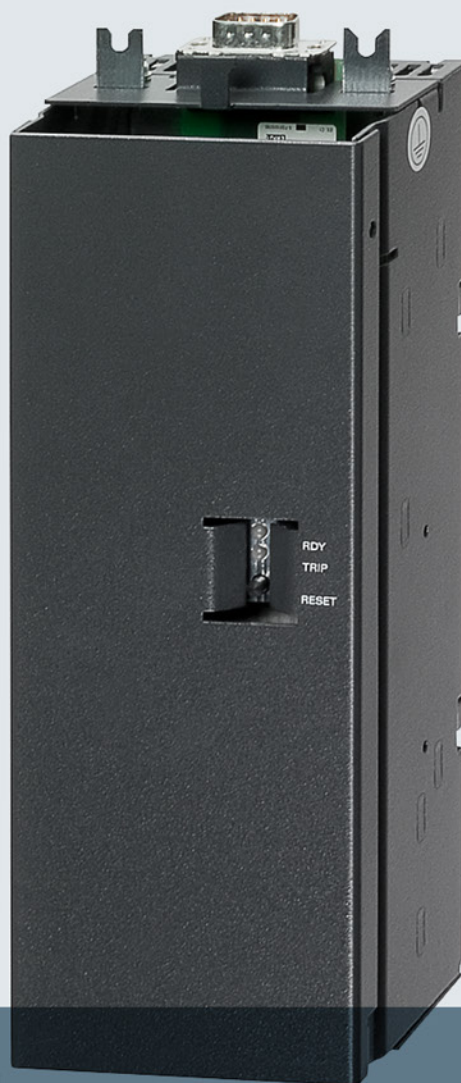


**SIEMENS**



# SINAMICS

## SINAMICS G120

Chemical industry module CM240NE with CU250S-2 DP

Operating Instructions

Edition

03/2014

Answers for industry.



# SIEMENS

## SINAMICS

### SINAMICS G120 Chemical industry module CM240NE with CU250S-2 DP

#### Operating Instructions




<u>Fundamental safety instructions</u>	<b>1</b>
<u>Introduction</u>	<b>2</b>
<u>Description</u>	<b>3</b>
<u>Assembling</u>	<b>4</b>
<u>Connecting</u>	<b>5</b>
<u>Operation (hardware)</u>	<b>6</b>
<u>Commissioning the chemical industry inverter</u>	<b>7</b>
<u>Functions</u>	<b>8</b>
<u>Technical data</u>	<b>9</b>
<u>Dimension drawings</u>	<b>10</b>
<u>Accessories</u>	<b>11</b>
<u>Appendix</u>	<b>A</b>
<u>List of abbreviations</u>	<b>B</b>

Valid for: SINAMICS G120 as of firmware version 4.6

## 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.

 <b>DANGER</b>
indicates that death or severe personal injury <b>will</b> result if proper precautions are not taken.
 <b>WARNING</b>
indicates that death or severe personal injury <b>may</b> result if proper precautions are not taken.
 <b>CAUTION</b>
indicates that minor personal injury can result if proper precautions are not taken.
<b>NOTICE</b>
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:

 <b>WARNING</b>
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

<b>1</b>	<b>Fundamental safety instructions</b> .....	<b>7</b>
1.1	General safety instructions .....	7
1.2	Safety instructions for electromagnetic fields (EMF) .....	10
1.3	Handling electrostatic sensitive devices (ESD) .....	11
1.4	Industrial security .....	11
1.5	Residual risks of power drive systems .....	12
<b>2</b>	<b>Introduction</b> .....	<b>15</b>
2.1	Terms and definitions .....	15
2.2	Documents for the chemical industry inverter .....	16
2.3	Product support .....	17
<b>3</b>	<b>Description</b> .....	<b>19</b>
3.1	The chemical industry inverter .....	19
3.2	The chemical industry module .....	21
<b>4</b>	<b>Assembling</b> .....	<b>23</b>
<b>5</b>	<b>Connecting</b> .....	<b>25</b>
5.1	Interfaces of the chemical industry module .....	25
5.1.1	Overview .....	25
5.1.2	Description .....	26
5.2	Interfaces of the CU250S-2 DP .....	29
5.3	Connecting the CM to the CU .....	31
5.4	Grounding the chemical industry module .....	34
5.5	Connecting the field-side signals to the CM .....	35
5.6	24V supply voltage protection .....	36
5.7	Connecting PROFIBUS DP .....	36
<b>6</b>	<b>Operation (hardware)</b> .....	<b>37</b>
6.1	Operator control elements .....	37
6.2	Display elements .....	38
<b>7</b>	<b>Commissioning the chemical industry inverter</b> .....	<b>39</b>
7.1	Commissioning information .....	39
7.2	Configuring the CU .....	40
7.3	Commissioning the basic unit .....	41
7.3.1	Preparation .....	41

7.3.2	Activating the free function blocks .....	48
7.4	Commissioning using the Drive Wizard .....	52
7.5	Commissioning with script file .....	59
7.6	Notes on Safety Integrated .....	67
<b>8</b>	<b>Functions</b> .....	<b>69</b>
8.1	Analog value de-coupling .....	69
8.2	Thermal motor protection .....	69
<b>9</b>	<b>Technical data</b> .....	<b>73</b>
<b>10</b>	<b>Dimension drawings</b> .....	<b>77</b>
<b>11</b>	<b>Accessories</b> .....	<b>79</b>
<b>A</b>	<b>Appendix</b> .....	<b>81</b>
A.1	Function overview of the NAMUR_G120_V3_xx script .....	81
A.2	Electromagnetic compatibility .....	82
A.2.1	General .....	82
A.2.2	Overall EMC behavior .....	83
A.3	Standards .....	84
A.4	ATEX application .....	86
A.4.1	Introduction .....	86
A.4.2	Marking .....	86
A.4.3	Installation .....	88
A.4.3.1	Inverters for explosion-protected motors in hazardous zones .....	88
A.4.3.2	Explosion-protected motors in hazardous zones .....	89
A.4.4	Safe commissioning .....	90
<b>B</b>	<b>List of abbreviations</b> .....	<b>95</b>
	<b>Glossary</b> .....	<b>97</b>
	<b>Index</b> .....	<b>99</b>

# Fundamental safety instructions

## 1.1 General safety instructions



### **DANGER**

#### **Danger to life due to live parts and other energy sources**

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

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

Generally, six steps apply when establishing safety:

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

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



### **WARNING**

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

Touching live components can result in death or severe injury.

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



**! WARNING**

**Danger to life when live parts are touched on damaged devices**

Improper handling of devices can cause damage.

For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

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



**! WARNING**

**Danger to life through electric shock due to unconnected cable shields**

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

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



**! WARNING**

**Danger to life due to electric shock when not grounded**

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

- Ground the device in compliance with the applicable regulations.



**! WARNING**

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

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

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

**! WARNING**

**Danger to life due to fire spreading if housing is inadequate**

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

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



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

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

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

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

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

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

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

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

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

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

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

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

**NOTICE**

**Device damage caused by incorrect voltage/insulation tests**

Incorrect voltage/insulation tests can damage the device.

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



**WARNING**

**Danger to life when safety functions are inactive**

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

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

**Note**

**Important safety notices for Safety Integrated functions**

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

## 1.2 Safety instructions for electromagnetic fields (EMF)



**WARNING**

**Danger to life from electromagnetic fields**

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

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

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

## 1.3 Handling electrostatic sensitive devices (ESD)

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



### NOTICE

#### Damage through electric fields or electrostatic discharge

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

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g. conductive foam rubber 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 products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

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

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

 **WARNING**

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

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

- Keep the software up to date.  
You will find relevant information and newsletters at this address (<http://support.automation.siemens.com>).
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.  
You will find further information at this address (<http://www.siemens.com/industrialsecurity>).
- Make sure that you include all installed products into the holistic industrial security concept.

## 1.5 Residual risks of power drive systems

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

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

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

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

1. Unintentional movements of driven machine components during commissioning, operation, maintenance, and repairs caused by, for example,
  - Hardware and/or software errors in the sensors, control system, actuators, and cables and connections
  - Response times of the control system and of the drive
  - Operation and/or environmental conditions outside the specification
  - Condensation/conductive contamination
  - Parameterization, programming, cabling, and installation errors
  - Use of wireless devices/mobile phones in the immediate vicinity of the control system
  - External influences/damage

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

Inverters of the Open Type/IP20 degree of protection must be installed in a metal control cabinet (or protected by another equivalent measure) such that contact with fire inside and outside the inverter is not possible.
3. Hazardous shock voltages caused by, for example,
  - Component failure
  - Influence during electrostatic charging
  - Induction of voltages in moving motors
  - Operation and/or environmental conditions outside the specification
  - Condensation/conductive contamination
  - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly

---

**Note**

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

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

---

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



# Introduction

## 2.1 Terms and definitions

### Chemical industry module (CM)

The CM240NE chemical industry module is a supplementary module for the SINAMICS G120 inverter with the following features:

- Isolated PTC thermistor connection (motor side) with PTC thermistor evaluation
- NAMUR terminal strip according to NE 37

### Chemical industry inverter

The chemical industry inverter is a combination of the chemical industry module with components from the SINAMICS G120 series of inverters, which provide safety-oriented functions.

Table 2- 1 Configurations of the chemical industry module

Voltage range	Configuration
500 V to 690 V	CM240NE + PM260 + CU250S-2 DP
400 V	CM240NE + PM250 + CU250S-2 DP + LC filter
400 V	CM240NE + PM240 + CU250S-2 DP + LC filter + line reactor

### NAMUR

NAMUR is an association of automation technology users in the process industry. The association issues recommendations that are designated with "NE xx".

### NE 37

NAMUR recommendation NE37 "Inverter version - standard terminal strip for variable-speed drives" describes the special arrangement of the terminal strips.

## 2.2 Documents for the chemical industry inverter

### Technical documentation that is available for installation, commissioning, and operation

The following document classes are available for SINAMICS inverters:

- Getting Started Sufficient for commissioning simple applications with STARTER
- Operating Instructions Standard reference with detailed information for commissioning
- Hardware Installation Manual Description of the Power Module installation
- List Manual Description of the settings and display parameters - drive know-how is required

### Useful Internet addresses for SINAMICS inverters

- Information and support tools:  
<http://support.automation.siemens.com>
- Documentation and application examples for SINAMICS G120:  
<http://www.siemens.com/sinamics-g120>
- SINAMICS G inverter, Safety Integrated for first-time users:  
<http://support.automation.siemens.com/WW/view/de/80561520>
- Safety Integrated Function Manual, SINAMICS G120, G120C and G120D:  
<http://support.automation.siemens.com/WW/view/de/70235827>

### Documentation for the components used in the chemical industry inverter

#### Hardware Installation Manual

SINAMICS G120 PM260 Power Module

SINAMICS G120 PM250 Power Module

SINAMICS G120 PM240 Power Module

#### Operating Instructions

SINAMICS G120 Inverter with CU250S-2 Control Units (Vector)

SINAMICS G120 CM240NE Chemical Industry Module

#### List Manual

SINAMICS G120 CU250S-2 Control Unit

#### Getting Started

SINAMICS G120 Power Module

SINAMICS G120 CU250S-2 Control Units



## 2.3 Product support

Table 2- 2 Technical support

France	Germany	Italy	Spain	Great Britain
+33 (0) 821 801 122	+49 (0)911 895 7222	+39 (02) 24362000	+34 902 237 238	+44 161 446 5545
Other service telephone numbers: Product support ( <a href="http://support.automation.siemens.com/WW/view/en/4000024">http://support.automation.siemens.com/WW/view/en/4000024</a> )				



## Description

### 3.1 The chemical industry inverter

#### Design

The chemical industry inverter comprises the SINAMICS G120 series of inverters and the chemical industry module.

The CU250S-2 DP (vector) is used as Control Unit. This is a CU with integrated safety-oriented functions and PROFIBUS DP interface.

The following Power Module versions are used:

- PM240 Power Module with DC braking function, 400 V line supply voltage
- PM250 Power Module with energy recovery capability, 400 V line supply voltage
- PM260 Power Module with energy recovery capability, 500 - 690 V line supply voltage

Depending on the power unit, additional components may be necessary to complete the system.

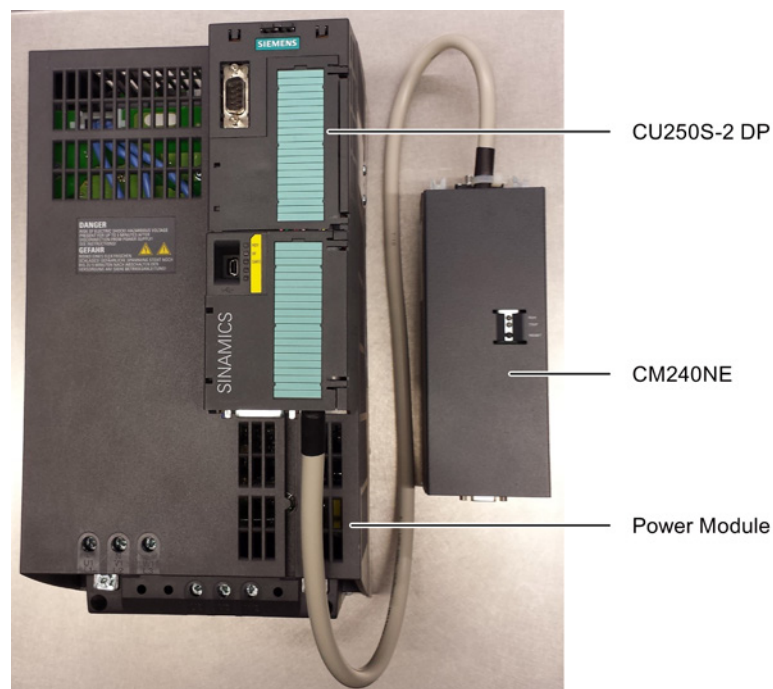


Figure 3-1 Chemical industry inverter (example)

---

**Note**

The chemical industry module requires an external 24 V power supply. The power is not supplied by the inverter.

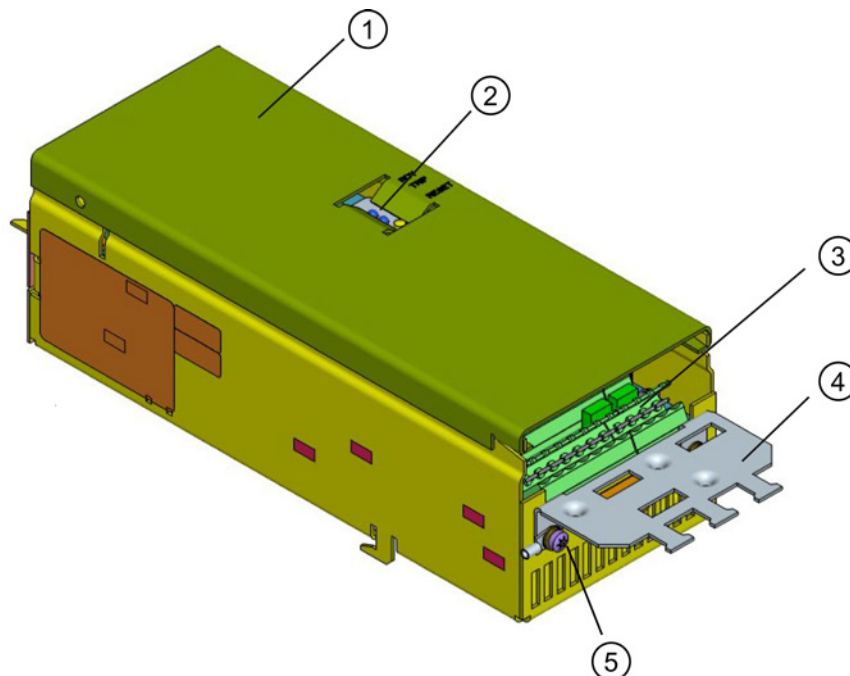
---

**Characteristics**

- Compact, modular inverter
- A series of inverters for the complete voltage (400 V to 690 V) and power range
- Isolated analog values in the chemical industry module (1 setpoint / 2 measured values)
- Isolated binary inputs and outputs in the CU
- Protective separation of the motor sensor cable with respect to the enclosure and other connections using reinforced insulation of the creepage and clearances (rated impulse voltage 12 kV) according to EN 60664-1
- Certified power disconnection (94/9/EC, ATEX) of the inverter without line contactor
- Terminal strip according to NE37 (2010)
- The integrated or external LC filter permits non-shielded motor cables up to 300 m, shielded motor cables are possible up to 200 m
- Special features of the PM250 and PM260:
  - A line reactor is not required
  - A braking resistor is not required
  - PM260 has an integrated LC filter
  - Favorably-priced, integrated energy recovery allows energy saving
- The standard pulse frequency of 16 kHz, the integrated LC filter for the PM260 and the fact that there is no line reactor permit quiet operation of the motors and inverters
- The integrated extended safety functions are used. A license is required for this purpose. The license can be ordered with the CompactFlash card (<http://support.automation.siemens.com/WW/view/en/77498613>)

## 3.2 The chemical industry module

The chemical industry module is an essential component of the chemical industry inverter.



- ① Cover
- ② Operator control and display elements
- ③ Interfaces (NE37, on the field side)
- ④ Shield plate
- ⑤ Ground connection

Figure 3-2 Chemical industry module

### Functions

- Thermal motor protection (TMP) using the the PTC thermistor integrated in the motor (incl. protective separation)
- Electrical isolation of the analog values (MW1 to 3)
- Provision of the NAMUR interface (-X2; -X3)

Block diagram

The functionality of the chemical industry module in the chemical industry inverter is shown in a simplified form in the following block diagram.

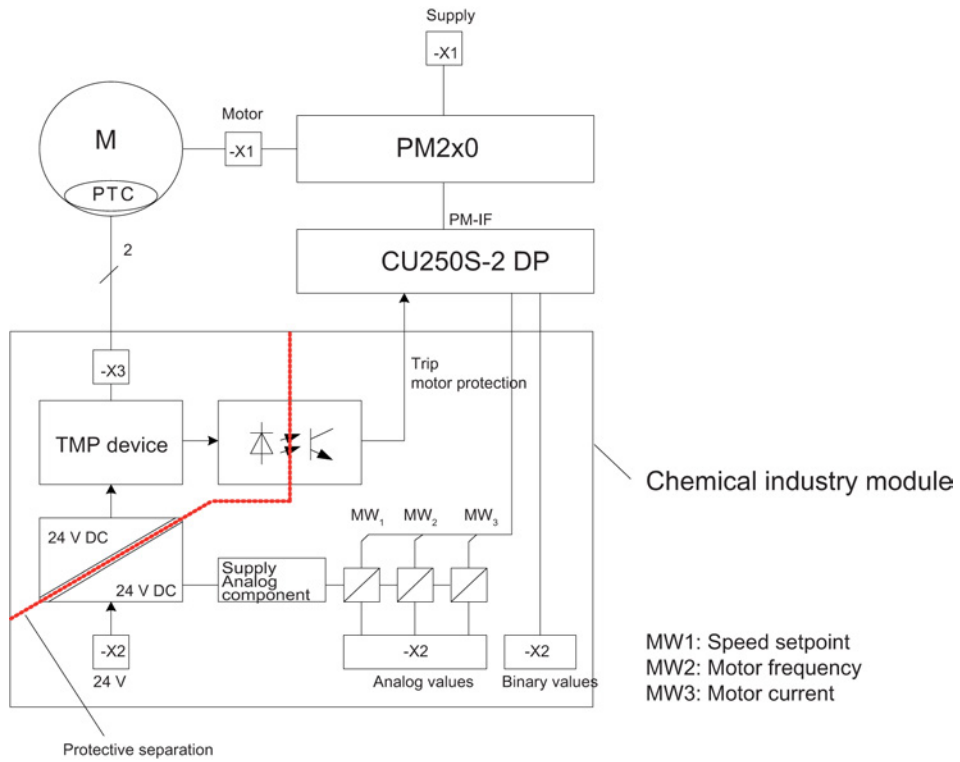


Figure 3-3 Block diagram of the chemical industry inverter

## Assembling

### Requirement

The rail adapter is screwed to the lower side of the CM using the screw (M3x6) provided in the mounting kit.

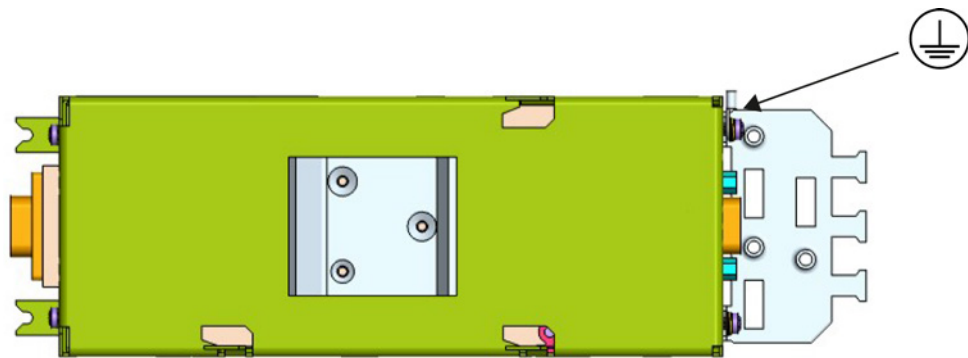


Figure 4-1 Rail mounting

### NOTICE

Only the original parts (mounting rail adapter) and the supplied screws may be used.

### Tools required

Torx screwdriver to screw on the mounting rail adapter.

Tightening torque: 0.6 Nm

## **Procedure**

Locate the chemical industry module on a mounting rail according to EN 50022 and snap into place.

---

### **Note**

The extended cable harness of the mounting kit should be used for the CM/CU connection.

When using a Power Module of size FSGx, the cable harness of the mounting kit must be appropriately extended in the electrical cabinet using individual conductors having the same cross-section. The screw terminals must be tightened with 0.25 Nm.

The grounding cable must be screwed to the position marked on the CM housing and connected to ground potential.

PROFIBUS can be directly connected to the CU.

---

## **See also**

Grounding the chemical industry module (Page 34)

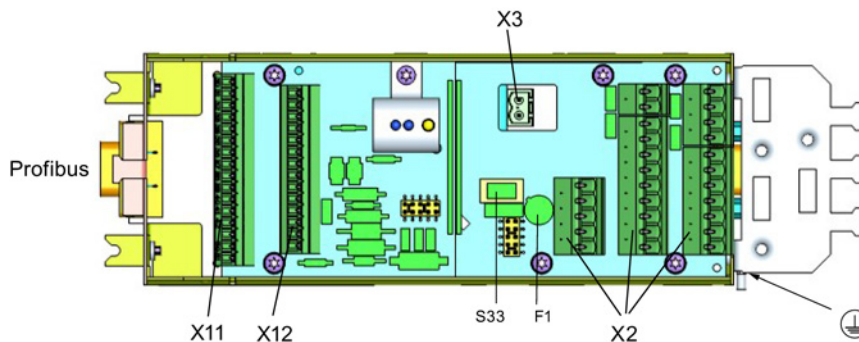


## Connecting

### 5.1 Interfaces of the chemical industry module

#### 5.1.1 Overview

The following interfaces are available at the chemical industry module:



- F1                      Fuse
- S33                     Commissioning switch

Figure 5-1 Interfaces at the CM

Table 5- 1 Interfaces at the CM

Designation	Description
Profibus	9-pin Sub-D connector or socket to connect Profibus
X11 and X12	Parallel connection between the CM and the CU
X2	Terminal strip in accordance with NAMUR recommendation NE37 (2.5 mm <sup>2</sup> screw terminals) <ul style="list-style-type: none"> <li>• General terminals</li> <li>• Binary inputs and outputs</li> <li>• Analog inputs and outputs</li> </ul>
X3	Terminal strip in accordance with NAMUR recommendation NE37 (2.5 mm <sup>2</sup> screw terminals) to connect the motor temperature sensor
⊕	Ground

### 5.1.2 Description

#### Connection diagram

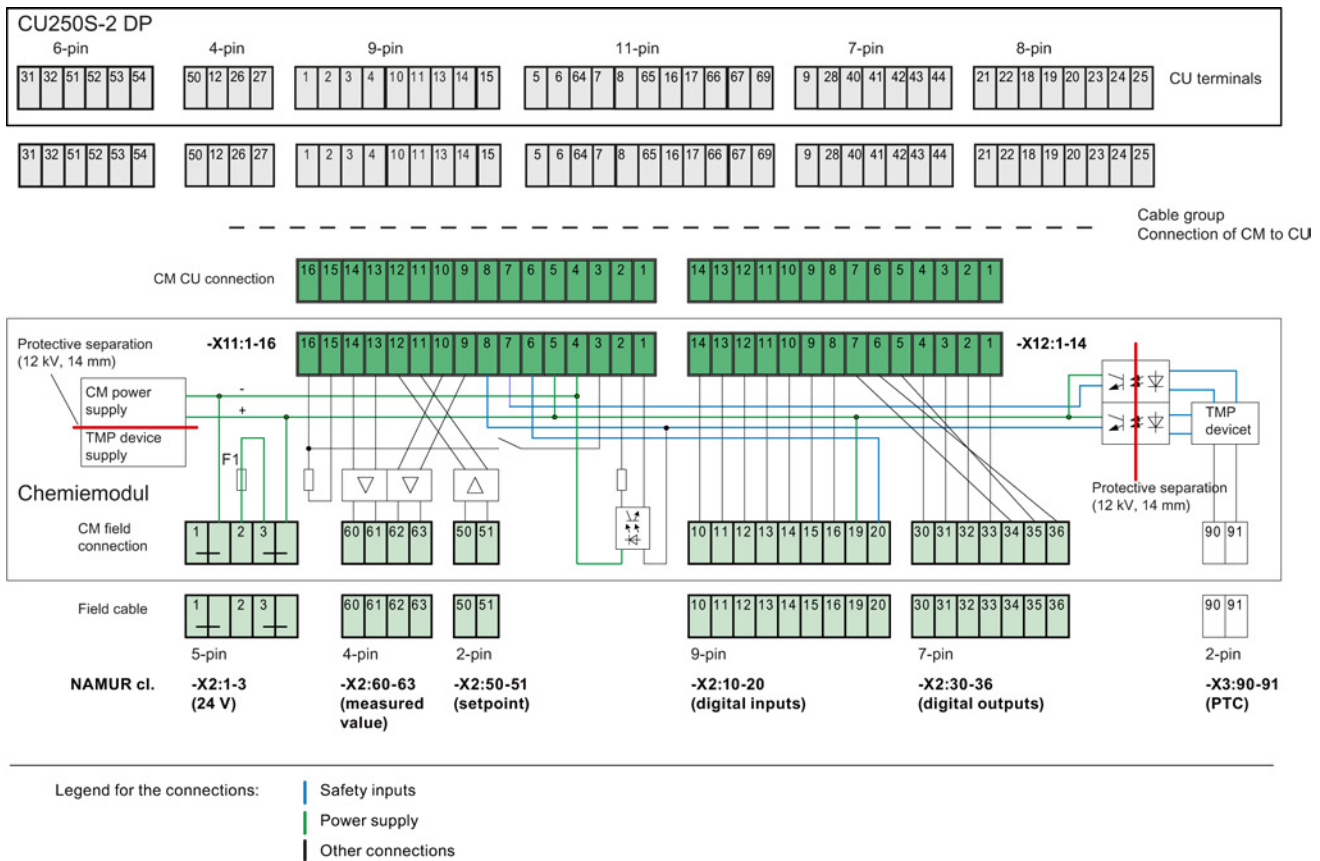


Figure 5-2 Connection diagram

**Assignment of the X11 and X12 terminal assignment to the terminals of the CU250S-2 DP**

The assignment of the CM terminals to the CU terminals is implemented with the appropriate wiring in the cable group.

X11	CU250S-2 DP		X12	CU250S-2 DP
1	15		1	25
2	14		2	24
3	1		3	22
4	28 and 32		4	21
5	31		5	20
6	7 and 8		6	19
7	6		7	18
8	5		8	-
9	27		9	43
10	26		10	42
11	11		11	41
12	10		12	67
13	13		13	17
14	12		14	16
15	2 and 4			
16	3			

**Terminal assignment, X2 and X3**

The assignment of terminals X2 and X3 is orientated to NAMUR recommendation NE37 (2010).

Table 5- 2 Terminal assignment, X2

Terminal	
1	GND 24 VDC
2	+24 VDC
3	+24 VDC Si
10	On [dyn], on/off [stat] (digital input)
11	Off [dyn] (digital input)
12	Faster (digital input)
13	Slower (digital input)
14	Reset (digital input)
15	Interlocking (digital input)
16	Counter-clockwise rotation (optional)
19	Forced inverter inhibit (safe digital input, closed-circuit principle)
20	Forced inverter inhibit (safe digital input, closed-circuit principle)
30	Ready for operation (digital output)
31	Ready for operation (digital output)
32	Motor rotates (digital output)
33	Motor rotates (digital output)
34	Fault, NC contact (digital output)
35	Fault, common (digital output)
36	Fault, NO contact (digital output)
50	+ speed (setpoint 0/4-20 mA)
51	- speed (setpoint 0/4-20 mA)
60	+ motor frequency (measured value 0/4-20 mA)
61	- motor frequency (measured value 0/4-20 mA)
62	+ motor current (measured value 0/4-20 mA)
63	- motor current (measured value 0/4-20 mA)

Table 5- 3 Terminal assignment X3

Terminal	
90	Temperature sensor (PTC+)
91	Temperature sensor (PTC-)

**See also**

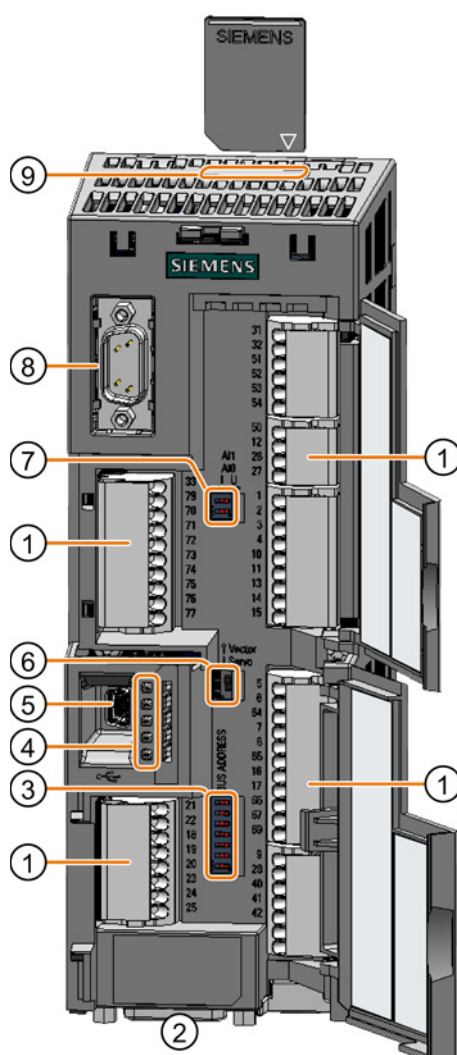
Connecting the field-side signals to the CM (Page 35)

24V supply voltage protection (Page 36)

## 5.2 Interfaces of the CU250S-2 DP

### Interfaces at the front of the Control Unit

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



- ① Memory card slot
- ② Connection to the Operator Panel
- ③ Switch for analog inputs

I 0/4 mA ... 20 mA

U -10/0 V ... 10 V



- ④ Terminal strips
- ⑤ Selecting the control mode

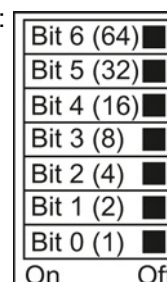


- ⑥ USB interface for connection to a PC
- ⑦ Status LED

RDY  
 BF  
 SAFE  
 LNK1, only for PROFINET  
 LNK2, only for PROFINET

- ⑧ Selecting the fieldbus address:

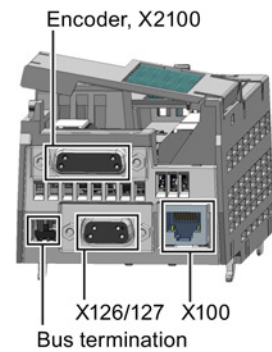
- PROFIBUS
- USS
- Modbus RTU
- CanOpen



### Interfaces at the lower side of the CU250S-2 DP

5.2 Interfaces of the CU250S-2 DP

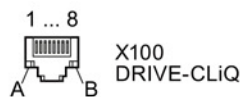
	9	15	X2100 Encoder	Motor temperature, KTY84 or PTC	HTL	TTL	SSI (RS422 standard)
	1	8					
1	Positive		X	---	---	---	---
2	Clock +		---	---	---	---	X
3	Clock -		---	---	---	---	X
4	Power supply, in relation to pin 7		---	X	X	X	X
5	Power supply, in relation to pin 7		---	X	X	X	X
6	P_Sense, sense input for the power supply		---	---	---	X	---
7	GND, reference potential for pins 4 and 5		---	X	X	X	X
8	Negative		X	---	---	---	---
9	M_Sense, sense input, GND		---	---	---	X	---
10	Z +		---	X	X	---	---
11	Z -		---	X	X	---	---
12	B -		---	X	X	---	---
13	B +		---	X	X	---	---
14	A - / data -		---	A -	A -	Data -	
15	A + / data +		---	A +	A +	Data +	



Bus termination



- 1 ---
- 2 M Reference potential for P24\_Serv
- 3 RxD/TxD-P receive and transmit (B/B')
- 4 CNTR-P control signal
- 5 GND reference potential for data (C/C')
- 6 + 5 V power supply
- 7 P24\_Serv
- 8 RxD/TxD-N receive and transmit (A/A')
- 9 ---



- 1 Transmit data +
- 2 Transmit data -
- 3 Receive data +
- 4 ---
- 5 ---
- 6 Receive data -
- 7 ---
- 8 ---
- A + 24 V power supply, max. 450 mA
- B M, reference potential for power supply

Terminal strips

The connection between the CM and CU is established via the terminal strips.

## 5.3 Connecting the CM to the CU

In order to connect the CU and CM, the front doors must be opened on the CU and the terminal cover removed on the CM.

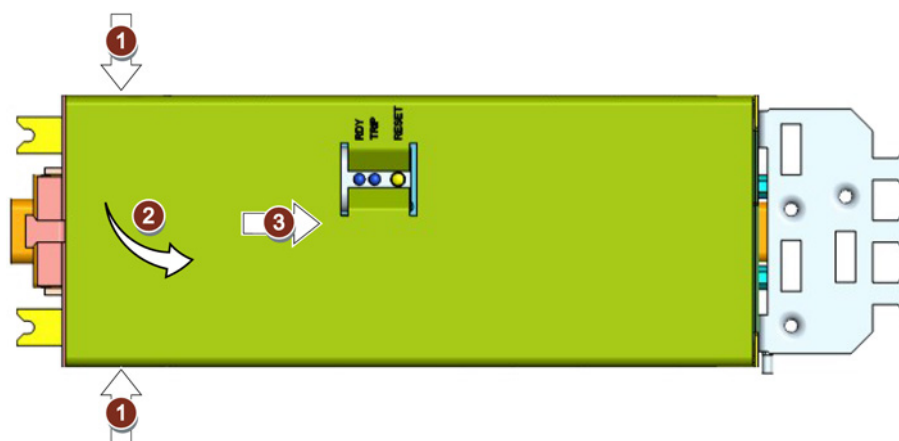


Figure 5-3 Removing the CM terminal cover

### Connecting the long cable harness

The CM is connected to the CU using the long cable harness included in the supplementary kit.

The following should be noted:

- Insert connector strips X12 and X11 into the CM

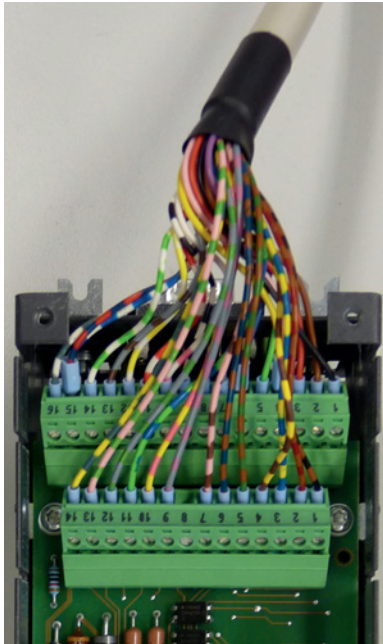


Figure 5-4 Inserting the cable harness into the CM

- Attach the strain relief (attach the cable harness to the strain relief provided using a cable tie)

---

**Note**

The cable harness insulation must extend up to the CM housing.

---

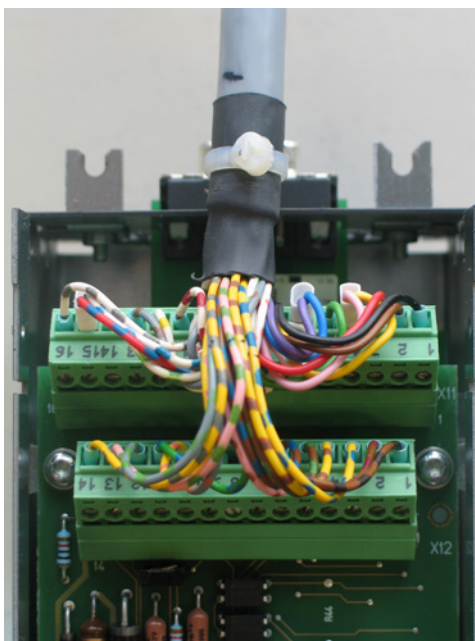


Figure 5-5 Strain relief





## 5.4 Grounding the chemical industry module

The CM is grounded depending on its mounting.

---

### Note

Only the CM base is grounded. All other metallic parts have protective separation with areas under voltage.

---

### Rail mounting

For rail mounting, it is absolutely necessary to connect a grounding cable ( $\geq 2.5 \text{ mm}^2$  green/yellow). The protective conductor is connected at the retaining screw of the shield plate as marked. The other end of the grounding cable should be connected to the ground potential of the electrical equipment.

It is recommended to use an insulated ring cable lug M3 for a conductor cross-section of  $2.5 \text{ mm}^2$ .

The protective conductor connection must be tightened to a torque of 0.8 - 1.0 Nm and suitable measures must be applied so that it cannot become loose.

<b>NOTICE</b>
---------------

The protective conductor connection must be periodically checked within the scope of the actual regulations (BGV A3 check).
---

## 5.5 Connecting the field-side signals to the CM

The CM is connected on the field side via terminal strips X2 and X3. The terminals are marked according to NAMUR recommendation NE 37.

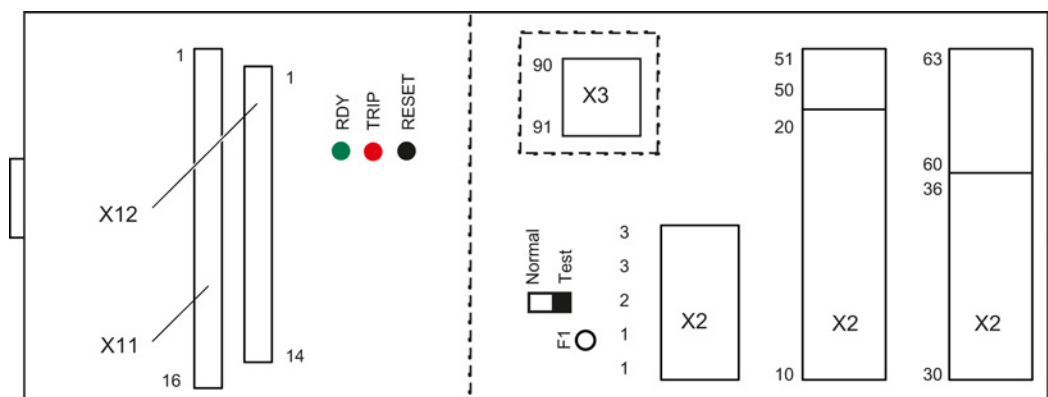


Figure 5-7 Overview of the terminal strips

### Procedure

- Remove the CM cover
- Connect and observe the following:
  - Tightening torque of the connecting terminals: 0.5 to 0.6 Nm
  - Maximum cable cross-section: 2.5 mm<sup>2</sup>
  - Maximum cable length 30 m for analog and digital cables (X2: 10-20; 30-36; 50-51; 60-63)
- Re-attach the terminal cover.

### Note

When connecting the temperature sensor to X3, the safety instructions from Chapter "Safety instructions, in operation" should be observed.

### See also

Description (Page 26)

## 5.6 24V supply voltage protection

The fuse is located close to the X2 terminals and is accessible under the CM cover. This is marked with F1 (type MST250).

### See also

Description (Page 26)

## 5.7 Connecting PROFIBUS DP

The function of the PROFIBUS DP interface is to establish a connection between inverters of the SINAMICS G120 product series and a higher-level automation system, e.g. SIMATIC S7 based on PROFIBUS DP.

Technical specifications and measures to establish the connection should be taken from the CU250S-2 DP (Vector) Operating Instructions. The rules and notes of the points described in the CU250S-2 DP (Vector) Operating Instructions apply.

D-sub connector or socket of the CM remains unconnected.

## Operation (hardware)

### 6.1 Operator control elements

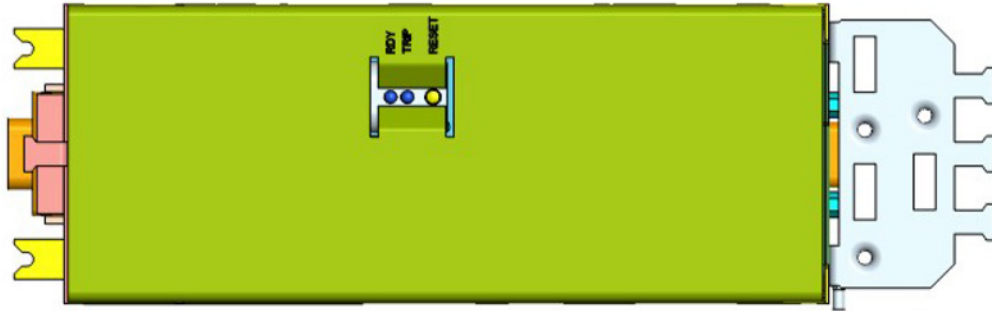


Figure 6-1 Operator control and display elements

#### TMP acknowledgement "RESET"

For the TMP function, the CM has the "RESET" button for acknowledgement. If tripped by an excessively hot motor, wire breakage or short-circuit of the sensor cable, after the fault has been removed or the motor has cooled down, the trip must be locally acknowledged, i.e. at the CM. This means that the inverter is brought into the fault-free state.

A trip also remains even if the supply voltage temporarily fails (24 V). The device (CM) operates in a non-volatile fashion.

A self-test is initiated if the button is kept pressed for longer than 2 s (this simulates a motor trip via the PTC thermistor).

#### Commissioning change-over switch "normal test"

"S33" slide switch is located under the CM cover and is used to change over between the "Normal" and "Test" operating modes.

The "Normal" operating mode allows the inverter to either be operated via PROFIBUS or terminals.

In the "Test" operating mode, the chemical industry inverter can be commissioned and/or locally controlled with the aid of an HMI device.

#### See also

Thermal motor protection (Page 69)

## 6.2 Display elements

### TMP display elements

Two LEDs are provided at the front of the device to display the operating states.

Table 6- 1 Operating states

Labeling	Color	Meaning
RDY	Green	Ready
TRIP	Red	Tripped

The green LED signals that the TMP function in the CM is ready. The state of the fuse is also indirectly displayed using this LED (displays a tripped fuse or if the 24 VDC is missing, LED off).


The red LED indicates that the TMP function has responded (the motor is too hot). Short-circuit and wire breakage are also monitored. In the case of a short-circuit in the sensor circuit of the PTC thermistor, the red LED flickers at approx. 4 Hz. For a wire breakage, it flashes at approx. 1 Hz.

# Commissioning the chemical industry inverter

## 7.1 Commissioning information

### General

Only the special features and issues when commissioning the chemical industry inverter are described in this chapter. It is based on the SINAMICS G120 documentation.

 <b>CAUTION</b>
--

An emergency stop button must be located close by so that in the case of danger it can be used to initiate a pulse inhibit. The effectiveness of the emergency stop function should be checked before starting commissioning.
---

The STARTER commissioning program is unsuitable for disconnecting the unit in the case of danger.
---

### Parameterizing the CM

The chemical industry module does not have to be parameterized. Parameterization is realized via the CU.

### Parameterizing the CU

The CU250S-2 DP (vector) must be parameterized when used in the chemical industry inverter. For parameterization using STARTER, a basic configuration (functions according to NE 37) are available in a script. This parameterization file can be obtained from the Product Support:

<http://support.automation.siemens.com/WW/view/de/30814192>

### Commissioning requirement

1. The components of the chemical industry inverter have been mounted and connected.
2. The script file for parameterizing using STARTER is available.
3. The operating voltage is present.
4. The extended safety license is activated.
5. STARTER is installed on your PC.

### Commissioning procedure

The chemical industry inverter is commissioned in four main steps.

The following sequence must be maintained:

1. Configuration of the CU250S-2 DP
2. Commissioning of the basic unit (preparatory measures)
3. Commissioning using the drive wizard (drive configuration with STARTER)
4. Commissioning with script (parameterizing the CU that matches CM using STARTER)
5. Commissioning of the extended safety functions

The steps described in these instructions refer to the first drive data set (DDS 0).

## 7.2 Configuring the CU

The chemical industry inverter is configured by making the appropriate settings at the CU250S-2 DP (vector). DIP switches are on the front of the CU that can be set appropriately.

### DIP switches for analog inputs of the CU250S-2 DP (vector)

DIP switches AI0 and AI1 **must be set to "U"** (0 ... 10 V).



Figure 7-1 Switch for analog inputs

### DIP switch for selecting the control mode

The switch must be set to the "Vector" control mode.

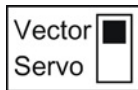


Figure 7-2 Switch for setting the control mode



## 7.3 Commissioning the basic unit

### 7.3.1 Preparation

The STARTER commissioning tool (as of Version 4.3.2.0) which is installed on the PC, is used for commissioning. The PC is connected to the CU via the PC connection kit (order number 6SL3255-0AA00-2CA0) and the communications interface is selected.



Figure 7-3 Connection using the PC connection kit

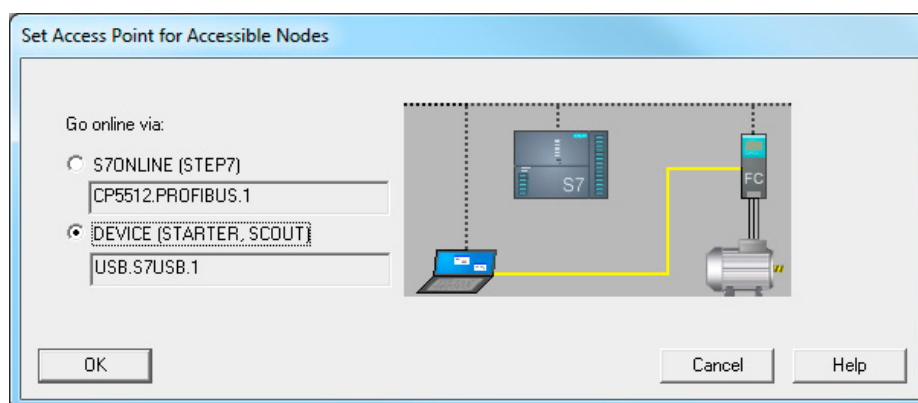


Figure 7-4 Setting a connection

A STARTER project for the chemical industry inverter (SINAMICS G120; drive unit CU250S-2 DP (vector); power unit PM...) has been created and called.

#### Note

Please refer to the CU250S-2 Control Unit Operating Instructions for detailed information about commissioning with STARTER and the configuration when using PROFIBUS.

### Searching for an accessible node

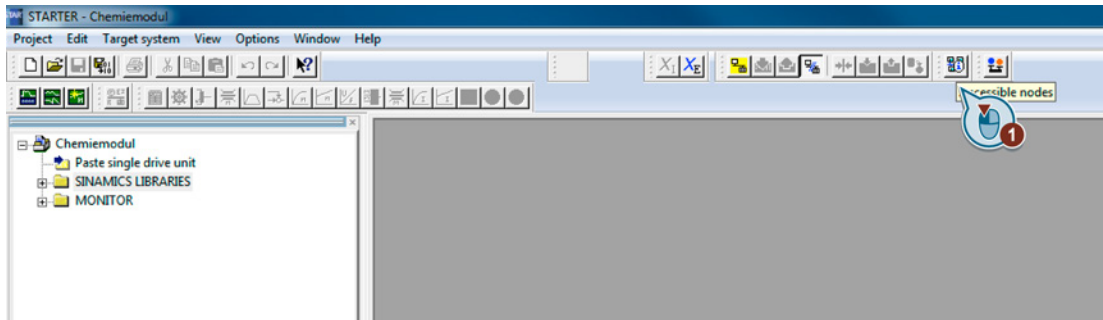


Figure 7-5 Search for a node

### Selecting and accepting the drive unit

- Select the drive unit (activate the checkbox ①) and then accept ②).

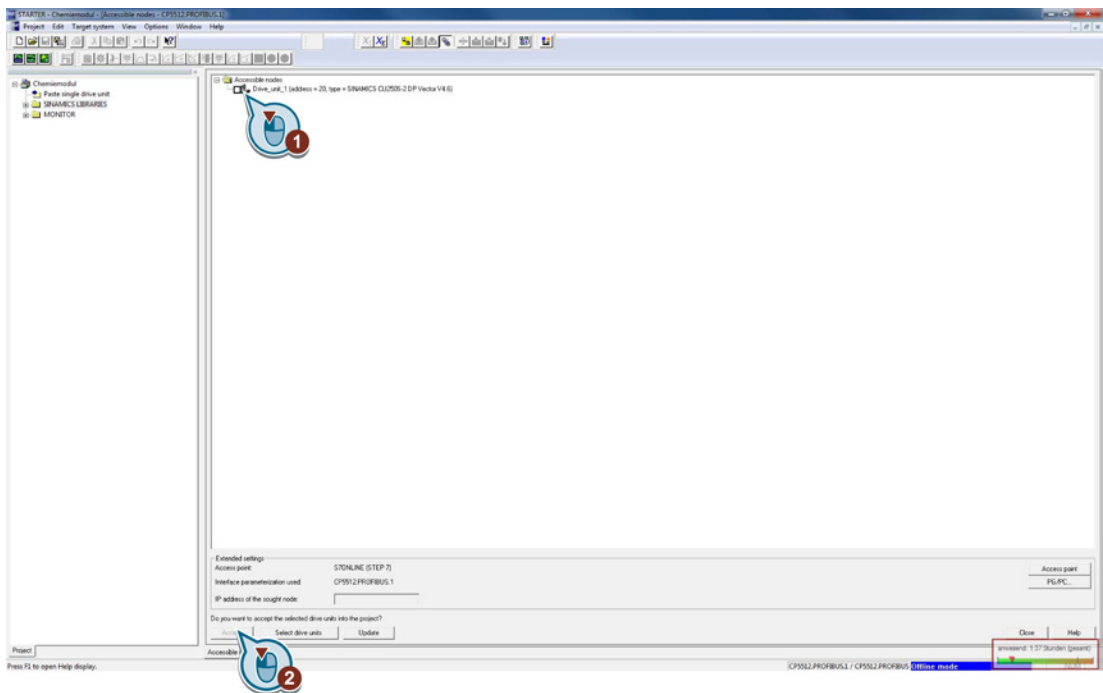


Figure 7-6 Selecting the drive unit

- Close the dialog box. The drive unit is inserted in the STARTER project.

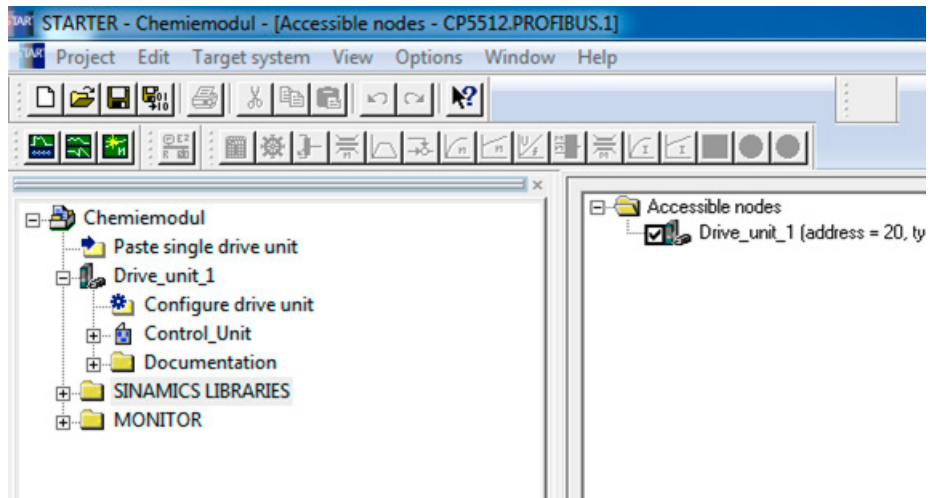


Figure 7-7 Node created

- Close the "Accessible Nodes" window.

### Establishing an online connection

The connection to the selected drive unit is established via the "Connect to target device" button.

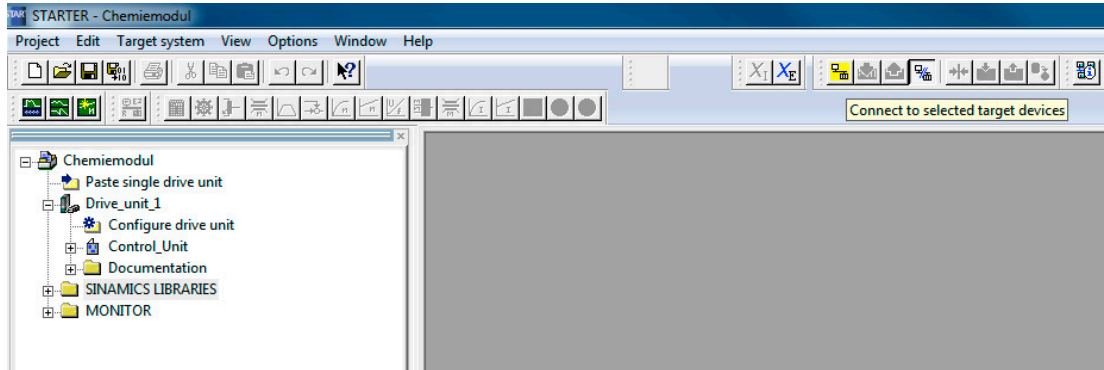


Figure 7-8 Establishing an online connection

After the connection has been established, an online/offline comparison opens and the connection is displayed in green in the STATER project.

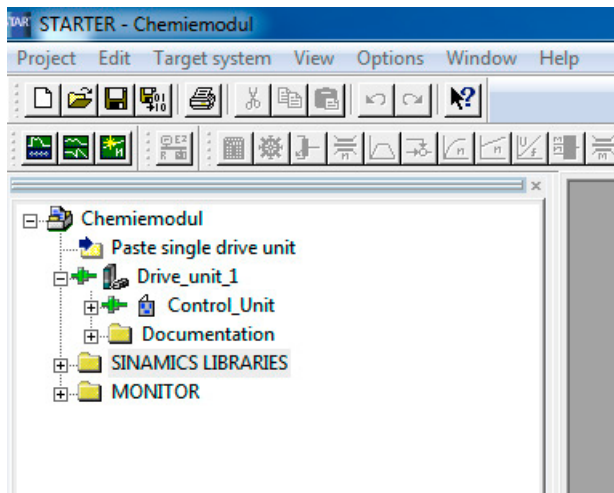


Figure 7-9 Online connection established

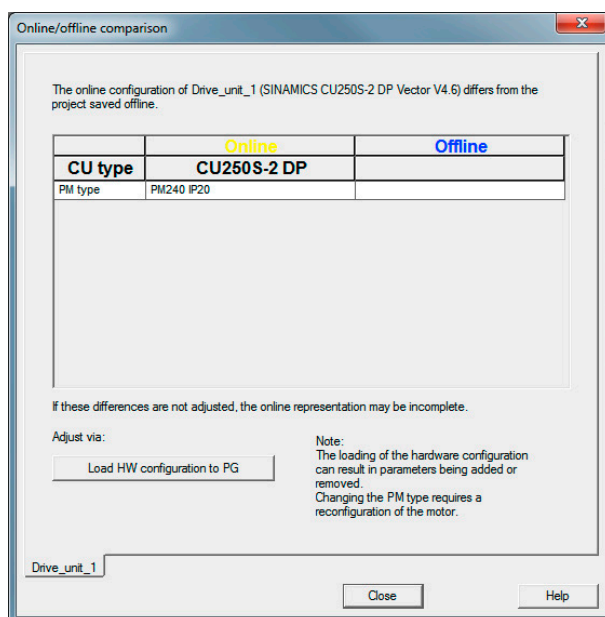


Figure 7-10 Online/offline comparison

The online/offline comparison shows the differences in the configuration. The "Load HW configuration to PG" is clicked for the alignment. The hardware configuration is loaded to the PC and the differences are corrected.

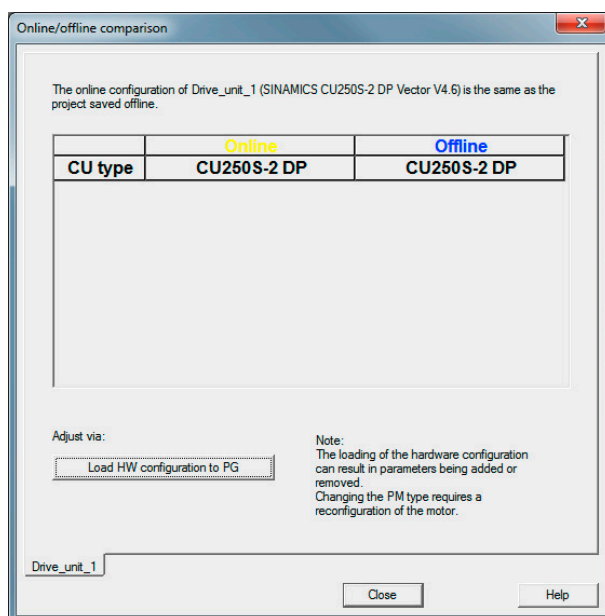


Figure 7-11 Online/offline comparison

Exit the window via "Close".

### Restoring the factory settings

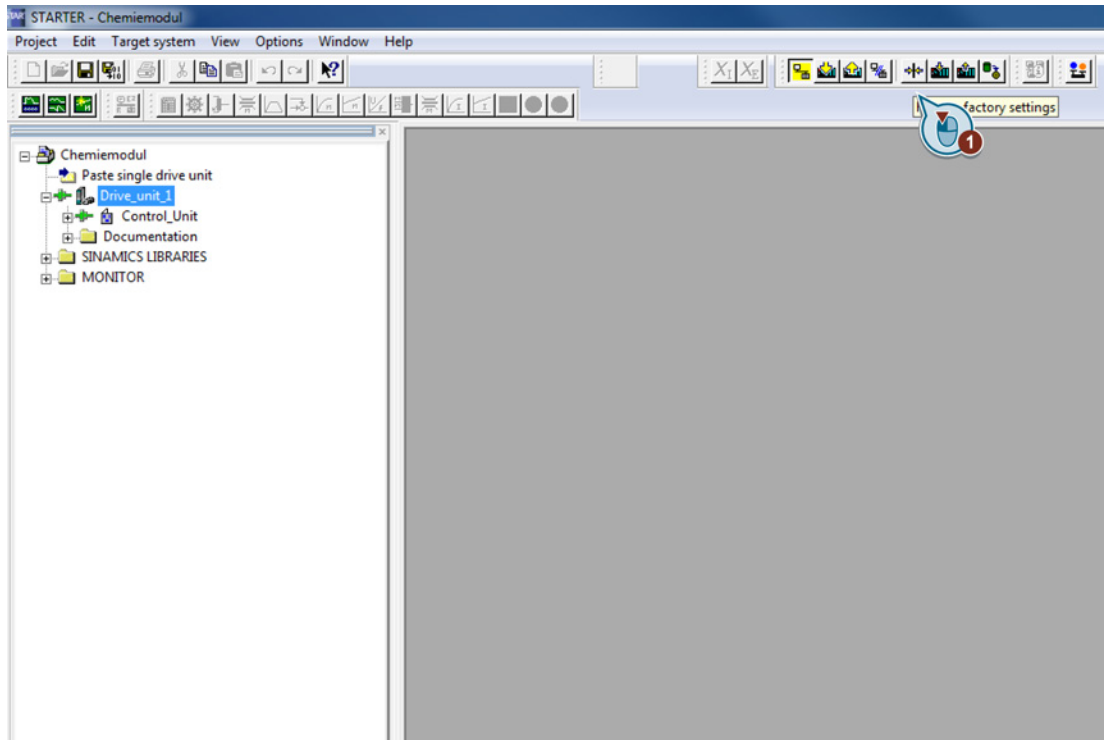


Figure 7-12 Restoring the factory settings

In the following prompt, the "Save device parameterization to ROM after completion" checkbox must be activated. Confirm the prompt with "Yes".

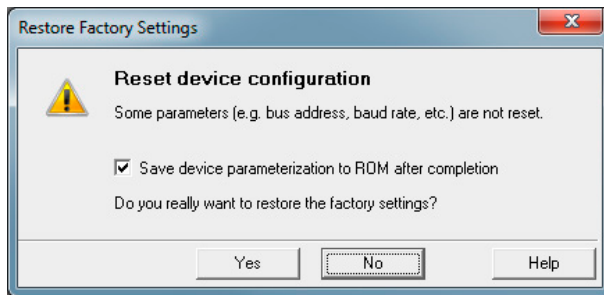


Figure 7-13 Device configuration prompt

The processing progress is displayed by progress bars.

## Loading the factory settings to the project

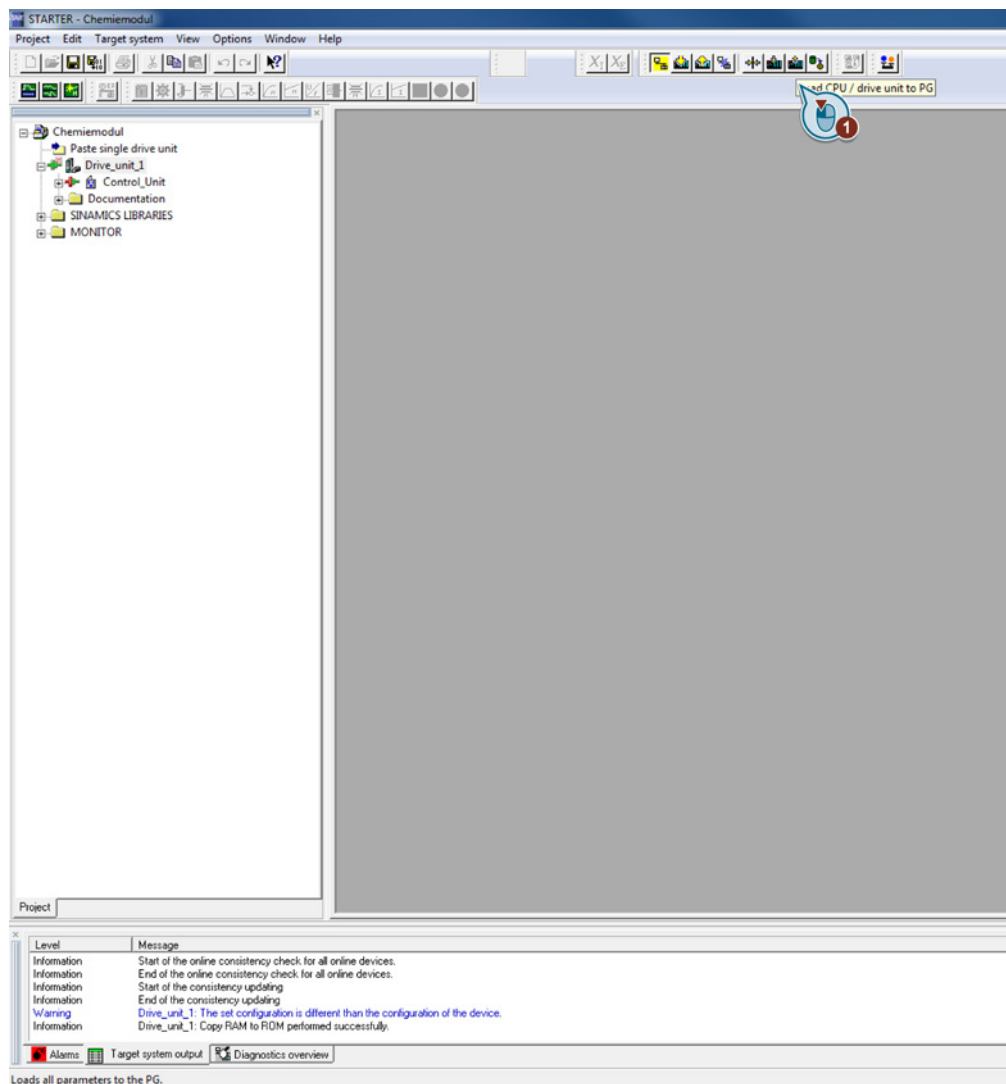


Figure 7-14 Loading the factory settings

Confirm the following prompt with "Yes". The data is loaded to the project.

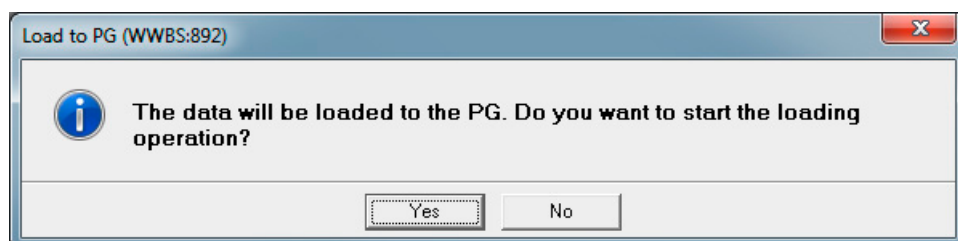


Figure 7-15 Prompt

The loading progress is displayed by a progress bar.

### Saving the project

After loading is completed, the project is saved ① and the PC disconnected from the inverter ②.

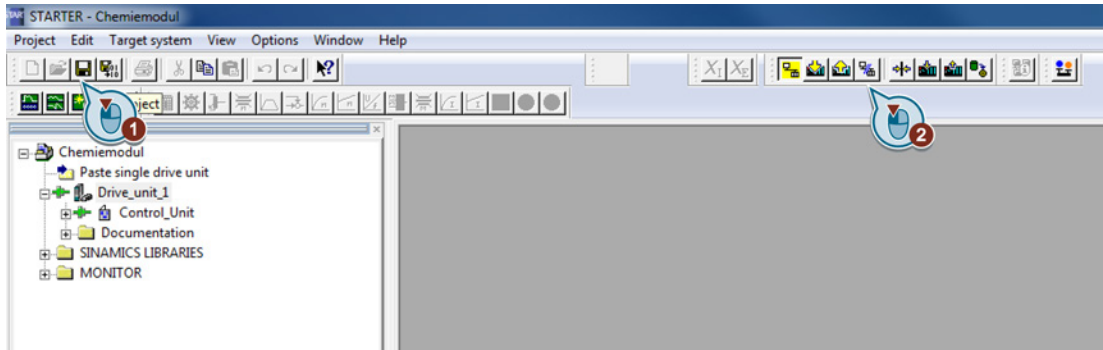


Figure 7-16 Saving the project

### 7.3.2 Activating the free function blocks

When the preparations are completed, the free function blocks must be activated offline.

#### Procedure

1. Select "Configuration" ① under Control Unit and start the wizard ②.

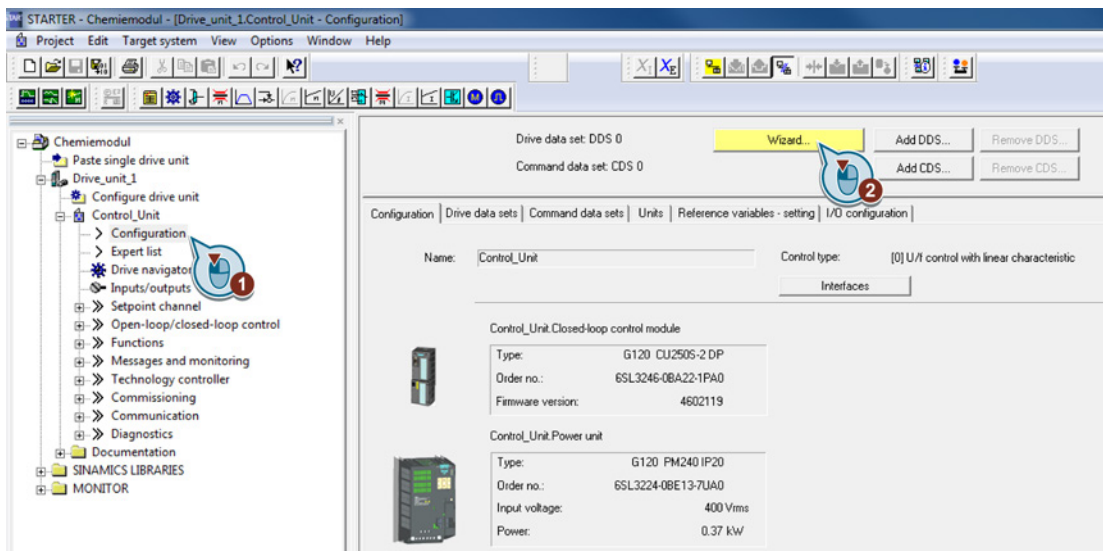


Figure 7-17 Starting the wizard



The window below opens.

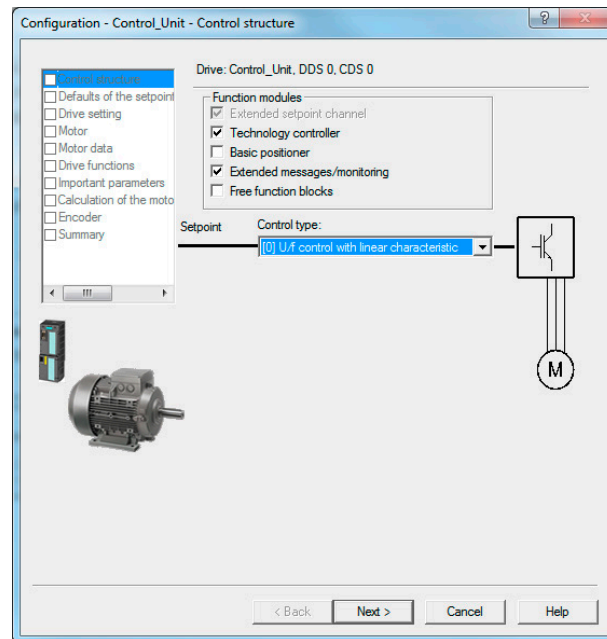


Figure 7-18 Configuration - Control structure

Activate the "Free function blocks" checkbox and run through the wizard without further changes with "Next".

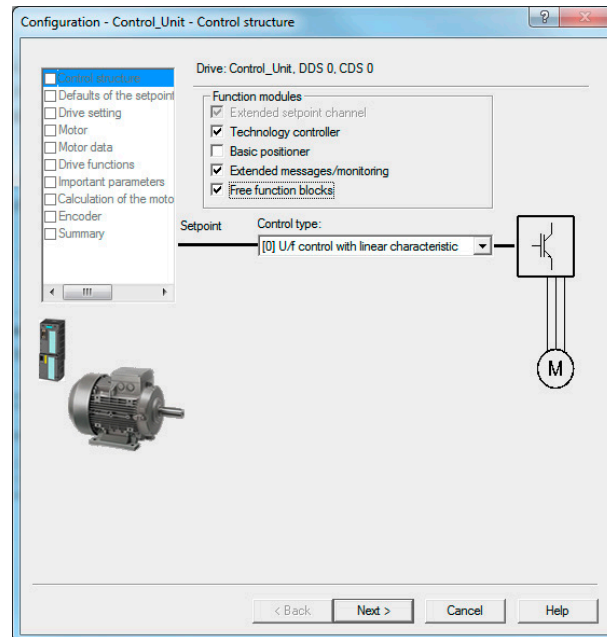


Figure 7-19 Free function blocks

2. Establish an online connection to the target device.

- 3. Correct the inconsistency of the configuration with "Download".

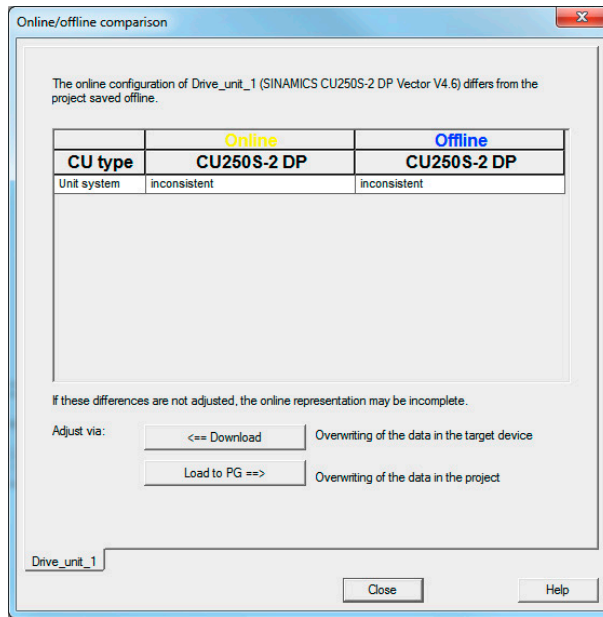


Figure 7-20 Online/offline comparison

- 4. Activate "After loading, copy RAM to ROM" in the following prompt and start the download.

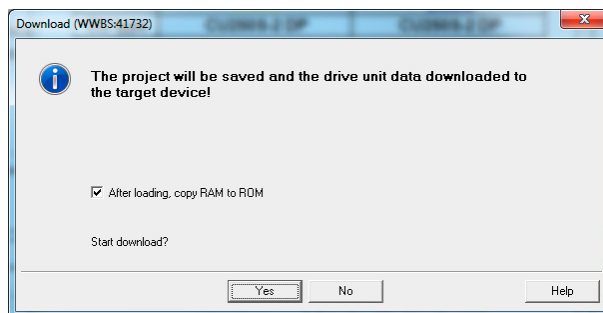


Figure 7-21 Download

The processing progress is displayed by progress bars.

5. The inconsistency is corrected and the free function blocks are activated.

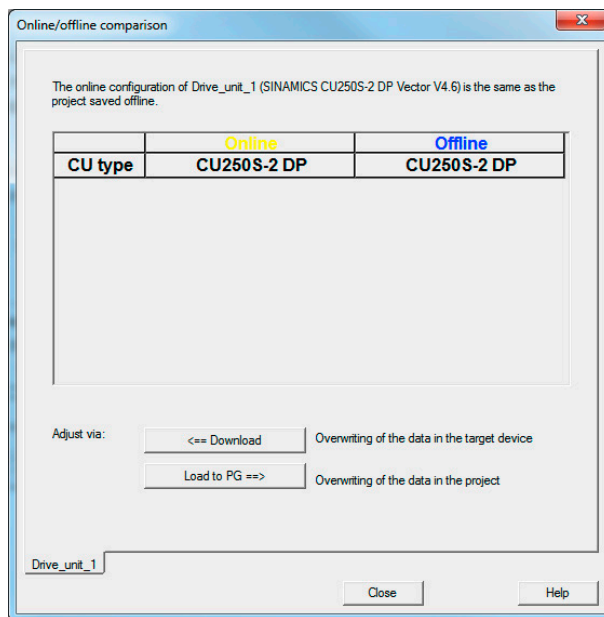


Figure 7-22 Online/offline comparison

## 7.4 Commissioning using the Drive Wizard

After the free function blocks have been activated, the motor and system data must be entered into the STARTER project. This is performed using the drive wizards. Basic settings for the system are made using pull-down menus. The next point is selected with "Continue".

The screenshots in the subsequent sequence have been taken from a configuration example with the chemical industry inverter.

### Procedure

1. Open the wizards (1) to configure the drive units

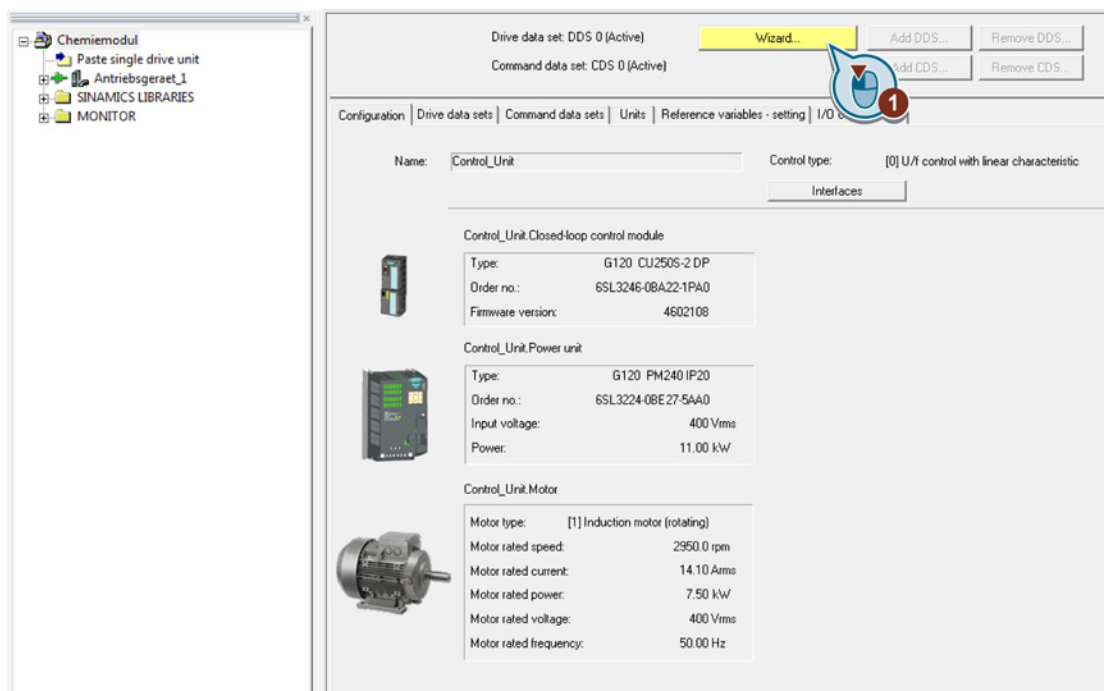


Figure 7-23 Start the wizards

2. Select the appropriate drive using the drop-down menu:
  - U/f control with linear characteristic (P1300=0) or (depending on the technology)
  - U/f control with square-law characteristic (P1300=2)

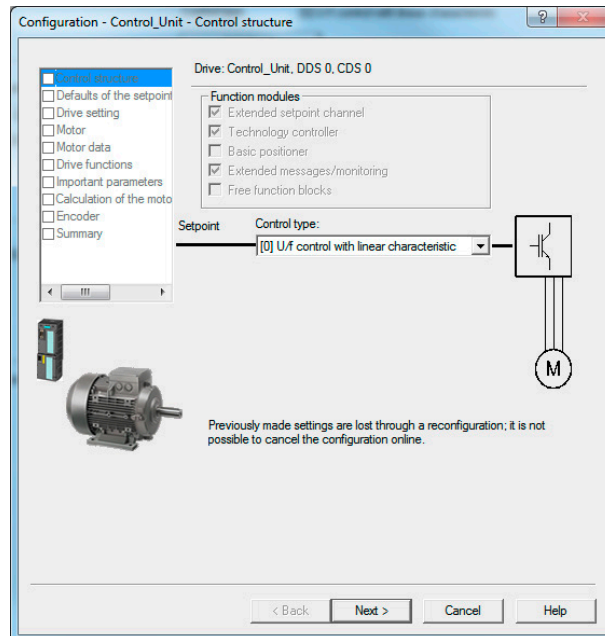


Figure 7-24 Control structure

3. Select "No selection" for "Defaults of the setpoints / command sources"

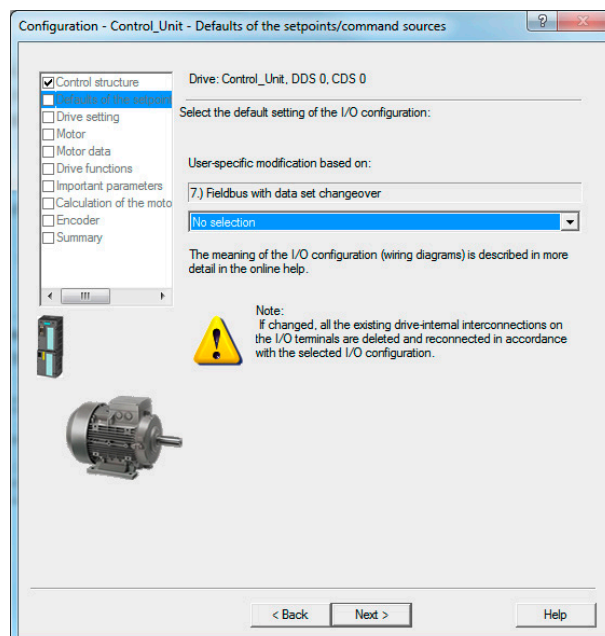


Figure 7-25 Command sources

4. Drive setting (P100=0 for Europe)

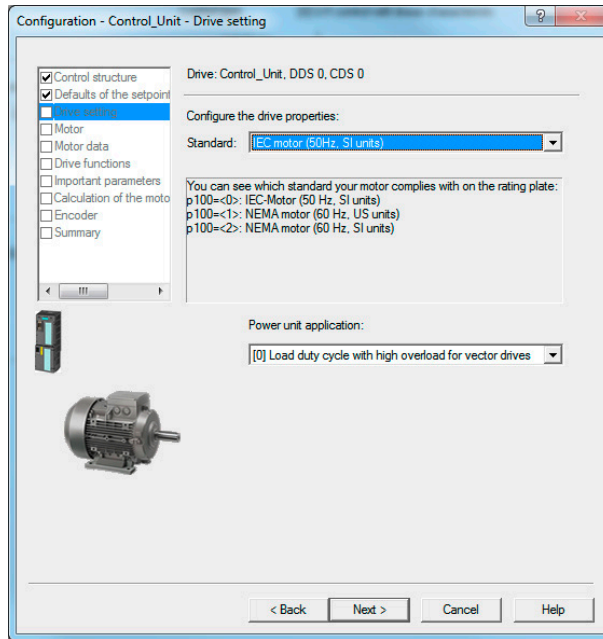


Figure 7-26 Base motor frequency

5. Select an induction motor (P300=1)

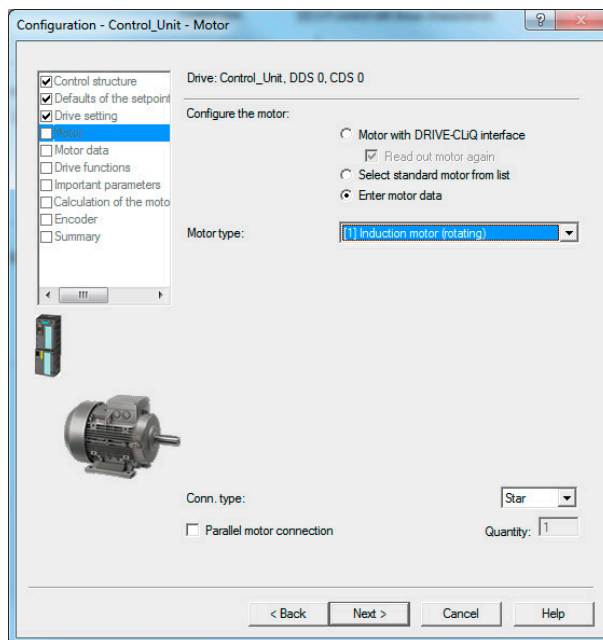


Figure 7-27 Motor type

6. Enter the motor data corresponding to the rating plate



Figure 7-28 Motor data

7. Motor identification locked (P1900=0)

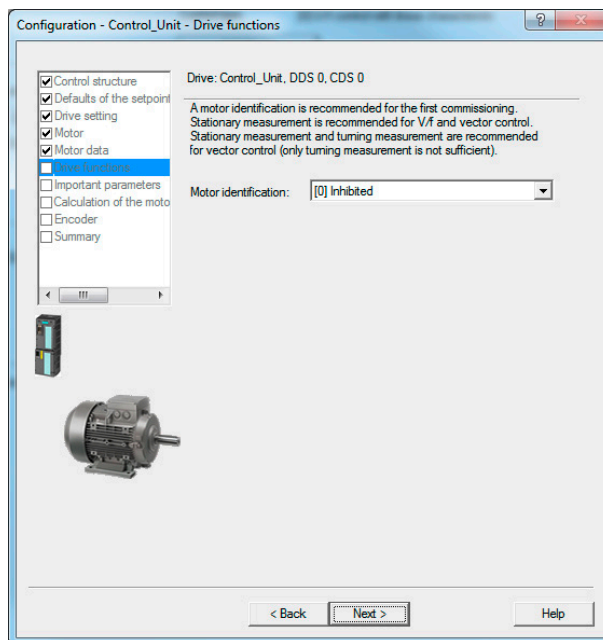


Figure 7-29 Motor identification

8. Enter important parameters (P640=0, the remaining parameters depend on the particular system)



Figure 7-30 Important parameters

9. Only calculate motor data

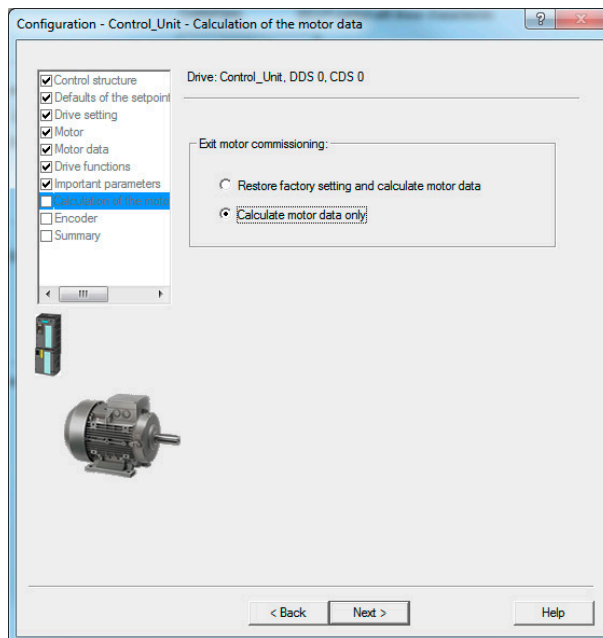


Figure 7-31 Calculate the motor data

The "Completion of basic commissioning" progress bar is displayed.



10.No encoder (P400=0)

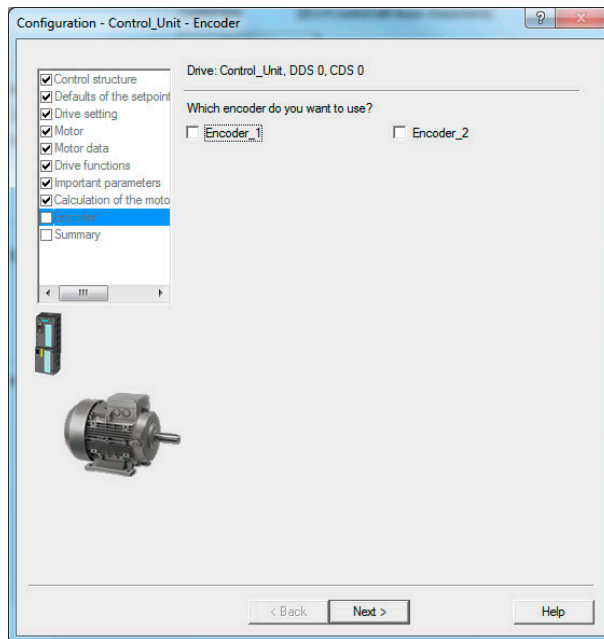


Figure 7-32 Encoder

11.Complete and save data in the drive

Activate the "Copy RAM to ROM" checkbox.

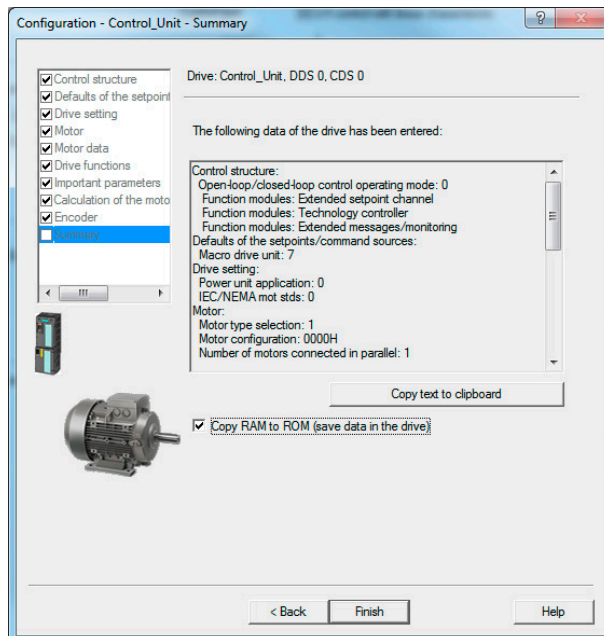


Figure 7-33 Summary

---

**Note**

"Finish" starts two processes that are displayed with progress bars.

- "Completion of basic commissioning"
  - "Copy RAM to ROM ..."
- 

If necessary, you must adapt the drive to the requirements of the application.

This means that the chemical industry inverter has been commissioned together with the corresponding drive.

## 7.5 Commissioning with script file

### Procedure

#### Note

For further information on the script, see Section Function overview of the NAMUR\_G120\_V3\_xx script (Page 81).

#### 1. Creating the script folder

In STARTER, right-click to open the shortcut menu ① and insert a script folder ② in the project archive.

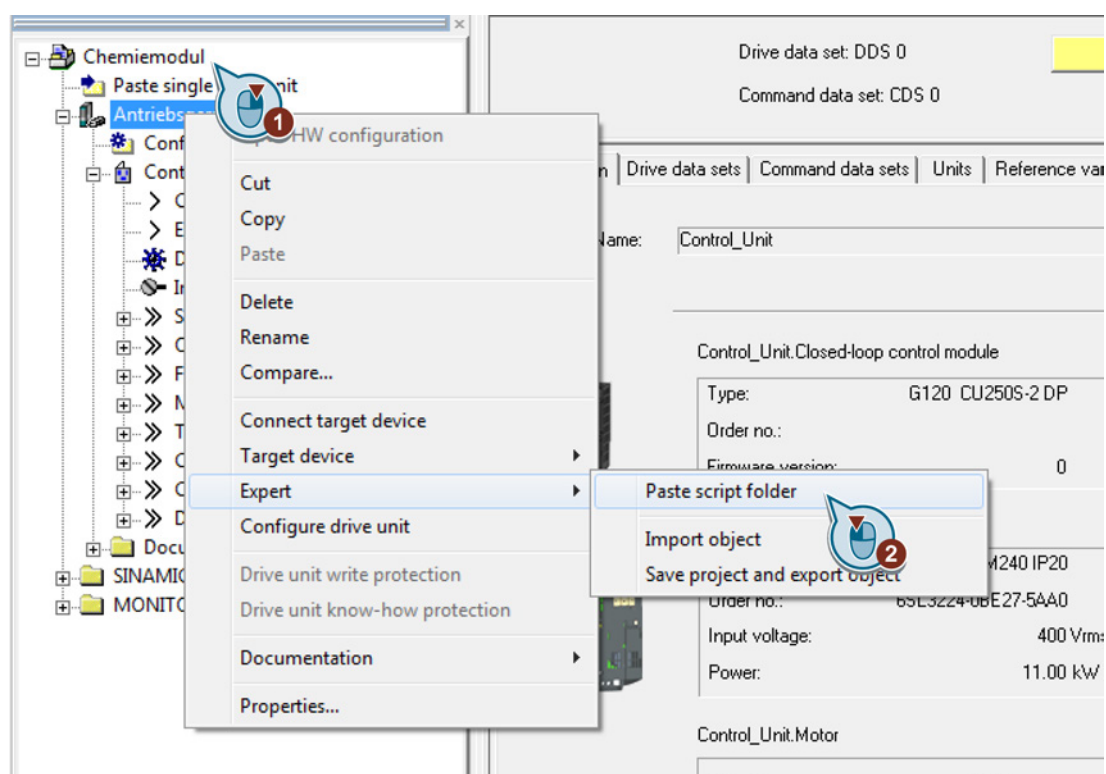


Figure 7-34 Creating a script folder

## 2. Importing the script

The script (NAMUR\_G120\_xxx.txt) for the configuration of the chemical industry module is available as a text file. Right-click to open the shortcut menu ① and insert the script folder ②.

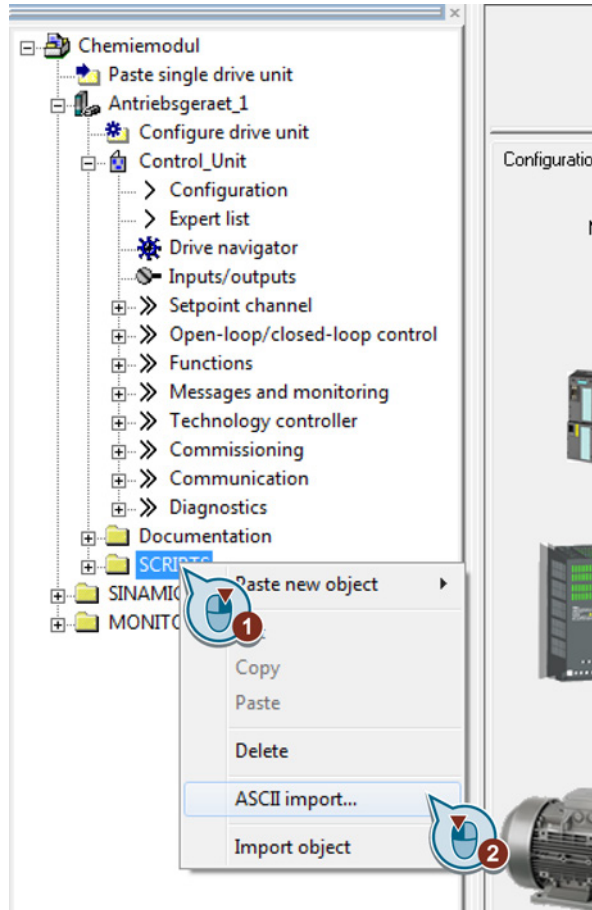


Figure 7-35 Importing a file

The name of the script file can be changed or retained. After it has been successfully imported the file can be seen in the script folder.

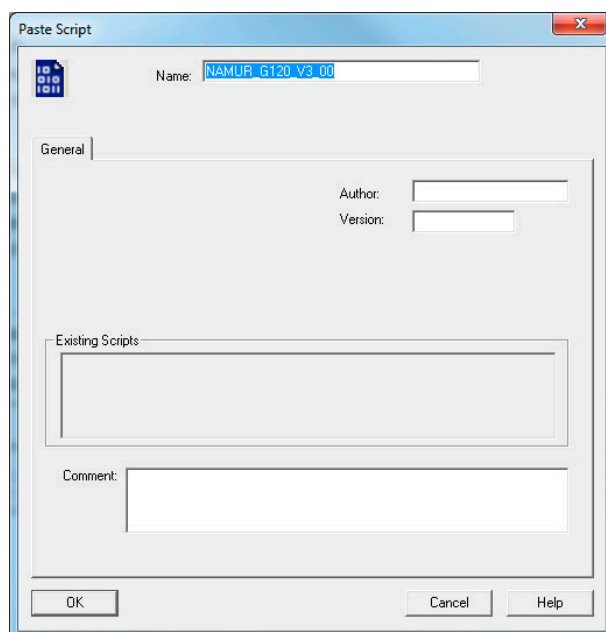


Figure 7-36 Inserting a script

### 3. Executing a script

The script can now be opened by double-clicking and then executed.

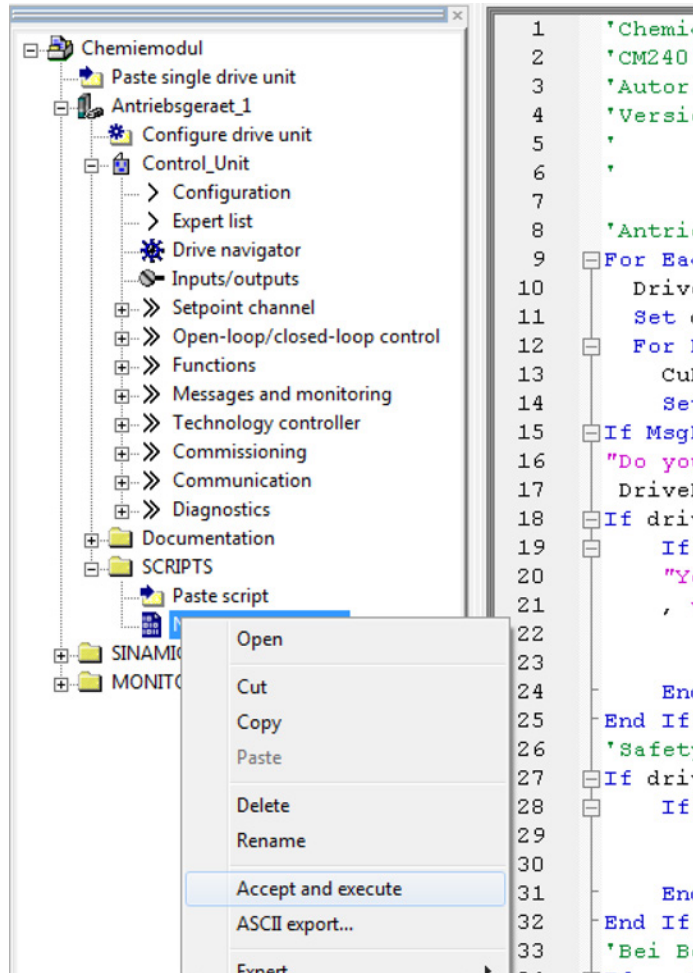


Figure 7-37 Executing the script

### 4. Commissioning using the script

Using the script, the inverter circuitry is selected that matches the chemical industry module. Execution of the script is shown step-by-step in the following.

---

#### Note

The response time between the individual steps varies considerably and can take up to one minute.

---

The script is executed. Commissioning with the script is started by acknowledging the input dialog box with "Yes".

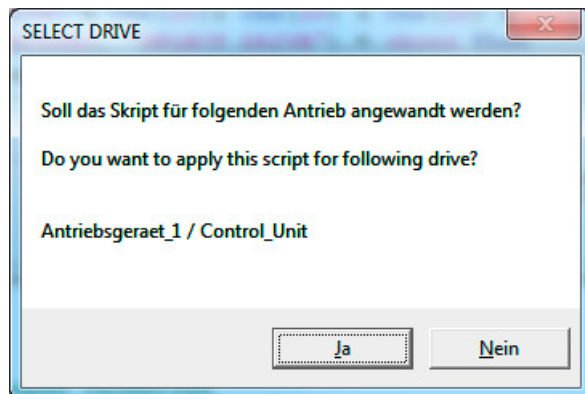


Figure 7-38 Input dialog box

---

### Note

The following prompt appears for inverters with a PM240 of a lower power rating (up to 4 kW). It must be confirmed with "OK".

---

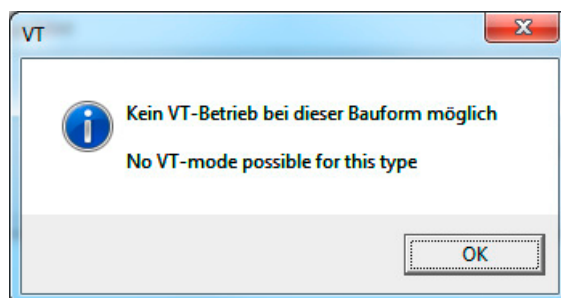


Figure 7-39 Prompt

- When using the temperature sensing in the motor (temperature sensor) acknowledge with "Yes".

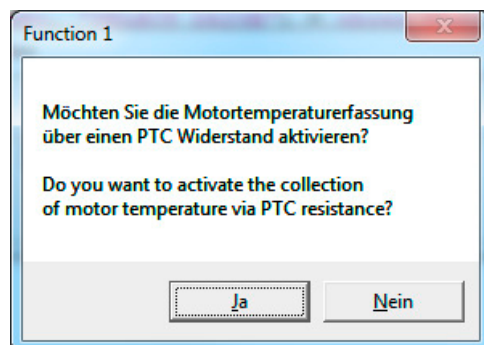


Figure 7-40 Temperature sensing

- Choosing the options

For each option, two functions are listed for selection, but only one can be used. The following options can be selected one after the other:

- The counter-clockwise or faster/slower function

The note regarding the connection of the cable harness, displayed after selection, must be observed under all circumstances.

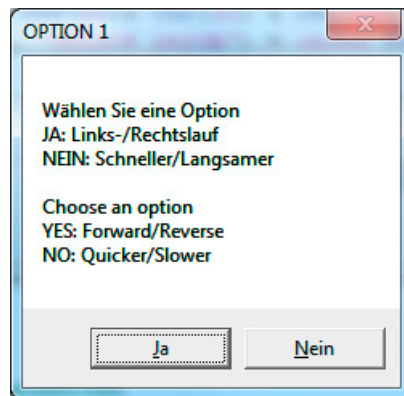


Figure 7-41 Option 1

- The "Flying restart after fault" function should be activated for systems that have a long follow-on time. This means that a restart after acknowledging the fault is still made possible in the follow-on time.
- The on/off static or on/off dynamic function

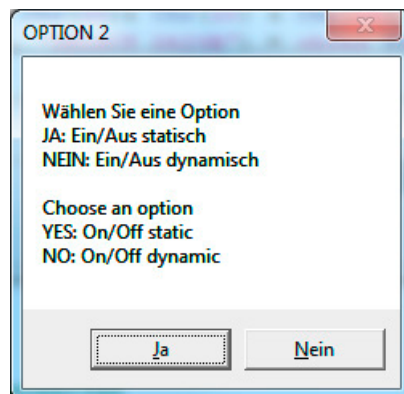


Figure 7-42 Option 2



- The safety settings at the inverter corresponding to NAMUR specifications are made automatically. The corresponding message must be acknowledged.

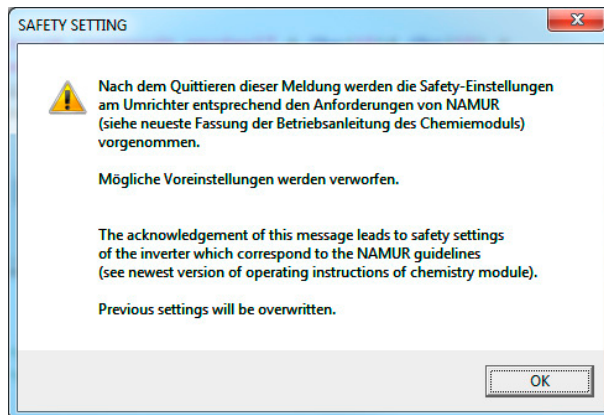


Figure 7-43 Safety settings

- This commissioning step is completed when the configuration is saved (confirm "Start RAM to ROM") and the "Done!" prompt confirmed.

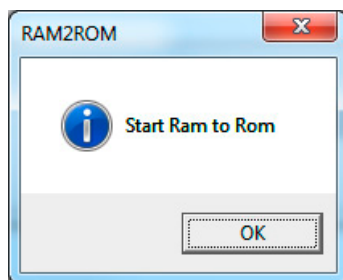


Figure 7-44 RAM to ROM



Figure 7-45 Power On



Figure 7-46 Done prompt

After loading and executing the script file, a warning is displayed in the STARTER status bar. This requires the motion monitoring to be tested.

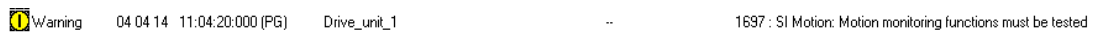


Figure 7-47 Warning

## 7.6 Notes on Safety Integrated

After loading and executing the script file, a warning appears in the STARTER window. This requires the motion monitoring to be tested. This is the so-called forced checking procedure.

The warning always appears when

- The drive is switched on completely
- The time set in p9559 "SI Motion forced checking procedure timer" has expired.

After the next selection of the forced checking procedure parameterized in p9705 "Test stop signal source", the message is withdrawn and the monitoring time is reset. This can be performed, for example, via a digital input with a connected pushbutton. The drive must be switched on for this purpose (pulses enabled).

### Procedure

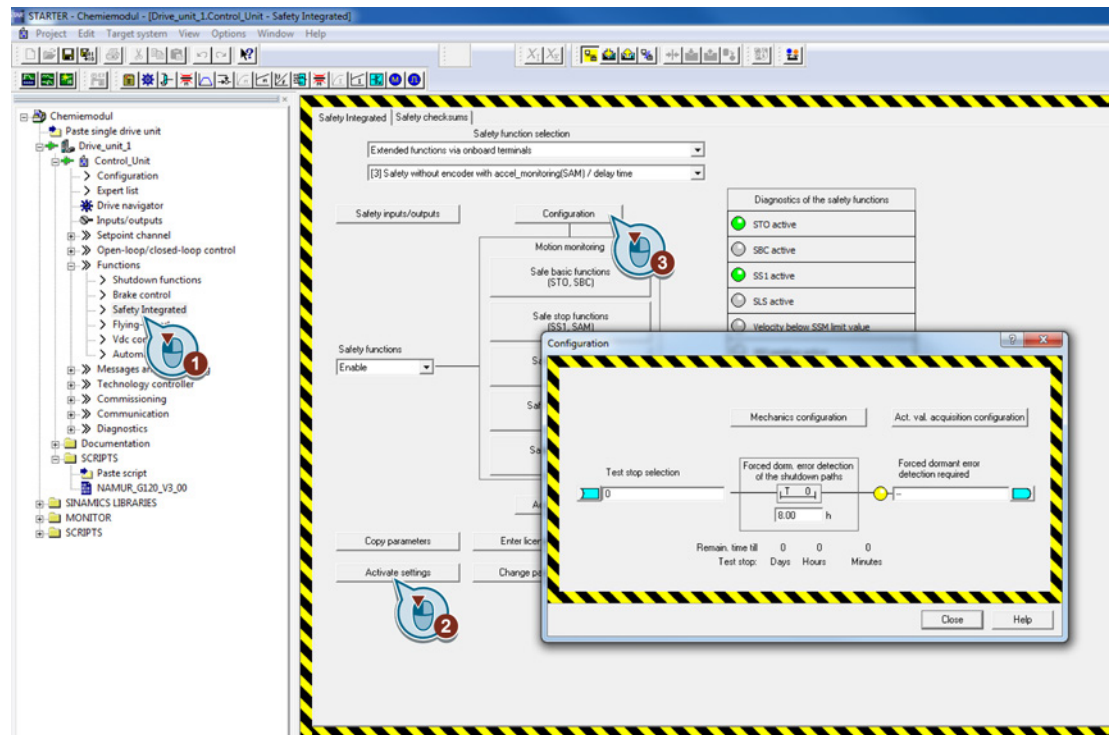


Figure 7-48 Commissioning safety function

After changing the input for the forced checking procedure ④, the changes are copied ⑤ and the settings activated ⑥. When activating, the instructions in the dialog boxes must be followed.

Commissioning the chemical industry inverter  
7.6 Notes on Safety Integrated

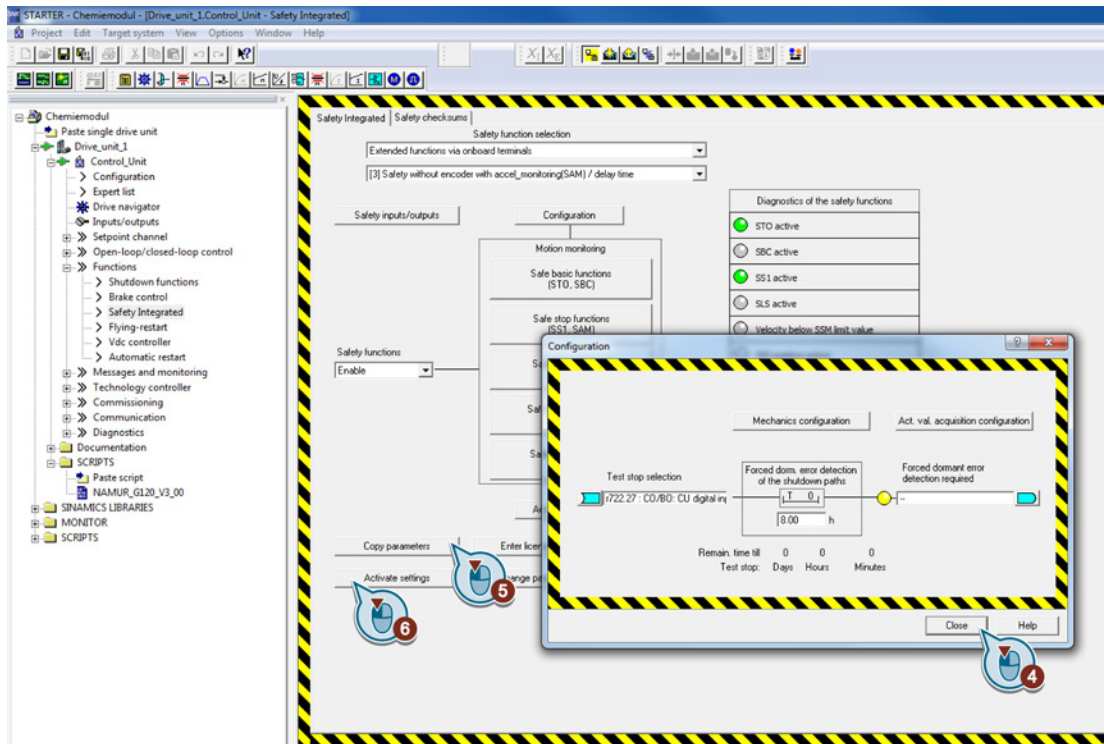


Figure 7-49 Commissioning safety function

The acceptance test for the forced checking procedure completes the commissioning. The inverter must be switched off and on again (400 VAC and 24 VDC).

## Functions

### 8.1 Analog value de-coupling

3 analog values can be connected-up in the chemical industry module. These involve, from the system perspective (field side) one setpoint (frequency/speed) and two measured values (motor current, motor frequency). Current signals DC 0/4 to 20 mA on the field side are used as carrier signals for these values. On the field and CU side, the analog values have a common reference potential. The setpoints and the two measured values are de-coupled from one another through a high-ohmic path ( $>10\text{ M}\Omega$ ).

In the CM, the analog values are isolated between the field (motor side) and the CU (inverter side). Maximum insulation voltages of 891 V (peak value, continuous operation) and 1670 V (peak value, max. 1 s, discharge) are reached.

### 8.2 Thermal motor protection

Thermal motor protection (TMP) is used to directly monitor the motor winding temperature. To realize this, the motor manufacturer integrates temperature-dependent resistors (PTC) directly in the motor winding. When it reaches its limit temperature, the resistance of the PTC suddenly changes (as a step function).

An evaluation unit is integrated in the chemical industry module for motors with integrated temperature protection (type A PTC sensor). This ensures that the motor operating temperature (when responding and switching back) is in conformance with IEC 60034-11-2 (DIN EN 60947-8).

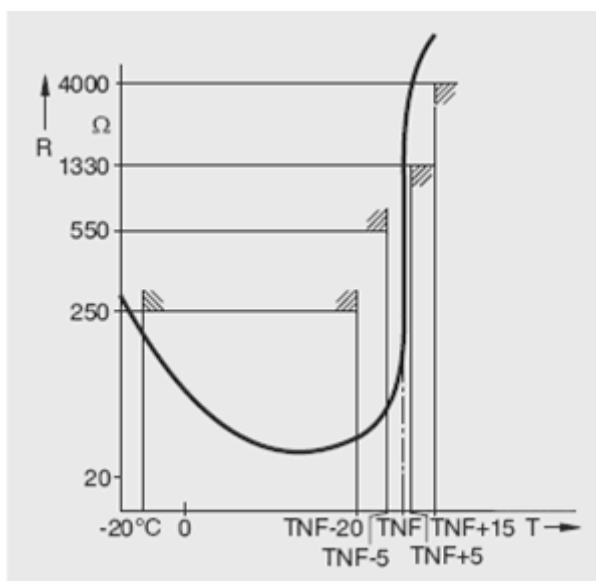


Figure 8-1 TMP characteristic

The following function is implemented:

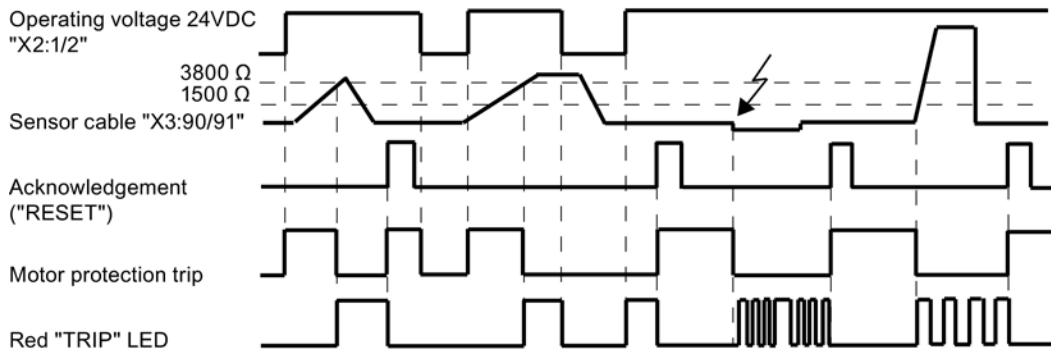


Figure 8-2 Control supply voltage

The device operates in a non-volatile fashion. This means that also when the control supply voltage fails (24 V DC), the previous trip is saved. When the control voltage fails, the trip signal is redundantly issued (voltage must be available at the signal if no fault is present). The sensor cable has a short-circuit and no-load detection function. The module has been designed so that the temperature sensor (not the device itself) at the motor can be connected in hazardous zones.

The sensor cable (X3) has protective separation with respect to the 24VDC supply, the other terminals and the housing (PELV/SELV). The sensor cable can be connected to motors for TN and IT line supplies up to 690 V.

The measuring circuit cables must be routed as separate control cables. It is not permissible to use the cores of the motor supply cable or other main supply cables. Shielded control cables should be used if extremely inductive or capacitive interference is expected as a result of power cables routed in parallel.

### Use in hazardous zones with the danger of gas explosion

The TMP functionality is permitted as associated equipment of device group II, Category (2) G, i.e. for use in areas where explosive gas atmospheres can occur in normal operation (Zone 1). Conformance with Directive 94/9 EC Appendix II is confirmed with PTB 09 ATEX 3008. The safety switching devices, with the appropriate settings, are required for safe operation of motors, type of protection "Increased safety" (Ex e) and "Flameproof enclosure" (Ex d) and are used outside hazardous zones.

#### PTB 09 ATEX 3008 Ex II (2) GD

The increased danger in hazardous zones demand that the following are carefully observed - the operating instructions, the safety and commissioning notes and standard (EN 60 079-14) for electrical equipment for hazardous zones with explosive gas atmospheres. A risk analysis must be drawn-up for the complete plant/system or machine. This device may not be used for plants/systems or machines with a higher potential of danger than indicated in the specified ATEX certification.

### **Use in hazardous areas with explosive dust atmospheres**

#### **PTB 09 ATEX 3008 Ex II (2) GD**

The TMP functionality of the CM can be used as protective equipment for motors in hazardous zones with explosive gas atmospheres to protect against inadmissible temperature rise as a result of overload. When the ATEX marking is extended to include "D:=Dust", these devices can also be used as protective device for motors in hazardous zones with explosive dust atmospheres (EN 61241-0 and EN 61241-1). Additional information can be taken from the EC type-examination certificate in the Internet.

### **See also**

Operator control elements (Page 37)





## Technical data

### Supply

Characteristic	Data
Operating voltage	External 24 VDC (20.4 to 28.8 VDC) at terminals X2:1(GND) and 2 (24 VDC)
Integrated inverse polarity protection	
Fuse (F1)	2.5 A time-lag (TR5 fuse, e.g. type MST250 from the Wickmann company)
Power loss	<3.0 W
Maximum cable length	Dependent on the cable cross-section and source, the voltage at X2:1 and 2 must be $\geq 20.4$ VDC)

### Sensor cable to connect to motors with 690 V (3-phase), TN and IT line supplies (sensor circuit)

Characteristic	Data
Sensor circuit voltage	at $R_F=1$ k $\Omega$ : 0.3 V
Sensor circuit current	at $R_F=1$ k $\Omega$ : 0.29 mA
Sensor circuit power drain	at $R_F=1$ k $\Omega$ : 87 $\mu$ W
Current for short-circuited sensor circuit	0.31 mA
Voltage for measuring sensor breakage	6.6 VDC
Measuring sensor, short-circuit detection	Disconnection: 12.8 Ohm Reclosing: 13.5 Ohm
Response temperature (specified by the sensor)	60 ... 180° C
Coupling time (defined by how the sensor is integrated)	Approx. 5 s
Total resistance when cold (for each sensor loop)	<1.5 k $\Omega$
Response tolerance	$\pm 6^\circ$ C
Maximum length of the sensor cable (X3) with short-circuit detection (<20 $\Omega$ ), copper conductor	<ul style="list-style-type: none"> <li>• at 2.5 mm<sup>2</sup> 300 m</li> <li>• at 1.5 mm<sup>2</sup> 150 m</li> <li>• at 0.5 mm<sup>2</sup> 50 m</li> </ul>

**Environmental conditions (Class 3K3 acc. to 60721-3-3)**

Characteristic	Data
Operating temperature	0° C...55° C (up to 1000 m installation altitude)
Maximum temperature change	< 0.5 K/min (as average over 5 min; corresponding to 30 K/h)
Humidity	Relative: > 5% to ≤ 90% Absolute: < 25 g/m <sup>3</sup>
Maximum variation of the relative air humidity	< 0.1 %/min; corresponding to 6 %/h
Condensation and ice formation	Not permissible
Dripping water, spray, splash water, jet-water	Not permissible
Thermal radiation	Can be neglected
Movement of the air	<1 m/s
Minimum air pressure	> 920 hPa (920 mbar) or ≤ 1000 m above sea level
Minimum air pressure	> 620 hPa (620 mbar) or ≤ 4000 m above sea level with derating of 3.5 K/500 m of the max. operating temperature
Maximum air pressure	< 1060 hPa (1060 mbar) or ≥ 0 m above sea level
Mechanically active environmental conditions, Class 3S2 acc. to EN 60721-3-3	1.5 mg/(m <sup>2</sup> h) dust deposit 0.2 mg/m <sup>3</sup> suspended solids in air
Biological environmental conditions, Class 3B1 acc. to EN 60721-3-3	Mold, mold growth, slime, rodents, termite and other animal vermin are not permissible
Chemically active environmental conditions, Class 3C2 acc. to EN 60721-3-3	Sea salt: Occurrence of salt-laden mist Additional values: Refer to the following table

Table 9- 1 Chemically active environmental conditions, Class 3C2 acc. to EN 60721-3-3

	Mean value	Limit value
Sea salt: Occurrence of salt-laden mist		
Sulfur dioxide	0.3 mg/m <sup>3</sup> & 0.11 cm <sup>3</sup> /m <sup>3</sup>	1.0 mg/m <sup>3</sup> & 0.37 cm <sup>3</sup> /m <sup>3</sup>
Hydrogen sulfide	0.1 mg/m <sup>3</sup> & 0.071 cm <sup>3</sup> /m <sup>3</sup>	0.5 mg/m <sup>3</sup> & 0.36 cm <sup>3</sup> /m <sup>3</sup>
Chlorine	0.1 mg/m <sup>3</sup> & 0.034 cm <sup>3</sup> /m <sup>3</sup>	0.3 mg/m <sup>3</sup> & 0.1 cm <sup>3</sup> /m <sup>3</sup>
Hydrogen chloride	0.1 mg/m <sup>3</sup> & 0.066 cm <sup>3</sup> /m <sup>3</sup>	0.5 mg/m <sup>3</sup> & 0.33 cm <sup>3</sup> /m <sup>3</sup>
Hydrogen fluoride	0.01 mg/m <sup>3</sup> & 0.012 cm <sup>3</sup> /m <sup>3</sup>	0.03 mg/m <sup>3</sup> & 0.036cm <sup>3</sup> /m <sup>3</sup>
Ammonia	1.0 mg/m <sup>3</sup> & 1.4 cm <sup>3</sup> /m <sup>3</sup>	3.0 mg/m <sup>3</sup> & 4.2 cm <sup>3</sup> /m <sup>3</sup>
Ozone	0.05 mg/m <sup>3</sup> & 0.025 cm <sup>3</sup> /m <sup>3</sup>	0.1 mg/m <sup>3</sup> & 0.05 cm <sup>3</sup> /m <sup>3</sup>
Nitrogen oxide (specified as equivalent values to nitrogen dioxide)	0.5 mg/m <sup>3</sup> & 0.26 cm <sup>3</sup> /m <sup>3</sup>	0.1 mg/m <sup>3</sup> & 0.52 cm <sup>3</sup> /m <sup>3</sup>

**Note**

The values specified in  $\text{cm}^3/\text{m}^3$  are calculated from the values specified in  $\text{mg}/\text{m}^3$ , referred to a temperature of  $20^\circ \text{C}$  and an air pressure of 101.3 kPa (sea level). The values are rounded-off. Mean values are the average values that can be expected (long-term values). The limit values are peak values. They do not occur for longer than 30 min daily.

**Protective separation between the sensor circuit (X3) with respect to the housing/control terminals (X2) (insulation data)**

- Pollution degree 2
- Overvoltage category III
- Base of the housing, protection class I acc. to EN 61140 protective conductor connection ( $\geq 2.5 \text{ mm}^2$ ) necessary
- Cover, mounted components, sensor cables, protection class II - characteristics
- Maximum installation altitude: 2000 m above sea level
- Sensor cable for motors up to 690 V connected to IT and TN line supplies
- Rated impulse voltage 12 kV (1.2/50  $\mu\text{s}$ ) up to 2000 m

**Digital inputs and outputs**

- Designed according to Section 5.1 and NAMUR recommendation NE 37
- Electrical parameters, refer to the user documentation for CU250S-2 DP (vector)

**Analog values**

- 4-20 mA at terminals X2:50/51 and 60/61/62/63
- Maximum cable lengths, refer to analog and digital control cables: 30 m
- Analog value transfer:  
Accuracy referred to a final value  $< 1\%$   
Electrical isolation: Peak value: 891 V continuous load / 1670 V for max. 1 s

**Sound pressure level and degree of protection**

Characteristic	Data
Sound pressure level (LpA)	$\sim 0 \text{ dB(A)}$
Degree of protection	IP 20 in the mounted and connected state

### Storage conditions (in transport packaging)

Characteristic	Data
Long-term storage	-25...55° C
Transport	-40...70° C
Humidity	5...95%

### Weight/dimensions

Characteristic	Data
Housing	Sheet steel, galvanized
Weight	Approx. 850 g
Dimensions (WxHxD)	191 mm x 75 mm x 64.5 mm
Color	IT gray (dark gray), surface is powder-coated

## Dimension drawings

### Chemical industry module

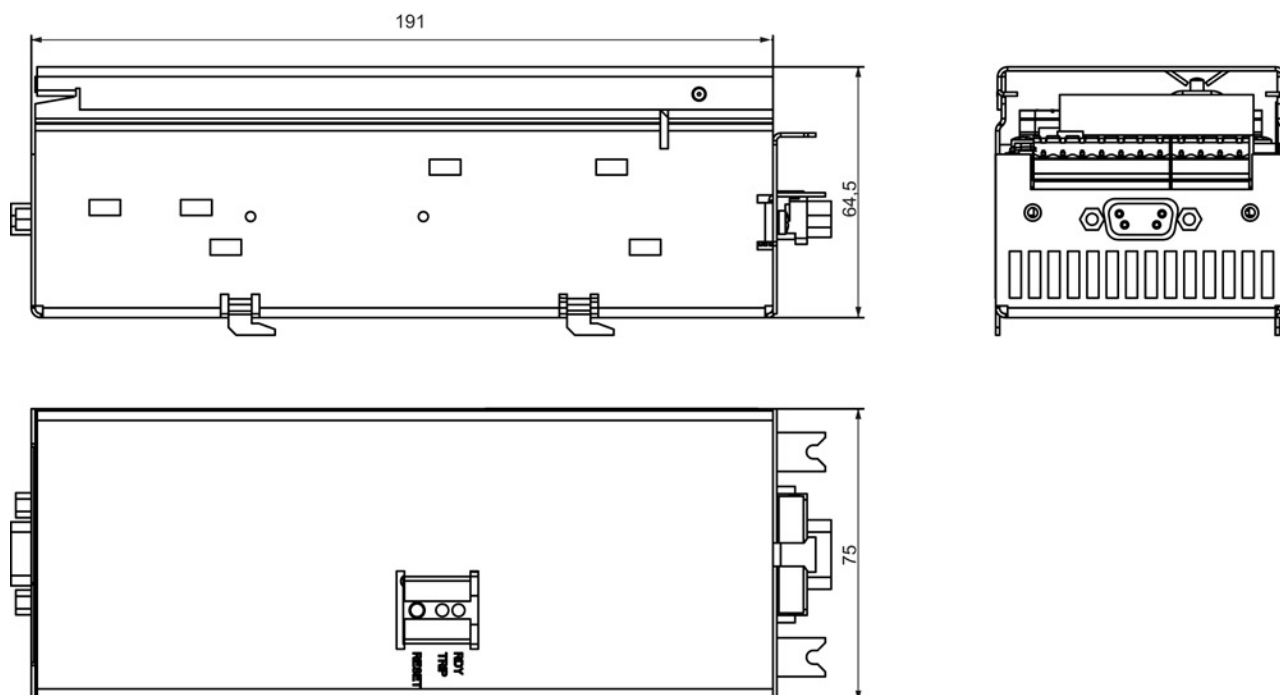


Figure 10-1 Dimension, CM



## Accessories

### Chemical industry module and accessories

The chemical industry module can be ordered under the following MLFB:

Chemical industry module	
MLFB	Designation
6SL3255-0BT01-0PA0	CM240NE chemical industry module
6SL3260-4TA00-1AA6	Supplementary kit for rail mounting comprising: <ul style="list-style-type: none"> <li>• Adapter to mount on rails (according to DIN 50022, 35x15 mm)</li> <li>• Long cable harness</li> </ul>

Commissioning tool	
MLFB	Designation
6SL3072-0AA00-0AG0	STARTER on DVD

Or download: <http://support.automation.siemens.com/WWW/view/en/10804985/133200>





## Appendix

### A.1 Function overview of the NAMUR\_G120\_V3\_xx script

The "NAMUR\_G120\_V3\_xx" script is available for the commissioning of the chemical industry inverter with the CM240NE chemical industry module and CU 250S-2 DP Control Unit.

The following functions are implemented by this script:

- Read-out of all drives in the project
- Query: Execution for the selected drive?
- Check: Online status
- Check: Free function blocks activated
- Specification of the duty cycle to light overload
- Query: Connection of PTC temperature sensor on the inverter?
- Reset of standard interconnections
- Interconnection of the inputs and outputs
- Scaling of analog input AI1
- Disabling of the master control of the BOP/IOP during normal operation
- Setting of the current limit to 140% of the rated current
- Interconnection of the setpoint channel
- Setting of the minimum speed to 10%
- Setting of the ramp times
- For PM240: Activation of the VDC max controller
- Interconnection of the PZD in the send direction
- Interconnection of the free function blocks
- Query: "On/off static" or "On/off dynamic" option?
- Restoration of the safety factory settings
- Activation of the extended safety functions
- Parameterization of the safety functions
- Backup of the parameters in the ROM
- Request for POWER ON
- Query: Execution of the script for the next drive?

## A.2 Electromagnetic compatibility

### A.2.1 General

The electromagnetic compatibility refers to both the immunity and the emitted interference of a device.

The following disturbance variables must be taken into consideration when evaluating the electromagnetic compatibility:

- Conducted low-frequency disturbance variables (harmonics)
- Conducted high-frequency disturbance variables
- Field-based, low-frequency disturbance variables
- Field-based, high-frequency disturbance variables

The permitted limit values are defined in the EMC product standard EN 61800-3 in EMC categories C1 to C4.

Below you will find some key definitions relating to this.

### Classification of EMC behavior

The EMC environment and the EMC Categories are defined in the EMC product standard EN 61800-3 as follows:

#### Environments:

##### First environment (public systems)

An environment that includes domestic premises and establishments that are connected directly to a public low-voltage line supply without the use of an intermediate transformer.

**Example:** Houses, apartments, commercial premises, or offices in residential buildings.

##### Second environment (industrial systems)

An environment that includes all other establishments which are not connected directly to a public low-voltage line supply.

**Example:** Industrial areas and technical areas of buildings that are supplied by an assigned transformer.

#### Categories

##### Category C4

Drive systems with a rated voltage  $\geq 1000$  V, with an LO output current  $\geq 400$  A, or for use in complex systems in the second environment

**Drive systems which correspond to category C4 may only be installed in the second environment.**

**Category C3**

Drive systems with a rated voltage < 1,000 V, which are intended for use in the second environment and not for use in the first environment.

**Drive systems which correspond to category C3 may only be installed in the second environment.**

**Category C2**

Drive systems with a rated voltage < 1,000 V, which are neither plug-in devices nor moveable devices and which, when used in the first environment, are only intended to be installed and commissioned by an expert.

**Drive systems which correspond to category C2 may only be used in the first environment if they are installed by an expert, with limit values for electromagnetic compatibility observed.**

**Category C1**

Drive systems with a rated voltage < 1000 V, which are intended for use in the first environment.

**Drive systems which correspond to category C1 can be installed in the first environment without restrictions.**

---

**Note****Expert**

An expert is a person or organization with the necessary experience for installing and/or commissioning drive systems (Power Drive Systems - PDS), including the associated EMC aspects.

---

**A.2.2 Overall EMC behavior**

The EMC of the chemical industry inverter depends on the SINAMICS G120 Power Module used. You will find details in the appropriate manuals of the Power Modules.

**See also**

Documents for the chemical industry inverter (Page 16)

## A.3 Standards

### Standards



---

#### European Low-Voltage Directive

The SINAMICS G120 product series meets the requirements of the Low-Voltage Directive 2006/95/EC. The devices are certified that they comply with the following standards:

EN 61800-5-1 - Semiconductor power inverters - General requirements and line-commutated inverters

EN 60204-1 - Safety of machinery - Electrical equipment of machines

---

#### European Machinery Directive

The SINAMICS G120 inverter series does not fall within the area covered by the Machinery Directive. However, the use of the products in a typical machine application has been fully assessed for compliance with the main regulations in this directive concerning health and safety. A declaration regarding the acceptance is available upon request.

---

#### European EMC Directive

When installed in accordance with the recommendations specified in this manual, the SINAMICS G120 complies with all regulations of the EMC Directive according to the definition provided by EN 61800-3 "EMC Product Standard for Power Drive Systems".

---

#### ISO 9001

Siemens AG uses a quality management system that meets the requirements of ISO 9001.

---

#### EN 60947-8 Type A

Evaluation device in the sense of this standard

---

### Directives

---

#### Directive 94/9/EC

Devices according to Device Group 2 of Category 2G and extension to D for temperature sensor X3

---

#### NAMUR Recommendation NE 37

Inverter design, standard terminal strip for variable-speed drives

---

## **Certificates**

---

---

### **PTB 09 ATEX 3007**

EC type-examination certificate for STO (Safe Torque Off); ATEX EC type-examination certificate

---

### **PTB 09 ATEX 3008**

EC type-examination certificate, explosion protection; ATEX EC type-examination certificate

---

Further certificates can be downloaded from the Internet under the following link:  
<http://support.automation.siemens.com/WW/view/en/22339653/134200>

## **A.4 ATEX application**

### **A.4.1 Introduction**

This document describes the use of a thermistor motor protection device to sense the motor overtemperature of an explosion-protected motor with integrated PTC thermistor in conjunction with a connected inverter with integrated, safe shutdown.

The shutdown for a motor overtemperature condition is achieved by safely shutting down the motor control pulses of the inverter - and not by disconnecting from the main power supply using a motor contactor. The following Ex classification is achieved for this application according to ATEX directive 94/9/EC.

**Ex II (2) GD**

### **A.4.2 Marking**

#### **Inverters for explosion-protected motors in hazardous areas**

Inverters for explosion-protected motors in a hazardous area must always be located outside the hazardous area. This is the reason why there is no special marking for explosion-protected motors regarding their use in hazardous areas.

### Thermistor motor protection device for explosion-protected motors in hazardous areas

The thermistor motor protection device for explosion-protected motors in hazardous areas must always be mounted outside the hazardous area. The TMS 3RN1013 (PTB 01 ATEX 3218) and the CM240NE chemical industry module (PTB 09 ATEX 3008) are certified. The following figure shows an example of a certified thermistor motor protection device (in this case, CM240NE) with the corresponding ATEX marking (lower right).

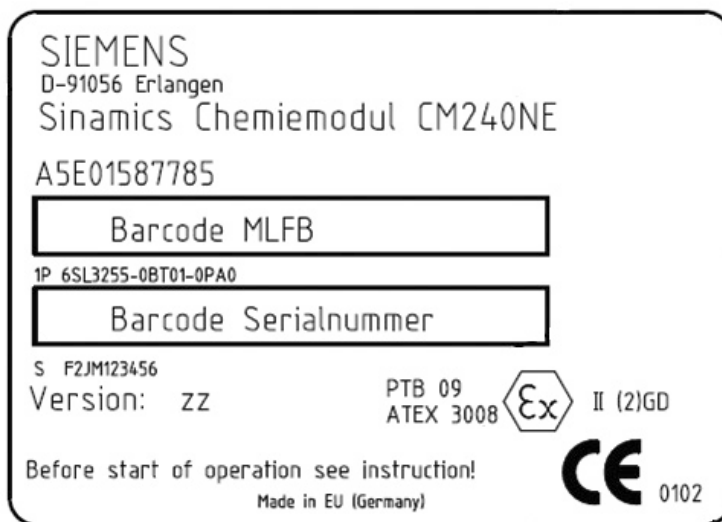


Figure A-1 Type plate of the CM240NE

### Explosion-protected motors in hazardous areas

In principle, all explosion-protected motors may be used with the appropriate ATEX certification and marking. They must be certified for inverter operation and have at least one PTC thermistor to measure the motor overtemperature.

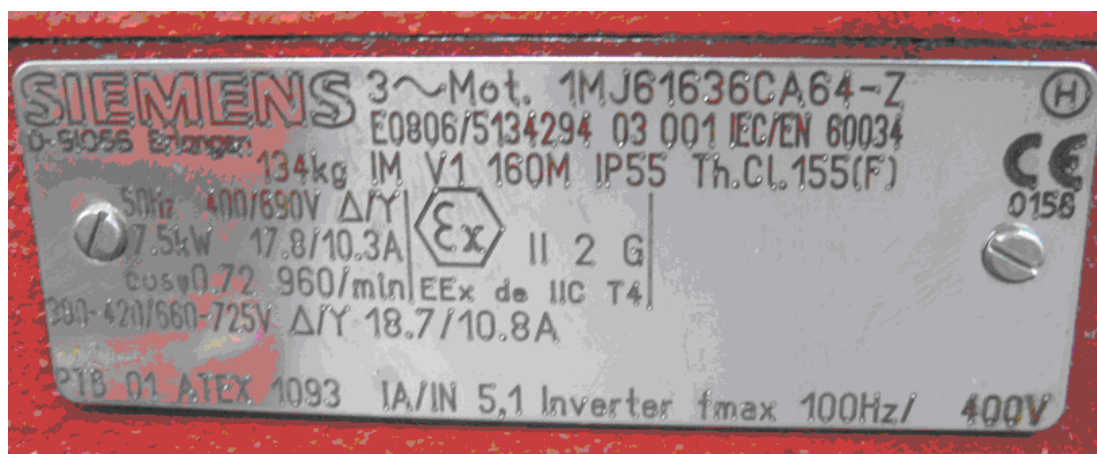



Figure A-2 Rating plate of an explosion-protected motor for inverter operation

### A.4.3 Installation

#### A.4.3.1 Inverters for explosion-protected motors in hazardous zones

<p> <b>WARNING</b></p> <p>Inverters must not be installed in hazardous zones. This can result in explosions. Inverters must only be installed in safe areas.</p> <p>These devices are at hazardous voltage levels and control rotating mechanical parts, which in some circumstances, can be dangerous. Non-observance of the warnings or non-compliance with the instructions in this manual can lead to danger to life, serious injury or substantial damage to property.</p> <p>Protection for direct contact using SELV/PELV is only permitted in areas with equipotential bonding and in dry indoor areas. If these conditions are not fulfilled, other protective measures against electric shock are to be taken, e.g., protective insulation.</p> <p>Only suitably qualified personnel who have familiarized themselves with all the instructions regarding safety, installation, operating and maintenance as set out in this manual are permitted to work on these devices. Successful and safe operation of these devices depends on their proper handling, installation, operation and maintenance.</p> <p><b>The line supply, DC voltage and motor terminals as well as the brake cables and thermistor cables can be at hazardous voltage levels even when the inverter is not operational. Once the line supply has been disconnected, wait at least 5 minutes until the device has discharged itself. Only then can you start the installation work.</b></p> <p>It is strictly forbidden to disconnect the motor from the inverter. Disconnection from the line supply must always be made on the line side of the inverter. Before the power supply for the inverter is connected, ensure that the terminal box of the motor is closed.</p> <p>If an LED or similar indicator does not light up or is not active when a function is switched from ON to OFF, this does not mean that the unit has been switched off or is current-free.</p> <p>The inverter must always be properly grounded.</p> <p>The device must be disconnected and isolated from the line supply before any cables, plugs or wires are connected to the device or altered.</p> <p>Make sure that the inverter has been configured for the correct supply voltage. It must be ensured that the inverter is not connected to a higher supply voltage.</p> <p>Static discharge on surfaces or at interfaces which are not generally accessible (e.g. terminals or connector pins) can cause malfunctions or defects. ESD protective measures should therefore be observed when working with inverters or inverter components.</p> <p>The general and regional installation and safety regulations for working on equipment at high hazardous voltage levels (e.g. EN 50178) as well as the relevant stipulations regarding the correct use of tools and personal protective equipment (PPE) are especially to be observed.</p>
---



### A.4.3.2 Explosion-protected motors in hazardous zones

Special rules and regulations apply - and which must be strictly observed - when operating motors in hazardous zones.

#### Rules

1. The motor must be certified for the particular hazardous zone. The appropriate marking is stamped on the motor rating plate.
2. The motor must be equipped with type A PTC thermistors (PTC) according to DIN 44081, DIN 44082 and EN 60947-8. These PTC thermistors are connected to the certified thermistor motor protection device (e.g. Sirius thermistor motor protection trip unit (TMS) module 3RN1013 or chemical industry module CM240NE). When the safety functions are appropriately parameterized, then the motor is protected against inadmissible temperature rises as a result of overload (according to DIN EN 60079-14/VDE 0165-1).
3. The safety regulations, which apply from the use of motors with increased safety (Ex e) or flameproof enclosure (Ex d) (Directive RL94/9/EG and EN 60079-14 or EN 60079-17) must be maintained.
4. The motor must be certified for inverter operation. The motor rating plate should be checked.
5. The motor must only be operated in the speed control range for which it is intended. In addition to the motor parameters, the parameter for  $f_{max}$  must also be specified for this purpose.
6. The maximum motor cable length must not be exceeded, as otherwise inadmissible voltage peaks can occur.
7. For EX(e) motors, the motor must be tested together with the inverter in the manufacturer's factory. It is not permissible that the system is commissioned without a test report.
8. For Ex(e) and Ex(n) motors, the value for  $I_{rated}$  must be set to the values specified by the motor manufacturer (refer to the data on the rating plate). These values must not be changed without first consulting the motor manufacturer.
9. Inverter fed motors in hazardous zones must be protected by using a PTC thermistor. This is the reason that an evaluation circuit must be used for the motor PTC thermistor according to the application description attached. The inverter is electronically shut down (contactlessly). A risk analysis according to ISO 14121 has indicated that protection against hazardous currents flowing through the human body is not guaranteed as opposed to shutdown using a contactor where it is guaranteed. As a result of the electronic shutdown path with a diverse two-channel structure, shutdown is still guaranteed even when a single fault occurs in the electronic shutdown path! Proof of functional safety regarding the shutdown path from the PTC to the inverter is realized according to IEC 61508:2000 and ISO 13849:2007.  
An analysis of multiple faults with common cause indicated that if at least two IGBTs fail (breakdown of the depletion layer) then this can result in a short-circuit - and in some cases, a short-circuit can even flow through the motor. This current must be limited or interrupted using suitable fuses so that the motor temperature cannot increase any further.
10. For Ex(e) motors (increased safety) a notified body (e.g. PTB) must test the motor together with the inverter in the manufacturer's factory (see EN 60079-7, Section 5.2.4.5).

The motor manufacturer is then issued an EC type test certificate with the defined parameter data for the inverter.

#### A.4.4 Safe commissioning

The relevant instructions must be read and understood before installation, operation, or maintenance of the device:

- Installation instructions: Explosion-protected motors (are included with the particular motor)
- Installation instructions: Thermistor motor protection trip unit
- Operating instructions: Thermistor motor protection trip unit
- Installation instructions: SINAMICS G120 PM240 (for configurations with PM240)
- Installation instructions: SINAMICS G120 PM250 (for configurations with PM250)
- Installation instructions: SINAMICS G120 PM260 (for configurations with PM260)
- Operating instructions: SINAMICS G120 Control Units
- Operating instructions: CM240NE chemical industry module

The relevant rules and regulations in the associated operating instructions must be carefully observed.

## Connecting the inverter

Connecting the inverter to the thermistor motor protection devices (TMS) and their interconnection are shown in Fig. 3.

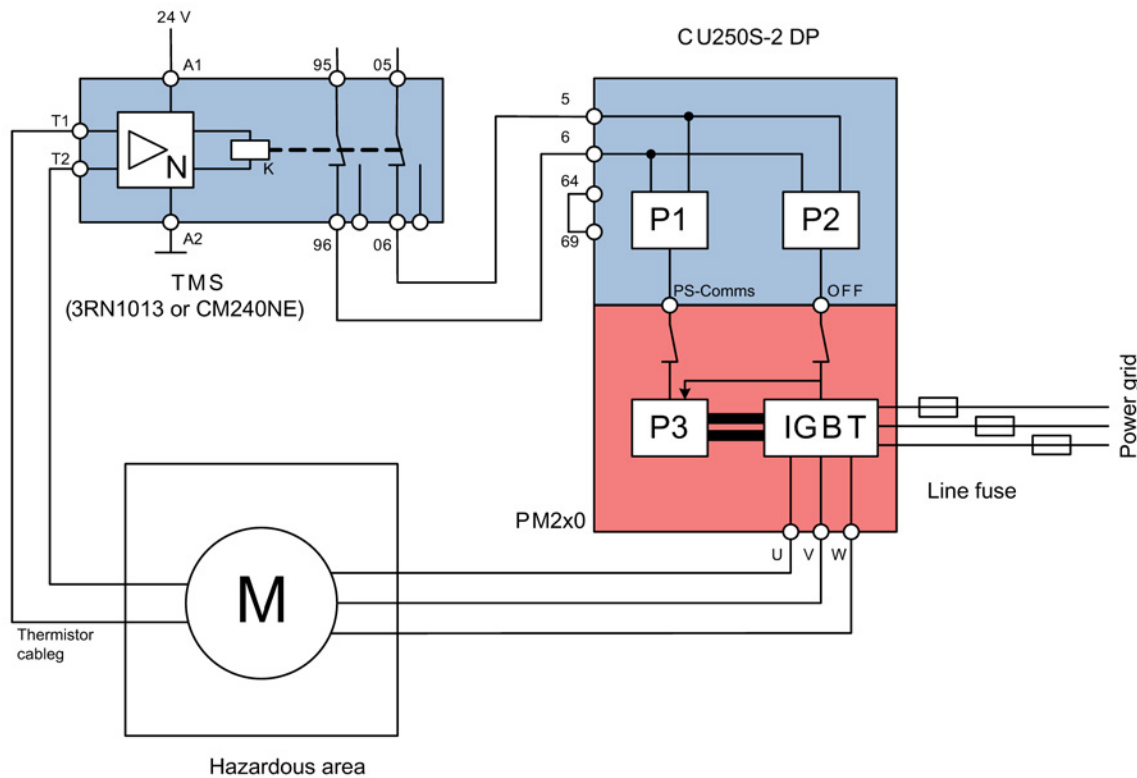


Figure A-3 Inverter, ATEX application

Install the TMS (e.g. CM240NE) corresponding to the installation instructions of the thermistor motor protection trip unit.

Install the inverter power unit corresponding to the PM240, PM250 or PM260 installation instructions.

Install the fail-safe control module (e.g. CU250S-2 DP) corresponding to the operating instructions of the SINAMICS G120 Control Unit.

24 VDC must be connected to the safety input terminals (5, 6 and 64) of the fail-safe control module via the TMS output terminals (the 24 V output of the inverter should be used for this purpose in order to avoid the formation of parasitic voltages). The wiring must be realized so that a short-circuit can be completely ruled-out (conductors must be separately routed). The terminal pair used must be parameterized with the safety function Safe Torque Off (STO) - according to the operating instructions for G120 Control Units.



## Example

- Rated motor current:  $I_n = 2 \text{ A}$
- DC-link voltage:  $Z_u = 600 \text{ V}$
- Winding resistance:  $R_w = 100 \text{ Ohm}$

In the case of a short-circuit, for this particular motor, a short-circuit current of 6 A would flow. In this particular case, a 16 A fuse would not rupture - and the temperature would continue to increase and with it the danger of an explosion.

An overview of the recommended fuses as example for various motors when using a PM260 power unit is shown in the following table.

Table A- 1 Recommended fuses for the PM260

Motor, 690 V		Rated device current, PM260			Fuse	
$P_N$ [kW]	$I_n$ [A]	MLFB	$P_N$ , cl. $\ddot{U}$ . [kW]	$I_n$ , cl. $\ddot{U}$ . [A]	MLFB	$I_n$ [A]
1.1	1.4	6SL3225-0BH27-5xA0	11	14	3NA3 801-6	6
1.5	1.9	6SL3225-0BH27-5xA0	11	14	3NA3 801-6	6
2.2	2.7	6SL3225-0BH27-5xA0	11	14	3NA3 801-6	6
3	3.7	6SL3225-0BH27-5xA0	11	14	3NA3 803-6	10
4	4.8	6SL3225-0BH27-5xA0	11	14	3NA3 805-6	16
5.5	6.6	6SL3225-0BH27-5xA0	11	14	3NA3 805-6	16
7.5	8.8	6SL3225-0BH27-5xA0	11	14	3NA3 807-6	20
11	12.4	6SL3225-0BH27-5xA0	11	14	3NA3 810-6	15
15	16.5	6SL3225-0BH31-1xA0	14	19	3NA3 814-6	35
18.5	20.5	6SL3225-0BH31-5xA0	18.5	23	3NA3 814-6	35
22	23.9	6SL3225-0BH32-2xA0	30	35	3NA3 822-6	63
30	31.7	6SL3225-0BH32-2xA0	30	35	3NA3 822-6	63
37	38.1	6SL3225-0BH33-0xA0	37	42	3NA3 824-6	80
45	46.2	6SL3225-0BH33-7xA0	55	62	3NA3 830-6	100
55	57.7	6SL3225-0BH33-7xA0	55	62	3NA3 830-6	100



# B

## List of abbreviations

Abbreviation	Status
<b>A</b>	
ASIC	Application-Specific Integrated Circuit
ATEX	"Atmosphère explosible", implementation of EC Directive 94/9/EC
<b>B</b>	
BOP	Basic Operator Panel
Braking R	Braking resistor at the inverter
<b>C</b>	
CE	Communauté Européenne
CM	Chemical industry module
CU	Control Unit
<b>D</b>	
DC	Direct Current
DP	Distributed I/Os
DP-V1	Non-cyclic data transfer (extended PROFIBUS function)
<b>E</b>	
ELV	Safe electrical separation
<b>F</b>	
F3E filter	Type of filter in the Power Module that results in low line harmonics for the inverter
FAQ	Frequently Asked Questions
FSx	Frame Size (i.e. the inverter power rating)
FSA	Frame size A
FSB	Frame size B
FSC	Frame size C
FSD	Frame size D
FSE	Frame size E
FSF	Frame size F
FSG	Frame size G
<b>G</b>	
G120	Series of inverters
<b>I</b>	
I/O	Input/output
IBN	Commissioning
IGBT	Insulated gate bipolar transistor
IT system	Type of ground connection of a distribution system (neutral point of the supply transformer non-grounded)
<b>L</b>	

Abbreviation	Status
LC filter	Coil-capacitor arrangement for filtering
LED	Light Emitting Diode
<b>M</b>	
MW	Measured value (general)
<b>N</b>	
NAMUR	Association of users of process control systems
NE xx	NAMUR recommendation
<b>P</b>	
PELV	Extra low-voltage circuit with protective separation (with protective conductor)
PM	Power Module (power unit)
PROFIBUS	Fieldbus in automation technology (serial, often with RS485)
PTB	Physikalisch Technische Bundesanstalt in Braunschweig (certified authority 94/9/EC)
PTC	Positive temperature coefficient
<b>S</b>	
SELV	Extra low-voltage circuit with protective separation (without protective conductor)
STO	Safe Torque Off (STO)
Sub-D	Connector type
<b>T</b>	
TIA	Totally Integrated Automation (concept for extensive networking and automation)
TMP	Thermal Motor Protection (for temperature sensors in motors)
TN system	Type of ground connection of a distribution system (neutral point of the supply transformer grounded, neutralization at the neutral point)
<b>V</b>	
VT	Variable torque (low overload)



# Glossary

## NAMUR

NAMUR is an association of automation technology users in the process industry. The association issues recommendations that are designated with "NE xx".

## NE 37

NAMUR recommendation NE37 "Inverter version - standard terminal strip for variable-speed drives" describes the special arrangement of the terminal strips.



# Index

## A

- Accessories, 79
- Analog value de-coupling, 69
- Analog values, 75
- ATEX application
  - Connecting the inverter, 91
  - Safe commissioning, 90

## B

- Block diagram, 22
- Bus termination, 29

## C

- Cable harness, long, 32
- Category C1, 83
- Category C2, 83
- Category C3, 83
- Category C4, 82
- Certificates, 85
- Chemical industry inverter, 15
  - Characteristics, 20
  - Design, 19
- Chemical industry module, 15, 21
- Classification of EMC behavior, 82
- Commissioning, 39
  - Procedure, 40
  - Requirement, 39
- Commissioning change-over switch "normal test", 37
- Commissioning the basic unit, 41
- Commissioning with script file, 59
- Commissioning with STARTER
  - Drive wizard, 52
  - Script file, 59
- Configuring the CU, 40
- Connecting PROFIBUS DP, 36
- Connecting the CU and CM, 31
- Connecting the field side, 35
- Connection diagram, 26

## D

- Digital inputs and outputs, 75

- Dimension drawing, 77
- Directives, 84
- Display elements, 37

## E

- Environmental conditions, 74
- European EMC Directive, 84
- European Low-Voltage Directive, 84
- European Machinery Directive, 84

## F

- Fieldbus interfaces, 29
- First environment, 82
- Forced checking procedure, 67
- Free function blocks
  - Activating, 48

## G

- Grounding, 34

## I

- Industrial systems, 82
- Insulation data, 75
- Interfaces, 29
- Interfaces at the CM, 25
- Inverters for explosion-protected motors
  - Marking, 86
- ISO 9001, 84

## M

- Mounting, 24

## O

- Operating states, 38
- Operator controls, 37
- Overview of the terminal strips, 35

## **P**

- Parameterization
  - Chemical industry module, 39
  - CU250S-2 DP (vector), 39
- Public systems, 82

## **S**

- Safety Integrated
  - Commissioning, 67
- Script
  - NAMUR\_G120\_V3\_xx, 81
  - Overview of functions, 81
- Second environment, 82
- Sensor cable, 73
- Standards, 84
  - EN 61800-3,
- Strain relief, 32

## **T**

- Technical data, 73
- Terminal assignment X3, 28
- Terminal assignment, X11 and X12
  - Assignment to the terminals of the CU250S-2 DP, 27
- Terminal assignment, X2 and X3, 28
- Thermal motor protection (TMP), 69
- TMP acknowledgement "RESET", 37
- TMP display elements, 38

## **U**

- User interfaces, 29



Siemens AG  
Industry Sector  
Postfach 48 48  
90026 NUREMBERG  
GERMANY

Subject to change without prior notice

© Siemens AG 2014

[www.siemens.com/automation](http://www.siemens.com/automation)