

SIEMENS



Operating Instructions

# SIPLUS HCS

IO Systems for heating elements

HCS4200 PROFINET / PROFIBUS DP

Edition

02/2021

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## IO systems for heating elements

### Heating control system SIPLUS HCS4200 PROFINET/PROFIBUS DP

#### Operating Instructions

<u>Introduction</u>	<b>1</b>
<u>Security information</u>	<b>2</b>
<u>System overview</u>	<b>3</b>
<u>Application planning</u>	<b>4</b>
<u>Installation/mounting</u>	<b>5</b>
<u>Connecting</u>	<b>6</b>
<u>Commissioning</u>	<b>7</b>
<u>Configuration</u>	<b>8</b>
<u>Functions</u>	<b>9</b>
<u>Communications</u>	<b>10</b>
<u>Process and system messages, error handling</u>	<b>11</b>
<u>Service and maintenance</u>	<b>12</b>
<u>Technical specifications</u>	<b>13</b>
<u>Appendix</u>	<b>A</b>

## Legal information

### Warning notice system

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

#### **DANGER**

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

#### **WARNING**

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

#### **CAUTION**

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

#### **NOTICE**

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

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

### Qualified Personnel

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

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# Table of contents

<b>1</b>	<b>Introduction.....</b>	<b>8</b>
1.1	Introduction.....	8
<b>2</b>	<b>Security information.....</b>	<b>12</b>
2.1	Safety information.....	12
2.2	Security information.....	14
2.3	Network settings of the HCS.....	14
<b>3</b>	<b>System overview.....</b>	<b>15</b>
3.1	Area of application.....	15
3.2	Features.....	15
3.3	Combination mode.....	19
3.4	System configuration.....	20
3.5	Central Interface Module (CIM).....	22
3.5.1	Function and design.....	22
3.6	Power Output Module (POM).....	25
3.6.1	POM4220.....	25
3.6.2	POM4320.....	28
3.7	I/O modules.....	29
3.7.1	PM4000 DI/DO.....	29
3.7.2	PM4000 U/I.....	30
3.7.3	PM4000 Temperature.....	31
<b>4</b>	<b>Application planning.....</b>	<b>33</b>
4.1	Shipping.....	33
4.2	Storage.....	33
4.3	Scope of delivery.....	33
4.4	Installation location.....	35
4.4.1	General requirements for the location of use.....	35
4.4.2	Double frame construction.....	39
4.4.3	Combined mode configuration.....	41
4.5	Power ratings.....	41
4.5.1	POM4220 power rating.....	42
4.5.2	POM4320 power rating.....	50

<b>5</b>	<b>Installation/mounting.....</b>	<b>52</b>
5.1	Requirements .....	52
5.2	Mounting the rack .....	52
5.3	Mounting the FM4240 Fan Module.....	54
5.4	Mounting the FM4240 Fan Module HP.....	56
5.5	Installing the central interface module (CIM).....	57
5.6	Installing the I/O module (PM).....	58
5.7	Mounting a POM4220 power output module .....	59
5.8	Mounting and dismantling CIM4210C PROFINET .....	60
5.9	Mounting the blanking covers.....	61
5.10	Double frame setup .....	61
5.11	Mounting a POM4320 power output module .....	63
5.11.1	Busbar mounting .....	63
5.11.1.1	Preparations .....	63
5.11.1.2	Adjusting the busbar adapter .....	64
5.11.1.3	Mounting the POM (busbar adapter) .....	67
5.11.2	Panel mounting .....	68
5.11.2.1	POM mounting (panel mounting) .....	68
<b>6</b>	<b>Connecting .....</b>	<b>69</b>
6.1	Safety information and guidelines.....	69
6.2	Connecting the protective conductor .....	70
6.3	Combined mode with POM4320 - Connecting system interfaces.....	72
6.4	Connecting the PROFINET/PROFIBUS fieldbus.....	74
6.5	Connect 24 V DC power supply .....	74
6.6	Connecting the heating elements and three-phase line supply.....	77
6.6.1	Connecting the heating elements and three-phase line supply.....	77
6.6.2	POM4220 Lowend block diagram.....	84
6.6.3	Block diagram POM4220 Midrange phase angle control and POM4220 Flexible .....	85
6.6.4	POM4220 Highend block diagram.....	86
6.6.5	Block diagram POM4320.....	91
6.7	Connecting I/O modules.....	92
6.7.1	PM4000 DI/DO .....	92
6.7.2	PM4000 U/I.....	94
6.7.3	PM4000 Temperature .....	95
<b>7</b>	<b>Commissioning .....</b>	<b>98</b>
7.1	Requirements .....	98
7.2	Commissioning.....	98
7.3	Insulation test.....	99

<b>8</b>	<b>Configuration.....</b>	<b>100</b>
8.1	Integrating the HCS4200 components into the PROFINET configuration.....	100
8.2	Integrating the HCS4200 components into the PROFIBUS configuration.....	100
8.3	Device configuration and configuration parameters in the TIA Portal.....	101
8.3.1	Device configuration PROFINET HCS4200 .....	101
8.3.2	Device configuration PROFINET HCS4200 combination mode .....	102
8.3.3	PROFIBUS device configuration .....	103
8.3.4	Configuration parameters .....	104
8.3.4.1	Configuration parameters for CIM and POM.....	104
8.3.4.2	Configuration parameters for I/O modules.....	108
8.4	Software tools for commissioning support.....	110
8.4.1	Overview of tools for commissioning support.....	110
8.5	Configuration control (option handling) .....	112
8.5.1	Configuration control.....	112
8.5.2	Configuring .....	113
8.5.3	Controller .....	113
8.5.3.1	Slot assignment .....	113
8.5.3.2	Control data record.....	114
8.5.3.3	Feedback data record.....	115
8.5.3.4	Transferring control data record in the startup program of the CPU.....	116
8.5.3.5	Behavior during operation.....	118
8.5.4	Examples of configuration control.....	119
8.5.4.1	Station master HCS4200 .....	119
8.5.4.2	Station master HCS4200 combined mode.....	122
<b>9</b>	<b>Functions .....</b>	<b>124</b>
9.1	Overview of functions.....	124
9.2	Status and actual displays .....	124
9.3	Power output control.....	125
9.3.1	Half-wave control .....	125
9.3.2	Phase angle control.....	126
9.3.3	Soft starting function.....	127
9.3.4	Switch on heating.....	128
9.3.5	Soft start during heater operation .....	129
9.3.6	Channel control via setpoints .....	129
9.3.7	Channel control via fields.....	129
9.3.8	Line voltage compensation .....	130
9.3.9	Power control .....	131
9.3.10	Behavior of the power outputs.....	132
9.4	Digital inputs/outputs.....	133
9.5	Recording of analog measured line values.....	134
9.5.1	Recording of analog measured line values with PM4000 U/I.....	134
9.5.2	Recording of analog measured line values with POM4220 Highend .....	135
9.6	Recording of analog measured values .....	136
9.7	Monitoring functions .....	137
9.7.1	Monitoring phase connection.....	137
9.7.2	Rotating field check .....	137

9.7.3	Line supply voltage monitoring .....	138
9.7.4	Monitoring of the 24 V DC supply voltage .....	139
9.7.5	Frequency monitoring .....	139
9.7.6	Temperature monitoring.....	140
9.7.7	Monitoring power channels .....	141
9.7.8	Monitoring power channels with loads connected in parallel .....	142
9.7.9	Total current monitoring.....	142
9.7.10	Fault current monitoring.....	143
9.7.11	Monitoring of output control .....	143
9.7.12	Monitoring of adaptive soft start.....	144
<b>10</b>	<b>Communications.....</b>	<b>145</b>
10.1	Cyclic data exchange .....	145
10.1.1	Cyclic output data .....	145
10.1.2	Cyclic input data .....	149
10.2	Acyclic data exchange.....	152
10.2.1	Acyclic output data .....	153
10.2.2	Acyclic input data .....	158
10.3	Transfer of diagnostic alarms to the controller.....	163
10.3.1	Transferring diagnostic alarms to the controller: PROFINET .....	163
10.3.2	Transferring diagnostic alarms to the controller: PROFIBUS .....	163
10.3.3	Manufacturer-specific error codes .....	164
<b>11</b>	<b>Process and system messages, error handling.....</b>	<b>168</b>
11.1	Central Interface Module (CIM) .....	168
11.1.1	LED operating display for CIM .....	168
11.2	Power Output Module (POM) .....	169
11.2.1	LED operating display for POM .....	169
11.2.2	Fault reporting through diagnostics data.....	169
11.3	I/O modules .....	172
<b>12</b>	<b>Service and maintenance .....</b>	<b>173</b>
12.1	Maintenance work.....	173
12.2	Firmware update .....	173
12.2.1	PROFINET firmware update .....	173
12.2.2	PROFIBUS firmware update .....	174
12.3	Fuse replacement .....	176
12.3.1	POM4220 Fuse Replacement.....	176
12.3.2	POM4320 Fuse Replacement.....	178
12.4	Replace fan.....	182
12.4.1	Replacing the Fan Module.....	182
12.4.2	POM4320 and CIM4210C PROFINET – Replacing fans .....	185
12.5	Replacing a power output module (POM) .....	186
12.5.1	Safety information.....	186
12.5.2	Replacing the POM4220.....	186
12.5.3	Replacing the POM4320.....	188
12.6	Replacing the Central Interface Module (CIM).....	189



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12.7	Replacing an I/O module .....	191
12.8	Recycling and disposal .....	193
<b>13</b>	<b>Technical specifications.....</b>	<b>194</b>
13.1	Technical specifications for Rack4200.....	194
13.2	Technical Specifications CIM4210 .....	196
13.3	Technical Specifications CIM4210C .....	199
13.4	Technical specifications of POM .....	202
13.4.1	Technical specifications of POM4220 .....	202
13.4.2	Technical Specifications POM4320 .....	212
13.5	Technical specifications for I/O module.....	222
13.6	Technical specifications for fan module .....	231
13.7	Technical specifications of expansion module EM4315 (for combined mode only) .....	233
13.8	Dimension drawings .....	236
13.8.1	HCS4200 components .....	236
13.8.2	HCS4300 components .....	239
<b>A</b>	<b>Appendix.....</b>	<b>242</b>
A.1	Certificates and approvals .....	242
A.1.1	Certificates and approvals .....	242
A.2	Ordering data .....	244
A.3	ESD guidelines .....	246
A.4	Service & Support .....	248
	<b>Index.....</b>	<b>250</b>

# Introduction

## 1.1 Introduction

### Purpose of this documentation

These operating instructions contain the information you require to commission, operate and service the HCS4200 heating control system.

### Target group

The documentation is intended for qualified personnel in the following specialist fields:

- Operators, project engineers, programmers
- Electrically skilled personnel who assemble, connect and commission the device.

### Required basic knowledge

- These operating instructions require prior knowledge of programming a SIMATIC S7 controller or SIMOTION.
- Knowledge of working with the PROFINET / PROFIBUS fieldbus is also necessary.

### Naming conventions and abbreviations

A synonym, an abbreviation, or the term "device" is sometimes used in this documentation instead of the full product name.

The following terms and abbreviations are used:

Heating control system	HCS
Power Output Module	POM
Central Interface Module	CIM
Rack	Rack
SIMATIC S7	S7
I/O module	PM

### History

The following earlier release versions of these operating instructions have been published:

Edition	Note
12/2014	First edition
10/2015	Expansion for operation of 24 POMs and one I/O module; rack for 4 POMs; connection to PROFIBUS DP

Edition	Note
12/2016	<ul style="list-style-type: none"><li>• Expansion with operation of POM4320 (combined mode)</li><li>• POM4220 Midrange phase angle control</li><li>• Configuration control (option handling)</li><li>• Commissioning support using PRONETA</li></ul>
10/2017	Expansion with POM4220 Highend and POM4220 Flexible
09/2018	Expansion with additional switching options and operating modes for POM4220 Highend
07/2019	Extension with CIM4210C PROFINET
02/2021	Extension with POM4240 Fan Module HP

## Scope of the document

This document is valid for all components of the SIPLUS HCS4200 specified in these operating instructions and describes the current delivery state.

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### Note

#### Notes for devices through FW version 1.x of the CIM

- A maximum of 12 POMs can be operated in one 12-unit rack.
- PMs and the DP connection are not available.
- The following applies to the reading data records 152, 200 and 201 (Acyclic input data (Page 158)):  
The information that is read is always for the full configuration, which means for 192 channels or 12 POMs.
- The data records 160, 190 and 202 are not available.

#### Notes for devices through FW version 2.0 of the CIM

- Configuration control is not available.
- The POM4220 Midrange phase angle control cannot be configured.
- No combination mode is supported.

#### Notes for devices through FW version 2.1 of the CIM

- POM4220 Highend and Flexible cannot be configured.
- Data record 50 is not available.

#### Notes for devices through FW version 2.2 of the CIM

The following functions of the POM4220 Highend are not available:

- Power control
- 2-pin switching
- Economy circuit
- Adaptive soft start

#### Notes for devices through FW version 2.3 of the CIM

- Data record 51 is not available.
- An update via TIA Portal is not possible

#### Notes for devices through FW version 2.4.1 of the CIM

- The POM4220 Midrange with phase control does not support the soft start for a transition from 0% to another value.
- 

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## Restrictions

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### Note

Restrictions for devices up to firmware version 2.3 of the CIM:

- Data record 51 is not available.
  - An update via TIA Portal is not possible.
- 

### Note

Restrictions for devices up to firmware version 2.4.1 of the CIM:

- POM422 Midrange with phase control does not support the soft start for a transition from 0% to any other value.
-

## Security information

### 2.1 Safety information

This device corresponds to the approvals printed on the type plate. If you have questions about whether it is permissible to install the device in the planned environment, please contact your service representative.

#### NOTICE

Alterations to the devices are not permitted.

Failure to observe these guidelines shall constitute a revocation of the approvals and manufacturer's warranty.


#### Warning symbols on the device



#### WARNING

**Electric shock hazard**

**May cause death or serious injury**

When this warning symbol  appears on the device, you must consult the operating instructions for the device. The operating instructions contain information about the potential risks and enable you to recognize risks and implement countermeasures.

#### Note before connecting the device


#### WARNING

**Electric shock hazard**

**May cause death or serious injury**

The supply system to which the heating control system is connected must have a circuit breaker. The device must be switched off and secured against switching on again, before connecting to the line voltage. Otherwise, there is a risk of electric shock.


## Working on the device or on components connected to it

 <b>WARNING</b>
<b>Electric shock hazard</b> <b>May cause death or serious injury</b> <ul style="list-style-type: none"><li>• Voltages of more than 60 V can occur in the control cabinet. Suitable safety precautions preventing contact must therefore be taken during commissioning and maintenance work.</li><li>• Before working on the heating control system or the connected components, ensure the system is disconnected.</li></ul>

## Fuse replacement

<b>NOTICE</b>
Use only the prescribed fuse types. If you operate a heating controller with unapproved fuses, the device could be destroyed.

## Repairs

 <b>WARNING</b>
<b>No user-serviceable parts</b> <b>May cause death or serious injury</b> <p>Incorrectly performed repairs may result in substantial damage to equipment or endanger the user. Return the device to Siemens for repair.</p>

## Access to the heating control system

<b>NOTICE</b>
Only authorized personnel are permitted to access the system and make changes to it.

## 2.2 Security information

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

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

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

For additional information on industrial security measures that may be implemented, please visit (<https://www.siemens.com/industrialsecurity>).

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

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed visit (<https://www.siemens.com/industrialsecurity>).

## 2.3 Network settings of the HCS

### Network settings

The following table shows the network settings of the HCS for communication:

Protocol	Transport protocol	Port number	Function
PROFINET IO	UDP	161	Port is used for the SNMPv1 service.
PROFINET IO	UDP	34964	Port is used for establishing connection.
PROFINET IO	UDP	49152...65535	Range from which a port that is used for acyclic communication between the IO controller and S7 CPU is defined while connection is established.
	TCP	998	Port is only used for servicing when reading the event storage. The communication between a PC and the HCS is only possible with interrupted PN connection.
	TCP	999	Port is only used as part of a service case when updating the firmware. The communication between a PC and the HCS is only possible with interrupted PN connection.



## System overview

### 3.1 Area of application

The SIPLUS HCS 4200 heating control system is used to control and switch heaters in industry control and operation e.g. quartz, ceramic, flash, halogen or infrared heaters. It is of modular design and can be flexibly adapted to suit the specific requirements of the respective application.

Typical application areas are:

- Thermal treatment of fabrics and plastics
- Drying of enamels and paint coats
- PET blow molding
- Welding of plastic parts
- Handling of carbon materials

In general, the HCS4200 can be used wherever compact or modular concepts are required with low to medium levels of power output.

### 3.2 Features

#### SIPLUS HCS4200

An HCS4200 system consists of at least one rack with 4 or 12 slots, one Central Interface Module (CIM) and a maximum of 24 Power Output Modules (POM). As an option, one I/O module can be operated on the CIM. Fan modules can be mounted on the rack. Each fan module serves 4 slots or POMs.



Figure 3-1 Heating control system HCS4200 with rack for 12/4 POMs

## SIPLUS HCS4200 Compact

HCS4200 Compact consists of a rack with integrated CIM4210 and two slots for Power Output Modules (POM). The fan is already mounted on the rack.



Figure 3-2 Heating control system CIM4210C PROFINET

## System components

The following types of system component are available:

System component	Version	Note
Rack	<ul style="list-style-type: none"> <li>Rack 4200 for 12 POMs</li> <li>Rack 4200 for 4 POMs</li> </ul>	The module racks can be combined as follows: 12 / 4 / 12 + 12 / 12 + 4 / 4 + 4 POM
Central Interface Module	<ul style="list-style-type: none"> <li>CIM4210 PROFINET</li> <li>CIM4210 PROFIBUS</li> </ul>	–
	<ul style="list-style-type: none"> <li>CIM4210C PROFINET</li> </ul>	Rack with 2 slots for POM, integrated fan, not expandable
I/O module	<ul style="list-style-type: none"> <li>PM4000 DI/DO</li> </ul>	<ul style="list-style-type: none"> <li>8 digital outputs</li> <li>8 configurable inputs/outputs</li> </ul>
	<ul style="list-style-type: none"> <li>PM4000 U/I</li> </ul>	Inputs for measuring mains voltage and mains current
	<ul style="list-style-type: none"> <li>PM4000 Temperature</li> </ul>	<ul style="list-style-type: none"> <li>4 analog inputs for 0 ... 20 mA</li> <li>4 measuring inputs for temperature</li> </ul>
Power Output Module	<ul style="list-style-type: none"> <li>POM4220 Lowend</li> </ul>	<ul style="list-style-type: none"> <li>230 V AC, 16 power outputs</li> <li>≤ 1449 W per power output</li> </ul>
	<ul style="list-style-type: none"> <li>POM4220 Midrange phase control</li> </ul>	<ul style="list-style-type: none"> <li>230/277 V AC, 12 power outputs</li> <li>≤ 4432 W per power output</li> </ul>

System component	Version	Note
	<ul style="list-style-type: none"><li>POM4220 Highend</li></ul>	<ul style="list-style-type: none"><li>230/277/400/480 V AC, 8 power outputs</li><li>≤ 9600 W per power output</li></ul>
	<ul style="list-style-type: none"><li>POM4220 Flexible</li></ul>	<ul style="list-style-type: none"><li>45 V AC, 75 V AC, 110 V AC, 230/277 V AC, 12 power outputs</li><li>≤ 4432 W per power output</li></ul>
Fan module	<ul style="list-style-type: none"><li>FM4240</li></ul>	Fan module for ventilation of 4 POM
	<ul style="list-style-type: none"><li>FM4240 HP</li></ul>	Fan module for ventilation of 4 POM, High Power

## Features

- Modular central configuration
- Communication over PROFINET or PROFIBUS (CIM4210C only PROFINET)
- Parameter assignment, commissioning, visualization diagnostics and FW update via Siemens TIA Portal
- Integrated diagnostic and monitoring functions
- Diagnostics, analysis and configuration of PROFINET networks with PRONETA
- Control modes:
  - POM4220 Lowend: Half-wave control
  - POM4220 Midrange phase angle control and POM4220 Highend:  
Half-wave control, Softstart and phase control
  - POM4220 Flexible: Half-wave control
- Connection of incoming supply through 3-pole connector on the front of the POM
- Connection of power outputs via two connectors on the front of the POM
- Only a 24 V supply is needed for up to 12 POMs (with one rack) or 24 POMs (when using a double rack).
- Slot for an I/O module (not with CIM4210C PROFINET).

A detailed list of the functions for the different POM versions is available in section Overview of functions (Page 124).

### 3.3 Combination mode

#### Combined mode with POM4320

To be able to combine the HCS systems HCS4200 and HCS4300, the HCS4200 system can be expanded with POMs from the HCS4300 system.



Figure 3-3 Example: Combined mode HCS4200 with POM4320

The following additional system components are available:

System components	Version	Description
Power Output Module (POM)	<ul style="list-style-type: none"> <li>POM4320, busbar mounting</li> </ul>	9 power outputs with diagnostics and error display per channel.
	<ul style="list-style-type: none"> <li>POM4320, rear wall mounting</li> </ul>	
Expansion module	<ul style="list-style-type: none"> <li>EM4315</li> </ul>	Enables operation of up to 8 additional POMs

#### Note

Combination mode is not possible with POM4320 Highend.

#### Features

- Operation of up to 4 POMs per rack
- Operation of 8 additional POMs by using an HCS4300 expansion module with 24 V DC supply.

## 3.4 System configuration

### System components

A complete HCS4200 heating control system includes the following components:

- Central Interface Module CIM4210 with PROFINET or PROFIBUS
- Power Output Module POM4220
- Power Output Module POM4320 (optional)
- Rack
- Fan module (optional)
- Higher-level controller (e.g. SIMATIC S7-1500 automation system with PROFINET or PROFIBUS)
- Field PG (optional, for commissioning and diagnostics)
- Industrial PC (optional, e.g. Panel PC SIMATIC IPC 477D)
- Heating field

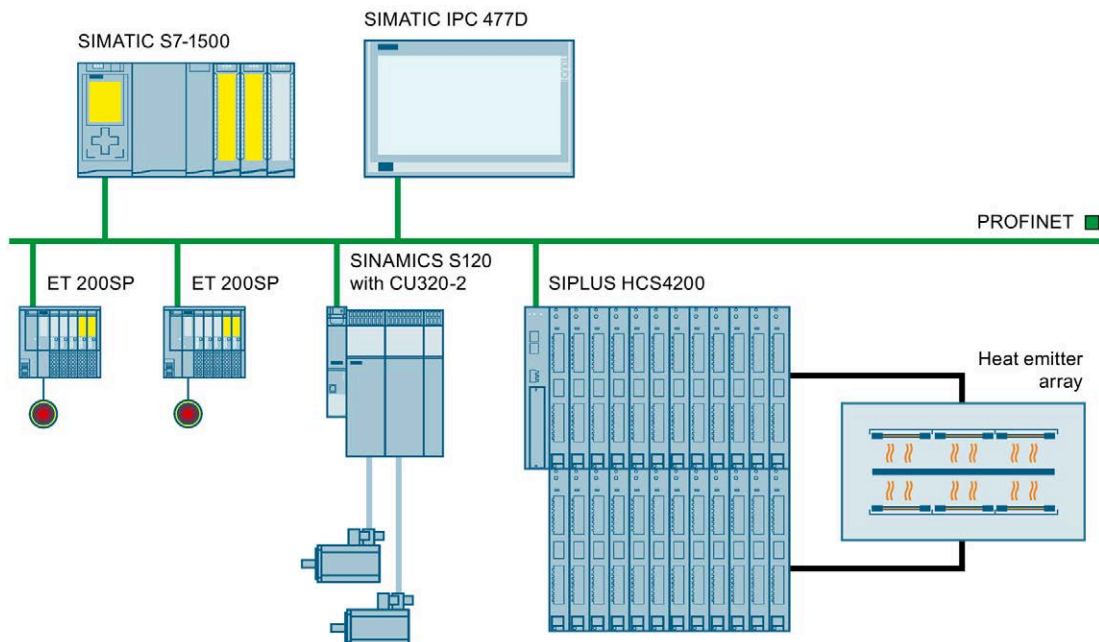


Figure 3-4 HCS4200 system configuration

### System configuration

Several POMs can be operated on one CIM. This supports the implementation of centralized heating applications, for example, in thermoforming, where the heating elements are implemented in numerous arrays and the modular heating control system is located in a central control cabinet.

## Communication over PROFINET or PROFIBUS

PROFINET unites the industrial experience of PROFIBUS with the openness and flexible options of Ethernet. PROFINET enables high-speed and secure data exchange at all levels, thus making it possible to implement innovative machine and plant concepts.

PROFIBUS has been established for years as the fieldbus for machines and plants. Based on serial bus technology, it is the foundation for the distributed concepts that are common today.

## 3.5 Central Interface Module (CIM)

### 3.5.1 Function and design

#### Function

The Central Interface Module (CIM) handles the communication with the higher-level controller and with the connected Power Output Modules (POM). In addition, the CIM provides the 24 V DC power supply for the connected POM and fan module FM4240.



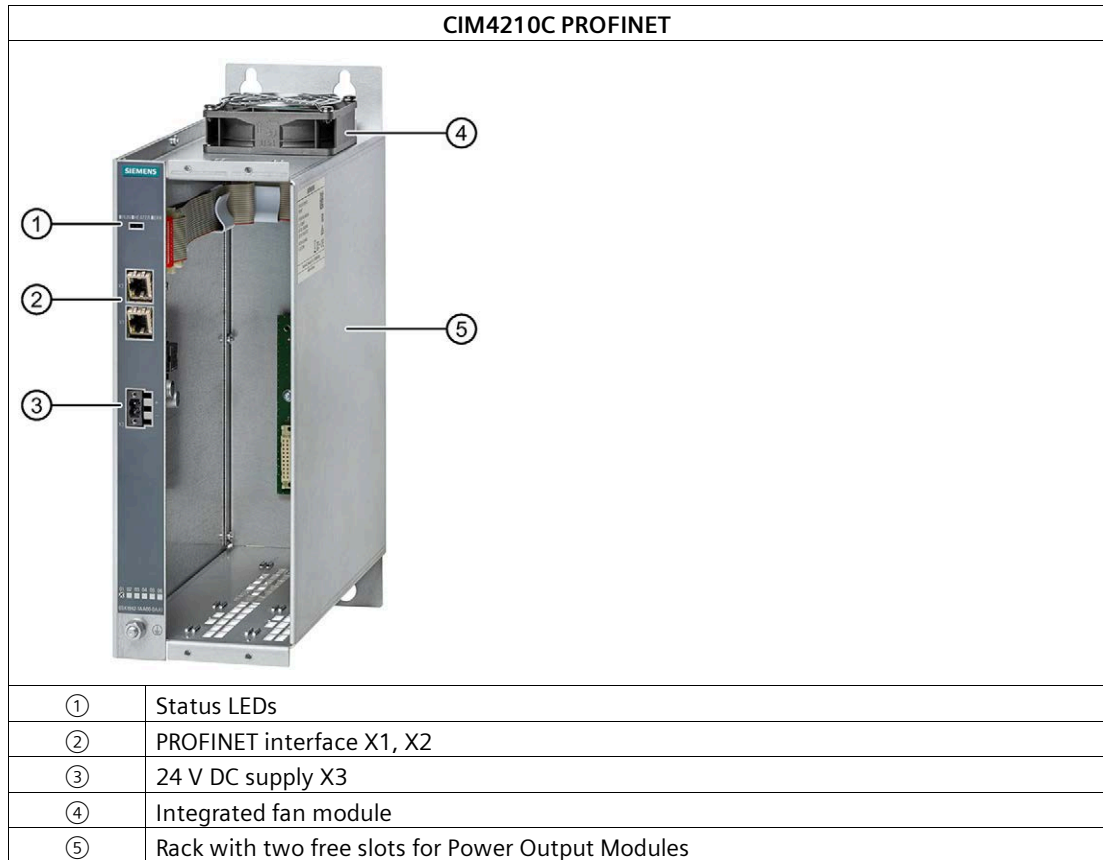
## CIM4210

The CIM4210 is available in two versions with PROFINET interface or with PROFIBUS interface.

CIM4210 PROFINET		CIM4210 PROFIBUS	
①	Status LEDs	①	Status LEDs
②	System interface to installation frame (rack)	②	System interface to installation frame (rack)
③	PROFINET interface X1, X2	③	Address selector switches S1 and S2 for PROFIBUS
④	24 V DC supply X3	④	<ul style="list-style-type: none"> <li>• PROFIBUS DP interface X1</li> <li>• Service interface X2</li> </ul>
⑤	Slot for I/O module	⑤	24 V DC supply X3
		⑥	Slot for I/O module

### CIM4210C

The CIM4210C features a PROFINET interface and has two slots for Power Output Modules.



## 3.6 Power Output Module (POM)

### 3.6.1 POM4220

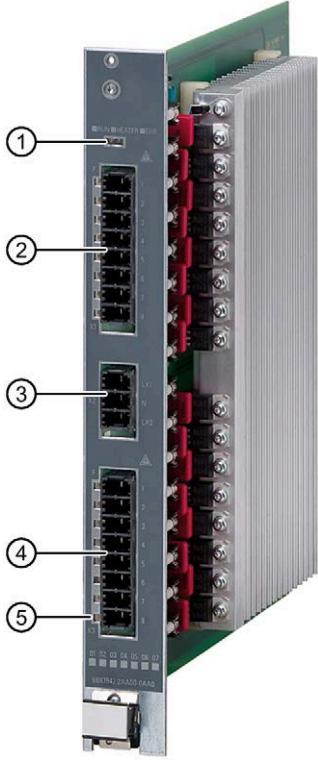
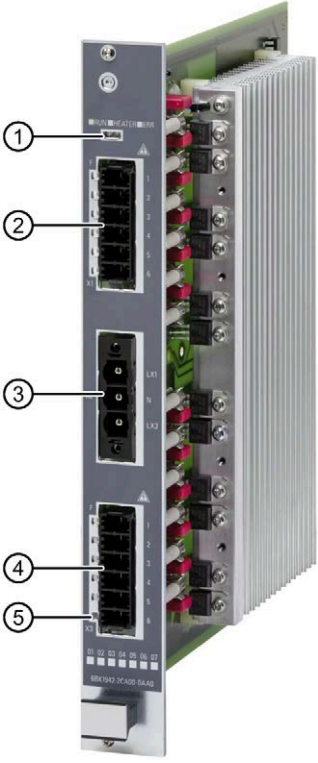
#### Function

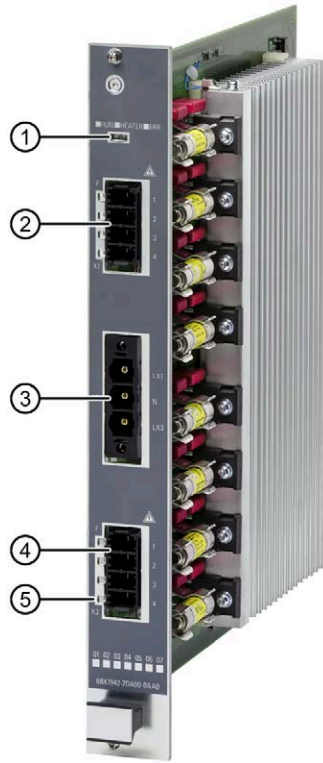
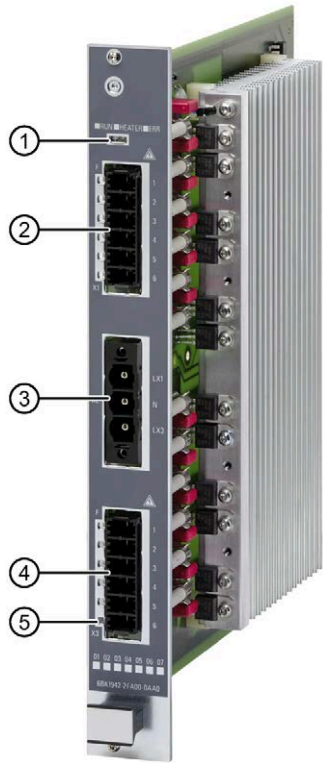
The power output module (POM) offers power outputs for resistive loads and can be operated in TN and TT networks.

POM version	Number of power outputs	Output voltage Total contact rating
POM4220 Lowend	16	<ul style="list-style-type: none"> <li>• 230 V AC / 16.1 kW</li> </ul>
POM4220 Midrange phase angle control	12	<ul style="list-style-type: none"> <li>• 230 V AC / 29.4 kW</li> <li>• 277 V AC / 35.5 kW</li> </ul>
POM4220 Highend	8	<ul style="list-style-type: none"> <li>• 230 V AC / 29.4 kW</li> <li>• 277 V AC / 35.5 kW</li> <li>• 400 V AC / 51.2 kW</li> <li>• 480 V AC / 61.4 kW</li> </ul>
POM4220 Flexible	12	<ul style="list-style-type: none"> <li>• 45 V AC / 5.8 kW</li> <li>• 70 V AC / 9 kW</li> <li>• 110 V AC / 14.1 kW</li> <li>• 230 V AC / 29.4 kW</li> <li>• 277 V AC / 35.5 kW</li> </ul>

You will find detailed connection information in the section "Technical specifications (Page 194)".

Design

POM4220 Lowend		POM4220 Midrange phase angle control	
			
①	Status LEDs	①	Status LEDs
②	Power outputs 1 ... 8	②	Power outputs 1 ... 6
③	Incoming supply	③	Incoming supply
④	Power outputs 9 ... 16	④	Power outputs 7 ... 12
⑤	Error LED for each channel	⑤	Error LED for each channel

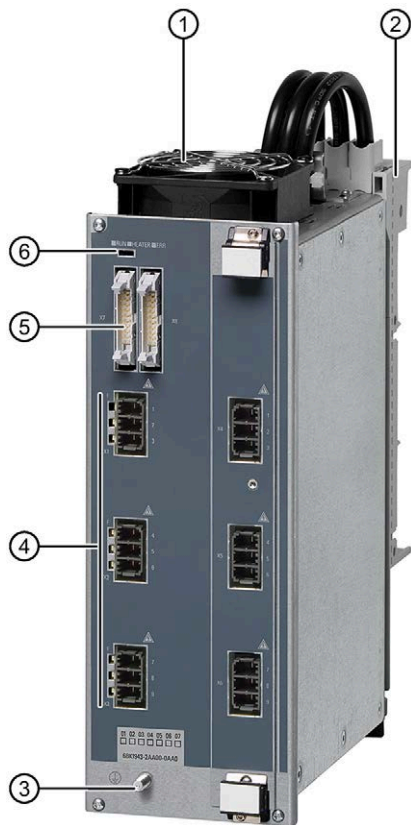
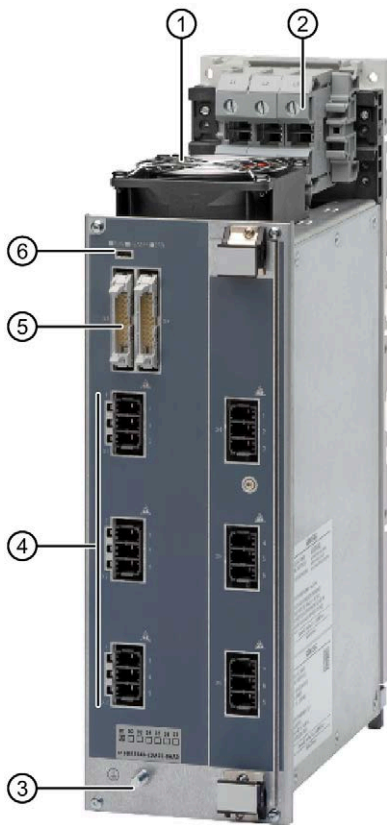
POM4220 Highend		POM4220 Flexible	
			
①	Status LEDs	①	Status LEDs
②	Power outputs 1 ... 4	②	Power outputs 1 ... 6
③	Incoming supply	③	Incoming supply
④	Power outputs 5 ... 8	④	Power outputs 7 ... 12
⑤	Error LED for each channel	⑤	Error LED for each channel

### 3.6.2 POM4320

#### Function

The Power Output Module (POM) offers 9 power outputs for resistive loads and can be operated in TN and TT networks. The Power Output Module is available in different versions for busbar or panel mounting.

#### Configuration

POM4320 for busbar mounting		POM4320 for panel mounting	
			
①	Fans	①	Fan
②	Busbar adapter	②	Mains connection L1/L2/L3
③	Protective conductor connection	③	Protective conductor connection
④	3 x 3 power outputs including feedback, error LED for each power output	④	3 x 3 power outputs including feedback, error LED for each power output
⑤	HCS system interface	⑤	HCS system interface
⑥	Status LEDs	⑥	Status LEDs

## 3.7 I/O modules

### 3.7.1 PM4000 DI/DO

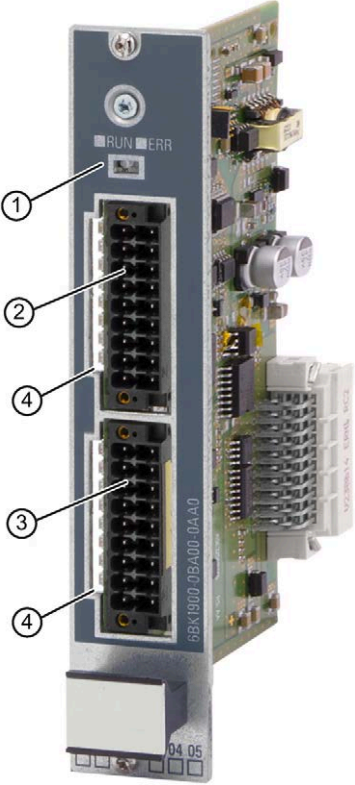
#### Function

The I/O module PM4000 DI/DO provides 8 digital outputs and 8 configurable inputs/outputs. The digital I/O modules are controlled by the S7-CPU using the process image.

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

The PM4000 DI/DO may not be used for safety-related functions.
--

Design

PM4000 DI/DO	Item	Description
	①	Status LEDs <ul style="list-style-type: none"> <li>• RUN LED lights up green: Power on / Initialization status</li> <li>• ERR LED lights up red: fault</li> </ul>
	②	Digital outputs 1 to 8
	③	Digital inputs/outputs 9 to 16 (switchable for each channel)
	④	LED to display switching status (one LED each per input/output) <ul style="list-style-type: none"> <li>• LED on: H state</li> <li>• LED off: L state</li> </ul>

3.7.2 PM4000 U/I

Function

The I/O module PM4000 U/I provides inputs for measuring line voltage and line current.

- Voltage measurement

Either the supplied line-to-line voltage or the star voltage is measured (parameterizable) The rms effective value is calculated from the measured values.

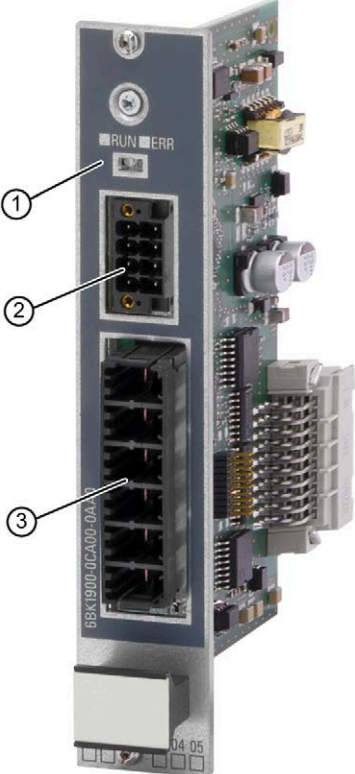
- Phase current measurement

Three current transformers can be connected to the module (L1, L2, L3). The rms effective value is calculated from the measured values. The measuring accuracy depends on the current transformers used.

The measured values are transferred via the fieldbus and can be evaluated and further processed by the user.



## Design

PM4000 U/I	Item	Description
	①	Status LEDs <ul style="list-style-type: none"> <li>• RUN LED lights up green: Power on / Initialization status</li> <li>• ERR LED lights up red: Fault</li> </ul>
	②	Measuring inputs, line current
	③	Measuring inputs, line voltage

### 3.7.3 PM4000 Temperature

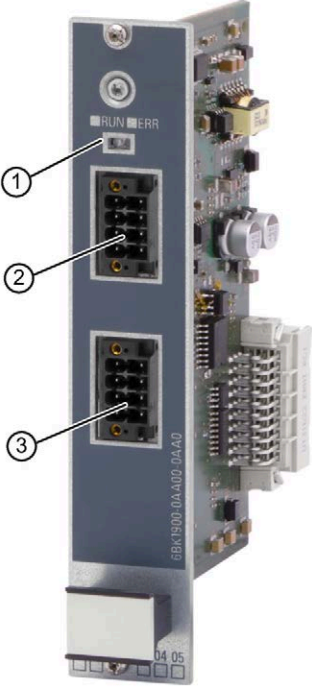
#### Function

Temperature I/O module for HCS Central Interface Module (CIM).

- Four measuring inputs for temperature in two-wire technology or two measuring inputs for temperature in four-wire technology.
- Four analog inputs for 0 ... 20 mA

The measured values are transferred via the fieldbus and can be evaluated and further processed by the user.

Design

PM4000 Temperature	Item	Description
	①	Status LEDs <ul style="list-style-type: none"> <li>• RUN LED lights up green: Power on / Initialization status</li> <li>• ERR LED lights up red: fault</li> </ul>
	②	Analog inputs 1 to 4
	③	Measuring inputs 1 to 4 for temperature

## Application planning

### 4.1 Shipping

#### Shipping

<b>NOTICE</b>
<p><b>Damage to the device</b></p> <p>The device can be damaged by inappropriate shipping. Transport the device, therefore, only in the original packaging. This will give it the necessary protection against shock and impact.</p>

### 4.2 Storage

It is absolutely essential that the device is stored in compliance with the storage conditions as described in Chapter Technical specifications (Page 194). In the event of ingress of dirt or liquid into the equipment, formation of condensation, damage or any other failures to comply with the prescribed storage conditions, the equipment must not be commissioned until the correct remedial procedure has been discussed with Siemens AG.

### 4.3 Scope of delivery

Depending on the components ordered, the scope of delivery includes:

HCS4200 component	Included in the scope of supply
HCS Rack4200	<ul style="list-style-type: none"> <li>• Compact Operating Instructions</li> </ul>
HCS POM4220	<ul style="list-style-type: none"> <li>• Compact Operating Instructions</li> <li>• For POM4220 Lowend: 2 plug connectors, 8-pin</li> <li>• For POM4220 Midrange phase angle control: 2 plug connectors, 6-pin</li> <li>• For POM4220 Highend: 2 plug connectors, 4-pin</li> <li>• For POM4220 Flexible: 2 plug connectors, 6-pin</li> <li>• 1 plug connector, 3-pin</li> </ul>

HCS4200 component	Included in the scope of supply
HCS CIM4210	<ul style="list-style-type: none"> <li>• Compact Operating Instructions</li> <li>• CD with license information (CIM PROFINET)</li> <li>• 1 plug connector, 2-pin</li> </ul>
HCS CIM4210C PROFINET	<ul style="list-style-type: none"> <li>• Compact operating instructions</li> <li>• CD with license information (CIM PROFINET)</li> <li>• 1 plug connector, 2-pin</li> </ul>
HCS FM4240 Fan Module	<ul style="list-style-type: none"> <li>• Compact operating instructions</li> </ul>
HCS FM4240 Fan Module HP	<ul style="list-style-type: none"> <li>• Compact Operating Instructions</li> <li>• 1 plug connector, 2-pin</li> </ul>
HCS PM4000 Temperature	<ul style="list-style-type: none"> <li>• Compact operating instructions</li> <li>• 2 plug connectors, 8-pin</li> </ul>
HCS PM4000 DI/DO	<ul style="list-style-type: none"> <li>• Compact operating instructions</li> <li>• 2 plug connectors, 18-pin</li> </ul>
HCS PM4000 U/I	<ul style="list-style-type: none"> <li>• Compact Operating Instructions</li> <li>• One 6-pin and one 8-pin plug connector</li> </ul>

HCS4300 component	Included in the scope of supply
SIPLUS HCS4300 POM	<ul style="list-style-type: none"> <li>• Compact Operating Instructions</li> <li>• Connection cable for system interface</li> <li>• 6 Plug-in connectors for attaching heating elements</li> </ul>
Expansion module EM4315	<ul style="list-style-type: none"> <li>• Compact Operating Instructions</li> <li>• 1 plug connector, 2-pin</li> </ul>

### Unpacking and checking the delivery

1. Unpack the device.
2. Make sure that the package is complete.
3. Check the device for transport damage by visual inspection.

#### NOTICE

##### Damage to the system

Damaged parts can result in damage to the system.

Only put undamaged parts into operation.

## 4.4 Installation location

### 4.4.1 General requirements for the location of use

The SIPLUS HCS4200 heating control system is designed for stationary installation in a control cabinet and is designed exclusively for indoor areas. The rack forms the "outer frame" of the heating control system that you install in the control cabinet.

#### Installation location requirements

 **WARNING**

**Electric shock hazard**

**May cause death or serious injury**

In order to reliably prevent hazards for the operating personnel, the control cabinet must satisfy the following requirements:

- Closed cabinet
- Grounded cabinet
- The control cabinet and device connection box must satisfy the regulations regarding fire-protection housing.
- Boards and components on the reverse side of the rack must not come into contact with cables that have only single insulation and are routed through the control cabinet.

 **WARNING**

**Electric shock hazard**

**May cause death or serious injury**

The mains supply to which the device is connected must have a circuit breaker or a fuse. The circuit breaker or fuse must be easily accessible and clearly assigned to the device. We recommend locating the circuit breaker or fuse near to the device. Take the maximum current consumption of the heating control system into consideration when selecting the circuit breaker or fuse.

**The following requirements apply for UL:**

- POM4220 Lowend: Only UL-listed branch circuit fuse
- POM4220 Midrange phase angle control, POM4220 Highend, POM4220 Flexible, POM4320:  
Circuit breaker according to UL489 or UL-listed branch circuit fuse.
- Observe the SCCR rating on the rating plate. Only use the device in circuits limited accordingly.
- You must use copper cables with a minimum rating of 75 °C for the cabling.

**Note**

**Residual current protective device**

- If a residual current protective device is provided for the mains supply, a residual current circuit breakers of Type A with short-time delay is sufficient for the HCS4200.
- If a residual current protective device is planned for the mains supply and at least one POM4220 Highend is operated, use a 300 mA model.

 **WARNING**

**Electric shock hazard**

**May cause death or serious injury**

The use of a residual current protective device as the sole protection against indirect contact is forbidden.

**Note**

**Installation in control cabinet**

- In these cases, only the LEDs on the front of the device will remain visible during commissioning. Please take this into consideration for subsequent operation of the device.
- Ensure that all cables and leads that protrude externally are equipped with adequate strain relief.

## Mounting position and clearance dimensions

- The rack is mounted in the horizontal position. The Power Output Modules (POM) are inserted vertically in the rack.
- Maintain the minimum clearances from walls and other devices:
  - Sides 0 mm (stackable)
  - Top 100 mm, bottom 100 mm for ventilation and deaeration

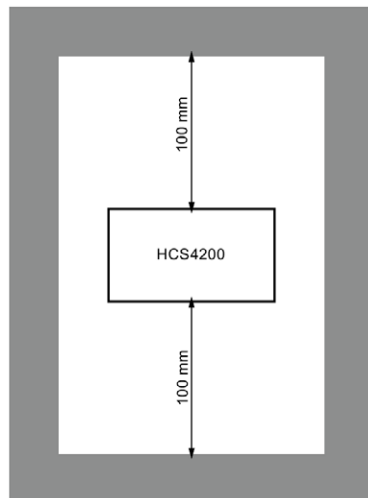


Figure 4-1 Clearances for installing an HCS4200

### NOTICE

#### Damage due to overheating

- You must comply with all the instructions regarding the installation location and mounting position. Otherwise, the device may malfunction or incur permanent damage as a result of overheating.
- Ensure that the permissible ambient temperature range is not exceeded (see Section Technical specifications (Page 194)).

## Pollution degree

SIPLUS HCS4200 is designed for pollution degree 2. Pollution degree 2 is defined as follows in the EN 50178 standard: In normal circumstances, only non-conductive pollution occurs. However, conductivity can occur occasionally and temporarily due to condensation when the device is not in operation.

### Electromagnetic compatibility (EMC) and overvoltage protection

<b>NOTICE</b>
<p><b>Damage to the device</b></p> <p>Inadequately dimensioned overvoltage protection can result in severe damage to the device.</p> <p>Therefore, ensure that the overvoltage protection is adequate (see section Connect 24 V DC power supply (Page 74)).</p>

### Power loss POM4220 Lowend, POM4220 Midrange phase angle control, POM4220 Highend and POM4220 Flexible

When planning and designing the cabinet cooling, take into consideration the power loss of the power output modules (POM). The power loss of a POM is calculated as follows:

POM version	Constant power loss per POM:	Channel power loss
<ul style="list-style-type: none"> <li>POM4220 Lowend</li> </ul>	1 W	$P_v = 0.04 \text{ W/A}^2 \cdot I^2 + 0.8 \text{ W/A} \cdot I$
<ul style="list-style-type: none"> <li>POM4220 Midrange phase control</li> <li>POM4220 Highend</li> <li>POM4220 Flexible</li> </ul>	1 W	$P_v = 0.02 \text{ W/A}^2 \cdot I^2 + 0.8 \text{ W/A} \cdot I$

You can find the power rating under POM4220 power rating (Page 42).

### Power loss of POM4320 (combined mode)

When planning and designing the cabinet cooling, take into consideration the power loss of the Power Output Modules (POM). The power loss of a POM is calculated as follows:

$$P_{VPOM} = P_{VChannel1} + P_{VChannel2} + \dots + P_{VChannel9} + 6 \text{ W}$$

$$P_{VChannel(x)} = I(x)^2 \cdot 0.04 \text{ W/A}^2 + I(x) \cdot 0.8 \text{ W/A}$$

x corresponds to the channel number

This power loss results from a 100 % activation of the channels. If the channels are not driven to 100%, which is proportional to the power loss  $P_{VChannel(x)}$ .

You can find the power rating under POM4320 power rating (Page 50).

### Restriction of the switching power when operating without soft start and phase angle control

Due to the different physical properties of radiation sources, this may result in restrictions of the permissible switching power depending on the type of radiation source.

Short-wave halogen or infrared emitters ("flash heating elements") have a high starting current due to their relatively low cold resistance. The starting current can be several times the rated current, especially during the first half waves.



Overloading of the internal fuses of the POM can occur depending on the number of switching operations as well as the duration of switching operations and pause times.

<p><b>NOTICE</b></p> <p><b>Restriction of the switching power</b></p> <p>The power limit for each POM is set by the technical parameter "Current carrying capacity per output, max. for heating elements with high inrush current" (see Technical specifications (Page 194)) for each POM.</p> <p>Therefore, we recommend you to have Siemens AG measure radiation sources with a high inrush current.</p>
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Also consider in this context the note on using contactors of the category AC 3 (see Connecting three-phase network (Page 77)).


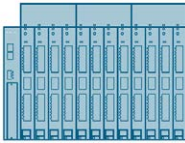
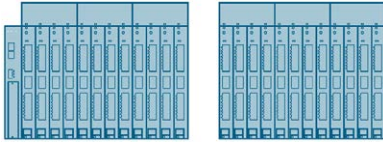
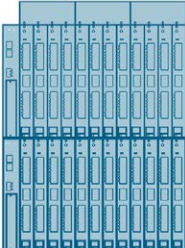
### Derating of fuses

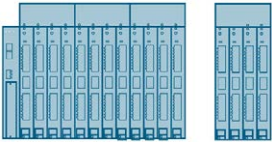
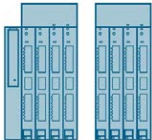
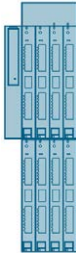
Note that fuses are subject to derating at high ambient temperatures, i.e. the rated current for a fuse is reduced.

## 4.4.2 Double frame construction

### Double frame construction

The following combinations are allowed for the installation and assembly of racks:

Combination	Side-by-side arrangement	Side-by-side arrangement
4		—
12		—
12 + 12		

Combination	Side-by-side arrangement	Side-by-side arrangement
12 + 4		–
4 + 4		

All combinations can be mounted side-by-side. The combination "4+4" and "12+12" can also be installed with only a single stacked row of fans without spacing.

**NOTICE**

- When you stack the racks, the fan in the top row must always be switched on. The user switches it on and off via a data record. See Acyclic output data (Page 153).
- When mounting the frame stacked, you need to observe a temperature derating of 10 °C.
- To control a fan, at least one POM4220 must be mounted in the frame below.

**Restrictions when using the POM4220 Highend**

Due to the power requirement of the POM4220, you cannot operate 24 POM4220 Highend at one CIM.

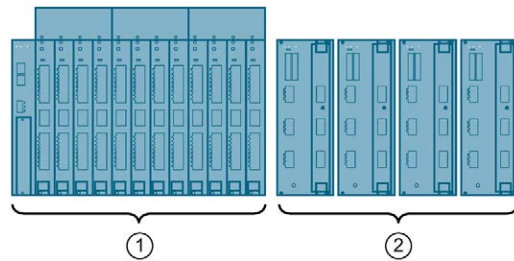
You can determine the maximum permitted number of POM4220 at one CIM with the table below:

POM	Possible POM combinations														
POM4220 Highend	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
POM4220 Lowend	21	18	17	16	15	14	13	12	11	10	8	5	3	2	1
POM4220 Midrange phase angle control															
POM4220 Flexible															

### 4.4.3 Combined mode configuration

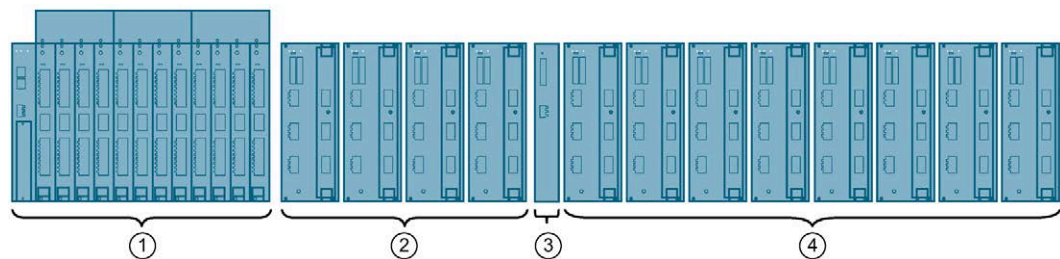
#### Combined mode configuration

HCS4200 heating control system can be combined with POM4320 as follows:



- ① HCS4200 rack with 4 or 12 POM4220
- ② 4 POM4320

Figure 4-2 HCS4200 combined mode, combination option 1



- ① HCS4200 rack with 4 or 12 POM4220
- ② 4 POM4320
- ③ 1 EM4315 expansion module
- ④ 8 POM4320

Figure 4-3 HCS4200 combined mode, combination option 2

## 4.5 Power ratings

The power ratings apply if the component HCS Rack4200 is used. Derating does not apply if the CIM4210C PROFINET is used.

### 4.5.1 POM4220 power rating

#### Power rating of the POM4220 Lowend, 230 V

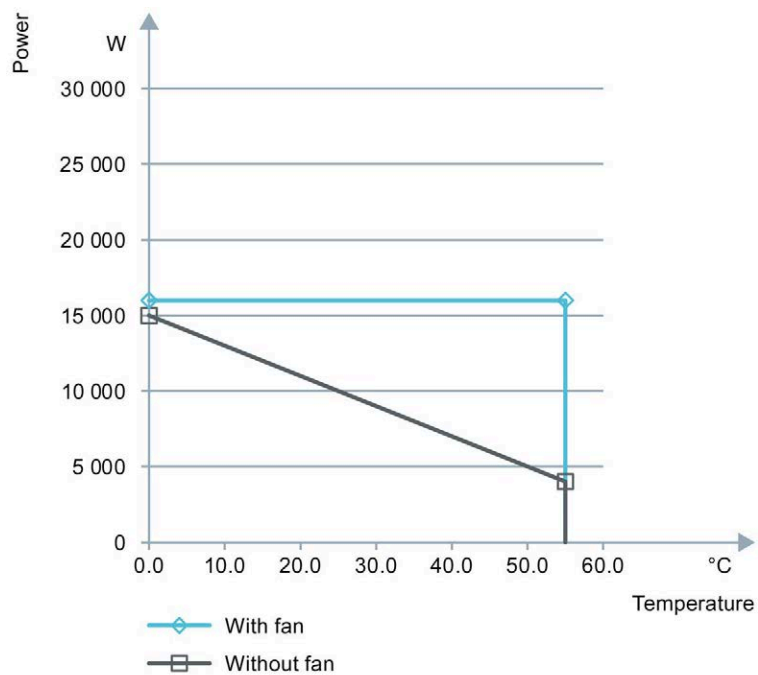


Figure 4-4 Power rating of the POM4220 Lowend, 230 V

**Power rating of the POM4220 Midrange phase angle control, POM4220 Highend and POM4220 Flexible, 230 V**

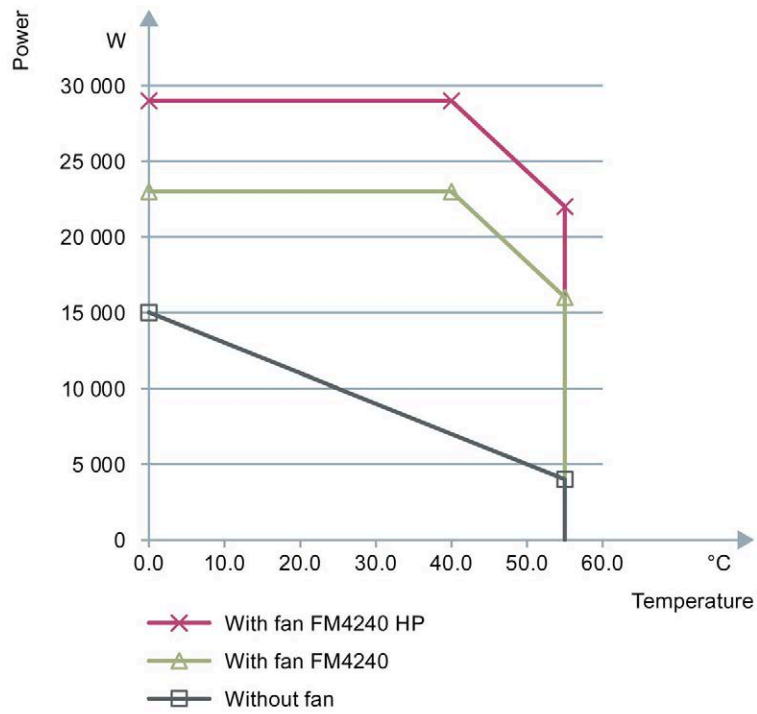


Figure 4-5 Power rating of the POM4220 Midrange phase angle control, POM4220 Highend and POM4220 Flexible, 230 V

**Power rating of the POM4220 Midrange phase angle control, POM4220 Highend and POM4220 Flexible, 277 V**

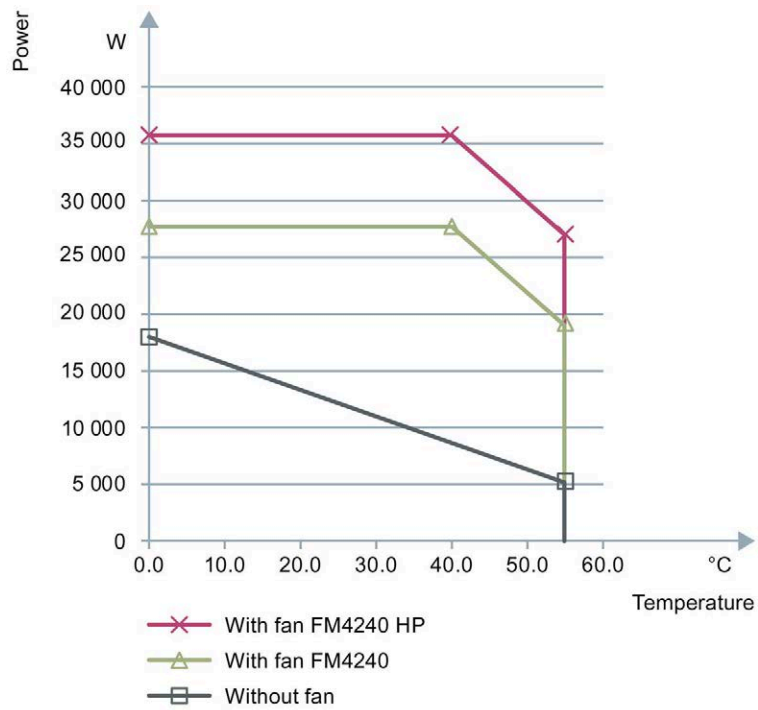


Figure 4-6 Power rating of the POM4220 Midrange phase angle control, POM4220 Highend and POM4220 Flexible, 277 V

### Power rating of the POM4220 Highend, 400 V and 480 V

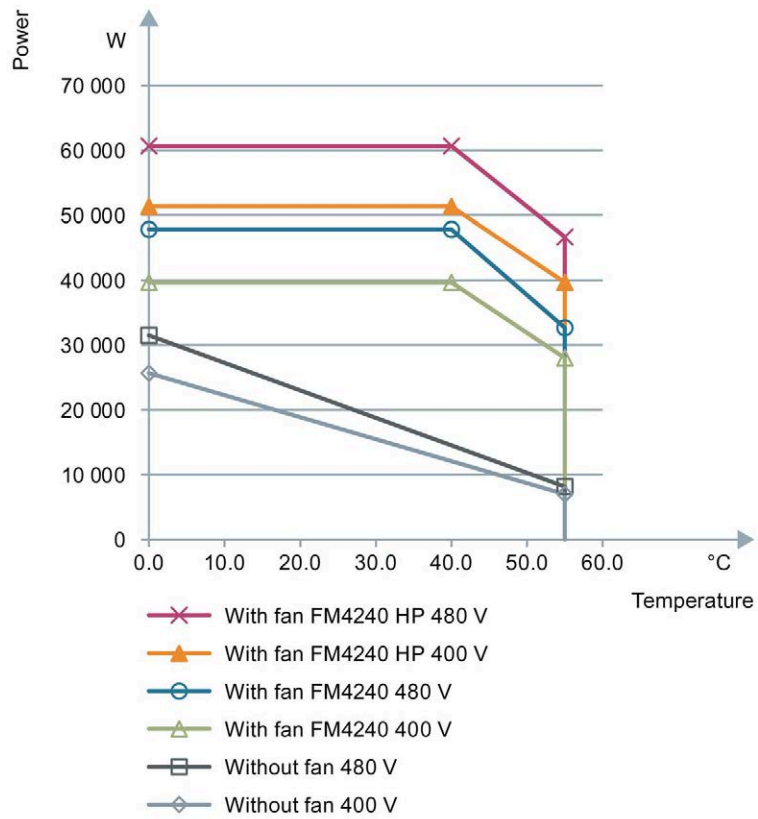


Figure 4-7 Power rating of the POM4220 Highend, 400 V and 480 V

Power rating of the POM4220 Highend, 2-pin switching, 230 V and 277 V

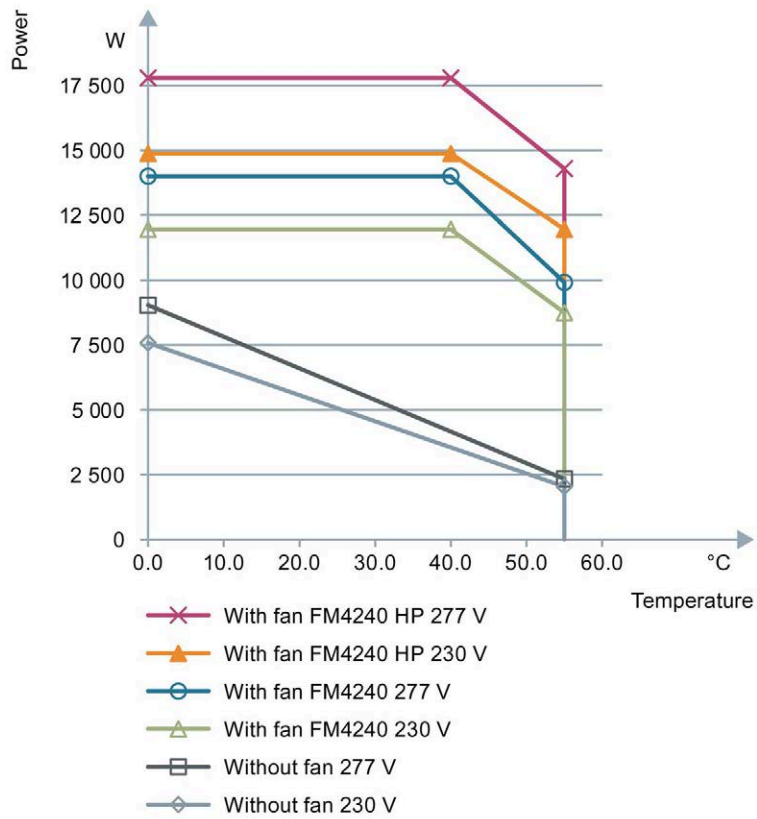


Figure 4-8 Power rating of the POM4220 Highend, 2-pin switching, 230 V and 277 V



Power rating of the POM4220 Highend, 2-pin switching, 400 V and 480 V

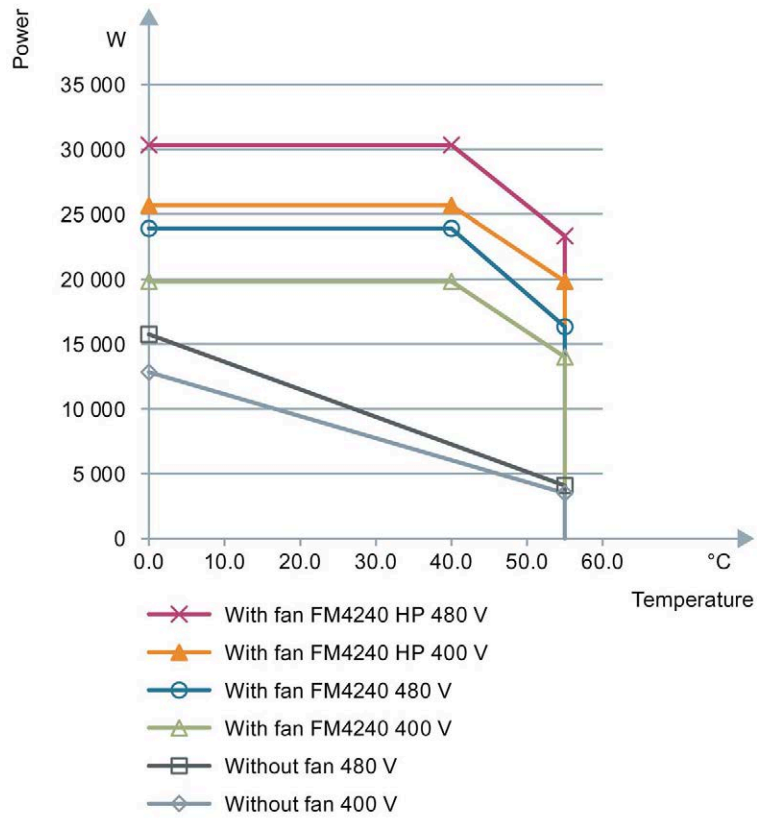


Figure 4-9 Power rating of the POM4220 Highend, 2-pin switching, 400 V and 480 V

Power rating of the POM4220 Highend, economy circuit

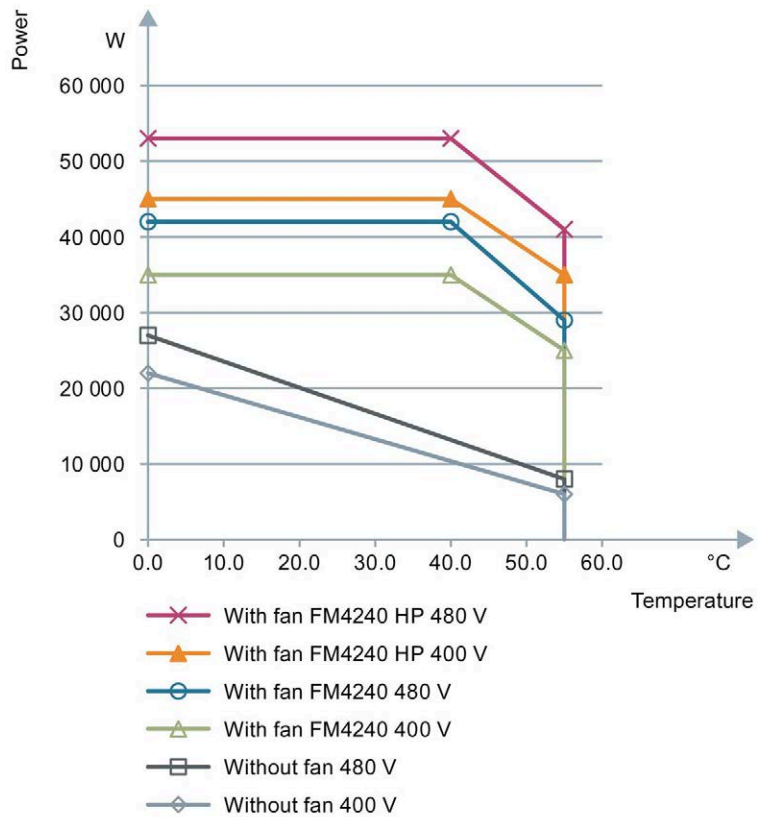


Figure 4-10 Power rating of the POM4220 Highend, economy circuit

### Power rating of the POM4220 Flexible, 45 V, 70 V and 110 V

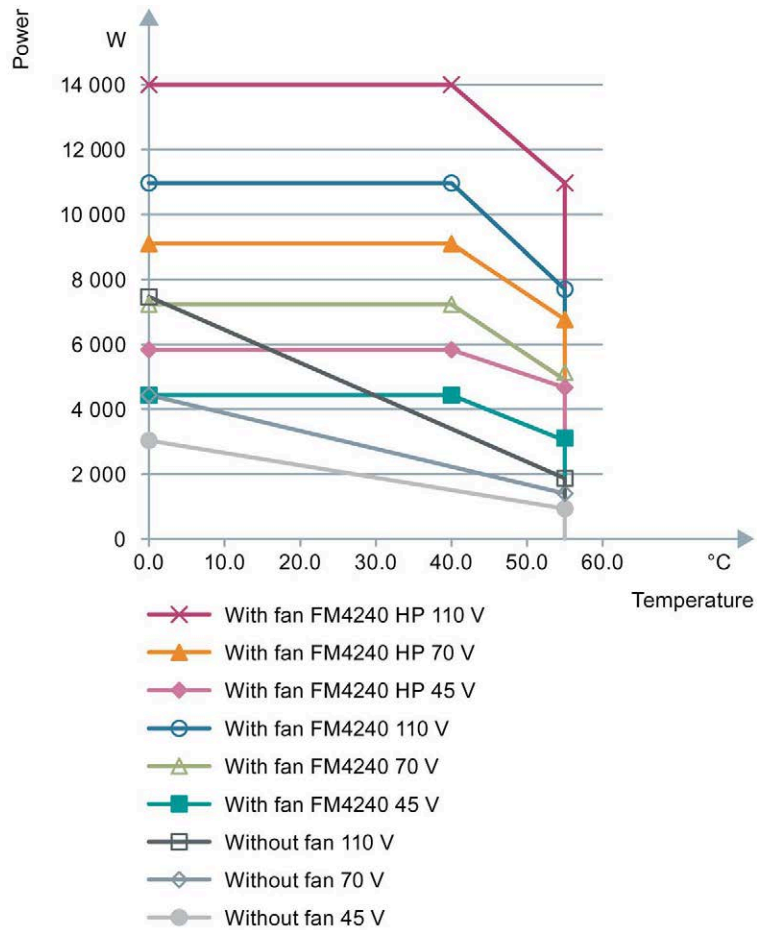


Figure 4-11 Power rating of the POM4220 Flexible, 45 V, 70 V and 110 V

### Temperature derating with double frame

**Note**

With stacked mounting of the racks a temperature derating of 10 °C is required.

### 4.5.2 POM4320 power rating

#### POM4320 IEC power rating

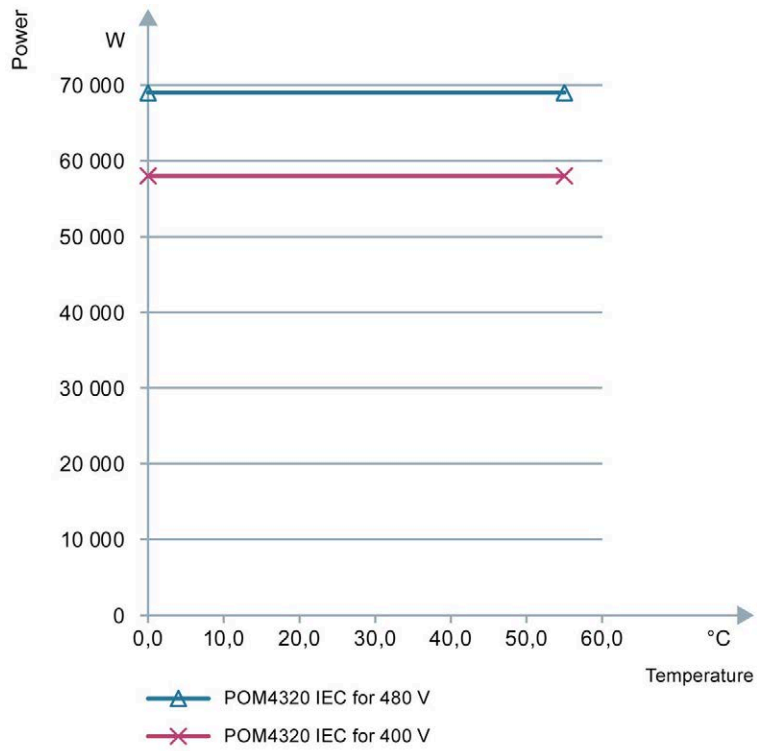


Figure 4-12 POM4320 IEC power rating

### Power rating POM4320 UL

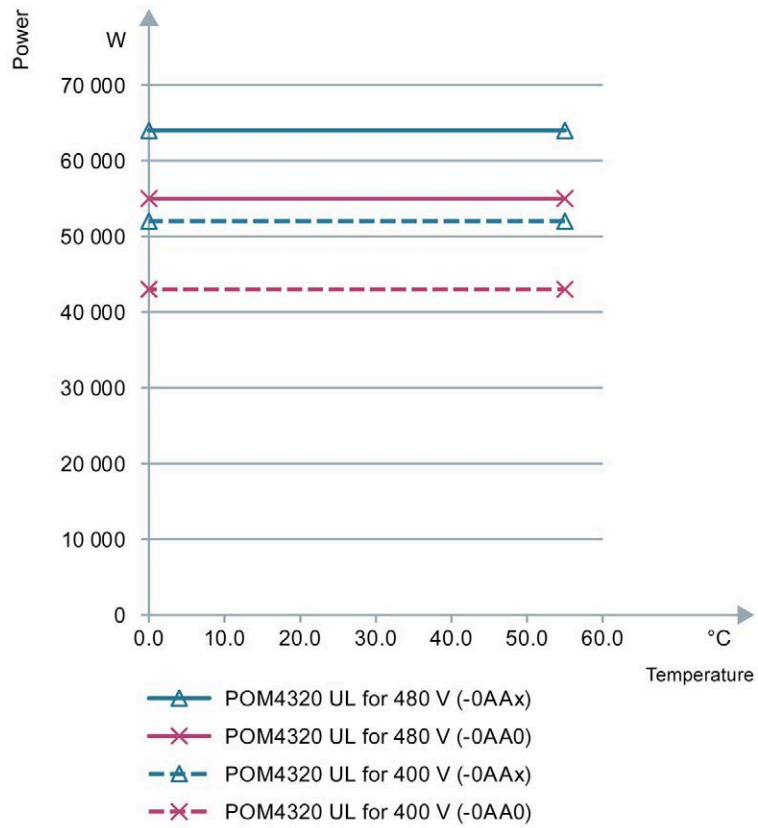


Figure 4-13 POM4320 UL power rating

# Installation/mounting

## 5.1 Requirements

### Safety information

 **WARNING**

**Dangerous voltages in the control cabinet**

**May cause death, serious injury or damage to property**

Dangerous voltages may be present in the control cabinet.

Before work starts on mounting and connecting the HCS4200 heating controller, you must implement safety measures to prevent any touching.

## 5.2 Mounting the rack

### Preparations

 **WARNING**

**Electric shock hazard**

**May cause death or serious injury**

Before installation work starts, switch off the power supply to the control cabinet and secure against switching on again.

## Installing a rack

Install the rack in the following sequence:

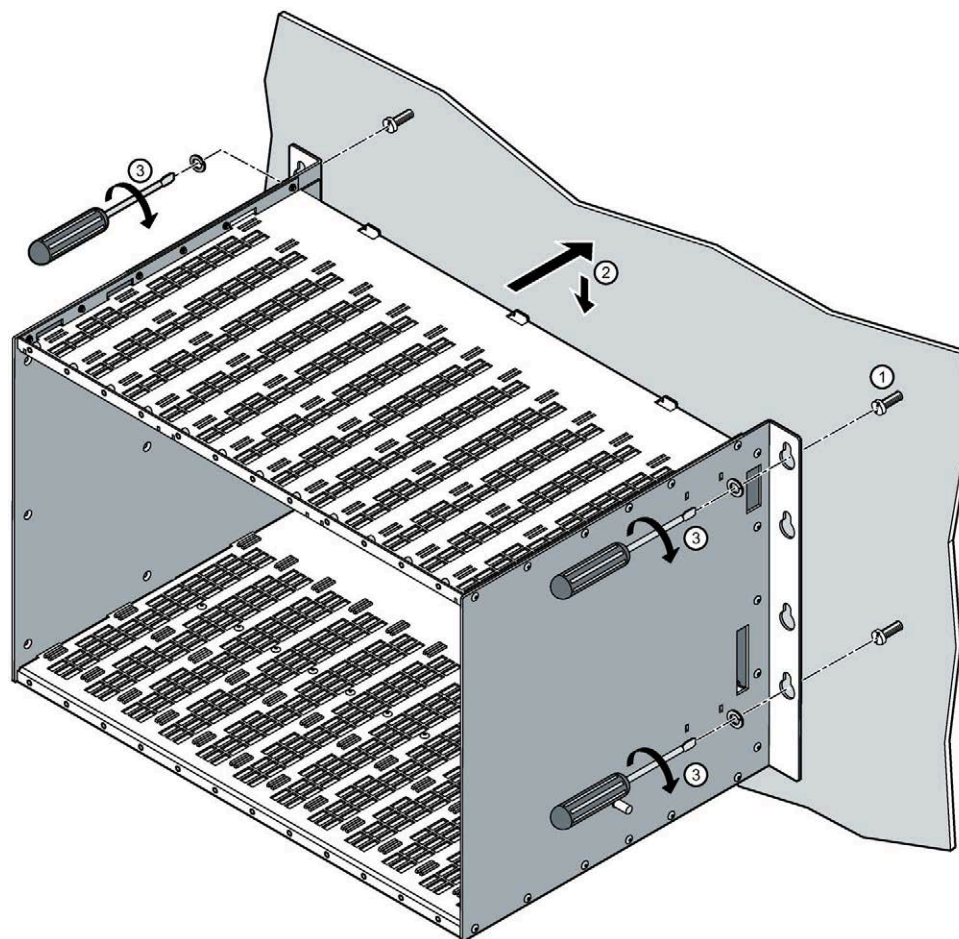


Figure 5-1 Installing a rack

Steps	
1	Drill the threads for the M6 fixing screws in the mounting plate. The positions of the pre-fabricated mounting holes on the rack are shown in the drill hole template (see figure below).
2	Screw the fixing screws into the mounting plate but do not tighten ①
3	Position the rack in the control cabinet ②
4	Screw the rack firmly into place ③

### Dimensions and distance between holes for installation on mounting plate

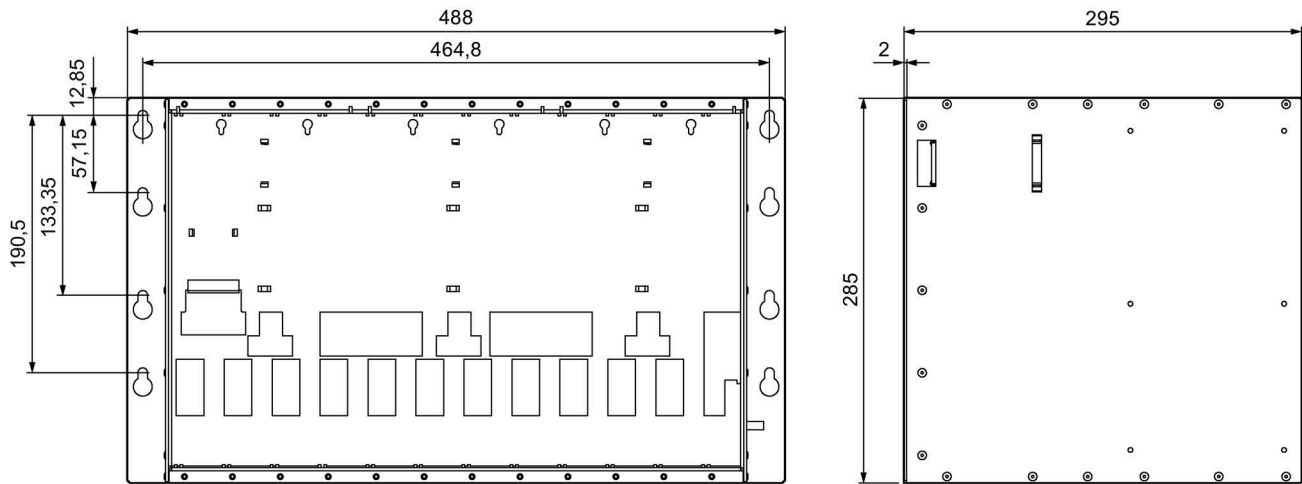


Figure 5-2 Rack4200 for 12 POMs: Dimensions and distance between holes for installation on mounting plate

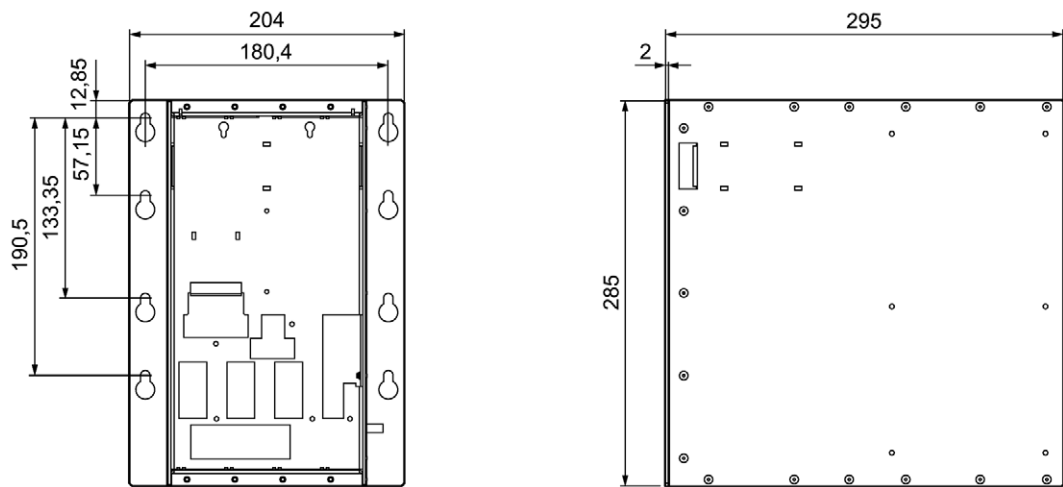


Figure 5-3 HCS Rack4200 for 4 POMs: Dimensions and distance between holes for installation on mounting plate

## 5.3 Mounting the FM4240 Fan Module

### Tool

You will need a Torx T10 screwdriver.



## Mounting the FM4240 Fan Module

The steps for mounting the fan module are specified below:

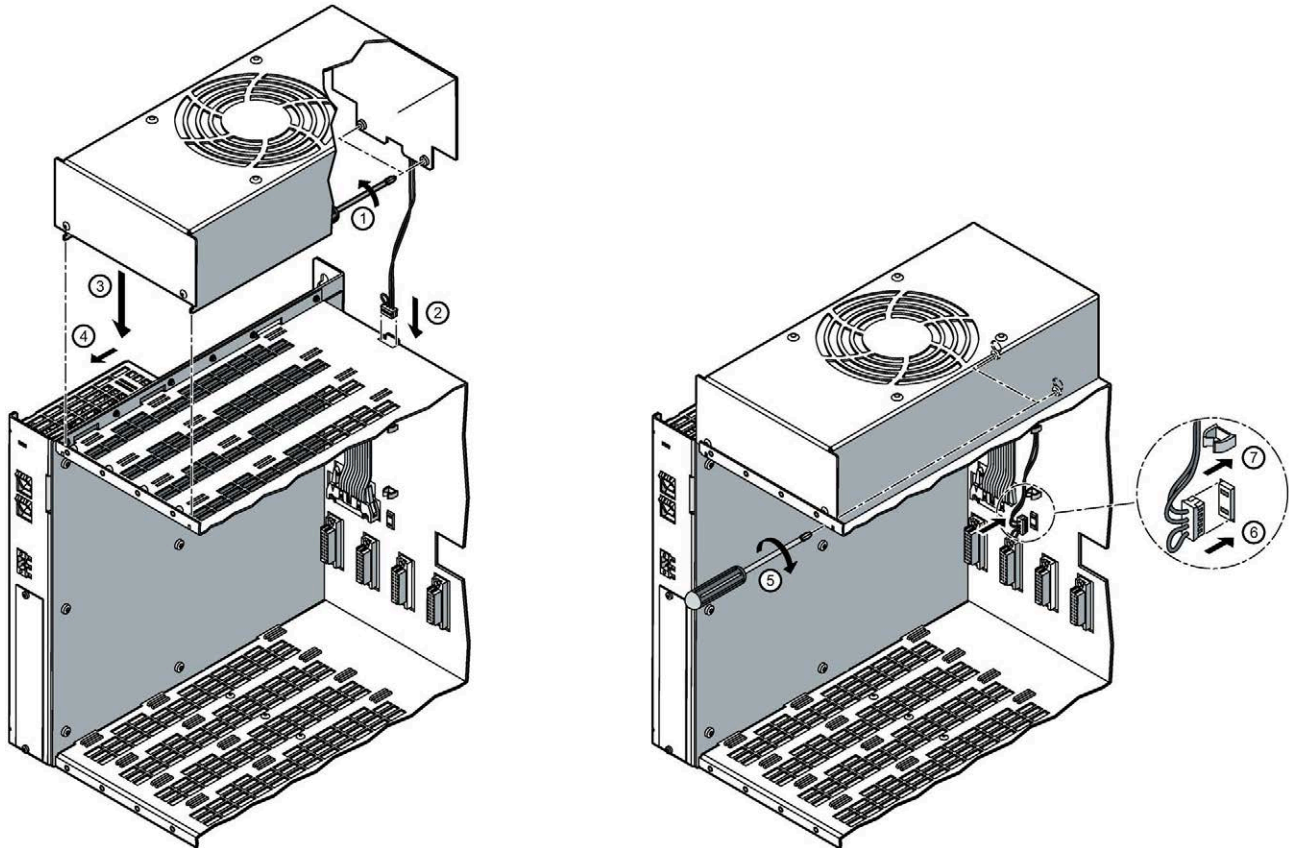


Figure 5-4 Mounting FM4240

Steps	
1	Loosen the two fixing screws on the fan module (but do not remove them) ①
2	Pull the connecting cable through the opening in the rack ②
3	<ul style="list-style-type: none"> <li>Place the fan module on the rack ③ and lift it at the rear until the screw heads fit through the two keyholes</li> <li>Push the fan module forward until the two lugs go through the corresponding openings ④</li> <li>Lower the fan module at the back (keyhole) and tighten the fixing screws on the fan module ⑤</li> </ul>
4	Insert the connection plug of the fan module on the connector at the rear panel ⑥ and press the connecting cable into the supports ⑦

## 5.4 Mounting the FM4240 Fan Module HP

### Tool

You will need a Torx T10 screwdriver.

### Mounting the FM4240 Fan Module HP

The steps for mounting the fan module are specified below:

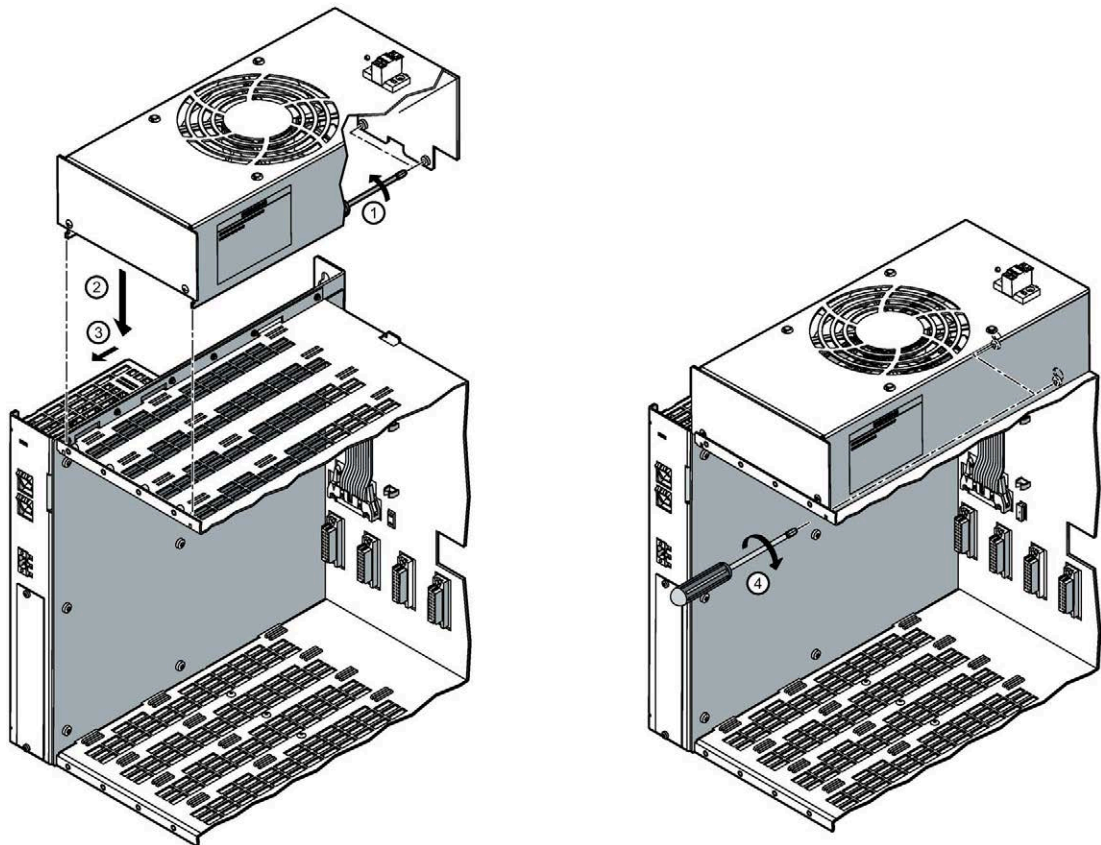


Figure 5-5 Mounting FM4240 HP

Steps	
1	Loosen the two fixing screws on the fan module (but do not remove them) ①
2	<ul style="list-style-type: none"> <li>Place the fan module on the rack ② and lift it at the rear until the screw heads fit through the two keyholes</li> <li>Push the fan module forward until the two lugs go through the corresponding openings ③</li> <li>Lower the fan module at the back (keyhole) and tighten the fixing screws on the fan module ④</li> </ul>

## 5.5 Installing the central interface module (CIM)

### Tool

You will need a Torx T10 screwdriver.

### Installing a central interface module

The Central Interface Module is screwed directly to the rack. The mounting steps are described below:

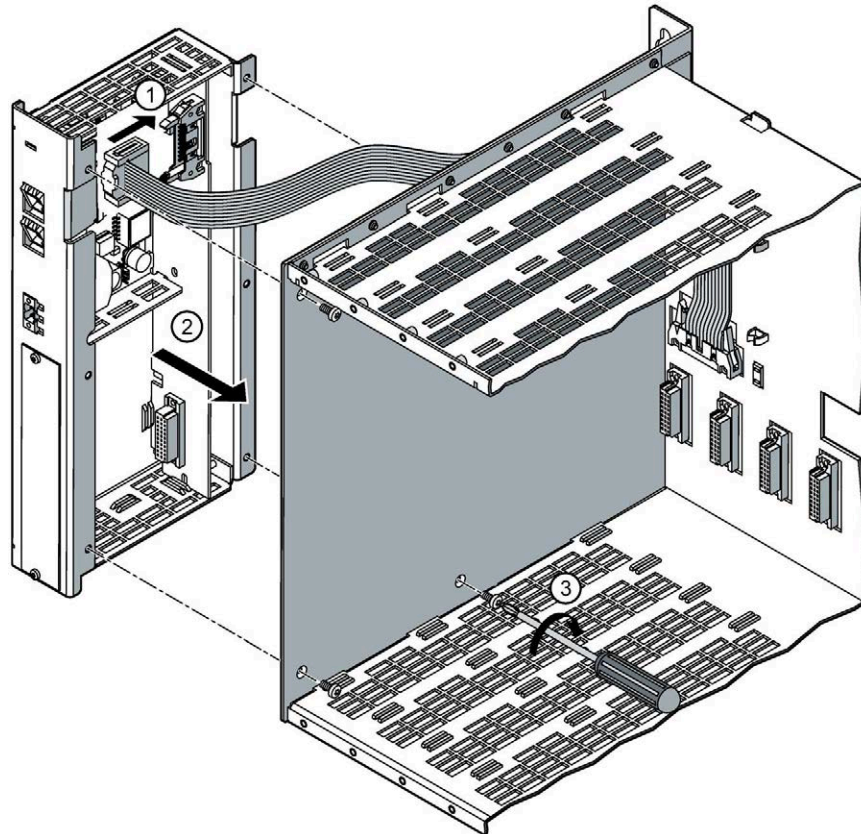


Figure 5-6 Mounting the CIM

1	The fixing screws are screwed into the CIM in the delivery condition. Unscrew these 4 fixing screws.
2	Connect the connector of the system interface to the CIM ①
3	Place the CIM on the rack ② and mount it with the 4 screws ③

## 5.6 Installing the I/O module (PM)

The CIM is equipped with a receptacle for one I/O module.

### Note

The I/O module may only be inserted or removed when the power is off.

### Tool

You will need a Torx T8 screwdriver.

### Installing an I/O module

The steps for mounting an I/O module are described below:

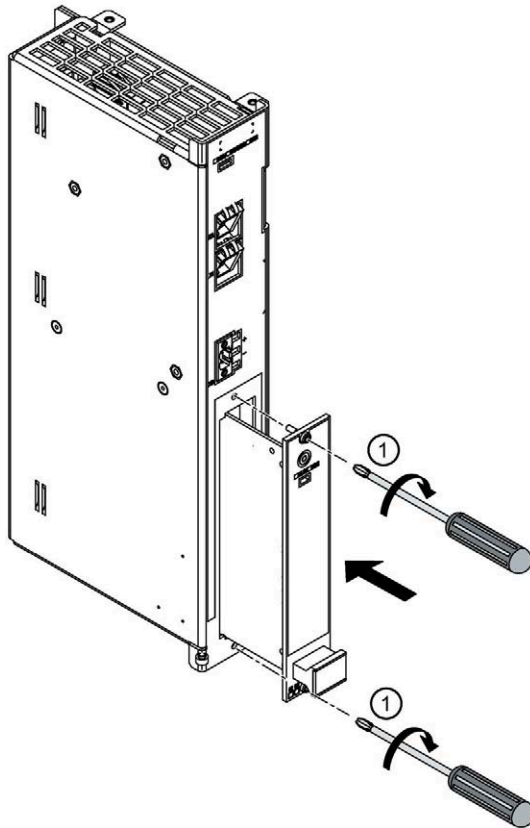


Figure 5-7 Installing an I/O module

Steps	
1	Dismantling the blanking cover of the receptacle on the CIM
2	Insert the I/O module into the receptacle and push it in as far as it will go.
3	Secure module tightly with screws ①

## 5.7 Mounting a POM4220 power output module

### Tool

You will need a Torx T8 screwdriver.

### Mounting the POM

The procedure for mounting the POM is described below:

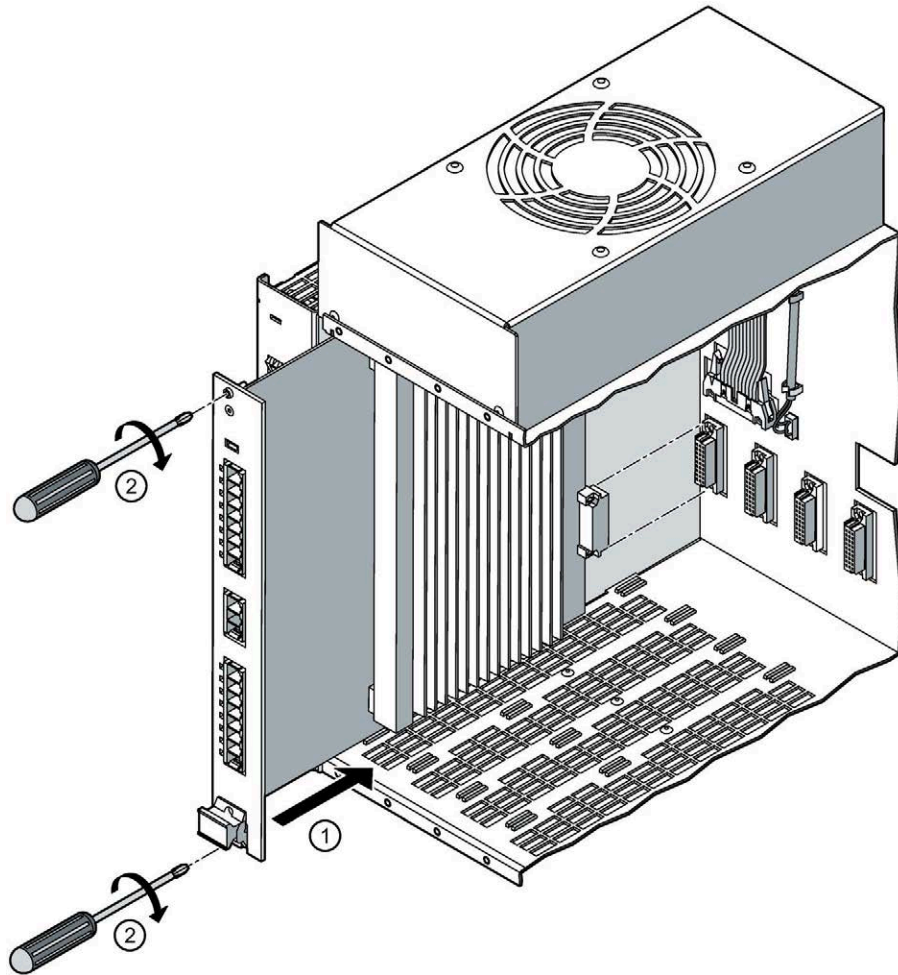


Figure 5-8 Mounting the POM

Steps	
1	Slide the POM into the rack ①
2	Screw in place at the top and bottom of the front plate ②

**NOTICE**

**Possible damage of the POM**

Make sure to insert the POM straight and not tilted because the POM may be damaged otherwise.

## 5.8 Mounting and dismantling CIM4210C PROFINET

### Mounting CIM4210C PROFINET

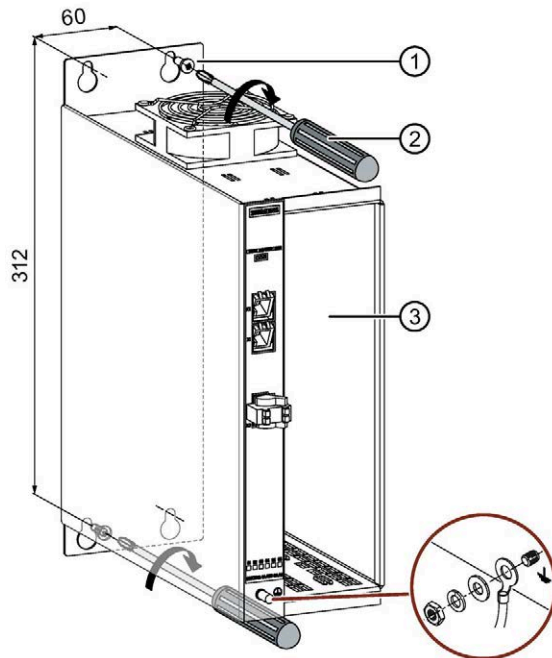


Figure 5-9 Installing CIM4210C

1	Drill 4 threaded holes M6 in the mounting plate The threaded holes are shown in the section "HCS4200 components (Page 236)".
2	Screw 4 screws M6 ① in the mounting plate
3	Insert the device ③ in the control cabinet.
4	Fasten the device ②.

### Dismantling CIM4210C PROFINET

1	Loosen the 4 screws ①.
2	Remove the device ③ from the control cabinet.



## 5.9 Mounting the blanking covers

You must cover the unused slots in the rack with blanking covers. Blanking covers are available as an accessory (Page 244).

### Tool

You will need a Torx T8 screwdriver.

### Mounting the blanking cover

1. Position the blanking cover over the appropriate slot
2. Screw the blanking cover to the rack with two screws, top and bottom.

## 5.10 Double frame setup

The following describes how to set up a double frame.

Modifications to the lower frame:

1. Release retaining clip on the right-hand (CIM) side by pressing on the interlock.
2. Feed the ribbon cable through the opening to the back.
3. By releasing and setting the ribbon cable clips, pull the ribbon cable to the left and secure it.
4. Fold the ribbon cable upward and secure it with the retaining clip that was removed from the right-hand side.

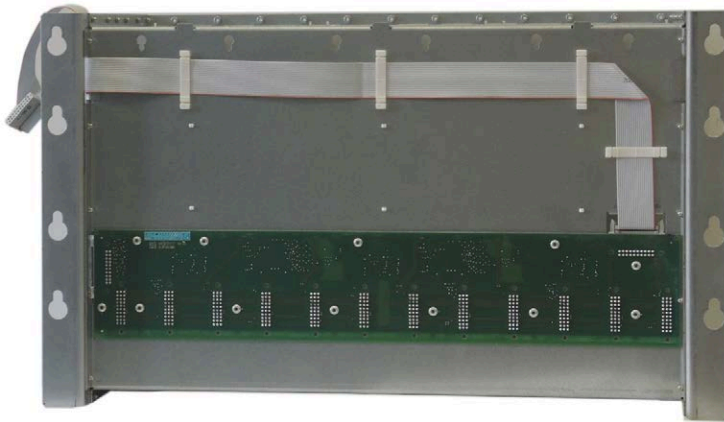


Figure 5-10 Lower frame

On the upper frame, fold the ribbon cable back and insert it into the plug connector. To secure it, use the spare retaining clip from the top frame.



Figure 5-11 Double frame completed



## 5.11 Mounting a POM4320 power output module

### 5.11.1 Busbar mounting

#### 5.11.1.1 Preparations

##### Busbar system

The mains infeed for the power output module is connected via a 3-phase busbar system. These include the following busbar systems:

- Siemens (SENTRON 60 mm)
- Wöhner (60 mm-EQUES)

#### WARNING

##### **Dangerous voltages on the busbar system**

##### **May cause death, serious injury or damage to property**

Dangerous voltages can be present on the busbar system.

The busbar system must therefore be isolated and secured against reclosing before work begins for mounting and connecting the HCS4300 heating control system.

#### NOTICE

##### **Clockwise rotating field**

When connecting the busbar system, make sure that the energy system is connected clockwise.

#### Note

##### **Residual current protective device**

If a residual current protective device is provided for the busbar system, a residual current circuit breaker of Type A is sufficient for the HCS4300.

#### Note

Due to the weight of the POM4320 we recommend mounting a busbar support after three devices.

5.11 Mounting a POM4320 power output module

**5.11.1.2 Adjusting the busbar adapter**

**Tool**

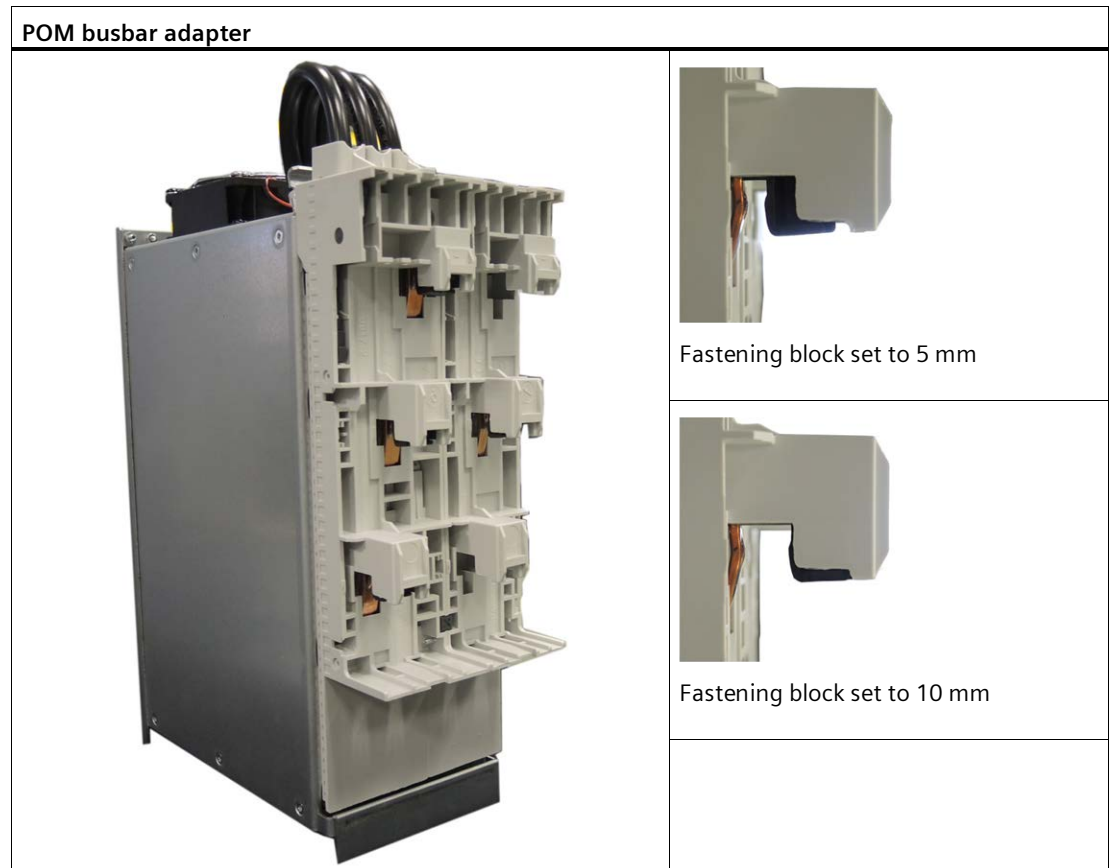
You need a Phillips screwdriver, size 0.6 x 3.5 mm.

**Adjusting the busbar adapter to the thickness of the busbar**

The busbar adapter of the POM can be adjusted for the following busbar thicknesses:

- 5 mm (delivery state)
- 10 mm


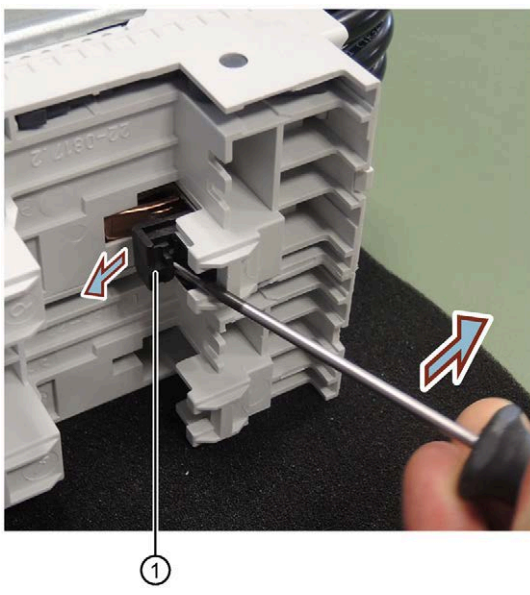
On the busbar adapter of the POM, there are four fastening blocks, which you can use to adjust the busbar adapter to the rail thickness. The following figure shows the position of the fastening blocks.



Proceed as follows for each of the four fastening blocks:

Steps
-------

Steps	
1	Use the screwdriver to push out the fastening block ①.
2	Position the fastening block in accordance with the rail thickness (5 mm / 10 mm)
3	Push the fastening block back until it latches in place.



### 5.11.1.3 Mounting the POM (busbar adapter)

The mounting of the POM on the busbar is carried out without the need for tools via the POM busbar adapter.

#### Installing the POM

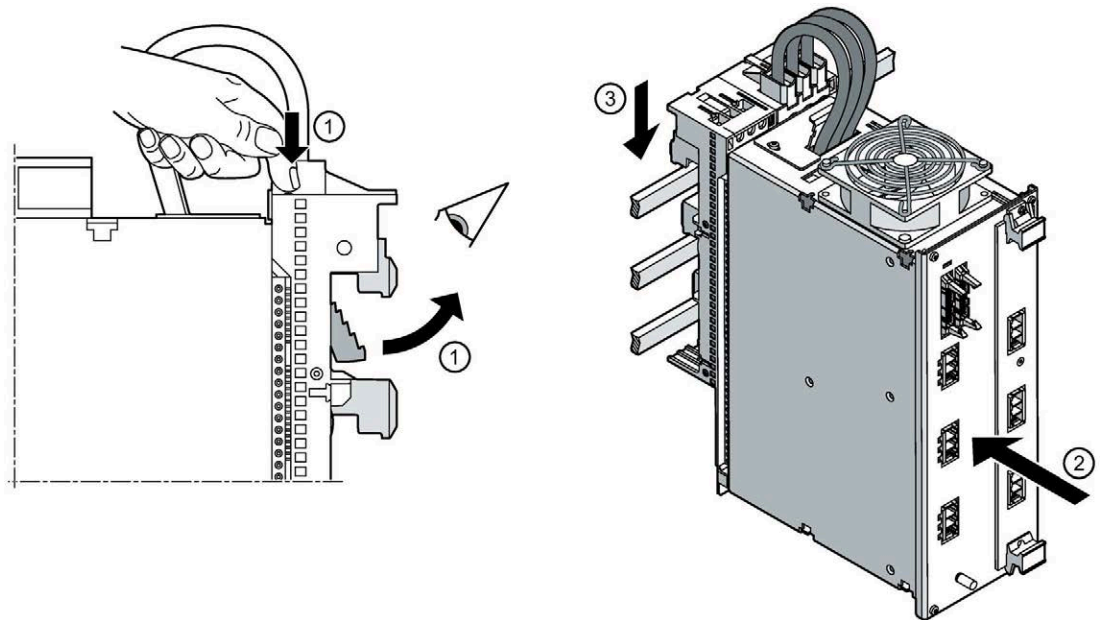


Figure 5-12 Installing the POM

Steps	
1	Press the button on the top of the busbar adapter ①. The holder must protrude beyond the busbar adapter as shown in the figure.
2	Place the busbar adapter on the busbar from above ②.
3	Press on the busbar adapter from above until the busbar adapter engages ③.

## 5.11.2 Panel mounting

### 5.11.2.1 POM mounting (panel mounting)

#### Installing the Power Output Modul (POM)

1. Predrill the holes in the rear panel for mounting.  
The required hole spacing is shown in the diagram below.
2. Screw the POM into place on the rear panel with four screws M5.

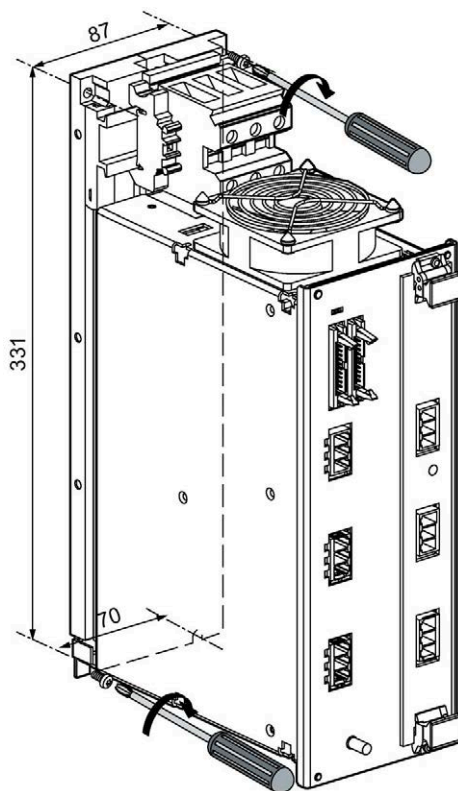


Figure 5-13 POM4320: Position of the mounting holes

#### Minimum spacing

Natural convection must be possible above and below the device. A clearance of 100 mm must be observed in both cases.

# Connecting

## 6.1 Safety information and guidelines

### Safety information

 **WARNING**

**Hazardous voltages from the mains power input or heating element feeder cables  
Will cause death, serious injury or damage to property**

Dangerous voltages may be present on mains from the supply and to heating elements. Before work starts on connecting the HCS4200 heating control system, the mains and heating element lines must be disconnected and secured against being switched on again.

 **WARNING**

**Electric shock hazard**

**May cause death or serious injury**

The mains supply to which the device is connected must have a circuit breaker or a fuse. The circuit breaker or fuse must be easily accessible and clearly assigned to the device. We recommend locating the circuit breaker or fuse near to the device. Take the maximum current consumption of the heating control system into consideration when selecting the circuit breaker or fuse.

**The following requirements apply for UL:**

- POM4220 Lowend: Only UL-listed branch circuit fuse
- POM4220 Midrange phase angle control, POM4220 Highend, POM4220 Flexible, POM4320:  
Circuit breaker according to UL489 or UL-listed branch circuit fuse.
- Observe the SCCR rating on the rating plate. Only use the device in circuits limited accordingly.
- You must use copper cables with a minimum rating of 75 °C for the cabling.

 **WARNING**

**Electric shock hazard**

**May cause death or serious injury**

- Voltages of more than 60 V can occur in the control cabinet. Suitable safety precautions preventing contact must therefore be taken during commissioning and maintenance work.
- Before working on the heating control system or the connected components, ensure the system is disconnected.

 **CAUTION**

**High levels of leakage current**

**Risk of injury**

Before connecting the device to the supply system, you must connect the grounding circuit (see Section Connecting the protective conductor (Page 70)).

**Connection requirements**

- The device has been mounted.
- The mains supply is disconnected at the mounting location of the device and secured against reconnection.
- The line voltage is secured by an easily accessible isolating mechanism.  
It is recommended that the external disconnecting means is located close to the device.
- The cables to be connected are not live.

## 6.2 Connecting the protective conductor

 **WARNING**

**Risk of electric shock**

**Can cause death or serious injury**

- The protective conductor must be connected to the threaded pin indicated.
- HSC4200: The cable cross-section for the protective conductor must be  $\geq 10 \text{ mm}^2$ .
- HSC4300: The cable cross-section for the protective conductor must be  $\geq 16 \text{ mm}^2$ .
- The cable lug used must have a tin-coated surface to ensure corrosion protection.
- When connecting the protective conductor, the applicable national and local regulations must be observed.

### Connecting a protective conductor to the rack

 **WARNING**

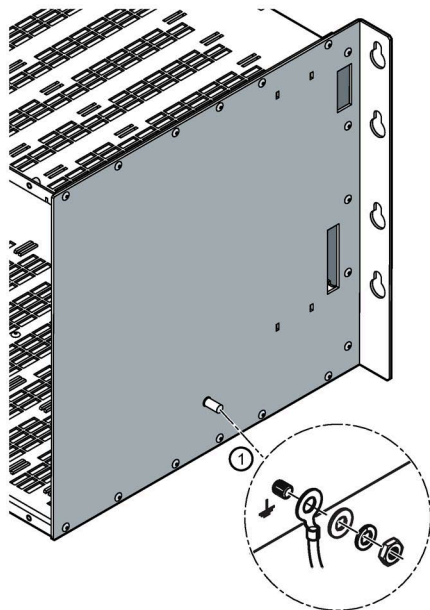
**Risk of electric shock**

The rear panel on which the rack is mounted must be metallically conductive and grounded. If this is not the case, you must ground the frame for a second time at a mounting hole.

If the rear panel is not metallically conductive and not grounded, the leakage current may be too high and there is a risk of danger to life.



Connect the rack to the protective conductor (PE). You will find an M6 threaded bolt on the right side of the rack for this purpose ①. The retaining elements (nut, washer and spring lock washer) are attached to the threaded bolt in the delivery condition.



### Connecting a protective conductor to the CIM4210C

#### **⚠ WARNING**

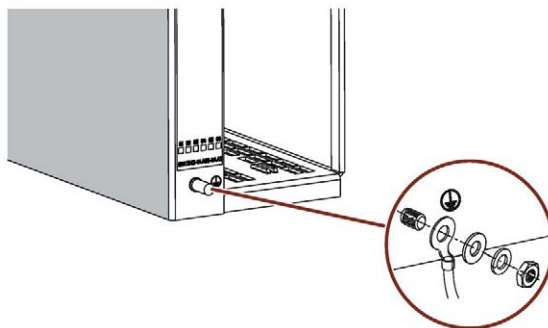
##### **Risk of electric shock**

The rear panel on which the rack is mounted must be metallically conductive and grounded. If this is not the case, you must ground the frame for a second time at a mounting hole.

If the rear panel is not metallically conductive and not grounded, the leakage current may be too high and there is a risk of danger to life.

1. Connect the CIM4210C to the protective conductor PE.

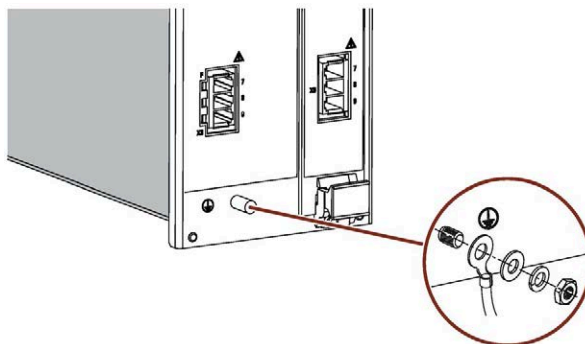
There is a threaded pin M6 for connecting the protective conductor at the front of the CIM4210C.



### Connecting a protective conductor to POM4320

1. Connect the POM4320 to the protective conductor PE.

There is a threaded pin M6 for connecting the protective conductor at the front of the POM4320.



## 6.3 Combined mode with POM4320 - Connecting system interfaces

### Connecting system interface

Connecting system interfaces - racks to POM	
	<p>Attach the connecting cable between the rack ① and POM ②.</p> <p>Additional POM can be connected with a ribbon cable to the preceding POM.</p> <p>You can operate up to 4 POM4320 without expansion module on a rack. Connecting cable, see Ordering data (Page 244).</p>

## Connecting system interfaces - racks to EM4315



Attach the connecting cable from the rack to the system interface ① of the EM4315. Additional POM can be connected with a ribbon cable ② to the preceding POM. The operation of up to 8 additional POM is possible with an EM4315 expansion module.

**Note**

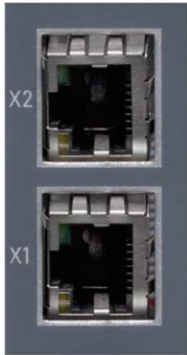
The last bus connector remains open on the last POM4320.

**NOTICE****Total length of all connecting cables**

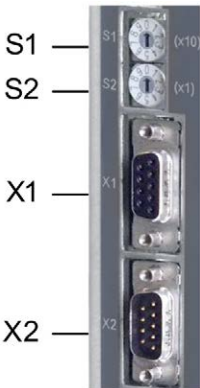
- The total length may amount to a maximum of 2 m at the system interface mounting rack.
- The total length may amount to a maximum of 3 m at the system interface EM4315.

## 6.4 Connecting the PROFINET/PROFIBUS fieldbus

### Connecting PROFINET

CIM PROFINET connection X1 and X2	
	Connect X1 and X2 to the higher-level controller and/or the next PROFINET device using an Ethernet cable according to the PROFINET specification.

### Connect PROFIBUS and set the PROFIBUS address

CIM PROFIBUS connection X1	
	<ul style="list-style-type: none"><li>Assign the PROFIBUS address using the S1 and S2 address selector switches. Addresses can be set from 0 to 99.</li><li>Connect X1 to the higher-level controller and/or the next PROFIBUS device via cable in accordance with the PROFIBUS specification.</li></ul>

## 6.5 Connect 24 V DC power supply

The power supply of the Central Interface Module (CIM) is via an external 24 V DC supply. Use a power supply unit with protection class III as the power supply (PELV, e.g. according to EN 50178) Power supply units from the SITOP product line are suitable, for example.

The CIM can supply up to 24 POMs and 6 fan modules through the HCS system interface.

## Layout of the 24 V DC power supply

You can determine the layout of the 24 V DC power supply using the following calculation formula:

Minimum power rating = 3 W +  
 (Number of POM4220 Lowend, POM4220 Midrange phase angle control, POM4220 Flexible • 1 W) +  
 (Number of POM4220 Highend • 1.5 W) +  
 (Number of fan modules • 10 W) +  
 (Number of I/O modules • 1 W)

### Example:

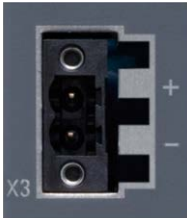
Supply of an HCS4200 comprising a rack, CIM PROFINET, 12 connected POMs and 3 fan modules.

The minimum power rating in accordance with the formula above is 45 W, i.e. the power pack must be able to supply current of at least 1875 mA.


### Note

The absorbed active power of all the connected components may not exceed 88 W in total.

## Connect 24 V DC supply voltage on CIM

CIM 24 V connection X3				
	The plug connector for the 24 V DC connection is included in the scope of delivery. Features: <ul style="list-style-type: none"> <li>• Push-in spring terminal with release clip</li> <li>• "Daisy Chain" wiring possible</li> </ul> Connect the 24 V DV supply voltage to the device as follows:			
	<table border="1"> <tbody> <tr> <td>+</td> <td>+24 V DC</td> </tr> <tr> <td>-</td> <td>GND</td> </tr> </tbody> </table>	+	+24 V DC	-
+	+24 V DC			
-	GND			

## Connecting the 24 V DC supply voltage to FM4240 HP

FM4240 HP 24 V connection X1				
	The plug connector for the 24 V DC connection is included in the scope of delivery. Features: <ul style="list-style-type: none"> <li>• Push-in spring connection</li> <li>• "Daisy chain" wiring possible</li> </ul> Connect the 24 V DC supply voltage to the device as follows:			
	<table border="1"> <tbody> <tr> <td>+</td> <td>+24 V DC</td> </tr> <tr> <td>-</td> <td>GND</td> </tr> </tbody> </table>	+	+24 V DC	-
+	+24 V DC			
-	GND			

---

**Note**

The supply line to the FM4240 HP may have a maximum length of 30 m.

---

## External lightning protector

---

**Note**

For cables longer than 30 m, the following applies:

An external lightning protection element should be connected upstream in the 24 V DC supply line:

Dehn, "Blitzductor BVT" type AD24, No. 918402 (or equivalent).

When using other items, you must ensure that the model used is equivalent (consult with lightning protection manufacturer). The lightning protection module must be installed and used in accordance with the manufacturer's specifications.

---

- With a lightning protection component, the following interference immunity is obtained per EN 61000-4-5:
  - 1.0 kV symmetrical  $R_i = 2 \Omega$ ; Assessment criterion B
- Without a lightning protection component, the following interference immunity is obtained:
  - 0.5 kV symmetrical  $R_i = 2 \Omega$ ; Assessment criterion B
  - 0.5 kV asymmetrical  $R_i = 12 \Omega$ ; assessment criterion B

## 6.6 Connecting the heating elements and three-phase line supply

### 6.6.1 Connecting the heating elements and three-phase line supply

#### Connecting the heating elements and three-phase line supply

##### POM4220

The heating elements are connected by means of two plug connectors at X1 and X3 of the POM:

- POM4220 Lowend: Two 8-pin plug connectors
- POM4220 Midrange phase angle control and POM4220 Flexible Two 6-pin plug connectors
- POM4220 Highend: Two 4-pin plug connectors

The 3-phase line is connected by means of one 3-pin plug connector at X2 of the POM.

---

##### Note

The middle connection X2.2 is only required for measurement purposes. The cross-section can be freely selected taking into consideration the general regulations and permissible cross-sections of the connector (see Technical specifications (Page 194)).

---

##### POM4320

The connection of the heating elements on the POM4320 is made with six 3-pin connectors. With the POM4320 for busbar mounting, the mains supply is a 3-phase busbar system. With the POM4320 for backplane mounting, three screw terminals provide the mains supply.

 <b>WARNING</b>
--

<b>Danger of electric shock from live heating control system or heating elements.</b>
---

<b>Can cause death or serious injury</b>
--

- |  |
|--|
| <ul style="list-style-type: none"><li>• Plug connectors may only be inserted in or removed from the connectors on the device in the de-energized state.</li><li>• Power supply cables must be de-energized during connection to the 3-pin X2 plug connector.</li></ul> |
|--|

**Note**

- The plug connectors for the heating elements and the power connection are included in the scope of supply of the heating control system.  
Features: Spring-loaded terminal and automatic tool-free interlock. To unlock, press down the two levers on the sides of the plug connectors. To lock the plug connector in place correctly, press it in by the plug body and not by the gray unlatching wedge.
  - If end sleeves are used on the cables, they must be 12 mm in length.
- 

**Note**

The connected loads (heating elements) must not exceed the maximum permissible current.

- POM4220 Lowend: Max. 35 A per phase
  - POM4220 Midrange phase angle control, POM4220 Highend and POM4220 Flexible:  
Max. 64 A per phase
  - POM4320: Maximum 83 A per phase
- 

**Note**

When using heating elements and radiation sources with inrush current, we recommend using Category AC 3 contactors.

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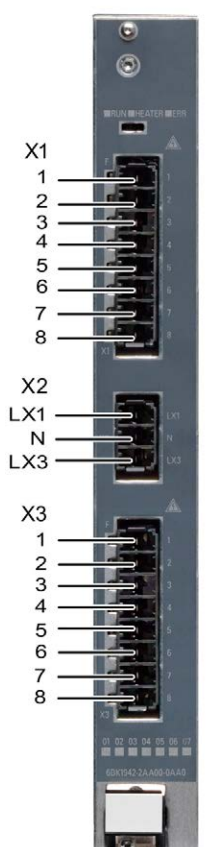
**Note**

You can find information on fastening the supply line from Siemens Industry Online Support. (<http://support.automation.siemens.com>)

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## POM4220 Lowend

Pin assignment X1 to X3		
 <p>The diagram shows a vertical terminal block with three main sections. The top section, labeled X1, has eight pins numbered 1 to 8. The middle section, labeled X2, has three pins labeled LX1, N, and LX3. The bottom section, labeled X3, also has eight pins numbered 1 to 8. Below the X3 section, there are labels 01, 02, 03, 04, 05, 06, 07, 08 and a barcode-like area with the text 6ES7342-2AA00-0AA0.</p>	X1	8-pin connector for power output 1...8
	X2	3-pin connector for line connection phase LX1, N, LX3
	X3	8-pin connector for power output 9...16

**POM4220 Midrange phase angle control and POM4220 Flexible**

Pin assignment X1 to X3		
	X1	6-pin connector for power output 1...6
	X2	3-pin connector for line connection phase LX1, N, LX3
	X3	6-pin connector for power output 7...12

POM4220 Highend

Pin assignment X1 to X3		
	X1	4-pin connector for power output 1...4
	X2	3-pin connector for line connection phase LX1, N, LX3
	X3	4-pin connector for power output 5...8

POM4320

Position of the connections	Pin assignments X1 to X6
	<p>X1 3-pin plug for L1: Power output 1 ... 3 outgoing</p>
	<p>X2 3-pin plug for L2: Power output 4 ... 6 outgoing</p>
	<p>X3 3-pin plug for L3: Power output 7 ... 9 outgoing</p>
	<p>X4 3-pin plug for L2: Power output 1 ... 3 incoming</p>
	<p>X5 3-pin plug for L3: Power output 4 ... 6 incoming</p>
	<p>X6 3-pin plug for L1: Power output 7 ... 9 incoming</p>

Wiring diagram for three-phase system

Note

- If you want to have load of the three-phase supply as evenly distributed as possible, consecutively connect infeed of the POMs (X2.1 / X2.3) to the phases L1, L2 and L3.
- To connect the POM4320 to the three-phase supply, pay attention to the rotating field (running clockwise).
- When connecting a POM4220 Highend and a POM4220 Midrange with phase control (only in the phase control operating mode), note that you have to use two different phases with a phase angle of 120°.

**Note**

- You can also operate POM 4220 Lowend and Flexible with 1 phase.
- You can operate POM4220 Midrange with 1 phase only for "half-wave control" operating mode.

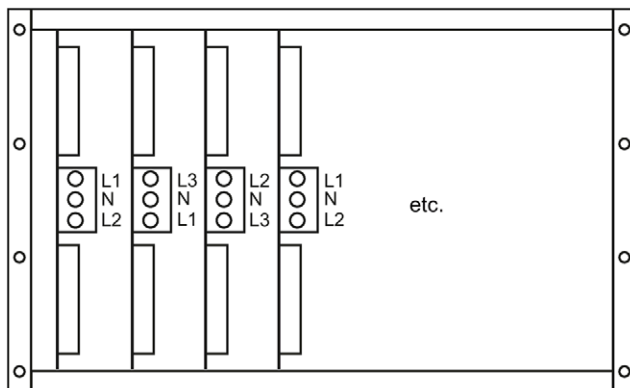


Figure 6-1 Wiring diagram for three-phase system

**Block wiring diagrams**

The block diagrams below show the main circuits of the POM4220 versions with power and heating element connections. The power outputs are protected internally with one fuse per power output. The individual phases of the mains supply are not protected on the POM; protection devices must be implemented externally by the user.

### 6.6.2 POM4220 Lowend block diagram

#### POM4220 Lowend power outputs

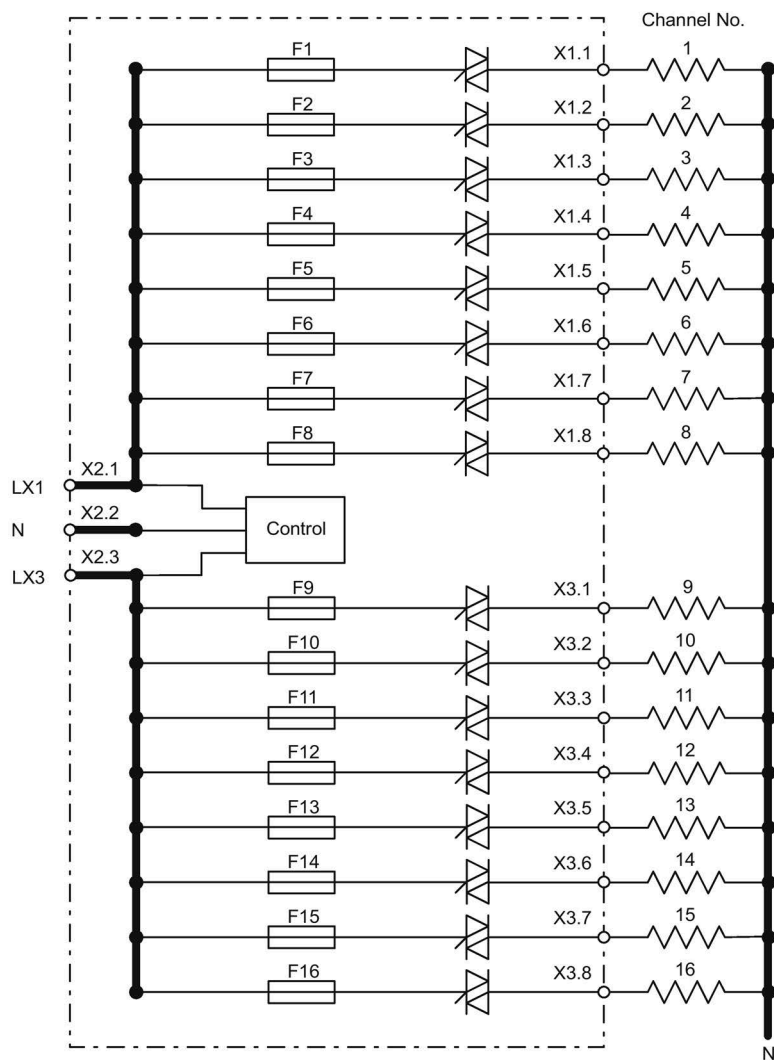


Figure 6-2 POM4220 Lowend power outputs

### 6.6.3 Block diagram POM4220 Midrange phase angle control and POM4220 Flexible

#### Power outputs POM4220 Midrange phase angle control and POM4220 Flexible

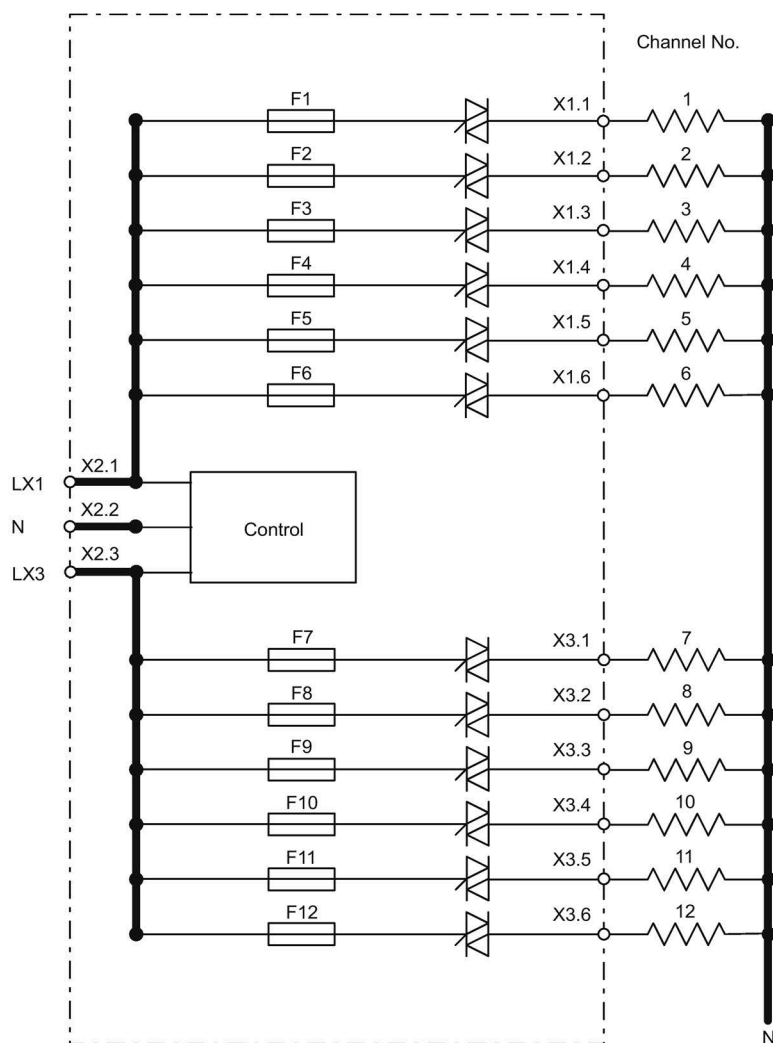


Figure 6-3 Power outputs POM4220 Midrange phase angle control and POM4220 Flexible

### 6.6.4 POM4220 Highend block diagram

#### Connection between phase and neutral conductor

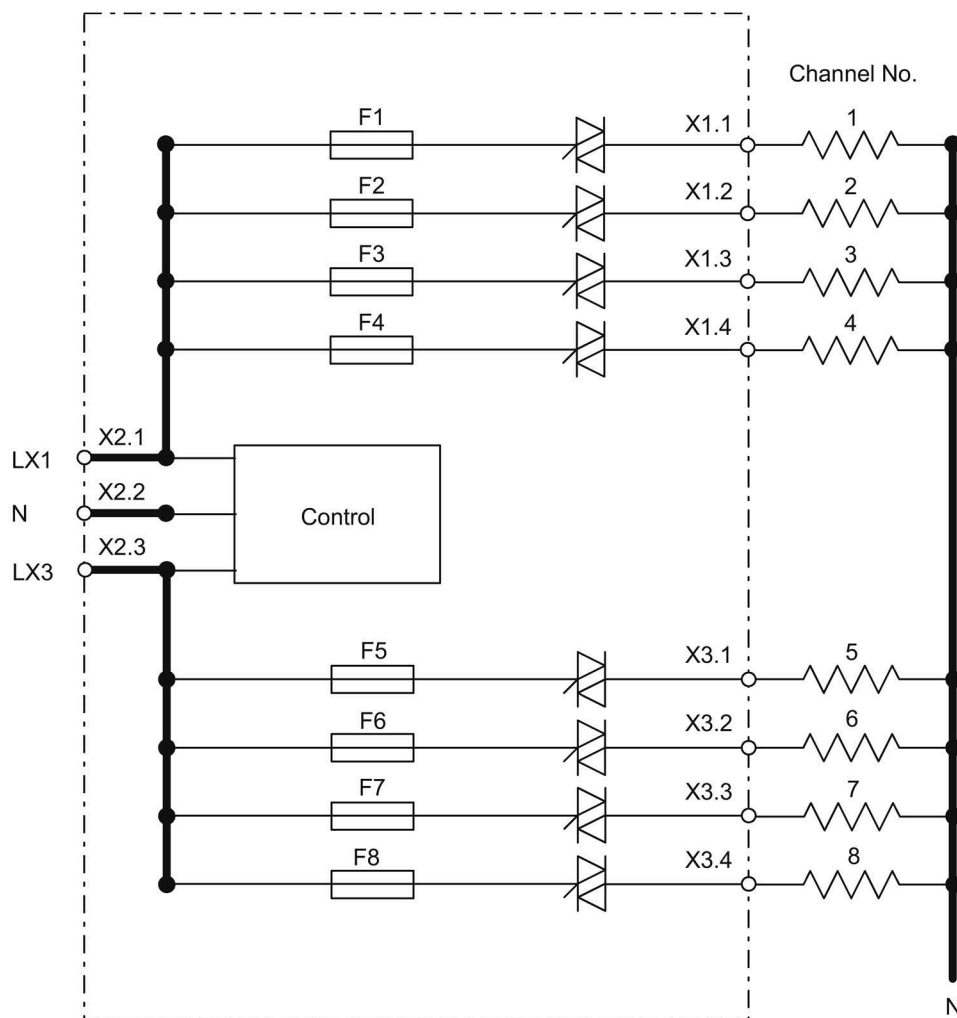


Figure 6-4 Power outputs POM4220 Highend - connection between phase and N-conductor



### Connection between phase and phase

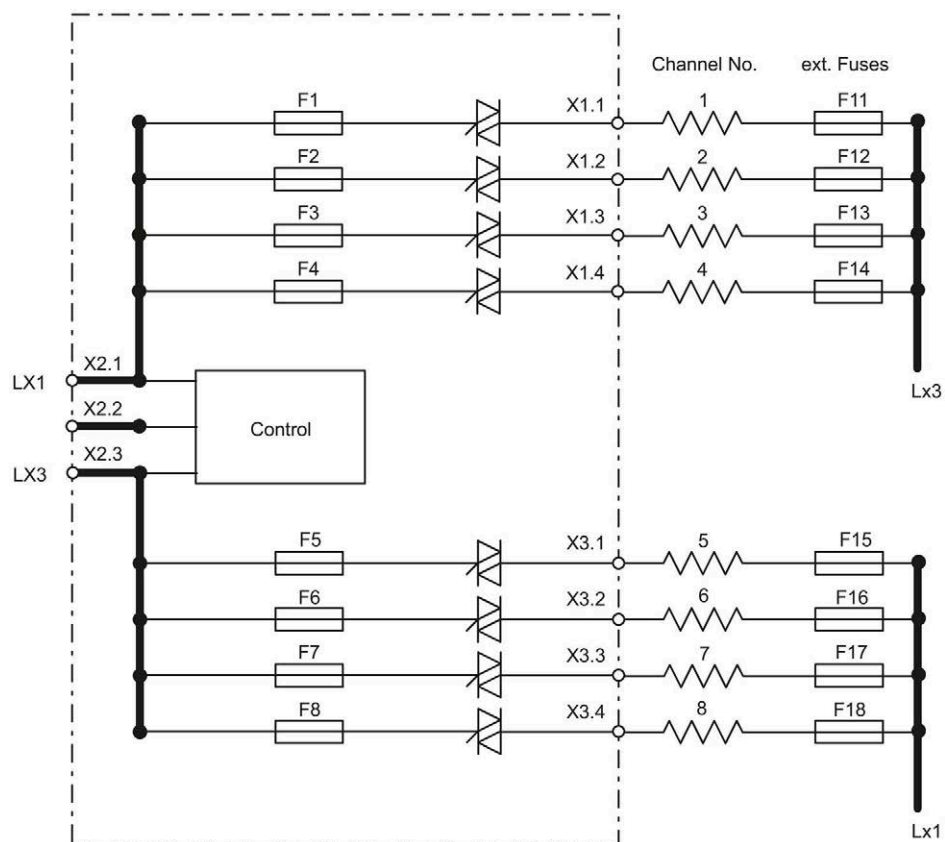


Figure 6-5 Power outputs POM4220 Highend - Connection between phase and phase

#### Note

The following applies to connections between phase and phase:

The heating elements must be switched to the other connected phase of the module.

## 2-pin connection between phase and neutral conductor (230 V)

For 2-pin switching of the outputs, the loads must be switched via the power semiconductors from two channels. This has the following advantage: In case of a cut-off of one of the two main power semiconductors (short-circuit), operation is still possible or the load can be turned off.

With this type of connection only channels 1 to 4 are used.

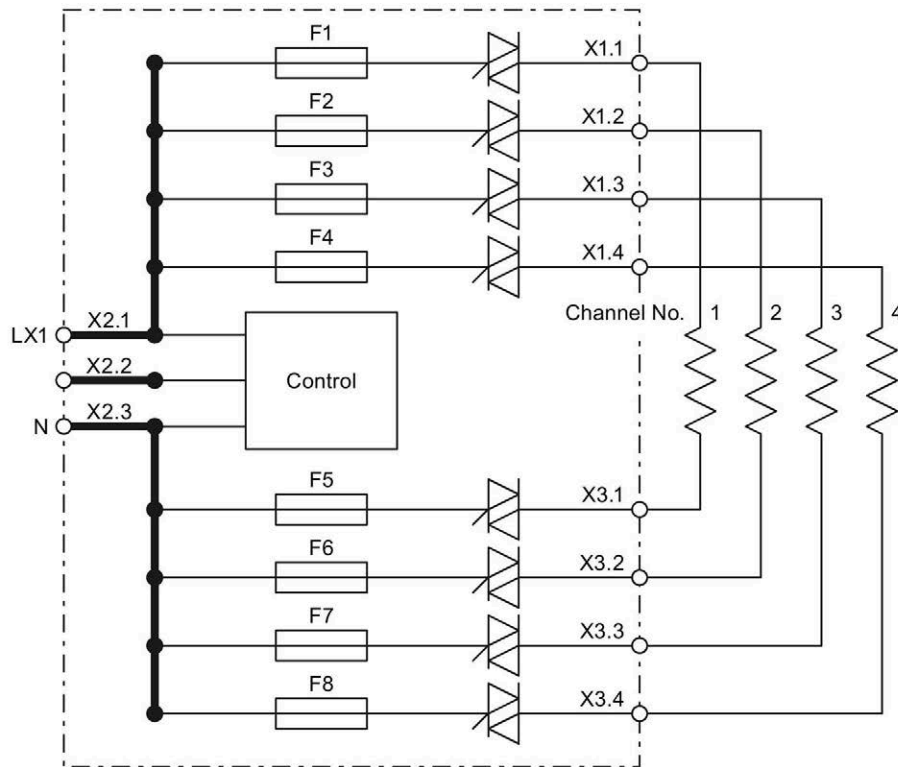


Figure 6-6 POM4220 Highend power outputs - 2-pin connection between phase and neutral conductor

Please note the particularities of this type of connection regarding the following aspects:

- Configuration parameters (see Configuration parameters for CIM and POM (Page 104))
- Cyclic data (see Cyclic data exchange (Page 145))
- Measured values (see Acyclic input data (Page 158))
- Error messages (see Manufacturer-specific error codes (Page 164))

## 2-pin connector between phase and phase (400 V)

For 2-pin switching of the outputs, the loads must be switched via the power semiconductors from two channels. This has the following advantage: In case of a cut-off of one of the two main power semiconductors (short-circuit), operation is still possible or the load can be turned off.

With this type of connection only channels 1 to 4 are used.

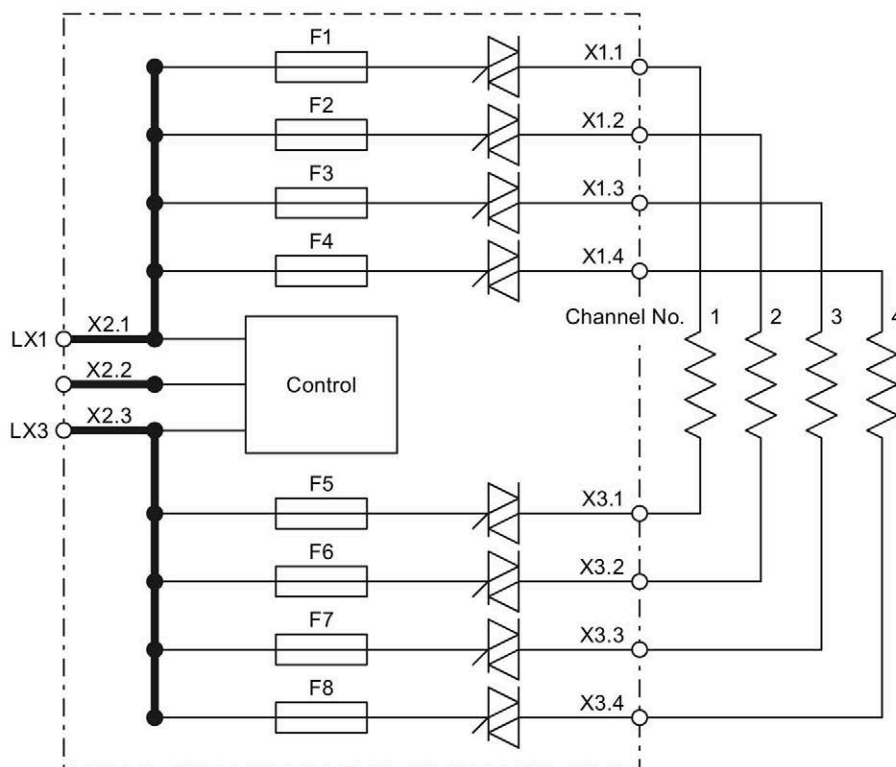


Figure 6-7 POM4220 Highend power outputs - 2 pin connection between phase and phase

Please note the particularities of this type of connection regarding the following aspects:

- Configuration parameters (see Configuration parameters for CIM and POM (Page 104))
- Cyclic data (see Cyclic data exchange (Page 145))
- Measured values (see Acyclic input data (Page 158))
- Error messages (see Manufacturer-specific error codes (Page 164))

### Economy circuit

With an economy circuit, a 3-pole star load is connected as shown in the block diagram.

Requirements:

- The three resistance values of the star load must be identical.
- Only loads with low temperature coefficients may be used. Radiators with tungsten heating coils, for example, are not permitted.

With this type of connection only channels 1 to 4 are used.

#### Note

A three-pin triangular load cannot be operated on the POM4220 Highend.

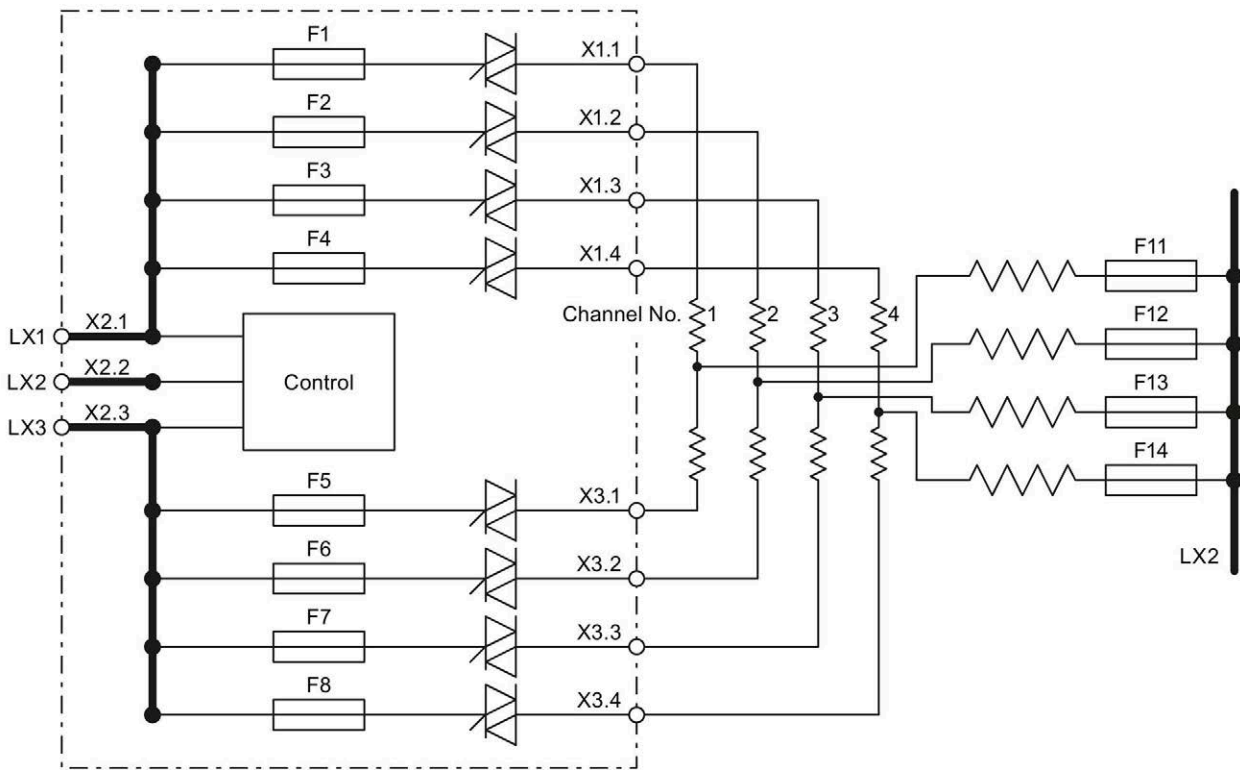


Figure 6-8 Power outputs POM4220 Highend - Economy circuit

Please note the particularities of this type of connection regarding the following aspects:

- Configuration parameters (see Configuration parameters for CIM and POM (Page 104))
- Cyclic data (see Cyclic data exchange (Page 145))
- Measured values (see Acyclic input data (Page 158))
- Error messages (see Manufacturer-specific error codes (Page 164))

### 6.6.5 Block diagram POM4320

#### Block diagram

The following figure shows the basic wiring of the POM4320 heating control system with mains and heating element connection. The power outputs are protected internally with two fuses per power output.

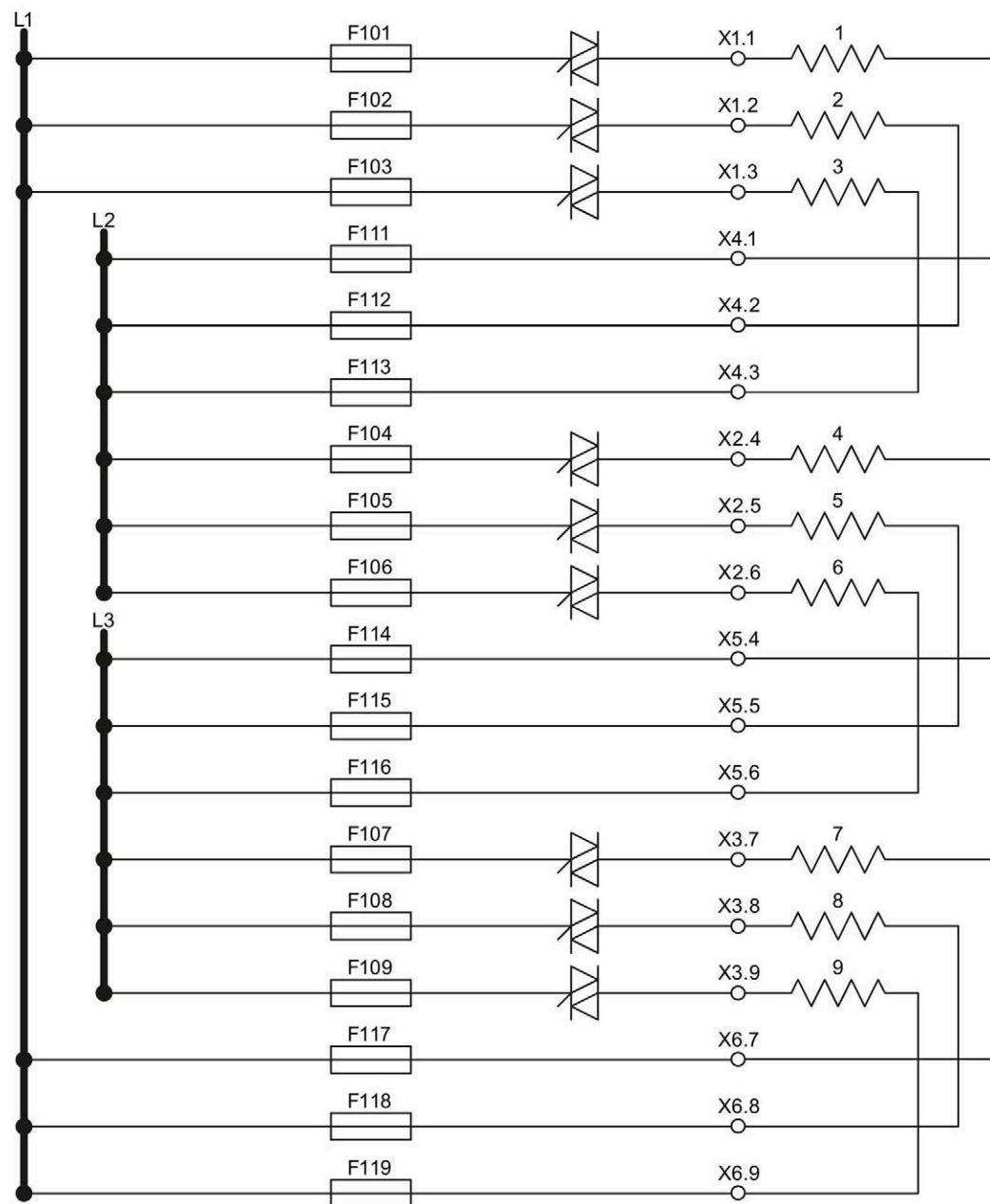


Figure 6-9 POM4320 power outputs

## 6.7 Connecting I/O modules

### 6.7.1 PM4000 DI/DO

#### Connecting the digital inputs/outputs

The connection is made by means of two 18-pin plug connectors of the PM4000 DI/DO.

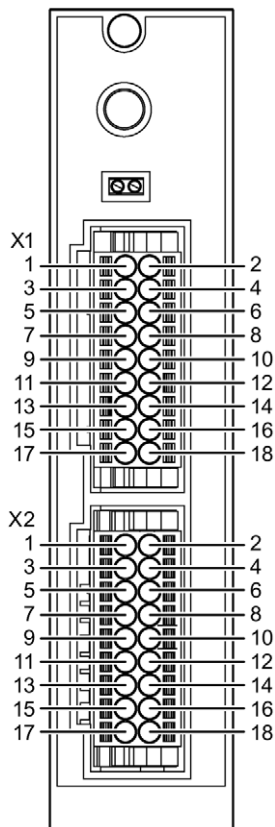


Figure 6-10 PM4000 DI/DO pin assignment

---

#### Note

The connection cables are to be shielded if longer than 30 m.

---

For each connector, one pin each is available for the connection or the reintroduction of the 24 V supply voltage and the 0 V supply voltage. All 24 V and GND pins of both connectors are respectively connected so that, with consideration to the maximum current, a looping-through of the supply voltage is possible (daisy chain).

**Note**

The maximum permission current of the connector is 8 A.

**X1: Digital outputs:**

18-pin connector with spring-loaded connection and interlock. The mating connectors are included in the scope of supply.

Pin	Assignment		Pin
1	GND	Digital output 1	2
3	GND	Digital output 2	4
5	GND	Digital output 3	6
7	GND	Digital output 4	8
9	GND	Digital output 5	10
11	GND	Digital output 6	12
13	GND	Digital output 7	14
15	GND	Digital output 8	16
17	GND	P24	18

**X2: Digital inputs / outputs**

18-pin connector with spring-loaded connection and interlock. The mating connectors are included in the scope of supply.

Pin	Assignment		Pin
1	GND	Digital input/output 9	2
3	GND	Digital input/output 10	4
5	GND	Digital input/output 11	6
7	GND	Digital input/output 12	8
9	GND	Digital input/output 13	10
11	GND	Digital input/output 14	12
13	GND	Digital input/output 15	14
15	GND	Digital input/output 16	16
17	GND	P24	18

6.7.2 PM4000 U/I

Connecting line measurement inputs

Connecting to mains power is done via the 8-pin plug-in connector X1 of the PM4000 U/I.  
 Connecting to mains voltage is done via the 6-pin plug-in connector X2 of the PM4000 U/I.

<p><b>! WARNING</b></p> <p><b>Voltage hazards</b></p> <p><b>Danger to life</b></p> <p>Before working on the heating control system or the connected components, ensure the system is disconnected.</p>
--

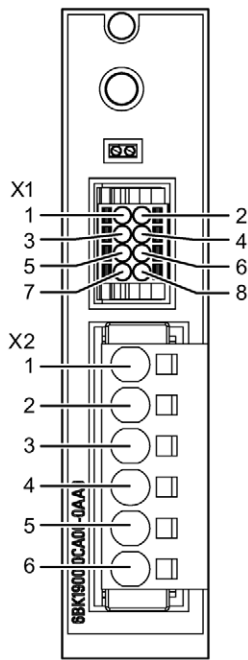


Figure 6-11 Line measurement inputs, pin assignment

X1: Current measurement

8-pin connector with spring-loaded connection and interlock. The mating connectors are included in the scope of supply.

Pin	Assignment		Pin
1	I1 -	I1 +	2
3	I2 -	I2 +	4
5	I3 -	I3 +	6
7	Reserved	Reserved	8



---

**Note**

The connection cable for the current measurement must not be longer than 30 m.

---

**X2: Voltage measurement**

6-pin connector with spring-loaded connection and interlock. The mating connectors are included in the scope of supply.

Pin	Assignment
1	Reserved
2	Phase 1
3	Phase 2
4	Phase 3
5	Neutral conductor
6	Reserved

**6.7.3 PM4000 Temperature**

**Connecting the measurement inputs**

The analog inputs 0...20 mA are connected by means of the 8-pin plug connector X1 of the PM4000 Temperature.

The measurement inputs for temperature are connected by means of the 8-pin plug connector X2 of the PM4000 Temperature.

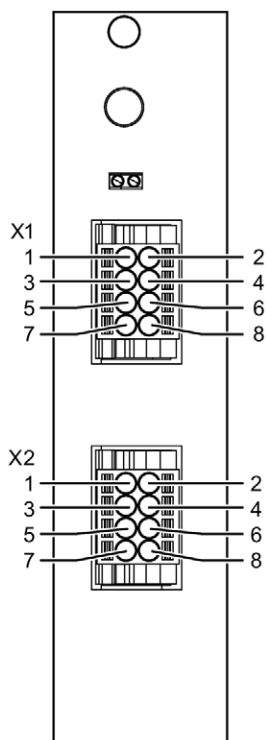


Figure 6-12 PM4000 Temperature pin assignment

### X1: Four analog inputs 0 ... 20 mA

8-pin connector with spring-loaded connection. The mating connectors are included in the scope of supply.

Pin	Assignment		Pin
1	Analog channel 1 -	Analog channel 1 +	2
3	Analog channel 2 -	Analog channel 2 +	4
5	Analog channel 3 -	Analog channel 3 +	6
7	Analog channel 4 -	Analog channel 4 +	8

### X2: Temperature measuring inputs

8-pin connector with spring-loaded connection. The mating connectors are included in the scope of supply.

#### 2-wire measurement

Pin	Assignment		Pin
1	Temperature channel 1 -	Temperature channel 1 +	2
3	Temperature channel 2 -	Temperature channel 2 +	4
5	Temperature channel 3 -	Temperature channel 3 +	6
7	Temperature channel 4 -	Temperature channel 4 +	8

### 4-wire measurement

Pin	Assignment		Pin
1	Temperature channel 1 U-	Temperature channel 1 U+	2
3	Temperature channel 1 I-	Temperature channel 1 I+	4
5	Temperature channel 3 U-	Temperature channel 3 U+	6
7	Temperature channel 3 I-	Temperature channel 3 I+	8

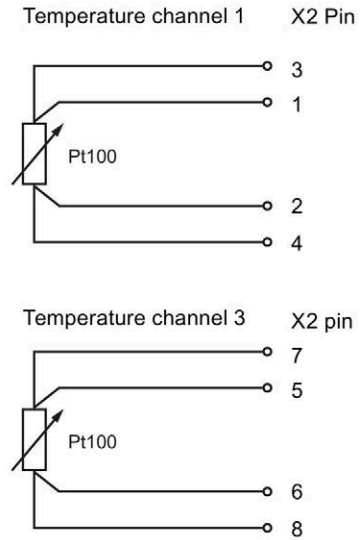


Figure 6-13 Wiring of the measuring inputs to X2 for 4-wire measurement using example of Pt100

# Commissioning

## 7.1 Requirements

Before commissioning starts, the system components must be installed and wired up.

Required:

- A programmable controller, e.g. SIMATIC S7 CPU or SIMOTION with PROFINET/PROFIBUS interface
- A SIPLUS HCS4200 heating controller consisting of the components:
  - Rack
  - Central Interface Module (CIM)
  - At least one Power Output Module (POM)

## 7.2 Commissioning

### Procedure

1. Turn on the 24 V DC power supply.
2. Switch on the AC power supply.  
The CIM and POM components of the heating control system start up.
3. Observe the operating state indicators (see Chapter Process and system messages, error handling (Page 168)).  
The heating controller is in operation.

## 7.3 Insulation test

### POM4220

Due to the protective impedances and filter capacitors installed in the device, you must remove the following connectors from the Power Output Module (POM) before performing an insulation test on the equipment:

- Plug connectors for the line supply X2
- Plug connectors for the heating elements X1, X3

Due to the protective impedances, the following protective conductor current flows under normal operating conditions:

Voltage	Protective conductor current		Note
	POM4220 Lowend POM4220 Midrange phase angle control POM4220 Flexible	POM4220 Highend	The specified protective conductor current refers to the output channels of one phase of a POM.
230 V / 50 Hz	<1.9 mA	<12.8 mA	
277 V / 50 Hz	<2.3 mA	<15.4 mA	

### POM4320

Because of the protective impedances in the device, the isolation resistance of a device of each phase to ground with an open load is around 124 k $\Omega$  and around 70 k $\Omega$  with connected heating loads. These values must be taken into account for an isolation test.

With multiple devices in a circuit, you have to factor in the parallel connection of the impedances. You may need to remove the device from the circuit prior to the isolation test.

Due to the protective impedances, the following protective conductor current flows under normal operating conditions:

Voltage	Protective conductor current
400 V / 50 Hz	<1.1 mA
480 V / 60 Hz	<1.4 mA

# Configuration

## 8.1 Integrating the HCS4200 components into the PROFINET configuration

### Procedure with SIMATIC S7

If the hardware catalog of your configuration software does not feature the HCS4200 yet, it can be integrated by installing an HSP. An HSP is available for the TIA Portal and can be downloaded from the Siemens Service&Support area (<http://www.siemens.com/automation/service&support>).

### Procedure with non-Siemens controllers

For PROFINET configuration you will need the language-specific GSDML file. The GSDML file must be installed in the configuration software.

The GSDML file "GSDML-V2.34-Siemens-002A-HCS4200-yyyymmdd" can be downloaded from the Siemens Service&Support area (<http://www.siemens.com/automation/service&support>).

If a non-Siemens PROFINET controller is used, install the GSDML file as described in the manufacturer's instructions.

## 8.2 Integrating the HCS4200 components into the PROFIBUS configuration

### Procedure with SIMATIC S7

If the hardware catalog of your configuration software does not feature the HCS4200 yet, it can be integrated by installing the GSD file. This is available in the following language versions: German (SIEM81C4.gsg) and English (SIEM81C4.gse) and can be downloaded from the Service&Support area (<http://www.siemens.com/automation/service&support>).

### Procedure with non-Siemens controllers

You will need the language-specific GSD file for PROFIBUS configuration. The SIEM81C4.gsx files can be downloaded from the Siemens Service&Support area (<http://www.siemens.com/automation/service&support>).

If a non-Siemens PROFIBUS controller is used, install the GSD file as described in the manufacturer's instructions.

## 8.3 Device configuration and configuration parameters in the TIA Portal

### 8.3.1 Device configuration PROFINET HCS4200

#### Device configuration

In the case of PROFINET, the structure of the hardware is mirrored in the TIA device configuration:

	CIM		POM 1	POM 2	POM 3	...	Final POM
Slot number	0 (PROFINET IO)		2	3	4		n
	1	CIM head Subslot 1.1					
		I/O module Subslot 1.2					

The configuration rules are as follows:

#### CIM

Slot 0 represents the PROFINET connection with the two ports. The CIM provides a slot for an I/O module. The CIM module and the CIM I/O module are assigned to slot 1 and are designed as submodules. If an I/O module is not used, subslot 1.2 remains empty.

#### POM

A maximum of 24 POMs can be operated on one CIM.

---

#### Note

The device configuration in the project engineering must match the configuration of the HCS that actually exists.

Otherwise, no startup can take place. Exception: Use of configuration control (see Configuration control (option handling) (Page 112)).

---

### 8.3.2 Device configuration PROFINET HCS4200 combination mode

#### Device configuration

In the case of PROFINET, the structure of the hardware is mirrored in the TIA device configuration:

Table 8- 1 Configuration using a 4x rack

	CIM	POM422 0	POM4220 or empty	POM4220 or empty	POM432 0	POM432 0	POM432 0
Slot (Slot) Number	0 PN 1.1 Head 1.2 PM	2	...	5	6	...	max. 17

Table 8- 2 Configuration using a 12x rack

	CIM	POM422 0	POM4220 or empty	POM4220 or empty	POM432 0	POM432 0	POM432 0
Slot (Slot) Number	0 PN 1.1 Head 1.2 PM	2	...	13	14	...	max. 25

The configuration rules are as follows:

#### CIM

Slot 0 represents the PROFINET connection with the two ports. The CIM provides a slot for an I/O module. The CIM module and the CIM I/O module are assigned to slot 1 and are designed as submodules. If an I/O module is not used, subslot 1.2 remains empty.

#### POM

A maximum of 12 POM4220 and 12 POM4320 can be operated on one CIM.

---

#### Note

When using a 4x rack, the POM4320 be plugged starting at slot 6, when using a 12x rack, it is plugged starting a slot 14. These slot numbers are permanently set, even if slots with POM4220 remain empty.

In any case, a POM4220 must be plugged into slot 2.

---

#### Note

The device configuration in the project engineering must match the configuration of the HCS that actually exists.

Otherwise, no startup can take place. Exception: Use of configuration control (Configuration control (option handling) (Page 112)).

---



### 8.3.3 PROFIBUS device configuration

#### Device configuration in the TIA Portal

In the case of PROFIBUS, the structure of the hardware is mirrored in the device configuration of the TIA Portal as follows:

	CIM	PM	POM 1	POM 2	POM 3	...	final POM
Slot number	1	2	3	4	5		n

The configuration rules are as follows:

#### CIM

The CIM module includes the PROFIBUS connection and is permanently present in slot 1.

#### PM

The CIM I/O module is present in slot 2. If no I/O module PM is used, an empty space must be configured here.

#### POM

A maximum of 12 POMs can be operated on one CIM.

#### NOTICE

##### No startup possible

If the device configuration in the project engineering does not match the configuration of the HCS that actually exists, the device does not start up.

Ensure that the device configuration and the configuration that actually exists match.

#### Restrictions for PROFIBUS connection

The following functions are not available or only with restrictions for a PROFIBUS connection:

- Configuration control is not available
- Combined mode with POM4320 is not possible
- In the case of operation of a POM4220 Midrange phase angle control, phase angle control cannot be configured.
- The operation of POM4220 Highend and POM4220 Flexible is not possible.

### 8.3.4 Configuration parameters

#### 8.3.4.1 Configuration parameters for CIM and POM

The configuration parameters are directly assigned to the respective modules and are set during device configuration. They are transferred automatically on start-up and during re-parameterization.

#### Configuration parameters CIM

Description	Value range
Rated voltage for line voltage compensation	<ul style="list-style-type: none"> <li>The permitted value depends on the used POM versions, see Line voltage compensation (Page 130).</li> </ul>
Configuration control switched on	<ul style="list-style-type: none"> <li>No (default)</li> <li>Yes</li> </ul>

#### Configuration parameters POM4220 Lowend

Description	Value range
Control type (setting once per POM)	<ul style="list-style-type: none"> <li>Half-wave control (default)</li> </ul>
Phase LX1 (setting once per POM)	<ul style="list-style-type: none"> <li>Connected (default)</li> <li>Not connected</li> </ul>
Phase LX3 (setting once per POM)	<ul style="list-style-type: none"> <li>Connected (default)</li> <li>Not connected</li> </ul>
Response to errors (setting per channel)	<ul style="list-style-type: none"> <li>Channel substitute value 0 (default)</li> <li>Channel value is retained</li> </ul>

### Configuration parameters POM4220 Flexible

Description	Value range
Control type (setting once per POM)	<ul style="list-style-type: none"> <li>Half-wave control (default)</li> </ul>
Rated voltage	<ul style="list-style-type: none"> <li>230/277 V (default)</li> <li>110 V</li> <li>70 V</li> <li>45 V</li> </ul>
Phase LX1 (setting once per POM)	<ul style="list-style-type: none"> <li>Connected (default)</li> <li>Not connected</li> </ul>
Phase LX3 (setting once per POM)	<ul style="list-style-type: none"> <li>Connected (default)</li> <li>Not connected</li> </ul>
Response to errors (setting per channel)	<ul style="list-style-type: none"> <li>Channel substitute value 0 (default)</li> <li>Channel value is retained</li> </ul>

### Configuration parameters POM4220 Midrange phase angle control

Description	Value range
Control type (setting once per POM)	<ul style="list-style-type: none"> <li>Half-wave control (default)</li> <li>Half-wave control with soft start version 1</li> <li>Half-wave control with soft start version 2</li> <li>Half-wave control with soft start version 3</li> <li>Phase angle control</li> <li>Phase angle control with Softstart version 1</li> <li>Phase angle control with Softstart version 2</li> <li>Phase angle control with Softstart version 3</li> </ul>
Phase LX1 (setting once per POM)	<ul style="list-style-type: none"> <li>Connected (default)</li> <li>Not connected</li> </ul>
Phase LX3 (setting once per POM)	<ul style="list-style-type: none"> <li>Connected (default)</li> <li>Not connected</li> </ul>
Response to errors (setting per channel)	<ul style="list-style-type: none"> <li>Channel substitute value 0 (default)</li> <li>Channel value is retained</li> </ul>
Soft start for each channel switch-on operation (Set once per POM)	<ul style="list-style-type: none"> <li>No (default)</li> <li>Yes</li> </ul>

**Configuration parameters POM4220 Highend**

Description	Value range
Control type (setting once per POM)	<ul style="list-style-type: none"> <li>• Half-wave control (default)</li> <li>• Half-wave control with soft start version 1</li> <li>• Half-wave control with soft start version 2</li> <li>• Half-wave control with adaptive soft start</li> <li>• Phase control</li> <li>• Phase control with soft start version 1</li> <li>• Phase control with soft start version 2</li> <li>• Phase angle control with adaptive soft start</li> </ul>
Connection type (setting once per POM)	<ul style="list-style-type: none"> <li>• Connection between phase and N-conductor</li> <li>• Connection between phase and phase</li> <li>• 2-pin connection between phase and neutral conductor</li> <li>• 2-pin connection between phase and phase</li> <li>• Economy circuit<sup>1)</sup></li> </ul>
Phase LX1 <sup>2)</sup> (setting once per POM)	<ul style="list-style-type: none"> <li>• Connected (default)</li> <li>• Not connected</li> </ul>
Phase LX3 <sup>2)</sup> (setting once per POM)	<ul style="list-style-type: none"> <li>• Connected (default)</li> <li>• Not connected</li> </ul>
Soft start for each channel switch-on operation (setting once per POM)	<ul style="list-style-type: none"> <li>• No (default)</li> <li>• Yes</li> </ul>
Enable output control (setting once per POM)	<ul style="list-style-type: none"> <li>• No (default)</li> <li>• Yes</li> </ul>
Enable fault current monitoring (setting once per POM)	<ul style="list-style-type: none"> <li>• No (default)</li> <li>• Yes</li> </ul>
Threshold for fault current monitoring	<ul style="list-style-type: none"> <li>• 400 to 2000 mA</li> </ul>
Response to errors (setting per channel)	<ul style="list-style-type: none"> <li>• Channel substitute value 0 (default)</li> <li>• Channel value is retained</li> </ul>
Parallel switching of loads (setting per channel)	<ul style="list-style-type: none"> <li>• No (default)</li> <li>• Yes</li> </ul>
Total power rating (setting per channel)	<ul style="list-style-type: none"> <li>• 400 ... 9600 W</li> </ul>
Max. permitted deviation from total power (setting per channel)	<ul style="list-style-type: none"> <li>• 50 ... 2000 W</li> </ul>

1) With the exception of the parameter "Response in the event of fault", all other parameter settings are irrelevant for this type of connection.

2) The parameters "Phase LX1" and "Phase LX3" are only relevant for connections between phase and neutral conductor.

**Note****Normalizing the total power**

- When connecting the load between phase and N-conductor, the power ratings to be configured must be normalized to 230 V.
- When connecting the load between phase and phase, the power ratings to be configured must be normalized to 400 V.

**Calculation example for interconnection phase - N-conductor**

Normalization:

$$P_{\text{scaled}} = P_{\text{load}} * (230 \text{ V}/U_{\text{load}})^2$$

Load with  $U_{\text{rated}} = 240 \text{ V}$ ;  $P_{\text{rated}} = 1500 \text{ W}$

$$P_{\text{normalized}} = 1500 \text{ W} * (230 \text{ V}/240 \text{ V})^2$$

$$P_{\text{normalized}} = 1378 \text{ W}$$

**Calculation example for interconnection phase - phase**

Normalization:

$$P_{\text{scaled}} = P_{\text{load}} * (400 \text{ V}/U_{\text{load}})^2$$

Load with  $U_{\text{rated}} = 480 \text{ V}$ ;  $P_{\text{rated}} = 6000 \text{ W}$

$$P_{\text{normalized}} = 6000 \text{ W} * (400 \text{ V}/480 \text{ V})^2$$

$$P_{\text{normalized}} = 4167 \text{ W}$$

**Configuration parameters POM4320**

Description	Value range
Control mode (Set once per POM)	<ul style="list-style-type: none"> <li>• Half-wave control (default)</li> <li>• Soft start version 1</li> <li>• Soft start version 2</li> <li>• Soft start version 3</li> <li>• Phase angle control<sup>1)</sup></li> <li>• Phase angle control with Softstart version 1</li> <li>• Phase angle control with Softstart version 2</li> <li>• Phase angle control with Softstart version 3<sup>3)</sup></li> </ul>
Response to errors (setting per channel)	<ul style="list-style-type: none"> <li>• Channel substitute value 0 (default)</li> <li>• Channel value is retained</li> </ul>

### 8.3.4.2 Configuration parameters for I/O modules

The configuration parameters are directly assigned to the respective I/O modules and are set during device configuration. They are transferred on start-up and during re-parameterization.

#### PM4000 Temperature parameters

Description	Value range
Analog channel 1 measuring range ... Analog channel 4 measuring range	<ul style="list-style-type: none"> <li>• Not connected (default)</li> <li>• 0 ... 20 mA</li> <li>• 4 ... 20 mA (open-circuit detection)</li> </ul>
Temperature channel 1 sensor type Temperature channel 3 sensor type	<ul style="list-style-type: none"> <li>• None (default)</li> <li>• Pt 100</li> <li>• Pt 100 (four-wire)</li> <li>• Pt 1000</li> <li>• Pt 1000 (four-wire)</li> <li>• Type J thermocouple</li> <li>• Type K thermocouple</li> <li>• Type L thermocouple</li> </ul>
Temperature channel 2 sensor type Temperature channel 4 sensor type	<ul style="list-style-type: none"> <li>• None (default)</li> <li>• Pt 100<sup>1)</sup></li> <li>• Pt 1000<sup>1)</sup></li> <li>• Type J thermocouple</li> <li>• Type K thermocouple</li> <li>• Type L thermocouple</li> </ul>
Compensation procedure	<ul style="list-style-type: none"> <li>• No compensation (default)</li> <li>• Internal sensor</li> <li>• External value</li> </ul>

<sup>1)</sup> When setting Pt 100/1000 (four-wire) for temperature channel 1 / 3, "none" must be selected for temperature channel 2 / 4.

**PM4000 DI/DO parameters**

Description	Value range
Digital channel 9 ... Digital channel 16	<ul style="list-style-type: none"> <li>Input (default)</li> <li>Output</li> </ul>
Output 1 Response to errors ... Output 16 Response to errors	<ul style="list-style-type: none"> <li>Shutdown (default)</li> <li>Keep last value</li> <li>Switching on</li> </ul>
Alarm on open circuit	<ul style="list-style-type: none"> <li>No (default)</li> <li>Yes</li> </ul> <p>Note: If power outage monitoring is enabled, unused outputs must be closed or controlled with "1".</p>
Alarm on absence of 24 V power supply	<ul style="list-style-type: none"> <li>No (default)</li> <li>Yes</li> </ul>

**Parameter PM4000 U/I**

Description	Value range
Type of voltage connection	<ul style="list-style-type: none"> <li>Star (default)</li> <li>None</li> </ul>
Type of current converter	<ul style="list-style-type: none"> <li>None (default)</li> <li>1 A</li> <li>5 A</li> </ul>

## 8.4 Software tools for commissioning support

### 8.4.1 Overview of tools for commissioning support

Listed below are the tools that can provide support with configuration and commissioning.

#### SIMATIC WinCC

A library in the TIA Portal for SIMATIC WinCC is available for integration in an HMI system. This library contains a specific number of channels and fields; setpoints can be assigned and actual values can be displayed.

#### Example application

An example project and a block library for the TIA Portal are available for the SIMATIC S7-1500 automation system to support commissioning of the heating control system.

#### HTML pages (SIMATIC S7)

SIMATIC controllers with PROFINET interface (e.g. S7-1500) have an integrated web server that contains web pages for displaying diagnostics data. This web server can be accessed via a standard web browser.

This supports scanning and saving of the firmware version, diagnostics buffer, tag tables and module status, as well as monitoring of communication links and displaying the topology of the plant.

In the event of a fault, the user can view the exact error message in plain text in the detail view for the module.

---

#### Note

##### Requirements

This function requires the use of the example application or at least the data structure of the example application.

---

#### PRONETA

SIEMENS PRONETA PC-based software tool that is provided free-of-charge, which simplifies the commissioning of PROFINET systems by performing the following tasks:

- Topology overview that automatically scans PROFINET and displays all connected components. This overview can be exported in the form of a device list. You have the option of "Initializing" the components and performing other simple configuration tasks, as well as comparing the actual configuration with a required configuration.
- IO check to quickly test the wiring of a plant and the module configuration of the components. By reading and writing the inputs and outputs, PRONETA makes sure that



the distributed I/O devices with their sensors and actuators are correctly wired. PRONETA can create test profile templates and store test logs to document the test results.

- All tasks can be performed even before a CPU is integrated into the network. Moreover, since no other engineering tools or hardware are required, PRONETA enables fast and convenient checking of a plant configuration at an early stage. You can find additional information on the PRONETA in the Support area (<http://support.automation.siemens.com/WW/view/en/67460624>).

## 8.5 Configuration control (option handling)

### 8.5.1 Configuration control

#### Introduction

Configuration control (option handling) is used to operate various standard machine configuration levels in one project without changing the configuration or the user program.

#### Operating principle of configuration control

You can use the configuration control to operate different expansion levels of a series machine with a single configuration of the HCS.

- A station master is configured in a project (maximum configuration). The station master comprises all modules needed for all possible plant parts of a modular standard machine.
- The project's user program provides for several station options for various standard machine configuration levels as well as selection of a station option. For example, a station option uses only some of the modules of the station master.
- The standard machine manufacturer selects a station option for a configuration of the standard machine. To do this, the project need not be modified, and it is not necessary to load a modified configuration.

Using a custom control data record, you inform the HCS which modules in a station option are missing or are located in a different slot as compared to the station master. The configuration control does not have an impact on the parameter assignment of the modules.

The following figure shows 3 expansion levels of a heating control system with the associated station options.

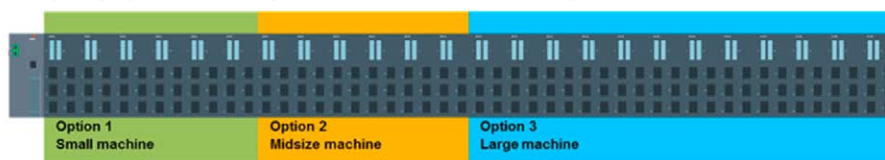


Figure 8-1 Configuration control

#### Advantages

- Simple project execution and commissioning by using a single STEP 7 project for all station options.
- Easy handling during maintenance, versioning and upgrades:
- Savings potential in the creation, commissioning and the documentation for standard machines.

## Procedure

To set up the configuration control, follow these steps:

Step	Procedure	See section
1	Enable configuration control in STEP 7	Configuring (Page 113)
2	Create control data record	Control data record (Page 114)
3	Transfer control data record	Transferring the control data record in the startup program of the CPU (Page 116)

## 8.5.2 Configuring

### Requirements

Configuration control only works with PROFINET.

- You need a CIM4210 PROFINET version V2.1 and higher.

### Required steps

When configuring the CIM4210 in STEP 7 (TIA Portal), enable the "Configuration control on" parameter.

## 8.5.3 Controller

### 8.5.3.1 Slot assignment

#### Slot assignment

The following table shows the possible slots for the various modules:

Table 8-3 Slot assignment

Modules	Possible slots	Note
CIM PN	0	The PN connection of the CIM is not an element of the configuration control.
CIM	1.1	The header of the CIM (subslot) is not an element of the configuration control, but instead controls it.
PM	1.2	As a sub-slot part of the configuration control (handled here as a slot 1).
POM	2 ... 25	Without empty slot directly after the CIM.

### 8.5.3.2 Control data record

#### Operating principle

You define a control data record 196 V1.0, which includes a slot assignment for the configuration control of an HSC. The control data record can also be read back.

The control data record is only processed with configured configuration control; otherwise it is rejected.

#### Rules

Observe the following rules:

- The entry for slot 1 only identifies the PM (see also Table 8-3 Slot assignment (Page 113)).
- All modules up to the max. possible configuration of the HCS must be registered in control data record.
- The entries up to at least the last slot of the station master must be contained in the control data record. Entries beyond the last slot must be pre-assigned with "Module not available".
- Multiple configured slots may not be assigned to the same actual slot. In other words, each station option slot may be present only once in the control data record.
- Empty slots are allowed in combined mode.
- Moving modules is not allowed.

## Control data record

The table below shows the structure of a control data record with explanations of the individual elements. The control data record can also be read back.

Table 8- 4 Structure of the simplified control data record V1.0

Byte	Element	Code	Explanation
0	Block length	4 + maximum slot	Header
1	Block ID	196	
2	Version	1	
3	Version	0	
4	Slot 1 of the station master	Slot assignment in the station option	<b>Control element</b> Contains information on which module is inserted in which slot. The value that you need to enter in the corresponding byte depends on the following rule: <ul style="list-style-type: none"> <li>• If the module is included in the                station option, enter the slot num-                ber of the module from the station                master.</li> <li>• If the slot in the station master is                not allocated (e.g. empty slots as                part of combined operation), then                enter the slot number of the mod-                ule + 128.                (Example: module as empty slot on                slot 3: Enter 131 in the control ele-                ment.)</li> <li>• If the module does not exist in the                station option, enter 0.</li> </ul>
5	Slot 2 of the station master	Slot assignment in the station option	
...	...	...	
28	Slot 25 of the station master	Slot order	

### 8.5.3.3 Feedback data record

#### Operating principle

The feedback data record informs you about the accuracy of the module assignment and gives you the option of detecting assignment errors in the control data record. The feedback data record is mapped via a separate data record 197 V2.0. The feedback data record is only processed with configured configuration control; otherwise it is rejected.

**Rules**

Observe the following rules:

- The feedback data record refers to the configured station configuration and always includes the maximum configuration limits, which is 25 modules.
- Partial reading of the feedback data record is not possible.
- As long as a control data record is not sent, it is assumed that no modules are inserted (DS197 has status "0").

**Feedback data record**

Table 8- 5 Feedback data record

Byte	Element	Code	Explanation
0	Block length	4 + (number of slots x 2)	Header
1	Block ID	197	
2	Version	2	
3		0	
4	Slot 1 status	0/1	Status = 1:
5	Reserved	0	
6	Slot 2 status	0/1	
7	Reserved	0	
:	:	:	• Module from station master is inserted in the station option • Slot is marked as not available in the control data record
53	Slot 25 status	0/1	
54	Reserved	0	Status = 0: • Module pulled • Incorrect module inserted in the station option*

\* Not possible if the slot is marked as not available.

**8.5.3.4 Transferring control data record in the startup program of the CPU**

**Required steps**

Transfer the created control data record 196 to the CIM using the WRREC (Write data record) instruction.

To verify the configuration, the feedback data record 197 can be queried by the CIM with the RDREC instruction (read data).

## Parameters of the instruction WRREC

Below, you will find explanations of individual parameters of the WRREC instruction which you must supply with specific values in the configuration control context. You can find additional information on the WRREC instruction in the STEP 7 online help.

ID	Hardware identifier
INDEX	Data record number: 196 (decimal)
RECORD	Control data record to be transferred. For the structure of the control data record, see table. (Page 114)

In case of error, the instruction WRREC returns the following error messages via the STATUS block parameter:

Table 8- 6 Error messages WRREC

Error code	Meaning
80B1H	Invalid length; the length information in data record 196 is not correct.
80B5H	Configuration control parameters not assigned.
80E2H	Data record was transferred in the wrong OB context. The data record must be transferred in the startup program.
80B8H	Parameter error A parameter error is caused by: <ul style="list-style-type: none"> <li>• Incorrect block ID in the header (not equal to 196)</li> <li>• Invalid version identifier in the header</li> <li>• A reserved bit was set</li> <li>• A station master slot was assigned an invalid slot in the station option</li> <li>• Multiple slots in the station master are assigned to the same slot in the station option</li> </ul>

## Parameters of the RDREC instruction

Below, you will find explanations of individual parameters of the WRREC instruction which you must supply with specific values in the configuration control context. You can find additional information on the WRREC instruction in the STEP 7 online help.

ID	Hardware identifier
INDEX	Data record number: 197 (decimal)
RECORD	Feedback data record to read For the structure of the control data record, see table. (Page 114)

In the event of an error, the RDREC instruction returns the following error messages via the STATUS block parameter:

Table 8-7 Error messages RDREC

Error code	Meaning
80B1H	Invalid length; the length information in data record 197 is not correct.
80B5H	Configuration control not configured
80B8H	Parameter error The following events cause a parameter error: <ul style="list-style-type: none"> <li>• Incorrect block ID in the header (not equal to 197)</li> <li>• Invalid version identifier in the header</li> <li>• A reserved bit was set</li> <li>• Multiple slots in the station master are assigned to the same slot in the station option</li> </ul>

### Special requirements relating to the transfer of the control data record

- If you have enabled configuration control, the HCS is not ready for operation without a control data record. As long as no valid control data record has been transferred, the I/O modules are considered as failed by the CPU and exhibit substitute value behavior. The CIM continues to be in data exchange.
- The control data record is stored retentively in the CIM. Note:
  - If there have been no changes to the configuration, you do not need to rewrite the control data record 196 during restart.
  - If you write a control data record with modified configuration to the CIM, it will result in a reset of the HCS (station failure). The original data record 196 is deleted and the new data record 196 is saved retentively. The station will then restart with the modified configuration.

#### 8.5.3.5 Behavior during operation

##### Response when modules are missing

If modules are entered as not present in the control data record, the automation system behaves as follows:

- Modules designated as not present in the control data record do not supply diagnostics and their status is always OK. The value status is OK.
- Direct write access to the outputs that are not present or write access to the process image of the outputs that are not present: Remains without effect; no access error is signaled.
- Direct read access to the inputs that are not present or read access to the process image of the inputs that are not present: Value "0" is supplied; no access error is signaled.



**Note**

The configuration from the control data record DS196 must match the configuration of the HCS that actually exists.

Otherwise, no startup can take place.

## 8.5.4 Examples of configuration control

### 8.5.4.1 Station master HCS4200

#### Station master HCS4200

In the following a station master, comprising an CIM4210, PM Temp, two POM4220 low-end and POM4220 mid-range each, is configured.



Figure 8-2 Station master HCS4200

With configuration control, the following station options are derived from the station master:

Station option with no PM

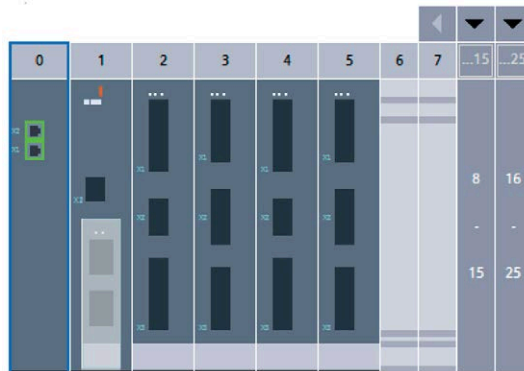


Figure 8-3 Station option with no PM

The associated control data record DS196 must be pre-assigned as follows:

Byte	Element	Code	Description
0	Block length	4+25	Header
1	Block ID	196	
2	Version	1	
3	Version	0	
4	Slot 1 of station master	0	PM is not inserted in the station options
5	Slot 2 of station master	2	POM available
6	Slot 3 of station master	3	POM available
7	Slot 4 of station master	4	POM available
8	Slot 5 of station master	5	POM available
9	Slot 6 of station master	0	Module not available
...	...		
28	Slot 25 of station master	0	Module not available

The data record can also be written in abbreviated form with length 4+5; the last entry is byte 8 in this case.

If there are no errors, the feedback data record DS197 contains the following entries:

Byte	Element	Code	Description
0	Block length	4+50	Header
1	Block ID	197	
2	Version	2	
3	Version	0	
4	Slot 1 of station master	1	Module is actually not available
5	Slot 2 of station master	1	Module is actually available
6	Slot 3 of station master	1	Module is actually available
7	Slot 4 of station master	1	Module is actually available
8	Slot 5 of station master	1	Module is actually available
9	Slot 6 of station master	1	Module is actually not available
...	...		
28	Slot 25 of station master	1	Module is actually not available

### Station option with no POMs



Figure 8-4 Station option with no POMs

The associated control data record DS196 must be pre-assigned as follows:

Byte	Element	Code	Description
0	Block length	4 + 25	Header
1	Block ID	196	
2	Version	1	
3	Version	0	
4	Slot 1 of station master	1	PM available
5	Slot 2 of station master	2	POM available
6	Slot 3 of station master	3	POM available
7	Slot 4 of station master	0	POM is not inserted in the station options
8	Slot 5 of station master	0	POM is not inserted in the station options
9	Slot 6 of station master	0	Module not available
...	...		
28	Slot 25 of station master	0	Module not available

The data record can also be written in abbreviated form with length 4+5; the last entry is byte 8 in this case.

If there are no errors, the feedback data record DS197 contains the following entries:

Byte	Element	Code	Description
0	Block length	4 + 50	Header
1	Block ID	197	
2	Version	2	
3	Version	0	
4	Slot 1 of station master	1	Module is actually available
5	Slot 2 of station master	1	Module is actually available
6	Slot 3 of station master	1	Module is actually available
7	Slot 4 of station master	1	Module is actually not available
8	Slot 5 of station master	1	Module is actually not available
9	Slot 6 of station master	1	Module is actually not available
...	...		
28	Slot 25 of station master	1	Module is actually not available

### 8.5.4.2 Station master HCS4200 combined mode

#### Station master HCS4200 combined operation

In the following a station master is configured comprising an CIM4210, one POM4220 low-end and one POM4220 mid-range each, two POM4320s.



Figure 8-5 Station master HCS combi

With configuration control, the following station option was derived from the station master:

#### Station option with no POMs



Figure 8-6 Station option with no POMs

The associated control data record DS196 must be pre-assigned as follows:

Byte	Element	Code	Description
0	Block length	4 + 25	Header
1	Block ID	196	
2	Version	1	
3	Version	0	
4	Slot 1 of station master	0	PM is not available
5	Slot 2 of station master	2	POM available
6	Slot 3 of station master	0	PM not available
7	Slot 4 of station master	128 + 4	Free space due to combined operation
8	Slot 5 of station master	128 + 5	Free space due to combined operation
9	Slot 6 of station master	6	POM available
10	Slot 7 of station master	0	PM not available
11	Slot 8 of station master	0	Module not available
...	...		
28	Slot 25 of station master	0	Module not available

The data record can also be written in abbreviated form with length 4+5; the last entry is byte 8 in this case.

If there are no errors, the feedback data record DS197 contains the following entries:

Byte	Element	Code	Description
0	Block length	4 + 50	Header
1	Block ID	197	
2	Version	2	
3	Version	0	
4	Slot 1 of station master	1	Module is actually not available
5	Slot 2 of station master	1	Module is actually available
6	Slot 3 of station master	1	Module is actually not available
7	Slot 4 of station master	1	Slot is empty
8	Slot 5 of station master	1	Slot is empty
9	Slot 6 of station master	1	Module is actually available
10	Slot 7 of station master	1	Module is actually not available
11	Slot 8 of station master	1	Module is actually not available
...	...		
28	Slot 25 of station master	1	Module is actually not available

## Functions

### 9.1 Overview of functions

The table below shows which functions are available for the different POM versions.

Function	POM4220 Lowend, Flexible	POM4220 Midrange phase angle control	POM4220 Highend	POM4320
Half-wave control	x	x	x	x
Phase angle control	-	x	x	x
Defined soft start (fixed number of half-waves)	-	x	x	x <sup>3</sup>
Adaptive soft start	-	-	x	-
Explicit switch-on of heating	x	x	x	x
Time-delayed startup of the channels	x	x	x	x
Soft start during heater operation	-	x	x	-
Channel control over setpoints	x	x	x	x
Channel control over fields	x	x	x	x
Line voltage compensation	x <sup>1</sup>	x <sup>1</sup>	x	x
Power control	-	-	x	-
Parameter assignment of behavior of the power outputs	x	x	x	x
Phase control monitoring	x	x	x	x
Rotating-field test	-	-	x <sup>2</sup>	x
Line voltage monitoring	x <sup>1</sup>	x <sup>1</sup>	x	x
Frequency monitoring	x	x	x	x
Temperature monitoring	x	x	x	x
Monitoring power channels	x	x	x	x
Monitoring power channels with loads connected in parallel	-	-	x	-
Total current monitoring	-	-	x	-
Fault current monitoring	-	-	x	-

<sup>1</sup> With PM-U/I

<sup>2</sup> Only with connection type economy circuit

<sup>3</sup> POM4320 as of MLFB -0AA2 is designed for phase angle control

### 9.2 Status and actual displays

You can obtain information about the current state of the device/system/process as follows:

## Operating status display via LEDs

The LEDs on the Central Interface Module (CIM) as well as on the Power Output Module (POM) provide information about the current operating status of the device or the heating system.

For detailed information on the meaning of the LED displays, see Section "LED operating display for CIM (Page 168)" and Section "LED operating display for POM (Page 169)".

## 9.3 Power output control

### 9.3.1 Half-wave control

Half-wave control can be parameterized for activating the heating elements. This parameterization is performed for each POM and applies to all channels of the POM.

#### Operating principle of half-wave control

The power outputs are controlled in half-waves: For each half-wave, the controller supplies On/Off information to the triac and this switches as specified.

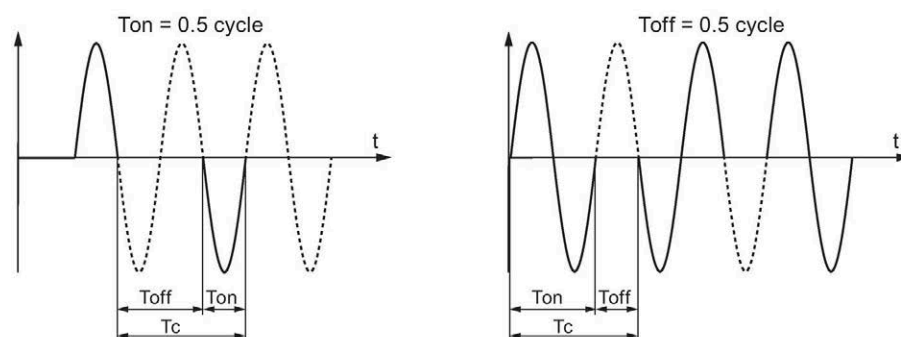


Figure 9-1 Half-wave control example: 33% and 66 %

The setpoints for controlling the power outputs lie within a value range of 0 % to 100 % (reference value: 100 half-waves).

Depending on the specified setpoint, the power outputs are controlled with an equal number of positive and negative half-waves (reference value: 200 half-waves).

To avoid excessively high inrush currents, the power outputs are switched on time-delayed. See Switch on heating (Page 128).

A static table is used for control so that a too frequent change of the setpoints can result in a significantly deviating setpoint. For this reason, the setpoints are only forwarded in a time scale of ca. 600 ms.

**Note**

If it is required for an application that a changed setpoint value is applied immediately, you can switch off this time grid (see Acyclic output data (Page 153)). When you disable the time scale, you must ensure that the setpoints are not changed too frequently within the reference period of 100 half-waves.

**9.3.2 Phase angle control**

The control mode phase angle control can be parameterized for controlling the heating elements. Compared to "zero-point switching", phase angle control has several advantages, such as even heat dissipation and prevention of flickering of emitters with low setpoints.

This parameterization is performed for each POM and applies to all channels of the POM.

**Operating principle of phase angle control**

The power outputs are controlled in the parts of a half wave: The HCS specifies the switch-on signal at the corresponding time in every half-wave depending on the setpoint for the Triac, which is then switched on until the next zero crossing.

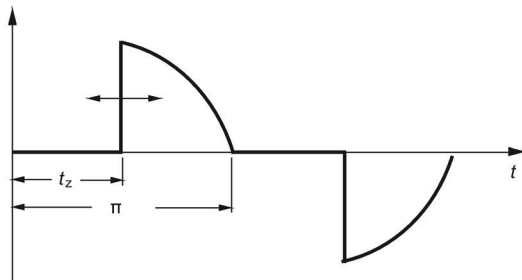


Figure 9-2 Phase control

The setpoints for controlling the power outputs are within a value range of 0 % to 100 % (reference value:  $U^2$ ). To avoid excessively high inrush currents, the power outputs are switched on time-delayed. See Switch on heating (Page 128).

**Note**

The control value is based on an ideal sine and not on the actual voltage curve.



**Note**

The disturbances caused on the supply cables by the phase angle control are filtered on the line side. This is necessary to comply with the EU directive for EMC. TDK/EPCOS B84144A0050R000 (for 3 phases) is a suitable filter, for example

### 9.3.3 Soft starting function

#### Operating principle

Soft starting can be parameterized for activating the channels in order to control loads with a high inrush current. This parameterization is performed for each POM and applies to all channels of the POM. Soft start means that the channels when turned on with a certain number of half-waves are controlled with phase angle control before being switched to half-wave operation or phase angle control.

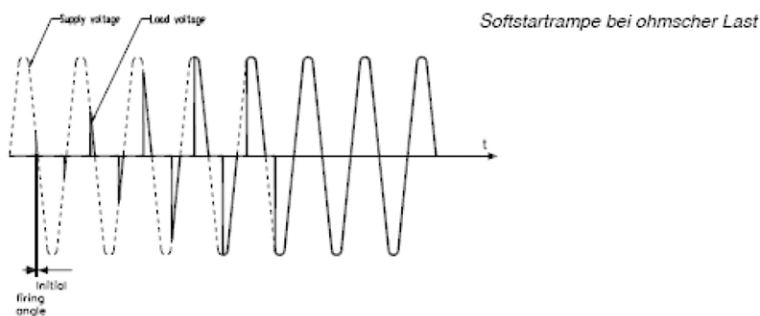


Figure 9-3 Soft starting function

**Note**

The disturbances caused on the supply cables by the soft starting are to be filtered on the line side. For suitable filters, see the note in the section Phase angle control (Page 126).

During a soft start, we distinguish between two procedures: the "defined soft start" (3 versions) as well as the "adaptive soft start".

#### Defined soft start

The soft start occurs with a fixed number of half-waves. While with phase angle control, this number is always constant (depending on the choice of version), for phase angle control, the soft start is already ended on reaching the setpoint.

The following versions can be configured in order to adapt to the conditions of the application:

Soft start version	Description
1	Time-optimized version of the soft start, enabling the heating elements to be warmed up very quickly. The time required for one channel is about 500 ms for POM4220 and 100 ms for POM4320.
2	Slower version of the soft start that ensures the heating element is not unduly loaded. The time required for one channel is about two seconds.
3	Reserved for future version, currently corresponds to Version 2.

### Adaptive soft start

With adaptive soft start, the phase angle is adjusted during runtime at the available radiators so that tripping of the fuse is avoided but the maximum possible start-up speed is reached. The duration of the soft start thus depends on the radiator used. While with half-wave control, the soft start only ends with a complete half-wave, phase angle control is already ended when the specified setpoint value is reached. If the soft start is not possible, an error message is generated. The radiator can thus not be operated on the POM.

## 9.3.4 Switch on heating

### Switch on heating

To control and diagnose the power outputs, the heating must first be activated. This is done via the cyclic data.

Heating status	Description
On	Channels are activated
Off	Channels are deactivated.

### Time-delayed channel start-up when switching on heating

To reduce the load on the supply system to a minimum, the power outputs are always switched on in sequence upon start-up. The sequence is as follows:

1	The user has specified the field setpoints and the channel setpoints
2	The user activates the required operating mode
3	The user switches the heating "On"
4	Several POMs are activated with a time offset in ascending slot order
5	Within each POM, the channels of a phase are also started in sequence.

Depending on the configuration, the overall startup can take up to 3 seconds.

If channels are switched off during operation (setpoint 0%) and then on again, switch-on takes place immediately.

### 9.3.5 Soft start during heater operation

If a channel is switched off during operation (setpoint 0 %) and then on again, this switch-on can take place via soft start if configured accordingly.

### 9.3.6 Channel control via setpoints

It is possible to control the channels using only the setpoints in the cyclic data. In this mode, it is not necessary to combine channels into fields and to assign field setpoints.

The operating mode setting in the cyclic data (production, standby) is not relevant in this case.

### 9.3.7 Channel control via fields

It is possible to control the channels via fields. For this, it is necessary to combine the channels into fields, and to assign setpoints for channels and fields.

## Operating modes

The operating mode can be pre-selected via the cyclic data. This makes it possible to change conveniently between two setpoints.

Heating mode	Description
Standby	The channel setpoint is multiplied by the "Standby" field setpoint.
Production	The channel setpoint is multiplied by the "Production" field setpoint.

## Combining channels into fields

The user can combine channels into fields, which can then be controlled by means of field setpoints.

There are two types of field:

- Field type 1: Channel series  
This field is described by specifying the numbers of the first and last channels in the field
- Field type 2: Specific field  
This field is described by specifying the number of channels and the channel numbers.

Two setpoints can be specified for fields:

- Field setpoint for "Standby" mode
- Field setpoint for "Production" mode

The field setpoints are used as follows in the calculation of the resulting setpoints in accordance with the set mode:

**Resulting setpoint = field setpoint × channel setpoint/100**

**Note**

Ensure that channels which you have not assigned to any field by default remain in a field with field number 0, whose field setpoints are preset with 100%.

### 9.3.8 Line voltage compensation

#### Line voltage compensation

Line voltage compensation makes it possible to achieve a balanced output on the power outputs, even when the voltage deviates from normal values. The function can be switched on and off by the user in the cyclic data.

The compensation factor, or the setpoint, is calculated as follows:

$$\text{Correction factor} = \left( \frac{\text{normal voltage value}}{\text{measured voltage value}} \right)^2$$

$$\text{New setpoint} = \text{correction factor} * \text{specified setpoint}$$

**Note**

- **POM4220 Lowend, POM4220 Midrange phase angle control, POM4220 Flexible**  
Line voltage compensation is only available if a PM4000 U/I is plugged in. The correction factors for all channels are calculated using the measured values of this I/O module.
- **POM4220 Highend, POM4320**  
The calculation of the correction factors for all channels is done with the measured values of the respective POM.
- **POM4220 Highend (connection between phase and phase), POM4320**  
The standard voltage value is calculated as follows:  
Standard voltage value POM4320 = CIM parameter • √3
- **POM4220 Highend**  
For economy circuit type of connection, no mains voltage compensation.

---

## Operation of a POM4220 Flexible

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### Note

- Without POM4220 Flexible or mixed equipment with POM4220 Flexible  
The parameter can be specified within the limits of 207 V to 300 V.
  - Only POM4220 Flexible  
The parameter can be specified with at least 40 V. The corresponding voltage must be connected to the U/I module.
- 

### 9.3.9 Power control

#### Operating principle

With phase control, the setpoint specification does not occur with values between 0 and 100%, but rather as an output value between 0 and 9600 W.

---

### Note

Output control cannot be used with an economy circuit.

---

The output control can be combined with the control types half-wave control and phase angle control as well as with all soft start options.

If the specified output cannot be reached, an error message is generated. The channel is not switched off, however.

It is also possible to use fields. You must ensure that the field setpoint value continues to be given in percent.

#### Output control with half-wave control

For each channel, based on the power rating, a setpoint value for control is calculated and generated, as described in section Half-wave control (Page 125).

The time basis for output control for 100 half-waves is: Every 100 half-waves, a new setpoint value is calculated and controlled. This time cannot be changed by the user.

- Switching on a heating element without soft start  
Switching on is controlled with a certain number of half-waves at 100%. Thereafter, it switches to output control.
- Switching on a heating element with soft start  
The transition to output control occurs upon ending the soft start.

### Output control with phase angle control

For each channel, based on the power rating, a setpoint value for control is calculated and generated, as described in section Phase angle control (Page 126).

The time basis for output control is 21 half-waves: Every 21 half-waves, a new setpoint value is calculated and controlled. This time cannot be changed by the user.

- Switching on a heating element without soft start  
Switching on is controlled with a certain number of half-waves at 100%. Thereafter, it switches to output control.
- Switching on a heating element with soft start  
The transition to output control occurs upon ending the soft start.

### 9.3.10 Behavior of the power outputs

#### Parameterizable response

The response of the power outputs to an interruption in communication with the higher-level controller can be defined. For each power output, the following can be parameterized:

- Power output is "deactivated" (default).
- The power output continues to operate with the most recent valid value.

#### Non-parameterizable, permanently defined response

The following events always result in deactivation of the power outputs:

- Overtemperature
- Failure of the 24 V supply voltage on the CIM or POM
- Violation of the voltage range 207 V to 300 V or 253 V with POM4220 when at least one POM4220 Low End is used (only with PM U/I).
- Violation of the valid voltage range (Page 138)
- Violation of the permitted frequency range for POM4220 Highend

#### Behavior during startup

The power outputs are "deactivated" until a connection to the higher-level controller has been established and user data has been transferred.

## 9.4 Digital inputs/outputs

---

### Note

A PM4000 DI/DO must be available for the processing of digital inputs/outputs.

---

No links of any kind to the functionality of the heating control are available.

### Digital outputs

The PM4000 DI/DO provides 8 digital outputs that the user can control directly. What is more, 8 further digital outputs are available if no digital inputs are used (configurable).

The status of the digital outputs in the event of a communication error is configurable.

### Digital inputs

The PM4000 DI/DO provides as many as 8 digital inputs with which the user can read signals directly from the process. The inputs are only available if they are not used as outputs.

### Behavior of the digital outputs

#### Parameterizable response

The response of the digital outputs to an interruption in communication with the higher-level controller can be defined. For each individual digital output, the following can be parameterized:

- Output is "deactivated" (default)
- The output continues to operate with the most recent valid value.
- Output is "activated"

#### Non-parameterizable, permanently defined response

The following events always result in deactivation of the outputs:

- Failure of the 24 V supply voltage on the CIM

#### Behavior during start up

The digital outputs remain "deactivated" until a connection to the higher-level controller has been established and user data has been transferred.

## 9.5 Recording of analog measured line values

### 9.5.1 Recording of analog measured line values with PM4000 U/I

---

**Note**

For recording analog measured line values, a PM4000 U/I must be available.

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#### Line current

Three inputs are available for recording measured current values. IL1, IL2, and IL3 can be connected. The measuring range (current converter output) is adjustable.

The value measured at the current converter output is displayed, not the value on the primary side. The latter must be determined by the user him/herself (transformation ratio of current converter).

Two measured values are determined for each current input:

- RMS measured value over 16 half-waves
- Measured value averaged over one control period of a power output (100 half-waves)

The measured current values are not linked to the functionality of the heating control. Further processing must be carried out by the user.

Application example:

- Recording of the control currents for detecting defective heating elements with parallel switching of multiple heating elements at one output

#### Line voltage

Four inputs are available for the recording of measured voltage values. It is possible to connect UL1, UL2, UL3 and N. Measurement can be performed in a star or delta circuit.

The voltage measurement values are linked with the functionality of the heating control: Monitoring offline voltage range (Page 138) and line voltage compensation (Page 130).

---

**Note**

During configuration, "delta" must be configured for the connection. Otherwise the heating control does not function.

---

#### Line power

The same applies for the line power as for the line current: The measured value refers to the output value of the current converter. The user him/herself must determine the measured line value of the primary side (transformation ratio of current converter).



Two measured values are determined for each phase:

- Measured value averaged over 16 half-waves
- Measured value averaged over one control period of a power output (100 half-waves)

### Line frequency

The measured frequency value is available as soon as the phase voltage is connected. This is not linked to the functionality of the heating control. Further processing must be carried out by the user.

## 9.5.2 Recording of analog measured line values with POM4220 Highend

### Line voltage

The line voltage measured values are transmitted according to the operating mode.

- For connection types "phase-neutral conductor": Voltage between phase and neutral conductor
- For connection types "phase-phase": Voltage between phase and phase

### Line frequency

Frequency measured value is communicated with one decimal place.

### Channel current

The averaged channel output measured values (over 200 half-waves for half-wave control or 100 half-waves for phase angle control) are transmitted.

### Channel output

The averaged channel output measured values (over 200 half-waves for half-wave control or 100 half-waves for phase angle control) are transmitted.

For economy circuit, the total output of the star load is transmitted (averaged over 100 half-waves).

### Fault current

Fault current is measured and communicated for connection type "2-pin switching".

## 9.6 Recording of analog measured values

---

### Note

For the recording of analog measured values a PM4000 U/I Temperature must be available.

---

No links of any kind to the functionality of the heating control are available.

### Analog inputs 0 ... 20 mA

Four inputs are available for recording of measured current values for a current measuring range of 0...20 mA.

The measured current values can, for example, be used with a pyrometer for temperature measurement.

If values are measured outside the measuring range, an error message is generated and an invalid measured value (-32767) is displayed.

### Temperature measuring inputs

Four measuring inputs are available for recording measured temperature values. Measured values for Pt100 and Pt1000 can be recorded, as well as for thermocouples of types J, K and L.

If values are measured outside the measuring range, an error message is generated and an invalid measured value (-32767) is displayed.

### Compensation procedure

Various compensation procedures are available for recording measured values of thermocouples:

- Internal compensation: In this procedure, the temperature is recorded at the terminal and included in the calculation of the temperature of the thermocouple.
- External compensation: In this procedure, the user can transmit the compensation value for the temperature calculation of a thermocouple which is recorded, for example, by means of a Pt100 outside the HCS.

## 9.7 Monitoring functions

### 9.7.1 Monitoring phase connection

#### POM4220

The two line voltage connections are monitored as to whether or not a phase is connected. If one phase is not connected, an error message is generated (see section Fault reporting through diagnostics data (Page 169)) and heating stops for this phase. The other phase can still be operated.

#### POM4220 Highend (for connection between phase and phase and economy circuit) / POM4320

The line voltage connection is monitored as to whether or not all phases are connected. If at least one phase is missing, an error message is generated (see Fault reporting through diagnostics data (Page 169)) and heating stops.

### 9.7.2 Rotating field check

#### POM4220 Highend

For POM4220 Highend a rotating field check is performed for "economy circuit" type of connection. The POM requires a clockwise rotating field. Otherwise an error message is generated. In case of an incorrect rotating field, no output switch-on occurs. See Figure 6-8 Power outputs POM4220 Highend - Economy circuit (Page 90).

#### POM4320

The rotating field is tested for connecting the phase voltages of each POM. The POM requires a clockwise rotating field. Otherwise an error message is generated.

---

**Note**

The heating system can also operate with a counter-clockwise rotating field. However, it is not possible to diagnose a defective heating element at a channel setpoint of 100%.

---

### 9.7.3 Line supply voltage monitoring

#### Line voltage monitoring

The POM power output modules can be operated in TN systems and TT systems. The permitted line voltage range depends on the POM used.

If the voltage lies outside the admissible range, an error message will be generated (see section Manufacturer-specific error codes (Page 164)) and heater operation stops. Heating can only be switched on again when the voltage has returned to the admissible range.

This error is a group error across all possible sources (PM U/I, POM4220 Highend, POM4320).

The monitored voltage range depends on the types of POM4220 that are used in the rack.

Examples:

- Only POM4220 Flexible

The minimum voltage range depends on the lowest configured rated voltage -10% of one of the POMs.

- POM4220 Flexible + POM4220 xxx:

The minimum voltage range is 230 V - 10%.

- POM4220 Lowend + POM4220 Midrange phase angle control

The maximum voltage range is 230 V + 10%.

- POM4220 Midrange phase angle control and POM4220 Highend:

The maximum voltage range is 277 V + 8%.

<b>NOTICE</b>
<b>Non-permitted voltage range</b>
Excessive voltage can damage the device.
Comply with the permitted voltage range. It is the responsibility of the user to ensure compliance with the permitted voltage range.

#### Line voltage monitoring POM4220 Lowend, POM4220 Midrange phase angle control and POM4220 Flexible

The monitoring function is only available for these modules if a PM U/I is plugged in.

Permitted line voltage range:

- POM4220 Lowend: 207 V to 253 V AC
- POM4220 Midrange phase angle control: 207 V AC to 300 V AC
- POM4220 Flexible:

Monitoring for the smallest and largest value of the POM used (max. 45 V AC - 10 % to 300 V AC)

### Line supply voltage monitoring POM4220 Highend

The measured values of the POM are used for monitoring. The permitted voltage range is:

- 207 to 300 V AC for:
  - Connection between phase and neutral conductor
  - 2-pin connection between phase and neutral conductor
- 360 to 520 V AC for:
  - Connection between phase and phase
  - 2-pin connection between phase and phase
  - Economy circuit

### Line supply voltage monitoring POM4320

The measured values of the POM are used for monitoring.

The permitted line voltage range is 360 V AC to 520 V AC.

#### 9.7.4 Monitoring of the 24 V DC supply voltage

The 24 V DC supply voltage is monitored on the CIM. If the 24 V fails, the power outputs of the POMs are automatically deactivated. There is no manufacturer-specific diagnostics alarm in the case of failure of the 24 V supply. Instead, the PROFINET/PROFIBUS controller detects and signals failure of the HCS system or individual modules.

#### 9.7.5 Frequency monitoring

##### Frequency monitoring

The frequency of the applied line voltage is automatically detected and monitored. The frequency value can be read by the user.

Frequency	Permitted range
50 Hz	47 Hz to 55 Hz
60 Hz	55 Hz to 63 Hz

##### Frequency fault

If the frequency of both phases lies outside the permissible range for several consecutive measurements (e.g. due to disturbance over an extended period), a frequency fault will be reported to the user (see section Diagnostics data (Page 169)).

This is a group error across all possible sources (PM UI, POMs).

**Fault reaction:**

The heating is not switched off and the last valid frequency value measured is retained.

**Fault reaction POM4220 Highend:**

The heating is switched off. Diagnostic messages and measuring values except for the heat sink temperature are no longer output in case of a shutdown due to a frequency error.

---

**Note**

If you operate the device outside the specification, diagnostic messages and functions do not work reliably.

---

## 9.7.6 Temperature monitoring

### Internal temperature monitoring

A sensor is installed on the heat sink inside the heating control system (POM) to measure the internal temperature.

An alarm threshold is defined for the internal temperature. The following reactions are triggered when the threshold is overshot:

- Signal to the higher-level controller.
- The channels are deactivated - regardless of which channel response was configured for the error (see section Behavior of the power outputs (Page 132)).

---

**Note**

If an internal temperature of 0 °C is reported, this indicates that a temperature sensor has been torn off.

---

### Heat dissipation via POM4220 fan

To achieve even heat distribution, an FM4240 or FM4240 HP fan module can be optionally externally mounted on the rack. The fan module FM4240 is controlled in relation to the internal temperature. For the performance profile of the Power Output Module (POM) with and without a fan, refer to section POM4220 power rating (Page 42).

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**Note**

You cannot use the automatic fan control system with fan module FM4240 HP.

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If it should prove necessary to operate the fans continuously, this can be done by the user.

## Heat dissipation via CIM4210C and POM4320 fans

A fan is installed on the exterior of the enclosure in order to achieve uniform heat distribution within the enclosure. The fan is controlled depending on the internal temperature.

If it should prove necessary to operate the fans continuously, this can be done by the user.

## 9.7.7 Monitoring power channels

### Power output diagnostics

The Power Output Module (POM) has a diagnostics function to detect faults in the power circuit. In every half-wave, the status of the power output is requested and checked at a fixed point in time.

The following faults are detected:

Fault	Description / Special characteristics
Heating element / heating element cable defective	POM4220 Highend: For phase-phase connection, even in case of failure of the incoming fuse
Triac breakdown	"Breakdown" means the triac is defective and conducts continuously even without being activated. This fault can only be detected if the power output is switched off. For a 100 % setpoint, the fault can be neither detected nor flagged. With POM4220 Highend, the "short-circuited triac" error is only detected when the load is connected.
Outgoing fuse tripped or triac has high resistance	This fault can only be detected if the power output is switched on. For a 0 % setpoint, the fault can be neither detected nor flagged.
Return fuse tripped	Only with POM4320

### Reporting of channel errors

Error states are only reported when the heater is switched on (Switch on heating (Page 128)).

The only exception is the "Triac breakdown" error. This error is always reported regardless of the heater status.

### Suppression of channel errors

By default, errors are diagnosed and reported for all power outputs/channels. The user can define a list of channels for which errors will not be reported. This is appropriate for those channels that are remain unconnected in the equipment.

### 9.7.8 Monitoring power channels with loads connected in parallel

#### Diagnostics for loads connected in parallel (POM4220 Highend only)

If several loads are connected in parallel at one output, in addition to the aforementioned faults, the failure of at least one heating element can be detected.

For this, the corresponding details on the total output power and permitted deviation from total power for the output must be entered (see Configuration parameters for CIM and POM (Page 104)).

The following faults are diagnosed:

Fault	Special features
Partial load failure	Error message if power rating is too low

#### Note

Parallel connection of loads with high inrush current (e.g. with tungsten loads) can result in a faulty diagnostics in the following circumstance:

The setpoint with which the output is controlled falls short of 90%.

#### Note

With parallel connection, all partial loads have to be above the minimum load. Otherwise, this can result in faulty diagnostics

#### Note

We recommend half the (standardized) power of the lowest parallel switched load as the maximum permissible deviation from the total power.

### 9.7.9 Total current monitoring

#### Channel total current

The current per power output is monitored. If the measured current is above the permitted operating range in normal operation (not startup after heating on), an error message "current load too high" is issued. The output can still be controlled, however.

#### Phase total current

The aggregate current over all power outputs of a phase is monitored. If the measured current is above the permitted operating range in normal operation (not startup after heating on), an error message "phase current too high" is issued. The outputs of the phase in question are still controlled.



### 9.7.10 Fault current monitoring

Any current which does not flow across the load connections, but rather irregularly over another path (e.g. via the housing of the load), is referred to as fault current.

Fault current is monitored for connection type "2-pin switching" via a channel pair. The threshold is set for each channel. In case the configured threshold is exceeded, an error message is generated; however, this does not result in switch-off of the output. Heating remains possible.

#### Conditions for secure control of the channels

##### NOTICE

##### Physical damage can occur

If the electric resistance through which the fault current flows exceeds twice the electric resistance of the load, the corresponding channel can no longer be correctly controlled.

Therefore comply with the following condition for secure control of the channel:

$$R_{\text{fault}} > 2 \cdot R_{\text{load}}$$

#### Displayed and actual fault current

##### WARNING

##### Risk of electric shock

##### May cause death or serious injury

The fault current is the current value averaged over 200 half-waves in case of half-wave control. Due to the pulse pattern of semi-wave control, the fault current in individual semi-waves may be higher than the displayed fault current.

#### Determining fault peak current

Peak fault current can be determined using a setpoint value correction:

Peak fault current = fault current / setpoint

Example: Fault current 400 mA; setpoint value 80%

Peak fault current = 400 mA / 0.8 = 500 mA

### 9.7.11 Monitoring of output control

When using power control, reaching the nominal output is monitored. If nominal output is not achieved at 100%, an error message is generated. This does not cause the output to switch off, heating is still possible.

### 9.7.12 Monitoring of adaptive soft start

When using a control type with adaptive soft start, it is monitored whether the connected heating element can actually be controlled by the POM. If this is not possible, an error message is generated. The channel is not controlled in that case. The error message then disappears when switching off the heater.

## Communications

The information provided in the section "Communication" refers to Siemens SIMATIC S7 controllers, but this also applies to other controllers with PROFINET/PROFIBUS due to the standardized PROFINET/PROFIBUS communication.

### 10.1 Cyclic data exchange

#### 10.1.1 Cyclic output data

Cyclic data exchange between the heating control system and the S7 takes place via the process/I/O address area of the CPU. The cyclic data can be addressed in the S7 through the process image or I/O commands.

#### Cyclic output data for CIM

Byte	Bit	Description
0	Control bits	
	0	Heater 0: Switch off heating 1: Switch on heating
	1	Operating mode 0: Select production mode 1: Select standby mode
	2	Line voltage compensation 0: switch off 1: Switch on
	3	0 (not in use)
	4	0 (not in use)
	5	0 (not in use)
	6	0 (not in use)
	7	0 (not in use)
1	–	0 (not in use)

#### Cyclic output data for POM4220 Low end

Byte	Description
0	Power output 1 setpoint
1	Power output 2 setpoint
2	Power output 3 setpoint

10.1 Cyclic data exchange

Byte	Description
3	Power output 4 setpoint
4	Power output 5 setpoint
5	Power output 6 setpoint
6	Power output 7 setpoint
7	Power output 8 setpoint
8	Power output 9 setpoint
9	Power output 10 setpoint
10	Power output 11 setpoint
11	Power output 12 setpoint
12	Power output 13 setpoint
13	Power output 14 setpoint
14	Power output 15 setpoint
15	Power output 16 setpoint

**Cyclic output data POM4220 Midrange phase angle control**

Byte	Description
0	Power output 1 setpoint
1	Power output 2 setpoint
2	Power output 3 setpoint
3	Power output 4 setpoint
4	Power output 5 setpoint
5	Power output 6 setpoint
6	Power output 7 setpoint
7	Power output 8 setpoint
8	Power output 9 setpoint
9	Power output 10 setpoint
10	Power output 11 setpoint
11	Power output 12 setpoint

### Cyclic output data for POM4220 Flexible

Byte	Meaning
0	Power output 1 setpoint
1	Power output 2 setpoint
2	Power output 3 setpoint
3	Power output 4 setpoint
4	Power output 5 setpoint
5	Power output 6 setpoint
6	Power output 7 setpoint
7	Power output 8 setpoint
8	Power output 9 setpoint
9	Power output 10 setpoint
10	Power output 11 setpoint
11	Power output 12 setpoint

### Cyclic output data for POM4220 Highend

Byte	Description
0...1	Power output 1 setpoint
2...3	Power output 2 setpoint
4...5	Power output 3 setpoint
6...7	Power output 4 setpoint
8...9	Power output 5 setpoint
10...11	Power output 6 setpoint
12...13	Power output 7 setpoint
14...15	Power output 8 setpoint

The range of values is 0 to 100%, or the output control 0 to 9600 W.

#### Note

For the connection types "2-pin switching" and "economy circuit" setpoint values are only relevant for channels 1 to 4.

**Cyclic output data for POM4320**

Byte	Description
0	Power output 1 setpoint
1	Power output 2 setpoint
2	Power output 3 setpoint
3	Power output 4 setpoint
4	Power output 5 setpoint
5	Power output 6 setpoint
6	Power output 7 setpoint
7	Power output 8 setpoint
8	Power output 9 setpoint

**Cyclic output data for PM4000 Temperature**

Byte	Description
0...1	Compensation temperature (in °C with one decimal place)

**Cyclic output data for PM4000 DI/DO**

Byte	Bit	Description
0	0	Digital output 1
	1	Digital output 2
	2	Digital output 3
	3	Digital output 4
	4	Digital output 5
	5	Digital output 6
	6	Digital output 7
	7	Digital output 8
1	0	Digital output 9
	1	Digital output 10
	2	Digital output 11
	3	Digital output 12
	4	Digital output 13
	5	Digital output 14
	6	Digital output 15
	7	Digital output 16

## 10.1.2 Cyclic input data

Cyclic data exchange between the heating control system and the S7 takes place via the process/I/O address area of the CPU. The cyclic data can be addressed in the S7 through the process image or I/O commands.

### Cyclic input data for CIM

Byte	Bit	Description
0	Status bits	
	0	Heater 0: Heating is switched off 1: Heating is switched on
	1	Operating mode 0: Production mode 1: Standby mode
	2	Line voltage compensation 0: is switched off 1: is switched on
	3	0 (not in use)
	4	0 (not in use)
	5	0 (not in use)
	6	0 (not in use)
	7	0 (not in use)
1	–	0 (not in use)

### Cyclic input data for POM4220 Low end

Byte	Description
0	Power output 1 actual value
1	Power output 2 actual value
2	Power output 3 actual value
3	Power output 4 actual value
4	Power output 5 actual value
5	Power output 6 actual value
6	Power output 7 actual value
7	Power output 8 actual value
8	Power output 9 actual value
9	Power output 10 actual value
10	Power output 11 actual value
11	Power output 12 actual value
12	Power output 13 actual value
13	Power output 14 actual value
14	Power output 15 actual value
15	Power output 16 actual value

**Cyclic input data POM4220 Midrange phase angle control**

Byte	Description
0	Power output 1 actual value
1	Power output 2 actual value
2	Power output 3 actual value
3	Power output 4 actual value
4	Power output 5 actual value
5	Power output 6 actual value
6	Power output 7 actual value
7	Power output 8 actual value
8	Power output 9 actual value
9	Power output 10 actual value
10	Power output 11 actual value
11	Power output 12 actual value

**Cyclic input data for POM4220 Flexible**

Byte	Meaning
0	Power output 1 actual value
1	Power output 2 actual value
2	Power output 3 actual value
3	Power output 4 actual value
4	Power output 5 actual value
5	Power output 6 actual value
6	Power output 7 actual value
7	Power output 8 actual value
8	Power output 9 actual value
9	Power output 10 actual value
10	Power output 11 actual value
11	Power output 12 actual value

**Cyclic input data for POM4220 Highend**

Byte	Description
0...1	Power output 1 actual value
2...3	Power output 2 actual value
4...5	Power output 3 actual value
6...7	Power output 4 actual value
8...9	Power output 5 actual value
10...11	Power output 6 actual value
12...13	Power output 7 actual value
14...15	Power output 8 actual value



The range of values is 0 to 100%, or the output control 0 to 9600 W.

**Note**

For the connection types "2-pin switching" and "economy circuit" actual values are only relevant for channels 1 to 4.

**Cyclic input data for POM4320**

Byte	Description
0	Power output 1 actual value
1	Power output 2 actual value
2	Power output 3 actual value
3	Power output 4 actual value
4	Power output 5 actual value
5	Power output 6 actual value
6	Power output 7 actual value
7	Power output 8 actual value
8	Power output 9 actual value

**Cyclic input data for CIM PM4000 Temperature**

Byte	Description
0...1	Analog channel 1 (value in mA with two decimal places)
2...3	Analog channel 2 (value in mA with two decimal places)
4...5	Analog channel 3 (value in mA with two decimal places)
6...7	Analog channel 4 (value in mA with two decimal places)
8...9	Temperature channel 1 (value in °C with one decimal place)
10...11	Temperature channel 2 (value in °C with one decimal place)
12...13	Temperature channel 3 (value in °C with one decimal place)
14...15	Temperature channel 4 (value in °C with one decimal place)

**Cyclic input data for CIM PM4000 DI/DO**

Byte	Bit	Description
0	0	Digital input 9
	1	Digital input 10
	2	Digital input 11
	3	Digital input 12
	4	Digital input 13
	5	Digital input 14
	6	Digital input 15
	7	Digital input 16

### Cyclic input data for CIM PM4000 U/I

Byte	Description
0...1	Measured value for line voltage L1/L12 (with one decimal place)
2...3	Measured value for line voltage L2/L23 (with one decimal place)
4...5	Measured value for line voltage L3/L31 (with one decimal place)

## 10.2 Acyclic data exchange

### Addressing

System function blocks are available for SIMATIC S7 for writing and reading this data. The following data is transferred for addressing:

Index	Dataset number
ID	<ul style="list-style-type: none"> <li>TIA Portal: Hardware identification of the hardware module (DP/PROFINET IO)</li> <li>STEP 7 classic: Logical address of the PROFINET IO component or DP slave component (module or sub-module)</li> </ul>
Length	<ul style="list-style-type: none"> <li>When writing: Length of the data in the dataset</li> <li>When reading: Max volume of data that can be received</li> </ul>

#### Note

#### The following applies for PROFIBUS DP:

The following data sets can be used via the C1 channel only, depending on the application.

### Acyclic data for HCS

We distinguish between two types of acyclic data for HCS:

- Acyclic output/input data which relate to the overall functionality and therefore address the HCS.

This data applies to the entire HCS.

- Acyclic output/input data which relate to only one module and therefore only address one module.

This data applies to one function of the module.

Addressing is described for the individual data sets.

## 10.2.1 Acyclic output data

### Data record 100 "Field type 1"

The data set describes an HCS function and addresses the HCS.

Byte	Description
0...1	Start channel for field 1
2...3	End channel for field 1
...	...
124...125	Start channel for field 32
126...127	End channel for field 32

Using this dataset, fields of type 1 can be defined. This field type comprises one channel range that is described by the first and last channel of the field.

Application range: Thermoforming, clustering of adjacent channels

Definition is via an array [1 ... 32] with two elements of type "Word". Up to 32 fields can be defined.

The field number corresponds to the array index.

Field number 0 cannot be used. It exists automatically in the HCS and contains all the channels of the HCS by default. Production and standby setpoints are preset to 100 %.

All channels that are not explicitly assigned to a new field remain in this default field.

To use fields, the user must ensure that all the existing channels are assigned to a user field.

A field can be erased by entering a 0 for the number of the start channel and the end channel.

---

#### Note

When a dataset 100 is written, it is no longer possible to use the datasets for field type 2.

---

### Data record 101 to 132 "Field type 2"

The data sets describe an HCS function and address the HCS.

Byte	Description
0...1	Number of channel 1 of field (dataset number minus 100)
1...2	Number of channel 2 of field (dataset number minus 100)
...	...
44...45	Number of channel 23 of field (dataset number minus 100)
46...47	Number of channel 24 of field (dataset number minus 100)

Using these datasets, fields of type 2 can be defined. This field type comprises channels that are directly assigned.

Application range: Blow-molding, forming a layer over all POMs (e.g. every first channel of a POM).

10.2 Acyclic data exchange

Definition is performed directly via the type "Word". Up to 24 channels can be defined.

The field number corresponds to the dataset number minus 100.

Field number 0 cannot be used. It exists automatically in the HCS and contains all the channels of the HCS by default. Production and standby setpoints are preset to 100 %.

All channels that are not explicitly assigned to a new field remain in this default field. To use fields, the user must ensure that all the existing channels are assigned to a user field.

A field can be erased by entering a 0 for all channels ("all" refers to the dataset length).

**Note**

When one of the datasets 101 to 132 is written, it is no longer possible to use the dataset for field type 1.

**Data record 150 "Production field value"**

The data set describes an HCS function and addresses the HCS.

Byte	Description
0	Setpoint for field 1
1	Setpoint for field 2
...	...
31	Setpoint for field 32

Definition is via an array [1 ... 32] with one element of type "Byte".

The field number corresponds to the array index.

**Data set 151 "Standby field value"**

The data set describes an HCS function and addresses the HCS.

Byte	Description
0	Setpoint for field 1
1	Setpoint for field 2
...	...
31	Setpoint for field 32

Definition is via an array [1..32] with one element of type "Byte".

The field number corresponds to the array index.

### Dataset 152 "Channels without diagnostic alarm"

The data set describes an HCS function and addresses the HCS.

Byte	Bit	Description
0	0	Setting for channel 1 0: Error message is output (default) 1: Error message is suppressed
	1	Setting for channel 2
	2	Setting for channel 3
	3	Setting for channel 4
	4	Setting for channel 5
	5	Setting for channel 6
	6	Setting for channel 7
	7	Setting for channel 8
1	0...7	Setting for channels 9...16
2	0...7	Setting for channels 17...24
3	0...7	Setting for channels 25...32
4	0...7	Setting for channels 33...40
5	0...7	Setting for channels 41...48
...	...	...
23	0...7	Setting for channels 185...192
...	...	...
47	0 ...7	Setting for channels 377...384

PROFINET: Definition is via an array [1 ... 384] with one element of type "Bool".

PROFIBUS: Definition is via an array [1 ... 192] with one element of type "Bool".

Each bit is assigned to one channel. The size of the array depends on the maximum configuration possible for the HCS (number of POMs, number of channels per POM).

### Data record 160 "Control of internal fans"

The data set describes an HCS function and addresses the HCS.

Byte	Bit	Description
0	0	Control of internal fans 0: Temperature controlled internally (default) 1: All fans are switched on
	1...7	0

Definition is via an element of the type "Byte".

**Data set 190 "System reset by user"**

The data set describes an HCS function and addresses the HCS.

Byte	Description
0	"R"
1	"I"
2	"S"
3	"I"
4	"T"
5	"I"

An array with 6 entries of the type "Char" is used here.

<b>NOTICE</b>
The data entered must not be modified.

The data set is acknowledged before the controller performs a reset about 2 seconds later.

**Data record 2 "POM4220 Highend configuration data"**

The data set describes a function of the POM4220 Highend and addresses one POM.

Byte	Bit	Description
0...1		Total power for channel 1
2...3		Maximum permitted deviation from total power for channel 1
4...5		Total power for channel 2
6...7		Maximum permitted deviation from total power for channel 2
8...9		Total power for channel 3
10...11		Maximum permitted deviation from total power for channel 3
12...13		Total power for channel 4
14...15		Maximum permitted deviation from total power for channel 4
16...17		Total power for channel 5
18...19		Maximum permitted deviation from total power for channel 5
20...21		Total power for channel 6
22...23		Maximum permitted deviation from total power for channel 6
24...25		Total power for channel 7
26...27		Maximum permitted deviation from total power for channel 7
28...29		Total power for channel 8
30...31		Maximum permitted deviation from total power for channel 8
32	0	Parallel connection of loads at channel 1 0: No (default) 1: Yes
	1	Parallel connection of loads at channel 2
	2	Parallel connection of loads at channel 3
	3	Parallel connection of loads at channel 4
	4	Parallel connection of loads at channel 5

Byte	Bit	Description
	5	Parallel connection of loads at channel 6
	6	Parallel connection of loads at channel 7
	7	Parallel connection of loads at channel 8

Definition is via an array [1 ... 8] with two elements of type "Integer". The data set corresponds to the information from the configuration (see section Configuration parameters for CIM and POM (Page 104)) and allows for the configuration to be exceeded during operation.

The data record is answered with errors if no POM4220 Highend is addressed.

### Data record 50 "Direct switching of the outputs"

The data set describes an HCS function and addresses the HCS.

Byte	Meaning
0...25	!SETPOINT WITHOUT TRIGGER!

This data set can be used to disable the time scale with which the setpoints are activated in the HCS (see section Half-wave control (Page 125)).

The process cannot be undone.

The definition takes place over an array [0...25] of the type char. The introductory text must correspond exactly to the specification; otherwise the data record is rejected with an error and is not executed.

### Data record 51, "Suppression of supply voltage errors with heating ON"

The data record describes an HCS function and addresses the HCS.

Byte	Meaning
0...22	!WITHOUT VOLTAGE ERROR!

The following errors are suppressed for heating OFF with this data record:

- Line voltage outside the range
- Frequency outside the range
- At least one phase is not connected yet
- Phase LX1/LX3 is not connected

The operation cannot be undone.

Definition is effected via an Array[0 ... 22] of the char type. The introduction text has to exactly correspond to the specification. Otherwise, the data record is rejected with errors and not executed.

### 10.2.2 Acyclic input data

The datasets/values described in section "Acyclic output data (Page 153)" can also be read.

#### Data record 100 "Field type 1"

One dataset of the maximum possible length (32 fields) is always returned. A non-assigned field is entered as channel number 0.

#### Data record 101 to 132 "Field type 2"

One dataset of the maximum possible length (24 channels) is always returned. Unassigned channels are entered as 0, the same applies to an unassigned field

#### Data record 150 "Production field value"

One dataset of the maximum possible length (32 fields) is always returned. Setpoint 0 is entered for unused fields.

#### Data record 151 "Standby field value"

One dataset of the maximum possible length (32 fields) is always returned. Setpoint 0 is entered for unused fields.

#### Dataset 152 "Channels without diagnostic alarm"

The data returned is the data of the channels actually available that belong to the POMs used.

#### Data record 50 "Direct switching of the outputs"

When the function is switched on, the text of the writing data record is returned. In normal circumstances, this is a text consisting of spaces.

#### Data record 51, "Suppression of supply voltage errors with heating ON"

When the function is switched on, the text of the writing data record is returned. Normally this is a text consisting of blanks.

#### Data record 160 "Control of internal fans"

The current setting for the fan control is returned.

#### Data record 2 "POM4220 Highend configuration data"

The current configuration parameters of the addressed POM are returned.



### Data record 200 "Measured values" (HCS4200 without POM4220 Highend)

The data set describes an HCS function and addresses the HCS.

	Byte	Description
Data POM 1	0	Internal temperature
	1	Reserved
	2...3	Frequency (to one decimal place)
Data POM 2	...	...
...	...	...
Data for POM 12/24	...	...

PROFINET: Definition is via an array [1 ... 24] with one element of type "Structure".

PROFIBUS: Definition is via an array [1 ... 12] with one element of type "Structure".

This comprises two elements of type "Byte" and one element of type "Word".

The POM number corresponds to the array index.

The length of the data record corresponds to the number of POMs used.

### Data record 200 "Measured values" (HCS4200 combined mode and HCS4200 with POM4220 Highend)

The data set describes an HCS function and addresses the HCS.

	Byte	Description
Data POM 1	0	Internal temperature
	1	Reserved
	2...3	Frequency (to one decimal place)
	4...5	Voltage measured value <sup>1</sup> L12/LX1 (with one decimal place)
	6...7	Voltage measured value <sup>1</sup> L23/LX3 (with one decimal place)
	8...9	Voltage measured value <sup>1</sup> L31/unused (with one decimal place)
Data POM 2	...	...
...	...	...
Data POM 24	...	...

<sup>1)</sup> Voltage measured value only for POM4320 and POM4220 Highend, otherwise value = 0

Definition is via an array [1 ... 24] with one element of type "Structure". This consists of two elements of the Byte type and four elements of Word type.

The POM number corresponds to the array index.

The length of the data record corresponds to the number of POMs used.

**Data record 201 "Versions"**

The data set describes an HCS function and addresses the HCS.

	Byte	Description
CIM / PM	0...3	FW version of CIM fieldbus controller
	4...7	FW version of CIM HCS master
	8	HW version of CIM
	9	HW version of PM
	10...3	FW version of PM
POM 1	14...17	Firmware version POM 1
	18	POM4220: HW version POM 1 POM4320: Hardware version triac POM 1
	19	POM4220: 0 POM4320: HW version fuse POM 1
POM 2	...	...
...	...	...
POM 12/24	...	...

All firmware versions contain one element of type "Char" and three elements of type "Byte". The hardware versions are all of type "Byte".

PROFINET: Definition of the POM versions is via an array [1...24] with one element of type "Structure".

PROFIBUS: Definition of the POM versions is via an array [1...12] with one element of type "Structure".

The POM number corresponds to the array index.

The length of the data record corresponds to the number of POMs used. The entry for CIM with I/O module is always available, even if the I/O module is not plugged in.

### Data record 202 "Measured values for PM4000 U/I"

The data set describes an HCS function with PM U/I and addresses the HCS.

Byte	Description
0...1	Frequency (with one decimal place)
2...3	Measured voltage value L1/L12 (in [V] with one decimal place)
4...5	Measured voltage value L2/L23 (in [V] with one decimal place)
6...7	Measured voltage value L3/L31 (in [V] with one decimal place)
8...9	Measured current value RMS L1/L12 (in [A] with three decimal places)
1...11	Measured current value RMS L2/L23 (in [A] with three decimal places)
12...13	Measured current value RMS L3/L31 (in [A] with three decimal places)
14...15	Measured current mean value RMS L1/L12 (in [A] with three decimal places)
16...17	Measured current mean value RMS L2/L23 (in [A] with three decimal places)
18...19	Measured current mean value RMS L3/L31 (in [A] with three decimal places)
20...21	Power L1/L12 in [W] with one decimal place
22...23	Power L2/L23 in [W] with one decimal place
24...25	Power L3/L31 in [W] with one decimal place
26...27	Power mean value L1/L12 (in [W] with one decimal place)
28...29	Power mean value L2/L23 (in [W] with one decimal place)
30...31	Power mean value L3/L31 (in [W] with one decimal place)

The definition is by means of a structure with elements of type INT.

The data record is answered with errors if no PM4000 U/I is present.

### Data record 203 "Measured values" (HCS4200 with POM4220 Highend)

The data set describes a function of the POM4220 Highend and addresses one POM.

Byte	Description
0...1	Current measured value RMS channel 1 in ampere (A) with two decimal places
...	...
14...15	Current measured value RMS channel 8 in ampere (A) with two decimal places
16...17	Power channel 1 (in [W])
...	...
30...31	Power channel 8 (in [W])
32...33	Fault current channel 1/5 in mA <sup>1)</sup>
34...35	Fault current channel 2/6 in mA <sup>1)</sup>
36...37	Fault current channel 3/7 in mA <sup>1)</sup>
38...39	Fault current channel 4/8 in mA <sup>1)</sup>

<sup>1)</sup> Only with connection type "2-pin switching", even without enabled fault current monitoring. The value is "0" for all other connection types.

10.2 Acyclic data exchange

The entire data record is always returned. The data record is answered with errors if no POM4220 Highend is addressed.

---

**Note**

For the connection types "2-pin switching" and "economy circuit" measured values are only relevant for channels 1 to 4.

---

## 10.3 Transfer of diagnostic alarms to the controller

### 10.3.1 Transferring diagnostic alarms to the controller: PROFINET

#### Diagnostics alarms

Diagnostics alarms are transferred as diagnostic interrupts using the channel diagnostics (identifier 8000h) as the diagnostic type.

The PROFINET device identification number is required for identifying a diagnostic interrupt.

The HCS4200 has the identification number 1003h.

The evaluation in SIMATIC is performed via I/O\_FLT1 (OB82) and RALRM (SFB54).

#### Structure of the diagnostics alarm

Channel diagnosis comprises 6 bytes:

Byte	Description
0...1	Channel number The following applies for channel numbers: <ul style="list-style-type: none"> <li>• Channel number = 0: Diagnostic information relates to one module (CIM, POM, PM)</li> <li>• Channel numbers &lt;&gt; 0: Diagnostic information relates to one channel (for POM, PM only) The power channel numbers are counted across the entire HCS.</li> </ul>
2	Channel type, fault type
3	Data format
4...5	Error code (see Manufacturer-specific error codes (Page 164))

### 10.3.2 Transferring diagnostic alarms to the controller: PROFIBUS

#### Diagnostics alarms

Diagnostic alarms are transferred as diagnostic interrupts. The PROFIBUS device identification number is required for identifying a diagnostic interrupt.

The HCS4200 has the identification number 81C4.

The evaluation in SIMATIC is performed via I/O\_FLT1 (OB82) and RALRM (SFB54).

10.3 Transfer of diagnostic alarms to the controller

**Structure of the diagnostics alarm**

The alarm message consists of 4 bytes of header (standardized) and 4 bytes of user-specific data. These are to be interpreted as follows:

Byte	Description
4...5	Channel number The following applies for channel numbers: <ul style="list-style-type: none"> <li>• Channel number = 0: Diagnostic information relates to one module (CIM, POM, PM)</li> <li>• Channel numbers &lt;&gt; 0: Diagnostic information relates to one channel (for POM, PM only)</li> </ul> The power channel numbers are counted across the entire HCS.
6...7	Error type (see Manufacturer-specific error codes (Page 164))

**10.3.3 Manufacturer-specific error codes**

**Error codes CIM**

Error code (hex)	Description	CIM4210
5102	Line voltage is outside the permissible range. The error message only applies to values from PM4000 U/I and POMs with their own voltage measurement.	✓
5103	Frequency is outside the permissible range. The error message can be initiated by any POM.	✓
510D	Communication fault internal	✓

## Error codes POM

Error code (hex)	Description	POM4220 Lowend	POM4220 Midrange phase angle control POM4220 Flexible	POM4220 Highend	POM4320
5101	Communication error on HCS bus	✓	✓	✓	✓
5104	Channel fault: Triac breakdown	✓	✓	✓	✓
5105	Channel fault: <ul style="list-style-type: none"> <li>• Triac has high resistance</li> <li>• Outgoing fuse defective</li> </ul>	✓	✓	✓	✓
5106	Channel fault: Return fuse defective	–	–	–	✓
5107	Channel fault: <ul style="list-style-type: none"> <li>• Defective heating element</li> <li>• External fault</li> </ul>	✓	✓	✓	✓
5109	Switch-off threshold for internal device temperature	✓	✓	✓	✓
510B	At least one voltage is not connected	–	–	✓	✓
510C	Channel fault: undefined	✓	✓	✓	✓
510E	Rotating field error	–	–	✓ <sup>1)</sup>	✓
510F	Phase LX1 is not connected.	✓	✓	✓	–
5110	Phase LX3 is not connected.	✓	✓	✓	–
5113	Channel fault: Partial load failure	–	–	✓	–
5114	Channel fault: Current load too high	–	–	✓	–
5115	Phase current LX1 too high	–	–	✓	–
5116	Phase current LX3 too high	–	–	✓	–
5117	Channel fault: Power setpoint is not reached	–	–	✓	–
5118	Channel fault: Fault current too high	–	–	✓	–
5119	Channel fault: Adaptive soft start cannot be ended	–	–	✓	–

1) Rotating field error is only detected with connection type "Economy circuit"

**Special features of POM 4220 Highend:**

Connection type "2-pin switching"			
Error code	Meaning		Description
5104	Channels 1 to 4	Both Triacs are fused	The error message is generated via channels 1 to 4.
	Channels 5 to 8	Exactly one Triac has fused	The error message is generated via channels 5 to 8.
5105	–	–	–
5107	Channels 1 to 4	<ul style="list-style-type: none"> <li>External fault</li> <li>Fuse F1 ... F8 is defective</li> <li>Triac 1 ... 8 has high resistance</li> </ul>	The error message is generated via channels 1 to 4. No distinction is possible between an external fault and a fuse fault. Therefore, the error code 5107 includes the following errors: <ul style="list-style-type: none"> <li>Channel fault "Triac has high resistance" / "outgoing fuse blown"</li> <li>Channel fault "external fault".</li> </ul> See also section Fault reporting through diagnostics data (Page 169).
	Channels 5 to 8	–	–

Connection type "economy circuit"			
Error code	Meaning		Description
5104	Channels 1 to 4	Triac 1 ... 4 is fused	From the user's point of view, only channels 1 through 4 are used. However, error messages 5104 and 5105 are generated specifically via channels 1 through 8.
	Channels 5 to 8	Triac 5 ... 8 is fused	
5105	Channels 1 to 4	<ul style="list-style-type: none"> <li>Fuse F1 ... F4 tripped</li> <li>Triac 1 ... 4 has high resistance</li> </ul>	
	Channels 5 to 8	<ul style="list-style-type: none"> <li>Fuse F5 ... F8 tripped</li> <li>Triac 5 ... 8 has high resistance</li> </ul>	
5107	Channels 1 to 4	External fault	–
	Channels 5 to 8	External fault	–



**PM error codes**

Error code (hex)	Description	PM Temperature	PM DI/DO	PM U/I
0001	Short-circuit	–	✓	–
0006	Wire break	✓	✓	–
0007	Measurement range, high limit exceeded	✓	–	–
0008	Measurement range, low limit violated	✓	–	–
0011	No supply voltage	–	✓	–
5101	Communication error on HCS bus	✓	✓	✓
510C	Error is not defined.	✓	✓	–
5112	Polarity reversal at measuring input	✓	–	–

**Note**

The following applies for PM4000 DI/DO:

The error codes for short-circuit and wire breakage can each only be reported for a group of 4 channels. The number of the first channel of the group of 4 is entered as the channel number.

**Causes of error and remedies**

You will find information about possible causes of error and remedies in Section Process and system messages, error handling (Page 168).

**Note**

The following applies to channel faults 0x5104 to 0x5107 and 0x510C:

If a fault status changes on a channel, the first fault to be reported is retained.



















## Process and system messages, error handling

### 11.1 Central Interface Module (CIM)

#### 11.1.1 LED operating display for CIM

The device has 3 LEDs on the front: The LEDs provide information about the operating state of the device or system.

#### Meaning of LEDs

READY green	HEATING ON yellow	ERROR red	
			Power OFF, device switched off
			Initialization: The LED flashes until the HCS is detected and accepted as a bus node by the higher-level control system. <b>Note</b> If a defective configuration is loaded in the case of reconfiguration, this culminates in the following error display: <ul style="list-style-type: none"> <li>• green = on</li> <li>• red = on</li> </ul>
			Device started up and ready
			Heating "ON"
			A general error has occurred: Fieldbus communication error
			Error in HCS communication

---

#### Note

The LEDs of the CIM4210C PROFINET behave like those of the CIM4210.



















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## 11.2 Power Output Module (POM)

### 11.2.1 LED operating display for POM

The device has 3 LEDs on the front: The LEDs provide information about the operating state of the device or system.

#### Meaning of LEDs

READY green	HEATING ON yellow	ERROR red	Description
			Power OFF, device switched off
			Initialization: The LED flashes until the device has been detected and addressed by the CIM.
			Device is ready
			Heating "ON"
			A general fault has occurred, e.g. communication, line voltage, temperature
			

Channel error red	Description
	LED x off: Channel x is OK LED x on: Channel x error

### 11.2.2 Fault reporting through diagnostics data

The internal monitoring functions (Page 141) recognize specific faults in the Power Output Module. The corresponding information is provided in the diagnostics data.

**Causes of errors and possible remedies**

Error code	Description	Possible causes and solutions
5104	Channel fault: Triac breakdown "Breakdown" means the triac is defective and conducts continuously even without being activated. For a 100 % setpoint, the fault can be neither detected nor flagged.	<ul style="list-style-type: none"> <li>• Triac is defective ⇒ Return POM</li> </ul>
5105	Channel fault: Fuse tripped or triac has high resistance	<ul style="list-style-type: none"> <li>• Switch off machine, check fuse, cabling, heating element and rectify fault, restart</li> <li>• Triac is defective =&gt; Return POM</li> </ul>
5106	Return fuse tripped	<ul style="list-style-type: none"> <li>• Switch off machine, check return fuse, cabling, heating element and rectify the fault, restart</li> </ul>
5107	Channel fault: Heating element or radiator wire defective	<ul style="list-style-type: none"> <li>• Switch off machine, check cabling and heating element and rectify fault, restart</li> <li>• For POM4220 Highend, connection type "phase-phase": Check incoming fuse</li> <li>• For POM4220 Highend, connection type "2-pin switching": Check fuse</li> </ul>
5109	Switch-off threshold for internal device temperature	<p>Trip threshold overshoot: The heating is switched off automatically by the device.</p> <p>Actions:</p> <ul style="list-style-type: none"> <li>• Check that the fan module is functioning correctly, if installed</li> <li>• Switch off the machine, rectify the fault (e.g. cooling malfunction), restart</li> </ul>
510B	At least one voltage is not connected	<ul style="list-style-type: none"> <li>• Check power supply, cabling and, if necessary, connect the missing voltage</li> </ul>
510E	Rotating field error	<ul style="list-style-type: none"> <li>• Check power supply, cabling and, if necessary, connect the missing voltage</li> </ul>
510F	Phase LX1 is not connected.	<ul style="list-style-type: none"> <li>• Check power supply, cabling and, if necessary, connect the missing voltage</li> <li>• Configure parameter "Phase LX1 / LX3" as "not connected"</li> </ul>
5110	Phase LX3 is not connected.	
5113	Channel fault: Partial load failure	<ul style="list-style-type: none"> <li>• Switch off machine, check cabling and heating elements and rectify fault, restart</li> </ul>
5114	Channel fault: Current load too high	<ul style="list-style-type: none"> <li>• Switch off machine, check cabling and heating elements and rectify fault, restart</li> </ul>
5115	Phase current LX1 too high	<ul style="list-style-type: none"> <li>• Switch off machine, check cabling and heating elements and rectify fault, restart</li> </ul>

---

Error code	Description	Possible causes and solutions
5116	Phase current LX3 too high	<ul style="list-style-type: none"><li>• Switch off machine, check cabling and heating elements and rectify fault, restart</li></ul>
5117	Channel fault: Power setpoint is not reached	<ul style="list-style-type: none"><li>• Check setpoint value specification</li><li>• Check heating element</li></ul>
5118	Channel fault: Fault current too high	<ul style="list-style-type: none"><li>• Check heating element</li></ul>
5119	Channel fault: Adaptive soft start cannot be ended	<ul style="list-style-type: none"><li>• Check heating element and, if needed, have looked at by Siemens</li></ul>

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**Note**

Proper frequency detection is required for correct control and diagnostics of the channels. If the frequency lies outside the permissible range (error code 5103), incorrect actuation or diagnostics may occur.









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## 11.3 I/O modules



### LED status display

The I/O module has 2 LEDs on the front. The LEDs provide information about the operating state of the device or system.

### Meaning of LEDs

RUN green	ERROR red	Meaning
		Power OFF, device switched off
		Initialization: The LED flashes until the HCS is detected and accepted as a bus node by the higher-level control system.
		Device has started up and is ready.
		An error has occurred: <ul style="list-style-type: none"> <li>• Error during general monitoring</li> <li>• Error in HCS communication</li> </ul> For PM U/I: Line voltage monitoring

PM4000 DI/DO has one LED per input/output for indicating the switching status.

Channel LED	Meaning
	LED off: "L" state
	LED on: "H" state

### Causes of errors and possible remedies

Error code	Description	Possible causes and solutions
0001	Short-circuit	<ul style="list-style-type: none"> <li>• Switch off the machine.</li> <li>• Check cabling and rectify fault</li> <li>• Restart</li> </ul>
0006	Wire break	
0011	No supply voltage	
5112	Polarity reversal at measuring input	

## Service and maintenance

### 12.1 Maintenance work

The following work must be carried out at regular intervals to guarantee smooth operation of the device.

Maintenance work	
Fan module	Check regularly that the fan is functional. Remove dust deposits with a cleaning brush and vacuum cleaner.

### 12.2 Firmware update

#### 12.2.1 PROFINET firmware update

##### Delivery condition

On delivery of the HCS4200 the current firmware version is already installed on the module.

##### Firmware update

If required, a PC tool and the necessary update files for updating the firmware are available to you at Customer Support.

---

##### Note

The PC tool has no access protection against unauthorized users. Ensure that it cannot be used by unauthorized persons.

Please also observe the IT security guidelines.

---

Observe the following information when updating the firmware:

##### Requirements

The following conditions must be met so that you can carry out an update:

Connect the PC to an Ethernet connection X1 or X2 on the CIM.

Either an IP address must be assigned to the Central Interface Module (delivery state 0.0.0.0) or the CIM must be in operation on a PROFINET CPU (IP address from PROFINET configuration).

Before the update, the connection to the CPU must be stopped or interrupted.

---

**Note**

If the connection is not interrupted, an error message appears in the PC tool, but this can be delayed.

---

**CIM:**

The update encompasses two firmware parts and is not completed until both parts have been successfully loaded.

After the update, the HCS4200 restarts automatically. Only in the event of a fault when the update has not been correctly completed do you have to restart the HCS4200.

**POM:**

In the event of a firmware update, all Power Output Modules that are operated on a Central Interface Module are loaded together with the new firmware.

After the update, the HCS4200 restarts automatically. Only in the event of a fault when the update has not been correctly completed do you have to restart the HCS4200.

**I/O module PM:**

In the event of a firmware update, new firmware is loaded into the inserted PM. After the update, the HCS4200 restarts automatically. You have to restart the HCS4200 only in the event of an error when the update was not correctly ended.

## 12.2.2 PROFIBUS firmware update

### Delivery condition

The current firmware version is already loaded on the module when the HCS4200 is shipped.

### Firmware update

If required, a PC tool and the necessary update files for updating the firmware are available to you at Customer Support.

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

The PC tool has no access protection against unauthorized users. Ensure that it cannot be used by unauthorized persons. Please also observe the IT security guidelines.
---

Observe the following information when updating the firmware:

**Requirements**

The following conditions must be met for you to carry out an update:



Connect the service interface X2 of the CIM to the computer using a 9-pin null modem cable. To do this, it may be necessary to remove the PROFIBUS connector first.

Before starting the updates, the HCS4200 heating control system must be switched off.

**Procedure**

1. Start the PC tool, select firmware and COM port and start update
2. Switch on the HCS4200

**CIM:**

The update encompasses two firmware parts and is not completed until both parts have been successfully loaded.

After the update, the HCS4200 restarts automatically. Only in the event of a fault when the update has not been correctly completed do you have to restart the HCS4200.

**POM:**

In a firmware update, new firmware is downloaded to all Power Output Modules (POMs) operated on a Central Interface Module (CIM).


After the update, the HCS4200 restarts automatically. Only in the event of a fault when the update has not been correctly completed do you have to restart the HCS4200.

**I/O module PM:**

In the event of a firmware update, new firmware is loaded into the inserted PM. After the update, the HCS4200 restarts automatically. Only in the event of a fault, if the update has not been correctly completed, is it necessary to restart the HCS4200.

## 12.3 Fuse replacement

### Safety guidelines

 <b>WARNING</b>
<b>Danger from electrical voltages</b> <b>May cause death or serious injury</b> <ul style="list-style-type: none"><li>• Before changing a fuse, you must isolate the load circuit from the supply.</li><li>• Before working on the heating control system or the connected components, ensure the system is disconnected.</li></ul>

<b>NOTICE</b>
Use only the prescribed fuse types (see section Ordering data (Page 244)). If you operate the device with unapproved fuses, the device could be destroyed.

### 12.3.1 POM4220 Fuse Replacement

#### Removing the POM4220

To replace the channel fuses, the Power Output Module (POM) on which the fuse to be replaced is located must be removed from the rack.

<b>NOTICE</b>
<b>ESD-sensitive components</b> Before you remove the board, please note the ESD information in Section ESD guidelines (Page 246).

1. Proceed as described in Section Replacing the POM4220 (Page 186).
2. Place the board on an ESD-compatible surface

## Position of fuses on the board

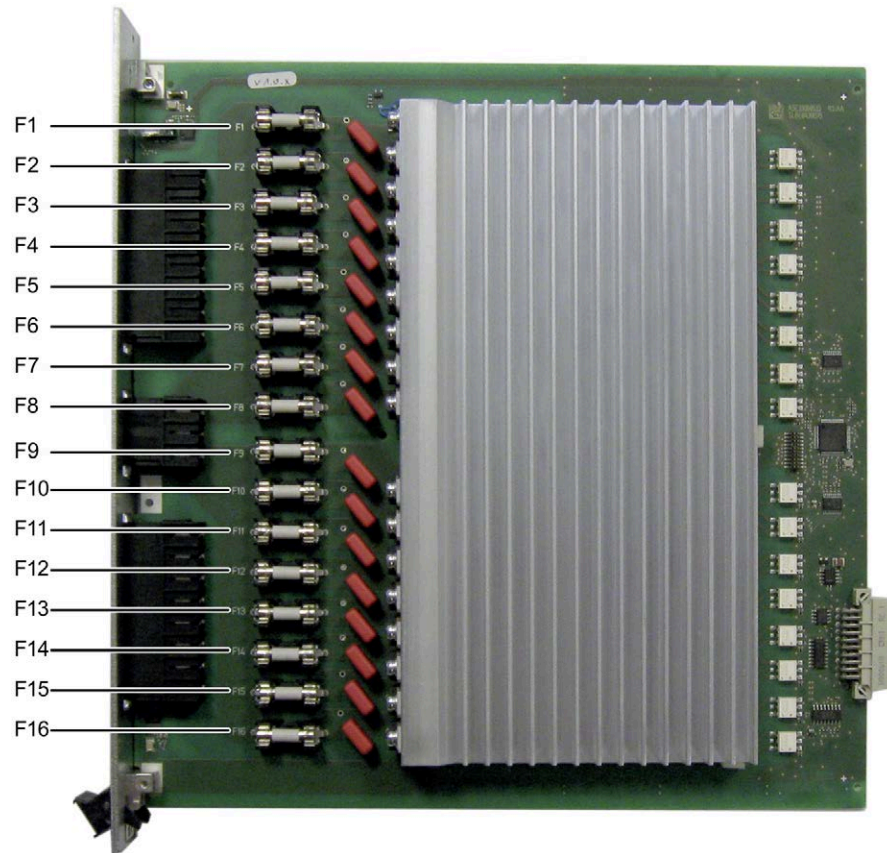


Figure 12-1 Position of fuses on the board

## Checking and changing fuses

---

### Note

Electronic components are fitted to the rear of the board. When replacing fuses, ensure that these components are not damaged.

---

1. Check for ruptured or defective fuses (refer to fault information in the section "Diagnostics data")
2. Remove the defective fuse with a suitable tool (e.g. flat-nose pliers) and insert the new fuse in the fuse holder.

## Reinstall the POM

Proceed as described in Section Mounting a POM4220 power output module (Page 59).

### Re-commissioning the device

Proceed as described in Section Commissioning (Page 98).

### See also

Ordering data (Page 244)

## 12.3.2 POM4320 Fuse Replacement

### Removing the fuse board

To replace the channel fuses, the board on which the fuse to be replaced is located must be removed from the POM.

<b>NOTICE</b>
<b>ESD-sensitive components</b>
Before you remove the board, please note the ESD information in Section ESD guidelines (Page 246).

### Tool

You will need a Torx T8 screwdriver.

Proceed as follows:

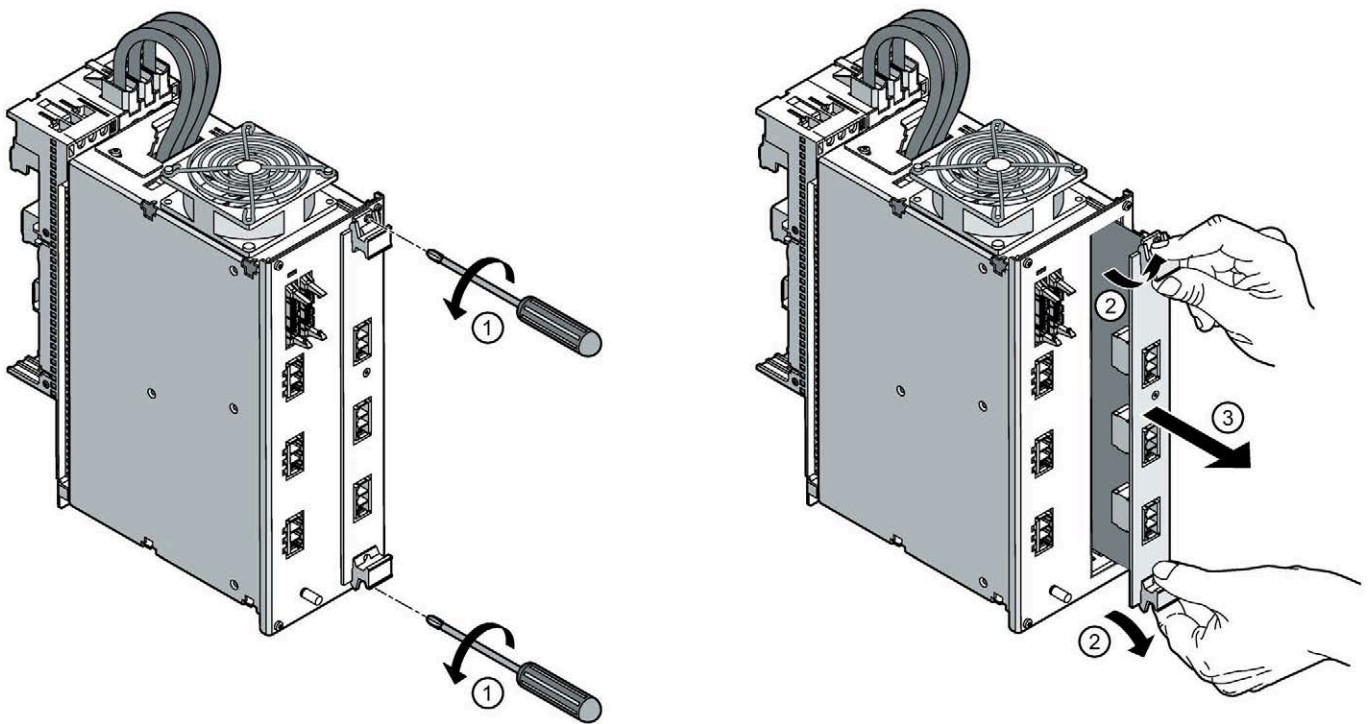


Figure 12-2 Removing the fuse board

Steps	
1	Loosen the two screws on the top and bottom of the fuse module ①
2	Unlatch retainer ②
3	Remove board ③
4	Place board on an ESD-compatible surface

### Position of fuses on the board

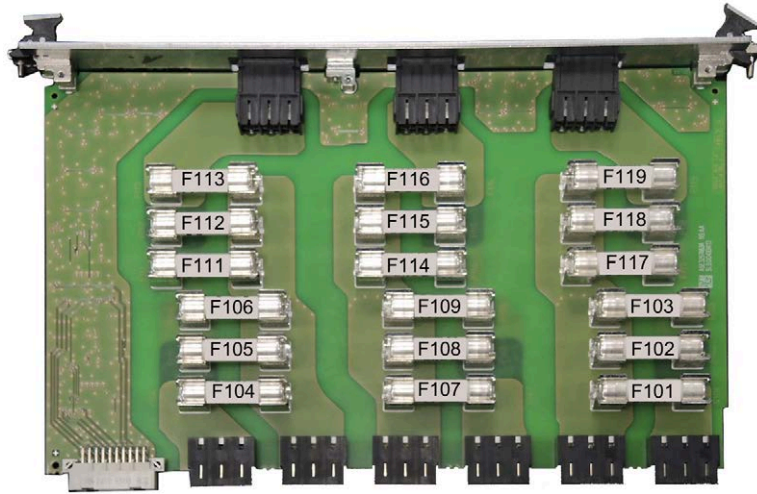


Figure 12-3 Position of fuses on the board

You can find the assignment of the fuses to the control channels in the block diagram (Page 91).

### Checking and changing fuses

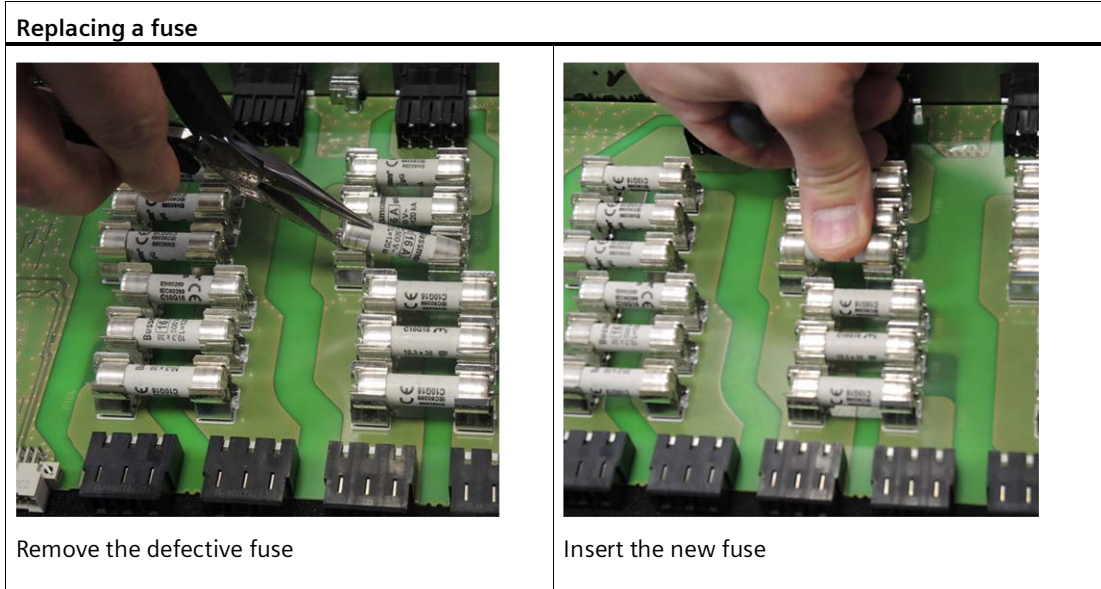
---

#### Note

Electronic components are fitted to the rear of the board. When replacing fuses, ensure that these components are not damaged.

---

1. Check for ruptured and defective fuses (refer to fault information in the section "Diagnostics data")
2. Remove the defective fuse with a suitable tool (e.g. flat-nose pliers) and insert the new fuse in the fuse holder.



### Insert the fuse board

Proceed as follows:


Steps	
1	Place board in the guides
2	Push board in as far as the stop <b>NOTICE</b> During insertion, ensure that none of the components on the the soldered side of the board are damaged.
3	Fix the board in place again using the screws ① (0.5 Nm).

### Re-commissioning the device

Proceed as described in section "Commissioning (Page 98)".

## 12.4 Replace fan

### Safety guidelines

 <b>WARNING</b>
<b>Electric shock hazard</b> The device is energized. Before you begin to replace components, you must: <ul style="list-style-type: none"><li>• Switch off the power supply to the busbar system and secure it against reconnection.</li><li>• Disconnect the 24 V DC voltage supply and secure it against reconnection.</li></ul>

### 12.4.1 Replacing the Fan Module

#### Tool

You will need a Torx T10 screwdriver

#### Preparations

Remove all the Power Output Modules that are located below the fan module. Refer to section Replacing the POM4220 (Page 186) for instructions on removing a Power Output Module.



## Dismantling the FM4240

Proceed as follows to dismantle the fan module:

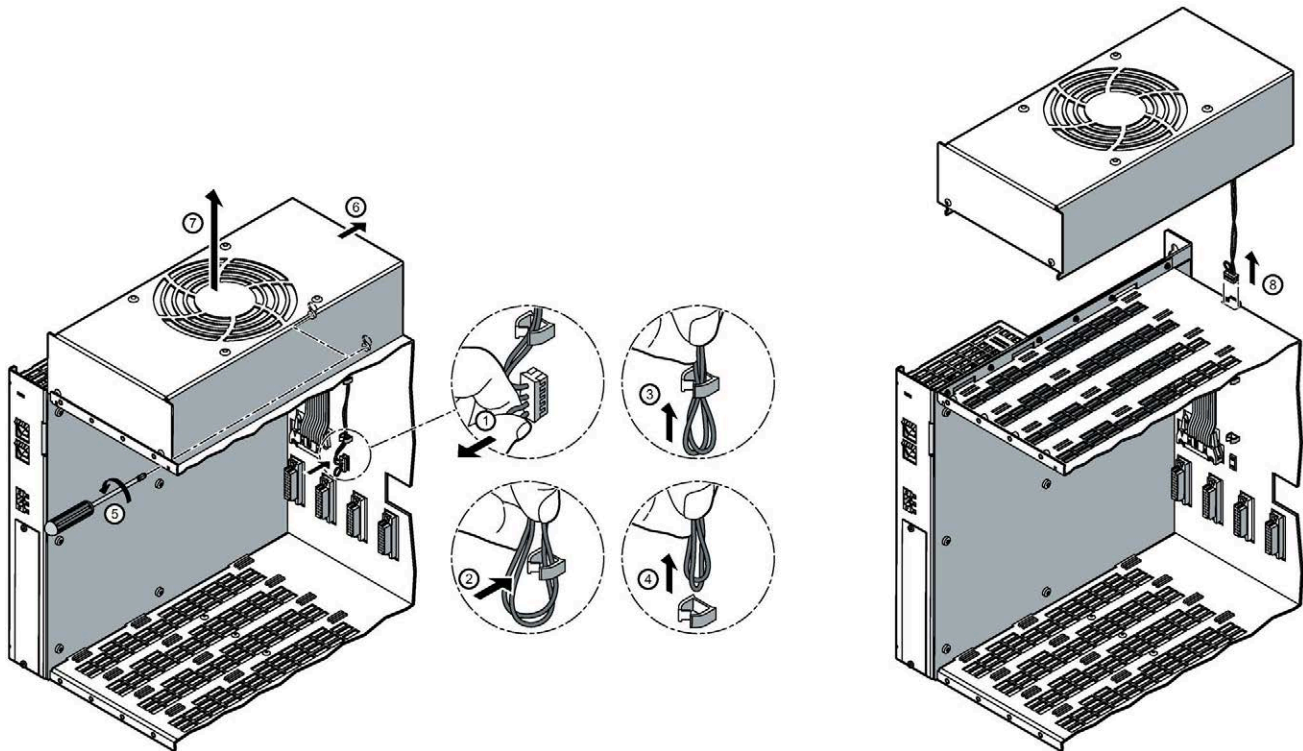


Figure 12-4 Dismantling the FM4240

Steps	
1	<ul style="list-style-type: none"> <li>Remove the fan connector Recommendation: Pulling directly at the cable makes it easier to remove the connector ①.</li> <li>Pull the fan cable out of the holder. Steps ②, ③, ④ shown in the figure illustrate how you can remove the fan cable from the holder without using tools.</li> </ul>
2	Release the two fastening screws ⑤
3	Lift the fan module at the rear and push it backward ⑥
4	Lift off the fan module ⑦ and pull the cable out through the opening in the enclosure ⑧

### Installing the FM4240

Refer to section Mounting the FM4240 Fan Module (Page 54) for instructions on mounting a fan module.

### Dismantling the FM4240 HP

Proceed as follows to dismantle the fan module:

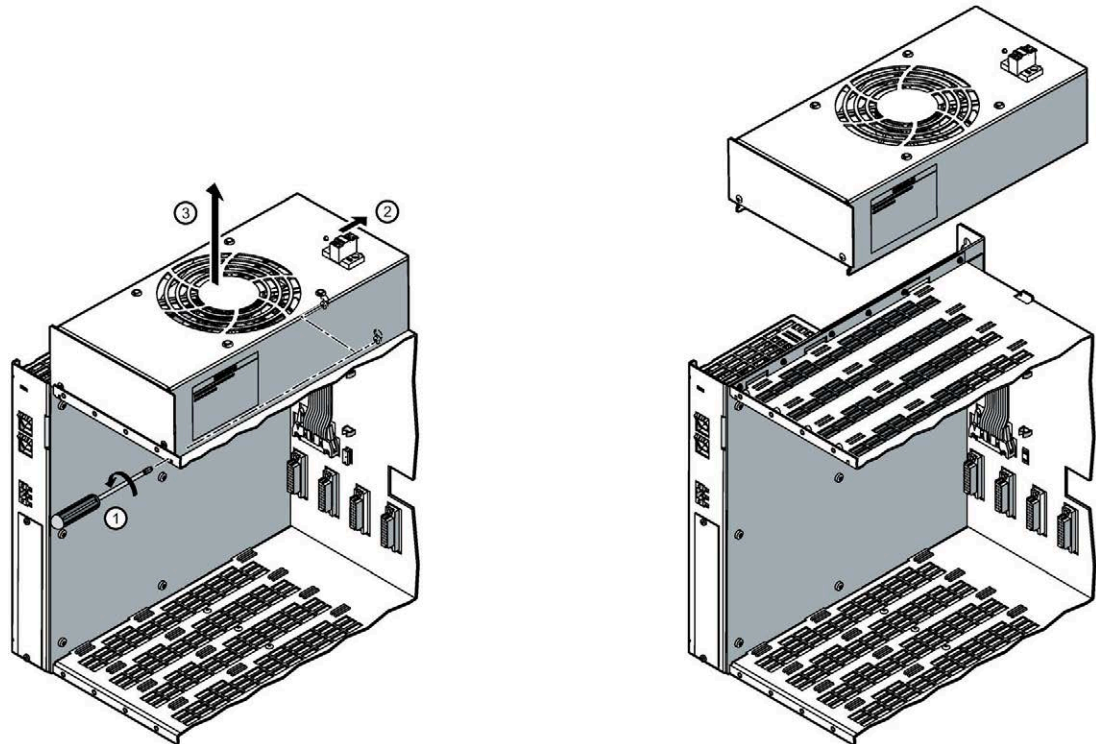


Figure 12-5 Dismantling the FM4240 HP

Steps	
1	Loosen the two fixing screws ①
2	Lift the fan module at the rear, slide it backwards ② and lift off the fan module ③

### Dismantling the FM4240 HP

Refer to section Mounting the FM4240 Fan Module HP (Page 56) for instructions on mounting a fan module.

## 12.4.2 POM4320 and CIM4210C PROFINET – Replacing fans

### Tool

You require a slotted screwdriver, size 0.4 x 2.5 mm (blade width x blade length) for levering out the plastic rivets.

### Replacing the fan

Proceed as follows to replace the fan:

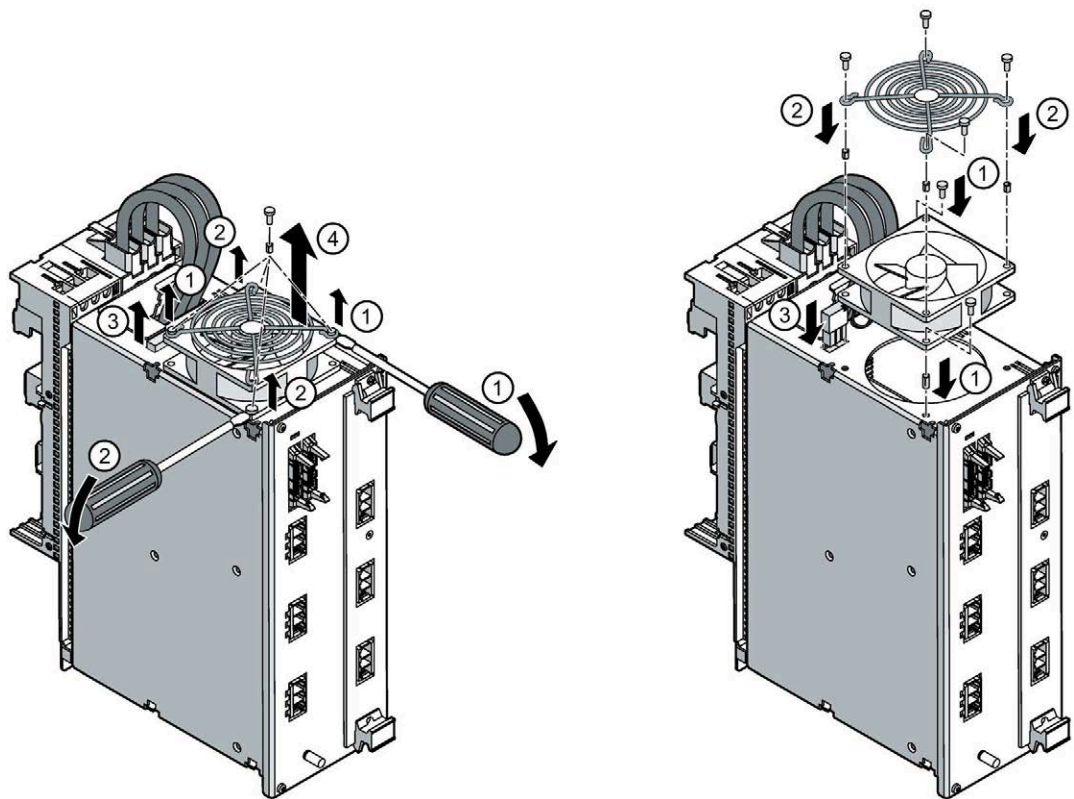


Figure 12-6 Replacing the fan


Procedure for removing the fan	
1	Remove the four plastic rivets of the fan grille. Use a screwdriver ①.
2	Remove the fan grille
3	Remove the two plastic rivets ② of the fan (proceed as for fan grille).
4	Unplug 24 V DC connectors of the defective fan ③.
5	Lift off fan ④

## 12.5 Replacing a power output module (POM)

Procedure for installing the new fan	
1	Position the new fan on the device
2	Insert the two plastic rivets of the fan ①. <ul style="list-style-type: none"> <li>• Insert sleeve</li> <li>• Push in pin</li> </ul>
3	Place fan grille on the new fan
4	Re-insert the four plastic rivets of the fan grille ②. <ul style="list-style-type: none"> <li>• Insert sleeve</li> <li>• Push in pin</li> </ul>
5	Plug in 24 V DC connector of the new fan ③.

## 12.5 Replacing a power output module (POM)

### 12.5.1 Safety information

 <b>WARNING</b>
<p><b>Danger from electrical voltages</b></p> <p><b>May cause death or serious injury</b></p> <ul style="list-style-type: none"> <li>• Before replacing the POM, the AC power supply at the installation location of the device must be de-energized and secured against reconnection.</li> <li>• The 24 V DC power supply must be interrupted.</li> </ul>

### 12.5.2 Replacing the POM4220

#### Tool

- You will need a Torx T8 screwdriver.

#### Preparations

Remove all connectors from the POM before dismantling the POM.

#### Note

To unlock, press down the two levers on the sides of the plug connectors.

## Dismantling the POM

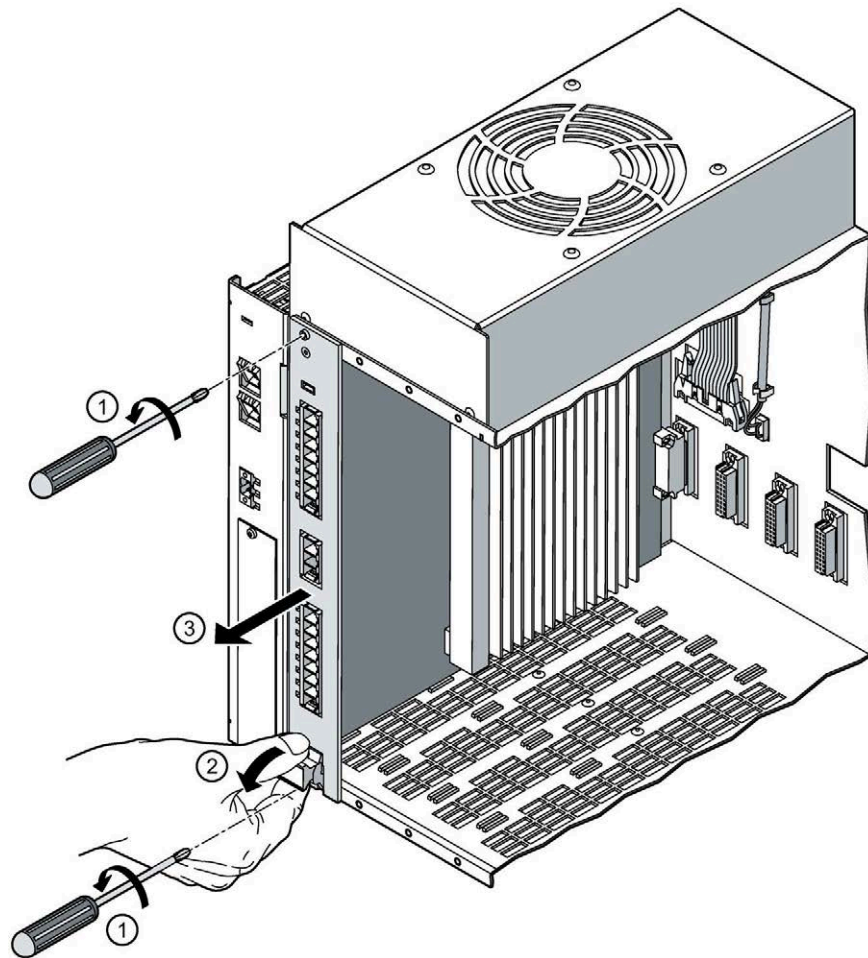


Figure 12-7 Dismantling the POM

Steps	
1	Unscrew the two fixing screws on the POM ①
2	Loosen POM with the help of the ejection lever ② and pull out the POM ③
3	Place POM on an ESD-compatible surface.

### NOTICE

#### Damage to the POM

The POM may be damaged during removal by tilting.

Pull the POM out of the enclosure without tilting it.

### Mounting, connecting and commissioning a POM

1. Follow the instructions in the following section:  
"Mounting a POM4220 power output module (Page 59)"
2. Follow the instructions in the following section: "Connecting (Page 69)"
3. Follow the instructions in the following section: "Commissioning (Page 98)"

### 12.5.3 Replacing the POM4320

#### Tool

- 4 mm screwdriver
- Wrench, size 10 for the nuts of the ground screw

#### Preparations

1. Remove all connectors from the POM.  
With backplane mounting: Remove the supply cables from the mains supply.
2. Disconnect the ground connection for the POM at the front screw terminal.

#### Dismantling the POM (busbar mounting)

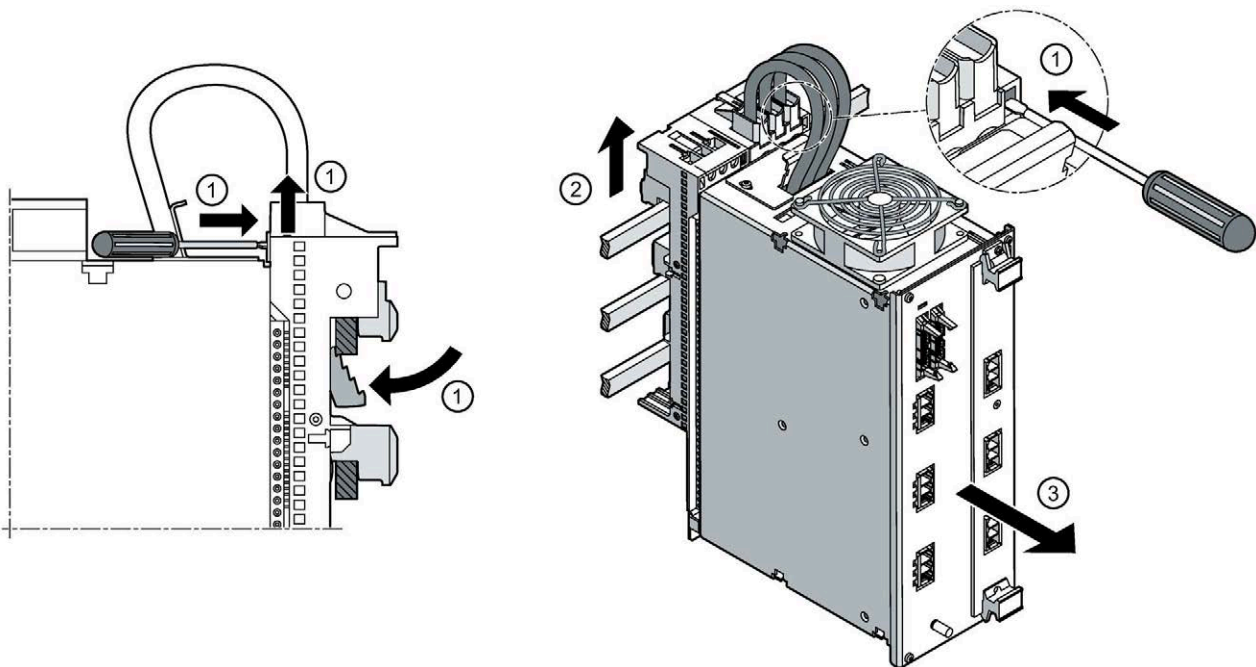


Figure 12-8 Dismantling the POM

Steps	
1	From the front, insert a screwdriver in the opening in the busbar adapter ①. The button on the top of the busbar adapter must click upwards.
2	Remove the busbar adapter by first pushing it upwards ②, and then pulling it forwards ③.

### Dismantling the POM (rear panel mounting)

Remove the four screws that secure the POM to the rear panel. See Panel mounting (Page 68)

### Mounting, connecting and commissioning a POM

1. Follow the instructions in the following section:  
"Mounting a POM4320 power output module (Page 63)"
2. Follow the instructions in the following section: "Connecting (Page 69)"
3. Follow the instructions in the following section: "Commissioning (Page 98)"

## 12.6 Replacing the Central Interface Module (CIM)

### Requirements

- The AC power supply is disconnected from the supply at the mounting location of the device and secured against switching on again.
- The 24 V DC supply voltage is disconnected.

### Preparations

To reach the fixing screws on the CIM, you may need to remove installed power output modules. This procedure is described in Section Replacing the POM4220 (Page 186).

### Tool

You will need a Torx T10 screwdriver.



## Removing the CIM

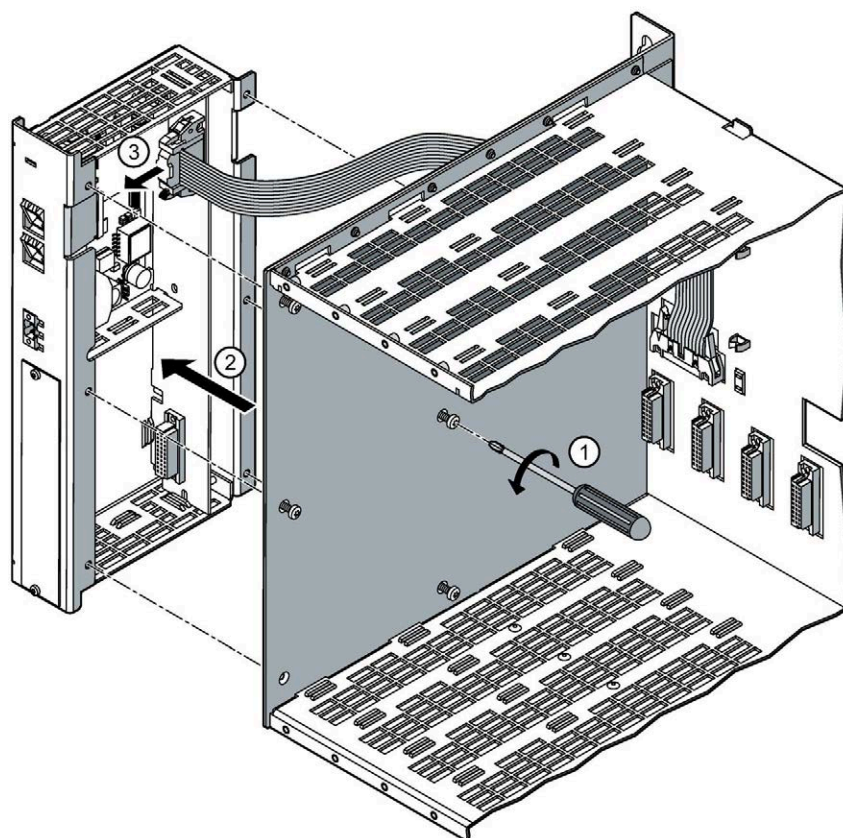


Figure 12-9 Removing the CIM

Procedure for removing the CIM	
1	Withdraw all connectors from the terminals on the front of the CIM.
2	Unscrew the six fixing screws ① and remove the CIM ②.
3	Withdraw the connector of the flat cable to the system interface ③.



## 12.7 Replacing an I/O module

### Requirement

- The AC power supply must be disconnected from the supply at the mounting location of the device and secured against switching on again.
- The 24 V DC supply voltage must be disconnected.

### Preparations

Remove all connectors from the PM before dismantling the I/O module.

---

#### Note

To unlock the connectors, press down the two levers on the sides of the plug connectors.

---

### Tool

You will need a Torx T8 screwdriver.

## Removing the I/O module

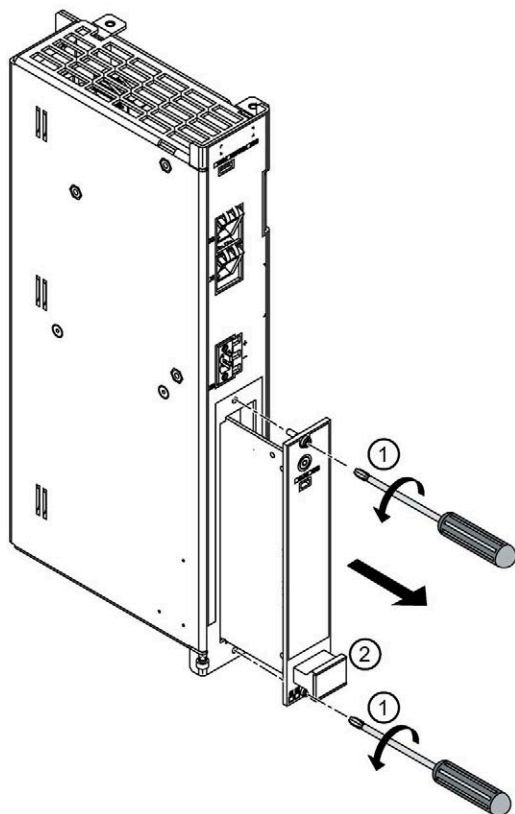


Figure 12-10 Removing the PM

1. Undo the two fixing screws ① on the PM
2. Release the PM using the ejector lever ② and pull PM out
3. Place board on an ESD-compatible surface

## **12.8 Recycling and disposal**

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### **Note**

The POM and CIM modules of the HCS heating control system fulfill the requirements RoHS-II and REACH.

Due to the low-pollutant components, the components are recyclable and must be recycled in accordance with Directive 2012/19/EC on Waste Electrical and Electronic Equipment (WEEE). For ecologically compatible recycling and disposal of your old device, contact a certificated waste disposal service for electronic scrap.

Observe the regulations applicable in your country.

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## Technical specifications

### 13.1 Technical specifications for Rack4200

Article number	6BK1942-0BA00-0AA0	6BK1942-0AA00-0AA0
<b>General information</b>		
Product type designation	RACK4200 for 4 POMs	Rack4200 for 12 POMs
<b>Installation type/mounting</b>		
Mounting type	Control cabinet backplane	
Mounting position	Horizontal	
Type of ventilation	Self ventilation or forced ventilation	
<b>Hardware configuration</b>		
<b>Slots</b>		
• Number of slots	4	12
<b>Interfaces</b>		
Interfaces/bus type	system interface	
<b>EMC</b>		
EMC interference emission	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011	
Electrostatic discharge acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge	
Field-related interference acc. to IEC 61000-4-3	10 V/m (80 ... 1 000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)	
<b>Ambient conditions</b>		
<b>Ambient temperature during operation</b>		
• min.	0 °C	
• max.	55 °C	
<b>Ambient temperature during storage/transportation</b>		
• Storage, min.	-25 °C	
• Storage, max.	70 °C	
• Transportation, min.	-25 °C	
• Transportation, max.	70 °C	
<b>Air pressure acc. to IEC 60068-2-13</b>		
• Operation, min.	860 hPa	
• Operation, max.	1 080 hPa	
• Storage, min.	660 hPa	
• Storage, max.	1 080 hPa	
<b>Altitude during operation relating to sea level</b>		

Article number	6BK1942-0BA00-0AA0	6BK1942-0AA00-0AA0
<ul style="list-style-type: none"> <li>Installation altitude above sea level, max.</li> </ul>	2 000 m	
<b>Relative humidity</b>		
<ul style="list-style-type: none"> <li>Operation at 25 °C, max.</li> </ul>	95 %	
<ul style="list-style-type: none"> <li>Operation at 50 °C, max.</li> </ul>	50 %; 95 % at 25 °C, decreasing linearly to 50 % at 50 °C	
<b>Vibrations</b>		
<ul style="list-style-type: none"> <li>Vibration resistance during operation acc. to IEC 60068-2-6</li> </ul>	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1 g	
<ul style="list-style-type: none"> <li>Vibration resistance during storage acc. to IEC 60068-2-6</li> </ul>	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1 g	
<b>Shock testing</b>		
<ul style="list-style-type: none"> <li>Shock resistance during operation acc. to IEC 60068-2-27</li> </ul>	15 g / 11 ms / 3 shocks/axis	
<ul style="list-style-type: none"> <li>Shock resistance during storage acc. to IEC 60068-2-29</li> </ul>	25 g / 6 ms / 1 000 shocks/axis	
<b>Dimensions</b>		
Width	204 mm	488 mm
Height	285 mm	
Depth	293 mm	

## 13.2 Technical Specifications CIM4210

Article number	6BK1942-1BA00-0AA0	6BK1942-1AA00-0AA0
<b>Installation type/mounting</b>		
Mounting type	Screw mounting to rack	
Mounting position	vertical	
Type of ventilation	Forced ventilation	
<b>Supply voltage</b>		
Type of supply voltage	DC	
Rated value (DC)	24 V	
relative symmetrical tolerance of the supply voltage	20 %	
<b>Connection method</b>		
<ul style="list-style-type: none"> <li>• Design of electrical connection for supply voltage</li> </ul>	Connector 2x 2-pin with tension spring connection	
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, solid</li> </ul>	1x (0.2 ... 2.5 mm <sup>2</sup> )	
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, finely stranded with wire end processing</li> </ul>	1x (0.2 ... 2.5 mm <sup>2</sup> )	
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections for AWG cables</li> </ul>	1x (26 ... 12)	
<b>Power</b>		
Active power input	3 W	
<b>Hardware configuration</b>		
<b>Slots</b>		
<ul style="list-style-type: none"> <li>• Number of slots</li> </ul>	1	
<b>Interfaces</b>		
Interfaces/bus type	PROFIBUS DP	PROFINET IO
Transmission rate, max.	12 Mbit/s	100 Mbit/s
<b>PROFIBUS DP</b>		
<ul style="list-style-type: none"> <li>• Design of electrical connection</li> </ul>	9-pin sub D socket	
<b>Supports protocol for PROFINET IO</b>		
<ul style="list-style-type: none"> <li>• Design of electrical connection of PROFINET interface</li> </ul>	2x RJ45	
<b>Protocols</b>		
Supports protocol for PROFINET IO	No	Yes
PROFIBUS DP	Yes	No
<b>Further protocols</b>		
<ul style="list-style-type: none"> <li>• EtherNet/IP</li> </ul>	No	
<b>Interrupts/diagnostics/status information</b>		
Number of status displays	3	
LED status display	LED green = ready, LED yellow = heating on/off, LED red = error display	
<b>Isolation</b>		
Overvoltage category	III	

Article number	6BK1942-1BA00-0AA0	6BK1942-1AA00-0AA0
<b>EMC</b>		
EMC interference emission	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011	
Electrostatic discharge acc. to IEC 61000-4-2	4 kV contact discharging, 8 kV air discharging	
Field-related interference acc. to IEC 61000-4-3	10 V/m (80 ... 1 000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)	
Conducted interference due to burst acc. to IEC 61000-4-4	2 kV power supply lines / 2 kV PROFIBUS cables	2 kV power supply lines, 2 kV PROFINET cables
Conducted interference due to surge acc. to IEC 61000-4-5	DC supply lines: 0.5 kV symmetrical and asymmetrical, PROFIBUS lines: 1 kV asymmetrical	DC supply lines: 0.5 kV symmetric and unsymmetrical PROFINET cables: 1 kV unsymmetric
Conducted interference due to high-frequency radiation acc. to IEC 61000-4-6	10 V (0.15 ... 80 MHz)	
<b>Ambient conditions</b>		
<b>Ambient temperature during operation</b>		
• min.	0 °C	
• max.	55 °C	
<b>Ambient temperature during storage/transportation</b>		
• Storage, min.	-25 °C	
• Storage, max.	70 °C	
• Transportation, min.	-25 °C	
• Transportation, max.	70 °C	
<b>Air pressure acc. to IEC 60068-2-13</b>		
• Operation, min.	860 hPa	
• Operation, max.	1 080 hPa	
• Storage, min.	660 hPa	
• Storage, max.	1 080 hPa	
<b>Altitude during operation relating to sea level</b>		
• Installation altitude above sea level, max.	2 000 m	
<b>Relative humidity</b>		
• Operation at 25 °C, max.	95 %	
• Operation at 50 °C, max.	50 %; 95 % at 25 °C, decreasing linearly to 50 % at 50 °C	
<b>Vibrations</b>		
• Vibration resistance during operation acc. to IEC 60068-2-6	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1 g	
• Vibration resistance during storage acc. to IEC 60068-2-6	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1 g	

Article number	6BK1942-1BA00-0AA0	6BK1942-1AA00-0AA0
<b>Shock testing</b>		
<ul style="list-style-type: none"> <li>Shock resistance during operation acc. to IEC 60068-2-27</li> </ul>	15 g / 11 ms / 3 shocks/axis	
<ul style="list-style-type: none"> <li>Shock resistance during storage acc. to IEC 60068-2-29</li> </ul>	25 g / 6 ms / 1 000 shocks/axis	
<b>Dimensions</b>		
Width	43 mm	
Height	285 mm	
Depth	136 mm	



## 13.3 Technical Specifications CIM4210C

<b>Article number</b>	<b>6BK1942-1AA00-0AA1</b>
<b>Installation type/mounting</b>	
Mounting type	Backplane mounting
Mounting position	vertical
Type of ventilation	Self-ventilation
<b>Supply voltage</b>	
Type of supply voltage	DC
Rated value (DC)	24 V
relative symmetrical tolerance of the supply voltage	20 %
<b>Connection method</b>	
• Design of electrical connection for supply voltage	Connector 2x 2-pin with tension spring connection
– Connectable conductor cross-sections, solid	1x (0.2 ... 2.5 mm <sup>2</sup> )
– Connectable conductor cross-sections, finely stranded with wire end processing	1x (0.2 ... 2.5 mm <sup>2</sup> )
– Connectable conductor cross-sections for AWG cables	1x (26 ... 12)
<b>Power</b>	
Active power input	8 W
<b>Hardware configuration</b>	
<b>Slots</b>	
• Number of slots	2
<b>Interfaces</b>	
Interfaces/bus type	PROFINET IO
Transmission rate, max.	100 Mbit/s
<b>Supports protocol for PROFINET IO</b>	
• Design of electrical connection of PROFINET interface	2x RJ45
<b>Protocols</b>	
Supports protocol for PROFINET IO	Yes
PROFIBUS DP	No
<b>Further protocols</b>	
• EtherNet/IP	No
<b>Interrupts/diagnostics/status information</b>	
Number of status displays	3
LED status display	LED green = ready, LED yellow = heating on/off, LED red = error display
<b>Isolation</b>	
Overvoltage category	III

Article number	6BK1942-1AA00-0AA1
<b>EMC</b>	
EMC interference emission	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011
Electrostatic discharge acc. to IEC 61000-4-2	4 kV contact discharging, 8 kV air discharging
Field-related interference acc. to IEC 61000-4-3	10 V/m (80 ... 1 000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)
Conducted interference due to burst acc. to IEC 61000-4-4	2 kV power supply lines, 2 kV PROFINET cables
Conducted interference due to surge acc. to IEC 61000-4-5	DC supply lines: 0.5 kV symmetric and unsymmetric PROFINET cables: 1 kV unsymmetric
Conducted interference due to high-frequency radiation acc. to IEC 61000-4-6	10 V (0.15 ... 80 MHz)
<b>Ambient conditions</b>	
<b>Ambient temperature during operation</b>	
• min.	0 °C
• max.	55 °C
<b>Ambient temperature during storage/transportation</b>	
• Storage, min.	-25 °C
• Storage, max.	70 °C
• Transportation, min.	-25 °C
• Transportation, max.	70 °C
<b>Air pressure acc. to IEC 60068-2-13</b>	
• Operation, min.	860 hPa
• Operation, max.	1 080 hPa
• Storage, min.	660 hPa
• Storage, max.	1 080 hPa
<b>Altitude during operation relating to sea level</b>	
• Installation altitude above sea level, max.	2 000 m
<b>Relative humidity</b>	
• Operation at 25 °C, max.	95 %
• Operation at 50 °C, max.	50 %; 95 % at 25 °C, decreasing linearly to 50 % at 50 °C
<b>Vibrations</b>	
• Vibration resistance during operation acc. to IEC 60068-2-6	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1 g
• Vibration resistance during storage acc. to IEC 60068-2-6	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1 g
<b>Shock testing</b>	
• Shock resistance during operation acc. to IEC 60068-2-27	15 g / 11 ms / 3 shocks/axis
• Shock resistance during storage acc. to IEC 60068-2-29	25 g / 6 ms / 1 000 shocks/axis

<b>Article number</b>	<b>6BK1942-1AA00-0AA1</b>
<b>Dimensions</b>	
Width	104 mm
Height	339 mm
Depth	296 mm

## 13.4 Technical specifications of POM

### 13.4.1 Technical specifications of POM4220

#### POM4220 Lowend and POM4220 Midrange phase angle control

Article number	6BK1942-2AA00-0AA0	6BK1942-2CA00-0AA1
<b>General information</b>		
Product type designation	POM4220 Lowend	POM4220 mid-range phase control
<b>Installation type/mounting</b>		
Mounting type	Screw mounting to rack	
Mounting position	vertical	
Type of ventilation	Self ventilation or forced ventilation	
<b>Supply voltage</b>		
Type of supply voltage	AC	
Rated value (AC)	230 V	
• Relative negative tolerance	10 %	
• Relative positive tolerance	10 %	30 %
2nd rated value (AC)	277 V	
• Relative negative tolerance	25 %	
• Relative positive tolerance	8 %	
<b>Line frequency</b>		
• Rated value 50 Hz	Yes	
• Rated value 60 Hz	Yes	
• Relative symmetrical tolerance	5 %	
<b>Mains buffering</b>		
• Recovery time after power failure, typ.	1 s	
<b>Connection method</b>		
• Design of electrical connection for supply voltage	Connector, 3-pole with spring-loaded connection	
– Connectable conductor cross-sections, solid	1x (0.2 ... 10 mm <sup>2</sup> )	1x (0.75 ... 16 mm <sup>2</sup> )
– Connectable conductor cross-sections, finely stranded with wire end processing	1x (0.25 ... 6 mm <sup>2</sup> )	1x (0.75 ... 16 mm <sup>2</sup> )
– Connectable conductor cross-sections for AWG cables	1x (24 ... 8)	1x (18 ... 4)
<b>Input voltage</b>		
Design of the power supply	Power supply via rack	

Article number	6BK1942-2AA00-0AA0	6BK1942-2CA00-0AA1
<b>Power</b>		
Active power input, max.	1 W	
<b>Power electronics</b>		
Type of load	Ohmic load	
Power capacity, max.	16.1 kW; at 230 V AC	29.4 kW; at 230 V AC
<ul style="list-style-type: none"> <li>For phase against neutral with fan at 40 °C, max.</li> </ul>	16.1 kW; at 230 V AC	29.4 kW; at 230 V AC
<ul style="list-style-type: none"> <li>For phase against neutral without fan at 40 °C, max.</li> </ul>	7.3 kW; at 230 V AC	
Switching capacity current per phase, max.	35 A	64 A
Short-time withstand current (SCCR) acc. to UL 508A	50 kA	100 kA
<b>Control of heating elements</b>		
<ul style="list-style-type: none"> <li>Half-wave control</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>Soft start</li> </ul>	No	Yes
<ul style="list-style-type: none"> <li>Phase control</li> </ul>	No	Yes
<b>Load connection type</b>		
<ul style="list-style-type: none"> <li>Star connection with neutral conductor (single-phase)</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>Open delta connection (single-phase)</li> </ul>	No	
<ul style="list-style-type: none"> <li>Closed delta connection (3-phase)</li> </ul>	No	
<ul style="list-style-type: none"> <li>Star connection with neutral conductor (2-phase)</li> </ul>	No	
<ul style="list-style-type: none"> <li>2-pole switching</li> </ul>	No	
<b>Setpoint input</b>		
<ul style="list-style-type: none"> <li>Percent</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>Watts</li> </ul>	No	
<b>Heating power</b>		
<ul style="list-style-type: none"> <li>Number of digital outputs</li> </ul>	16	12
<ul style="list-style-type: none"> <li>Number of heating elements per output, max.</li> </ul>	1	
<ul style="list-style-type: none"> <li>Output voltage for heating power</li> </ul>	230 V	
<ul style="list-style-type: none"> <li>2nd output voltage for heating power</li> </ul>		277 V
<ul style="list-style-type: none"> <li>Power carrying capacity per output, min.</li> </ul>	40 W; at 230 V AC	60 W; at 230 V AC
<ul style="list-style-type: none"> <li>Power carrying capacity per output, max.</li> </ul>	1 449 W; at 230 V AC	3 680 W; at 230 V AC

13.4 Technical specifications of POM

Article number	6BK1942-2AA00-0AA0	6BK1942-2CA00-0AA1
<ul style="list-style-type: none"> <li>– for heating elements with high inrush current, max.</li> <li>• Output current for heating power</li> <li>• Melting I<sup>2</sup>t value</li> <li>• Design of short-circuit protection per output</li> <li>• Design of overvoltage protection</li> </ul>	<p>750 W; at 230 V AC</p> <p>6.3 A; max.</p> <p>57 A<sup>2</sup>·s</p> <p>Safety fuse 6.3 A</p> <p>Transil Diode</p>	<p>1 600 W; at 230 V AC</p> <p>16 A; max.</p> <p>20 A<sup>2</sup>·s</p> <p>Fuse 16 A</p>
<p><b>Connection method</b></p> <ul style="list-style-type: none"> <li>• Design of electrical connection at output for heating and fan                             <ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, solid</li> <li>– Connectable conductor cross-sections, finely stranded with wire end processing</li> <li>– Connectable conductor cross-sections for AWG cables, stranded</li> </ul> </li> </ul>	<p>plug, 8-pole with spring-type terminal, push-in</p> <p>1x (0.2 ... 10 mm<sup>2</sup>)</p> <p>1x (0.25 ... 6 mm<sup>2</sup>)</p> <p>1x (24 ... 8)</p>	<p>Connector, 6-pole with spring-loaded connection</p>
<p><b>Interfaces</b></p> <p>Interfaces/bus type</p>	<p>system interface</p>	
<p><b>Interrupts/diagnostics/status information</b></p> <p>Number of status displays</p> <p>LED status display</p> <p>Diagnostics function</p>	<p>19</p> <p>LED green = ready, LED yellow = heating on/off, LED red = error display, LED red = error for each channel</p> <p>Voltage diagnostics</p>	<p>15</p>
<p><b>Diagnoses</b></p> <ul style="list-style-type: none"> <li>• Fuse blown</li> <li>• Load failure</li> <li>• Triac error</li> <li>• Switch-off threshold for internal device temperature</li> <li>• Parallel-connected heating elements</li> <li>• Rotating field fault</li> <li>• Communication error</li> <li>• Supply voltage not connected</li> <li>• Line voltage outside the permissible range</li> <li>• Frequency outside the permissible range</li> <li>• Fault current too high</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>No</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>No</p>	<p>No</p> <p>No</p>

Article number	6BK1942-2AA00-0AA0	6BK1942-2CA00-0AA1
<b>Integrated Functions</b>		
<b>Monitoring functions</b>		
• Temperature monitoring	Yes	
• Type of temperature monitoring	NTC thermistor	
<b>Measuring functions</b>		
• Voltage measurement	No	
• Current measurement	No	
• Fault current detection	No	
<b>Potential separation</b>		
Design of electrical isolation between the outputs	Optocoupler and/or protective impedance between main circuit and PELV	
	No	
<b>Isolation</b>		
Overvoltage category	III	
<b>EMC</b>		
EMC interference emission	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011	
Electrostatic discharge acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge	
Field-related interference acc. to IEC 61000-4-3	10 V/m (80 ... 1 000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)	
Conducted interference due to burst acc. to IEC 61000-4-4	2 kV power supply lines, 2 kV load lines	
Conducted interference due to surge acc. to IEC 61000-4-5	Supply and load lines: 1 kV symmetrical, 2 kV asymmetrical	
Conducted interference due to high-frequency radiation acc. to IEC 61000-4-6	10 V (0.15 ... 80 MHz)	
<b>Ambient conditions</b>		
<b>Ambient temperature during operation</b>		
• min.	0 °C	
• max.	55 °C	
<b>Ambient temperature during storage/transportation</b>		
• Storage, min.	-25 °C	
• Storage, max.	70 °C	
• Transportation, min.	-25 °C	
• Transportation, max.	70 °C	
<b>Air pressure acc. to IEC 60068-2-13</b>		
• Operation, min.	860 hPa	
• Operation, max.	1 080 hPa	
• Storage, min.	660 hPa	
• Storage, max.	1 080 hPa	

13.4 Technical specifications of POM

Article number	6BK1942-2AA00-0AA0	6BK1942-2CA00-0AA1
<b>Altitude during operation relating to sea level</b>		
<ul style="list-style-type: none"> <li>Installation altitude above sea level, max.</li> </ul>	2 000 m	
<b>Relative humidity</b>		
<ul style="list-style-type: none"> <li>Operation at 25 °C, max.</li> </ul>	95 %	
<ul style="list-style-type: none"> <li>Operation at 50 °C, max.</li> </ul>	50 %; 95 % at 25 °C, decreasing linearly to 50 % at 50 °C	
<b>Vibrations</b>		
<ul style="list-style-type: none"> <li>Vibration resistance during operation acc. to IEC 60068-2-6</li> </ul>	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1 g	
<ul style="list-style-type: none"> <li>Vibration resistance during storage acc. to IEC 60068-2-6</li> </ul>	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1 g	
<b>Shock testing</b>		
<ul style="list-style-type: none"> <li>Shock resistance during operation acc. to IEC 60068-2-27</li> </ul>	15 g / 11 ms / 3 shocks/axis	
<ul style="list-style-type: none"> <li>Shock resistance during storage acc. to IEC 60068-2-29</li> </ul>	25 g / 6 ms / 1 000 shocks/axis	
<b>Dimensions</b>		
Width	36 mm	
Height	285 mm	
Depth	281 mm	



**POM4220 Highend and POM4220 Flexible**

Article number	6BK1942-2DA00-0AA0	6BK1942-2FA00-0AA0
<b>General information</b>		
Product type designation	POM4220 High-end	POM4220 Flexible
<b>Installation type/mounting</b>		
Mounting type	Screw mounting to rack	
Mounting position	vertical	
Type of ventilation	Self ventilation or forced ventilation	
<b>Supply voltage</b>		
Type of supply voltage	AC	
Rated value (AC)	230 V	
• Relative negative tolerance	10 %	
• Relative positive tolerance	30 %	
2nd rated value (AC)	277 V	
• Relative negative tolerance	25 %	
• Relative positive tolerance	8 %	
3rd rated value (AC)	400 V	110 V
• Relative negative tolerance	10 %	
• Relative positive tolerance	30 %	50 %
4th rated value (AC)	480 V	70 V
• Relative negative tolerance	25 %	10 %
• Relative positive tolerance	8 %	15 %
5th rated value (AC)		45 V
• Relative negative tolerance		10 %
• Relative positive tolerance		15 %
<b>Line frequency</b>		
• Rated value 50 Hz	Yes	
• Rated value 60 Hz	Yes	
• Relative symmetrical tolerance	5 %	
<b>Mains buffering</b>		
• Recovery time after power failure, typ.	1 s	
<b>Connection method</b>		
• Design of electrical connection for supply voltage	Connector, 3-pole with spring-loaded connection	
– Connectable conductor cross-sections, solid	1x (0.75 ... 16 mm <sup>2</sup> )	
– Connectable conductor cross-sections, finely stranded with wire end processing	1x (0.75 ... 16 mm <sup>2</sup> )	
– Connectable conductor cross-sections for AWG cables	1x (18 ... 4)	

Article number	6BK1942-2DA00-0AA0	6BK1942-2FA00-0AA0
<b>Input voltage</b>		
Design of the power supply	Power supply via rack	
<b>Power</b>		
Active power input, max.	1.5 W	1 W
<b>Power electronics</b>		
Type of load	Ohmic load	
Power capacity, max.	51.2 kW; At 400 V AC	29.4 kW; at 230 V AC
<ul style="list-style-type: none"> <li>For phase against phase with fan at 40 °C, max.</li> </ul>	51.2 kW; At 400 V AC	
<ul style="list-style-type: none"> <li>For phase against phase without fan at 40 °C, max.</li> </ul>	12.5 kW; At 400 V AC	
<ul style="list-style-type: none"> <li>For phase against neutral with fan at 40 °C, max.</li> </ul>	29.4 kW; at 230 V AC	
<ul style="list-style-type: none"> <li>For phase against neutral without fan at 40 °C, max.</li> </ul>	7.3 kW; at 230 V AC	
Switching capacity current per phase, max.	64 A	
Short-time withstand current (SCCR) acc. to UL 508A	100 kA	
<b>Control of heating elements</b>		
<ul style="list-style-type: none"> <li>Half-wave control</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>Soft start</li> </ul>	Yes	No
<ul style="list-style-type: none"> <li>Phase control</li> </ul>	Yes	No
<b>Load connection type</b>		
<ul style="list-style-type: none"> <li>Star connection with neutral conductor (single-phase)</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>Open delta connection (single-phase)</li> </ul>	Yes	No
<ul style="list-style-type: none"> <li>Closed delta connection (3-phase)</li> </ul>	No	
<ul style="list-style-type: none"> <li>Star connection with neutral conductor (2-phase)</li> </ul>	Yes; Economy circuit	No
<ul style="list-style-type: none"> <li>2-pole switching</li> </ul>	Yes; Phase - neutral conductor, phase - phase	No
<b>Setpoint input</b>		
<ul style="list-style-type: none"> <li>Percent</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>Watts</li> </ul>	Yes	No
<b>Heating power</b>		
<ul style="list-style-type: none"> <li>Number of digital outputs</li> </ul>	8	12
<ul style="list-style-type: none"> <li>Number of heating elements per output, max.</li> </ul>	5; Recommended, depends on tolerance of heating elements	1
<ul style="list-style-type: none"> <li>Output voltage for heating power</li> </ul>	230 V	

Article number	6BK1942-2DA00-0AA0	6BK1942-2FA00-0AA0
<ul style="list-style-type: none"> <li>• 2nd output voltage for heating power</li> <li>• 3rd output voltage for heating power</li> <li>• 4th output voltage for heating power</li> <li>• 5th output voltage for heating power</li> <li>• Power carrying capacity per output, min.</li> <li>• Power carrying capacity per output, max.                             <ul style="list-style-type: none"> <li>– for heating elements with high inrush current, max.</li> </ul> </li> <li>• Output current for heating power</li> <li>• Melting I<sup>2</sup>t value</li> <li>• Design of short-circuit protection per output</li> <li>• Design of overvoltage protection</li> </ul>	<p>277 V</p> <p>400 V</p> <p>480 V</p> <p>400 W; at 230 V AC</p> <p>4 600 W; at 230 V AC</p> <p>2 700 W; at 230 V AC</p> <p>20 A; max.</p> <p>120 A<sup>2</sup>·s</p> <p>Melting fuse 25 A</p> <p>Transil Diode</p>	<p>110 V</p> <p>70 V</p> <p>45 V</p> <p>100 W; at 230 V AC</p> <p>3 680 W; at 230 V AC</p> <p>1 600 W; at 230 V AC</p> <p>16 A; max.</p> <p>20 A<sup>2</sup>·s</p> <p>Fuse 16 A</p>
<p><b>Connection method</b></p> <ul style="list-style-type: none"> <li>• Design of electrical connection at output for heating and fan                             <ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, solid</li> <li>– Connectable conductor cross-sections, finely stranded with wire end processing</li> <li>– Connectable conductor cross-sections for AWG cables, stranded</li> </ul> </li> </ul>	<p>Plug, 4-pole, with spring-loaded connection</p> <p>1x (0.2 ... 10 mm<sup>2</sup>)</p> <p>1x (0.25 ... 6 mm<sup>2</sup>)</p> <p>1x (24 ... 8)</p>	<p>Connector, 6-pole with spring-loaded connection</p>
<p><b>Interfaces</b></p> <p>Interfaces/bus type</p>	<p>system interface</p>	
<p><b>Interrupts/diagnostics/status information</b></p> <p>Number of status displays</p> <p>LED status display</p> <p>Diagnostics function</p>	<p>11</p> <p>LED green = ready, LED yellow = heating on/off, LED red = error display, LED red = error for each channel</p> <p>Voltage and current diagnosis</p>	<p>15</p> <p>Voltage diagnostics</p>
<p><b>Diagnoses</b></p> <ul style="list-style-type: none"> <li>• Fuse blown</li> <li>• Load failure</li> <li>• Triac error</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p>	

13.4 Technical specifications of POM

Article number	6BK1942-2DA00-0AA0	6BK1942-2FA00-0AA0
<ul style="list-style-type: none"> <li>Switch-off threshold for internal device temperature</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>Parallel-connected heating elements</li> </ul>	Yes	No
<ul style="list-style-type: none"> <li>Rotating field fault</li> </ul>	Yes	No
<ul style="list-style-type: none"> <li>Communication error</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>Supply voltage not connected</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>Line voltage outside the permissible range</li> </ul>	Yes	No
<ul style="list-style-type: none"> <li>Frequency outside the permissible range</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>Fault current too high</li> </ul>	Yes	No
<b>Integrated Functions</b>		
<b>Monitoring functions</b>		
<ul style="list-style-type: none"> <li>Temperature monitoring</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>Type of temperature monitoring</li> </ul>	NTC thermistor	
<b>Measuring functions</b>		
<ul style="list-style-type: none"> <li>Voltage measurement</li> </ul>	Yes	No
<ul style="list-style-type: none"> <li>Current measurement</li> </ul>	Yes	No
<ul style="list-style-type: none"> <li>Fault current detection</li> </ul>	Yes; For 2-pole switching	No
<b>Potential separation</b>		
Design of electrical isolation between the outputs	Optocoupler and/or protective impedance between main circuit and PELV	
	No	
<b>Isolation</b>		
Overvoltage category	III	
<b>EMC</b>		
EMC interference emission	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011	
Electrostatic discharge acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge	
Field-related interference acc. to IEC 61000-4-3	10 V/m (80 ... 1 000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)	
Conducted interference due to burst acc. to IEC 61000-4-4	2 kV power supply lines, 2 kV load lines	
Conducted interference due to surge acc. to IEC 61000-4-5	Supply and load lines: 1 kV symmetrical, 2 kV asymmetrical	
Conducted interference due to high-frequency radiation acc. to IEC 61000-4-6	10 V (0.15 ... 80 MHz)	
<b>Ambient conditions</b>		
<b>Ambient temperature during operation</b>		
<ul style="list-style-type: none"> <li>min.</li> </ul>	0 °C	
<ul style="list-style-type: none"> <li>max.</li> </ul>	55 °C	

Article number	6BK1942-2DA00-0AA0	6BK1942-2FA00-0AA0
<b>Ambient temperature during storage/transportation</b>		
<ul style="list-style-type: none"> <li>Storage, min.</li> <li>Storage, max.</li> <li>Transportation, min.</li> <li>Transportation, max.</li> </ul>	<p>-25 °C</p> <p>70 °C</p> <p>-25 °C</p> <p>70 °C</p>	
<b>Air pressure acc. to IEC 60068-2-13</b>		
<ul style="list-style-type: none"> <li>Operation, min.</li> <li>Operation, max.</li> <li>Storage, min.</li> <li>Storage, max.</li> </ul>	<p>860 hPa</p> <p>1 080 hPa</p> <p>660 hPa</p> <p>1 080 hPa</p>	
<b>Altitude during operation relating to sea level</b>		
<ul style="list-style-type: none"> <li>Installation altitude above sea level, max.</li> </ul>	2 000 m	
<b>Relative humidity</b>		
<ul style="list-style-type: none"> <li>Operation at 25 °C, max.</li> <li>Operation at 50 °C, max.</li> </ul>	<p>95 %</p> <p>50 %; 95 % at 25 °C, decreasing linearly to 50 % at 50 °C</p>	
<b>Vibrations</b>		
<ul style="list-style-type: none"> <li>Vibration resistance during operation acc. to IEC 60068-2-6</li> <li>Vibration resistance during storage acc. to IEC 60068-2-6</li> </ul>	<p>10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1 g</p> <p>5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1 g</p>	
<b>Shock testing</b>		
<ul style="list-style-type: none"> <li>Shock resistance during operation acc. to IEC 60068-2-27</li> <li>Shock resistance during storage acc. to IEC 60068-2-29</li> </ul>	<p>15 g / 11 ms / 3 shocks/axis</p> <p>25 g / 6 ms / 1 000 shocks/axis</p>	
<b>Dimensions</b>		
Width	36 mm	
Height	285 mm	
Depth	281 mm	

## 13.4.2 Technical Specifications POM4320

### Technical specifications of POM4320 busbar mounting (-0AA2)

Article number	6BK1943-2AA00-0AA2	6BK1943-2BA00-0AA2
<b>General information</b>		
Product type designation	POM4320 BUSBAR MOUNTING (IEC)	POM4320 BUSBAR MOUNTING (UL)
<b>Installation type/mounting</b>		
Mounting type	Busbar mounting	
Mounting position	vertical	
Type of ventilation	Self-ventilation	
<b>Supply voltage</b>		
Type of supply voltage	AC	
Rated value (AC)	400 V	
• Relative negative tolerance	10 %	
• Relative positive tolerance	30 %	
2nd rated value (AC)	480 V	
• Relative negative tolerance	25 %	
• Relative positive tolerance	8 %	
<b>Line frequency</b>		
• Rated value 50 Hz	Yes	
• Rated value 60 Hz	Yes	
• Relative symmetrical tolerance	5 %	
<b>Mains buffering</b>		
• Recovery time after power failure, typ.	1 s	
<b>Connection method</b>		
• Design of electrical connection for supply voltage	Busbar mounting, 3-pole + PE	
<b>Input voltage</b>		
Design of the power supply	Power supply via CIM	
<b>Power</b>		
Active power input, max.	8 W	
<b>Power electronics</b>		
Type of load	Ohmic load	
Power capacity, max.	57.6 kW; At 400 V AC	64.8 kW; At 480 V AC
• For phase against phase with fan at 40 °C, max.	57.6 kW; At 400 V AC	64.8 kW; At 480 V AC
Switching capacity current per phase, max.	83 A	80 A
Short-time withstand current (SCCR) acc. to UL 508A		100 kA

Article number	6BK1943-2AA00-0AA2	6BK1943-2BA00-0AA2
<b>Control of heating elements</b>		
• Half-wave control	Yes	
• Soft start	Yes	
• Phase control	Yes	
<b>Load connection type</b>		
• Star connection with neutral conductor (single-phase)	No	
• Open delta connection (single-phase)	Yes; Incoming fuse contained in the device	
• Closed delta connection (3-phase)	No	
• Star connection with neutral conductor (2-phase)	No	
• 2-pole switching	No	
<b>Setpoint input</b>		
• Percent	Yes	
• Watts	No	
<b>Heating power</b>		
• Number of digital outputs	9	
• Number of heating elements per output, max.	1	
• Output voltage for heating power	400 V	
• 2nd output voltage for heating power	480 V	
• Power carrying capacity per output, min.	200 W; At 400 V AC	200 W; At 480 V AC
• Power carrying capacity per output, max.	6 400 W; At 400 V AC	7 200 W; At 480 V AC
– for heating elements with high inrush current, max.	4 000 W; At 400 V AC	4 000 W; At 480 V AC
• Output current for heating power	16 A; max.	15 A; max.
• Melting I <sup>2</sup> t value	250 A <sup>2</sup> ·s	400 A <sup>2</sup> ·s
• Design of short-circuit protection per output	Fuse 16 A	Melting fuse 20 A
• Design of overvoltage protection	Transil Diode	
<b>Connection method</b>		
• Design of electrical connection at output for heating and fan	Connector, 3-pole with spring-loaded connection	
– Connectable conductor cross-sections, solid	1x (0.2 ... 10 mm <sup>2</sup> )	

Article number	6BK1943-2AA00-0AA2	6BK1943-2BA00-0AA2
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, finely stranded with wire end processing</li> <li>– Connectable conductor cross-sections for AWG cables, stranded</li> </ul>	1x (0.25 ... 6 mm <sup>2</sup> )	
	1x (24 ... 8)	
<b>Interfaces</b>		
Interfaces/bus type	system interface	
<b>Interrupts/diagnostics/status information</b>		
Number of status displays	12	
LED status display	LED green = ready, LED yellow = heating on/off, LED red = error display, LED red = error for each channel	
Diagnostics function	Voltage diagnostics	
<b>Diagnoses</b>		
<ul style="list-style-type: none"> <li>• Fuse blown</li> <li>• Load failure</li> <li>• Triac error</li> <li>• Switch-off threshold for internal device temperature</li> <li>• Parallel-connected heating elements</li> <li>• Rotating field fault</li> <li>• Communication error</li> <li>• Supply voltage not connected</li> <li>• Line voltage outside the permissible range</li> <li>• Frequency outside the permissible range</li> <li>• Fault current too high</li> </ul>	Yes	
	Yes	
	Yes	
	Yes	
	No	
	Yes	
	Yes	
	Yes	
	Yes	
	No	
<b>Integrated Functions</b>		
<b>Monitoring functions</b>		
<ul style="list-style-type: none"> <li>• Temperature monitoring</li> <li>• Type of temperature monitoring</li> </ul>	Yes	
	NTC thermistor	
<b>Measuring functions</b>		
<ul style="list-style-type: none"> <li>• Voltage measurement</li> <li>• Current measurement</li> <li>• Fault current detection</li> </ul>	Yes	
	No	
	No	
<b>Potential separation</b>		
Design of electrical isolation between the outputs	Optocoupler and/or protective impedance between main circuit and PELV	
	No	



Article number	6BK1943-2AA00-0AA2	6BK1943-2BA00-0AA2
<b>Isolation</b>		
Overvoltage category	III	
<b>EMC</b>		
EMC interference emission	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011	
Electrostatic discharge acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge	
Field-related interference acc. to IEC 61000-4-3	10 V/m (80 ... 1 000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)	
Conducted interference due to burst acc. to IEC 61000-4-4	2 kV power supply lines, 2 kV load lines	
Conducted interference due to surge acc. to IEC 61000-4-5	on supply and load lines: 1 kV symmetric, 2 kV unsymmetric	
Conducted interference due to high-frequency radiation acc. to IEC 61000-4-6	10 V (0.15 ... 80 MHz)	
<b>Ambient conditions</b>		
<b>Ambient temperature during operation</b>		
• min.	0 °C	
• max.	55 °C	
<b>Ambient temperature during storage/transportation</b>		
• Storage, min.	-25 °C	
• Storage, max.	70 °C	
• Transportation, min.	-25 °C	
• Transportation, max.	70 °C	
<b>Air pressure acc. to IEC 60068-2-13</b>		
• Operation, min.	860 hPa	
• Operation, max.	1 080 hPa	
• Storage, min.	660 hPa	
• Storage, max.	1 080 hPa	
<b>Altitude during operation relating to sea level</b>		
• Installation altitude above sea level, max.	2 000 m	
<b>Relative humidity</b>		
• Operation at 25 °C, max.	95 %	
• Operation at 50 °C, max.	50 %; 95 % at 25 °C, decreasing linearly to 50 % at 50 °C	
<b>Vibrations</b>		
• Vibration resistance during operation acc. to IEC 60068-2-6	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1 g	
• Vibration resistance during storage acc. to IEC 60068-2-6	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1 g	

Article number	6BK1943-2AA00-0AA2	6BK1943-2BA00-0AA2
<b>Shock testing</b>		
<ul style="list-style-type: none"> <li>Shock resistance during operation acc. to IEC 60068-2-27</li> <li>Shock resistance during storage acc. to IEC 60068-2-29</li> </ul>	15 g / 11 ms / 3 shocks/axis	25 g / 6 ms / 1 000 shocks/axis
<b>Dimensions</b>		
Width	104 mm	
Height	340 mm	
Depth	250 mm	

## Technical specifications of POM4320 rear panel mounting (-0AA2)

Article number	6BK1943-2CA00-0AA2	6BK1943-2DA00-0AA2
<b>General information</b>		
Product type designation	POM4320 rear panel mounting (IEC)	POM4320 rear panel mounting (UL)
<b>Installation type/mounting</b>		
Mounting type	Backplane mounting	
Mounting position	vertical	
Type of ventilation	Self-ventilation	
<b>Supply voltage</b>		
Type of supply voltage	AC	
Rated value (AC)	400 V	
• Relative negative tolerance	10 %	
• Relative positive tolerance	30 %	
2nd rated value (AC)	480 V	
• Relative negative tolerance	25 %	
• Relative positive tolerance	8 %	
<b>Line frequency</b>		
• Rated value 50 Hz	Yes	
• Rated value 60 Hz	Yes	
• Relative symmetrical tolerance	5 %	
<b>Mains buffering</b>		
• Recovery time after power failure, typ.	1 s	
<b>Connection method</b>		
• Design of electrical connection for supply voltage	Terminal, 3-pin	
– Connectable conductor cross-sections, solid	1x (1.5 ... 50 mm <sup>2</sup> )	
– Connectable conductor cross-sections, finely stranded with wire end processing	1x (1.5 ... 35 mm <sup>2</sup> )	
– Connectable conductor cross-sections for AWG cables	1x (16 ... 1)	
<b>Input voltage</b>		
Design of the power supply	Power supply via CIM	
<b>Power</b>		
Active power input, max.	8 W	
<b>Power electronics</b>		
Type of load	Ohmic load	
Power capacity, max.	57.6 kW; At 400 V AC	64.8 kW; At 480 V AC
• For phase against phase with fan at 40 °C, max.	57.6 kW; At 400 V AC	64.8 kW; At 480 V AC

13.4 Technical specifications of POM

Article number	6BK1943-2CA00-0AA2	6BK1943-2DA00-0AA2
Switching capacity current per phase, max.	83 A	80 A
Short-time withstand current (SCCR) acc. to UL 508A		100 kA
<b>Control of heating elements</b>		
• Half-wave control	Yes	
• Soft start	Yes	
• Phase control	Yes	
<b>Load connection type</b>		
• Star connection with neutral conductor (single-phase)	No	
• Open delta connection (single-phase)	Yes; Incoming fuse contained in the device	
• Closed delta connection (3-phase)	No	
• Star connection with neutral conductor (2-phase)	No	
• 2-pole switching	No	
<b>Setpoint input</b>		
• Percent	Yes	
• Watts	No	
<b>Heating power</b>		
• Number of digital outputs	9	
• Number of heating elements per output, max.	1	
• Output voltage for heating power	400 V	
• 2nd output voltage for heating power	480 V	
• Power carrying capacity per output, min.	200 W; At 400 V AC	200 W; At 480 V AC
• Power carrying capacity per output, max.	6 400 W; At 400 V AC	7 200 W; At 480 V AC
– for heating elements with high inrush current, max.	4 000 W; At 400 V AC	4 000 W; At 480 V AC
• Output current for heating power	16 A; max.	15 A; max.
• Melting I <sup>2</sup> t value	250 A <sup>2</sup> ·s	400 A <sup>2</sup> ·s
• Design of short-circuit protection per output	Fuse 16 A	Melting fuse 20 A
• Design of overvoltage protection	Transil Diode	

Article number	6BK1943-2CA00-0AA2	6BK1943-2DA00-0AA2
<b>Connection method</b>		
<ul style="list-style-type: none"> <li>• Design of electrical connection at output for heating and fan</li> </ul>	Connector, 3-pole with spring-loaded connection	
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, solid</li> </ul>	1x (0.2 ... 10 mm <sup>2</sup> )	
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, finely stranded with wire end processing</li> </ul>	1x (0.25 ... 6 mm <sup>2</sup> )	
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections for AWG cables, stranded</li> </ul>	1x (24 ... 8)	
<b>Interfaces</b>		
Interfaces/bus type	system interface	
<b>Interrupts/diagnostics/status information</b>		
Number of status displays	12	
LED status display	LED green = ready, LED yellow = heating on/off, LED red = error display, LED red = error for each channel	
Diagnostics function	Voltage diagnostics	
<b>Diagnoses</b>		
<ul style="list-style-type: none"> <li>• Fuse blown</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>• Load failure</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>• Triac error</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>• Switch-off threshold for internal device temperature</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>• Parallel-connected heating elements</li> </ul>	No	
<ul style="list-style-type: none"> <li>• Rotating field fault</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>• Communication error</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>• Supply voltage not connected</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>• Line voltage outside the permissible range</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>• Frequency outside the permissible range</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>• Fault current too high</li> </ul>	No	
<b>Integrated Functions</b>		
<b>Monitoring functions</b>		
<ul style="list-style-type: none"> <li>• Temperature monitoring</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>• Type of temperature monitoring</li> </ul>	NTC thermistor	
<b>Measuring functions</b>		
<ul style="list-style-type: none"> <li>• Voltage measurement</li> </ul>	Yes	
<ul style="list-style-type: none"> <li>• Current measurement</li> </ul>	No	
<ul style="list-style-type: none"> <li>• Fault current detection</li> </ul>	No	

Article number	6BK1943-2CA00-0AA2	6BK1943-2DA00-0AA2
<b>Potential separation</b>		
Design of electrical isolation between the outputs	Optocoupler and/or protective impedance between main circuit and PELV No	
<b>Isolation</b>		
Overtoltage category	III	
<b>EMC</b>		
EMC interference emission	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011	
Electrostatic discharge acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge	
Field-related interference acc. to IEC 61000-4-3	10 V/m (80 ... 1 000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)	
Conducted interference due to burst acc. to IEC 61000-4-4	2 kV power supply lines, 2 kV load lines	
Conducted interference due to surge acc. to IEC 61000-4-5	on supply and load lines: 1 kV symmetric, 2 kV unsymmetric	
Conducted interference due to high-frequency radiation acc. to IEC 61000-4-6	10 V (0.15 ... 80 MHz)	
<b>Ambient conditions</b>		
<b>Ambient temperature during operation</b>		
• min.	0 °C	
• max.	55 °C	
<b>Ambient temperature during storage/transportation</b>		
• Storage, min.	-25 °C	
• Storage, max.	70 °C	
• Transportation, min.	-25 °C	
• Transportation, max.	70 °C	
<b>Air pressure acc. to IEC 60068-2-13</b>		
• Operation, min.	860 hPa	
• Operation, max.	1 080 hPa	
• Storage, min.	660 hPa	
• Storage, max.	1 080 hPa	
<b>Altitude during operation relating to sea level</b>		
• Installation altitude above sea level, max.	2 000 m	
<b>Relative humidity</b>		
• Operation at 25 °C, max.	95 %	
• Operation at 50 °C, max.	50 %; 95 % at 25 °C, decreasing linearly to 50 % at 50 °C	

Article number	6BK1943-2CA00-0AA2	6BK1943-2DA00-0AA2
<b>Vibrations</b>		
<ul style="list-style-type: none"> <li>Vibration resistance during operation acc. to IEC 60068-2-6</li> </ul>	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1 g	
<ul style="list-style-type: none"> <li>Vibration resistance during storage acc. to IEC 60068-2-6</li> </ul>	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1 g	
<b>Shock testing</b>		
<ul style="list-style-type: none"> <li>Shock resistance during operation acc. to IEC 60068-2-27</li> </ul>	15 g / 11 ms / 3 shocks/axis	
<ul style="list-style-type: none"> <li>Shock resistance during storage acc. to IEC 60068-2-29</li> </ul>	25 g / 6 ms / 1 000 shocks/axis	
<b>Dimensions</b>		
Width	104 mm	
Height	344 mm	
Depth	217 mm	

## 13.5 Technical specifications for I/O module

### PM4000 DI/DO

<b>Article number</b>	<b>6BK1900-0BA00-0AA0</b>
<b>General information</b>	
Product type designation	PM4000 DI/DO
<b>Installation type/mounting</b>	
Mounting type	Screw mounting to CIM
Mounting position	vertical
Type of ventilation	Forced ventilation
<b>Supply voltage</b>	
Design of the power supply	Power supply via CIM
<b>Power</b>	
Active power input, max.	1 W
<b>Digital inputs</b>	
Number of digital inputs	8
<b>Connection method</b>	
<ul style="list-style-type: none"> <li>• Design of electrical connection at the digital inputs</li> </ul>	1x 18 pole connector with spring-loaded connection
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, solid</li> </ul>	1x (0.2 ... 1.5 mm <sup>2</sup> )
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, finely stranded with wire end processing</li> </ul>	1x (0.25 ... 1.5 mm <sup>2</sup> )
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections for AWG cables</li> </ul>	1x (24 ... 16)
<b>Digital outputs</b>	
Type of digital output	semiconductor output (high side switch)
Number of digital outputs	16
Switching performance	monostable
short-circuit proof	Yes
<b>Output voltage</b>	
<ul style="list-style-type: none"> <li>• Type of output voltage</li> </ul>	DC
<ul style="list-style-type: none"> <li>• Rated value (DC)</li> </ul>	24 V
<ul style="list-style-type: none"> <li>• permissible voltage at output, min.</li> </ul>	19.2 V
<ul style="list-style-type: none"> <li>• permissible voltage at output, max.</li> </ul>	28.8 V
<b>Output current</b>	
<ul style="list-style-type: none"> <li>• for signal "1" permissible range, max.</li> </ul>	500 mA
<b>Connection method</b>	
<ul style="list-style-type: none"> <li>• Design of electrical connection at the digital outputs</li> </ul>	2x 18 pole connector with spring-loaded connection
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, solid</li> </ul>	1x (0.2 ... 1.5 mm <sup>2</sup> )



<b>Article number</b>	<b>6BK1900-OBA00-OAA0</b>
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, finely stranded with wire end processing</li> <li>– Connectable conductor cross-sections for AWG cables</li> <li>• Design of electrical connection for control supply voltage</li> <li>– Connectable conductor cross-sections with wire end processing</li> <li>– Connectable conductor cross-sections for AWG cables</li> </ul>	1x (0.25 ... 1.5 mm <sup>2</sup> )  1x (24 ... 16)  2x 18 pole connector with spring-loaded connection  1x (0.25 ... 1.5 mm <sup>2</sup> )  1x (24 ... 16)
<b>Interfaces</b>	
Interfaces/bus type	system interface
<b>Interrupts/diagnostics/status information</b>	
Number of status displays	18
LED status display	LED green = Ready, LED red = Error display, 1 LED yellow per output: LED on - H status; LED off -L status
<b>Potential separation</b>	
between outputs and system interface	Yes
<b>Isolation</b>	
Overvoltage category	III
<b>EMC</b>	
EMC interference emission	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011
Electrostatic discharge acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge
Field-related interference acc. to IEC 61000-4-3	10 V/m (80 ... 1 000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)
Conducted interference due to burst acc. to IEC 61000-4-4	2 kV signal lines
Conducted interference due to surge acc. to IEC 61000-4-5	DC supply cables: 0.5 kV balanced and unbalanced
Conducted interference due to high-frequency radiation acc. to IEC 61000-4-6	10 V (0.15 ... 80 MHz)
<b>Ambient conditions</b>	
<b>Ambient temperature during operation</b>	
• min.	0 °C
• max.	55 °C
<b>Ambient temperature during storage/transportation</b>	
• Storage, min.	-25 °C
• Storage, max.	70 °C
• Transportation, min.	-25 °C
• Transportation, max.	70 °C

<b>Article number</b>	<b>6BK1900-0BA00-0AA0</b>
<b>Air pressure acc. to IEC 60068-2-13</b>	
• Operation, min.	860 hPa
• Operation, max.	1 080 hPa
• Storage, min.	660 hPa
• Storage, max.	1 080 hPa
<b>Altitude during operation relating to sea level</b>	
• Installation altitude above sea level, max.	2 000 m
<b>Relative humidity</b>	
• Operation at 25 °C, max.	95 %
• Operation at 50 °C, max.	50 %; 95 % at 25 °C, decreasing linearly to 50 % at 50 °C
<b>Vibrations</b>	
• Vibration resistance during operation acc. to IEC 60068-2-6	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1 g
• Vibration resistance during storage acc. to IEC 60068-2-6	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1 g
<b>Shock testing</b>	
• Shock resistance during operation acc. to IEC 60068-2-27	15 g / 11 ms / 3 shocks/axis
• Shock resistance during storage acc. to IEC 60068-2-29	25 g / 6 ms / 1 000 shocks/axis
<b>Dimensions</b>	
Width	27 mm
Height	141 mm
Depth	110 mm

## PM4000 U/I

<b>Article number</b>	<b>6BK1900-OCA00-OAA0</b>
<b>General information</b>	
Product type designation	For PM4000 U/I
<b>Installation type/mounting</b>	
Mounting type	Screw mounting to CIM
Mounting position	vertical
Type of ventilation	Forced ventilation
<b>Supply voltage</b>	
Design of the power supply	Power supply via CIM
<b>Power</b>	
Active power input, max.	1 W
<b>Interfaces</b>	
Interfaces/bus type	system interface
<b>Interrupts/diagnostics/status information</b>	
Number of status displays	2
LED status display	LED green = Ready, LED red = Error display
<b>Integrated Functions</b>	
<b>Measuring functions</b>	
• Voltage measurement	Yes
• Current measurement	Yes
<b>Operating mode for measured value acquisition</b>	
– Operating frequency, min.	50 Hz
– Operating frequency, max.	60 Hz
<b>Measuring inputs for voltage</b>	
– Voltage measurement range, min.	230 V
– Voltage measuring range, max.	480 V
– Relative measuring accuracy voltage	0.5 %
– Design of electrical connection at the measuring inputs for voltage	plug, 6-pole with spring-type terminal, push-in
– Connectable conductor cross-sections, solid	1x (0.2 ... 10 mm <sup>2</sup> )
– Connectable conductor cross-sections, finely stranded with wire end processing	1x (0.25 ... 6 mm <sup>2</sup> )
– Connectable conductor cross-sections for AWG cables	1x (24 ... 8)
<b>Measuring inputs for current</b>	
– Current measurement range, min.	0 A
– Current measurement range, max.	5 A
– Relative measuring accuracy current	0.5 %
– Design of electrical connection at the measuring inputs for current	plug, 8-pole with spring-type terminal, push-in

<b>Article number</b>	<b>6BK1900-0CA00-0AA0</b>
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, solid</li> <li>– Connectable conductor cross-sections, finely stranded with wire end processing</li> <li>– Connectable conductor cross-sections for AWG cables</li> </ul>	<p>1x (0.2 ... 1.5 mm<sup>2</sup>)</p> <p>1x (0.2 ... 1.5 mm<sup>2</sup>)</p> <p>1x (24 ... 16)</p>
<b>Isolation</b>	
Overvoltage category	III
<b>EMC</b>	
EMC interference emission	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011
Electrostatic discharge acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge
Field-related interference acc. to IEC 61000-4-3	10 V/m (80 ... 1 000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)
Conducted interference due to burst acc. to IEC 61000-4-4	2 kV signal lines
Conducted interference due to surge acc. to IEC 61000-4-5	Voltage measurement inputs: 1 kV balanced, 2 kV unbalanced
Conducted interference due to high-frequency radiation acc. to IEC 61000-4-6	10 V (0.15 ... 80 MHz)
<b>Ambient conditions</b>	
<b>Ambient temperature during operation</b>	
<ul style="list-style-type: none"> <li>• min.</li> <li>• max.</li> </ul>	<p>0 °C</p> <p>55 °C</p>
<b>Ambient temperature during storage/transportation</b>	
<ul style="list-style-type: none"> <li>• Storage, min.</li> <li>• Storage, max.</li> <li>• Transportation, min.</li> <li>• Transportation, max.</li> </ul>	<p>-25 °C</p> <p>70 °C</p> <p>-25 °C</p> <p>70 °C</p>
<b>Air pressure acc. to IEC 60068-2-13</b>	
<ul style="list-style-type: none"> <li>• Operation, min.</li> <li>• Operation, max.</li> <li>• Storage, min.</li> <li>• Storage, max.</li> </ul>	<p>860 hPa</p> <p>1 080 hPa</p> <p>660 hPa</p> <p>1 080 hPa</p>
<b>Altitude during operation relating to sea level</b>	
<ul style="list-style-type: none"> <li>• Installation altitude above sea level, max.</li> </ul>	2 000 m
<b>Relative humidity</b>	
<ul style="list-style-type: none"> <li>• Operation at 25 °C, max.</li> <li>• Operation at 50 °C, max.</li> </ul>	<p>95 %</p> <p>50 %; 95 % at 25 °C, decreasing linearly to 50 % at 50 °C</p>

<b>Article number</b>	<b>6BK1900-OCA00-0AA0</b>
<b>Vibrations</b>	
<ul style="list-style-type: none"> <li>Vibration resistance during operation acc. to IEC 60068-2-6</li> </ul>	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1 g
<ul style="list-style-type: none"> <li>Vibration resistance during storage acc. to IEC 60068-2-6</li> </ul>	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1 g
<b>Shock testing</b>	
<ul style="list-style-type: none"> <li>Shock resistance during operation acc. to IEC 60068-2-27</li> </ul>	15 g / 11 ms / 3 shocks/axis
<ul style="list-style-type: none"> <li>Shock resistance during storage acc. to IEC 60068-2-29</li> </ul>	25 g / 6 ms / 1 000 shocks/axis
<b>Dimensions</b>	
Width	27 mm
Height	141 mm
Depth	110 mm

## PM4000 Temperature

<b>Article number</b>	<b>6BK1900-0AA00-0AA0</b>
<b>General information</b>	
Product type designation	PM4000 temperature
<b>Installation type/mounting</b>	
Mounting type	Screw mounting to CIM
Mounting position	vertical
Type of ventilation	Forced ventilation
<b>Supply voltage</b>	
Design of the power supply	Power supply via CIM
<b>Power</b>	
Active power input, max.	1 W
<b>Analog inputs</b>	
Number of analog inputs	
• for 2-wire system	4
• for 4-wire system	2
Type of A/D conversion	Sigma Delta
Conversion time	150 ms
Sensor current, typ.	210 µA
Impulse voltage resistance, max.	15 V
<b>Input ranges</b>	
• Thermocouple	Yes
• Resistance thermometer	Yes
<b>Measuring range</b>	
• Temperature for type J thermocouple, min.	0 °C
• Temperature for type J thermocouple, max.	650 °C
• Temperature for type K thermocouple, min.	0 °C
• Temperature for type K thermocouple, max.	440 °C
• Temperature for type L thermocouple, min.	0 °C
• Temperature for type L thermocouple, max.	640 °C
• Temperature for Pt 100 according to IEC 60751, min.	0 °C
• Temperature for Pt 100 according to IEC 60751, max.	410 °C
• Temperature for Pt 1000 according to IEC 60751, min.	0 °C
• Temperature for Pt 1000 according to IEC 60751, max.	850 °C
<b>Errors/accuracies</b>	
• Temperature drift per °C, typ.	0.05 %/°C
• Temperature offset per K, max.	0.1 K/K

<b>Article number</b>	<b>6BK1900-0AA00-0AA0</b>
<b>Connection method</b>	
<ul style="list-style-type: none"> <li>• Design of electrical connection for temperature sensors <ul style="list-style-type: none"> <li>– Connectable conductor cross-sections for AWG cables</li> <li>– Connectable conductor cross-sections, solid</li> <li>– Connectable conductor cross-sections with wire end processing</li> </ul> </li> </ul>	<p>plug, 8-pole with spring-type terminal, push-in</p> <p>1x (24 ... 16)</p> <p>1x (0.2 ... 1.5 mm<sup>2</sup>)</p> <p>1x (0.25 ... 1.5 mm<sup>2</sup>)</p>
<b>Interfaces</b>	
Interfaces/bus type	system interface
<b>Interrupts/diagnostics/status information</b>	
Number of status displays	2
LED status display	LED green = Ready, LED red = Error display
<b>Integrated Functions</b>	
<b>Measuring functions</b>	
<ul style="list-style-type: none"> <li>• Current measurement</li> </ul>	Yes
<b>Measuring inputs for current</b>	
<ul style="list-style-type: none"> <li>– Current measurement range, min.</li> <li>– Current measurement range, max.</li> <li>– Relative measuring accuracy current</li> <li>– Design of electrical connection at the measuring inputs for current</li> <li>– Connectable conductor cross-sections, solid</li> <li>– Connectable conductor cross-sections, finely stranded with wire end processing</li> <li>– Connectable conductor cross-sections for AWG cables</li> </ul>	<p>0 mA</p> <p>20 mA</p> <p>0.5 %</p> <p>plug, 8-pole with spring-type terminal, push-in</p> <p>1x (0.2 ... 1.5 mm<sup>2</sup>)</p> <p>1x (0.25 ... 1.5 mm<sup>2</sup>)</p> <p>1x (24 ... 16)</p>
<b>Potential separation</b>	
between the channels	No
<b>Isolation</b>	
Overvoltage category	III
<b>EMC</b>	
EMC interference emission	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011
Electrostatic discharge acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge
Field-related interference acc. to IEC 61000-4-3	10 V/m (80 ... 1 000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)
Conducted interference due to burst acc. to IEC 61000-4-4	2 kV signal lines
Conducted interference due to surge acc. to IEC 61000-4-5	Not applicable
Conducted interference due to high-frequency radiation acc. to IEC 61000-4-6	10 V (0.15 ... 80 MHz)

<b>Article number</b>	<b>6BK1900-0AA00-0AA0</b>
<b>Ambient conditions</b>	
<b>Ambient temperature during operation</b>	
• min.	0 °C
• max.	55 °C
<b>Ambient temperature during storage/transportation</b>	
• Storage, min.	-25 °C
• Storage, max.	70 °C
• Transportation, min.	-25 °C
• Transportation, max.	70 °C
<b>Air pressure acc. to IEC 60068-2-13</b>	
• Operation, min.	860 hPa
• Operation, max.	1 080 hPa
• Storage, min.	660 hPa
• Storage, max.	1 080 hPa
<b>Altitude during operation relating to sea level</b>	
• Installation altitude above sea level, max.	2 000 m
<b>Relative humidity</b>	
• Operation at 25 °C, max.	95 %
• Operation at 50 °C, max.	50 %; 95 % at 25 °C, decreasing linearly to 50 % at 50 °C
<b>Vibrations</b>	
• Vibration resistance during operation acc. to IEC 60068-2-6	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1 g
• Vibration resistance during storage acc. to IEC 60068-2-6	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1 g
<b>Shock testing</b>	
• Shock resistance during operation acc. to IEC 60068-2-27	15 g / 11 ms / 3 shocks/axis
• Shock resistance during storage acc. to IEC 60068-2-29	25 g / 6 ms / 1 000 shocks/axis
<b>Dimensions</b>	
Width	27 mm
Height	141 mm
Depth	110 mm



## 13.6 Technical specifications for fan module

Article number	6BK1942-4AA00-0AA0	6BK1942-4BA00-0AA0
<b>General information</b>		
Product type designation	FM4240 fan module	FM4240 fan module HP
<b>Installation type/mounting</b>		
Mounting type	Screw mounting to rack	
Mounting position	Horizontal	
Type of ventilation	Self-ventilation	
<b>Supply voltage</b>		
Design of the power supply	Power supply via rack	external
<b>Power</b>		
Active power input	10 W	12 W
Active power input, max.		48 W; fan start
<b>EMC</b>		
EMC interference emission	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011	
Electrostatic discharge acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge	
Field-related interference acc. to IEC 61000-4-3	10 V/m (80 ... 1 000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)	
<b>Standards, approvals, certificates</b>		
reference designation according to IEC 81346-2 (2009)	G	
<b>Ambient conditions</b>		
<b>Ambient temperature during operation</b>		
• min.	0 °C	
• max.	55 °C	
<b>Ambient temperature during storage/transportation</b>		
• Storage, min.	-25 °C	
• Storage, max.	70 °C	
• Transportation, min.	-25 °C	
• Transportation, max.	70 °C	
<b>Air pressure acc. to IEC 60068-2-13</b>		
• Operation, min.	860 hPa	
• Operation, max.	1 080 hPa	
• Storage, min.	660 hPa	
• Storage, max.	1 080 hPa	
<b>Altitude during operation relating to sea level</b>		
• Installation altitude above sea level, max.	2 000 m	

13.6 Technical specifications for fan module

Article number	6BK1942-4AA00-0AA0	6BK1942-4BA00-0AA0
<b>Relative humidity</b>		
<ul style="list-style-type: none"> <li>• Operation at 25 °C, max.</li> </ul>	95 %	
<ul style="list-style-type: none"> <li>• Operation at 50 °C, max.</li> </ul>	50 %; 95 % at 25 °C, decreasing linearly to 50 % at 50 °C	
<b>Vibrations</b>		
<ul style="list-style-type: none"> <li>• Vibration resistance during operation acc. to IEC 60068-2-6</li> </ul>	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1 g	
<ul style="list-style-type: none"> <li>• Vibration resistance during storage acc. to IEC 60068-2-6</li> </ul>	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1 g	
<b>Shock testing</b>		
<ul style="list-style-type: none"> <li>• Shock resistance during operation acc. to IEC 60068-2-27</li> </ul>	15 g / 11 ms / 3 shocks/axis	
<ul style="list-style-type: none"> <li>• Shock resistance during storage acc. to IEC 60068-2-29</li> </ul>	25 g / 6 ms / 1 000 shocks/axis	
<b>Dimensions</b>		
Width	142 mm	
Height	94 mm	
Depth	274 mm	

(for combined mode only)

## 13.7 Technical specifications of expansion module EM4315 (for combined mode only)

<b>Article number</b>	<b>6BK1943-1AA50-0AA0</b>
<b>General information</b>	
Product type designation	EM4315
<b>Installation type/mounting</b>	
Mounting type	Screw mounting to POM
Mounting position	vertical
Type of ventilation	Forced ventilation
<b>Supply voltage</b>	
Type of supply voltage	DC
Rated value (DC)	24 V
relative symmetrical tolerance of the supply voltage	20 %
<b>Connection method</b>	
<ul style="list-style-type: none"> <li>• Design of electrical connection for supply voltage</li> </ul>	Connector 2x 2-pin with tension spring connection
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, solid</li> </ul>	1x (0.2 ... 2.5 mm <sup>2</sup> )
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections, finely stranded with wire end processing</li> </ul>	1x (0.2 ... 2.5 mm <sup>2</sup> )
<ul style="list-style-type: none"> <li>– Connectable conductor cross-sections for AWG cables</li> </ul>	1x (26 ... 12)
<b>Power</b>	
Active power input	1 W
<b>Hardware configuration</b>	
<b>Slots</b>	
<ul style="list-style-type: none"> <li>• Number of slots</li> </ul>	0
<b>Interfaces</b>	
Interfaces/bus type	system interface
<b>Protocols</b>	
Supports protocol for PROFINET IO	No
PROFIBUS DP	No
<b>Further protocols</b>	
<ul style="list-style-type: none"> <li>• EtherNet/IP</li> </ul>	No
<b>Interrupts/diagnostics/status information</b>	
Number of status displays	1
LED status display	LED green = ready
<b>Isolation</b>	
Overvoltage category	III

13.7 Technical specifications of expansion module EM4315  
(for combined mode only)

Article number	6BK1943-1AA50-0AA0
<b>EMC</b>	
EMC interference emission	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011
Electrostatic discharge acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge
Field-related interference acc. to IEC 61000-4-3	10 V/m (80 ... 1 000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)
Conducted interference due to burst acc. to IEC 61000-4-4	2 kV power supply lines
Conducted interference due to surge acc. to IEC 61000-4-5	On DC supply lines: 0.5 kV symmetrical and asymmetrical
Conducted interference due to high-frequency radiation acc. to IEC 61000-4-6	10 V (0.15 ... 80 MHz)
<b>Ambient conditions</b>	
<b>Ambient temperature during operation</b>	
• min.	0 °C
• max.	55 °C
<b>Ambient temperature during storage/transportation</b>	
• Storage, min.	-25 °C
• Storage, max.	70 °C
• Transportation, min.	-25 °C
• Transportation, max.	70 °C
<b>Air pressure acc. to IEC 60068-2-13</b>	
• Operation, min.	860 hPa
• Operation, max.	1 080 hPa
• Storage, min.	660 hPa
• Storage, max.	1 080 hPa
<b>Altitude during operation relating to sea level</b>	
• Installation altitude above sea level, max.	2 000 m
<b>Relative humidity</b>	
• Operation at 25 °C, max.	95 %
• Operation at 50 °C, max.	50 %; 95 % at 25 °C, decreasing linearly to 50 % at 50 °C
<b>Vibrations</b>	
• Vibration resistance during operation acc. to IEC 60068-2-6	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1 g
• Vibration resistance during storage acc. to IEC 60068-2-6	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1 g
<b>Shock testing</b>	
• Shock resistance during operation acc. to IEC 60068-2-27	15 g / 11 ms / 3 shocks/axis

(for combined mode only)

<b>Article number</b>	<b>6BK1943-1AA50-0AA0</b>
<ul style="list-style-type: none"> <li>Shock resistance during storage acc. to IEC 60068-2-29</li> </ul>	25 g / 6 ms / 1 000 shocks/axis
<b>Dimensions</b>	
Width	56 mm
Height	285 mm
Depth	122 mm

## 13.8 Dimension drawings

### 13.8.1 HCS4200 components

#### HCS4200 with Rack4200 for 12 POM full configuration

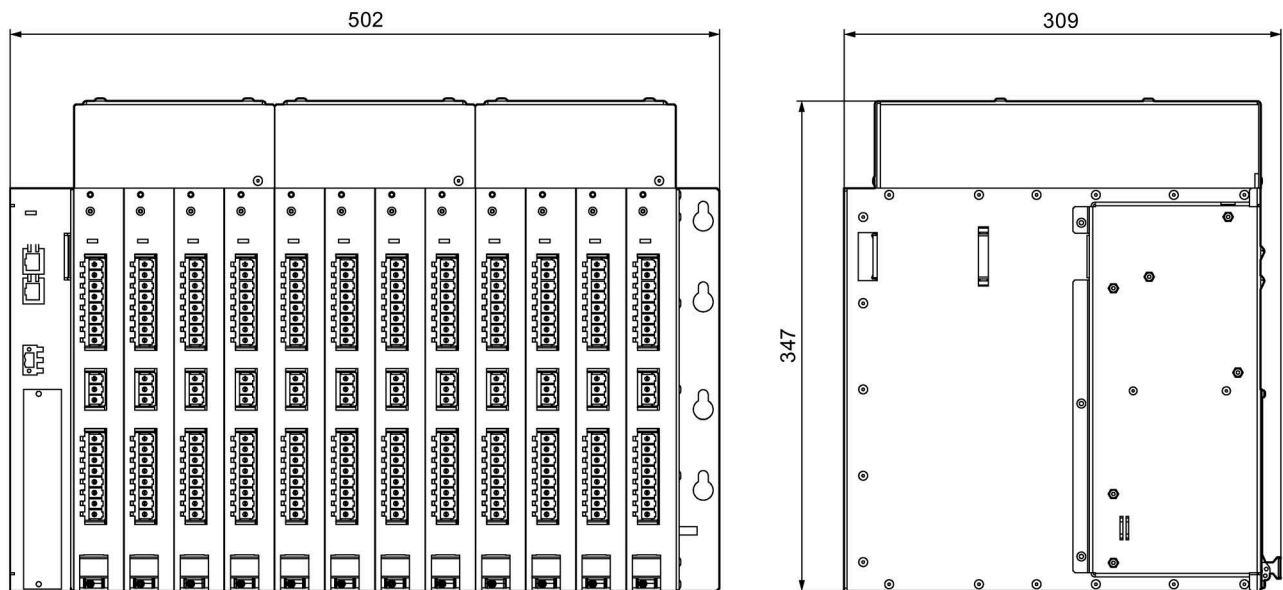


Figure 13-1 Dimensions of HCS4200 with Rack4200 for 12 POMs, full configuration

#### Rack4200 for 12 POMs

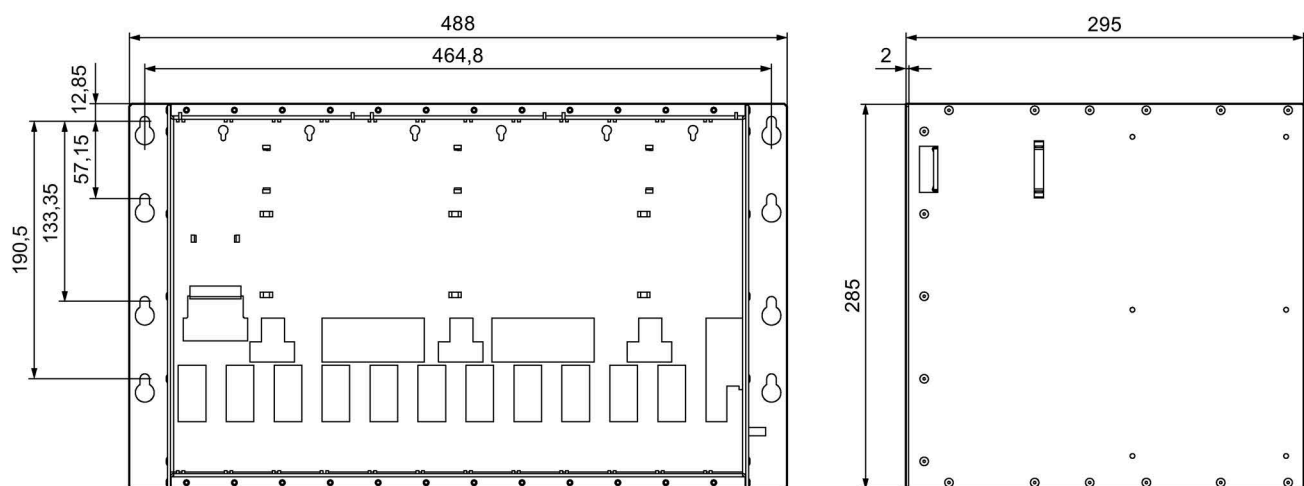


Figure 13-2 Dimension drawing for Rack 4200 for 12 POMs

### Rack4200 for 4 POMs

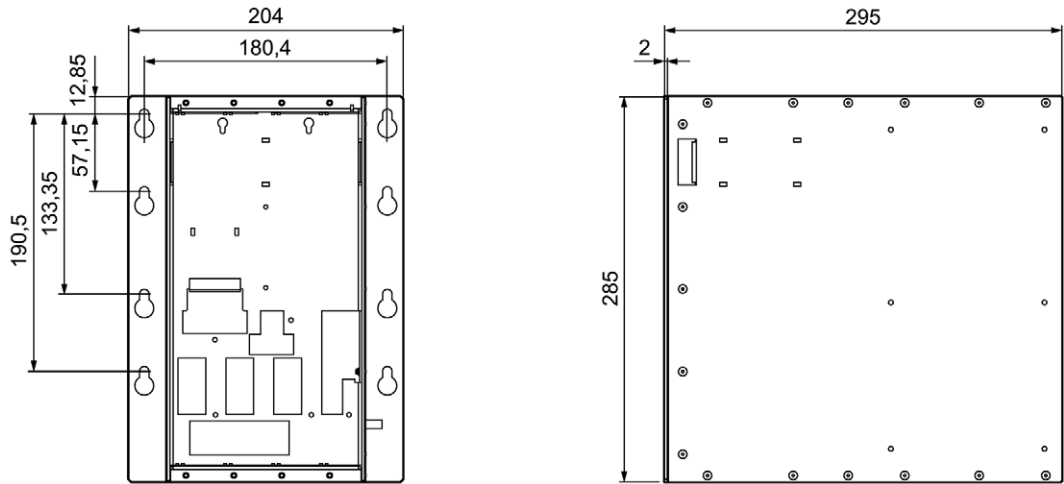


Figure 13-3 Dimension drawing for Rack 4200 for 4 POMs

### Dimension drawing for CIM4210

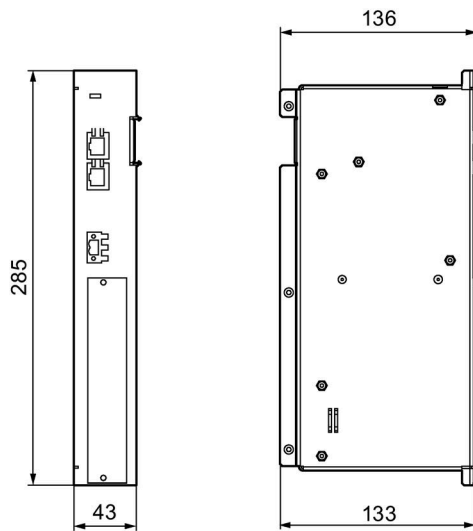
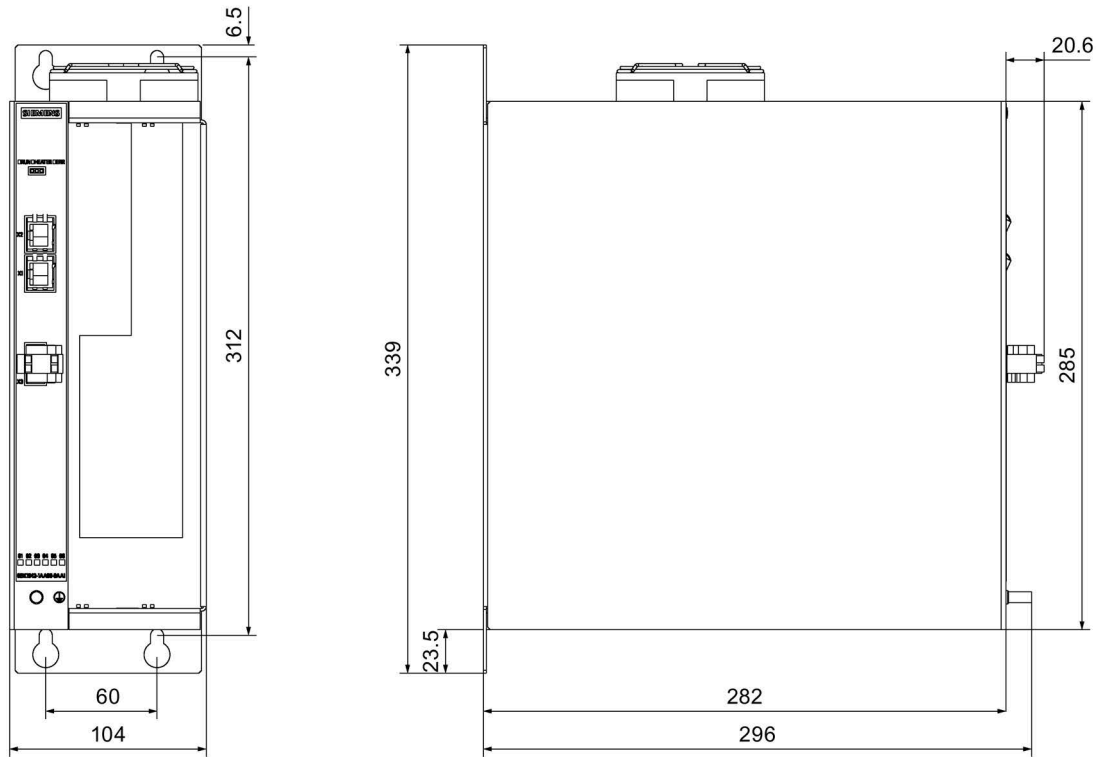


Figure 13-4 Dimension drawing for CIM4210

### Dimension drawing CIM4210C PROFINET



### Dimension drawing for POM4220

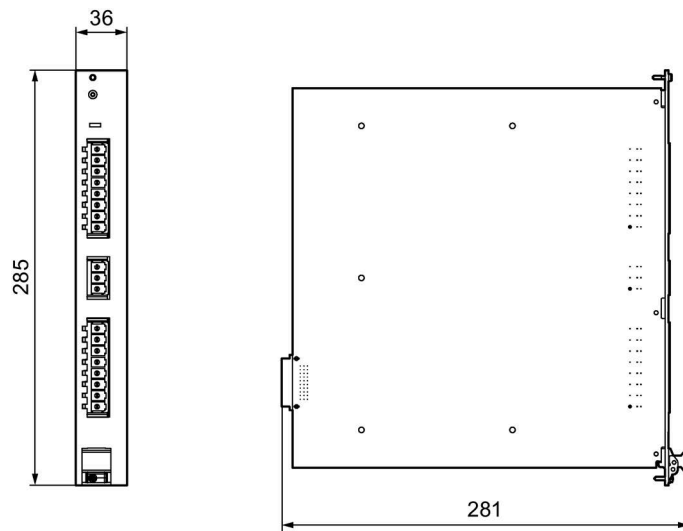


Figure 13-5 Dimension drawing for POM4220



### Dimension drawing Fan Module FM4240

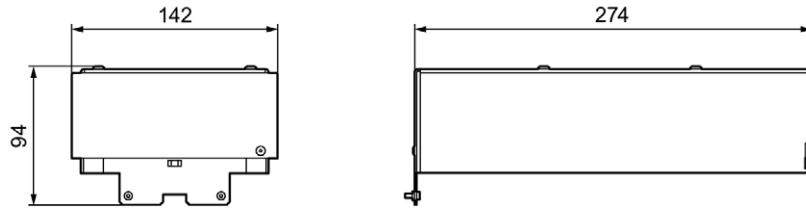


Figure 13-6 Dimension diagram FM4240

### Dimension drawing Fan Module FM4240 HP

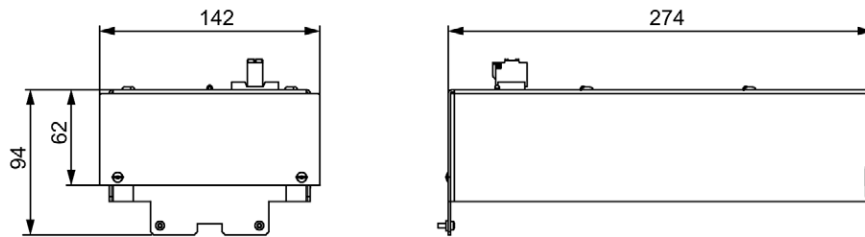


Figure 13-7 Dimension diagram FM4240 HP

## 13.8.2 HCS4300 components

### Dimension drawing of power output module POM4320 for busbar mounting

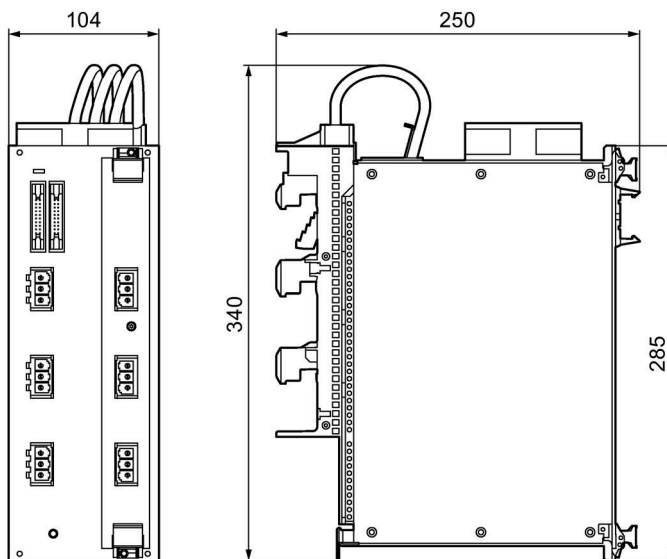


Figure 13-8 Dimension drawing of POM for busbar mounting

**Dimension drawing of power output module POM4320 for rear panel mounting**

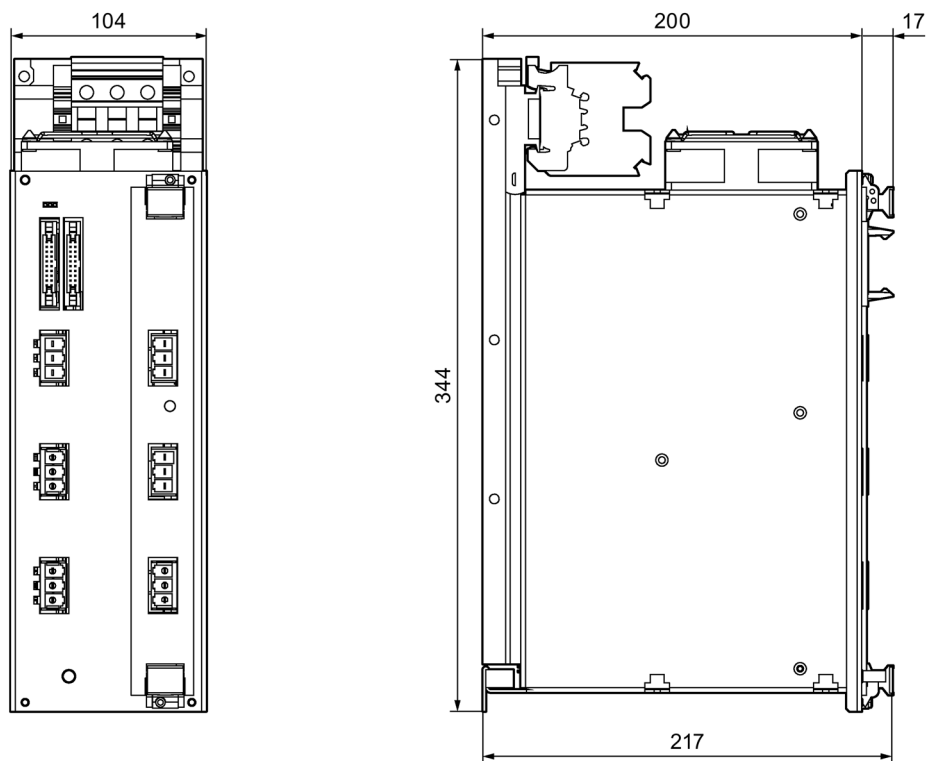


Figure 13-9 Dimension drawing of POM for rear panel mounting

### Expansion module EM4315

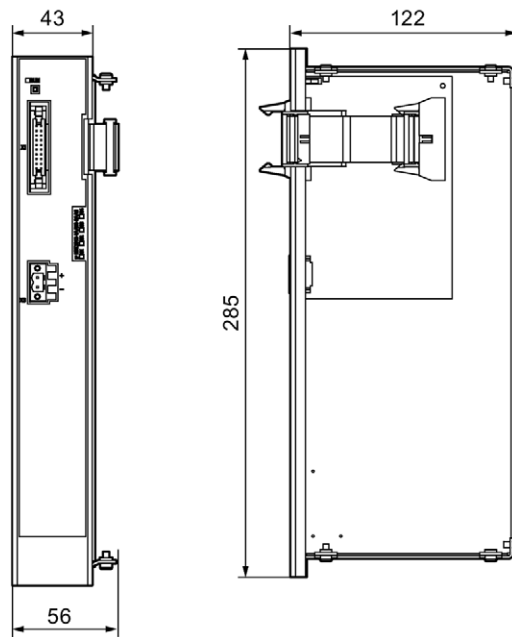


Figure 13-10 Dimension drawing for EM4315 expansion module

## Appendix

### A.1 Certificates and approvals

#### A.1.1 Certificates and approvals

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**Note****Approvals are only valid when marked on the product**

The specified approvals apply only when the corresponding mark is printed on the product. You can check which of the following approvals have been granted for your product by the markings on the type plate.

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#### EC directives

SIPLUS HCS products complies with the requirements and protection objectives of the following EC directives.

#### Low-voltage directive

SIPLUS HCS products complies with the requirements of the EC directives: 2014/35/EU "Electrical Safety". The product is designed in accordance with EN 50178.

#### Guideline 2011/65/EU (RoHS 2)

Information on disposal, see section Recycling and disposal (Page 193).

#### EMC directive (electromagnetic compatibility)

SIPLUS HCS products complies with the requirements of the EC directives: 2014/30/EU "Electromagnetic Compatibility"

The product is designed for operation in **industrial areas** with the following requirements:

- Interference emission according to EN 61000-6-4
- Noise immunity according to EN 61000-6-2

**Note for the manufacturers of machines**

This product is not a machine in the sense of the EC Machinery Directive. Therefore there is no declaration of conformity relating to the EC Machinery Directive 2006/42/EC for this product.

## A.2 Ordering data

### HCS4200 components

Ordering data	
Single part	Article number
HCS Rack 4200 for 12 POMs	6BK1942-0AA00-0AA0
HCS Rack 4200 for 4 POMs	6BK1942-0BA00-0AA0
HCS CIM4210 PROFINET	6BK1942-1AA00-0AA0
HCS CIM4210C PROFINET	6BK1942-1AA00-0AA1
HCS CIM4210 PROFIBUS	6BK1942-1BA00-0AA0
HCS POM4220 Lowend	6BK1942-2AA00-0AA0
HCS POM4220 Midrange phase control	6BK1942-2CA00-0AA1
HCS POM4220 Highend	6BK1942-2DA00-0AA0
HCS POM4220 Flexible	6BK1942-2FA00-0AA0
HCS FM4240 Fan Module	6BK1942-4AA00-0AA0
HCS PM4000 Temperature	6BK1900-0AA00-0AA0
HCS PM4000 DI/DO	6BK1900-0BA00-0AA0
HCS PM4000 U/I	6BK1900-0CA00-0AA0
HCS fuse 6.3 A/250 V for POM4220 Lowend (50 units)	6BK1942-6AA00-0AA0 (Littelfuse: 21606.3XP)
HCS fuse 16A/500 V for POM4220 Midrange (20 units)	6BK1942-6BA00-0AA0 (Littelfuse: 0505016.MXP)
HCS fuse 16 A gRL / 400 V for: <ul style="list-style-type: none"> <li>• POM4220 Midrange phase angle control</li> <li>• POM4220 Flexible (20 units)</li> </ul>	6BK1942-6HA00-0AA0 (SIBA: 7006584.16)
HCS fuse 25 A Class CC / 600 V for POM4220 Highend (20 units)	6BK1942-6KA00-0AA0 (Bussmann: LP-CC-25)
Fan SIPLUS HCS Power Output Module 80 mm	6BK1700-2GA00-0AA0
HCS rack blanking cover (10 units)	6BK1942-6DA00-0AA0
HCS connector set, 8-pin for POM4220 Lowend (5 units)	6BK1942-6CA00-0AA0
HCS connector set, 3-pin for POM4320/4220 Lowend (10 units)	6BK1943-6AA00-0AA0
HCS connector set 6-pin (6 units) for: <ul style="list-style-type: none"> <li>• POM4220 Midrange phase angle control</li> <li>• POM4220 Flexible</li> <li>• PM-U/I</li> </ul>	6BK1942-6EA00-0AA0
HCS connector set, 2-pin for CIM4210 and CIM4310 (20 units)	6BK1942-6FA00-0AA0
HCS connector set 3-pin (6 units) for: <ul style="list-style-type: none"> <li>• POM4220 Midrange phase angle control</li> <li>• POM4220 Highend</li> <li>• POM4220 Flexible</li> </ul>	6BK1942-6GA00-0AA0
HCS connector set 4-pin for POM4220 Highend (6 units)	6BK1942-6LA00-0AA0
HCS connector set, 8-pin for PM4000 Temperature / PM4000 U/I (10 units)	6BK1900-6AA00-0AA0

Ordering data	
Single part	Article number
HCS connector set 18-pin for PM4000 DI/DO (8 units)	6BK1900-6BA00-0AA0
Plug, female, 2x2 pin, ET200SP (10 units) for FM4240 HP	6ES7193-4JB00-0AA0

### Combined mode with HCS4300 components

Ordering data	
Single part	Article number
HCS POM4320, busbar mounting, CE version	6BK1943-2AA00-0AAx
HCS POM4320, panel mounting, CE version	6BK1943-2CA00-0AAx
HCS POM4320, busbar mounting, UL version	6BK1943-2BA00-0AAx
HCS POM4320, panel mounting, UL version	6BK1943-2DA00-0AAx
HCS EM4315 expansion module	6BK1943-1AA50-0AA0
HCS fuse 16 A/500 V 10x38 gG (50 units) For all POM4320 IEC variants 6BK1943-2AA00-0AAx and 6BK1943-2CA00-0AAx	<ul style="list-style-type: none"> <li>• 6BK1943-6BA00-0AA0</li> <li>• Alternatively: Cooper Bussmann (www.cooperindustries.com), Article number: C10G16</li> </ul>
SENTRON, cylinder fuse, Class CC, 15 A, slow, Un AC: 600 V For POM4320 UL variants with MLFB number 6BK1943-2BA00-0AA0 and 6BK1943-2DA00-0AA0	3NW1150-0HG
SENTRON, cylinder fuse, Class CC, 20 A, slow, Un AC: 600 V For POM4320 UL variants with MLFB number 6BK1943-2BA00-0AA2 and 6BK1943-2DA00-0AA2	3NW1200-0HG
Fan SIPLUS HCS Power Output Module 80 mm	6BK1700-2GA00-0AA0
Cable SIPLUS HCS4300 POM/POM 100 mm (10 units)	6BK1943-5AA00-0AA0
Cable SIPLUS HCS4300 POM/POM 250 mm (10 units)	6BK1943-5BA00-0AA0
Cable SIPLUS HCS4300 POM/POM 1000 mm (10 units)	6BK1943-5CA00-0AA0
Cable SIPLUS HCS4300 POM/POM 1500 mm (5 units)	6BK1943-5DA00-0AA0
HCS connector set, 3-pin for POM4320/4220 Lowend (10 units)	6BK1943-6AA00-0AA0

## A.3 ESD guidelines

### Definition of ESD

All electronic modules are equipped with large-scale integrated ICs or components. Due to their design, these electronic elements are highly sensitive to overvoltage, and thus to any electrostatic discharge.

The electrostatic sensitive components/modules are commonly referred to as ESD devices. This is also the international abbreviation for such devices.

ESD modules are identified by the following symbol:



---

#### Note

ESD devices can be destroyed by voltages well below the threshold of human perception. These static voltages develop when you touch a component or electrical connection of a device without having drained the static charges present on your body. The electrostatic discharge current may lead to latent failure of a module, that is, this damage may not be significant immediately, but in operation may cause malfunction.

---

### Electrostatic charging

Any person who is not conductively connected to the electrical potential of the environment can accumulate an electrostatic charge.

The figure below shows the maximum electrostatic voltage which may build up on a person coming into contact with the materials indicated. These values correspond to IEC 801-2 specifications.



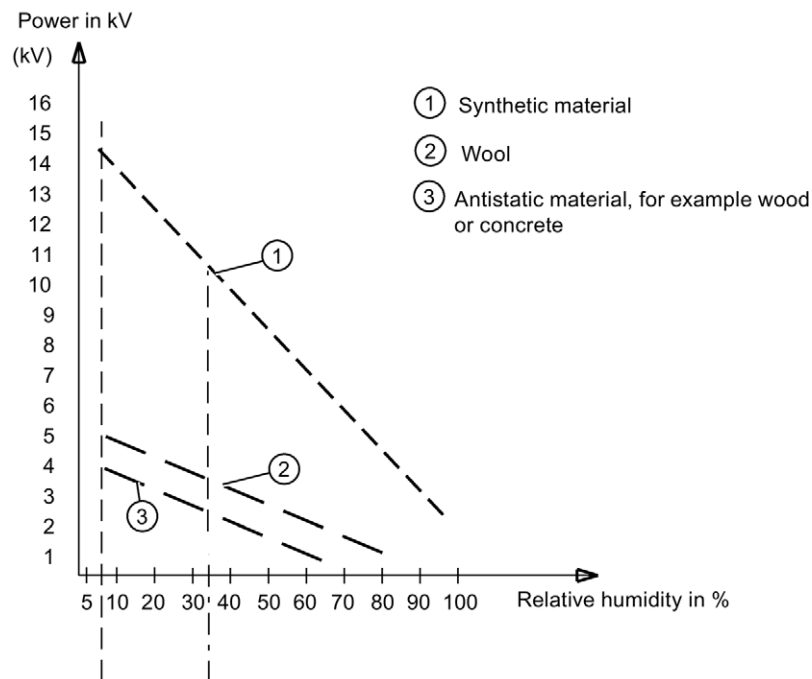


Figure A-1 Electrostatic voltages on an operator

### Basic protective measures against electrostatic discharge

- Ensure sufficient grounding

When working with electrostatic sensitive devices, make sure that personnel, workstations and packaging are properly grounded. This prevents electrostatic charge.

- Avoid direct contact

You should only touch ESD components if unavoidable (for example, during maintenance work). Handle the modules without touching any chip pins or PCB traces. In this way, the discharged energy can not affect the sensitive devices.

Discharge your body before you start taking any measurements on a module. Do so by touching grounded metallic parts. Always use grounded measuring instruments.

## A.4 Service & Support

### Contacts

Please talk to your Siemens contact (<http://www.siemens.com/automation/partner>) at one of our agencies or local offices if you have any questions about the products described here and do not find the answers in this manual.

### Technical Support

You can contact Technical Support for SIPLUS HCS systems as follows:

- Phone: + 49 (0) 911 895 7222

### See also

E-mail (<mailto:technical-assistance@siemens.com>)

### Siemens Industry Online Support

You can find various services on the Support home page (<http://support.automation.siemens.com>) on the Internet.

There you will find the following information, for example:

- The correct documents for you via product-related search functions
- Online support request form
- You local representative
- Information about on-site service, repairs, and spare parts.
- A forum for exchanging information among users and specialists.all over the world.
- Our newsletter containing up-to-date information on your products.

### Online catalog and ordering system

The online catalog and the online ordering system can also be found at Industry Mall homepage (<http://www.siemens.com/industrymall>)

### SIPLUS HCS heating control systems on the Internet

Current information on SIPLUS HCS is provided as part of our online presence (<http://www.siemens.com/siplus-hcs>).

### Application example

An example application for SIMATIC S7 is available as a guide and basis for your own applications. This application example explains the mode of operation of the heating controller.

You can download the application example from the Siemens Service&Support website .

# Index

## A

Application example, 249  
Approvals, 242

## B

Basic knowledge, 8

## C

Cleaning work, 173  
Configuration control, 112  
Connecting  
    Safety information, 12

## D

Delivery  
    Unpacking, 34  
Diagnostics data, 169  
Diagnostics function, 141  
    Power output fault, 141, 141  
Disposal, 193

## E

EC directives, 242  
EMC directive, 242  
ESD guidelines, 246

## F

Fault, 169  
Frequency fault, 139  
Frequency monitoring, 139  
Fuse replacement, 176  
Fuse types, 176  
fuses  
    Checking, 177, 180

## G

GSD file  
    download, 100  
GSDML file  
    download, 100  
Guidelines  
    ESD guidelines, 246

## H

History, 8

## I

Inrush current, 125

## L

Line voltage compensation, 130  
Line voltage monitoring, 138  
Line voltage monitoring: POM4320,  
Low-voltage directive, 242

## M

Manufacturer's warranty, 12  
Monitoring functions, 169

## N

Note  
    Shipping, 33

## O

Option handling, (See configuration control)  
Ordering data, 244, 245

## P

Power output diagnostics, 141

Power output fault  
  Diagnostics function, 141  
Power outputs  
  Control, 125

## Q

Qualified personnel, 8

## R

Recycling, 193  
Registered trademarks, 10

## S

Safety information  
  Changes to the devices, 12  
  Circuit breaker, 12  
  Connecting, 12  
  Fuse replacement, 13  
  Repairs, 13  
  Working on the device, 13  
Scope of delivery, 34  
Shipping  
  Note, 33  
Storage, 33  
Storage conditions, 33

## T

Target group, 8  
Technical Support, 248  
Temperature monitoring, 140