SIEMENS

SIMATIC

S7-1500/ET 200MP Communications module CM PtP RS422/485 BA (6ES7540-1AB01-0AA0), CM PtP RS422/485 HF (6ES7541-1AB01-0AB0)

Equipment Manual

06/2024

A5E03777484-AB

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.

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

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

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Preface

Preface

Purpose of the documentation

This documentation provides important information on installing, wiring and commissioning the point-to-point communications module for the ET 200MP.

This equipment manual supplements the S7-1500 / ET 200MP Automation system (http://support.automation.siemens.com/WW/view/en/59191792) system manual. You can find functions generally relating to the S7-1500 or the ET 200MP in the S7-1500 / ET 200MP Automation system manual.

Conventions

This documentation contains figures of the described device. The figures may differ slightly from the devices supplied.

Please also observe notes marked as follows:

Note

A note contain important information on the product described in the documentation, on the handling of the product and on the section of the documentation to which particular attention should be paid.

Document history

The following table shows the most important changes to the documentation compared to the previous edition.

Manual edition	Comments
06/2024	All sections have been revised. The equipment manual is valid for the modules CM PtP RS422/485 BA **and** CM PtP RS422/485 HF.
01/2013	First edition

Security information

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

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

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For legal reasons, we are obliged to publish the original text of the license conditions and copyright notices. Please read the information on this on the Internet (https://support.industry.siemens.com/cs/ww/en/view/109740777).

Table of contents

S7-1500/ET 200MP Documentation Guide

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1.1 S7-1500 / ET 200MP Documentation Guide

The documentation for the SIMATIC S7-1500 automation system and the ET 200MP distributed I/O system is arranged into three areas.

This arrangement enables you to access the specific content you require. Changes and supplements to the manuals are documented in a Product Information.

You can download the documentation free of charge from the Internet (https://support.industry.siemens.com/cs/ww/en/view/109742691).

Basic information

The System Manual and Getting Started describe in detail the configuration, installation, wiring and commissioning of the SIMATIC S7-1500 and ET 200MP systems.

The STEP 7 online help supports you in the configuration and programming.

Examples:

- Getting Started S7-1500
- S7-1500/ET 200MP System Manual
- Online help TIA Portal

Device information

Equipment manuals contain a compact description of the module-specific information, such as properties, wiring diagrams, characteristics and technical specifications.

Examples:

- Equipment Manuals CPUs
- Equipment Manuals Interface Modules
- Equipment Manuals Digital Modules
- Equipment Manuals Analog Modules
- Equipment Manuals Communications Modules
- Equipment Manuals Technology Modules
- Equipment Manuals Power Supply Modules

General information

The function manuals contain detailed descriptions on general topics relating to the SIMATIC S7-1500 and ET 200MPsystems.

Examples:

- Function Manual Diagnostics
- Function Manual Communication
- Function Manual Motion Control
- Function Manual Web Server
- Function Manual Cycle and Response Times
- PROFINET Function Manual
- PROFIBUS Function Manual

Product Information

Changes and supplements to the manuals are documented in a Product Information. The Product Information takes precedence over the device and system manuals.

You can find the latest Product Information on the S7-1500 and ET 200MP systems on the Internet (https://support.industry.siemens.com/cs/de/en/view/68052815).

Manual Collection S7-1500/ET 200MP

The Manual Collection contains the complete documentation on the SIMATIC S7-1500 automation system and the ET 200MP distributed I/O system gathered together in one file.

You can find the Manual Collection on the Internet.
(https://support.industry.siemens.com/cs/ww/en/view/86140384)

SIMATIC S7-1500 comparison list for programming languages

The comparison list contains an overview of which instructions and functions you can use for which controller families.

You can find the comparison list on the Internet
(https://support.industry.siemens.com/cs/ww/en/view/86630375).

1.2 SIMATIC Technical Documentation

Additional SIMATIC documents will complete your information. You can find these documents and their use at the following links and QR codes.

The Industry Online Support gives you the option to get information on all topics. Application examples support you in solving your automation tasks.

Overview of the SIMATIC Technical Documentation

Here you will find an overview of the SIMATIC documentation available in Siemens Industry Online Support:

Industry Online Support International (https://support.industry.siemens.com/cs/ww/en/view/109742705)

Watch this short video to find out where you can find the overview directly in Siemens Industry Online Support and how to use Siemens Industry Online Support on your mobile device:

Quick introduction to the technical documentation of automation products per video (https://support.industry.siemens.com/cs/us/en/view/109780491)

YouTube video: Siemens Automation Products - Technical Documentation at a Glance (https://youtu.be/TwLSxxRQQsA)

Retention of the documentation

Retain the documentation for later use.

For documentation provided in digital form:

1. Download the associated documentation after receiving your product and before initial installation/commissioning. Use the following download options:
   - Industry Online Support International: (https://support.industry.siemens.com)

     The article number is used to assign the documentation to the product. The article number is specified on the product and on the packaging label. Products with new, non-compatible functions are provided with a new article number and documentation.
   - ID link:

     Your product may have an ID link. The ID link is a QR code with a frame and a black frame corner at the bottom right. The ID link takes you to the digital nameplate of your product. Scan the QR code on the product or on the packaging label with a smartphone camera, barcode scanner, or reader app. Call up the ID link.
2. Retain this version of the documentation.

Updating the documentation

The documentation of the product is updated in digital form. In particular in the case of function extensions, the new performance features are provided in an updated version.

1. Download the current version as described above via the Industry Online Support or the ID link.
2. Also retain this version of the documentation.

mySupport

With "mySupport" you can get the most out of your Industry Online Support.

Registration	You must register once to use the full functionality of "mySupport". After registration, you can create filters, favorites and tabs in your personal workspace.
Support requests	Your data is already filled out in support requests, and you can get an overview of your current requests at any time.
Documentation	In the Documentation area you can build your personal library.
Favorites	You can use the "Add to mySupport favorites" to flag especially interesting or frequently needed content. Under "Favorites", you will find a list of your flagged entries.
Recently viewed articles	The most recently viewed pages in mySupport are available under "Recently viewed articles".
CAx data	The CAx data area gives you access to the latest product data for your CAx or CAe system. You configure your own download package with a few clicks: • Product images, 2D dimension drawings, 3D models, internal circuit diagrams, EPLAN macro files • Manuals, characteristics, operating manuals, certificates • Product master data

You can find "mySupport" on the Internet. (https://support.industry.siemens.com/My/ww/en)

Application examples

The application examples support you with various tools and examples for solving your automation tasks. Solutions are shown in interplay with multiple components in the system - separated from the focus on individual products.

You can find the application examples on the Internet.
(https://support.industry.siemens.com/cs/ww/en/ps/ae)

1.3 Tool support

The tools described below support you in all steps: from planning, over commissioning, all the way to analysis of your system.

TIA Selection Tool

The TIA Selection Tool tool supports you in the selection, configuration, and ordering of devices for Totally Integrated Automation (TIA).

As successor of the SIMATIC Selection Tools , the TIA Selection Tool assembles the already known configurators for automation technology into a single tool.

With the TIA Selection Tool , you can generate a complete order list from your product selection or product configuration.

You can find the TIA Selection Tool on the Internet.
(https://support.industry.siemens.com/cs/ww/en/view/109767888)

SINETPLAN

SINETPLAN, the Siemens Network Planner, supports you in planning automation systems and networks based on PROFINET. The tool facilitates professional and predictive dimensioning of your PROFINET installation as early as in the planning stage. In addition, SINETPLAN supports you during network optimization and helps you to exploit network resources optimally and to plan reserves. This helps to prevent problems in commissioning or failures during productive operation even in advance of a planned operation. This increases the availability of the production plant and helps improve operational safety.

The advantages at a glance

- Network optimization thanks to port-specific calculation of the network load
- Increased production availability thanks to online scan and verification of existing systems
- Transparency before commissioning through importing and simulation of existing STEP 7 projects
- Efficiency through securing existing investments in the long term and the optimal use of resources

You can find SINETPLAN on the Internet
(https://new.siemens.com/global/en/products/automation/industrial-communication/profinet/sinetplan.html).

See also

PRONETA Professional (https://support.industry.siemens.com/cs/ww/en/view/109781283)

Product overview

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2.1 Properties

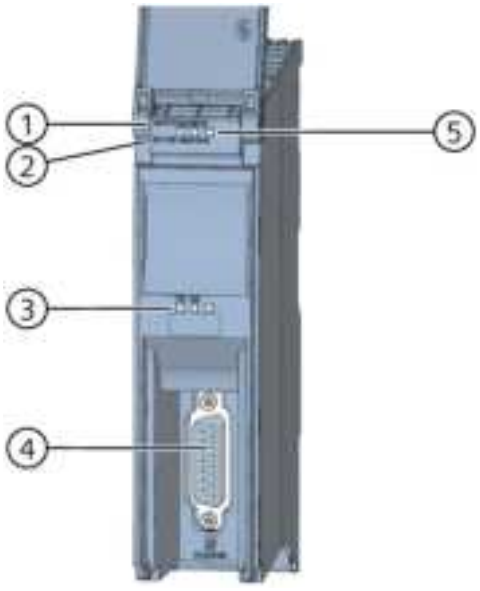
Article numbers

	CM PtP RS422/485 BA	CM PtP RS422/485 HF
Article number	6ES7540-1AB01-0AA0	6ES7541-1AB01-0AB0
Note	The CM PtP module with the article number 6ES7540-1AB01-0AA0 is a compatible replacement for the CM PtP module with the article number 6ES7540-1AB00-0AA0 .	The CM PtP module with the article number 6ES7541-1AB01-0AB0 is a compatible replacement for the CM PtP module with the article number 6ES7541-1AB00-0AB0.

Firmware version

This equipment manual describes the properties of firmware version V2.0 of the module.

View of the module



① Module type and designation
② Article number
③ LEDs for RS422/485 interface
④ 15-pin D-sub socket
⑤ LEDs for diagnostics

Figure 2-1 View of the CM PtP RS422/485 BA/HF module as an example

Properties

The communications module has the following properties:

- RS422/485 interface
- short-circuit proof
- electrically disconnected
- Protocols:
  - 3964(R)
  - Freeport
  - USS via instructions
  - Modbus master (RTU) and Modbus slave (RTU) via instructions (only for CM PtP RS422/485 HF)

Table 2- 1 Version dependencies of the functions

Function	Firmware version of the module	Configurable as of		
		STEP 7 (TIA Portal)	GSD	
			PROFINET IO	PROFIBUS DP
Firmware update	V1.0 or higher	V12	X	—
I&M identification data	V1.0 or higher	V12	X	X
Parameter reassignment in RUN (using instructions)	V1.0 or higher	V12	X	X
Diagnostic interrupts	V1.0 or higher	V12	X	X
Option for performance optimization	V2.0 or higher	V17 with HSP0367	X	X
Diagnostics via the EventTracePtP data record	V2.0 or higher	V17 with HSP0367	X	X

Firmware version V1.0 is available for article numbers 6ES7540-1AB00-0AA0 and 6ES7541-1AB00-0AB0.
Firmware version V2.0 is available for article numbers 6ES7540-1AB01-0AA0 and 6ES7541-1AB01-0AB0.

Accessories

The following components are supplied with the technology module and can also be ordered separately as replacement parts:

- U connector (6ES7590-0AA00-0AA0)
- Front flap (6ES7528-0AA00-7AA0)

Other components

The following plug-in cables, which can be ordered separately, are available with the lengths 5 m, 10 m and 50 m (15-pin D-sub male plug at each end of the cable):

- Connecting cable X27 (RS422), 5 m (6ES7902-3AB00-0AA0)
- Connecting cable X27 (RS422), 10 m (6ES7902-3AC00-0AA0)
- Connecting cable X27 (RS422), 50 m (6ES7902-3AG00-0AA0)

You can find additional information on the connecting cables for a point-to-point connection between the communications module and communication partner CM PtP - Configurations for point-to-point connections (http://support.automation.siemens.com/WW/view/en/59057093) in section 3 of the function manual.

Additional information

You can find additional information on the properties of the CM PtP in the function manual CM PtP - Configurations for point-to-point connections (http://support.automation.siemens.com/WW/view/en/59057093).

Additional information on the properties of the S7-1500 and associated modules can be found in the system manual S7-1500 / ET 200MP automation system (http://support.automation.siemens.com/WW/view/en/59191792).

Additional information on using the CM PtP without the prepared instruction libraries is available in the programming and operating manual CM PtP in operation without SIMATIC system instructions (http://support.automation.siemens.com/WW/view/en/59062563).

2.2 Functions

Introduction

The communications module allows you to exchange data between your own and other programmable controllers or computers by means of a point-to-point connection, and to connect various devices from a variety of manufacturers.

Functionality

The communications module offers the following functionality:

- RS422/485 interface
- Data transmission rate:
  - CM PtP RS422/485 BA: 300 to 19200 bit/s
  - CM PtP RS422/485 HF: 300 to 250000 bit/s
- Maximum frame length:
  - Without option for performance optimization:
    CM PtP RS422/485 BA: 1024 bytes
    CM PtP RS422/485 HF: 4096 bytes
  - With option for performance optimization: 24 bytes for receiving, 30 bytes for sending
- Transmission protocols:
  - CM PtP RS422/485 BA: Freeport, 3964(R), USS via instructions (Page 29)
  - CM PtP RS422/485 HF: Freeport, 3964(R), USS via instructions, Modbus via instructions (Page 29)

Hardware components of a point-to-point connection

You require the following hardware components for a point-to-point connection with the communications module:

Components	Function
Automation system	... contains the CPU and PROFINET interface, and the centralized I/O, if applicable, and executes the user program.
Communications module	... communicates with a communication partner (point-to-point) by means of the interface.
Connecting cable	... connects the communications module with the communication partner. 

Applications for a point-to-point connection are, for example:

- Communication with a converter via USS
- Communication with a heating control system via Modbus

Additional information

You can find information on the configuration and programming of the communications module in the function manual CM PtP - Configurations for point-to-point connections (http://support.automation.siemens.com/WW/view/en/59057093) and in the information system of STEP 7 (TIA Portal).

2.3 Properties of the RS422/485 interface

Definition

The RS422/485 (X27) interface is a differential voltage interface and is used for serial data transmission.

Properties

The RS422/485 (X27) interface has the following properties and meets the following requirements:

Type:	Differential voltage interface
Front connector:	15-pin D-sub socket with screw interlock (see RS422/485 (X27) interface of the communication module (Page 16) for assignment)
RS422 signals:	T (A), R (A), T (B), R (B), GND; all signals are isolated against the backplane bus
RS485 signals:	R/T (A), R/T (B), GND; all signals isolated against backplane bus
Max. data transmission rate:	CM PtP RS422/485 BA: 19200 bit/s CM PtP RS422/485 HF: 250000 bit/s
Max. cable length:	1200 m at 300...19200 bit/s, 500 m at 38400 bit/s, 350 m at 76800 bit/s, 250 m at 115200 bit/s; 100 m at 250000 bit/s; Cable type LIYCY 3 x 2 x 0.14. T(A)/T(B) and R(A)/R(B) twisted in pairs. To ensure interference-free operation for cable lengths > 50 m, you must install a terminating resistor of approx. 330 Ω at the receiver end. You can find information on connecting the modules in the FAQ with the entry ID 109736665 on the Internet (https://support.industry.siemens.com/cs/ww/en/view/109736665).
Standard:	DIN 66259 Parts 1 and 3, EIA-RS422/485, CCITT V.11

Connecting

3

3.1 RS422/485 (X27) interface of the communication module

The RS422/485 (X27) interface is a differential voltage interface and is used for serial data transmission.

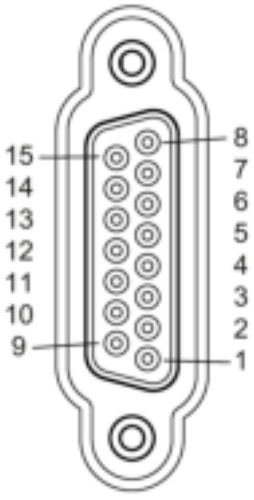
The inputs and outputs are not isolated from each other. The inputs and outputs are electrically isolated from the backplane bus.

Terminal assignment

Plug the connecting cable into the 15-pin D-sub socket behind the front flap of the communications module.

The table below shows the pin assignment of the 15-pin D-sub socket.

Table 3- 1 Pin assignment for the 15-pin D-sub socket of the integrated interface of the communications module

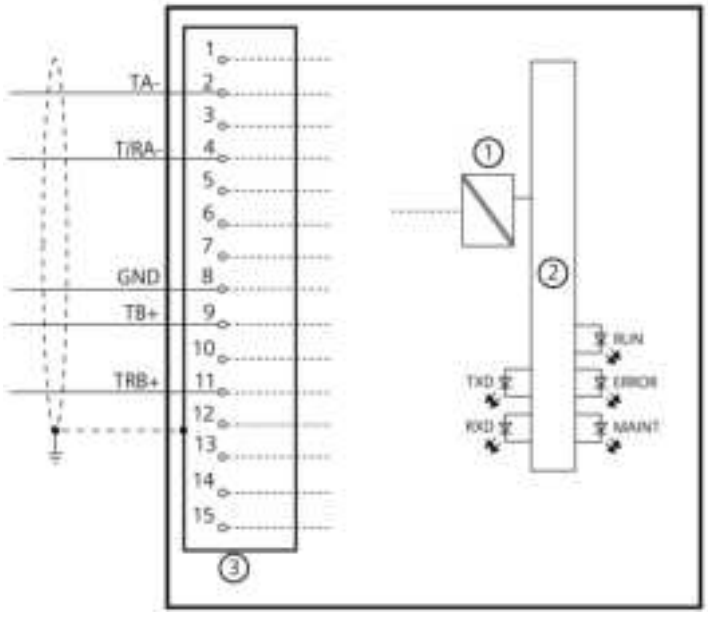
RS422/485 socket	Pin	Designation	Input/output	Meaning
	2	T (A)-	Output	Send data (four-wire mode)
	4	R (A)- T(A)/R(A)	Input Input/output	Receive data (four-wire mode) Receive/send data (two-wire mode)
	8	GND	—	Shared ground reference (ground)
	9	T (B)+	Output	Send data (four-wire mode)
	11	R (B)+ T(B)/R(B)	Input Input/output	Receive data (four-wire mode) Receive/send data (two-wire mode)
Front view				

Schematic circuit diagram

Standard connecting cables of various lengths (see section Properties (Page 11)) are available for connection with a communication partner which also has a 15-pin D-sub socket.

Note that you must only use shielded connector enclosures and cables. A large surface area of the cable shield must be in contact with the connector enclosure at both ends of the cable. You must ground the shields of the cables between communication partner and communications module both through the enclosure of the male plug and on the communication partner.

The figure below shows the circuit diagram of the communications module for operation at the RS422/485 connection.



① Electrical isolation
② Technology and backplane bus interface
③ Enclosure of the D-sub socket

Figure 3-1 Schematic circuit diagram

CAUTION

Never connect cable shield with GND

Never connect the cable shield with the GND, as this could destroy the interfaces. GND must always be connected with the communications module *and* communication partner; otherwise the interface modules could again be destroyed.

Note

Ensure the power supply is disconnected before you wire the communications module.

Note

To ensure interference-free operation for cable lengths > 50 m, you must install a terminating resistor of approx. 330 Ω at the receiver end.

Additional information

You can find information on connecting the modules in the FAQ with the entry ID 109736665 (https://support.industry.siemens.com/cs/ww/en/view/109736665) and in the system manual Automation System S7-1500 / ET 200MP (http://support.automation.siemens.com/WW/view/en/59191792).

3.2 Installation guidelines

To take into consideration

The general installation guidelines must be taken into consideration (see the EMC/EMI compatible installation of control systems (http://support.automation.siemens.com/WW/view/en/59193566) Function Manual).

Configuring/address space

4

4.1 Configuring

Introduction

You configure and assign the parameters of the communications module with STEP 7 (TIA Portal).

System environment

The communications module can be used in the following system environments:

Applications	Components required	Configuration software	In the user program
Central operation with an S7-1500 CPU	• S7-1500 automation system • CM PtP RS422/485 BA/HF	STEP 7 (TIA Portal): Device configuration and parameter setting with hardware configuration	Instruction libraries PtP Communication, USS Communication and MODBUS (RTU)[1] (Page 29)
Distributed operation with an S7-1500 CPU	• S7-1500 automation system • ET 200MP distributed I/O system • CM PtP RS422/485 BA/HF	STEP 7 (TIA Portal): Device configuration and parameter setting with hardware configuration	
Distributed operation with an S7-300/400 CPU	• S7-300/400 automation system • ET 200MP distributed I/O system • CM PtP RS422/485 BA/HF	STEP 7 (TIA Portal): Device configuration and parameter setting with hardware configuration	
		STEP 7: Device configuration and parameter setting with GSD file	Instruction libraries PtP Communication, USS Communication and MODBUS (RTU)[1] according to entry ID 75226762 in the Internet (https://support.industry.siemens.com/cs/ww/en/view/75226762)
Distributed operation in a third-party system[2]	• Third-party automation system • ET 200MP distributed I/O system • CM PtP RS422/485 BA/HF	Third-party configuration software: Device configuration and parameter setting with GSD file	Instructions for control and parameter assignment according to the programming manual[2]

[1] MODBUS (RTU) is only available for CM PtP RS422/485 HF

[2] Information on using the communications module in a third-party system is available in the programming and operating manual CM PtP in operation without SIMATIC system instructions (http://support.automation.siemens.com/WW/view/en/59062563).

Additional information

A detailed description of the point-to-point connections and their configuration is available:

- In the Function Manual CM PtP - Configurations for point-to-point connections as download on the Internet (http://support.automation.siemens.com/WW/view/en/59057093)
- In the STEP 7 (TIA Portal) information system under "Edit devices and networks > Configuring devices and networks > Create configurations > Configurations for point-to-point connections (S7-1500)"
- In the FAQ with the entry ID 109477693 in the Internet (https://support.industry.siemens.com/cs/ww/en/view/109477693)

Hardware Support Packages (HSP)

You need HSP0367 to use the module in TIA Portal V17 and V18. The module is integrated in the subsequent TIA Portal versions.

You can find the Hardware Support Packages (HSP) for download on the Internet (https://support.industry.siemens.com/cs/ww/en/view/72341852).

Alternatively, you can access the download via the menu bar of STEP 7 (TIA Portal): "Options > Support Packages > Download from the Internet".

GSD file

The respective GSD file for the ET 200MP distributed I/O system is available for download on the Internet:

- GSD file PROFINET IO (https://support.industry.siemens.com/cs/ww/en/view/68189683)
- GSD file PROFIBUS DP (https://support.industry.siemens.com/cs/ww/en/view/80206700)

4.2 Parameter setting

You can use various parameters to define the properties of the communications module. Depending on the settings, not all parameters are available.

You set the parameters of the module as follows:

Parameter setting via ...	Basic procedure
Hardware configuration in STEP 7 (TIA Portal)	1. Insert the module from the hardware catalog under "Communications modules". 2. Set the parameters of the module in the hardware configuration. 3. Download the project to the CPU.
Hardware configuration using GSD file for distributed operation on the PROFINET IO	1. Install the latest PROFINET GSD file. You will then find the module in the hardware catalog under "Other field devices > PROFINET IO > I/O". 2. Set the parameters in the hardware configuration. 3. Download the project to the CPU.
Hardware configuration using GSD file for distributed operation on the PROFIBUS DP	1. Install the latest PROFIBUS GSD file. You will then find the module in the hardware catalog under "Other field devices > PROFIBUS DP > I/O". 2. Load the project into the CPU. Due to the limited number of parameters at a maximum of 244 bytes per station with a PROFIBUS GSD configuration, the configuration options are restricted. The parameters are preassigned in the module with the default setting. 3. If your PROFIBUS controller supports the "Read/write data record" function, you can set the parameters in the user program using the respective data records.

Parameters of the CM PtP RS422/485 BA/HF for Freeport protocol

The following parameter settings are possible when you select the "Freeport" protocol. The default settings of the parameters are shown in bold in the "Value range" column.

Table 4- 1 Programmable parameters

Parameter	Value range
Specification of the operating mode	
Specification of the operating mode	• Full duplex (RS422) 4-wire operation (point-to-point) • Half duplex (RS485) 2-wire operation
Receive line initial state	• None • Signal R(A)=5 V, Signal R(B)=0 V (break detection) • Signal R(A)=0 V, Signal R(B)=5 V

Parameter	Value range
Port configuration	
Performance optimized for many short frames[1]	• **Deactivated** • Activated
Data transmission rate	• 300 bits/s • 600 bits/s • 1200 bits/s • 2400 bits/s • 4800 bits/s • **9600 bits/s** • 19200 bits/s • 38400 bits/s[2] • 57600 bits/s[2] • 76800 bits/s[2] • 115200 bits/s[2] • 250000 bits/s[2]
Parity	• **None**[3] • Even • Odd • Mark: Set parity bit to 1 • Space: Set parity bit to 0 • Any
Data bits	• **8 bits** • 7 bits
Stop bits	• **1** • 2
Data flow control	• **None** • XON/XOFF
XON character	0...**11**...FF
XOFF character	0...**13**...FF
Wait for XON after XOFF	0...**20000**...65535 ms
Diagnostics	
Activate break detection	• **Deactivated** • Activated
Enable diagnostics interrupt	• Deactivated • **Activated**

Parameter	Value range
Configuration of message sending: Frame default settings	
Send break before frame start	• **Deactivated** • Activated
Break duration	0...**12**...65535 bit times
Send idle line	• Deactivated • **Activated**
Duration of the idle line	0...**384**...65535 bit times
Configuration of message sending: RTS delay	
RTS ON delay	**0**...65535 ms
RTS OFF delay	**0**...65535 ms
Configuration of message sending: End delimiter	
Send up to and including the end delimiter	• **Deactivated** • Activated
No. of end delimiters	0...**1**...2
1st end delimiter (Hex)	**0**...FF
2nd end delimiter (Hex)	**0**...FF
Configuration of message sending: Appended characters	
Number of appended characters	**0**...5
Hex	0...FF
Configuration of message reception: Frame start detection	
Frame start detection	• **Start on any character** • Start on special condition
After detection of a line break	• **Deactivated** • Activated
After detection of an idle line	• Deactivated • **Activated**
Duration of the idle line	0...**40**...65535 bit times
After receipt of a start character	• **Deactivated** • Activated
Start character (Hex)	**0**...FF
After detection of a start sequence	• **Deactivated** • Activated
Number of sequences to be defined	• **1** • 2 • 3 • 4
Check this character	• **Deactivated** • Activated
Character (HEX)	0...FF

Parameter	Value range
Configuration of message reception: Frame end identifier	
Recognize message end by message timeout	• **Deactivated** • Activated
Message timeout	1...**200**...65535 ms
Recognize message end by response timeout	• **Deactivated** • Activated
Response timeout	1...**200**...65535 ms
After character delay time elapses	• Deactivated • **Activated**
Character delay time	1...**288**...65535 bit times
After receipt of a fixed frame length	• **Deactivated** • Activated
Frame length (CM PtP RS422/485 BA)	**1**...1024 bytes
Frame length (CM PtP RS422/485 HF)	**1**...4096 bytes
After receipt of a maximum number of characters	• **Deactivated** • Activated
Frame length (CM PtP RS422/485 BA)	**1**...1024 bytes
Frame length (CM PtP RS422/485 HF)	**1**...4096 bytes
Read message length from message	• **Deactivated** • Activated
Offset of length field in message (CM PtP RS422/485 BA)	**0**...1023 bytes
Offset of length field in message (CM PtP RS422/485 HF)	**0**...4095 bytes
Size of length field	• **1** • 2 • 4
Number of characters not counted in length specification	**0**...255 bytes
After receipt of an end sequence	• **Deactivated** • Activated
Check this character	• **Deactivated** • Activated
Character (HEX)	0...FF

Parameter	Value range
Configuration of message reception: Receive buffer	
Buffered received frames	1...**255**
Prevent overwriting	• Deactivated • **Activated**
Clear receive buffer on startup	• **Deactivated** • Activated

1 When configuring with GSD file, you specify the option by selecting the module name in the hardware catalog.

2 Only available for CM PtP RS422/485 HF

3 Preset as of firmware version V2.0 of the module. "Even" is preset with firmware version < V2.0.

Parameters of the CM PtP RS422/485 BA/HF with protocol 3964(R)

The following parameter settings are possible when you select protocol "3964(R)". The default settings of the parameters are shown in bold in the "Value range" column.

Table 4- 2 Programmable parameters

Parameter	Value range
Specification of the operating mode	
Specification of the operating mode	• Full duplex (RS422) 4-wire operation (point-to-point)
Receive line initial state	• None • Signal R(A)=5 V, Signal R(B)=0 V (break detection) • Signal R(A)=0 V, Signal R(B)=5 V
Port configuration	
Performance optimized for many short frames[1]	• **Deactivated** • Activated
Data transmission rate	• 300 bits/s • 600 bits/s • 1200 bits/s • 2400 bits/s • 4800 bits/s • **9600 bits/s** • 19200 bits/s • 38400 bits/s[2] • 57600 bits/s[2] • 76800 bits/s[2] • 115200 bits/s[2] • 250000 bits/s[2]

Parameter	Value range
Parity	• **None**[3] • Even • Odd • Mark: Set parity bit to 1 • Space: Set parity bit to 0 • Any
Data bits	• **8 bits** • 7 bits
Stop bits	• **1** • 2
Diagnostics	
Activate break detection	• **Deactivated** • Activated
Enable diagnostics interrupt	• Deactivated • **Activated**
3964(R) configuration	
Priority	• **High** • Low
With block check (3964R)	• Deactivated • **Activated**
Use default values	• Deactivated • **Activated**
Connection attempts	1...**6**...255
Transmission attempts	1...**6**...255
Character delay time	20...**220**...65535 ms
Acknowledgment delay	20...**2000**...65535 ms

[1] When configuring with GSD file, you specify the option by selecting the module name in the hardware catalog.

[2] Only available for CM PtP RS422/485 HF

[3] Preset as of firmware version V2.0 of the module. "Even" is preset with firmware version < V2.0.

Using the GSD file for PROFIBUS DP

For parameter assignment of the communications module, depending on the protocol use, you must call the following instructions (Page 29) in GSD mode:

With the Freeport protocol:

- Port_Config (Port configuration record - data record 57)
- Send_Config (Send configuration record - data record 59)
- Receive_Config (Receive configuration record - data record 60)
- Set_Features (Activate special function - data record 58)

With the 3964(R) protocol:

- Port_Config (Port configuration record - data record 57)
- P3964_Config (3964 protocol configuration - data record 61)
- Set_Features (Activate special function - data record 58)

Note

The Set_Features instruction must always be called as the last configuration instruction.

Note

If the module restarts during operation of the plant (e.g. by pulling and plugging the module or due to an interruption of the voltage supply) you have to call up the specified instructions again.

Additional information

The equipment manual of the communications module is supplemented by the function manual CM PtP - Configurations for point-to-point connections (http://support.automation.siemens.com/WW/view/en/59057093) and the STEP 7 (TIA Portal) information system. There you will find information on the following topics:

- Operating modes
- Option for performance optimization
- Receive buffer
- Data flow control
- Transmission integrity
- Data transmission - protocol specific
- Programming/configuring in STEP 7 (TIA Portal)
- Module-specific instructions
- Diagnostics
- Data record EventTracePtP

Information on using the communications module in a third-party system is available in the programming and operating manual CM PtP in operation without SIMATIC system instructions (http://support.automation.siemens.com/WW/view/en/59062563).

To use the communications module in a third-party system, the CPU must support communication by means of data records.

Information on reparameterization after failure and return of the power or the PROFINET/PROFIBUS interface is available in the FAQ with the entry ID 109783576 (https://support.industry.siemens.com/cs/ww/en/view/109783576).

4.3 Address space

Address space of the communications module

The size of the input and output addresses of the communications module depends on whether the performance optimization option (Page 29) is enabled.

Table 4- 3 Size of the input and output addresses

	Inputs	Outputs
Scope without option for performance optimization	8 bytes	0 bytes
Scope with option for performance optimization	32 bytes	32 bytes

4.4 Reaction to CPU STOP

Ongoing transmissions are aborted when the higher-level control (CPU) goes to STOP.

Frames will continue to be received and are retained in the receive buffer. Information about this is forwarded to the CPU only after a STOP-RUN transition, provided you have configured that the receive buffer is not cleared in the hardware configuration of the module (Page 21).

Programming

5

Data communication

You define the type of data exchange with the "Performance optimized for many short frames" parameter of the module in the hardware configuration (Page 21). It is recommended to use the option for performance optimization, provided that the maximum length for incoming/outgoing frames is not exceeded.

Two types of data exchange between the CPU and the communications module are possible:

- Asynchronous data exchange

  The point-to-point instructions communicate with the communications module asynchronously (to the application cycle) by reading or writing data records. Data transmission takes place across several cycles. The respective maximum frame length according to the technical specifications (Page 35) applies.

- Synchronous data exchange (option for performance optimization)

  The point-to-point instructions communicate with the communications module synchronously with the application cycle via the IO data of the communications module.

  The maximum length is 24 bytes for incoming frames and 30 bytes for outgoing frames. By using data synchronous to the application cycle, the reaction time is optimized, especially if you are using several CM PtPs in parallel.

Note

The performance optimization option is available with the PtP Communication instruction library as of V4.0.

Overview of the instructions

Communication between the CPU, the communications module and a communication partner takes place by means of special instructions and protocols that support the corresponding communications modules.

The instructions of the PtP Communication instruction library process the exchange of data between the CPU and the communications module. They must be called once or cyclically from the user program. The instructions independently detect whether the option for performance optimization is active and match the method for the data exchange.

Point-to-point instruction	Meaning
Port_Config	Dynamically assign the basic interface parameters (Initialization phase of the communications module)
Send_Config	Send configuration Dynamically assigning serial send parameters of a protocol
Receive_Config	Receive configuration Dynamically assigning serial receive parameters of a protocol
P3964_Config	Protocol configuration Dynamically configuring the parameters of procedure 3964(R)
Send_P2P	Send data to a communication partner
Receive_P2P	Receive data from a communication partner
Receive_Reset	Clear receive buffer of the communications module
Get_Features	Read the extended functions supported by the communications module
Set_Features	Set extended functions supported by the communications module

USS instruction	Meaning
USS_Port_Scan	Communication using USS
USS_Drive_Control / USS_Drive_Control_31	Exchange data with a drive
USS_Read_Param / USS_Read_Param_31	Readout parameters from the drive
USS_Write_Param / USS_Write_Param_31	Change parameters in the drive

MODBUS instruction (only for CM PtP RS422/485 HF)	Meaning
Modbus_Comm_Load	The Modbus_Comm_Load instruction enables you to configure the port of the communications module for Modbus RTU.
Modbus_Master	The Modbus_Master instruction enables you to communicate as Modbus master via the PtP port.
Modbus_Slave	The Modbus_Slave instruction enables you to communicate as Modbus slave via the PtP port.

The instructions are part of STEP 7 (TIA Portal). The instructions are available in the "Instructions" task card under Communication > Communication processor.

Additional information

Additional information on programming the communications modules is available in the function manual CM PtP - Configurations for point-to-point connections (http://support.automation.siemens.com/WW/view/en/59057093) and in the STEP 7 (TIA Portal) information system.

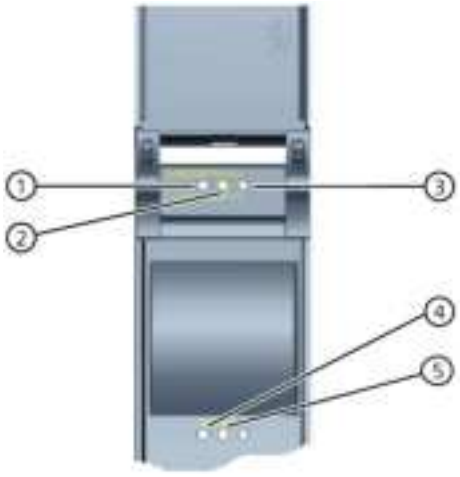
Interrupts/diagnostic messages

6

6.1 Status and error displays

LED displays of the communication module

The figure below shows the LED displays of the communications module with open front flap.



① RUN (green)
② ERROR (red)
③ MAINT (yellow)
④ TXD (yellow)
⑤ RXD (yellow)

Figure 6-1 LED displays of the CM PtP RS422/485 BA/HF

Meaning of the LED displays

The following tables explain the meaning of the status and fault displays. You can find remedial measures for diagnostic messages in the section Diagnostic alarms (Page 33).

Table 6- 1 Status and fault displays RUN/ERROR/MAINT

LEDs			Meaning	Solution
RUN	ERROR	MAINT		
Off	Off	Off	Voltage missing or too low at back-plane bus	Switch on the CPU and/or the system power supply modules. • Verify that the U connectors are inserted. • Check to see if too many modules are inserted.
Flashes	Off	Off	CM not configured	—
On	Off	Off	CM parameters assigned and no module diagnostics	
On	Flashes	Off	CM parameters assigned and module diagnostics (at least one error pending)	Evaluate the diagnostic messages and eliminate the error.[1]
Flashes	Flashes	Flashes	Hardware or firmware fault	Replace the communications module.

[1] Information on startup and diagnostics of the communications module is available in the CM PtP - Configurations for point-to-point connections (http://support.automation.siemens.com/WW/view/en/59057093) function manual.

Table 6- 2 Status displays TXD/RXD

LEDs		Meaning
TXD	RXD	
Flashes	Off	Interface is transmitting
Off	Flashes	Interface is receiving

6.2 Diagnostic alarms

Enabling of diagnostics interrupts

You enable the diagnostic interrupts in the device configuration.

The communications module can trigger the following diagnostic interrupts:

Table 6- 3 Possible diagnostic interrupts

Diagnostic interrupt	Monitoring
• Error • Parameter assignment error	Monitoring is always active. A diagnostic interrupt is triggered each time an error is detected.
• Wire break	An error detected only triggers a diagnostic interrupt if "Activate break detection" and "Enable diagnostics interrupt" have been enabled in the device configuration.

Reactions to a diagnostic interrupt

The following happens when an event occurs that triggers a diagnostic interrupt:

- The ERROR LED flashes red.

  Once you have remedied the error, the ERROR LED goes out.
- The S7-1500 CPU interrupts the processing of the user program. The diagnostic interrupt OB (e.g. OB 82) is called. The event that triggered the interrupt is entered in the start information of the diagnostic interrupt OB.
- CPU S7-1500 remains in RUN even if no diagnostic interrupt OB is present in the CPU. The communications module continues working unchanged if this is possible despite the error.

You can obtain detailed information on the error event in the error organization block with instruction "RALRM" (Read additional alarm information), in the information system of STEP 7 and in function manual Diagnostics (https://support.industry.siemens.com/cs/ww/en/view/59192926), section "System diagnostics in user program".

If the module is being operated as a distributed module in an ET 200MP system with PROFIBUS DP, you have the option of reading out diagnostics data with the RDREC or RD_REC instruction using data record 0 and 1. For the structure of the data records, refer to the equipment manual for the IM 155-5 DP ST interface module, which is available for download on the Internet (https://support.industry.siemens.com/cs/ww/de/view/78324181).

Diagnostic messages

The diagnostic messages are displayed as plain text in STEP 7 (TIA Portal) in the online and diagnostics view. You can evaluate the error codes with the user program.

The following diagnostics can be signaled:

Table 6- 4 Diagnostic messages, their meaning and remedies

Diagnostic message	Error code	Meaning	Solution
Error	9H	• Internal module error occurred • Possible cause: – Firmware update was aborted – Communication module defective	• Repeat firmware update • Replace communication module
Parameter assignment error	10H	The received parameter data record is invalid	Check parameter data record
Wire break	109H	Interruption of the line between communication module and communication partner	Check process wiring

6.3 Diagnostics via the EventTracePtP

Diagnostics via the EventTracePtP data record

With the EventTracePtP data record, you can save and read out the last 1000 most recent (communication) events and the parameterization of the communications module.

Information on the configuration of the data record can be found in the function manual CM PtP - Configurations for point-to-point connections (http://support.automation.siemens.com/WW/view/en/59057093) (Edition 2024).

Technical specifications

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The following table shows the technical specifications as of the issue date. You can find a data sheet with up-to-date technical specifications on the Internet.

- CM PtP RS422/485 BA (https://support.industry.siemens.com/cs/de/en/pv/6ES7540-1AB01-0AA0/td?dl=en)
- CM PtP RS422/485 HF (https://support.industry.siemens.com/cs/de/en/pv/6ES7541-1AB01-0AB0/td?dl=en)

Article number	**6ES7540-1AB01-0AA0**	**6ES7541-1AB01-0AB0**
General information		
Product type designation	CM PtP RS 422 / 485 BA	CM PtP RS 422 / 485 HF
Product function		
• I&M data	Yes; I&M 0	Yes; I&M 0
• Fast startup	Yes	Yes
Engineering with		
• STEP 7 configurable/integrated from version	V5.5 SP2 with GSD file	V5.5 SP2 with GSD file
• PROFIBUS from GSD version/GSD revision	- / -	- / -
• PROFINET from GSD version/GSD revision	GSDML V2.42	GSDML V2.42
Installation type/mounting		
Rail mounting	Yes; S7-1500 mounting rail	Yes; S7-1500 mounting rail
Supply voltage		
Design of the power supply	system power supply	system power supply
Input current		
Current consumption (rated value)	43 mA; From the backplane bus	43 mA; From the backplane bus
Power		
Power available from the backplane bus	0.65 W	0.65 W
Power loss		
Power loss, typ.	0.6 W	0.6 W
Address area		
Address space per module		
• Inputs	8 byte; performance mode: 32 byte	8 byte; performance mode: 32 byte
• Outputs	0 byte; performance mode: 32 byte	0 byte; performance mode: 32 byte

Article number	6ES7540-1AB01-0AA0	6ES7541-1AB01-0AB0
Interface types		
RS 485		
• Transmission rate, max.	19.2 kbit/s	250 kbit/s
• Cable length, max.	1 200 m	1 200 m
RS 422		
• Transmission rate, max.	19.2 kbit/s	115.2 kbit/s
• Cable length, max.	1 200 m	1 200 m
• 4-wire full duplex connection	Yes	Yes
• 4-wire multipoint connection	No	No
Protocols		
Integrated protocols		
Freeport		
– Telegram length, max.	1 kbyte	4 kbyte
– Bits per character	7 or 8	7 or 8
– Number of stop bits	1 or 2 bit	1 or 2 bit
– Parity	None, even, odd, always 1, always 0, any	None, even, odd, always 1, always 0, any
3964 (R)		
– Telegram length, max.	1 kbyte	4 kbyte
– Bits per character	7 or 8	7 or 8
– Number of stop bits	1 or 2 bit	1 or 2 bit
– Parity	None, even, odd, always 1, always 0, any	None, even, odd, always 1, always 0, any
Modbus RTU master		
– Address area		1 to 247, extended 1 to 65535
– Number of slaves, max.		32
MODBUS RTU slave		
– Address area		1 to 247, extended 1 to 65535
Telegram buffer		
• Buffer memory for telegrams	2 kbyte	8 kbyte
• Number of telegrams which can be buffered	255	255

Article number	6ES7540-1AB01-0AA0	6ES7541-1AB01-0AB0
Interrupts/diagnostics/status information		
Diagnostics function	Yes	Yes
Alarms		
• Diagnostic alarm	Yes	Yes
• Hardware interrupt	No	No
Diagnoses		
• Wire-break	Yes	Yes
Diagnostics indication LED		
• RUN LED	Yes; green LED	Yes; green LED
• ERROR LED	Yes; red LED	Yes; red LED
• Receive RxD	Yes; Yellow LED	Yes; Yellow LED
• Transmit TxD	Yes; Yellow LED	Yes; Yellow LED
Potential separation		
between backplane bus and interface	Yes	Yes
Isolation		
Isolation tested with	707 V DC (type test)	707 V DC (type test)
Ambient conditions		
Ambient temperature during operation		
• horizontal installation, min.	-30 °C	-30 °C
• horizontal installation, max.	60 °C	60 °C
• vertical installation, min.	-30 °C	-30 °C
• vertical installation, max.	40 °C	40 °C
Altitude during operation relating to sea level		
• Installation altitude above sea level, max.	5 000 m; restrictions for installation altitudes > 2 000 m, see ET 200MP system manual	5 000 m; restrictions for installation altitudes > 2 000 m, see ET 200MP system manual
Decentralized operation		
to SIMATIC S7-300	Yes	Yes
to SIMATIC S7-400	Yes	Yes
to SIMATIC S7-1500	Yes	Yes
to standard PROFINET controller	Yes	Yes
Dimensions		
Width	35 mm	35 mm
Height	147 mm	147 mm
Depth	127 mm	127 mm
Weights		
Weight, approx.	0.22 kg	0.22 kg

Additional general technical specifications for SIMATIC S7-1500 are available in the system manual S7 -1500 Automation System (http://support.automation.siemens.com/WW/view/en/59191792).

Dimensional drawing

A

The following figures show the dimension drawing of the module on the mounting rail, as well as a dimension drawing with open front flap. Always observe the specified dimensions for installation in cabinets, control rooms, etc.

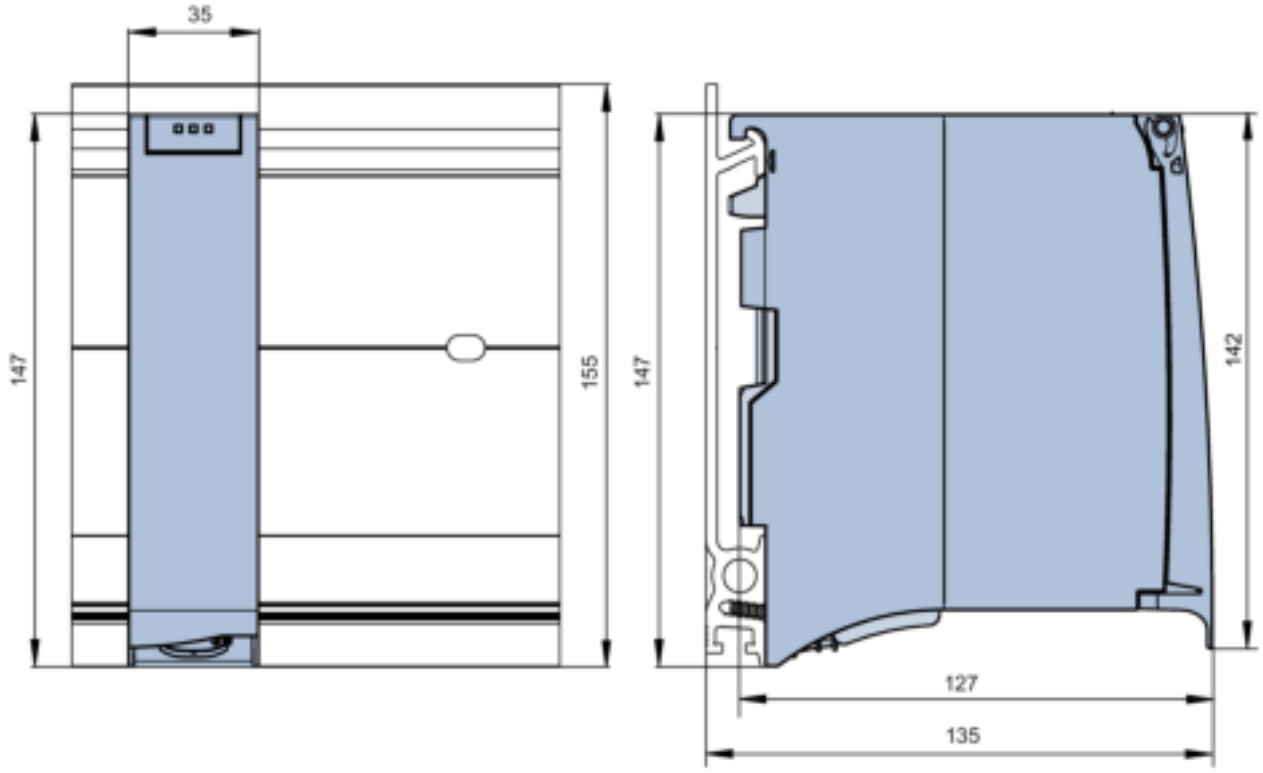

Figure A-1 Dimensional drawing of the communications module CM PtP RS422/485 BA/HF with front and side view

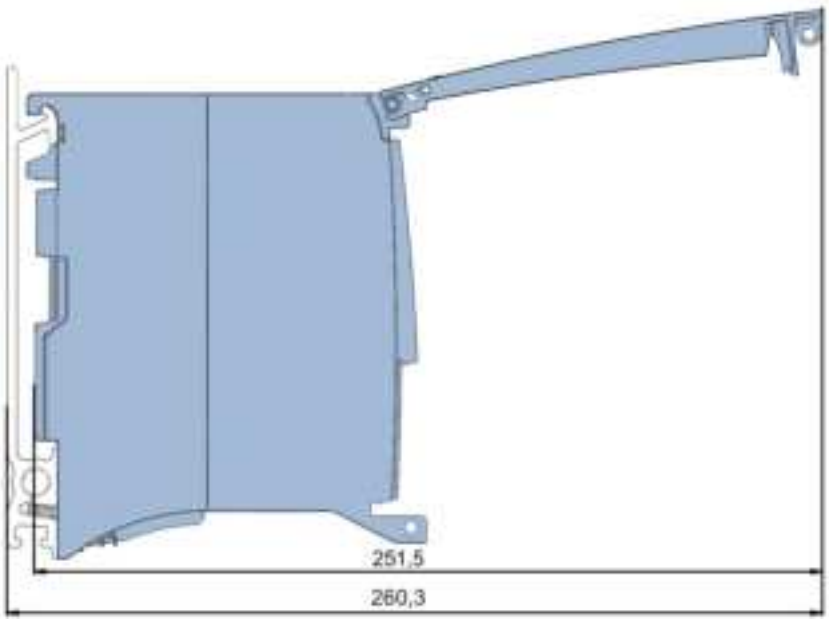

Figure A-2 Dimensional drawing of the communications module CM PtP RS422/485 BA in side view with open front flap