SINAMICS
SINAMICS G110M
Distributed converter for SIMOGEAR geared motors

Getting Started
Legal information

Warning notice system

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

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

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

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

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

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

Trademarks

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

Disclaimer of Liability

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

## 1 Safety instructions
- General safety instructions ................................................................. 7
- Safety instructions for electromagnetic fields (EMF) .......................... 10
- Handling electrostatic sensitive devices (ESD) ................................. 10
- Industrial security .............................................................................. 11
- Residual risks of power drive systems .............................................. 12

## 2 Description
- Identifying the components of the system ........................................ 15
- SINAMICS G110M Inverter ................................................................. 16
- General layout SINAMICS G110M system ....................................... 23

## 3 Installation
- Mechanical Installation ...................................................................... 28
- Dimensions of converters and motors .............................................. 28
- System Installation ............................................................................ 31
- Installation Procedures ...................................................................... 31
- Grounding the terminal housing ..................................................... 45
- Installing the 24V power supply ...................................................... 46
- Electrical Installation ........................................................................ 49
- SINAMICS G110M Electrical data ................................................... 49
- Connections and interference suppression .................................... 51
- Basic EMC rules .............................................................................. 52
- Connection and cables ..................................................................... 53
- Cable protection ................................................................................ 61

## 4 Commissioning
- Commissioning tools ........................................................................ 63
- Motor data using p300 and p301 ..................................................... 64
- Collecting motor data ....................................................................... 66
- Wiring example for the factory settings .......................................... 68
- Factory setting of the inverter control ............................................ 70
- V/f control or speed control ............................................................. 71
- p0015 Macros .................................................................................. 72
- Basic Commissioning with DIP switches ....................................... 74
- Basic commissioning with IOP ......................................................... 79
- Basic commissioning with STARTER .............................................. 83
4.10.1 Adapting the USB interface ................................................................. 84
4.10.2 Generating a STARTER project ......................................................... 85
4.10.3 Go online and start wizard for basic commissioning ...................... 85
4.10.4 Identifying motor data ....................................................................... 88
4.10.5 Change settings .................................................................................. 90
4.10.6 Optimize the drive using the trace function .................................... 91

5 Troubleshooting ......................................................................................... 95

5.1 Status LED overview ............................................................................. 95
1.1 General safety instructions

**DANGER**

Danger to life due to live parts and other energy sources

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

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

Generally, six steps apply when establishing safety:

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

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

**WARNING**

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

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

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

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Danger to life when live parts are touched on damaged devices</strong></td>
</tr>
<tr>
<td>Improper handling of devices can cause damage. Hazardous voltages can be present at the housing or exposed components on damaged devices.</td>
</tr>
<tr>
<td>• Ensure compliance with the limit values specified in the technical data during transport, storage and operation.</td>
</tr>
<tr>
<td>• Do not use any damaged devices.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Danger to life through electric shock due to unconnected cable shields</strong></td>
</tr>
<tr>
<td>Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.</td>
</tr>
<tr>
<td>• As a minimum, connect cable shields and the cores of power cables that are not used (e.g. brake cores) at one end at the grounded housing potential.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Danger to life due to electric shock when not grounded</strong></td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>• Ground the device in compliance with the applicable regulations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Danger to life due to electric shock when opening plug connections in operation</strong></td>
</tr>
<tr>
<td>When opening plug connections in operation, arcs can result in severe injury or death.</td>
</tr>
<tr>
<td>• 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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Danger to life due to fire spreading if housing is inadequate</strong></td>
</tr>
<tr>
<td>Fire and smoke development can cause severe personal injury or material damage.</td>
</tr>
<tr>
<td>• Install devices without a protective housing in a metal control cabinet (or protect the device by another equivalent measure) in such a way that contact with fire inside and outside the device is prevented.</td>
</tr>
<tr>
<td>• Additionally, select the installation site so that an uncontrolled spreading of smoke can be avoided in the case of a fire.</td>
</tr>
<tr>
<td>• Ensure that smoke can escape via designated paths.</td>
</tr>
</tbody>
</table>
Safety instructions
1.1 General safety instructions

⚠️ WARNING
Danger to life through unexpected movement of machines when using mobile wireless devices or mobile phones
Using mobile wireless devices or mobile phones with a transmitter power > 1 W closer than approx. 2 m to the components may cause the devices to malfunction and influence the functional safety of machines, therefore putting people at risk or causing material damage.
- Switch the wireless devices or mobile phones off in the immediate vicinity of the components.

⚠️ WARNING
Danger to life due to the motor catching fire in the event of insulation overload
There is a greater load on the motor insulation through a ground fault in an IT system. A possible result is the failure of the insulation with a risk for personnel through smoke development and fire.
- Use a monitoring device that signals an insulation fault.
- Correct the fault as quickly as possible so the motor insulation is not overloaded.

⚠️ WARNING
Danger to life due to fire if overheating occurs because of insufficient ventilation clearances
Inadequate ventilation clearances can cause overheating with a risk for personnel through smoke development and fire. This can also result in increased downtime and reduced service lives for devices / systems.
- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component. They can be found in the dimension drawings or in the "Product-specific safety instructions" at the start of the respective section.

⚠️ WARNING
Danger of an accident occurring due to missing or illegible warning labels
Missing or illegible warning labels can result in death or serious injury.
- Check 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 test, disconnect the system/machine.
All converters and motors are subject to a high voltage test in the manufacturer's facility. As a consequence, it is not necessary to carry out additional tasks in the system/machine.
1.2 Safety instructions for electromagnetic fields (EMF)

**WARNING**

**Danger to life when safety functions are inactive**
Safety functions that are inactive or that have not been adjusted accordingly can cause operational faults on machines that could lead to serious injury or death.
- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Run a function test.
- Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

**Note**

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

---

1.3 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 or 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 automation and drive products with industrial security functions that support the secure operation of plants or machines. They are an important component in a holistic industrial security concept. With this in mind, our products undergo continuous development. We therefore recommend that you keep yourself informed with the latest information and updates of our product.

Information and newsletters can be found at:

http://support.automation.siemens.com

To ensure the secure operation of a plant or machine, it is also necessary to take suitable preventive action (e.g. cell protection concept) and to integrate the automation and drive components into a state-of-the-art holistic industrial security concept for the entire plant or machine. Any third-party products used must also be taken into account.

For more detailed information, go to:

http://www.siemens.com/industrialsecurity
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:
Safety instructions

1.5 Residual risks of power drive systems

1. Unintentional movements of driven machine components during commissioning, operation, maintenance, and repairs caused by, for example:
   - Hardware defects and/or software errors in the sensors, controllers, actuators, and connection technology
   - Response times of the controller and drive
   - Operating and/or ambient conditions outside of the specification
   - Condensation / conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of radio devices / cellular phones in the immediate vicinity of the controller
   - External influences / damage

2. In the event of a fault, exceptionally high temperatures, including an open fire, as well as emissions of light, noise, particles, gases, etc. can occur inside and outside the inverter, e.g.:
   - Component malfunctions
   - Software errors
   - Operating and/or ambient conditions outside of the specification
   - External influences / damage

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

3. Hazardous shock voltages caused by, for example:
   - Component malfunctions
   - Influence of electrostatic charging
   - Induction of voltages in moving motors
   - Operating and/or ambient conditions outside of the specification
   - Condensation / conductive contamination
   - External influences / damage

4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc. if they are too close.

5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly.

Note

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

Assuming that conductive contamination at the installation site can definitely be excluded, a lower degree of cabinet protection may be permitted.
For more information about residual risks of the components in a drive system, see the relevant sections in the technical user documentation.
## 2 Description

### 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

Yellow denotes the locations of the rating labels.
2.2 SINAMICS G110M Inverter

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.

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

<table>
<thead>
<tr>
<th>Frame size</th>
<th>Rated output power (kW)</th>
<th>Rated output current (A)</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSA</td>
<td>0.37</td>
<td>1.3</td>
<td>6SL3517-1BE11-3AM0</td>
</tr>
<tr>
<td>FSA</td>
<td>0.75</td>
<td>2.2</td>
<td>6SL3517-1BE12-3AM0</td>
</tr>
<tr>
<td>FSA</td>
<td>1.1</td>
<td>3.1</td>
<td>6SL3517-1BE13-3AM0</td>
</tr>
<tr>
<td>FSA</td>
<td>1.5</td>
<td>4.1</td>
<td>6SL3517-1BE14-3AM0</td>
</tr>
<tr>
<td>FSB</td>
<td>2.2</td>
<td>5.6</td>
<td>6SL3517-1BE16-3AM0</td>
</tr>
<tr>
<td>FSB</td>
<td>3.0</td>
<td>7.3</td>
<td>6SL3517-1BE17-7AM0</td>
</tr>
<tr>
<td>FSB</td>
<td>4.0</td>
<td>8.8</td>
<td>6SL3517-1BE21-0AM0</td>
</tr>
</tbody>
</table>
Table 2-2 CU240M Terminal Housing (including the Control Module)

<table>
<thead>
<tr>
<th>Comms</th>
<th>Motor frame size</th>
<th>Mains / 24 V DC connections</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>USS</td>
<td>FS71</td>
<td>Cable glands</td>
<td>6SL3544-0LB02-1BA0</td>
</tr>
<tr>
<td>USS</td>
<td>FS80/90</td>
<td>Cable glands</td>
<td>6SL3544-0MB02-1BA0</td>
</tr>
<tr>
<td>USS</td>
<td>FS100/112</td>
<td>Cable glands</td>
<td>6SL3544-0NB02-1BA0</td>
</tr>
<tr>
<td>PROFIBUS</td>
<td>FS71</td>
<td>Cable glands</td>
<td>6SL3544-0LB02-1PA0</td>
</tr>
<tr>
<td>PROFIBUS</td>
<td>FS100/112</td>
<td>Cable glands</td>
<td>6SL3544-0NB02-1PA0</td>
</tr>
<tr>
<td>PROFIBUS</td>
<td>FS71</td>
<td>HanQ 4/2 / 7/8&quot;</td>
<td>6SL3544-0TB02-1PA0</td>
</tr>
<tr>
<td>PROFIBUS</td>
<td>FS80/90</td>
<td>HanQ 4/2 / 7/8&quot;</td>
<td>6SL3544-0PB02-1PA0</td>
</tr>
<tr>
<td>PROFIBUS</td>
<td>FS100/112</td>
<td>HanQ 4/2 / 7/8&quot;</td>
<td>6SL3544-0QB02-1PA0</td>
</tr>
<tr>
<td>PROFINET</td>
<td>FS71</td>
<td>Cable glands</td>
<td>6SL3544-0LB02-1FA0</td>
</tr>
<tr>
<td>PROFINET</td>
<td>FS80/90</td>
<td>Cable glands</td>
<td>6SL3544-0MB02-1FA0</td>
</tr>
<tr>
<td>PROFINET</td>
<td>FS100/112</td>
<td>Cable glands</td>
<td>6SL3544-0NB02-1FA0</td>
</tr>
<tr>
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<td>FS71</td>
<td>HanQ 4/2 / 7/8&quot;</td>
<td>6SL3544-0TB02-1FA0</td>
</tr>
<tr>
<td>PROFINET</td>
<td>FS80/90</td>
<td>HanQ 4/2 / 7/8&quot;</td>
<td>6SL3544-0PB02-1FA0</td>
</tr>
<tr>
<td>PROFINET</td>
<td>FS100/112</td>
<td>HanQ 4/2 / 7/8&quot;</td>
<td>6SL3544-0QB02-1FA0</td>
</tr>
</tbody>
</table>

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.

SINAMICS G110M PROFIBUS variant
PROFIBUS Communications cable for connecting the CPI board to the communications connection on the Control Module.

SINAMICS G110M PROFINET variant
PROFINET 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.
Description

2.2 SINAMICS G110M Inverter

Table 2-3 SINAMICS G110M Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 V Power supply</td>
<td>Internal 24 V DC power supply for the CU240M</td>
<td>6SL3555-OPV00-0AA0</td>
</tr>
<tr>
<td>Internal braking resistor (FSA)</td>
<td>10% duty cycle with 5% peak braking power, peak power 75 W, instantaneous power 1.9 kW, average power 7.5 W, resistance 350 Ohms.</td>
<td>6SL3501-0BE18-8AA0</td>
</tr>
<tr>
<td>Internal braking resistor (FSB)</td>
<td>10% duty cycle with 5% peak braking power, peak power 200 W, instantaneous power 3.8 kW, average power 20 W, resistance 175 Ohms.</td>
<td>6SL3501-0BE22-0AA0</td>
</tr>
<tr>
<td>Glanded connector kit</td>
<td>Comprises the following connectors:</td>
<td>6SL3566-2VA00-0GA0</td>
</tr>
<tr>
<td></td>
<td>• M20 screw gland - used for 24 V power supply daisy chain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• M25 plastic gland - used for the 3-phase mains daisy chain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• M12 plastic gland - used for the EM-brake cable entry.</td>
<td></td>
</tr>
<tr>
<td>HanQ connector kit</td>
<td>Comprises the following connectors:</td>
<td>6SL3566-2LA00-0GA0</td>
</tr>
<tr>
<td></td>
<td>• Connector cap 7/8th internal thread - used for the 24 V power blanking cap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• HanQ blanking cap - used for the mains input blanking cap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• M12 plastic gland - used for the EM-brake cable entry.</td>
<td></td>
</tr>
</tbody>
</table>

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.
- 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 Inverter >= rated input current of the motor.
- Mechanical adaptation for the Inverter terminal housing; the terminal housing can only be used in conjunction with 1LA FS71 or 1LE FS80, FS90, FS100 or FS112 motors.
- The terminal box of the motor must only be Non-Drive End (NDE) configuration. This is an option available when choosing the motor; for 1LE motor choose option H08, or for 1LA motors choose option M64.

<table>
<thead>
<tr>
<th>SINAMICS G110M characteristics</th>
<th>Motor characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HO power (kW)</strong></td>
<td><strong>Rated output current (A)</strong></td>
</tr>
<tr>
<td>0.37</td>
<td>1.30</td>
</tr>
<tr>
<td>0.37</td>
<td>1.30</td>
</tr>
<tr>
<td>0.75</td>
<td>2.20</td>
</tr>
<tr>
<td>0.75</td>
<td>2.20</td>
</tr>
<tr>
<td>0.75</td>
<td>2.20</td>
</tr>
<tr>
<td>1.1</td>
<td>3.10</td>
</tr>
<tr>
<td>1.1</td>
<td>3.10</td>
</tr>
<tr>
<td>1.1</td>
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<td>5.60</td>
</tr>
<tr>
<td>2.2</td>
<td>5.60</td>
</tr>
</tbody>
</table>
## Description

### 2.2 SINAMICS G110M Inverter

<table>
<thead>
<tr>
<th>HO power (kW)</th>
<th>Rated output current (A)</th>
<th>Frame size</th>
<th>Order number</th>
<th>Power (kW)</th>
<th>Frame size</th>
<th>Rated current (A)</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
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### Table 2-5: 4-pole, 400 VAC, 50 Hz motors

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### SINAMICS G110M characteristics

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<th>Rated output current (A)</th>
<th>Frame size</th>
<th>Order number</th>
<th>Power (kW)</th>
<th>Frame size</th>
<th>Rated current (A)</th>
<th>Efficiency</th>
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<td>IE2</td>
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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 connections on the terminal housing are delivered with either HAN Q (pluggable) or Glanded connectors depending on the variant that has been ordered.
2.3 General layout SINAMICS G110M system

Figure 2-2 General layout of the system
### Table 2-6 Description and location of interfaces

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power Module</td>
<td>13</td>
<td>Blanking plate - to seal the opposite side of the Terminal Housing from which the CPI has been fitted.</td>
</tr>
<tr>
<td>2</td>
<td>Interface cover</td>
<td>14</td>
<td>Cable gland or HANQ connections for left-side mounting or daisy chaining the mains supply.</td>
</tr>
<tr>
<td>3</td>
<td>Communications port 1</td>
<td>15</td>
<td>Potentiometer</td>
</tr>
<tr>
<td>4</td>
<td>Digital input 2 and digital input 3</td>
<td>16</td>
<td>Optical I/O connection</td>
</tr>
<tr>
<td>5</td>
<td>Communications port 2</td>
<td>17</td>
<td>Mini USB connection</td>
</tr>
<tr>
<td>6</td>
<td>Digital output 0 and digital output 1</td>
<td>18</td>
<td>Memory card reader</td>
</tr>
<tr>
<td>7</td>
<td>Analog input 0 and analog input 1</td>
<td>19</td>
<td>Braking resistor &amp; motor connection terminals</td>
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<tr>
<td>8</td>
<td>External 24 Vdc OUT</td>
<td>20</td>
<td>Communications &amp; Power Interface (CPI) interface ribbon cable</td>
</tr>
<tr>
<td>9</td>
<td>External 24 Vdc IN</td>
<td>21</td>
<td>PROFIBUS address and Commissioning DIP switches 1 and 2</td>
</tr>
<tr>
<td>10</td>
<td>Digital input 0 and digital input 1</td>
<td>22</td>
<td>EM Brake &amp; mains supply connection terminals</td>
</tr>
<tr>
<td>11</td>
<td>Mains supply connection</td>
<td>23</td>
<td>Control Module (CM)</td>
</tr>
<tr>
<td>12</td>
<td>Terminal housing</td>
<td>24</td>
<td>PROFIBUS/PROFINET communications cable</td>
</tr>
</tbody>
</table>
2.3 General layout SINAMICS G110M system
Installation

---

**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.

---

**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.

![Dimensions of the converter](image)

Figure 3-1 Dimensions of the converter

<table>
<thead>
<tr>
<th>Frame size</th>
<th>H (mm)</th>
<th>L (mm)</th>
<th>D1 (mm)</th>
<th>D2 (mm)</th>
<th>D3 (mm)</th>
<th>W (mm) without glands</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>135</td>
<td>270</td>
<td>208</td>
<td>216</td>
<td>161</td>
<td>132</td>
</tr>
<tr>
<td>B</td>
<td>135</td>
<td>309</td>
<td>208</td>
<td>216</td>
<td>181</td>
<td>132</td>
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</tbody>
</table>

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 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.
3.1 Mechanical Installation

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.
Installation

3.1 Mechanical Installation

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 may not 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 is 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 28).
- 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 mm².
- The EM brake is an optional extra which is ordered separately.

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 mm². 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 blank plate 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 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 74)

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)**

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 mm² without isolated cable ends (ferrels).
  - 0.25 ... 1.5 mm² with isolated cable ends (ferrels).

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.
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.
3.2 System Installation

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.
- 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.
Installation

3.2 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.

Figure 3-6 Fitting the DC+ and DC- inputs to the terminals
Figure 3-6 Fitting the 24 V cable to the Control Module

Fitting the input and output connections
3.3 Electrical Installation

3.3.1 SINAMICS G110M Electrical data

Power Module specifications - 3AC 380 V (-10%) ... 500 V (+6%)

Table 3-2 Rated Output, Input and Fuses

<table>
<thead>
<tr>
<th>Product</th>
<th>Frame size</th>
<th>Rated output</th>
<th>HO</th>
<th>3NA3...</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SL3517-...</td>
<td>kW hp</td>
<td>A A A Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1BE11-3AM0</td>
<td>A</td>
<td>0.37 0.5</td>
<td>1.3 1.3 10 803</td>
<td></td>
</tr>
<tr>
<td>1BE12-3AM0</td>
<td>A</td>
<td>0.75 1.0</td>
<td>2.2 2.0 10 803</td>
<td></td>
</tr>
<tr>
<td>1BE13-3AM0</td>
<td>A</td>
<td>1.1 1.5</td>
<td>3.1 2.8 10 803</td>
<td></td>
</tr>
<tr>
<td>1BE14-3AM0</td>
<td>A</td>
<td>1.5 2.0</td>
<td>4.1 3.6 10 803</td>
<td></td>
</tr>
<tr>
<td>1BE16-3AM0</td>
<td>B</td>
<td>2.2 3.0</td>
<td>5.6 5.3 20 807</td>
<td></td>
</tr>
<tr>
<td>1BE17-7AM0</td>
<td>B</td>
<td>3.0 4.0</td>
<td>7.3 6.9 20 807</td>
<td></td>
</tr>
<tr>
<td>1BE21-0AM0</td>
<td>B</td>
<td>4.0 5.0</td>
<td>8.8 8.0 20 807</td>
<td></td>
</tr>
</tbody>
</table>

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 were 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>
<thead>
<tr>
<th>Device</th>
<th>Power supply</th>
<th>Standby current (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G110M FSA (0.37 ... 1.5 kW)</td>
<td>Mains only</td>
<td>325</td>
</tr>
<tr>
<td>G110M FSB (2.2 ... 4.0 kW)</td>
<td>Mains only</td>
<td>445</td>
</tr>
<tr>
<td>G110 FSA + Optional 24 V PSU</td>
<td>Mains + Optional 24 V PSU</td>
<td>340</td>
</tr>
<tr>
<td>G110 FSB + Optional 24 V PSU</td>
<td>Mains + Optional 24 V PSU</td>
<td>460</td>
</tr>
<tr>
<td>PROFIBUS / USS CM</td>
<td>External 24 V</td>
<td>235</td>
</tr>
<tr>
<td>PROFINET CM</td>
<td>External 24 V</td>
<td>290</td>
</tr>
</tbody>
</table>
### 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 Electrical Installation

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>
<thead>
<tr>
<th>Cable</th>
<th>Screening</th>
<th>Max. length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital inputs</td>
<td>Unscreened</td>
<td>15 m (49 ft)</td>
</tr>
<tr>
<td>Digital outputs</td>
<td>Unsreened</td>
<td>15 m (49 ft)</td>
</tr>
<tr>
<td>Analog input</td>
<td>screened</td>
<td>15 m (49 ft)</td>
</tr>
</tbody>
</table>

The maximum cable lengths for USS, PROFIBUS and PROFINET 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 and PROFINET

<table>
<thead>
<tr>
<th>Communications protocol</th>
<th>Transfer rate or cable type</th>
<th>Maximum cable length</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.6 kbit/s</td>
<td>1200 m (3,940 ft)</td>
</tr>
<tr>
<td></td>
<td>19.2 kbit/s</td>
<td>1200 m (3,940 ft)</td>
</tr>
<tr>
<td></td>
<td>38.4 kbit/s</td>
<td>1200 m (3,940 ft)</td>
</tr>
<tr>
<td></td>
<td>187.5 kbit/s</td>
<td>1000 m (3,280 ft)</td>
</tr>
<tr>
<td><strong>PROFIBUS-DP</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.6 - 187.5 kbit/s</td>
<td>1000 m (3,280 ft)</td>
</tr>
<tr>
<td></td>
<td>500 kbit/s</td>
<td>400 m (1,312 ft)</td>
</tr>
<tr>
<td></td>
<td>1.5 Mbit/s</td>
<td>200 m (656 ft)</td>
</tr>
<tr>
<td></td>
<td>3, 6 and 12 Mbit/s</td>
<td>100 m (328 ft)</td>
</tr>
<tr>
<td><strong>PROFINET</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAT5 network cable</td>
<td>100 m (328 ft)</td>
</tr>
</tbody>
</table>
Outline block diagram

Figure 3-7  Outline block diagram SINAMICS CU240M and PM240M
3.3 Electrical Installation

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

- Siemens supplementary product information

- Siemens supplementary product information

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.
### 3.3 Electrical Installation

<table>
<thead>
<tr>
<th>Control Module CU240M-USS</th>
<th>Connector on CPI</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>24V Power supply IN</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X01.1 Switched 0V (2M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X01.2 Unswitched 0V (1M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X01.3 Functional Earth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X01.4 Unswitched +24V (1L+)</td>
<td></td>
<td>7/8&quot; - 16UN (male) connector. The CU metalwork is separated from high voltage circuits by reinforced insulation and so protective earth is not required. The maximum current drawn on the unswitched 24 V supply is 750 mA for a unit with a fan and 600 mA for a unit without a fan. The maximum current drawn on the switched 24 V supply is 1 A.</td>
</tr>
<tr>
<td>X01.5 Switched +24V (2L+)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>24V Power supply OUT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X02.1 Switched 0V (2M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X02.2 Unswitched 0V (1M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X02.3 Functional Earth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X02.4 Unswitched +24V (1L+)</td>
<td></td>
<td>Type: 7/8&quot; - 16UN (female) connector</td>
</tr>
<tr>
<td>X02.5 Switched +24V (2L+)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>USS IN</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X03.1 Not Connected</td>
<td></td>
<td>M12 - 5 Pole (male) connector</td>
</tr>
<tr>
<td>X03.2 RS485N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X03.3 Not connected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X03.4 RS485P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X03.5 Functional Earth</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>USS OUT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X04.1 Not Connected</td>
<td></td>
<td>M12 - 5 Pole (female) connector</td>
</tr>
<tr>
<td>X04.2 RS485N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X04.3 Not connected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X04.4 RS485P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X04.5 Functional Earth</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>24V 500 mA max</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X05.1 Not connected</td>
<td></td>
<td>M12 - 5 Pole (female) connector</td>
</tr>
<tr>
<td>X05.2 Digital Output 1</td>
<td></td>
<td>Specification: PNP, SIMATIC-compatible, low &lt;5 V, high &gt; 10 V maximum, input voltage 30 V.</td>
</tr>
<tr>
<td>X05.3 Switched 0V (2M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X05.4 Digital Output 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X05.5 Functional Earth</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>X7.2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X7.1 Digital Input 1</td>
<td></td>
<td>M12 - 5 Pole (female) connector</td>
</tr>
<tr>
<td>X7.3 Unswitched 0V (1M)</td>
<td></td>
<td>Specification: PNP, SIMATIC-compatible, low &lt;5 V, high &gt; 10 V maximum, input voltage 30 V.</td>
</tr>
<tr>
<td>X7.4 Digital Input 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X7.5 Functional Earth</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>X8.2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X8.1 Digital Output 3</td>
<td></td>
<td>M12 - 5 Pole (female) connector</td>
</tr>
<tr>
<td>X8.3 Unswitched 0V (1M)</td>
<td></td>
<td>Specification: PNP, SIMATIC-compatible, low &lt;5 V, high &gt; 10 V maximum, input voltage 30 V.</td>
</tr>
<tr>
<td>X8.4 Digital Output 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X8.5 Functional Earth</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>X10.2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X10.1 Not connected</td>
<td></td>
<td>M12 - 8 Pole (female) connector</td>
</tr>
<tr>
<td>X10.2 +10 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X10.3 Analog input 0+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X10.4 Analog input 1+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X10.5 Analog input 0-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X10.6 Analog input 1-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X10.7 Unswitched 0 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X10.8 Not connected</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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 and outputs is 200 mA and the maximum combined current for all digital outputs is 500 mA.

Figure 3-8  SINAMICS G110M CU240M USS terminal diagram
## 3.3 Electrical Installation

### Control Unit CU240M-DP

<table>
<thead>
<tr>
<th>Control Unit</th>
<th>Connector on CPI</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>24V Power supply IN</td>
<td>X.1.1 Switched 0V (2M)</td>
<td>7/8&quot; - 16UN (male) connector</td>
</tr>
<tr>
<td></td>
<td>X.1.2 Unswitched 0V (1M)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.1.3 Functional Earth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.1.4 Unswitched +24V (1L+)</td>
<td>The CU metalwork is separated from high voltage circuits by reinforced insulation and so protective earth is not required.</td>
</tr>
<tr>
<td></td>
<td>X.1.5 Switched +24V (2L+)</td>
<td>The maximum current drawn on the unswitched 24 V supply is 750 mA for a unit with a fan and 600 mA for a unit without a fan. The maximum current drawn on the switched 24 V supply is 1 A.</td>
</tr>
<tr>
<td>24V Power supply OUT</td>
<td>X.2.1 Switched 0V (2M)</td>
<td>Type: 7/8&quot; - 16UN (female) connector</td>
</tr>
<tr>
<td></td>
<td>X.2.2 Unswitched 0V (1M)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.2.3 Functional Earth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.2.4 Unswitched +24V (1L+)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.2.5 Switched +24V (2L+)</td>
<td></td>
</tr>
<tr>
<td>PROFIBUS DP IN</td>
<td>X.3.1 Not connected</td>
<td>M12 - 5 Pole (male) connector</td>
</tr>
<tr>
<td></td>
<td>X.3.2 Data A (N)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.3.3 Not connected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.3.4 Data B (P)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.3.5 Functional Earth</td>
<td></td>
</tr>
<tr>
<td>PROFIBUS DP OUT</td>
<td>X.4.1 Not connected</td>
<td>M12 - 5 Pole (female) connector</td>
</tr>
<tr>
<td></td>
<td>X.4.2 Data A (N)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.4.3 Not connected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.4.4 Data B (P)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.4.5 Functional Earth</td>
<td></td>
</tr>
<tr>
<td>24V 500 mA max.</td>
<td>X.5.1 Not connected</td>
<td>M12 - 5 Pole (female) connector</td>
</tr>
<tr>
<td></td>
<td>X.5.2 Digital Output 1</td>
<td>Specification: PNP, SIMATIC-compatible, low &lt; 5 V, high &gt; 10 V maximum, input voltage 30 V. See Note 3.</td>
</tr>
<tr>
<td></td>
<td>X.5.3 Switched 0V (2M)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.5.4 Digital Output 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.5.5 Functional Earth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.7.1 Unswitched 24V (1L+)</td>
<td>M12 - 5 Pole (female) connector</td>
</tr>
<tr>
<td></td>
<td>X.7.2 Digital input 1</td>
<td>Specification: PNP, SIMATIC-compatible, low &lt; 5 V, high &gt; 10 V maximum, input voltage 30 V. See Note 3.</td>
</tr>
<tr>
<td></td>
<td>X.7.3 Unswitched 0V (1M)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.7.4 Digital input 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.7.5 Functional Earth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.8.1 Unswitched 24V (1L+)</td>
<td>M12 - 5 Pole (female) connector</td>
</tr>
<tr>
<td></td>
<td>X.8.2 Digital input 3</td>
<td>Specification: PNP, SIMATIC-compatible, low &lt; 5 V, high &gt; 10 V maximum, input voltage 30 V. See Note 3.</td>
</tr>
<tr>
<td></td>
<td>X.8.3 Unswitched 0V (1M)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.8.4 Digital input 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.8.5 Functional Earth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.10.1 Not connected</td>
<td>M12 - 8 Pole (female) connector</td>
</tr>
<tr>
<td></td>
<td>X.10.2 +10V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.10.3 Analog input 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.10.4 Analog input 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.10.5 Analog input 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.10.6 Analog input 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.10.7 Unswitched 0 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.10.8 Not connected</td>
<td></td>
</tr>
</tbody>
</table>

### 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 and outputs is 200 mA and the maximum combined current for all digital outputs is 500 mA.

Figure 3-9  SINAMICS G110M CU240M PROFIBUS terminal diagram
3.3 Electrical Installation

Figure 3-10  SINAMICS G110M CU240M PROFINET 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.
3.3 Electrical Installation

Terminal housing mains supply connections

<table>
<thead>
<tr>
<th>Pin</th>
<th>Mains IN</th>
<th>Mains OUT</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L1</td>
<td></td>
<td>Type: HAN Q4/2 (Input and Output)</td>
</tr>
<tr>
<td>2</td>
<td>L2</td>
<td>12</td>
<td>Spec: 3 AC 380 V (-10%) ... 500 V (+6%)</td>
</tr>
<tr>
<td>3</td>
<td>L3</td>
<td>13</td>
<td>Important:</td>
</tr>
<tr>
<td>4</td>
<td>Not connected</td>
<td>14</td>
<td>The pinouts refer to the actual connectors on the terminal housing.</td>
</tr>
<tr>
<td>PE</td>
<td>Protective Earth</td>
<td>15</td>
<td>The terminal designation X1/3 is used because the mains input and output can be swapped around depending on which side of the terminal housing the CPI is mounted.</td>
</tr>
</tbody>
</table>

Figure 3-11  SINAMICS G110M PM240M connections diagram

Figure 3-12  24 V glanded input and output connections

Note
Adaptation of inputs and outputs
Further adaptation 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 3-13  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

<table>
<thead>
<tr>
<th>Rated power</th>
<th>Power Module</th>
<th>Frame size</th>
<th>Fuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.37 kW</td>
<td>6SL3517-1BE11-3AM0</td>
<td>FSA</td>
<td>10 A</td>
</tr>
<tr>
<td>0.75 kW</td>
<td>6SL3517-1BE12-3AM0</td>
<td>FSA</td>
<td>10 A</td>
</tr>
<tr>
<td>1.1 kW</td>
<td>6SL3517-1BE13-3AM0</td>
<td>FSA</td>
<td>10 A</td>
</tr>
<tr>
<td>1.5 kW</td>
<td>6SL3517-1BE14-3AM0</td>
<td>FSA</td>
<td>10 A</td>
</tr>
<tr>
<td>2.2 kW</td>
<td>6SL3517-1BE16-3AM0</td>
<td>FSB</td>
<td>20 A</td>
</tr>
<tr>
<td>3 kW</td>
<td>6SL3517-1BE17-3AM0</td>
<td>FSB</td>
<td>20 A</td>
</tr>
<tr>
<td>4 kW</td>
<td>6SL3517-1BE21-3AM0</td>
<td>FSB</td>
<td>20 A</td>
</tr>
</tbody>
</table>

For additional information, please refer to Catalog D31 at the following link:

SINAMICS and motors for Single-Axis Drives D31 catalog
(https://intranet.automation.siemens.com/mcms/infcntnr/content/en/Pages/order_form.asp?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 user's 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.
Figure 3-14  Daisy chaining power between Inverters

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.
4 Commissioning

4.1 Commissioning tools

- IOP Handheld Kit
- Optical cable
- USB Interface cable
- STARTER or Stardrive software
- PROFIBUS DP
- PROFINET
- Industrial Ethernet
### 4.2 Motor data using p300 and p301

#### Preassigned motor data using p0300 and p0301

The SINAMICS G110M software has been configured to utilize the input of the motor data using a motor code. There are two parameters associated with this function, they are p0300 (motor type) and p0301 (motor code).

When the SINAMICS G110M is ordered and delivered as a complete system, the motor data is already correctly configured and does not require any adjustment.

When the SINAMICS G110M is ordered and delivered as separate items, the user must install the system and enter the relevant motor data during basic commissioning.

When commissioning of the motor is required, there are two options available to the user:
Commissioning using motor codes

When commissioning using the motor codes, for example, in STARTER utilizing the "Expert List", the follow steps should be performed:

2. Set p0300 to 100 (1LE1 standard induction motor) or 177 (1LA7 standard induction motor).
3. Enter the relevant motor code into p0301 as shown in the following table:

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Power rating (kW)</th>
<th>Motor code for p0301</th>
</tr>
</thead>
<tbody>
<tr>
<td>1LA7</td>
<td>0.37</td>
<td>17726</td>
</tr>
<tr>
<td>1LE1</td>
<td>0.75</td>
<td>12017</td>
</tr>
<tr>
<td>1LE1</td>
<td>1.10</td>
<td>12018</td>
</tr>
<tr>
<td>1LE1</td>
<td>1.50</td>
<td>12019</td>
</tr>
<tr>
<td>1LE1</td>
<td>2.20</td>
<td>12020</td>
</tr>
<tr>
<td>1LE1</td>
<td>3.00</td>
<td>12021</td>
</tr>
<tr>
<td>1LE1</td>
<td>4.00</td>
<td>12023</td>
</tr>
</tbody>
</table>

When the relevant motor code is entered, the motor data automatically assigned for the selected motor. The user can then complete the commissioning process without the need to perform a motor ID.

Commissioning without using motor codes

When commissioning the system without using motor codes, the following steps must be performed, otherwise the motor will not be commissioned correctly.

1. Set p0010 = 1 (Enter the quick commissioning mode).
2. Set p0300 = 1 (Induction motor [rotating]).
3. Set p0301 = 0 (This disables the automatic motor data assignment).
4. Complete the commissioning process, entering the motor data (from the motor rating label) into the relevant parameters.
5. Set p3900 = 1, 2 or 3 to end quick commissioning, depending on the users requirements.

⚠️ CAUTION

Parameter p0300 must be set to 0

When commissioning using the manual input of motor data, it is important that p0300 is set to 0.

If p0300 is not set to 0, then even if the motor ID function is selected at the completion of the commissioning process, no motor ID will actually be performed. If the motor ID is not performed it could leave the motor in an unpredictable state and that may adversely affect the users application.

Therefore, it is essential that p0300 is checked to ensure it is actually set to 0.
4.3 Collecting motor data

The SINAMICS G110M system is generally delivered as a completely assembled, Inverter, Power Module and motor, but it may be necessary to input specific motor data depending on the requirements of the users application. All the necessary motor data is displayed on the motor rating label as shown in the following example.

![SIMOGEAR motor rating label example](image)

**Commissioning with the Intelligent Operator Panel (IOP)**

When using the basic commissioning wizard on the IOP the user will presented with a screen asking for the motor type (p0300) to be entered. Depending on the value that is input into the IOP, there are two different branches to the commissioning wizard.

**Action 1 (using motor codes):**
1. If 100 or 177 is entered, the user is then presented with the motor code screen (p0301).
2. Entered the relevant code for the motor.
3. The motor data is automatically assigned for the motor.
4. The basic commissioning wizard continues but does not ask for any further motor data to be entered.

**Action 2 (no motor codes):**
1. If 1 is entered (Induction motor), the IOP will automatically set p0301 to 0.
2. The basic commissioning wizard continues and asks for the relevant motor data to be entered during the commissioning process.
4.3 Collecting motor data

1 Matrix code
2 Applied standard
3 Serial No.
   FDU = Siemens AG, Bahnhofstr. 40, 72072 Tübingen, Germany
4 CE marking or other marking, if required
5 Order No.
6 Model - Type - Size
7 Mounting position
8 Degree of protection according to IEC 60034-5 or IEC 60529
9 Weight m [kg]
10 Customer ID
11 Oil quantity [l] main gearbox / intermediate gearbox
12 Type of oil
13 Oil viscosity ISO VG class according to DIN 51519 / ISO 3448
14 Total transmission ratio i

**Frequency 1**
15 Rated frequency f [Hz]
16 Gearbox output speed n2 [rpm]
17 Geared motor output torque T2 [Nm]
18 Service factor fB

**Frequency 2**
19 Rated frequency f [Hz]
20 Gearbox output speed n2 [rpm]
21 Geared motor output torque T2 [Nm]
22 Service factor fB

**Motor data**
23 Phase number and type of current for the motor
24 Temperature class Th.Cl.
25 Symbols (IEC 60617-2): = brake
26 Rated braking torque TBr [Nm]
27 Brake supply voltage U [V]

**Frequency 1**
28 Rated frequency f [Hz]
29 Rated voltage / range U [V]
30 Circuit, graphical symbols according to DIN EN 60617 Part 6 / IEC 60617-6
31 Rated current IN [A]
32 Power factor cos φ
33 Rated power PN [kW], duty type (if ≠ S1)
34 Efficiency class marking according to IEC 60034-30
35 Rated speed nN [rpm]
4.4 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 3-8 SINAMICS G110M CU240M USS terminal diagram (Page 57)
- Figure 3-9 SINAMICS G110M CU240M PROFIBUS terminal diagram (Page 58)
- Figure 3-10 SINAMICS G110M CU240M PROFINET terminal diagram (Page 59).

Figure 4-3 Default wiring of the SINAMICS G110M CU240M USS
### 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

4.5 Factory setting of the inverter control

Switching the motor on and off

The inverter is set in the factory so that after it has been switched on, the motor accelerates 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.

![Diagram of motor switching and reversing](image1)

Switching the motor on and off in the jog mode

For inverters with PROFIBUS interface, operation can be switched over using digital input DI 3. The motor is either switched on and off via PROFIBUS – or operated in the jog mode via its digital inputs.

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

![Diagram of jog mode operation](image2)
4.6 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:

<table>
<thead>
<tr>
<th>Converter pulse frequency</th>
<th>2 kHz</th>
<th>4 kHz and higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole number of the motor</td>
<td>4-pole</td>
<td>4-pole</td>
</tr>
<tr>
<td>Maximum motor speed [rpm]</td>
<td>4980</td>
<td>7200</td>
</tr>
</tbody>
</table>
4.7 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 and Macro 29 is the default setting for the CU240M USS Control Module.

Macro 7 - DI 3 = LOW

<table>
<thead>
<tr>
<th>Fieldbus PROFIBUS or PROFINET</th>
<th>X7.4 DI 0</th>
<th>Command dataset 1 Fault X5.4 DO 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X7.2 DI 1 Command dataset 2 Alarm X5.2 DO 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X8.4 DI 2</td>
<td>Acknowledge</td>
</tr>
<tr>
<td></td>
<td>X8.2 DI 3 LOW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X10.3 AI 0 ---</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X10.4 AI 1 ---</td>
<td></td>
</tr>
</tbody>
</table>

Macro 9 - Motorized potentiometer (MOP)

<table>
<thead>
<tr>
<th>Motorized potentiometer (MOP)</th>
<th>X7.4 DI 0</th>
<th>ON/OFF1 Fault X5.4 DO 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X7.2 DI 1 MOP higher Alarm X5.2 DO 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X8.4 DI 2 MOP lower Acknowledge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X8.2 DI 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X10.3 AI 0 ---</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X10.4 AI 1 ---</td>
<td></td>
</tr>
</tbody>
</table>

Macro 12 - Standard IO with analog setpoint

<table>
<thead>
<tr>
<th>Standard IO with analog setpoint</th>
<th>X7.4 DI 0</th>
<th>ON/OFF1 Fault X5.4 DO 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X7.2 DI 1 MOP higher Alarm X5.2 DO 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X8.4 DI 2 MOP lower Acknowledge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X8.2 DI 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X10.3 AI 0 Setpoint 0V ... 10V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X10.4 AI 1 ---</td>
<td></td>
</tr>
</tbody>
</table>

Two-wire control

<table>
<thead>
<tr>
<th>Method 2</th>
<th>Method 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control command 1</td>
<td>ON/OFF1 right</td>
</tr>
<tr>
<td>Control command 2</td>
<td>ON/OFF1 left</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control command 1</th>
<th>Control command 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON/OFF1 right</td>
<td>ON/OFF1 left</td>
</tr>
</tbody>
</table>

Figure 4-7 Fieldbus communications with Command Dataset selection (default for CU240M DP and CU240M PN)

Figure 4-8 Standard input and output with motorized potentiometer

Figure 4-9 Standard input and output with analog setpoint

Figure 4-10 Two-wire control
### 4.7 p0015 Macros

#### Three-wire control

<table>
<thead>
<tr>
<th>Control command 1</th>
<th>Method 1</th>
<th>Method 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable/Off1</td>
<td>Enable/Off1</td>
<td></td>
</tr>
<tr>
<td>Control command 2</td>
<td>ON left</td>
<td>Reversing</td>
</tr>
<tr>
<td>Control command 3</td>
<td>ON right</td>
<td></td>
</tr>
</tbody>
</table>

- **Figure 4-11** Three-wire control

#### Fieldbus USS

<table>
<thead>
<tr>
<th>Macro 21</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>p2020 = Baud rate</td>
<td>X7.4 DI 0 Control command 1</td>
</tr>
<tr>
<td>p2021 = Fieldbus interface address</td>
<td>X7.2 DI 1 Control command 2</td>
</tr>
<tr>
<td>p2024 = Fieldbus interface times</td>
<td>X6.4 DI 2 Control command 3</td>
</tr>
<tr>
<td>p2025 = Fieldbus interface settings</td>
<td>X6.2 DI 3 Acknowledge</td>
</tr>
<tr>
<td>p2028 = Fieldbus interface COV increment</td>
<td>X10.3 AI 0 Setpoint</td>
</tr>
<tr>
<td>p2030 = Fieldbus interface protocol selection</td>
<td>X10.4 AI 1 -10 V ... 10 V</td>
</tr>
</tbody>
</table>

- **Figure 4-12** USS fieldbus communications

#### Conveyor with two fixed speeds

<table>
<thead>
<tr>
<th>Macro 28</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1001 = Fixed speed 1</td>
<td>X7.4 DI 0 ON/OFF1</td>
</tr>
<tr>
<td>p1001 = Fixed speed 2</td>
<td>X7.2 DI 1 Fixed speed 1</td>
</tr>
<tr>
<td>DI 1 and DI 2 = HIGH:</td>
<td>X6.4 DI 2 Fixed speed 2</td>
</tr>
<tr>
<td>Converter adds together</td>
<td>X6.2 DI 3 Acknowledge</td>
</tr>
<tr>
<td>fixed speed 1 + fixed speed 2</td>
<td>X9.3 DI 4</td>
</tr>
<tr>
<td></td>
<td>X9.2 DI 5</td>
</tr>
<tr>
<td></td>
<td>X10.3 AI 0 ---</td>
</tr>
<tr>
<td></td>
<td>X10.4 AI 1 ---</td>
</tr>
</tbody>
</table>

- **Figure 4-13** Conveyor with two fixed speeds

#### Conveyor with potentiometer and one fixed speed

<table>
<thead>
<tr>
<th>Macro 29</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1001 = Fixed speed 1</td>
<td>X7.4 DI 0 ON/OFF1</td>
</tr>
<tr>
<td></td>
<td>X7.2 DI 1 Fixed speed 1</td>
</tr>
<tr>
<td></td>
<td>X8.4 DI 2 MOP</td>
</tr>
<tr>
<td></td>
<td>X8.2 DI 3 Acknowledge</td>
</tr>
<tr>
<td></td>
<td>X9.3 DI 4</td>
</tr>
<tr>
<td></td>
<td>X9.2 DI 5</td>
</tr>
<tr>
<td></td>
<td>X10.3 AI 0 ---</td>
</tr>
<tr>
<td></td>
<td>X10.4 AI 1 ---</td>
</tr>
</tbody>
</table>

- **Figure 4-14** Conveyor with potentiometer and one fixed speed (default for the CU240M USS)
### 4.8 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.

![DIP Switches location](image)

**Figure 4-15 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 4-16 Removing the Power Module](image)

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.
4.8 Basic Commissioning with DIP switches

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

<table>
<thead>
<tr>
<th>DIP switch</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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 &quot;ON&quot; to operate the motor with the 87 Hz characteristic. Electromechanical (EM) brake - select on if an EM brake is fitted. The final DIP-switch is not used for any function and is not connected.</td>
</tr>
<tr>
<td>2</td>
<td>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</td>
</tr>
<tr>
<td>3</td>
<td>PROFIUS address DIP-switch for use with the PROFIUS and USS variant of the CU240M.</td>
</tr>
</tbody>
</table>

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

Figure 4-17 PROFIBUS address DIP Switch

Example: Set address = 10
### 4.8 Basic Commissioning with DIP switches

#### Commissioning DIP Switch 1

<table>
<thead>
<tr>
<th>Value</th>
<th>DIP switch position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software*</td>
<td></td>
</tr>
<tr>
<td>PTC</td>
<td></td>
</tr>
<tr>
<td>KTYB4</td>
<td></td>
</tr>
<tr>
<td>Temperature switch</td>
<td></td>
</tr>
</tbody>
</table>

*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 4-18  Commissioning DIP Switch 1
4.8 Basic Commissioning with DIP switches

**Figure 4-19 Commissioning DIP Switch 2**

*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.
4.9 Basic commissioning with IOP

Basic commissioning wizard (with P0015)

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

Note

Equipment required to commission system with the IOP

To commission the SINAMICS G110M system using the Intelligent Operator Panel (IOP), the user will require the IOP Hand-held Kit (IOP HHK) and the special optical communications cable. The order details for these items are given below.

- IOP HHK, order number: 6SL3255-0AA00-4HA0
- Optical cable, order number: 3RK1922-2BP00

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

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

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

3. Select the Control Mode for the attached motor.
4. Select the correct Motor Data for your Inverter and attached motor.
   This data is used to calculate the correct speed and displayed values for the application.

5. Select the correct frequency for your Inverter and attached motor.
   The use of the 87 Hz characteristic allows the motor to operate at 1.73 times of its normal speed.
   Note: If the 87 Hz characteristic is select then the user will require to use a Power Module of the next highest power rating. For example, if a 1.5 kW motor is being used, then a 2.2 kW Power Module should be used when utilizing the 87 Hz characteristic.

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

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

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

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

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

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

13. Select the macro that is suitable for your application. Once selected all inputs, outputs, command sources and setpoints will be automatically configured by the software.
14. Set the Minimum Speed at which the attached motor should run.

15. Set the Ramp Up time in seconds.
   This is the time the Inverter/motor system will take from being given the run command, to reaching the selected motor speed.

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

17. A summary of all the settings is displayed.
   If the settings are correct, select Continue.

18. The final screen gives two options:
   - Save settings
   - Cancel Wizard
   If save is selected, a factory reset will be performed then the settings are saved to the Inverter memory. The location of saved data is assigned using the "Parameter saving mode" function in "Parameter settings" in "Menu".
4.10 Basic commissioning with STARTER

STARTER and STARTER screen forms
STARTER is a PC-based tool to commission Siemens inverters. The graphic user interface of STARTER supports you when commissioning your inverter. Most inverter functions are combined in screen forms in STARTER.

The STARTER screen forms that are shown in this manual show general examples. You may therefore find that a screen contains more or fewer setting options than are shown in these instructions. A commissioning step may also be shown using an inverter other than the one you are using.

Overview: Commission the inverter in the online mode
We recommend that you commission the inverter using STARTER in the online mode. STARTER offers two options of going online with an inverter:
- Via the USB interface
- Via PROFIBUS or PROFINET

Precondition
You require the following to commission the inverter using STARTER:
- A pre-installed drive (motor and inverter)
- A computer with Windows XP or Windows 7, on which STARTER V4.3 or higher is installed.

Procedure
Proceed as follows to carry out the basic commissioning of the inverter online using STARTER:
1. Adapt the inverter and PC interfaces:
   - Go online via USB:Adapting the USB interface (Page 84)
   - Go online via PROFINET:
     Configure the communication between inverter and PC.
2. Create a STARTER project.
3. Go online and commission the inverter using the wizards.
   This means that you have completed the basic commissioning.

See also
Download STARTER
Generating a STARTER project (Page 85)
Commissioning using STARTER

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

<table>
<thead>
<tr>
<th>Type</th>
<th>USB</th>
<th>PROFIBUS</th>
<th>PROFINET</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC connected to CU using</td>
<td>USB cable</td>
<td>PROFIBUS interface</td>
<td>PROFINET interface</td>
</tr>
<tr>
<td>Interface</td>
<td>Mini-USB</td>
<td>M12 - 5 pole connector</td>
<td>M12 - 4 pole connector</td>
</tr>
<tr>
<td>Restrictions</td>
<td>-</td>
<td>up to 125 slaves</td>
<td>None</td>
</tr>
</tbody>
</table>

In the following the commissioning via USB is described.

4.10.1 Adapting the USB interface

Procedure

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".

![Accessible nodes](image)

7. Close this screen form without selecting the converter(s) that has/have been found.

8. Create your STARTER project (Page 85).

---

4.10.2 Generating a STARTER project

Creating a STARTER project using project wizards

**Procedure**

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.

![Project Wizard Starter](image)

You have created your STARTER project.

4.10.3 Go online and start wizard for basic commissioning

**Procedure**

Proceed as follows to start the basic commissioning online with the converter:
1. Select your project and go online.
2. Select the device or the devices with which you wish to go online.
3. Download the hardware configuration found online in your project (PG or PC). STARTER shows you which converter it is accessing online and which offline:
   ② The converter is online
   ③ The converter is offline
4. When you are online, double-click on "Control Unit".
5. Start the wizard for basic commissioning.

You are online and have started basic commissioning.
2. Checkmark [ ] Default of the sequence
   Select the default setting of the inverter interfaces.

3. Checkmark [ ] Drive setting
   Select the application for the inverter:
   Low overload for applications that only require a low dynamic performance, e.g. pumps or fans.
   High overload for applications requiring a high dynamic performance, e.g. conveyor systems.

4. Checkmark [ ] Motor
   Select your motor.

5. Checkmark [ ] Motor data
   Enter the motor data according to the rating plate of your motor.
   If you have selected a motor based on its order number, the data has already been entered.

6. Checkmark [ ] Drive functions
   If you have set the "Speed control" control mode, then we recommend setting [1] Identify motor data at standstill and with motor rotating".
   With this setting, the inverter optimizes its speed controller.
   If one of the following cases is applicable, select the setting [2] Identify motor data at standstill":
   - 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.

7. Checkmark [ ] Important parameters
   Set the most important parameters to suit your application.

8. Checkmark [ ] Calculation of the motor
   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.
4.10.4 Identifying motor data

Preconditions

- In the basic commissioning, you have selected the motor identification (MOT ID). In this case, after the basic commissioning has been completed, the converter issues the alarm A07991.

- The motor has cooled down to the ambient temperature.

If the motor is too hot, the motor data identification will provide incorrect values and the closed-loop speed control will become unstable.

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of injury or material damage as a result of machine movements when switching on the motor</td>
</tr>
</tbody>
</table>

Switching on the motor for identification purposes may result in hazardous machine movements.

Secure dangerous machine parts before starting motor data identification:

- Before switching on, check that no parts are loose on the machine or can be spun out.
- Before switching on, ensure that nobody is working on the machine or located within its working area.
- Secure the machine's work area against unintended access.
- Lower hanging/suspended loads to the floor.
Procedure

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

1. Open by double-clicking on the control panel in STARTER.
2. Assume master control for the converter.
3. Set the "Enable signals"
4. Switch on the motor.
   
   The converter starts the motor data identification. This measurement can take several minutes. After the measurement, the converter switches off the motor.
5. Relinquish the master control after the motor data identification.
6. Click the Save (RAM to ROM) button.

You have now completed motor data identification.

Self-optimization of the closed-loop control

If you have also selected a rotating measurement with self-optimization of the speed control in addition to the motor data identification, then you must switch on the motor again as described above and wait for the optimization run to be completed.
4.10.5 Change settings

After the basic commissioning, you can adapt the inverter to your application.

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. 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".
4.10.6 Optimize the drive using the trace function

Description

The trace function is used for inverter diagnostics and helps to optimize the behavior of the drive. Start the function in the navigation bar using "...Control_Unit/Commissioning/Device trace".

In two settings that are independent of one another, using you can interconnect eight signals each. Each signal that you interconnect is active as standard.

You can start a measurement as often as required; the results are temporarily stored (until you exit STARTER) under the "Measurements" tab, together with the date 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 traces in the project or export them in the *.clg format – and if necessary, load or import.

Recording

Recording is performed in a CU-dependent basic clock cycle. The maximum recording duration depends on the number of recorded signals and the trace clock cycle.

You can extend the recording duration by increasing the trace clock cycle by multiplying with an integer factor and then accepting the displayed maximum duration with Alternatively, you can also specify the measurement period and then calculate the trace clock cycle of STARTER using .

Recording individual bits for bit parameters

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

Mathematical function

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

Note

If you use the "record individual bits" or "mathematical functions" option, then this is displayed under signal No. 9.

Trigger

You can create your own start condition (trigger) for the trace. With the factory setting (default setting) the trace starts as soon as you press the button (Start Trace). Using the button you can define another trigger to start the measurement.
Using pretrigger, set the time for the recording before the trigger is set. 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 \[\text{Select}\] select "Trigger to variable - bit pattern"

Using \[\text{Select}\] select the bit parameter

Using \[\text{Select}\] 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 4-20 Bit pattern**

In the example, the trace starts if DI0 and DI3 are high and DI2 is low. The state of the other digital inputs is not relevant for the start of the trace.

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.

- Repeating measurements
  This places the measurements that you wish to perform at different times above one other.

- Arrange the curves in tracks
  This means you define whether the trace of all measured values is displayed with respect to a common zero line – or to separate zero lines.

- Measuring cursor on
  This allows you to analyze the measuring intervals in more detail.

Figure 4-21 Trace dialog box
4.10 Basic commissioning with STARTER
Troubleshooting

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.

Figure 5-1 Status LED locations
**Troubleshooting**

5.1 Status LED overview

**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

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

### Table 5-2 Description of PROFIBUS communications LED

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

### Table 5-3 Description of PROFINET communications LED

<table>
<thead>
<tr>
<th>PROFINET LED</th>
<th>Description of function</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNK - On</td>
<td>Link is active</td>
</tr>
<tr>
<td>LNK - Off</td>
<td>Link inactive with no data being transferred</td>
</tr>
</tbody>
</table>