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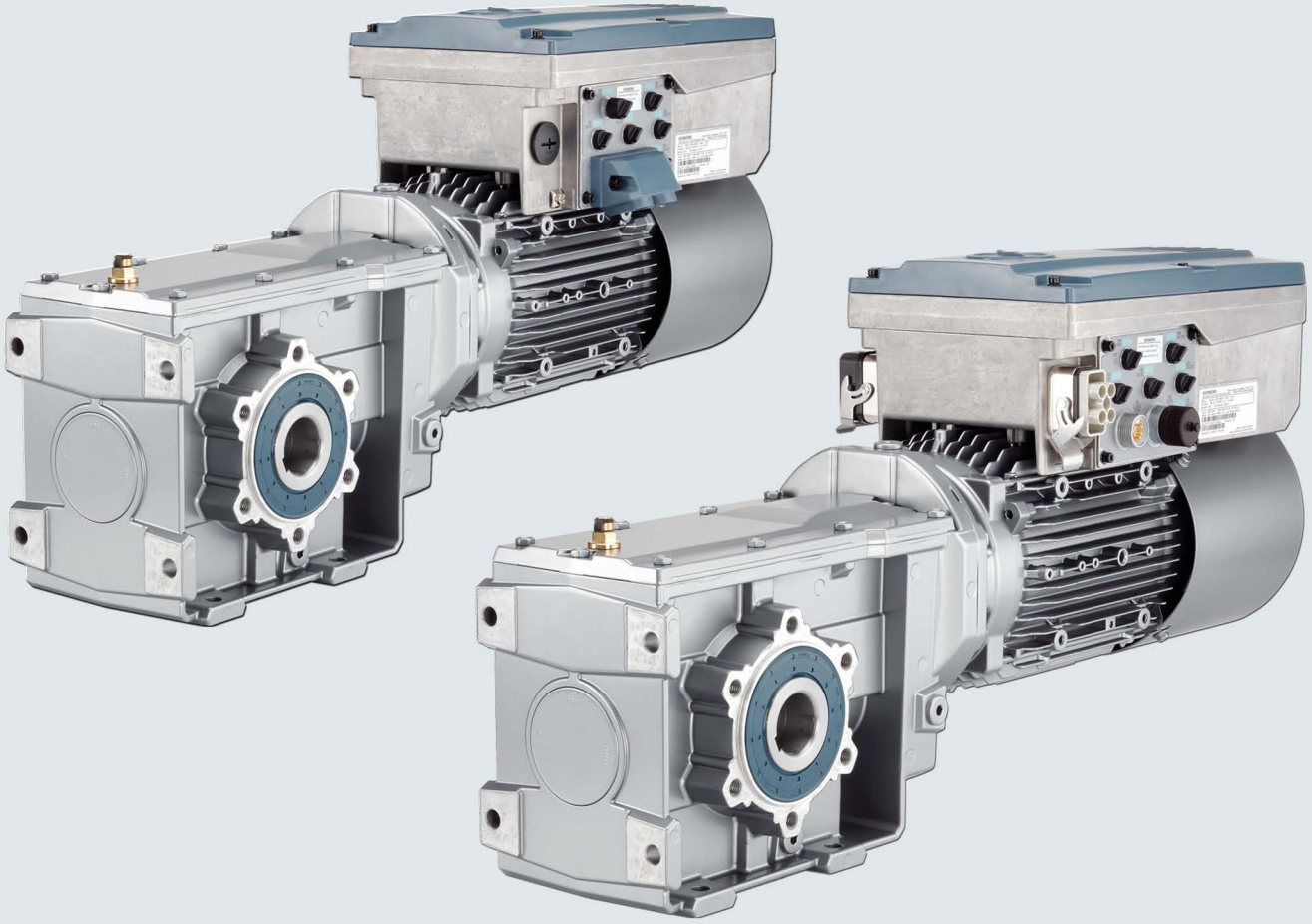

SINAMICS

SINAMICS G110M

Distributed converter for SIMOGEAR geared motors

Getting Started

Edition 04/2015

Answers for industry.

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SINAMICS G110M
SINAMICS G110M Getting Started

Getting Started

Edition 04/2015, Firmware V4.7.3

04/2015, FW V4.7.3

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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

Disclaimer of Liability

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

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Order number: (null)
℗ 07/2015 Subject to change

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Fundamental safety instructions

1

1.1 General safety instructions

⚠ DANGER

Danger to life due to live parts and other energy sources

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

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

Generally, six steps apply when establishing safety:

1. Prepare for shutdown and notify all those who will be affected by the procedure.
2. Disconnect the machine from the supply.
   - Switch off the machine.
   - Wait until the discharge time specified on the warning labels has elapsed.
   - Check that it really is in a no-voltage condition, from phase conductor to phase conductor and phase conductor to protective conductor.
   - Check whether the existing auxiliary supply circuits are de-energized.
   - Ensure that the motors cannot move.
3. Identify all other 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. Secure the energy sources against switching on again.
6. Ensure that the correct machine is completely interlocked.

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

⚠ WARNING

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

Touching live components can result in death or severe injury.

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

⚠WARNING

Danger to life when live parts are touched on damaged devices

Improper handling of devices can cause damage.

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

Danger to life through electric shock due to unconnected cable shields

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

- 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

Danger to life due to electric shock when not grounded

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

- Ground the device in compliance with the applicable regulations.

⚠WARNING

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

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

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

⚠WARNING

Danger to life due to fire spreading if housing is inadequate

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

- Install devices without a protective housing in a metal control cabinet (or protect the device by another equivalent measure) in such a way that contact with fire is prevented.
- Ensure that smoke can only escape via controlled and monitored paths.

⚠WARNING

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

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

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

⚠WARNING

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

There is higher stress on the motor insulation through a ground fault in an IT system. If the insulation fails, it is possible that death or severe injury can occur as a result of smoke and fire.

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

⚠WARNING

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

Inadequate ventilation clearances can cause overheating 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

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

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

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

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

Danger to life when safety functions are inactive

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

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- 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

Danger to life or malfunctions of the machine as a result of incorrect or changed parameterization

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.
- Respond to possible malfunctions by applying suitable measures (e.g. EMERGENCY STOP or EMERGENCY OFF).

1.2 Safety instructions for electromagnetic fields (EMF)

⚠WARNING

Danger to life from electromagnetic fields

Electromagnetic fields (EMF) are generated by the operation of electrical power equipment such as transformers, converters or motors.

People with pacemakers or implants are at a special risk in the immediate vicinity of these devices/systems.

- Ensure that the persons involved are the necessary distance away (minimum 2 m).

1.3 Handling electrostatic sensitive devices (ESD)

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

NOTICE

Damage through 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).

1.4 Industrial security

Note

Industrial security

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit this address (http://www.siemens.com/industrialsecurity).

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit this address (http://support.automation.siemens.com).

⚠WARNING

Danger as a result of unsafe operating states resulting from software manipulation

Software manipulation (e.g. by viruses, Trojan horses, malware, worms) can cause unsafe operating states to develop in your installation which can result in death, severe injuries and/or material damage.

- Keep the software up to date.

  You will find relevant information and newsletters at this address (http://support.automation.siemens.com).
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.

  You will find further information at this address (http://www.siemens.com/industrialsecurity).
- Make sure that you include all installed products into the holistic industrial security concept.

1.5 Residual risks of power drive systems

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

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

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

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

1. Unintentional movements of driven machine components during commissioning, operation, maintenance, and repairs caused by, for example,
   - Hardware 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 the control system
   - 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 failure
   - Software errors
   - Operation and/or environmental conditions outside 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 contact with fire inside and outside the inverter is not possible.
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

Note

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

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

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

Description

2

2.1 Identifying the components of the system

The SINAMICS G110M is a complete converter system for controlling the speed of a three-phase motor.

Each part of the system is shown in the following figure.

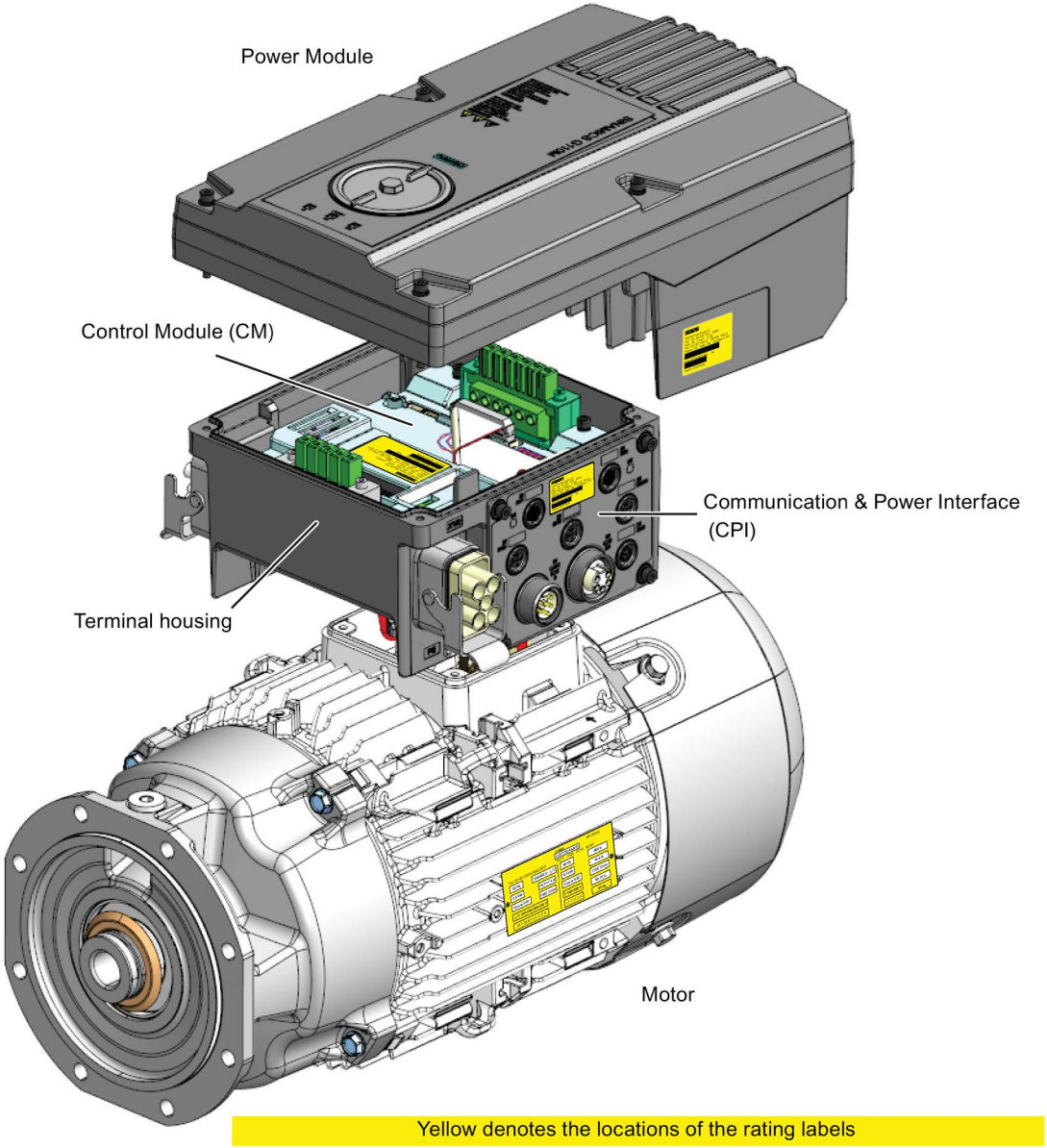


Figure 2-1 Identifying the components of the system

2.2 SINAMICS G110M converter

Overview

The SINAMICS G110M system consists of the following components:

- Terminal Housing (including the Control Module)
- Power Module
- Three-phase motor.

The Power Modules are designed for a specific power range and the terminal housings are designed to work with specific motors. The terminal housing not only allows the direct mounting onto a motor but specific cable glands and mains connectors are specified. All the various combinations of Power Modules, terminal housings (including the Control Modules) and Options are given in the tables below.

⚠CAUTION

Converter has the potential to start running of a PLC power-cycle

The converter has the potential to start running after a power-cycle of the controlling PLC, if an ON command was present prior to the power-cycle of the PLC.

It is the users responsibility to ensure that the converter runs only when it is appropriate of the user's application.

Table 2- 1 PM240M Power Modules - 3AC, 400 V, Class A, IP66

Frame size	Rated output power (kW)	Rated output current (A)	Article number
	based on High Overload (HO)		
FSA	0.37	1.3	6SL3517-1BE11-3AM0
FSA	0.75	2.2	6SL3517-1BE12-3AM0
FSA	1.1	3.1	6SL3517-1BE13-3AM0
FSA	1.5	4.1	6SL3517-1BE14-3AM0
FSB	2.2	5.6	6SL3517-1BE16-3AM0
FSB	3.0	7.3	6SL3517-1BE17-7AM0
FSB	4.0	8.8	6SL3517-1BE21-0AM0

Table 2- 2 CU240M Terminal Housing (including the Control Module)

Communications	Motor frame size	Mains / 24 V DC connections	Article number
USS	FS71	Cable glands	6SL3544-0LB02-1BA0
USS	FS80/90	Cable glands	6SL3544-0MB02-1BA0
USS	FS100/112	Cable glands	6SL3544-0NB02-1BA0
PROFIBUS	FS71	Cable glands	6SL3544-0LB02-1PA0
PROFIBUS	FS80/90	Cable glands	6SL3544-0MB02-1PA0
PROFIBUS	FS100/112	Cable glands	6SL3544-0NB02-1PA0
PROFIBUS	FS71	HanQ 4/2 / 7/8"	6SL3544-0TB02-1PA0
PROFIBUS	FS80/90	HanQ 4/2 / 7/8"	6SL3544-0PB02-1PA0
PROFIBUS	FS100/112	HanQ 4/2 / 7/8"	6SL3544-0QB02-1PA0
PROFINET	FS71	Cable glands	6SL3544-0LB02-1FA0
PROFINET	FS80/90	Cable glands	6SL3544-0MB02-1FA0
PROFINET	FS100/112	Cable glands	6SL3544-0NB02-1FA0
PROFINET	FS71	HanQ 4/2 / 7/8"	6SL3544-0TB02-1FA0
PROFINET	FS80/90	HanQ 4/2 / 7/8"	6SL3544-0PB02-1FA0
PROFINET	FS100/112	HanQ 4/2 / 7/8"	6SL3544-0QB02-1FA0
AS-i	FS71	Cable glands	6SL3544-0LB02-1MA0
AS-i	FS80/90	Cable glands	6SL3544-0MB02-1MA0
AS-i	FS100/112	Cable glands	6SL3544-0NB02-1MA0
AS-i	FS71	HanQ 4/2 / 7/8"	6SL3544-0TB02-1MA0
AS-i	FS80/90	HanQ 4/2 / 7/8"	6SL3544-0PB02-1MA0
AS-i	FS100/112	HanQ 4/2 / 7/8"	6SL3544-0QB02-1MA0

Every SINAMICS G110M is delivered with the following accessories:

All variants

- PTC connection cable - this is the extension cable used to connect the PTC wires from the motor to the connection on the CPI board.
- EM brake cable - this the extension cable used to connect the EM brake wires from the motor to the mains connector when the EM brake wire is too short.
- Pre-wired motor terminal cables ready for connecting to the motor terminals on the motor.
- Earthing cable for earthing the motor to the terminal housing (except FS80/90).
- PROFIBUS Communications cable for connecting the CPI board to the communications connection on the Control Module.

SINAMICS G110M HanQ 4/2 variant

- Male and female HanQ connectors, one of which is pre-wired with pins crimped on the other end ready for assembly.
- Blanking cap for users not wishing to utilize the power-through daisy chain.

Table 2- 3 SINAMICS G110M Options

Option	Description	Article number
24 V Power supply	Internal 24 V DC power supply for the CU240M	6SL3555-0PV00-0AA0
Internal braking resistor (FSA)	Continuous braking power 7.5 W, peak power 75 W (load period t_a=12s over a period t=240s) resistance 350 Ω	6SL3501-0BE18-8AA0
Internal braking resistor (FSB)	Continuous braking power 20 W, peak power 200 W (load period t_a=12s over a period t=240s) resistance 175 Ω	6SL3501-0BE22-0AA0
Glanded connector kit	Comprises the following connectors: • M20 screw gland - used for 24 V power supply daisy chain • M25 plastic gland - used for the 3-phase mains daisy chain • M12 plastic gland - used for the EM-brake cable entry.	6SL3566-2VA00-0GA0
HanQ connector kit	Comprises the following connectors: • Connector cap 7/8th internal thread - used for the 24 V power blanking cap • HanQ blanking cap - used for the mains input blank-ingcap • M12 plastic gland - used for the EM-brake cable entry.	6SL3566-2LA00-0GA0
Repair Switch	The Repair Switch allows the motor/converter to be isolated from the mains. This means that all power to the motor is terminated and the converter cannot start or stop the motor.	6SL3555-0PR01-0AA0
Wall Mount Kit (WMK)	The WMK allows the converter to be mounted on a wall or flat surface separate from the location of the motor.	6SL3566-1GA00-0GA0

Compatible motors for the SINAMICS G110M system

The following tables detail the motors that are compatible with the SINAMICS G110M system.

Due to the unique nature of the SINAMICS G110M system, there are a number of restrictions regarding the type of options and devices used with the motors. These are listed below:

- No encoders can be used with the SINAMICS G110M.
- The brake lever cannot be used in the "12 O'Clock" position; this is not possible because of the position of the terminal housing of the Inverter.
- The use of only 180 Vdc brakes are permissible.
- 230/400 Vac brake voltage is not allowed.
- Standby heating of the motor is not allowed.
- An external motor fan cannot be fitted if the terminal housing is in the "12 O'Clock" position.

Rules for the use of the motors:

- Rated output current of the converter ≥ rated input current of the motor.
- For the SINAMICS G110M use only the following types of motors:
  - SIMOTICS GP 1LA, frame size 71
  - SIMOTICS GP 1LE1 frame sizes 80, 90 100 and 112.
- The motors must be configured with the terminal box on the B-side (BS) of the motor (NDE = Non Drive End) as shown in the figure below. For this configuration, select the following options during the motor selection:
  - For SIMOTICS GP 1LA motors, option M64
  - For SIMOTICS GP 1LE1 motors, option H08 (in preparation for 1LE1 motors for frame sizes 80 and 90).

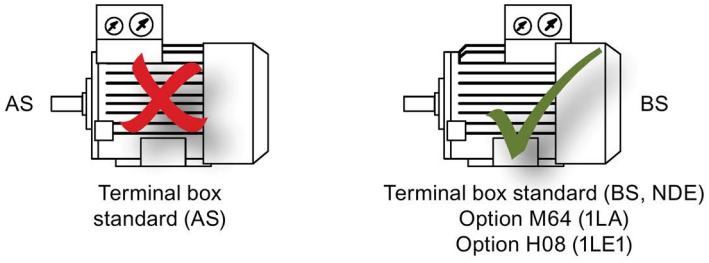


Figure 2-2 Correct motor types

Table 2- 4 Compatible motors for the SINAMICS G110M

Power Modules	Control Units			Motors			
Type	Motor Frame Size	Com-munica-tions	Type	Frame Size	Power (kW)	Efficiency	Type
6SL3517-1BE11-3AM0 6SL3517-1BE12-3AM0 6SL3517-1BE13-3AM0 6SL3517-1BE14-3AM0 6SL3517-1BE16-3AM0 6SL3517-1BE17-7AM0 6SL3517-1BE21-0AM0	FS 71	USS	6SL3544-0LB02-1BA0	71M	0.37	IE1	1LA7073-4AB
		AS-i	6SL3544-0LB02-1MA0				
			6SL3544-0TB02-1MA0				
		DP	6SL3544-0LB02-1PA0				
			6SL3544-0TB02-1PA0				
		PN	6SL3544-0LB02-1FA0				
			6SL3544-0TB02-1FA0				
	FS 80/90	USS	6SL3544-0MB02-1BA0	80M	0.75	IE2	1LE1001-0DB3
		AS-i	6SL3544-0MB02-1MA0	90S	1.10	IE2	1LE1001-0EB0
			6SL3544-0PB02-1MA0	90L	1.50	IE2	1LE1001-0EB4
		DP	6SL3544-0MB02-1PA0				
			6SL3544-0PB02-1PA0				
		PN	6SL3544-0MB02-1FA0				
			6SL3544-0PB02-1FA0				
	FS 100/112	USS	6SL3544-0NB02-1BA0	100L	2.20	IE2	1LE1001-1AB4
		AS-i	6SL3544-0NB02-1MA0	100L	3.00	IE2	1LE1001-1AB5
			6SL3544-0QB02-1MA0	112M	4.00	IE2	1LE1001-1BB2
		DP	6SL3544-0NB02-1PA0				
			6SL3544-0QB02-1PA0				
		PN	6SL3544-0NB02-1FA0				
			6SL3544-0QB02-1FA0				

2.3 General layout SINAMICS G110M system

Introduction

The locations and description of the various interface connections of the CU240M Terminal housing (including the Control Module (CM)) and the PM240M Power Module (PM) are detailed in the figure and table below.

The layout and interfaces of the AS-i variant is shown in a separate figure and table below. The connections on the terminal housing are delivered with either HAN Q (pluggable) or Glanded connectors depending on the variant that has been ordered.

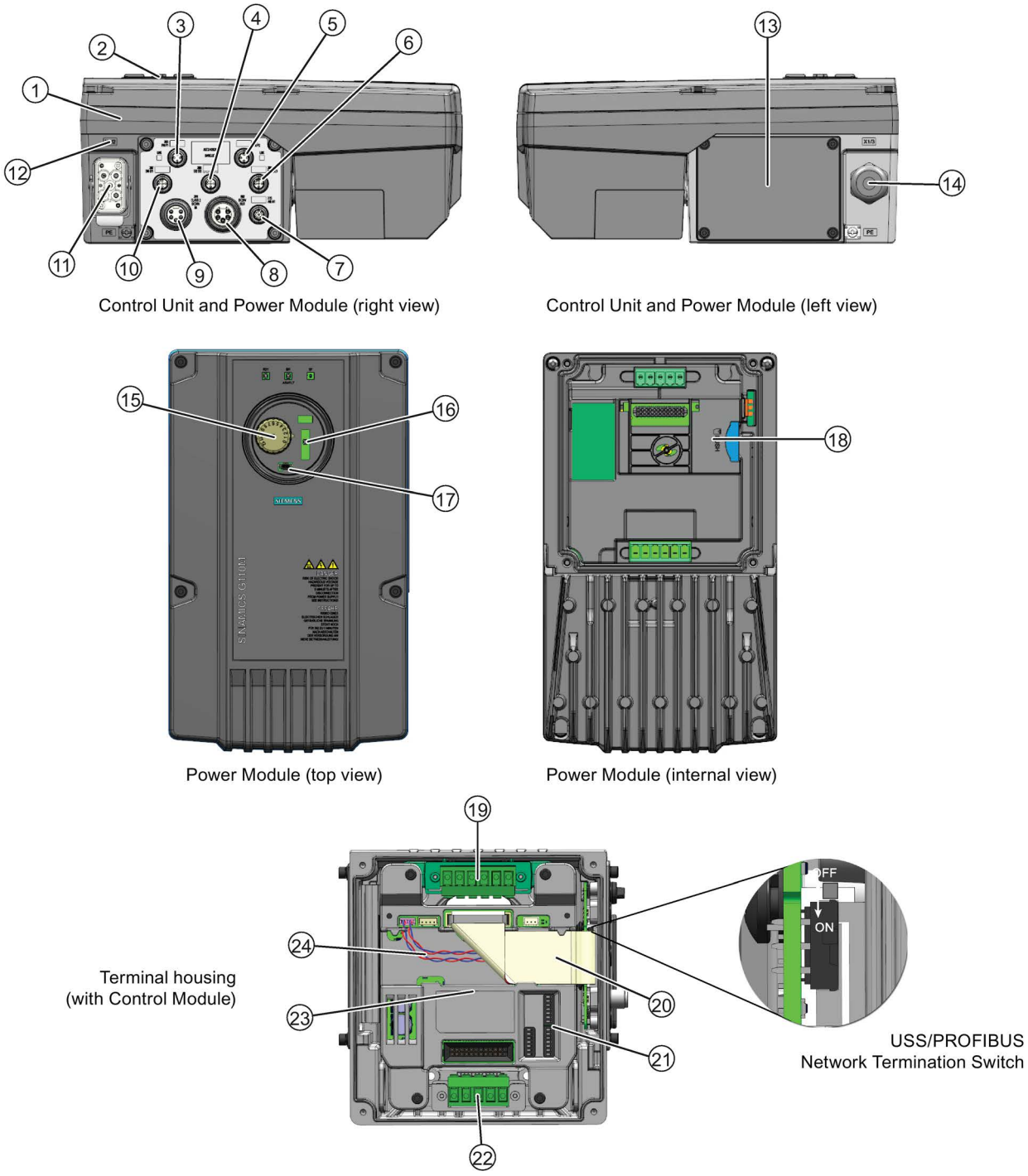


Figure 2-3 General layout of the system - all variants except CU240M AS-i

Table 2- 5 Description and location of interfaces

Item	Description	Item	Description
①	Power Module	⑬	Blanking plate - to seal the opposite side of the Terminal Housing from which the CPI has been fitted.
②	Interface cover	⑭	Cable gland or HANQ connections for left-side mounting or daisy chaining the mains supply
③	Communications port 1	⑮	Potentiometer
④	Digital input 2 and digital input 3	⑯	Optical I/O connection
⑤	Communications port 2	⑰	Mini USB connection
⑥	Digital output 0 and digital output 1	⑱	Memory card reader
⑦	Analog input 0 and analog input 1	⑲	Braking resistor & motor connection terminals
⑧	External 24 Vdc OUT	⑳	Communications & Power Interface (CPI) interface ribbon cable
⑨	External 24 Vdc IN	㉑	PROFIBUS/USS address and commissioning DIP switches 1 and 2
⑩	Digital input 0 and digital input 1	㉒	EM Brake & mains supply connection terminals
⑪	Mains supply connection	㉓	Control Module (CM)
⑫	Terminal housing	㉔	PROFIBUS/PROFINET/USS communications cable

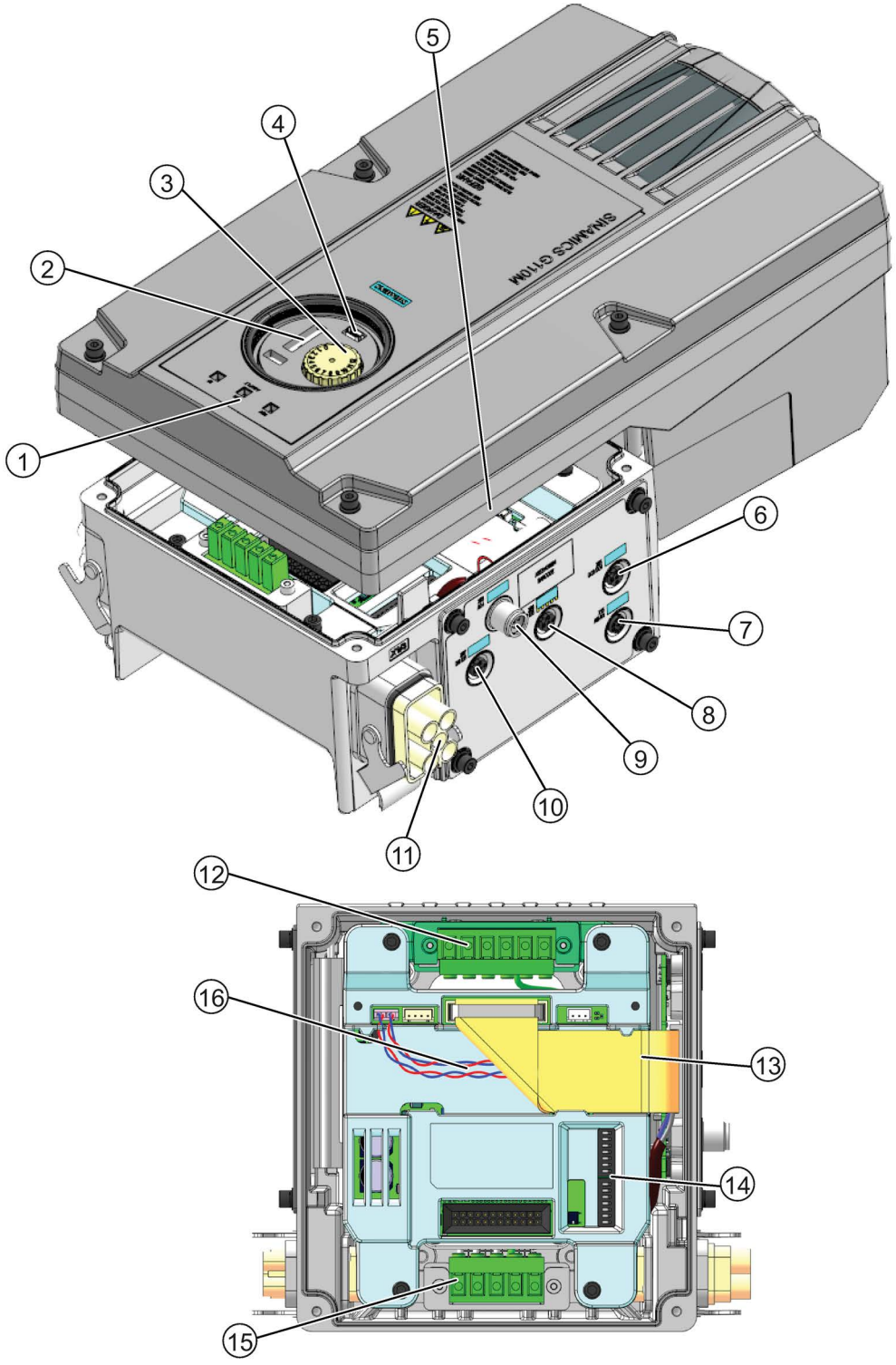


Figure 2-4 SINAMICS G110M ASi General Layout

Table 2- 6 Description and location of interfaces

Item	Description	Item	Description
①	Status LEDs	⑨	AS-i connection and Aux power
②	Optical I/O connection	⑩	Digital inputs 0 and 1
③	Potentiometer	⑪	Mains supply connection
④	Mini USB connection	⑫	Braking resistor & motor connection terminals
⑤	Card reader (on underside of Power Module)	⑬	Communications & Power Interface (CPI) interface ribbon cable
⑥	Digital outputs 0 and 1	⑭	Commissioning DIP switches 1 & 2
⑦	Analog inputs 0 and 1	⑮	EM brake & mains supply connection terminals
⑧	Digital inputs 2 and 3	⑯	Communications cable

Installation

3

⚠DANGER

Operation with ungrounded (IT) mains supplies can produce extremely dangerous conditions

The converter must always be grounded. If the converter is not grounded correctly, extremely dangerous conditions may arise within the inverter which could prove potentially fatal.

The converter can only be used on TT and TN mains supplies.

⚠DANGER

Risk of burns and fire due to high temperatures

During operation and for a short time after switching the converter off, the surfaces reach temperatures that can inflict burns or start fires!

Before attempting to touch the surfaces of the converter, ensure that enough time is given to allow the converter to cool down to a safe temperature to avoid personal injury.

Remove any flammable materials from around the converter to reduce the risk of fire.

⚠WARNING

Direct current on the PE conductor

This product can cause a direct current on the PE conductor.

If the wrong type of protection device is used, then the expected protection by such a device could fail to provide the expected protection.

If a residual current device (RCD) is used to provide protection in case of direct or indirect contact, **only a type B RCD** may be used on the power supply side of this product.

⚠WARNING

Use Only 75°C copper cable for all mains cables

Due to the high internal temperatures, that may exist within the converter housing of the SINAMICS G110M converter, it is possible that any mains cables that are rated below 75°C could suffer the loss of their insulating properties.

Therefore, all mains cables used with the SINAMICS G110M converter MUST be at least 75°C copper cables.

In addition, to comply with the UL requirements, all mains cables MUST be only 75°C copper cables.

⚠ CAUTION

Converter must not be used as a step or ledge

The converter has not been designed to support a substantial weight and therefore must not be used as a step or a ledge.

Should substantial weight be placed on the system it could result in severe damage to the equipment which could adversely affect the application and any persons coming in contact with the system.

3.1 Mechanical Installation

3.1.1 Dimensions of converters and motors

Dimensions of the system

The converter has two frame sizes. Frame size A (FSA) and Frame size B (FSB), the dimensions of each frame size is given in the figure and table below.

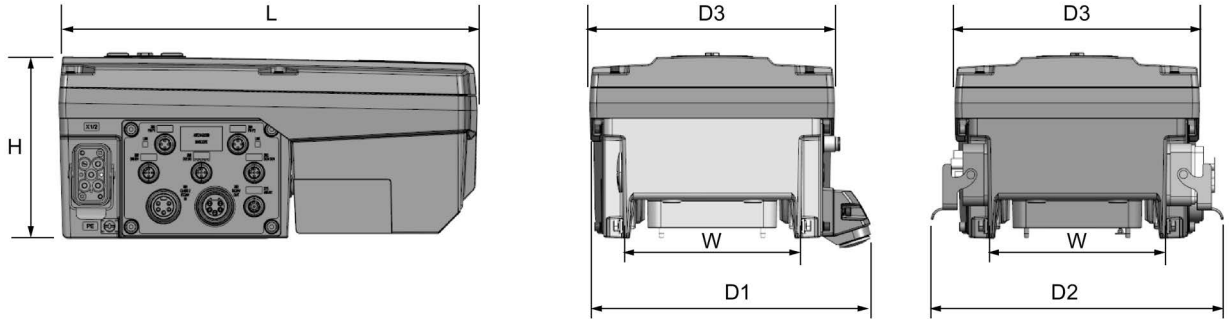


Figure 3-1 Dimensions of the converter

Table 3- 1 Converter dimensions

Frame size	H (mm)	L (mm)	D1 (mm)	D2 (mm)	D3 (mm)	W (mm) without glands
A	135	270	208	216	161	132
B	135	309	208	216	181	132

Terminal housing dimensions and fixing points

The terminal housing of the G110M system replaces the existing terminal housing on the connected motor. There are three different types of the terminal housings and they are shown in the following figure. All three terminal housings have the same external dimensions:

- Height: 92 mm.
- Width: 161 mm
- Depth: 171 mm

Please note that the fixing points (for securing the terminal housing to the motor) are indicated in RED. The FS 80/90 terminal housing has six fixing points, two of which are marked in GREEN and indicated by the ground symbol. These fixing points provide the correct earthing between the terminal housing and the motor and MUST be used.

All fixing bolts for the terminal housing are supplied with each terminal housing.

Note

FS 80/90 terminal housing 21 mm fixing screws

The 21 mm fixing screws for the FS 80/90 terminal housing are not supplied with the product.

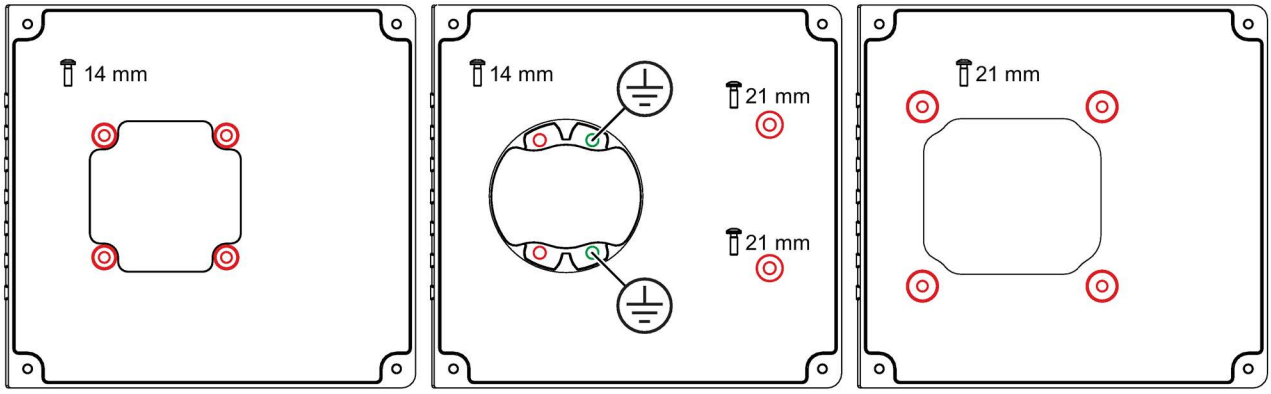


Figure 3-2 Terminal housing dimensions

Motor dimensions

There are a large number of motors associated with the G110M system, with each motor being uniquely configured for the user requirements.

To ensure that the correct motor is selected the following sources of information should be consulted:

- The relevant system catalog, for example the SINAMICS G120 catalog.
- The relevant motor catalog.
- The Siemens "Configurator" online software application for dimensioning motors (Siemens motor configurator (https://eb.automation.siemens.com/goos/catalog/Pages/ProductData.aspx?catalogRegion=WW&language=en&nodeid=10028832&tree=CatalogTree&regionUrl=%2F&autoopen=false&activetab=product#topAnch&activetab=config&))

The "Configurator" tool allows the user to precisely configure a motor with all the accessories and options that are required, then generate dimensional data, including 2D and 3D CAD models, which can be downloaded to the users local system.

The figure below shows an example of the type of data available.

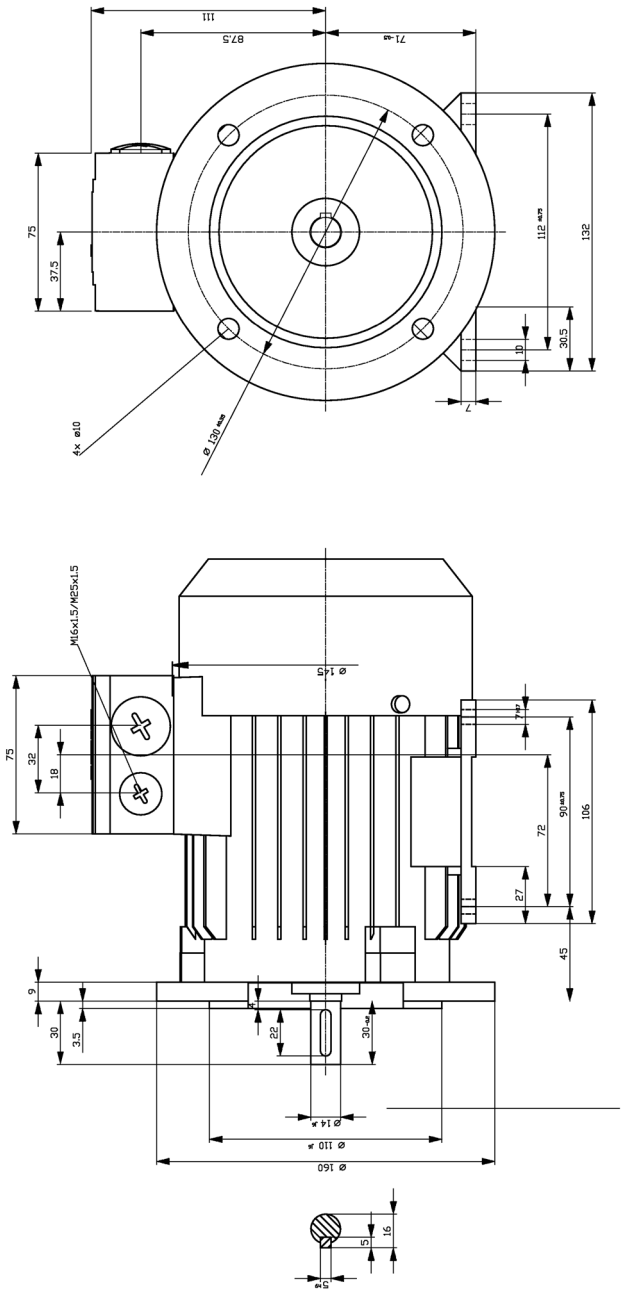


Figure 3-3 Example of the data available from the Sizer program

Mounting orientation

The G110M system has been designed to operate in any orientation depending on the motor mounting configuration.

3.2 System Installation

3.2.1 Installation Procedures

Overview

The SINAMICS G110M is generally delivered as a complete system, which comprises a Power Module, a terminal housing (which includes the Control Module) and a motor/geared motor. If the system is delivered as a complete system, then it is delivered totally assembled and all that is required is the external wiring of the system.

It is also possible that the SINAMICS G110M system is delivered as separate components, which will require the system to be fitted together before installation and commissioning can take place.

To perform the complete assembly of the system, the procedures in the following sections should be performed.

⚠DANGER

Risk of electrical shock

When the converter and motor are powered-up, high voltages are present in the electrical components of the system, any contact with these components could result in severe personal injury or death.

During the installation procedure, the mains supply and external power sources should not be applied to the system.

⚠CAUTION

Potential damage to the Control and Power Interface (CPI) by the internal braking resistor

The internal braking resistor, when used, generates a large amount of heat. This heat has the potential to overheat the electrical components of the CPI.

The internal braking resistor must be fitted on the opposite side of the terminal housing from the CPI.

⚠CAUTION

Risk of damage to wiring/cables in the Communications and Power Interface (CPI)

The terminal housing has two sets of terminals which are supported on two posts. The terminals are secured when the Control Module (CM) is screwed into place.

If any cables or wires are routed behind the terminal posts, the downward pressure from the terminal post clamps has the potential to damage any wire or cable routed behind the terminal support posts.

Do not route any cables or wires behind the terminal posts.

⚠CAUTION

Converter must not be used as a step or ledge

The converter has not been designed to support a substantial weight and therefore must not be used as a step or a ledge.

Should substantial weight be placed on the system it could result in severe damage to the equipment which could adversely affect the application and any persons coming into contact with the system.

Note

Diagrams and illustrations

In some of the diagrams and illustrations throughout this section, the colour of components or cables have been selected to make them more visible and do not necessarily reflect the real colour of the component or cable. In some illustrations, components have been removed to enhance the clarity of what is being described.

Note

Use only Non-Drive End (NDE) motor configurations

The SINAMICS G110M has been designed to be used in conjunction with NDE motors. Do not use standard motor terminal box mountings with the SINAMICS G110M systems.

Disassembly procedure

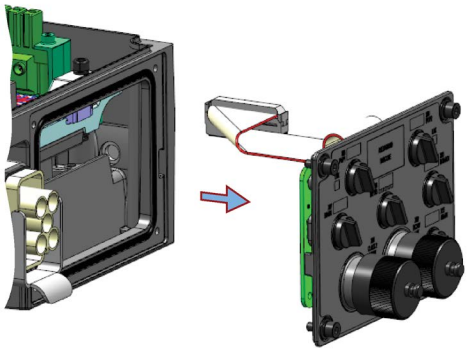
When the SINAMICS G110M is delivered as separate components, the terminal housing must be fitted to the motor. To accomplish this task it is necessary to disassemble the terminal housing to gain access to the motor mounting fixtures in the base of the terminal housing.

To disassemble the terminal housing, the following procedure should be performed.

1. **Remove the Communications & Power Interface (CPI)**
   1. Remove the CPI ribbon cable from the Control Module.
   2. Unscrew the four screws holding the CPI in place on the terminal housing.

   Notes:

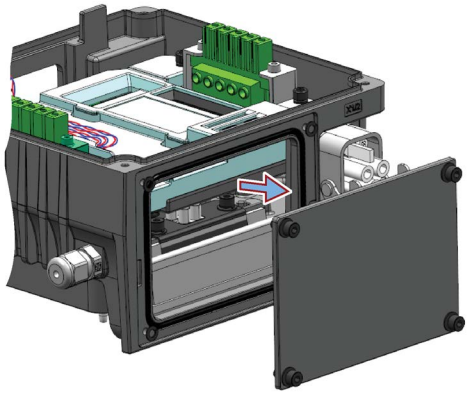
   - The CPI ribbon cable is permanently attached to the CPI board and therefore no attempt should be made to remove it from the CPI board.
   - The seal on the terminal housing behind the CPI is a moulded seal and no attempt to remove them from the terminal housing should be made, as this would permanently damage the seal and significantly reduce the IP rating of the terminal housing.



2. **Remove the blanking plate**
   1. Unscrew the four screws holding the blanking plate in place on the terminal housing.
   2. Do not try and remove the seal on the terminal housing.

   Note:

   The seal on the terminal housing behind the blanking plate is a moulded seal and no attempt to remove them from the Terminal Housing should be made, as this would permanently damage the seal and significantly reduce the IP rating of the terminal housing.

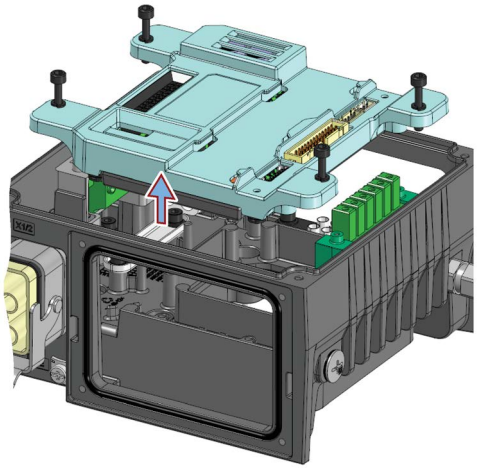


3. Remove the Control Module

1. Unscrew the four self-retaining screws that secure the Control Module in place.
2. Carefully lift the Control Module out of the terminal housing.

Note:

The screws that secure the Control Module in place are self-retaining screws and cannot be fully removed from the Control Module casing.

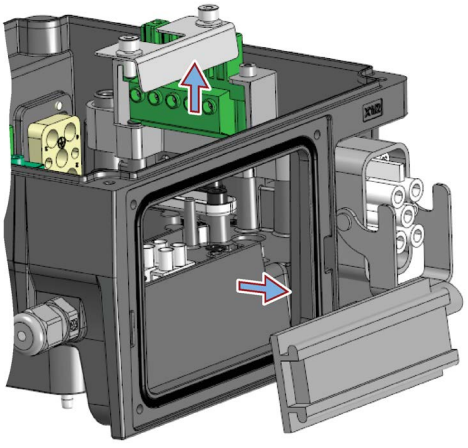


4. Remove the internal braking resistor

1. Remove the internal resistor holding clamp.
2. Disconnect the brake resistor wires from the motor terminals (R2 and R1).
3. Slide the internal braking resistor out from the terminal housing.

Note:

- The internal braking resistor is an optional extra and should be fitted to the terminal housing.
- The internal braking resistor must not be fitted on the same side as the CPI.

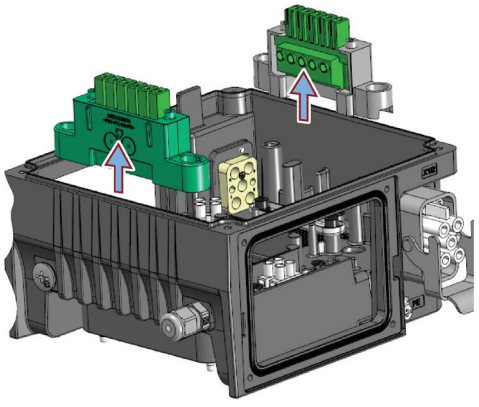


5. Remove the terminal housing terminal connectors

1. Remove the mains terminals connector
2. Remove the motor terminals connector

Notes:

- The terminal connectors are removed to allow easy access to the earthing posts located underneath the individual terminals.
- There are no screws holding down the connectors - they are secured and held in place when the Control Module is fitted.



Installation procedure

Having dismantled the SINAMICS G110M Terminal Housing, the following procedure should be performed to complete the installation of the whole system.

1. **Star and Delta Configuration**

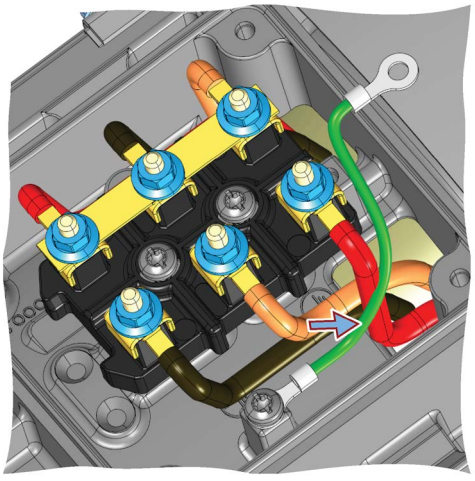
   Configure the motor terminals for either star or delta configuration depending upon the voltage requirement of the application and the mains input voltage.

2. **Fit the earth cable to the motor**

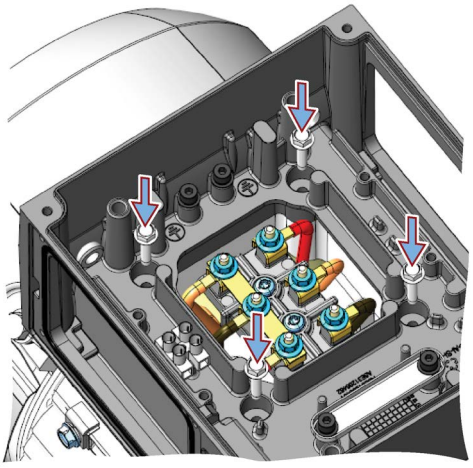
   1. Secure the earth cable to the motor terminal box.
   2. Ensure that the cable is facing in the correct direction to allow connection to the earthing post on the terminal housing.

   Note:

   - The earthing cable is supplied with the terminal housing.
   - On the FS80/90 terminal housings there are two additional fixing points which are the earthing points between the terminal housing and the motor. These earthing points must be used and therefore, the earthing cable does not need to be fitted.
   - If the SINAMICS G110M is ordered as a complete system, then all mechanical and electrical installation is completed in the factory prior to delivery.



3. Fitting the terminal housing to the motor



1. Remove the existing motor terminal housing (the terminal housing will become the motor terminal housing).
2. Align the terminal housing with the motor terminal housing.
3. Secure the terminal housing to the motor terminal housing.

Notes:

- Ensure that the terminal housing is fitted to the motor with the Power Module heatsink over the non-drive end of the motor.
- There are three different terminal housings, please ensure you have the correct terminal housing configuration for the motor to which it is to be fitted.
- All the required fixing bolts are supplied in the packaging with the product.
- On the FS80/90 terminal housings there are two additional fixing points which are the earthing points between the terminal housing and the motor. These earthing points must be used and therefore, the earthing cable does not need to be fitted.
- The FS80/90 terminal housings cannot be fitted directly over the terminal block of the motor - the terminal block of the motor must be removed from the motor, then the terminal housing is fitted to the motor and then the motor terminal block is fitted back onto the motor.
- For the exact dimensions and fixing points of the terminal housing, please refer to Dimensions of converters and motors (Page 26).
- The tightening torques for fitting the terminal housing to the motor terminal box are contained in the Operating Instructions for the motor. For further information, please refer to the following document: LA/LE motors for mounting on SIMOGEAR gearboxes (http://support.automation.siemens.com/WW/view/en/60666508).
- If the SINAMICS G110M is ordered as a complete system, then all mechanical and electrical installation is completed in the factory prior to delivery.

4. Connect the motor earth cable to the terminal housing

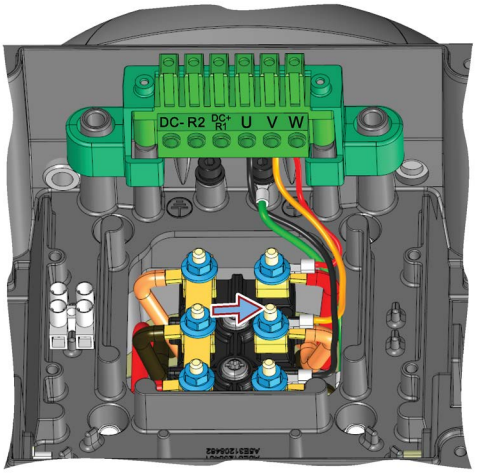
1. Feed the motor earth cable through the terminal housing.
2. Secure the motor earth cable to the terminal housing earthing post (1.5 Nm).

5. Connect the terminal housing motor terminals to the motor

1. Connect the U, V and W terminals of the terminal housing to U1, V1 and W1 terminals of the motor.
2. Ensure that the cables are routed as to not obstruct access to other components of the system.

Note:

- The motor terminals on the terminal housing are delivered pre-wired at the correct length for easy fitting.
- The mains supply and motor terminals have a maximum torque of 0.8 Nm.

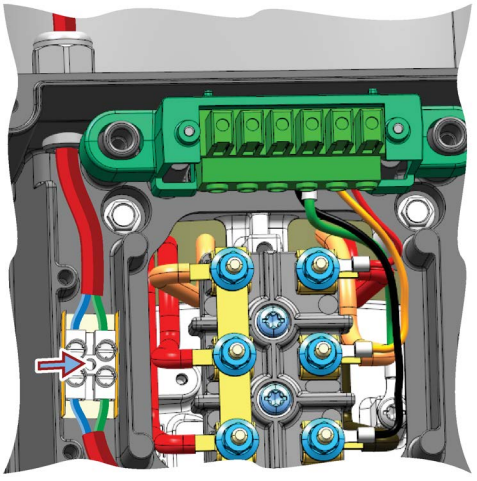


6. Connect the EM brake cables

1. Feed the external EM brake cable through the EM brake cable gland.
2. Connect the external EM brake cable to the EM brake terminal block.
3. Ensure that the plastic insulation sleeve is fitted correctly to the EM brake terminal block (which is part of the accessories supplied with the product).
4. Tighten the cable gland to secure the cable in place.

Notes:

- Only a 180 Vdc EM brake can be used.
- If a brake is not used the cable entry must be sealed with a blanking plug to ensure the IP65 rating of the system is maintained.

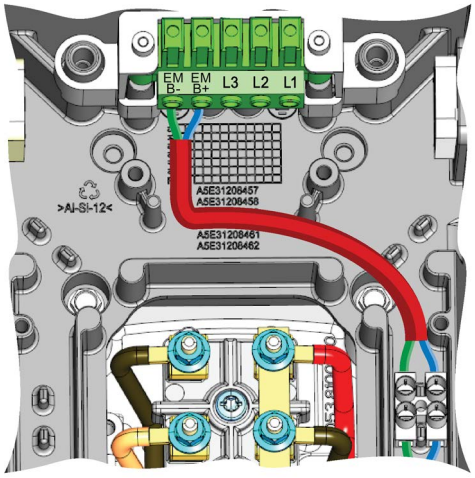


Connect the EM brake cables to the EM brake terminals

1. Connect the EM brake cables to the EM brake terminal block.
2. Connect the EM brake cables to the EMB+ and EMB- terminals on the terminal block.

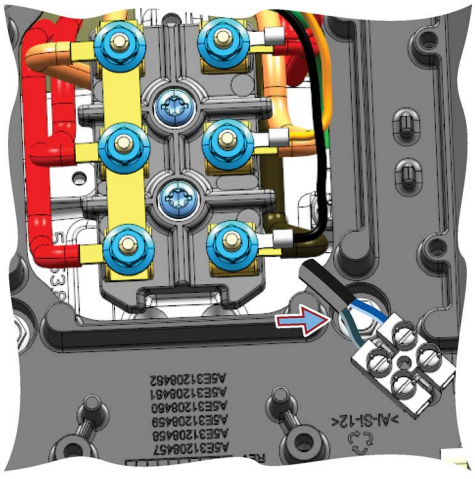
Notes:

- Ensure that the cable is routed under the cable clamp.
- The terminals can accept cable to a maximum size of 4 mm^2.
- The EM brake is an optional extra which is ordered separately.



7. Connect the motor temperature sensor

1. Connect the motor temperature sensor cables to the temperature sensor terminal block.
2. Ensure that the cable is clear of any obstructions and does not restrict access to other cables and connectors within the terminal housing.

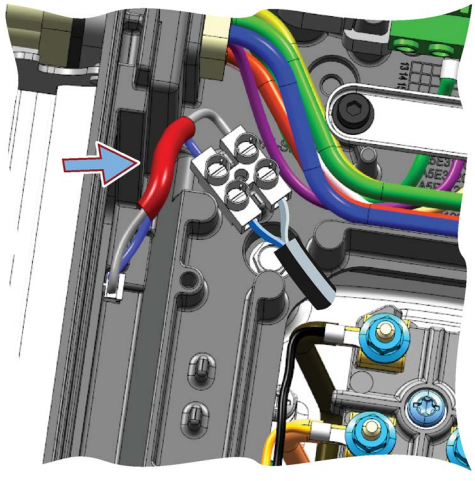


Connect the motor temperature sensor (second part)

1. Connect the second part of the motor temperature sensor cable to the temperature sensor terminal block.
2. The connector on the second part of the motor temperature sensor is plugged into the Communications and Power Interface (CPI).

Notes:

- The motor temperature sensor terminal block has a diameter of 2.79 mm.
- The final connection of the temperature sensor cannot be completed until the CPI has been fitted. This will be done after the CPI is fitted, as shown later in this procedure.

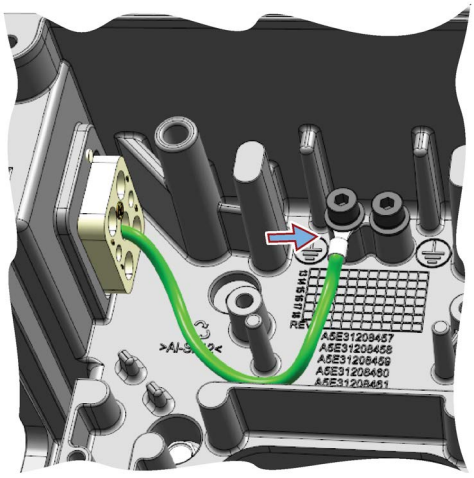


8. Connecting the mains earth cable (HANQ variant)

1. Connect the HANQ earth connection to the earthing post of the terminal housing.
2. Tighten the earthing post screw to 1.5 Nm.

Note:

If the SINAMICS G110M is ordered as a complete system, then all mechanical and electrical installation is completed in the factory prior to delivery.

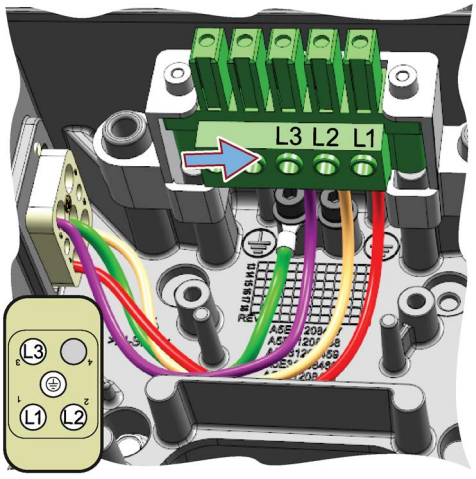


9. Connecting the mains cables (HANQ variant)

1. Ensure that the cable clamp has been removed.
2. Connect the HANQ L1, L2 and L3 connections to the L1, L2 and L3 connections on the mains connector.
3. When the connections are completed, replace the cable clamp over the cables (ensuring that the cable clamp is the correct way round).

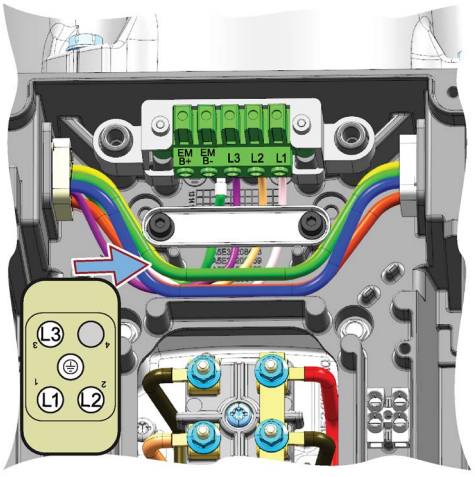
Note:

Tightening torque of the mains terminals are a maximum of 0.8 Nm.



10. Connecting the power-through cables (HANQ variant)

To allow the power provided to one system to supply the power to another system in a daisy-chain, the input power is routed directly from the mains input HANQ connector to the mains output connector in the same terminal housing.



1. Connect the Earth connection from the input HANQ connector to the output HANQ connector.
2. Connect the L1 connection from the input HANQ connector to the output HANQ connector.
3. Connect the L2 connection from the input HANQ connector to the output HANQ connector.
4. Connect the L3 connection from the input HANQ connector to the output HANQ connector.

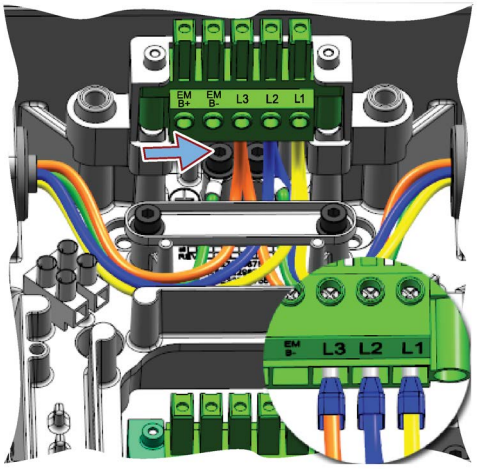
Note:

The power-through cables are provided with the terminal housing and are the correct size and dimensions to allow the power-through connections to be made easily.

11. Connecting the power-through cables (Glanded variant)

In the glanded variant the power-through connections use a different methodology.

The terminal housing terminals L1, L2 and L3 require two cables to be fitted to each terminal - this makes the maximum cable cross-section 2.5 mm^2. The input and output cables are connected to the terminals through a twin ferrule connector, as shown in the callout in the figure on the right. The twin ferrules are available from Phoenix Connector under order number: 3200836.



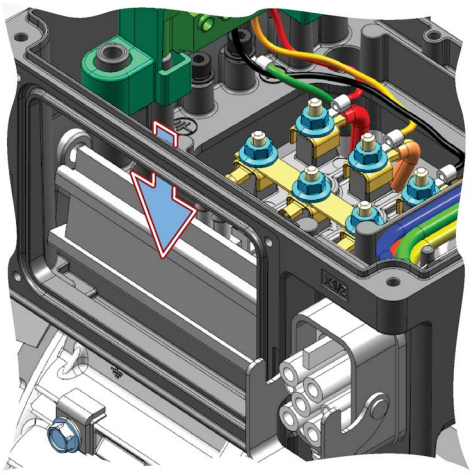
1. Connect the Input cables to the L1, L2 and L3 terminals of the terminal housing.
2. Connect the Input earth cable to the first earthing post of the terminal housing.
3. Connect the L1, L2 and L3 terminals of the terminal housing to the output cable through the cable gland.

Note:

On the glanded variant no pre-cut cables are provided.

12. Fitting the internal braking resistor

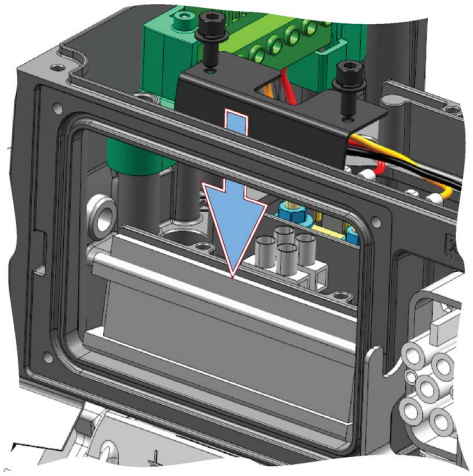
The internal braking resistor is an optional extra and is fitted into the terminal housing.

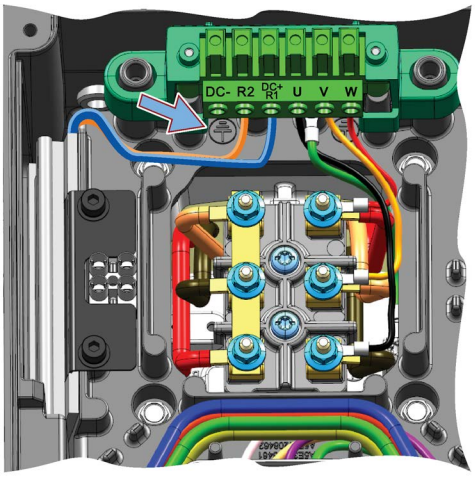


1. Slide the internal braking resistor into place on the opposite side to which the CPI will be fitted.
2. Fit the internal braking resistor securing bracket.
3. Secure the bracket in place using the two screws to a tightening torque of 1.5 Nm.
4. Connect the internal braking resistor cables to the R2 and R1 terminals of the terminal housing motor terminals.

Note:

The internal braking resistor can be fitted on the left or right side of the terminal housing, but must always be fitted on the opposite side of the terminal housing from Communications and Power Interface (CPI).



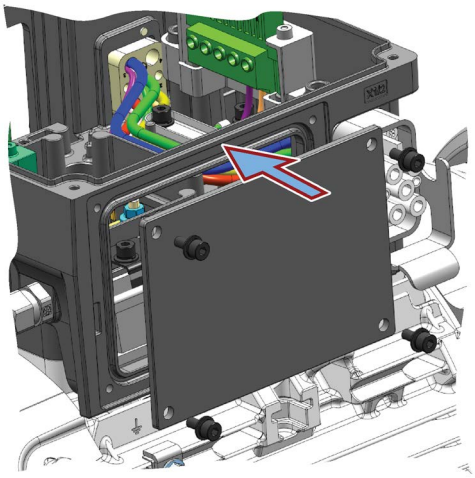


13. Fitting the blanking plate

1. Using the four screws, fit the blank plate to the side of the terminal housing.
2. Ensure that no cables or components are trapped between the blanking plate and the terminal housing seal, as this would adversely affect the IP rating of the terminal housing.

Note:

Screws tightening torque: 1.5 Nm.

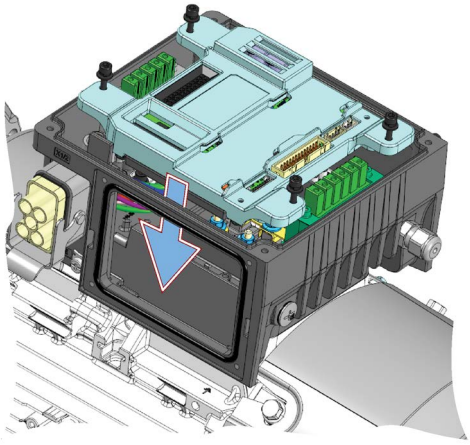


14. Fitting the Control Module

1. Ensuring that no wiring is trapped by the Control Module, place the module on the four supporting posts of the terminal housing.
2. Using the four screws (self-retaining), secure the Control Module into place.

Note:

Screws tightening torque: 1.5 Nm.

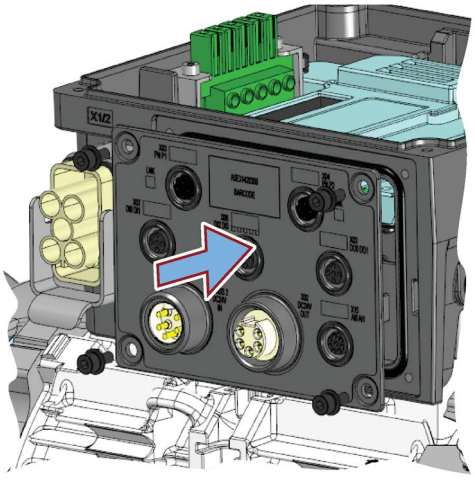


15. Fitting the Communications and Power Interface (CPI)

1. Using the four screws, fit the CPI to the side of the terminal housing.
2. Ensure that no cables or components are trapped between the CPI and the terminal housing seal, as this would adversely affect the IP rating of the terminal housing.

Notes:

- Screws tightening torque: 1.5 Nm.
- The Communications and Power Interface (CPI) can be fitted on the left or right side of the terminal housing, but must always be fitted on the opposite side of the terminal housing from the internal braking resistor.

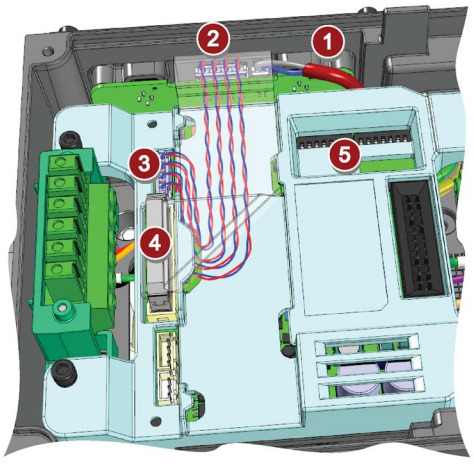


16. Final connection and adjustments

1. Connect the temperature sensor connector into the connector at the top edge of the CPI.
2. Connect the small communications connector into the connector at the top of the CPI.
3. Connect the large communications connector into the connector on the top of the Control Module.
4. Connect the CPI ribbon cable to the connector on the top of the Control Module.
5. Configure the DIP switches to the requirements of the application (see Step 17 below).

Note:

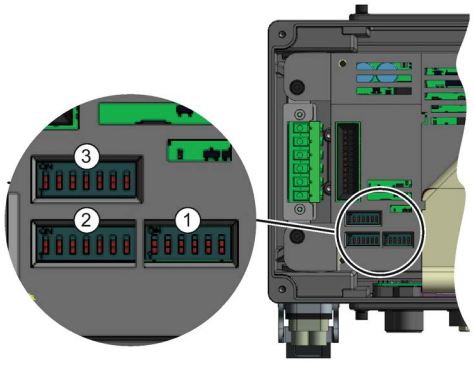
The PROFIBUS/PROFINET communications cable is not pre-fitted to the Control Module, it is part of the accessories supplied in the product packaging.



17. PROFIBUS / USS address and basic commissioning DIP-switches

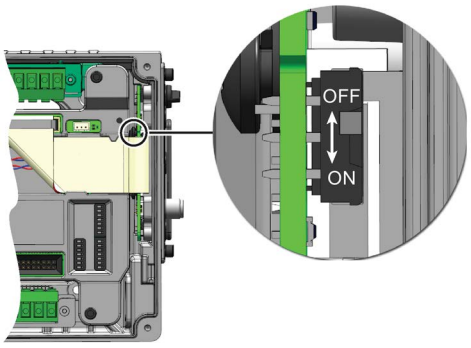
There are three sets of DIP-switches that allow the user to configure the network device address and perform a basic commissioning of the system.

For further information, please see Basic Commissioning with DIP switches (Page 77)



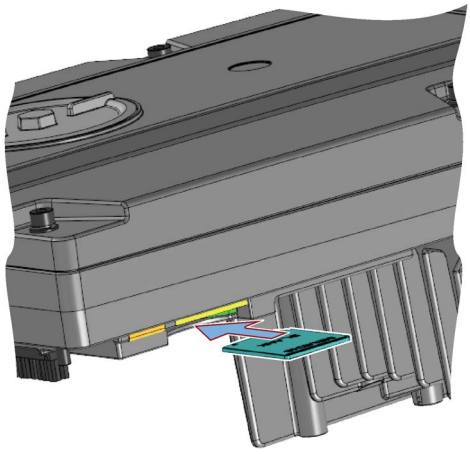
18. PROFIBUS / USS network termination switch

When using the PROFIBUS or USS communications protocols, the last converter on the network must have the network termination switch in the ON position.



19. Fit memory card into the Power Module

To allow parameter settings to be stored or copied to the converter, the memory card must be fitted into the memory card reader.

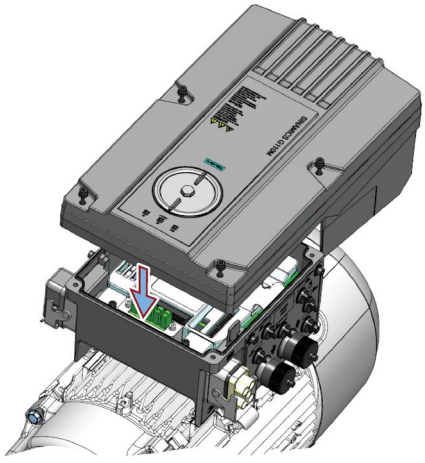


20. Fit Power Module onto the terminal housing

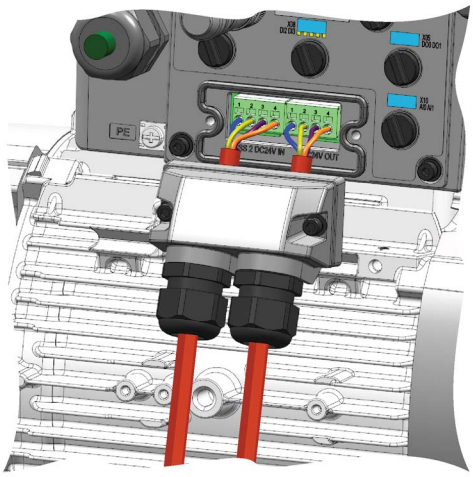
The Power Module is fitted on top of the terminal housing and screwed in place with the four self-retaining screws.

Note:

Screws tightening torque: 2.0 Nm.



21. Connecting the 24 V external supply (glanded variant - but not the AS-i variant)



1. Feed the two 4-core cables through the cable glands.
2. Connect each 4-core cable to the DC 24 V input and the DC 24 V output.
3. Secure the cable cover to the CPI using the two screws.
4. Tighten the cable glands to secure the cables in place.

Notes:

- The terminals for the 24 V external supply both input and output are as follows:
  - 1 = +24V unswitched
  - 2 = 0V unswitched
  - 3 = +24V switched
  - 4 = 0V switched
- Screws tightening torque: 1.5 Nm.
- The cable glands have a diameter of 20 mm
- Wiring dimensions:
  - 0.25 ... 2.5 mm^2 without isolated cable ends (ferrels).
  - 0.25 ... 1.5 mm^2 with isolated cable ends (ferrels).

Note

Unswitched and switched power supply

The unswitched 24 V power supply (also known as non-switched) on X1.2 and X1.4 provides power to the general electronics of the Control Unit. The switched 24 V power supply on X1.1 and X1.5 supplies power for the two digital outputs (DI0 and DI1). For a complete explanation of the unswitched and switched 24 V supplies and their limitations, please read the FAQ at the following link:

Unswitched and switched 24 V supply
(http://support.automation.siemens.com/WW/view/en/26986267)

After the system installation has been completed, the external electrical connections can be performed. See Connection and cables (Page 53)

3.2.2 Grounding the terminal housing

Grounding the terminal housing

To ensure that the Inverter is properly grounded and protected, an earthing cable **MUST** be fitted to the terminal housing of the G110M system.

- Connect the PE terminal on the left-hand side of the inverter to appropriate grounding point of the installation.
- Use a short wire connection.
- 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.

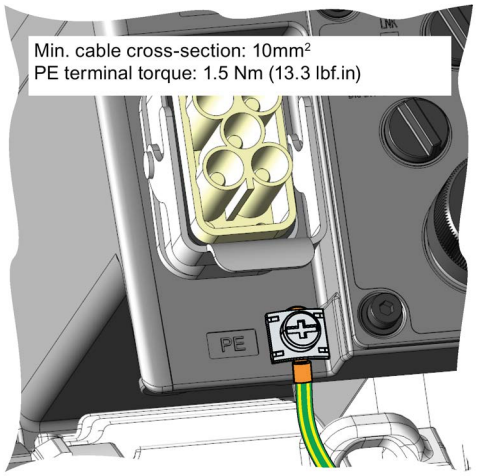


Figure 3-4 Terminal housing PE terminal

3.2.3 Installing the 24V power supply

Introduction

The optional 24V PSU allows the user to draw the necessary 24V to power the internal electronic of the Control Module direct from the converters DC link voltage. This has the advantage that no external cabling is required and therefore, only a 3-phase mains supply cable is required.

The following electronics are powered by the optional 24V PSU:

- Internal circuits in the Control Module (CM).
- Low voltage components in the Power Module (PM).
- All input and output, for example the digital outputs on the Communications and Power Interface (CPI).

At the base of the 24V PSU housing is a cable gland opening (which is sealed with a blanking plug) which provides and entry point for the cables from an external braking resistor.

The optional 24V PSU can be ordered using the following order number:

6SL3555-0PV00-0AA0

A brief description of the layout and the connections of the 24V PSU are given in the following figure.

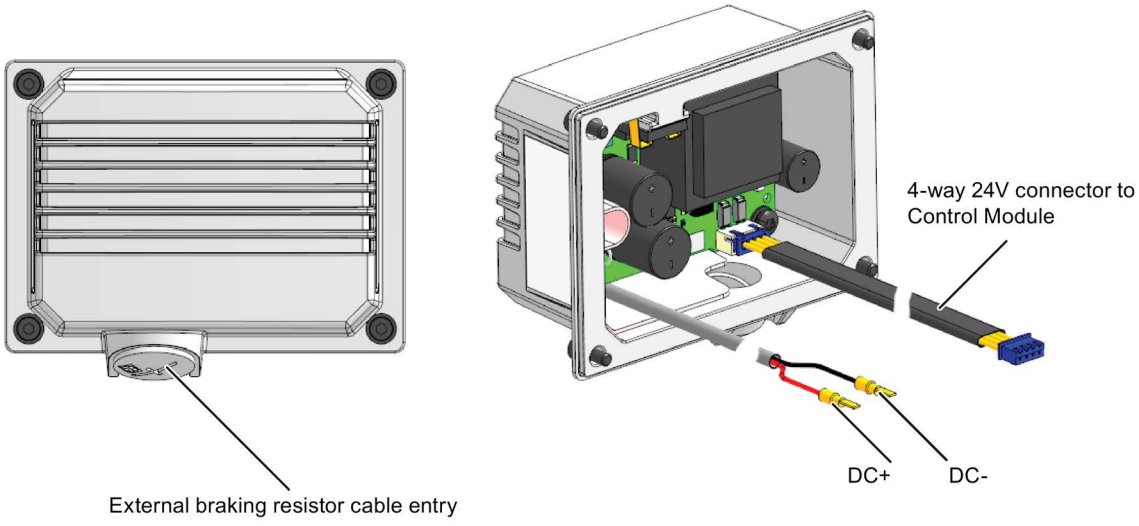


Figure 3-5 24V PSU Layout

Restrictions

DANGER

Risk of electrical shock

The DC link within the Power Module (PM) carries high voltages which has the potential to cause severe personal injury.

Before performing any installation work on the system, it is essential that all power supplies to the system are disconnected.

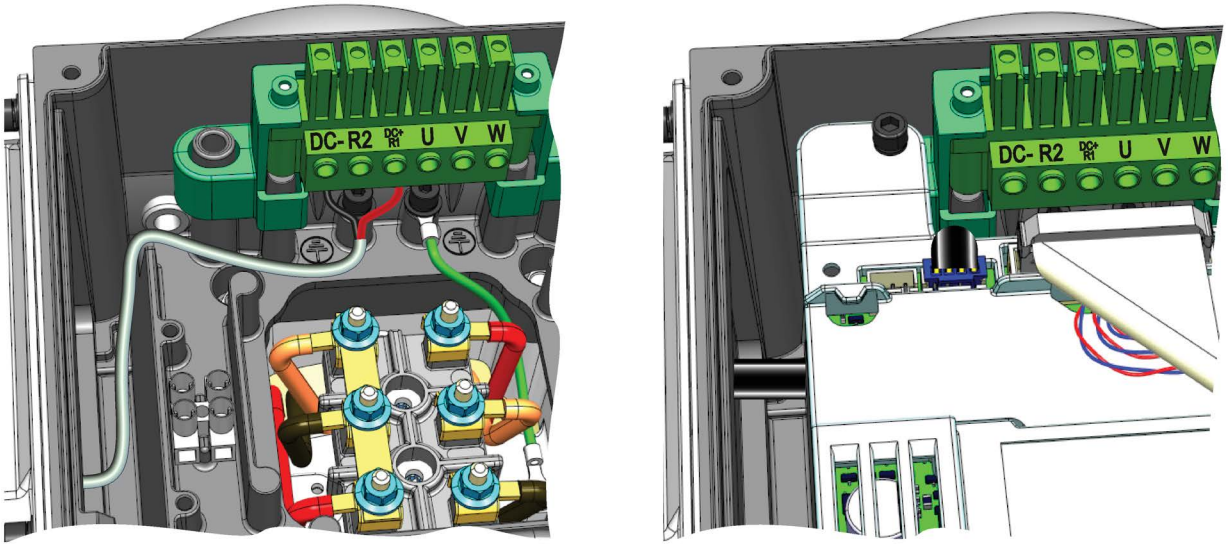
After the power supplies have been disconnected from the system, it is necessary to wait for at least five minutes before accessing any electrical connections of the system, this allows time for the high voltage capacitors within the system to completely discharge.

The following restrictions should be observed when installing the 24V PSU:

- If an external braking resistor is not used, the cable gland opening must be sealed with a blanking plug to maintain the IP rating of the system.
- The 24V DC IN and OUT connectors and the CPI must be sealed with screw caps to maintain the IP rating of the system.
- When using the 24V PSU there is no longer any isolation between the 24V PSU and the digital outputs of the system.
- Since the 24V PSU utilizes the DC link voltage to provide the 24V supply to the Control Module, when the mains supply is disconnected, all power will be lost to the Control Module.
- The 24V PSU is not suitable for use with the SINAMICS G110M AS-i variants of the SINAMICS G110M system.

Installation

1. Disconnected all power supplies to the system and wait 5 minutes.
2. Remove the Power Module (PM).
3. Remove the blank plate from the side of the terminal housing.
4. Remove the Control Module (CM).
5. Fit the 24V PSU to the side of the terminal housing, ensuring that no cables or wiring are trapped between the 24V PSU and the terminal housing. Tightening torque: 1.5 Nm.
6. Connect the input cable to the DC link terminals in the terminal housing (black to DC- and red to DC+).
7. The 4-way 24V cable is routed underneath and then over the top of the CM.
8. Fit the 4-way connector as shown in the illustration below.
9. Fit the CM back into place - ensuring that it securely fastened into place.
10. Replace the PM.
11. Fit blanking cap to the 7/8th connector.
12. Power can now be restored to the system.



Fitting the DC+ and DC- inputs to the terminals

Fitting the 24 V cable to the Control Module

Figure 3-6 Fitting the input and output connections

3.3 Electrical Installation

3.3.1 SINAMICS G110M Electrical data

Power Module specifications - 3AC 380 V (-10%) ... 480 V (+10%)

Table 3- 2 Rated Output, Input and Fuses

Product	Frame size	Rated output		HO		Fuse*	
				Rated output current	Rated input current		3NA3…
6SL3517-…		kW	hp	A	A	A	Type
1BE11-3AM0	A	0.37	0.5	1.3	1.3	10	803 -
1BE12-3AM0	A	0.75	1.0	2.2	2.0	10	803 -
1BE13-3AM0	A	1.1	1.5	3.1	2.8	10	803 -
1BE14-3AM0	A	1.5	2.0	4.1	3.6	10	803 -

Product	Frame size	Rated output		HO		Fuse*	
				Rated output current	Rated input current		3NA3…
6SL3517-…		kW	hp	A	A	A	Type
1BE16-3AM0	B	2.2	3.0	5.6	5.3	20	807 -
1BE17-7AM0	B	3.0	4.0	7.3	6.9	20	807 -
1BE21-0AM0	B	4.0	5.0	8.8	8.0	20	807 -

*For UL applications use Class J or CC fuses.

Standby current

The PM240M 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 Converter is in the ready-to-run mode. This means that the Converter is powered-up but the motor is not running. The phenomenon of capacitive reactive current standby occurs in all Power Modules and Converters with filter capacitors on the line side.

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

The Control Module (CM) and the communications input and outputs are normally powered by a Class 2 external 24 V supply, which does not influence the standby current of the Converter. However, the optional 24 V PSU draws it power directly from the DC link of the Power Module (PM), in this case, the standby current of the Converter increases, by an additional current of 15 mA.

The standby currents for all the possible combinations of the SINAMICS G110M are given in the following table:

Table 3- 3 SINAMICS G110M Standby currents

Device	Power supply	Standby current (mA)
G110M FSA (0.37 ... 1.5 kW)	Mains only	325
G110M FSB (2.2 ... 4.0 kW)	Mains only	445
G110 FSA + Optional 24 V PSU or External 24 V	Mains + Optional 24 V PSU or External 24 V*	340
G110 FSB + Optional 24 V PSU or External 24 V	Mains + Optional 24 V PSU or External 24 V*	460
PROFIBUS / USS CM only	External 24 V only* (mains supply switched off)	235
PROFINET / AS-i CM only	External 24 V only* (mains supply switched off)	290
* The optional 24 V PSU is an orderable item which is designed specifically for use with the SINAMICS G110M converter. The 24 V PSU is fitted to the terminal housing as shown in Installing the 24V power supply (Page 45). The external 24 V supply is sourced by the user and is connected to the converter through the 24 V connections as shown in Connection and cables (Page 53). The maximum combined current for all digital inputs is 200 mA, the maximum combined currents for all the digital outputs is 500 mA.		

⚠ CAUTION

Thermal stability of the system

The SINAMICS G110M system is comprised of a motor and a converter which are designed to work together. The system can generate a significant amount of heat which can affect the performance of your application.

If the duty cycles of the system are not calculated properly, it could result in your application not working efficiently and produce nuisance trips from overtemperature faults.

To ensure the thermal stability of the system, duty cycles should be calculated using the lowest rated component of the system - this should be either the motor or the converter depending on the your application.

NOTICE

Line impedance

To ensure trouble free operation we recommend the mains supply impedance is less than 1% (RSC > 100).

NOTICE

UL transient surge suppression requirements

To ensure that the electrical installation of this equipment complies with the UL requirements for transient surge protection, the following requirement must be strictly adhered to:

Transient surge suppression shall be installed on the line side of this equipment and shall be rated 480 v (phase to ground), 480 v (phase to phase), suitable for overvoltage category III and shall provide protection for a VPR maximum of 2 kv, type 1 or type 2 SPD application.

Note

Optional 24 V PSU loss of power

The optional 24 V PSU derives power from the mains supply to the converter. Should the mains supply be removed from the converter, the 24 V PSU will not longer provide power to the control and communications components of the

converter.

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

3.3.3 Basic EMC rules

Measures to limit Electromagnetic Interference (EMI)

In the following list are the necessary measures that must be taken to ensure the correct installation of the Converter within a system, which should minimize the effects 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.
- Do not route signal and data cables parallel to the line supply cables.
- Signal and data cables should not cross the line supply cables; if crossing is necessary, they should cross at an angle of 90 °.
- Shield analog 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) separately from signal and data cables. The minimum distance should be approximately 25 cm.

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 Converter.
- Don't interrupt cable shields by intermediate terminals.
- In the case of both signal and data cables, the cable shields should be connected by means of suitable EMC glands. The cables 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 (for example, PROFIBUS cables).

3.3.4 Connection and cables

Connections and cables

The following block diagrams and tables describe the details and limitations of the connections on the converter.

Wiring stripping

The following components are delivered with pre-prepared cables and no wire stripping is necessary:

- Internal 24 V DC power supply
- Internal braking resistor for FSA
- Internal braking resistor for FSB
- Motor EM brake
- The motor terminals for the terminal housing (for connection to the motor terminals).

All other connections to the Phoenix mains and motor connectors need to be stripped to a length of 10 mm, with a maximum torque of 0.8 Nm.

Cable lengths

The maximum cable lengths for all the converters are shown in the following table.

Table 3- 4 Maximum cable lengths

Cable	Screening	Max. length
Digital inputs	Unscreened	15 m (49 ft)
Digital outputs	Unscreened	15 m (49 ft)
Analog input	Screened	15 m (49 ft)
Motor cable with Wall Mount Kit		5 m (16.40 ft)

The maximum cable lengths for communications are determined by a number of factors, for example, the maximum length of the cable for USS and PROFIBUS are dependent on the data transfer rate being utilized by the network.

In some cases, it is possible to extend the cable length by the use of appropriate repeaters. The maximum cable lengths for the various communications protocols are given in the following table:

Table 3- 5 Maximum cable lengths for USS, PROFIBUS, PROFINET and AS-i

Communications protocol	Transfer rate or cable type	Maximum overall length of cable
USS		
	9.6 kbit/s	1200 m (3,940 ft)
	19.2 kbit/s	1200 m (3,940 ft)
	38.4 kbit/s	1200 m (3,940 ft)
	187.5 kbit/s	1000 m (3,280 ft)
PROFIBUS-DP		
	9.6 - 187.5 kbit/s	1000 m (3.280 ft)
	500 kbit/s	400 m (1,312 ft)
	1.5 Mbit/s	200 m (656 ft)
	3, 6 and 12 Mbit/s	100 m (328 ft)
PROFINET		
	CAT5 network cable	100 m (328 ft)
AS-i		
	Maximum length per segment	100 m (328 ft)

Permissible AS-i cable lengths

The maximum length of any one segment on the AS-i network is normally 100 m (328 ft). However there are a number of devices that allow the length of network segments to be extended.

Repeater

A repeater allows the maximum cable length to be extended to 300 m (984 ft) using the maximum of two repeaters. Slave nodes can be used on both sides of a repeater.

Extender

The extender allows the distance between the AS-i master and an AS-i segment of the network to be extended to a maximum of 100 m (328 ft). With repeaters connected in parallel, a cable length significantly longer than 300 m (984 ft) can be achieved. The maximum

span is 500 m (1640 ft). The only limitation of the extender is that slaves can only be used downstream from the extender.

Extension plug

Using the extension plug, the maximum possible cable length in an AS-i segment can be doubled from 100 m (328 ft) to 200 m (656 ft). The extension plug is a passive device and is connected to the part of the AS-i network furthest from the power unit. Only one power

unit is required to power the slaves on the segement up to 200 m (656 ft).

Outline block diagram

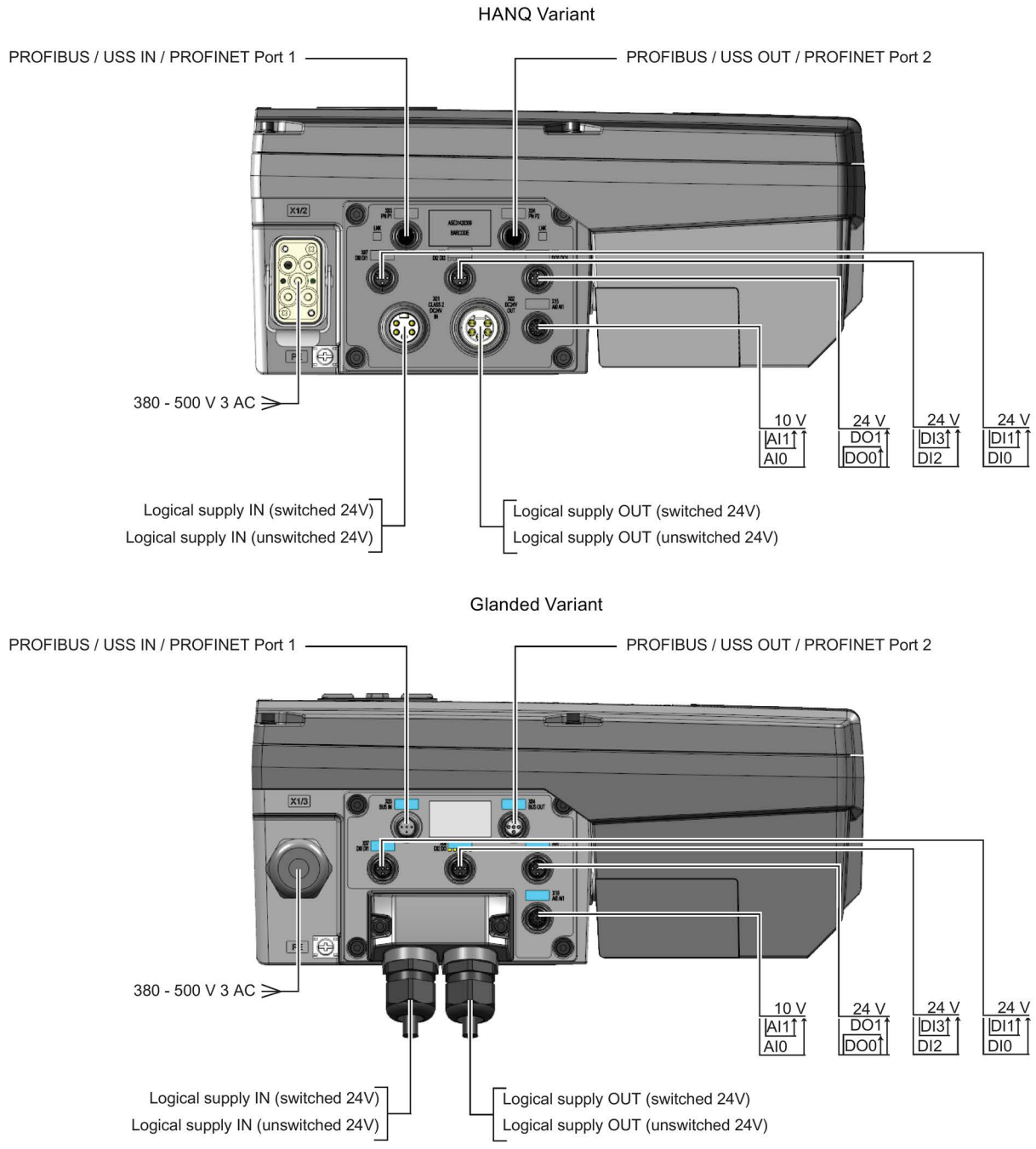


Figure 3-7 Outline block diagram SINAMICS CU240M and PM240M

Outline block diagram (AS-i variant)

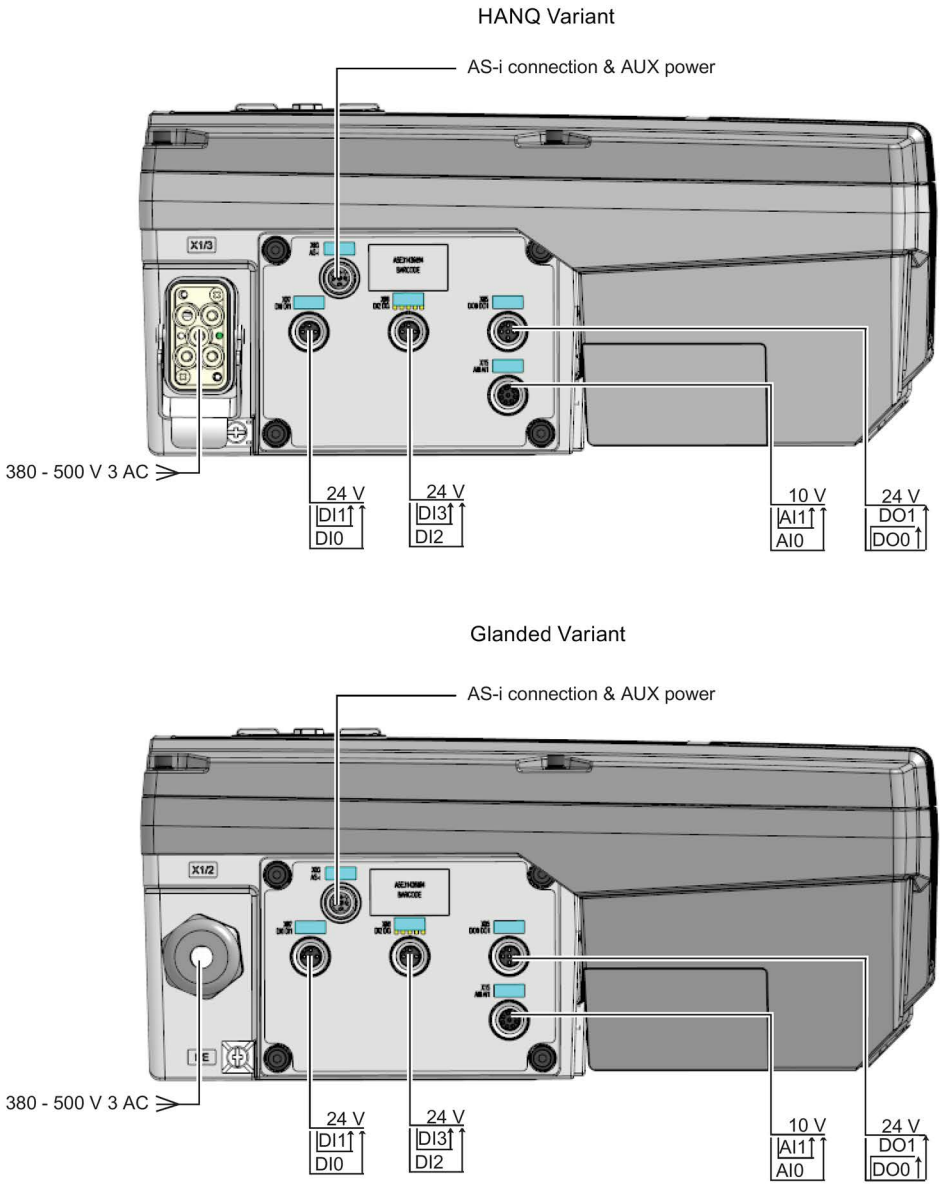


Figure 3-8 Outline block diagram AS-i

Cable, connectors and tools specifications

The detailed specifications for the cables, connectors and tools required to manufacture the necessary cables for the SINAMICS G110M are listed in the following documents and can be accessed using the relevant links:

SINAMICS and motors for Single-Axis Drives D31 catalog (https://intranet.automation.siemens.com/mcms/infocenter/content/en/Pages/order_form.aspx?nodeKey=key_566000&infotype=catalogs&linkit=null)

Siemens supplementary product information
(http://support.automation.siemens.com/WW/view/en/65355810)

The connections that are detailed in this section relate to the physical connections that exist on the converter.

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).

Note

Mains supply impedance

To ensure trouble free operation we recommend the mains supply impedance is less than 1% (RSC > 100).

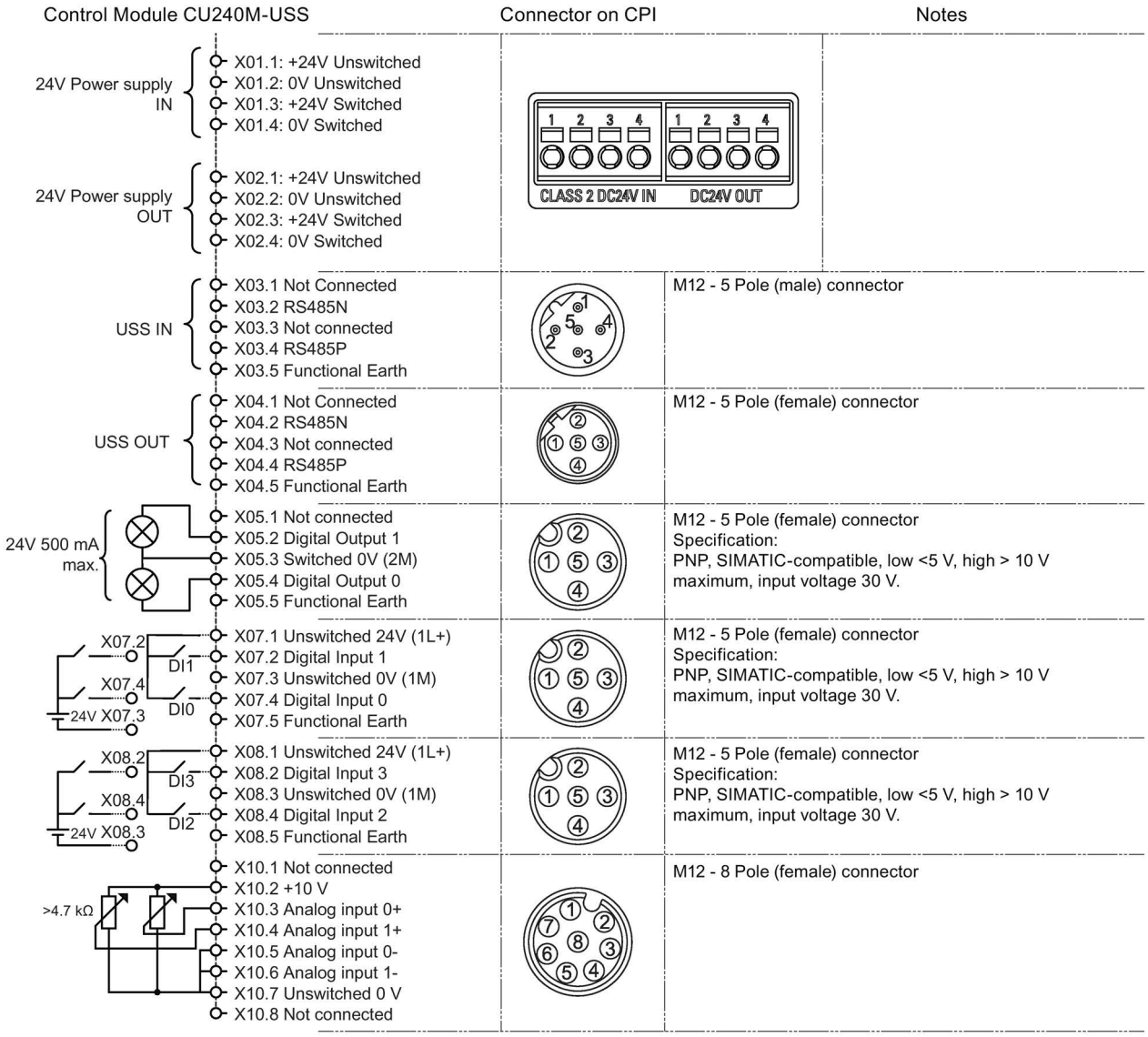
Connection and terminal diagrams

⚠ CAUTION

Orientation of Connectors

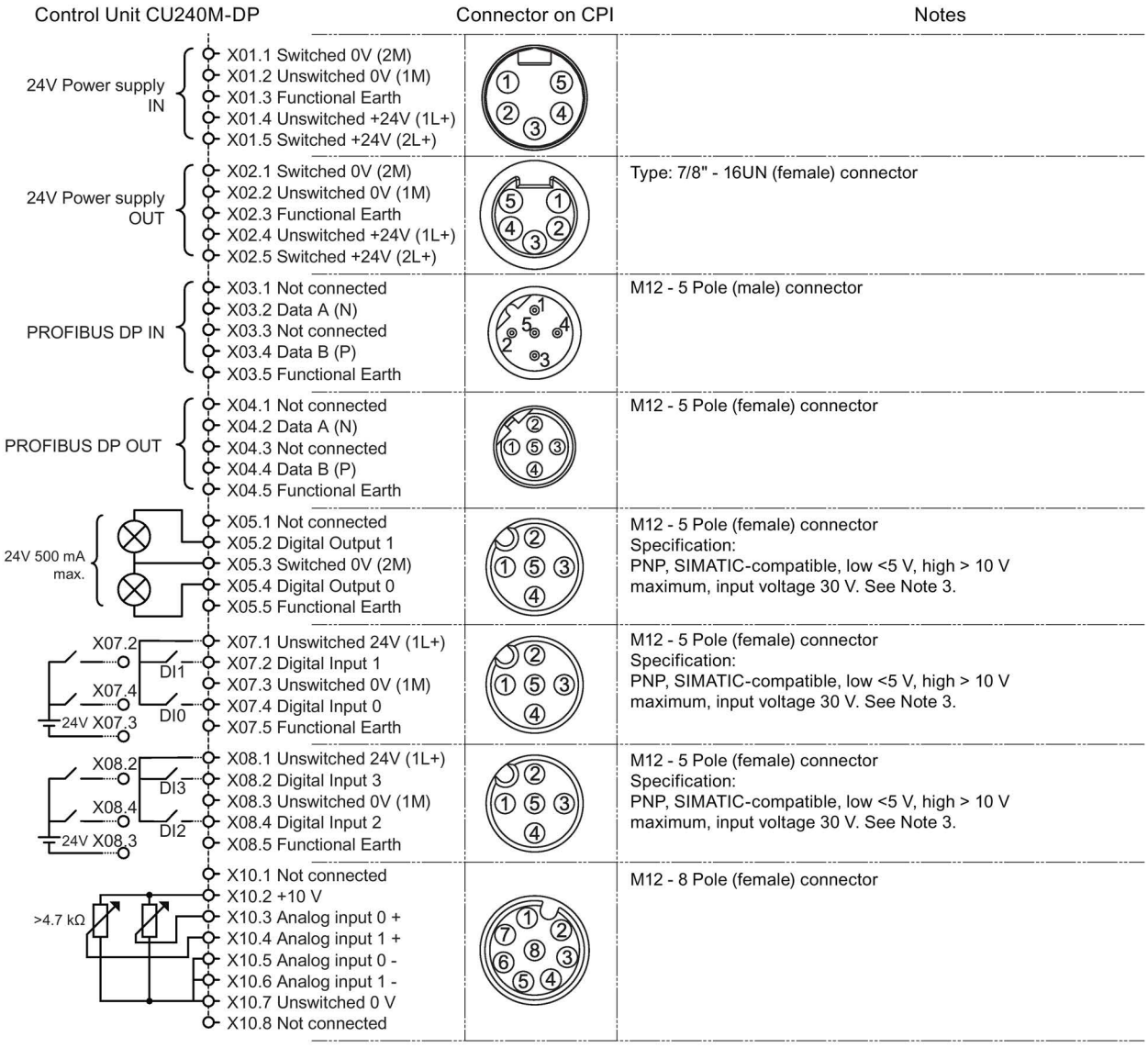
The connection diagrams given in this manual show the physical connections on the Communications and Power Interface (CPI). Different manufacturers of mating connectors may have differing pinout arrangements, it is essential that when making-up the necessary cables and connectors that the connections match those given in the connection diagrams.

For example, the orientation of the key-notch on the CPI 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 CPI.



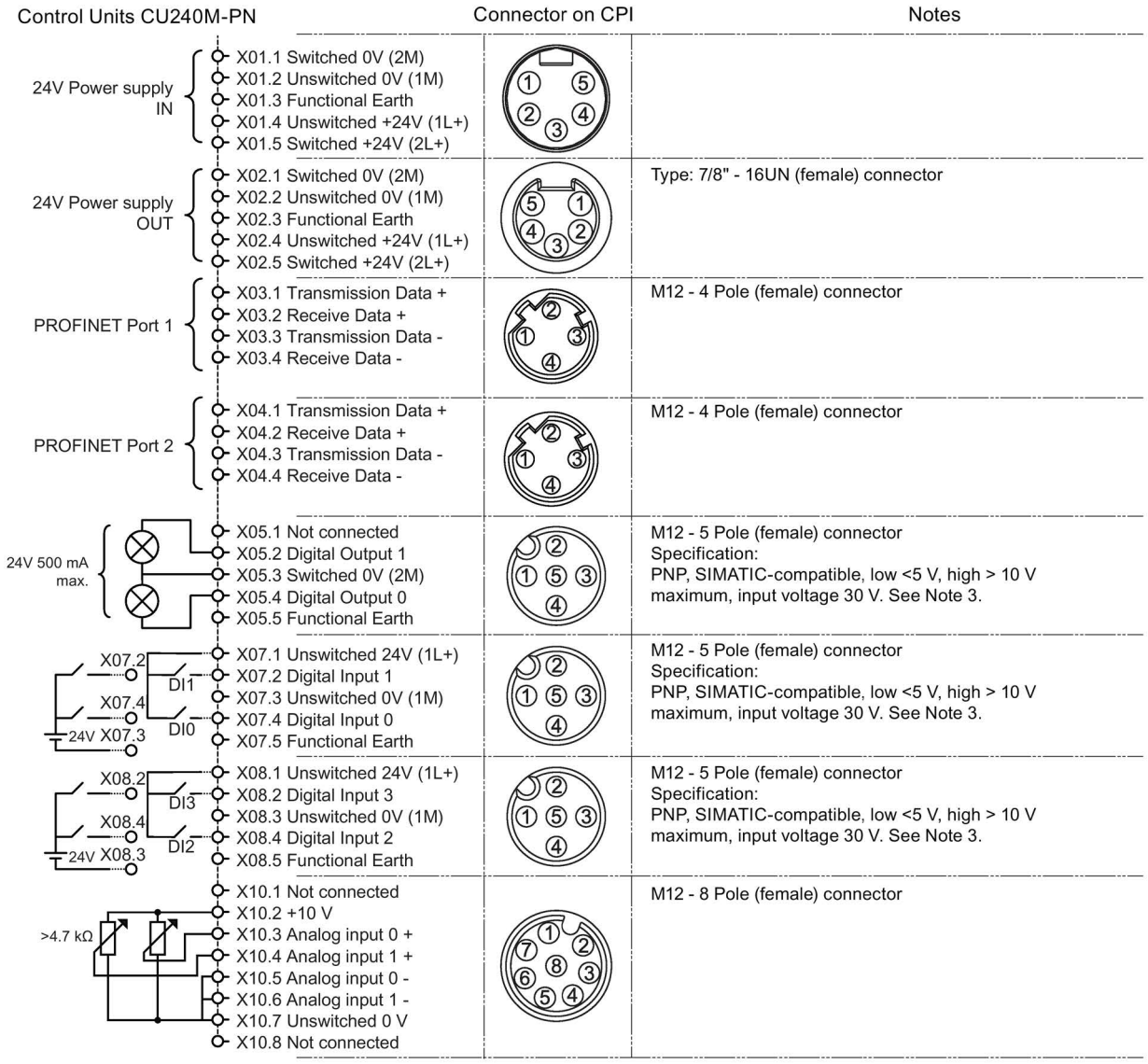
Important:
1. The connection pinouts refer to the actual connectors on the Communications and Power Interface (CPI).
2. The 24 Vdc supply must be Class 2 or limited in voltage/current to ensure no excessive voltage/current can be drawn by the CU.
3. The Control Module (CM) is fitted inside the terminal housing and it connected by ribbon cable to the CPI.
4. The maximum combined current for all digital inputs is 200 mA and the maximum combined current for all digital outputs is 500 mA.

Figure 3-9 SINAMICS G110M CU240M USS terminal diagram



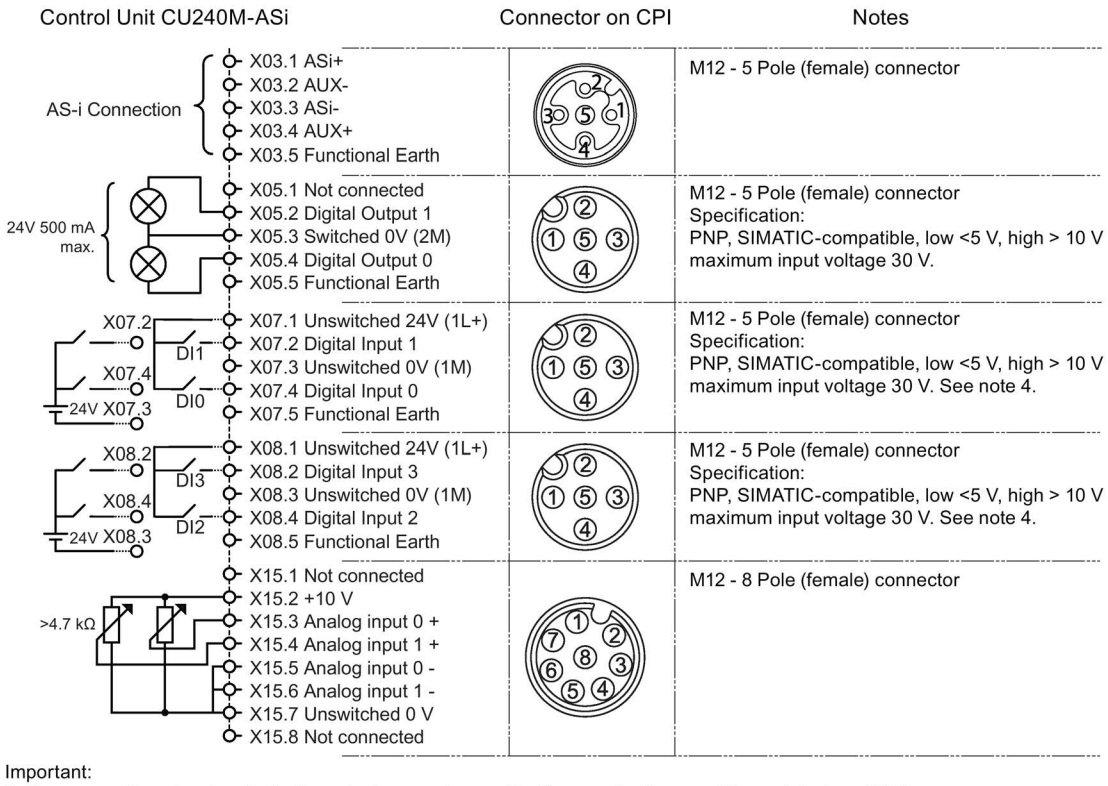
Important:
1. The connection pinouts refer to the actual connectors on the Communications and Power Interface (CPI).
2. The 24 Vdc supply must be Class 2 or limited in voltage/current to ensure no excessive voltage/current can be drawn by the CU.
3. The Control Module (CM) is fitted inside the terminal housing and it connected by ribbon cable to the CPI.
4. The maximum combined current for all digital inputs is 200 mA and the maximum combined current for all digital outputs is 500 mA.

Figure 3-10 SINAMICS G110M CU240M PROFIBUS terminal diagram



Important:
1. The connection pinouts refer to the actual connectors on the Communications and Power Interface (CPI).
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.
3. The Control Module (CM) is fitted inside the terminal housing and it connected by ribbon cable to the CPI.
4. The maximum combined current for all digital inputs is 200 mA and the maximum combined current for all digital outputs is 500 mA.

Figure 3-11 SINAMICS G110M CU240M PROFINET terminal diagram



Important:
1. The connection pinouts refer to the actual connectors on the Communications and Power Interface (CPI).
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.
3. The Control Module (CM) is fitted inside the terminal housing and it connected by ribbon cable to the CPI.
4. The maximum combined current for all digital inputs is 200 mA and the maximum combined current for all digital outputs is 500 mA.

Figure 3-12 SINAMICS G110M CU240M ASi terminal diagram

When the HAN Q4/2 connector is used on the CPI/terminal housing the mains supply connections are shown in the following figure.

Terminal housing mains supply connections

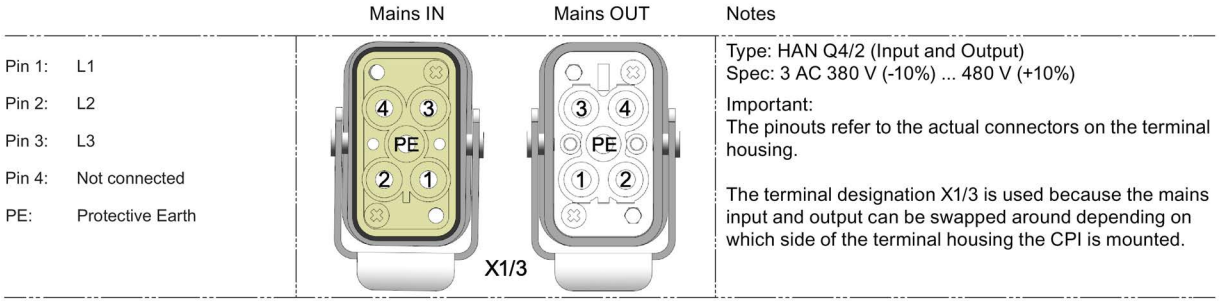
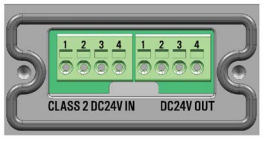


Figure 3-13 SINAMICS G110M PM240M connections diagram



1. +24 V unswitched
2. 0V unswitched
3. +24 V switched
4. 0 V switched

Figure 3-14 24 V glanded input and output connections

Note

Adaption of inputs and outputs

Further adaption of the inputs and outputs of the Inverter are possible, please refer to relevant section in the SINAMICS G110M Operating Instructions for further information.

The internal motor and power connections on the G110M system are located inside the Control Unit and motor housing. The connections are shown in the following figure.

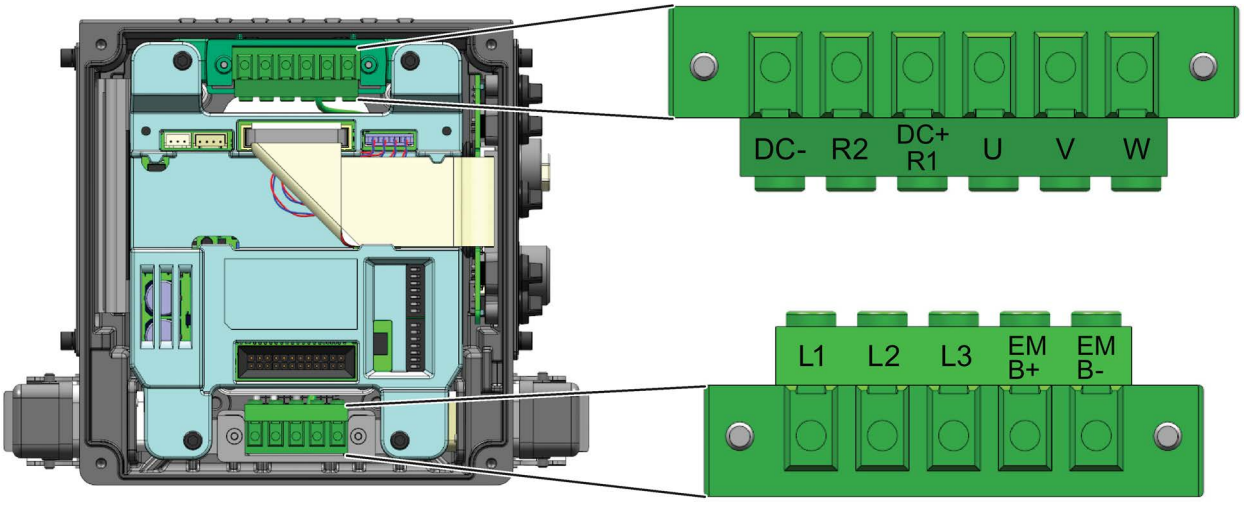


Figure 3-15 Control Unit motor and power connections

3.3.5 Cable protection

Cable protection for individual converters

If you individually protect an Inverter, then you must protect the Inverter feeder cable using a fuse.

Table 3- 6 Individual fuse protection

Rated power	Power Module	Frame size	Fuse	
0.37 kW	6SL3517-1BE11-3AM0	FSA	10 A	3NA3803
0.75 kW	6SL3517-1BE12-3AM0	FSA	10 A	3NA3803
1.1 kW	6SL3517-1BE13-3AM0	FSA	10 A	3NA3803
1.5 kW	6SL3517-1BE14-3AM0	FSA	10 A	3NA3803
2.2 kW	6SL3517-1BE16-3AM0	FSB	20 A	3NA3807
3 kW	6SL3517-1BE17-3AM0	FSB	20 A	3NA3807
4 kW	6SL3517-1BE21-3AM0	FSB	20 A	3NA3807

For additional information, please refer to Catalog D31at the following link:

SINAMICS and motors for Single-Axis Drives D31 catalog (https://intranet.automation.siemens.com/mcms/infocenter/content/en/Pages/order_form.aspx?nodeKey=key_566000&infotype=catalogs&linkit=null)

Installation using power-through daisy chain

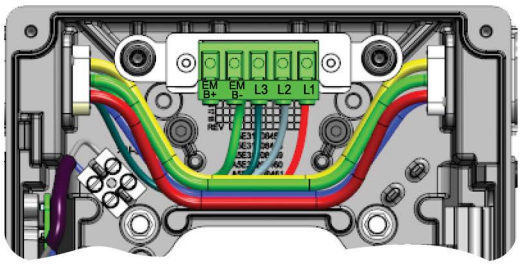
The SINAMICS G110M system has been designed to allow a converter to utilize power-through to provide the mains power for a number of converters in a daisy chain.

The maximum current limits for the daisy chain are given below:

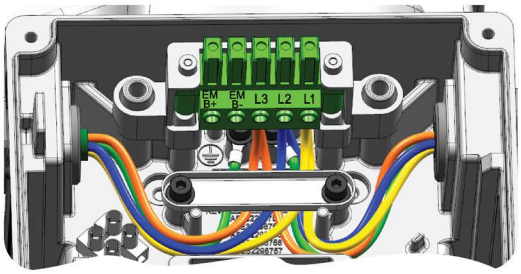
- For the HanQ variants the maximum current of the daisy chained converters must not exceed 16 A.
- For the Glanded variants the maximum current on the daisy chained converters must not exceed 12 A.
- For both HanQ and Glanded variants the input for the daisy chained converters can be protected by a 20 A fuse.

It is the users responsibility to ensure that the current limits are not exceeded.

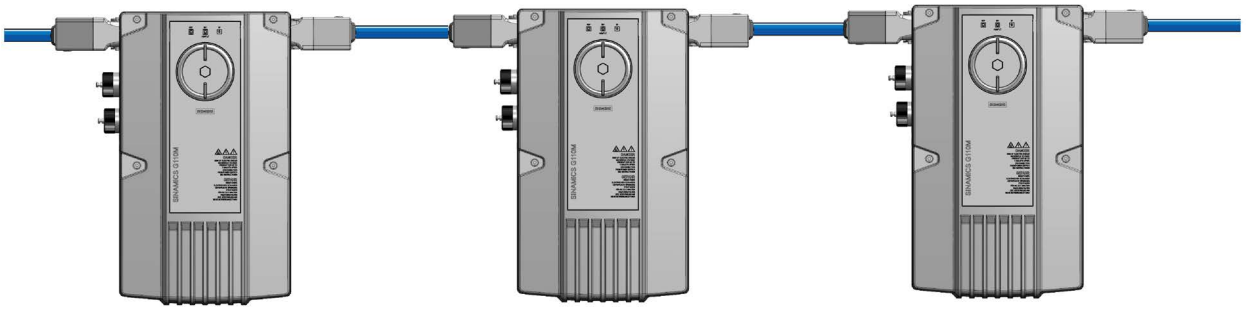
The methodology for daisy chaining a number of Inverter is shown in the following diagram.



HanQ variant wiring example



Glanded variant wiring example



Note:
The cable clamp has been removed from the HanQ variant to allow the mains terminal wiring to be easily visible - the cable clamp must be in place before power is applied to the system.

Figure 3-16 Daisy chaining power between Inverters

Commissioning

4

4.1 Commissioning tools

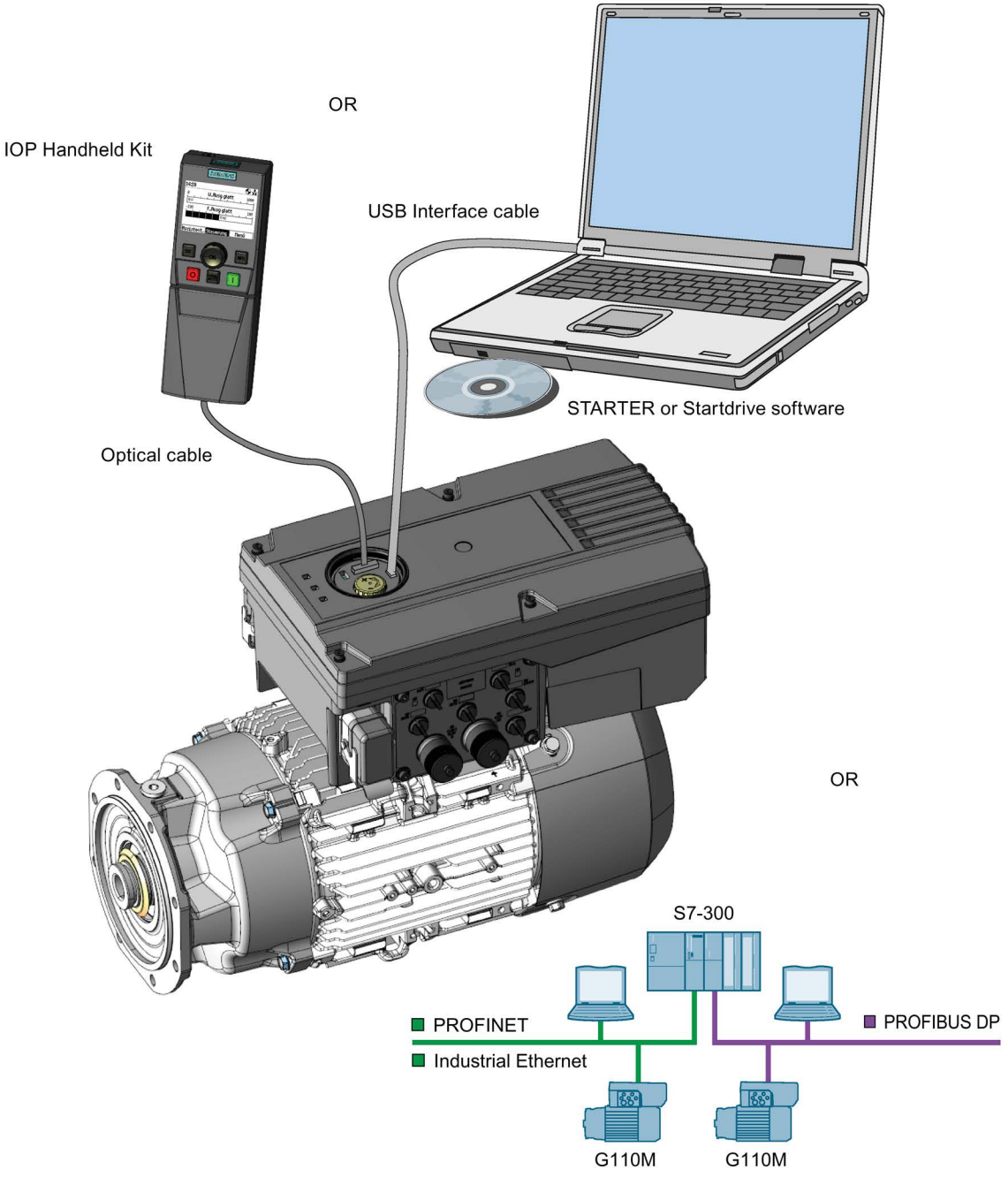


Figure 4-1 Commissioning tools - PC or IOP Handheld Kit

Table 4- 1 Components and tools for commissioning and data backup

Component or tool			Article number
Operator Panel	IOP Handheld Kit - Version 1.5 or later		6SL3255-0AA00-4HA0
Optical cable	Required for using IOP Handheld Kit with CU240M		3RK1922-2BP00
STARTER	Commissioning tool (PC software) - Version 4.3.3 or later		You can 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)
StartDrive	Commissioning tool (PC software) - Version 12 or later		You can obtain StartDrive on a DVD (6SL3072-4CA02-1XG0) and it can be downloaded: StartDrive download (http://support.automation.siemens.com/WW/view/en/68034568)
PC Connection Kit	Contains the 3 m USB cable necessary to connect your converter to a PC.		6SL3255-0AA00-2CA0
	Optional memory card for storing and transferring the converter settings	SD card	6SL3054-4AG00-2AA0

4.2 Wiring example for the factory settings

To ensure that the factory setting can be used, you must wire your drive as shown in the following examples.

Factory pre-assignment of the interfaces on the drive

For a complete technical specification of the individual connections, as shown in the following diagram, please refer to following figures:

- Figure 3-9 SINAMICS G110M CU240M USS terminal diagram (Page 58)
- Figure 3-10 SINAMICS G110M CU240M PROFIBUS terminal diagram (Page 59)
- Figure 3-11 SINAMICS G110M CU240M PROFINET terminal diagram (Page 60)
- Figure 3-12 SINAMICS G110M CU240M ASi terminal diagram (Page 61).

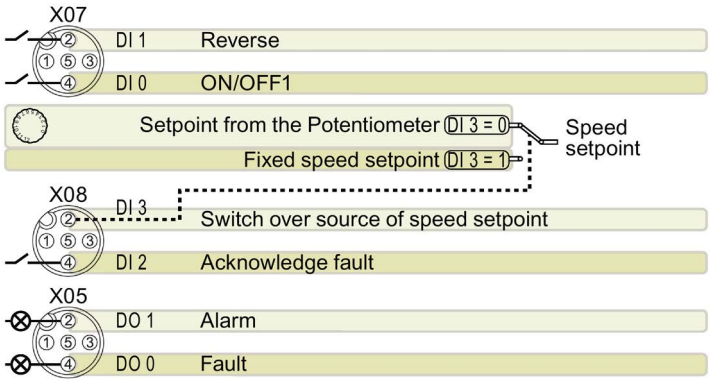


Figure 4-2 Macro 29 - Conveyer with potentiometer and fixed setpoint (Default USS)

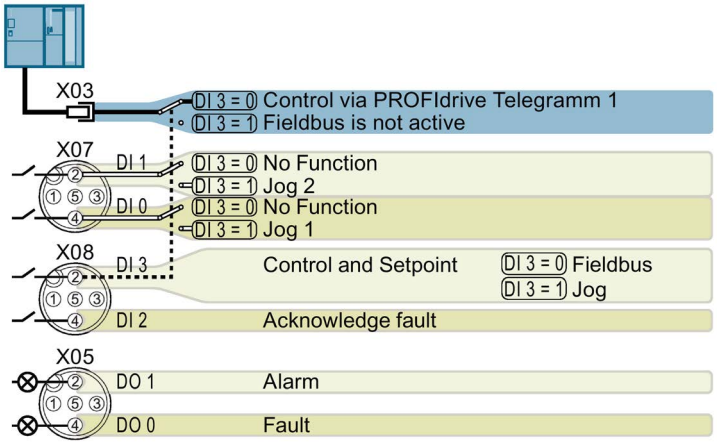


Figure 4-3 Macro 7 - Switch over between fieldbus and jogging using DI 3 (default DP/PN)

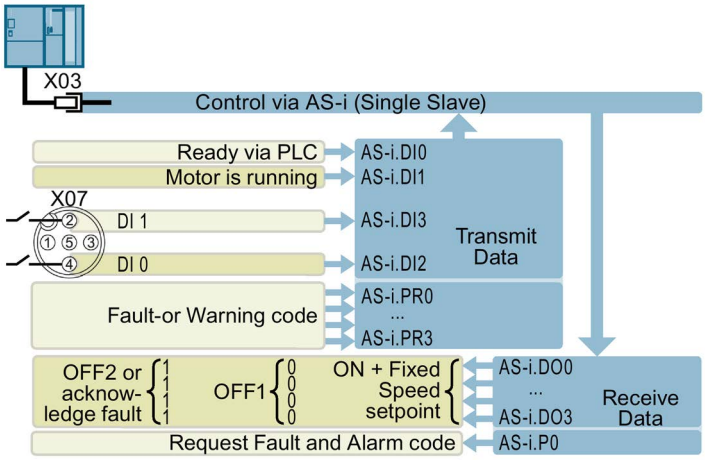


Figure 4-4 Macro 30 - ASi Single slave with fixed setpoints (default ASi)

Note

Unswitched and switched power supply

The unswitched 24 V power supply (also known as non-switched) on X1.2 and X1.4 provides power to the general electronics of the Control Unit. The switched 24 V power supply on X1.1 and X1.5 supplies power for the two digital outputs (DI0 and DI1). For a complete explanation of the unswitched and switched 24 V supplies and their limitations, please read the FAQ at the following link:

Unswitched and switched 24 V supply
(http://support.automation.siemens.com/WW/view/en/26986267)

4.3 Inverter factory setting

Motor

With its factory settings, the inverter is set up for an induction motor suitable for the power rating of the Power Module.

Inverter control

You will find the factory setting of the inverter control in chapter: Wiring example for the factory settings (Page 66)

Switching the motor on and off

The inverters are set in the factory in such a way that, after switching on, the motor will accelerate up to its speed setpoint in 10 seconds (referred to 1500 rpm). After it has been switched off, the motor also brakes with a ramp-down time of 10 seconds.

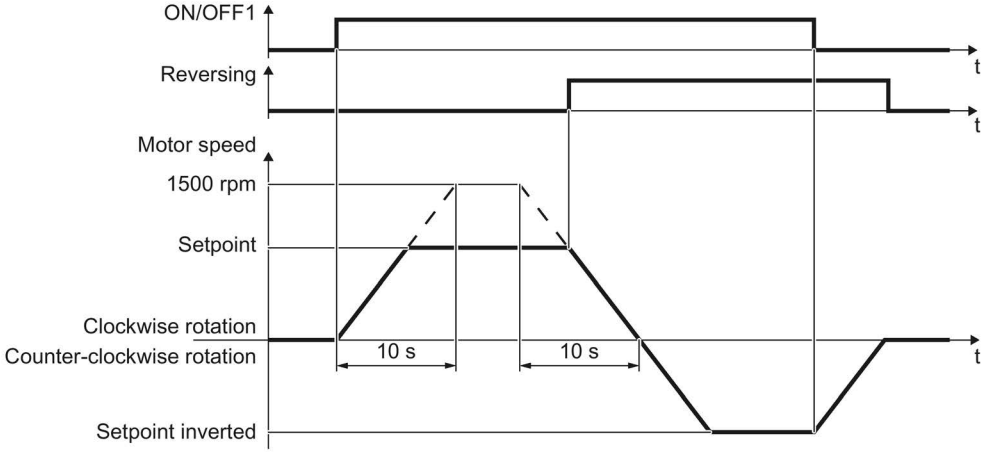


Figure 4-5 Switching on and switching off the motor and reversing in the factory setting

Switching the motor on and off in the jog mode

In the case of inverters with a PROFIBUS or PROFINET interface, operation can be switched via digital input DI 3. The motor is either switched on and off via PROFIBUS – or operated in jog mode via its digital inputs.

When a control command is received at the respective digital input, the motor rotates at ±150 rpm. The ramp-up and ramp-down times are also 10 seconds, referred to 1500 rpm.

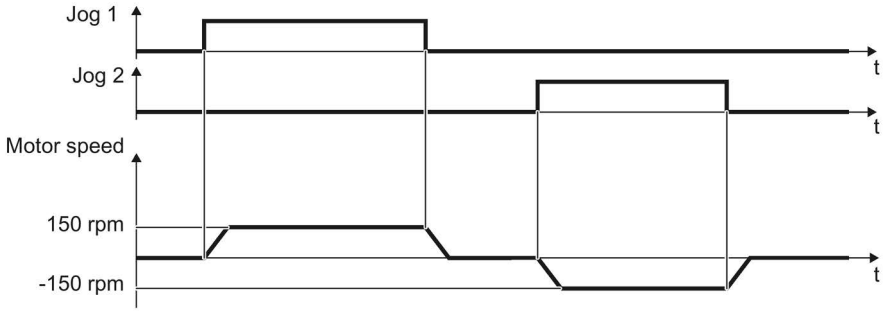


Figure 4-6 Jogging the motor with the factory settings

Operating the motor with the factory settings

In simple applications, you can attempt to operate the drive with a power rating < 18.5 kW without having commissioned it. Check that the control quality of the drive is good enough for the requirements of the application without commissioning.

We recommend configuring the drive with the precise motor data.

4.4 V/f control or speed control

For induction motors, there are two different open-loop control or closed-loop control techniques:

- V/f control (calculation of the motor voltage using a characteristic curve)
- Closed-loop speed control (also: field-oriented control or vector control)

Criteria for selecting either V/f control or speed control

In many applications, the V/f control suffices to change the speed of induction motors. Examples of typical applications for V/f control include:

- Pumps
- Fans
- Compressors
- Horizontal conveyors

When compared to V/f control, vector control offers the following advantages:

- The speed is more stable for motor load changes.
- Shorter accelerating times when the setpoint changes.
- Acceleration and braking are possible with an adjustable maximum torque.
- Improved protection of the motor and the driven machine as a result of the adjustable torque limiting.
- Torque control is only possible with vector control.

Examples of typical applications in which speed control is used:

- Hoisting gear and vertical conveyors
- Winders
- Extruders

It is not permissible to use speed control in the following cases:

- If the motor is too small in comparison to the converter (the rated motor power must not be less than one quarter of the rated converter power)
- When you operate several motors on one converter
- When the maximum motor speed exceeds the following values:

Converter pulse frequency	2 kHz	4 kHz and higher
Pole number of the motor	4-pole	4-pole
Maximum motor speed [rpm]	4980	7200

4.5 p0015 Macros

Macros for the CU240M

The macros that are available for the CU240M Control Modules are shown in the figures below. Macro 7 is the default setting for the CU240M DP and CU240M PN Control Modules, Macro 21 is the default settings for the CU240M USS Control Module and Macro 30 is the default settings for the CU240M ASi Control Modules.

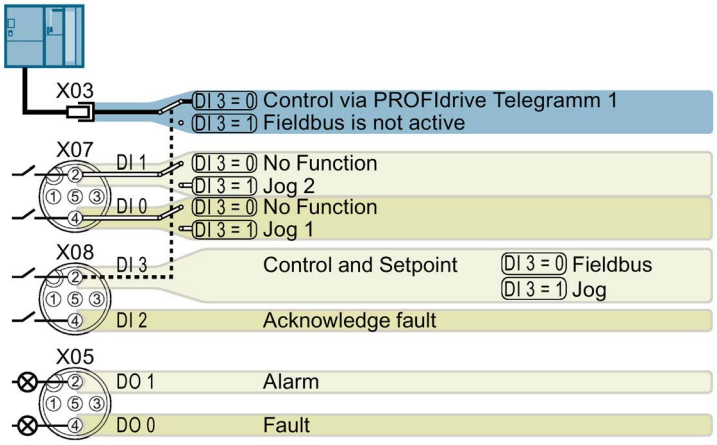


Figure 4-7 Macro 7 - Switch over between fieldbus and jogging using DI 3 (default DP/PN)

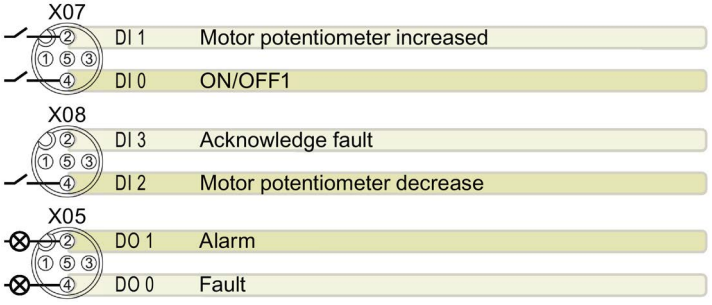


Figure 4-8 Macro 9 - Motorized potentiometer (MOP)

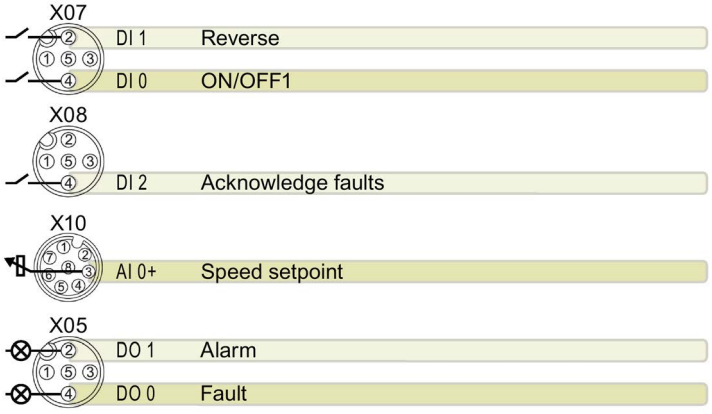


Figure 4-9 Macro 12 - Two-wire control with method 1

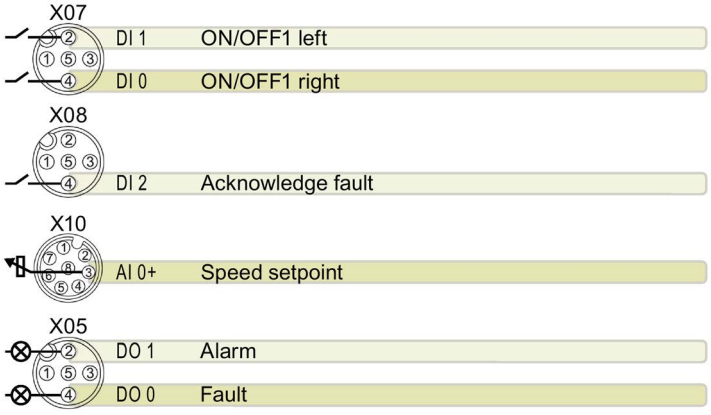


Figure 4-10 Macro 17 - Two-wire control with method 2

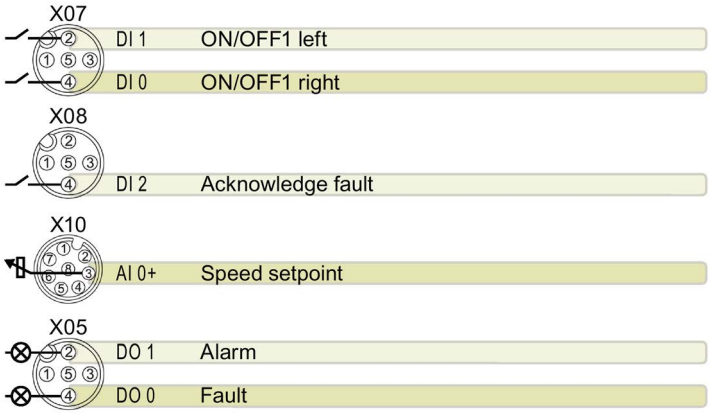


Figure 4-11 Macro 18 - Two-wire control with method 3

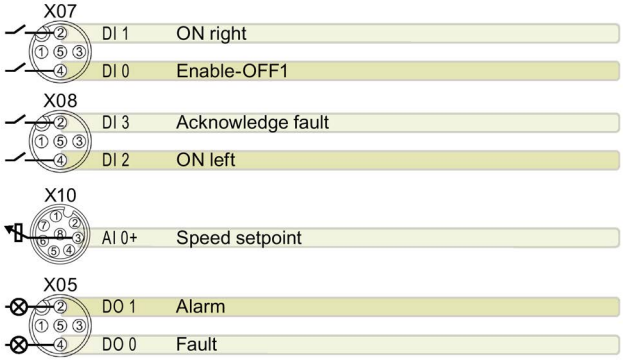


Figure 4-12 Macro 19 - Three-wire control with method 1

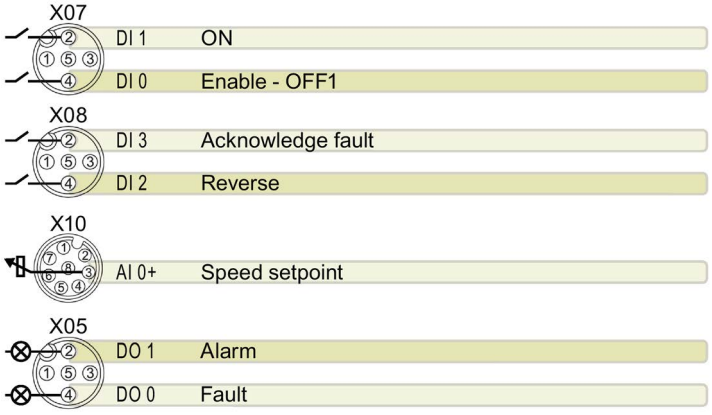


Figure 4-13 Macro 20 - Three-wire control with method 2

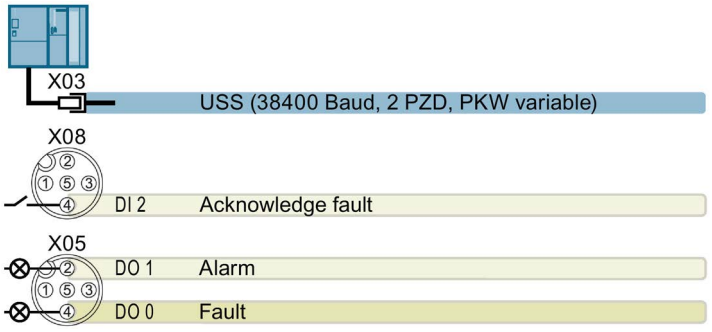


Figure 4-14 Macro 21 - Fieldbus USS

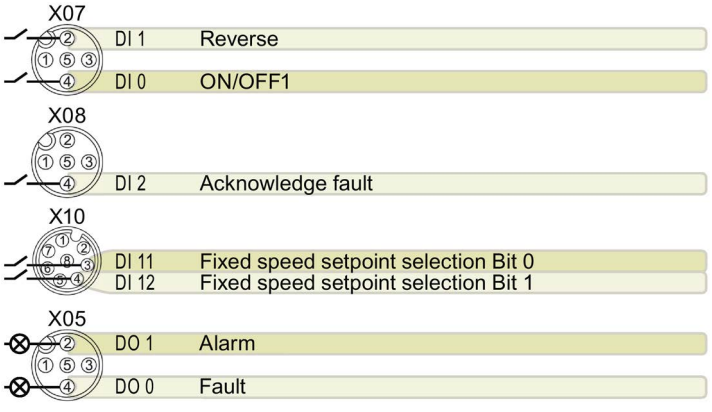


Figure 4-15 Macro 28 - Conveyor with 2 fixed setpoints

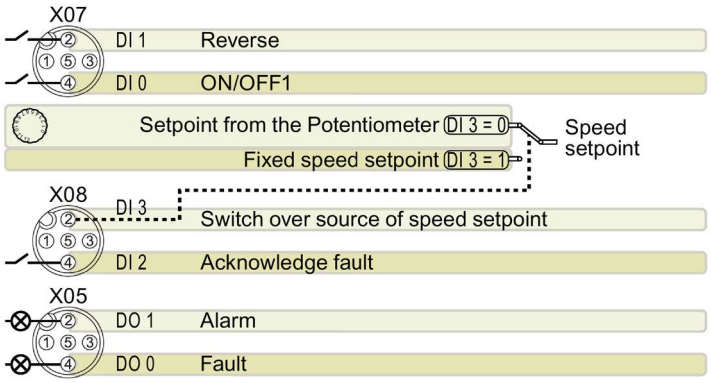


Figure 4-16 Macro 29 - Conveyer with potentiometer and fixed setpoint (default USS)

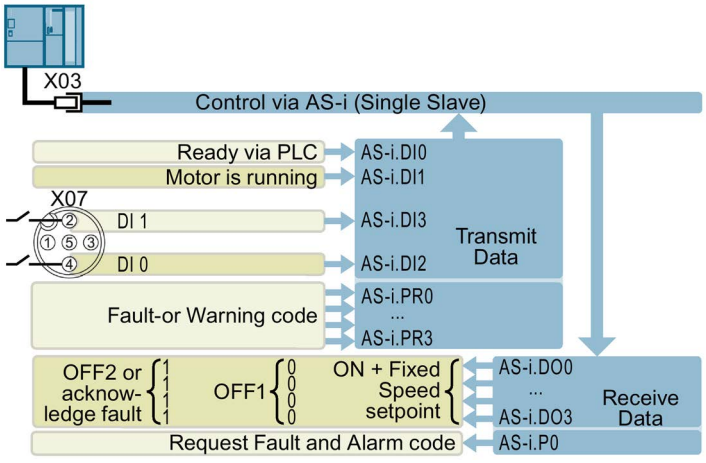


Figure 4-17 Macro 30 - ASi Single slave with fixed setpoints (default ASi)

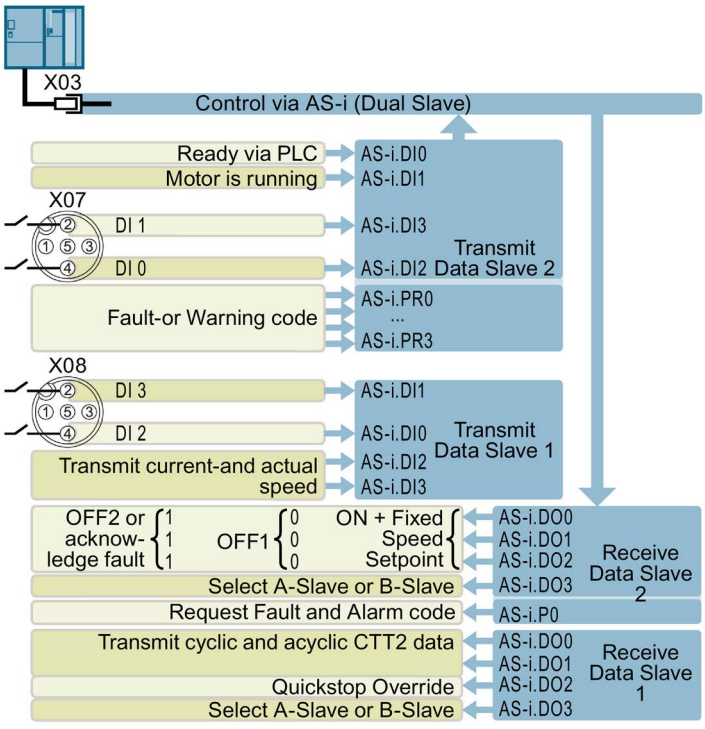


Figure 4-18 Macro 31 - ASi Dual slave with fixed setpoints

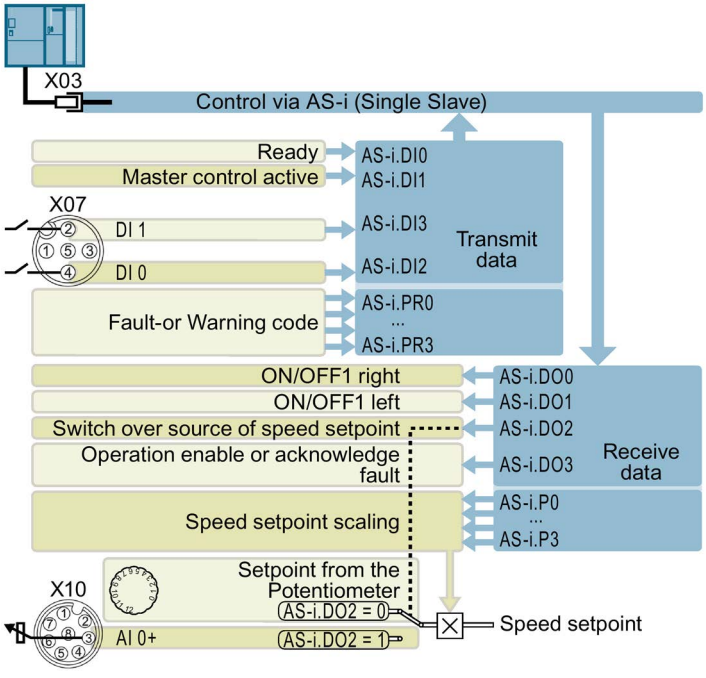


Figure 4-19 Macro 32 - ASi Single slave with analog setpoint

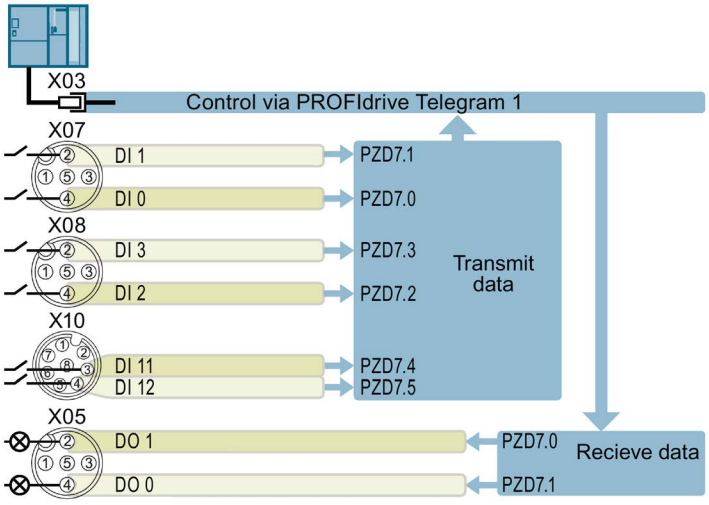


Figure 4-20 Macro 33 - 4DI decentral conveyor with fieldbus

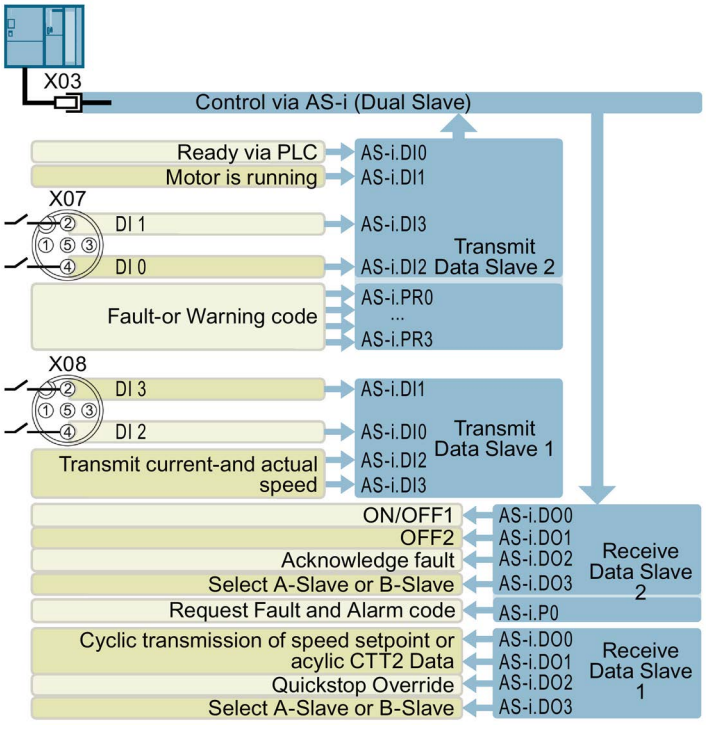


Figure 4-21 Macro 34 - ASi Dual slave with setpoint

4.6 Basic Commissioning with DIP switches

Overview

The CU240M Control Units have been designed to allow basic commissioning to be performed using a set of three DIP switches. The DIP switches are located on the communications board within the Control Unit housing, as shown in the figure below.

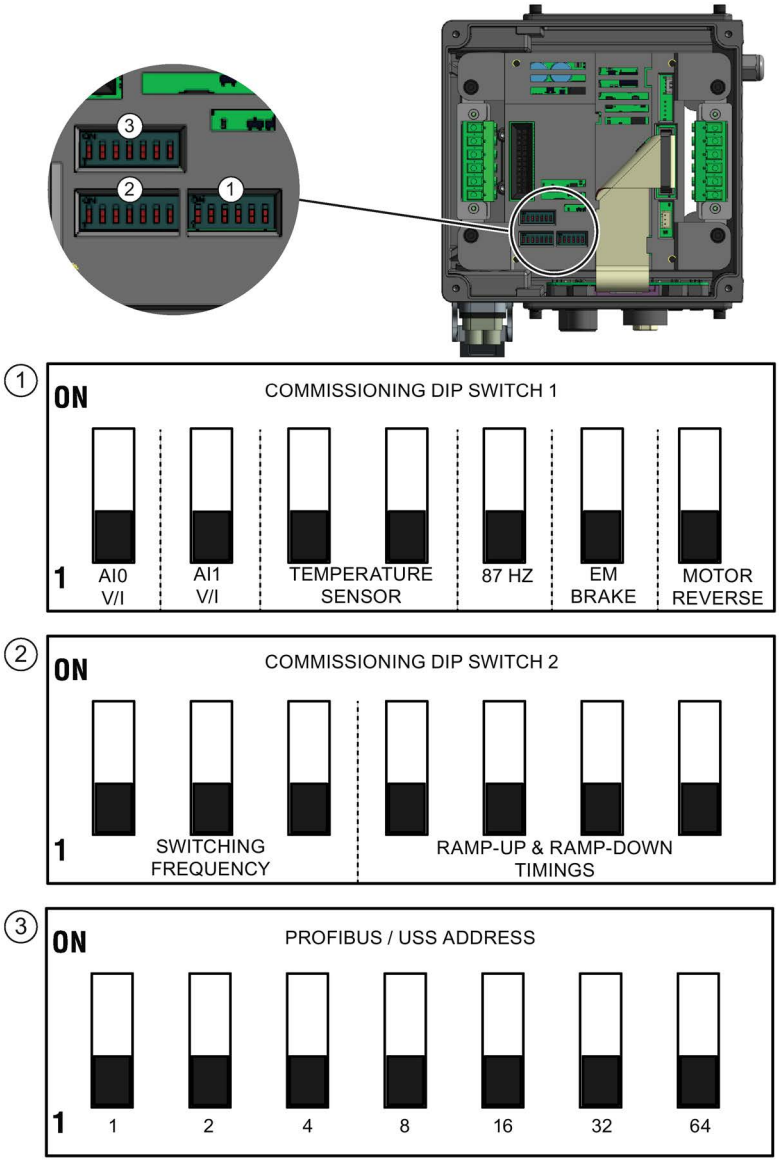


Figure 4-22 DIP Switches location

Accessing the DIP switches

⚠DANGER

Dangerous voltages and currents are present in the active converter

When power is applied to the converter, even when it is not active, dangerous levels of voltage and current are present in the system.

Before attempting the removal of any components of the system the following steps should be taken to ensure that the system is completely safe:

1. Ensure that the converter is not running, if so, the converter must be stopped.
2. Disconnect all mains power supplies to the system. If an external 24 V supply is connected to the system, then this does not have to be disconnected.
3. Wait 5 minutes to allow all the residual current and voltages to dissipate fully.

Generally the G110M system is delivered fully assembled on a motor which prohibits easy access to the DIP switches. To access the DIP switches it is necessary to remove the Power Module; this action is illustrated in the figure below.

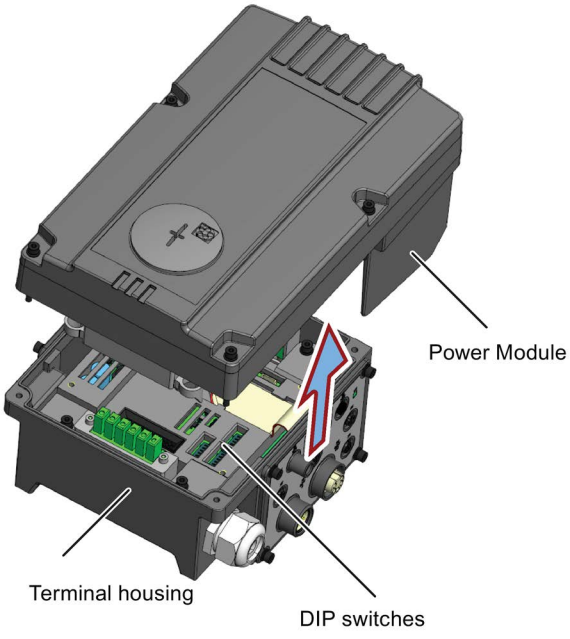


Figure 4-23 Removing the Power Module

Description of the DIP switches functions

When the DIP switches are in the OFF position, the value of the function is defined by the default value of the parameter. If the DIP switch is activated for a specific function, then the parameters for that function cannot be modified by manually editing the parameter value, i.e. ready-only.

The DIP switches allows specific functions of the converter to be set and are shown in the table below.

Table 4- 2 Function of the DIP switches

DIP switch	Function
①	Selects current or voltage input for the analog inputs.
	Temperature sensor - sets the type of temperature sensor fitted to the motor.
	87 Hz characteristic - set "ON" to operate the motor with the 87 Hz characteristic.
	Electromechanical (EM) brake - select on if an EM brake is fitted.
	Motor reverse
②	Switching frequency - the user can select one of seven different switching frequencies.
	Ramp-up and ramp-down timings - user can select from 0.1 seconds to 70 seconds
③	PROFIBUS address DIP-switch for use with the PROFIBUS and USS variant of the CU240M.

Examples of the DIP switches and their individual settings are illustrated in the figures below.

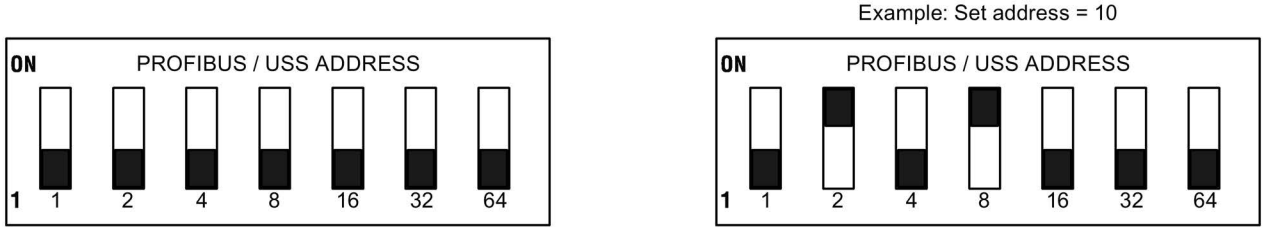
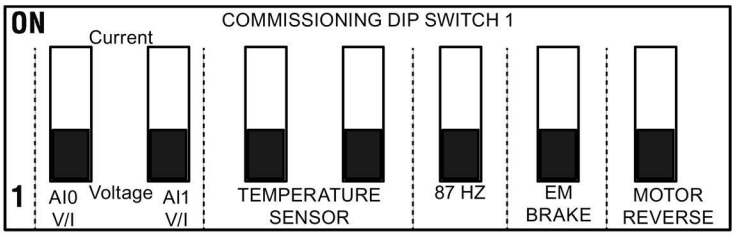


Figure 4-24 PROFIBUS address DIP Switch

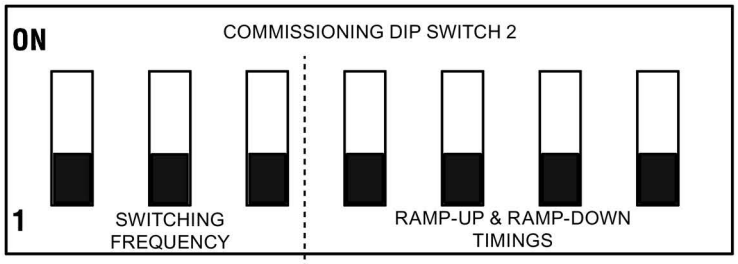


Value	DIP switch position
Software*	
KTY84	
PTC	
Temperature switch	

*SOFTWARE:
When the DIP switches are in the OFF position the value of the function is defined by the default parameter value or a user-defined value.

PARAMETER MODIFICATION:
If the DIP switch is activated for a specific function, the parameters for that function cannot be modified by editing the actual parameter.

Figure 4-25 Commissioning DIP Switch 1



Value	DIP switch position
Software*	
4 kHz	
6 kHz	
8 kHz	
10 kHz	
12 kHz	
14 kHz	
16 kHz	

Value	DIP switch position
Software*	
0.1 Secs	
0.2 Secs	
0.3 Secs	
0.5 Secs	
0.7 Secs	
1.0 Secs	
2.0 Secs	
3.0 Secs	
5.0 Secs	
7.0 Secs	
10.0 Secs	
20.0 Secs	
30.0 Secs	
50.0 Secs	
70.0 Secs	

*SOFTWARE:
When the DIP switches are in the OFF position the value of the function is defined by the default parameter value or a user-defined value.

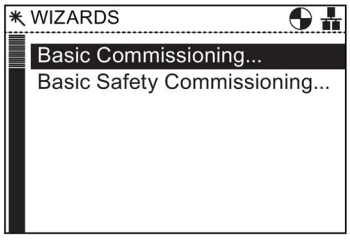
PARAMETER MODIFICATION:
If the DIP switch is activated for a specific function, the parameters for that function cannot be modified by editing the actual parameter.

Figure 4-26 Commissioning DIP Switch 2

4.7 Basic commissioning with IOP

Basic commissioning wizard

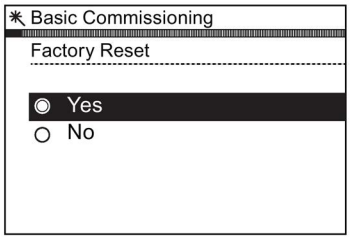
1. Select "**Basic Commissioning...**" from the Wizards menu.



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

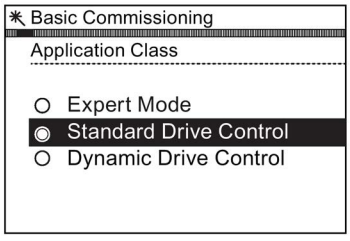
   It is recommended that a factory reset is performed to ensure that the converter is in a known and stable state prior to commissioning.

   Once "**Yes**" is selected the IOP will initiate a factory reset immediately.



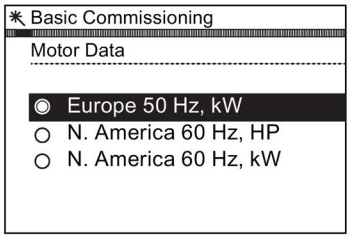
3. On completion of the factory reset the "**Application Class**" is selected.

   In this example the "Standard Drive Control" is selected.

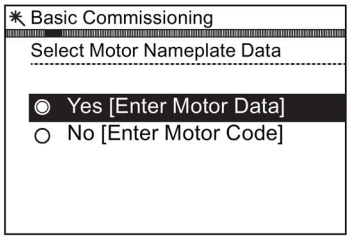


4. Select the correct Motor Data for your Inverter and attached motor.

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

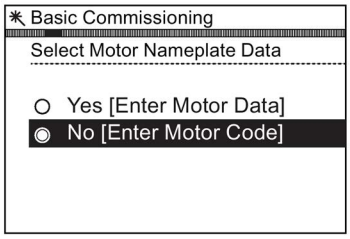


5. Select "**Yes (Enter Motor Data)**" to manually enter the motor data from the rating label of the motor.



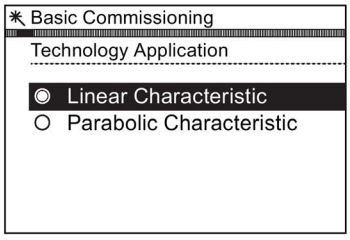
OR

6. Select "**No (Enter Motor Code)**" to enter the motor code from the motor rating label.
   All the relevant motor data will be automatically entered.

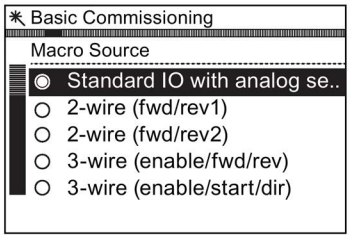


7. The IOP will then present a number of screens, specific to your selection of Step 5 or Step 6. Enter the relevant data in the appropriate fields as they are presented. You will automatically advanced through the commissioning process. Once the motor data has been entered, the steps shown below will be presented.

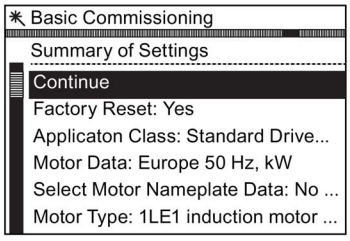
8. Select the Technology Application characteristics of the application.



11. Select the required macro source.
    See p0015 Macros (Page 70).

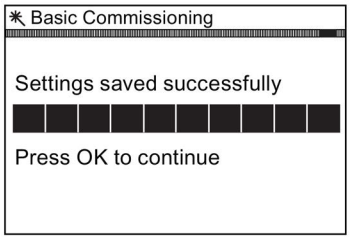


15. A summary of all the settings are displayed.
    If the settings are correct, select continue.



16. The final screens gives two options:
    - Save settings
    - Cancel Wizard

    If the save option is selected, the settings are saved to the converter memory. The location of the saved data is assigned using the "**Parameter Saving Mode**" function in "**Parameter Settings**" in "**Menu**".



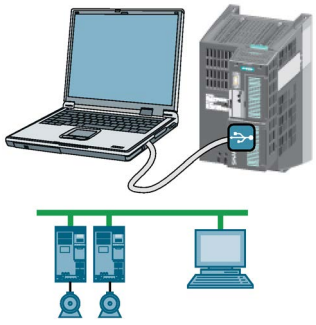
4.8 Basic commissioning with STARTER

PC-based commissioning tools

STARTER and Startdrive are PC tools to commission Siemens inverters. The graphic user interface supports you when commissioning your inverter. Most of the inverter functions are available in screen forms.

The screen forms that are shown in this manual show generally valid examples. The number of setting options available in screen forms depends on the particular inverter type.

Preconditions for commissioning



You can access the inverter with STARTER or Startdrive either via a USB connection or via the fieldbus.

System requirements and download:

- Adapting the USB interface (Page 85)
- Download STARTER (http://support.automation.siemens.com/WW/view/en/10804985/133100)

Help for operation and for the functions of the commissioning tools:

- Adapting the USB interface (Page 85)
- Download STARTER (http://support.automation.siemens.com/WW/view/en/10804985/133100)

Commissioning using STARTER

The following interfaces - which are control unit dependent - are available:

Table 4- 3 Connection possibilities for STARTER

Type	USB	PROFIBUS	PROFINET
PC connected to CU using	USB cable	PROFIBUS interface	PROFINET interface
Interface	Mini-USB	M12 - 5 pole connector	M12 - 4 pole connector
Restrictions	-	up to 125 slaves	None

In the following the commissioning via USB is described.

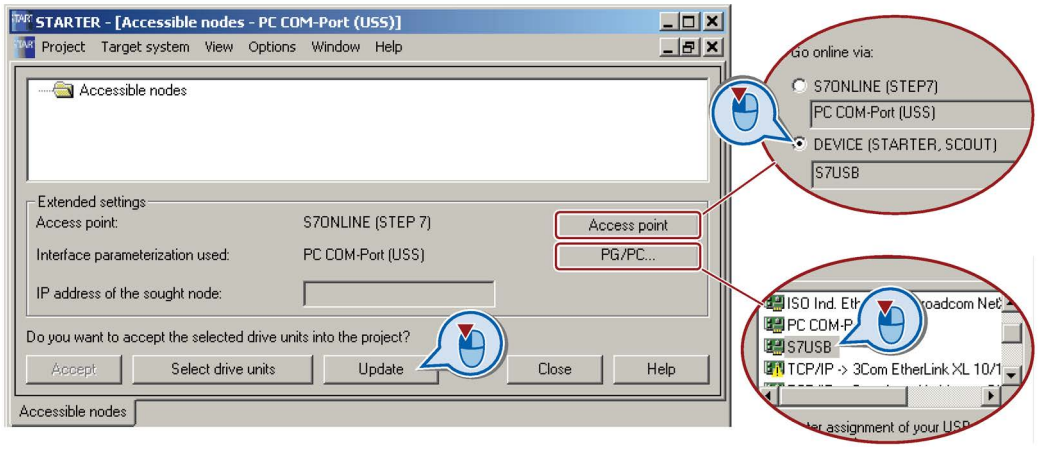
4.8.1 Adapting the USB interface

Procedure

Proceed as follows to set the USB interface:

1. Switch on the converter power supply and connect the converter to the PC via USB.
2. The USB drivers are installed if you are connecting the converter and PC together for the first time. Windows 7 automatically installs the drivers without you having to take any action. For older Windows versions, acknowledge the corresponding screen forms with OK.
3. Start the STARTER commissioning software.
4. If you are using STARTER for the first time, you must check the USB interface setting. To do this, click in STARTER on  ("Accessible nodes").
   If the interface is appropriately set, then the "Accessible nodes" screen form lists the converters, which are connected via the USB interface. In this case, go to Point 7.
   If incorrectly set, then the "No additional nodes found" message is displayed.

5. Acknowledge this message, and set the "Access point" to "DEVICE (STARTER, Scout)" and the "PG/PC interface" to "S7USB".



6. Then click on "Update". The connected converters are now displayed in "Accessible nodes".

7. Close this screen form without selecting the converter(s) that has/have been found.
8. Create your STARTER project (Page 87).

You have set the USB interface.

4.8.2 Generating a STARTER project

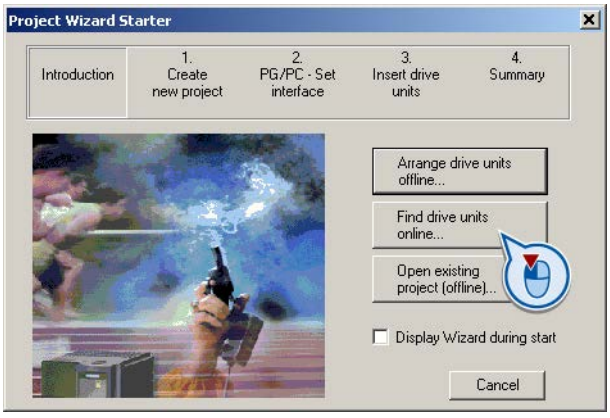
Creating a STARTER project using project wizards

Procedure

1
2

To create a project with the STARTER project Wizards, proceed as follows:

1. Using "Project / New with wizard" create a new project.
2. To start the wizard, click on "Search online for drive units ...".
3. Follow the instructions of the Wizard, and set everything that you require for your particular project.



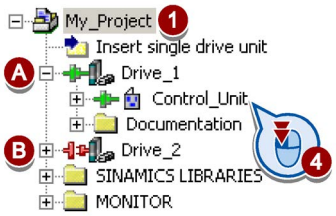
You have created your STARTER project.

4.8.3 Go online and start the configuration wizards - STARTER

Procedure with STARTER

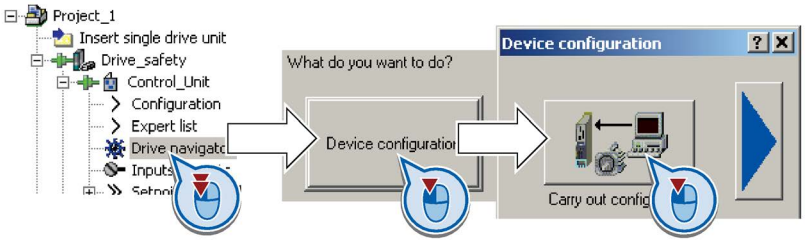
1
2

Proceed as follows to start configuration of the inverter:



1. Select your project and go online: .
2. In the following screen form, select the inverter with which you wish to go online.
3. Download the hardware configuration found online in your project (PG or PC).

   Significance of the symbol in front of the inverter:
   (A) The inverter is online.
   (B) The inverter is offline
4. When you are online, double-click on "Control Unit".
5. Start the configuration wizards:



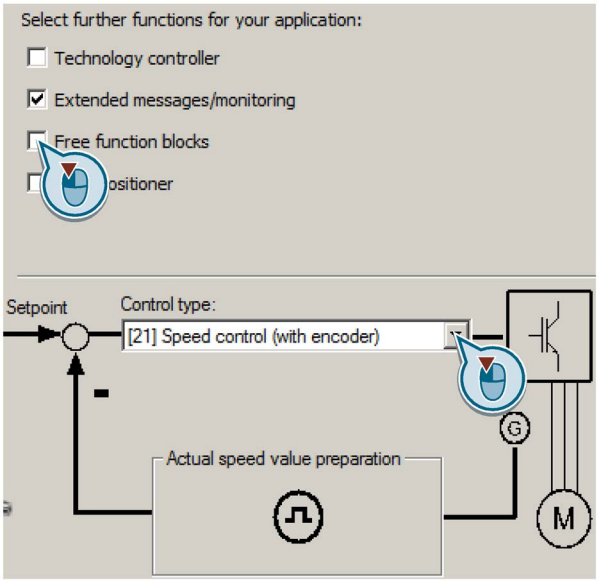
You have started to configure the inverter.

Procedure without application class or for the application class [0]: Expert

2. ☑ Control structure

   Select the required function modules for your application.

   Select the control mode.



3. ☑ Defaults of the setpoin

   Select the I/O configuration to preassign the inverter interfaces.
   The possible configurations are listed in Sections: Inverter factory setting (Page 68) and Wiring example for the factory settings (Page 66).

4. ☑ Drive setting

   Set the applicable motor standard and the inverter supply voltage.

   Select the application for the inverter:

   - "[0] Load cycle with high overload for applications requiring a high dynamic performance, e.g. conveyor systems.
   - "[1] Load cycle with low overload ..." for applications that do not require a high dynamic performance, e.g. pumps or fans.
   - [6], [7]: Load cycles for applications with encoderless 1FK7 synchronous motors.

5. ☑ Motor

   Select your motor.

6. ☑ Motor data

   Enter the motor data according to the rating plate of your motor.
   If you have selected a motor based on its article number, the data has already been entered.

7. ☑ Important parameters

   Set the most important parameters to suit your application.

8. ☑ Drive functions

   Technological use:

   - [0]: In all applications that do not fall under [1] … [3]
   - [1]: Applications involving pumps and fans
   - [2]: Applications with short ramp-up and ramp-down times. However, this setting is not suitable for hoisting gear and cranes/lifting gear.
   - [3]: Setting only for steady-state operation with slow speed changes. We recommend setting [1] if load surges in operation cannot be ruled out.

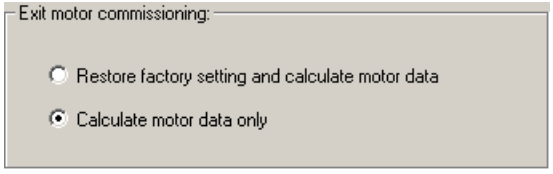
Motor identification:

- [1]: Recommended setting for closed-loop speed control. After an ON command, the inverter identifies the motor data – and with a new ON command, optimizes the speed controller.
- [2]: After an ON command, the inverter identifies the motor data at standstill. Recommended setting for the following cases:
  – You have selected "Speed control" as control mode, however the motor cannot freely rotate, e.g. for mechanically limited traversing sections.
  – You have set "V/f control" as control mode.
- [3]: This setting only makes sense after the motor identification [2]. The inverter optimizes the speed controller at the next ON command.
- [11] or [12]: The setting is the same as [1] or [2], however with the difference that after the motor identification, the inverter immediately changes into the "Operation" state.

Calculating the motor parameters: Select "Complete calculation".

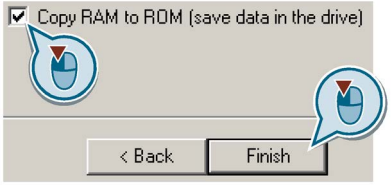
9. → Identify motor data - STARTER (Page 91)

8. ☑ Calculation of the motc We recommend the setting "Calculate motor data only".



9. Set the check mark for "RAM to ROM (save data in the drive)" in order to save your data in the inverter so that it is not lost when the power fails.

   Exit basic commissioning.



You have entered all of the data that is necessary for the basic commissioning of your inverter.

4.8.4 Identify motor data - STARTER

Identify motor data

WARNING

Danger to life from machine movements while motor data identification is in progress

The stationary measurement can turn the motor a number of revolutions. The rotating measurement accelerates the motor up to the rated speed. Secure dangerous machine parts before starting motor data identification:

- Before switching on, ensure that nobody is working on the machine or located within its working area.
- Secure the machine's working area against unintended access.
- Lower suspended loads to the floor.

Preconditions

- You selected a method of motor data identification during basic commissioning, e.g. measurement of the motor data while the motor is stationary.

  When basic commissioning is complete, the inverter issues alarm A07991.
- The motor has cooled down to the ambient temperature.

  An excessively high motor temperature distorts the results of motor data identification.

Procedure with STARTER

1
2

To initiate motor data identification and optimize the motor control, proceed as follows:

1. Open the control panel.

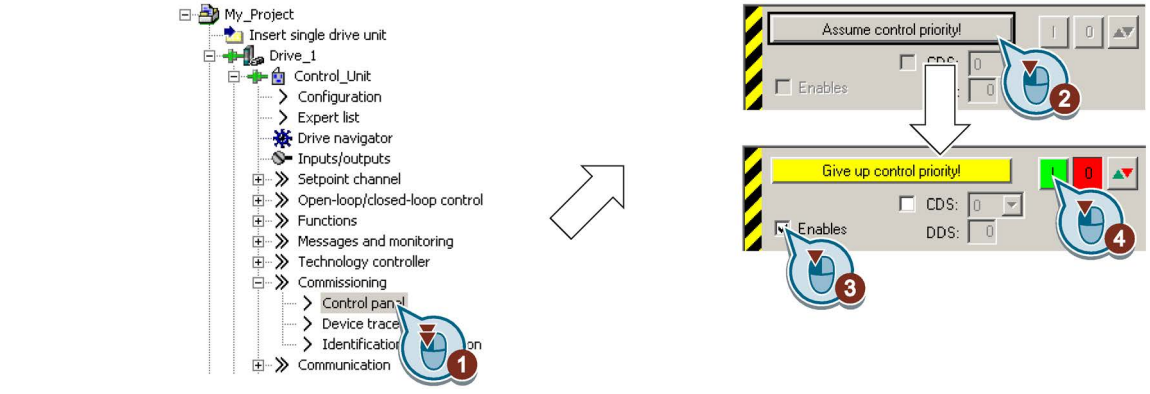


Figure 4-27 Control panel

2. Assume master control for the inverter.
3. Set the "Enable signals"

4. Switch on the motor.

   The inverter starts the motor data identification. This measurement can take several minutes. After the measurement, the inverter switches off the motor.

5. Relinquish the master control after the motor data identification.
6. Press button (RAM to ROM).

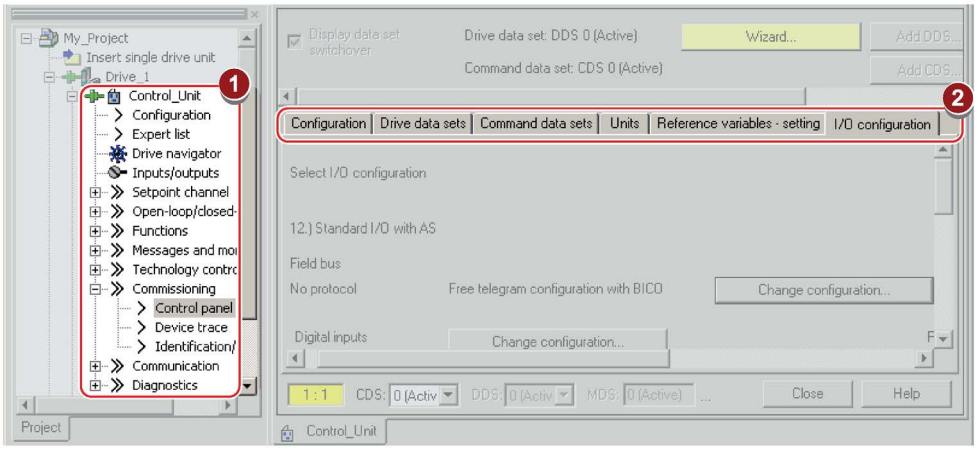
You have completed the motor data identification.

4.8.5 Change settings

After the basic commissioning, you can adapt the inverter to your application as described in the Commissioning (Page 65).

STARTER offers two options:

- Change the settings using the appropriate screen forms - **our recommendation**.
  ① Navigation bar: For each inverter function, select the corresponding screen form.
  ② tabs: Switch between screen forms.
  If you change the settings using screen forms you do not need to know the parameter numbers.



- You change the settings using the parameters in the expert list.
  If you wish to change the settings using the expert list, you need to know the corresponding parameter number and its significance.

Saving settings so that they are not lost when the power fails

The inverter initially only saves changes temporarily. You must do the following so that the inverter saves your settings securely in the event of a power failure.

Procedure

1
2 Proceed as follows to save your settings in the inverter so that they are not lost when the power fails:

1. Mark the appropriate drive in the project navigator.
2. Click the Save (RAM to ROM) button.

You have saved your settings securely in the inverter in case of a power failure.

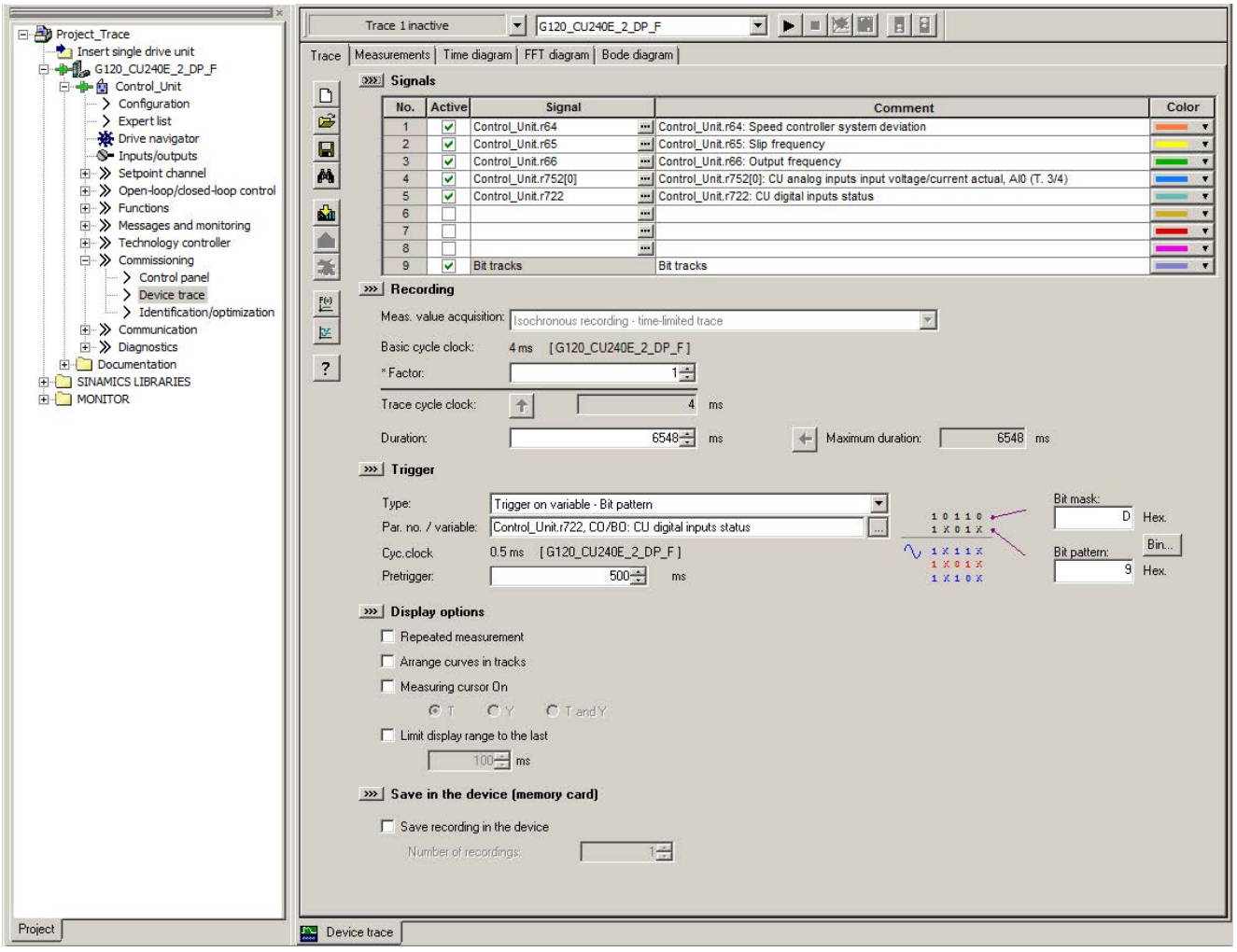
Go offline

You can now exit the online connection after the data backup (RAM to ROM) with "Disconnect from target system".

4.8.6 The device trace in STARTER

Description

The device trace graphically displays inverter signals with respect to time.



Signals

In two settings that are independent of one another, using ... you can interconnect eight signals each.

Recording

You can start a measurement as frequently as you require. As long as you do not exit START, the results remain under the "Measurements" tab with data and time. When terminating STARTER or under the "Measurements" tab, you can save the measurement results in the *.trc format.

If you require more than two settings for your measurements, you can either save the individual settings in the project or export them in *.clg format, and load or import them, if necessary.

You can record individual bits of a parameter (e.g. r0722. 1) by allocating the relevant bit using "bit track" ( ).

Using the mathematical function ( ) you can define a curve, for example, the difference between the speed setpoint and the speed actual value.

The device trace shows "individual bits" or "mathematical functions" as signal No. 9.

Recording cycle and duration

The device trace records data in a CU-dependent basic cycle clock. The maximum recording duration depends on the number of recorded signals and the trace clock cycle.

Proceed as follows to extend the recording duration:

1. Multiply the trace clock cycle by an integral number.
2. Accept the displayed maximum duration using .

Alternatively, you can also specify the measurement period and then calculate the trace clock cycle of STARTER using .

Trigger (condition to start the device trace)

The device trace starts as soon as you press the (start trace) button.

Using the button , you can define another trigger to start the device trace.

The pretrigger defines the time in which the signals are traced before the trigger condition. As a consequence, the trigger condition traces itself.

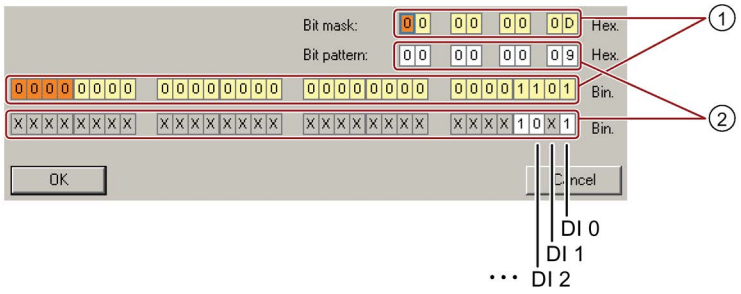
Example of a bit pattern as trigger:

You must define the pattern and value of a bit parameter for the trigger. To do so, proceed as follows:

Using , select "Trigger to variable - bit pattern"

Using , select the bit parameter

Using bin..., open the screen form in which you set the bits and their values for the start condition



① Select the bits for the trace trigger, upper row hex format, lower row binary format

② Define the bits for the trace trigger, upper row hex format, lower row binary format

Figure 4-28 Trigger as bit pattern of r0722 (status of the digital inputs)

In the example, the trace starts if digital inputs DI 0 and DI 3 are high, and DI 2 is low. The state of the other digital inputs is not relevant for the trigger condition.

Further, you can either set an alarm or fault as start condition.

Display options

In this area, you can set how the measurement results are displayed.

- Repeat measurement
  This places the measurements that you wish to perform at different times above one other.
- Arrange curves in tracks
  This defines whether the device trace will show all measured values on a common zero line or on separate zero lines.
- Measuring cursor On
  This allows you to analyze the measuring intervals in more detail.

Save to device (memory card)

In this area, you define whether the device trace will save successive measurements in directory /USER/SINAMICS/DATA/TRACE on a inserted memory card.

Displaying the measurements backed up on the memory card

Procedure

1
2

To display the measurements backed up on the memory card, proceed as follows:

1. Insert the memory card into a card reader.
2. Go to the "Measurements" tab in the device trace.
3. Open the read out ACX files with the "Open measurements" button.

STARTER shows the measurements backed up on the memory card.

4.9 Using the AS-i Programmer

Setting the slave address with the AS-i Address Programmer

The Inverter contains two logical AS-i slaves. Either slave can be assigned an address in the range 1A...31A or 1B...31B. The addresses can be allocated to the slaves sequentially, for example, 3A and 4A, 10B and 11B or they can occupy the same number using extended addressing, for example, 20A and 20B. If necessary they can have completely different unassociated addresses, for example, 14A and 16B.

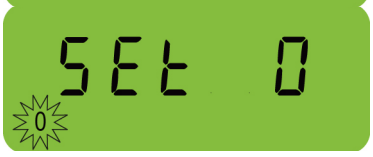
The decision on how to allocate these addresses must also take into account the addressing used in the PLC program by either adherence to the memory map of the AS-i master or the way in which the inputs and outputs can be allocated by the PLC hardware configuration.

The default address of both slaves is 0.

Setting the AS-i address of slave 1

1. Plug the AS-i Programmer into the addressing socket of the Inverter.
2. Turn the dial on the Programmer to the **ADDR** position. The display will indicate that this mode has been selected.

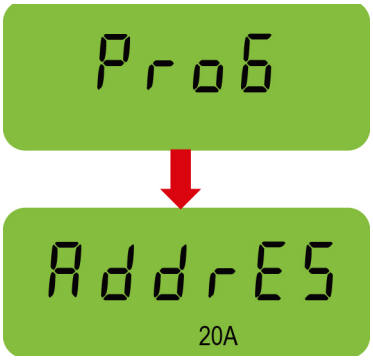
3. Press the ↵ button; the screen will display the text, **SEt 0** with a small flashing **0** to the left of the display.



4. Press the ▲ button until you reach the required number.
   By pressing both the ▲ and ▼ simultaneously, you can toggle between A and B identifiers of the address.
5. Press the ↵ button to confirm the selected address.

   ProG is momentarily displayed, followed by **AddrES**.

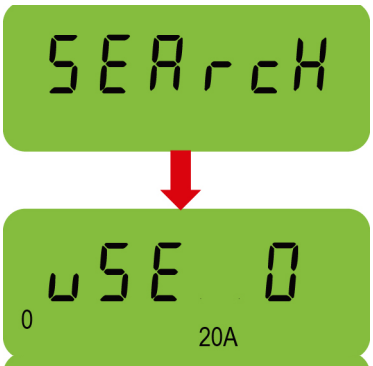
   The number allocated to slave 1 is now shown at the bottom of the display.



Setting the AS-i address of slave 2

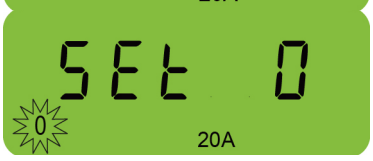
1. Press the ⏎ button; the display shows the text **SEArcH** followed by **uSE 0**.

   A small 0 is displayed to the left of the display and the number of the first slave that has already been allocated to slave 1 is shown at the bottom of the display.



2. Press the ⏎ button to select this number.

   SEt 0 appears and the small **0** in the left of the display starts flashing.

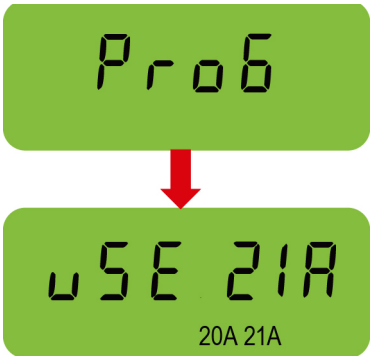


3. Press the ▲ button until you reach the required number.
   By pressing both the ▲ and ▼ simultaneously, you can toggle between A and B identifiers of the address.

4. Press the ⏎ button to accept this number.

   ProG is displayed briefly.

   Both of the numbers allocated to the slaves are now displayed in the lower part of the screen.



Changing existing addresses of the AS-i slaves

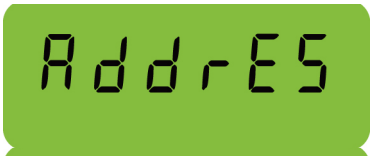
If the allocated addresses used two different numbers, for example, 10A and 11A, then if one of the slave addresses is reset to 0 the other slave is not affected.

If the allocated addresses use the same number, for example, 20A and 20B, then if one slave addresses is reset to 0, then both slaves numbers will be reset to 0.

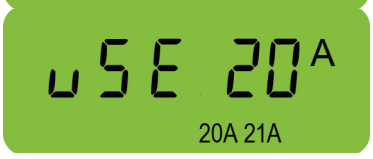
Modifying an existing address of a single slave within the Inverter will not affect the address of the other slave.

To change an existing address of a slave, the following procedure should be performed:

1. Plug the AS-i Programmer into the addressing socket of the Inverter
2. Turn the dial on the Programmer to the **ADDR** position. The display will indicate that this mode has been selected.

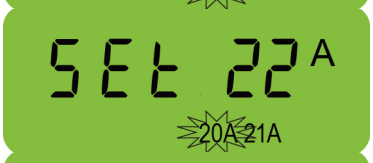


3. Press the ↵ button; the screen will display **uSE** and the number of the lower addressed slave. The existing slave addresses are shown at the bottom of the display.

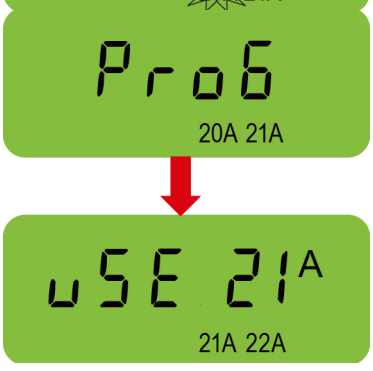


4. Press the ↑ and ↓ buttons to select the slave address number to be changed.
5. Press the ↵ button; the display now shows **SEt**. The selected number will begin to flash.

6. Press the ↑ and ↓ buttons to select the new slave address number.



7. Press the ↵ button to confirm the new address. **ProG** is displayed briefly followed by confirmation of the address change.



Troubleshooting

5

5.1 Status LED overview

LED status indicators

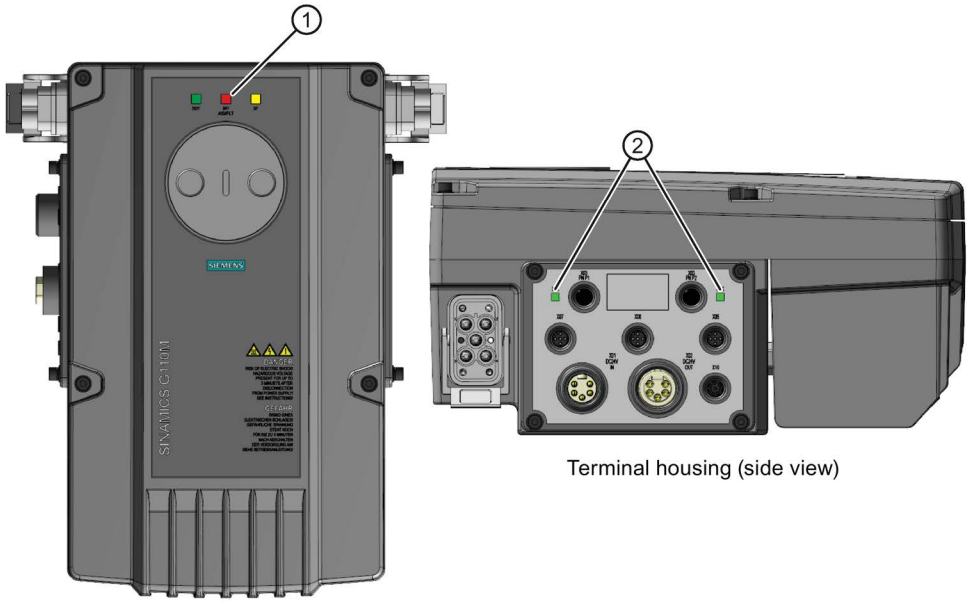
The Power Module has number of dual-colour LEDs which are designed to indicate the operational state of the Inverter. The LEDs are used to indicate the status of the following states:

- General fault conditions
- Communication status

The location of the various LEDs on the Power Module and Communications and Power Interface (which is attached to the terminal housing) are shown in the figure below.

① Status LEDs

② PROFINET LEDs



Terminal housing (side view)

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- 1 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	ORANGE - flashing slowly	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- 2 Description of fieldbus communications LED

BF LED	Description of function
Off	Cyclic data exchange (or fieldbus 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- 3 Description of SAFE LED

SAFE LED	Description of function
YELLOW - On	Safety function is enabled - but not active
YELLOW - Flashing slowly	Safety function is active - no safety function faults have occurred
YELLOW - Flashing quickly	The converter has detected a safety function fault and initiated a stop response

Table 5- 4 Description of PROFINET communications LED

PROFINET LED	Description of function
LNK - On	Link is active
LNK - Off	Link inactive with no data being transferred

Table 5- 5 Description of AS-i communications LED

AS-i/FLT	Description of function
Flashing -RED	No communications between processors within the converter
Flashing - RED/YELLOW	Slave address 0
Flashing - GREEN/RED	Converter trip
RED	AS-i master not connected
GREEN	System OK

SINAMICS G110M
DOCUMENTATION PACK

A5E36100338

Factory processing label - for factory use only

Printed in the United Kingdom

More information

SINAMICS inverter:
www.siemens.com/sinamics

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

PROFINET:
www.siemens.com/profinet

Siemens AG
Digital Factory
Motion Control
Postfach 3180
91050 ERLANGEN
GERMANY

For more information on SINAMICS G110M, scan the QR code.

www.siemens.com/drives