

# Manual CUBE20S PROFINET IO

Art.-No. 57106 Bus node incl. power module

**This document is valid for the following products:**

<b>Material short text</b>	<b>Art.-No.</b>
Cube20S PROFINET IO Busknoten	57106

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**NOTE**

Translation of the original instructions

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# Table of Contents

<b>1</b>	<b>Introduction</b>	<b>6</b>
1.1	Service and support	6
1.2	Introduction / about this document	7
1.3	Symbols	7
1.4	Trademarks	8
<b>2</b>	<b>For your own safety</b>	<b>9</b>
2.1	Target group	9
2.2	Intended purpose	9
2.3	General safety instructions	9
2.4	Notes on electrostatically sensitive equipment	10
2.5	EMC installation guidelines	11
2.6	Notes on spare parts and accessories	11
2.7	Environmentally friendly disposal	12
2.8	EC Declaration of Conformity	12
2.9	Warranty and liability	12
<b>3</b>	<b>System description</b>	<b>13</b>
3.1	Hardware revision	17
<b>4</b>	<b>General data</b>	<b>18</b>
<b>5</b>	<b>Technical Data</b>	<b>20</b>
<b>6</b>	<b>Mounting</b>	<b>22</b>
6.1	Dimensions	22
6.2	General notes	23
6.2.1	Functional principle of the locking	24
6.3	Installing the DIN rail	25
6.4	Mounting of the bus node	26
6.5	Installing the expansion modules	27
6.6	Replacing an electronic module	28
6.7	Installing the bus cover	29
6.8	Installing the shield bus carrier	30
<b>7</b>	<b>Disassembling and replacing modules</b>	<b>31</b>
7.1	Procedure	31
7.2	Replacing the bus node	32
7.3	Replacing an expansion module	33
7.4	Replacing an electronic module	35
7.5	Replacing a module group	36
<b>8</b>	<b>Installation</b>	<b>38</b>
8.1	General notes	38

8.2	Spring terminals	38
8.2.1	Procedure	40
8.3	Wiring of the bus node	41
8.4	Wiring of the expansion modules	42
8.5	Wiring of the power modules	42
8.6	Fixing the shield	44
8.7	Fuse protection	45
8.7.1	Power modules	45
8.7.2	System	45
8.7.3	Fuse-protection with MICO circuit breakers	46
8.8	Using power modules	47
8.8.1	Power module art. no. 57130	47
8.8.2	Power module art. no. 57131	47

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<b>9</b>	<b>Troubleshooting</b>	<b>49</b>
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<b>10</b>	<b>Art.-No. 57106 PROFINET IO bus node</b>	<b>50</b>
10.1	Features	50
10.2	Structure	51
10.3	Interfaces	51
10.3.1	Address switch	52
10.4	LED status indication	54

---

<b>11</b>	<b>PROFINET IO</b>	<b>57</b>
11.1	Basics	57
11.2	PROFINET installation guidelines	60
11.3	System access	62
11.3.1	Overview	62
11.3.2	Access to the I/O range	63
11.3.3	Access to parameter data	63
11.3.4	Access to diagnostic data	64
11.4	Planning	65
11.5	Web server	71
11.5.1	Access via IP address	71
11.5.2	Structure of the web server	71
11.5.3	Web page with selected PROFINET IO device	71
11.5.4	Website if a module is selected	72
11.6	FMM - Free Module Mapping	73
11.6.1	Overview	73
11.6.2	Configuration	73
11.6.3	Data record 0x7F	74
11.6.4	Start-up	74
11.6.5	Configuration examples	75
11.6.5.1	Nominal configuration	75
11.6.5.2	Hardware variants	75
11.7	Diagnosis and interrupt	79
11.7.1	Process interrupt	79

11.7.2	Diagnostic interrupt	80
11.8	Access to diagnostic data	83
11.8.1	Acyclic Access	83
11.8.2	Diagnostic data of PROFINET IO device	83
11.8.3	Diagnostic data modules	84
11.9	I&M data	86
11.10	Index overview	88
<b>12</b>	<b>Appendix</b>	<b>90</b>
12.1	Accessories	90
12.2	Glossary	91
12.3	Legal notes	92

# 1 Introduction

## 1.1 Service and support

### Service and support

#### Sales

Our sales staff in-house and in the field, and our technicians will support you at all times.

#### Sales support

Our sales support will assist you:

- with consultation during the development phase of your application,
- with extensive system design across all product groups,
- with visits from traveling sales representatives,
- with a system analysis.

For any further questions, please do not hesitate to contact our sales representatives!

#### Application support

Our application support will assist you:

- with product-related questions during commissioning,
- with product-related and customer-specific software components supporting your application, such as diagnostics.

For any further questions, please do not hesitate to contact our sales representatives!

#### Customer Service Center (CSC)

Our staff of the Customer Service Center will help you with all questions concerning installation and start-up. They support you, for example, if you have problems with combining hardware and software products from different manufacturers.

A number of support tools and measurement facilities are available for field bus systems and EMC interference.

Call us on +49 7191 47-2050 or send us an e-mail to: [support@murrelektronik.com](mailto:support@murrelektronik.com)

#### Service addresses

Murrelektronik GmbH has a policy of customer proximity, both at the national and international level. Please visit our website to find your contact person:

[www.murrelektronik.com](http://www.murrelektronik.com)

## 1.2 Introduction / about this document

### Purpose of this document

This document describes the use of the Cube20S PROFINET IO bus node module from the CUBE20S system by Murrelektronik GmbH. It describes the design, engineering and application.



#### NOTE

Translation of the original manual.

## 1.3 Symbols

This document includes information and notes that have to be observed for your own safety and to avoid injuries and material damage. They are marked as follows:



#### **DANGER!**

##### Immediate danger

→ Failure to observe this warning involves an imminent risk of death or serious injuries.



#### **WARNING!**

##### Possible danger

→ Failure to observe this warning can lead to death or serious injuries.



#### **CAUTION!**

##### Low-risk danger

→ Failure to observe this warning can lead to mild to moderate injuries.

#### **NOTICE**

##### Possible material damage

→ Failure to observe the warning may cause damage to the device and/or the system.



#### NOTE

Other technical information and notes of Murrelektronik GmbH.



#### RECOMMENDATION

Notes with this symbol are recommendations of Murrelektronik GmbH.



#### PRODUCTS AND ACCESSORIES

This symbol indicates accessories or product recommendations.

### Instruction for use

- An arrow marks instructions.
- Read and observe the instructions.

1 | If they are numbered, it is absolutely necessary to follow them in the correct order.

2 | Read and observe the instructions.

#### Hexadecimal numbers

Hexadecimal numbers are written in the **0x** format usually used by programmers, e.g. : **0x15AE** = 15AEh

## 1.4 Trademarks

Trademarks of the following companies and institutions are used in this documentation:

<b>PROFINET/PROFINET IO</b>	PROFIBUS Nutzerorganisation e.V. (PNO)
<b>PRONETA</b>	Siemens AG
<b>S7-300</b>	Siemens AG
<b>S7-400</b>	Siemens AG
<b>S7-1500</b>	Siemens AG
<b>SIMATIC</b>	Siemens AG
<b>STEP</b>	Siemens AG
<b>TIA Portal</b>	Siemens AG



## 2 For your own safety

### 2.1 Target group

<b>Users</b>	This manual is intended for users who have knowledge of automation systems.
<b>Documentation</b>	Please give this manual to all employees involved in the following tasks: <ul style="list-style-type: none"><li>■ Planning</li><li>■ Installation</li><li>■ Set-up</li><li>■ Operation</li></ul>

### 2.2 Intended purpose

<b>Designated use</b>	The Cube20S system has been designed and manufactured for: <ul style="list-style-type: none"><li>■ communication and process control</li><li>■ general control and automation tasks</li><li>■ industrial use</li><li>■ operation under the ambient conditions specified under technical data</li><li>■ installation in a switch cabinet</li></ul>
<b>Foreseeable misuse</b>	The device is not approved for being used: <ul style="list-style-type: none"><li>■ in potentially explosive atmospheres (EX Zone)</li><li>■ outside of switch cabinets.</li></ul>

### 2.3 General safety instructions

**Please note:**

- the relevant safety and accident prevention regulations;
- the EC Directives or other national regulations;
- generally recognized safety rules;
- the section 2.5 "EMC installation guidelines".

#### **NOTICE**

**Defective device!**

Improper use of hardware and software can cause damage to the device.

- Only qualified personnel of Murrelektronik GmbH may manipulate the device.
- Use the device only to the extent described in the manual.

**Avoid accidents caused by electrical voltage!**

- Comply with the 5 safety rules of electrical engineering!
- Disconnect the device from the mains.
- Then carry out installation or repair work.

**Avoid personal injury and material damage due to malfunctions!**

- Provide external circuit breakers.
- The device may only be operated within the specified tolerances.

**Avoid undefined states!**

- ➔ Select and install connection lines so that capacitive and inductive interferences do not have adverse effects on the system.
- ➔ Protect the device against improper and unintended use.

## 2.4 Notes on electrostatically sensitive equipment

**NOTICE****Electrostatic sensitive product**

The assemblies might get damaged.

- ➔ Ensure sufficient grounding of persons and working material!

**Handling**

Murrelektronik assemblies include highly integrated MOS components. These components are extremely sensitive to over-voltage occurring, for example, due to electrostatic discharge. Assemblies at risk are marked with the adjacent symbol.

The symbol is affixed to assemblies, sub-racks or packaging and indicates electrostatically sensitive equipment. These assemblies may become irreparably damaged by voltage and energy levels which are far below the perception levels of human beings.

If a person who is not electrostatically discharged handles electrostatically sensitive equipment, voltages may be produced. They may damage components, impair the functioning of assemblies or render assemblies inoperative. Frequently, assemblies thus damaged cannot directly be recognized as faulty. The fault may only show up after prolonged operation.

Components damaged by electrostatic discharge may produce temporary faults in case of temperature changes, vibrations or load changes.

Only with a consistent use of protective devices and a responsible compliance of the instructions for use can you avoid malfunctions or failures of the electrostatically sensitive equipment.

**Shipping**

- ➔ For shipping electrostatically sensitive equipment, use **always** the original packaging.

**Measurements**

Observe the following notes for measurements on electrostatically sensitive equipment:

- ➔ Discharge potential-free measuring instrument briefly
- ➔ Ground the measuring instruments used

## 2.5 EMC installation guidelines

### Industrial use

The Cube20S is an electronic device manufactured according to the current state-of-the-art standards. Both the robust mechanical construction and the design of the electronic components make it ideal for industrial use.

To guarantee a trouble-free operation, observe the following rules when installing the device in systems. Otherwise, the high interference immunity and resistance to damage of the device may become partially ineffective.

The interference immunity of the entire system considerably depends on the correct installation, location and wiring.

- 1 | For safe operation, check the installation regulations stipulated by the manufacturer of the controller.
- 2 | Bring them in line with the recommendations for an EMC-compatible design.
- 3 | Then install Cube20S.

## 2.6 Notes on spare parts and accessories

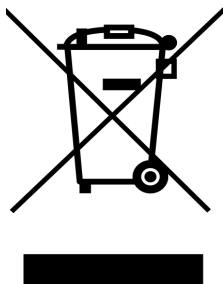
### Spare parts

- Only use the original spare parts or spare parts by other manufacturers expressly authorized by Murrelektronik GmbH.
- Check the function of the device after having replaced a component.

### Accessories

- The use of accessories may alter the device function. Use only accessories authorized by Murrelektronik GmbH.
- Observe the enclosed instructions of the accessories when installing them.

## 2.7 Environmentally friendly disposal



### Disposal

The product can be returned to Murrelektronik GmbH free of charge for disposal. The same is true for the original packaging and any batteries or power packs. Any units that have been contaminated with hazardous substances will not be accepted for repair or disposal.

### Returns

- ➔ Label the product and the packaging with **"For disposal"**.
- ➔ Package the product.
- ➔ Send the package to:  
**Murrelektronik GmbH**  
**Falkenstraße 3**  
**71570 Oppenweiler | GERMANY**

We will make sure that the items are disposed of in accordance with German legislation. The most recent owner is responsible for transport to the return point until items arrive at their destination.

## 2.8 EC Declaration of Conformity



Murrelektronik GmbH herewith declares that the products and systems comply with the basic requirements and directives:

- 2004/108/EC Electromagnetic compatibility
- 2011/65/EU RoHS

## 2.9 Warranty and liability

### Warranty and liability claims

Warranty and liability claims shall be lost if

- the product is not used according to its designated use,
- damage is caused because the manual and the operating instructions have not been observed,
- the personnel was/is not qualified.

### 3 System description

#### Overview

The Cube20S system is a modular automation system mounted on a 35 mm DIN rail in the control cabinet.

Using 2-, 4- and 8-channel expansion modules, you can adapt this system exactly to your automation tasks.

You do not need much wiring because the 24 V DC power supply is integrated in the backplane bus. Defective electronic modules can be replaced without having to replace the wiring.

The use of power modules with different colors allows you to define further potential ranges for the 24 V DC power supply within the system or expand the electronic supply by 2 A.

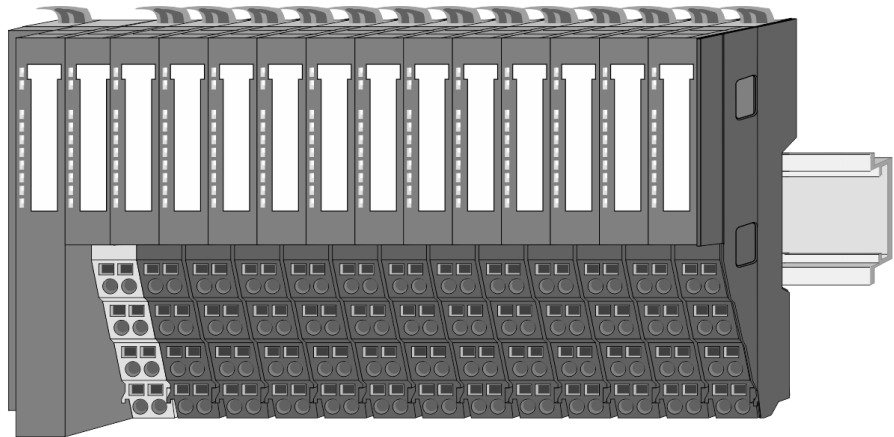


Fig. 3-1: Cube20S system

#### Components

The Cube20S system consists of the following components:

- Bus node
- Expansion modules
- Accessories



#### NOTE

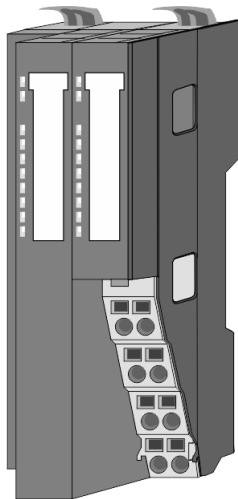
The use of the Cube20S system is only permitted with a combination of modules from Murrelektronik. Operation together with modules of other manufacturers is impermissible!

### Bus node

Bus interface and power module of the bus node are integrated in one housing. The bus interface is used for connection to a superior bus system.

Both bus interface and the electronics of the connected expansion modules are supplied with power via the power module.

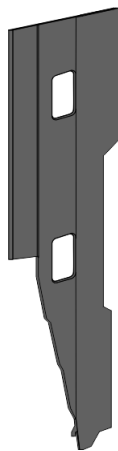
There is another connection on the power module for the 24 V DC power supply of the connected expansion modules.



By installing up to 64 expansion modules on the bus node, they will be electrically connected, i.e.:

- they are incorporated in the back-plane bus,
- the electronic modules are supplied with power,
- each expansion module is connected to the 24 V DC power supply.

### Bus cover



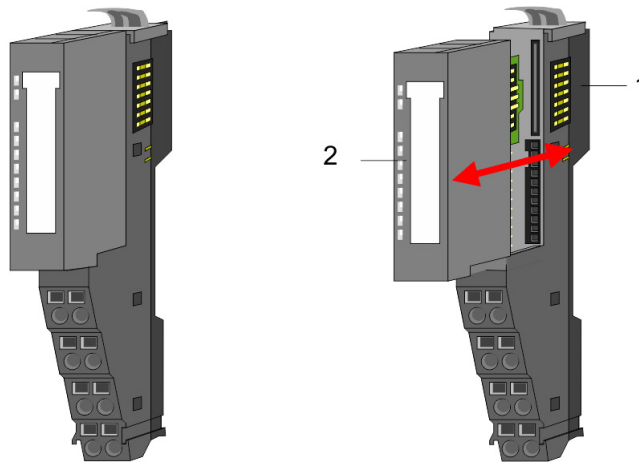
Each bus node has a cover to protect the contacts.

- ➔ Remove the cover on the bus node before installing Cube20 modules.
- ➔ To protect the contacts, mount the bus cover on the outermost module.

The bus cover is also available as accessory (see chapter 12.1 "Accessories").

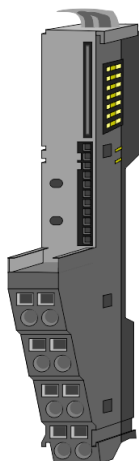
## Expansion modules

Each expansion module consists of a terminal and an electronic module.



- 1 Terminal module
- 2 Electronic module

## Terminal module

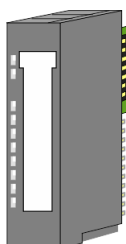


The terminal module consists of the following functional elements:

- sliding mechanism to fasten the electronic module,
- backplane bus with power supply for the electronics,
- connection to the 24 V DC power supply,
- staircase-shaped terminal block for wiring,
- safe locking system for fastening on a mounting rail.

This locking mechanism allows you to mount your Cube20S system outside the control cabinet and fix the complete system later in the control cabinet.

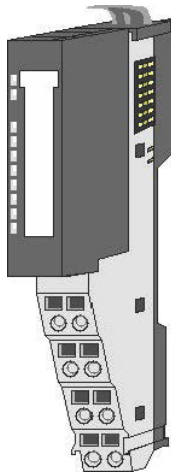
## Electronic module



The functionality of an expansion module is defined over the electronic module.

- If the electronic module is defective, it can be replaced while wiring is kept.
- There are LEDs indicating the status on the front side.
- To facilitate wiring, there are wiring diagrams on the front and on the side of each electronic module.

### Power modules



Power modules provide the Cube20S system with power. The power modules are either integrated into the bus node or may be plugged in between the expansion modules.

Depending on the type of power module, groups of potential can be defined for the 24 V DC power supply, or the electronics supply may be extended by 2 A.

For better recognition, the power modules have a color different from the expansion modules.



## 3.1 Hardware revision

### Front printing

- The hardware revision is printed on each Cube20S module.
- Since a Cube20S module consists of a terminal and an electronic module, the respective hardware revision is printed on both modules.
- Important for the hardware revision of a Cube20S module is the hardware revision of the electronic module, which can be found below the labeling strip of the respective electronic module.
- On modules without labeling strip, the hardware revision is printed on the front side.



The example below shows the hardware revision 1. The number 1 is identified with an "X".

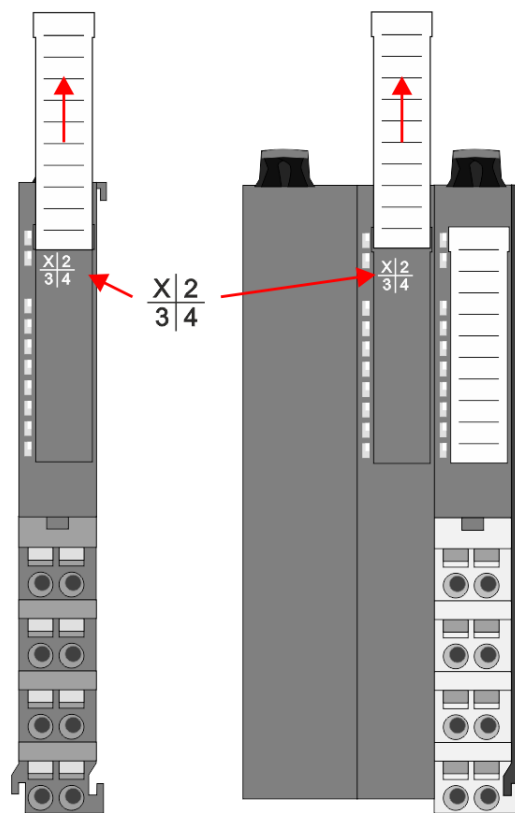



Fig. 3-2: Front printing

### Web server

The hardware version "HW revision" for bus nodes with web server can be output via the integrated web server.

## 4 General data

Conformity			
	CE	2014/30/EU	EMC Directive
		2011/65/EU	RoHS
Certifications			
	Certification according to UL		Yes
	Certification according to KC		Yes
Personal and device protection			
	Degree of protection	EN 60529	IP20
	Electrical isolation		
	To fieldbus	-	Galvanically decoupled
	To process level	-	Galvanically decoupled
	Insulation resistance	EN 61131-2	-
	Insulation voltage to reference ground		
	Inputs / outputs	-	50 V ~ /  , at a test voltage of 500 V ~
	Protective measures	-	against short circuit
Ambient conditions			
	Climatic		
	Storage / transport	EN 60068-2-14	-25 ... +70 °C
	Operation		
	Horizontal installation, sus- pended	EN 61131-2	0 ... +60 °C
	Horizontal installation, lying	EN 61131-2	0 .... +55 °C
	Vertical installation	EN 61131-2	0 ... +50 °C
	Air humidity	EN 60068-2-30	RH1 (without condensation, relative humidity 10 ... 95 %)
	Pollution	EN 61131-2	Degree of pollution 2
	Installation height	Above sea level	≤2000 m
	Mechanical		
	vibration	EN 60068-2-6	1 g, 9 Hz ... 150 Hz
Shock	EN 60068-2-27	15 g, 11 ms	
Mounting conditions			
	Installation site	-	Inside the switch cabinet
	Installation position	-	Horizontal and vertical
	Fastening	-	35 mm DIN rail

EMC / standards			Remarks
	Emitted interference	EN 61000-6-4	Class A (industrial environments)
	Immunity Zone B	EN 61000-6-2	Industrial environments
		EN 61000-4-2	ESD 8 kV with air discharge (severity grade 3), 4 kV with contact discharge (severity grade 2)
		EN 61000-4-3	HF irradiation (housing) 80 MHz ... 1000 MHz, 10 V/m, 80 % AM (1 kHz) 1.4 GHz ... 2.0 GHz, 3 V/m, 80 % AM (1 kHz) 2 GHz ... 2.7 GHz, 1 V/m, 80 % AM (1 kHz)
		EN 61000-4-6	conducted 150 kHz ... 80 MHz, 10 V, 80 % AM (1 kHz)
		EN 61000-4-4	Burst, severity grade 3
		EN 61000-4-5	Surge, installation class 3 *)

\*) Due to single high-energy impulses, a suitable external wiring with lightning protection elements is required for surge, e.g. lightning arresters and surge arresters.

## 5 Technical Data

Hardware and software version		Cube20S PROFIBUS DP bus node Art.-No.57101	
	Hardware version	04	
	Firmware version	V1.5.7	
Power supply			
	Supply voltage (nominal value)	24 V $\overline{---}$	
	Supply voltage (admissible range)	20.4...28.8 V $\overline{---}$	
	Reverse-polarity protection	Yes	
	Power consumption (idle)	95 mA	
	Power consumption (nominal value)	0.95 A	
	Switch-on current	3.9 A	
	$I^2t$	0.14 A <sup>2</sup> s	
	Current supply on the backplane bus	≤3 A	
	Current supply load supply	≤10 A	
	Power dissipation	3 W	
Status, alarm, diagnostics			
	Status indication	Yes	
	Alarms	Yes, configurable	
	Process interrupt	Yes, configurable	
	Diagnostic interrupt	Yes, configurable	
	Diagnostic function	Yes, configurable	
	Diagnostic information can be read out	possible	
	Supply voltage indication	Green LED	
	Maintenance indication	Yellow LED	
	Collective error indication	Red LED	
	Channel error display	None	
Design			
	Max. racks	1	
	Assemblies in each rack	64	
	Max. no. of digital assembly groups	64	
	Max. no. of analog assembly groups	64	
Communication			
	Fieldbus	PROFINET IO	
	Physics	Ethernet 100 MBit	
	Connection	2 x RJ45	
	Topology		
	electrically isolated	yes	
	Max. no. of devices		
	Device address		
	Min. transfer rate	100 Mbit/s	
	Max. transfer rate	100 Mbit/s	
	Max. address range for inputs	512 bytes	
	Max. address range for outputs	512 bytes	
	Max. no. of TxPDO		
	Max. no. of RxPDO		

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (WxH xD) [mm]	48.5 x 109 x 76.5
	Net weight	167.5 g
	Weight, incl. accessories	167.5 g
	Gross weight	185 g

## 6 Mounting

### 6.1 Dimensions

#### Dimensions of the bus node



Fig. 6-1: Dimensions of the bus node in mm

#### Dimensions Expansion module

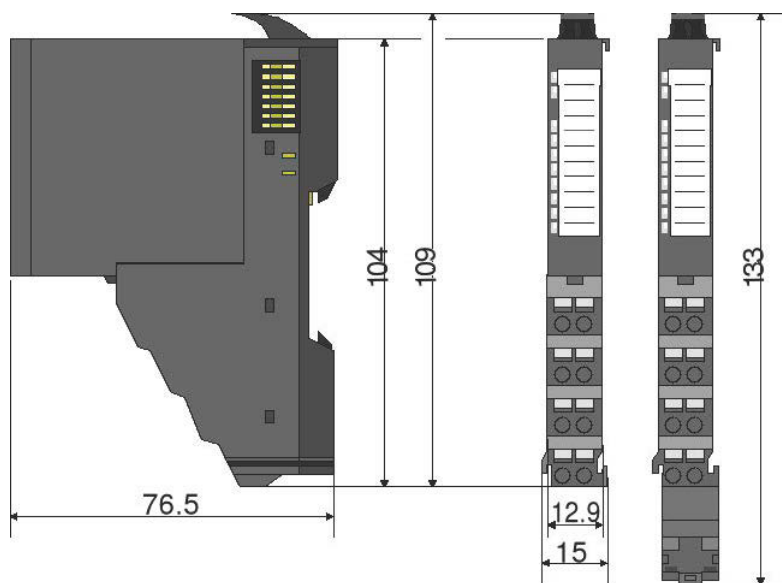


Fig. 6-2: Dimensions of the expansion module in mm

#### Dimensions of the electronic module

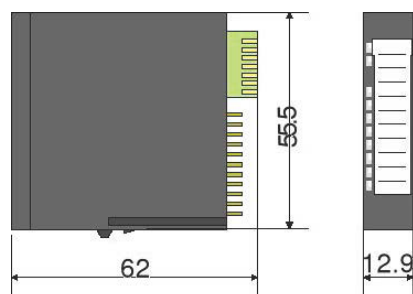


Fig. 6-3: Dimensions of the electronic module in mm

## 6.2 General notes



### WARNING!

#### Danger due to electric current!

Device and environment in the switch cabinet may carry lethal voltages.

- ➔ Before carrying out any work, make sure that the device and environment are disconnected from the power supply.
- ➔ Observe the relevant safety regulations when handling live devices.
- ➔ Ensure that only qualified personnel mount and install this module.



### CAUTION!

#### Power module and bus interface as well as power and terminal module each form one unit!

Separating destroys the modules.

- ➔ Do not separate power module and bus interface or power and terminal module! Disconnecting destroys the modules.



### NOTE

You can mount the modules individually or as a whole block on the DIN rail. For block installation, please observe the following: **All** locking levers must be open.

The individual modules are mounted directly on a DIN rail. Electronics and power supply are connected over the backplane bus.

Conditions:

- Max. number of plug-in modules: 64
- Max. total current of the electronics supply: 3 A

A **power module Art.-No. 57131** extends the current for the electronics (refer to section 8.8 Using power modules, Seite 47).

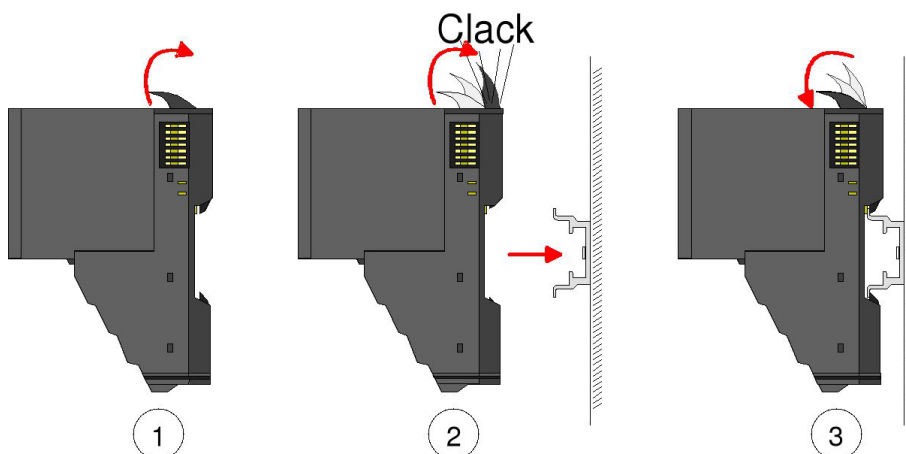


Fig. 6-4: Installing the module

## 6.2.1 Functional principle of the locking

### ***Inserting and locking the module***

- ✂ The terminal module has a locking lever at its top.
- 1 | For installation and disassembly, please press this locking lever upwards until it engages audibly.
- 2 | Plug the module to be mounted in the previously plugged-in module.
- 3 | Slide the module with the help of the guide strips at top and bottom onto the DIN rail.
- 4 | Flap the locking lever downwards.

*The module is fastened to the DIN rail.*



## 6.3 Installing the DIN rail

- ➔ Install the DIN rail with the necessary distances (see Fig. 6-5: "Installation distances").

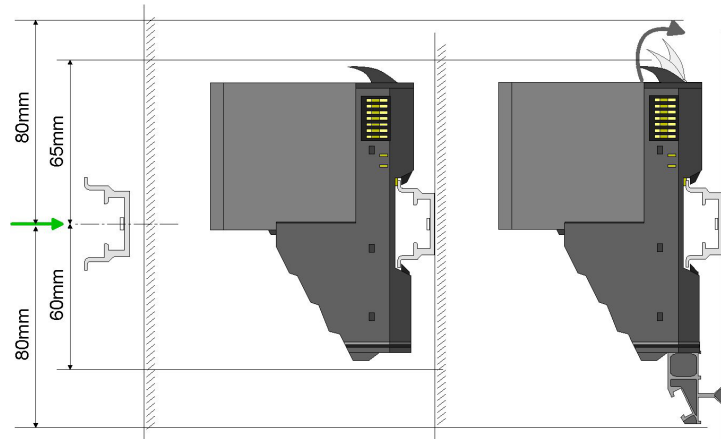


Fig. 6-5: Installation distances

## 6.4 Mounting of the bus node

- ✓ To mount the system, start on the left with the bus node.
- 1 | Flap the two locking levers of the bus node upwards (Figure 1).
- 2 | Plug the bus node in the DIN rail (Figure 1).
- 3 | Flap the two locking levers of the bus node downwards (Figure 2).
- 4 | To remove the right bus cover, pull it out towards the front (Figure 2).
- 5 | Store the bus cover to use it as termination of the system.

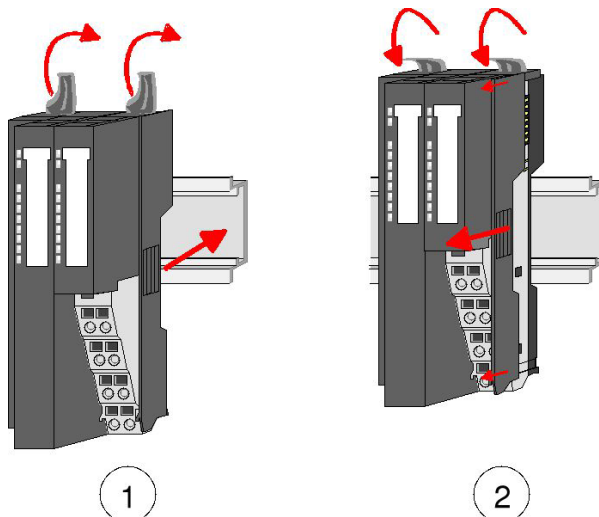


Fig. 6-6: Installing the bus node

## 6.5 Installing the expansion modules

- 1 | Flap the locking lever of the expansion module upwards.
- 2 | Plug the expansion module in the DIN rail.
- 3 | Push the expansion module towards the bus node or the last expansion module.
- 4 | Flap the locking lever of the expansion module downwards.
- 5 | Mount all expansion modules as described.
- 6 | To protect the contacts, mount the bus cover on the outmost module (see section 6.7 "Installing the bus cover").

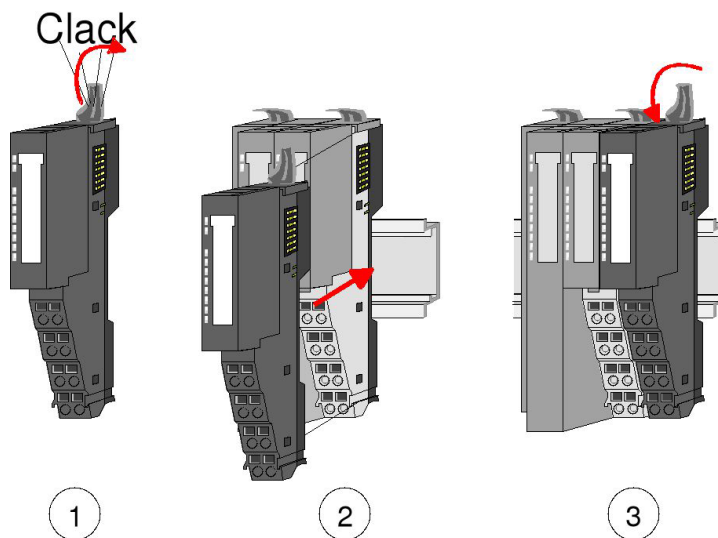
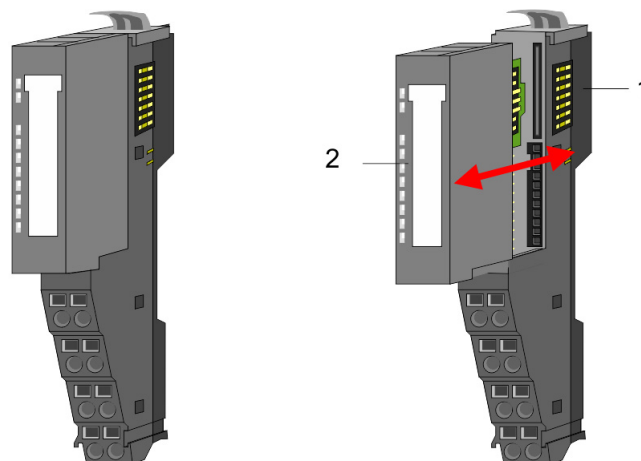


Fig. 6-7: Installing the expansion module

## 6.6 Replacing an electronic module

### Expansion modules

Each expansion module consists of a terminal and an electronic module.



- 1 Terminal module
- 2 Electronic module

#### Disassembly

- ✓ The electronic module has a locking lever at the bottom.
  - 1 | **Power-off your system!**
  - 2 | Press the locking lever upwards for disassembly.
  - 3 | To remove the electronic module, pull it out towards the front.
- The electronic module has been removed.*

#### Installation

- ✓ The electronic module has a locking lever at the bottom.
  - ➔ Slide the electronic module with the help of the guide strip into the terminal module.
- The electronic module engages audibly at the bottom.*  
*Now you can bring your system back into operation.*

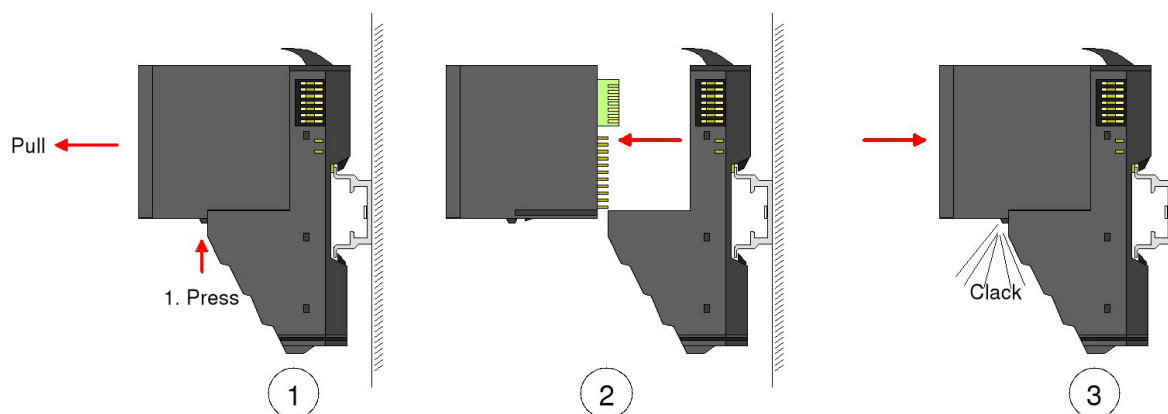


Fig. 6-8: Disassembling and installing the electronic module

## 6.7 Installing the bus cover

### Protection of the bus contacts by means of the bus cover

#### *Placing the bus cover on the expansion module*

- ✓ Prerequisite: The system has been completely mounted.
- ➔ Attach the bus cover to the outermost module.

#### *Placing the bus cover on the terminal module*

- ✓ Prerequisite: The system has been completely mounted.
- ➔ Break the front part off the bus cover.
- ➔ Attach the bus cover to the terminal module.

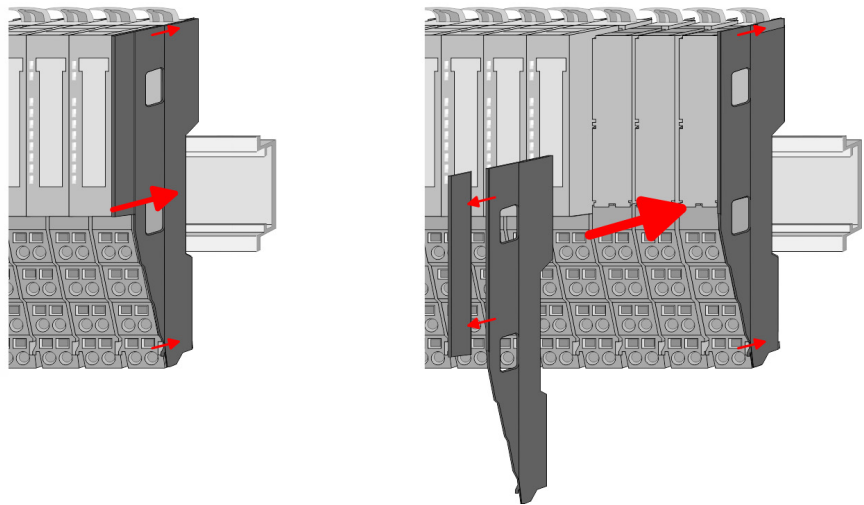
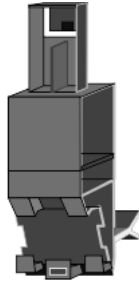


Fig. 6-9: Installing the bus cover

## 6.8 Installing the shield bus carrier

### Carrier for shield busses art. no. 57191

The shield busses (10 mm x 3 mm) for connection of cable shields are fastened to the carrier.



#### NOTE

Carriers for shield busses, shield busses and cable shield fasteners are not included in the scope of delivery.

### Installing the carrier

- ✓ Prerequisite: The Cube20S system has been completely mounted.
- ➔ If the DIN rail is flat, break the spacer off the carrier.
- ➔ Plug the carrier into the terminal module below the terminal block until it engages.

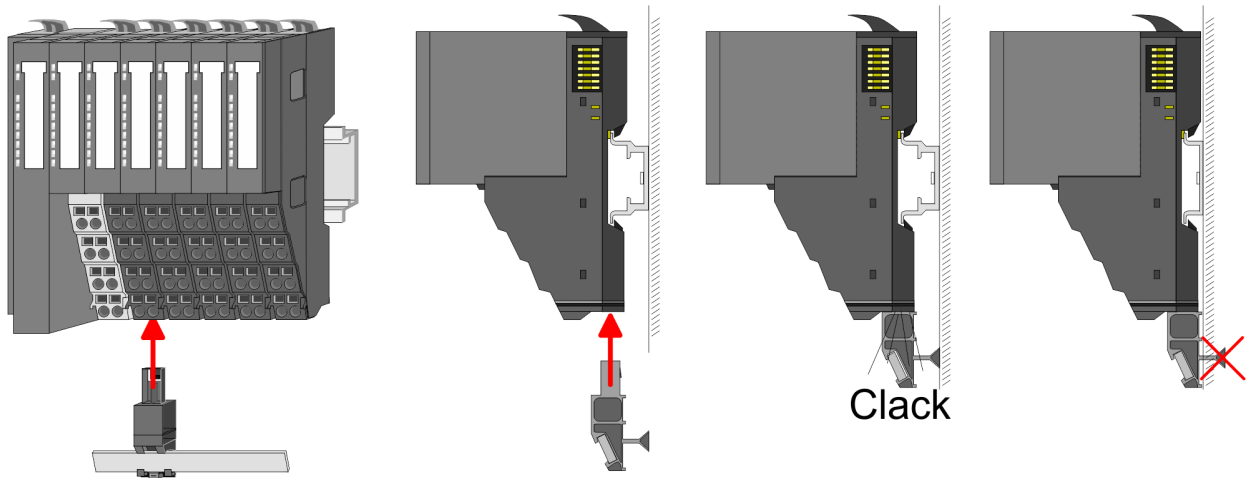


Fig. 6-10: Installing the carriers for shield busses

## 7 Disassembling and replacing modules

### 7.1 Procedure



---

**NOTE**

For demounting and exchange of a bus node, a module or a group of modules, due to mounting reasons you always have to remove the electronic module right beside. After mounting it may be plugged again.

---

***During disassembly or when replacing bus node, a module or module group, please observe the following:***

- 1 | Switch off the system's power supply.
- 2 | If existing remove the shield, the shield bus and the shield bus carriers.
- 3 | Remove the electronic module to the right of the module or module group.
  - a) For this purpose, actuate the unlocking device of the electronic module.
  - b) To remove the electronic module, pull it out towards the front.
- 4 | Dismount/replace the module or module group to be exchanged.
- 5 | Plug the electronic module in again to the right of the module.
- 6 | If necessary, fit the shield rail carriers, shield bus and shield.

## 7.2 Replacing the bus node

### Disassembly



#### CAUTION!

**Power module and bus interface belong together!**

If separated, the modules get destroyed.

→ Do not separate power module and bus interface!

- 1 | **Switch off the system's power supply!**
- 2 | Remove the wiring from the bus node, if any (see section 8 "Installation").
- 3 | Unlock the electronic module to its right at the bottom.
- 4 | To remove the electronic module, pull it out towards the front.
- 5 | Flap the locking lever of the bus node upwards.
- 6 | To remove the bus node, pull it out towards the front.

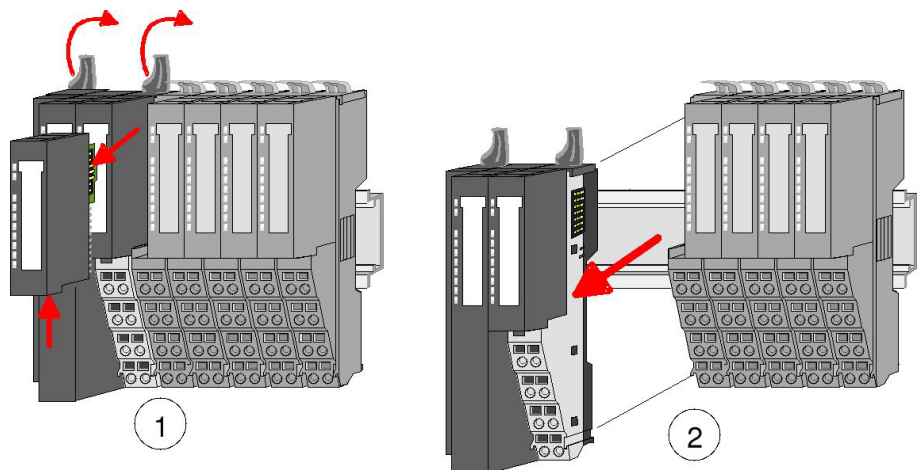


Fig. 7-1: Disassembling the bus node



**Installing the new bus node**

- 1 | Flap the locking levers of the bus node upwards.
- 2 | Plug the bus node in the left module.
- 3 | Slide the bus node with the help of the guide strips onto the DIN rail.
- 4 | Flap the locking levers downwards.
- 5 | Plug in the electronic module.

*Now you can bring your system back into operation.*

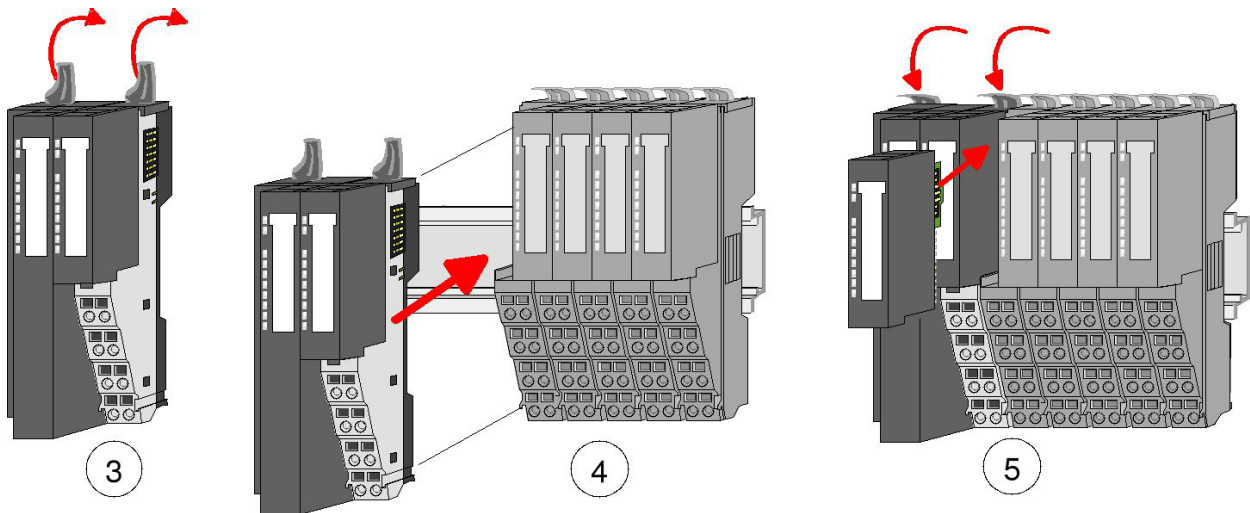


Fig. 7-2: Installing the new bus node

## 7.3 Replacing an expansion module

**NOTE**

For demounting and exchange of a bus node, a module or a group of modules, due to mounting reasons you always have to remove the electronic module right beside. After mounting it may be plugged again.

**Dismounting**

- 1 | **Switch off the system's power supply!**
- 2 | Remove the wiring from the module, if any. For details refer to section 8 "Installation".
- 3 | Unlock the electronic module to its right at the bottom.
- 4 | To remove the electronic module, pull it out towards the front.
- 5 | Flap the locking lever of the module to be replaced upwards.
- 6 | To remove the module, pull it out towards the front.

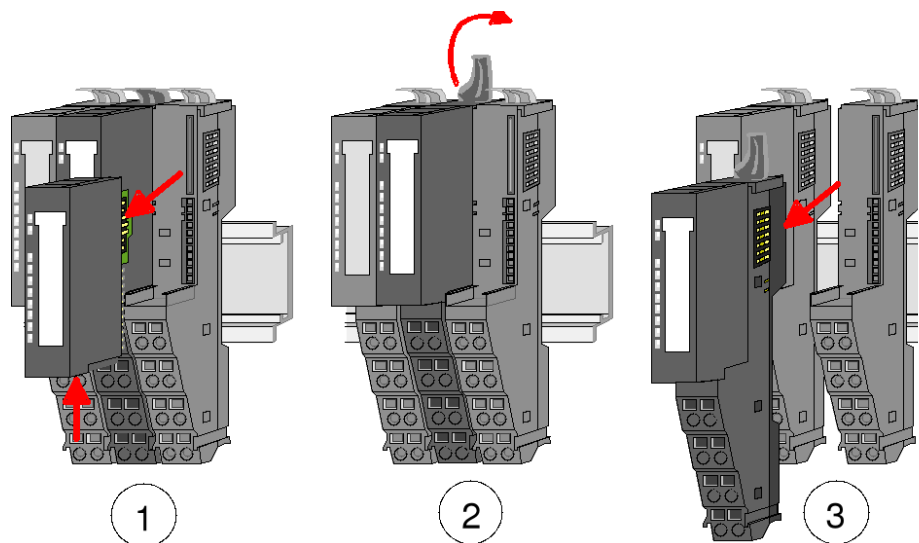


Fig. 7-3: Disassembling a module

#### Installing the new module

- 1 | Flap the locking lever of the module upwards.
- 2 | Plug the module in the gap between the modules.
- 3 | Slide the module with the help of the guide strips at both sides onto the DIN rail.
- 4 | Flap the locking lever of the module downwards.
- 5 | Plug in the electronic module.

Now you can bring your system back into operation.

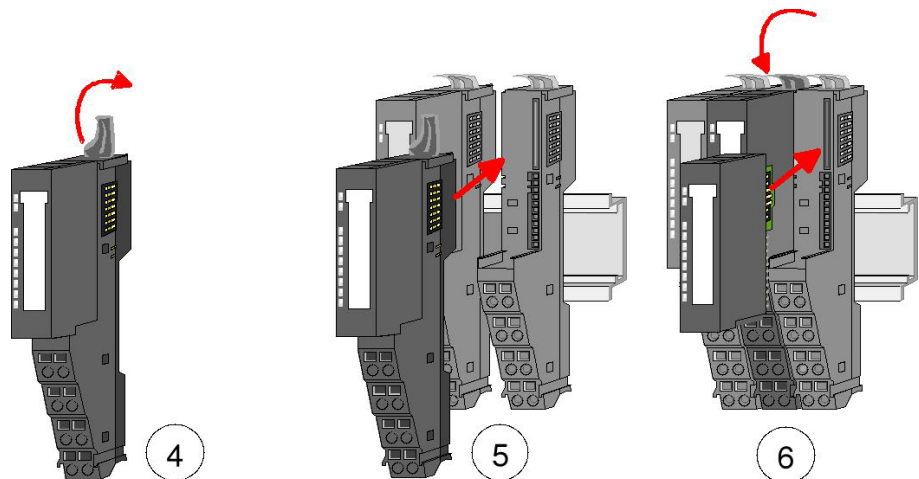


Fig. 7-4: Installing the new module

## 7.4 Replacing an electronic module

### Disassembly

✓ The electronic module has a locking lever at the bottom.

1 | **Power-off your system!**

2 | Press the locking lever upwards for disassembly.

3 | To remove the electronic module, pull it out towards the front.

*The electronic module has been removed.*

### Installation

✓ The electronic module has a locking lever at the bottom.

➔ Slide the electronic module with the help of the guide strip into the terminal module.

*The electronic module engages audibly at the bottom.*

*Now you can bring your system back into operation.*

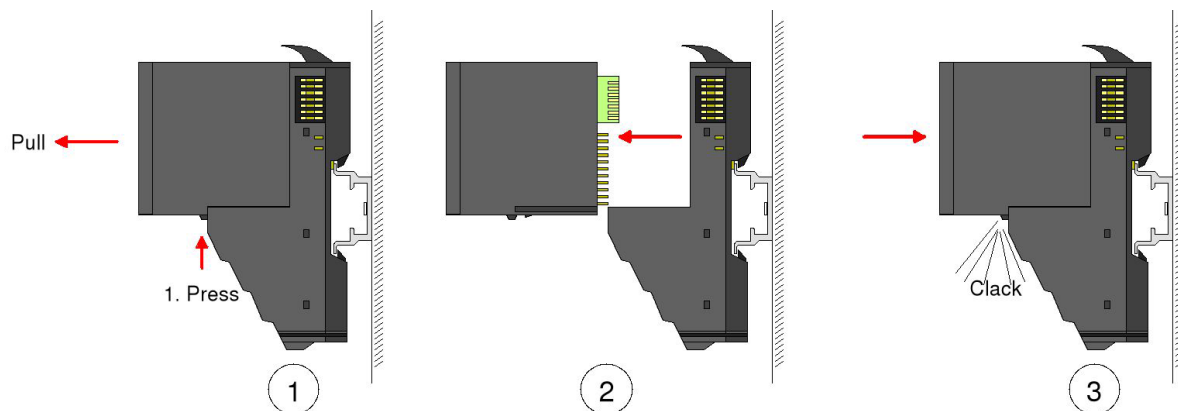


Fig. 7-5: Disassembling and installing the electronic module

## 7.5 Replacing a module group



### NOTE

For demounting and exchange of a bus node, a module or a group of modules, due to mounting reasons you always have to remove the electronic module right beside. After mounting it may be plugged again.

### Disassembly

- 1 | **Switch off the system's power supply!**
- 2 | Remove the wiring from the module group, if any (see section 8 "Installation").
- 3 | Unlock the electronic module to its right at the bottom.
- 4 | To remove the electronic module, pull it out towards the front.
- 5 | Flap the locking levers of the module group to be exchanged upwards.
- 6 | To remove the module group, pull it out towards the front.

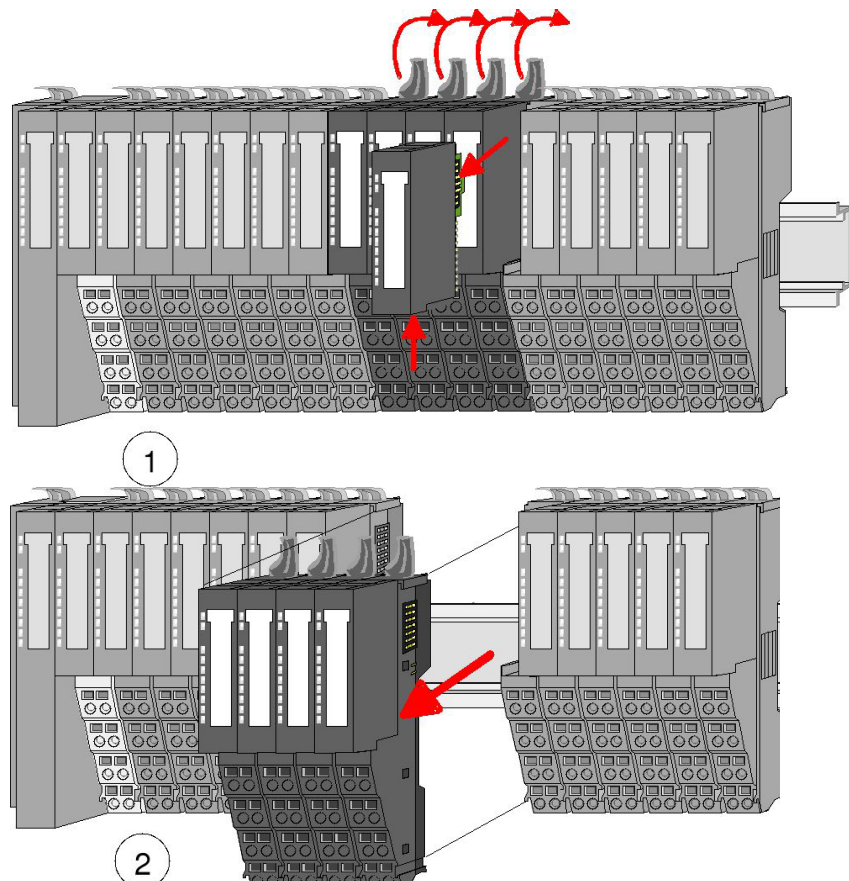


Fig. 7-6: Disassembling the module group

### Installing the new module group

- 1 | Flap the locking levers of the module group upwards.
- 2 | Plug the module group in the gap between the modules.
- 3 | Slide the module group with the help of the guide strips at both sides onto the DIN rail.
- 4 | Flap the locking levers of the module group downwards.
- 5 | Plug in the electronic module.
- 6 | Wire the new module group.

*Now you can bring your system back into operation.*

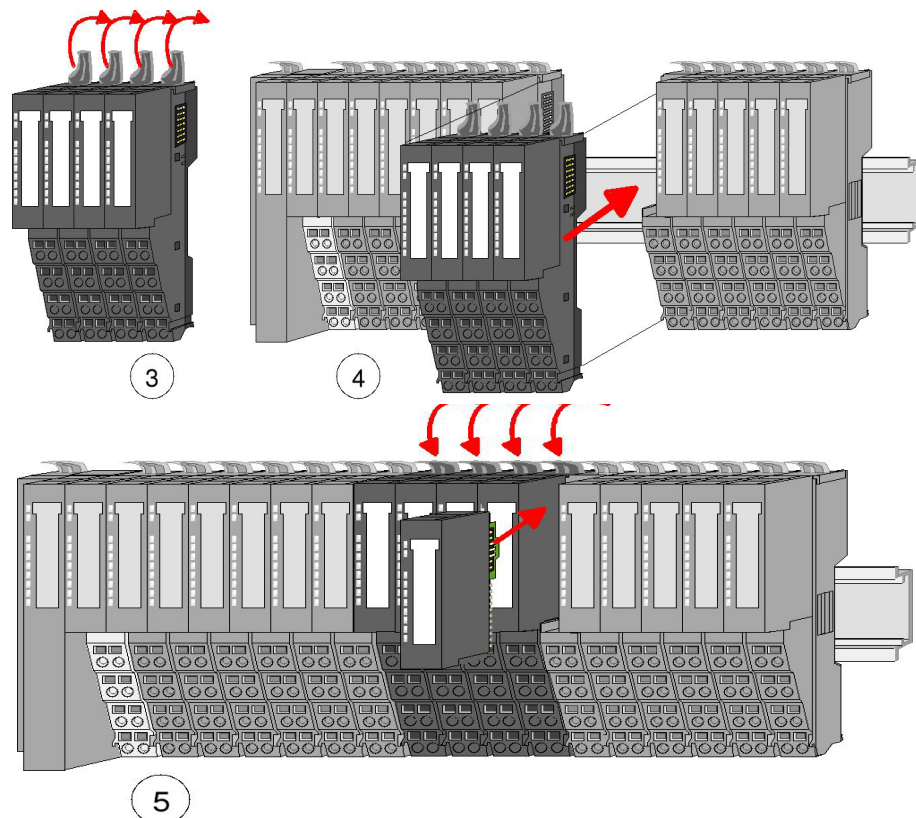


Fig. 7-7: Mounting of the module group

## 8 Installation

### 8.1 General notes



#### WARNING!

##### **Danger due to electric current!**

Device and environment in the switch cabinet may carry lethal voltages.

- ➔ Before carrying out any work, make sure that the device and environment are disconnected from the power supply.
- ➔ Observe the relevant safety regulations when handling live devices.
- ➔ Ensure that only qualified personnel mount and install this module.



#### CAUTION!

##### **Temperature rise of external lines!**

The heat dissipation of the system can raise the temperature of external lines.

- ➔ Only use thermally suitable connecting cables. The temperature specification must be 5 °C above the ambient temperature!

#### NOTICE

##### **Destruction of the bus node by the compensating currents**

Potential differences between grounding points may cause compensating current in the shield connected on both sides.

- ➔ Eliminate this situation by means of lines for equipotential bonding.



#### NOTE

##### **Separate the insulation areas!**

The Cube20S is specified for the SELV/PELV environment. The devices connected to the system must be specified for the SELV/PELV environment.

- ➔ Install cables of devices which do not correspond to the SELV/PELV environment separately from the SELV/PELV environment!



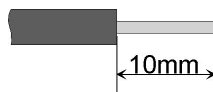
#### NOTE

##### **Conditions for UL compliant operation:**

- ➔ Use only SELV / PELV power supplies for power.
- ➔ The Cube20S system may only be installed and operated in a housing in accordance with IEC 61010-19.3.2 c).

### 8.2 Spring terminals

Cable data  
expansion modules



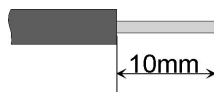
$U_{\max.}$ : 240 V ~ / 30 V ---

$I_{\max.}$ : 10 A

Cross-section: 0.08 – 1.5 mm<sup>2</sup> (AWG 28 – 16)

Stripping length: 10 mm

**Cable data  
power module**

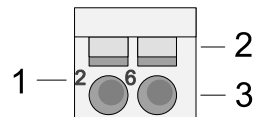


$U_{\max.}: 30 \text{ V} \text{ ---}$

$I_{\max.}: 10 \text{ A}$

Cross-section:  $0.08 - 1.5 \text{ mm}^2$  (AWG 28 – 16)

Stripping length: 10 mm

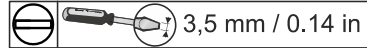


- 1 Pin no. on the plug connector
- 2 Unlocking device for screwdriver
- 3 Connection opening for wire

## 8.2.1 Procedure

### Wiring

✂ Tools: suitable screwdriver



✂ Wire cross section: 0.08 mm<sup>2</sup> ... 1.5 mm<sup>2</sup> (AWG 28 ... 16)

- 1 | Insert the screwdriver slightly inclined in the rectangular opening (see Fig. 8-3: "Wiring" 1).
- 2 | Press and hold the screwdriver away from the round opening. The contact spring is open (see Fig. 8-3: "Wiring" 2).
- 3 | Put the stripped wire in the round opening (see Fig. 8-3: "Wiring" 2).
- 4 | Remove the screwdriver (see Fig. 8-3: "Wiring" 3).

*The wire is securely connected to the terminal by means of a spring contact.*

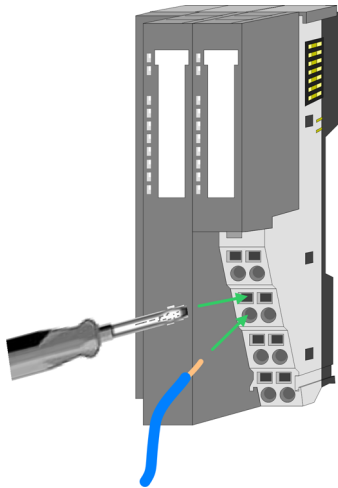


Fig. 8-1: Spring-clamp technology (bus nodes and power modules)

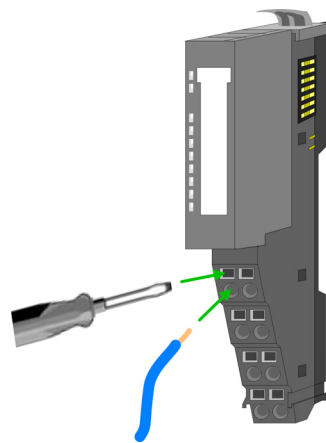


Fig. 8-2: Spring-clamp technology (expansion modules)

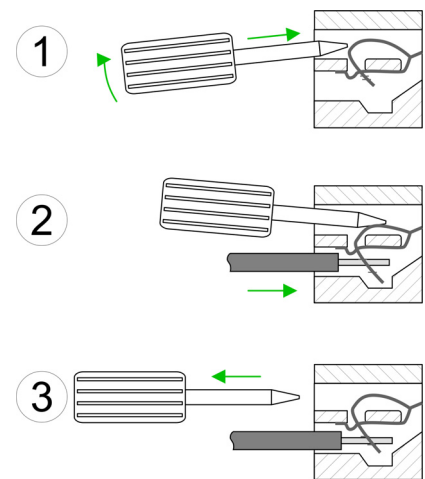


Fig. 8-3: Wiring



## 8.3 Wiring of the bus node

### Terminal module spring terminals

A power module is integrated in the bus node of the Cube20S system. Spring terminals are used for wiring. Spring terminals allow you to connect the signaling lines and power cables fast and easily. In contrast to the screw connection, this type of connection is resistant to vibrations.

The installation procedure with spring terminals is described in 8.2 "Spring terminals".

### Standard wiring

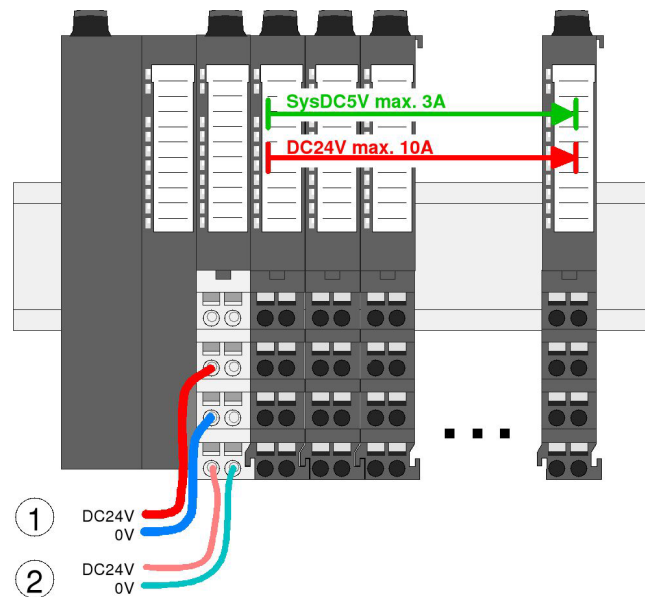


Fig. 8-4: Standard wiring

- 1 24 V DC for power supply of I/O level (max. 10 A)
- 2 24 V DC for electronics supply, bus node and I/O level

### Standard wiring of the power modules

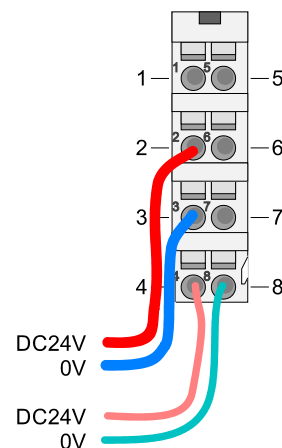


Fig. 8-5: Standard wiring

For wires with a cross-section of 0.08 mm<sup>2</sup> to 1.5 mm<sup>2</sup>.

Pos.	Function	Type	Description
1	-	-	not used
2	24 V DC	Input	<b>24 V DC for power supply</b>
3	0 V	Input	GND for power supply

Pos.	Function	Type	Description
4	Sys 24 V DC	Input	24 V DC for electronics supply
5	-	-	not used
6	24 V DC	Input	24 V DC for power supply
7	0 V	Input	GND for power supply
8	Sys 0 V	Input	GND for electronics supply

## 8.4 Wiring of the expansion modules

### Terminal module connection terminals



#### CAUTION!

#### Connection of dangerous voltage

Dangerous voltage on the terminal module will destroy the modules.

**Exception:** If this has been specified explicitly in the module description.

→ Do not connect the terminal module to dangerous voltage!

Terminals with spring-clamp technology are used for wiring the terminal modules. The wiring with spring-clamp technology allow you to connect the signaling lines and power cables fast and easily. In contrast to the screw connection, this type of connection is resistant to vibrations.

The installation procedure with spring terminals is described in 8.2 "Spring terminals".

### Standard wiring

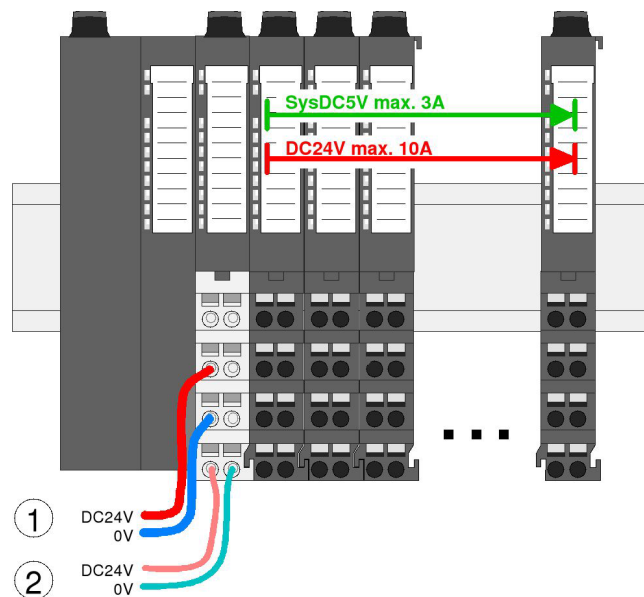


Fig. 8-6: Standard wiring

- 1 24 V DC for power supply of I/O level (max. 10 A)
- 2 24 V DC for electronics supply, bus node and I/O level

## 8.5 Wiring of the power modules

### Terminal module connection terminals

Power modules are either integrated into the bus node or may be plugged between the expansion modules.

Terminals with spring-clamp technology are used for the wiring of power modules. The wiring with spring-clamp technology allow you to connect the signaling lines and power cables fast and easily. In contrast to the screw connection, this type of connection is resistant to vibrations.

The installation procedure with spring terminals is described in 8.2 "Spring terminals".

### Standard wiring

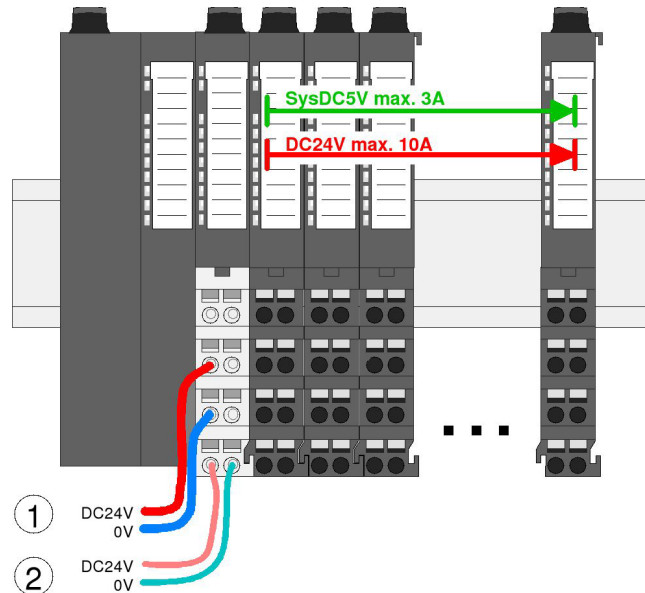


Fig. 8-7: Standard wiring

- 1 24 V DC for power supply of I/O level (max. 10 A)
- 2 24 V DC for electronics supply, bus node and I/O level

### Standard wiring of the power modules

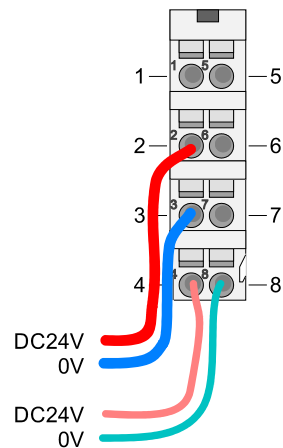


Fig. 8-8: Standard wiring

For wires with a cross-section of 0.08 mm<sup>2</sup> to 1.5 mm<sup>2</sup>.

Pos.	Function	Type	Description
1	-	-	not used
2	24 V DC	Input	<b>24 V DC for power supply</b>
3	0 V	Input	GND for power supply
4	Sys 24 V DC	Input	24 V DC for electronics supply
5	-	-	not used

Pos.	Function	Type	Description
6	24 V DC	Input	24 V DC for power supply
7	0 V	Input	GND for power supply
8	Sys 0 V	Input	GND for electronics supply

## 8.6 Fixing the shield

### Shield bus carrier

Shield bus carriers are required for installing a shield (see section 12.1 "Accessories"). The shield bus carrier supports the shield bus for connecting cable shields.

### Fixing the shield

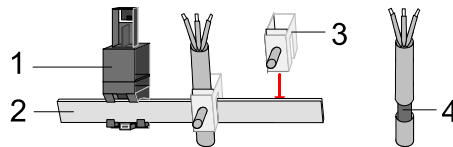


Fig. 8-9: Shield

- 1 Shield bus carrier
- 2 Shield bus (10 mm x 3 mm)
- 3 Shield terminal block
- 4 Shielding

### Installing the shield bus

- ✓ Each Cube20S module is provided on the bottom side with an opening for the shield bus carrier. The bus node has two openings.
- ➔ Insert the shield bus carriers until they engage in the module.
- ➔ If the mounting rail is flat, break the spacer off the shield bus carrier for adjustment.
- ➔ Insert the shield bus into the shield bus carrier.

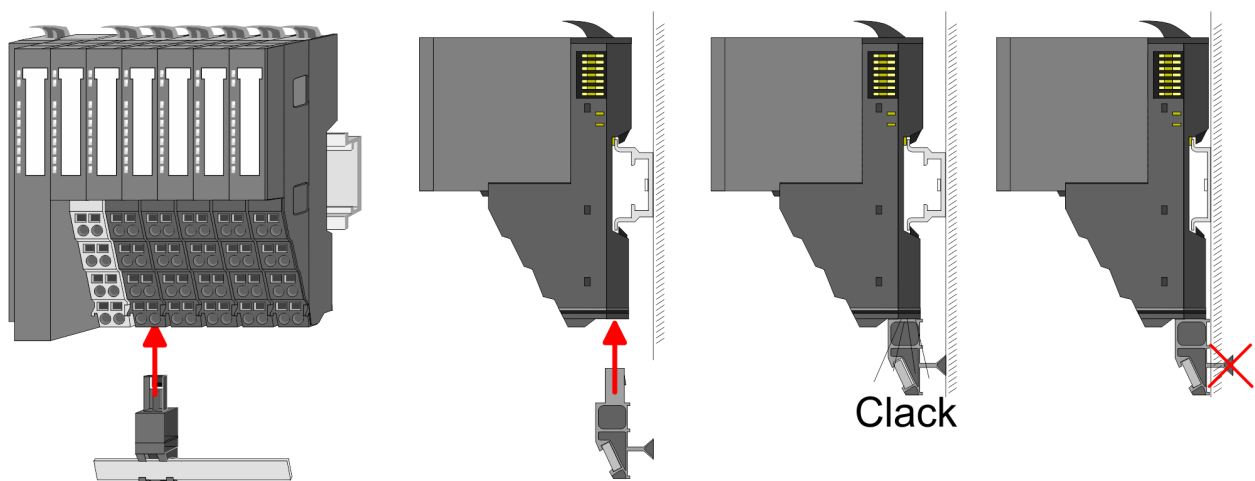


Fig. 8-10: Fixing the shield

### Fixing the shielding

- ✓ The shield bus carrier and the shield bus have been plugged in.
- ➔ Fasten the cables with the stripped cable shielding.
- ➔ Connect the shield terminal block to the shield bus.

## 8.7 Fuse protection

### 8.7.1 Power modules

#### Fuse protection of the power supply



#### CAUTION!

**The power supply of the power module is not internally fuse-protected**  
Without protection, the power modules can be destroyed.

- ➔ The power supply must be fuse-protected externally according to the corresponding maximum current!
- ➔ For up to 10 A use a 10 A fuse (fast) or a 10 A circuit breaker of characteristic Z!

#### Fuse protection of the electronics supply

**The electronics supply of the power module is internally protected against excessive voltage. The fuse is located inside the power module.**

- ➔ Replace the power module if the fuse has tripped!

#### Power module art. no. 57131

#### Fuse protection of the power module electronics supply of the I/O level

- ➔ Fuse-protect the electronics supply externally!
- ➔ Use:
  - A 1 A fuse (fast)  
or
  - a 1 A circuit breaker of characteristic Z  
or
  - MICO load circuit monitoring,  
e.g. MICO 4.4, Art.-No. 9000-41034-0100400

### 8.7.2 System

#### Fuse protection of the power supply

#### **The power supply is not internally fuse-protected**

- ➔ The power supply must be fuse-protected externally according to the corresponding maximum current!
- ➔ For up to 10 A use:
  - A 10 A fuse (fast)  
or
  - a 10 A circuit breaker of characteristic Z  
or
  - MICO load circuit monitoring,  
e.g. MICO 4.10, Art.-No. 9000-41042-0401000

**Bus node and I/O modules**
**External fuse-protection of electronics supply, bus node and I/O modules**

- ➔ Externally fuse-protect the electronics supply for bus node and I/O level with a fuse corresponding to the maximum current!
- ➔ For up to 10 A use:
  - A 2 A fuse (fast)
  - or
  - a 2 A circuit breaker of characteristic Z
  - or
  - MICO load circuit monitoring, e.g. MICO 4.6, Art.-No. 9000-41034-0100600


**8.7.3 Fuse-protection with MICO circuit breakers**
**External fuse**

To protect the power supply, Murrelektronik provides a number of circuit breakers. They can be found under the product name **MICO** on the internet [www.murrelektronik.com](http://www.murrelektronik.com).

**MICO-variants for intelligent current monitoring**

- MICO monitors currents
- MICO signals limit loads
- MICO detects overloads
- MICO enables flexibility

**MICO 4-channel**

Art. no.	Designation	Rated operating branch current [A]	Figure: MICO 4.6
9000-41034-0100400	MICO 4.4	1-2-3-4	
9000-41034-0100600	MICO 4.6	1-2-4-6	
9000-41042-0401000	MICO 4.10	4-6-8-10	

Tab. 8-1: MICO load circuit monitoring, 4 channels

## 8.8 Using power modules

### Status of the electronics power supply

After switching on the Cube20S system, the RUN or MF LED lights up on every module.

**If the total current for the electronics supply exceeds 3 A, the LEDs are no longer activated.**

→ In this case, plug in the power module, art. no. 57131, between the expansion modules.



#### NOTE

To guarantee power supply, the power modules can be used in any combination.

### 8.8.1 Power module art. no. 57130

**Use the power module art. no. 57130:**

- If 10 A is no longer sufficient for the power supply.
- If you want to have groups of different voltages.

#### Power module Art.-No. 57130

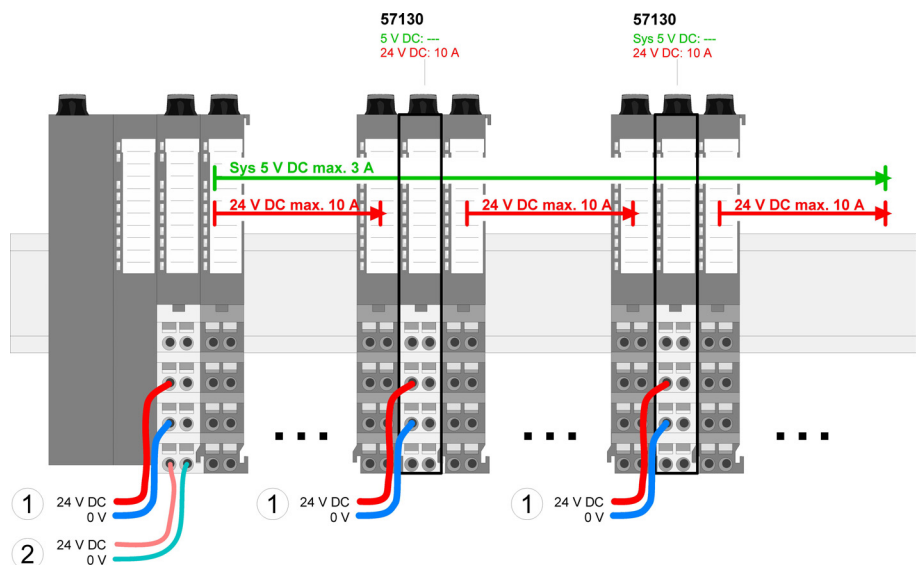


Fig. 8-11: Power module Art.-No. 57130

- 1 24 V DC for power supply of I/O level (max. 10 A)
- 2 24 V DC for electronics supply, bus node and I/O level

### 8.8.2 Power module art. no. 57131

**Using power module Art.-No. 57131:**

- If 3 A are not enough for the electronics supply on the backplane bus.
  - If you want to have groups of different potentials.
- In addition, you will get a new voltage group for 24 V DC power supply with max. 4 A.

**Connecting power module Art.-No. 57130**

- ➔ Plug in a power module.
- ➔ Then, plug in modules with a maximum total current of 2 A in the back-plane bus.
- ➔ Afterwards, you have to plug in another power module.

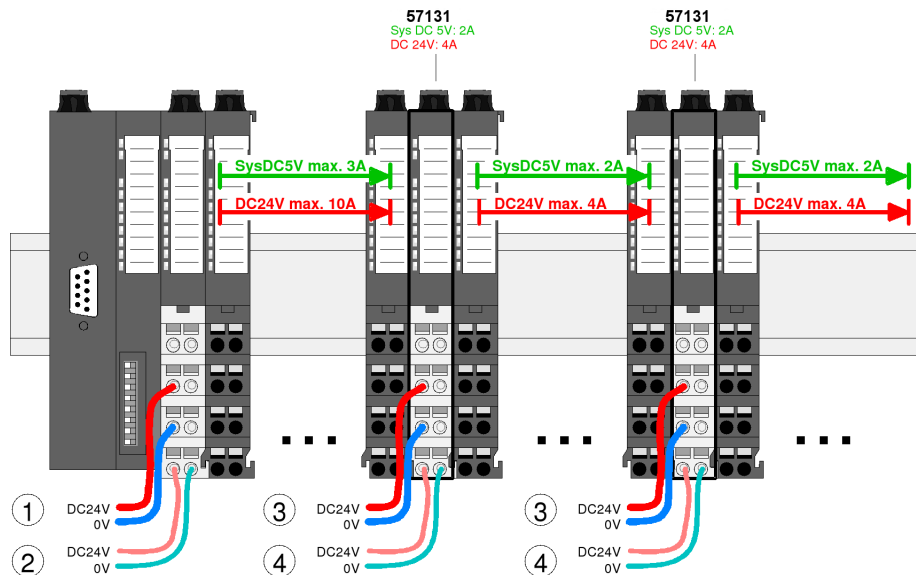
**Power module art. no. 57131**


Fig. 8-12: Power module art. no. 57131







- 1 24 V DC for power supply of I/O level (max. 10 A)
- 2 24 V DC for electronics supply, bus node and I/O level
- 3 24 V DC for power supply of I/O level (max. 4 A)
- 4 24 V DC for electronics supply, I/O level



## 9 Troubleshooting

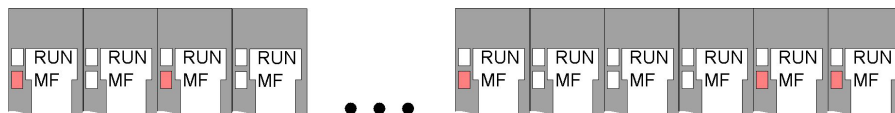
### General

Each expansion module has the LEDs **RUN** and **MF** on the front side. These LEDs help you find errors in your system or faulty modules.

Designation	Display	LED state
RUN LEDs		Off
		Green
		Green, flashing (2 Hz)
MF LEDs		Off
		Red
		Red, flashing (2Hz)

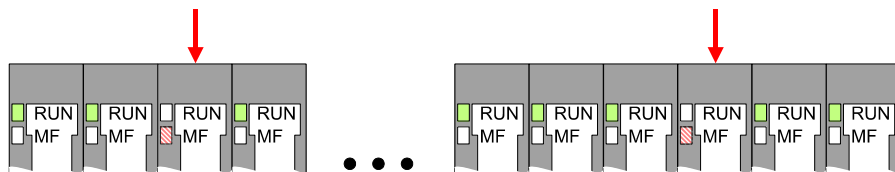
Tab. 9-1: State indications of the LEDs

### Total current of electronics supply exceeded



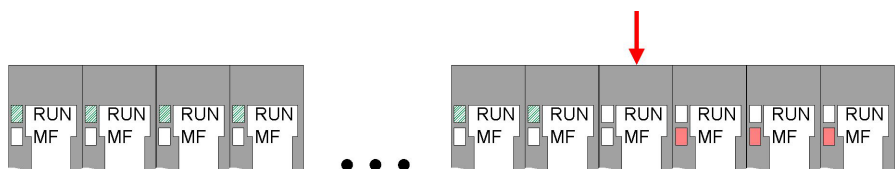
Behavior of the LEDs after switching on:	The <b>RUN LED</b> is off on all modules. The <b>MF LED</b> is only lit on some modules.
Cause:	The total current for electronics supply exceeds the maximum current.
Remedy:	Plug in the power module, Art-No. 57131 (see section 8 Installation, Seite 38).

### Configuration error



Behavior of the LEDs after switching on:	The <b>RUN LED</b> is off on one or several modules. The <b>MF LED</b> is flashing on these modules.
Cause:	The module whose <b>MF LED</b> is flashing does not correspond to the current configuration.
Remedy:	Match configuration and hardware structure.

### Module failure



Behavior of the LEDs after switching on:	The <b>RUN LEDs</b> are flashing up to the module to the left of the defective module. On the following modules, the <b>RUN LED</b> is off. The <b>MF LEDs</b> are off up to the module to the left of the defective module. On the following modules, the <b>MF LED</b> is lit.
Cause:	The module to the right of the flashing modules is defective.
Remedy:	Replace the defective module.

## 10 Art.-No. 57106 PROFINET IO bus node

### 10.1 Features

#### Properties

- Fieldbus: PROFINET according to IEC 61158-6-10 and IEC 61784-2
- PROFINET for max. 64 peripheral modules
- Max. 512 Byte input and 512 Byte output data
- Transfer rate 100 MBit/s full duplex
- The following are supported:
  - MRP slave (Media Redundancy Protocol) as MRP client
  - Shared Devices with up to 3 connections
  - FMM (Free Module Mapping)
  - Multiple and Single Write (acyclic communication)
- The following are integrated:
  - Web server
  - DHCP client
  - 24 V DC power supply unit for electronics and power supply of the expansion modules
  - 2-port switch

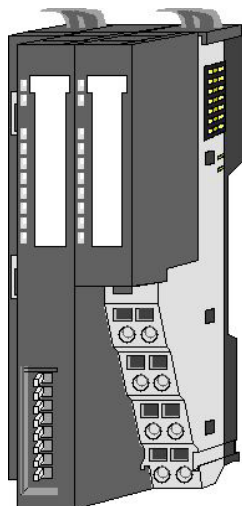


Fig. 10-1: PROFINET IO bus node, Art.-No. 57106

#### Order data

Type	Art. no.	Description
Cube20S bus node	57106	Cube20S PROFINET IO bus node

## 10.2 Structure

57106

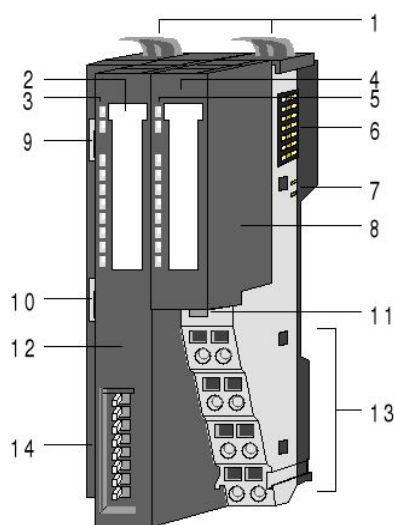


Fig. 10-2: Design of PROFINET IO bus node

- 1 Locking lever of terminal module
- 2 Labeling strip of bus interface
- 3 LED status indication of bus interface
- 4 Labeling strips of power module
- 5 LED status indication of power module
- 6 Backplane bus
- 7 24 V DC power supply
- 8 Power module
- 9 PROFINET RJ45 bus interface **P1**
- 10 PROFINET RJ45 bus interface **P2**
- 11 Power module unlocking
- 12 Bus interface
- 13 Connecting terminal
- 14 Address switch

## 10.3 Interfaces



### CAUTION!

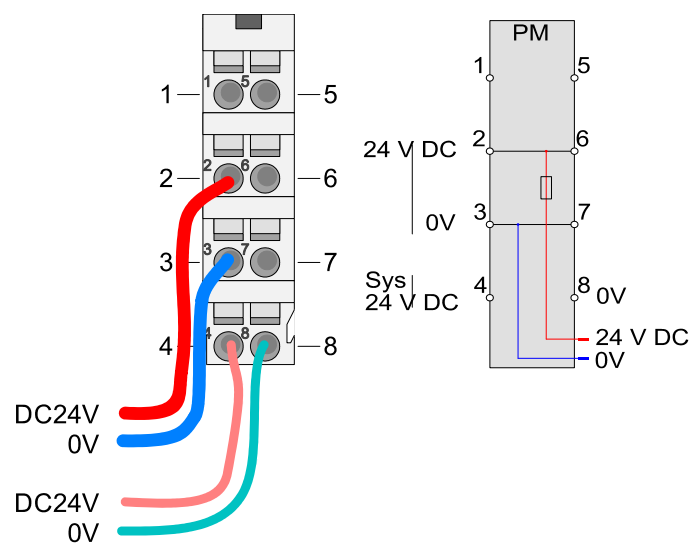
**Power module and bus interface as well as power and terminal module each form one unit!**

Separating destroys the modules.

→ Do not separate power module and bus interface or power and terminal module! Disconnecting destroys the modules.

### Connecting terminal

Connect the wires with a cross section of 0.08 mm<sup>2</sup> (AWG 28) up to 1.5 mm<sup>2</sup> (AWG 16).



Pos.	Function	Type	Description
1	---	---	Not used
2	24 V DC	Input	24 V DC for power supply
3	0 V	Input	GND for power supply
4	Sys 24 V DC	Input	24 V DC for electronics supply
5	---	---	Not used
6	24 V DC	Input	24 V DC for power supply
7	0 V	Input	GND for power supply
8	Sys 0 V	Input	GND for electronics supply

Tab. 10-1: Assignment of connecting terminals

### PROFINET RJ45 bus interface

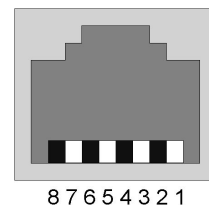
A 2-port switch is integrated in the bus interface, it has the following properties:

- Ethernet connection via 2 RJ45 sockets
- Auto negotiation (negotiating the transmission parameters)
- Auto crossover (if necessary, the send and receive lines are crossed automatically)

RJ45 sockets P1 and P2



8-pole RJ45 socket



Pos.	Assignment	Pos.	Assignment
1	Transmit +	5	GND
2	Transmit -	6	Receive -
3	Receive +	7	GND
4	GND	8	GND

Tab. 10-2: Assignment of the PROFINET RJ45 socket

### 10.3.1 Address switch

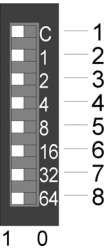
#### Address switch

##### Set at the address switch:

- address usage
- PROFINET names

##### Please note:

- A PROFINET name must be assigned only once on the bus!
- Changes at the address switch become effective only after PowerOn or Reset!
- The PROFINET name set at the address switch must be identical to the device name in your project!

Address switches	Pos.	Description
	1	DHCP client <input type="checkbox"/> 0 = deactivated <input type="checkbox"/> 1 = activated
	2	$2^0 = 1$
	3	$2^1 = 2$
	4	$2^2 = 4$
	5	$2^3 = 8$
	6	$2^4 = 16$
	7	$2^5 = 32$
	8	$2^6 = 64$
		PROFINET name: Murrelektronik57106-xxx with xxx = decimal value of pos. 2 ... 8

### Important switch positions

Pos.	Switch position	Behavior during restart
1	0	DHCP client is deactivated.
1	1	DHCP client is activated. <input type="checkbox"/> The IP address data are queried via DHCP. <input type="checkbox"/> The address data are not stored in the flash and the first DHCP "offer" is used. <input type="checkbox"/> The DHCP client is deactivated as soon as the first new IP settings have been received via DCP or the first PROFINET connection has been established.
2 ... 8	0 <sup>1</sup>	<input type="checkbox"/> PROFINET compliant (IEC 61158-6-10, IEC 61784-2) <input type="checkbox"/> PROFINET name (device name) resp. IP address parameter come from the flash memory. <input type="checkbox"/> The device name can be selected freely.
2 ... 8	[1 ... 127] <sup>2</sup>	<input type="checkbox"/> PROFINET name (device name): <b>Murrelektronik57106-xxx</b> with xxx = decimal value of position 2 ... 8 (20 ... 26)

#### 1: Pos. 2 ... 8, switch position 0



#### NOTE

For the PROFINET controller to find the PROFINET device, you must assign the device name or the IP address to the PROFINET device by means of an initialization (see below: initialization - assigning a device name).

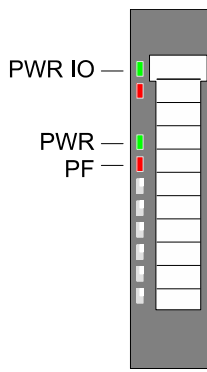






#### 2: Pos. 2, switch position 1 ... 127

##### Specifying the PROFINET name







- ➔ Specify a PROFINET name in your project in the Properties of the PROFINET IO device.
- ➔ Set this name using the address switch.
- ➔ If necessary, specify the IP address parameter.

## 10.4 LED status indication

### Power module LEDs

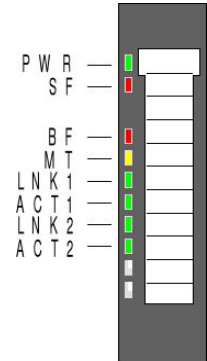






Display	LED	Color	LED states	
	PWR IO	Green		Off
				On
	PWR	Green		Off
				On
	PF	Red		Off
				On

Tab. 10-3: State indications of the LEDs

PWR IO	PWR	PF	Description of the display
	X		Power supply OK
			Electronics supply OK
X	X		Fuse of electronics supply defective.
Not relevant: X			

Tab. 10-4: Description of the LED display

### Bus interface LEDs











Display	LED	Color	State	Description
	PWR	 Green	On	Bus interface is supplied with power
	SF	 Red	On	Station error, error on PROFINET or on CUBE20S bus
	BF	 Red	On	Bus error: error in PROFINET communication
	MT	 Yellow	On	Maintenance: maintenance request of PROFINET
	LNK1/2	 Green	On	Link: physical connection to Ethernet
	ACT1/2	 Green	On	Activity: communication via Ethernet

Tab. 10-5: Status indication of bus interface












































**NOTE**

The LEDs for status indication allow full diagnostic during the switch-on procedure and during operation. Crucial for the diagnostic is the combination of different LEDs and the current operating mode.

**LED status**

<b>Green:</b>		off
PWR		on
LNK1, ACT1		flashing
LNK2, ACT2		
<b>Red:</b>		off
SF, BF		on
		flashing
<b>Yellow:</b>		off
MT		on
		flashing

[ ]: option; x: irrelevant; P: flashes

PWR	SF	BF	MT	LNK1	ACT1	LNK2	ACT2	Description
								
Green	Red	Red	Yellow	Green	Green	Green	Green	
	X	X	X	X	X	X	X	PROFINET IO device is supplied with voltage.
		 0.5 Hz	X	 [On]	X	 [On]	X	No connection to the PROFINET IO controller <sup>1</sup>
			X					No physical connection to the Ethernet LNK1 and LNK2 are off.
	X		X	 [On]	 P	 [On]	 P	Connection to a PROFINET IO controller is established <sup>2</sup>
		X	X	X	X	X	X	General error <sup>3</sup>
	 2 Hz		X		X		X	Error IP address <sup>4</sup>
	X	 1 Hz	 1 Hz	X	X	X	X	Firmware update is being performed currently. BF and MT are flashing alternately.
	X	X	X	 [2 Hz]	X	 [2 Hz]	X	Identification via DCP <sup>5</sup>
		X		X	X	X	X	Maintenance request <sup>6</sup>
P: flashes; [ ]: option; X: irrelevant								

**1) No connection to the PROFINET IO controller**

- There is a connection to switch
- no application relation active (= AR (Application Relation))
- LNK1 or LNK2 is on.

**2) Connection to a PROFINET IO controller is established**

- at least one application relation active
- LNK1 or LNK2 is on

**3) General error**

- Non-acknowledged diagnosis message available
- Error at the backplane bus, for example module failure, bus failure.
- Error during firmware update, displayed only briefly, after that restart.

**4) Error IP address**

- No valid IP address assigned.
- The assigned IP address already exists in the system.

**5) Identification via DCP**

- Depending on connection LNK1 or LNK2 are flashing for 3 seconds with 2 Hz.

**6) Maintenance request (Maintenance demanded/requested)**

- After parameterization of the IO device no Sync telegram received.
- Jitter outside the limits (repeated synchronization).
- Switch has discarded 10 telegrams (network congestion).
- Error on Cube20S bus (version error)



## 11 PROFINET IO

### 11.1 Basics

#### General information

PROFINET is an open Industrial Ethernet standard of PROFIBUS & PROFINET International (PI) for the automation system. PROFINET is standardized in IEC 61158.

PROFINET uses TCP/IP and IT standards and supplements the PROFIBUS technology for applications in which fast data communication is required in combination with industrial IT functions.

There are 2 PROFINET functional classes:

- **PROFINET IO** (the class used in the bus node art. no. 57106)
- PROFINET CBA

These classes can be realized in 3 performance levels:

- TCP/IP communication
- **RT communication** (the level used in the bus node art. no. 57106)
- IRT communication

#### PROFINET IO

PROFINET IO describes an I/O data view of decentralized periphery. It describes the entire data exchange between the IO controller and IO device. The planning of PROFINET IO is based on PROFIBUS. PROFINET IO includes the real-time concept (RT).

A provider-consumer model is used in PROFINET IO. It supports the application relations (AR = **A**pplication **R**elation) between nodes with equal access rights on the Ethernet. In this case the provider sends its data without request of the communication partner. Beside process data exchange it also supports the functions for parameterization and diagnosis.

#### PROFINET CBA

PROFINET CBA stands for **C**omponent **B**ased **A**utomation.

- The purpose of this component model is the communication between autonomously working control units.
- It allows a modular design of complex systems with the help of distributed intelligence by means of a graphic configuration of the communication between intelligent modules.

#### TCP/IP communication

This is an open communication via Ethernet TCP/IP which does not take place mandatorily in real time.

#### RT communication

RT stands for **R**eal-**T**ime.

- The RT communication is the basis for the data exchange on PROFINET IO.
- RT data are handled with higher priority.

#### IRT communication

IRT stands for **I**sochronous **R**eal-**T**ime.

- During the IRT communication, the start of the bus cycle is exactly timed, i.e., with a maximum permissible deviation and with constant synchronization. This guarantees time-controlled and isochronous transfer of data.
- Sync telegrams from a Sync master in the network are used for synchronization.

## Technical characteristics of PROFINET

According to IEC 61158 PROFINET has the following technical characteristics:

- **Full-duplex transmission**  
with 100 MBit/s via the copper wire or optic fiber
- **Switched Ethernet**
- **Auto negotiation**  
Negotiating the transmission parameters
- **Auto crossover**  
If necessary, the send and receive lines are crossed automatically
- **Wireless communication over WLAN**
- **User Datagram Protocol**  
UDP/IP is used as the higher level protocol. UDP stands for **U**ser **D**ata-  
**g**ram **P**rotocol and contains the nonsecure, connectionless broadcast communication in conjunction with IP.

## PROFINET devices

PROFINET IO classifies the following devices according to their tasks:

- **IO controller**  
The *IO controller* is the PLC with PROFINET connection, on which the automation program is running.
- **IO device**  
An *IO device* is a decentralized I/O field device, which is connected via PROFINET.
- **IO supervisor**  
An *IO supervisor* is an engineering station such as a programming device, PC or control panel for start-up and diagnosis.

## AR

AR (**A**pplication **R**elation) corresponds to a connection with an IO controller and an IO supervisor.

## API

API stands for Application Process Identifier and defines not only slots and subslots but also an additional addressing level.

This additional addressing mode helps you prevent overlapping of data ranges when using different applications.

The Cube20S PROFINET IO devices currently support the following APIs:

- DEFAULT\_API (0x00000000)
- DRIVE\_API (0x00003A00)
- ENCODER\_API (0x00003D00)
- FIELDBUS\_INTEGRATION\_API (0x00004600)
- RFID\_READER\_API (0x00005B00)
- BARCODE\_READER\_API (0x00005B10)
- INTELLIGENT\_PUMP\_API (0x00005D00)

## GSDML file

To configure a device-IO connection, you receive a GSDML file for each PROFINET bus node of the CUBE20S system. The GSDML file includes all Cube20S modules in form of XML data.

This file can be found in the download area of [www.murrelektronik.de](http://www.murrelektronik.de).

### Installing the GSDML file

- ➔ Install the GSDML file in your configuration tool.

More details on the installation of the GSDML file are given in the manual of the configuration tool.



Correctly select the PROFINET IO devices made available within the GSDML file.

In case of restrictions regarding the compatibility, the valid hardware version is always included in the device name of the hardware catalog (e.g.: 57106 PROFINET Device >= HW 04).



---

**NOTE**

Structure and contents of the GSDML file are stipulated by the standard IEC 61158.

---

**Addressing**

In PROFINET each device can be identified unambiguously by means of its PROFINET interface:

- IP address or MAC address
- Device name

**Transfer medium**

PROFINET is compatible with Ethernet according to the IEEE standards. The PROFINET IO field devices are connected only via switches as network components either in a star topology using the multiport switches or in a line topology using the switch integrated in the field device.

## 11.2 PROFINET installation guidelines

### General information on the data safety

Data safety and access protection become more and more important even in the industrial environment. The growing interconnectedness of entire industrial plants with the company levels and the functions of remote maintenance place higher requirements regarding the protection of industrial plants.

Hazards may be caused by internal manipulation, such as technical errors, operating and programming errors or external manipulation such as software viruses, worms, Trojans and password phishing.

### Protective measures

The most important protection measures against manipulation and loss of the data safety in an industrial area are:

- **Certificates**

Encryption of the data traffic by means of certificates.

- **VPN**

Filtering and control of the data traffic by VPN - "Virtual Private Networks".

- **Authentication**

Identification of the participants through an "authentication" via a secure channel.

- **Segmentation**

Segmentation in protected automation cells so that only devices in the same group are allowed to exchange data.

### Data and information security

With the VDI guideline **VDI/VDE 2182 Part 1** the VDI/VDE society for Measurement and Automatic Control has issued a guideline on implementation of security architecture in the industrial environment.

The guideline can be found under:

[www.vdi.de](http://www.vdi.de)

The PROFIBUS & PROFINET International (PI) supports you in the designing process of security standards with a **PROFINET Security Guideline**.

More details on this topic can be found under:

[www.profibus.com](http://www.profibus.com)

### Industrial Ethernet

Due to openness of the PROFINET standard you can use the standard Ethernet components. However, for use in industrial environments and due to high transfer rate of 100 MBit/s you should design your PROFINET system using Industrial Ethernet components.

All devices connected by means of switches are in the same network and can communicate with each other directly.

A network is limited physically by a router. For communication beyond the network limits you must program your routers in such a way that they allow such communication.

### Topology

#### Line

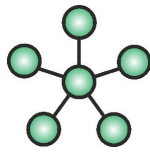


For the line structure all communication nodes are connected in series consecutively. The line topology is implemented by means of switches

in the PROFINET devices.

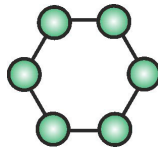
If a communication node fails, communication over the failed participant is not possible.

#### Star

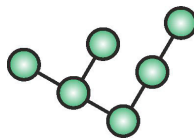


subnet.

### Ring



### Tree



Connecting communication nodes to a switch with more than 2 PROFINET interfaces automatically creates a star-shaped network topology.

If an individual PROFINET device fails, with this structure it will not lead to failure of the entire network. Only switch failure causes failure of the

To increase the availability, you can connect both open ends of a line structure using a switch. If you parameterize the switch as a redundancy manager, it will make sure that in case of network interruption the data are transmitted via a functioning network connection.

Connection of several star-shaped structures creates a tree-shaped network topology.

### Sample network

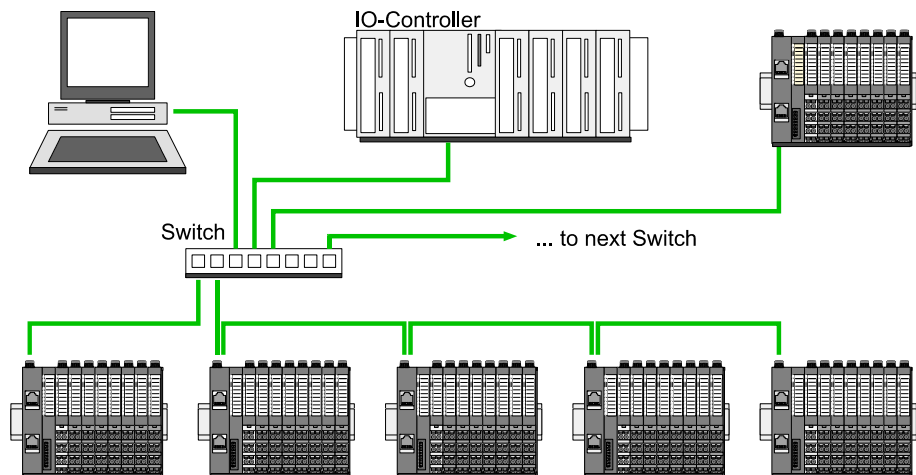


Fig. 11-1: Sample network

## 11.3 System access

### 11.3.1 Overview

In the following, we describe the access under PROFINET IO to the following parts of the Cube20S system:

- I/O range
- Parameter data
- Diagnostic data

Information about the ranges can be found in the description of the Cube20S module.



#### GSDML file

##### NOTE

The power and terminal modules have no type identification. They are not recognized by the bus node and not considered in the list or assignment of slots.

To configure a device-IO connection, you receive a GSDML file for each PROFINET bus node of the CUBE20S system. The GSDML file includes all Cube20S modules in form of XML data.

This file can be found in the download area of [www.murrelektronik.de](http://www.murrelektronik.de).

##### Installing the GSDML file

- ➔ Install the GSDML file in your configuration tool.

More details on the installation of the GSDML file are given in the manual of the configuration tool.



Correctly select the PROFINET IO devices made available within the GSDML file.

In case of restrictions regarding the compatibility, the valid hardware version is always included in the device name of the hardware catalog (e.g.: 57106 PROFINET Device >= HW 04).



#### Function blocks

##### NOTE

Structure and contents of the GSDML file are stipulated by the standard IEC 61158.

To transfer or modify data records at runtime, function blocks for **read/write data record** are required.

The following function blocks are available for CPUs that can be programmed by means of Siemens STEP 7:

<b>SFB 52</b>	RDREC	Read data record
<b>SFB 53</b>	WRREC	Write data record
<b>SFB 54</b>	ALARM	Read diagnostic data

##### Addressing the function blocks

- ➔ Address the module at the **slot**.
- ➔ Address the associated data range using the **index**.

### Acyclic access to the system Cube20S

For the acyclic access to the PROFINET IO device, the data records are read and written using the index from or to the desired API, slot or subslot.

Currently, the PROFINET IO device supports API 0. More information on the telegram structure can be found in the current PROFINET specification.



#### NOTE

The overview of all index numbers which can be addressed via PROFINET-IO device can be found in the section 11.10 Index overview, Seite 88.

### 11.3.2 Access to the I/O range

In PROFINET the input and output range in the corresponding address range of the master system is automatically displayed.

Using the function block SFB 52 - RDREC gives you acyclic access to the I/O areas via the following index numbers:

- **Index** = 0x8028: Reading of input data (**slot** 1 ... 64 / subslot 1)
- **Index** = 0x8029: Reading of output data (**slot** 1 ... 64 / subslot 1)

### 11.3.3 Access to parameter data

In the GSDML file, you can set parameter data for the corresponding modules using hardware configuration.

#### Data transmission:

- 1 | Set the parameter data.
- 2 | During start-up of the I/O device the I/O controller transmits the parameter data once to the modules.
- 3 | After the transfer the parameter data are active in the module.

Access

Access	Slot (subslot always 1)	Index
All parameters of PROFINET IO device incl. header (4 Byte)	0	0x007D Can also be addressed via 0x007E
All module parameters incl. header (4 Byte)	1 ... 64	0x007D Can also be addressed via 0x007E

Tab. 11-1: Access to parameter data



#### NOTE

Information about the ranges can be found in the description of the Cube20S module.

### 11.3.4 Access to diagnostic data

#### Process interrupt data

If the process interrupt has been activated via the parameterization in the corresponding module or in the Cube20S PROFINET IO device, Cube20S modules capable of triggering interrupts send process interrupt data automatically using the diagnostic telegram.

***In case of a process interrupt, the master system goes to a interrupt routine***

- where the process interrupt data can be read with the function block SFB 54 - RALARM.



#### NOTE

For further information on the process interrupts, refer to section 11.7.1 Process interrupt, Seite 79.

#### Diagnostic interrupt data

If the interrupt has been activated via the parameterization in the corresponding module or in the Cube20S PROFINET IO device, Cube20S modules capable of triggering interrupts automatically send process diagnostic interrupt data to the master system.

In case of a diagnostic interrupt, the master system goes to an interrupt routine

- where the diagnostic interrupt data can be read with the function block SFB 54 - RALARM.
- Using the parameterization of Cube20S PROFINET IO device, you can specify the interrupt behavior and the structure of the diagnostic data.
- The functional block SFB 52 - RDREC can be used to read the diagnostic data sent last in an acyclic manner from the module.



#### NOTE

You will find further information on the diagnostic interrupts in section 11.7.2 Diagnostic interrupt, Seite 80.



## 11.4 Planning

### General information

Plan the system as hardware configuration in your PROFINET planning tool, for example Siemens SIMATIC Manager.

Assign the corresponding IO device to your IO controller. Using the PROFINET address assign the module directly. The address has to be set before that in the IO device by means of the address switch and in the Properties of the IO device.

By integrating the corresponding GSDML file, the IO device is indicated as **Murrelektronik 57106**

(PROFINET IO → Other field devices → I/O → Cube20S system → Murrelektronik 57106).

### GSDML file

To configure a device-IO connection, you receive a GSDML file for each PROFINET bus node of the CUBE20S system. The GSDML file includes all Cube20S modules in form of XML data.

This file can be found in the download area of [www.murrelektronik.de](http://www.murrelektronik.de).

#### Installing the GSDML file

→ Install the GSDML file in your configuration tool.

More details on the installation of the GSDML file are given in the manual of the configuration tool.



Correctly select the PROFINET IO devices made available within the GSDML file.

In case of restrictions regarding the compatibility, the valid hardware version is always included in the device name of the hardware catalog (e.g.: 57106 PROFINET Device >= HW 04).



#### NOTE

Structure and contents of the GSDML file are stipulated by the standard IEC 61158.

### Example Siemens SIMATIC Manager

After installation of the GSDML file, you will find the IO device in the hardware catalog under:

- PROFINET IO
- Other field devices
- I/O
- Murrelektronik\_Cube20S
- Murrelektronik 57106

### Issuing device names

For the PROFINET controller to identify a PROFINET device, you have to assign a corresponding device name to the PROFINET device. This name must always be identical to the device name in your project!

For device name specification the PROFINET IO device 57106 has an address switch.

#### Switch position 0

- PROFINET compliant (IEC 61158-6-10, IEC 61784-2)
- PROFINET name (device name) resp. IP address parameter come from the Flash memory.
- The device name can be selected freely.

**NOTE**

For the PROFINET controller to find the PROFINET device, you must assign device name resp. the IP address to the PROFINET device by means of **initialization**.

**Switch position 1 ... 127**

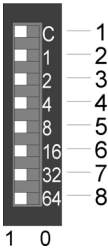
- PROFINET name (device name):  
**Murrelektronik57106-xxx**  
with xxx = decimal value of position 2 ... 8 (20 ... 26)
- ➔ Specify a PROFINET name in your project in the Properties of the PROFINET IO device.
- ➔ Set this name using the address switch.
- ➔ If necessary, specify the IP address parameter.

**Address switch****Set at the address switch:**

- address usage
- PROFINET names

**Please note:**

- A PROFINET name must be assigned only once on the bus!
- Changes at the address switch become effective only after PowerOn or Reset!
- The PROFINET name set at the address switch must be identical to the device name in your project!

Address switches	Pos.	Description
	1	DHCP client ■ 0 = deactivated ■ 1 = activated
	2	$2^0 = 1$
	3	$2^1 = 2$
	4	$2^2 = 4$
	5	$2^3 = 8$
	6	$2^4 = 16$
	7	$2^5 = 32$
	8	$2^6 = 64$
		PROFINET name: Murrelektronik57106-xxx  with xxx = decimal value of pos. 2 ... 8

**Important switch positions**

Pos.	Switch position	Behavior during restart
1	0	DHCP client is deactivated.
1	1	DHCP client is activated. ■ The IP address data are queried via DHCP. ■ The address data are not stored in the flash and the first DHCP "offer" is used. ■ The DHCP client is deactivated as soon as the first new IP settings have been received via DCP or the first PROFINET connection has been established.
2 ... 8	0 <sup>1</sup>	<ul style="list-style-type: none"> <li>■ PROFINET compliant (IEC 61158-6-10, IEC 61784-2)</li> <li>■ PROFINET name (device name) resp. IP address parameter come from the flash memory.</li> <li>■ The device name can be selected freely.</li> </ul>
2 ... 8	[1 ... 127] <sup>2</sup>	<ul style="list-style-type: none"> <li>■ PROFINET name (device name): <b>Murrelektronik57106-xxx</b> with xxx = decimal value of position 2 ... 8 (20 ... 26)</li> </ul>



## 1: Pos. 2 ... 8, switch position 0

### NOTE

For the PROFINET controller to find the PROFINET device, you must assign the device name or the IP address to the PROFINET device by means of an initialization (see below: initialization - assigning a device name).

## 2: Pos. 2, switch position 1 ... 127

### Specifying the PROFINET name

- ➔ Specify a PROFINET name in your project in the Properties of the PROFINET IO device.
- ➔ Set this name using the address switch.
- ➔ If necessary, specify the IP address parameter.

### Initialization - Assigning a device name

If all switches of the address switch at the PROFINET IO device are set to 0, proceed as follows to transfer the name from your project to the flash memory of your PROFINET IO device.

#### Initialization with Siemens SIMATIC manager

- ✓ All switches at the address switch of the PROFINET IO device are at 0.
- 1 | Perform PowerOn.
- 2 | Load your project.
- 3 | Select your PROFINET IO controller.
- 4 | Select **Target system > Edit Ethernet users**.
- 5 | Click **Search** in **Ethernet users**.  
*All reachable users are listed.*
- 6 | Select the PROFINET IO device with the suitable MAC address. The MAC address can be found on the front side of the module.
- 7 | Click **OK**.
  - a) If the device name, however, starts with "57106...", not all switches of the address switch are set to 0!
  - b) Please correct this.
- 8 | Specify the device name from your project under **Issuing device name**.
- 9 | Click **Assign name**.  
*The name is stored permanently in the flash memory of the PROFINET device.*

### Reset to factory settings

In **Reset to factory settings** you can delete the name.

#### Reset to factory settings with the Siemens SIMATIC Manager

- 1 | Start the Siemens SIMATIC Manager.
- 2 | Select **Target system > Edit Ethernet users**.
- 3 | Click **Search** in **Ethernet users**.  
*All reachable users are listed.*
- 4 | Select the PROFINET IO device with the suitable MAC address.
- 5 | Click **OK**.
- 6 | In **Reset to factory settings**, you delete the name in the flash memory by clicking **Reset**.

**Planning****Procedure**

- 1 | Design your PROFINET IO system.
- 2 | Start your planning tool with a new project.
- 3 | Plan a master system and create a new PROFINET IO subnet.
- 4 | Take the PROFINET IO device 57106 from the hardware catalog and drag it onto the PROFINET IO master subnet.
- 5 | Specify in Properties / General of the PROFINET IO slave a PROFINET IO address within the range between 1 and 125.
- 6 | Set this address at the address switch.
- 7 | Open the specific Murrelektronik Properties dialog in the slot overview and parameterize the PROFINET IO slave.
- 8 | Embed the expansion modules from the hardware catalog.
- 9 | Parameterize the expansion modules if necessary.
- 10 | Transfer your project to the PLC.

**Parameter data**  
**PROFINET IO device**

Byte	Bit 7 ... 0	Description	Default
0	Bit 0	Process interrupt 0 = lock 1 = enable	0x00
	Bit 1	Diagnostic interrupt 0 = lock 1 = enable	
	Bit 2	Diagnostic interrupt type 0 = manufacturer-specific data 1 = channel-specific data	
	Bit 3	Auto-Acknowledge 0 = lock 1 = enable	
	Bit 4	Reserved	
	Bit 5	Web server 0 = lock 1 = enable	
	Bit 6	Reserved	
	Bit 7	Data format 0 = Motorola 1 = Intel	
1 ... 4		0x00 (fixed)	0x00
5	Bit 0	FMM: Activation 0 = lock 1 = enable	0x00
	Bit 1	FMM: Automatic restart 0 = lock 1 = enable	
	Bit 7 ... 2	Reserved	
6		0x00 (fixed)	0x00

Tab. 11-2: Parameter data

**Diagnostic interrupt type**

Here you can define the structure of the diagnostic interrupt data. In case of an error they are sent in the diagnosis telegram. You can retrieve them using the default PROFINET index numbers.

- **Manufacturer specific data:**

You receive the data record DS 0x01 of the module diagnostic data.

- **Channel-specific data:**

You receive the data record DS 0x00 of the module diagnostic data.

**Auto-Acknowledge**

Interrupt acknowledgements at Cube20S backplane bus:

**Auto-Acknowledge = 0**

- With Auto-Acknowledge = 0 you are responsible for the acknowledgement yourself.
- You receive the data record DS 0x01 of the module diagnostic data.
- You will be informed about each interrupt.
- As long as an interrupt has not been acknowledged by the PROFINET controller, further interrupts of the corresponding module are blocked.



Data format  
Motorola/Intel

Auto-Acknowledge = 1 (default)

- With Auto-Acknowledge = 1 each interrupt is acknowledged by the PROF-  
INET device itself.
- In this mode the diagnostic data are overwritten by the new interrupts.

---

#### HINT

Activate the **Auto-Acknowledge** for the continuous use.

---

This parameter is only analyzed when analog modules are used; it defines how a value is stored in the CPU addressing range.

#### Motorola format

In Motorola format (default), the bytes are stored in decreasing order, i.e. the first byte is the high byte, the second byte the low byte.

#### Intel format

In Intel format, the order is inverted and the bytes stored in increasing order, i.e. the first byte is the low byte, the second byte the high byte.

## 11.5 Web server



### NOTE

The power and terminal modules have no type identification. They are not recognized by the bus node and not considered in the list or assignment of slots.

### 11.5.1 Access via IP address

#### Setting options

In the as-delivered state, the PROFINET IO device does not have an IP address. In order to access the web server, you have to assign the IP address data to it.

#### *IP address data setting options*

##### 1 | Address switch:

Activate the DHCP client via DIP switch 1 of the address switch and request an IP address from your DHCP server in the network.

##### 2 | DCP tool

Assign IP address data by means of a DCP tool.

##### 3 | IO controller

Assign IP address data via an IO controller. It allows you to access the web server and change the IP address data accordingly.

### 11.5.2 Structure of the web server

The web page is structured dynamically and depends on the number of modules connected to the PROFINET IO device.

#### 1 | Module list:

PROFINET IO device and Cube20S modules in the order they are plugged in

#### 2 | Functions for the module selected in the module list

#### 3 | Information and input field for the corresponding function



### NOTE

For fast diagnostic, the missing or incorrectly configured modules are shown in red letters in the module list after refreshing the web page.

### 11.5.3 Web page with selected PROFINET IO device

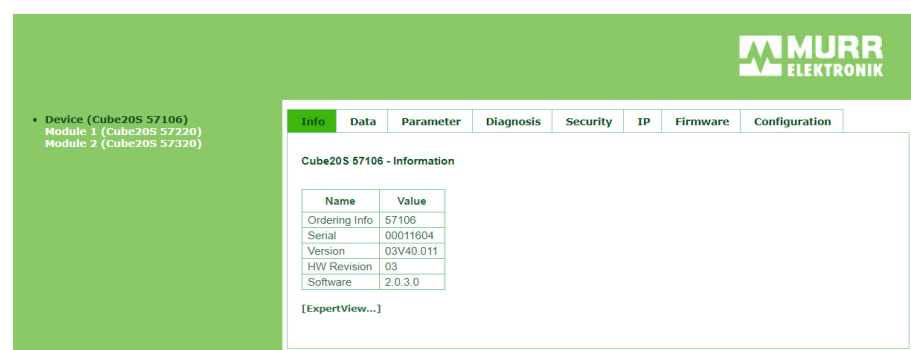


Fig. 11-2: Web page with selected PROFIBUS IO device

**Info**

- **Info:** The **Info** tab shows data of the PROFINET IO device.

- ☐ Order No.
- ☐ Serial number
- ☐ Firmware version
- ☐ Hardware version

**Data**

The PROFINET IO device does not have any data.

**Parameter**

This tab shows the current parameters of the PROFINET IO device.

**Security**

On the **Security** tab, you can protect all functions for the write access to the PROFINET IO device with a password.

**IP**

This tab shows the current IP address data of the PROFINET IO device.

**Firmware**

Use to this function to install a firmware update.

Murrelektronik will provide you with the respective firmware file.

## 11.5.4 Website if a module is selected

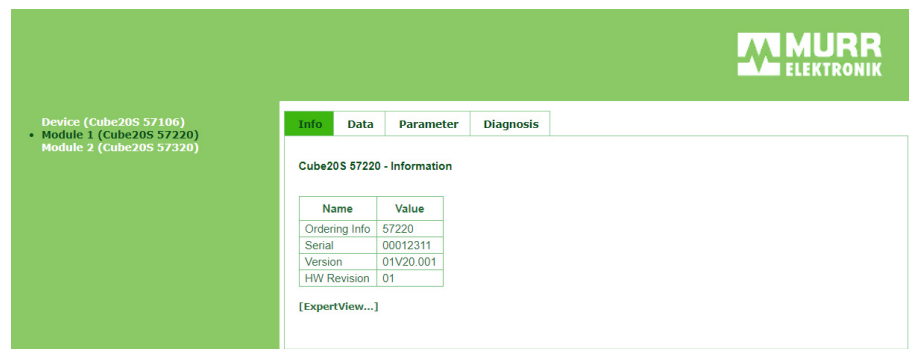


Fig. 11-3: Website if a module is selected

**Info**

- **Info:** The **Info** tab shows the data of the selected module.

- ☐ Order No.
- ☐ Serial number
- ☐ Firmware version
- ☐ Hardware version

**Data**

Information about the status of inputs and outputs is shown under **Data**.

**Parameter**

If available, the current parameters of the selected modules are shown.



## 11.6 FMM - Free Module Mapping

### 11.6.1 Overview

- FMM can be used to operate the same user program with a standard hardware configuration on different extension levels without detecting a nominal/actual difference of the hardware.
- PROFINET IO devices of Murrelektronik support the functions of FMM.

#### **Activating FMM (by default, FMM is deactivated)**

- ➔ Activate FMM in the parameterization in the PROFINET IO device.  
For further information on the parameterization, refer to 11.3.3 Access to parameter data, Seite 63.
- ➔ Define the mapping of the ports for the FMM via the data record **0x7F**.
- ➔ Activate the parameter **Startup when nominal/actual configuration differ** in the CPU.

#### **Result:**

*The PROFINET IO device transmits the FMM mapping to the CPU during commissioning.*

If FMM is activated and correctly configured, the system shows the following behavior:

- During commissioning, no difference between the nominal and the actual state of the hardware is diagnosed.
- Output data of missing modules are ignored and are not output.
- Input data of missing modules are set to 0.

### 11.6.2 Configuration

- The data record **0x7F** with a size of 64 bytes determines the mapping of the modules as a configuration.
- The PROFINET IO device saves the data record in a remanent manner. It is therefore not sent to the PROFINET IO device by the PROFINET controller when establishing the connection.
- Writing and reading the configuration is only possible if the FMM has previously been activated in the parameterization of the PROFINET IO device.
- The user program transfers the data record to the PROFINET IO device through a write command.
- You can also use the data record read command to read parts of the active configuration. But you always have to write the whole data record.
- Every written and valid configuration is only saved if there is a difference to the actual configuration.
- The configuration is only applied after a restart.
- In the parameterization of the PROFINET IO device, you can define that the PROFINET IO device is restarted when a configuration is received. Otherwise a manual restart is required after the transmission of your configuration.

### 11.6.3 Data record 0x7F

Data record 0x7F						
Byte	0	1	2	3	...	63
Mapping						

The following values can be entered for the mapping:

- 0: The slot is empty.
- 1...64: The slot corresponds to the current hardware configuration (actual configuration).
- 255: Virtual module - The module is not available in the actual configuration.

Behavior of a virtual module:

- The input range receives the value 0, independently of its size.
- The writing of the output range has no effect.
- The following data records can be read:
  - 0x8028: Read Input Data - returns 0.
  - 0x8029: Read Output Data - returns 0.
  - 0xAFF0: IM0 data - Returns a name identified from the module ID.
  - To identify the virtual module, the name is composed of the first 3 characters of the module type and the attachment "-XXXXX" (e.g. 031-XXXXX). The SW/HW version is the version of the PROFINET IO device.
- Other data records are acknowledged negatively. Establishing the connection is not affected by this.

### 11.6.4 Start-up

This section describes how your control units with different hardware extension but the same hardware configuration are put into operation:

#### Planning

- ➔ Plan your system with a hardware configuration with maximum extension (nominal configuration).

#### Activating FMM

- ➔ Activate FMM in the parameterization in the PROFINET IO device.  
For further information on the parameterization, refer to 11.3.3 Access to parameter data, Seite 63.
- ➔ Define the mapping of the ports for the FMM via the data record **0x7F**.
- ➔ Activate the parameter **Startup when nominal/actual configuration differ** in the CPU.

#### Result:

*The PROFINET IO device transmits the FMM mapping to the CPU during commissioning.*

- ➔ Activate the automatic restart of the PROFINET IO device when a configuration is received. Otherwise it must be restarted manually.

### Creating a configuration data record

- ➔ In the machine application, create a storage area for the configuration data record, which can be manipulated by the user program and transmitted to the PROFINET IO device. You can achieve this, for example, via an MMI in a protected area.
- ➔ Create the configuration by defining the deviation of the actual from the nominal configuration in the data record 0x7F for the current hardware extension.

### Transmitting the configuration data record

- ➔ Transmit this data record by means of a write command to the PROFINET IO device.

*The PROFINET IO device stores the configuration permanently. The configuration is applied after the next restart.*

## 11.6.5 Configuration examples

### 11.6.5.1 Nominal configuration

#### Example application

							SlotSoll	Module
Slot	1	2	3	4	5	6	1	DI
							2	DO
							3	DIO
							4	AI
							5	AO
							6	CP
	DI	DO	DIO	AI	AO	CP		



#### NOTE

The FMM configuration always refers to the port (slot) of the nominal configuration.

### 11.6.5.2 Hardware variants

Starting from the nominal configuration, the following examples show you how the FMM values for the hardware variants can be determined.

#### Variant 1

#### Same type and number of modules but swapped slots

(1): Nominal configuration							Slot <sub>Nominal</sub>	Module <sub>Nominal</sub>	Slot <sub>Actual</sub>	Module <sub>Actual</sub>	FMM	
(2): Actual configuration												
①	Slot	1	2	3	4	5	6	1	DI		DO	2
								2	DO		DI	1
								3	DIO		DIO	3
								4	AI		CP	4
								5	AO		AI	6
								6	CP		AO	4
②												

**Determination of FMM**

- Slot 1: The module of slot<sub>Nominal</sub> = 1 is located in the actual configuration on slot<sub>Actual</sub> = 2 → FMM = 2
- Slot 2: The module of slot<sub>Nominal</sub> = 2 is located in the actual configuration on slot<sub>Actual</sub> = 1 → FMM = 1
- Slot 3: The module of slot<sub>Nominal</sub> = 3 is located in the actual configuration on slot<sub>Actual</sub> = 3 → FMM = 3
- Slot 4: The module of slot<sub>Nominal</sub> = 4 is located in the actual configuration on slot<sub>Actual</sub> = 5 → FMM = 5
- Slot 5: The module of slot<sub>Nominal</sub> = 5 is located in the actual configuration on slot<sub>Actual</sub> = 6 → FMM = 6
- Slot 6: The module of slot<sub>Nominal</sub> = 6 is located in the actual configuration on slot<sub>Actual</sub> = 4 → FMM = 4

Data record 0x7F										
Mapping	2	1	3	5	6	4	0	0	...	0

**Legend**

- Slot<sub>Nominal</sub> The FMM configuration always refers to the port (slot) of the nominal configuration.
- Module<sub>Nominal</sub> Module on the port of the nominal configuration.
- Slot<sub>Actual</sub> Port of the actual configuration.
- Module<sub>Actual</sub> Module on the port of the actual configuration.
- FMM For variant 1, FMM corresponds to the value of slot<sub>Actual</sub> i.e., the slot of the actual configuration on which the module of the nominal configuration is located.
- FMM must be adapted during the configuration of the hardware variant.

**Variant 2****Swapped slots and modules are absent**

(1): Nominal configuration (2): Actual configuration		Slot <sub>Nominal</sub>	Module <sub>Nominal</sub>	Slot <sub>Actual</sub>	Module <sub>Actual</sub>	FMM
①	Slot 1 2 3 4 5 6	1	DI	1	DI	1
	PN	2	DO	-	DIO	255
		3	DIO	2	AI	2
		4	AI	3	AO	3
		5	AO	4	-	4
		6	CP	-	-	255
②	Slot 1 2 3 4 5 6					
	PN					

**Determination of FMM**

- Slot 1: The module of slot<sub>Nominal</sub> = 1 is located in the actual configuration on slot<sub>Actual</sub> = 1 → FMM = 1
- Slot 2: The module of slot<sub>Nominal</sub> = 2 is not available in the actual configuration → FMM = 255
- Slot 3: The module of slot<sub>Nominal</sub> = 3 is located in the actual configuration on slot<sub>Actual</sub> = 2 → FMM = 2
- Slot 4: The module of slot<sub>Nominal</sub> = 4 is located in the actual configuration on slot<sub>Actual</sub> = 3 → FMM = 3
- Slot 5: The module of slot<sub>Nominal</sub> = 5 is located in the actual configuration on slot<sub>Actual</sub> = 4 → FMM = 4
- Slot 6: The module of slot<sub>Nominal</sub> = 6 is not available in the actual configuration → FMM = 255

Data record 0x7F										
Mapping	1	255	2	3	4	255	0	0	...	0

## Legend

Slot <sub>Nominal</sub>	The FMM configuration always refers to the port (slot) of the nominal configuration.
Module <sub>Nominal</sub>	Module on the port of the nominal configuration.
Slot <sub>Actual</sub>	Port of the actual configuration.
Module <sub>Actual</sub>	Module on the port of the actual configuration.
FMM	For variant 2, FMM corresponds to the value of slot <sub>Actual</sub> i.e., the slot of the actual configuration on which the module of the nominal configuration is located.  If a module from the nominal configuration is not available, the value 255 for "virtual module" has to be used for FMM.

## Variant 3

### Modules are ignored

(1): Nominal configuration (2): Actual configuration							Slot <sub>Nominal</sub>	Module <sub>Nominal</sub>	Slot <sub>Actual</sub>	Module <sub>Actual</sub>	FMM
Slot	1	2	3	4	5	6	1	DI	empty	-	0
①	DI	DO	DIO	AI	AO	CP	2	DO	empty	-	0
							3	DIO	3	DIO	3
							4	AI	4	AI	4
							5	AO	5	AO	5
							6	CP	6	CP	6
②											

### Determination of FMM

- Slot 1: The module of slot<sub>Nominal</sub> = 1 is ignored in the actual configuration → FMM = 0
- Slot 2: The module of slot<sub>Nominal</sub> = 2 is ignored in the actual configuration → FMM = 0
- Slot 2: The module of slot<sub>Nominal</sub> 2 is not available in the actual configuration → FMM = 255
- Slot 3: The module of slot<sub>Nominal</sub> = 3 is located in the actual configuration on slot<sub>Actual</sub> = 3 → FMM = 3
- Slot 4: The module of slot<sub>Nominal</sub> = 4 is located in the actual configuration on slot<sub>Actual</sub> = 4 → FMM = 4
- Slot 5: The module of slot<sub>Nominal</sub> = 5 is located in the actual configuration on slot<sub>Actual</sub> = 5 → FMM = 5
- Slot 6: The module of slot<sub>Nominal</sub> = 6 is located in the actual configuration on slot<sub>Actual</sub> = 6 → FMM = 6

Data record 0x7F										
Mapping	0	0	3	4	5	6	0	0	...	0

## Legend

Slot <sub>Nominal</sub>	The FMM configuration always refers to the port (slot) of the nominal configuration.
Module <sub>Nominal</sub>	Module on the port of the nominal configuration.
Slot <sub>Actual</sub>	Port of the actual configuration.
Module <sub>Actual</sub>	Module on the port of the actual configuration.
FMM	For variant 3, FMM corresponds to the value of slot <sub>Actual</sub> i.e., the slot of the actual configuration on which the module of the nominal configuration is located.  If the modules of the nominal configuration are to be ignored, the value 0 must be used for FMM.



---

**NOTE**

The planning of gaps is not allowed in the Cube20S system! You can, however, plug in modules and configure them via the configuration as empty slots for the nominal hardware configuration.

---

***Planning of gaps***

- 1 | Plug in the modules.
- 2 | Define the modules via the configuration as empty slots for the nominal hardware configuration.

## 11.7 Diagnosis and interrupt

### 11.7.1 Process interrupt

**Process interrupt data** If the process interrupt has been activated via the parameterization in the corresponding module or in the Cube20S PROFINET IO device, Cube20S modules capable of triggering interrupts send process interrupt data automatically using the diagnostic telegram.

***In case of a process interrupt, the master system goes to a interrupt routine***

→ where the process interrupt data can be read with the function block SFB 54 - RALARM.

#### Process interrupt data

Byte	Description		Example	Contents
0 ... 1	AlarmModification		0x0002	PROFINET interrupt data
	1	High		
	2	Low		
2 ... 3	BlockLength		0x001E	
4 ... 5	Version		0x0100	
	High/Low			
6 ... 7	AlarmType		0x0002	
	1	Diagnostics		
	2	Process		
	3	Pull		
8 ... 11	API		0x0000	
			0x0000	
12 ... 13	Slot		0x0003	
14 ... 15	SubSlot		0x0001	
16 ... 19	ModuleIdentNumber		0x0006	
			0x1F41	
20 ... 23	SubmoduleIdentNumber		0x0000	
			0x0001	
24 ... 25	DiagnosticsState (PROFINET specific IEC 61158-6-10)		0x0005	
26 ... 27	UserStructureIdentifier		0x1000	Process interrupt (Specific for Murrelektronik)
	0x0000 ... 0x7FFF	UserSpecifiedDiagnostics		
	0x1000	Process interrupt		
	0x8002	ExtChannelDiag		
28 ... 47	Process interrupt data Specific for Murrelektronik		...	Process interrupt data (see Module description)

Tab. 11-3: Process interrupt data

## 11.7.2 Diagnostic interrupt

### Diagnostic interrupt

If the diagnostic interrupt has been activated via Parameterization in the corresponding module or in the PROFINET IO device, modules capable of triggering interrupts send diagnostic interrupt data automatically to the master system.

In case of a diagnostic interrupt, the master system goes to an interrupt routine

→ where the diagnostic interrupt data can be read with the function block SFB 54 - RALARM.

Via the parameterization of the PROFINET IO device, you can specify the interrupt behavior and the structure of the diagnostic data.

Among other things here you can choose from the following diagnostic data:

- UserSpecifiedDiagnostics (manufacturer specific)  
Here you have access to all diagnostic data.
- ExtendedChannelDiagnostics (channel-specific)  
Here you have access to the data record 0 (4 Byte) of the diagnostic data. Further diagnostic data must be requested individually.

### UserSpecified Dignostics

Here you have access to all diagnostic data. They are manufacturer specific.

Byte	Description	Example	Contents
0 ... 1	AlarmModification	0x0001	PROFINET interrupt data (header)
	1 High		
	2 Low		
2 ... 3	BlockLength	0x0030	
4 ... 5	Version High/Low	0x0100	
6 ... 7	AlarmType	0x0001	
	1 Diagnostics		
	2 Process		
	3 Pull		
8 ... 11	API	0x0000, 0x0000	
12 ... 13	Slot	0x0001	
14 ... 15	SubSlot	0x0001	
16 ... 19	ModuleIdentNumber	0x0403, 0x1543	UserSpecifiedDiagnostics 0x01FB = 0x01F4 + 0x7 Error in the module, ChannelErrorType: 7 (Upper limit value exceeded)
20 ... 23	SubmoduleIdentNumber	0x0000, 0x0001	
24 ... 25	DiagnosticsState (PROFINET specific IEC 61158-6-10)	0xB001	
26 ... 27	UserStructureIdentifier	0x01FB	
	0x0000 ... 0x7FFF	UserSpecifiedDiagnostics Specific for Murrelektronik Offset + ChannelErrorType Offset: ■ 0x0000: Error on PROFINET IO device ■ 0x01F4: Error on the Cube20S module	
	0x8002	ExtChannelDiag (see table Tab. 11-5: "Extended-Channel Diagnostics (channel-specific)")	
28 ... 47	Diagnostic interrupt data DS 1: specific for Murrelektronik	...	Diagnostic data, data record 1 (see module description)



Byte	Description	Example	Contents
48 ... 49	Slot/SubSlot: specific for Murrelektronik	0x0101	Slot 1 / SubSlot 1
50 ... 51	Channel: specific for Murrelektronik	0x0001	Channel 1
	0x0000 ... 0x7FFF UserSpecific		
	0x8000 SubSlotSpecific - for all channels		

Tab. 11-4: UserSpecified Diagnostics (manufacturer specific)

### ExtendedChannel Diagnostics

Here you have access to diagnostic data record 0 (4 Byte). They are specific for each channel.

Further diagnostic data must be requested explicitly.

Byte	Description		Example	Contents
0 ... 1	AlarmModification		0x0001	PROFINET interrupt data (header)
	1	High		
	2	Low		
2 ... 3	BlockLength		0x0030	
4 ... 5	Version High/Low		0x0100	
6 ... 7	AlarmType		0x0001	
	1	Diagnostics		
	2	Process		
	3	Pull		
8 ... 11	API		0x0000, 0x0000	
12 ... 13	Slot		0x0001	
14 ... 15	SubSlot		0x0001	
16 ... 19	ModuleIdentNumber		0x0403, 0x1543	
20 ... 23	SubmoduleIdentNumber		0x0000, 0x0001	
24 ... 25	DiagnosticsState (PROFINET specific IEC 61158-6-10)		0xA807	
26 ... 27	UserStructureIdentifier		0x8002	ExtendedChannelDiagnostics
	0x0000 ... 0x7FFF	UserSpecifiedDiagnostics		
	0x8002	ExtendedChannelDiagnostics		
28 ... 29	Channel		0x0001	Channel 1
	0x0000 ... 0x7FFF	UserSpecific		
	0x8000	SubSlotSpecific - for all channels		
30 ... 31	ChannelProperties (PROFINET specific IEC 61158-6-10)		0x2805	Channel properties: Input, 16 bit, interrupt <sub>t<sub>incoming</sub></sub>
32 ... 33	ChannelErrorType (see table)		0x0007	Upper limit value exceeded
34 ... 35	ExtendedChannelErrorType Specific for Murrelektronik		0x01F4	Error on Cube20S module
	0x0000	Error on IO device		
	0x01F4	Error on Cube20S module		
36 ... 39	ExtendedChannelAddValue		0x0000	Diagnostic data record 0 (see module description)
	Specific for Murrelektronik: Diagnostic data DS 0		0x150D	

Tab. 11-5: ExtendedChannel Diagnostics (channel-specific)

## ChannelErrorTypes

Code	Description
0x0001	Short circuit
0x0002	Undervoltage (supply voltage)
0x0003	Overvoltage (supply voltage)
0x0004	Output module is overloaded
0x0005	Overtemperature output module
0x0006	Cable break of the sensor or actuator
0x0007	Upper limit value exceeded
0x0008	Lower limit value exceeded
0x0009	Error (on-load voltage at output, sensor supply, hardware error)
0x000A	Simulation active
0x0010	Parameterization error
0x0011	Sensor or on-load voltage missing
0x0012	Fuse defective
0x0013	Communication error
0x0014	Grounding error
0x0015	Reference channel error
0x0016	Process interrupt lost
0x0017	Threshold interrupt
0x0018	Outputs are disabled
0x0019	Safety-related disconnection
0x001A	External error
0x001B	Unspecified error
0x001C	Cube20S: error on Cube20S bus
0x001D	Cube20S: failed to write parameter
0x001E	Cube20S: version error
0x0101	IO device: unexpected restart
0x0108	Shared Device error - This hardware revision state does not support Shared Device.
0x0109	FMM configuration has been changed - manual restart required.

Tab. 11-6: ChannelErrorTypes

## 11.8 Access to diagnostic data

### 11.8.1 Acyclic Access

If the interrupt has been activated via the parameterization in the corresponding module or in the Cube20S PROFINET IO device, Cube20S modules capable of triggering interrupts automatically send process diagnostic interrupt data to the master system.

→ The functional block SFB 52 - RDREC can be used to read the diagnostic data sent last in an acyclic manner from the module.

### 11.8.2 Diagnostic data of PROFINET IO device

Using **slot** = 0 / **subslot** = 1 access the PROFINET IO device.

Depending on the index you receive the following data back:

- Index = 0x0000: 4 bytes
  - Byte 0: diagnostic byte 1
  - Byte 1: diagnostic byte 2
  - Bytes 2 ... 3: 0 (fixed)
- Index = 0x0001: 20 bytes
  - Byte 0: diagnostic byte 1
  - Bytes 1 ... 19: 0 (fixed)

#### Design

Byte	Bit 7 ... 0	Comment
0 diagnostic -byte 1	Bit 0	Error on the Cube20S bus
	Bit 1	The parameters could not be written to the PROFINET IO device.
	Bit 2	General parameter error of PROFINET IO device
	Bit 3	Version error on Cube20S bus (at least one module on Cube20S bus is not supported)
	Bit 4	An unexpected restart has been performed
	Bit 5	Port monitoring (Data transmission impossible according to PROFINET IEC 61158)
	Bit 6	Port monitoring (Remote mismatch after PROFINET IEC 61158)
	Bit 7	Configuration error Cube20S bus (Actual configuration does not match the nominal configuration)
1 diagnostic -byte 2	Bit 0	Module has been removed.
	Bit 1	Shared Device error. This hardware revision state does not support Shared Device.
	Bit 2	FMM configuration has been changed - manual restart required. (see section 11.6 FMM - Free Module Mapping, Seite 73)
	Bit 7 ... 3	fixed
2 ... 3 (19)	0x00 fixed	

Tab. 11-7: Structure of diagnostic data record

### 11.8.3 Diagnostic data modules

#### Diagnostic data module

Using **slot** = 1 ... 64 / **subslot** = 1 access the corresponding Cube20S module. Depending on the **index** you receive the following data back:

- **Index** = 0x0000: data record DS 0x00 of the diagnostic data
- **Index** = 0x0001: data record DS 0x01 of the diagnostic data



#### NOTE

Information about the ranges can be found in the description of the Cube20S module.

Name	Bytes	Function
ERR_A	1	Diagnosis
MODTYP	1	Module information
ERR_C	1	reserved
ERR_D	1	Diagnosis
CHTYP	1	Channel type
NUMBIT	1	No. of diagnostic bits per channel
NUMCH	1	Number of channels of the module
CHERR	1	Channel error
CHxERR	8	Channel-specific error of channel x
DIAG_US	4	µs ticker

Tab. 11-8: Diagnosis data

#### ERR\_A Diagnose

Byte	Bit 7 ... 0	Description
0	Bit 0	Set in case of <b>Assembly fault</b>
	Bit 1	Reserved
	Bit 2	Set in case of <b>External error</b>
	Bit 3	Set in case of <b>Channel error available</b>
	Bit 4	Set in case of <b>Missing external power supply</b>
	Bit 5, 6	Reserved
	Bit 7	Set in case of <b>Invalid parameter</b>

#### MODTYP Module information

Byte	Bit 7 ... 0	Description
0	Bit 3 ... 0	Module class
		■ 0101b Analog module
		■ 1000b FM
		■ 0111b ETS, CP
		■ 1111b Digital module
	Bit 4	Set in case of <b>Channel information available</b>
	Bit 7 ... 5	Reserved

#### ERR\_C reserved

Byte	Bit 7 ... 0	Description
0	7 ... 0	reserved

#### ERR\_D Diagnosis

Byte	Bit 7 ... 0	Description
0	Bit 5 ... 0	Reserved
		Set in case of <b>Prozess interrupt lost</b>
	Bit 7	Reserved

Tab. 11-9: ERR\_D

**CHTYP**  
**Channel type**

Byte	Bit 7 ... 0	Description
0	Bit 6 ... 0	Channel type
		0x70 Digital input
		0x71 Analog input
		0x72 Digital output
		0x73 Analog output
		0x74 Analog input/output
		0x76 Counter
	Bit 7	Reserved

**NUMBIT**  
**Diagnostic bits**

Byte	Bit 7 ... 0	Description
0		Number of diagnostic bits of the module per channel.

**NUMCH**  
**Channels**

Byte	Bit 7 ... 0	Description
0		Number of channels of a module.

**CHERR**  
**Channel error**

Byte	Bit 7 ... 0	Description
0	Bit 0	Set in case of <b>Error in channel 0</b>
	Bit 1	Set in case of <b>Error in channel 1</b>
	Bit 2	Set in case of <b>Error in channel 2</b>
	Bit 3	Set in case of <b>Error in channel 3</b>
	Bit 4	Set in case of <b>Error in channel 4</b>
	Bit 5	Set in case of <b>Error in channel 5</b>
	Bit 6	Set in case of <b>Error in channel 6</b>
	Bit 7	Set in case of <b>Error in channel 7</b>

**CHxERR**  
**Channel-specific error**

Byte	Bit 7 ... 0	Description
0		Information on the assignment can be found in the description of the Cube20S module.

**DIAG\_US**  
**µs ticker**

Byte	Bit 7 ... 0	Description
0 ... 3		Value of the µs ticker at the moment of the diagnosis


**µs ticker**

There is a timer (µs ticker) in the module, it is started by means of PowerON and starts counting from 0 after  $2^{32}-1$  µs.

## 11.9 I&M data

### Overview

Identification and maintenance data (I&M) is information stored in the module; it helps you in the following cases:

- Checking the system configuration
- Finding hardware changes in a system
- Eliminating errors in a system

I&M data allows you to clearly identify modules.



### NOTE

Only one master may access the I&M data of a bus node at a time.

### Identification data

Identification data (I data) is information about the module, such as order number or serial number. Partly, this information is printed on the housing of the module. I data is the information a manufacturer provides for the module. It can only be read.

### Maintenance data

Maintenance data (M data) is system-specific information, such as installation site and date. M data is created during planning, written to the module, and saved there permanently.

### Structure of the data records

Using **Read data record** you can access certain identification data specifically. In this case you address parts of identification data using the corresponding index. The data records have the structure shown in the following table.

### Header information

Contents	Length (Byte)	Coding (hex)
- BlockType	2	I&M0: 0x0020 I&M1: 0x0021 I&M2: 0x0022 I&M3: 0x0023
- BlockLength	2	I&M0: 0x0038 I&M1: 0x0038 I&M2: 0x0012 I&M3: 0x0038
- BlockVersionHigh	1	0x01
- BlockVersionLow	1	0x00
Identification data (see the following table)	I&M0 / Index 0xAFF0: 0x54 I&M1 / Index 0xAFF1: 0x54 I&M2 / Index 0xAFF2: 0x16 I&M3 / Index 0xAFF3: 0x54	

Tab. 11-10: I&M data, header information

### Identification data 0: IN-DEX: 0xAFF0

Representation: R = read access

I&M data	Access	Presetting	Description
VendorIDHigh	R (1 bytes)	0x02	Name of the manufacturer
VendorIDLow	R (1 bytes)	0x2B	555 = Murrelektronik GmbH
Order_ID	R (20 bytes)		Order number
IM_SERIAL_NUMBER	R (16 bytes)	-	Serial number
IM_HARDWARE_REVISION	R (2 bytes)	1	Hardware revision

I&M data	Access	Presetting	Description
IM_SOFTWARE_REVISION	R	Firmware revision	Firmware revision
- SWRevisionPrefix	(1 Byte)	V, R, P, U, T	
- IM_SWRevision_Functional_Enhancement	(1 Byte)	0x00 ... 0xFF	
- IM_SWRevision_Bug_Fix	(1 Byte)	0x00 ... 0xFF	
- IM_SWRevision_Internal_Change	(1 Byte)	0x00 ... 0xFF	
IM_REVISION_COUNTER	(2 Byte)	0x0000	for internal use
IM_PROFILE_ID	(2 Byte)	0x0000	for internal use
IM_PROFILE_SPECIFIC_TYPE	(2 Byte)	0x0005	for internal use
IM_VERSION	R	0x0101	Version of the I&M data (e.g. 0x0101 = version 1.1)
- IM_Version_Major	(1 Byte)		
- IM_Version_Minor	(1 Byte)		
IM_SUPPORTED	R (2 bytes)	0x000E	I&M1 ... I&M3 are available

Tab. 11-11: Identification data 0: index 0xAFF0

**Maintenance data 1: INDEX: 0xAFF1** Representation: R/W = read and write access

I&M data	Access	Presetting	Description
IM_TAG_FUNCTION	R/W (32 bytes)	-	Specification of a unique identification
IM_TAG_LOCATION	R/W (22 bytes)	-	Specification of the installation location

Tab. 11-12: Maintenance data 1: INDEX: 0xAFF1

**Maintenance data 2: INDEX: 0xAFF2** Representation: R/W = read and write access

I&M data	Access	Presetting	Description
IM_DATE	R/W (16 bytes)	-	Specification of an input date (YYYY-MM-DD HH:MM)

Tab. 11-13: Maintenance data 2: Index: 0xAFF2

**Maintenance data 3: INDEX: 0xAFF3** Representation: R/W = read and write access

I&M data	Access	Presetting	Description
IM_DESCRIPTOR	R/W (54 bytes)	-	Specification of a comment

Tab. 11-14: Maintenance data 3: Index 0xAFF3

## 11.10 Index overview

### General information

The I/O, parameter and diagnosis data are accessed by means of the index numbers within one module. PROFINET combines the index numbers in ranges.

Number	Index
0x0000 ... 0x7FFF	Manufacturer specific index numbers
0x8000 ... 0xF7FF	Default index numbers of PROFINET

Tab. 11-15: Ranges for index numbers in PROFINET



### Index numbers

#### Readable index numbers (manufacturer specific)

Further information is given in the PROFINET Specification. **Index** is also referred to as **data record** in there.

The supported index numbers are listed below.

Index	Access	Description
0x0000	IO device + Cube20S modules	DS 0x00 diagnostic data
0x0001		DS 0x01 diagnostic data
0x007D		All parameter data
0x007E		DS 0x00 of the parameter data
0x007F	IO device	DS 0x01 of the parameter data
0x0080 ... 0x0090		DS 0x80 ... DS 0x90 of the parameter data
0x8028		Input data of a subslot
0x8029		Output data of a subslot
0xAFF0	Cube20S modules	I&M 0 (serial no., name, SW/HW version)
0xAFF1		I&M 1 (identification and installation location)
0xAFF2		I&M 2 (installation date)
0xAFF3		I&M 3 (comment)

Tab. 11-16: Readable index numbers (manufacturer specific)

#### Writable index numbers (manufacturer specific)

Index	Access	Description
0x0000	IO device + Cube20S modules	Write DS 0x00 of the parameter data
0x0001		Write DS 0x01 of the parameter data
0x007D		All parameter data
0x007E		DS 0x00 diagnostic data
0x007F	IO device	FMM configuration (see section 11.6 FMM - Free Module Mapping, Seite 73)
0x007F		DS 0x01 of the parameter data
0x0080 ... 0x0090		DS 0x80 ... DS 0x90 of the parameter data
0xAFF1		I&M 1 (identification and installation location)
0xAFF2	Cube20S modules	I&M 2 (installation date)
0xAFF3		I&M 3 (comment)

Tab. 11-17: Writable index numbers (manufacturer-specific)



**Readable index numbers  
(PROFINET)**
**Index (see PROFINET Specification)**

0x8000 / 0x8001 / 0x800A / 0x800B / 0x800C / 0x8010 / 0x8011 / 0x8012 /  
 0x8013 / 0x801E / 0x802A / 0x802B / 0x802C / 0x802D / 0x802F / 0x8030 /  
 0x8031 / 0x8050 / 0x8051 / 0x8052 / 0x8053 / 0x8054 / 0x8060 / 0x8061 /  
 0x8062 / 0x8070 / 0x8080 / 0x8090

*Tab. 11-18: Readable index numbers (PROFINET)*

**Writable index numbers  
(PROFINET)**
**Index (see PROFINET Specification)**

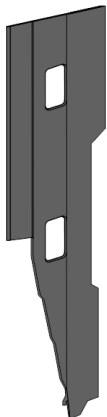
0xC000 / 0xC001 / 0xC00A / 0xC00B / 0xC00C / 0xC010 / 0xC011 / 0xC012 /  
 0xC013 / 0xE000 / 0xE001 / 0xE002 / 0xE00A / 0xE00B / 0xE00C / 0xE010 /  
 0xE011 / 0xE012 / 0xE013 / 0xE030 / 0xE040 / 0xE050 / 0xF000 / 0xF001 /  
 0xF00A / 0xF00B / 0xF00C / 0xF010 / 0xF011 / 0xF012 / 0xF013 / 0xF020 /  
 0xF80C / 0xF820 / 0xF821 / 0xF830 / 0xF831 / 0xF840 / 8041 / 0xF842

*Tab. 11-19: Writable index numbers (PROFINET)*

## 12 Appendix

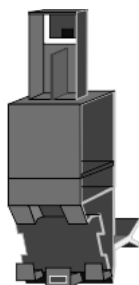
### 12.1 Accessories

**Bus cover Art.-No. 57190**



**Carrier for shield busses art. no. 57191**

The shield busses (10 mm x 3 mm) for connection of cable shields are fastened to the carrier.



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**NOTE**

Carriers for shield busses, shield busses and cable shield fasteners are not included in the scope of delivery.

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## 12.2 Glossary

### PROFINET IO:

Term	Meaning
AI	Analog Input
Actuator short circuit	Short circuit or overload at an output switches off the output.
AO	Analog Output
Bus segment	Due to the electrical specification of the RS-485 interface, the number of devices in an RS485 network is limited to 32. If you want to use more than 32 PROFIBUS devices, subdivide the network into segments using repeaters.
Byte	Term from IEC 61158. Corresponds to 1 byte or 8 bits.
DI	Digital Input
DO	Digital Output
EMC	Electromagnetic compatibility
EN	European standard
ESD	Electrostatic discharges
FE	Functional earth
GSDML	The General Station Description in xml format describes the technical features of a PROFINET product. This file is required when planning a PROFINET system; it is provided by the device manufacturer.
I	Current
IP20	
LED	Light Emitting Diode
PNO	Profibus Nutzerorganisation e.V.
Directive 2004/108/CE	EMC Directive
PLC	Programmable Logic Controller

## 12.3 Legal notes

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