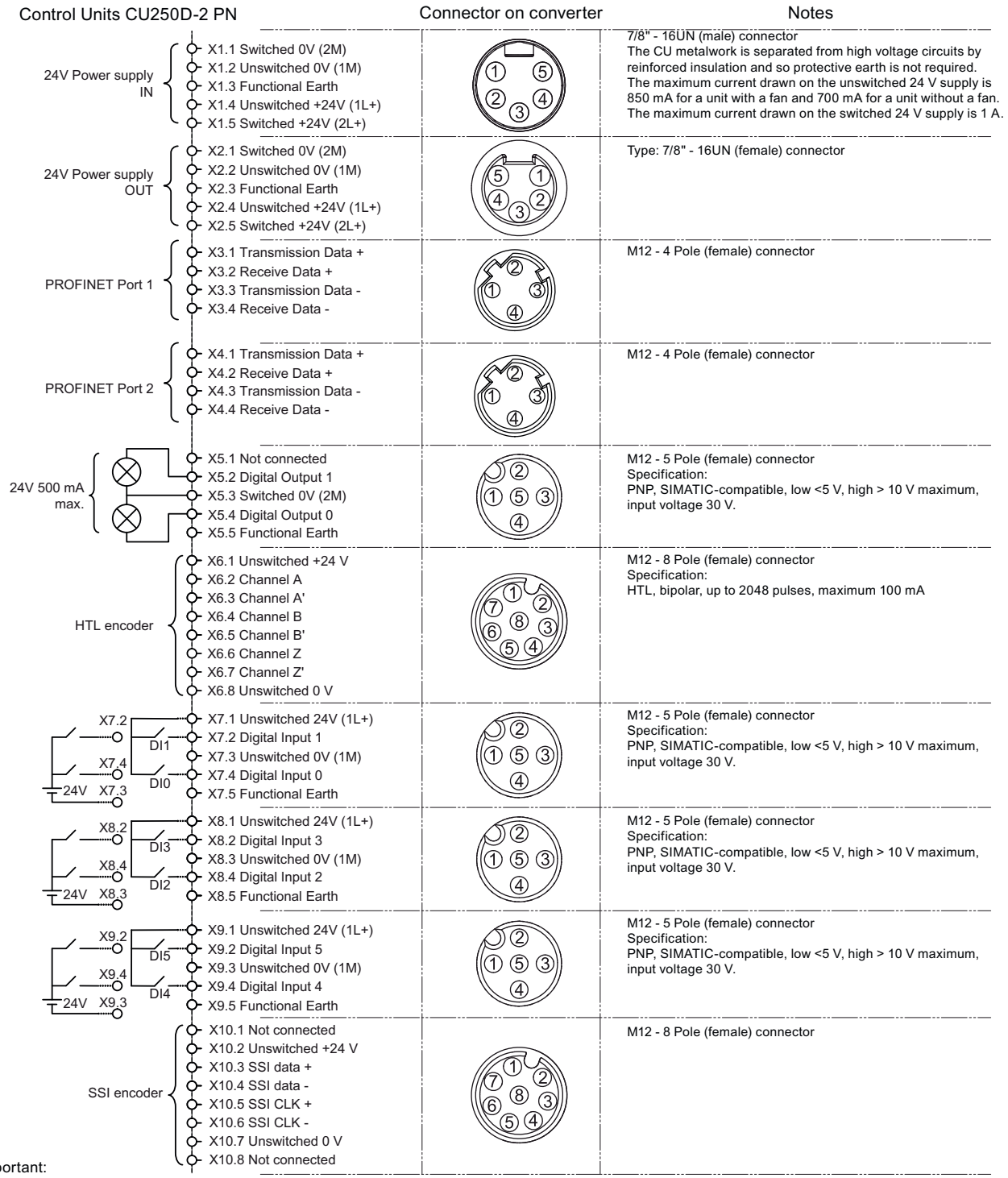
Important:
1. The connection pinouts refer to the actual connectors on the Control Unit.
2. The 24 Vdc supply must be Class 2 or limited in voltage/current to ensure no excessive voltage/current can be drawn by the CU.

Figure 3-12 G120D CU240D-2 PROFINET terminal diagram



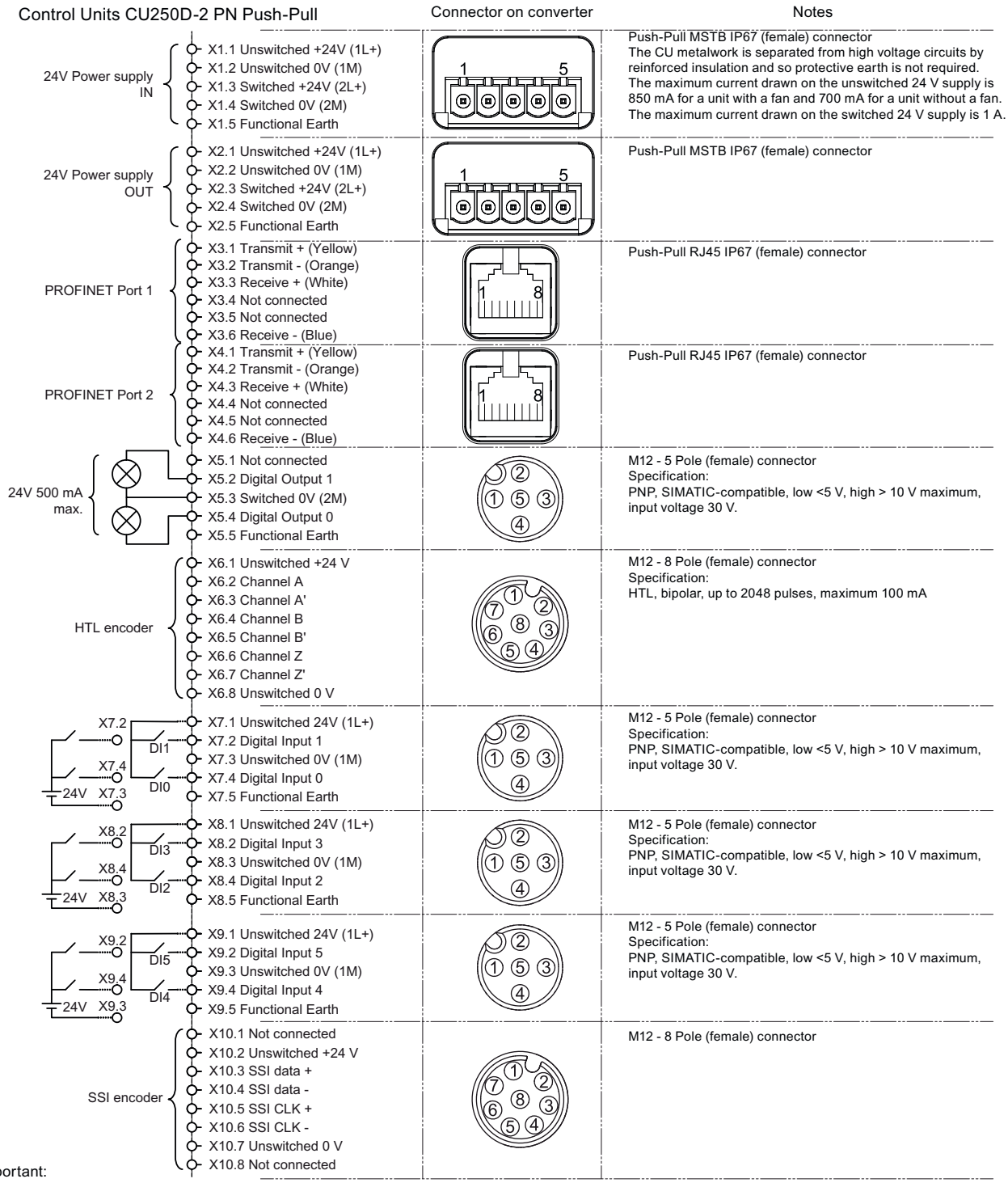
Important:
1. The connection pinouts refer to the actual connectors on the Control Unit.
2. The 24 Vdc supply must be Class 2 or limited in voltage/current to ensure no excessive voltage/current can be drawn by the CU.

Figure 3-13 G120D CU250D-2 PROFIBUS terminal diagram



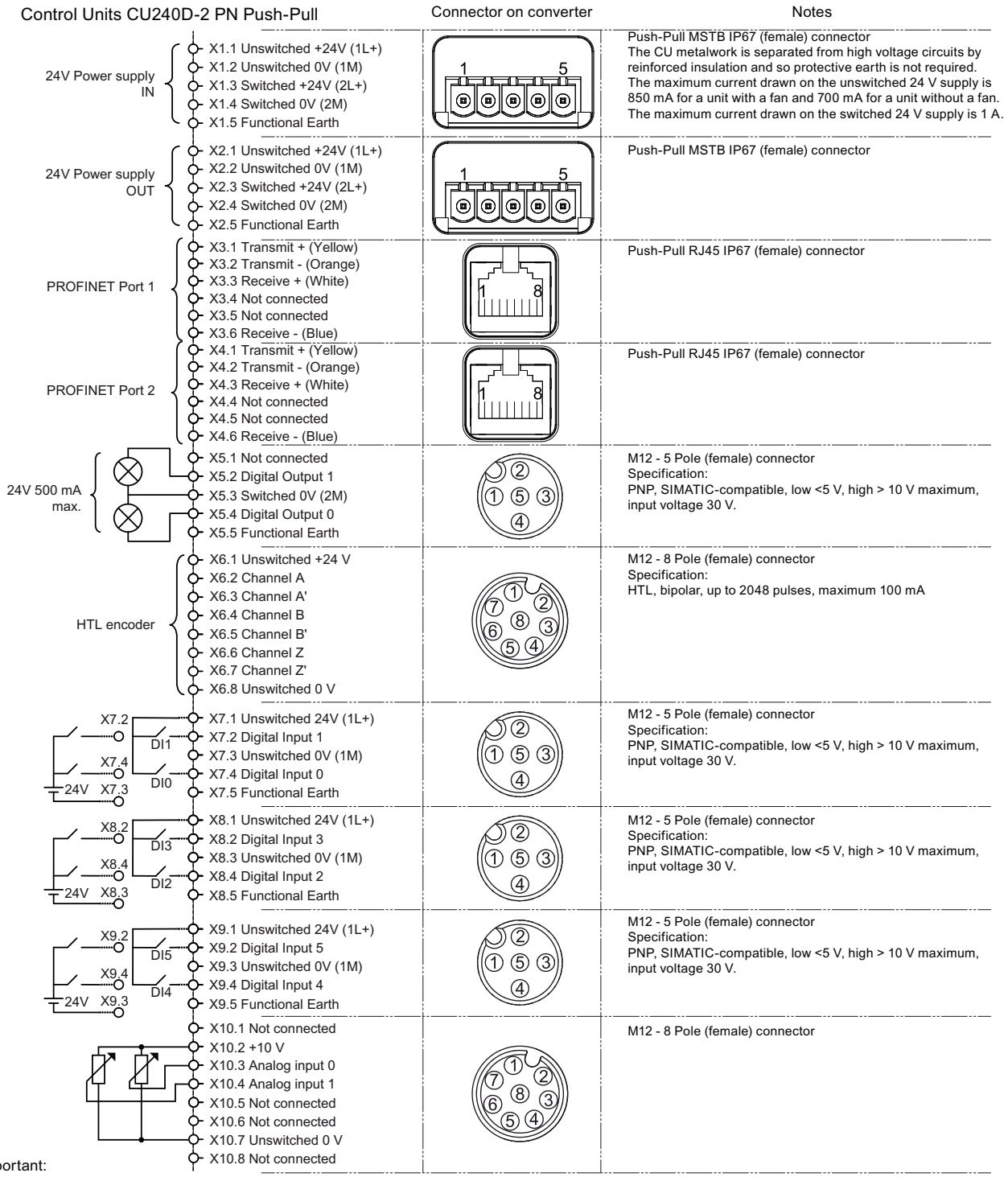
Important:
1. The connection pinouts refer to the actual connectors on the Control Unit.
2. The 24 Vdc supply must be Class 2 or limited in voltage/current to ensure no excessive voltage/current can be drawn by the CU.

Figure 3-14 G120D CU250D-2 PROFINET terminal diagram



Important:
1. The connection pinouts refer to the actual connectors on the Control Unit.
2. The 24 Vdc supply must be Class 2 or limited in voltage/current to ensure no excessive voltage/current can be drawn by the CU.

Figure 3-15 G120D CU250D-2 PROFINET Push-Pull terminal diagram



Important:
1. The connection pinouts refer to the actual connectors on the Control Unit.
2. The 24 Vdc supply must be Class 2 or limited in voltage/current to ensure no excessive voltage/current can be drawn by the CU.

Figure 3-16 G120D CU240D-2 PROFINET Push-Pull terminal diagram

PM250D connections

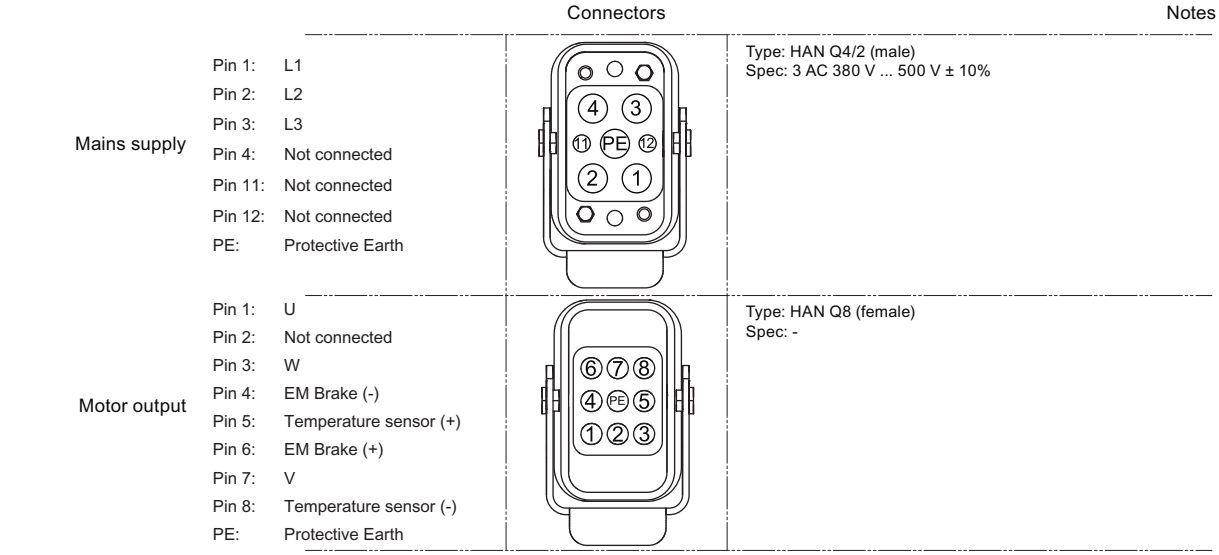


Figure 3-17 PM250D connections diagram

3.7 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 125.

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
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 3- 11 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							

3.8 Connecting the PROFINET interface

Industrial Ethernet Cables and cable length

Listed in the table below are the recommended Ethernet cables.

Table 3- 12 Recommended PROFINET cables

	Max. Cable Length	Order 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.

3.9 Finding a suitable setting for the interfaces

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

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

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

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

Procedure

1
2

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

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

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

You have found the appropriate inverter pre-assignment.

Fixed speeds

The default "Macro 1" is available only with Control Units CU240D-2 DP and CU240D-2 PN.

Macro 1	Two-wire control with two fixed speeds

p1003 = Fixed speed 3
p1004 = Fixed speed 4

DI 4 and DI 5 = HIGH:
Converter adds together
fixed speed 3 + fixed speed 4

X7.4	DI 0	ON/OFF1 right	Fault	X5.4 DO 0
X7.2	DI 1	ON/OFF1 left	Alarm	X5.2 DO 1
X8.4	DI 2	Acknowledge		
X8.2	DI 3	---		
X9.4	DI 4	Fixed speed 3		
X9.2	DI 5	Fixed speed 4		
X10.3	AI 0	---		
X10.4	AI 1	---		

Macro 2	Two fixed speeds with safety function

p1001 = Fixed speed 1
p1002 = Fixed speed 2

DI 0 and DI 1 = HIGH:
Motor rotates
with fixed speed 1 + fixed speed 2

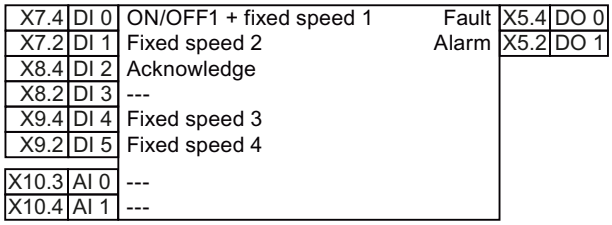
X7.4	DI 0	ON/OFF1 + fixed speed 1	Fault	X5.4 DO 0
X7.2	DI 1	Fixed speed 2	Alarm	X5.2 DO 1
X8.4	DI 2	Acknowledge		
X8.2	DI 3	---		
X9.4	DI 4	Reserved for safety function		
X9.2	DI 5			
X10.3	AI 0	---		
X10.4	AI 1	---		

You must enable the safety function.

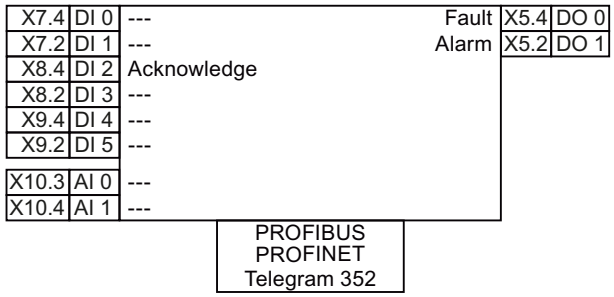
Macro 3 **Four fixed speeds**

p1001 = Fixed speed 1
p1002 = Fixed speed 2
p1003 = Fixed speed 3
p1004 = Fixed speed 4

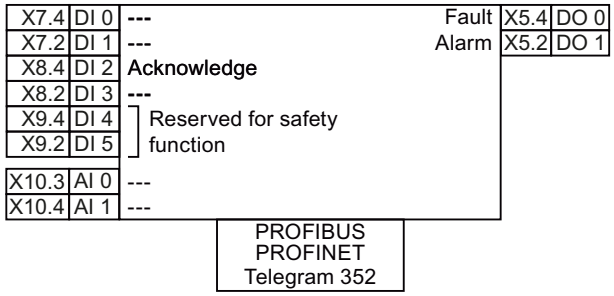
Several DI = HIGH:
Converter adds together corresponding fixed speeds



Macro 4 **Fieldbus PROFIBUS or PROFINET**



Macro 5 **Fieldbus PROFIBUS or PROFINET with safety function**

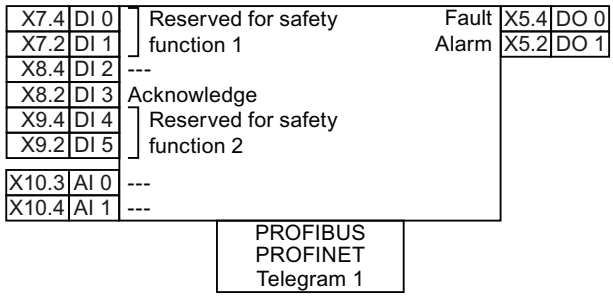


You must enable the safety function.

Two safety functions

The default "Macro 6" is available only with Control Units CU240D-2 DP F, CU240D-2 PN F and CU240D-2 PN F PP.

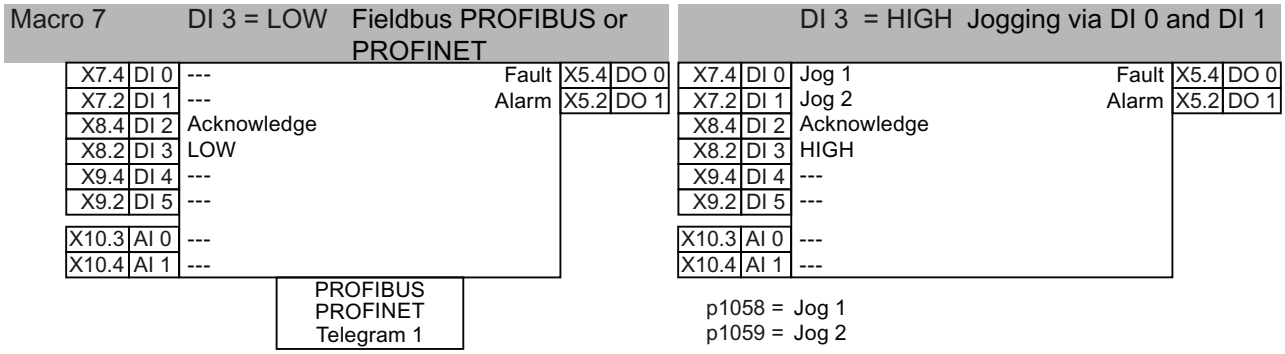
Macro 6 **Fieldbus PROFIBUS or PROFINET with two safety functions**



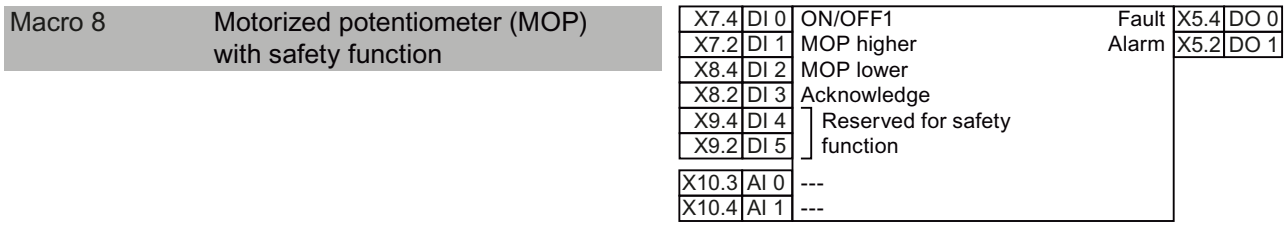
You must enable the safety function.

Automatic/local - Changeover between fieldbus and jog mode

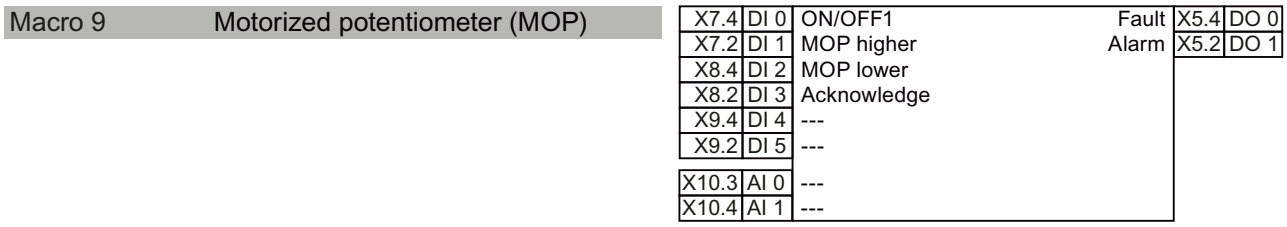
Factory settings for the converter.



Motorized potentiometer

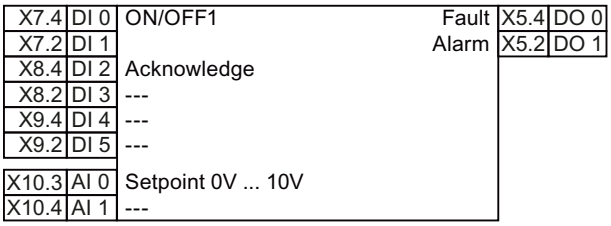


You must enable the safety function.



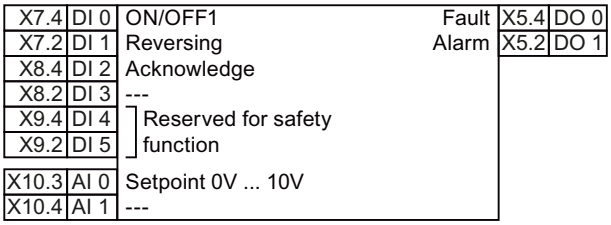
Two-wire control

Macro 12	Two-wire control (method 1)



Applications with analog setpoint

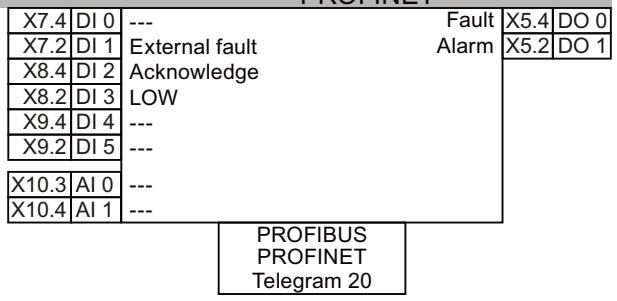
Macro 13	Safety function



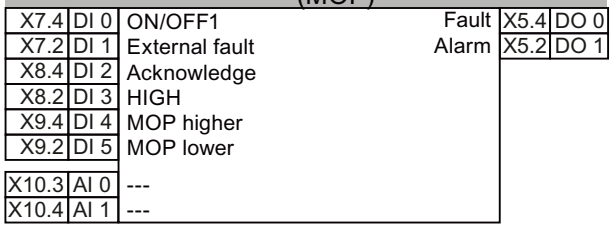
You must enable the safety function.

Process industry

Macro 14	DI 3 = LOW	Fieldbus PROFIBUS or PROFINET



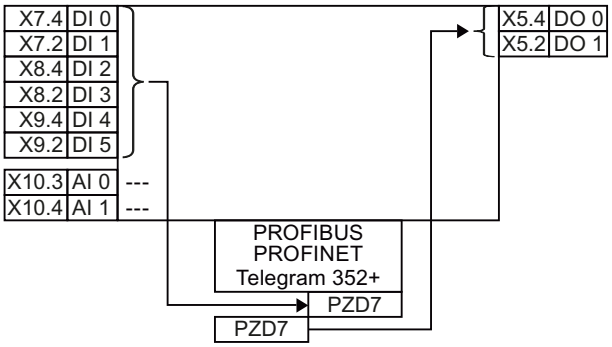
	DI 3 = HIGH	Motorized potentiometer (MOP)



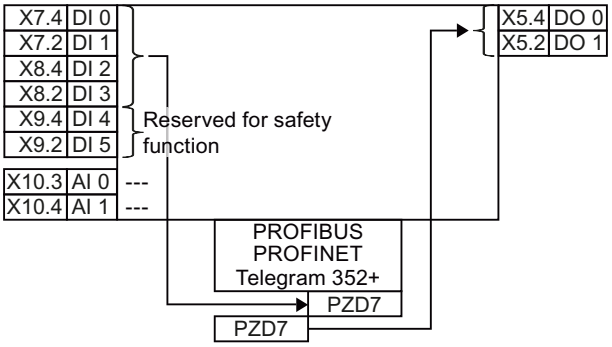
Distributed conveyor technology

The converter inputs and outputs are interconnected with process data 7 (PZD7) of the fieldbus.

Macro 24	Distributed conveyor systems with fieldbus PROFIBUS or PROFINET



Macro 25	Distributed conveyor systems with fieldbus PROFIBUS or PROFINET and safety function



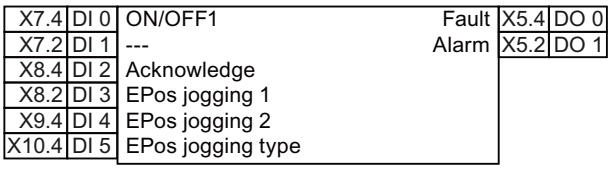
Basic positioner

Macro 26 is set in the factory setting of the converter.

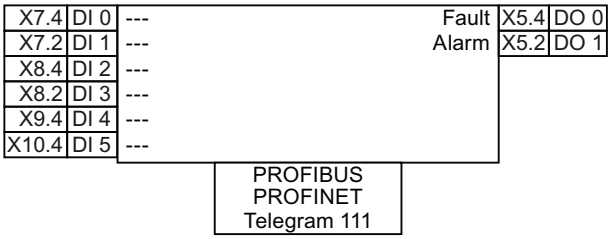
Macro 26	Basic positioner without fieldbus

DI 5 = HIGH Incremental jogging
DI 5 = LOW Jog velocity

p2585 = Setpoint, jogging 1 velocity
p2586 = Setpoint, jogging 2 velocity
p2587 = Setpoint, jogging 1 distance
p2588 = Setpoint, jogging 2 distance



Macro 27	Basic positioner with fieldbus



Commissioning

4

4.1 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.

4.2 Commissioning with the IOP

Commission the Inverter

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

The IOP 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 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 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 Handheld Kit - order number: 6SL3255-0AA00-4HA0.
- Optical Cable - order number: 3RK1922-2BP00

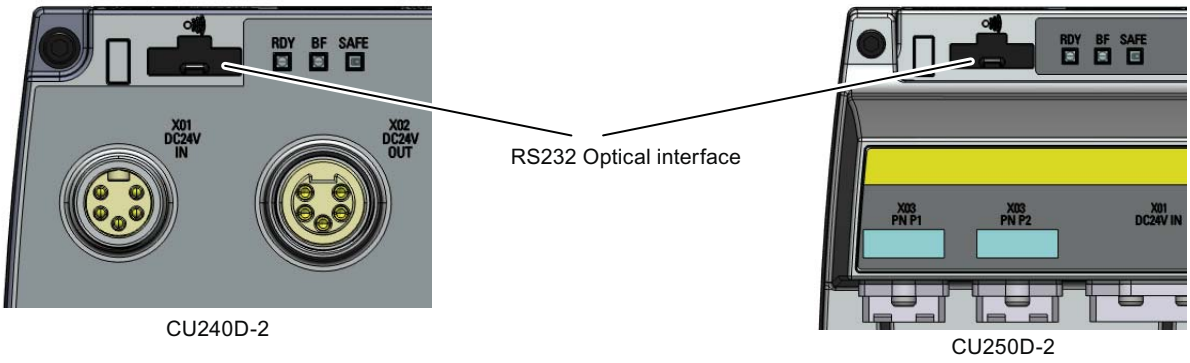


Figure 4-1 CU240D-2 and CU250D-2 Optical Interfaces

4.2.1 Basic commissioning with IOP and P0015 Macros

Basic commissioning wizard

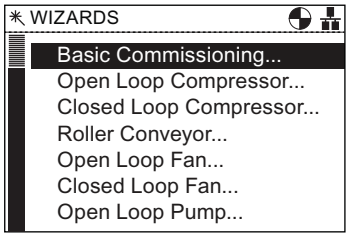
The Basic Commissioning wizard detailed below is for Control Units with version 4.4 software or higher.

Procedure

1
2

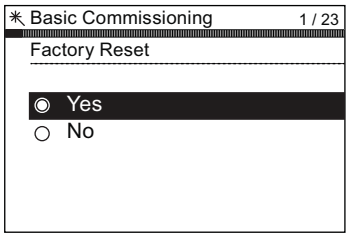
For performing the basic commissioning of the converter with the IOP operator panel, proceed the following steps:

1. Select "Basic Commissioning..." from the Wizards menu.

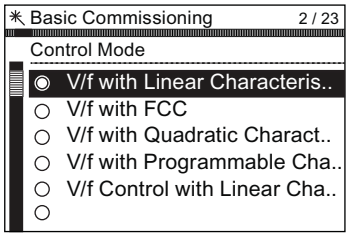


2. Select "Yes" or "No" to a factory reset.

   The factory reset is performed prior to saving all the parameter changes that have been made during the basic commissioning process.

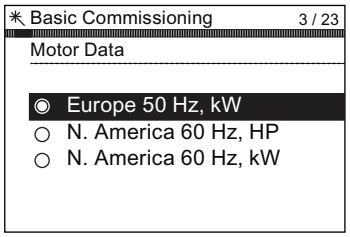


3. Select the Control Mode for the attached motor.



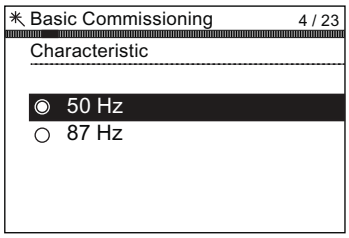
4. Select the correct Motor Data for your Inverter and attached motor.

   This data is used to calulate the correct speed and displayed values for the application.

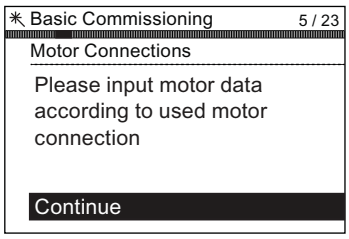


5. Select the correct frequency for your Inverter and attached motor.

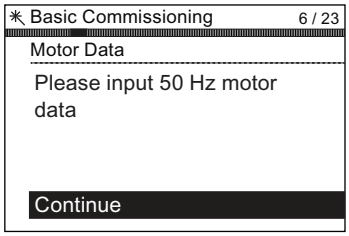
   The use of the 87 Hz characteristic allows the motor to operate at 1.73 times of its normal speed.



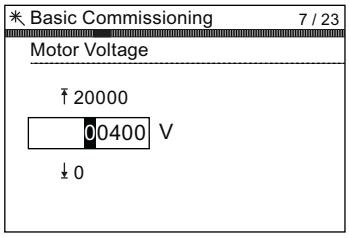
6. At this stage the wizard will begin to ask for the data relating specifically to the attached motor. The data is obtained from the motor rating plate.



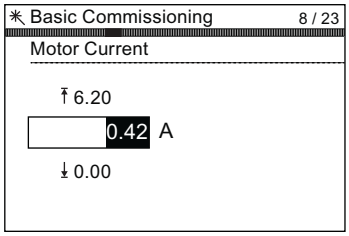
7. The Motor Data screen indicates the frequency characteristic of the attached motor.



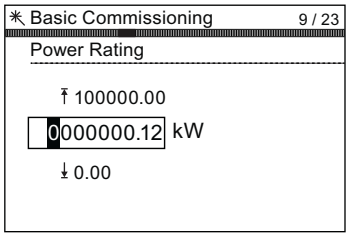
8. Input the correct Motor Voltage from the motor rating plate.



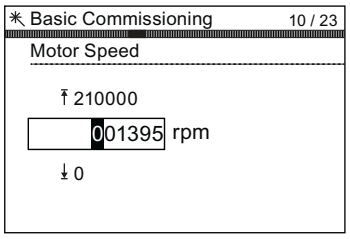
9. Input the correct Motor Current from the motor rating plate.



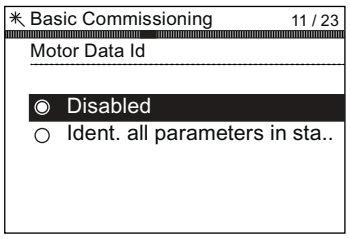
10. Input the correct Power Rating from the motor rating plate.



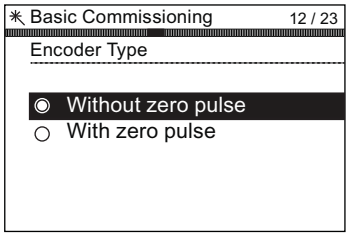
11. Input the correct Motor Speed from the motor rating plate.
    This value is given in RPM.



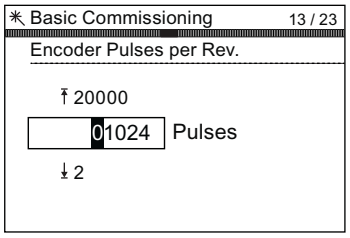
12. Select to run or disable Motor Data Identification function.
    This function, if active, will not start until the first run command is given to the Inverter.



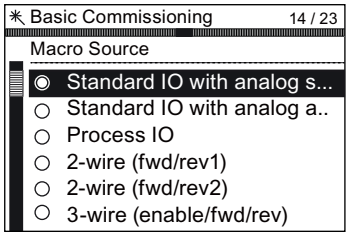
13. Select either zero pulse on no zero pulse for the attached encoder.
    If no encoder is fitted to the motor, the option will not be displayed.



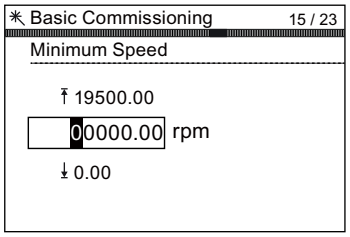
14. Enter the correct pulses per revolution for the encoder.
    This information is normally printed on the casing of the encoder.



15. Select the macro that is suitable for your application. Once selected all inputs, outputs, command sources and setpoints will be automatically configured by the software.
    For further information see the section that details the precise settings for each macro. Please see installation section of this manual.

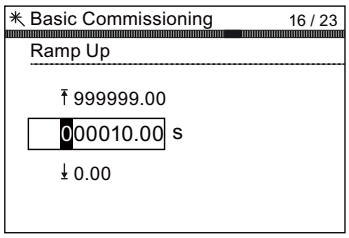


16. Set the Minimum Speed at which the attached motor should run.



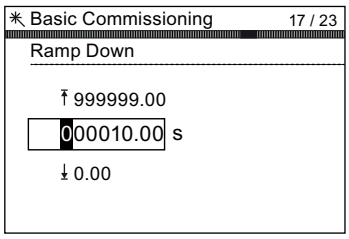
17. Set the Ramp Up time in seconds.

    This is the time the Inverter/motor system will take from being given the run command, to reaching the selected motor speed.



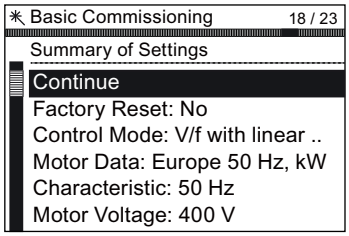
18. Set the Ramp Down time in seconds.

    This is the time the Inverter/motor system will take from being given the OFF1 command, for the motor to reach a standstill.



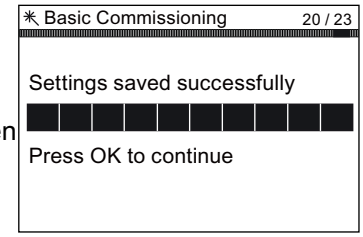
19. A summary of all the settings is display.

    If the settings are correct, select Continue.



20. The final screen gives two options:
    - Save settings
    - Cancel Wizard

    If save is selected, a factory reset will be performed then the settings are saved to the Inverter memory. The location of safe data is assigned using the "Parameter saving mode" function in "Menu".



The basic commissioning of your converter is finished.

4.3 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.

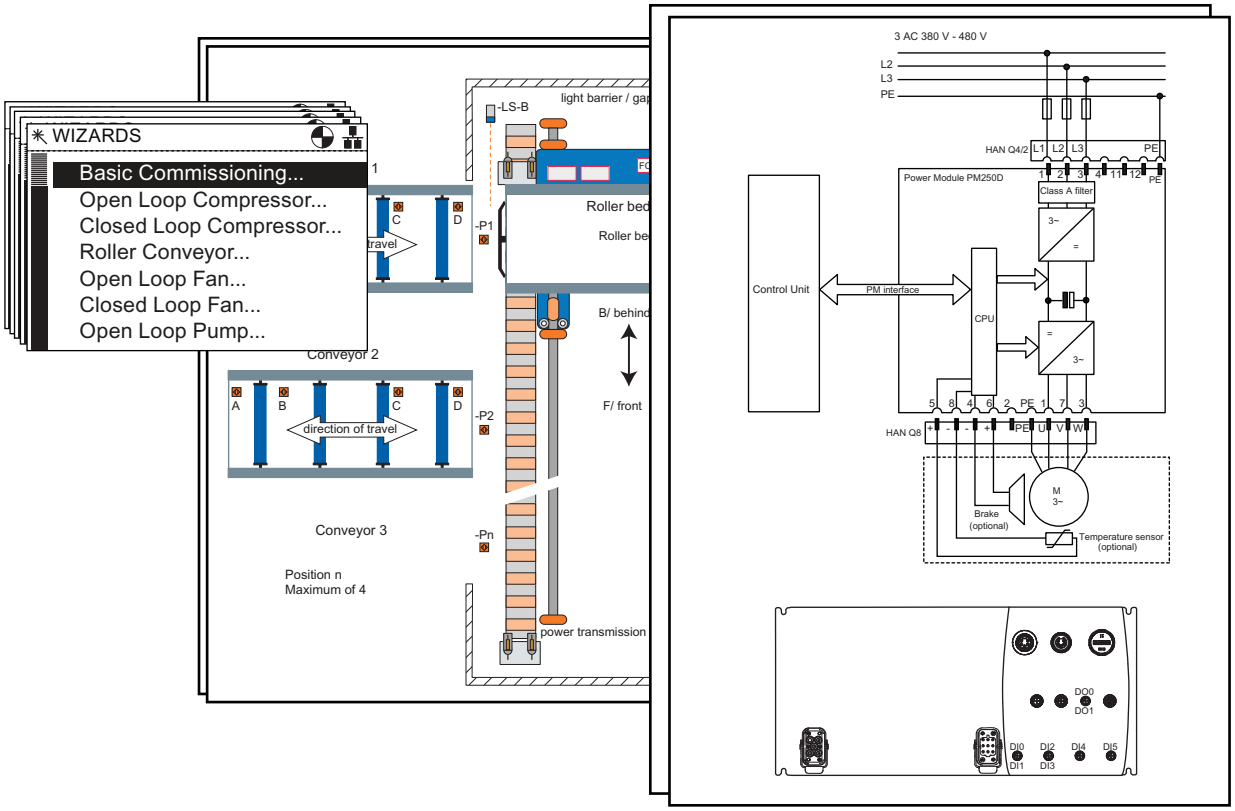


Figure 4-2 Example of IOP Wizards and Inverter wiring diagrams

4.4 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

5

5.1 List of alarms and faults

Axxxxx Alarm

Fyyyyy: Fault

Table 5- 1 The most important alarms and faults of the safety functions

Number	Cause	Remedy	
F01600	STOP A Triggered	STO Select and then deselect again.	
F01650	Acceptance test required	Carry out acceptance test and create test certificate. Switch the Control Unit off and then on again.	
F01659	Write task for parameter rejected	Cause: The converter should be reset to the factory setting. The resetting of the safety functions is, however, not allowed, because 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 converter sets p0970 = 5 if it has reset the parameters.
		Then reset the converter to the factory setting again.	
A01666	Static 1 signal atF-DI for safe acknowledgment	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	Shutdown path test required	After the next time that the "STO" function is deselected, the message is withdrawn and the monitoring time is reset.	
F30600	STOP A Triggered	STO Select and then deselect again.	

Table 5- 2 The most important alarms and faults

Number	Cause	Remedy
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 converter.
A01028	Configuration error	Explanation: Parameterization on the memory card has been created with a different type of module (order number, MLFB) Check the module parameters and recommission if necessary.
F01033	Unit switchover: Reference parameter value invalid	Set the value of the reference parameter to a value other than 0.0 (p0304, p0305, p0310, p0596, p2000, p2001, p2002, p2003, r2004).

Number	Cause	Remedy
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).
F01122	Frequency at the probe input too high	Reduce the frequency of the pulses at the probe input.
A01590	Motor maintenance interval lapsed	Carry out the maintenance.
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	Fieldbus SS 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.
F03505	Analog input, wire break	Check the connection to the signal source for interrupts. Check the level of the signal supplied. The input current measured by the analog input can be read out in r0752.
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 sensor's wiring and connection.
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).
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 current number of start attempts is shown in r1214. Increase the wait time in p1212 and/or monitoring time in p1213. Create 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 the controller is not to intervene: • Increase the ramp-down times. • Deactivate the V_{DC_max} controller (p1240 = 0 for vector control, p1280 = 0 for V/f control).
A07409	V/f control current limiting controller active	The alarm automatically disappears after one of the following measures: • Increase the current limit (p0640). • Reduce load. • Increase the ramp-up time to the speed setpoint.
F07426	Technology controller actual value limited	• Adapt the limits to the signal level (p2267, p2268). • Check the actual value scaling (p2264).
F07801	Motor overcurrent	Check current limits (p0640). 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.
F07807	Short circuit detected	• Check the converter connection on the motor side for any phase-phase short-circuit. • Rule out that line and motor cables have been interchanged.
A07850	External alarm 1	The signal for "external alarm 1" has been triggered. Parameter p2112 defines the signal source of the external alarm. Remedy: Rectify the cause of this alarm.
F07860	External fault 1	Remove the external causes for this fault.
F07900	Motor blocked	• Make sure that the motor can rotate freely. • Check the torque limit: r1538 for a positive direction of rotation; r1539 for a negative direction of rotation.

Number	Cause	Remedy
F07901	Motor overspeed	Activate precontrol of the speed limiting controller (p1401 bit 7 = 1).
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 sensor.
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
A07980	Rotary measurement activated	Not required
A07981	No enabling for rotary measurement	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).
A08565	Consistency error affecting 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.

Number	Cause	Remedy
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 during checking of the memory card. • Insert a suitable memory card and switch the converter 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's 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).
F30004	Converter overtemperature	Check whether the converter 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 converter overload	Check the rated currents of the motor and Power Module. Reduce current limit p0640. When operating with U/f characteristic: Reduce p1341.

Number	Cause	Remedy
F30011	Line phase failure	Check the converter'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).
F30027	Time monitoring for DC link pre-charging	Check the supply voltage on 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.
F30059	Internal fan defective	Check the internal fan and if required replace.
F30074	Communications fault between Control Unit and Power Module	The 24V voltage supply of the converter (terminals 31 and 32) was interrupted briefly. Please check the voltage supply and the wiring.
A30502	DC link overvoltage	• Check the device supply voltage (p0210). • Check the line reactor dimensioning
A30920	Temperature sensor fault	Check that the sensor is connected correctly.
A50001	PROFINET configuration error	A PROFINET controller is attempting to establish a connection with a faulty configuration telegram. Check to see whether "Shared Device" is activated (p8929 = 2).
A50010	PROFINET name of station invalid	Correct name of station (p8920) and activate (p8925 = 2).
A50020	PROFINET: Second controller missing	"Shared Device" is activated (p8929 = 2). However, only the connection to a PROFINET controller is present.

For further information, please refer to the List Manual.

5.2 Status LED overview

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 5-1 Status LED locations

Explanation of status LEDs

An explanation of the various states indicated by the LEDs are given in the tables below.

Table 5- 3 Description of general status LEDS

LED		Description of function
RDY	BF	
GREEN - On	-	Ready for operation (no active fault)
GREEN - flashing slowly	-	Commissioning or reset of factory settings
RED - on	Off	Firmware update in progress
RED - flashing slowly	RED - flashing slowly	Firmware updated is complete - power ON reset required
RED - flashing quickly	-	General fault condition
RED - flashing quickly	RED - On	Fault occurred during firmware update
RED - flashing quickly	RED - flashing quickly	Incompatible firmware or incorrect memory card

Table 5- 4 Description of PROFIBUS communications LED

BF LED	Description of function
Off	Cyclic data exchange (or PROFIBUS not in use - p2030 = 0)
RED - flashing slowly	Bus fault - configuration fault
RED - flashing quickly	Bus fault: - no data exchange - baud rate search - cannot detect the correct baud rate - no connection - the connection between the Inverter and PLC has been lost

Table 5- 5 Description of SAFE LED

SAFE LED	Description of function
YELLOW - On	One or more safety functions are enabled - but not active
YELLOW - flashing slowly	One or more safety functions are active - no safety function faults have occurred.
YELLOW - flashing quickly	The Inverter has detected a safety function fault and initiated a stop response.

Table 5- 6 Description of PROFINET communications LEDS

LED		Description of function
ACT	LNK	
On/flashing	On	Link active and data transfer active if flashing
Off	Off	Link inactive with no data transfer

Table 5- 7 Description of Digital Input and Output LEDs

DI / DO LED	Description of function
On	Input/Output connected and working
Off	Input/Output not connected or has stopped working

5.3 Further information

Table 5- 8 Technical Support

France	Germany	Italy	Spain	United Kingdom
+33 (0) 821 801 122	+49 (0)911 895 7222	+39 (02) 24362000	+34 902 237 238	+44 161 446 5545
Further service contact information: Support contacts (http://support.automation.siemens.com/WW/view/en/16604999)				

Table 5- 9 Manuals with further information

Information level	Manual	Content	Available languages	Download or order number
+	Getting Started	(this manual)	English German Italian French Spanish	**Manuals** Manuals can be download using the following link: Document download (http://support.automation.siemens.com/WW/view/en/25021636/133300) **SINAMICS Manual Collection (DVD)** The manual collection can be order using the following order number: • 6SL3298-0CA00-0MG0
++	Operating instructions - inverter	Installing, commissioning and operating the inverter. Description of inverter functions. Technical data.		
+++	Function Manual Safety Integrated	Configuring PROFIsafe. Installing, commissioning and operating the integrated fail-safe function.	English, German	
+++	List manual	Complete list of parameters, alarms and faults. Graphic function block diagrams.		
+++	Operating instructions - BOP-2, IOP	Description of operator panel		

Index

Siemens AG
Industry Sector
Drive Technologies
Motion Control Systems
Postfach 3180
91050 ERLANGEN
GERMANY

www.siemens.com/sinamics-g120