MURR ELEKTRONIK

stay connected

CUBE20S Expansion manual

Digital input and output modules incl. base

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This document is valid for the following products:

Cube20S	Name	Art. no.
Digital input modules incl. base:	DI 2xDC 24V	57220
	DI 2xDC 24V 2µs...4ms	57221
	DI 2xDC 24V NPN	57222
	DI 2xDC 24V ETS	57223
	DI 4xDC 24V	57240
	DI 4xDC 24V 2µs...4ms	57241
	DI 4xDC 24V NPN	57242
	DI 4xDC 24V ETS	57243
	DI 4xDC 24V 3-Leiter	57244
	DI 8xDC 24V	57280
	DI 8xDC 24V NPN	57282
Digital output modules incl. base:	DO 2xDC 24V	57320
	DO 2xDC 24V 0,5A NPN	57322
	DO 2xDC 24V 0,5A ETS	57323
	DO 2xDC 24V 2A	57325
	DO 2xDC 24V 0,5A PWM	57326
	DO 2xRelais	57327
	DO 4xDC 24V 0,5A	57340
	DO 4xDC 24V 0,5A NPN	57342
	DO 4xDC 24V 0,5A ETS	57343
	DO 4xDC 24V 2A	57345
	DO 8xDC 24V 0,5A	57380
	DO 8xDC 24V 0,5A NPN	57382

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NOTE
Translation of the original instructions

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1 Introduction

1.1 Service and support

Sales

Support is available at all times from our technicians, office support team and field service staff.

CONNECTIVITY system advisors

Our system advisors are your competent contact partners if you want to develop CONNECTIVITY solutions. They cooperate with you to find the best solutions for your electrical installations.

Our CONNECTIVITY system advisors work with you to find ways to help you permanently strengthen the competitiveness of your machines and systems.

Customer Service Center (CSC)

Our staff of the Customer Service Center will help you with all questions concerning installation and set-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 interferences.

Please do not hesitate to call us at +49 (0) 7191 47-2050 or send an e-mail to support@murrelektronik.com.

Service addresses

Please visit our website to find your contact person:

www.murrelektronik.com

1.2 Introduction / about this document

Purpose of this document

This document describes the use of the digital input and output modules from the CUBE20S system by Murrelektronik GmbH. It describes the design, engineering and application.

1.3 Applicable documents

Applicable documents

Document	Location
Operating manual	Online shop of Murrelektronik GmbH

1.4 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. : **0x**15AE = 15AEh

1.5 Trademarks

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

PROFIBUS	PROFIBUS Nutzerorganisation e.V. (PNO)
PROFINET/PROFINET IO	PROFIBUS Nutzerorganisation e.V. (PNO)
Ethernet/IP	Open DeviceNet Vendor Association (ODVA)
CANopen	CAN in AUTOMATION - International Users and Manufacturers Group e.V.
Modbus	Gould Inc. Corporation
PRONETA	Siemens AG
S7-300	Siemens AG

S7-400	Siemens AG
S7-1500	Siemens AG
SIMATIC	Siemens AG
STEP	Siemens AG
TIA Portal	Siemens AG

2 For your own safety

2.1 Target group

Documentation

Please give this manual to all employees involved in the following tasks:

- Planning
- Installation
- Set-up
- Operation

Users

This manual is intended for users who have knowledge of automation systems.

2.1.1 Training / qualification

⚠ WARNING!

Risk of injury in case of insufficient qualification!

Improper use can result in severe personal injuries and material damage.

➔ Have specific activities carried out only by persons specified in the corresponding chapters of these operating instructions.

Qualification

In the operating instructions, the following qualifications for different fields of activity are named:

Operating personnel

The automation system may only be operated by persons that are trained, instructed and authorized for this kind of work.

Troubleshooting, servicing, cleaning, maintenance and replacement may only be carried out by trained or instructed personnel. These persons must know the contents of the operating instructions and act accordingly.

Start-up and instruction must be carried out by qualified personnel only.

Qualified personnel

Authorized by the manufacturer electrical engineers and skilled electricians of the customer or third parties who have been trained by the manufacturer in the installation and start-up and are entitled to put circuits and devices into operation, to ground and label according to the standards of safety technology.

Qualified personnel is trained or instructed in the respective local valid standards of the safety technology in maintenance and use of the appropriate safety equipment.

2.2 Intended purpose

Designated use

The Cube20S system has been designed and manufactured for:

- communication and process control
- general control and automation tasks
- industrial use
- operation under the ambient conditions specified under technical data
- installation in a switch cabinet

Foreseeable misuse

The device is not approved for being used:

- in potentially explosive atmospheres (EX Zone)
- outside of switch cabinets.

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 overvoltage 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

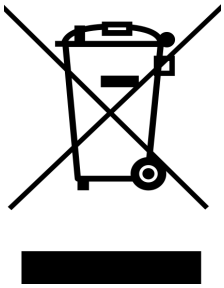
Spare parts

- 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

CE

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.

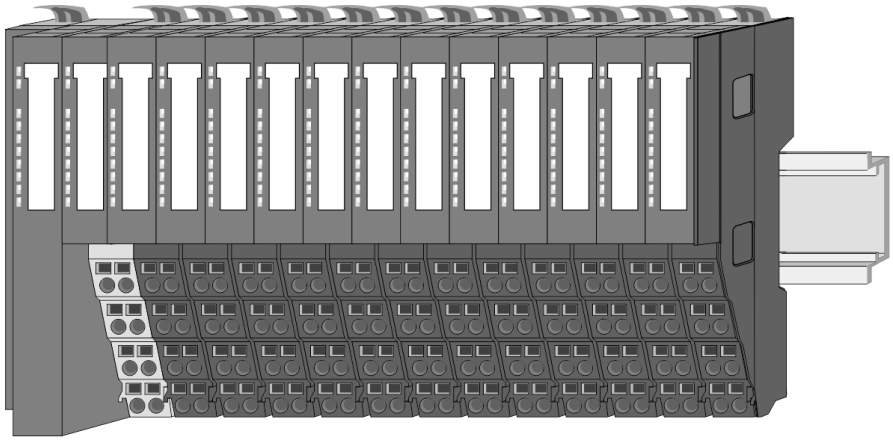


Fig. 3-1: Cube20S system

Components

The Cube20S system consists of the following components:

- Bus node
- Expansion modules
- Accessories

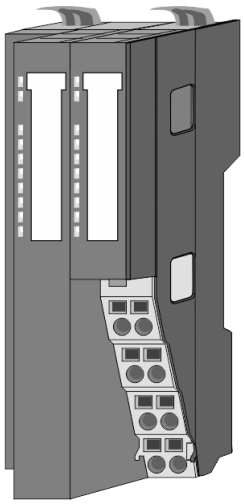
NOTE
The use of the Cube20S system is only permitted with a combination of modules from Murrelektronik. Operation together with modules of other manufacturers is impermissible!

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.

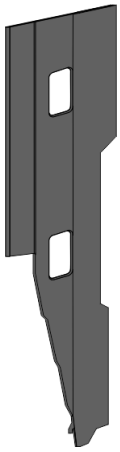
There is another connection on the power module for the 24 V DC power supply of the connected expansion modules.



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

- they are incorporated in the backplane 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.

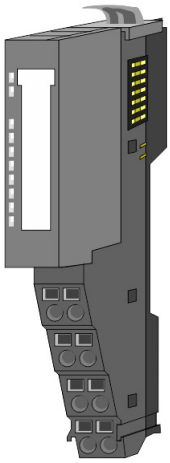
➔ Remove the cover on the bus node before installing Cube20 modules.

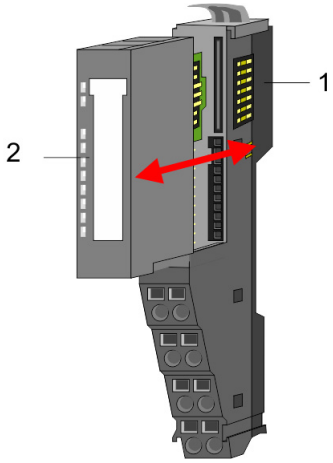
➔ To protect the contacts, mount the bus cover on the outermost module.

The bus cover is also available as accessory (see chapter 11.1 "Accessories").

Expansion modules

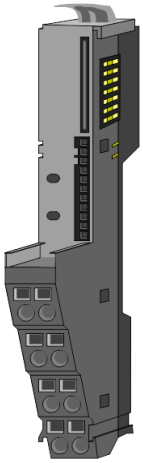
Each expansion module consists of a terminal and an electronic module.





1 Terminal module
2 Electronic module

Terminal module

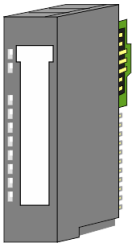


The terminal module consists of the following functional elements:

- 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.

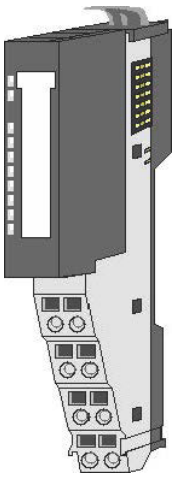
Electronic module



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".

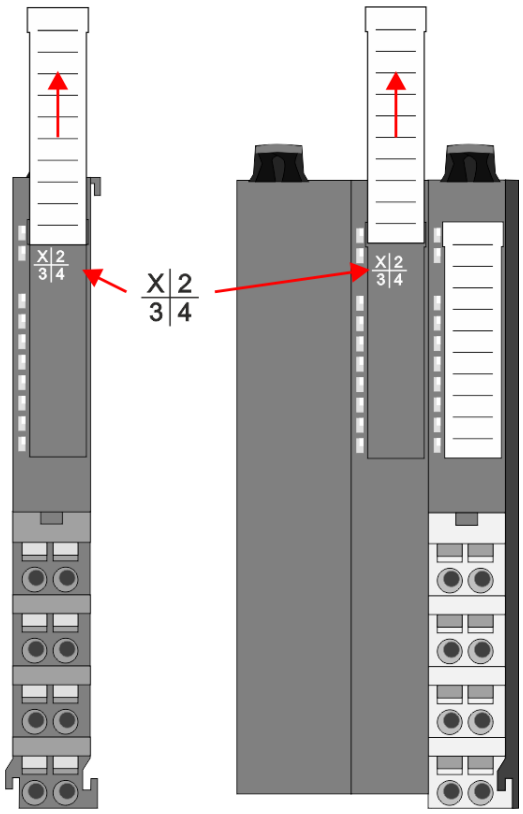


Fig. 3-2: Front printing

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	Art.-No. 57327, DO 2xrelays	2014/35/EU	Low voltage directive
CE	All DI/DO modules	2014/30/EU	EMC Directive
		2011/65/EU	RoHS Directive (products, lead-free)

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, suspended	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

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.

Mounting conditions			
	Installation site	-	Inside the switch cabinet
	Installation position	-	Horizontal and vertical
	Fastening	-	35 mm DIN rail

5 Mounting

5.1 Dimensions

Dimensions of the bus node

Fig. 5-1: Dimensions of the bus node in mm

Dimensions Expansion module

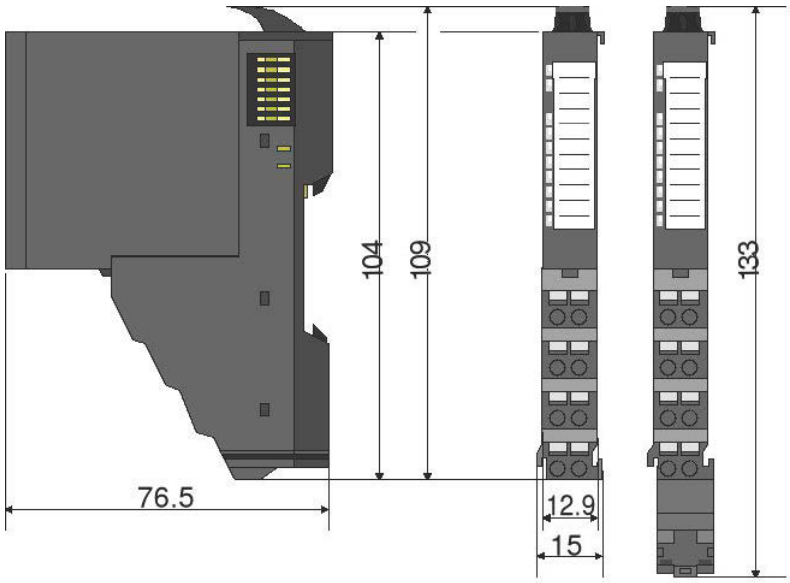


Fig. 5-2: Dimensions of the expansion module in mm

Dimensions of the electronic module

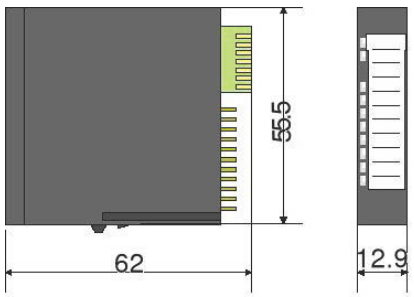


Fig. 5-3: Dimensions of the electronic module in mm

5.2 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 7.8 Using power modules, Seite 48).

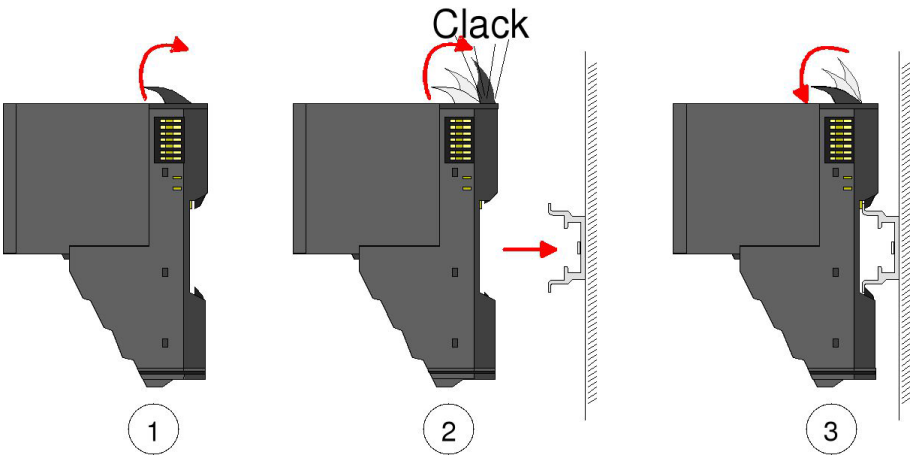


Fig. 5-4: Installing the module

5.2.1 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.

5.3 Installing the DIN rail

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

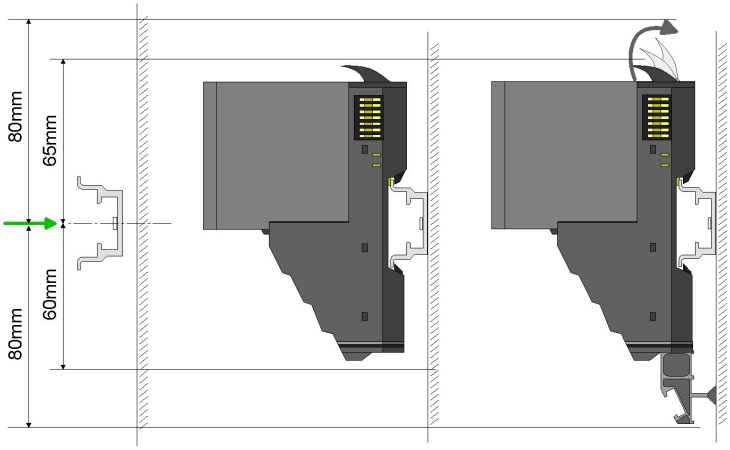


Fig. 5-5: Installation distances

5.4 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.

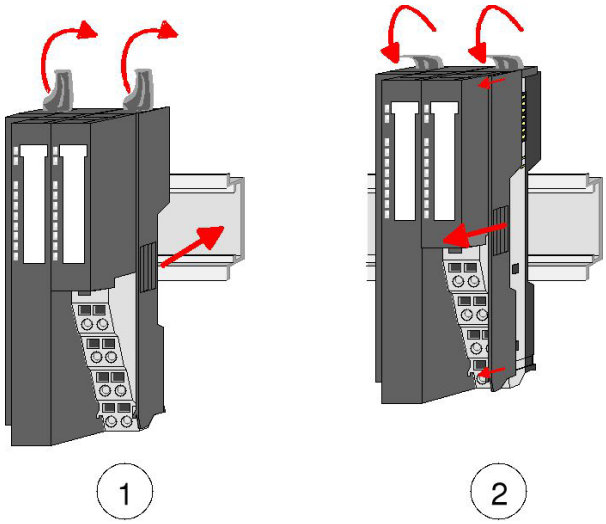


Fig. 5-6: Installing the bus node

5.5 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 5.7 "Installing the bus cover").

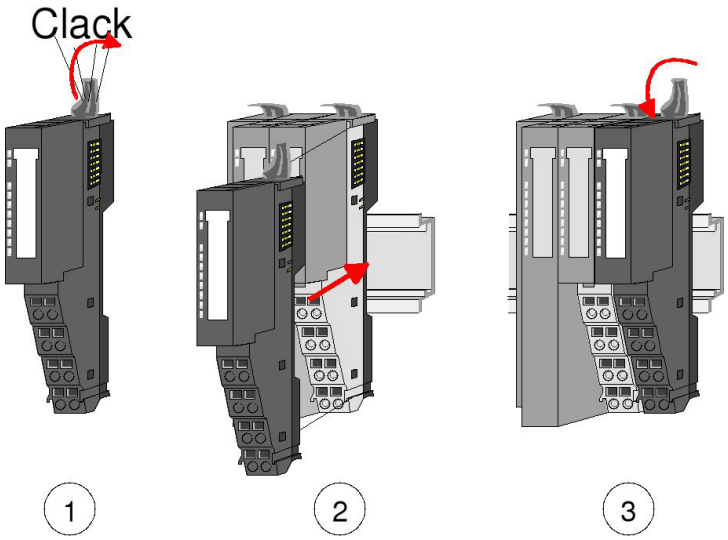
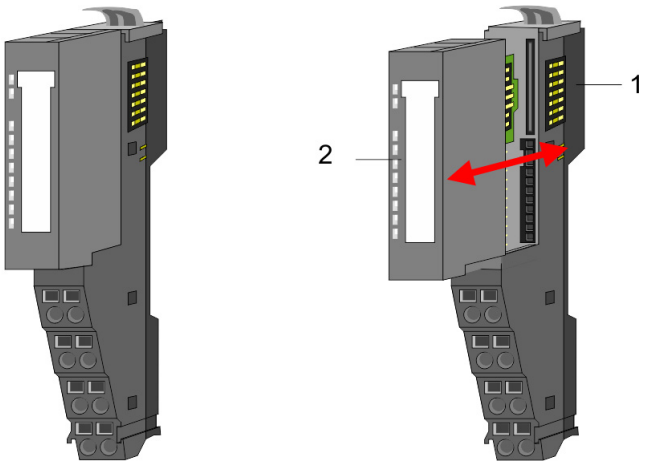


Fig. 5-7: Installing the expansion module

5.6 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.

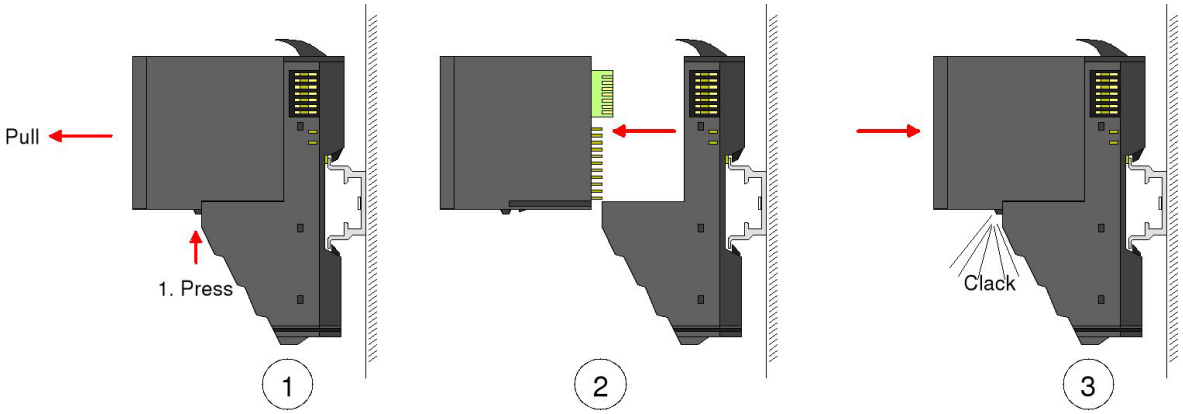


Fig. 5-8: Disassembling and installing the electronic module

5.7 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.

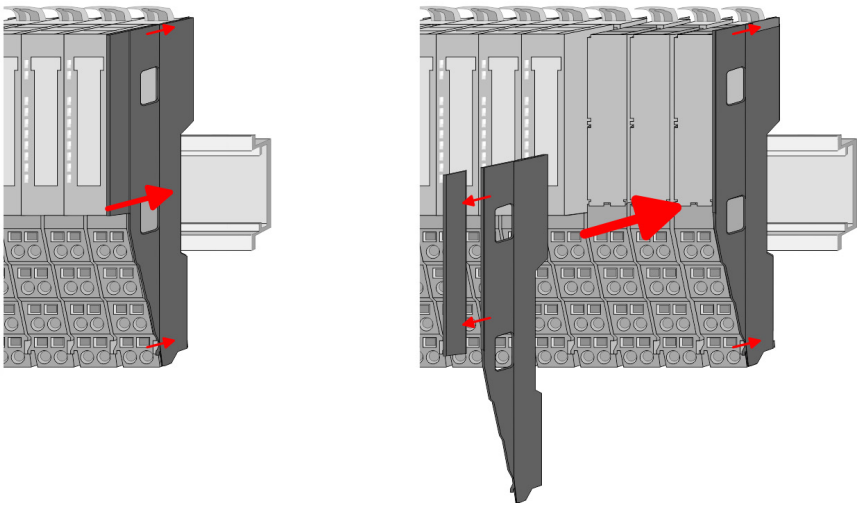
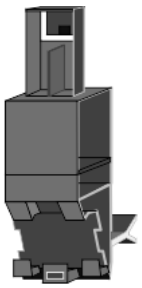


Fig. 5-9: Installing the bus cover

5.8 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.

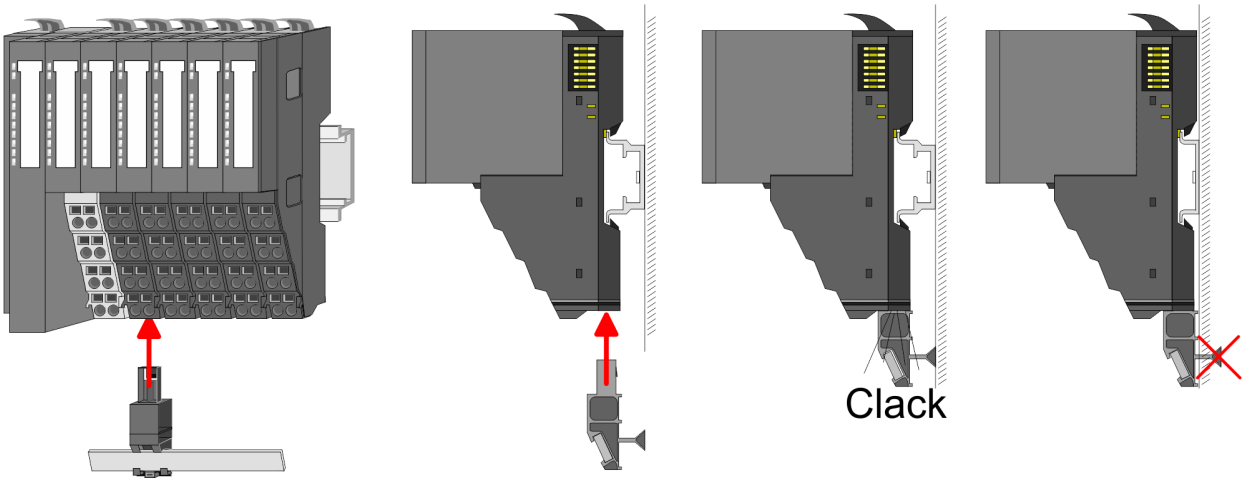


Fig. 5-10: Installing the carriers for shield busses

6 Disassembling and replacing modules

6.1 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, sthe 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.

6.2 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 7 "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.

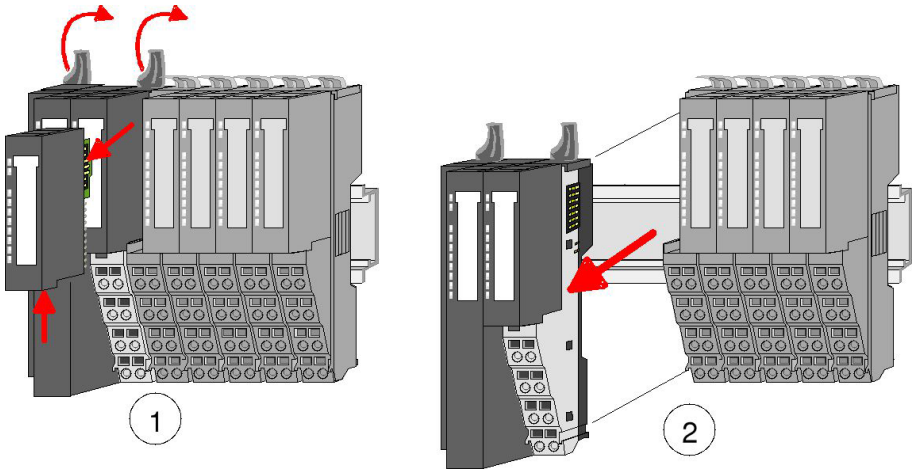


Fig. 6-1: Disassembling the bus node

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.

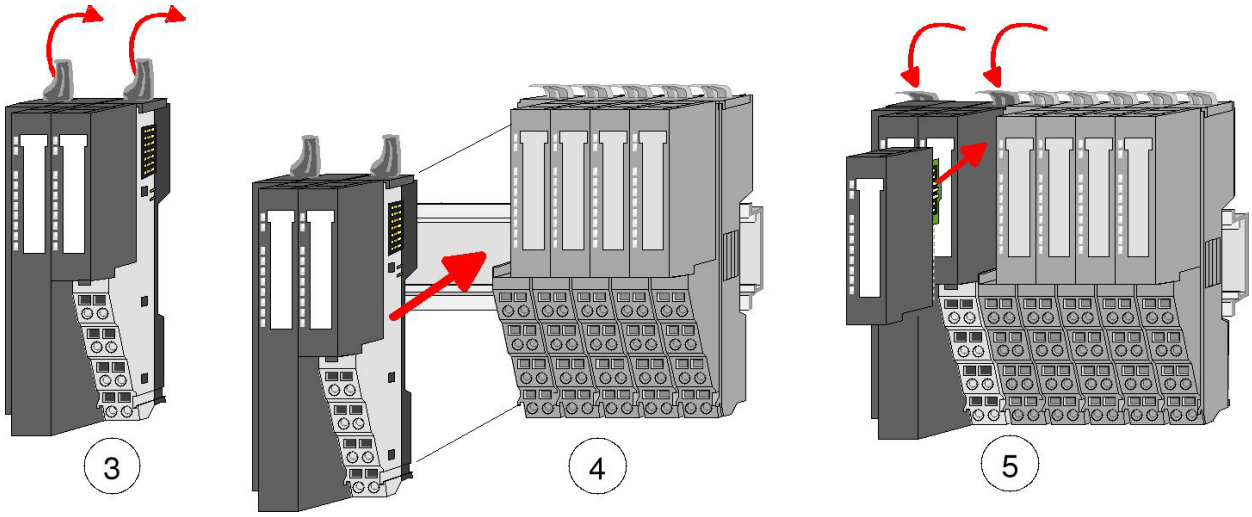


Fig. 6-2: Installing the new bus node

6.3 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 7 "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.

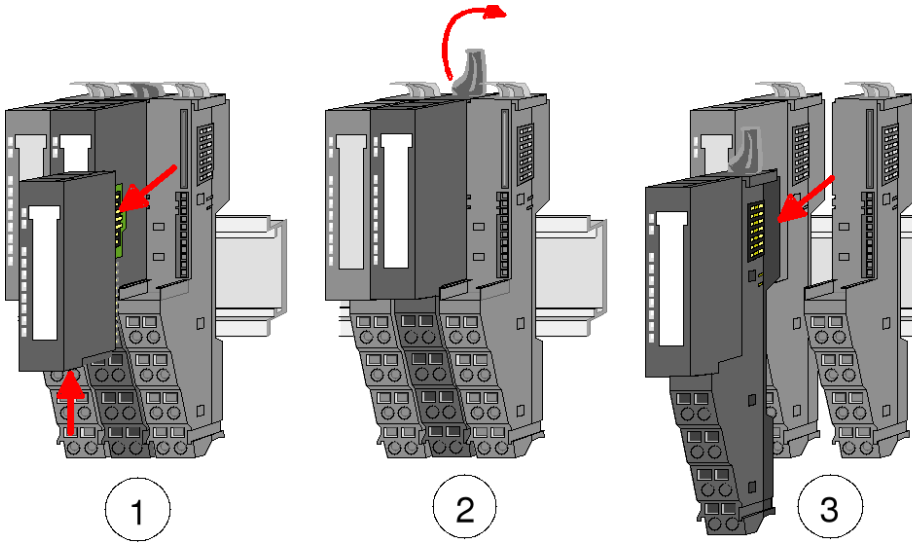


Fig. 6-3: Disassembling a module

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.

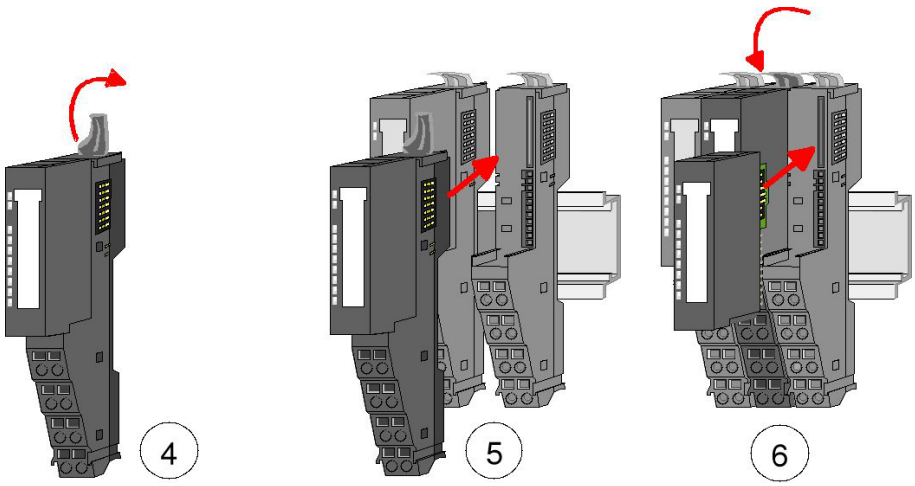


Fig. 6-4: Installing the new module

6.4 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.

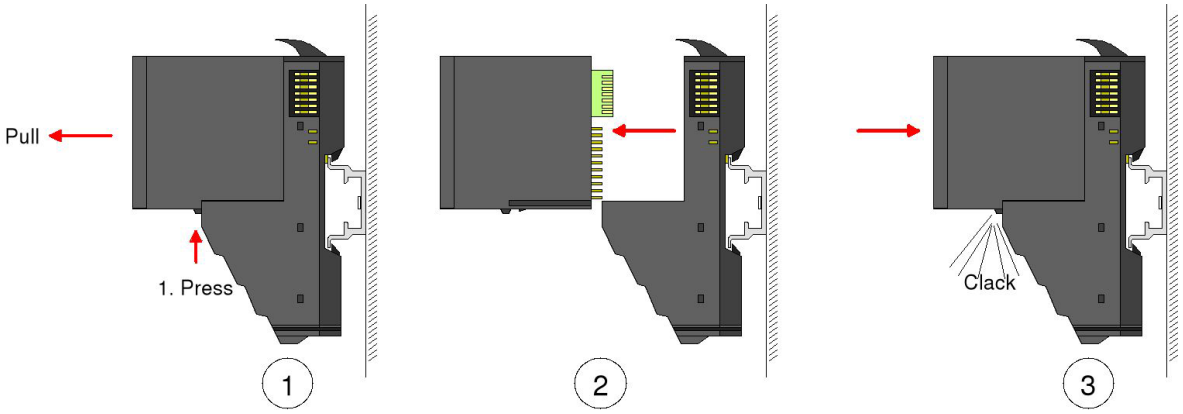


Fig. 6-5: Disassembling and installing the electronic module

6.5 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 7 "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.

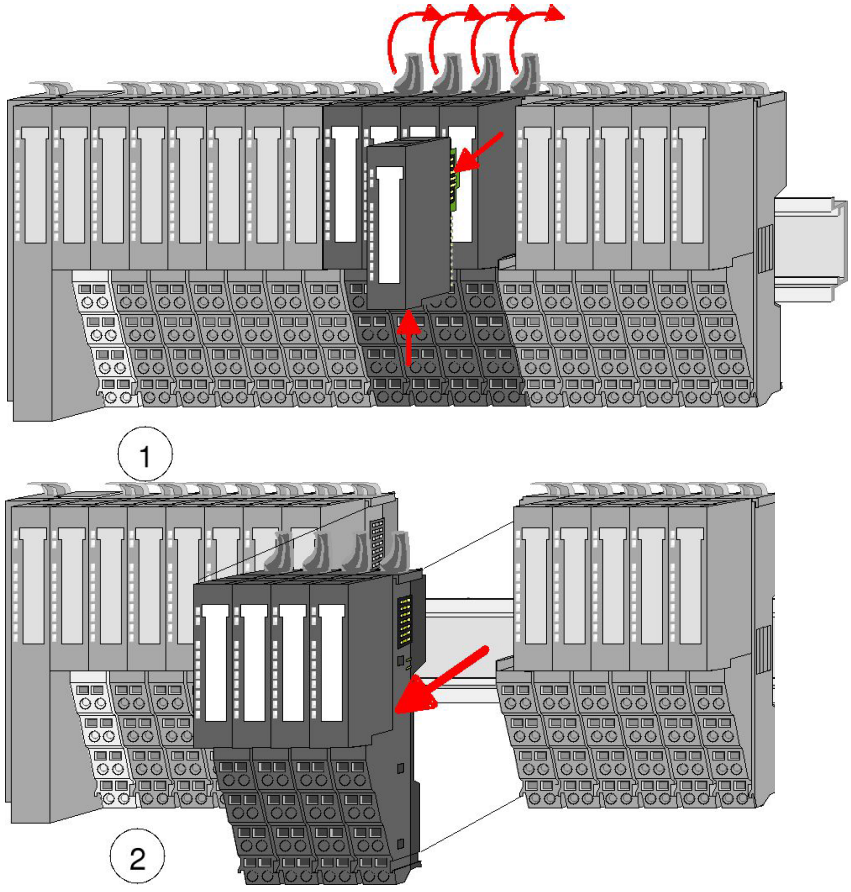


Fig. 6-6: Disassembling the module group

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.

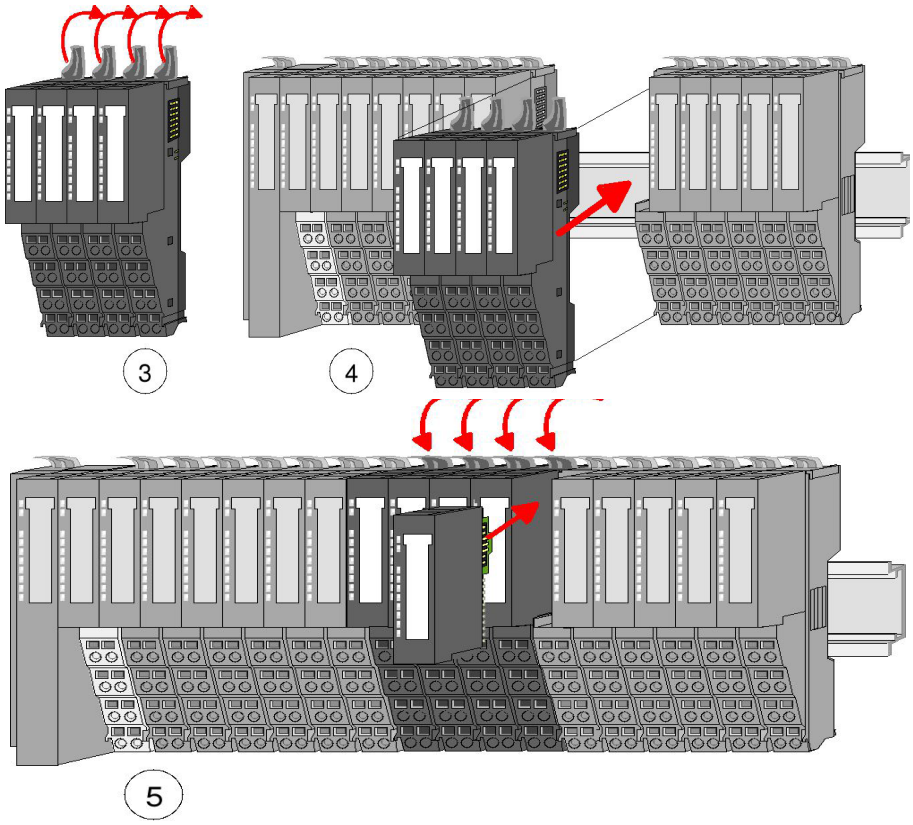


Fig. 6-7: Mounting of the module group

7 Installation

7.1 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!

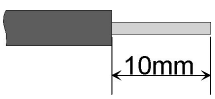
NOTE

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).

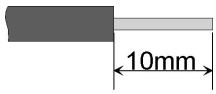
7.2 Spring terminals

Cable data expansion modules

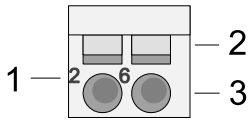


$U_{max.}$: 240 V ~ / 30 V ⎓
$I_{max.}$: 10 A
Cross-section: 0.08 – 1.5 mm^2 (AWG 28 – 16)
Stripping length: 10 mm

Cable data power module



$U_{max.}$: 30 V ⎓
$I_{max.}$: 10 A
Cross-section: 0.08 – 1.5 mm² (AWG 28 – 16)
Stripping length: 10 mm

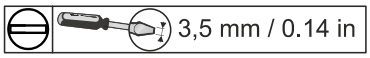


1 Pin no. on the plug connector
2 Unlocking device for screwdriver
3 Connection opening for wire

7.2.1 Procedure

Wiring

Tools: suitable screwdriver



Wire cross section: 0.08 mm² ...1.5 mm² (AWG 28 ... 16)

1 | Insert the screwdriver slightly inclined in the rectangular opening (see Fig. 7-3: "Wiring" 1).

2 | Press and hold the screwdriver away from the round opening. The contact spring is open (see Fig. 7-3: "Wiring" 2).

3 | Put the stripped wire in the round opening (see Fig. 7-3: "Wiring" 2).

4 | Remove the screwdriver (see Fig. 7-3: "Wiring" 3).

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

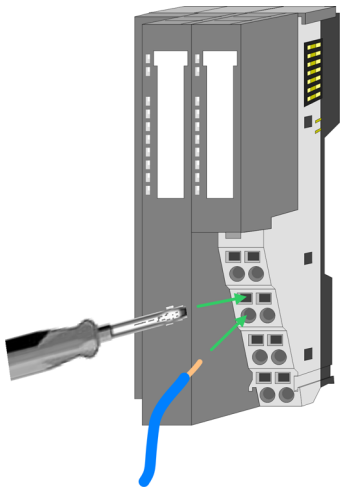


Fig. 7-1: Spring-clamp technology (bus nodes and power modules)

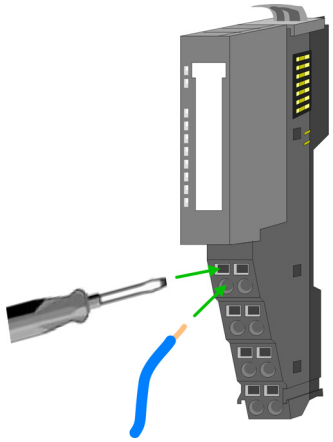


Fig. 7-2: Spring-clamp technology (expansion modules)

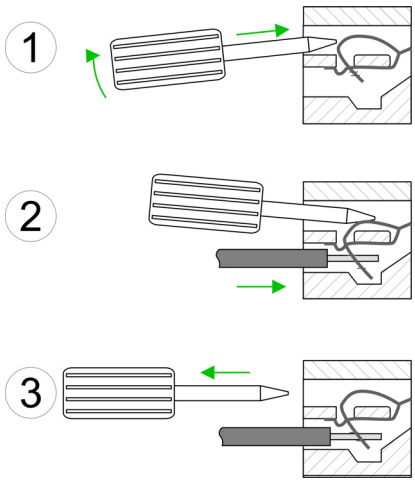


Fig. 7-3: Wiring

7.3 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 resistent to vibrations.

The installation procedure with spring terminals is described in 7.2 "Spring terminals".

Standard wiring

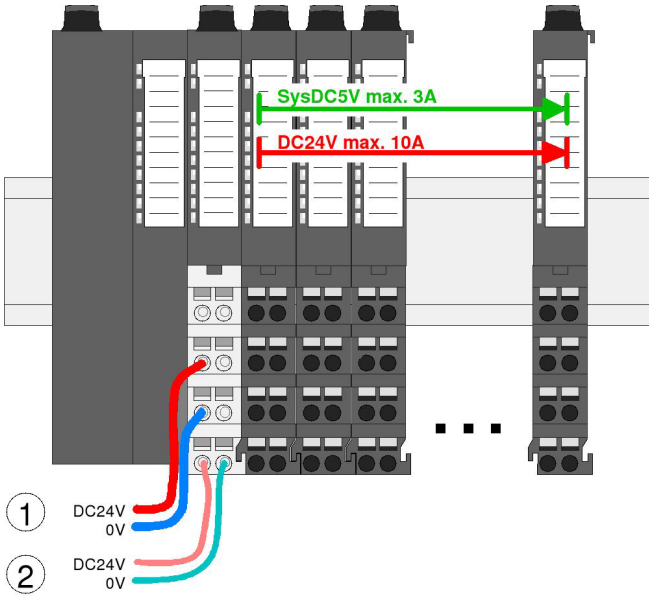


Fig. 7-4: Standard wiring

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

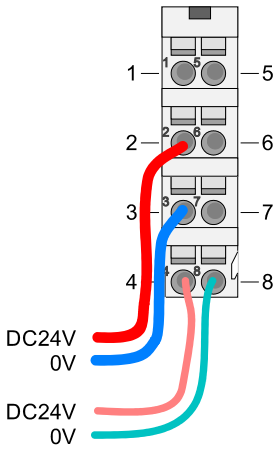


Fig. 7-5: Standard wiring

For wires with a cross-section of 0.08 mm^2 to 1.5 mm^2.

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

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

7.4 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 7.2 "Spring terminals".

Standard wiring

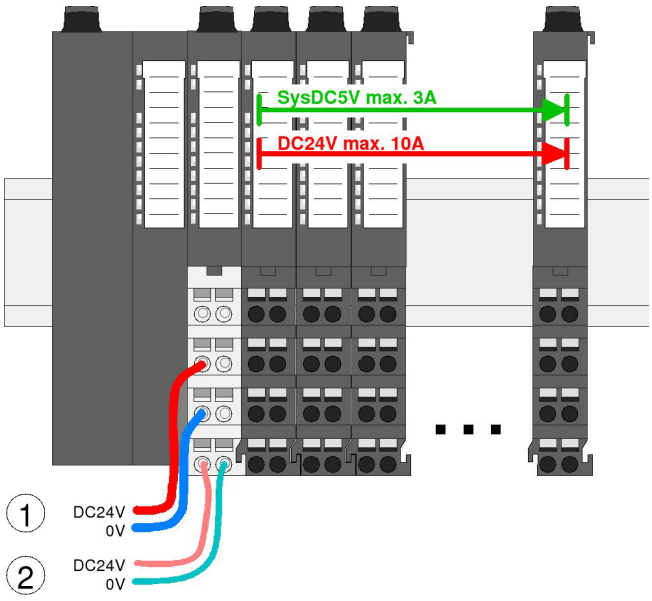


Fig. 7-6: Standard wiring

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

7.5 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 7.2 "Spring terminals".

Standard wiring

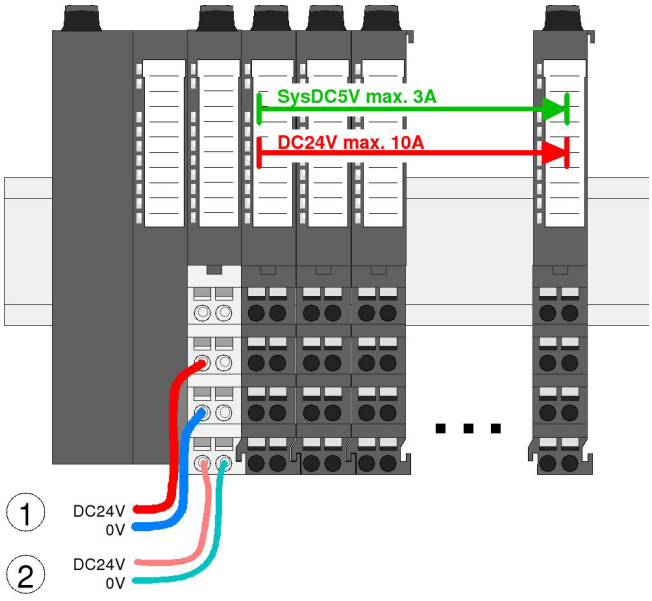


Fig. 7-7: Standard wiring

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

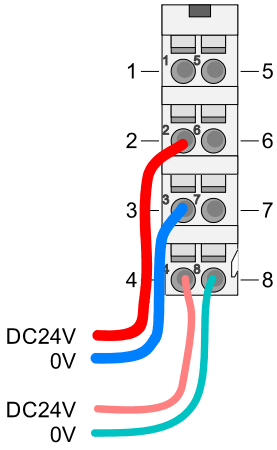


Fig. 7-8: Standard wiring

For wires with a cross-section of 0.08 mm^2 to 1.5 mm^2.

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

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

7.6 Fixing the shield

Shield bus carrier

Shield bus carriers are required for installing a shield (see section 11.1 "Accessories"). The shield bus carrier supports the shield bus for connecting cable shields.

Fixing the shield

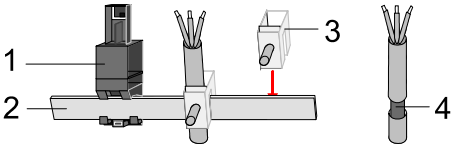


Fig. 7-9: Shield

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.

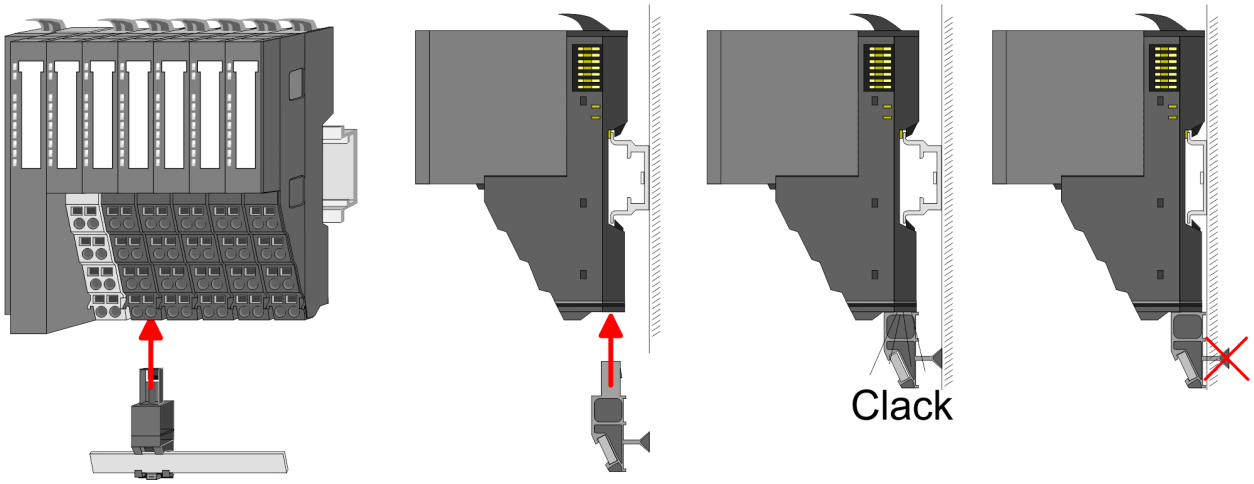


Fig. 7-10: Fixing the shield

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.

7.7 Fuse protection

7.7.1 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

7.7.2 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

7.7.3 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.

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. 7-1: MICO load circuit monitoring, 4 channels

7.8 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.

7.8.1 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

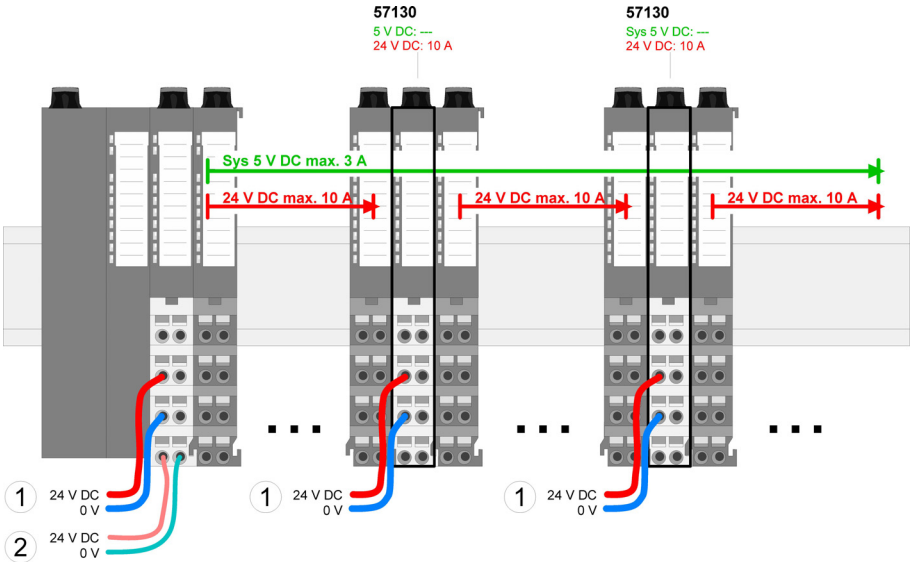


Fig. 7-11: Power module Art.-No. 57130

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

7.8.2 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 backplane bus.
- ➔ Afterwards, you have to plug in another power module.

Power module art. no. 57131

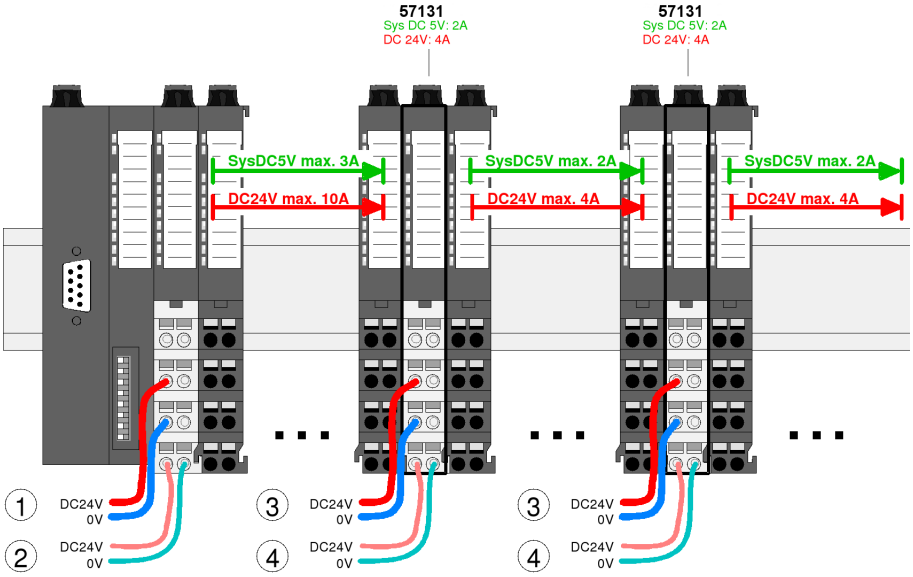


Fig. 7-12: Power module art. no. 57131

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

8 Troubleshooting

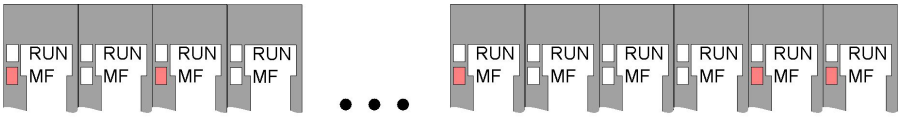
General

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)

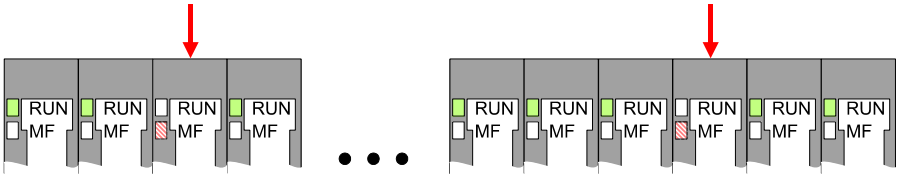
Tab. 8-1: State indications of the LEDs

Total current of electronics supply exceeded



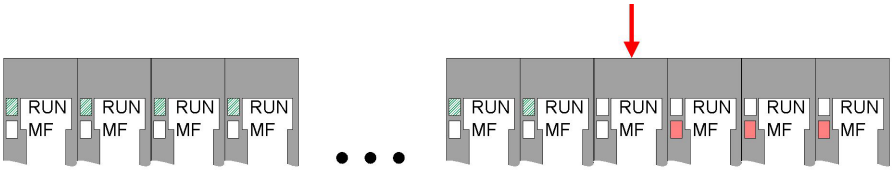
Behavior of the LEDs after switching on:	The **RUN LED** is off on all modules. The **MF LED** is only lit on some modules.
Cause:	The total current for electronics supply exceeds the maximum current.
Remedy:	Plug in the power module, Art-No. 57131 (see section 7 Installation, Seite 40).

Configuration error



Behavior of the LEDs after switching on:	The **RUN LED** is off on one or several modules. The **MF LED** is flashing on these modules.
Cause:	The module whose **MF LED** 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 **RUN LEDs** are flashing up to the module to the left of the defective module. On the following modules, the **RUN LED** is off. The **MF LEDs** are off up to the module to the left of the defective module. On the following modules, the **MF LED** is lit.
Cause:	The module to the right of the flashing modules is defective.
Remedy:	Replace the defective module.

9 Digital inputs

9.1 Art.-No. 57220, DI 2x 24 V DC

9.1.1 Features

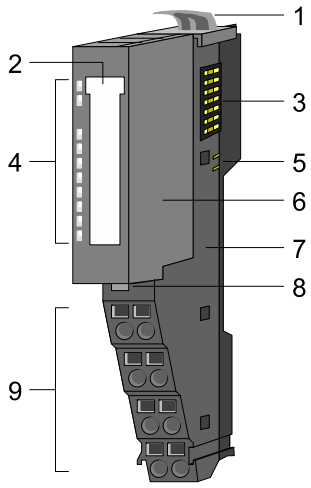
Description

The electronic module records the binary control signals from the process level and transmits them electrically isolated to the superordinate bus system. It has 2 channels which indicate their status by means of LEDs.

Properties

- 2 digital inputs electrically isolated from the backplane bus.
- Suitable for switches and proximity switches
- Status indication of the channels by means of LEDs, also with deactivated electronics power supply

9.1.2 Structure

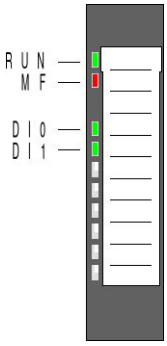


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital input module	57220	Digital input module incl. base DI 2xDC 24V

Status indication



RUN
- Off
- On

MF
- Off
- On
- Flashing with 2 Hz

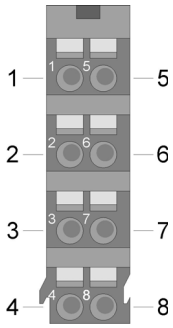
DI x
- Off
- On

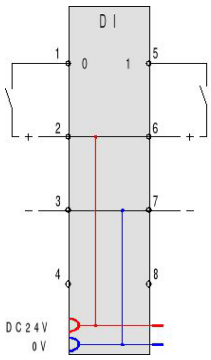
RUN	MF	DI x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error
		X	Bus communication is not possible Module status reports error
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital input has 1 signal
			Digital input has 0 signal
X: not relevant			

Tab. 9-1: Status indications of the LEDs

Terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2.





Pos.	Function	Type	Description
1	DI 0	Input	Digital input DI 0
2	24 V DC	Output	24 V DC for transmitter
3	0 V	Output	GND
4	---	---	not used
5	DI 1	Input	Digital input DI 1
6	24 V DC	Output	24 V DC for transmitter
7	0 V	Output	GND
8	---	---	not used

Tab. 9-2: Terminal assignment

9.1.3 Input/output range

Input range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX = subindex for access via EtherCAT with index 0x6000 + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PII	1	Status of the inputs	0x5000	
			Bit 0: DI 0		0x01
			Bit 1: DI 1		0x02
			Bit 7 ... 2: reserved		

Tab. 9-3: Input range

Output range

No bytes reserved for the module in the output range.

9.1.4 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	65 mA
	Power dissipation	0.5 W

Digital inputs		
	Number of inputs	2
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal value	20.4...28.8 V ⎓
	Input voltage for signal "0"	0...5 V ⎓
	Input voltage for signal "1"	15 ... 28.8 V ⎓
	Signal logic input	P reading
	Input current for signal "1"	3 mA
	Connection of 2-wire proximity switch possible	yes
	Max. permitted proximity switch quiescent current	0.5 mA
	Input delay of "0" after "1"	3 ms
	Input delay of "1" after "0"	3 ms
	Number of inputs in horizontal installation that can be used simultaneously	2
	Number of inputs in vertical installation that can be used simultaneously	2
	Input characteristic curve	IEC 61131-2, type 1
	Input data size	2 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓
Data sizes		
	Input bytes	1
	Output bytes	0
	Parameter bytes	0
	Diagnostic bytes	0
Mechanical data	**Housing**	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	57 g
	Weight incl. accessories	57 g
	Gross weight	72 g

9.2 Art. no. 57221, DI 2x 24 V DC 2 µs ... 4 ms

9.2.1 Features

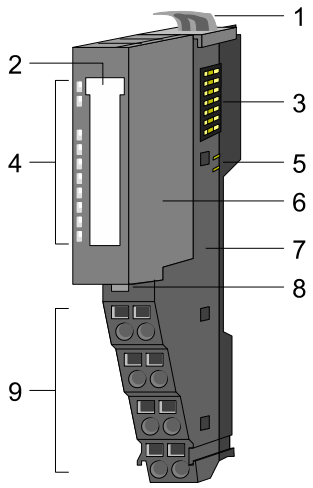
Description

The electronic module records the binary control signals from the process level and transmits them electrically isolated to the superordinate bus system. It has 2 quick digital input channels which indicate their status by means of LEDs.

Properties

- 2 digital inputs, electrically isolated from the backplane bus
- Suitable for switches and proximity switches
- Status indication of the channels by means of LEDs, also with deactivated electronics power supply
- Input filters with adjustable parameters
- Alarm and diagnostic function

9.2.2 Structure

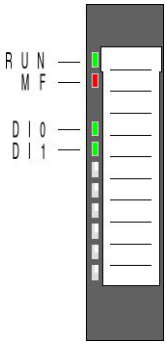


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital input module	57221	Digital input module incl. base DI 2xDC 24V 2µs...4ms

Status indication



RUN
- Off
- On

MF
- Off
- On
- Flashing with 2 Hz

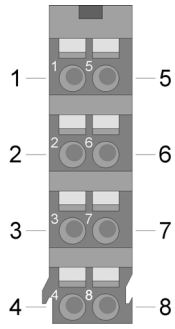
DI x
- Off
- On

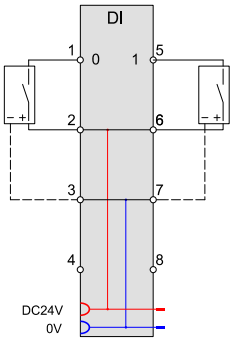
RUN	MF	DI x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error
		X	Bus communication is not possible Module status reports error
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital input has 1 signal
			Digital input has 0 signal
X: not relevant			

Tab. 9-4: Status indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2in the TIA Portal.





Pos.	Function	Type	Description
1	DI 0	Input	Digital input DI 0
2	24 V DC	Output	24 V DC for encoder
3	0 V	Output	GND
4	---	---	not used
5	DI 1	Input	Digital input DI 1
6	24 V DC	Output	24 V DC for encoder
7	0 V	Output	GND
8	---	---	not used

Tab. 9-5: Assignment of connecting terminals

9.2.3 Input/output range

Input range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX = subindex for access via EtherCAT with index 0x6000 + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PII	1	Status of the inputs	0x5000	
			Bit 0: DI 0		0x01
			Bit 1: DI 1		0x02
			Bit 7 ... 2: reserved		

Tab. 9-6: Input range

Output range

No bytes reserved for the module in the output range.

9.2.4 Parameterization data

Parameter

DS	Data record for access using PROFIBUS and PROFINET
IX	Index for access using CANopen
SX	Subindex for access via EtherCAT with index 0x3100 + EtherCAT port

NOTE
For further information, please refer to the manual of your bus node.

Name	Bytes	Function	Default	DS	IX	SX
DIAG_EN	1	Diagnostic interrupt*	0x00	0x00	0x3100	0x01
CH0D	1	Input delay DI 0	0x02	0x01	0x3101	0x02
CH1D	1	Input delay DI 1	0x02	0x01	0x3102	0x03
INTRE	1	Process interrupt after edge 0-1 at DI x	0x00	0x80	0x3103	0x04
INTFE	1	Process interrupt after edge 1-0 at DI x	0x00	0x80	0x3104	0x05
*) You may only transfer this data record in STOP mode.						

Tab. 9-7: Parameters

DIAG_EN
Diagnostic interrupt

Byte	Bit 7 ... 0	Description	
0	7 ... 0	Diagnostic interrupt	
		0x00	disable
		0x40	enabled

Tab. 9-8: Diagnostic interrupt

➔ Enable or disable the diagnostic function here.

CHxD
Input delay

Byte	Function	Possible values	
0	Input delay DI x	0x00: 1 µs	0x07: 86 µs
		0x02: 3 µs	0x09: 342 µs
		0x04: 10 µs	0x0C: 2731 µs
		Other values are not permitted!	

➔ Specification of the input delay can be used here to define a filter for the corresponding channel.

A filter can used, for example, to filter the signal peaks in case of unclear input signal.

INTRE
Interrupt edge 0-1

Byte	Bit 7 ... 0	Description	
0	Bit 0	Process interrupt after edge 0-1 at DI 0	
	Bit 1	Process interrupt after edge 0-1 at DI 1	
		0	disable
		1	enabled
	Bit 7 ... 2	reserved	

INTFE
Interrupt edge 0-1

Byte	Bit 7 ... 0	Description	
0	Bit 0	Process interrupt after edge 1-0 at DI 0	
	Bit 1	Process interrupt after edge 1-0 at DI 1	
		0	disable
		1	enabled
	Bit 7 ... 2	reserved	

9.2.5 Diagnosis and interrupt

Diagnosis and interrupt

Trigger	Process interrupt	Diagnostic interrupt	can be parameterized
Edge 0-1 DI x	x	-	x
Edge 1-0 DI x	x	-	x
Diagnosis buffer overflow	-	x	-
Process interrupt lost	-	x	-

Process interrupt data

Enable process interrupts in order to respond to asynchronous events. A process interrupt stops the linear program sequence and branches depending on the master system into a certain interrupt routine. Here you can respond to the process interrupt.

CANopen transmits the process interrupt data in an Emergency telegram.

If PROFIBUS and PROFINET are used for access, they transmit this process interrupt data in a diagnostic telegram.

SX = Subindex for access via EtherCAT with index 0x5000.

NOTE

For further information, please refer to the manual of your bus node.

Name	Bytes	Function	Default	SX
PRIT_A	1	Process interrupt data	0x00	0x02
PRIT_B	1	Status of the inputs	0x00	0x03
PRIT_US	2	µs ticker	0x00	0x04 (high byte) 0x05 (low byte)

Tab. 9-9: Process interrupts

PRIT_A
Process interrupt data

Byte	Bit 7 ... 0	Description
0	Bit 0	Edge at the digital input DI 0
	Bit 1	Edge at the digital input DI 1
	Bit 7 ... 2	reserved

PRIT_B
Status of the inputs

Byte	Bit 7 ... 0	Description
0	Status of the inputs at the moment of process interrupt	
	Bit 0	Status of the input DI 0
	Bit 1	Status of the input DI 1
	Bit 7 ... 2	reserved

PRIT_US
µs ticker

Byte	Bit 7 ... 0	Description
0 ... 1		Value of the µs ticker at the moment of the process interrupt

Tab. 9-10: µs ticker

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.

PRIT_US represents the lower 2 Bytes of the µs-ticker value (0 ... 2^{16}-1).

9.2.5.1 Diagnostics

Diagnostic data

Using Parameterization activate a diagnostic interrupt for the module.

Function

- Once a diagnostic interrupt has been triggered, the module provides$_{incoming}$ diagnostic data for diagnostics.
- As soon as the reasons for the triggering a diagnostic interrupt are no longer present, you will automatically receive an$_{outgoing\ diagnostic\ interrupt.}$
- If an$_{incoming}$ diagnostic interrupt has been triggered for a channel due to process interrupt lost, all events up to a certain$_{outgoing}$ diagnostic interrupt will be lost.
- During this period (1st diagnostic interrupt$_{incoming}$ until the last diagnostic interrupt$_{outgoing}$) the MF LED of the module is lit.

Diagnostics

DS	Data record for access using PROFIBUS and PROFINET Access using DS 0x01. Besides, you can access the first 4 bytes using DS 0x00.
IX	Index for access using CANopen. Access using IX 0x2F01. Besides, you can access the first 4 bytes using IX 0x2F00.
SX	Subindex for access via EtherCAT with index 0x5005.

NOTE

For further information, please refer to the manual of your bus node.

Name	Bytes	Function	Default	DS	IX	SX
ERR_A	1	Diagnostic	0x00	0x01	0x2F01	0x02
MODTYP	1	Module information	0x1F			0x03
ERR_C	1	reserved	0x00			0x04
ERR_D	1	Diagnostic	0x00			0x05
CHTYP	1	Channel type	0x70			0x06
NUMBIT	1	No. of diagnostic bits per channel	0x00			0x07
NUMCH	1	Number of channels of the module	0x02			0x08
CHERR	1	Channel error	0x00			0x09
CH0ERR ... CH7ERR	8	reserved	0x00			0x0A ... 0x11
DIAG_US	4	µs ticker	0x00			0x13

ERR_A
Diagnosis

Byte	Bit 7 ... 0	Description
0	Bit 0	set in case of ***Assembly fault***
	Bit 1	reserved
	Bit 2	set in case of ***External error***
	Bit 3	set in case of ***Channel error available***
	Bit 7 ... 5	reserved

MODTYP
Module information

Byte	Bit 7 ... 0	Description	
0	Bit 3 ... 0	Module class	
		1111b	Digital module
	Bit 4	set in case of ***Channel information available***	
	Bit 7 ... 5	reserved	

ERR_C
reserved

Byte	Bit 7 ... 0	Description
0		reserved

Tab. 9-11: ERR_C

ERR_D
Diagnosis

Byte	Bit 7 ... 0	Description
0	2 ... 0	reserved
	3	set in case of ***Internal diagnosis buffer overflow***
	5 ... 4	reserved
	6	Process interrupt lost
	7	reserved

Tab. 9-12: Diagnosis

CHTYP
Channel type

Byte	Bit 7 ... 0	Description
0	Bit 6 ... 0	Channel type
		0x70 Digital input
	Bit 7	reserved

NUMBIT
Diagnostic bits

Byte	Bit 7 ... 0	Description
0		Number of diagnostic bits of the module per channel (here 0x00)

NUMCH
Channels

Byte	Bit 7 ... 0	Description
0		Number of channels of a module (here 0x02)

CHERR
Channel error

Byte	Bit 7 ... 0	Description
0	Bit 0	Edge lost at **DI 0**
	Bit 1	Edge lost at **DI 1**
	Bit 7 ... 2	reserved

CHxERR
reserved

Byte	Bit 7 ... 0	Description
0		reserved

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.

9.2.6 Technical Data

Current consumption / power dissipation		
	Current consumption from the backplane bus	100 mA
	Power dissipation	0.9 W
Digital inputs		
	Number of inputs	2
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	20.4...28.8 V ⎓
	Current consumption from load voltage L+ (without load)	12 mA
	Nominal value	20.4...28.8 V ⎓
	Input voltage for signal "0"	0...5 V ⎓
	Input voltage for signal "1"	15 ... 28.8 V ⎓
	Signal logic input	P reading
	Input capacitance	-
	Input current for signal "1"	3 mA
	Connection of 2-wire proximity switch possible	yes
	max. permitted proximity switch quiescent current	0.5 mA
	Input delay of "0" after "1"	Configurable 2 µs ... 3 ms
	Input delay of "1" after "0"	Configurable 2 µs ... 3 ms
	Number of inputs in horizontal installation that can be used simultaneously	2
	Number of inputs in vertical installation that can be used simultaneously	2
	Input characteristic curve	IEC 61131-2, type 1
	Input data size	2 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	Yes, configurable
	Process interrupt	Yes, configurable
	Diagnostic interrupt	Yes, configurable
	Diagnostic function	Yes
	Diagnostic information can be read out	possible
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓
Data sizes		
	Input bytes	1
	Output bytes	0
	Parameter bytes	9
	Diagnosis bytes	20

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	58 g
	Weight incl. accessories	58 g
	Gross weight	73 g

9.3 Art. no. 57222, DI 2x 24 V DC NPN

9.3.1 Features

Description

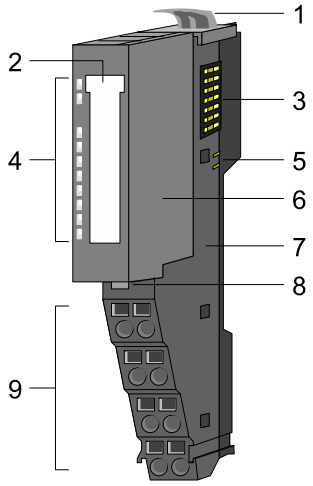
The electronic module records the binary control signals from the process level and transmits them electrically isolated to the superior bus system. It has 2 channels that indicate their state by means of LEDs.

An input becomes active as soon as it is connected to ground.

Properties

- 2 digital inputs (M reading), electrically isolated from the backplane bus
- Suitable for switches and proximity switches
- Status indication of the channels by means of LEDs, also with deactivated electronics power supply

9.3.2 Structure

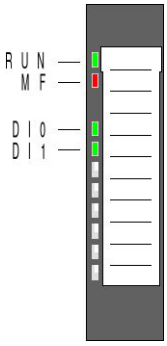


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital input module	57222	Digital input module incl. base DI 2xDC 24V NPN

Status indication



RUN: Off / On

MF: Off / On / Flashing with 2 Hz

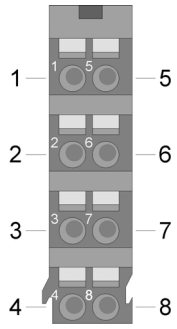
DI x: Off / On

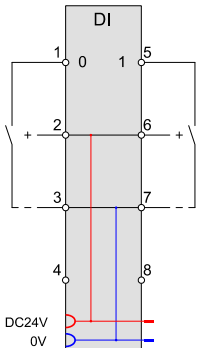
RUN	MF	DI x	Description
■	□	X	Bus communication is OK Module status is OK
■	■	X	Bus communication is OK Module status reports error
□	■	X	Bus communication is not possible Module status reports error
□	□	X	Error of bus supply voltage
X	▨	X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
■	□	■	Digital input has 1 signal
■	□	□	Digital input has 0 signal
X: not relevant			

Tab. 9-13: Status indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2.





Pos.	Function	Type	Description
1	DI 0	Input	Digital input DI 0
2	24 V DC	Output	24 V DC for encoder
3	0 V	Output	GND
4	---	---	not used
5	DI 1	Input	Digital input DI 1
6	24 V DC	Output	24 V DC for encoder
7	0 V	Output	GND
8	---	---	not used

Tab. 9-14: Assignment of connecting terminals

9.3.3 Input/output range

Input range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX = subindex for access via EtherCAT with index 0x6000 + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PII	1	Status of the inputs	0x5000	
			Bit 0: DI 0		0x01
			Bit 1: DI 1		0x02
			Bit 7 ... 2: reserved		

Tab. 9-15: Input range

Output range

No bytes reserved for the module in the output range.

9.3.4 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	65 mA
	Power dissipation	0.5 W

Digital inputs		
	Number of inputs	2
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal value	20.4 ... 28.8 V ⎓
	Input voltage for signal "0"	15 ... 28.8 V ⎓
	Input voltage for signal "1"	0...5 V ⎓
	Signal logic input	M reading
	Input current for signal "1"	3 mA
	Connection of 2-wire proximity switch possible	Yes
	max. permitted proximity switch quiescent current	0.5 mA
	Input delay of "0" after "1"	3 ms
	Input delay of "1" after "0"	3 ms
	Number of inputs in horizontal installation that can be used simultaneously	2
	Number of inputs in vertical installation that can be used simultaneously	2
	Input data size	2 bits

Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None

Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓

Data sizes		
	Input bytes	1
	Output bytes	0
	Parameter bytes	0
	Diagnostic bytes	0

Mechanical data	**Housing**	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	57 g
	Weight incl. accessories	57 g
	Gross weight	72 g

9.4 Art. no. 57223, DI 2x 24 V DC Time Stamp ETS

9.4.1 Features

Description

The electronic module records the binary control signals from the process level and transmits them galvanically isolated to the superior bus system. It has 2 channels which indicate their state by means of LEDs.

If the ETS (ETS = **e**dge **t**ime **s**tamp) function is set, the current time value of the µs ticker is stored together with the input states in the process image when there is a matching (rising/falling) edge. Depending on the planning, 5 (20 bytes) or 15 (60 bytes) ETS entries can be recorded one after the other in the process image.

Properties

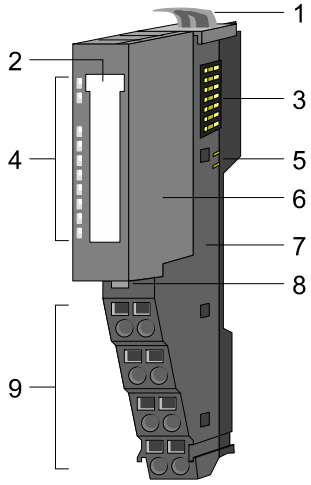
- 2 digital inputs electrically isolated from the backplane bus
- Configurable ETS function for 5 or 15 ETS entries (4 bytes each)
- Diagnostic function
- Suitable for switches and proximity switches
- Status indication of the channels by means of LEDs, also with deactivated electronics power supply

NOTE

➔ Operation of ETS modules only makes sense on bus nodes that have an integrated µs ticker!

➔ The Ethernet bus node with Modbus TCP, for example, is not provided with a µs ticker.

9.4.2 Structure

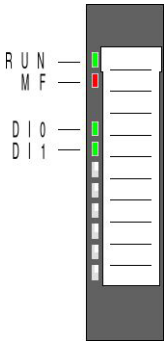


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital input module	57223	Digital input module incl. base DI 2xDC 24V ETS

Status indication



RUN: Off / On

MF: Off / On / Flashing with 2 Hz

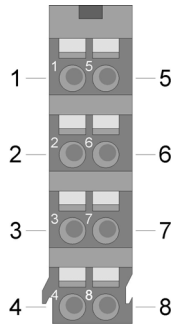
DI x: Off / On

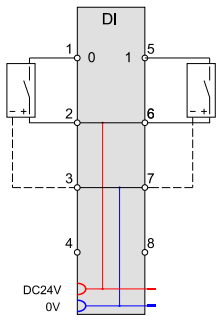
RUN	MF	DI x	Description
■	□	X	Bus communication is OK Module status is OK
■	■	X	Bus communication is OK Module status reports error
□	■	X	Bus communication is not possible Module status reports error
□	□	X	Error of bus supply voltage
X	▨	X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
■	□	■	Digital input has 1 signal
■	□	□	Digital input has 0 signal
X: not relevant			

Tab. 9-16: Status indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2.





Pos.	Function	Type	Description
1	DI 0	Input	Digital input DI 0
2	24 V DC	Output	24 V DC for encoder
3	0 V	Output	GND
4	---	---	not used
5	DI 1	Input	Digital input DI 1
6	24 V DC	Output	24 V DC for encoder
7	0 V	Output	GND
8	---	---	not used

Tab. 9-17: Assignment of connecting terminals

9.4.3 Input/output range

Input/output range

If the ETS (ETS=**e**dge **t**ime **s**tamp) function is set, the current time value of the Cube20S µs ticker is stored together with the input states and a consecutive number as ETS entry in the process image when there is a matching edge.

You can plan the following variants:

- **Cube20S DI2 ETS (20): 20 bytes occupied in process image of the inputs for 5 ETS entries**
- **Cube20S DI2 ETS (60): 60 bytes occupied in process image of the inputs for 15 ETS entries**

Input range 20 bytes or 60 bytes

Depending on the planned variant, 5 or 15 ETS entries can be written using the output range. Each ETS entry uses 4 bytes of the input range.

Input range

The input range is used for the status message. In PROFIBUS and PROFINET, the input range is displayed in the corresponding address range.

IX	Index for access using CANopen. Use s = subindex to address the corresponding ETS entry.
SX	SX = Subindex for access via EtherCAT. Subindex for access via EtherCAT with index 0x6000 + EtherCAT port.

Information on access to the Cube20S is given in the manual of the corresponding bus node.

Output range

No bytes reserved for the module in the output range.

9.4.3.1 ETS entries

Structure of an ETS entry

Addr.	Name	Bytes	Function	IX	SX
+0	PII	1	Status of the inputs	0x5430/s	0x01
+1	RN	1	Consecutive number		0x02
+2	ETS_US	2	µs ticker		0x03

PII

The input states after change of edge are saved here. The input byte has the following bit assignment:

Bit 0: DI 0

Bit 1: DI 1

Bit 2 ... 7: 0 (fixed)

RN

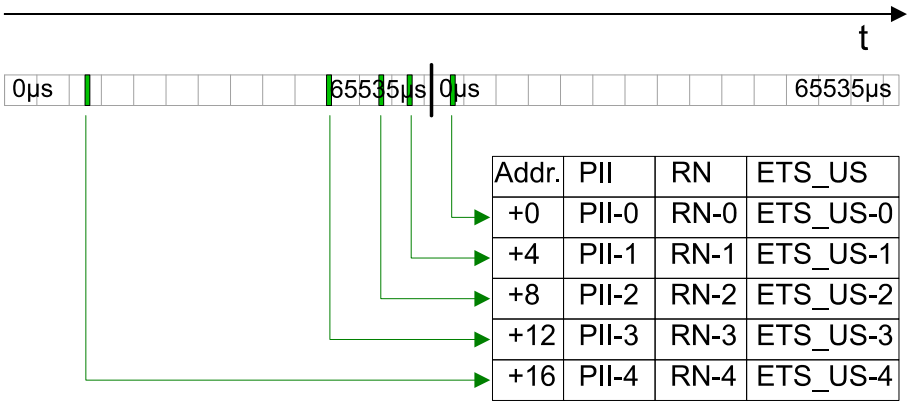
The RN (**R**unning **N**umber) is a consecutive number from 0 ... 127, which starts with 1. The RN describes the chronological order of the edges.

ETS_US

- The Cube20S module has a 32-bit timer (µs ticker), which is started using PowerON and starts again after 2^{32}-1 µs with 0.
- ETS_US always contains the low word of the µs ticker **(0 ... 65535 µs)**.

ETS functionality

- When there is a matching edge, the time value of the ETS_US timer is stored together with the states of the inputs PII and a consecutive number RN as RTS entry in the process image.
- In the following, you can see how the ETS entries are stored chronologically in the input range.



Input range

The input range is used for the status message. In PROFIBUS and PROFINET, the input range is displayed in the corresponding address range.

IX Index for access using CANopen.
Use s = subindex to address the corresponding ETS entry.

SX SX = Subindex for access via EtherCAT.
Subindex for access via EtherCAT with index 0x6000 + EtherCAT port.

Information on access to the Cube20S is given in the manual of the corresponding bus node.

Engineering as Art.-No. 57223

5 ETS entries

Art.-No 57223					DI 2 x 24 V DC (20) 20 bytes 5 ETS entries							
Addr.	PII	IX= 0x5430	SX		Addr.	RN	IX= 0x5430	SX		Addr.	ETS-US	IX= 0x5430	SX
+0	PII-0	s=1	0x01		+1	RN-0	s=1	0x02		+2	ETS_US-0	s=1	0x03
+4	PII-1	s=2	0x04		+5	RN-1	s=2	0x05		+6	ETS_US-1	s=2	0x06
+8	PII-2	s=3	0x07		+9	RN-2	s=3	0x08		+10	ETS_US-2	s=3	0x09
+12	PII-3	s=4	0x0A		+13	RN-3	s=4	0x0B		+14	ETS_US-3	s=4	0x0C
+16	PII-4	s=5	0x0D		+17	RN-4	s=5	00E		+18	ETS_US-4	s=5	0x0F

Engineering as Art.-No. 57223

15 ETS entries

Art.-No 57223					DI 2 x 24 V DC (60) 60 bytes - 15 ETS entries							
Addr.	PII	IX= 0x5430	SX		Addr.	RN	IX= 0x5430	SX		Addr.	ETS-US	IX= 0x5430	SX
+0	PII-0	s=1	0x01		+1	RN-0	s=1	0x02		+2	ETS_US-0	s=1	0x03
+4	PII-1	s=2	0x04		+5	RN-1	s=2	0x05		+6	ETS_US-1	s=2	0x06
+8	PII-2	s=3	0x07		+9	RN-2	s=3	0x08		+10	ETS_US-2	s=3	0x09
+12	PII-3	s=4	0x0A		+13	RN-3	s=4	0x0B		+14	ETS_US-3	s=4	0x0C
+16	PII-4	s=5	0x0D		+17	RN-4	s=5	0x0E		+18	ETS_US-4	s=5	0x0F
+20	PII-5	s=6	0x10		+21	RN-5	s=6	0x11		+22	ETS_US-5	s=6	0x12
+24	PII-6	s=7	0x13		+25	RN-6	s=7	0x14		+26	ETS_US-6	s=7	0x15
+28	PII-7	s=8	0x16		+29	RN-7	s=8	0x17		+30	ETS_US-7	s=8	0x18
+32	PII-8	s=9	0x19		+33	RN-8	s=9	0x1A		+34	ETS_US-8	s=9	0x1B
+36	PII-9	s=10	0x1C		+37	RN-9	s=10	0x1D		+38	ETS_US-9	s=10	0x1E
+40	PII-10	s=11	0x1F		+41	RN-10	s=11	0x20		+42	ETS_US-10	s=11	0x21
+44	PII-11	s=12	0x22		+45	RN-11	s=12	0x23		+46	ETS_US-11	s=12	0x24
+48	PII-12	s=13	0x25		+49	RN-12	s=13	0x26		+50	ETS_US-12	s=13	0x27
+52	PII-13	s=14	0x28		+53	RN-13	s=14	0x29		+54	ETS_US-13	s=14	0x2A
+56	PII-14	s=15	0x2B		+57	RN-14	s=15	0x2C		+58	ETS_US-14	s=15	0x2D

9.4.4 Parameter data

Parameterization data

You can plan the following variants:

- Cube20S DI2 ETS (20): 20 bytes occupied in process image of the inputs for 5 ETS entries
- Cube20S DI2 ETS (60): 60 bytes occupied in process image of the inputs for 15 ETS entries

Both variants have the following parameter data:

DS	Data record for access using PROFIBUS and PROFINET
IX	Index for access using CANopen
SX	Subindex for access via EtherCAT with index 0x3100 + EtherCAT slot

Information on access to the Cube20S is given in the manual of the corresponding bus node.

Name	Bytes	Function	Default	DS	IX	SX
PII_L	1	Length of the process image Input data[ab]	0x14 or 0x3C (fixed)	0x02	0x3100	0x01
PIQ_L	1	Length Process image Output data[c]	0x00 (fixed)	0x02	0x3101	0x02
CH0D	1	Input delay DI 0	0x02	0x01	0x3102	0x03
CH1D	1	Input delay DI 1	0x02	0x01	0x3103	0x04
TSER	1	0-1 edge on DI x	0x00	0x80	0x3104	0x05
TSEF	1	1-0 edge on DI x	0x00	0x80	0x3105	0x06

a. This parameter corresponds of the configured variant.

b. This record set may only be transferred at STOP state.

c. This record set may only be transferred at STOP state.

PII_L

Byte	Bit 7 ... 0	Description
0		The length for the process image is set fixedly to the length of the planned variant (0x14 or 0x3C).

PIQ_L

Byte	Bit 7 ... 0	Description
0		The length for the process image of the output data is set fixedly to 0 bytes.

CHxD
DI x

Byte	Description	Possible values	
0	Input delay DI x	0x00: 1 µs	0x07: 86 µs
		0x02: 3 µs	0x09: 342 µs
		0x04: 10 µs	0x0C: 2731 µs
		Other values are not permitted!	

- A filter can used, for example, to filter the signal peaks in case of unclear input signal.

Edge selection

You can configure the ETS function for DI 0 and DI 1. The two bytes define for which edge of the input signal the current µs time value is stored together with the input states in the process image.

TSER
0-1 edge DI x

Byte	Bit 7 ... 0	Description	
0	Bit 0	ETS entry on edge 0-1 (rising edge) DI 0	
	Bit 1	ETS entry on 0-1 edge (rising edge) DI 1	
		0	disable
		1	enabled
	Bit 7 ... 2	reserved	

TSEF
1-0 edge DI x

Byte	Bit 7 ... 0	Description	
0	Bit 0	ETS entry on 1-0 edge (falling edge) DI 0	
	Bit 1	ETS entry on 1-0 edge (falling edge) DI 1	
		0	disable
		1	enabled
	Bit 7 ... 2	reserved	

9.4.5 Example

Example of Mode of operation

Below an example of the sequence in which the ETS entries are saved.

This example refers to a module that occupies 20 bytes for 5 ETS entries in the input range.

The following edges are preset for the input channels:

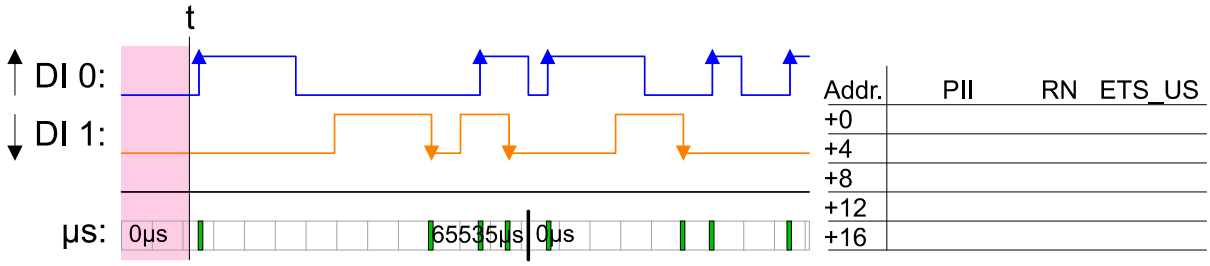
- **DI 0: 0-1 edge: rising**
- **DI 1: 1-0 edge: falling**

➔ The **green** area in the diagram shows the ETS entries available at time **"t"**.

➔ ETS entries that are **not (longer)** available have a **red** background.

Process image is empty

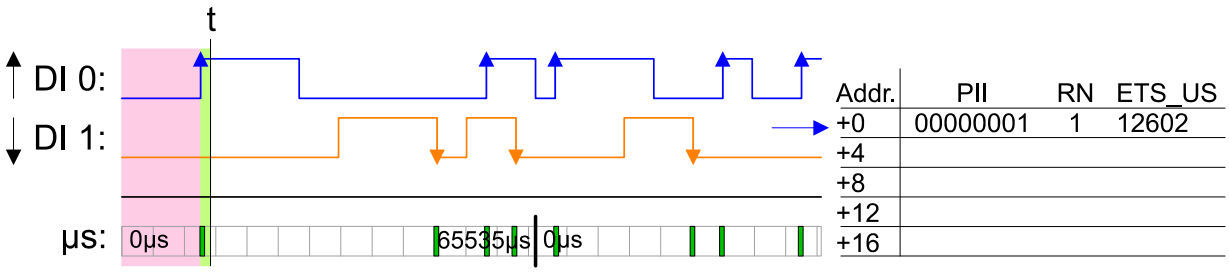
- New ETS entries are always entered starting with address +0.
- Existing ETS entries are moved by 4 bytes.



1st ETS entry

Triggered by 0-1 edge of DI 0

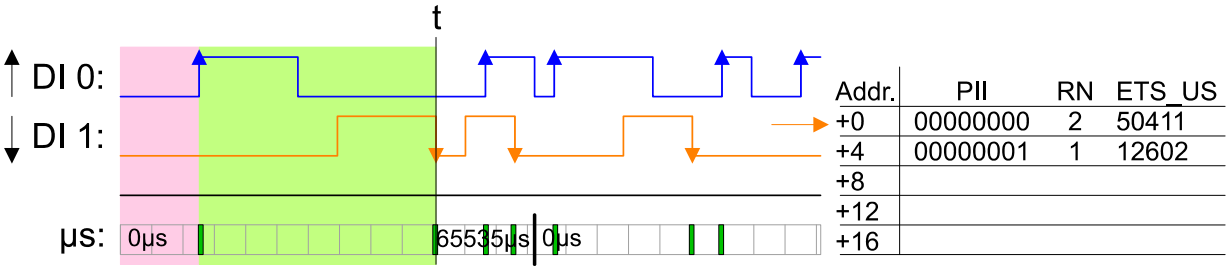
- the 1st entry is entered from address +0



2nd ETS entry

Triggered by 1-0 edge of DI 1

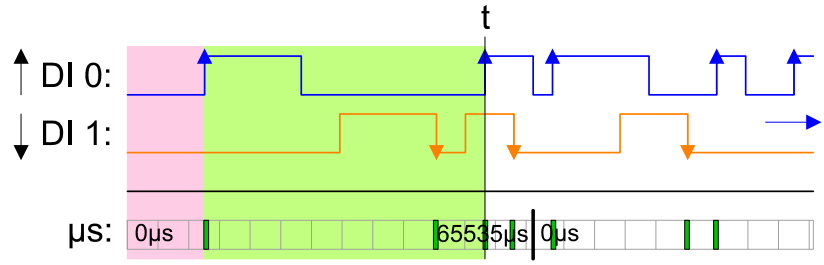
- the 2nd entry is entered from address +0
- the 1st ETS entry is moved by 4 bytes



3rd ETS entry

Triggered by 0-1 edge of DI 0

- the 3rd entry is entered from address +0
- already existing ETS entries are moved by 4 bytes

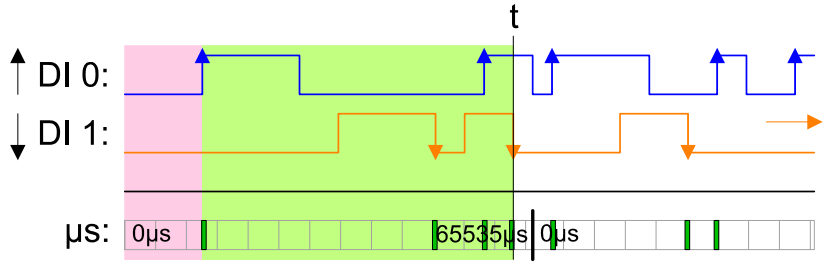


Addr.	PII	RN	ETS_US
+0	00000011	3	57973
+4	00000000	2	50411
+8	00000001	1	12602
+12			
+16			

4th ETS entry

Triggered by 1-0 edge of DI 1

- the 4th entry is entered from address +0
- already existing ETS entries are moved by 4 bytes

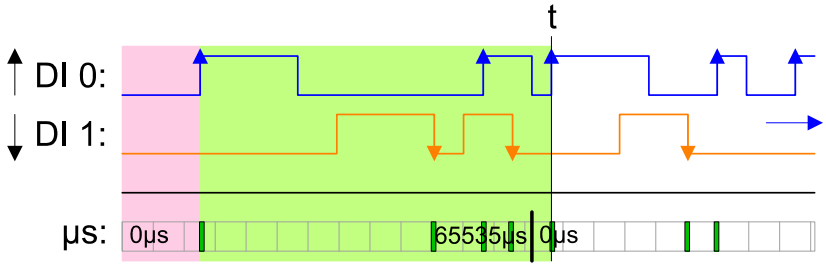


Addr.	PII	RN	ETS_US
+0	00000001	4	62384
+4	00000011	3	57973
+8	00000000	2	50411
+12	00000001	1	12602
+16			

5th ETS entry

Triggered by 0-1 edge of DI 0

- the 5th entry is entered from address +0
- already existing ETS entries are moved by 4 bytes
- The maximum number of ETS entries is reached.

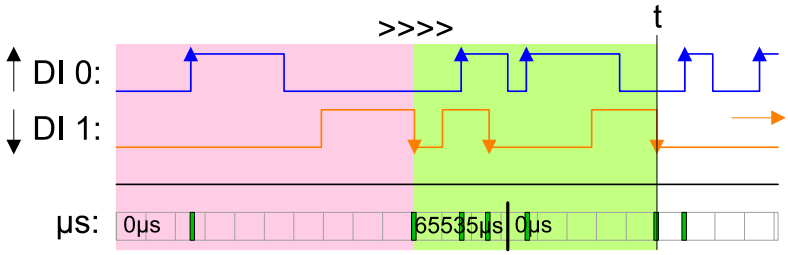


Addr.	PII	RN	ETS_US
+0	00000001	5	3150
+4	00000001	4	62384
+8	00000011	3	57973
+12	00000000	2	50411
+16	00000001	1	12602

6th ETS entry

Triggered by 1-0 edge of DI 1

- the 6th entry is entered from address +0
- already existing ETS entries are moved by 4 bytes
- The 1st ETS entry is deleted and is no longer available.

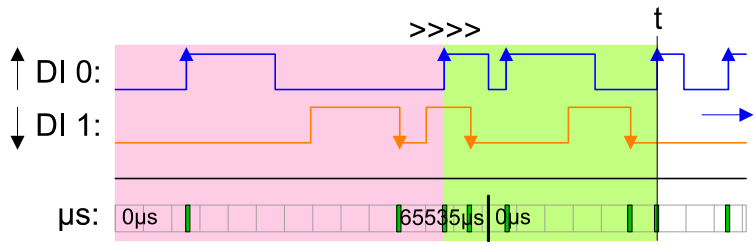


Addr.	PII	RN	ETS_US
+0	00000000	6	25205
+4	00000001	5	3150
+8	00000001	4	62384
+12	00000011	3	57973
+16	00000000	2	50411
	00000001	1	12602

7th ETS entry

Triggered by 0-1 edge of DI 0

- the 7th entry is entered from address +0
- already existing ETS entries are moved by 4 bytes
- The 2nd ETS entry is deleted and is no longer available.

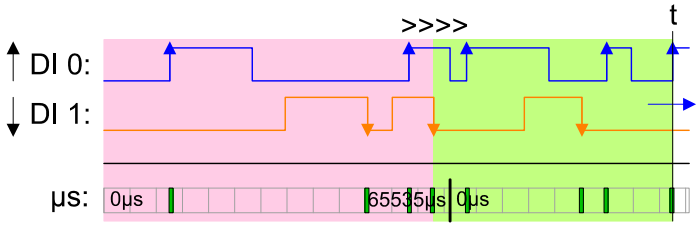


Addr.	PII	RN	ETS_US
+0	00000001	7	29616
+4	00000000	6	25205
+8	00000001	5	3150
+12	00000001	4	62384
+16	00000011	3	57973
	00000000	2	50411
	00000001	1	12602

8th ETS entry

Triggered by 0-1 edge of DI 0

- the 8th entry is entered from address +0
- already existing ETS entries are moved by 4 bytes
- The 3rd ETS entry is deleted and is no longer available.



Addr.	PII	RN	ETS_US
+0	00000001	8	42219
+4	00000001	7	29616
+8	00000000	6	25205
+12	00000001	5	3150
+16	00000001	4	62384
	00000011	3	57973
	00000000	2	50411
	00000001	1	12602

NOTE

- ➔ Operation of ETS modules only makes sense on bus nodes that have an integrated µs ticker!
- ➔ The Ethernet bus node with Modbus TCP, for example, is not provided with a µs ticker.

9.4.6 Diagnostics

Diagnostic data

Since this module does not support any diagnostic interrupt, the diagnostic data give information on this module.

Diagnostics

DS Data record for access using PROFIBUS and PROFINET
Access using DS 0x01.
Besides, you can access the first 4 bytes using DS 0x00.

IX Index for access using CANopen.
Access using IX 0x2F01.
Besides, you can access the first 4 bytes using IX 0x2F00.

SX Subindex for access via EtherCAT with index 0x5005 + EtherCAT port.

Information on accessing the Cube20S is given in the manual of the corresponding bus node.

Name	Bytes	Function	Default	DS	IX	SX
ERR_A	1	reserved	0x00	0x01	0x2F01	0x02
MODTYP	1	Module information	0x1F			0x03
ERR_C	1	reserved	0x00			0x04
ERR_D	1	reserved	0x00			0x05
CHTYP	1	Channel type	0x70			0x06
NUMBIT	1	No. of diagnostic bits per channel	0x00			0x07
NUMCH	1	Number of channels of the module	0x02			0x08
CHERR	1	reserved	0x00			0x09
CH0ERR ... CH7ERR	8	reserved	0x00			0x0A ... 0x11
DIAG_US	4	µs ticker	0x00			0x13

MODTYP
Module information

Byte	Bit 7 ... 0	Description
0	Bit 3 ... 0	Module class
		1111b Digital module
	Bit 4	set in case of ***Channel information available***
	Bit 7 ... 5	reserved

CHTYP
Channel type

Byte	Bit 7 ... 0	Description
0	Bit 6 ... 0	Channel type
		0x70 Digital input
	Bit 7	0 (fixed)

NUMBIT
Diagnostic bits

Byte	Bit 7 ... 0	Description
0		Number of diagnostic bits of the module per channel (here 0x00)

NUMCH
Channels

Byte	Bit 7 ... 0	Description
0		Number of channels of a module (here 0x02)

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.

ERR_A/C/D
CHERR
CHxERR

Byte	Bit 7 ... 0	Description
0		Reserved

9.4.7 Technical Data

Current consumption / power dissipation		
	Current consumption from the backplane bus	100 mA
	Power dissipation	0.9 W
Digital inputs		
	Number of inputs	2
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	24 V ⎓
	Current consumption from load voltage L+ (without load)	10 mA
	Nominal value	20.4...28.8 V ⎓
	Input voltage for signal "0"	0...5 V ⎓
	Input voltage for signal "1"	15 ... 28.8 V ⎓
	Signal logic input	P reading
	Input current for signal "1"	3 mA
	Connection of 2-wire proximity switch possible	Yes
	Max. permitted proximity switch quiescent current	0.5 mA
	Input delay of "0" after "1"	Configurable 2 µs ... 3 ms
	Input delay of "1" after "0"	Configurable 2 µs ... 3 ms
	Number of inputs in horizontal installation that can be used simultaneously	2
	Number of inputs in vertical installation that can be used simultaneously	2
	Input characteristic curve	IEC 61131-2, type 1
	Input data size	60 bytes
Status, interrupt, diagnoses		
	Status indication	Green LED per channel
	Interrupts	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnosis information readable	Possible
	Module status	Green LED
	Module error indication	Red LED
	Channel error indication	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓
Data sizes		
	Input bytes	20 / 60
	Output bytes	0
	Parameter bytes	10
	Diagnostic bytes	20

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	58 g
	Weight incl. accessories	58 g
	Gross weight	73 g

9.5 Art. no. 57240, DI 4x 24 V DC

9.5.1 Features

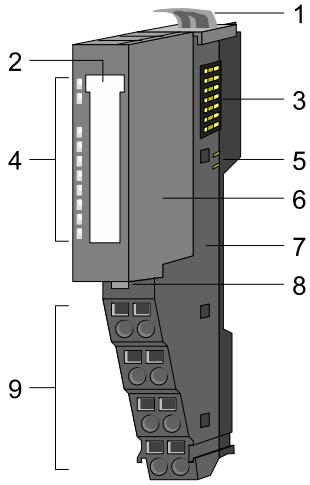
Description

The electronic module records the binary control signals from the process level and transmits them electrically isolated to the superordinate bus system. It has 4 channels which indicate their status by means of LEDs.

Properties

- 4 digital inputs electrically isolated from the backplane bus.
- Suitable for switches and proximity switches
- Status indication of the channels by means of LEDs, also with deactivated electronics power supply

9.5.2 Structure

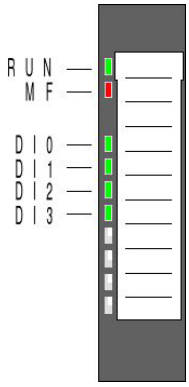


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital input module	57240	Digital input module incl. base DI 4xDC 24V

Status indication



RUN
- Off
- On

MF
- Off
- On
- Flashing at 2 Hz

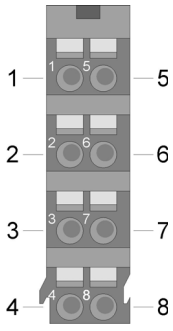
DI x
- Off
- On

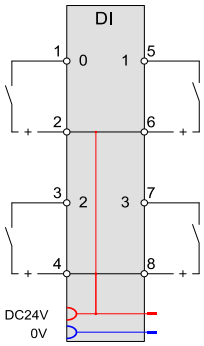
RUN	MF	DI x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error
		X	Bus communication is not possible Module status reports error
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital input has 1 signal
			Digital input has 0 signal
X: not relevant			

Tab. 9-18: Status indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2.





Pos.	Function	Type	Description
1	DI 0	Input	Digital input DI 0
2	24 V DC	Output	24 V DC for encoder
3	DI 2	Input	Digital input DI 2
4	24 V DC	Output	24 V DC for encoder
5	DI 1	Input	Digital input DI 1
6	24 V DC	Output	24 V DC for encoder
7	DI 3	Input	Digital input DI 3
8	24 V DC	Output	24 V DC for encoder

Tab. 9-19: Assignment of connecting terminals

9.5.3 Input/output range

Input range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX = subindex for access via EtherCAT with index 0x6000 + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PII	1	Status of the inputs	0x5000	
			Bit 0: DI 0		0x01
			Bit 1: DI 1		0x02
			Bit 2: DI 2		0x03
			Bit 3: DI 3		0x04
			Bit 7 ... 4: reserved		

Tab. 9-20: Input range

Output range

No bytes reserved for the module in the output range.

9.5.4 Technical Data

Current consumption / power dissipation		
	Current consumption from the backplane bus	65 mA
	Power dissipation	0.6 W

Digital inputs		
	Number of inputs	4
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal value	20.4...28.8 V ⎓
	Input voltage for signal "0"	0...5 V ⎓
	Input voltage for signal "1"	15 ... 28.8 V ⎓
	Signal logic input	P reading
	Input capacitance	-
	Input current for signal "1"	3 mA
	Connection of 2-wire proximity switch possible	Yes
	max. permitted proximity switch quiescent current	0.5 mA
	Input delay of "0" after "1"	3 ms
	Input delay of "1" after "0"	3 ms
	Number of inputs in horizontal installation that can be used simultaneously	4
	Number of inputs in vertical installation that can be used simultaneously	4
	Input characteristic curve	IEC 61131-2, type 1
	Input data size	4 bits

Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None

Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓

Data sizes		
	Input bytes	1
	Output bytes	0
	Parameter bytes	0
	Diagnostic bytes	0

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	57 g
	Weight incl. accessories	57 g
	Gross weight	72 g

9.6 Art. no. 57241, DI 4x 24 V DC 2 µs ... 4 ms

9.6.1 Features

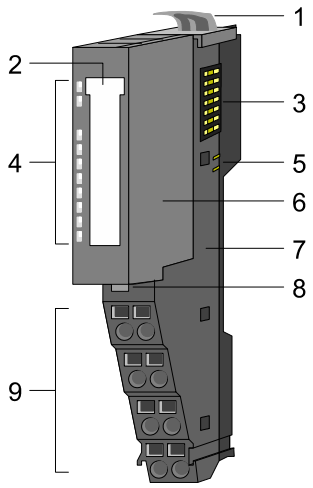
Description

The electronic module records the binary control signals from the process level and transmits them electrically isolated to the superordinate bus system. It has 4 quick digital input channels which indicate their status by means of LEDs.

Features

- 4 digital inputs electrically isolated from the backplane bus.
- Suitable for switches and proximity switches
- Status indication of the channels by means of LEDs, also with deactivated electronics power supply
- Input filters with adjustable parameters
- Alarm and diagnostic function

9.6.2 Structure

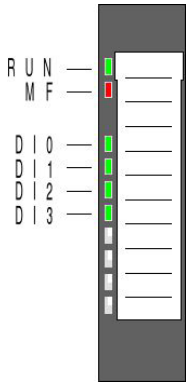


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital input module	57241	Digital input module incl. base DI 4xDC 24V 2µs...4ms

Status indication



RUN
- Off
- On

MF
- Off
- On
- Flashing at 2 Hz

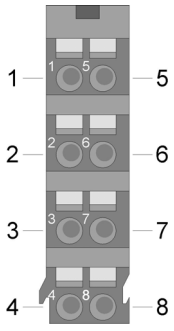
DI x
- Off
- On

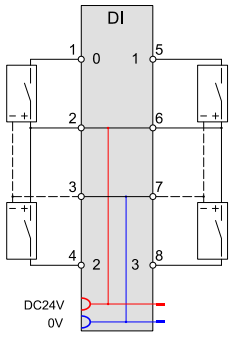
RUN	MF	DI x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error
		X	Bus communication is not possible Module status reports error
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital input has 1 signal
			Digital input has 0 signal
X: not relevant			

Tab. 9-21: Status indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2.





Pos.	Function	Type	Description
1	DI 0	Input	Digital input DI 0
2	24 V DC	Output	24 V DC for encoder
3	0 V	Output	GND
4	DI 2	Input	Digital input DI 2
5	DI 1	Input	Digital input DI 1
6	24 V DC	Output	24 V DC for encoder
7	0 V	Output	GND
8	DI 3	Input	Digital input DI 3

Tab. 9-22: Assignment of connecting terminals

9.6.3 Input/output range

Input range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX = subindex for access via EtherCAT with index 0x6000 + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PII	1	Status of the inputs	0x5000	
			Bit 0: DI 0		0x01
			Bit 1: DI 1		0x02
			Bit 2: DI 2		0x03
			Bit 3: DI 3		0x04
			Bit 7 ... 4: reserved		

Tab. 9-23: Input range

Output range

No bytes reserved for the module in the output range.

9.6.4 Parameterization data

Parameter

DS	Data record for access using PROFIBUS and PROFINET
IX	Index for access using CANopen
SX	Subindex for access via EtherCAT with index 0x3100 + EtherCAT port

NOTE
For further information, please refer to the manual of your bus node.

Name	Bytes	Function	Default	DS	IX	SX
DIAG_EN	1	Diagnostic interrupt	0x00	0x00	0x3100	0x01
CH0D	1	Input delay DI 0	0x02	0x01	0x3101	0x02
CH1D	1	Input delay DI 1	0x02	0x01	0x3102	0x03
CH2D	1	Input delay DI 2	0x02	0x01	0x3103	0x04
CH3D	1	Input delay DI 3	0x02	0x01	0x3104	0x05
INTRE	1	Process interrupt after edge 0-1 at DI x	0x00	0x80	0x3105	0x06
INTFE	1	Process interrupt after edge 1-0 at DI x	0x00	0x80	0x3106	0x07

DIAG_EN
Diagnostic interrupt

Byte	Bit 7 ... 0	Description	
0	7 ... 0	Diagnostic interrupt	
		0x00	disable
		0x40	enabled

Tab. 9-24: Diagnostic interrupt

➔ Enable or disable the diagnostic function here.

CHxD
Input delay

Byte	Function	Possible values	
0	Input delay DI x	0x00: 1 µs	0x07: 86 µs
		0x02: 3 µs	0x09: 342 µs
		0x04: 10 µs	0x0C: 2731 µs
		Other values are not permitted!	

➔ Specification of the input delay can be used here to define a filter for the corresponding channel.

A filter can used, for example, to filter the signal peaks in case of unclear input signal.

INTRE
Interrupt edge 0-1

Byte	Bit 7 ... 0	Description	
0	Bit 0	Process interrupt after edge 0-1 at DI 0	
	Bit 1	Process interrupt after edge 0-1 at DI 1	
	Bit 2	Process interrupt after edge 0-1 at DI 2	
	Bit 3	Process interrupt after edge 0-1 at DI 3	
		0	disable
		1	enabled
	Bit 7 ... 4	reserved	

INTFE
Interrupt edge 0-1

Byte	Bit 7 ... 0	Description	
0	Bit 0	Process interrupt after edge 1-0 at DI 0	
	Bit 1	Process interrupt after edge 1-0 at DI 1	
	Bit 2	Process interrupt after edge 1-0 at DI 2	
	Bit 3	Process interrupt after edge 1-0 at DI 3	
		0	disable
		1	enabled
	Bit 7 ... 4	reserved	

9.6.5 Diagnosis and interrupt

Diagnosis and interrupt

Trigger	Process interrupt	Diagnostic interrupt	can be parameterized
Edge 0-1 DI x	x	-	x
Edge 1-0 DI x	x	-	x
Diagnosis buffer overflow	-	x	-
Process interrupt lost	-	x	-

Process interrupt data

Enable process interrupts in order to respond to asynchronous events. A process interrupt stops the linear program sequence and branches depending on the master system into a certain interrupt routine. Here you can respond to the process interrupt.

CANopen transmits the process interrupt data in an Emergency telegram.

If PROFIBUS and PROFINET are used for access, they transmit this process interrupt data in a diagnostic telegram.

SX = Subindex for access via EtherCAT with index 0x5000.

NOTE

For further information, please refer to the manual of your bus node.

Name	Bytes	Function	Default	SX
PRIT_A	1	Process interrupt data	0x00	0x02
PRIT_B	1	Status of the inputs	0x00	0x03
PRIT_US	2	µs ticker	0x00	0x04 (high byte) 0x05 (low byte)

Tab. 9-25: Process interrupts

PRIT_A
Process interrupt data

Byte	Bit 7 ... 0	Description
0	Bit 0	Edge at the digital input DI 0
	Bit 1	Edge at the digital input DI 1
	Bit 2	Edge at the digital input DI 2
	Bit 3	Edge at the digital input DI 3
	Bit 7 ... 4	reserved

PRIT_B
Status of the inputs

Byte	Bit 7 ... 0	Description
0	Status of the inputs at the moment of process interrupt	
	Bit 0	State of the input DI 0
	Bit 1	State of the input DI 1
	Bit 2	State of the input DI 2
	Bit 3	State of the input DI 3
	Bit 7 ... 4	reserved

PRIT_US
µs ticker

Byte	Bit 7 ... 0	Description
0 ... 1		Value of the µs ticker at the moment of the process interrupt

Tab. 9-26: µs ticker

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.

PRIT_US represents the lower 2 Bytes of the µs-ticker value (0 ... 2^{16}-1).

9.6.5.1 Diagnostics

Diagnostic data

Using Parameterization activate a diagnostic interrupt for the module.

Function

- Once a diagnostic interrupt has been triggered, the module provides$_{\text{incoming}}$ diagnostic data for diagnostics.
- As soon as the reasons for the triggering a diagnostic interrupt are no longer present, you will automatically receive an$_{\text{outgoing}}$ diagnostic interrupt.·
- If an$_{\text{incoming}}$ diagnostic interrupt has been triggered for a channel due to process interrupt lost, all events up to a certain$_{\text{outgoing}}$ diagnostic interrupt will be lost.
- During this period (1st diagnostic interrupt$_{\text{incoming}}$ until the last diagnostic interrupt$_{\text{outgoing}}$) the MF LED of the module is lit.

Diagnostics

DS	Data record for access using PROFIBUS and PROFINET Access using DS 0x01. Besides, you can access the first 4 bytes using DS 0x00.
IX	Index for access using CANopen. Access using IX 0x2F01. Besides, you can access the first 4 bytes using IX 0x2F00.
SX	Subindex for access via EtherCAT with index 0x5005.

NOTE

For further information, please refer to the manual of your bus node.

Name	Bytes	Function	Default	DS	IX	SX
ERR_A	1	Diagnostic	0x00	0x01	0x2F01	0x02
MODTYP	1	Module information	0x1F			0x03
ERR_C	1	reserved	0x00			0x04
ERR_D	1	Diagnostic	0x00			0x05
CHTYP	1	Channel type	0x70			0x06
NUMBIT	1	No. of diagnostic bits per channel	0x00			0x07
NUMCH	1	Number of channels of the module	0x02			0x08
CHERR	1	Channel error	0x00			0x09
CH0ERR ... CH7ERR	8	reserved	0x00			0x0A ... 0x11
DIAG_US	4	µs ticker	0x00			0x13

ERR_A
Diagnosis

Byte	Bit 7 ... 0	Description
0	Bit 0	set in case of ***Assembly fault***
	Bit 1	reserved
	Bit 2	set in case of ***External error***
	Bit 3	set in case of ***Channel error available***
	Bit 7 ... 5	reserved

MODTYP
Module information

Byte	Bit 7 ... 0	Description	
0	Bit 3 ... 0	Module class	
		1111b	Digital module
	Bit 4	set in case of ***Channel information available***	
	Bit 7 ... 5	reserved	

ERR_C
reserved

Byte	Bit 7 ... 0	Description
0		reserved

Tab. 9-27: ERR_C

ERR_D
Diagnosis

Byte	Bit 7 ... 0	Description
0	2 ... 0	reserved
	3	set in case of ***Internal diagnosis buffer overflow***
	5 ... 4	reserved
	6	Process interrupt lost
	7	reserved

Tab. 9-28: Diagnosis

CHTYP
Channel type

Byte	Bit 7 ... 0	Description
0	Bit 6 ... 0	Channel type
		0x70 Digital input
	Bit 7	reserved

NUMBIT
Diagnostic bits

Byte	Bit 7 ... 0	Description
0		Number of diagnostic bits of the module per channel (here 0x00)

NUMCH
Channels

Byte	Bit 7 ... 0	Description
0		Number of channels of a module (here 0x02)

CHERR
Channel error

Byte	Bit 7 ... 0	Description
0	Bit 0	Edge lost at **DI 0**
	Bit 1	Edge lost at **DI 1**
	Bit 2	Edge lost at **DI 2**
	Bit 3	Edge lost at **DI 3**
	Bit 7 ... 4	reserved

CHxERR
reserved

Byte	Bit 7 ... 0	Description
0		reserved

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.

9.6.6 Technical Data

Current consumption / power dissipation		
	Current consumption from the backplane bus	100 mA
	Power dissipation	0.95 W
Digital inputs		
	Number of inputs	4
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	20.4 ... 28.8 V ⎓
	Current consumption from load voltage L+ (without load)	15 mA
	Nominal value	20.4 ... 28.8 V ⎓
	Input voltage for signal "0"	0...5 V ⎓
	Input voltage for signal "1"	15 ... 28.8 V ⎓
	Signal logic input	P reading
	Input current for signal "1"	3 mA
	Connection of 2-wire proximity switch possible	Yes
	Max. permitted proximity switch quiescent current	0.5 mA
	Input delay of "0" after "1"	Configurable 2 µs ... 3 ms
	Input delay of "1" after "0"	Configurable 2 µs ... 3 ms
	Number of inputs in horizontal installation that can be used simultaneously	4
	Number of inputs in vertical installation that can be used simultaneously	4
	Input characteristic curve	IEC 61131-2, type 1
	Input data size	4 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	Yes, configurable
	Process interrupt	Yes, configurable
	Diagnostic interrupt	Yes, configurable
	Diagnostic function	Yes
	Diagnostic information can be read out	possible
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓
Data sizes		
	Input bytes	1
	Output bytes	0
	Parameter bytes	11
	Diagnosis bytes	20

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	59 g
	Weight incl. accessories	59 g
	Gross weight	73 g

9.7 Art. no. 57242, DI 4x24 V DC NPN

9.7.1 Features

Description

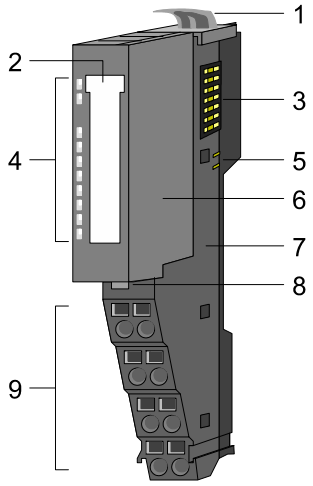
The electronic module records the binary control signals from the process level and transmits them electrically isolated to the superordinate bus system. It has 4 channels which indicate their status by means of LEDs.

An input becomes active as soon as it is connected to ground.

Properties

- 4 digital inputs (M reading), electrically isolated from the backplane bus
- Suitable for switches and proximity switches
- Status indication of the channels by means of LEDs, also with deactivated electronics power supply

9.7.2 Structure

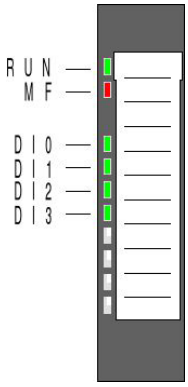


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital input module	57242	Digital input module incl. base DI 4xDC 24V NPN

Status indication



RUN
- Off
- On

MF
- Off
- On
- Flashing at 2 Hz

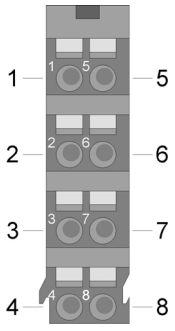
DI x
- Off
- On

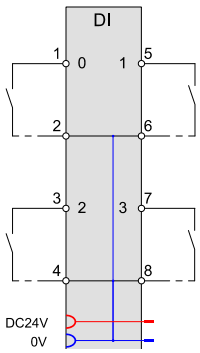
RUN	MF	DI x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error
		X	Bus communication is not possible Module status reports error
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital input has 1 signal
			Digital input has 0 signal
X: not relevant			

Tab. 9-29: Status indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2.





Pos.	Function	Type	Description
1	DI 0	Input	Digital input DI 0
2	0 V	Output	GND
3	DI 2	Input	Digital input DI 2
4	0 V	Output	GND
5	DI 1	Input	Digital input DI 1
6	0 V	Output	GND
7	DI 3	Input	Digital input DI 3
8	0 V	Output	GND

Tab. 9-30: Assignment of connecting terminals

9.7.3 Input/output range

Input range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX = subindex for access via EtherCAT with index 0x6000 + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PII	1	Status of the inputs	0x5000	
			Bit 0: DI 0		0x01
			Bit 1: DI 1		0x02
			Bit 2: DI 2		0x03
			Bit 3: DI 3		0x04
			Bit 7 ... 4: reserved		

Tab. 9-31: Input range

Output range

No bytes reserved for the module in the output range.

9.7.4 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	65 mA
	Power dissipation	0.6 W

Digital inputs		
	Number of inputs	4
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal value	20.4...28.8 V ⎓
	Input voltage for signal "0"	15 ... 28.8 V ⎓
	Input voltage for signal "1"	0...5 V ⎓
	Signal logic input	M reading
	Input capacitance	-
	Input current for signal "1"	3 mA
	Connection of 2-wire proximity switch possible	Yes
	Max. permitted proximity switch quiescent current	0.5 mA
	Input delay of "0" after "1"	3 ms
	Input delay of "1" after "0"	3 ms
	Number of inputs in horizontal installation that can be used simultaneously	4
	Number of inputs in vertical installation that can be used simultaneously	4
	Input data size	4 bits

Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None

Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓

Data sizes		
	Input bytes	1
	Output bytes	0
	Parameter bytes	0
	Diagnostic bytes	0

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	58 g
	Weight incl. accessories	58 g
	Gross weight	72 g

9.8 Art. no. 57243, DI 4x24 V DC Time Stamp ETS

9.8.1 Features

Description

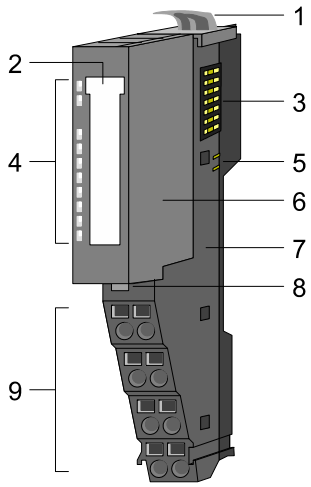
The electronic module records the binary control signals from the process level and transmits them electrically isolated to the parent bus system. It has 4 channels, which indicate their status by means of LEDs.

If the ETS (ETS = **e**dge **t**ime **s**tamp) function is set, the current time value of the µs ticker is stored together with the input states in the process image when there is a matching (rising/falling) edge. Depending on the planning, 5 (20 bytes) or 15 (60 bytes) ETS entries can be recorded one after the other in the process image.

Features

- 4 digital inputs electrically isolated from the backplane bus
- Configurable ETS function for 5 or 15 ETS entries (4 bytes each)
- Diagnostic function
- Suitable for switches and proximity switches
- Status indication of the channels by means of LEDs, also with deactivated electronics power supply

9.8.2 Structure

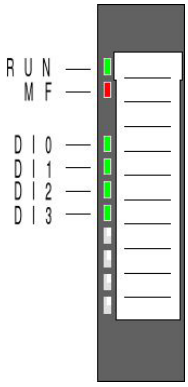


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital input module	57243	Digital input module incl. base DI 4xDC 24V ETS

Status indication



RUN
- Off
- On

MF
- Off
- On
- Flashing at 2 Hz

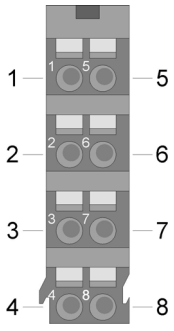
DI x
- Off
- On

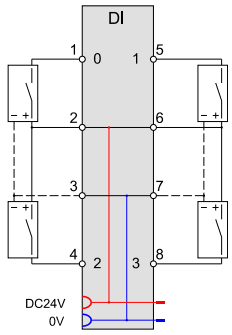
RUN	MF	DI x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error
		X	Bus communication is not possible Module status reports error
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital input has 1 signal
			Digital input has 0 signal
X: not relevant			

Tab. 9-32: Status indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2.





Pos.	Function	Type	Description
1	DI 0	Input	Digital input DI 0
2	24 V DC	Output	24 V DC for encoder
3	0 V	Output	GND
4	DI 2	Input	Digital input DI 2
5	DI 1	Input	Digital input DI 1
6	24 V DC	Output	24 V DC for encoder
7	0 V	Output	GND
8	DI 3	Input	Digital input DI 3

Tab. 9-33: Assignment of connecting terminals

NOTE

➔ Operation of ETS modules only makes sense on bus nodes that have an integrated µs ticker!

➔ The Ethernet bus node with Modbus TCP, for example, is not provided with a µs ticker.

9.8.3 Input/output range

Input/output range

If the ETS (ETS=**e**dge **t**ime **s**tamp) function is set, the current time value of the Cube20S µs ticker is stored together with the input states and a consecutive number as ETS entry in the process image when there is a matching edge.

You can plan the following variants:

- **Cube20S DI2 ETS (20): 20 bytes occupied in process image of the inputs for 5 ETS entries**
- **Cube20S DI2 ETS (60): 60 bytes occupied in process image of the inputs for 15 ETS entries**

Input range 20 bytes or 60 bytes

Depending on the planned variant, 5 or 15 ETS entries can be written using the output range. Each ETS entry uses 4 bytes of the input range.

Input range

The input range is used for the status message. In PROFIBUS and PROFINET, the input range is displayed in the corresponding address range.

IX	Index for access using CANopen. Use s = subindex to address the corresponding ETS entry.
SX	SX = Subindex for access via EtherCAT. Subindex for access via EtherCAT with index 0x6000 + EtherCAT port.

Information on access to the Cube20S is given in the manual of the corresponding bus node.

Output range

No bytes reserved for the module in the output range.

9.8.3.1 ETS entries

Structure of an ETS entry

Addr.	Name	Bytes	Function	IX	SX
+0	PII	1	Status of the inputs	0x5430/s	0x01
+1	RN	1	Consecutive number		0x02
+2	ETS_US	2	µs ticker		0x03

PII

The input states after change of edge are saved here. The input byte has the following bit assignment:

Bit 0: DI 0

Bit 1: DI 1

Bit 2: DI 2

Bit 3: DI 3

Bit 4 ... 7: 0 (fixed)

RN

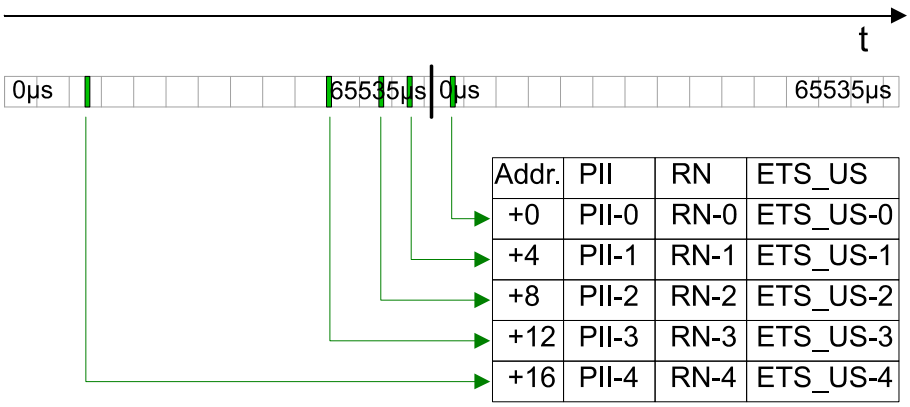
The RN (**R**unning **N**umber) is a consecutive number from 0 ... 127, which starts with 1. The RN describes the chronological order of the edges.

ETS_US

- The Cube20S module has a 32-bit timer (µs ticker), which is started using PowerON and starts again after 2^{32}-1 µs with 0.
- ETS_US always contains the low word of the µs ticker **(0 ... 65535 µs)**.

ETS functionality

- When there is a matching edge, the time value of the ETS_US timer is stored together with the states of the inputs PII and a consecutive number RN as RTS entry in the process image.
- In the following, you can see how the ETS entries are stored chronologically in the input range.



Addr.	PII	RN	ETS_US
+0	PII-0	RN-0	ETS_US-0
+4	PII-1	RN-1	ETS_US-1
+8	PII-2	RN-2	ETS_US-2
+12	PII-3	RN-3	ETS_US-3
+16	PII-4	RN-4	ETS_US-4

Input range

The input range is used for the status message. In PROFIBUS and PROFINET, the input range is displayed in the corresponding address range.

IX Index for access using CANopen.
Use s = subindex to address the corresponding ETS entry.

SX SX = Subindex for access via EtherCAT.
Subindex for access via EtherCAT with index 0x6000 + EtherCAT port.

Information on access to the Cube20S is given in the manual of the corresponding bus node.

Engineering as Art.-No. 57243

5 ETS entries

Art.-No. 57243					DI 4 x 24 V DC (20) 20 bytes - 5 ETS entries							
Addr.	**PII**	**IX= 0x5430**	**SX**		**Addr.**	**RN**	**IX= 0x5430**	**SX**		**Addr.**	**ETS-US**	**IX= 0x5430**	**SX**
+0	PII-0	s=1	0x01		+1	RN-0	s=1	0x02		+2	ETS_US-0	s=1	0x03
+4	PII-1	s=2	0x04		+5	RN-1	s=2	0x05		+6	ETS_US-1	s=2	0x06
+8	PII-2	s=3	0x07		+9	RN-2	s=3	0x08		+10	ETS_US-2	s=3	0x09
+12	PII-3	s=4	0x0A		+13	RN-3	s=4	0x0B		+14	ETS_US-3	s=4	0x0C
+16	PII-4	s=5	0x0D		+17	RN-4	s=5	00E		+18	ETS_US-4	s=5	0x0F

Engineering as Art.-No. 57243

15 ETS entries

Art.-No. 57243					DI 4 x 24 V DC (60) 60 bytes - 15 ETS entries							
Addr.	**PII**	**IX= 0x5430**	**SX**		**Addr.**	**RN**	**IX= 0x5430**	**SX**		**Addr.**	**ETS-US**	**IX= 0x5430**	**SX**
+0	PII-0	s=1	0x01		+1	RN-0	s=1	0x02		+2	ETS_US-0	s=1	0x03
+4	PII-1	s=2	0x04		+5	RN-1	s=2	0x05		+6	ETS_US-1	s=2	0x06
+8	PII-2	s=3	0x07		+9	RN-2	s=3	0x08		+10	ETS_US-2	s=3	0x09
+12	PII-3	s=4	0x0A		+13	RN-3	s=4	0x0B		+14	ETS_US-3	s=4	0x0C
+16	PII-4	s=5	0x0D		+17	RN-4	s=5	0x0E		+18	ETS_US-4	s=5	0x0F
+20	PII-5	s=6	0x10		+21	RN-5	s=6	0x11		+22	ETS_US-5	s=6	0x12
+24	PII-6	s=7	0x13		+25	RN-6	s=7	0x14		+26	ETS_US-6	s=7	0x15
+28	PII-7	s=8	0x16		+29	RN-7	s=8	0x17		+30	ETS_US-7	s=8	0x18
+32	PII-8	s=9	0x19		+33	RN-8	s=9	0x1A		+34	ETS_US-8	s=9	0x1B
+36	PII-9	s=10	0x1C		+37	RN-9	s=10	0x1D		+38	ETS_US-9	s=10	0x1E
+40	PII-10	s=11	0x1F		+41	RN-10	s=11	0x20		+42	ETS_US-10	s=11	0x21
+44	PII-11	s=12	0x22		+45	RN-11	s=12	0x23		+46	ETS_US-11	s=12	0x24
+48	PII-12	s=13	0x25		+49	RN-12	s=13	0x26		+50	ETS_US-12	s=13	0x27
+52	PII-13	s=14	0x28		+53	RN-13	s=14	0x29		+54	ETS_US-13	s=14	0x2A
+56	PII-14	s=15	0x2B		+57	RN-14	s=15	0x2C		+58	ETS_US-14	s=15	0x2D

9.8.4 Parameter data

Parameterization data

You can plan the following variants:

- Cube20S DI4 ETS (20): 20 bytes occupied in process image of the inputs for 5 ETS entries
- Cube20S DI4 ETS (60): 60 bytes occupied in process image of the inputs for 15 ETS entries

Both variants have the following parameter data:

DS	Data record for access using PROFIBUS and PROFINET
IX	Index for access using CANopen
SX	Subindex for access via EtherCAT with index 0x3100 + EtherCAT slot

Information on access to the Cube20S is given in the manual of the corresponding bus node.

Name	Bytes	Function	Default	DS	IX	SX
PII_L	1	Length of the process image input data [ab]	0x14 or 0x3C (fixed)	0x02	0x3100	0x01
PIQ_L	1	Length of the process image output data [c]	0x00 (fixed)	0x02	0x3101	0x02
CH0D	1	Input delay DI 0	0x02	0x01	0x3102	0x03
CH1D	1	Input delay DI 1	0x02	0x01	0x3103	0x04
CH2D	1	Input delay DI 2	0x02	0x01	0x3104	0x05
CH3D	1	Input delay DI 3	0x02	0x01	0x3105	0x06
TSER	1	0-1 edge on DI x	0x00	0x80	0x3106	0x07
TSEF	1	1-0 edge on DI x	0x00	0x80	0x3107	0x08

a. This parameter depends on the planned variant.

b. You are only allowed to transmit this data record in the STOP state.

c. You are only allowed to transmit this data record in the STOP state.

PII_L

Byte	Bit 7 ... 0	Description
0		The length for the process image is set fixedly to the length of the planned variant (0x14 or 0x3C).

PIQ_L

Byte	Bit 7 ... 0	Description
0		The length for the process image of the output data is set fixedly to 0 bytes.

CHxD
DI x

Byte	Description	Possible values	
0	Input delay DI x	0x00: 1 µs	0x07: 86 µs
		0x02: 3 µs	0x09: 342 µs
		0x04: 10 µs	0x0C: 2731 µs
		Other values are not permitted!	

- A filter can used, for example, to filter the signal peaks in case of unclear input signal.

Edge selection

You can configure the ETS function for DI 0 and DI 1. The two bytes define for which edge of the input signal the current µs time value is stored together with the input states in the process image.

TSER
0-1 edge DI x

Byte	Bit 7 ... 0	Description	
0	Bit 0	ETS entry on 0-1 edge (rising edge) DI 0	
	Bit 1	ETS entry on 0-1 edge (rising edge) DI 1	
	Bit 2	ETS entry on 0-1 edge (rising edge) DI 2	
	Bit 3	ETS entry on 0-1 edge (rising edge) DI 3	
		0	disable
		1	enabled
	Bit 7 ... 4	reserved	

TSEF
1-0 edge DI x

Byte	Bit 7 ... 0	Description	
0	Bit 0	ETS entry on 1-0 edge (falling edge) DI 0	
	Bit 1	ETS entry on 1-0 edge (falling edge) DI 1	
	Bit 2	ETS entry on 1-0 edge (falling edge) DI 2	
	Bit 3	ETS entry on 1-0 edge (falling edge) DI 3	
		0	disable
		1	enabled
	Bit 7 ... 4	reserved	

9.8.5 Example

Example of Mode of operation

Below an example of the sequence in which the ETS entries are saved.

This example refers to a module that occupies 20 bytes for 5 ETS entries in the input range.

The following edges are preset for the input channels:

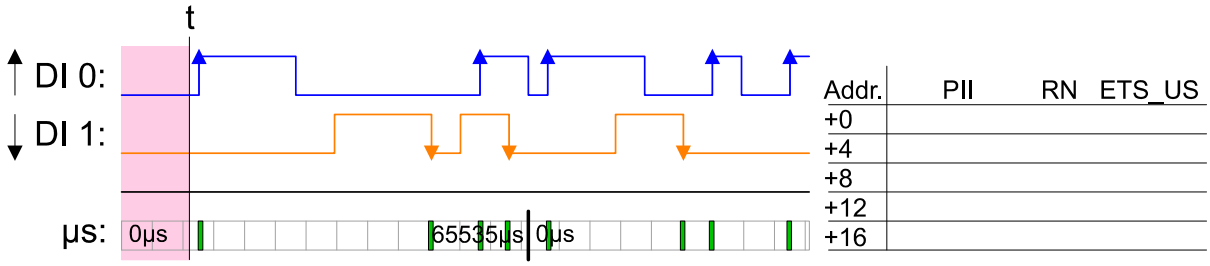
- **DI 0: 0-1 edge: rising**
- **DI 1: 1-0 edge: falling**

➔ The **green** area in the diagram shows the ETS entries available at time **"t"**.

➔ ETS entries that are **not (longer)** available have a **red** background.

Process image is empty

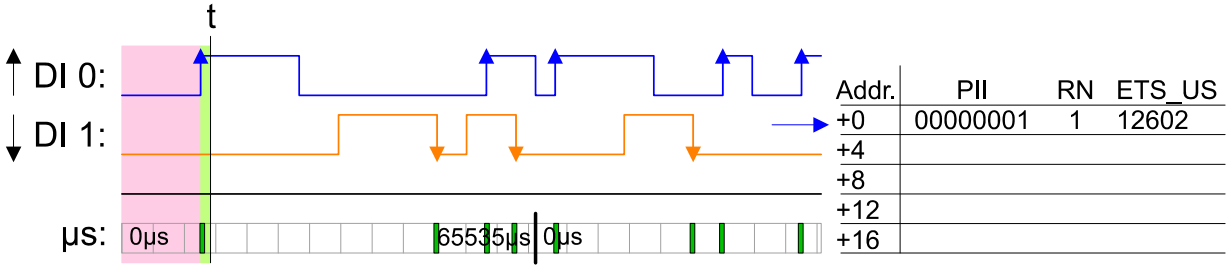
- New ETS entries are always entered starting with address +0.
- Existing ETS entries are moved by 4 bytes.



1st ETS entry

Triggered by 0-1 edge of DI 0

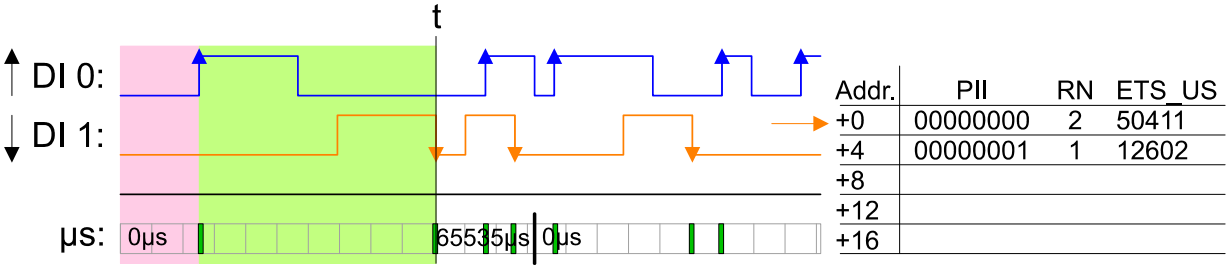
- the 1st entry is entered from address +0



2nd ETS entry

Triggered by 1-0 edge of DI 1

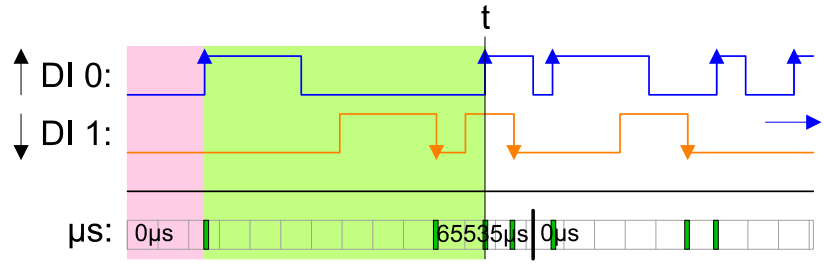
- the 2nd entry is entered from address +0
- the 1st ETS entry is moved by 4 bytes



3rd ETS entry

Triggered by 0-1 edge of DI 0

- the 3rd entry is entered from address +0
- already existing ETS entries are moved by 4 bytes

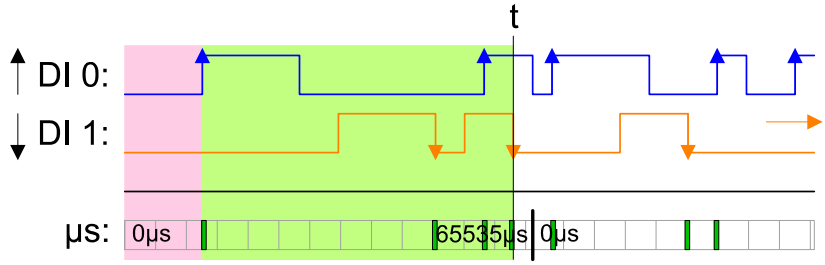


Addr.	PII	RN	ETS_US
+0	00000011	3	57973
+4	00000000	2	50411
+8	00000001	1	12602
+12			
+16			

4th ETS entry

Triggered by 1-0 edge of DI 1

- the 4th entry is entered from address +0
- already existing ETS entries are moved by 4 bytes

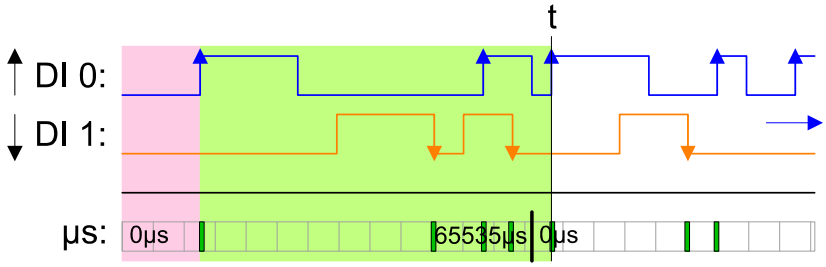


Addr.	PII	RN	ETS_US
+0	00000001	4	62384
+4	00000011	3	57973
+8	00000000	2	50411
+12	00000001	1	12602
+16			

5th ETS entry

Triggered by 0-1 edge of DI 0

- the 5th entry is entered from address +0
- already existing ETS entries are moved by 4 bytes
- The maximum number of ETS entries is reached.

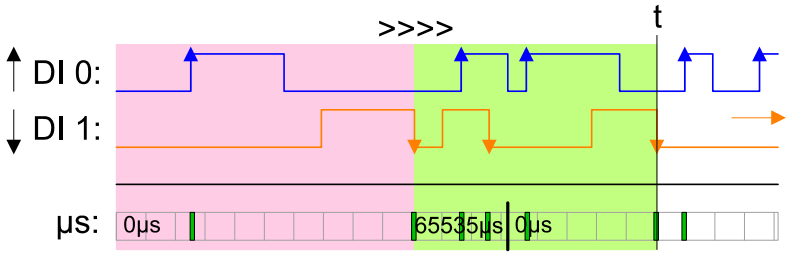


Addr.	PII	RN	ETS_US
+0	00000001	5	3150
+4	00000001	4	62384
+8	00000011	3	57973
+12	00000000	2	50411
+16	00000001	1	12602

6th ETS entry

Triggered by 1-0 edge of DI 1

- the 6th entry is entered from address +0
- already existing ETS entries are moved by 4 bytes
- The 1st ETS entry is deleted and is no longer available.

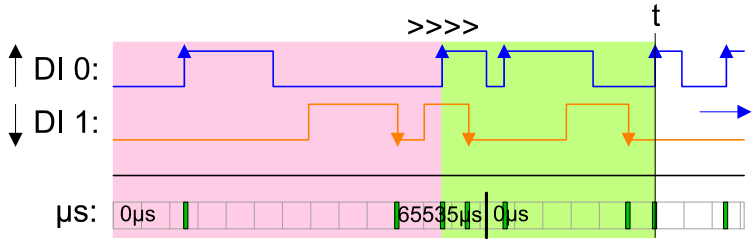


Addr.	PII	RN	ETS_US
+0	00000000	6	25205
+4	00000001	5	3150
+8	00000001	4	62384
+12	00000011	3	57973
+16	00000000	2	50411
	00000001	1	12602

7th ETS entry

Triggered by 0-1 edge of DI 0

- the 7th entry is entered from address +0
- already existing ETS entries are moved by 4 bytes
- The 2nd ETS entry is deleted and is no longer available.

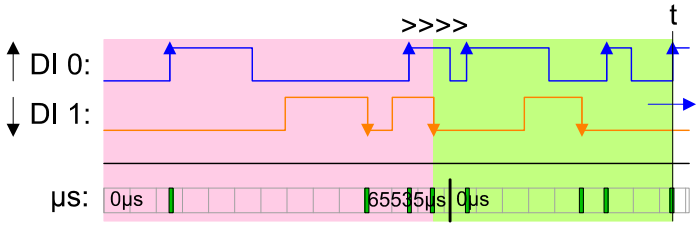


Addr.	PII	RN	ETS_US
+0	00000001	7	29616
+4	00000000	6	25205
+8	00000001	5	3150
+12	00000001	4	62384
+16	00000011	3	57973
	00000000	2	50411
	00000001	1	12602

8th ETS entry

Triggered by 0-1 edge of DI 0

- the 8th entry is entered from address +0
- already existing ETS entries are moved by 4 bytes
- The 3rd ETS entry is deleted and is no longer available.



Addr.	PII	RN	ETS_US
+0	00000001	8	42219
+4	00000001	7	29616
+8	00000000	6	25205
+12	00000001	5	3150
+16	00000001	4	62384
	00000011	3	57973
	00000000	2	50411
	00000001	1	12602

9.8.6 Diagnostics

Diagnostic data

Since this module does not support any diagnostic interrupt, the diagnostic data give information on this module.

Diagnostics

DS	Data record for access using PROFIBUS and PROFINET Access using DS 0x01. Besides, you can access the first 4 bytes using DS 0x00.
IX	Index for access using CANopen. Access using IX 0x2F01. Besides, you can access the first 4 bytes using IX 0x2F00.
SX	Subindex for access via EtherCAT with index 0x5005 + EtherCAT port.

NOTE

For further information, please refer to the manual of your bus node.

Name	Bytes	Function	Default	DS	IX	SX
ERR_A	1	reserved	0x00	0x01	0x2F01	0x02
MODTYP	1	Module information	0x1F			0x03
ERR_C	1	reserved	0x00			0x04
ERR_D	1	reserved	0x00			0x05
CHTYP	1	Channel type	0x70			0x06
NUMBIT	1	No. of diagnostic bits per channel	0x00			0x07
NUMCH	1	Number of channels of the module	0x04			0x08
CHERR	1	reserved	0x00			0x09
CH0ERR ... CH7ERR	8	reserved	0x00			0x0A ... 0x11
DIAG_US	4	µs ticker	0x00			0x13

MODTYP
Module information

Byte	Bit 7 ... 0	Description
0	Bit 3 ... 0	Module class
		1111b: Digital module
	Bit 4	set in case of ***Channel information available***
	Bit 7 ... 5	reserved

CHTYP
Channel type

Byte	Bit 7 ... 0	Description
0	Bit 6 ... 0	Channel type
		0x70: Digital input
	Bit 7	0 (fixed)

NUMBIT
Diagnostic bits

Byte	Bit 7 ... 0	Description
0		Number of diagnostic bits of the module per channel (here 0x00)

NUMCH
Channels

Byte	Bit 7 ... 0	Description
0		Number of channels of a module (here 0x02)

DIAG_US
µs ticker

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

ERR_A/C/D
CHERR
CHxERR

Byte	Bit 7 ... 0	Description
0		Reserved

9.8.7 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	100 mA
	Power dissipation	0.95 W
Digital inputs		
	Number of inputs	4
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	24 V ⎓
	Current consumption from load voltage L+ (without load)	15 mA
	Nominal value	20.4...28.8 V ⎓
	Input voltage for signal "0"	0...5 V ⎓
	Input voltage for signal "1"	15 ... 28.8 V ⎓
	Signal logic input	P reading
	Input capacitance	-
	Input current for signal "1"	3 mA
	Connection of 2-wire proximity switch possible	Yes
	Max. permitted proximity switch quiescent current	0.5 mA
	Input delay of "0" after "1"	Configurable 2 µs - 3 ms
	Input delay of "1" after "0"	Configurable 2 µs ... 3 ms
	Number of inputs in horizontal installation that can be used simultaneously	4
	Number of inputs in vertical installation that can be used simultaneously	4
	Input characteristic curve	IEC 61131-2, type 1
	Input data size	60 bytes
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	possible
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓
Data sizes		
	Input bytes	20 / 60
	Output bytes	0
	Parameter bytes	12
	Diagnostic bytes	20

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	58 g
	Weight incl. accessories	58 g
	Gross weight	73 g

9.9 Art. no. 57244, DI 4x 24 V DC 3-wire

9.9.1 Features

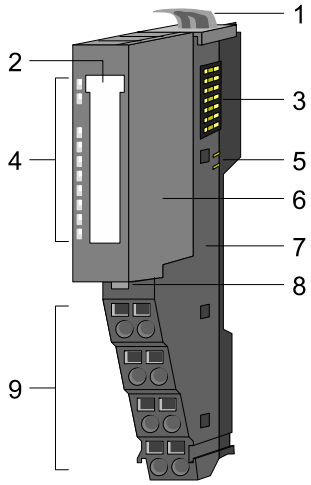
Description

The electronic module records the binary control signals from the process level and transmits them electrically isolated to the superordinate bus system. It has 4 channels which indicate their status by means of LEDs.

Properties

- 4 digital inputs in 3-wire connection, electrically isolated from the backplane bus
- Suitable for switches and proximity switches
- Status indication of the channels by means of LEDs, also with deactivated electronics power supply

9.9.2 Structure

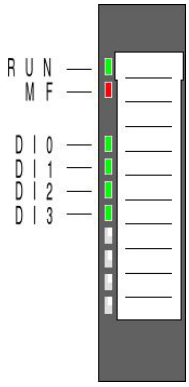


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital input module	57244	Digital input module incl. base DI 4xDC 24V 3-wire

Status indication



RUN
- Off
- On

MF
- Off
- On
- Flashing at 2 Hz

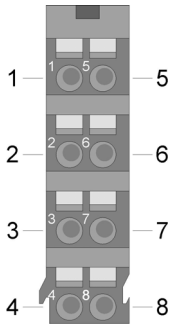
DI x
- Off
- On

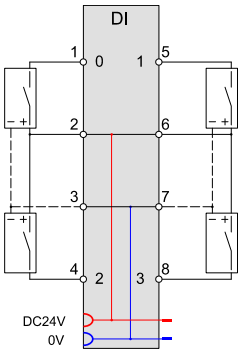
RUN	MF	DI x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error
		X	Bus communication is not possible Module status reports error
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital input has 1 signal
			Digital input has 0 signal
X: not relevant			

Tab. 9-34: Status indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2.





Pos.	Function	Type	Description
1	DI 0	Input	Digital input DI 0
2	24 V DC	Output	24 V DC for encoder
3	0 V	Output	GND
4	DI 2	Input	Digital input DI 2
5	DI 1	Input	Digital input DI 1
6	24 V DC	Output	24 V DC for encoder
7	0 V	Output	GND
8	DI 3	Input	Digital input DI 3

Tab. 9-35: Assignment of connecting terminals

9.9.3 Input/output range

Input range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX = subindex for access via EtherCAT with index 0x6000 + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PII	1	Status of the inputs	0x5000	
			Bit 0: DI 0		0x01
			Bit 1: DI 1		0x02
			Bit 2: DI 2		0x03
			Bit 3: DI 3		0x04
			Bit 7 ... 4: reserved		

Tab. 9-36: Input range

Output range

No bytes reserved for the module in the output range.

9.9.4 Technical Data

Current consumption / power dissipation		
	Current consumption from the backplane bus	65 mA
	Power dissipation	0.6 W

Digital inputs		
	Number of inputs	4
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal value	20.4 ... 28.8 V ⎓
	Input voltage for signal "0"	0...5 V ⎓
	Input voltage for signal "1"	15 ... 28.8 V ⎓
	Signal logic input	P reading
	Input capacitance	-
	Input current for signal "1"	3 mA
	Connection of 2-wire proximity switch possible	Yes
	Max. permitted proximity switch quiescent current	0.5 mA
	Input delay of "0" after "1"	3 ms
	Input delay of "1" after "0"	3 ms
	Number of inputs in horizontal installation that can be used simultaneously	4
	Number of inputs in vertical installation that can be used simultaneously	4
	Input characteristic curve	IEC 61131-2, type 1
	Input data size	4 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓
Data sizes		
	Input bytes	1
	Output bytes	0
	Parameter bytes	0
	Diagnostic bytes	0
Mechanical data	**Housing**	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	57 g
	Weight incl. accessories	57 g
	Gross weight	71 g

9.10 Art. no. 57280, DI 8x 24 V DC

9.10.1 Features

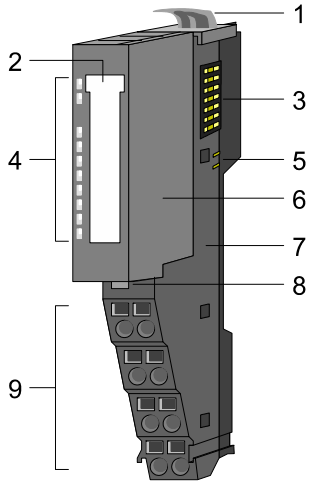
Description

The electronic module records the binary control signals from the process level and transmits them electrically isolated to the superordinate bus system. It has 8 channels which indicate their status by means of LEDs.

Properties

- 8 digital inputs electrically isolated from the backplane bus.
- Suitable for switches and proximity switches
- Status indication of the channels by means of LEDs, also with deactivated electronics power supply

9.10.2 Structure

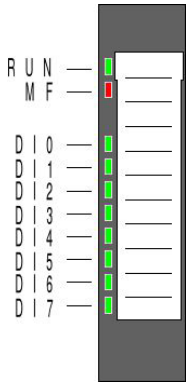


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital input module	57280	Digital input module incl. base DI 8xDC 24V

Status indication



RUN
- Off
- On

MF
- Off
- On
- Flashing at 2 Hz

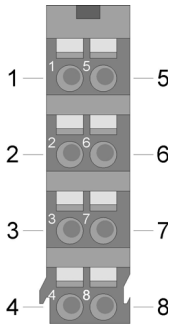
DI x
- Off
- On

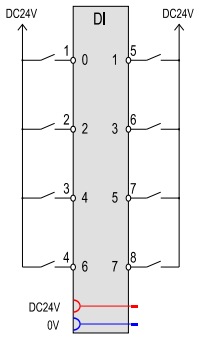
RUN	MF	DI x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error
		X	Bus communication is not possible Module status reports error
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital input has 1 signal
			Digital input has 0 signal
X: not relevant			

Tab. 9-37: Status indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2.





Pos.	Function	Type	Description
1	DI 0	Input	Digital input DI 0
2	DI 2	Input	Digital input DI 2
3	DI 4	Input	Digital input DI 4
4	DI 6	Input	Digital input DI 6
5	DI 1	Input	Digital input DI 1
6	DI 3	Input	Digital input DI 3
7	DI 5	Input	Digital input DI 5
8	DI 7	Input	Digital input DI 7

Tab. 9-38: Assignment of connecting terminals

9.10.3 Input/output range

Input range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX = subindex for access via EtherCAT with index 0x6000 + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PII	1	Status of the inputs	0x6000	
			Bit 0: DI 0		0x01
			Bit 1: DI 1		0x02
			Bit 2: DI 2		0x03
			Bit 3: DI 3		0x04
			Bit 4: DI 4		0x05
			Bit 5: DI 5		0x06
			Bit 6: DI 6		0x07
			Bit 7: DI 7		0x08

Tab. 9-39: Input range

Output range

No bytes reserved for the module in the output range.

9.10.4 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	65 mA
	Power dissipation	0.9 W

Digital inputs		
	Number of inputs	8
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal value	20.4...28.8 V ⎓
	Input voltage for signal "0"	0...5 V ⎓
	Input voltage for signal "1"	15 ... 28.8 V ⎓
	Signal logic input	P reading
	Input capacitance	-
	Input current for signal "1"	3 mA
	Connection of 2-wire proximity switch possible	Yes
	Max. permitted proximity switch quiescent current	0.5 mA
	Input delay of "0" after "1"	3 ms
	Input delay of "1" after "0"	3 ms
	Number of inputs in horizontal installation that can be used simultaneously	8
	Number of inputs in vertical installation that can be used simultaneously	8
	Input characteristic curve	IEC 61131-2, type 1
	Input data size	8 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓
Data sizes		
	Input bytes	1
	Output bytes	0
	Parameter bytes	0
	Diagnostic bytes	0
Mechanical data	**Housing**	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	57 g
	Weight incl. accessories	57 g
	Gross weight	71 g

9.11 Art. no. 57282, DI 8x 24 V DC NPN

9.11.1 Features

Description

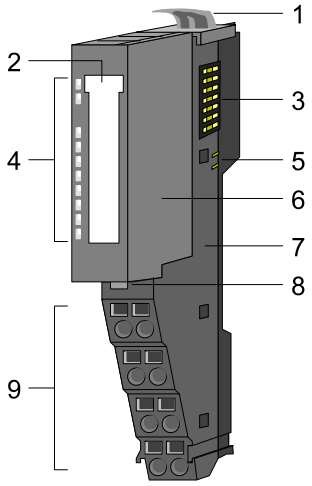
The electronic module records the binary control signals from the process level and transmits them electrically isolated to the superordinate bus system. It has 8 channels which indicate their status by means of LEDs.

An input becomes active as soon as it is connected to ground.

Properties

- 8 digital inputs (M reading), electrically isolated from the backplane bus
- Suitable for switches and proximity switches
- Status indication of the channels by means of LEDs, also with deactivated electronics power supply

9.11.2 Structure

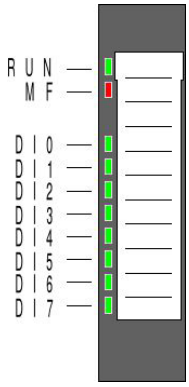


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital input module	57282	Digital input module incl. base DI 8xDC 24V NPN

Status indication



RUN
- Off
- On

MF
- Off
- On
- Flashing at 2 Hz

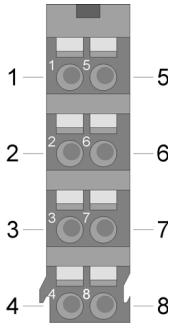
DI x
- Off
- On

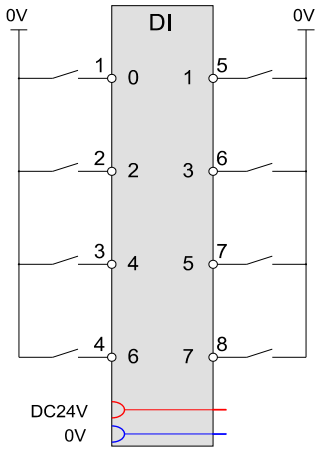
RUN	MF	DI x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error
		X	Bus communication is not possible Module status reports error
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital input has 1 signal
			Digital input has 0 signal
X: not relevant			

Tab. 9-40: Status indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm² to 1.5 mm².





Pos.	Function	Type	Description
1	DI 0	Input	Digital input DI 0
2	DI 2	Input	Digital input DI 2
3	DI 4	Input	Digital input DI 4
4	DI 6	Input	Digital input DI 6
5	DI 1	Input	Digital input DI 1
6	DI 3	Input	Digital input DI 3
7	DI 5	Input	Digital input DI 5
8	DI 7	Input	Digital input DI 7

Tab. 9-41: Assignment of connecting terminals

9.11.3 Input/output range

Input range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX = subindex for access via EtherCAT with index 0x6000 + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PII	1	Status of the inputs	0x6000	
			Bit 0: DI 0		0x01
			Bit 1: DI 1		0x02
			Bit 2: DI 2		0x03
			Bit 3: DI 3		0x04
			Bit 4: DI 4		0x05
			Bit 5: DI 5		0x06
			Bit 6: DI 6		0x07
			Bit 7: DI 7		0x08

Tab. 9-42: Input range

Output range

No bytes reserved for the module in the output range.

9.11.4 Technical Data

Current consumption / power dissipation		
	Current consumption from the backplane bus	65 mA
	Power dissipation	0.9 W
Digital inputs		
	Number of inputs	8
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal value	20.4...28.8 V ⎓
	Input voltage for signal "0"	15 ... 28.8 V ⎓
	Input voltage for signal "1"	0...5 V ⎓
	Signal logic input	M reading
	Input capacitance	-
	Input current for signal "1"	3 mA
	Connection of 2-wire proximity switch possible	Yes
	Max. permitted proximity switch quiescent current	0.5 mA
	Input delay of "0" after "1"	3ms
	Input delay of "1" after "0"	3ms
	Number of inputs in horizontal installation that can be used simultaneously	8
	Number of inputs in vertical installation that can be used simultaneously	8
	Input data size	8 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓
Data sizes		
	Input bytes	1
	Output bytes	0
	Parameter bytes	0
	Diagnostic bytes	0
Mechanical data	**Housing**	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	57 g
	Weight incl. accessories	57 g
	Gross weight	71 g

10 Digital outputs

10.1 Art. no. 57320, DO 2x 24 V DC 0.5 A

10.1.1 Features

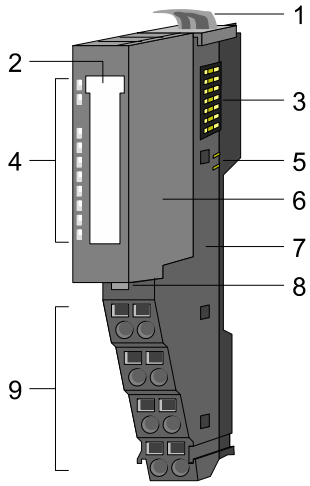
Description

The electronic module records the binary control signals from the superordinate bus system and transmits via the outputs to the process level. It has 2 channels which indicate their status by means of LEDs.

Properties

- 2 digital outputs electrically isolated from the backplane bus
- Status indication of the channels by means of LEDs.

10.1.2 Structure

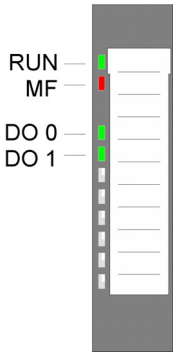


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital output module	57320	Digital output module incl. base DO 2xDC 24V

Status indication

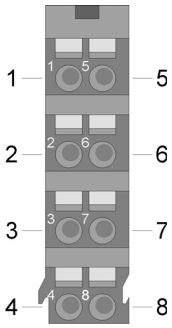


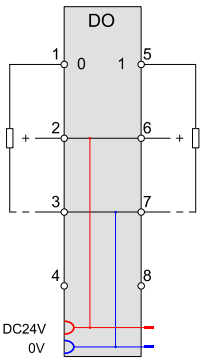
RUN	MF	DO x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error in case of over-load, short circuit or excessive temperature
		X	Bus communication is not possible Module status reports error in case of over-load, short circuit or excessive temperature
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital output has 1 signal
			Digital output has 0 signal
X: not relevant			

Tab. 10-1: State indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2.





Pos.	Function	Type	Description
1	DO 0	Output	Digital output DO 0
2	24 V DC	Output	24 V DC
3	0 V	Output	GND for actuator
4	---	---	not used
5	DO 1	Output	Digital output DO 1
6	24 V DC	Output	24 V DC
7	0 V	Output	GND for actuator
8	---	---	not used

Tab. 10-2: Assignment of connecting terminals

NOTICE

Property damage due to incorrect connection

No voltage may be applied to outputs. The voltage can destroy the module!

➔ Do not supply external voltages to the outputs.

10.1.3 Input/output range

Input range

No bytes reserved for the module in the input range.

Output range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX - subindex for access via EtherCAT with index 7000h + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PIQ	1	Status of the outputs	0x5200	
			Bit 0: DO 0		0x01
			Bit 1: DO 1		0x02
			Bit 7 ... 2: reserved		

Tab. 10-3: Output range

10.1.4 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	70 mA
	Power dissipation	0.4 W

Digital outputs		
	Number of outputs	2
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	20.4 ... 28.8 V ⎓
	Current consumption from load voltage L+ (without load)	5 mA
	Total current for each group, horizontal installation, 40°C	1 A
	Total current for each group, horizontal installation, 60°C	1 A
	Total current for each group, vertical installation	1 A
	Output current with signal "1", nominal value	0.5 A
	Signal logic output	P switching
	Output delay from "0" to "1"	30 µs
	Output delay from "1" to "0"	175 µs
	Lamp load	10 W
	Parallel connection of outputs for the redundant activation	Not possible
	Parallel connection of outputs for the redundant actuation to increase the output capacity	Not possible
	Activating a digital input	Yes
	Switching frequency with resistive load	≤1000 Hz
	Switching frequency with inductive load	≤0.5 Hz
	Switching frequency with lamp load	≤10 Hz
	(Internal) limiting of inductive cut-off voltage	L+ (-45 V)
	Short-circuit protection of the output	Yes, electronically
	Response threshold of the protection	1 A
	Output data size	2 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓
Data sizes		
	Input bytes	0
	Output bytes	1
	Parameter bytes	0
	Diagnosis bytes	0

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	58 g
	Weight incl. accessories	58 g
	Gross weight	72 g

10.2 Art. no. 57322, DO 2x 24 V DC 0.5 A NPN

10.2.1 Features

Description

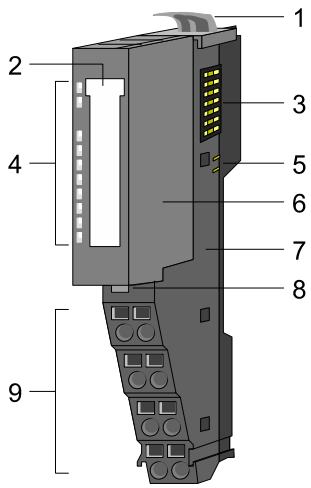
The electronic module records the binary control signals from the parent bus system and transmits them via the outputs to the process level. It has 2 channels working as low-side switch. They indicate their states by means of LEDs.

Low-side switches can be used for switching masses. If there is a short circuit between control line and mass, the load is activated, but the supply voltage is not affected.

Properties

- 2 digital low-side outputs electrically isolated from the backplane bus
- Status indication of the channels by means of LEDs.

10.2.2 Structure

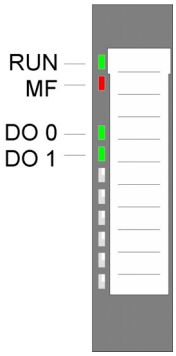


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital output module	57322	Digital output module incl. base DO 2xDC 24V 0.5A NPN

Status indication

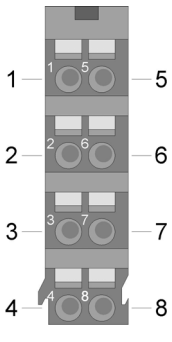


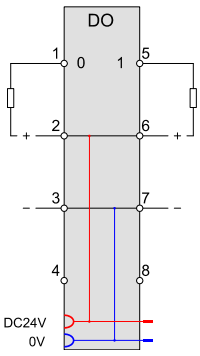
RUN	MF	DO x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error in case of over-load, short circuit or excessive temperature
		X	Bus communication is not possible Module status reports error in case of over-load, short circuit or excessive temperature
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital output has 1 signal
			Digital output has 0 signal
X: not relevant			

Tab. 10-4: State indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2 .





Pos.	Function	Type	Description
1	DO 0	Output	Digital output DO 0
2	24 V DC	Output	24V DC for actuator
3	0 V	Output	GND
4	---	---	not used
5	DO 1	Output	Digital output DO 1
6	24 V DC	Output	24V DC for actuator
7	0 V	Output	GND
8	---	---	not used

Tab. 10-5: Assignment of connecting terminals

NOTICE

Property damage due to incorrect connection

No voltage may be applied to outputs. The voltage can destroy the module!

➔ Do not supply external voltages to the outputs.

10.2.3 Input/output range

Input range

No bytes reserved for the module in the input range.

Output range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX - subindex for access via EtherCAT with index 7000h + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PIQ	1	Status of the outputs	0x5200	
			Bit 0: DO 0		0x01
			Bit 1: DO 1		0x02
			Bit 7 ... 2: reserved		

Tab. 10-6: Output range

10.2.4 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	70 mA
	Power dissipation	0.4 W

Digital outputs		
	Number of outputs	2
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	20.4 ... 28.8 V ⎓
	Current consumption from load voltage L+ (without load)	2.5 mA
	Total current for each group, horizontal installation, 40°C	1 A
	Total current for each group, horizontal installation, 60°C	1 A
	Total current for each group, vertical installation	1 A
	Output current with signal "1", nominal value	0.5 A
	Signal logic output	M switching
	Output delay from "0" to "1"	30 µs
	Output delay from "1" to "0"	100 µs
	Lamp load	10 W
	Parallel connection of outputs for redundant activation	Not possible
	Parallel connection of outputs for the redundant actuation to increase the output capacity	Not possible
	Activating a digital input	Yes
	Switching frequency with resistive load	≤1000 Hz
	Switching frequency with inductive load	≤0.5 Hz
	Switching frequency with lamp load	≤10 Hz
	(Internal) limiting of inductive interrupt voltage	+45 V
	Short-circuit protection of the output	Yes, electronically
	Response threshold of the protection	1.7 A
	Output data size	2 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓
Data sizes		
	Input bytes	0
	Output bytes	1
	Parameter bytes	0
	Diagnosis bytes	0

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	57 g
	Weight incl. accessories	57 g
	Gross weight	71 g

10.3 Art. no. 57323, DO 2x 24 V DC 0.5A Time Stamp ETS

10.3.1 Features

Description

The electronic module records the binary control signals from the parent bus system and transmits them via the outputs to the process level. It has 2 channels working as low-side switch. They indicate their states by means of LEDs.

With the parameterized ETS function (ETS = **e**dge **t**ime **s**tamp), you can transfer 5 (20 bytes) or 15 (60 bytes) states (depending on the parameterization) for the outputs together with a time value of the µs ticker to the FIFO memory as an ETS entry. The FIFO memory provides space for max. 31 ETS entries.

Features

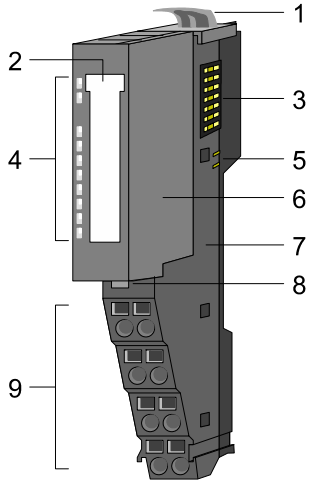
- 2 digital outputs electrically isolated from the backplane bus
- ETS function for 5 or 15 ETS entries (4 bytes each)
- Diagnostic function
- Control by means of process image or handling block
- Status indication of the channels by means of LEDs

NOTE

➔ Operation of ETS modules only makes sense on bus nodes that have an integrated µs ticker!

➔ The Ethernet bus node with Modbus TCP, for example, is not provided with a µs ticker.

10.3.2 Structure

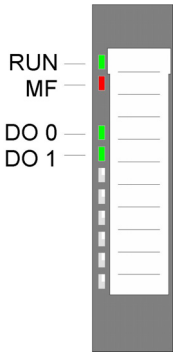


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital output module	57323	Digital output module incl. base DO 2xDC 24V 0.5A ETS

Status indication

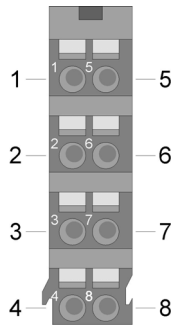


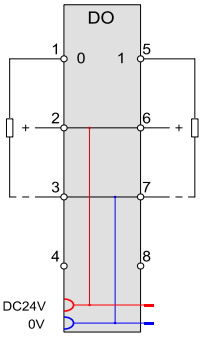
RUN	MF	DO x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error in case of over-load, short circuit or excessive temperature
		X	Bus communication is not possible Module status reports error in case of over-load, short circuit or excessive temperature
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital output has 1 signal
			Digital output has 0 signal
X: not relevant			

Tab. 10-7: State indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2 .





Pos.	Function	Type	Description
1	DO 0	Output	Digital output DO 0
2	24 V DC	Output	24 V DC
3	0 V	Output	GND for actuator
4	---	---	not used
5	DO 1	Output	Digital output DO 1
6	24 V DC	Output	24 V DC
7	0 V	Output	GND for actuator
8	---	---	not used

Tab. 10-8: Assignment of connecting terminals

NOTICE

Property damage due to incorrect connection

No voltage may be applied to outputs. The voltage can destroy the module!

➔ Do not supply external voltages to the outputs.

10.3.3 Input/output range

Input/output range

Use the ETS function (ETS=**e**dge **t**ime **s**tamp) to save a required time value (ETS_US) and the state of the outputs (PIQ) together with a consecutive number (RN) in the process image as an ETS entry.

You can plan the following variants:

- **Cube20S DO2 ETS (20): FIFO with 20 bytes for 5 ETS entries**
- **Cube20S DO2 ETS (60): FIFO with 60 bytes for 15 ETS entries**

NOTE

The full **FIFO memory** does not accept any further ETS entries.

Make sure that the entries will be accepted:

1 | First determine the state of the **FIFO memory** in the input range.

2 | Then transfer the ETS entries via **STS_FIFO**.

Input range 4 bytes

In PROFIBUS and PROFINET, the input range is displayed in the corresponding address range.

IX	Index for access using CANopen.
SX	Subindex for access via EtherCAT with index 0x6000 + EtherCAT slot.

Information on access to the Cube20S is given in the manual of the corresponding bus node.

Addr.	Name	Bytes	Function		IX	SX
+0	RN_LAST	1	Bit 5 ... 0	RN last FIFO entry	0x5440	0x01
			Bit 6	1 (fix)		
			Bit 7	0 (fixed)		
+1	RN_NEXT	1	Bit 5 ... 0	RN next FIFO entry to be processed		0x02
			Bit 6	1 (fix)		
			Bit 7	1 (fix)		
+2	STS_FIFO	1		Status of the FIFO memory		0x03
+3	NUM_ETS	1		Number of the ETS entries in the FIFO memory		0x04

10.3.3.1 ETS assignment in the input range

RN_LAST

Bit 5 ... 0:	Here you will find the last **RN** of the **ETS entry** which has been recognized as valid by the module and then written into the **FIFO memory** of the module.	
Bit 6:	1 (fixed)	Identifies RN_LAST in the process image
Bit 7:	0 (fixed)	Identifies RN_LAST in the process image

RN_NEXT

Bit 5 ... 0:	Here you will find the **RN** of the **ETS entry** which will be processed next in the **FIFO memory** of the module. **Please note** that the bits 6 and 7 are always set in **RN_NEXT**.	
Bit 6:	1 (fixed)	Identifies RN_NEXT in the process image
Bit 7:	1 (fixed)	Identifies RN_NEXT in the process image

STS_FIFO

Here you will find information on the state of the FIFO memory:

STS_FIFO	Description
0x00 / 0x80	Everything is ok. You receive this message directly after saving to the **FIFO memory** of the module.
0x01 / 0x81	There is no subsequent **ETS entry** in the **FIFO** available. The **RN** does not correspond to the expected **RN**. Check your **RN** in the output range.
0x02 / 0x82	There are no new **ETS entries** available in the **FIFO**.
0x03 / 0x83	FIFO memory is full. No further ETS entries can be accepted.

- If less **ETS entries** are written than possible, then you must set Bit 6 of the **RN** for the last **ETS entry**.

  This is necessary to avoid that the following entries are **invalid**.
- The module ignores all **ETS entries** after an entry with the set **Bit 6.**
- If there is an **ETS entry** with an **RN** with set **Bit 6 in the FIFO memory**, **STS_FIFO** is also returned with a logical OR connection with **0x80**.

NUM_ETS

Here you will always find the current number of the **ETS entries** in the **FIFO memory** of the module.

10.3.3.2 Structure of an ETS entry

Structure of an ETS entry

Depending on the planned variant, 5 or 15 ETS entries can be written using the output range. For this purpose, 4 bytes are provided for each ETS entry in the process image:

Addr.	Name	Bytes	Function	IX	SX
+0	PIQ	1	Output byte	0x5640/s	0x01
+1	RN	1	Consecutive number		0x02
+2	ETS_US	2	µs ticker		0x03

PIQ

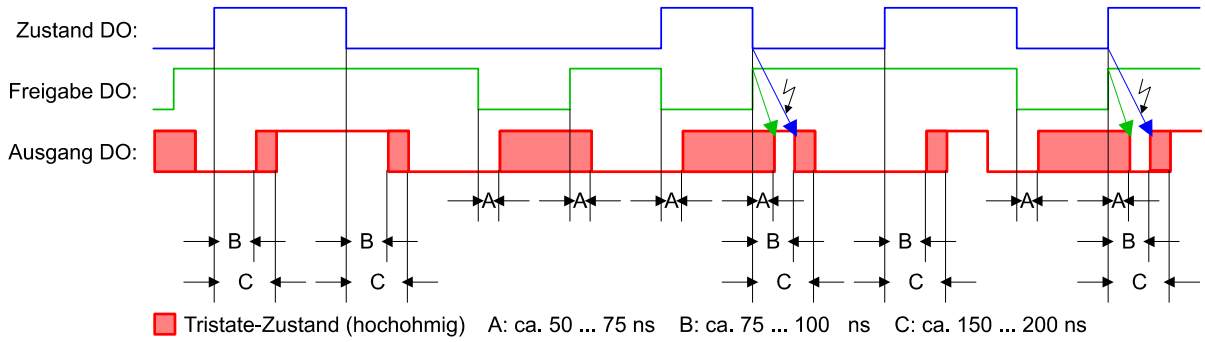
Here you can define the state of the outputs at the required time and disable or enable the corresponding output channel.

The output byte has the following bit assignment:

Byte	Bit	Description	
0	3 ... 0	Fixed	
	4	Enable of DO 1	
	5	Enable of DO 0	
		0	Lock
		1	Enable
	6	Status DO 1	
	7	Status DO 0	

Chronological behavior of the output

The simultaneous release and enabling and disabling of an output should be avoided. Due to different runtimes (see times A, B and C) until states change, there might be undesired switching operations. The following figure shows the chronological behavior of an output if the enable bit is used.



RN

- The RN (**R**unning **N**umber) is a consecutive number from 0 ... 63, which starts with 1.
- Using the RN, you determine the chronological sequence of the ETS entries.
- RN has to be incremented for each ETS entry, otherwise, the ETS entry is not recognized by the module.

Note!

➔ If less ETS entries are written than possible, then you must set Bit 6 of the RN for the last ETS entry.

➔ This is necessary to avoid that the following entries are "invalid".

➔ The module ignores all ETS entries after an entry with the set Bit 6.

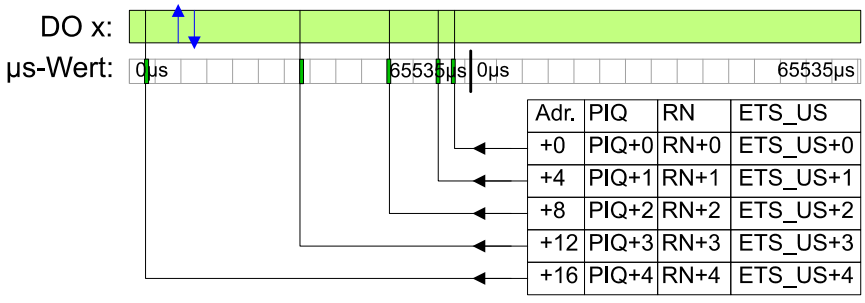
ETS_US

- The Cube20S module has a 32-bit timer (µs ticker), which is started with PowerON and starts again after 2^{32}-1 µs with 0.
- To specify ETS_US, define a time value for your ETS entry from the low word of the µs ticker (**0 ... 65535 µs**).

➔ Specify here a time value in µs by which the status of the outputs has to be accepted. (**Value range: 0 ... 65535**)

ETS functionality

- Below you can see how to save the ETS entries in the output range in such a way that they can be accepted in the FIFO memory.



Adr.	PIQ	RN	ETS_US
+0	PIQ+0	RN+0	ETS_US+0
+4	PIQ+1	RN+1	ETS_US+1
+8	PIQ+2	RN+2	ETS_US+2
+12	PIQ+3	RN+3	ETS_US+3
+16	PIQ+4	RN+4	ETS_US+4

10.3.3.3 ETS assignment in the output range

Output range 20 bytes or 60 bytes

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

IX Index for access using CANopen.
Use s = subindex to address the corresponding ETS entry.

SX SX = Subindex for access via EtherCAT.
Subindex for access via EtherCAT with index 0x7000 + EtherCAT port.

Information on accessing the Cube20S is given in the manual of the corresponding bus node.

Engineering as Art.-No. 57323

DO 2 x 24 V DC (20) 20 bytes - 5 ETS entries

Addr.	PII	IX= 0x5640	SX
+0	PIQ+0	s=1	0x01
+4	PIQ+1	s=2	0x04
+8	PIQ+2	s=3	0x07
+12	PIQ+3	s=4	0x0A
+16	PIQ+4	s=5	0x0D

Addr.	RN	IX= 0x5640	SX
+1	RN+0	s=1	0x02
+5	RN+1	s=2	0x05
+9	RN+2	s=3	0x08
+13	RN+3	s=4	0x0B
+17	RN+4	s=5	0x0E

Addr.	ETS-US	IX= 0x5640	SX
+2	ETS_US+0	s=1	0x03
+6	ETS_US+1	s=2	0x06
+10	ETS_US+2	s=3	0x09
+14	ETS_US+3	s=4	0x0C
+18	ETS_US+4	s=5	0x0F

Engineering as Art.-No. 57323

DO 2 x 24 V DC (60) 60 bytes - 15 ETS entries

Addr	PII	IX= 0x5640	SX
+0	PIQ+0	s=1	0x01
+4	PIQ+1	s=2	0x04
+8	PIQ+2	s=3	0x07
+12	PIQ+3	s=4	0x0A
+16	PIQ+4	s=5	0x0D
+20	PIQ+5	s=6	0x10
+24	PIQ+6	s=7	0x13
+28	PIQ+7	s=8	0x16
+32	PIQ+8	s=9	0x19
+36	PIQ+9	s=10	0x1C
+40	PIQ+10	s=11	0x1F
+44	PIQ+11	s=12	0x22
+48	PIQ+12	s=13	0x25
+52	PIQ+13	s=14	0x28
+56	PIQ+14	s=15	0x2B

Addr	RN	IX= 0x5640	SX
+1	RN+0	s=1	0x02
+5	RN+1	s=2	0x05
+9	RN+2	s=3	0x08
+13	RN+3	s=4	0x0B
+17	RN+4	s=5	0x0E
+21	RN+5	s=6	0x11
+25	RN+6	s=7	0x14
+29	RN+7	s=8	0x17
+33	RN+8	s=9	0x1A
+37	RN+9	s=10	0x1D
+41	RN+10	s=11	0x20
+45	RN+11	s=12	0x23
+49	RN+12	s=13	0x26
+53	RN+13	s=14	0x29
+57	RN+14	s=15	0x2C

Addr.	ETS-US	IX= 0x5640	SX
+2	ETS_US+0	s=1	0x03
+6	ETS_US+1	s=2	0x06
+10	ETS_US+2	s=3	0x09
+14	ETS_US+3	s=4	0x0C
+18	ETS_US+4	s=5	0x0F
+22	ETS_US+5	s=6	0x12
+26	ETS_US+6	s=7	0x15
+30	ETS_US+7	s=8	0x18
+34	ETS_US+8	s=9	0x1B
+38	ETS_US+9	s=10	0x1E
+42	ETS_US+10	s=11	0x21
+46	ETS_US+11	s=12	0x24
+50	ETS_US+12	s=13	0x27
+54	ETS_US+13	s=14	0x2A
+58	ETS_US+14	s=15	0x2D

10.3.4 Parameter data

Parameterization data

The module provides the following parameterization data which are permanently set and cannot be changed.

DS	Data record for access using PROFIBUS and PROFINET
IX	Index for access using CANopen
SX	Subindex for access via EtherCAT with index 0x3100 + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Name	Bytes	Function	Default	DS	IX	SX
PII_L	1	Length of the process image input data [a]	0x04 (fixed)	0x02	0x3100	0x01
PIQ_L	1	Length of the process image output data [bc]	0x14 or 0x3C (fixed)	0x02	0x3101	0x02

a. You are only allowed to transmit this data record in the STOP state.

b. You are only allowed to transmit this data record in the STOP state.

c. This parameter depends on the planned variant.

PII_L

Byte	Bit 7 ... 0	Description
0		The length for the process image of the input data is set fixedly to 4 bytes.

PIQ_L

Byte	Bit 7 ... 0	Description
0		The length for the process image is set fixedly to the length of the planned variant (0x14 or 0x3C).

10.3.5 Example

Example of Mode of operation

Below an example of the sequence in which the ETS entries are saved.

This example refers to a module, which uses 20 bytes for 5 ETS entries in the output range PIQ.

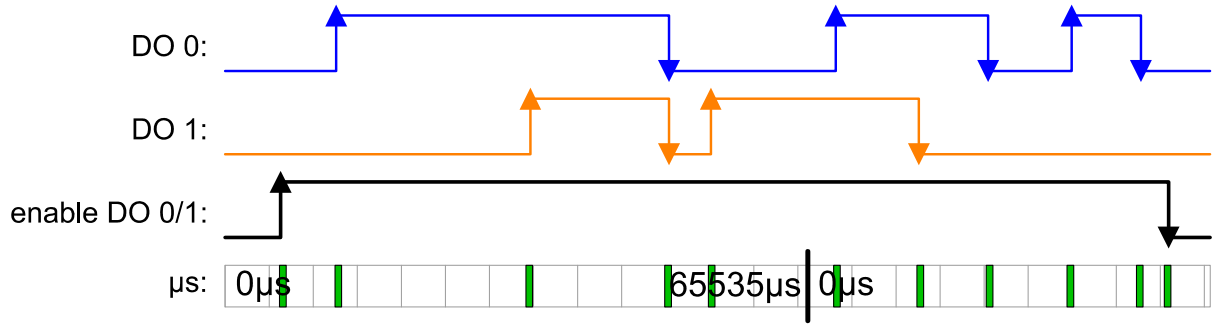
ETS values

- At the following times of the µs ticker, the outputs should enter the following states

RN	ETS_US in µs	PIQ DO 0 (Bit 7)	PIQ DO 1 (Bit 6)	PIQ release DO 0 (Bit 5)	PIQ release DO 0 (Bit 4)
0x01	6000	0	0	1	1
0x02	12506	1	0	1	1
0x03	34518	1	1	1	1
0x04	49526	0	0	1	1
0x05	54529	0	1	1	1
0x06	3500	1	1	1	1
0x07	12443	1	0	1	1
0x08	20185	0	0	1	1
0x09	30140	1	0	1	1
0x0A	37330	0	0	1	1
0x0B	40000	0	0	0	0

Time diagram

The following time diagram results from the table.



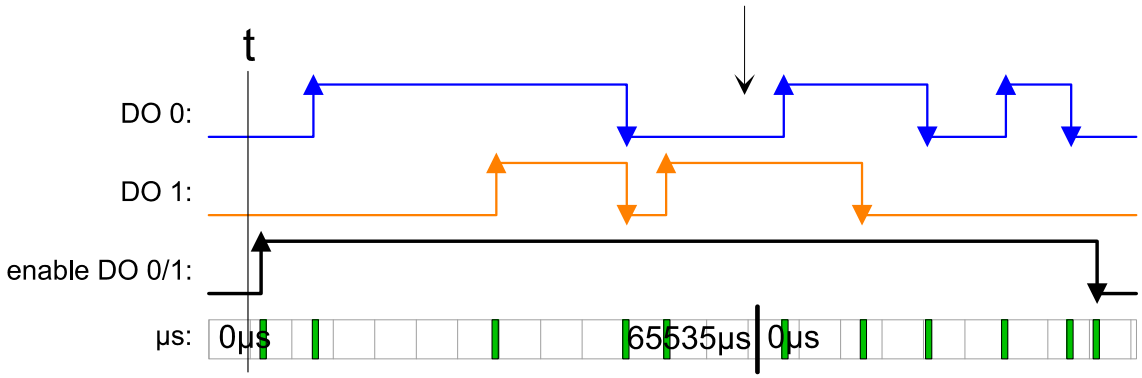
5 ETS entries Writing

- After writing 5 ETS entries in the process output data, they are transferred directly to the FIFO memory of the module.
- The diagram shows the states of the outputs at the time **"t"**.
- The status bytes are listed in PII.

Addr.	PIQ	RN	ETS_US
+0	00110000	0x01	6000
+4	10110000	0x02	12506
+8	11110000	0x03	34518
+12	00110000	0x04	49526
+16	01110000	0x05	54529

→

FIFO	PIQ	RN	ETS_US	PII
1	00110000	0x01	6000	RN_LAST: 0x45
2	10110000	0x02	12506	RN_NEXT: 0xC1
3	11110000	0x03	34518	STS_FIFO: 0x00
4	00110000	0x04	49526	NUM_ETS: 0x05
5	01110000	0x05	54529	
6	00000000	0x00	0	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



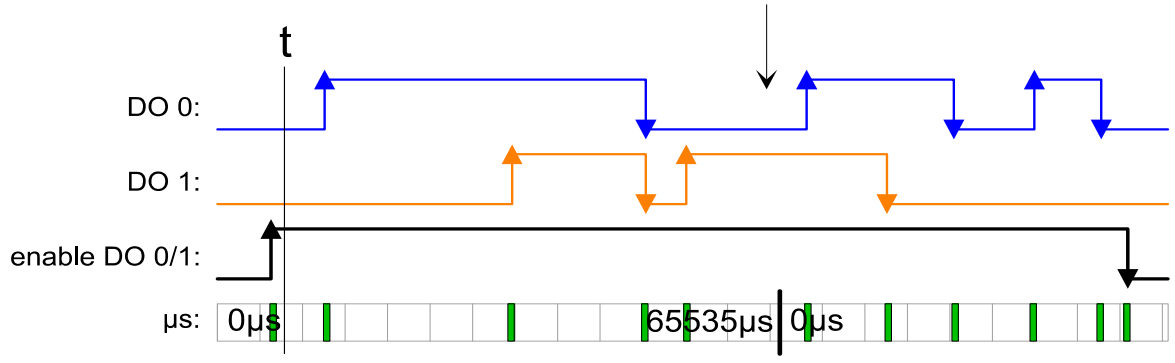
Executing the ETS function
Executing RN = 0x01

- To control the outputs, they have to be enabled first.
- In this example, the 1st RN enables the outputs.
- The ETS entry (RN = 0x01) is executed and deleted from FIFO.

Addr.	PIQ	RN	ETS_US
+0	00110000	0x01	6000
+4	10110000	0x02	12506
+8	11110000	0x03	34518
+12	00110000	0x04	49526
+16	01110000	0x05	54529

→

FIFO	PIQ	RN	ETS_US	PII
1	10110000	0x02	12506	RN_LAST: 0x45
2	11110000	0x03	34518	RN_NEXT: 0xC2
3	00110000	0x04	49526	STS_FIFO: 0x00 / 0x02
4	01110000	0x05	54529	NUM_ETS: 0x04
5	00000000	0x00	0	
6	00000000	0x00	0	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



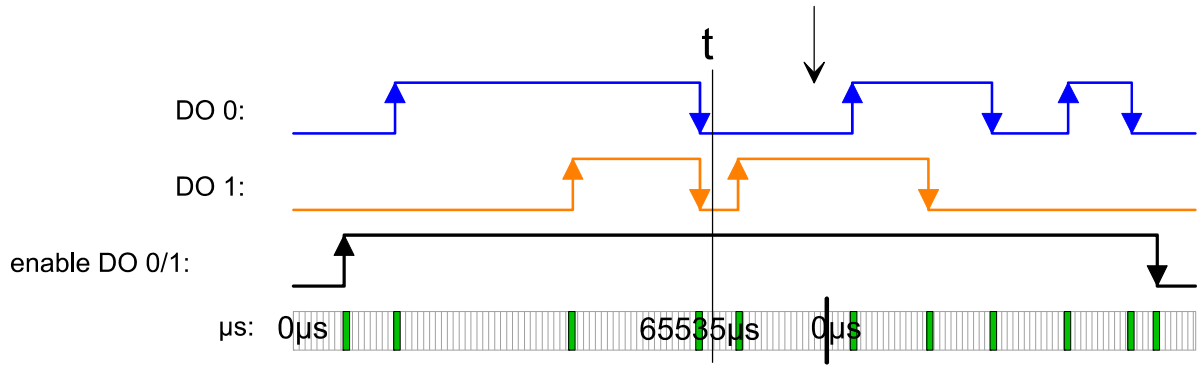
Executing the ETS function
RN = 0x02 ... 0x04

- The states of RN = 0x02 ... RN 0x04 will be output one after the other and deleted from FIFO.

Addr.	PIQ	RN	ETS_US
+0	00110000	0x01	6000
+4	10110000	0x02	12506
+8	11110000	0x03	34518
+12	00110000	0x04	49526
+16	01110000	0x05	54529

→

FIFO	PIQ	RN	ETS_US	PII
1	01110000	0x05	54529	RN_LAST: 0x45
2	00000000	0x00	0	RN_NEXT: 0xC5
3	00000000	0x00	0	STS_FIFO: 0x00 / 0x02
4	00000000	0x00	0	NUM_ETS: 0x01
5	00000000	0x00	0	
6	00000000	0x00	0	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



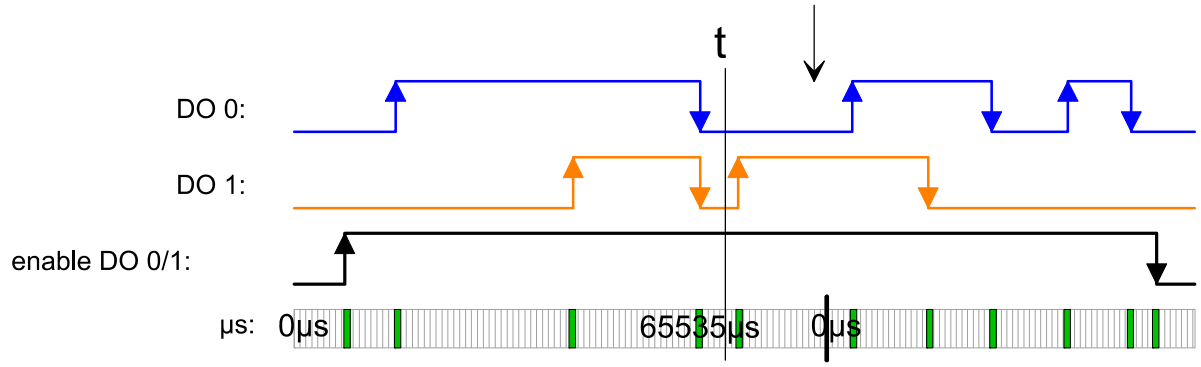
5 ETS entries Writing

After writing the next 5 ETS entries in the process output data, they are transferred directly to the FIFO memory of the module.

Addr.	PIQ	RN	ETS_US
+0	11110000	0x06	3500
+4	10110000	0x07	12443
+8	00110000	0x08	20185
+12	00110000	0x09	30140
+16	00110000	0x0A	37330

→

FIFO	PIQ	RN	ETS_US	PII
1	01110000	0x05	54529	RN_LAST: 0x4A
2	11110000	0x06	3500	RN_NEXT: 0xC5
3	10110000	0x07	12443	STS_FIFO: 0x00 / 0x02
4	00110000	0x08	20185	NUM_ETS: 0x06
5	10110000	0x09	30140	
6	00110000	0x0A	37330	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



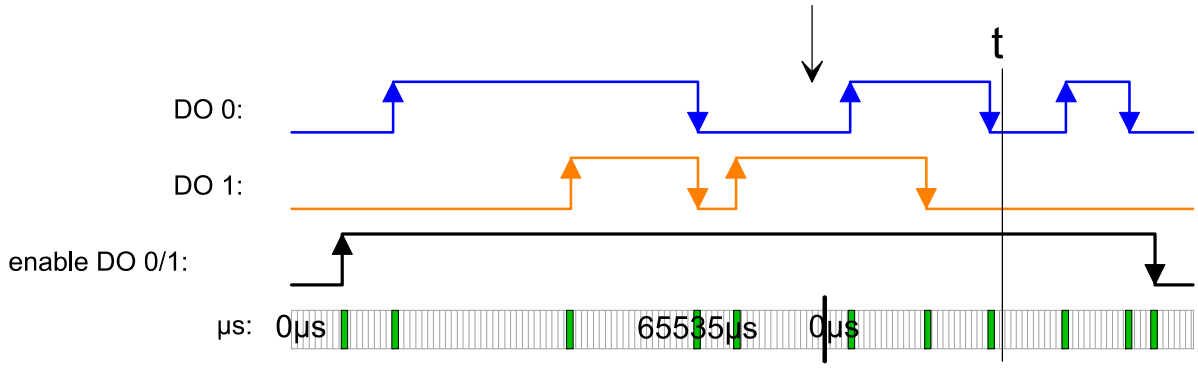
Executing the ETS function
RN = 0x06 ... 0x08

- The states of RN = 0x06 ... RN 0x08 will be output one after the other and deleted from FIFO.

Addr.	PIQ	RN	ETS_US
+0	11110000	0x06	3500
+4	10110000	0x07	12443
+8	00110000	0x08	20185
+12	10110000	0x09	30140
+16	00110000	0x0A	37330

→

FIFO	PIQ	RN	ETS_US	PII
1	10110000	0x09	30140	RN_LAST: 0x4A
2	00110000	0x0A	37330	RN_NEXT: 0xC5
3	00000000	0x00	0	STS_FIFO: 0x00 / 0x02
4	00000000	0x00	0	NUM_ETS: 0x02
5	00000000	0x00	0	
6	00000000	0x00	0	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



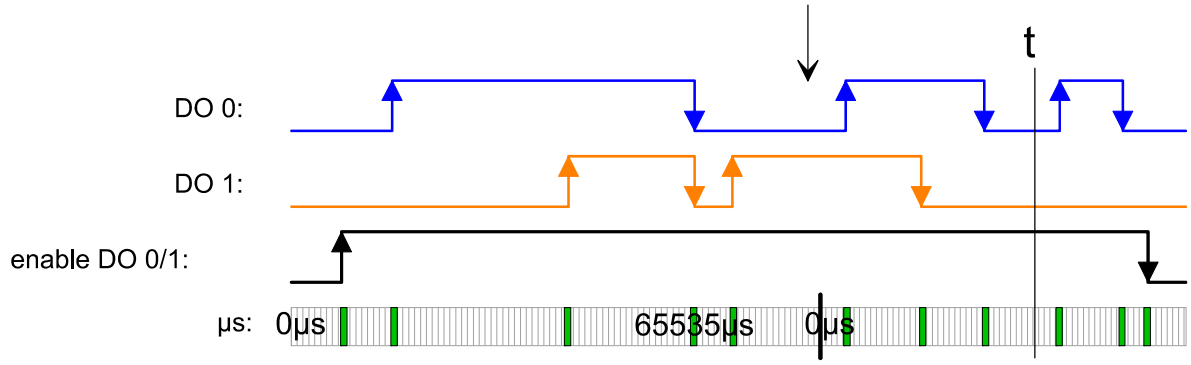
Last ETS entry Writing

- Since less than 5 ETS entries are written, then you must set Bit 6 of the RN for the last ETS entry. RN = 0x0B becomes 0x4B.

Addr.	PIQ	RN	ETS_US
+0	00000000	0x4B	40000
+4	**10110000**	**0x07**	**12443**
+8	**00110000**	**0x08**	**20185**
+12	**10110000**	**0x09**	**30140**
+16	**00110000**	**0x0A**	**37330**

→

FIFO	PIQ	RN	ETS_US	PII
1	10110000	0x09	30140	RN_LAST: 0x4B
2	00110000	0x0A	37330	RN_NEXT: 0xC9
3	00000000	**0x4B**	40000	STS_FIFO: 0x80 / 0x82
4	00000000	0x00	0	NUM_ETS: 0x03
5	00000000	0x00	0	
6	00000000	0x00	0	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	

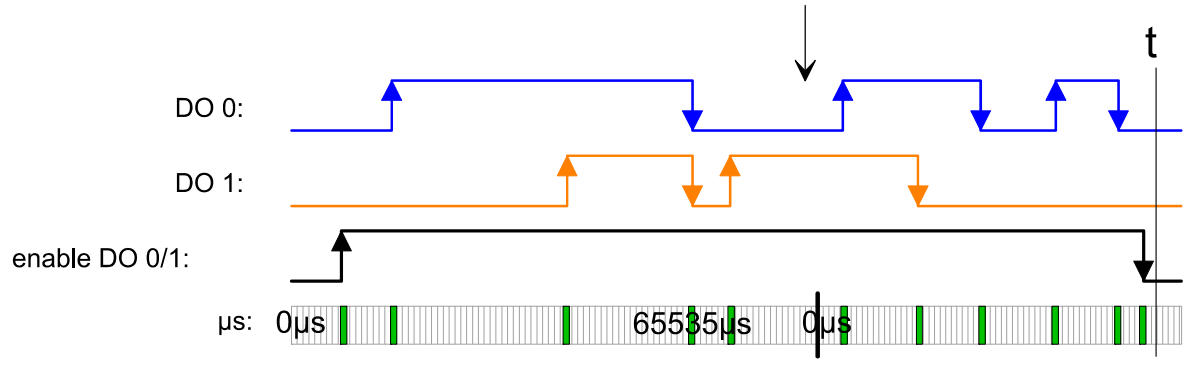


Executing the ETS function
RN = 0x09 ... 0x4B

- The states of RN = 0x09 ... RN 0x4B will be output one after the other and deleted from FIFO.

Addr.	PIQ	RN	ETS_US
+0	00000000	0x4B	40000
+4	**10110000**	**0x07**	**12443**
+8	**00110000**	**0x08**	**20185**
+12	**10110000**	**0x09**	**30140**
+16	**00110000**	**0x0A**	**37330**

FIFO	PIQ	RN	ETS_US	PII
1	00000000	0x00	0	RN_LAST: 0x4B
2	00000000	0x00	0	RN_NEXT: 0xCC
3	00000000	0x00	0	STS_FIFO: 0x80 / 0x82
4	00000000	0x00	0	NUM_ETS: 0x00
5	00000000	0x00	0	
6	00000000	0x00	0	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



10.3.6 Diagnostics

Diagnostic data

Since this module does not support any diagnostic interrupt, the diagnostic data give information on this module.

Diagnosis

DS Data record for access using PROFIBUS and PROFINET
Access using DS 0x01.
Besides, you can access the first 4 bytes using DS 0x00.

IX Index for access using CANopen.
Access using IX 0x2F01.
Besides, you can access the first 4 bytes using IX 0x2F00.

SX Subindex for access via EtherCAT with index 0x5005 + EtherCAT slot.

Information on access to the Cube20S is given in the manual of the corresponding bus node.

Name	Bytes	Function	Default	DS	IX	SX
ERR_A	1	reserved	0x00	0x01	0x2F01	0x02
MODTYP	1	Module information	0x1F			0x03
ERR_C	1	reserved	0x00			0x04
ERR_D	1	reserved	0x00			0x05
CHTYP	1	Channel type	0x72			0x06
NUMBIT	1	No. of diagnostic bits per channel	0x00			0x07
NUMCH	1	Number of channels of the module	0x02			0x08
CHERR	1	reserved	0x00			0x09
CH0ERR ... CH7ERR	8	reserved	0x00			0x0A ... 0x11
DIAG_US	4	µ ticker (32 bits)	0x00			0x12

MODTYP
Module information

Byte	Bit 7 ... 0	Description	
0	Bit 3 ... 0	Module class	
		1111b	Digital module
	Bit 4	set in case of ***Channel information available***	
	Bit 7 ... 5	reserved	

CHTYP
Channel type

Byte	Bit 7 ... 0	Description	
0	Bit 6 ... 0	Channel type	
		0x72	Digital output
	Bit 7	0 (fixed)	

NUMBIT
Diagnostic bits

Byte	Bit 7 ... 0	Description
0		Number of diagnostic bits of the module per channel (here 0x00)

NUMCH
Channels

Byte	Bit 7 ... 0	Description
0		Number of channels of a module (here 0x02)

DIAG_US
µs ticker

Byte	Bit 7 ... 0	Description
0 ... 3	7 ... 0	Value of the µs ticker when generating diagnostic data

Tab. 10-9: µs ticker

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.

ERR_A/C/D
CHERR
CHxERR

Byte	Bit 7 ... 0	Description
0		Reserved

10.3.7 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	105 mA
	Power dissipation	0.95 W
Digital outputs		
	Number of outputs	2
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	20.4 ... 28.8 V ⎓
	Current consumption from load voltage L+ (without load)	15 mA
	Total current for each group, horizontal installation, 40°C	1 A
	Total current for each group, horizontal installation, 60°C	1 A
	Total current for each group, vertical installation	1 A
	Output current with signal "1", nominal value	0.5 A
	Output delay from "0" to "1"	≤100 ns
	Signal logic output	P switching
	Output delay from "1" to "0"	≤100 ns
	Lamp load	10 W
	Parallel connection of outputs for redundant activation	Not possible
	Parallel connection of outputs for the redundant actuation to increase the output capacity	Not possible
	Activating a digital input	Yes
	Switching frequency with resistive load	≤40 kHz
	Switching frequency with inductive load	≤40 kHz
	Switching frequency with lamp load	≤40 kHz
	(Internal) limiting of inductive cut-off voltage	L+ (-52 V)
	Short-circuit protection of the output	Yes, electronically; only high side
	Response threshold of the protection	2.5 A
	Output data size	60 bytes
Status, interrupt, diagnoses		
	Status indication	Green LED per channel
	Interrupts	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnosis information readable	Possible
	Module status	Green LED
	Module error indication	Red LED
	Channel error indication	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓

Data sizes		
	Input bytes	4
	Output bytes	20 / 60
	Parameter bytes	6
	Diagnostic bytes	20

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	61 g
	Weight incl. accessories	61 g
	Gross weight	75 g

10.4 Art. no. 57325, DO 2x 24 V DC 2 A

10.4.1 Features

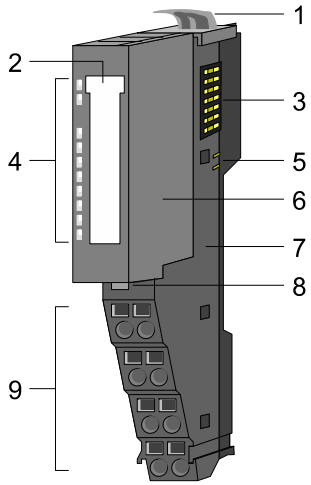
Description

The electronic module records the binary control signals from the superordinate bus system and transmits via the outputs to the process level. It has 2 channels which indicate their status by means of LEDs.

Properties

- 2 digital outputs electrically isolated from the backplane bus
- Status indication of the channels by means of LEDs.

10.4.2 Structure

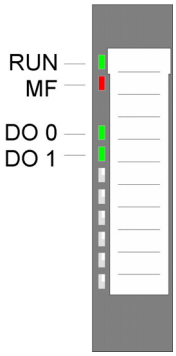


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital output module	57325	Digital output module incl. base DO 2xDC 24V 2A

Status indication

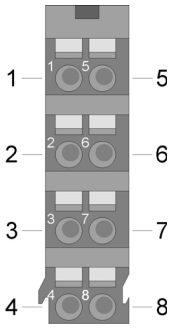


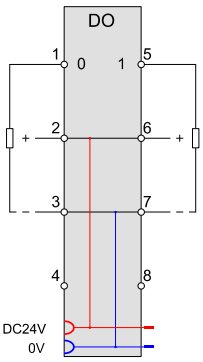
RUN	MF	DO x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error in case of over-load, short circuit or excessive temperature
		X	Bus communication is not possible Module status reports error in case of over-load, short circuit or excessive temperature
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital output has 1 signal
			Digital output has 0 signal
X: not relevant			

Tab. 10-10: State indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2.





Pos.	Function	Type	Description
1	DO 0	Output	Digital output DO 0
2	24 V DC	Output	24 V DC
3	0 V	Output	GND for actuator
4	---	---	not used
5	DO 1	Output	Digital output DO 1
6	24 V DC	Output	24 V DC
7	0 V	Output	GND for actuator
8	---	---	not used

Tab. 10-11: Assignment of connecting terminals

NOTICE

Property damage due to incorrect connection

No voltage may be applied to outputs. The voltage can destroy the module!

➔ Do not supply external voltages to the outputs.

10.4.3 Input/output range

Input range

No bytes reserved for the module in the input range.

Output range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX - subindex for access via EtherCAT with index 7000h + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PIQ	1	Status of the outputs	0x5200	
			Bit 0: DO 0		0x01
			Bit 1: DO 1		0x02
			Bit 7 ... 2: reserved		

Tab. 10-12: Output range

10.4.4 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	70 mA
	Power dissipation	0.55 W

Digital outputs		
	Number of outputs	2
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	20.4 ... 28.8 V ⎓
	Current consumption from load voltage L+ (without load)	10 mA
	Total current for each group, horizontal installation, 40°C	4 A
	Total current for each group, horizontal installation, 60°C	4 A
	Total current for each group, vertical installation	4 A
	Output current with signal "1", nominal value	2 A
	Signal logic output	P switching
	Output delay from "0" to "1"	100 µs
	Output delay from "1" to "0"	250 µs
	Lamp load	10 W
	Parallel connection of outputs for redundant activation	Not possible
	Parallel connection of outputs for the redundant actuation to increase the output capacity	Not possible
	Activating a digital input	Yes
	Switching frequency with resistive load	≤1000 Hz
	Switching frequency with inductive load	≤0.5 Hz
	Switching frequency with lamp load	≤10 Hz
	(Internal) limiting of inductive interrupt voltage	L+ (-52 V)
	Short-circuit protection of the output	Yes, electronically
	Response threshold of the protection	2.7 A
	Output data size	2 bits

Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None

Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓

Data sizes		
	Input bytes	0
	Output bytes	1
	Parameter bytes	0
	Diagnosis bytes	0

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	57 g
	Weight incl. accessories	57 g
	Gross weight	71 g

10.5 Art. no. 57326, DO 2x 24 V DC 0.5 A PWM

10.5.1 Features

Description

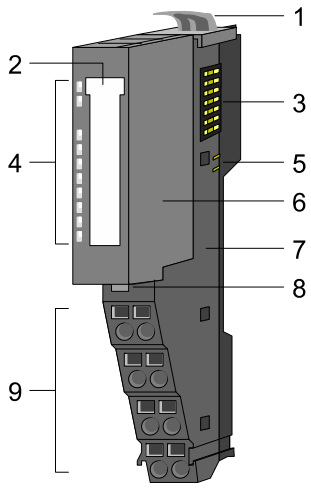
The electronic module has 2 output channels with PWM function (PWM = **P**ulse **W**idth **M**odulation).

Specification of time parameters can be used to output a pulse sequence with the required pulse/pause ratio at the corresponding output channel.

Features

- 2 digital PWM outputs electrically isolated from the backplane bus.
- PWM outputs can be switched between **push/pull** and **high side**
- Diagnostic function
- Status indication of the channels by means of LEDs.
- PWM status
- Variable period duration and duty cycle

10.5.2 Structure

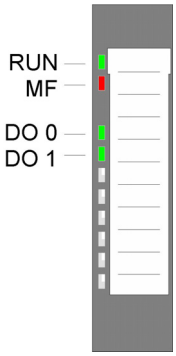


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital output module	57326	Digital output module incl. base DO 2xDC 24V 0.5A PWM

Status indication

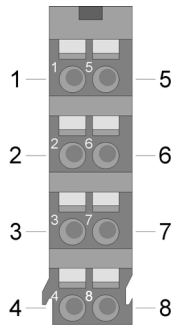


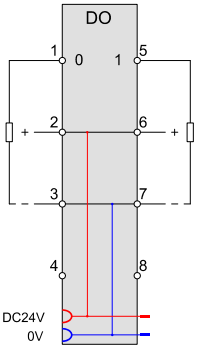
RUN	MF	DO x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error in case of over-load, short circuit or excessive temperature
		X	Bus communication is not possible Module status reports error in case of over-load, short circuit or excessive temperature
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital output has 1 signal
			Digital output has 0 signal
X: not relevant			

Tab. 10-13: State indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2 .





Pos.	Function	Type	Description
1	DO 0	Output	Digital PWM output DO 0
2	24 V DC	Output	24 V DC
3	0 V	Output	GND for actuator
4	---	---	not used
5	DO 1	Output	Digital PWM output DO 1
6	24 V DC	Output	24 V DC
7	0 V	Output	GND for actuator
8	---	---	not used

Tab. 10-14: Assignment of connecting terminals

NOTICE

Property damage due to incorrect connection

No voltage may be applied to outputs. The voltage can destroy the module!

➔ Do not supply external voltages to the outputs.

10.5.3 Input/output range

Input/output range

The following input/output ranges are reserved for the module

Input range 4 Bytes

In PROFIBUS and PROFINET, the input range is displayed in the corresponding address range.

IX Index for access using CANopen,
With s = Subindex, depending on the number of the PWM modules..

SX Subindex for access via EtherCAT with index 0x6000 + EtherCAT slot.

Information on access to the Cube20S is given in the manual of the corresponding bus node.

Addr.	Name	Bytes	Function		IX	SX
+0	PWMSTS_I	2	PWM 0	Status	0x5420/s	0x01
+2	PWMSTS_II	2	PWM 1	Status	0x5420/s+1	0x02

PWM status x

Bit	Name	Function	
0	---	reserved	
1	STS_PWM	PWM status	
		0	PWM output stopped
		1	PWM output active
2	STS_OUTBV	Status output	
		0	Push/Pull output
		1	High-side output
3 ...15	STS_FIFO	reserved	

Output range 12 Byte

In PROFIBUS and PROFINET, the input range is displayed in the corresponding address range.

IX Index for access using CANopen,
With s = Subindex, depending on the number of the PWM modules..

SX Subindex for access via EtherCAT with index 0x7000 + EtherCAT slot.

Information on access to the Cube20S is given in the manual of the corresponding bus node.

Output range 12 Bytes

Addr.	Name	Bytes	PWM function		IX	SX
+0	PWMPD_I	4	0	Pulse duration	0x5620/s	0x01
+4	PWMPD_II	4	1		0x5620/s+1	0x02
+8	PWMCTRL_I	2	0	Control word	0x5621/s	0x03
+10	PWMCTRL_II	2	1		0x5621/s+1	0x04

PWMPD_I
PWMPD_II
Pulse duration

- Determine the duty cycle for the parameterized period duration here
- by specifying the duration for the high level for the corresponding PWM channel.
- The pulse duration has to be selected as a factor to the base 20.83 ns.

  Value range: **48 ... 8388607** (1 µs ... approx. 175 ms)

PWMCTRL_I
PWMCTRL_II
Control word

Here you can specify the PWM output characteristics for the corresponding channel and start or stop the PWM output.

Bit	Name	Function	
0 ... 1	---	reserved	
2	CTRL_OUTBV	PWM output characteristics	
		0	Push/Pull output
		1	High-side output
		In the ***Push/Pull mode*** it is possible to switch to high level and low level actively.	
		In the ***High-side mode*** the active switching is performed only to high level.	
3 ... 7	---	reserved	
8	CTRL_STRT	Edge 0-1 starts PWM output at channel x	
9	CTRL_STP	Edge 0-1 stops PWM output at channel x	
10 ... 15	---	reserved	

10.5.4 Parameter data

Parameterization data

DS Data record for access using PROFIBUS and PROFINET

IX Index for access using CANopen

SX Subindex for access via EtherCAT with index 0x3100 + EtherCAT port

Information on accessing the Cube20S is given in the manual of the corresponding bus node.

Name	Bytes	PWM function		Default	DS	IX	SX
PWMPD_I	4	0	PWM 0/1: Period duration	0x1F40	0x80	0x3100 ... 0x3103	0x01
PWMPD_II	4	1	(Basic time: 20.83 ns)	0x1F40	0x81	0x3104 ... 0x3107	0x02

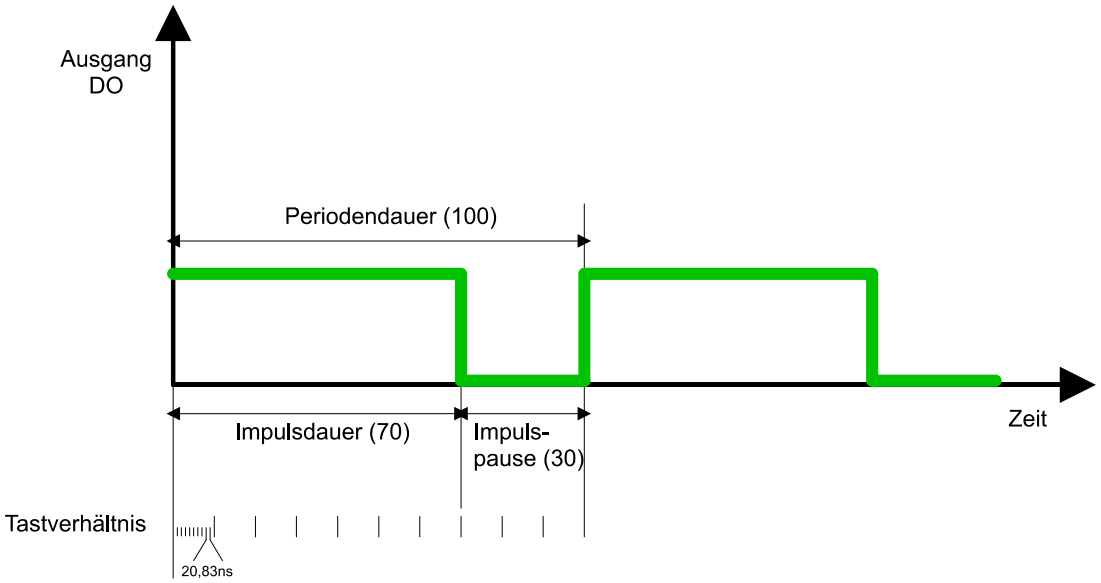
PWMPD_x period duration

Byte	Bit 7 ... 0
0 ... 3	■ PWM x period duration ■ Configure the total time for the ***pulse duration*** and ***pulse pause***. ■ The time has to be set as a factor to the base 20.83 ns. ■ The values less than 25 µs are ignored. ■ If the ***pulse duration*** is higher or equal to the ***period duration***, the DO output remains set permanently. Value range: **1200 ... 8388607** (25 µs ... approx. 175 ms)

Mode of operation

Specification of the ***period duration*** using parameterization and ***pulse duration*** using the output range can be used to define the duty cycle for the corresponding PWM output channel.

By changing the duty cycle you can, for example control the drive connected by means of PWM using the user program.



10.5.5 Diagnostics

Diagnostic data

Since this module does not support any diagnostic interrupt, the diagnostic data give information on this module.

Diagnostics

DS Data record for access using PROFIBUS and PROFINET
Access using DS 0x01.
Besides, you can access the first 4 bytes using DS 0x00.

IX Index for access using CANopen.
Access using IX 0x2F01.
Besides, you can access the first 4 bytes using IX 0x2F00.

SX Subindex for access via EtherCAT with index 0x5005.

Information on accessing the Cube20S is given in the manual of the corresponding bus node.

Name	Bytes	Function	Default	DS	IX	SX
ERR_A	1	Reserved	0x00	0x01	0x2F01	0x02
MODTYP	1	Module information	0x1F			0x03
ERR_C	1	Reserved	0x00			0x04
ERR_D	1	Reserved	0x00			0x05
CHTYP	1	Channel type	0x72			0x06
NUMBIT	1	No. of diagnostic bits per channel	0x00			0x07
NUMCH	1	Number of channels of the module	0x02			0x08
CHERR	1	Reserved	0x00			0x09
CH0ERR ... CH7ERR	8	Reserved	0x00			0x0A ... 0x11
DIAG_US	4	µs ticker	0x00			0x12

MODTYP
Module information

Byte	Bit 7 ... 0	Description	
0	Bit 3 ... 0	Module class	
		1111b	Digital module
	Bit 4	set in case of ***Channel information available***	
	Bit 7 ... 5	reserved	

CHTYP
Channel type

Byte	Bit 7 ... 0	Description	
0	Bit 6 ... 0	Channel type	
		0x72	Digital output
	Bit 7	reserved	

NUMBIT
Diagnostic bits

Byte	Bit 7 ... 0	Description
0		Number of diagnostic bits of the module per channel (here 0x00)

NUMCH
Channels

Byte	Bit 7 ... 0	Description
0		Number of channels of a module (here 0x02)

DIAG_US
µs ticker

Byte	Bit 7 ... 0	Description
0 ... 3	7 ... 0	Value of the µs ticker when generating diagnostic data

Tab. 10-15: µs ticker

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.

ERR_A/C/D
CHERR
CHxERR

Byte	Bit 7 ... 0	Description
0		Reserved

10.5.6 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	105 mA
	Power dissipation	0.95 W
Digital outputs		
	Number of outputs	2
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	20.4...28.8 V ⎓
	Current consumption from load voltage L+ (without load)	15 mA
	Total current for each group, horizontal installation, 40°C	1 A
	Total current for each group, horizontal installation, 60°C	1 A
	Total current for each group, vertical installation	1 A
	Output current with signal "1", nominal value	0.5 A
	Signal logic output	P switching
	Output delay from "0" to "1"	≤100 ns
	Output delay from "1" to "0"	≤100 ns
	Lamp load	10 W
	Parallel connection of outputs for redundant activation	Not possible
	Parallel connection of outputs for the redundant actuation to increase the output capacity	Not possible
	Activating a digital input	Yes
	Switching frequency with resistive load	≤40 kHz
	Switching frequency with inductive load	≤40 kHz
	Switching frequency with lamp load	≤40 kHz
	(Internal) limiting of inductive cut-off voltage	L+ (-52 V)
	Short-circuit protection of the output	Yes, electronically; only high side
	Response threshold of the protection	2.5 A
	Output data size	12 bytes
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Module status	Green LED
	Module error display	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓

PWM data		
	PWM channels	2
	PWM time base	20.83 ns
	Period duration	1200 ... 8388607 * time base
	Pulse width	≥1 µs
	Output type	Push-Pull / high side

Data sizes		
	Input bytes	4
	Output bytes	12
	Parameter bytes	12
	Diagnosis bytes	20

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	61 g
	Weight incl. accessories	61 g
	Gross weight	75 g

10.6 Art.-no. 57327, DO 2x 230 V AC 3,0A Relais

WARNING!

Danger due to electric voltage

The electrical safety, with regard to touch safety, is not guaranteed!

➔ Do not mix touch-proof and non-touch-safe voltages!

NOTICE

Property damage due to high electrical voltages

When switching inductive loads, components can be destroyed by high voltages.

➔ Use an effective suppressor circuit when using inductive loads (see 2.5 EMC installation guidelines, Seite 15)!

NOTE

To improve the EMC resistance, a suppressor capacitor (15 nF) is connected in parallel with each relay contact as of hardware version 04.

10.6.1 Features

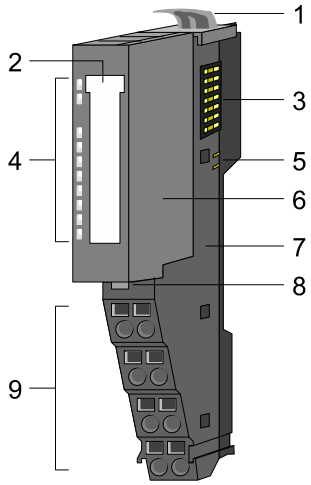
Description

The electronic module records the binary control signals from the superior bus system and transmits them via the relay outputs to the process level. There are 2 channels working as switches and indicating their status by means of LEDs.

Properties

- 2 relay outputs electrically isolated from the backplane bus
- 30 V DC / 230 V AC, 3 A
- Status indication of the channels by means of LEDs.

10.6.2 Structure

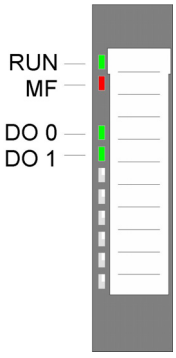


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital output module	57327	Digital output module incl. base DO 2 x relays

Status indication

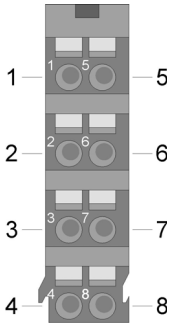


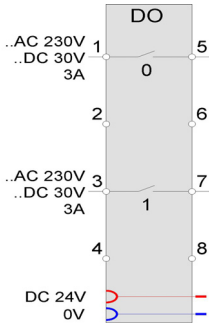
RUN	MF	DO x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error in case of overload, short circuit or excess temperature
		X	Bus communication is not possible Module status reports error in case of overload, short circuit or excess temperature
		X	Error of bus supply voltage
		X	Flashing (2Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Relay output has "1" signal
			Relay output has "0" signal
Not relevant: X			

Tab. 10-16: State indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2 .

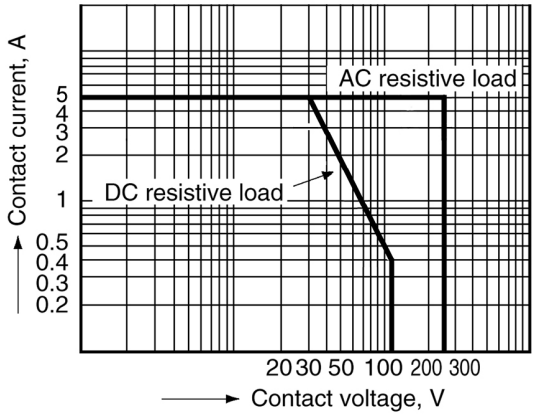




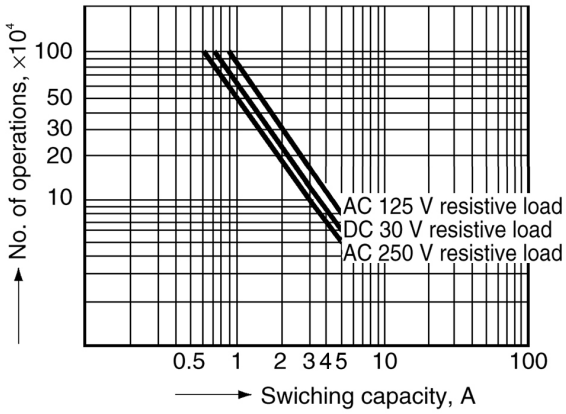
Pos.	Function	Type	Description
1	DO 0	Output	Digital output DO 0
2	---	---	not used
3	DO 1	Output	Digital output DO 1
4	---	---	not used
5	DO 0	Output	Digital output DO 0
6	---	---	not used
7	DO 1	Output	Digital output DO 1
8	---	---	not used

Tab. 10-17: Assignment of connecting terminals

Maximum switching capacity



Service life



10.6.3 Input/output range

Input range

No bytes reserved for the module in the input range.

Output range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX - subindex for access via EtherCAT with index 7000h + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PIQ	1	Status of the outputs	0x5200	
			Bit 0: DO 0		0x01
			Bit 1: DO 1		0x02
			Bit 7 ... 2: reserved		

Tab. 10-18: Output range

10.6.4 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	120 mA
	Power dissipation	0.7 W
Digital outputs		
	Number of outputs	2
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	30 V ⎓ / 230 V ~
	Total current for each group, horizontal installation, 40°C	3 A
	Total current for each group, horizontal installation, 60°C	3 A
	Total current for each group, vertical installation	3 A
	Output current with signal "1", nominal value	3 A
	Signal logic output	Potential-free
	Output delay from "0" to "1"	10 ms
	Output delay from "1" to "0"	5 ms
	Parallel connection of outputs for redundant activation	Not possible
	Parallel connection of outputs for increasing the output capacity	Not possible
	Switching frequency with resistive load	≤0.33 Hz
	Switching frequency with inductive load	≤0.33 Hz
	Switching frequency with lamp load	≤0.33 Hz
	Switching capacity of the relay contacts	3 A
	Output data size	2 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Display of the supply voltage	Green LED
	Display of the collective error	Red LED
	Channel error display	None
Galvanic isolation		
	Between the channels	Yes
	Between the channels and backplane bus	Yes
	Insulation tested with	2 200 V AC
Data sizes		
	Input bytes	0
	Output bytes	1
	Parameter bytes	0
	Diagnosis bytes	0

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	62 g
	Weight incl. accessories	62 g
	Gross weight	76 g

10.7 Art. no. 57340, DO 4x 24 V DC 0.5 A

10.7.1 Features

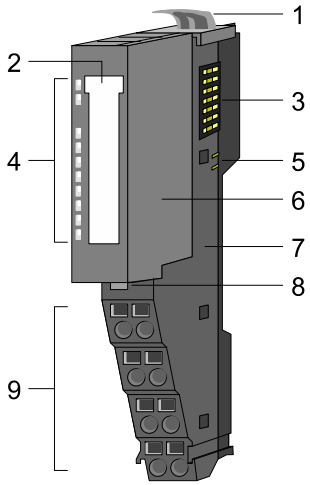
Description

The electronic module records the binary control signals from the superordinate bus system and transmits via the outputs to the process level. It has 4 channels which indicate their status by means of LEDs.

Properties

- 4 digital outputs electrically isolated from the backplane bus.
- Status indication of the channels by means of LEDs.

10.7.2 Structure

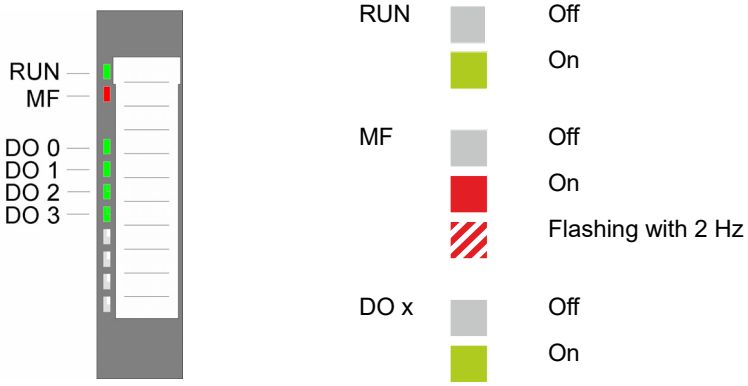


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital output module	57340	Digital output module incl. base DO 4xDC 24V 0.5A

Status indication

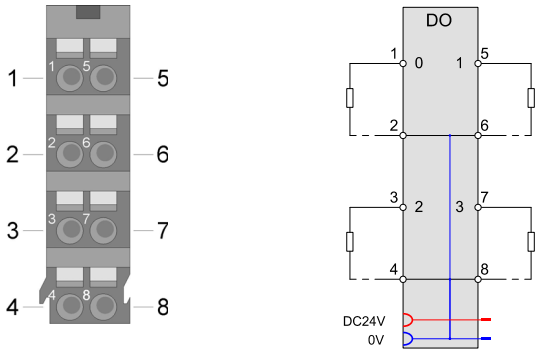


RUN	MF	DO x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error in case of over-load, short circuit or excessive temperature
		X	Bus communication is not possible Module status reports error in case of over-load, short circuit or excessive temperature
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital output has 1 signal
			Digital output has 0 signal
X: not relevant			

Tab. 10-19: State indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2 .



Pos.	Function	Type	Description
1	DO 0	Output	Digital output DO 0
2	0 V	Output	GND for actuator DO 0
3	DO 2	Output	Digital output DO 2
4	0 V	Output	GND for actuator DO 2
5	DO 1	Output	Digital output DO 1
6	0 V	Output	GND for actuator DO 1
7	DO 3	Output	Digital output DO 3
8	0 V	Output	GND for actuator DO 3

Tab. 10-20: Assignment of connecting terminals

NOTICE

Property damage due to incorrect connection

No voltage may be applied to outputs. The voltage can destroy the module!

➔ Do not supply external voltages to the outputs.

10.7.3 Input/output range

Input range

No bytes reserved for the module in the input range.

Output range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX - subindex for access via EtherCAT with index 7000h + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PIQ	1	Status of the outputs	0x5200	
			Bit 0: DO 0		0x01
			Bit 1: DO 1		0x02
			Bit 2: DO 2		0x03
			Bit 3: DO 3		0x04
			Bit 7 ... 4: reserved		

Tab. 10-21: Output range

10.7.4 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	75 mA
	Power dissipation	0.5 W
Digital outputs		
	Number of outputs	4
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	20.4 ... 28.8 V ⎓
	Current consumption from load voltage L+ (without load)	10 mA
	Total current for each group, horizontal installation, 40°C	2 A
	Total current for each group, horizontal installation, 60°C	2 A
	Total current for each group, vertical installation	2 A
	Output current with signal "1", nominal value	0.5 A
	Signal logic output	P switching
	Output delay from "0" to "1"	30 µs
	Output delay from "1" to "0"	175 µs
	Lamp load	10 W
	Parallel connection of outputs for redundant activation	Not possible
	Parallel connection of outputs for the redundant actuation to increase the output capacity	Not possible
	Activating a digital input	Yes
	Switching frequency with resistive load	≤1000 Hz
	Switching frequency with inductive load	≤0.5 Hz
	Switching frequency with lamp load	≤10 Hz
	(Internal) limiting of inductive interrupt voltage	L+ (-45 V)
	Short-circuit protection of the output	Yes, electronically
	Response threshold of the protection	1 A
	Output data size	4 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Display of the supply voltage	Green LED
	Display of the collective error	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓

Data sizes		
	Input bytes	0
	Output bytes	1
	Parameter bytes	0
	Diagnosis bytes	0

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	57 g
	Weight incl. accessories	57 g
	Gross weight	71 g

10.8 Art. no. 57342, DO 4x 24 V DC 0.5A NPN

10.8.1 Features

Description

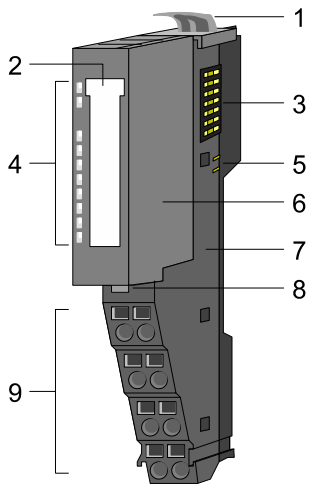
The electronic module records the binary control signals from the parent bus system and transmits them via the outputs to the process level. It has 4 channels working as low-side switch. They indicate their states by means of LEDs.

Low-side switches can be used for switching masses. If there is a short circuit between control line and mass, the load is activated, but the supply voltage is not affected.

Features

- 4 digital low-side outputs electrically isolated from the backplane bus
- Status indication of the channels by means of LEDs.

10.8.2 Structure

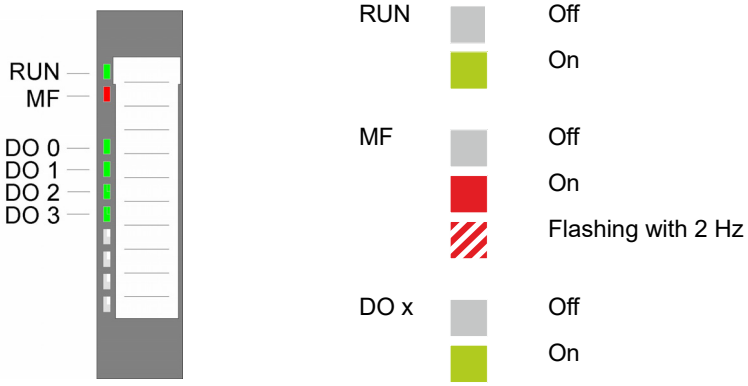


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital output module	57342	Digital output module incl. base DO 4xDC 24V 0.5A NPN

Status indication

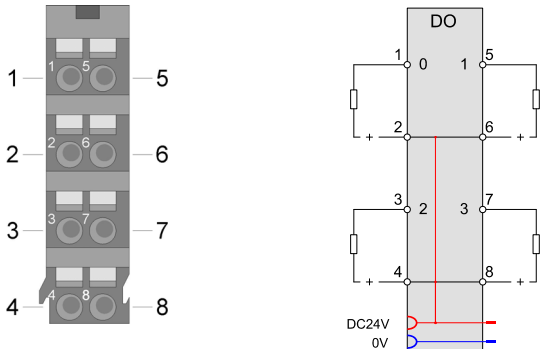


RUN	MF	DO x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error in case of over-load, short circuit or excessive temperature
		X	Bus communication is not possible Module status reports error in case of over-load, short circuit or excessive temperature
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital output has 1 signal
			Digital output has 0 signal
X: not relevant			

Tab. 10-22: State indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2 .



Pos.	Function	Type	Description
1	DO 0	Output	Digital output DO 0
2	24 V DC	Output	24 V DC for actuator DO 0
3	DO 2	Output	Digital output DO 2
4	24 V DC	Output	24 V DC for actuator DO 2
5	DO 1	Output	Digital output DO 1
6	24 V DC	Output	24 V DC for actuator DO 1
7	DO 3	Output	Digital output DO 3
8	24 V DC	Output	24 V DC for actuator DO 3

Tab. 10-23: Assignment of connecting terminals

NOTICE

Property damage due to incorrect connection

No voltage may be applied to outputs. The voltage can destroy the module!

➔ Do not supply external voltages to the outputs.

10.8.3 Input/output range

Input range

No bytes reserved for the module in the input range.

Output range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX - subindex for access via EtherCAT with index 7000h + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PIQ	1	Status of the outputs	0x5200	
			Bit 0: DO 0		0x01
			Bit 1: DO 1		0x02
			Bit 2: DO 2		0x03
			Bit 3: DO 3		0x04
			Bit 7 ... 4: reserved		

Tab. 10-24: Output range

10.8.4 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	75 mA
	Power dissipation	0.5 W
Digital outputs		
	Number of outputs	4
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	20.4 ... 28.8 V ⎓
	Current consumption from load voltage L+ (without load)	5 mA
	Total current for each group, horizontal installation, 40°C	2 A
	Total current for each group, horizontal installation, 60°C	2 A
	Total current for each group, vertical installation	2 A
	Output current with signal "1", nominal value	0.5 A
	Signal logic output	M switching
	Output delay from "0" to "1"	30 µs
	Output delay from "1" to "0"	100 µs
	Lamp load	10 W
	Parallel connection of outputs for redundant activation	Not possible
	Parallel connection of outputs for increasing the output capacity	Not possible
	Activating a digital input	Yes
	Switching frequency with resistive load	≤1000 Hz
	Switching frequency with inductive load	≤0.5 Hz
	Switching frequency with lamp load	≤10 Hz
	(Internal) limiting of inductive interrupt voltage	+45 V
	Short-circuit protection of the output	Yes, electronically
	Response threshold of the protection	1.7 A
	Output data size	4 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Display of the supply voltage	Green LED
	Display of the collective error	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓

Data sizes		
	Input bytes	0
	Output bytes	1
	Parameter bytes	0
	Diagnosis bytes	0

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	57 g
	Weight incl. accessories	57 g
	Gross weight	72 g

10.9 Art. no. 57343, DO 4x 24 V DC 0.5 A Time Stamp ETS

10.9.1 Features

Description

The electronic module records the binary control signals from the superior bus system and transmits them time-controlled by means of the ETS functions via the outputs to the process level. It has 4 channels working as low-side switches. They indicate their states by means of LEDs. They indicate their states by means of LEDs.

With the parameterized ETS function (ETS = **e**dge **t**ime **s**tamp), you can transfer 5 (20 bytes) or 15 (60 bytes) states (depending on the parameterization) for the outputs together with a time value of the µs ticker to the FIFO memory as an ETS entry. The FIFO memory provides space for max. 31 ETS entries.

Features

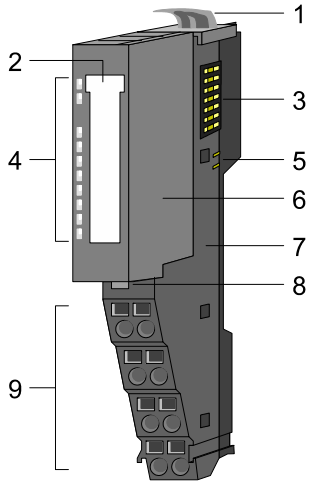
- 4 digital outputs electrically isolated from the backplane bus
- ETS function for 5 or 15 ETS entries (4 bytes each)
- Diagnostic function
- Control by means of process image or handling block
- Status indication of the channels by means of LEDs

NOTE

➔ Operation of ETS modules only makes sense on bus nodes that have an integrated µs ticker!

➔ The Ethernet bus node with Modbus TCP, for example, is not provided with a µs ticker.

10.9.2 Structure

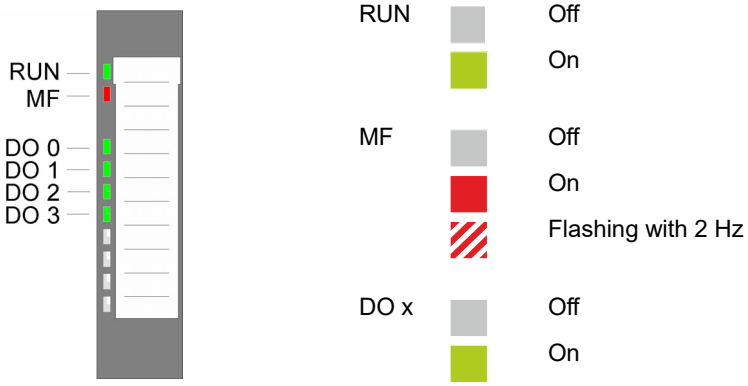


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital output module	57343	Digital output module incl. base DO 4xDC 24V 0.5A ETS

Status indication

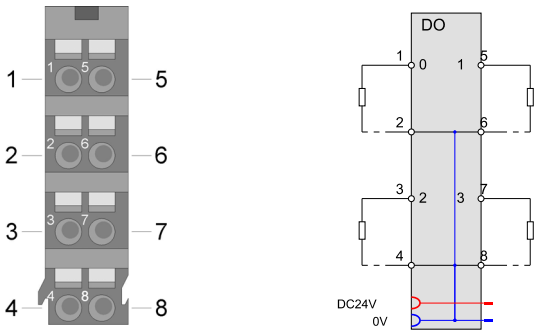


RUN	MF	DO x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error in case of over-load, short circuit or excessive temperature
		X	Bus communication is not possible Module status reports error in case of over-load, short circuit or excessive temperature
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital output has 1 signal
			Digital output has 0 signal
X: not relevant			

Tab. 10-25: State indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2 .



Pos.	Function	Type	Description
1	DO 0	Output	Digital output DO 0
2	0 V	Output	GND for actuator DO 0
3	DO 2	Output	Digital output DO 2
4	0 V	Output	GND for actuator DO 2
5	DO 1	Output	Digital output DO 1
6	0 V	Output	GND for actuator DO 1
7	DO 3	Output	Digital output DO 3
8	0 V	Output	GND for actuator DO 3

Tab. 10-26: Assignment of connecting terminals

NOTICE

Property damage due to incorrect connection

No voltage may be applied to outputs. The voltage can destroy the module!

➔ Do not supply external voltages to the outputs.

10.9.3 Input/output range

Input/output range

Use the ETS function (ETS=**e**dge **t**ime **s**tamp) to save a required time value (ETS_US) and the state of the outputs (PIQ) together with a consecutive number (RN) in the process image as an ETS entry. You can plan the following variants:

You can plan the following variants:

- **Cube20S DO4 ETS (20): FIFO with 20 bytes for 5 ETS entries**
- **Cube20S DO4 ETS (60): FIFO with 60 bytes for 15 ETS entries**

NOTE

The full **FIFO memory** does not accept any further ETS entries.

Make sure that the entries will be accepted:

1 | First determine the state of the **FIFO memory** in the input range.

2 | Then transfer the ETS entries via **STS_FIFO**.

Input range 4 bytes

In PROFIBUS and PROFINET, the input range is displayed in the corresponding address range.

IX Index for access using CANopen.

SX Subindex for access via EtherCAT with index 0x6000 + EtherCAT slot.

Information on access to the Cube20S is given in the manual of the corresponding bus node.

Addr.	Name	Bytes	Function		IX	SX
+0	RN_LAST	1	Bit 5 ... 0	RN last FIFO entry	0x5440	0x01
			Bit 6	1 (fix)		
			Bit 7	0 (fixed)		
+1	RN_NEXT	1	Bit 5 ... 0	RN next FIFO entry to be processed		0x02
			Bit 6	1 (fix)		
			Bit 7	1 (fix)		
+2	STS_FIFO	1		Status of the FIFO memory		0x03
+3	NUM_ETS	1		Number of the ETS entries in the FIFO memory		0x04

10.9.4 ETS assignment in the input range

RN_LAST

Bit 5 ... 0:	Here you will find the last **RN** of the **ETS entry** which has been recognized as valid by the module and then written into the **FIFO memory** of the module.	
Bit 6:	1 (fixed)	Identifies RN_LAST in the process image
Bit 7:	0 (fixed)	Identifies RN_LAST in the process image

RN_NEXT

Bit 5 ... 0:	Here you will find the **RN** of the **ETS entry** which will be processed next in the **FIFO memory** of the module. **Please note** that the bits 6 and 7 are always set in **RN_NEXT**.	
Bit 6:	1 (fixed)	Identifies RN_NEXT in the process image
Bit 7:	1 (fixed)	Identifies RN_NEXT in the process image

STS_FIFO

Here you will find information on the state of the FIFO memory:

STS_FIFO	Description
0x00 / 0x80	Everything is ok. You receive this message directly after saving to the **FIFO memory** of the module.
0x01 / 0x81	There is no subsequent **ETS entry** in the **FIFO** available. The **RN** does not correspond to the expected **RN**. Check your **RN** in the output range.
0x02 / 0x82	There are no new **ETS entries** available in the **FIFO**.
0x03 / 0x83	FIFO memory is full. No further ETS entries can be accepted.

- If less **ETS entries** are written than possible, then you must set Bit 6 of the **RN** for the last **ETS entry**.

  This is necessary to avoid that the following entries are **invalid**.
- The module ignores all **ETS entries** after an entry with the set **Bit 6.**
- If there is an **ETS entry** with an **RN** with set **Bit 6 in the FIFO memory**, **STS_FIFO** is also returned with a logical OR connection with **0x80**.

NUM_ETS

Here you will always find the current number of the **ETS entries** in the **FIFO memory** of the module.

10.9.5 Structure of an ETS entry

Structure of an ETS entry

Depending on the planned variant, 5 or 15 ETS entries can be written using the output range. For this purpose, 4 bytes are provided for each ETS entry in the process image:

Addr.	Name	Bytes	Function	IX	SX
+0	PIQ	1	Output byte	0x5640/s	0x01
+1	RN	1	Consecutive number		0x02
+2	ETS_US	2	µs ticker		0x03

PIQ

Here you can define the state of the outputs at the required time and disable or enable the corresponding output channel. The output byte has the following bit assignment:

Byte	Bit	Description
0	3 ... 0	0 (fix)
	4	Status DO 3
	5	Status DO 2
	6	Status DO 1
	7	Status DO 0

RN

- The RN (**R**unning **N**umber) is a consecutive number from 0 ... 63, which starts with 1.
- Using the RN, you determine the chronological sequence of the ETS entries.
- RN has to be incremented for each ETS entry, otherwise, the ETS entry is not recognized by the module.

Note!

➔ If less ETS entries are written than possible, then you must set Bit 6 of the RN for the last ETS entry.

➔ This is necessary to avoid that the following entries are "invalid".

➔ The module ignores all ETS entries after an entry with the set Bit 6.

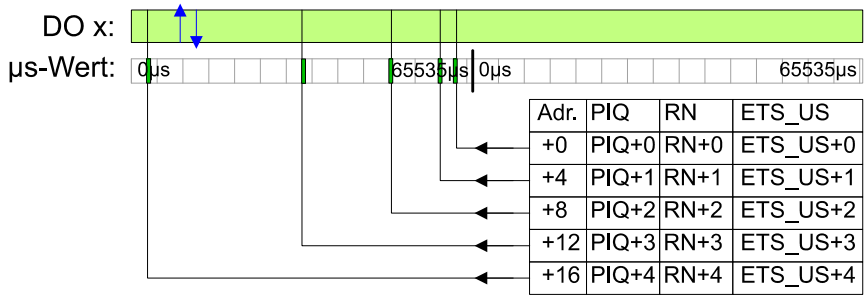
ETS_US

- The Cube20S module has a 32-bit timer (µs ticker), which is started with PowerON and starts again after 2^{32}-1 µs with 0.
- To specify ETS_US, define a time value for your ETS entry from the low word of the µs ticker (**0 ... 65535 µs**).

➔ Specify here a time value in µs by which the status of the outputs has to be accepted. (**Value range: 0 ... 65535**)

ETS functionality

- Below you can see how to save the ETS entries in the output range in such a way that they can be accepted in the FIFO memory.



Adr.	PIQ	RN	ETS_US
+0	PIQ+0	RN+0	ETS_US+0
+4	PIQ+1	RN+1	ETS_US+1
+8	PIQ+2	RN+2	ETS_US+2
+12	PIQ+3	RN+3	ETS_US+3
+16	PIQ+4	RN+4	ETS_US+4

10.9.6 ETS assignment in the output range

Output range 20 bytes or 60 bytes

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

IX	Index for access using CANopen. Use s = subindex to address the corresponding ETS entry.
SX	SX = Subindex for access via EtherCAT. Subindex for access via EtherCAT with index 0x7000 + EtherCAT port.

Information on accessing the Cube20S is given in the manual of the corresponding bus node.

Engineering as Art.-No. 57343

DO 4 x 24 V DC (20) 20 bytes - 5 ETS entries

Ad-dr.	PII	IX= 0x5640	SX
+0	PIQ+0	s=1	0x01
+4	PIQ+1	s=2	0x04
+8	PIQ+2	s=3	0x07
+12	PIQ+3	s=4	0x0A
+16	PIQ+4	s=5	0x0D

Ad-dr.	RN	IX= 0x5640	SX
+1	RN+0	s=1	0x02
+5	RN+1	s=2	0x05
+9	RN+2	s=3	0x08
+13	RN+3	s=4	0x0B
+17	RN+4	s=5	0x0E

Ad-dr.	ETS-US	IX= 0x5640	SX
+2	ETS_US+0	s=1	0x03
+6	ETS_US+1	s=2	0x06
+10	ETS_US+2	s=3	0x09
+14	ETS_US+3	s=4	0x0C
+18	ETS_US+4	s=5	0x0F

Planning as Art.-No. 57343

DO 4 x 24 V DC (60) 60 bytes - 15 ETS entries

Addr	PII	IX= 0x5640	SX
+0	PIQ+0	s=1	0x01
+4	PIQ+1	s=2	0x04
+8	PIQ+2	s=3	0x07
+12	PIQ+3	s=4	0x0A
+16	PIQ+4	s=5	0x0D
+20	PIQ+5	s=6	0x10
+24	PIQ+6	s=7	0x13
+28	PIQ+7	s=8	0x16
+32	PIQ+8	s=9	0x19
+36	PIQ+9	s=10	0x1C
+40	PIQ+10	s=11	0x1F
+44	PIQ+11	s=12	0x22
+48	PIQ+12	s=13	0x25
+52	PIQ+13	s=14	0x28
+56	PIQ+14	s=15	0x2B

Addr	RN	IX= 0x5640	SX
+1	RN+0	s=1	0x02
+5	RN+1	s=2	0x05
+9	RN+2	s=3	0x08
+13	RN+3	s=4	0x0B
+17	RN+4	s=5	0x0E
+21	RN+5	s=6	0x11
+25	RN+6	s=7	0x14
+29	RN+7	s=8	0x17
+33	RN+8	s=9	0x1A
+37	RN+9	s=10	0x1D
+41	RN+10	s=11	0x20
+45	RN+11	s=12	0x23
+49	RN+12	s=13	0x26
+53	RN+13	s=14	0x29
+57	RN+14	s=15	0x2C

Ad-dr.	ETS-US	IX= 0x5640	SX
+2	ETS_US+0	s=1	0x03
+6	ETS_US+1	s=2	0x06
+10	ETS_US+2	s=3	0x09
+14	ETS_US+3	s=4	0x0C
+18	ETS_US+4	s=5	0x0F
+22	ETS_US+5	s=6	0x12
+26	ETS_US+6	s=7	0x15
+30	ETS_US+7	s=8	0x18
+34	ETS_US+8	s=9	0x1B
+38	ETS_US+9	s=10	0x1E
+42	ETS_US+10	s=11	0x21
+46	ETS_US+11	s=12	0x24
+50	ETS_US+12	s=13	0x27
+54	ETS_US+13	s=14	0x2A
+58	ETS_US+14	s=15	0x2D

10.9.7 Parameter data

Parameterization data

The module provides the following parameterization data which are permanently set and cannot be changed.

DS	Data record for access using PROFIBUS and PROFINET
IX	Index for access using CANopen
SX	Subindex for access via EtherCAT with index 0x3100 + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Name	Bytes	Function	Default	DS	IX	SX
PII_L	1	Length of the process image input data [a]	0x04 (fixed)	0x02	0x3100	0x01
PIQ_L	1	Length of the process image output data [bc]	0x14 or 0x3C (fixed)	0x02	0x3101	0x02

a. You are only allowed to transmit this data record in the STOP state.

b. You are only allowed to transmit this data record in the STOP state.

c. This parameter depends on the planned variant.

PII_L

Byte	Bit 7 ... 0	Description
0		The length for the process image of the input data is set fixedly to 4 bytes.

PIQ_L

Byte	Bit 7 ... 0	Description
0		The length for the process image is set fixedly to the length of the planned variant (0x14 or 0x3C).

10.9.8 Example

Example of Mode of operation

Below an example of the sequence in which the ETS entries are saved.

This example refers to a module, which uses 20 bytes for 5 ETS entries in the output range PIQ.

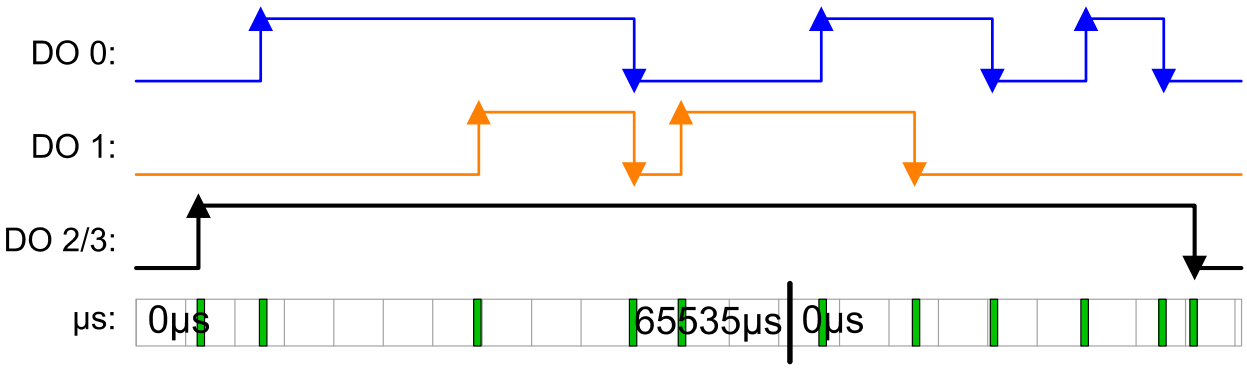
ETS values

- At the following times of the µs ticker, the outputs should enter the following states

RN	ETS_US in µs	PIQ DO 0 (Bit 7)	PIQ DO 1 (Bit 6)	PIQ release DO 0 (Bit 5)	PIQ release DO 0 (Bit 4)
0x01	6000	0	0	1	1
0x02	12506	1	0	1	1
0x03	34518	1	1	1	1
0x04	49526	0	0	1	1
0x05	54529	0	1	1	1
0x06	3500	1	1	1	1
0x07	12443	1	0	1	1
0x08	20185	0	0	1	1
0x09	30140	1	0	1	1
0x0A	37330	0	0	1	1
0x0B	40000	0	0	0	0

Time diagram

The following time diagram results from the table.



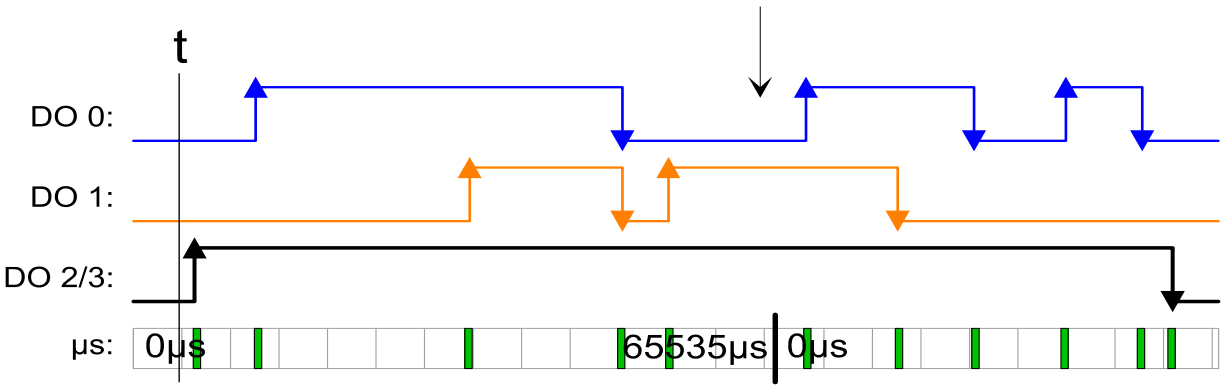
Writing 5 ETS entries

- After writing 5 ETS entries in the process output data, they are transferred directly to the FIFO memory of the module.
- The diagram shows the states of the outputs at the time **"t"**.
- The status bytes are listed in PII.

Addr.	PIQ	RN	ETS_US
+0	00110000	0x01	6000
+4	10110000	0x02	12506
+8	11110000	0x03	34518
+12	00110000	0x04	49526
+16	01110000	0x05	54529

→

FIFO	PIQ	RN	ETS_US	PII
1	00110000	0x01	6000	RN_LAST: 0x45
2	10110000	0x02	12506	RN_NEXT: 0xC1
3	11110000	0x03	34518	STS_FIFO: 0x00
4	00110000	0x04	49526	NUM_ETS: 0x05
5	01110000	0x05	54529	
6	00000000	0x00	0	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



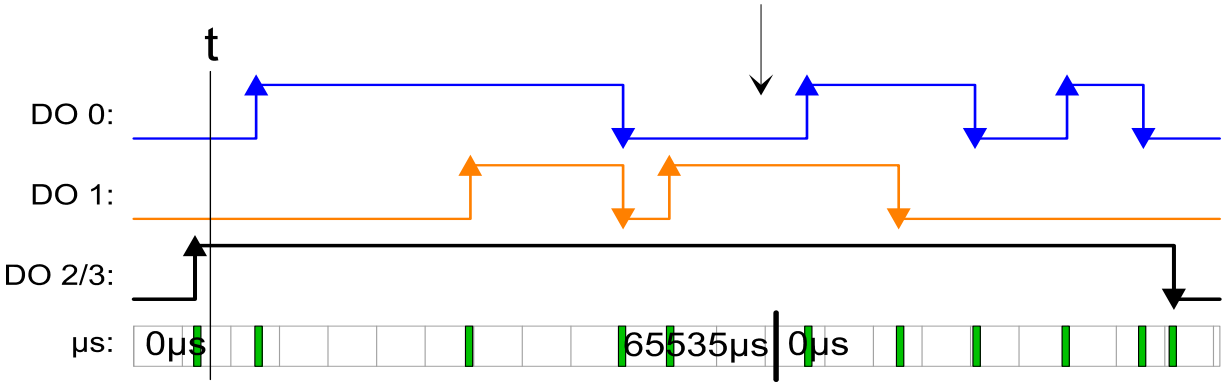
Executing the ETS function
Executing RN = 0x01

- To actuate the outputs, they have to be enabled first.
- In this example, the 1st RN enables the outputs.
- The ETS entry (RN = 0x01) is executed and deleted from FIFO.

Addr.	PIQ	RN	ETS_US
+0	00110000	0x01	6000
+4	10110000	0x02	12506
+8	11110000	0x03	34518
+12	00110000	0x04	49526
+16	01110000	0x05	54529

→

FIFO	PIQ	RN	ETS_US	PII
1	10110000	0x02	12506	RN_LAST: 0x45
2	11110000	0x03	34518	RN_NEXT: 0xC2
3	00110000	0x04	49526	STS_FIFO: 0x00 / 0x02
4	01110000	0x05	54529	NUM_ETS: 0x04
5	00000000	0x00	0	
6	00000000	0x00	0	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



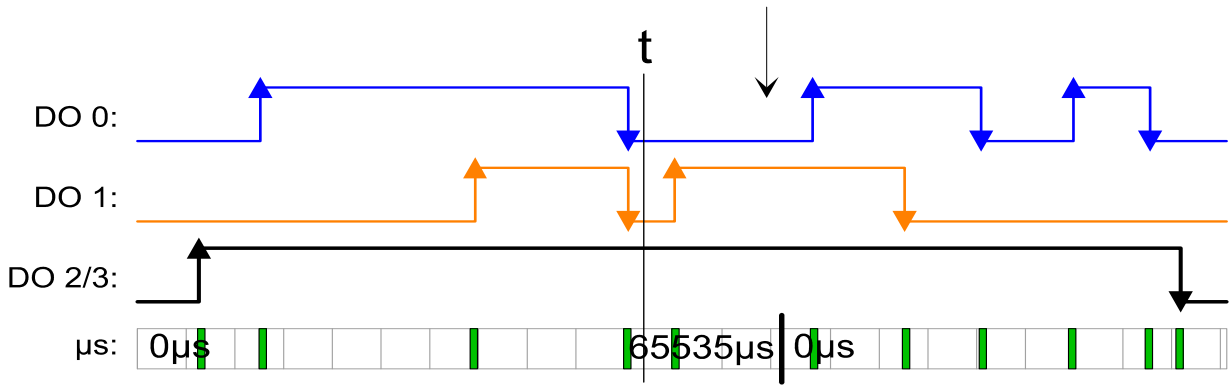
Executing the ETS function
RN = 0x02 ... 0x04

- The states of RN = 0x02 ... RN 0x04 are output one after the other and deleted from FIFO.

Addr.	PIQ	RN	ETS_US
+0	00110000	0x01	6000
+4	10110000	0x02	12506
+8	11110000	0x03	34518
+12	00110000	0x04	49526
+16	01110000	0x05	54529

→

FIFO	PIQ	RN	ETS_US	PII
1	01110000	0x05	54529	RN_LAST: 0x45
2	00000000	0x00	0	RN_NEXT: 0xC5
3	00000000	0x00	0	STS_FIFO: 0x00 / 0x02
4	00000000	0x00	0	NUM_ETS: 0x01
5	00000000	0x00	0	
6	00000000	0x00	0	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



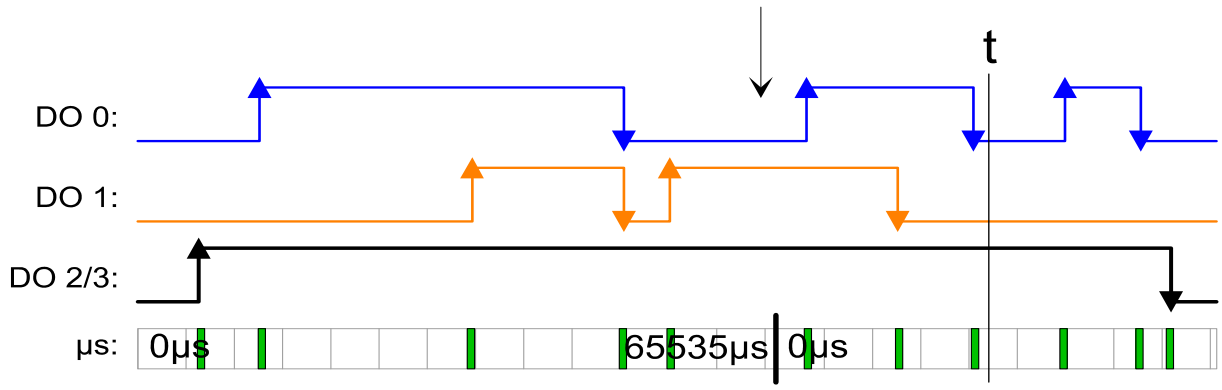
Executing the ETS function
RN = 0x06 ... 0x08

- The states of RN = 0x06 ... RN 0x08 are output one after the other and deleted from FIFO.

Addr.	PIQ	RN	ETS_US
+0	11110000	0x06	3500
+4	10110000	0x07	12443
+8	00110000	0x08	20185
+12	10110000	0x09	30140
+16	00110000	0x0A	37330

→

FIFO	PIQ	RN	ETS_US	PII
1	10110000	0x09	30140	RN_LAST: 0x4A
2	00110000	0x0A	37330	RN_NEXT: 0xC5
3	00000000	0x00	0	STS_FIFO: 0x00 / 0x02
4	00000000	0x00	0	NUM_ETS: 0x02
5	00000000	0x00	0	
6	00000000	0x00	0	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



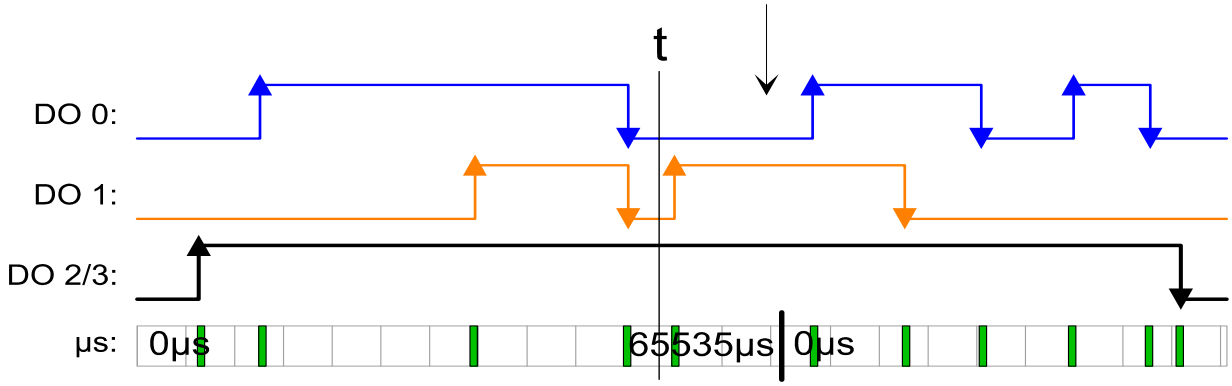
Writing 5 ETS entries

- After writing the next 5 ETS entries in the process output data, they are transferred directly to the FIFO memory of the module.

Addr.	PIQ	RN	ETS_US
+0	11110000	0x06	3500
+4	10110000	0x07	12443
+8	00110000	0x08	20185
+12	00110000	0x09	30140
+16	00110000	0x0A	37330

→

FIFO	PIQ	RN	ETS_US	PII
1	01110000	0x05	54529	RN_LAST: 0x4A
2	11110000	0x06	3500	RN_NEXT: 0xC5
3	10110000	0x07	12443	STS_FIFO: 0x00 / 0x02
4	00110000	0x08	20185	NUM_ETS: 0x06
5	10110000	0x09	30140	
6	00110000	0x0A	37330	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



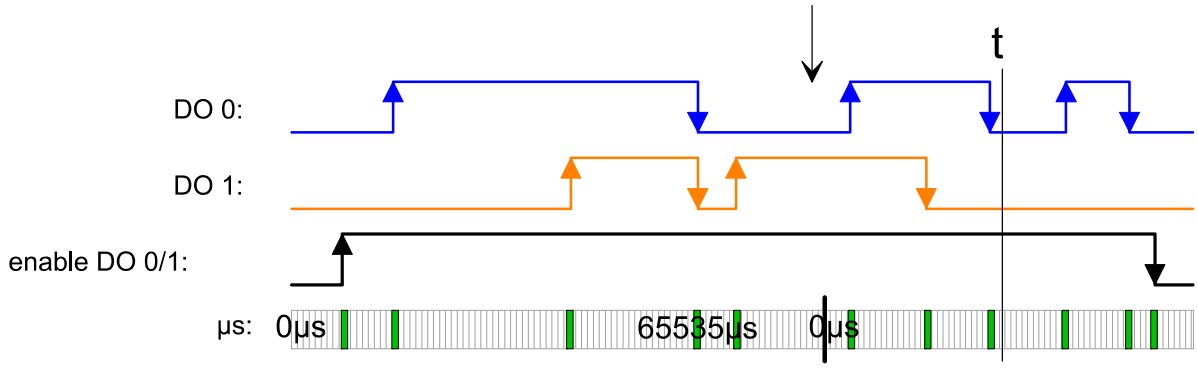
Executing the ETS function
RN = 0x06 ... 0x08

- The states of RN = 0x06 ... RN 0x08 will be output one after the other and deleted from FIFO.

Addr.	PIQ	RN	ETS_US
+0	11110000	0x06	3500
+4	10110000	0x07	12443
+8	00110000	0x08	20185
+12	10110000	0x09	30140
+16	00110000	0x0A	37330

→

FIFO	PIQ	RN	ETS_US	PII
1	10110000	0x09	30140	RN_LAST: 0x4A
2	00110000	0x0A	37330	RN_NEXT: 0xC5
3	00000000	0x00	0	STS_FIFO: 0x00 / 0x02
4	00000000	0x00	0	NUM_ETS: 0x02
5	00000000	0x00	0	
6	00000000	0x00	0	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



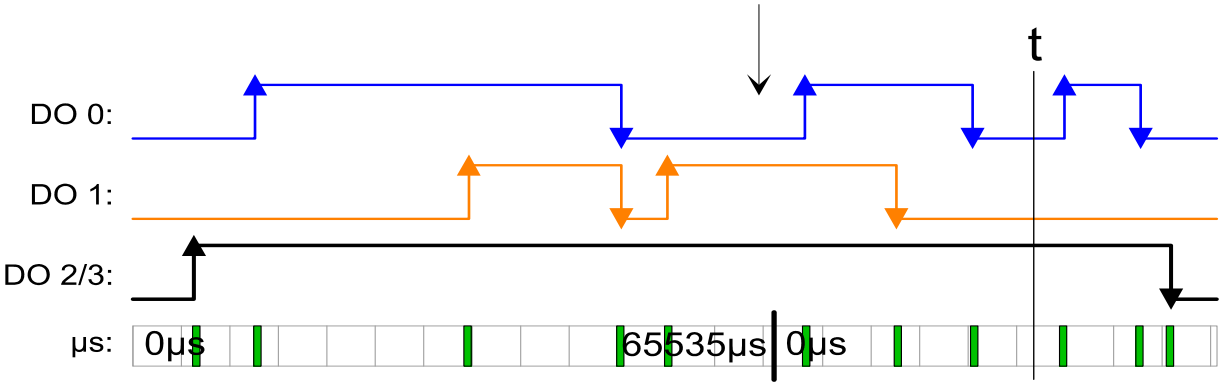
Writing the last ETS entry

- Since less than 5 ETS entries are written, then you must set bit 6 of the RN for the last ETS entry. RN = 0x0B becomes 0x4B.

Addr.	PIQ	RN	ETS_US
+0	00000000	0x4B	40000
+4	**10110000**	**0x07**	**12443**
+8	**00110000**	**0x08**	**20185**
+12	**10110000**	**0x09**	**30140**
+16	**00110000**	**0x0A**	**37330**

→

FIFO	PIQ	RN	ETS_US	PII
1	10110000	0x09	30140	RN_LAST: 0x4B
2	00110000	0x0A	37330	RN_NEXT: 0xC9
3	00000000	**0x4B**	40000	STS_FIFO: 0x80 / 0x82
4	00000000	0x00	0	NUM_ETS: 0x03
5	00000000	0x00	0	
6	00000000	0x00	0	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



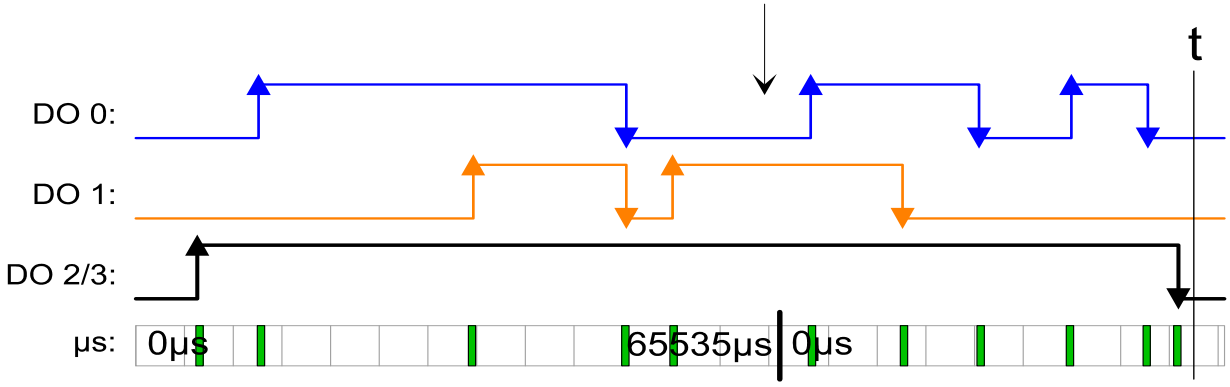
Executing the ETS function
RN = 0x09 ... 0x4B

- The states of RN = 0x09 ... RN 0x4B are output one after the other and deleted from FIFO.

Addr.	PIQ	RN	ETS_US
+0	00000000	0x4B	40000
+4	**10110000**	**0x07**	**12443**
+8	**00110000**	**0x08**	**20185**
+12	**10110000**	**0x09**	**30140**
+16	**00110000**	**0x0A**	**37330**

→

FIFO	PIQ	RN	ETS_US	PII
1	00000000	0x00	0	RN_LAST: 0x4B
2	00000000	0x00	0	RN_NEXT: 0xCC
3	00000000	0x00	0	STS_FIFO: 0x80 / 0x82
4	00000000	0x00	0	NUM_ETS: 0x00
5	00000000	0x00	0	
6	00000000	0x00	0	
7	00000000	0x00	0	
8	00000000	0x00	0	
9	00000000	0x00	0	
...	00000000	0x00	0	
31	00000000	0x00	0	



10.9.9 Diagnostics

Diagnostic data

Since this module does not support any diagnostic interrupt, the diagnostic data give information on this module.

Diagnostics

DS Data record for access using PROFIBUS and PROFINET
Access using DS 0x01.
Besides, you can access the first 4 bytes using DS 0x00.

IX Index for access using CANopen.
Access using IX 0x2F01.
Besides, you can access the first 4 bytes using IX 0x2F00.

SX Subindex for access via EtherCAT with index 0x5005 + EtherCAT port.

Information on accessing the Cube20S is given in the manual of the corresponding bus node.

Name	Bytes	Function	Default	DS	IX	SX
ERR_A	1	reserved	0x00	0x01	0x2F01	0x02
MODTYP	1	Module information	0x1F			0x03
ERR_C	1	reserved	0x00			0x04
ERR_D	1	reserved	0x00			0x05
CHTYP	1	Channel type	0x72			0x06
NUMBIT	1	No. of diagnostic bits per channel	0x00			0x07
NUMCH	1	Number of channels of the module	0x04			0x08
CHERR	1	reserved	0x00			0x09
CH0ERR ... CH7ERR	8	reserved	0x00			0x0A ... 0x11
DIAG_US	4	µ ticker (32 bits)	0x00			0x13

MODTYP
Module information

Byte	Bit 7 ... 0	Description	
0	Bit 3 ... 0	Module class	
		1111b	Digital module
	Bit 4	set in case of ***Channel information available***	
	Bit 7 ... 5	reserved	

CHTYP
Channel type

Byte	Bit 7 ... 0	Description	
0	Bit 6 ... 0	Channel type	
		0x72	Digital output
	Bit 7	0 (fixed)	

NUMBIT
Diagnostic bits

Byte	Bit 7 ... 0	Description
0		Number of diagnostic bits of the module per channel (here 0x00)

NUMCH
channels

Byte	Bit 7 ... 0	Description
0		Number of channels of a module (here 0x04)

DIAG_US
µs ticker

Byte	Bit 7 ... 0	Description
0 ... 3	7 ... 0	Value of the µs ticker when generating diagnostic data

Tab. 10-27: µs ticker

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.

ERR_A/C/D
CHERR
CHxERR

Byte	Bit 7 ... 0	Description
0		Reserved

10.9.10 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	105 mA
	Power dissipation	0.95 W
Digital outputs		
	Number of outputs	4
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	20.4...28.8 V ⎓
	Current consumption from load voltage L+ (without load)	25 mA
	Total current for each group, horizontal installation, 40°C	2 A
	Total current for each group, horizontal installation, 60°C	2 A
	Total current for each group, vertical installation	2 A
	Output current with signal "1", nominal value	0.5 A
	Signal logic output	P switching
	Output delay from "0" to "1"	≤100 ns
	Output delay from "1" to "0"	≤100 ns
	Lamp load	10 W
	Parallel connection of outputs for redundant activation	Not possible
	Parallel connection of outputs for increasing the output capacity	Not possible
	Activating a digital input	Yes
	Switching frequency with resistive load	≤40 kHz
	Switching frequency with inductive load	≤40 kHz
	Switching frequency with lamp load	≤40 kHz
	(Internal) limiting of inductive cut-off voltage	L+ (-52 V)
	Short-circuit protection of the output	Yes, electronically; only high side
	Response threshold of the protection	2.5 A
	Output data size	60 bytes
Status, interrupt, diagnoses		
	Status indication	Green LED per channel
	Interrupts	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnosis information readable	Possible
	Supply voltage display	Green LED
	Group error display	Red LED
	Channel error indication	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓

Data sizes		
	Input bytes	4
	Output bytes	20 / 60
	Parameter bytes	6
	Diagnostic bytes	20

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	61 g
	Net weight	61 g
	Gross weight	76 g

10.10 Art. no. 57345, DO 4x 24 V DC 2 A

10.10.1 Features

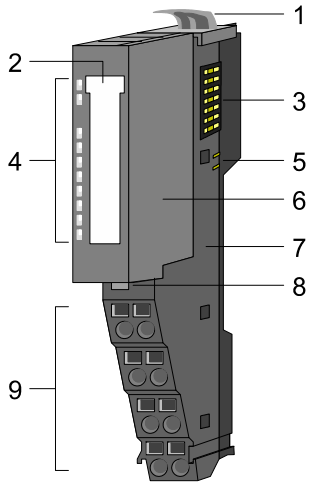
Description

The electronic module records the binary control signals from the superordinate bus system and transmits via the outputs to the process level. It has 4 channels which indicate their status by means of LEDs.

Properties

- 4 digital outputs electrically isolated from the backplane bus.
- Status indication of the channels by means of LEDs.

10.10.2 Structure

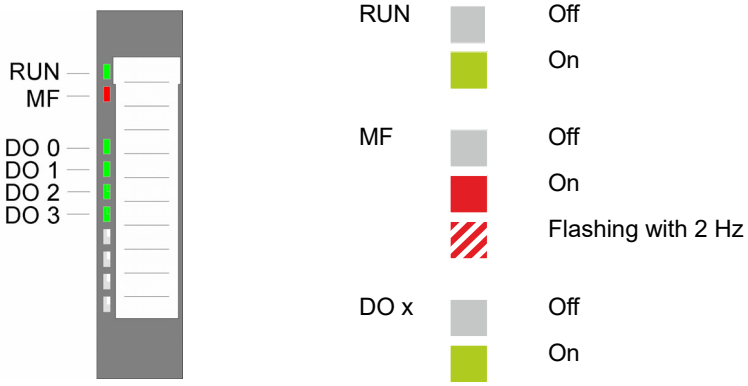


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital output module	57345	Digital output module incl. base DO 4xDC 24V 2A

Status indication

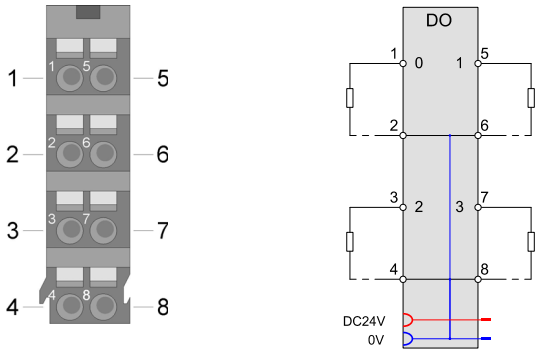


RUN	MF	DO x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error in case of over-load, short circuit or excessive temperature
		X	Bus communication is not possible Module status reports error in case of over-load, short circuit or excessive temperature
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital output has 1 signal
			Digital output has 0 signal
X: not relevant			

Tab. 10-28: State indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2 .



Pos.	Function	Type	Description
1	DO 0	Output	Digital output DO 0
2	0 V	Output	GND for actuator DO 0
3	DO 2	Output	Digital output DO 2
4	0 V	Output	GND for actuator DO 2
5	DO 1	Output	Digital output DO 1
6	0 V	Output	GND for actuator DO 1
7	DO 3	Output	Digital output DO 3
8	0 V	Output	GND for actuator DO 3

Tab. 10-29: Assignment of connecting terminals

NOTICE

Property damage due to incorrect connection

No voltage may be applied to outputs. The voltage can destroy the module!

➔ Do not supply external voltages to the outputs.

10.10.3 Input/output range

Input range

No bytes reserved for the module in the input range.

Output range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX - subindex for access via EtherCAT with index 7000h + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Addr.	Name	Bytes	Function	IX	SX
+0	PIQ	1	Status of the outputs	0x5200	
			Bit 0: DO 0		0x01
			Bit 1: DO 1		0x02
			Bit 2: DO 2		0x03
			Bit 3: DO 3		0x04
			Bit 7 ... 4: reserved		

Tab. 10-30: Output range

10.10.4 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	75 mA
	Power dissipation	0.8 W
Digital outputs		
	Number of outputs	4
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	20.4...28.8 V ⎓
	Current consumption from load voltage L+ (without load)	20 mA
	Total current for each group, horizontal installation, 40°C	4 A
	Total current for each group, horizontal installation, 60°C	4 A
	Total current for each group, vertical installation	4 A
	Output current with signal "1", nominal value	2 A
	Signal logic output	P switching
	Output delay from "0" to "1"	100 µs
	Output delay from "1" to "0"	250 µs
	Lamp load	10 W
	Parallel connection of outputs for redundant activation	Not possible
	Parallel connection of outputs for increasing the output capacity	Not possible
	Activating a digital input	Yes
	Switching frequency with resistive load	≤1000 Hz
	Switching frequency with inductive load	≤0.5 Hz
	Switching frequency with lamp load	≤10 Hz
	(Internal) limiting of inductive cut-off voltage	L+ (-52 V)
	Short-circuit protection of the output	Yes, electronically
	Response threshold of the protection	2.7 A
	Output data size	4 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Display of the supply voltage	Green LED
	Display of the collective error	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓

Data sizes		
	Input bytes	0
	Output bytes	1
	Parameter bytes	0
	Diagnosis bytes	0

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	58 g
	Weight incl. accessories	58 g
	Gross weight	73 g

10.11 Art. no. 57380, DO 8x 24 V DC 0.5 A

10.11.1 Features

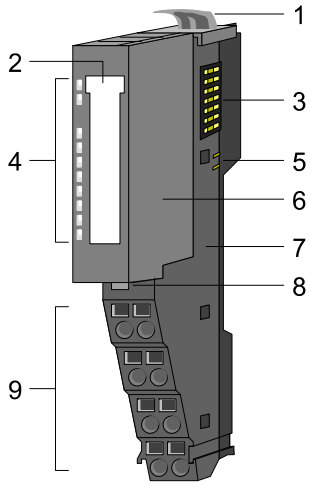
Description

The electronic module records the binary control signals from the superordinate bus system and transmits via the outputs to the process level. It has 8 channels which indicate their status by means of LEDs.

Properties

- 8 digital outputs electrically isolated from the backplane bus.
- Status indication of the channels by means of LEDs.

10.11.2 Structure

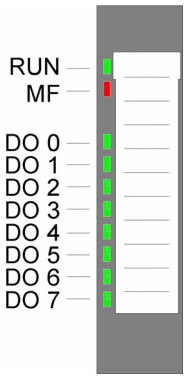


1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital output module	57380	Digital output module incl. base DO 8xDC 24V 0.5A

Status indication

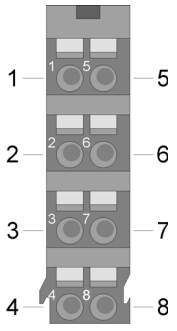


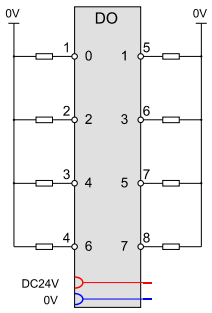
RUN	MF	DO x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error in case of over-load, short circuit or excessive temperature
		X	Bus communication is not possible Module status reports error in case of over-load, short circuit or excessive temperature
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital output has 1 signal
			Digital output has 0 signal
X: not relevant			

Tab. 10-31: State indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2 .





Pos.	Function	Type	Description
1	DO 0	Output	Digital output DO 0
2	DO 2	Output	Digital output DO 2
3	DO 4	Output	Digital output DO 4
4	DO 6	Output	Digital output DO 6
5	DO 1	Output	Digital output DO 1
6	DO 3	Output	Digital output DO 3
7	DO 5	Output	Digital output DO 5
8	DO 7	Output	Digital output DO 7

Tab. 10-32: Assignment of connecting terminals

NOTICE

Property damage due to incorrect connection

No voltage may be applied to outputs. The voltage can destroy the module!

➔ Do not supply external voltages to the outputs.

10.11.3 Input/output range

Input range

No bytes reserved for the module in the input range.

Output range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX - subindex for access via EtherCAT with index 7000h + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Output range

Addr.	Name	Bytes	Function	IX	SX
+0	PIQ	1	Status of the outputs	0x6200	
			Bit 0: DO 0		0x01
			Bit 1: DO 1		0x02
			Bit 2: DO 2		0x03
			Bit 3: DO 3		0x04
			Bit 4: DO 4		0x05
			Bit 5: DO 5		0x06
			Bit 6: DO 6		0x07
			Bit 7: DO 7		0x08

Tab. 10-33: Output range

10.11.4 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	80 mA
	Power dissipation	0.7 W
Digital outputs		
	Number of outputs	8
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	20.4...28.8 V ⎓
	Current consumption from load voltage L+ (without load)	15 mA
	Total current for each group, horizontal installation, 40°C	4 A
	Total current for each group, horizontal installation, 60°C	4 A
	Total current for each group, vertical installation	4 A
	Output current with signal "1", nominal value	0.5 A
	Signal logic output	P switching
	Output delay from "0" to "1"	30 µs
	Output delay from "1" to "0"	175 µs
	Lamp load	10 W
	Parallel connection of outputs for redundant activation	Not possible
	Parallel connection of outputs for increasing the output capacity	Not possible
	Activating a digital input	Yes
	Switching frequency with resistive load	≤1000 Hz
	Switching frequency with inductive load	≤0.5 Hz
	Switching frequency with lamp load	≤10 Hz
	(Internal) limiting of inductive cut-off voltage	L+ (-45 V)
	Short-circuit protection of the output	Yes, electronically
	Response threshold of the protection	1 A
	Output data size	8 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Display of the supply voltage	Green LED
	Display of the collective error	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓

Data sizes		
	Input bytes	0
	Output bytes	1
	Parameter bytes	0
	Diagnosis bytes	0

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	58 g
	Weight incl. accessories	58 g
	Gross weight	73 g

10.12 Art.-No. 57382, DO 8x 24 V DC 0,5A NPN

10.12.1 Features

Description

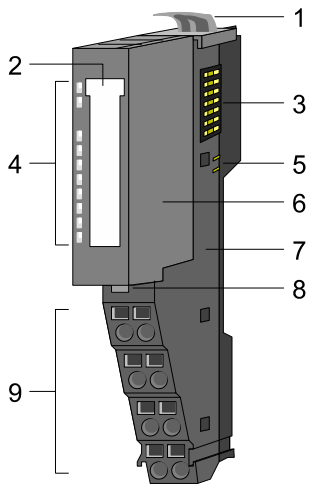
The electronic module records the binary control signals from the parent bus system and transmits them via the outputs to the process level. It has 8 channels working as low-side switch. They indicate their states by means of LEDs.

Low-side switches can be used for switching masses. If there is a short circuit between control line and mass, the load is activated, but the supply voltage is not affected.

Features

- 8 digital low-side outputs electrically isolated from the backplane bus
- Status indication of the channels by means of LEDs.

10.12.2 Structure



1 Locking lever on the terminal module
2 Labeling strips
3 Backplane bus
4 LED status indication
5 24 V DC power supply
6 Electronic module
7 Terminal module
8 Locking lever on the electronic module
9 Terminals

Order data

Type	Art.-No.	Description
Digital output module	57382	Digital output module incl. base DO 8xDC 24V 0.5A NPN

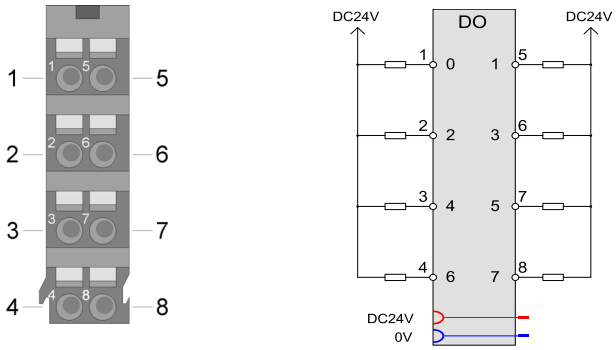
Status indication

RUN	MF	DO x	Description
		X	Bus communication is OK Module status is OK
		X	Bus communication is OK Module status reports error in case of over-load, short circuit or excessive temperature
		X	Bus communication is not possible Module status reports error in case of over-load, short circuit or excessive temperature
		X	Error of bus supply voltage
X		X	Flashing (2 Hz): configuration error (see 8 Troubleshooting, Seite 50)
			Digital output has 1 signal
			Digital output has 0 signal
X: not relevant			

Tab. 10-34: State indications of the LEDs

Connecting terminal

➔ Connect the wires with a cross section of 0.08 mm^2 to 1.5 mm^2 .



Pos.	Function	Type	Description
1	DO 0	Output	Digital output DO 0
2	DO 2	Output	Digital output DO 2
3	DO 4	Output	Digital output DO 4
4	DO 6	Output	Digital output DO 6
5	DO 1	Output	Digital output DO 1
6	DO 3	Output	Digital output DO 3
7	DO 5	Output	Digital output DO 5
8	DO 7	Output	Digital output DO 7

Tab. 10-35: Assignment of connecting terminals

NOTICE

Property damage due to incorrect connection

No voltage may be applied to outputs. The voltage can destroy the module!

➔ Do not supply external voltages to the outputs.

10.12.3 Input/output range

Input range

No bytes reserved for the module in the input range.

Output range

In PROFIBUS and PROFINET, the input or output range is displayed in the corresponding address range.

- IX = Index for access using CANopen
- SX - subindex for access via EtherCAT with index 7000h + EtherCAT port

NOTE

For further information, please refer to the manual of your bus node.

Output range

Addr.	Name	Bytes	Function	IX	SX
+0	PIQ	1	Status of the outputs	0x6200	
			Bit 0: DO 0		0x01
			Bit 1: DO 1		0x02
			Bit 2: DO 2		0x03
			Bit 3: DO 3		0x04
			Bit 4: DO 4		0x05
			Bit 5: DO 5		0x06
			Bit 6: DO 6		0x07
			Bit 7: DO 7		0x08

Tab. 10-36: Output range

10.12.4 Technical Data

Power consumption / power dissipation		
	Power consumption from the backplane bus	80 mA
	Power dissipation	0.6 W
Digital outputs		
	Number of outputs	8
	Cable length shielded	1000 m
	Cable length unshielded	600 m
	Nominal load voltage	20.4...28.8 V ⎓
	Current consumption from load voltage L+ (without load)	10 mA
	Total current for each group, horizontal installation, 40°C	2.5 A
	Total current for each group, horizontal installation, 60°C	2.5 A
	Total current for each group, vertical installation	2.5 A
	Output current with signal "1", nominal value	0.5 A
	Signal logic output	M switching
	Output delay from "0" to "1"	30 µs
	Output delay from "1" to "0"	100 µs
	Lamp load	10 W
	Parallel connection of outputs for redundant activation	Not possible
	Parallel connection of outputs for increasing the output capacity	Not possible
	Activating a digital input	Yes
	Switching frequency with resistive load	≤1000 Hz
	Switching frequency with inductive load	≤0.5 Hz
	Switching frequency with lamp load	≤10 Hz
	(Internal) limiting of inductive cut-off voltage	+45 V
	Short-circuit protection of the output	Yes, electronically
	Response threshold of the protection	1.7 A
	Output data size	8 bits
Status, alarm, diagnostics		
	Status indication	Green LED per channel
	Alarms	No
	Process interrupt	No
	Diagnostic interrupt	No
	Diagnostic function	No
	Diagnostic information can be read out	None
	Display of the supply voltage	Green LED
	Display of the collective error	Red LED
	Channel error display	None
Electrical isolation		
	Between the channels and backplane bus	Yes
	Insulation tested with	500 V ⎓

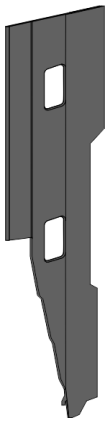
Data sizes		
	Input bytes	0
	Output bytes	1
	Parameter bytes	0
	Diagnosis bytes	0

Mechanical data	Housing	
	Material	PPE / PPE GF10
	Dimensions (W x H x D)	12.9 x 109 x 76.5 mm
	Net weight	58 g
	Weight incl. accessories	58 g
	Gross weight	73 g

11 Appendix

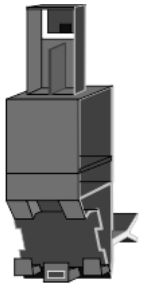
11.1 Accessories

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.



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.

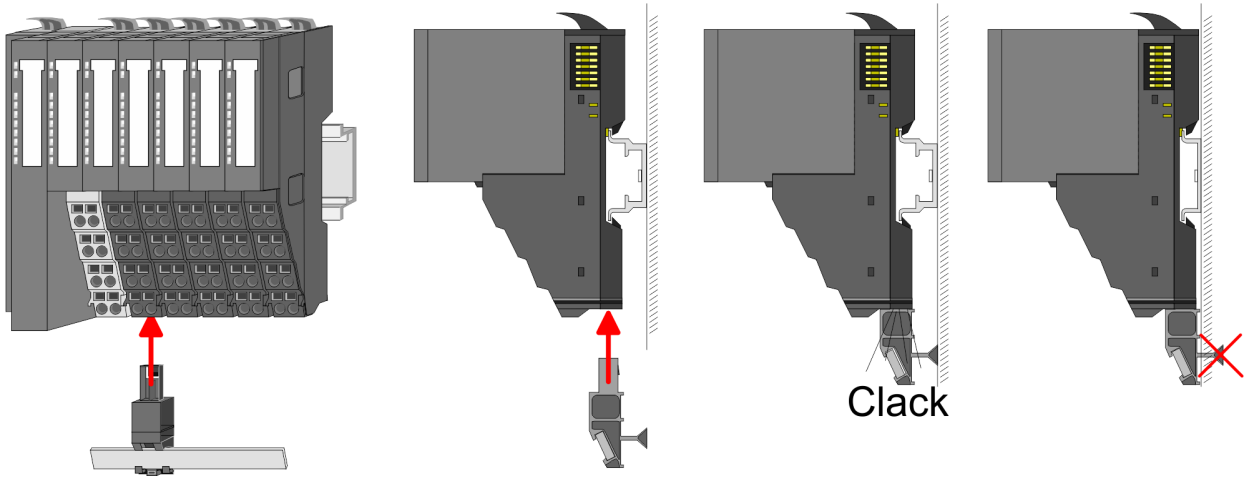


Fig. 11-1: Installing the carriers for shield busses

11.2 Glossary

General terms:

Term	Meaning
Intended purpose	Use of a product, process, or feature according to the specifications, instructions, and information supplied by the MANUFACTURER.
Bit	Binary digit
Byte	1 byte corresponds to 8 bits
DI	Digital inputs
DIN	Deutsches Institut für Normung (German Institute for Standardization)
I/O	Input/Output
EU Directive 2014/30/EU	EMC Directive
EMC	Electromagnetic compatibility
EN	European standard
ESD	Electrostatic discharges
FE	Functional earth
I	Current
IEC	International Electrotechnical Commission, international standardization institute
IN	Input
IP20	Ingress Protection, protection class according to DIN EN 60529 1st code digit = Protection against accidental contact and solid foreign objects 2nd code digit = Protection against ingress of water 2: protected against: solid foreign objects with diameter starting from 12.5 mm and contact with a finger. 0: No protection
IP67	6: Dustproof, protection against contact with a wire 7: Protection against the effects of temporary submersion in water
ISO	International Standard Organization
LED	Light Emitting Diode
n. c.	not connected
OUT	Output
PELV	Protective Extra Low Voltage
SELV	Safety Extra Low Voltage
U	Voltage
U/I	Voltage / current

11.3 Legal notes

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