



Heating Control Systems

SIPLUS HCS

Heating control system HCS4300

Operating Instructions

Edition

11/2015

Answers for the industry.

Heating control systems

Heating control system SIPLUS HCS4300

Operating Instructions

<u>Introduction</u>	1
<u>Safety notes</u>	2
<u>System overview</u>	3
<u>Application planning</u>	4
<u>Installing/mounting</u>	5
<u>Connection</u>	6
<u>Commissioning</u>	7
<u>Planning/configuring</u>	8
<u>Functions</u>	9
<u>Communications</u>	10
<u>Process and system messages, error handling</u>	11
<u>Service and maintenance</u>	12
<u>Technical data</u>	13
<u>Appendix</u>	A

Legal information

Warning notice system

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

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

WARNING

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

Trademarks

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Disclaimer of Liability

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

Table of contents

1	Introduction	9
1.1	Introduction	9
2	Safety notes.....	11
2.1	IT security	11
2.2	Safety notes	12
3	System overview.....	15
3.1	Area of application	15
3.2	Features	16
3.3	System configuration	18
3.4	Central interface module (CIM).....	19
3.4.1	Function and design.....	19
3.5	Power output module (POM)	20
3.5.1	Function and design.....	20
3.6	I/O modules.....	22
3.6.1	PM4000 DI/DO	22
3.6.2	PM4000 U/I	23
3.6.3	PM4000 Temperature	24
3.7	EM4315 expansion module	25
3.7.1	Design	25
4	Application planning.....	27
4.1	Shipping	27
4.2	Storage	27
4.3	Scope of delivery	28
4.4	Installation location	29
4.5	POM4320 power rating	31
5	Installing/mounting	33
5.1	Requirements.....	33
5.2	Installing the Power Output Module (POM)	34
5.2.1	Busbar mounting.....	34
5.2.1.1	Preparations.....	34
5.2.1.2	Adjusting the busbar adapter.....	35
5.2.1.3	Mounting the POM (busbar adapter)	37
5.2.2	Panel mounting.....	38
5.2.2.1	POM mounting (panel mounting).....	38
5.3	Installing the Central Interface Module	39

5.4	Installing the EM4315 expansion module	40
5.5	Installing the I/O module (PM)	40
6	Connection	43
6.1	Safety instructions and guidelines	43
6.2	Connecting the protective conductor	45
6.3	Connect PROFINET / PROFIBUS fieldbus	46
6.4	Connecting the 24 V DC power supply	47
6.5	Connecting the heating elements and three-phase line supply	48
6.5.1	Connecting the three-phase line supply	48
6.5.2	Connecting heating elements	49
6.5.3	Block diagram	50
6.6	Connecting system interfaces	51
6.7	Connecting I/O modules	52
6.7.1	PM4000 DI/DO	52
6.7.2	PM4000 U/I	54
6.7.3	PM4000 Temperature	56
7	Commissioning	59
7.1	Requirements	59
7.2	Commissioning	59
7.3	Insulation test	59
8	Planning/configuring	61
8.1	Integrating the HCS4300 into the PROFINET configuration	61
8.2	Integrating the HCS4300 into the PROFIBUS configuration	61
8.3	Device/hardware configuration in the TIA Portal	62
8.3.1	PROFINET device configuration	62
8.3.2	PROFIBUS device configuration	63
8.3.3	Configuration parameters	64
8.3.3.1	CIM / POM configuration parameters	64
8.3.3.2	Configuration parameters for I/O modules	65
8.4	Software tools for commissioning support	67
8.4.1	Overview of tools for commissioning support	67
9	Functions	69
9.1	Status and actual displays	69
9.2	Power output control	70
9.2.1	Half-wave control	70
9.2.2	Soft starting function	71
9.2.3	Switch on heating	72
9.2.4	Channel control via setpoints	72
9.2.5	Channel control via fields	73
9.2.6	Line voltage compensation	74
9.2.7	Behavior of the power outputs	74

9.3	Recording of analog measured values	75
9.4	Digital inputs/outputs.....	76
9.5	Recording of analog measured line values.....	77
9.6	Monitoring functions	78
9.6.1	Line supply voltage monitoring	78
9.6.2	Rotating-field test	78
9.6.3	Monitoring of the 24 V DC supply voltage	78
9.6.4	Frequency monitoring	79
9.6.5	Temperature monitoring.....	79
9.6.6	Monitoring power channels	80
9.6.7	Further diagnostics	81
10	Communications	83
10.1	Cyclic data exchange	83
10.1.1	Cyclic output data	83
10.1.2	Cyclic input data.....	85
10.2	Acyclic data exchange	87
10.2.1	Acyclic output data.....	87
10.2.2	Acyclic input data	91
10.3	Transfer of diagnostic alarms to the controller	94
10.3.1	Transferring diagnostic alarms to the controller: PROFINET	94
10.3.2	Transferring diagnostic alarms to the controller: PROFIBUS	95
10.3.3	Manufacturer-specific error codes	96
11	Process and system messages, error handling.....	99
11.1	Central Interface Module (CIM)	99
11.2	Power Output Module (POM)	100
11.2.1	LED operating display for POM	100
11.2.2	Fault reporting through diagnostics data	101
11.3	I/O modules.....	102
12	Service and maintenance.....	103
12.1	Maintenance work.....	103
12.2	Firmware update	104
12.2.1	PROFINET firmware update	104
12.2.2	PROFIBUS firmware update.....	106
12.3	Fuse replacement	108
12.4	Replace fan	112
12.5	Replacing the power output module (POM)	115
12.6	Replacing the central interface module (CIM)	117
12.7	Replacing an I/O module	118
12.8	Recycling and disposal	120

13	Technical data	121
13.1	Technical specifications for POM.....	121
13.2	Technical specifications for CIM	127
13.3	Technical specifications for I/O module	129
13.4	Technical specifications for EM4315 expansion module	137
13.5	Dimension drawings.....	139
A	Appendix	143
A.1	Certificates and approvals	143
A.1.1	Certificates and approvals	143
A.2	Article numbers for spare parts/accessories.....	144
A.2.1	Ordering data	144
A.3	ESD Guidelines	145
A.4	Service & Support	147
A.4.1	Application example	148
	Index	149

Introduction

1.1 Introduction

Purpose of this documentation

These operating instructions contain the information you require to commission, operate and service the HCS4300 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 start up the device.

Required basic knowledge

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

History

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

Edition	Note
11/2014	First edition
10/2015	Expansion to include POM with panel mounting, PROFIBUS, I/O modules, expansion module for additional 2 x 8 POMs

Scope of validity of this document

This documentation is valid for all components of the SIPLUS CMS4300 specified in these operating instructions and describes the most recent delivery state at the time of writing.

Note

Note for devices up to firmware version 1.x

- A maximum of 6 POMs can be operated.
 - Expansion module, PMs and the DP connection are not available
 - The following applies for reading datasets 152, 200 and 201: The information that is read is always for the full configuration, i.e. for 54 channels or 6 POMs.
 - The datasets 160, 190 and 202 are not available.
-

Naming conventions and abbreviations

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

The followings terms and abbreviations are used:

SIPLUS HCS4300	HCS
Power Output Module	POM
Central Interface Module	CIM
I/O module	PM

Registered trademarks

SIPLUS ® is a registered trademark of Siemens AG.

Safety notes

2.1 IT security

IT security guidelines

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

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

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

Protective measures for the HCS4300 heating control system

NOTICE
Only authorized personnel are permitted to access the system and make changes to it.

2.2 Safety notes

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.
- The HCS4300 heating control system is not a safety product. In the event of a fault, the machine must be brought to the safe state on the plant side.

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

WARNING

Electric shock hazard

May cause death or serious injury

- In the control cabinet, voltages of > 60 V occur. Suitable safety precautions must therefore be taken before commissioning and maintenance work.
- Before working on the heating control system or the connected components, ensure the system is disconnected.

Fuse replacement

NOTICE

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

Repairs

WARNING

No user-serviceable parts

May cause death or serious injury

Incorrectly performed repairs may result in substantial damage to equipment or endanger the user. Return the device to Siemens for repair.

System overview

3.1 Area of application

The SIPLUS HCS 4300 heating control system is used to activate and switch heating elements in industry, such as quartz, ceramic, flash, halogen or infrared emitters. It is of modular design and can be flexibly adapted to suit the specific requirements of the respective application.

Typical application areas are:

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

In general, the HCS4300 can be used wherever compact or modular concepts are required with high levels of power output.

3.2 Features

An HCS4300 system comprises one Central Interface Module (CIM) and up to 24 Power Output Modules (POM). As an option, one I/O module can be operated on the CIM.

The picture below shows an example of an HCS4300, consisting of one CIM4310 for PROFINET and one POM4320 for busbar mounting.



Image 3-1 HCS4300 comprising CIM ① and POM ②

The following types of system component are available:

System component	Version	Description
Central Interface Module (CIM)	- CIM 4310 PROFINET - CIM 4310 PROFIBUS	-
I/O module	PM4000 DI/DO	8 digital outputs and 8 configurable inputs/outputs.
	PM4000 U/I	Inputs for measuring line voltage and line current.
	PM4000 Temperature	4 analog inputs for 0...20 mA and 4 measuring inputs for temperature
Power Output Module (POM)	POM4320 busbar mounting:	9 power outputs with diagnostic function and fault indication per channel.
	POM4320 panel mounting	
Expansion module	EM4315	Permits the operation of as many as 8 additional POMs.

Features

- Modular (centralized) and compact (distributed) configurations possible
- Communication via PROFINET/PROFIBUS
- Parameterization, commissioning, visualization and diagnostics via the Siemens TIA Portal
- Commissioning and diagnostics tool for on-site diagnostics directly at the heating control system
- Integrated diagnostics and monitoring functions
- Control modes: Half-wave control and soft-starting
- Line voltage compensation for smoothing line voltage fluctuations integrated
- Only one 24 V infeed is required for up to 8 Power Output Modules (POM)
- Slot for one I/O module (PM)
- Expansion module (optional) with 24 V infeed for operating additional 2 x 8 POMs

3.3 System configuration

System components

A complete heating control system with HCS4300 includes the following components:

- Central Interface Module (CIM) 4310 with PROFINET or PROFIBUS
- Power Output Module (POM) 4320 for busbar or panel mounting
- Higher-level controller (e.g. SIMATIC S7-1500 automation system with PROFINET/PROFIBUS)
- Field PG (optional, for commissioning and diagnostics)
- HMI Panel (optional, e.g. SIMATIC HMI TP1500)
- Heat emitter array

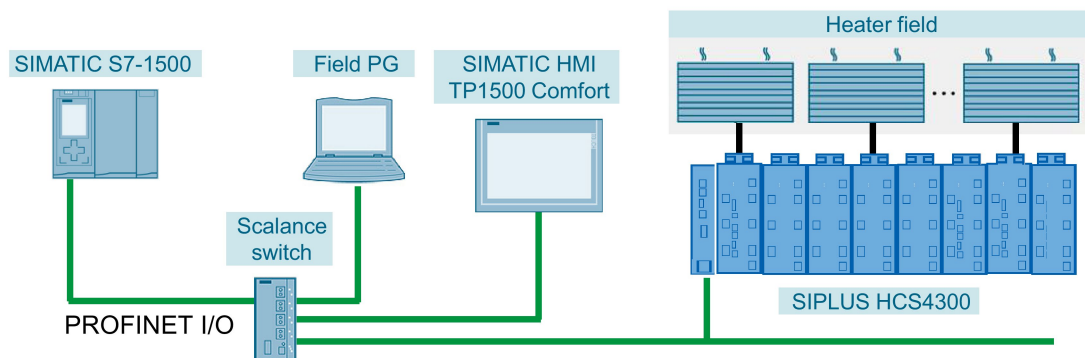


Image 3-2 HCS 4300 system configuration

Centralized/distributed system configuration

You can operate up to 8 POMs on one CIM. Up to 24 POMs can be operated in the maximum configuration with two expansion modules. Configurations are possible for both distributed heating applications, such as PET blow molding, in which the heating control system is located below the heat boxes, and centralized applications, such as thermoforming, in which emitters are assembled into multi-tier arrays and the modular heating control system is located in a central control cabinet.

Communication via PROFINET or PROFIBUS

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.

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.

3.4 Central interface module (CIM)

3.4.1 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). The CIM also provides the 24 V DC power supply for the connected POMs. The CIM is available in two versions: with a PROFINET interface or with a PROFIBUS interface.

Design

CIM 4310 PROFINET		CIM 4310 PROFIBUS	
①	Status LEDs	①	Status LEDs
②	System interface to POM	②	System interface to POM
③	PROFINET interface X1, X2	③	Address selection switch S1 / S2 for PROFIBUS
④	24 V DC power supply X3	④	- PROFIBUS DP interface X1 - Service interface X2
⑤	Slot for I/O module	⑤	24 V DC power supply X3
		⑥	Slot for I/O module

3.5 Power output module (POM)

3.5.1 Function and design

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.

POM4320 design for busbar mounting

Power Output Module POM

① Fans

② Busbar adapter

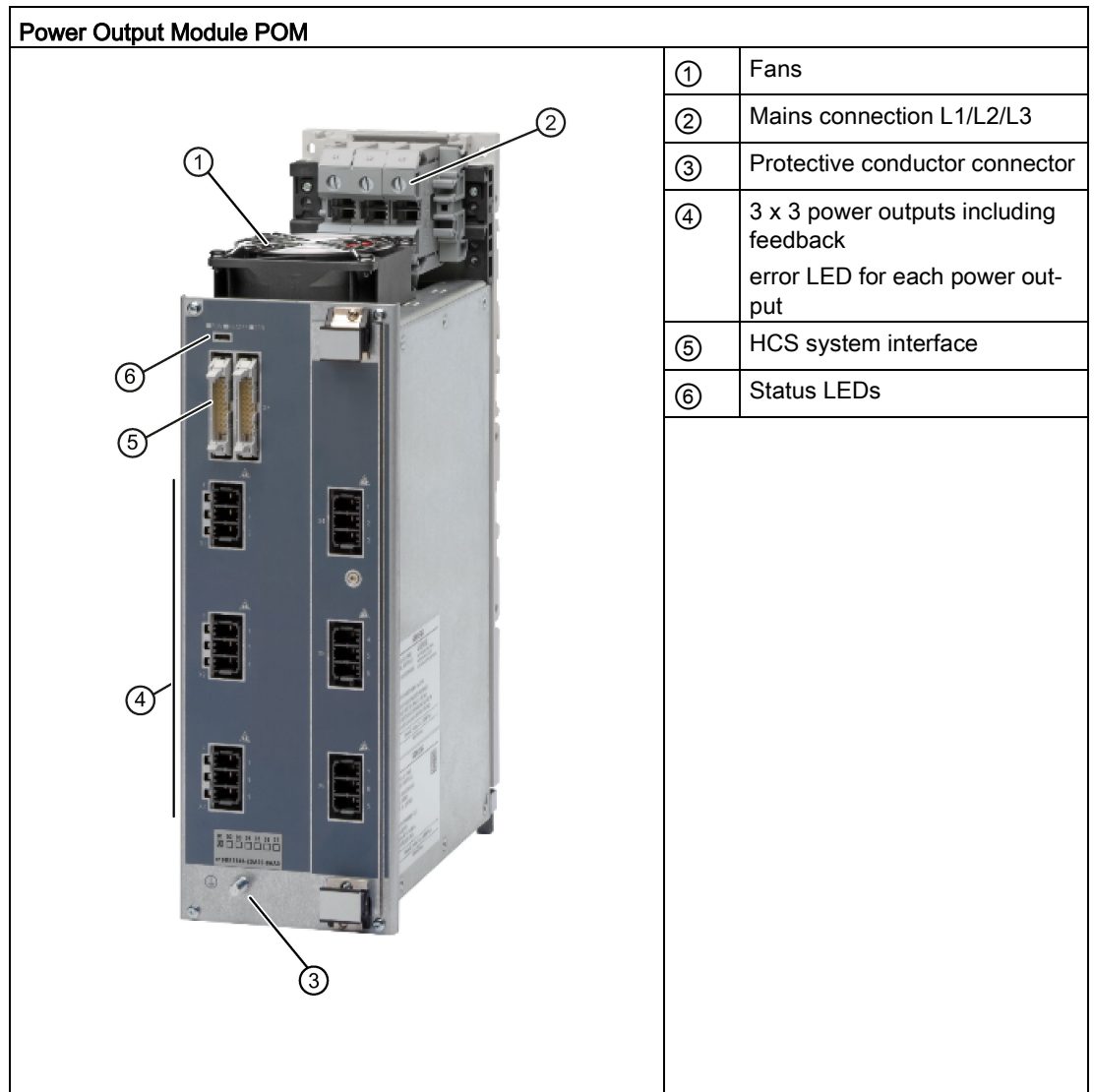
③ Protective conductor connector

④ 3 x 3 power outputs including feedback error LED for each power output

⑤ HCS system interface

⑥ Status LEDs

POM4320 design for panel mounting



3.6 I/O modules

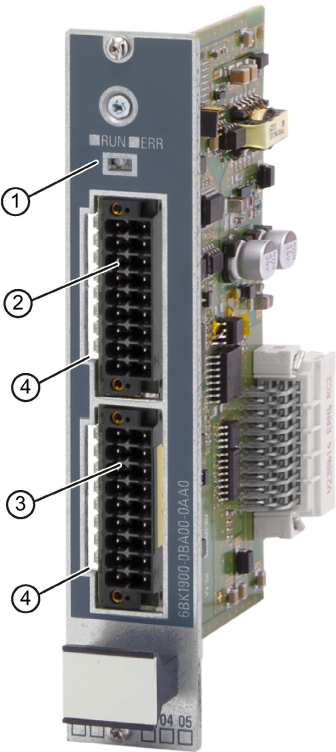
3.6.1 PM4000 DI/DO

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.

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

Design

PM4000 DI/DO	Item	Description
	①	Status LEDs - RUN LED lights up green: Power on / initialization status - ERR LED lights up red: Fault status
	②	Digital outputs 1 to 8
	③	Digital inputs/outputs 9 to 16 (switchable per channel)
	④	LEDs for displaying the switching state (one LED per input/output) - LED on: H state - LED off: L state

3.6.2 PM4000 U/I

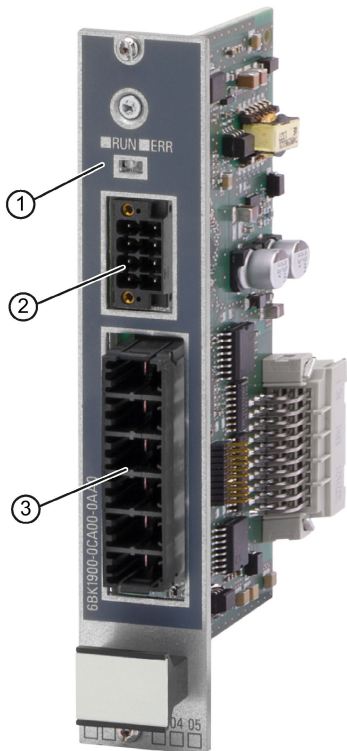
Function

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 • RUN LED lights up green: Power on / initialization status • ERR LED lights up red: Fault status
	②	Measuring inputs, line current
	③	Measuring inputs, line voltage

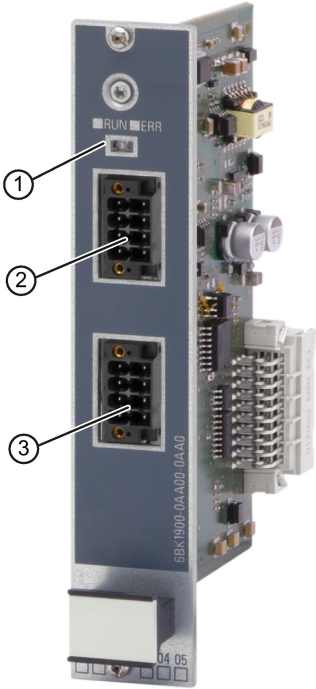
3.6.3 PM4000 Temperature

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 • RUN LED lights up green: Power on / initialization status • ERR LED lights up red: Fault status
	②	Analog inputs 1 to 4
	③	Measuring inputs 1 to 4 for temperature

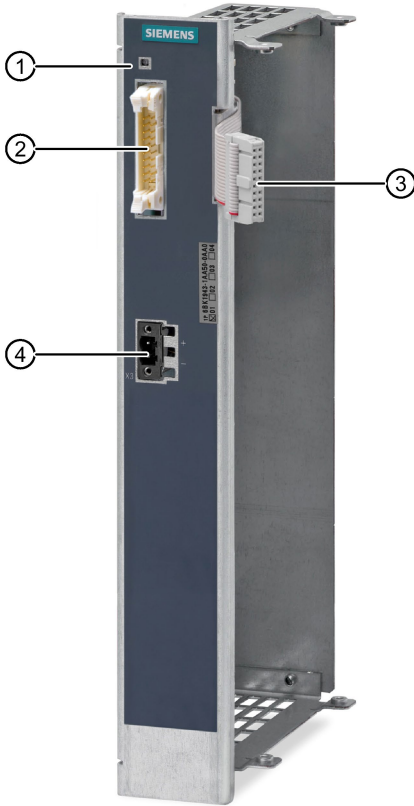
3.7 EM4315 expansion module

3.7.1 Design

Function

In the basic configuration, a maximum of 8 POMs can be operated with a CIM. The operation of up to 8 additional POMs is possible with an EM4315 expansion module. In the maximum configuration, two expansion modules can be used, making it possible to operate 24 POMs with a single CIM.

Design

EM4315 expansion module		
	①	Status LEDs
	②	System interface to last POM
	③	System interface to next POM
	④	24 V DC power supply

Application planning

4.1 Shipping

Shipping

NOTICE
Damage to the device 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.

Lifting and carrying the power output module (POM)

NOTICE
Damage to the device The power output module (POM) is connected to the busbar adapter with 3 leads. Do not use these leads to lift or carry the POM.

4.2 Storage

It is absolutely essential that the device is stored in compliance with the storage conditions as described in Chapter Technical data (Page 121). 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:

Component	Included in the scope of supply
SIPLUS HCS4300 POM	• Connecting cable for system interface • 6 plug connectors for connecting the heating elements • Compact operating instructions
SIPLUS HCS4300 CIM	• CD with license information (CIM PROFINET) • 1 plug connector, 2-pin • Compact operating instructions
EM4315 expansion module	• Compact operating instructions • 1 plug connector, 2-pin
HCS PM4000 temperature	• Compact operating instructions • 2 plug connectors, 8-pin
HCS PM4000 DI/DO	• Compact operating instructions • 2 plug connectors, 18-pin
HCS PM4000 U/I	• Compact operating instructions • One 6-pin and one 8-pin plug connector

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. Do not use any parts that show evidence of damage!

4.4 Installation location

Installation location requirements

Note**Installation in control cabinet/device connection box**

The SIPLUS HCS4300 heating control system is intended for installation in a control cabinet or a device connection box.

- 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.
 - The control cabinet / device connection box must satisfy the regulations regarding fire-protection housing.
 - Ensure that all cables and leads that protrude externally are equipped with adequate strain relief.
-

Mounting position and clearance dimensions

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 suffer permanent damage as a result of overheating.

- The device is to be installed and operated in a vertical position.
- Ensure that the permissible ambient temperature range is not exceeded (see Section Technical data (Page 121)).
- Maintain the minimum clearances from walls and other devices:
 - Sides 0 mm (side-by-side mounting permitted), top 100 mm, bottom 100 mm for ventilation

Degree of pollution

SIPLUS HCS4300 is designed for pollution degree 2. According to the EN 50178 standard, pollution degree 2 is non-conductive pollution under normal circumstances, which can, however, become temporarily conductive as a result of condensation when the device is not in service.

Electromagnetic compatibility (EMC) and overvoltage protection

NOTICE

Damage to the device

Inadequately dimensioned overvoltage protection can result in severe damage to the device. Always ensure, therefore, that the overvoltage protection is adequate (see Connecting the 24 V DC power supply (Page 47)Section).

Power losses of the Power Output Module (POM)

When planning and dimensioning the cabinet cooling system, the power losses of the Power Output Module (POM) must be taken into account. The power losses of a POM can be calculated as follows:

$$P_{\text{LossPOM}} = P_{\text{LossChannel1}} + P_{\text{LossChannel2}} + \dots + P_{\text{LossChannel9}} + 6 \text{ W}$$

$$P_{\text{LossChannel}(x)} = I(x)^2 \cdot 0.07 \, \Omega + I(x) \cdot 0.8 \text{ V}$$

x represents the channel number

This power loss occurs at 100 % activation of the channels. If the channels are not 100 % activated, the power loss $P_{\text{LossChannel}(x)}$ reduces proportionately.

Restriction of the switching power

Due to the different physical properties of heat emitters, restrictions can be imposed on their permissible switching capacity depending on the type of heat emitter.

Short-wave halogen or infrared emitters ("flash emitters") 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.

NOTICE

Restriction of the switching power

If flash emitters with an output of more than 4000 W at 400 V are used, switching operations can result in extremely high currents and the triggering of the channel fuses.

We therefore recommend that you have these emitters gauged by Siemens AG.

Derating of fuses

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

4.5 POM4320 power rating

POM4320 IEC power rating

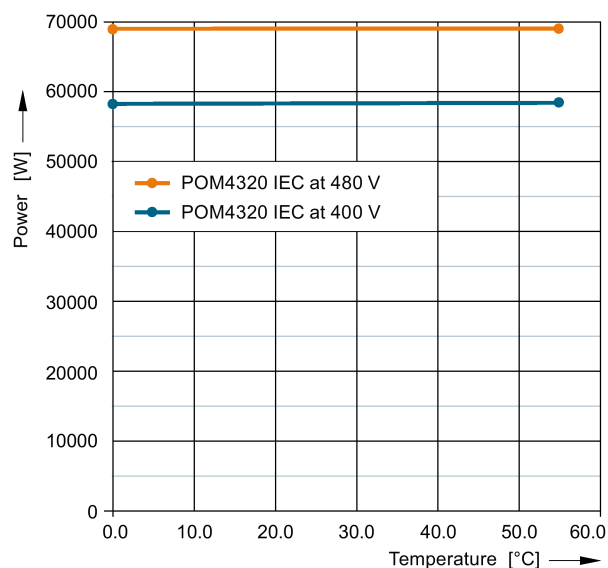


Image 4-1 POM4320 IEC power rating

POM 4320 UL power rating

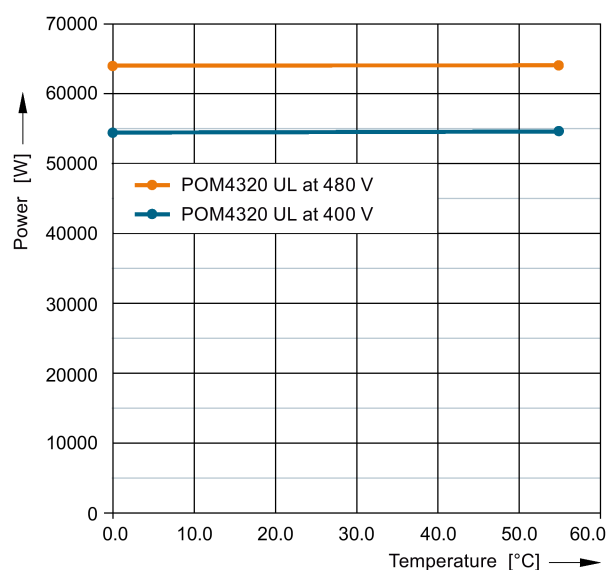


Image 4-2 POM4320 UL power rating

Installing/mounting

5.1 Requirements

Safety guidelines

WARNING
Hazardous voltages on the heating control system May cause death, serious injury or damage to property Before starting installation or connection work on the HCS4300 heating control system, you must isolate the heating control system and secure it against reclosing.

5.2 Installing the Power Output Module (POM)

5.2.1 Busbar mounting

5.2.1.1 Preparations

Busbar system

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

- 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 protection device of Type A is sufficient for the HCS4300.

5.2.1.2 Adjusting the busbar adapter

Tool

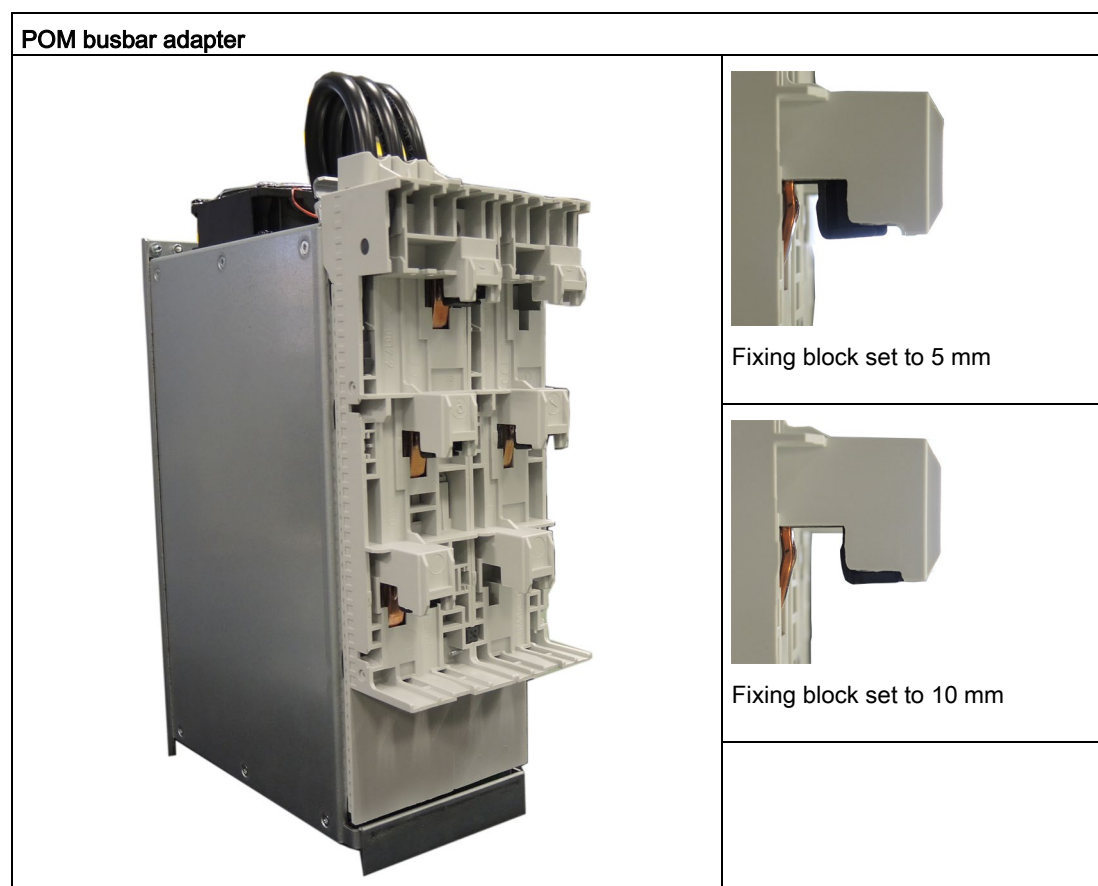
You will need a slot head screwdriver of size 0.6 x 3.5 mm

Adjusting the busbar adapter to the thickness of the busbar

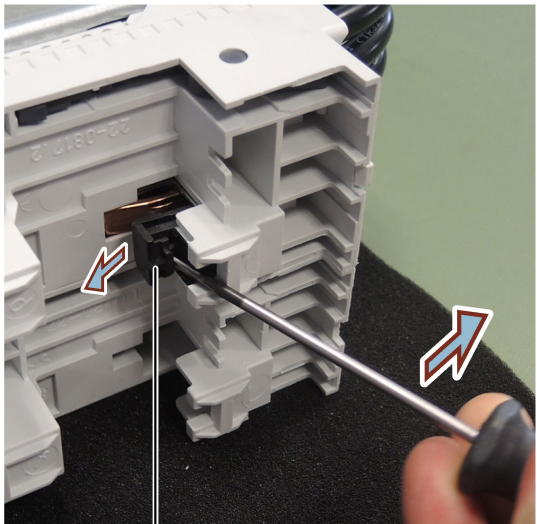
The busbar adapter of the POM can be adjusted for the following busbar thicknesses:

- 5 mm (delivery state)
- 10 mm

On the busbar adapter of the POM, there are four fixing blocks ① which you can use to adjust the busbar adapter to the rail thickness. The following figure shows the position of the fixing blocks.



Proceed as follows for each of the four fixing blocks:

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

5.2.1.3 Mounting the POM (busbar adapter)

The POM can be mounted on the busbar without the need for tools, using the POM busbar adapter.

Mounting the POM

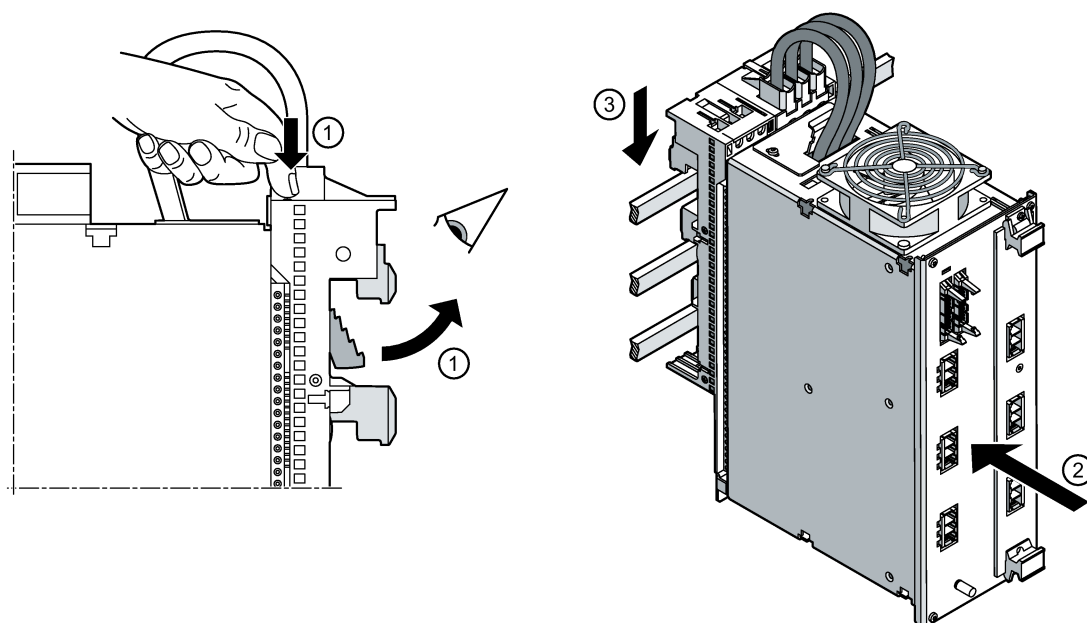


Image 5-1 Mounting the POM

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

5.2.2 Panel mounting

5.2.2.1 POM mounting (panel mounting)

Installing the Power Output Module (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 panel with four screws (M5).

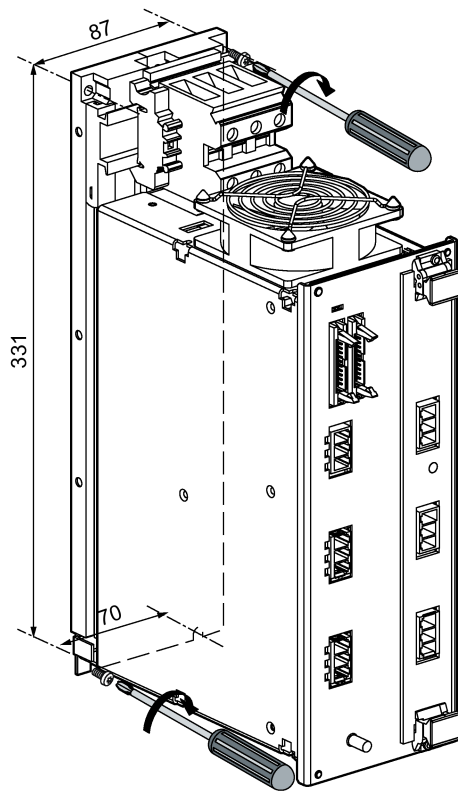


Image 5-2 POM4320: Position of the mounting holes

Minimum spacing

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

5.3 Installing the Central Interface Module

Tool

You will need a Torx T10 screwdriver.

Mounting the Central Interface Module (CIM)

The CIM is screwed directly onto the POM. The mounting procedure is described below:

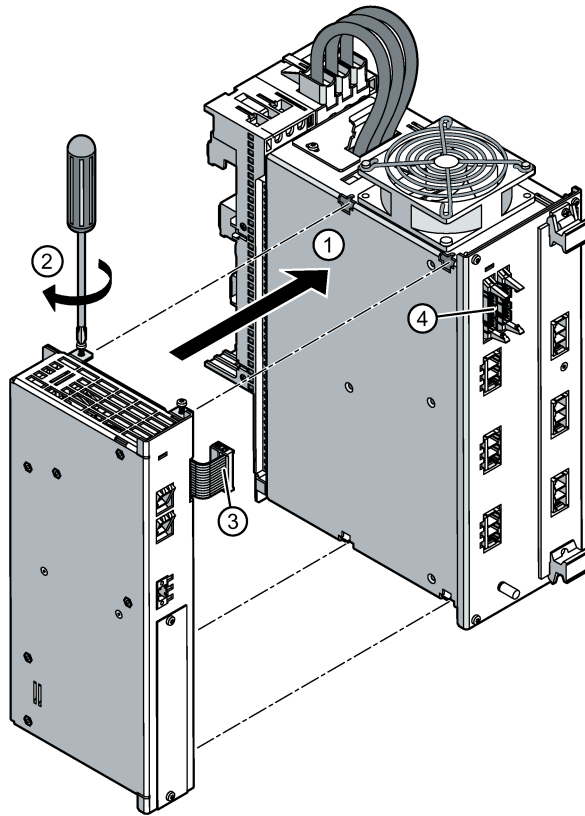


Image 5-3 Mounting the CIM

Steps	
1	Plug the CIM into the POM by means of the four connecting lugs ①.
2	Tighten the four screws ②.

5.4 Installing the EM4315 expansion module

Tool

You will need a Torx T10 screwdriver.

Installing the EM4315 expansion module

Proceed as described in Section Installing the Central Interface Module (Page 39).

5.5 Installing the I/O module (PM)

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

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

Tool

You will need a Torx T8 screwdriver.

Installing the I/O module

The procedure for installing an I/O module is described below:

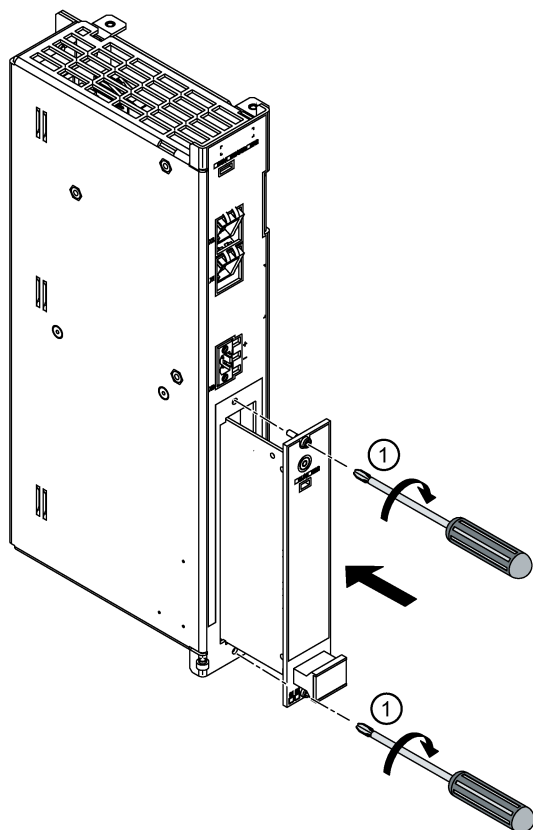


Image 5-4 Installing the I/O module

1	Remove the blanking cover from the CIM receptacle.
2	Insert the I/O module into the receptacle and push it in as far as it will go.
3	Secure the module with screws ①.

Connection

6.1 Safety instructions and guidelines

Safety instruction

 WARNING
Hazardous voltages from the mains power input or heating element feeder cables Will cause death, serious injury or damage to property Hazardous voltages may be present on the mains power input and heating element feeder cables. Before work starts on connecting the HCS4300 heating control system, the incoming supply and heating element lines must be disconnected and secured against being switched on again.
 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 before and during commissioning and maintenance work. • Before working on the heating control system or the connected components, ensure the system is disconnected.



WARNING

Electric shock hazard

May cause death or serious injury

The line voltage to which the device is connected must have a circuit breaker. The circuit breaker must be easily accessible and uniquely assigned to the device. It is advisable to locate the circuit breaker near to the device. The maximum current consumption of the heating control system must be taken into consideration when selecting the circuit breaker.

The following applies to the UL version of the heating control system:

- Only use the device in circuits limited to 50 kA.
- Only use 60/75°C copper cables for the cabling.
- The HCS POM4320 panel mounting (UL) device must be protected with an additional UL-listed branch circuit fuse.

Connection requirements

- The device is installed.
- The incoming supply is disconnected at the mounting location of the device and secured against being switched on again.
- The mains voltage is secured by an easily accessible isolating mechanism. It is recommended that the external isolating mechanism is located close to the device.
- The cables to be connected are not live.

6.2 Connecting the protective conductor

Connecting the protective conductor

Connect the POM to the protective conductor (PE). An M6 threaded bolt is provided on the front of the POM for connection of the protective conductor.



WARNING

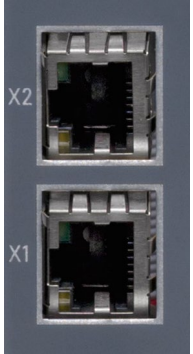
Electric shock hazard

May cause death or serious injury

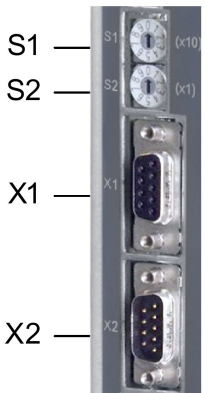
- The protective conductor must be connected to the threaded bolt marked appropriately.
- The cross-section of the lead to the protective conductor must be at least 16 mm².
- The cable lug used must have a tinned surface to guarantee corrosion protection.
- When connecting the protective conductor, the applicable national or local regulations must be complied with.
- Torque for protective conductor connection: 6 Nm

6.3 Connect PROFINET / PROFIBUS fieldbus

Connecting PROFINET

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

Connecting PROFIBUS / setting PROFIBUS address

CIM PROFIBUS connection X1	
	• The PROFIBUS address is assigned using the S1 / S2 address selector switches. Addresses can be set from 0 to 99. • In accordance with the PROFIBUS specification, connect X1 to the higher-level controller and/or the next PROFIBUS device via cable.

6.4 Connecting the 24 V DC power supply

The Control Interface Module (CIM) and Expansion Module EM4315 are supplied from the external 24 V DC power supply. Use a power supply unit which conforms to IEC 60536, protection class III (PELV). Power supply units from the SITOP product line are suitable, for example.

Both the CIM and the EM4315 can supply up to 8 POMs through the HCS system interface.

Dimensioning of the 24 V power supply

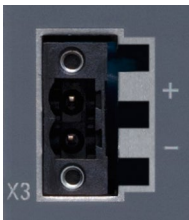
You can calculate the 24 V power supply using the following formula:

Minimum current consumption = 100 mA + number of POMs • 250 mA.

Example:

To supply a CIM PROFINET and 6 connected POMs, the 24 V power supply must be able to deliver a current of at least 1600 mA.

Connect the 24 V DC supply to the CIM / EM4315

24 V connection to CIM / EM4315		
	Connect the 24 V DC supply voltage to the device as follows:	
	+	+24 V DC
	-	GND

External lightning protector

NOTICE

An external lightning protector must be connected in the 24 V DC supply line:
Dehn, "Blitzductor BVT" type AD24, No. 918402 (or equivalent).

If other lightning protectors are used, you must ensure that the types are equivalent (check with the manufacturer of the lightning protector).

The lightning protector must be installed and used in accordance with the manufacturer's instructions.

With a lightning protector, the following interference immunity is achieved:

1.0 kV symmetrical with $R_i = 2 \Omega$; evaluation criterion B

Without a lightning protector, the following interference immunity is achieved:

0.5 kV symmetrical with $R_i = 2 \Omega$; evaluation criterion B

0.5 kV asymmetrical with $R_i = 12 \Omega$; evaluation criterion B

6.5 Connecting the heating elements and three-phase line supply

6.5.1 Connecting the three-phase line supply

In the case of POM4320 for busbar mounting, the network infeed is via a 3-phase busbar system. See Section Busbar mounting (Page 34).

In the case of POM4320 for panel mounting, the network infeed is via three screw terminals L1 / L2 / L3. The position of the screw terminals on the POM is shown in Section Function and design (Page 20).

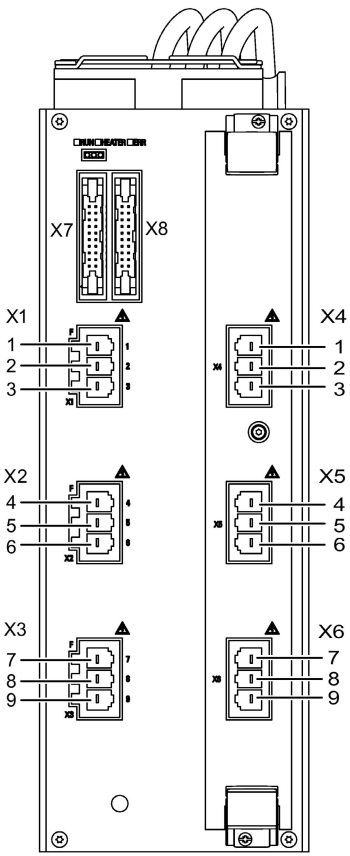
6.5.2 Connecting heating elements

Heating elements are connected to the POM using six 3-pole connectors.

NOTICE
The connected loads (heating elements) must not exceed the maximum permissible line current of 83 A.

Note

The maximum admissible length of the leads to the heating elements is 30 m.

Location of the connections	Connector assignment, X1 to X6
 POM power outputs	X1 3-pin connector for L1: Power output 1 ... 3 outgoing
	X2 3-pin connector for L2: Power output 4 ... 6 outgoing
	X3 3-pin connector for L3: Power output 7 ... 9 outgoing
	X4 3-pin connector for L2: Power output 1 ... 3 incoming
	X5 3-pin connector for L3: Power output 4 ... 6 incoming
	X6 3-pin connector for L1: Power output 7 ... 9 incoming

See also

Function and design (Page 20)

Busbar mounting (Page 34)

6.5.3 Block diagram

Block diagram

The figure below shows the main connections between the HCS4300 heating controller and the main supply and heating elements. The power outputs are protected internally with two fuses per power output.

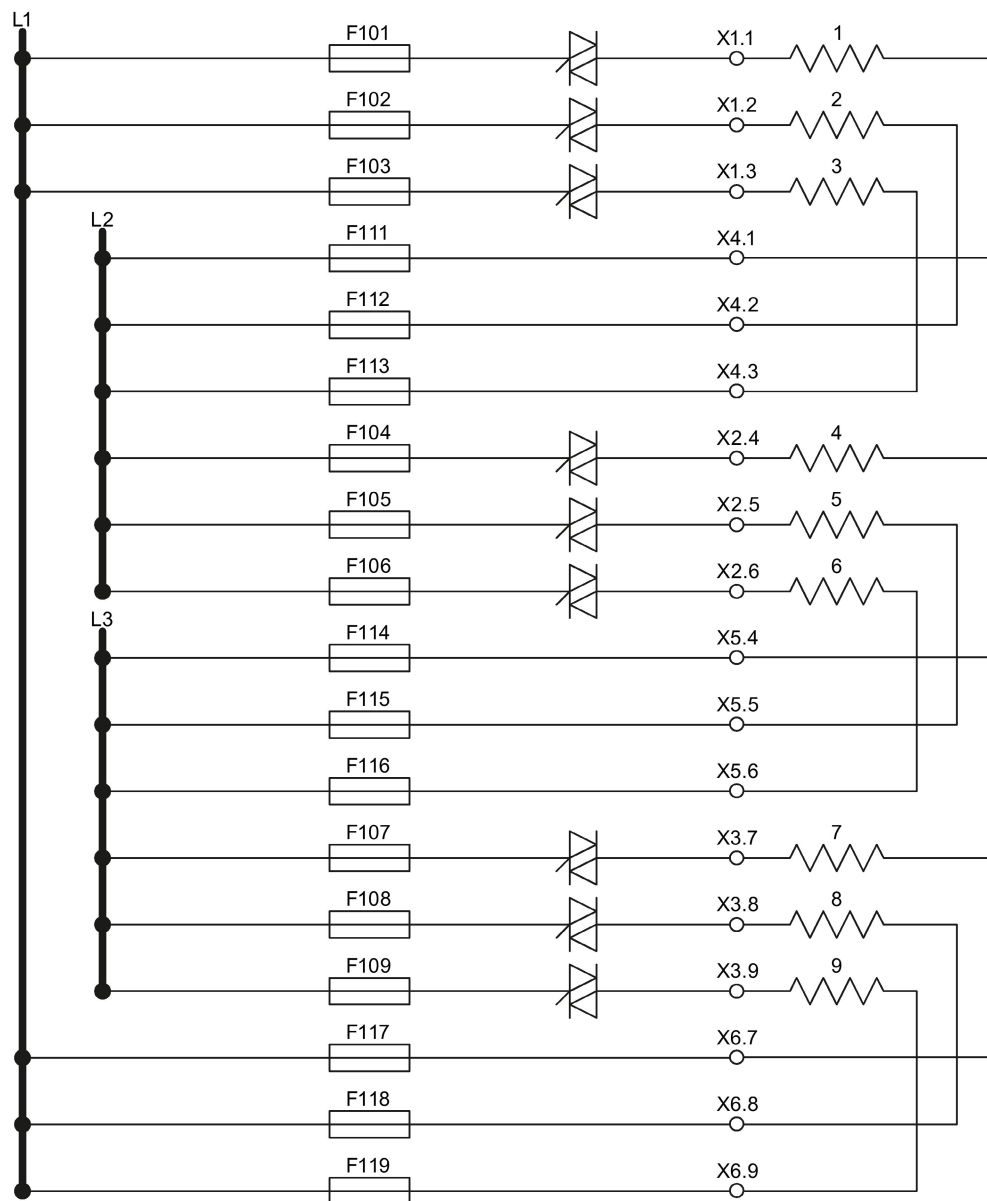
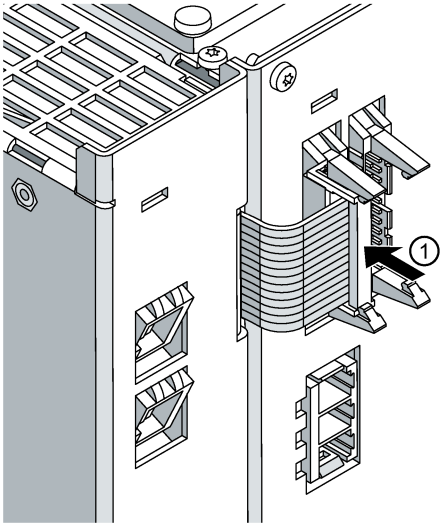


Image 6-1 POM power outputs

6.6 Connecting system interfaces

Connecting system interfaces (front)

System interface CIM or EM4315 to POM	
	Attach the connecting cable between the CIM / EM4315 and POM ①. You can operate up to 8 POMs on one CIM / EM4315. Additional POMs can be connected with a ribbon cable to the preceding POM.

NOTICE

The total length of all connecting cables at the system interface of each CIM4310 / EM4315 must not exceed 2 m.

6.7 Connecting I/O modules

6.7.1 PM4000 DI/DO

Connecting digital inputs/outputs

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

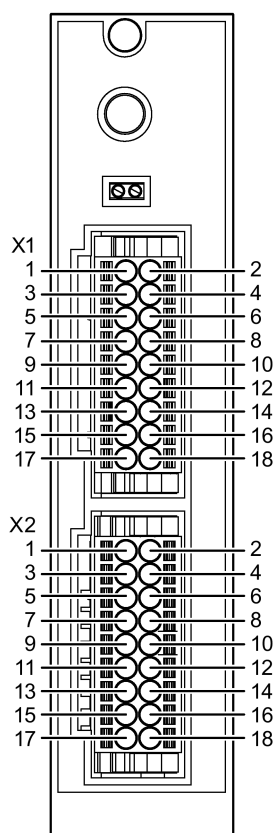


Image 6-2 PM4000 DI/DO pin assignment

Note

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

For every connector there is one pin for connecting or looping through the 24 V supply voltage and the 0 V. All 24 V and GND pins of both connectors are connected to each other, making it possible to loop through the supply voltage (daisy chain), while taking the maximum current into account.

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

The line current is connected by means of the 8-pin X1 plug connector of the PM4000 U/I.

The line voltage is connected by means of the 6-pin X2 plug connector of the PM4000 U/I.

! WARNING

Voltage hazards

Danger to life

Before working on the heating control system or the connected components, ensure the system is disconnected.

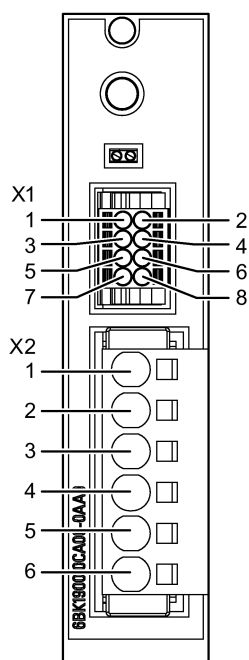


Image 6-3 Line measurement inputs, pin assignment

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	PEN 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.

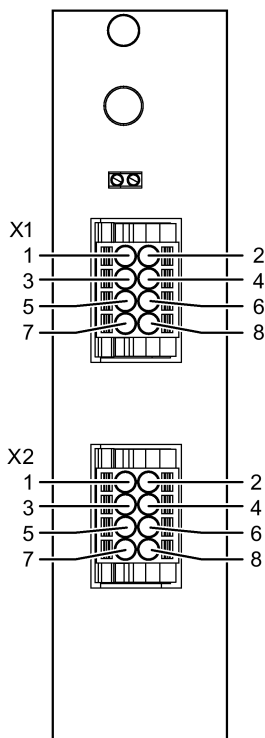


Image 6-4 PM4000 Temperature pin assignment

X1: Four analog inputs for 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

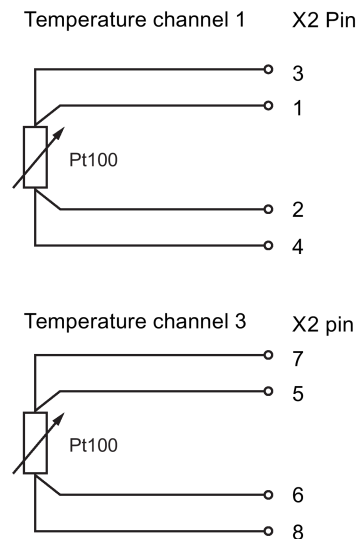


Image 6-5 Wiring of the measuring inputs to X2 for 4-wire measurement using example of Pt100

Commissioning

7.1 Requirements

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

The following is necessary:

- A SIMATIC S7 CPU / SIMOTION with PROFINET/PROFIBUS interface
- A SIPLUS HCS4300 heating control system, comprising one central interface module (CIM) and at least one power output module (POM).

7.2 Commissioning

Procedure

1. Switch on the 24 V DC power supply.
2. Switch on the three-phase power supply for the heating control system.
The CIM, POM and, where applicable, the I/O module components of the heating control system start up. Observe the operating state indicators (see Chapter Process and system messages, error handling (Page 99)).

The heating control system is in operation.

7.3 Insulation test

Insulation test

Owing to the protective impedances in the device, the insulation resistance of one device from each phase after grounding is approx. 124 kOhm without a connected load and approx. 70 kOhm with connected heater loads. These values must be taken into account during the insulation test on the system.

If there are several devices in one circuit, you must allow for the parallel connection of the impedances. If necessary, you must remove the device from the circuit before the insulation 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

Planning/configuring

8.1 Integrating the HCS4300 into the PROFINET configuration

Procedure with SIMATIC S7

If the hardware catalog of your configuration software does not feature the HCS4300 yet, it can be integrated by installing an HSP. HSPs are available for TIA V12/V13, Classic V5.5 and can be downloaded from the Service & Support website (<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.

You can download the GSDML file "GSDML-V2.3-Siemens-002A-HCS4300-yyyymmdd" from the Siemens Service & Support website (<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 HCS4300 into the PROFIBUS configuration

Procedure with SIMATIC S7

If the hardware catalog of your configuration software does not feature the HCS4300 yet, it can be integrated by installing the GSD file. This is available in German (SIEM81C5.gsg) and English (SIEM81C5.gse) versions and is available for download from the Siemens Service&Support Portal (<http://www.siemens.com/automation/service&support/>).

Procedure with non-Siemens controllers

You will need the language-specific GSD file for PROFIBUS configuration. You can download the SIEM81C5.gsx files from the Siemens Service&Support portal (<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/hardware configuration in the TIA Portal

8.3.1 PROFINET device configuration

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 has a slot for one 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 actual configuration of the HCS.

Otherwise the system cannot start up.

8.3.2 PROFIBUS device configuration

Device configuration

In the case of PROFIBUS, the structure of the hardware is mirrored in the TIA device configuration 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 24 POMs can be operated on one CIM.

Note

The device configuration in the project engineering must match the actual configuration of the HCS.

Otherwise the system cannot start up.

8.3.3 Configuration parameters

8.3.3.1 CIM / POM configuration parameters

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.

CIM parameters

Description	Value range
Rated voltage for line voltage compensation	360 V to 520 V

POM parameters

Description	Value range
Control mode (Set once per POM)	- Half-wave control (default): - Soft start version 1 - Soft start version 2 - Soft start version 3
Response to faults (setting per channel)	- Channel substitute value 0 (default) - Channel value retained

8.3.3.2 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	Range of values
Analog channel 1 measuring range ... Analog channel 4 measuring range	- Not connected (default) 0...20 mA 4...20 mA (open-circuit detection)
Temperature channel 1 sensor type Temperature channel 3 sensor type	- None (default) - Pt 100 - Pt 100 (four-wire) - Pt 1000 - Pt 1000 (four-wire) - Type J thermocouple - Type K thermocouple - Type L thermocouple
Temperature channel 2 sensor type Temperature channel 4 sensor type	- None (default) - Pt 100¹⁾ - Pt 1000¹⁾ - Type J thermocouple - Type K thermocouple - Type L thermocouple
Compensation procedure	- No compensation (default) - Internal sensor - External value

¹⁾ 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	Range of values
Digital channel 9 ... Digital channel 16	- Input (default) - Output
Output 1 Response to errors ... Output 16 Response to errors	- Switch off (default) - Hold last value - Switch on
Alarm on open circuit	- No (default) - Yes Note: If open-circuit monitoring is activated, unused outputs are either to be shut down again or assigned the state "1".
Alarm on absence of 24 V power supply	- No (default) - Yes

Parameter PM4000 U/I

Description	Range of values
Type of voltage connection	- Star (default) - Delta - None
Type of current converter	- None (default) 1 A 5 A

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 systems to support commissioning of the heating control system.

Note

There is no example project or block library for Step 7 Classic.

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 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

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

Functions

9.1 Status and actual displays

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

Status display via LEDs

The LEDs on the control 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 "Central Interface Module (CIM) (Page 99)" and Section "LED operating display for POM (Page 100)".

9.2 Power output control

9.2.1 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.

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.

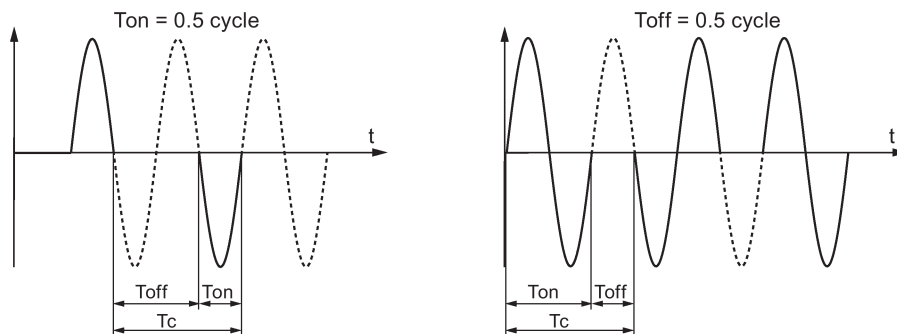


Image 9-1 Half-wave control example: 33 % and 66 %

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 72).

9.2.2 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 starting means that when switched on, the channels are controlled with a fixed number of half waves with leading-edge phasing before half-wave mode is activated. Soft starting is performed with a fixed number of phased-in half-waves.

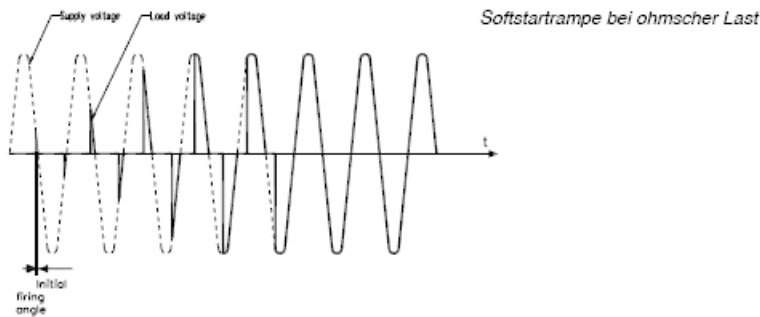


Image 9-2 Soft starting function

Note

The disturbances caused on the supply cables by the soft starting are to be filtered on the line side.

Soft start versions

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 100 ms.
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.

9.2.3 Switch on heating

Switch on heating

To control 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.

Note

A time-delayed start-up or channel soft start only occurs if heating is "On".

Time-delayed channel start-up

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. The channels of the three phases are activated "simultaneously" in each POM.

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

If during operation a channel is switched off and then on again, switch-on takes place immediately.

9.2.4 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.

9.2.5 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

Note that channels that you have not assigned to a field remain as standard in a field with the field number 0 whose field setpoints are fixed at 100%.

9.2.6 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 or off by the user.

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

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

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

The correction factors for the channels of a POM are calculated using the measured values of this POM.

9.2.7 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. The same applies in the event that the higher-level controller sends invalid data (e.g. S7-CPU in Stop). For each power output, the following can be parameterized:

- Power output is "deactivated".
This is the default and ensures the safe response of the power outputs.
- 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.
- Voltage not within in range from 360 V to 520 V
- Failure of the 24 V supply voltage on the CIM or POM

Behavior during startup

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

9.3 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 Pt 100 and Pt 1000 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 Pt 100 outside the HCS.

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 digital output, the following can be parameterized:

- Output is "deactivated" (default)
- 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

Note

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

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

Line current

Three inputs are available for the recording of 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 measured, not the value on the primary side. The latter must be determined by the user himself (transformation ratio of current converter).

Two measured values are determined for each current input:

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

Supply 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.

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 himself 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)

9.6 Monitoring functions

9.6.1 Line supply voltage monitoring

Line supply voltage monitoring

The Power Output Module (POM) can be operated in TN systems and TT systems. The admissible line supply voltage is between 360 V and 520 V AC. The active line voltage is measured and monitored for each POM and each phase. The actual voltage measurement is reported to the user (see section Cyclic input data (Page 85)).

If the voltage lies outside the admissible range, an error message will be generated (see section Process and system messages, error handling (Page 99)) and heater operation stops. Heating can only be switched on again when the voltage has returned to the admissible range.

NOTICE
Excessive voltages can damage the device
It is the responsibility of the user to ensure compliance with the maximum voltage limits.

9.6.2 Rotating-field test

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 emitter at a channel setpoint of 100 %.

9.6.3 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 the failure of the HCS system or modules.

9.6.4 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	Valid range
50 Hz	47 Hz to 55 Hz
60 Hz	55 Hz to 63 Hz

Frequency fault

If the frequency of at least one phase 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). The heating unit is not switched off and the measured frequency values continue to be updated.

9.6.5 Temperature monitoring

Internal temperature monitoring

A sensor is installed 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 74)).

Note

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

Cooling via fan

To achieve even heat distribution, an external fan is mounted on the POM enclosure. The fan is controlled depending on the internal temperature.

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

9.6.6 Monitoring power channels

Power output diagnostics

The power output module (POM) has a diagnostics function to detect errors in the power outputs. 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 / emitter cable defective	-
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 indicated.
Incoming fuse has tripped	-
Outgoing fuse ruptured or triac has high resistance	This fault can only be detected if the power output is switched on. For a 0 % setpoint, the fault is not detected and also cannot be indicated.

Note

The "triac breakdown" fault is always indicated (provided the mains voltage is connected), regardless of heating status; all other faults are only indicated when heating is enabled (heating is "ON").

For more information about the structure and output of diagnostic alarms, see Section Transfer of diagnostic alarms to the controller (Page 94).

You will find information about the causes of faults and possible rectification measures in Section Auto-Hotspot.

Suppression of channel errors

Errors are reported for all power outputs/channels as standard. The user can, however, define a list of channels for which errors should not be reported. This is appropriate when some channels are not wired up in the plant.

9.6.7 Further diagnostics

The following are also monitored, depending on the configuration level:

- Communication between the CIM and POM / PM
- Internal communication CIM
- Measuring range (PM4000 Temp)
- 24 V supply (PM4000 DI/DO)
- Open-circuit (PM4000 Temp and PM4000 DI/DO)
- Short circuit (PM4000 DI/DO)

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 POM

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

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 Off 1: Is 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)
2,3		Measured value ¹⁾ for line supply voltage L12 (with one decimal place)
4,5		Measured value ¹⁾ for line supply voltage L23 (with one decimal place)
6,7		Measured value ¹⁾ for line supply voltage L31 (with one decimal place)

1) The measured values represent the measured values of the POM1.

Cyclic input data POM

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
2,3	Analog channel 2
4,5	Analog channel 3
6,7	Analog channel 4
8,9	Temperature channel 1
10,11	Temperature channel 2
12,13	Temperature channel 3
14,15	Temperature channel 4

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 supply voltage L1/12 (with one decimal place)
2,3	Measured value for line supply voltage L2/23 (with one decimal place)
4,5	Measured value for line supply voltage L3/31 (with one decimal place)

10.2 Acyclic data exchange

S7 has system function blocks for writing / reading this data. The following data is transferred for addressing:

Index	Data record number
ID	Logical address of the PROFINET/PROFIBUS component For the datasets described below, the logical address is always the diagnostics address from the hardware configuration.
Length	- When writing: Length of the data in the dataset - When reading: Maximum number of data items that can be received simultaneously.

Note

The following applies for PROFIBUS DP:

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

10.2.1 Acyclic output data

Dataset 100 "field type 1"

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.

Dataset 101 to 132 "field type 2"

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).

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 ("0" 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.

Dataset 150 "Production field value"

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 151 "Standby field value"

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"

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
...	...	...
26	0...7	Setting for channels 209...216

Definition is via an array [1...216] 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).

Dataset 160 "Control of internal fans"

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".

Dataset 190 "System reset by user"

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

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

NOTICE

The data entered must not be modified.

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

10.2.2 Acyclic input data

The datasets/values described in section "Acyclic output data (Page 87)" can also be read.

Dataset 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.

Dataset 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

Dataset 150 "Production field value"

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

Dataset 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.

Dataset 160 "Control of internal fans"

The current setting for the fan controller is returned.

Dataset 200 "measured values"

	Byte	Description
Data POM 1	0	Internal temperature
	1	Reserved
	2,3	Frequency (with one decimal place)
	4,5	Voltage measured value L12 (with one decimal place)
	6,7	Voltage measured value L23 (with one decimal place)
	8,9	Voltage measured value L31 (with one decimal place)
Data POM 2	...	...
...	...	...
Data for POM 24	...	...

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

The POM number corresponds to the array index.

The length of the dataset corresponds to the number of POMs that are used.

Dataset 201 "versions"

	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...13	FW version of PM
POM 1	14...17	Firmware version POM 1
	18	Hardware version triac POM 1
	19	Hardware version fuse POM 1
POM 2	...	...
...	...	...
POM 24	...	...

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

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

The POM number corresponds to the array index.

The length of the dataset corresponds to the number of POMs that are used. The entry for CIM with PM is always available, even if the PM is not plugged in.

Dataset 202 "Measured values for PM4000 U/I"

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)
10,11	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 RMS L1/L12 (in [W] with one decimal place)
22,23	Power RMS L2/L23 (in [W] with one decimal place)
24,25	Power RMS 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 dataset is answered with errors if no PM U/I is present.

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 HCS4300 has the identification number 1002h.

The evaluation in SIMATIC is performed via I/O_FLT1 (OB82) and RALRM (SFB54).

Structure of the diagnostic alarm

Channel diagnosis comprises 6 bytes:

Byte	Description
0.1	Channel number The following applies for channel numbers: • Channel number = 0: Diagnostic information relates to one module (CIM, POM, PM) • Channel numbers $\neq$ 0: Diagnostic information relates to one channel (for POM, PM only) The channel numbers are counted across the entire HCS.
2	Channel type, fault type
3	Data format
4.5	Fault type (see table below)

10.3.2 Transferring diagnostic alarms to the controller: PROFIBUS

Diagnostic alarms

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

The HCS4300 has the identification number 81C5h.

The evaluation in SIMATIC is performed via I/O_FLT1 (OB82) and RALRM (SFB54).

Structure of the diagnostic alarm

The interrupt 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: • Channel number = 0: Diagnostic information relates to one module (CIM, POM, PM) • Channel numbers <> 0: Diagnostic information relates to one channel (for POM, PM only) The channel numbers are counted across the entire HCS.
6.7	Error type (see Auto-Hotspot)

10.3.3 Manufacturer-specific error codes

CIM / POM error codes

Error code	Description	CIM4310	POM4320
5101	Communication error on HCS bus	-	✓
5102	Line supply voltage is outside the permissible range (error message can be initiated by any POM)	✓	-
5103	Frequency is outside the permissible range (error message can be initiated by any POM)	✓	-
5104	Channel fault: Triac failed	-	✓
5105	Channel fault: Triac has high resistance / outgoing fuse blown	-	✓
5106	Channel fault: Incoming fuse blown	-	✓
5107	Channel fault: Emitter defective	-	✓
5109	Switch-off threshold for internal device temperature	-	✓
510B	At least one voltage is not connected	-	✓
510C	Channel fault: Undefined	-	✓
510D	Communication fault internal	✓	-
510E	Rotating field 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 / upper limit exceeded	✓	.	-
0008	Measurement range / lower limit violated	✓	-	-
0011	No supply voltage	-	✓	-
5101	Communication error on HCS bus	✓	✓	✓
510C	Undefined error	✓	✓	-
5112	Polarity reversal at measuring input	✓	-	-

Note

The following applies for PM4000 DI/DO:

The error codes for short-circuit and wire break are each signaled for one group of 4 channels only. 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 Fault reporting through diagnostics data (Page 101).

Note

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)

The device has 3 LEDs on the front: The LEDs provide information about the operating status of the device/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. Note: If, during reconfiguration, an incorrect configuration is loaded, this leads to the fault indication green=on and red=on.
			Device has started up and is ready.
			Heating "ON"
			A general error has occurred: Fault in fieldbus communication, fault in HCS communication
			

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 status of the device/system.

Meaning of LEDs

READY green	HEATING ON yellow	ERROR red	Description
			Power OFF, device switched off
			Initialization: The LED flashes until the device is detected and addressed by the CIM.
			The device is ready.
			Heating "ON"
			A general fault has occurred, e.g., communication, system 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 device-internal monitoring functions recognize specific faults in the power output module. The corresponding information is provided in the diagnostics data.

Causes of error and possible remedies

Error code	Description	Possible causes / Corrective action
5104	Channel fault: 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 indicated.	• Triac is defective ⇒ Return POM
5105	Channel fault: Fuse tripped or triac has high resistance	• Switch off machine, check outgoing fuse/cabling/heating element and rectify fault, restart • Triac is defective ⇒ Return POM
5106	Incoming fuse has tripped	• Switch off machine, check return fuse/cabling/heating element and rectify fault, restart
5107	Channel fault: Heating element / emitter cable defective	• Switch off machine, check cabling/heating element and rectify fault, restart
5109	Switch-off threshold for internal device temperature	Trip threshold overshoot: The heating is switched off automatically by the device. Actions: • Check the fan module is functioning correctly (if installed) • Switch off the machine, rectify the fault (e.g. cooling malfunction), restart
510B	At least one voltage is not connected	• Check power supply / cabling and, if necessary, connect the missing voltage
510E	Rotating field fault	• Check power supply / cabling and, if necessary, connect the missing voltage

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 status of the device/system.

Meaning of LEDs

RUN green	ERROR red	Description
		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: Error in general monitoring; error in HCS communication For PM U/I: Line supply voltage monitoring

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

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

Causes of errors and possible remedies

Error code	Description	Possible causes / corrective action
0001	Short-circuit	Switch off machine, check cabling and rectify fault; restart
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 Power output module (POM)	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

The current firmware version is already loaded on the module when the HCS4300 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 (Page 147).

NOTICE
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 (Page 11).

Observe the following information when updating the firmware:

Requirements

The following conditions must be met for you to carry out an update:

Connect the PC to an Ethernet port (X1 or X2) of the CIM.

Either the Central Interface Module (CIM) must be assigned an IP address (delivery state 0.0.0.0), or the CIM must have been 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 HCS4300 restarts automatically. Only in the event of a fault when the update has not been correctly completed do you have to restart the HCS4300.

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 HCS4300 restarts automatically. Only in the event of a fault when the update has not been correctly completed do you have to restart the HCS4300.

I/O module PM:

In the event of a firmware update, new firmware is loaded into the inserted PM. After the update, the HCS4300 restarts automatically. Only in the event of a fault, if the update has not been correctly completed, is it necessary to restart the HCS4300.

12.2.2 PROFIBUS firmware update

Delivery condition

The current firmware version is already loaded on the module when the HCS4300 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 .

NOTICE
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 HCS4300 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 HCS4300

CIM:

The update encompasses two firmware parts and is not completed until both parts have been successfully loaded.

After the update, the HCS4300 restarts automatically. Only in the event of a fault when the update has not been correctly completed do you have to restart the HCS4300.

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 HCS4300 restarts automatically. Only in the event of a fault when the update has not been correctly completed do you have to restart the HCS4300.

I/O module PM:

In the event of a firmware update, new firmware is loaded into the inserted PM. After the update, the HCS4300 restarts automatically. Only in the event of a fault, if the update has not been correctly completed, is it necessary to restart the HCS4300.

12.3 Fuse replacement

Safety guidelines

WARNING
--

Voltage hazards

May cause death or serious injury

- | |
|--|
| <ul style="list-style-type: none">• The fuse board must only be disconnected and connected in the de-energized state.• Before changing a fuse, you must isolate the load circuit from the supply and secure it against switching on again.• Before working on the heating control system or the connected components, ensure the system is disconnected. |
|--|

NOTICE

Use only the prescribed fuse types (see section Ordering data (Page 144)). If you operate the device with unapproved fuses, the device could be destroyed.
--

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.

NOTICE

ESD-sensitive components

Before you remove the board, please note the ESD information in Section ESD Guidelines (Page 145).

Tool

You will need a Torx T8 screwdriver.

Proceed as follows to remove it:

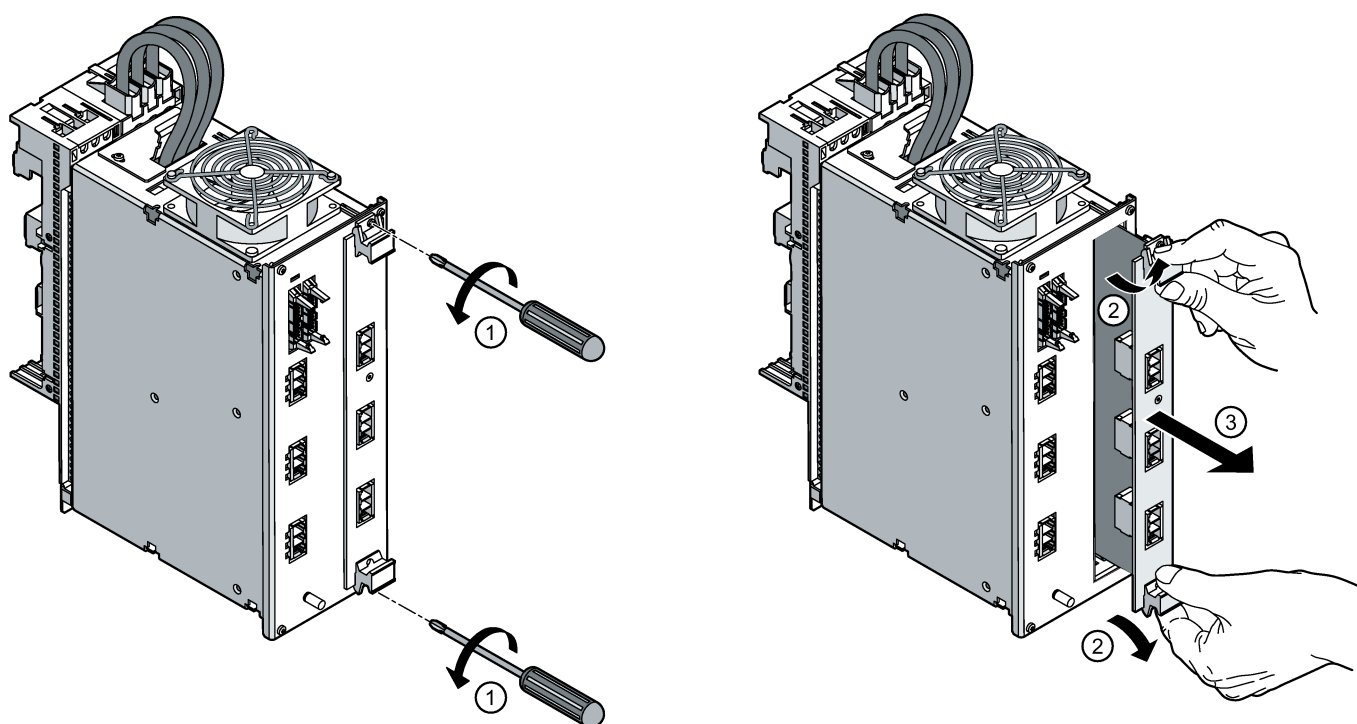


Image 12-1 Removing the fuse board

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

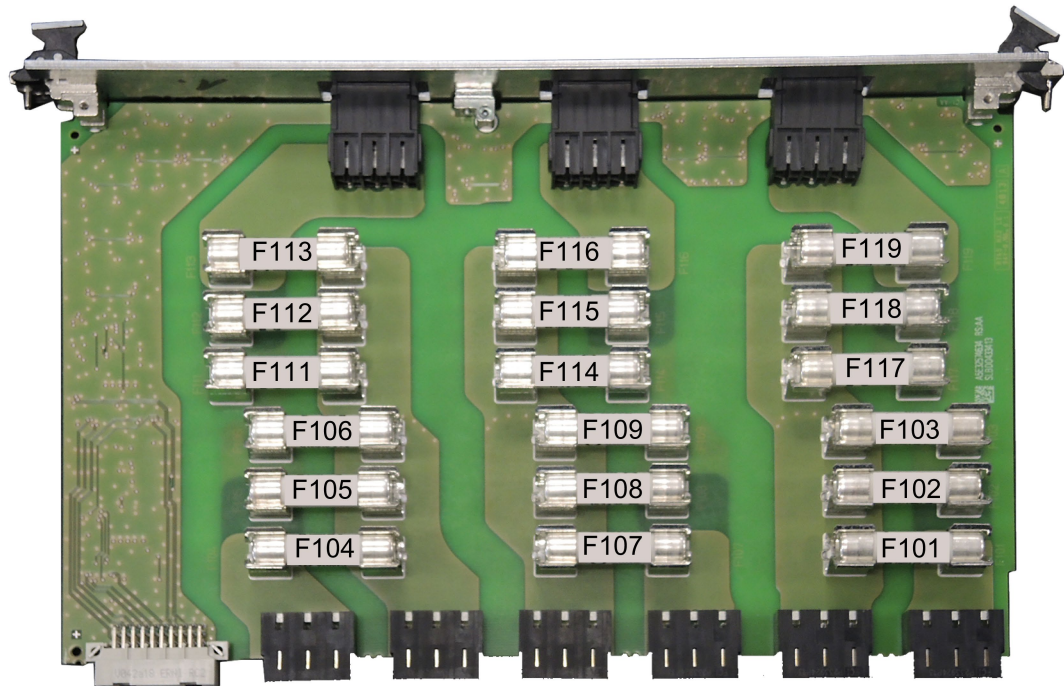


Image 12-2 Position of fuses on the board

Checking/replacing fuses

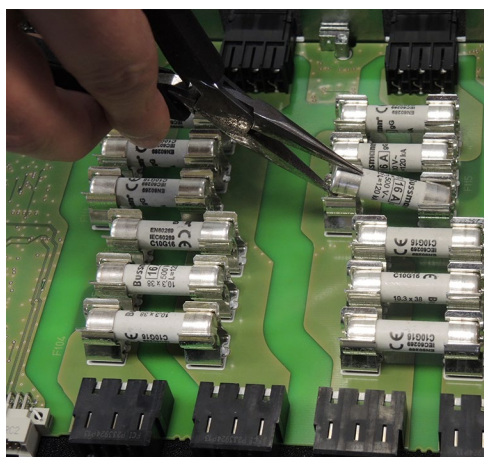
NOTICE

Electronic components are fitted to the rear of the board. When replacing fuses, ensure that these components are not damaged.

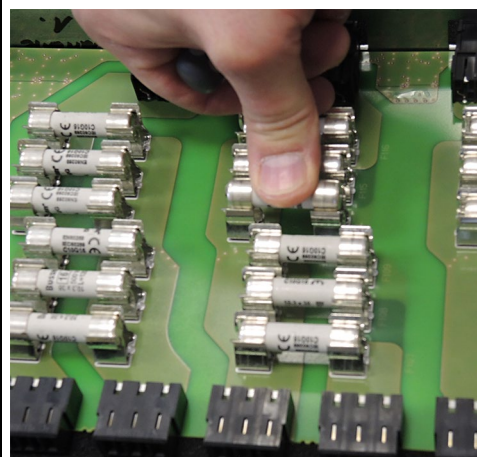
1. Check for ruptured or defective fuses (refer to fault information in the section "Diagnostics data")

2. Remove the defective fuse with a suitable tool (e.g. flat-nose pliers) and insert the fuse in the fuse holder.

Replacing a fuse



Remove the defective fuse



Insert the new fuse

Re-installing the fuse board

Proceed as follows:

Steps	
1	Place board in the guides
2	Push board in as far as the stop CAUTION: During insertion, ensure that none of the components on the the soldered side of the board are damaged.
3	Fix board in place again using the screws ① (0.5 Nm)

Re-commissioning the device

To do so, follow the procedure outlined in the section "Commissioning".

12.4 Replace fan

Requirements

WARNING
Electric shock hazard The device is energized. Before you begin to replace components, you must: • Disconnect the power supply of the busbar system and secure it against reclosing. • Disconnect the 24 V DC supply and secure it against reclosing.

Tools required:

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:

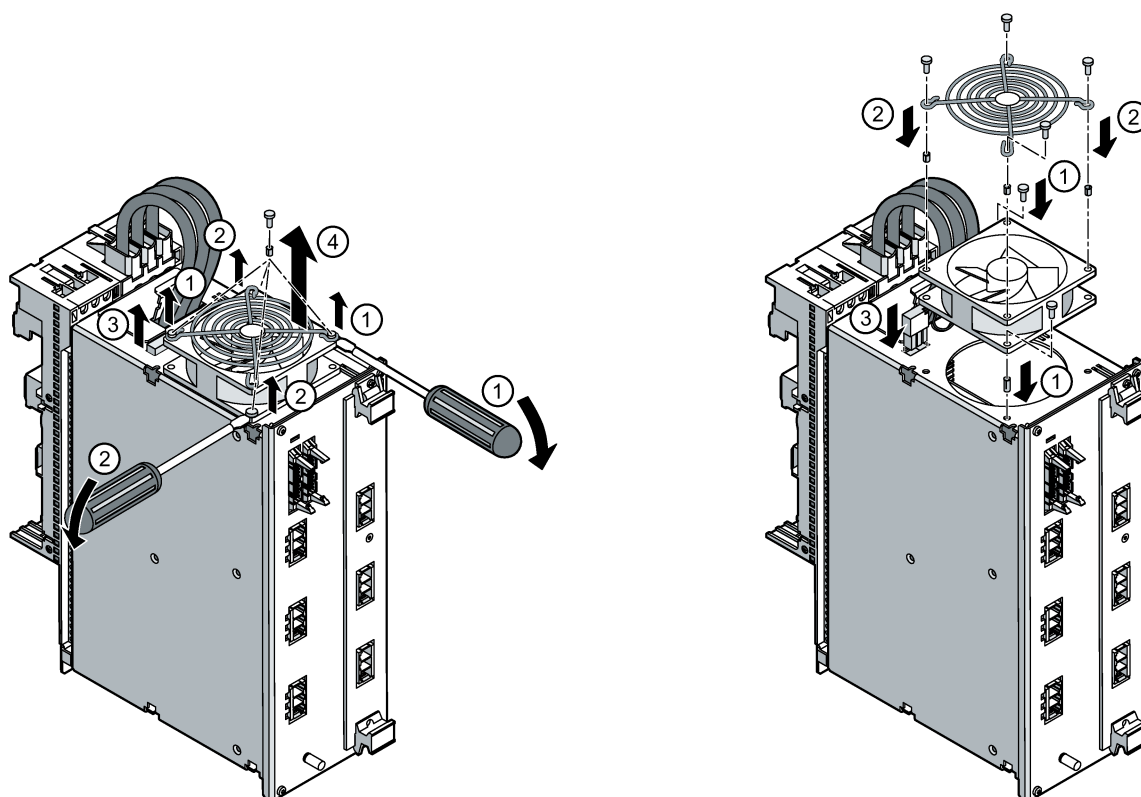


Image 12-3 Replacing the fan

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 connector of the defective fan ③
5	Lift off fan ④

Procedure for installing the new fan

1	Position the new fan on the device
2	Re-insert the two plastic rivets of the fan ① - Insert sleeve - Push in pin
3	Place fan grille on the new fan

12.4 Replace fan

Procedure for installing the new fan	
4	Re-insert the four plastic rivets of the fan grille ② - Insert sleeve - Push in pin
5	Plug in 24 V DC connector of the new fan ③

12.5 Replacing the power output module (POM)

Requirements

- The power bus system or the incoming supply is disconnected at the mounting location of the device and secured against being switched on again.
- The 24 V DC supply is disconnected and secured against reclosing.

Tool

- 4 mm screwdriver
- Open-ended, ring or socket spanner size 10 for the nuts of the ground screw

Preparations

1. Remove all connectors from the POM.
2. Disconnect the ground connection for the device at the front screw terminal.

Removing the POM (power bus mounting)

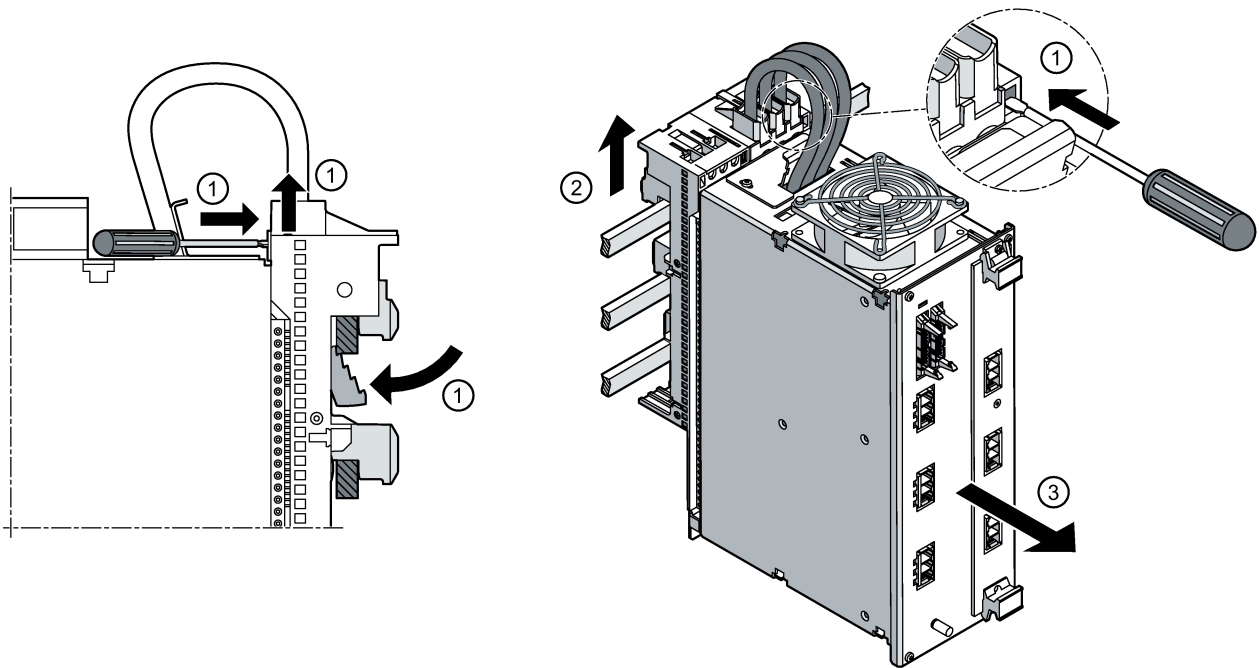


Image 12-4 Removing the POM

Steps	
1	From the front, insert a screwdriver in the opening in the busbar adapter ①. The button on top of the busbar adapter must snap upwards.
2	Remove the busbar adapter by first pushing it upwards ②, and then pulling it forwards ③.

Removing the POM (panel mounting)

Remove the four screws that secure the module to the rear panel. See Panel mounting (Page 38).

Assembly, connection and commissioning

1. Follow the instructions in this chapter: "Installing the Power Output Module (POM) (Page 34)"
2. Follow the instructions in this chapter: "Connection (Page 43)"
3. Follow the instructions in this chapter: "Commissioning (Page 59)"

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 must be disconnected.

Tool

You will need a Torx T10 screwdriver.

Removing the CIM

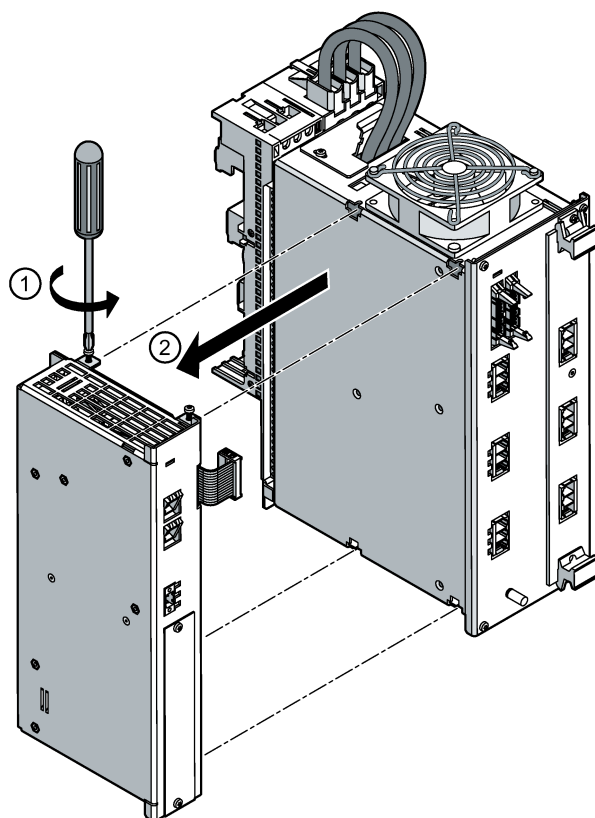


Image 12-5 Removing the CIM

Procedure for removing the CIM	
1	• Remove all connectors from the CIM. • Detach the connector from the system interface to the POM.
2	Remove the four screws ① and detach the CIM from the POM ②.

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

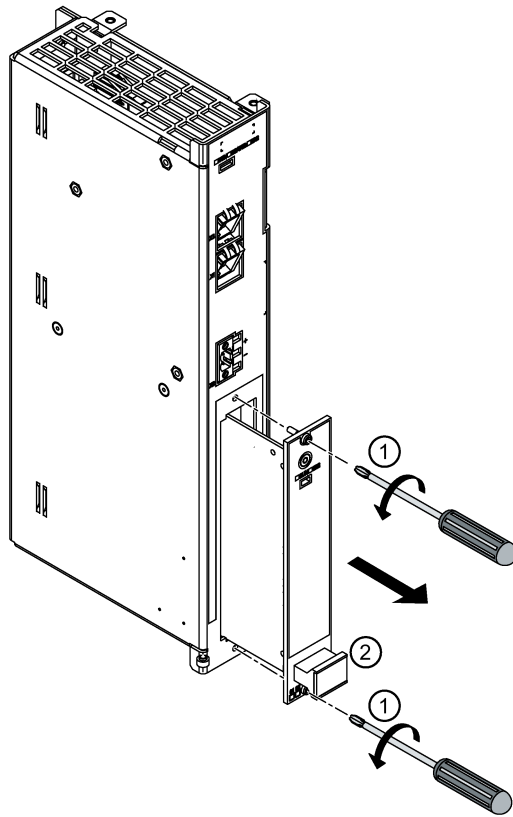


Image 12-6 Removing the PM

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

Note

The POM and CIM modules of the HCS4300 heating control system fulfill the requirements of RoHS-II and REACH.

The components can be recycled due to their lack of harmful materials. Contact a certified electronic scrap disposal company in order to ensure the environmentally-friendly recycling and disposal of your used device.

Technical data

13.1 Technical specifications for POM

Technical specifications for POM4320 busbar mounting

product brand name	SIPLUS	
Product designation	POM4320 BUSBAR MOUNTING (IEC)	POM4320 BUSBAR MOUNTING (UL)
General technical data:		
Type of load	Ohmic load	
Equipment marking / acc. to DIN EN 81346-2	Q	
Supply voltage:		
Type of voltage / of the supply voltage	AC	
Supply voltage / at AC / rated value	400 V	
Relative negative tolerance / of the supply voltage	10 %	
Relative positive tolerance / of the supply voltage	30 %	
Supply voltage frequency / 1 / rated value	50 Hz	
Supply voltage frequency / 2 / rated value	60 Hz	
Relative symmetrical tolerance / of the supply voltage frequency	5 %	
Power capacity		
• of the module / with delta connection / at 40 °C / with fan / maximum	69.1 kW	64.8 kW
• maximum permissible	69.1 kW	64.8 kW
Switching capacity current / per phase / maximum	83 A	80 A
Short-time withstand current (SCCR) / acc. to UL 508A		50 kA
Design of the electrical isolation	Optocoupler and/or protective impedance between main circuit and PELV	
Recovery time / after power failure / typical	1 s	
Type of electrical connection / for supply voltage	Busbar adapter, 3-pole + PE	

13.1 Technical specifications for POM

Power Electronics:		
Control version / of heat emitters	Half-wave control and soft start	
Number of outputs / for heating power	9	
Number of heat emitters / per output / maximum	1	
Output voltage / at output / for heating power	400 V	
Power capacity / per output	200 W ... 7 680 W	200 W ... 7 200 W
Output current / at output / for heating power / Rated value	16 A	15 A
Peak current	150 A	135 A
Design of short-circuit protection / for heating power / per output	Fuse 16 A	Fuse 15 A
Melting I2t value	250 A²·s	225 A²·s
Design of the overvoltage protection	Transil Diode	
Galvanic isolation / between the outputs	No	
Type of electrical connection	Connector, 3-pin with tension spring connection	
Type of connectable conductor cross-section / for heating and fan / solid	1x (0.2 ... 10 mm²)	
Type of connectable conductor cross-section / for heating and fan / finely stranded / with core end processing	1x (0,25 ... 6 mm²)	
Type of connectable conductor cross-sections / at AWG conductors / stranded	1x (24 ... 8)	
Product function / voltage detection	Yes	
Communication:		
Design of the interface	system interface	
Display:		
Number of status displays	12	
Display version / as status display by LED	LED green = ready, LED yellow = heating on/off, LED red = error display, LED red = error for each channel	
Auxiliary circuit:		
Design of the power supply	Power supply via CIM	
Active power consumption / maximum	8 W	
Protective and monitoring functions:		
Product function / Temperature monitoring	Yes	
Type of the temperature monitoring	NTC thermistor	
Diagnostics function	Voltage diagnostics	
Tripped fuse	Yes	
Cable break	Yes	
Heat emitter failure	Yes	

Mechanical data:	
Mounting position	vertical
Mounting type	Busbar mounting
Type of ventilation	Self-ventilation
Vibration resistance	
• during operation / acc. to IEC 60068-2-6	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1g
• during storage / acc. to IEC 60068-2-6	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1g
Shock resistance	
• acc. to IEC 60068-2-27	15g / 11 ms / 3 shocks / axis
• acc. to IEC 60068-2-29	25 g / 6 ms / 1000 shocks / axis
Protection class IP	IP20
Depth	250 mm
Height	340 mm
Width	104 mm
Electromagnetic compatibility:	
EMC emitted interference	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011
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)
Field-bound parasitic coupling / acc. to IEC 61000-4-3	10 V/m (80 ... 1000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)
Electrostatic discharge / acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge
Overvoltage category	III
Ambient conditions:	
Ambient temperature	
• during operation	0 ... 55 °C
• during storage	-25 ... +70 °C
• during transport	-25 ... +70 °C
Air pressure	
• during operation	860 ... 1 080 hPa
• during storage	660 ... 1 080 hPa
Degree of pollution	2
Installation altitude / at height above sea level / maximum	2 000 m
Relative humidity	
• at 25 °C / during operation / maximum	95 %
• at 50 °C / during operation / maximum	50 %
• at 50 °C / during operation / maximum / Note	95% at 25 °C, decreasing linearly to 50% at 50 °C

Technical specifications for POM4320 rear panel mounting

product brand name	SIPLUS	
Product designation	POM4320 rear panel mounting (IEC)	POM4320 rear panel mounting (UL)
General technical data:		
Type of load	Ohmic load	
Equipment marking / acc. to DIN EN 81346-2	Q	
Supply voltage:		
Type of voltage / of the supply voltage	AC	
Supply voltage / at AC / rated value	400 V	
Relative negative tolerance / of the supply voltage	10 %	
Relative positive tolerance / of the supply voltage	30 %	
Supply voltage frequency / 1 / rated value	50 Hz	
Supply voltage frequency / 2 / rated value	60 Hz	
Relative symmetrical tolerance / of the supply voltage frequency	5 %	
Power capacity		
• of the module / with delta connection / at 40 °C / with fan / maximum	69.1 kW	64.8 kW
• maximum permissible	69.1 kW	64.8 kW
Switching capacity current / per phase / maximum	83 A	80 A
Short-time withstand current (SCCR) / acc. to UL 508A	-	50 kA
Design of the electrical isolation	Optocoupler and/or protective impedance between main circuit and PELV	
Recovery time / after power failure / typical	1 s	
Type of electrical connection / for supply voltage	Terminal, 3-pin	
Type of connectable conductor cross-section		
• for supply voltage / solid	1x (1.5 ... 50 mm²)	
• for supply voltage / finely stranded / with core end processing	1x (1.5 ... 35 mm²)	
• for AWG conductors / for supply voltage	1x (16 ... 1)	

Power Electronics:		
Control version / of heat emitters	Half-wave control and soft start	
Number of outputs / for heating power	9	
Number of heat emitters / per output / maximum	1	
Output voltage / at output / for heating power	400 V	
Power capacity / per output	200 W ... 7 680 W	200 W ... 7 200 W
Output current / at output / for heating power / Rated value	16 A	15 A
Peak current	150 A	135 A
Design of short-circuit protection / for heating power / per output	Fuse 16 A	Fuse 15 A
Melting I2t value	250 A²·s	225 A²·s
Design of the overvoltage protection	Transil Diode	
Galvanic isolation / between the outputs	No	
Type of electrical connection / at output / for heating and fan	Connector, 3-pin with tension spring connection	
• Type of connectable conductor cross-section / for heating and fan / solid	1x (0.2 ... 10 mm²)	
• Type of connectable conductor cross-section / for heating and fan / finely stranded / with core end processing	1x (0,25 ... 6 mm²)	
• Type of connectable conductor cross-sections / at AWG conductors / stranded	1x (24 ... 8)	
Product function / voltage detection	Yes	
Communication:		
Design of the interface	system interface	
Display:		
Number of status displays	12	
Display version / as status display by LED	LED green = ready, LED yellow = heating on/off, LED red = error display, LED red = error for each channel	
Auxiliary circuit:		
Design of the power supply	Power supply via CIM	
Active power consumption / maximum	8 W	
Protective and monitoring functions:		
Product function / Temperature monitoring	Yes	
Type of the temperature monitoring	NTC thermistor	
Diagnostics function	Voltage diagnostics	
• Tripped fuse	Yes	
• Cable break	Yes	
• Heat emitter failure	Yes	

13.1 Technical specifications for POM

Mechanical data:	
Mounting position	vertical
Mounting type	Backplane mounting
Type of ventilation	Self-ventilation
Vibration resistance	
• during operation / acc. to IEC 60068-2-6	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1g
• during storage / acc. to IEC 60068-2-6	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1g
Shock resistance	
• acc. to IEC 60068-2-27	15g / 11 ms / 3 shocks / axis
• acc. to IEC 60068-2-29	25 g / 6 ms / 1000 shocks / axis
Protection class IP	IP20
Depth	217 mm
Height	344 mm
Width	104 mm
Electromagnetic compatibility:	
EMC emitted interference	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011
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)
Field-bound parasitic coupling / acc. to IEC 61000-4-3	10 V/m (80 ... 1000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)
Electrostatic discharge / acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge
Overvoltage category	III
Ambient conditions:	
Ambient temperature	
• during operation	0 ... 55 °C
• during storage	-25 ... +70 °C
• during transport	-25 ... +70 °C
Air pressure	
• during operation	860 ... 1 080 hPa
• during storage	660 ... 1 080 hPa
Degree of pollution	2
Installation altitude / at height above sea level / maximum	2 000 m
Relative humidity	
• at 25 °C / during operation / maximum	95 %
• at 50 °C / during operation / maximum	50 %
• at 50 °C / during operation / maximum / Note	95% at 25 °C, decreasing linearly to 50% at 50 °C

13.2 Technical specifications for CIM

product brand name	SIPLUS	
Product designation	CIM4310 PROFINET	CIM4310 PROFIBUS
General technical data:		
Equipment marking / acc. to DIN EN 81346-2	K	
Number of slots	1	
Type of power output / connectable	POM4320	
Supply voltage:		
Type of voltage / of the supply voltage	DC	
Supply voltage / 1 / at DC / rated value	24 V	
Relative negative tolerance / of the supply voltage	20 %	
Relative positive tolerance / of the supply voltage	20 %	
Active power consumption	3 W	
Type of electrical connection / for supply voltage	Connector 2x2-pin with tension spring connection	
Type of connectable conductor cross-section		
• for supply voltage / solid	1x (0.2 ... 2.5 mm²)	
• for supply voltage / finely stranded / with core end processing	1x (0.2 ... 2.5 mm²)	
• for AWG conductors / for supply voltage	1x (26 ... 12)	
Communication:		
Design of the interface	PROFINET IO	PROFIBUS DP
Protocol / is supported		
• PROFIBUS DP protocol	No	Yes
• PROFINET IO protocol	Yes	No
Transfer rate		
• with PROFIBUS DP / maximum	-	12 Mbit/s
• with PROFINET IO / maximum	100 Mbit/s	-
Type of electrical connection		
• of the PROFIBUS interface	-	9-pin D-Sub socket
• of the PROFINET interface	2 x RJ45	-
Display:		
Number of status displays	3	
Display version / as status display by LED	LED green = ready, LED yellow = heating on/off, LED red = error display	

13.2 Technical specifications for CIM

Mechanical data:		
Mounting position	vertical	
Mounting type	Screw mounting to POM	
Type of ventilation	Forced ventilation	
Vibration resistance		
• during operation / acc. to IEC 60068-2-6	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1g	
• during storage / acc. to IEC 60068-2-6	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1g	
Shock resistance		
• acc. to IEC 60068-2-27	15g / 11 ms / 3 shocks / axis	
• acc. to IEC 60068-2-29	25 g / 6 ms / 1000 shocks / axis	
Protection class IP	IP20	
Depth	136 mm	
Height	285 mm	
Width	56 mm	
Electromagnetic compatibility:		
EMC emitted interference	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011	
Conducted interference / due to burst / acc. to IEC 61000-4-4	2 kV power supply lines, 2 kV PROFINET cables	2 kV power supply lines, 2 kV PROFIBUS 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	DC supply lines: 0.5 kV symmetric and unsymmetric, PROFIBUS cables: 1 kV unsymmetric
Conducted interference / due to high-frequency radiation / acc. to IEC 61000-4-6	10 V (0.15 ... 80 MHz)	
Field-bound parasitic coupling / acc. to IEC 61000-4-3	10 V/m (80 ... 1000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)	
Electrostatic discharge / acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge	
Overvoltage category	III	
Ambient conditions:		
Ambient temperature		
• during operation	0 ... 55 °C	
• during storage	-25 ... +70 °C	
• during transport	-25 ... +70 °C	
Air pressure		
• during operation	860 ... 1 080 hPa	
• during storage	660 ... 1 080 hPa	
Degree of pollution	2	
Installation altitude / at height above sea level / maximum	2 000 m	
Relative humidity		
• at 25 °C / during operation / maximum	95 %	
• at 50 °C / during operation / maximum	50 %	
• at 50 °C / during operation / maximum / Note	95% at 25 °C, decreasing linearly to 50% at 50 °C	

13.3 Technical specifications for I/O module

PM4000 DI/DO

product brand name	SIPLUS
Product designation	I/O4000 DI/DO
General technical data:	
Equipment marking / acc. to DIN EN 81346-2	K
Digital Inputs:	
Number of digital inputs	8
Type of electrical connection / at the digital inputs	1 x 18-pin connector with tension spring connection
Type of connectable conductor cross-sections / at the digital inputs / solid	1x (0.2 ... 1.5 mm ²)
Type of connectable conductor cross-sections / at the digital inputs / finely stranded / with core end processing	1x (0.25 ... 1.5 mm ²)
Type of connectable conductor cross-section / at the digital inputs / for AWG conductors	1x (24 ... 16)
Digital Outputs:	
Control supply voltage / at DC / rated value	19.2 ... 28.8 V
Type of electrical connection / for control supply voltage	2 x 18-pin connector with tension spring connection
Type of connectable conductor cross-section	
for heating and fan / solid	1x (0.2 ... 1.5 mm ²)
for control supply voltage / with core end processing	1x (0.25 ... 1.5 mm ²)
for AWG conductors / for control supply voltage	1x (24 ... 16)
Number of semiconductor outputs	16
Type of switching output	semiconductor output (high side switch)
Type of voltage / of output voltages	DC
Output voltage / at DC / Rated value	24 V
Output voltage	19.2 ... 28.8 V
Output current / at digital output / for signal <1> / maximum	500 mA
Galvanic isolation / between the outputs and system interface	Yes
Switching behavior	monostable
Property of the output / Short-circuit proof	Yes
Type of electrical connection / at the digital outputs	2 x 18-pin connector with tension spring connection
Type of connectable conductor cross-sections / at the digital outputs / solid	1x (0.2 ... 1.5 mm ²)
Type of connectable conductor cross-sections / at the digital outputs / finely stranded / with core end processing	1x (0.25 ... 1.5 mm ²)

13.3 Technical specifications for I/O module

Type of connectable conductor cross-section / at the digital outputs / for AWG conductors	1x (24 ... 16)
Communication:	
Design of the interface	system interface
Display:	
Number of status displays	18
Display version / as status display by LED	LED green = Ready, LED red = Error display, 1 LED yellow per output: LED on - H status; LED off -L status
Auxiliary circuit:	
Design of the power supply	Power supply via CIM
Active power consumption / maximum	1 W
Mechanical data:	
Mounting position	vertical
Mounting type	Screw mounting to CIM
Type of ventilation	Forced ventilation
Vibration resistance	
during operation / acc. to IEC 60068-2-6	10 ... 58 Hz / 0.075 mm. 58 ... 150 Hz / 1 g
during storage / acc. to IEC 60068-2-6	5 ... 8.5 Hz / 3.5 mm. 8.5 ... 500 Hz / 1 g
Shock resistance	
acc. to IEC 60068-2-27	15g / 11 ms / 3 shocks / axis
acc. to IEC 60068-2-29	25 g / 6 ms / 1000 shocks / axis
Protection class IP	IP20
Depth	110 mm
Height	141 mm
Width	27 mm
Electromagnetic compatibility:	
EMC emitted interference	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011
Conducted interference / due to burst / acc. to IEC 61000-4-4	2 kV signal cables
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)
Field-bound parasitic coupling / acc. to IEC 61000-4-3	10 V/m (80 ... 1000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)
Electrostatic discharge / acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge
Overvoltage category	III

Ambient conditions:	
Ambient temperature	
• during operation	0 ... 55 °C
• during storage	-25 ... +70 °C
• during transport	-25 ... +70 °C
Air pressure	
• during operation	860 ... 1 080 hPa
• during storage	660 ... 1 080 hPa
Degree of pollution	2
Installation altitude / at height above sea level / maximum	2 000 m
Relative humidity	
• at 25 °C / during operation / maximum	95 %
• at 50 °C / during operation / maximum	50 %
• at 50 °C / during operation / maximum / Note	95% at 25°C, decreasing linearly down to 50% at 50°C

PM4000 U/I

product brand name	SIPLUS
Product designation	I/O4000 U/I
General technical data:	
Equipment marking / acc. to DIN EN 81346-2	K
Measuring inputs for current:	
Product function / Current detection	Yes
Current measuring range	0 ... 5 A
Relative metering precision / relating to measured voltage	0.5 %
Operating frequency / 1 / rated value	50 Hz
Operating frequency / 2 / rated value	60 Hz
Type of electrical connection / at the measurement inputs for current	1 x 8-pin connector with tension spring connection
Type of connectable conductor cross-sections / at the measurement inputs for current / solid	1x (0.2 ... 1.5 mm ²)
Type of connectable conductor cross-sections / at the measurement inputs for current / finely stranded / with core end processing	1x (0.25 ... 1.5 mm ²)
Type of connectable conductor cross-section / at the measurement inputs for current / for AWG conductors	1x (24 ... 16)
Measuring inputs for voltage:	
Product function / voltage detection	Yes
Operating voltage / at AC / at 50 Hz / rated value	230 ... 480 V
Operating voltage / at AC / at 60 Hz / rated value	230 ... 480 V
Operating frequency / rated value	50 ... 60 Hz
Relative metering precision / relating to measured current	0.5 %
Type of electrical connection / at the measurement inputs for voltage	Connector, 6-pin with tension spring connection
Type of connectable conductor cross-sections / at the measurement inputs for voltage / solid	1x (0.2 ... 10 mm ²)
Type of connectable conductor cross-sections / at the measurement inputs for voltage / finely stranded / with core end processing	1x (0.25 ... 6 mm ²)
Type of connectable conductor cross-section / at the measurement inputs for voltage / for AWG conductors	1x (24 ... 8)
Communication:	
Design of the interface	system interface
Display:	
Number of status displays	2
Display version / as status display by LED	LED green = Ready, LED red = Error display
Auxiliary circuit:	
Design of the power supply	Power supply via CIM
Active power consumption / maximum	1 W

Mechanical data:	
Mounting position	vertical
Mounting type	Screw mounting to CIM
Type of ventilation	Forced ventilation
Vibration resistance	
• during operation / acc. to IEC 60068-2-6	10 ... 58 Hz / 0.075 mm. 58 ... 150 Hz / 1 g
• during storage / acc. to IEC 60068-2-6	5 ... 8.5 Hz / 3.5 mm. 8.5 ... 500 Hz / 1 g
Shock resistance	
• acc. to IEC 60068-2-27	15g / 11 ms / 3 shocks / axis
• acc. to IEC 60068-2-29	25 g / 6 ms / 1000 shocks / axis
Protection class IP	IP20
Depth	110 mm
Height	141 mm
Width	27 mm
Electromagnetic compatibility:	
EMC emitted interference	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011
Conducted interference / due to burst / acc. to IEC 61000-4-4	2 kV signal cables
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)
Field-bound parasitic coupling / acc. to IEC 61000-4-3	10 V/m (80 ... 1000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)
Electrostatic discharge / acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge
Overvoltage category	III
Ambient conditions:	
Ambient temperature	
• during operation	0 ... 55 °C
• during storage	-25 ... +70 °C
• during transport	-25 ... +70 °C
Air pressure	
• during operation	860 ... 1 080 hPa
• during storage	660 ... 1 080 hPa
Degree of pollution	2
Installation altitude / at height above sea level / maximum	2 000 m
Relative humidity	
• at 25 °C / during operation / maximum	95 %
• at 50 °C / during operation / maximum	50 %
• at 50 °C / during operation / maximum / Note	95% at 25°C, decreasing linearly down to 50% at 50°C

PM4000 Temperature

product brand name	SIPLUS
Product designation	I/O4000 Temperature
General technical data:	
Equipment marking / acc. to DIN EN 81346-2	K
Analog channels:	
Product component / input for analog temperature sensors	Yes
Type of connection	2- and 4-wire technology
Number of analog inputs / for 2-wire technology	4
Number of analog inputs / for 4-wire technology	2
physical measuring principle	Delta-sigma
Measuring precision	+/-1 K
A/D conversion time / at the analog input	150 ms
Sensor current / typical	210 µA
Galvanic isolation / between the channels	No
Temperature drift per °C / typical	0.05 %/°C
Offset temperature per K / maximum	0.1 K/K
Temperature measurement deviation per K / maximum	-
Type of electrical connection / for temperature sensors	1 x 8-pin connector with tension spring connection
Type of connectable conductor cross-section / for temperature sensors / solid	1x (0.2 ... 1.5 mm²)
Type of connectable conductor cross-section / for temperature sensors / with core end processing	1x (0.25 ... 1.5 mm²)
Type of connectable conductor cross-section / for AWG conductors / for temperature sensors	1x (24 ... 16)
Connectable probes:	
Temperature measuring range / for Pt 100 acc. to IEC 60751	0 ... 410 °C
Temperature measuring range / for Pt 1000 acc. to IEC 60751	0 ... 850 °C
Temperature measuring range / for thermocouple type J	0 ... 650 °C
Temperature measuring range / for thermocouple type K	0 ... 440 °C
Temperature measuring range / for thermocouple type L	0 ... 640 °C
Measuring inputs for current:	
Number of inputs	4
Product function / Current detection	Yes
Current measuring range	0 ... 20 mA
Relative metering precision / relating to measured voltage	0.5 %
Type of electrical connection / at the measurement inputs for current	1 x 8-pin connector with tension spring connection
Type of connectable conductor cross-sections / at the measurement inputs for current / solid	1x (0.2 ... 1.5 mm²)
Type of connectable conductor cross-sections / at the measurement inputs for current / finely stranded / with core end processing	1x (0.25 ... 1.5 mm²)

13.3 Technical specifications for I/O module

Type of connectable conductor cross-section / at the measurement inputs for current / for AWG conductors	1x (24 ... 16)
Communication:	
Design of the interface	system interface
Display:	
Number of status displays	2
Display version / as status display by LED	LED green = Ready, LED red = Error display
Auxiliary circuit:	
Design of the power supply	Power supply via CIM
Active power consumption / maximum	1 W
Mechanical data:	
Mounting position	vertical
Mounting type	Screw mounting to CIM
Type of ventilation	Forced ventilation
Vibration resistance	
during operation / acc. to IEC 60068-2-6	10 ... 58 Hz / 0.075 mm. 58 ... 150 Hz / 1 g
during storage / acc. to IEC 60068-2-6	5 ... 8.5 Hz / 3.5 mm. 8.5 ... 500 Hz / 1 g
Shock resistance	
acc. to IEC 60068-2-27	15g / 11 ms / 3 shocks / axis
acc. to IEC 60068-2-29	25 g / 6 ms / 1000 shocks / axis
Protection class IP	IP20
Depth	110 mm
Height	141 mm
Width	27 mm
Electromagnetic compatibility:	
EMC emitted interference	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011
Conducted interference / due to burst / acc. to IEC 61000-4-4	2 kV signal cables
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)
Field-bound parasitic coupling / acc. to IEC 61000-4-3	10 V/m (80 ... 1000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)
Electrostatic discharge / acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge
Overvoltage category	III

Ambient conditions:	
Ambient temperature	
• during operation	0 ... 55 °C
• during storage	-25 ... +70 °C
• during transport	-25 ... +70 °C
Air pressure	
• during operation	860 ... 1 080 hPa
• during storage	660 ... 1 080 hPa
Degree of pollution	2
Installation altitude / at height above sea level / maximum	2 000 m
Relative humidity	
• at 25 °C / during operation / maximum	95 %
• at 50 °C / during operation / maximum	50 %
• at 50 °C / during operation / maximum / Note	95% at 25°C, decreasing linearly down to 50% at 50°C

13.4 Technical specifications for EM4315 expansion module

product brand name	SIPLUS
Product designation	EM4315 Expansion module
General technical data:	
Equipment marking / acc. to DIN EN 81346-2	K
Number of slots	0
Type of power output / connectable	POM4320
Supply voltage:	
Type of voltage / of the supply voltage	DC
Supply voltage / 1 / at DC / rated value	24 V
Relative negative tolerance / of the supply voltage	20 %
Relative positive tolerance / of the supply voltage	20 %
Active power consumption	1 W
Type of electrical connection	Connector 2x2-pin with tension spring connection
Type of connectable conductor cross-section	
• for supply voltage / solid	1x (0.2 ... 2.5 mm ²)
• for supply voltage / finely stranded / with core end processing	1x (0.2 ... 2.5 mm ²)
• for AWG conductors / for supply voltage	1x (26 ... 12)
Communication:	
Design of the interface	system interface
Protocol / is supported	
• PROFIBUS DP protocol	No
• PROFINET IO protocol	No
Display:	
Number of status displays	1
Display version / as status display by LED	LED green = Ready
Mechanical data:	
Mounting position	vertical
Mounting type	Screw mounting to POM
Type of ventilation	Forced ventilation
Vibration resistance	
• during operation / acc. to IEC 60068-2-6	10 ... 58 Hz / 0.075 mm, 58 ... 150 Hz / 1g
• during storage / acc. to IEC 60068-2-6	5 ... 8.5 Hz / 3.5 mm, 8.5 ... 500 Hz / 1g
Shock resistance	
• acc. to IEC 60068-2-27	15g / 11 ms / 3 shocks / axis
• acc. to IEC 60068-2-29	25 g / 6 ms / 1000 shocks / axis
Protection class IP	IP20
Depth	136 mm
Height	285 mm

13.4 Technical specifications for EM4315 expansion module

Width	56 mm
Electromagnetic compatibility:	
EMC emitted interference	Limit value in accordance with IEC 61000-6-4:2007 + A1:2011
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 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)
Field-bound parasitic coupling / acc. to IEC 61000-4-3	10 V/m (80 ... 1000 MHz), 3 V/m (1.4 ... 2.0 GHz), 1 V/m (2.0 ... 2.7 GHz)
Electrostatic discharge / acc. to IEC 61000-4-2	4 kV contact discharge / 8 kV air discharge
Overvoltage category	III
Ambient conditions:	
Ambient temperature	
• during operation	0 ... 55 °C
• during storage	-25 ... +70 °C
• during transport	-25 ... +70 °C
Air pressure	
• during operation	860 ... 1 080 hPa
• during storage	660 ... 1 080 hPa
Degree of pollution	2
Installation altitude / at height above sea level / maximum	2 000 m
Relative humidity	
• at 25 °C / during operation / maximum	95 %
• at 50 °C / during operation / maximum	50 %
• at 50 °C / during operation / maximum / Note	95% at 25 °C, decreasing linearly to 50% at 50 °C

13.5 Dimension drawings

Central Interface Module CIM4310

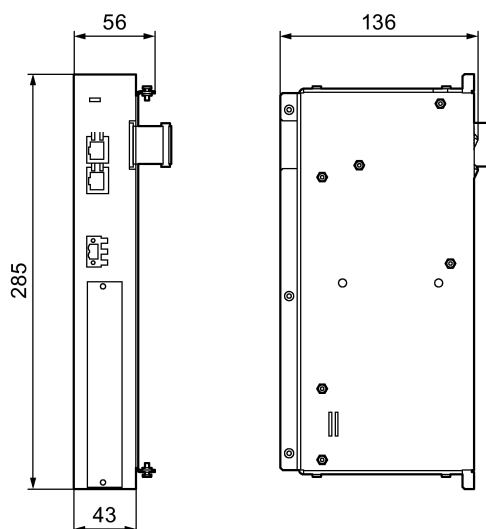


Image 13-1 Dimension drawing of CIM

Dimension drawing of power output module POM4320 for busbar mounting

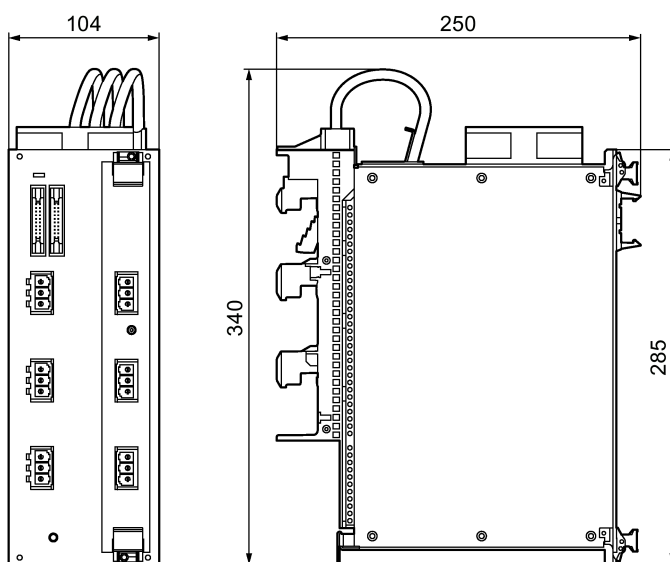


Image 13-2 Dimension drawing of POM for busbar mounting

Dimension drawing of power output module POM4320 for rear panel mounting

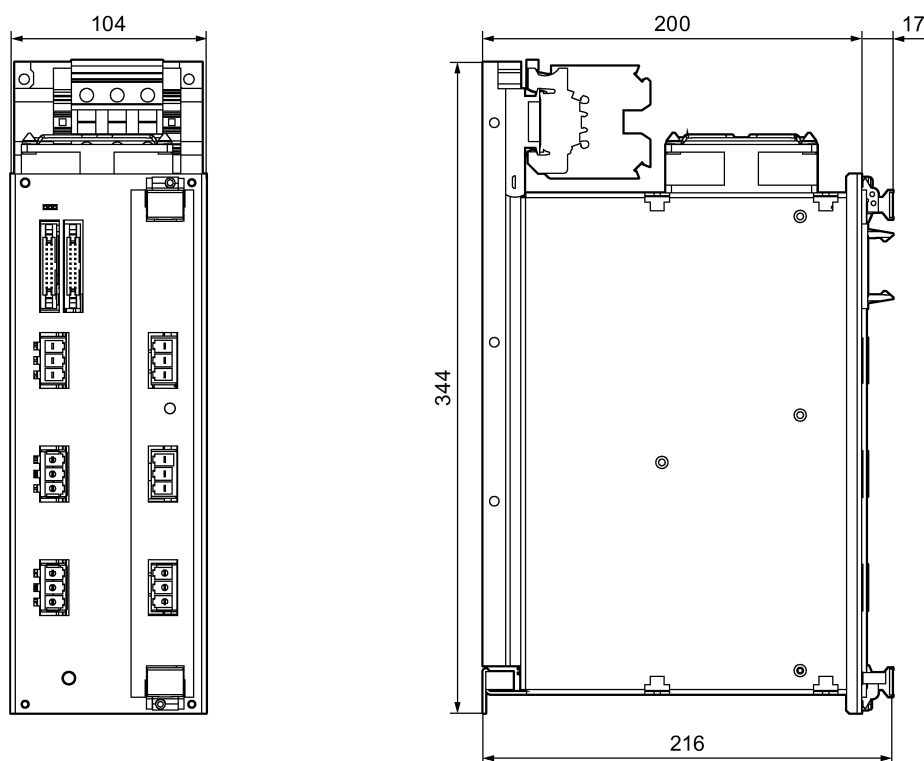


Image 13-3 Dimension drawing of POM for rear panel mounting

EM4315 expansion module

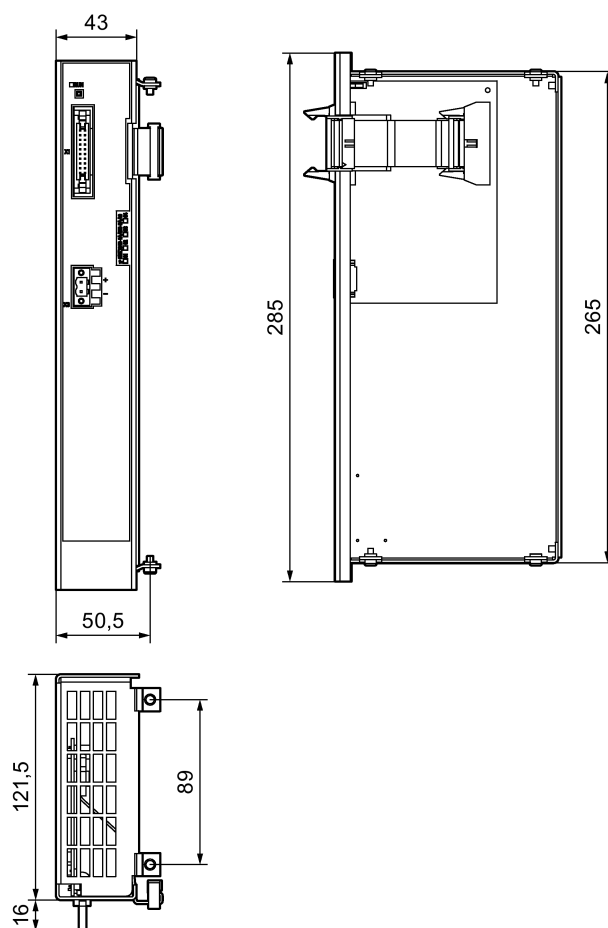


Image 13-4 Dimension drawing for EM4315 expansion module

Appendix

A.1 Certificates and approvals

A.1.1 Certificates and approvals

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.

EC directives

SIPLUS HCS4300 products conform to the requirements and safety objectives of the EC Directives listed below.

Low-voltage directive

SIPLUS HCS4300 products meet the requirements of the EC Directive: 2006/95/EC "Electrical Safety". The product is designed in accordance with EN 50178.

EMC directive (electromagnetic compatibility)

SIPLUS HCS4300 products meet the requirements of the EC Directive: 2004/108/EC "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. There is therefore no declaration of conformity relating to the EC Machinery Directive 89/392/EEC for this product.

A.2 Article numbers for spare parts/accessories

A.2.1 Ordering data

Ordering data	
Single part	Article No.
HCS CIM4310 with PROFINET	6BK1943-1AA00-0AA0
HCS CIM4310 with PROFIBUS	6BK1943-1BA00-0AA0
HCS POM4320, power bus mounting, CE version	6BK1943-2AA00-0AA0
HCS POM4320, panel mounting, CE version	6BK1943-2CA00-0AA0
HCS POM4320, power bus mounting, UL version	6BK1943-2BA00-0AA0
HCS POM4320, panel mounting, UL version	6BK1943-2DA00-0AA0
HCS EM4315 expansion module	6BK1943-1AA50-0AA0
HCS PM4000 Temperature	6BK1900-0AA00-0AA0
HCS PM4000 DI/DO	6BK1900-0BA00-0AA0
HCS PM4000 U/I	6BK1900-0CA00-0AA0
HCS fuse 16 A/500 V 10x38 gG (50 units)	6BK1943-6BA00-0AA0 - Alternative: Cooper Bussmann (www.cooperindustries.com) Article No.: C10G16
HCS fuse 15/500 V 10x38 CC (50 units)	6BK1943-6CA00-0AA0
Fan SIPLUS HCS Power Output Module 80 mm	6BK1700-2GA00-0AA0
Cable SIPLUS HCS4300 POM/POM 100 mm	6BK1943-5AA00-0AA0
Cable SIPLUS HCS4300 POM/POM 250 mm	6BK1943-5BA00-0AA0
HCS connector set, 3-pin, POM4320/4220	6BK1943-6AA00-0AA0
HCS connector set, 2-pin, 24 VDC CIM4310	6BK1942-6FA00-0AA0
HCS connector set, 18-pin, PM4000 DI/DO	6BK1900-6AA00-0AA0
HCS connector set, 8-pin, PM4000 Temperature / PM4000 U/I	6BK1900-6BA00-0AA0

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:



NOTICE

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

Anyone who is not connected to the electrical potential of their surroundings can be electrostatically charged.

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.

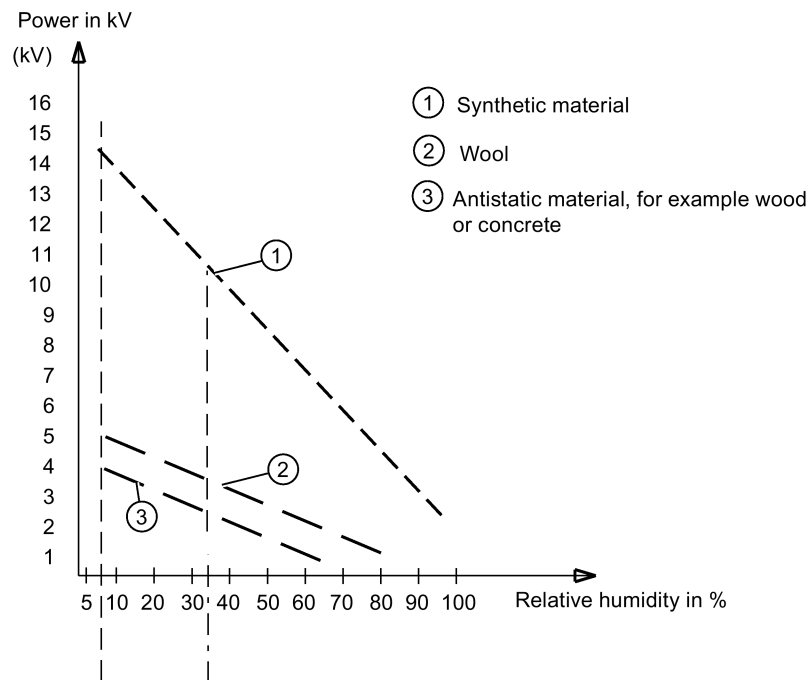


Image A-1 Electrostatic voltages on an operator

Basic protective measures against electrostatic discharge

- **Ensure good equipotential bonding:**
When handling electrostatic sensitive devices, ensure that your body, the workplace and packaging are grounded. This prevents electrostatic charge.
- **Avoid direct contact:**
As a general rule, only touch electrostatic sensitive devices when this is unavoidable (e.g. 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 homepage (<http://www.siemens.com/automation/service&support>) 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
- Your 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>).

A.4.1 Application example

Application example

An example application for SIMATIC S7 and SIMOTION is available as a guide and basis for your own applications. This application example explains the mode of operation of the heater control.

You can download the application example from the Siemens Service&Support website (<http://support.automation.siemens.com/>).

Index

A

Application example, 148
Approvals, 143

B

Basic knowledge, 9

C

Causes of error, 101
Cleaning work, 103
Connecting
 Safety guidelines, 12

D

Delivery
 Unpacking, 28
Diagnostics data, 101
Diagnostics function, 80
 Power output fault, 80, 80
Disposal, 120

E

EC directives, 143
EMC directive, 143
ESD guidelines, 145

F

Fault, 101
Frequency fault, 79
Frequency monitoring, 79
Fuse replacement, 108
Fuse types, 108
fuses
 Checking, 110

G

GSD file
 download, 61
GSDML file
 download, 61
Guidelines
 ESD guidelines, 145

H

History, 9

I

Inrush current, 70
Installation
 Ambient conditions, 29
 Device dimensions, 29
 Minimum spacing, 29
 Mounting position, 29
 Notes, 29
IT security, 11

L

Line supply voltage monitoring, 78
Line voltage compensation, 74
Low-voltage directive, 143

M

Manufacturer's warranty, 12
Monitoring functions, 101

N

Note
 Shipping, 27
Notes
 Installation, 29

O

Ordering data, 144

P

Power output diagnostics, 80

Power output fault

 Diagnostics function, 80

Power outputs

 Control, 70

Q

Qualified personnel, 9

R

Recycling, 120

Registered trademarks, 10

S

Safety guidelines

 Changes to the devices, 12

 Circuit breaker, 12

 Connecting, 12

 Fuse replacement, 13

 Repairs, 13

 Working on the device, 13

Scope of delivery, 28

Shipping

 Note, 27

Storage, 27

Storage conditions, 27

T

Target group, 9

Technical Support, 147

Temperature monitoring, 79

TN system, 78