

VIPA System SLIO

SM-DIO | | Manual

HB300 | SM-DIO | | en | 19-22

Digital signal modules - SM 02x



VIPA GmbH Ohmstr. 4 91074 Herzogenaurach

Telephone: 09132-744-0 Fax: 09132-744-1864 Email: info@vipa.com Internet: www.vipa.com

Table of contents

| 1 | General | . 5 |
|---|------------------------------------|-----|
| | 1.1 Copyright © VIPA GmbH | . 5 |
| | 1.2 About this manual | 6 |
| | 1.3 Safety information | 7 |
| 2 | Basics and mounting | . 8 |
| | 2.1 Safety information for users | |
| | 2.2 System conception | |
| | 2.2.1 Overview | |
| | 2.2.2 Components | |
| | 2.2.3 Accessories | |
| | 2.2.4 Hardware revision | |
| | 2.3 Dimensions | |
| | 2.4 Mounting periphery modules | |
| | 2.5 Wiring periphery modules | |
| | 2.6 Wiring power modules | |
| | 2.7 Demounting periphery modules | |
| | 2.8 Trouble shooting - LEDs | 28 |
| | 2.9 Installation guidelines | 29 |
| | 2.10 General data | 31 |
| 3 | Digital Input | 33 |
| | 3.1 021-1BB00 - DI 2xDC 24V | |
| | 3.1.1 Technical data | |
| | 3.2 021-1BB10 - DI 2xDC 24V 2µs4ms | |
| | 3.2.1 Technical data | |
| | 3.2.2 Parameter data | |
| | 3.2.3 Diagnostics and interrupt | |
| | 3.3 021-1BB50 - DI 2xDC 24V NPN | |
| | 3.3.1 Technical data | |
| | 3.4 021-1BB70 - DI 2xDC 24V ETS | |
| | 3.4.1 Technical data | |
| | 3.4.2 Parameter data | |
| | 3.4.3 Diagnostic data | |
| | 3.5 021-1BD00 - DI 4xDC 24V | |
| | 3.5.1 Technical data | 64 |
| | 3.6 021-1BD10 - DI 4xDC 24V 2µs4ms | 66 |
| | 3.6.1 Technical data | 68 |
| | 3.6.2 Parameter data | 70 |
| | 3.6.3 Diagnostics and interrupt | 71 |
| | 3.7 021-1BD40 - DI 4xDC 24V 3 wire | 75 |
| | 3.7.1 Technical data | 77 |
| | 3.8 021-1BD50 - DI 4xDC 24V NPN | 79 |
| | 3.8.1 Technical data | |
| | 3.9 021-1BD70 - DI 4xDC 24V ETS | 83 |
| | 3.9.1 Technical data | 87 |
| | 3.9.2 Parameter data | 89 |
| | 3.9.3 Diagnostic data | 93 |
| | 3.10 021-1BF00 - DI 8xDC 24V | 95 |

| | 3.10.1 Technical data | 97 |
|---|--|-----|
| | 3.11 021-1BF01 - DI 8xDC 24V 0.5ms | 100 |
| | 3.11.1 Technical data | 102 |
| | 3.12 021-1BF50 - DI 8xDC 24V NPN | 105 |
| | 3.12.1 Technical data | 107 |
| | 3.13 021-1DF00 - DI 8xDC 24V Diagnosis | 110 |
| | 3.13.1 Technical data | 112 |
| | 3.13.2 Parameter data | 114 |
| | 3.13.3 Diagnostic data | 115 |
| 4 | Digital Output | 118 |
| | 4.1 022-1BB00 - DO 2xDC 24V 0.5A | |
| | 4.1.1 Technical data | |
| | 4.2 022-1BB20 - DO 2xDC 24V 2A | |
| | 4.2.1 Technical data | |
| | 4.3 022-1BB50 - DO 2xDC 24V 0.5A NPN | |
| | 4.3.1 Technical data | |
| | 4.4 022-1BB70 - DO 2xDC 24V 0.5A ETS | |
| | 4.4.1 Technical data | |
| | 4.4.2 Parameter data | |
| | 4.4.3 Diagnostic data | |
| | 4.5 022-1BB90 - DO 2xDC 24V 0.5A PWM | |
| | 4.5.1 Technical data | |
| | 4.5.2 Parameter data | |
| | 4.5.3 Diagnostic data | |
| | 4.6 022-1BD00 - DO 4xDC 24V 0.5A | |
| | 4.6.1 Technical data | |
| | 4.7 022-1BD20 - DO 4xDC 24V 2A | |
| | 4.7.1 Technical data | |
| | 4.8 022-1BD50 - DO 4xDC 24V 0.5A NPN | |
| | 4.8.1 Technical data | |
| | 4.9 022-1BD70 - DO 4xDC 24V 0.5A ETS | |
| | 4.9.1 Technical data | |
| | 4.9.2 Parameter data | 181 |
| | 4.9.3 Diagnostic data | 187 |
| | 4.10 022-1BF00 - DO 8xDC 24V 0.5A | 189 |
| | 4.10.1 Technical data | |
| | 4.11 022-1BF50 - DO 8xDC 24V 0.5A NPN | |
| | 4.11.1 Technical data | |
| | 4.12 022-1DF00 - DO 8xDC 24V 0.5A Diagnostic | |
| | 4.12.1 Technical data | |
| | 4.12.2 Parameter data | |
| | 4.12.3 Diagnostic data | |
| | 4.13 022-1HB10 - DO 2xRelay | |
| | 4.13.1 Technical data | |
| | 4.14 022-1HD10 - DO 4xRelay | |
| | 4.14.1 Technical data | 215 |

VIPA System SLIO General

Copyright © VIPA GmbH

1 General

1.1 Copyright © VIPA GmbH

All Rights Reserved

This document contains proprietary information of VIPA and is not to be disclosed or used except in accordance with applicable agreements.

This material is protected by the copyright laws. It may not be reproduced, distributed, or altered in any fashion by any entity (either internal or external to VIPA), except in accordance with applicable agreements, contracts or licensing, without the express written consent of VIPA and the business management owner of the material.

For permission to reproduce or distribute, please contact: VIPA, Gesellschaft für Visualisierung und Prozessautomatisierung mbH Ohmstraße 4, D-91074 Herzogenaurach, Germany

Tel.: +49 9132 744 -0 Fax.: +49 9132 744-1864

EMail: info@vipa.de http://www.vipa.com



Every effort has been made to ensure that the information contained in this document was complete and accurate at the time of publishing. Nevertheless, the authors retain the right to modify the information.

This customer document describes all the hardware units and functions known at the present time. Descriptions may be included for units which are not present at the customer site. The exact scope of delivery is described in the respective purchase contract.

EC Conformity Declaration

Hereby, VIPA GmbH declares that the products and systems are in compliance with the essential requirements and other relevant provisions. Conformity is indicated by the CE marking affixed to the product.

Conformity Information

For more information regarding CE marking and Declaration of Conformity (DoC), please contact your local VIPA customer service organization.

Trademarks

VIPA, SLIO, System 100V, System 200V, System 300V, System 300S, System 400V, System 500S and Commander Compact are registered trademarks of VIPA Gesellschaft für Visualisierung und Prozessautomatisierung mbH.

SPEED7 is a registered trademark of profichip GmbH.

SIMATIC, STEP, SINEC, TIA Portal, S7-300, S7-400 and S7-1500 are registered trademarks of Siemens AG.

Microsoft and Windows are registered trademarks of Microsoft Inc., USA.

Portable Document Format (PDF) and Postscript are registered trademarks of Adobe Systems, Inc.

All other trademarks, logos and service or product marks specified herein are owned by their respective companies.

General VIPA System SLIO

About this manual

Information product support

Contact your local VIPA Customer Service Organization representative if you wish to report errors or questions regarding the contents of this document. If you are unable to locate a customer service centre, contact VIPA as follows:

VIPA GmbH, Ohmstraße 4, 91074 Herzogenaurach, Germany

Telefax: +49 9132 744-1204 EMail: documentation@vipa.de

Technical support

Contact your local VIPA Customer Service Organization representative if you encounter problems with the product or have questions regarding the product. If you are unable to locate a customer service centre, contact VIPA as follows:

VIPA GmbH, Ohmstraße 4, 91074 Herzogenaurach, Germany

Tel.: +49 9132 744-1150 (Hotline)

EMail: support@vipa.de

1.2 About this manual

Target audience

The manual is targeted at users who have a background in automation technology.

Structure of the manual

The manual consists of chapters. Every chapter provides a self-contained description of a specific topic.

Guide to the document

The following guides are available in the manual:

- An overall table of contents at the beginning of the manual
- References with page numbers

Availability

The manual is available in:

- printed form, on paper
- in electronic form as PDF-file (Adobe Acrobat Reader)

Icons Headings

Important passages in the text are highlighted by following icons and headings:



DANGER!

Immediate or likely danger. Personal injury is possible.



CAUTION!

Damages to property is likely if these warnings are not heeded.



Supplementary information and useful tips.

VIPA System SLIO General

Safety information

1.3 Safety information

Applications conforming with specifications

The system is constructed and produced for:

- communication and process control
- general control and automation tasks
- industrial applications
- operation within the environmental conditions specified in the technical data
- installation into a cubicle



DANGER!

This device is not certified for applications in

in explosive environments (EX-zone)

Documentation

The manual must be available to all personnel in the

- project design department
- installation department
- commissioning
- operation



CAUTION!

The following conditions must be met before using or commissioning the components described in this manual:

- Hardware modifications to the process control system should only be carried out when the system has been disconnected from power!
- Installation and hardware modifications only by properly trained personnel.
- The national rules and regulations of the respective country must be satisfied (installation, safety, EMC ...)

Disposal

National rules and regulations apply to the disposal of the unit!

Safety information for users

2 Basics and mounting

2.1 Safety information for users

Handling of electrostatic sensitive modules

VIPA modules make use of highly integrated components in MOS-Technology. These components are extremely sensitive to over-voltages that can occur during electrostatic discharges. The following symbol is attached to modules that can be destroyed by electrostatic discharges.



The Symbol is located on the module, the module rack or on packing material and it indicates the presence of electrostatic sensitive equipment. It is possible that electrostatic sensitive equipment is destroyed by energies and voltages that are far less than the human threshold of perception. These voltages can occur where persons do not discharge themselves before handling electrostatic sensitive modules and they can damage components thereby, causing the module to become inoperable or unusable. Modules that have been damaged by electrostatic discharges can fail after a temperature change, mechanical shock or changes in the electrical load. Only the consequent implementation of protection devices and meticulous attention to the applicable rules and regulations for handling the respective equipment can prevent failures of electrostatic sensitive modules.

Shipping of modules

Modules must be shipped in the original packing material.

Measurements and alterations on electrostatic sensitive modules When you are conducting measurements on electrostatic sensitive modules you should take the following precautions:

- Floating instruments must be discharged before use.
- Instruments must be grounded.

Modifying electrostatic sensitive modules you should only use soldering irons with grounded tips.



CAUTION!

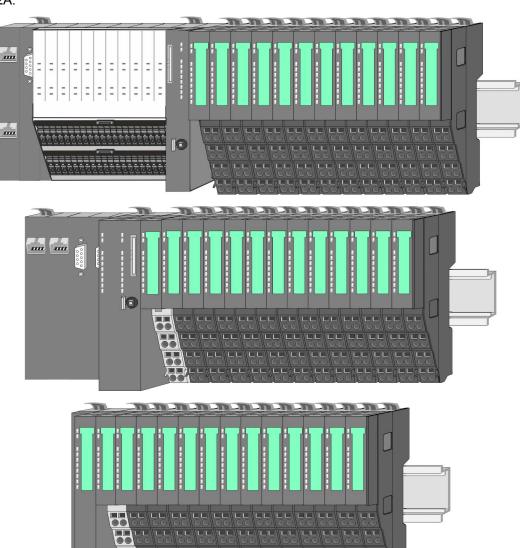
Personnel and instruments should be grounded when working on electrostatic sensitive modules.

System conception > Overview

2.2 System conception

2.2.1 Overview

System SLIO is a modular automation system for assembly on a 35mm mounting rail. By means of the peripheral modules with 2, 4 or 8 channels this system may properly be adapted matching to your automation tasks. The wiring complexity is low, because the supply of the DC 24V power section is integrated to the backplane bus and defective modules may be replaced with standing wiring. By deployment of the power modules in contrasting colors within the system, further isolated areas may be defined for the DC 24V power section supply, respectively the electronic power supply may be extended with 2A.



System conception > Components

2.2.2 Components

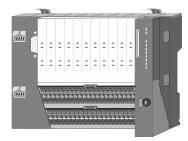
- CPU (head module)
- Bus coupler (head module)
- Line extension
- Periphery modules
- Accessories



CAUTION!

Only modules of VIPA may be combined. A mixed operation with third-party modules is not allowed!

CPU 01xC



With this CPU 01xC, the CPU electronic, input/output components and power supply are integrated to one casing. In addition, up to 64 periphery modules of the System SLIO can be connected to the backplane bus. As head module via the integrated power supply CPU electronic and the I/O components are power supplied as well as the electronic of the connected periphery modules. To connect the power supply of the I/O components and for DC 24V power supply of via backplane bus connected peripheral modules, the CPU has removable connectors. By installing of up to 64 periphery modules at the backplane bus, these are electrically connected, this means these are assigned to the backplane bus, the electronic modules are power supplied and each periphery module is connected to the DC 24V power section supply.

CPU 01x



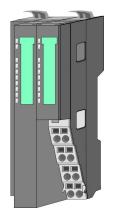
With this CPU 01x, the CPU electronic and power supply are integrated to one casing. As head module, via the integrated power module for power supply, CPU electronic and the electronic of the connected periphery modules are supplied. The DC 24 power section supply for the linked periphery modules is established via a further connection of the power module. By installing of up to 64 periphery modules at the backplane bus, these are electrically connected, this means these are assigned to the backplane bus, the electronic modules are power supplied and each periphery module is connected to the DC 24V power section supply.



CAUTION!

CPU part and power module may not be separated! Here you may only exchange the electronic module!

Bus coupler



With a bus coupler bus interface and power module is integrated to one casing. With the bus interface you get access to a subordinated bus system. As head module, via the integrated power module for power supply, bus interface and the electronic of the connected periphery modules are supplied. The DC 24 power section supply for the linked periphery modules is established via a further connection of the power module. By installing of up to 64 periphery modules at the bus coupler, these are electrically connected, this means these are assigned to the backplane bus, the electronic modules are power supplied and each periphery module is connected to the DC 24V power section supply.

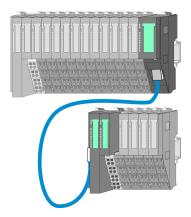


CAUTION!

Bus interface and power module may not be separated! Here you may only exchange the electronic module!

System conception > Components

Line extension

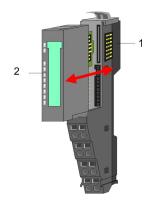


In the System SLIO there is the possibility to place up to 64 modules in on line. By means of the line extension you can divide this line into several lines. Here you have to place a line extension master at each end of a line and the subsequent line has to start with a line extension slave. Master and slave are to be connected via a special connecting cable. In this way, you can divide a line on up to 5 lines. For each line extension the maximum number of pluggable modules at the System SLIO bus is decreased by 1. To use the line extension no special configuration is required.

Periphery modules

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





- 1 Terminal module
- 2 Electronic module

Terminal module



The *terminal* module serves to carry the electronic module, contains the backplane bus with power supply for the electronic, the DC 24V power section supply and the staircase-shaped terminal for wiring. Additionally the terminal module has a locking system for fixing at a mounting rail. By means of this locking system your SLIO system may be assembled outside of your switchgear cabinet to be later mounted there as whole system.

Electronic module



The functionality of a SLIO periphery module is defined by the *electronic* module, which is mounted to the terminal module by a sliding mechanism. With an error the defective module may be exchanged for a functional module with standing installation. At the front side there are LEDs for status indication. For simple wiring each module shows a corresponding connection diagram at the front and at the side.

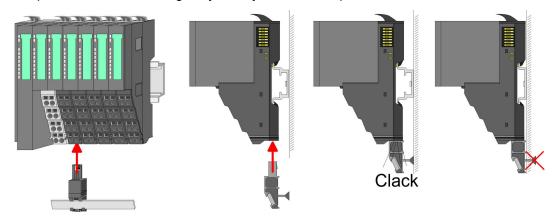
System conception > Accessories

2.2.3 Accessories

Shield bus carrier



The shield bus carrier (order no.: 000-0AB00) serves to carry the shield bus (10mm x 3mm) to connect cable shields. Shield bus carriers, shield bus and shield fixings are not in the scope of delivery. They are only available as accessories. The shield bus carrier is mounted underneath the terminal of the terminal module. With a flat mounting rail for adaptation to a flat mounting rail you may remove the spacer of the shield bus carrier.



Bus cover



With each head module, to protect the backplane bus connectors, there is a mounted bus cover in the scope of delivery. You have to remove the bus cover of the head module before mounting a System SLIO module. For the protection of the backplane bus connector you always have to mount the bus cover at the last module of your system again. The bus cover has the order no. 000-0AA00.

Coding pins



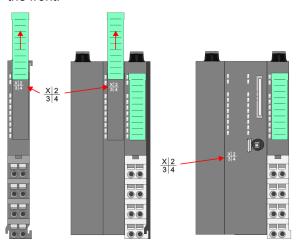
There is the possibility to fix the assignment of electronic and terminal module. Here coding pins (order number 000-0AC00) from VIPA can be used. The coding pin consists of a coding jack and a coding plug. By combining electronic and terminal module with coding pin, the coding jack remains in the electronic module and the coding plug in the terminal module. This ensures that after replacing the electronics module just another electronic module can be plugged with the same encoding.

Dimensions

2.2.4 Hardware revision

Hardware revision on the front

- The hardware revision version is printed on every System SLIO module.
- Since a System SLIO module consists of a terminal and electronics module, you will find a hardware revision on each of them.
- Authoritative for the hardware revision of a System SLIO module is the hardware revision of the electronic module. This is always located under the labeling strip of the corresponding electronic module.
- On modules without labeling strip, such as CPUs, the hardware revision is printed on the front.



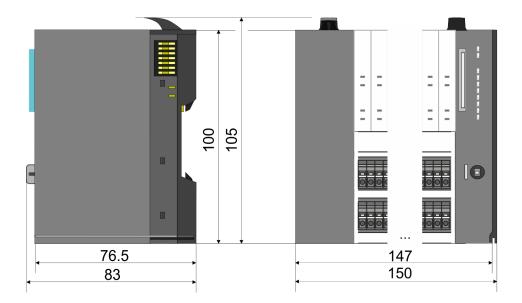
The example here shows the hardware revision 1. 1 is marked with X.

Hardware revision via web server

On the CPUs and some bus couplers, you can output the hardware revision *'HW Revision'* via the integrated web server.

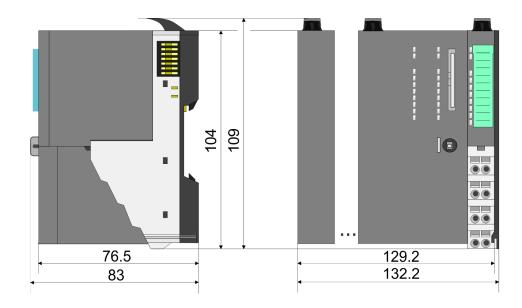
2.3 Dimensions

Dimensions CPU 01xC

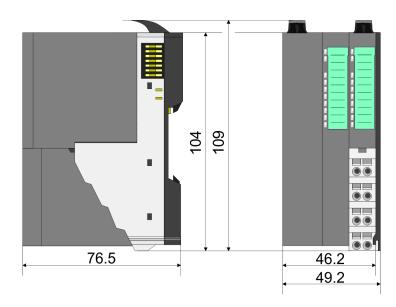


Dimensions

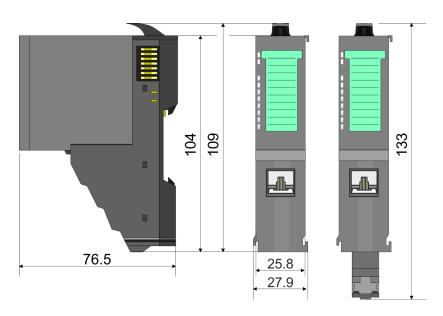
Dimensions CPU 01x



Dimensions bus coupler and line extension slave

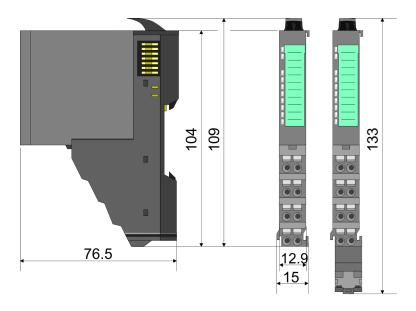


Dimensions line extension master

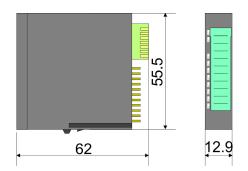


Dimensions

Dimension periphery module



Dimensions electronic module



Dimensions in mm

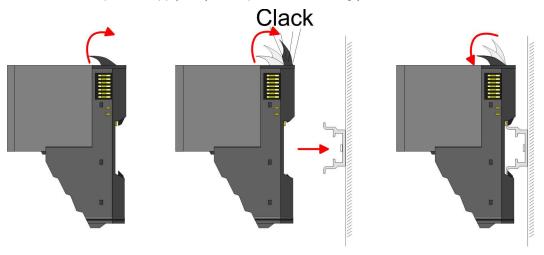
Mounting periphery modules

2.4 Mounting periphery modules

Requirements for UL compliance use

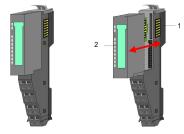
- Use for power supply exclusively SELV/PELV power supplies.
- The System SLIO must be installed and operated in a housing according to IEC 61010-1 9.3.2 c).

There is a locking lever at the top side of the module. For mounting and demounting this locking lever is to be turned upwards until this engages. For mounting place the module to the module installed before and push the module to the mounting rail guided by the strips at the upper and lower side of the module. The module is fixed to the mounting rail by pushing downward the locking lever. The modules may either separately be mounted to the mounting rail or as block. Here is to be considered that each locking lever is opened. The modules are each installed on a mounting rail. The electronic and power section supply are connected via the backplane bus. Up to 64 modules may be mounted. Please consider here that the sum current of the electronic power supply does not exceed the maximum value of 3A. By means of the power module 007-1AB10 the current of the electronic power supply may be expanded accordingly.



Terminal and electronic module

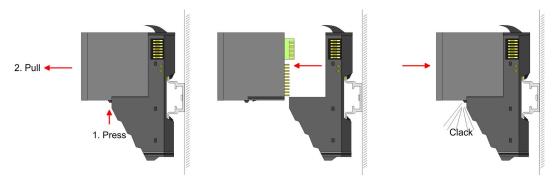




2 Electronic module

For the exchange of a electronic module, the electronic module may be pulled forward after pressing the unlocking lever at the lower side of the module. For installation plug the electronic module guided by the strips at the lower side until this engages audible to the terminal module.

Each periphery module consists of a *terminal* and an *electronic module*.

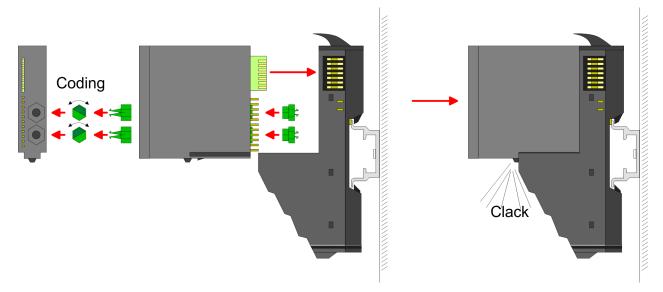


Mounting periphery modules

Coding



There is the possibility to fix the assignment of electronic and terminal module. Here coding pins (order number 000-0AC00) from VIPA can be used. The coding pin consists of a coding jack and a coding plug. By combining electronic and terminal module with coding pin, the coding jack remains in the electronic module and the coding plug in the terminal module. This ensures that after replacing the electronics module just another electronic module can be plugged with the same encoding.



Each electronic module has on its back 2 coding sockets for coding jacks. Due to the characteristics, with the coding jack 6 different positions can be plugged, each. Thus there are 36 possible combinations for coding with the use of both coding sockets.

- 1. Plug, according to your coding, 2 coding jacks in the coding sockets of your electronic module until they lock
- **2.** Now plug the according coding plugs into the coding jacks.
- 3. To fix the coding put both the electronic and terminal module together until they lock



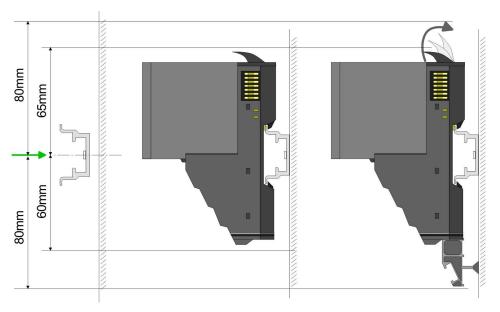
CAUTION!

Please consider that when replacing an already coded electronic module, this is always be replaced by an electronic module with the same coding.

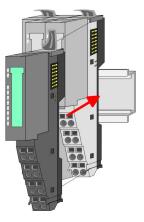
Even with an existing coding on the terminal module, you can plug an electronic module without coding. The user is responsible for the correct usage of the coding pins. VIPA assumes no liability for incorrectly attached electronic modules or for damages which arise due to incorrect coding!

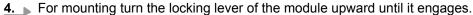
Mounting periphery modules

Mounting periphery modules



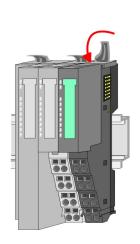
- 1. Mount the mounting rail! Please consider that a clearance from the middle of the mounting rail of at least 80mm above and 60mm below, respectively 80mm by deployment of shield bus carriers, exist.
- 2. Mount your head module such as CPU or field bus coupler.
- **3.** Before mounting the periphery modules you have to remove the bus cover at the right side of the Head module by pulling it forward. Keep the cover for later mounting.



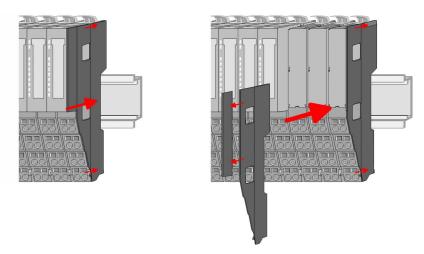


- **5.** For mounting place the module to the module installed before and push the module to the mounting rail guided by the strips at the upper and lower side of the module.
- **6.** Turn the locking lever of the periphery module downward, again.





Wiring periphery modules



After mounting the whole system, to protect the backplane bus connectors at the last module you have to mount the bus cover, now. If the last module is a clamp module, for adaptation the upper part of the bus cover is to be removed.

2.5 Wiring periphery modules

Terminal module terminals



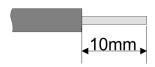
CAUTION!

Do not connect hazardous voltages!

If this is not explicitly stated in the corresponding module description, hazardous voltages are not allowed to be connected to the corresponding terminal module!

With wiring the terminal modules, terminals with spring clamp technology are used for wiring. The spring clamp technology allows quick and easy connection of your signal and supply lines. In contrast to screw terminal connections this type of connection is vibration proof.

Data



U_{max} 240V AC / 30V DC

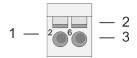
 I_{max} 10A

Cross section 0.08 ... 1.5mm² (AWG 28 ... 16)

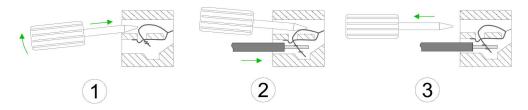
Stripping length 10mm

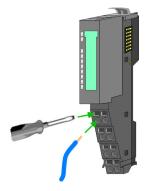
Wiring periphery modules

Wiring procedure



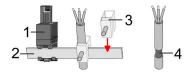
- 1 Pin number at the connector
- 2 Opening for screwdriver
- 3 Connection hole for wire





- 1. Insert a suited screwdriver at an angel into the square opening as shown. Press and hold the screwdriver in the opposite direction to open the contact spring.
- 2. Insert the stripped end of wire into the round opening. You can use wires with a cross section of 0.08mm² up to 1.5mm²
- **3.** By removing the screwdriver, the wire is securely fixed via the spring contact to the terminal.

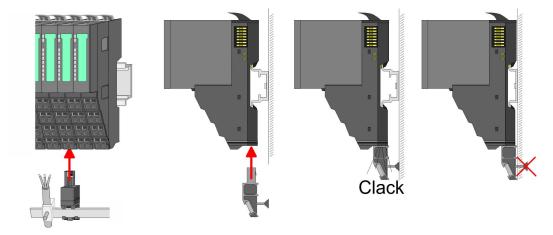
Shield attachment



- 1 Shield bus carrier
- 2 Shield bus (10mm x 3mm)
- 3 Shield clamp
- 4 Cable shield

To attach the shield the mounting of shield bus carriers are necessary. The shield bus carrier (available as accessory) serves to carry the shield bus to connect cable shields.

- **1.** Each System SLIO module has a carrier hole for the shield bus carrier. Push the shield bus carrier, until they engage into the module. With a flat mounting rail for adaptation to a flat mounting rail you may remove the spacer of the shield bus carrier.
- 2. Put your shield bus into the shield bus carrier.



3. Attach the cables with the accordingly stripped cable screen and fix it by the shield clamp with the shield bus.

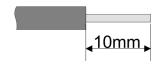
Wiring power modules

2.6 Wiring power modules

Terminal module terminals

Power modules are either integrated to the head module or may be installed between the periphery modules. With power modules, terminals with spring clamp technology are used for wiring. The spring clamp technology allows quick and easy connection of your signal and supply lines. In contrast to screw terminal connections this type of connection is vibration proof.

Data

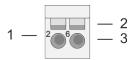


 U_{max} 30V DC 10A I_{max}

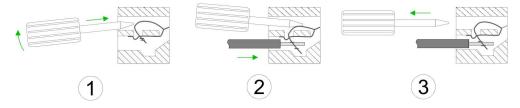
0.08 ... 1.5mm² (AWG 28 ... 16) Cross section

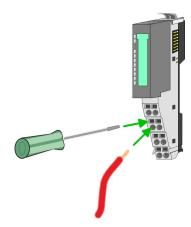
Stripping length 10mm

Wiring procedure



- Pin number at the connector
- Opening for screwdriver
- 2 Connection hole for wire

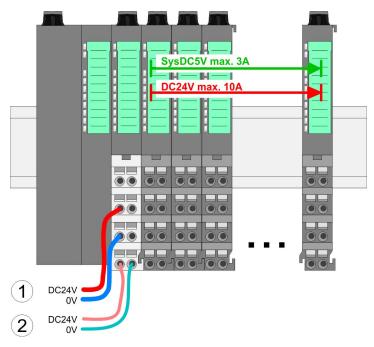




- Insert a suited screwdriver at an angel into the square opening as shown. Press and hold the screwdriver in the opposite direction to open the contact spring.
- 2. Insert the stripped end of wire into the round opening. You can use wires with a cross section of 0.08mm² up to 1.5mm²
- By removing the screwdriver, the wire is securely fixed via the spring contact to the terminal.

Wiring power modules

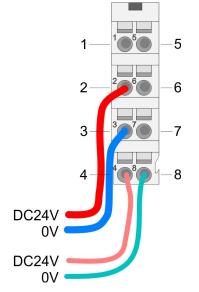
Standard wiring



- (1) DC 24V for power section supply I/O area (max. 10A)
- (2) DC 24V for electronic power supply bus coupler and I/O area

PM - Power module

For wires with a core cross-section of 0.08mm² up to 1.5mm².



| Pos. | Function | Туре | Description |
|------|------------|------|--------------------------------------|
| 1 | | | not connected |
| 2 | DC 24V | I | DC 24V for power section supply |
| 3 | 0V | I | GND for power section supply |
| 4 | Sys DC 24V | I | DC 24V for electronic section supply |
| 5 | | | not connected |
| 6 | DC 24V | I | DC 24V for power section supply |
| 7 | 0V | I | GND for power section supply |
| 8 | Sys 0V | I | GND for electronic section supply |

I: Input



CAUTION!

Since the power section supply is not internally protected, it is to be externally protected with a fuse, which corresponds to the maximum current. This means max. 10A is to be protected by a 10A fuse (fast) respectively by a line circuit breaker 10A characteristics Z!



The electronic power section supply is internally protected against higher voltage by fuse. The fuse is within the power module. If the fuse releases, its electronic module must be exchanged!

Wiring power modules

Fusing

■ The power section supply is to be externally protected with a fuse, which corresponds to the maximum current. This means max. 10A is to be protected with a 10A fuse (fast) respectively by a line circuit breaker 10A characteristics Z!

- It is recommended to externally protect the electronic power supply for head modules and I/O area with a 2A fuse (fast) respectively by a line circuit breaker 2A characteristics Z.
- The electronic power supply for the I/O area of the power module 007-1AB10 should also be externally protected with a 1A fuse (fast) respectively by a line circuit breaker 1A characteristics Z.

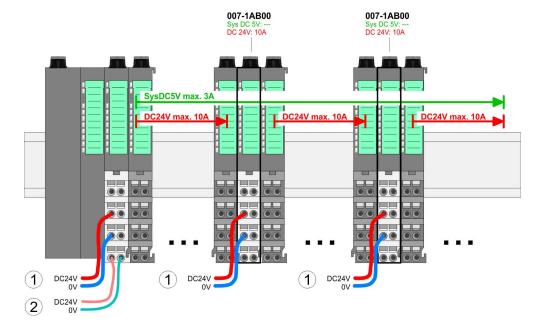
State of the electronic power supply via LEDs

After PowerON of the System SLIO the LEDs RUN respectively MF get on so far as the sum current does not exceed 3A. With a sum current greater than 3A the LEDs may not be activated. Here the power module with the order number 007-1AB10 is to be placed between the peripheral modules.

Deployment of the power modules

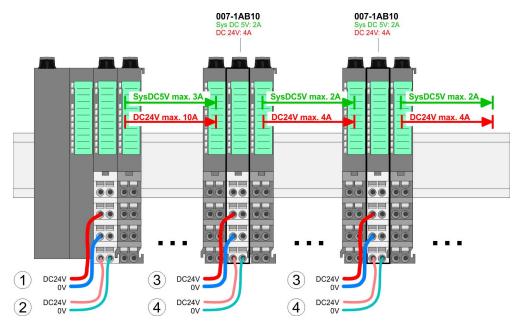
- If the 10A for the power section supply is no longer sufficient, you may use the power module from VIPA with the order number 007-1AB00. So you have also the possibility to define isolated groups.
- The power module with the order number 007-1AB10 is to be used if the 3A for the electronic power supply at the backplane bus is no longer sufficient. Additionally you get an isolated group for the DC 24V power section supply with max. 4A.
- By placing the power module 007-1AB10 at the following backplane bus modules may be placed with a sum current of max. 2A. Afterwards a power module is to be placed again. To secure the power supply, the power modules may be mixed used.

Power module 007-1AB00



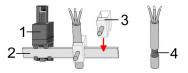
Wiring power modules

Power module 007-1AB10



- (1) DC 24V for power section supply I/O area (max. 10A)
- (2) DC 24V for electronic power supply bus coupler and I/O area (3) DC 24V for power section supply I/O area (max. 4A)
- (4) DC 24V for electronic power supply I/O area

Shield attachment

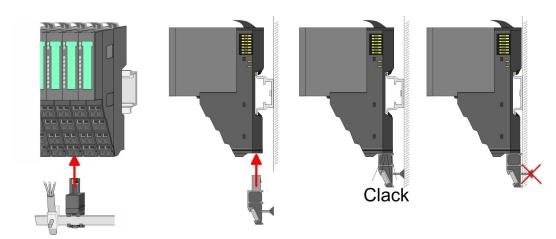


- Shield bus carrier
- 2 Shield bus (10mm x 3mm)
- Shield clamp 3
- Cable shield

To attach the shield the mounting of shield bus carriers are necessary. The shield bus carrier (available as accessory) serves to carry the shield bus to connect cable shields.

- 1. Each System SLIO module has a carrier hole for the shield bus carrier. Push the shield bus carrier, until they engage into the module. With a flat mounting rail for adaptation to a flat mounting rail you may remove the spacer of the shield bus carrier.
- 2. Put your shield bus into the shield bus carrier.

Demounting periphery modules



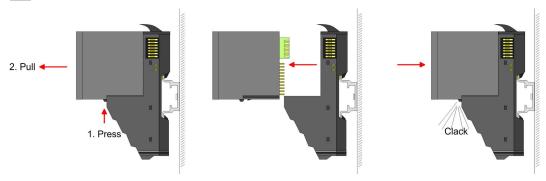
3. Attach the cables with the accordingly stripped cable screen and fix it by the shield clamp with the shield bus.

2.7 Demounting periphery modules

Proceeding

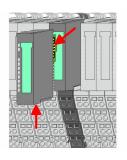
Exchange of an electronic module

1. Power-off your system.



- **2.** For the exchange of a electronic module, the electronic module may be pulled forward after pressing the unlocking lever at the lower side of the module.
- **3.** For installation plug the new electronic module guided by the strips at the lower side until this engages to the terminal module.
 - ⇒ Now you can bring your system back into operation.

Exchange of a periphery module



- **1.** Power-off your system.
- **2.** Remove if exists the wiring of the module.

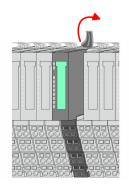
3.



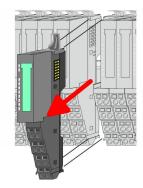
For demounting and exchange of a (head) module or a group of modules, due to mounting reasons you always have to remove the electronic module <u>right</u> beside. After mounting it may be plugged again.

Press the unlocking lever at the lower side of the just mounted right module and pull it forward.

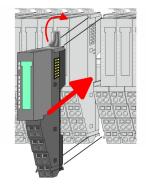
Demounting periphery modules



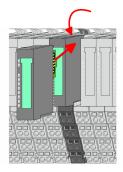
4. Turn the locking lever of the module to be exchanged upwards.



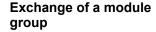
- **5.** Pull the module.
- **6.** For mounting turn the locking lever of the module to be mounted upwards.

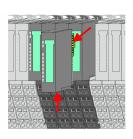


- 7. To mount the module put it to the gap between the both modules and push it, guided by the stripes at both sides, to the mounting rail.
- **8.** Turn the locking lever downward, again.



- **9.** Plug again the electronic module, which you have removed before.
- 10. Wire your module.
 - ⇒ Now you can bring your system back into operation.





- **1.** Power-off your system.
- **2.** Remove if exists the wiring of the module group.

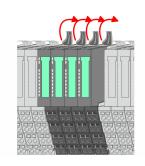
3.



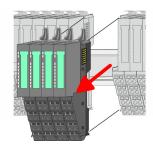
For demounting and exchange of a (head) module or a group of modules, due to mounting reasons you always have to remove the electronic module <u>right</u> beside. After mounting it may be plugged again.

Press the unlocking lever at the lower side of the just mounted right module near the module group and pull it forward.

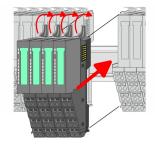
Demounting periphery modules



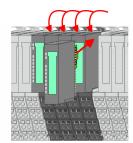
4. Turn all the locking lever of the module group to be exchanged upwards.



- **5.** Pull the module group forward.
- **6.** For mounting turn all the locking lever of the module group to be mounted upwards.



- 7. To mount the module group put it to the gap between the both modules and push it, guided by the stripes at both sides, to the mounting rail.
- **8.** Turn all the locking lever downward, again.



- **9.** Plug again the electronic module, which you have removed before.
- **10.** Wire your module group.
 - ⇒ Now you can bring your system back into operation.

Trouble shooting - LEDs

2.8 Trouble shooting - LEDs

General

Each module has the LEDs RUN and MF on its front side. Errors or incorrect modules may be located by means of these LEDs.

In the following illustrations flashing LEDs are marked by \tilde{\pi}.

Sum current of the electronic power supply exceeded

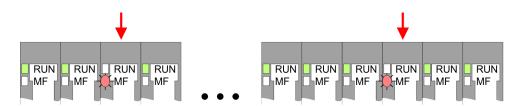


Behaviour: After PowerON the RUN LED of each module is off and the MF LED of each module is sporadically on.

Reason: The maximum current for the electronic power supply is exceeded.

Remedy: As soon as the sum current of the electronic power supply is exceeded, always place the power module 007-1AB10. & Chap. 2.6 'Wiring power modules' page 21

Error in configuration

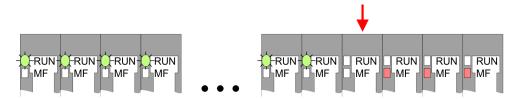


Behaviour: After PowerON the MF LED of one module respectively more modules flashes. The RUN LED remains off.

Reason: At this position a module is placed, which does not correspond to the configured module.

Remedy: Match configuration and hardware structure.

Module failure



Behaviour: After PowerON all of the RUN LEDs up to the defective module are flashing. With all following modules the MF LED is on and the RUN LED is off.

Reason: The module on the right of the flashing modules is defective.

Remedy: Replace the defective module.

Installation guidelines

2.9 Installation guidelines

General

The installation guidelines contain information about the interference free deployment of a PLC system. There is the description of the ways, interference may occur in your PLC, how you can make sure the electromagnetic compatibility (EMC), and how you manage the isolation.

What does EMC mean?

Electromagnetic compatibility (EMC) means the ability of an electrical device, to function error free in an electromagnetic environment without being interfered respectively without interfering the environment.

The components of VIPA are developed for the deployment in industrial environments and meets high demands on the EMC. Nevertheless you should project an EMC planning before installing the components and take conceivable interference causes into account.

Possible interference causes

Electromagnetic interferences may interfere your control via different ways:

- Electromagnetic fields (RF coupling)
- Magnetic fields with power frequency
- Bus system
- Power supply
- Protected earth conductor

Depending on the spreading medium (lead bound or lead free) and the distance to the interference cause, interferences to your control occur by means of different coupling mechanisms.

There are:

- galvanic coupling
- capacitive coupling
- inductive coupling
- radiant coupling

Basic rules for EMC

In the most times it is enough to take care of some elementary rules to guarantee the EMC. Please regard the following basic rules when installing your PLC.

- Take care of a correct area-wide grounding of the inactive metal parts when installing your components.
 - Install a central connection between the ground and the protected earth conductor system.
 - Connect all inactive metal extensive and impedance-low.
 - Please try not to use aluminium parts. Aluminium is easily oxidizing and is therefore less suitable for grounding.
- When cabling, take care of the correct line routing.
 - Organize your cabling in line groups (high voltage, current supply, signal and data lines).
 - Always lay your high voltage lines and signal respectively data lines in separate channels or bundles.
 - Route the signal and data lines as near as possible beside ground areas (e.g. suspension bars, metal rails, tin cabinet).

Installation guidelines

- Proof the correct fixing of the lead isolation.
 - Data lines must be laid isolated.
 - Analog lines must be laid isolated. When transmitting signals with small amplitudes the one sided laying of the isolation may be favourable.
 - Lay the line isolation extensively on an isolation/protected earth conductor rail directly after the cabinet entry and fix the isolation with cable clamps.
 - Make sure that the isolation/protected earth conductor rail is connected impedance-low with the cabinet.
 - Use metallic or metallised plug cases for isolated data lines.
- In special use cases you should appoint special EMC actions.
 - Consider to wire all inductivities with erase links.
 - Please consider luminescent lamps can influence signal lines.
- Create a homogeneous reference potential and ground all electrical operating supplies when possible.
 - Please take care for the targeted employment of the grounding actions. The grounding of the PLC serves for protection and functionality activity.
 - Connect installation parts and cabinets with your PLC in star topology with the isolation/protected earth conductor system. So you avoid ground loops.
 - If there are potential differences between installation parts and cabinets, lay sufficiently dimensioned potential compensation lines.

Isolation of conductors

Electrical, magnetically and electromagnetic interference fields are weakened by means of an isolation, one talks of absorption. Via the isolation rail, that is connected conductive with the rack, interference currents are shunt via cable isolation to the ground. Here you have to make sure, that the connection to the protected earth conductor is impedancelow, because otherwise the interference currents may appear as interference cause.

When isolating cables you have to regard the following:

- If possible, use only cables with isolation tangle.
- The hiding power of the isolation should be higher than 80%.
- Normally you should always lay the isolation of cables on both sides. Only by means of the both-sided connection of the isolation you achieve high quality interference suppression in the higher frequency area. Only as exception you may also lay the isolation one-sided. Then you only achieve the absorption of the lower frequencies. A one-sided isolation connection may be convenient, if:
 - the conduction of a potential compensating line is not possible.
 - analog signals (some mV respectively μA) are transferred.
 - foil isolations (static isolations) are used.
- With data lines always use metallic or metallised plugs for serial couplings. Fix the isolation of the data line at the plug rack. Do not lay the isolation on the PIN 1 of the plug bar!
- At stationary operation it is convenient to strip the insulated cable interruption free and lay it on the isolation/protected earth conductor line.
- To fix the isolation tangles use cable clamps out of metal. The clamps must clasp the isolation extensively and have well contact.
- Lay the isolation on an isolation rail directly after the entry of the cable in the cabinet. Lead the isolation further on to your PLC and don't lay it on there again!



CAUTION!

Please regard at installation!

At potential differences between the grounding points, there may be a compensation current via the isolation connected at both sides.

Remedy: Potential compensation line

General data

2.10 General data

| Conformity and approval | | | | |
|-------------------------|------------|---|--|--|
| Conformity | | | | |
| CE | 2014/35/EU | Low-voltage directive | | |
| | 2014/30/EU | EMC directive | | |
| Approval | | | | |
| UL | - | Refer to Technical data | | |
| others | | | | |
| RoHS | 2011/65/EU | Restriction of the use of certain hazardous substances in electrical and electronic equipment | | |

| Protection of persons and device protection | | | | |
|---|---|-----------------------------------|--|--|
| Type of protection | - | IP20 | | |
| Electrical isolation | | | | |
| to the field bus | - | electrically isolated | | |
| to the process level | - | electrically isolated | | |
| Insulation resistance | - | - | | |
| Insulation voltage to reference earth | | | | |
| Inputs / outputs | - | AC / DC 50V, test voltage AC 500V | | |
| Protective measures | - | against short circuit | | |

| Environmental conditions to EN 61131-2 | | | | | |
|--|---------------|---|--|--|--|
| Climatic | | | | | |
| Storage / transport | EN 60068-2-14 | -25+70°C | | | |
| Operation | | | | | |
| Horizontal installation hanging | 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, rel. humidity 1095%) | | | |
| Pollution | EN 61131-2 | Degree of pollution 2 | | | |
| Installation altitude max. | - | 2000m | | | |
| Mechanical | | | | | |
| Oscillation | EN 60068-2-6 | 1g, 9Hz 150Hz | | | |
| Shock | EN 60068-2-27 | 15g, 11ms | | | |

General data

| Mounting conditions | | | | |
|---------------------|---|-------------------------|--|--|
| Mounting place | - | In the control cabinet | | |
| Mounting position | - | Horizontal and vertical | | |

| EMC | Standard | | Comment |
|----------------------|--------------|--------------|---|
| Emitted interference | EN 61000-6-4 | | Class A (Industrial area) |
| Noise immunity | EN 61000-6-2 | | Industrial area |
| zone B | | EN 61000-4-2 | ESD |
| | | | 8kV at air discharge (degree of severity 3), |
| | | | 4kV at contact discharge (degree of severity 2) |
| | | EN 61000-4-3 | HF field immunity (casing) |
| | | | 80MHz 1000MHz, 10V/m, 80% AM (1kHz) |
| | | | 1.4GHz 2.0GHz, 3V/m, 80% AM (1kHz) |
| | E | | 2GHz 2.7GHz, 1V/m, 80% AM (1kHz) |
| | | EN 61000-4-6 | HF conducted |
| | | | 150kHz 80MHz, 10V, 80% AM (1kHz) |
| | | EN 61000-4-4 | Burst, degree of severity 3 |
| | | EN 61000-4-5 | Surge, degree of severity 3 * |

^{*)} Due to the high-energetic single pulses with Surge an appropriate external protective circuit with lightning protection elements like conductors for lightning and overvoltage is necessary.

VIPA System SLIO Digital Input

021-1BB00 - DI 2xDC 24V

3 Digital Input

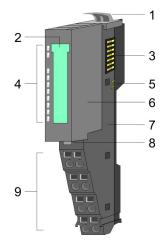
3.1 021-1BB00 - DI 2xDC 24V

Properties

The electronic module collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 2 channels and their status is monitored via LEDs.

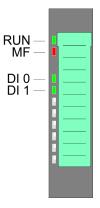
- 2 digital inputs, isolated to the backplane bus
- Suited for switches and approximate switches
- Status indication of the channels via LEDs also with de-activated electronic power supply

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

Status indication



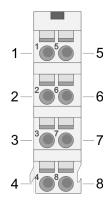
| RUN green | MF red | DI x green | Description | |
|-----------------|--------|------------|---|--|
| | | X | Bus communication is OK | |
| | | ^ | Module status is OK | |
| | _ | X | Bus communication is OK | |
| | | ^ | Module status reports an error | |
| | _ | X | Bus communication is not possible | |
| | | ^ | Module status reports an error | |
| | | Χ | Error at bus power supply | |
| | | | Flashing: Error in configuration | |
| X | ZHz | X | Chap. 2.8 'Trouble shooting - LEDs' page 28 | |
| | | | Digital input has signal "1" | |
| | | | Digital input has signal "0" | |
| not relevant: X | | | | |

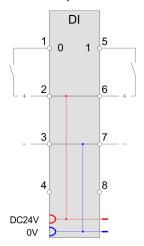
Digital Input VIPA System SLIO

021-1BB00 - DI 2xDC 24V

Pin assignment

For wires with a cross section of 0.08mm² up to 1.5mm².





| Pos. | Function | Туре | Description |
|------|----------|------|--------------------|
| 1 | DI 0 | I | Digital input DI 0 |
| 2 | DC 24V | 0 | DC 24V for sensor |
| 3 | 0V | 0 | GND |
| 4 | | | not connected |
| 5 | DI 1 | I | Digital input DI 1 |
| 6 | DC 24V | 0 | DC 24V for sensor |
| 7 | 0V | 0 | GND |
| 8 | | | not connected |

I: Input, O: Output

Input area

At CPU, PROFIBUS and PROFINET the input area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|----------|------|---------------------|-------------------|----|-----|
| +0 PII 1 | | State of the inputs | 5000h | | |
| | | | Bit 0: DI 0 | | 01h |
| | | | Bit 1: DI 1 | | 02h |
| | | | Bit 7 2: reserved | | |

Output area

No byte of the output area is used by the module.

VIPA System SLIO Digital Input

021-1BB00 - DI 2xDC 24V > Technical data

3.1.1 Technical data

| Order no. | 021-1BB00 |
|---|-----------------------|
| Туре | SM 021 |
| Module ID | 0001 9F82 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 65 mA |
| Power loss | 0.5 W |
| Technical data digital inputs | |
| Number of inputs | 2 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | - |
| Current consumption from load voltage L+ (without load) | - |
| Rated value | DC 20.428.8 V |
| Input voltage for signal "0" | DC 05 V |
| Input voltage for signal "1" | DC 1528.8 V |
| Input voltage hysteresis | - |
| Signal logic input | Sinking input |
| Frequency range | - |
| Input resistance | - |
| Input capacitance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |
| Max. permissible BERO quiescent current | 0.5 mA |
| Input delay of "0" to "1" | 3 ms |
| Input delay of "1" to "0" | 3 ms |
| Number of simultaneously utilizable inputs horizontal configuration | 2 |
| Number of simultaneously utilizable inputs vertical configuration | 2 |
| Input characteristic curve | IEC 61131-2, type 1 |
| Initial data size | 2 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |

Digital Input VIPA System SLIO

021-1BB00 - DI 2xDC 24V > Technical data

| Order no. | 021-1BB00 |
|------------------------------------|----------------------------|
| Diagnostics information read-out | none |
| Module state | green LED |
| Module error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse outputs | - |
| Datasizes | |
| Input bytes | 1 |
| Output bytes | 0 |
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 57 g |
| Weight including accessories | 57 g |
| Gross weight | 72 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

021-1BB10 - DI 2xDC 24V 2µs...4ms

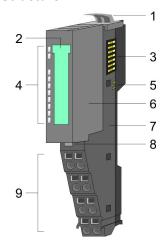
3.2 021-1BB10 - DI 2xDC 24V 2µs...4ms

Properties

The electronic module collects the binary control signals from the process level and transmits them isolated to the central bus system. The module has 2 fast digital input channels and their status is monitored via LEDs.

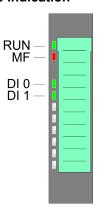
- 2 fast digital inputs, isolated to the backplane bus
- Suited for switches and approximate switches
- Status indication of the channels via LEDs also with de-activated electronic power supply
- Parameterizable input delay
- Interrupt and diagnostics function

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

Status indication

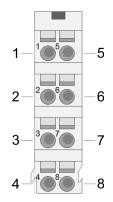


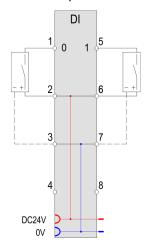
| RUN | MF | DI x | Description | |
|-----------------|-----|----------|---|--|
| green | red | green | | |
| | | X | Bus communication is OK | |
| _ | | X | Module status is OK | |
| | | X | Bus communication is OK | |
| | | ^ | Module status reports an error | |
| | | X | Bus communication is not possible | |
| | | ^ | Module status reports an error | |
| | | X | Error at bus power supply | |
| | | | Flashing: Error in configuration | |
| X | ZHz | X | ⇔ Chap. 2.8 'Trouble shooting - LEDs' page 28 | |
| | | | Digital input has signal "1" | |
| | | | Digital input has signal "0" | |
| not relevant: X | | | | |

021-1BB10 - DI 2xDC 24V 2µs...4ms

Pin assignment

For wires with a cross section of 0.08mm² up to 1.5mm².





| Pos. | Function | Туре | Description |
|------|----------|------|--------------------|
| 1 | DI 0 | 1 | Digital input DI 0 |
| 2 | DC 24V | 0 | DC 24V for sensor |
| 3 | 0V | 0 | GND |
| 4 | | | not connected |
| 5 | DI 1 | 1 | Digital input DI 1 |
| 6 | DC 24V | 0 | DC 24V for sensor |
| 7 | 0V | 0 | GND |
| 8 | | | not connected |

I: Input, O: Output

Input area

At CPU, PROFIBUS and PROFINET the input area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|--------|------|---------------------|-------------------|-----|-----|
| +0 PII | 1 | State of the inputs | 5000h | | |
| | | | Bit 0: DI 0 | | 01h |
| | | Bit 1: DI 1 | | 02h | |
| | | | Bit 7 2: reserved | | |

Output area

No byte of the output area is used by the module.

021-1BB10 - DI 2xDC 24V 2µs...4ms > Technical data

3.2.1 Technical data

| Order no. | 021-1BB10 |
|---|---------------------------|
| Туре | SM 021 |
| Module ID | 000A 1F02 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 100 mA |
| Power loss | 0.9 W |
| Technical data digital inputs | |
| Number of inputs | 2 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.428.8 V |
| Current consumption from load voltage L+ (without load) | 12 mA |
| Rated value | DC 20.428.8 V |
| Input voltage for signal "0" | DC 05 V |
| Input voltage for signal "1" | DC 1528.8 V |
| Input voltage hysteresis | - |
| Signal logic input | Sinking input |
| Frequency range | - |
| Input resistance | - |
| Input capacitance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |
| Max. permissible BERO quiescent current | 0.5 mA |
| Input delay of "0" to "1" | parameterizable 2µs - 3ms |
| Input delay of "1" to "0" | parameterizable 2µs - 3ms |
| Number of simultaneously utilizable inputs horizontal configuration | 2 |
| Number of simultaneously utilizable inputs vertical configuration | 2 |
| Input characteristic curve | IEC 61131-2, type 1 |
| Initial data size | 2 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | yes, parameterizable |
| Process alarm | yes, parameterizable |
| Diagnostic interrupt | yes, parameterizable |
| Diagnostic functions | yes |

021-1BB10 - DI 2xDC 24V 2µs...4ms > Technical data

| Diagnostics information read-out possible Module error display red LED Channel error display none Isolation Image: Control of State (Control of State (Cont | Order no. | 021-1BB10 |
|--|------------------------------------|----------------------------|
| Module error display red LED Channel error display none Isolation - Between channels - Between channels of groups to - Between channels and backplane bus -/ Insulation tested with DC 500 V Safety - Safety protocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes 1 Input bytes 1 Output bytes 9 Diagnostic bytes 9 Diagnostic bytes 20 Housing Profile rail 35 mm Mechanical data Profile rail 35 mm Mechanical data Profile rail 35 mm Mechanical data Profile rail 35 mm Method including accessories 58 g Gross weight 7 g Environmental conditions - Operating temperature - | Diagnostics information read-out | possible |
| Channel error display none Isolation Fetween channels Between channels of groups to - Between channels and backplane bus ✓ Insulation tested with DC 500 V Safety — Safety rotocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes — Input bytes 1 Output bytes 9 Parameter bytes 9 Diagnostic bytes 20 Housing Profile rail 35 mm Mechanical data Profile rail 35 mm <tr< td=""><td>Module state</td><td>green LED</td></tr<> | Module state | green LED |
| Isolation - Between channels - Between channels of groups to - Between channels and backplane bus ✓ Insulation tested with DC 500 V Safety — Safety protocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes - Input bytes 1 Output bytes 9 Diagnostic bytes 9 Parameter bytes 9 Diagnostic bytes 20 Housing PPE PPE GF10 Mounting Profile rail 35 mm Mechanical data PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Profile rail 35 mm Metweight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions - Operat | Module error display | red LED |
| Between channels - Between channels of groups to - Between channels and backplane bus ✓ Insulation tested with DC 500 V Safety Safety protocol Safety protocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes outputs Input bytes 1 Output bytes 9 Parameter bytes 9 Diagnostic bytes 20 Housing Profile rail 35 mm Mechanical data Profile rail 35 mm Mechanical data Profile rail 35 mm Mechanical data 12.9 mm x 109 mm x 76.5 mm Wet weight including accessories 58 g Gross weight 73 g Environmental conditions - Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification | Channel error display | none |
| Between channels of groups to - Between channels and backplane bus ✓ Insulation tested with DC 500 V Safety — Safety protocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes outputs Input bytes 1 Output bytes 0 Parameter bytes 9 Diagnostic bytes 20 Housing Profile rail 35 mm Methala PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Profile rail 35 mm Mechanical data Profile rail 35 mm Weight including accessories 58 g Gross weight 73 g Environmental conditions Very Cto 60 °C Storage temperature -25 °C to 70 °C Certifications Very Cto 60 °C | Isolation | |
| Between channels and backplane bus ✓ Insulation tested with DC 500 V Safety ✓ Safety protocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes - Input bytes 1 Output bytes 0 Parameter bytes 9 Diagnostic bytes 20 Housing PPE / PPE GF 10 Mounting Profile rail 35 mm Mechanical data Profile rail 35 mm Mechanical data Pimensions (WxHxD) Net weight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions Cot 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification UL certification yes | Between channels | - |
| Insulation tested with DC 500 V Safety Common state of the protocol Safety protocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes Input bytes 1 Output bytes 0 Parameter bytes 9 Diagnostic bytes 20 Housing PE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Profile rail 35 mm Mechanical data Dimensions (WxHxD) Net weight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions O °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification UL certification yes | Between channels of groups to | - |
| Safety Safety protocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes - Input bytes 1 Output bytes 0 Parameter bytes 9 Diagnostic bytes 20 Housing PE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions - Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification | Between channels and backplane bus | ✓ |
| Safety protocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes 1 Output bytes 0 Parameter bytes 9 Diagnostic bytes 20 Housing Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data - Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions - Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications - UL certification yes | Insulation tested with | DC 500 V |
| Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes Input bytes 0 Output bytes 9 Parameter bytes 9 Diagnostic bytes 20 Housing PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Profile rail 35 mm Mechanical with the weight 12.9 mm x 109 mm x 76.5 mm Net weight including accessories 58 g Gross weight 73 g Environmental conditions 73 g Environmental conditions 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications yes | Safety | |
| Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes Input bytes 0 Output bytes 9 Parameter bytes 9 Diagnostic bytes 20 Housing PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification UL certification yes | Safety protocol | - |
| Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes 1 Output bytes 0 Parameter bytes 9 Diagnostic bytes 20 Housing Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data | Safety requirements | - |
| Two channels Test pulse outputs Datasizes Input bytes Output bytes Output bytes 0 Parameter bytes 9 Diagnostic bytes Housing Material Mechanical data Dimensions (WxHxD) Net weight Weight including accessories Gross weight Environmental conditions Operating temperature Or Cot 60 °C Certification Verification Parameter bytes 1 1 1 1 1 1 1 1 1 1 1 1 1 | Secure user address | - |
| Test pulse outputs Datasizes Input bytes 1 Output bytes 0 Parameter bytes 9 Diagnostic bytes 20 Housing Material Mounting PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 58 g Weight including accessories Gross weight Froile rail 35 mm Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Watchdog | - |
| Input bytes Input | Two channels | - |
| Input bytes Output bytes Output bytes Output bytes 9 Diagnostic bytes 20 Housing Material Mounting Prefile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight Weight including accessories Forss weight Toss weight Toss weight Toss weight Operating temperature Operating temperature Operating temperature Operating temperature Certifications UL certification 10 Operating temperature Ope | Test pulse outputs | - |
| Output bytes Parameter bytes 9 Diagnostic bytes 20 Housing Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature 2-25 °C to 70 °C Certifications UL certification yes | Datasizes | |
| Parameter bytes Diagnostic bytes 20 Housing Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Input bytes | 1 |
| Diagnostic bytes Housing Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Output bytes | 0 |
| Housing Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Parameter bytes | 9 |
| Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Diagnostic bytes | 20 |
| Mounting Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Housing | |
| Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Material | PPE / PPE GF10 |
| Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 58 g Weight including accessories 58 g Gross weight 73 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Mounting | Profile rail 35 mm |
| Net weight S8 g Weight including accessories Gross weight 73 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Mechanical data | |
| Weight including accessories 58 g Gross weight 73 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Gross weight 73 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Net weight | 58 g |
| Environmental conditions Operating temperature O °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Weight including accessories | 58 g |
| Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Gross weight | 73 g |
| Storage temperature -25 °C to 70 °C Certifications UL certification yes | Environmental conditions | |
| Certifications UL certification yes | Operating temperature | 0 °C to 60 °C |
| UL certification yes | Storage temperature | -25 °C to 70 °C |
| • | Certifications | |
| KC certification yes | UL certification | yes |
| | KC certification | yes |

021-1BB10 - DI 2xDC 24V 2µs...4ms > Parameter data

3.2.2 Parameter data

DS - Record set for access via CPU, PROFIBUS and PROFINET

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 3100h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|--|-------|---------------------------------------|---------|-----|-------|-----|
| DIAG_EN | 1 | Diagnostic interrupt * | 00h | 00h | 3100h | 01h |
| CH0D | 1 | Input delay DI 0 | 02h | 01h | 3101h | 02h |
| CH1D | 1 | Input delay DI 1 | 02h | 01h | 3102h | 03h |
| INTRE | 1 | Process interrupt at edge 0-1 of DI x | 00h | 80h | 3103h | 04h |
| INTFE | 1 | Process interrupt at edge 1-0 of DI x | 00h | 80h | 3104h | 05h |
| *) This record set may only be transferred at STOP state | | | | | | |

^{*)} This record set may only be transferred at STOP state

DIAG_EN Diagnostic inter-rupt

| Byte | Bit 7 0 |
|------|----------------------|
| 0 | Diagnostic interrupt |
| | 00h: disable |
| | 40h: enable |

■ Here you activate res. de-activate the diagnostic function.

CHxD Input delay

| Byte | Function | Possible values | |
|------|------------------|---------------------|----------------|
| 0 | Input delay DI x | 00h: 1μs | 07h: 86μs |
| | | 02h: 3μs | 09h: 342μs |
| | | 04h: 10μs | 0Ch: 2731µs |
| | | Other values are no | t permissible! |

Input delay allows you to preset a filter for the corresponding channel. With the help of filters you may e.g. filter signal peaks at a blurred input signal.

INTRE Interrupt edge 0-1

| Byte | Bit 7 0 |
|------|--|
| 0 | Bit 0: Process interrupt at edge 0-1 of DI 0 |
| | Bit 1: Process interrupt at edge 0-1 of DI 1 |
| | (0: disable, 1: enable) |
| | Bit 7 2: reserved |

021-1BB10 - DI 2xDC 24V 2µs...4ms > Diagnostics and interrupt

INTFE Interrupt edge 1-0

| Byte | Bit 7 0 |
|------|--|
| 0 | Bit 0: Process interrupt at edge 1-0 of DI 0 |
| | Bit 1: Process interrupt at edge 1-0 of DI 1 |
| | (0: disable, 1: enable) |
| | Bit 7 2: reserved |

3.2.3 Diagnostics and interrupt

| Event | Process interrupt | Diagnostics inter- rupt | parameterizable |
|-----------------------------|-------------------|----------------------------|-----------------|
| Edge 0-1 DI x | X | - | X |
| Edge 1-0 DI x | X | - | X |
| Diagnostics buffer overflow | - | X | - |
| Process interrupt lost | - | X | - |

Process interrupt

So you may react to asynchronous events, there is the possibility to activate a process interrupt. A process interrupt interrupts the linear program sequence and jumps depending on the master system to a corresponding Interrupt routine. Here you can react to the process interrupt accordingly.

With CANopen the process interrupt data a transferred via an emergency telegram.

Operating with CPU, PROFIBUS and PROFINET the process interrupt data were transferred via diagnostics telegram.

SX - Subindex for access via EtherCAT with Index 5000h

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | SX |
|---------|-------|------------------------|---------|-----------------|
| PRIT_A | 1 | Process interrupt data | 00h | 02h |
| PRIT_B | 1 | State of the inputs | 00h | 03h |
| PRIT_US | 2 | μs ticker | 00h | 04h (high byte) |
| | | | | 05h (low byte) |

PRIT_A Process interrupt data

| Byte | Bit 7 0 |
|------|-----------------------------------|
| 0 | Bit 0: Edge at Digital input DI 0 |
| | Bit 1: Edge at Digital input DI 1 |
| | Bit 7 2: reserved |

021-1BB10 - DI 2xDC 24V 2µs...4ms > Diagnostics and interrupt

PRIT_B State of the inputs

| Byte | Bit 7 0 |
|------|--|
| 0 | State of the inputs at the moment of the process interrupt |
| | Bit 0: State Input DI 0 |
| | Bit 1: State Input DI 1 |
| | Bit 7 2: reserved |

PRIT_US µs-Ticker

| Byte | Bit 7 0 |
|------|---|
| 0 1 | Value of the µs ticker at the moment of the process interrupt |

µs ticker

In the SLIO module there is a 32 bit timer (μ s ticker). With PowerON the timer starts counting with 0. After 2^{32} - 1μ s the timer starts with 0 again.

PRIT_US represents the lower 2 byte of the µs ticker value (0 ... 2¹⁶-1).

Diagnostic data

Via the parameterization you may activate a diagnostic interrupt for the module.

With a diagnostics interrupt the module serves for diagnostics data for diagnostic interrupt incoming.

As soon as the reason for releasing a diagnostic interrupt is no longer present, the diagnostic interrupt $_{\rm going}$ automatically takes place.

All events of a channel between diagnostic interrupt $_{\text{incoming}}$ and diagnostic interrupt $_{\text{going}}$ are not stored and get lost.

Within this time window (1. diagnostic interrupt _{incoming} until last diagnostic interrupt _{going}) the MF-LED of the module is on.

- DS Record set for access via CPU, PROFIBUS and PROFINET. The access happens by DS 01h. Additionally the first 4 bytes may be accessed by DS 00h.
- IX Index for access via CANopen. The access happens by IX 2F01h. Additionally the first 4 bytes may be accessed by IX 2F00h.
- SX Subindex for access via EtherCAT with Index 5005h.

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|--------|-------|--|---------|-----|-------|-----|
| ERR_A | 1 | Diagnostic | 00h | 01h | 2F01h | 02h |
| MODTYP | 1 | Module information | 1Fh | | | 03h |
| ERR_C | 1 | reserved | 00h | | | 04h |
| ERR_D | 1 | Diagnostic | 00h | | | 05h |
| CHTYP | 1 | Channel type | 70h | | | 06h |
| NUMBIT | 1 | Number of diagnostics bits per channel | 00h | | | 07h |
| NUMCH | 1 | Number channels of the module | 02h | | | 08h |
| CHERR | 1 | Channel error | 00h | | | 09h |

021-1BB10 - DI 2xDC 24V 2μs...4ms > Diagnostics and interrupt

| Name | Bytes | Function | Default | DS | IX | SX |
|------------------|-------|-----------|---------|----|----|---------|
| CH0ERR CH7ERR | 8 | reserved | 00h | | | 0Ah 11h |
| DIAG_US | 4 | μs ticker | 00h | | | 13h |

ERR_A Diagnostic

| Byte | Bit 7 0 |
|------|------------------------------|
| 0 | Bit 0: set at module failure |
| | Bit 1: reserved |
| | Bit 2: set at external error |
| | Bit 3: set at channel error |
| | Bit 7 4: reserved |

MODTYP Modul information

| Byte | Bit 7 0 |
|------|------------------------------------|
| 0 | Bit 3 0: Module class |
| | 1111b Digital module |
| | Bit 4: Channel information present |
| | Bit 7 5: reserved |

ERR_C reserved

| Byte | Bit 7 0 |
|------|----------|
| 0 | reserved |

ERR_D Diagnostic

| Byte | Bit 7 0 |
|------|--|
| 0 | Bit 2 0: reserved |
| | Bit 3: set at internal diagnostics buffer overflow |
| | Bit 5 4: reserved |
| | Bit 6: Process interrupt lost |
| | Bit 7: reserved |

CHTYP Channel type

| Byte | Bit 7 0 |
|------|-----------------------|
| 0 | Bit 6 0: Channel type |
| | 70h: Digital input |
| | Bit 7: reserved |

NUMBIT Diagnostic bits

| Byte | Bit 7 0 |
|------|--|
| 0 | Number of diagnostics bits of the module per channel |
| | (here 00h) |

021-1BB10 - DI 2xDC 24V 2µs...4ms > Diagnostics and interrupt

NUMCH Channels

| Byte | Bit 7 0 |
|------|----------------------------------|
| 0 | Number of channels of the module |
| | (here 02h) |

CHERR Channel error

| Byte | Bit 7 0 |
|------|--------------------------|
| 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 |
|------|----------|
| 0 | reserved |

DIAG_US µs ticker

| Byte | Bit 7 0 |
|------|--|
| 0 3 | Value of the µs ticker at the moment of the diagnostic |

μs ticker

In the SLIO module there is a 32 bit timer (μ s ticker). With PowerON the timer starts counting with 0. After 2^{32} - 1μ s the timer starts with 0 again.

021-1BB50 - DI 2xDC 24V NPN

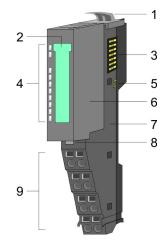
3.3 021-1BB50 - DI 2xDC 24V NPN

Properties

The electronic module collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 2 channels and their status is monitored via LEDs. An input becomes active as soon as it is connected to ground.

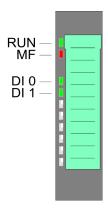
- 2 digital inputs (Sourcing input), isolated to the backplane bus
- Suited for switches and approximate switches
- Status indication of the channels via LEDs also with de-activated electronic power supply

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

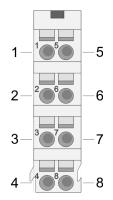
Status indication



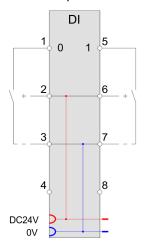
| RUN green | MF red | DI x green | Description |
|---------------|--------|------------|---|
| | | | Bus communication is OK |
| | | X | Module status is OK |
| | _ | X | Bus communication is OK |
| | | X | Module status reports an error |
| | _ | X | Bus communication is not possible |
| | | | Module status reports an error |
| | | Χ | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital input has signal "1" |
| | | | Digital input has signal "0" |
| not relevant: | Х | | |

021-1BB50 - DI 2xDC 24V NPN

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



| Pos. | Function | Туре | Description |
|------|----------|------|--------------------|
| 1 | DI 0 | I | Digital input DI 0 |
| 2 | DC 24V | 0 | DC 24V for sensor |
| 3 | 0V | 0 | GND |
| 4 | | | not connected |
| 5 | DI 1 | I | Digital input DI 1 |
| 6 | DC 24V | 0 | DC 24V for sensor |
| 7 | 0V | 0 | GND |
| 8 | | | not connected |

I: Input, O: Output

Input area

At CPU, PROFIBUS and PROFINET the input area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|-------|------|-------------|---------------------|-------------|-----|
| +0 | PII | 1 | State of the inputs | 5000h | |
| | | Bit 0: DI 0 | | 01h | |
| | | | | Bit 1: DI 1 | 02h |
| | | | Bit 7 2: reserved | | |

Output area

No byte of the output area is used by the module.

021-1BB50 - DI 2xDC 24V NPN > Technical data

3.3.1 Technical data

| Order no. | 021-1BB50 |
|---|-----------------------|
| Туре | SM 021 |
| Module ID | 0002 9F82 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 65 mA |
| Power loss | 0.5 W |
| Technical data digital inputs | |
| Number of inputs | 2 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | - |
| Current consumption from load voltage L+ (without load) | - |
| Rated value | DC 20.428.8 V |
| Input voltage for signal "0" | DC 1528.8 V |
| Input voltage for signal "1" | DC 05 V |
| Input voltage hysteresis | - |
| Signal logic input | Sourcing input |
| Frequency range | - |
| Input resistance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |
| Max. permissible BERO quiescent current | 0.5 mA |
| Input delay of "0" to "1" | 3 ms |
| Input delay of "1" to "0" | 3 ms |
| Number of simultaneously utilizable inputs horizontal configuration | 2 |
| Number of simultaneously utilizable inputs vertical configuration | 2 |
| Input characteristic curve | - |
| Initial data size | 2 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | none |

021-1BB50 - DI 2xDC 24V NPN > Technical data

| Order no. | 021-1BB50 |
|------------------------------------|----------------------------|
| Module state | green LED |
| Module error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse outputs | - |
| Datasizes | |
| Input bytes | 1 |
| Output bytes | 0 |
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 57 g |
| Weight including accessories | 57 g |
| Gross weight | 72 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

021-1BB70 - DI 2xDC 24V ETS

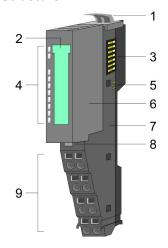
3.4 021-1BB70 - DI 2xDC 24V ETS

Properties

The electronic module collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 2 channels and their status is monitored via LEDs. With configured ETS functionality (ETS = edge time stamp) and the corresponding (rising/falling) edge the current time value of the µs timer is stored together with the state of the inputs in the process image. Depending on the configuration 5 (20byte) respectively 15 (60byte) ETS entries may be stored in the process image one after another.

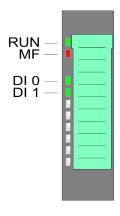
- 2 digital inputs, isolated to the backplane bus
- Configurable ETS functionality for 5 respectively 15 ETS entries (each 4byte)
- Diagnostics function
- Suited for switches and approximate switches
- Status indication of the channels via LEDs also with de-activated electronic power supply

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

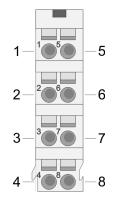
Status indication



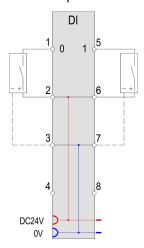
| RUN green | MF red | DI x green | Description |
|---------------|--------|------------|---|
| | | X | Bus communication is OK |
| | | ^ | Module status is OK |
| | _ | Х | Bus communication is OK |
| | _ | ^ | Module status reports an error |
| | _ | X | Bus communication is not possible |
| | | ٨ | Module status reports an error |
| | | Χ | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | ♦ Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital input has signal "1" |
| | | | Digital input has signal "0" |
| not relevant: | Χ | | |

021-1BB70 - DI 2xDC 24V ETS

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



| Pos. | Function | Туре | Description |
|------|----------|------|--------------------|
| 1 | DI 0 | I | Digital input DI 0 |
| 2 | DC 24V | 0 | DC 24V for sensor |
| 3 | 0V | 0 | GND |
| 4 | | | not connected |
| 5 | DI 1 | I | Digital input DI 1 |
| 6 | DC 24V | 0 | DC 24V for sensor |
| 7 | 0V | 0 | GND |
| 8 | | | not connected |

I: Input, O: Output

In-/Output area

With configured ETS functionality (ETS=edge time stamp) and the corresponding edge the current time value of the SLIO μ s timer is stored together with the state of the inputs and a running number as ETS entry in the process image.

You may configure the following variants:

- 021-1BB70 DI 2xDC24V (20): uses 20byte in the PII for 5 ETS entries
- 021-1BB70 DI 2xDC24V (60): uses 60byte in the PII for 15 ETS entries

Output area

No byte of the output area is used by the module.

Input area 20byte respectively 60byte

Depending on the configured variant, the module serves for an area for 5 resp. 15 ETS entries. Each ETS entry uses 4byte in input area:

Input area

The input range is used for status message. At CPU, PROFIBUS and PROFINET the input respectively output area is embedded to the corresponding address area.

- IX IX = Index for access via CANopen. With s = Subindex the corresponding ETS entry is addressed.
- SX Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

021-1BB70 - DI 2xDC 24V ETS

Structure of an ETS entry

| Addr. | Name | Bytes | Function | IX | SX |
|-------|--------|-------|---------------------|---------|-----|
| +0 | PII | 1 | State of the inputs | 5430h/s | 01h |
| +1 | RN | 1 | Running number | | 02h |
| +2 | ETS_US | 2 | μs ticker | | 03h |

PII

Here the state of the inputs after an edge change is stored.

The input byte has the following bit assignment:

Bit 0: DI 0 Bit 1: DI 1

Bit 2 ... 7: 0 (fix)

RN

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

ETS_US

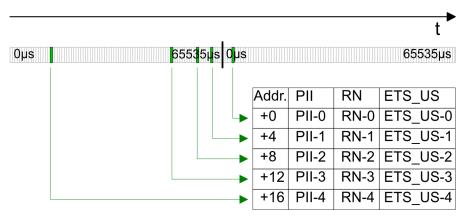
In the SLIO module there is a 32 bit timer (μ s ticker). With PowerON the timer starts counting with 0. After 2^{32} -1 μ s the timer starts with 0 again.

ETS_US always contains the low word of the µs ticker (0...65535µs).

ETS functionality

With the corresponding edge the value of the timer is stored as ETS entry in the process image as ETS_US together with the state of the inputs PII and the running number RN.

The following figure shows the sequence of how the ETS entries are stored in the input area.



Input area

The input range is used for status message. At CPU, PROFIBUS and PROFINET the input respectively output area is embedded to the corresponding address area.

- IX = Index for access via CANopen. With s = Subindex the corresponding ETS entry is addressed.
- SX Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

Configured as 021-1BB70

DI 2xDC 24V (20) 20byte - 5 ETS entries

021-1BB70 - DI 2xDC 24V ETS

| Addr. | PII | IX=5430h | SX | Addr. | RN | IX=5430h | SX | Addr. | ETS-US | IX=5430h | SX |
|-------|-------|----------|-----|-------|------|----------|-----|-------|----------|----------|-----|
| +0 | PII-0 | s=1 | 01h | +1 | RN-0 | s=1 | 02h | +2 | ETS_US-0 | s=1 | 03h |
| +4 | PII-1 | s=2 | 04h | +5 | RN-1 | s=2 | 05h | +6 | ETS_US-1 | s=2 | 06h |
| +8 | PII-2 | s=3 | 07h | +9 | RN-2 | s=3 | 08h | +10 | ETS_US-2 | s=3 | 09h |
| +12 | PII-3 | s=4 | 0Ah | +13 | RN-3 | s=4 | 0Bh | +14 | ETS_US-3 | s=4 | 0Ch |
| +16 | PII-4 | s=5 | 0Dh | +17 | RN-4 | s=5 | 0Eh | +18 | ETS_US-4 | s=5 | 0Fh |

Configured as 021-1BB70 DI 2xDC 24V (60) 60byte - 15 ETS entries

| Addr. | PII | IX=5430h | SX | Addr. | RN | IX=5430h | SX | Addr. | ETS-US | IX=5430h | SX |
|-------|--------|----------|-----|-------|-------|----------|-----|-------|-----------|----------|-----|
| +0 | PII-0 | s=1 | 01h | +1 | RN-0 | s=1 | 02h | +2 | ETS_US-0 | s=1 | 03h |
| +4 | PII-1 | s=2 | 04h | +5 | RN-1 | s=2 | 05h | +6 | ETS_US-1 | s=2 | 06h |
| +8 | PII-2 | s=3 | 07h | +9 | RN-2 | s=3 | 08h | +10 | ETS_US-2 | s=3 | 09h |
| +12 | PII-3 | s=4 | 0Ah | +13 | RN-3 | s=4 | 0Bh | +14 | ETS_US-3 | s=4 | 0Ch |
| +16 | PII-4 | s=5 | 0Dh | +17 | RN-4 | s=5 | 0Eh | +18 | ETS_US-4 | s=5 | 0Fh |
| +20 | PII-5 | s=6 | 10h | +21 | RN-5 | s=6 | 11h | +22 | ETS_US-5 | s=6 | 12h |
| +24 | PII-6 | s=7 | 13h | +25 | RN-6 | s=7 | 14h | +26 | ETS_US-6 | s=7 | 15h |
| +28 | PII-7 | s=8 | 16h | +29 | RN-7 | s=8 | 17h | +30 | ETS_US-7 | s=8 | 18h |
| +32 | PII-8 | s=9 | 19h | +33 | RN-8 | s=9 | 1Ah | +34 | ETS_US-8 | s=9 | 1Bh |
| +36 | PII-9 | s=10 | 1Ch | +37 | RN-9 | s=10 | 1Dh | +38 | ETS_US-9 | s=10 | 1Eh |
| +40 | PII-10 | s=11 | 1Fh | +41 | RN-10 | s=11 | 20h | +42 | ETS_US-10 | s=11 | 21h |
| +44 | PII-11 | s=12 | 22h | +45 | RN-11 | s=12 | 23h | +46 | ETS_US-11 | s=12 | 24h |
| +48 | PII-12 | s=13 | 25h | +49 | RN-12 | s=13 | 26h | +50 | ETS_US-12 | s=13 | 27h |
| +52 | PII-13 | s=14 | 28h | +53 | RN-13 | s=14 | 29h | +54 | ETS_US-13 | s=14 | 2Ah |
| +56 | PII-14 | s=15 | 2Bh | +57 | RN-14 | s=15 | 2Ch | +58 | ETS_US-14 | s=15 | 2Dh |



The ETS module may only be accessed by the System SLIO CPU by means of SFC 14 or via the process image.

021-1BB70 - DI 2xDC 24V ETS > Technical data

3.4.1 Technical data

| Order no. | 021-1BB70 |
|---|---------------------------|
| Туре | SM 021 |
| Module ID | 0F01 47C1 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 100 mA |
| Power loss | 0.9 W |
| Technical data digital inputs | |
| Number of inputs | 2 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 24 V |
| Current consumption from load voltage L+ (without load) | 10 mA |
| Rated value | DC 20.428.8 V |
| Input voltage for signal "0" | DC 05 V |
| Input voltage for signal "1" | DC 1528.8 V |
| Input voltage hysteresis | - |
| Signal logic input | Sinking input |
| Frequency range | - |
| Input resistance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |
| Max. permissible BERO quiescent current | 0.5 mA |
| Input delay of "0" to "1" | parameterizable 2µs - 3ms |
| Input delay of "1" to "0" | parameterizable 2µs - 3ms |
| Number of simultaneously utilizable inputs horizontal configuration | 2 |
| Number of simultaneously utilizable inputs vertical configuration | 2 |
| Input characteristic curve | IEC 61131-2, type 1 |
| Initial data size | 60 Byte |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | possible |

021-1BB70 - DI 2xDC 24V ETS > Technical data

| Order no. | 021-1BB70 |
|------------------------------------|----------------------------|
| Module state | green LED |
| Module error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| Safety | |
| Safety protocol | - |
| Safety requirements | _ |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse outputs | - |
| Datasizes | |
| Input bytes | 20 / 60 |
| Output bytes | 0 |
| Parameter bytes | 10 |
| Diagnostic bytes | 20 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 58 g |
| Weight including accessories | 58 g |
| Gross weight | 73 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

021-1BB70 - DI 2xDC 24V ETS > Parameter data

3.4.2 Parameter data

The following variants may be configured:

- 021-1BB70 DI 2xDC24V (20): uses 20byte in the PII for 5 ETS entries
- 021-1BB70 DI 2xDC24V (60): uses 60byte in the PII for 15 ETS entries

3.4.2.1 Parameters

DS - Record set for access via CPU, PROFIBUS and PROFINET

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 3100h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|-------|-------|----------------------------|-----------|-----|-------|-----|
| PII_L | 1 | Length process image | 14h resp. | 02h | 3100h | 01h |
| | | input data ^{1, 2} | 3Ch (fix) | | | |
| PIQ_L | 1 | Length process image | 00h (fix) | 02h | 3101h | 02h |
| | | output data ² | | | | |
| CH0D | 1 | Input delay DI 0 | 02h | 01h | 3102h | 03h |
| CH1D | 1 | Input delay DI 1 | 02h | 01h | 3103h | 04h |
| TSER | 1 | Raising edge 0-1 at DI x | 00h | 80h | 3104h | 05h |
| TSEF | 1 | Falling edge 1-0 at DI x | 00h | 80h | 3105h | 06h |

¹⁾ This parameter corresponds of the configured variant.

²⁾ This record set may only be transferred at STOP state.

| D | ш | |
|---|---|---|
| г | ш | _ |

| Byte | Bit 7 0 |
|------|---|
| 0 | The length for the process image is fixed adjusted to the length of the parameterized variant (14h or 3Ch). |

PIQ_L

| Byte | Bit 7 0 |
|------|---|
| 0 | The length of the process image of the output data is fix set to 0byte. |

CHxD DI x

| Byte | Description | Possible values | | |
|------|------------------|-----------------------------------|-------------|--|
| 0 | Input delay DI x | 00h: 1µs | 07h: 86μs | |
| | | 02h: 3μs | 09h: 342μs | |
| | | 04h: 10μs | 0Ch: 2731μs | |
| | | Other values are not permissible! | | |

With the help of filters you may e.g. filter signal peaks at a blurred input signal.

021-1BB70 - DI 2xDC 24V ETS > Parameter data

Edge select

Here the ETS function for DI 0 and DI 1 may be activated. With these 2 bytes you may define the type of edge of the input signal, to which the current μ s timer value is stored in the process image together with the state of the inputs.

TSER edge 0-1 DI x

| Byte | Bit 7 0 | | | |
|------|--|--|--|--|
| 0 | Bit 0: ETS record at edge 0-1 (rising edge) DI 0 | | | |
| | Bit 1: ETS record at edge 0-1 (rising edge) DI 1 | | | |
| | (0: disable, 1: enable) | | | |
| | Bit 7 2: reserved | | | |

TSEF edge 1-0 DI x

| Byte | Bit 7 0 |
|------|---|
| 0 | Bit 0: ETS record at edge 1-0 (falling edge) DI 0 |
| | Bit 1: ETS record at edge 1-0 (falling edge) DI 1 |
| | (0: disable, 1: enable) |
| | Bit 7 2: reserved |

3.4.2.2 Example of the principle of operation

In the following it is demonstrated by an example, in which order the ETS entries are stored.

In this example a module is configured, which occupies 20byte for 5 ETS entries.

The following edges for the input channels are preset.

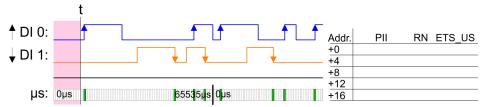
- DI 0: Edge 0-1: ↑

- DI 1: Edge 1-0: ↓

The green area of the diagram indicates the ETS entries, which were available at time "t". ETS entries, which are not (longer) available are marked red.

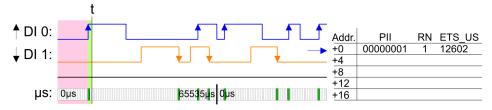
Process image is empty

New ETS entries are always registered starting from address +0. Thereby already existing ETS entries are shifted 4 byte each.



1. ETS entry

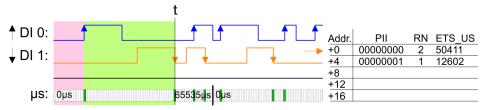
Released by an edge 0-1 from DI 0 the 1. ETS entry is registered starting from address +0.



021-1BB70 - DI 2xDC 24V ETS > Parameter data

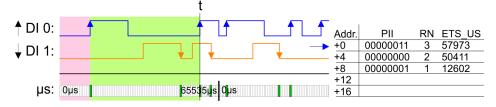
2. ETS entry

Released by an edge 1-0 from DI 1 the 2. ETS entry is registered starting from address +0 and the 1. ETS entry is shifted 4 byte.



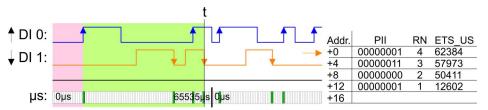
3. ETS entry

Released by an edge 1-0 from DI 1 the 2. ETS entry is registered starting from address +0 and the 1. ETS entry is shifted 4 byte.



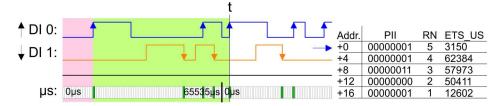
4. ETS entry

Released by an edge 1-0 from DI 1 the 4. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each.



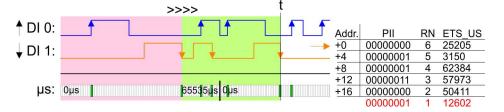
5. ETS entry

Released by an edge 0-1 from DI 0 the 5. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each. The maximum number of ETS entries is reached.



6. ETS entry

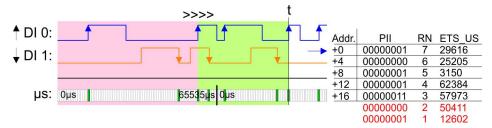
Released by an edge 1-0 from DI 1 the 6. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each. Thereby the 1. ETS entry is deleted and is not available any longer.



021-1BB70 - DI 2xDC 24V ETS > Parameter data

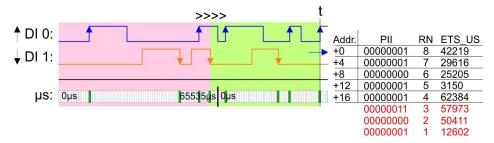
7. ETS entry

Released by an edge 0-1 from DI 0 the 7. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each. Thereby the 2. ETS entry is deleted and is not available any longer.



8. ETS entry

Released by an edge 0-1 from DI 0 the 8. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each. Thereby the 3. ETS entry is deleted and is not available any longer.





Please consider the ETS modules can only effectively be used together with head modules, which have an integrated μ s ticker. The Ethernet coupler with ModbusTCP 053-1MT00 for example does not have an μ s ticker.

021-1BB70 - DI 2xDC 24V ETS > Diagnostic data

3.4.3 Diagnostic data

So this module does not support interrupt functions, the diagnostic data serve the information about this module.

- DS Record set for access via CPU, PROFIBUS and PROFINET. The access happens by DS 01h. Additionally the first 4 bytes may be accessed by DS 00h.
- IX Index for access via CANopen. The access happens by IX 2F01h. Additionally the first 4 bytes may be accessed by IX 2F00h.
- SX Subindex for access via EtherCAT with Index 5005h.

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|------------------|-------|--|---------|-----|-------|---------|
| ERR_A | 1 | reserved | 00h | 01h | 2F01h | 02h |
| MODTYP | 1 | Module information | 1Fh | | | 03h |
| ERR_C | 1 | reserved | 00h | | | 04h |
| ERR_D | 1 | reserved | 00h | | | 05h |
| CHTYP | 1 | Channel type | 70h | | | 06h |
| NUMBIT | 1 | Number of diagnostics bits per channel | 00h | | | 07h |
| NUMCH | 1 | Number channels of the module | 02h | | | 08h |
| CHERR | 1 | reserved | 00h | | | 09h |
| CH0ERR CH7ERR | 8 | reserved | 00h | | | 0Ah 11h |
| DIAG_US | 4 | μs ticker (32bit) | 00h | | | 13h |

MODTYP Modul information

| Byte | Bit 7 0 |
|------|------------------------------------|
| 0 | Bit 3 0: Module class |
| | 1111b Digital module |
| | Bit 4: Channel information present |
| | Bit 7 5: reserved |

CHTYP Channel type

| Byte | Bit 7 0 |
|------|-----------------------|
| 0 | Bit 6 0: Channel type |
| | 70h: Digital input |
| | Bit 7: 0 (fix) |

NUMBIT Diagnostic bits

| Byte | Bit 7 0 |
|------|--|
| 0 | Number of diagnostics bits of the module per channel |
| | (here 00h) |

021-1BB70 - DI 2xDC 24V ETS > Diagnostic data

| NUMCH channe | ls |
|--------------|----|
|--------------|----|

| Byte | Bit 7 0 |
|------|----------------------------------|
| 0 | Number of channels of the module |
| | (here 02h) |

DIAG_US µs ticker

| Byte | Bit 7 0 |
|------|---|
| 0 3 | Value of the μs ticker at the moment of the diagnostic data generation |

ERR_A/C/D CHERR, CHxERR reserved

| Byte | Bit 7 0 |
|------|----------|
| 0 | reserved |

021-1BD00 - DI 4xDC 24V

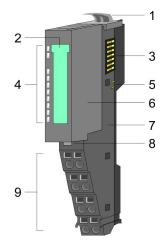
3.5 021-1BD00 - DI 4xDC 24V

Properties

The electronic module collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 4 channels and their status is monitored via LEDs.

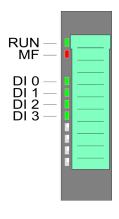
- 4 digital inputs, isolated to the backplane bus
- Suited for switches and approximate switches
- Status indication of the channels via LEDs also with de-activated electronic power supply

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

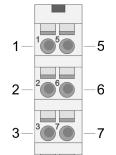
Status indication



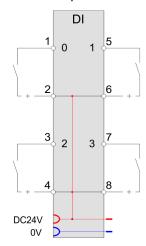
| RUN green | MF red | DI x green | Description |
|-----------------|--------|------------|---|
| | | X | Bus communication is OK |
| | | ^ | Module status is OK |
| | | X | Bus communication is OK |
| | • | | Module status reports an error |
| | | X | Bus communication is not possible |
| | | X | Module status reports an error |
| | | Χ | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital input has signal "1" |
| | | | Digital input has signal "0" |
| not relevant: X | | | |

021-1BD00 - DI 4xDC 24V

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



| Pos. | Function | Туре | Description |
|------|----------|------|--------------------|
| 1 | DI 0 | 1 | Digital input DI 0 |
| 2 | DC 24V | 0 | DC 24V for sensor |
| 3 | DI 2 | I | Digital input DI 2 |
| 4 | DC 24V | 0 | DC 24V for sensor |
| 5 | DI 1 | I | Digital input DI 1 |
| 6 | DC 24V | 0 | DC 24V for sensor |
| 7 | DI 3 | 1 | Digital input DI 3 |
| 8 | DC 24V | 0 | DC 24V for sensor |

I: Input, O: Output

Input area

At CPU, PROFIBUS and PROFINET the input area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|-------|------|-------------|---------------------|-------|-----|
| +0 | PII | PII 1 | State of the inputs | 5000h | |
| | | | Bit 0: DI 0 | | 01h |
| | | | Bit 1: DI 1 | | 02h |
| | | | Bit 2: DI 2 03h | 03h | |
| | | Bit 3: DI 3 | | 04h | |
| | | | Bit 7 4: reserved | | |

Output area

No byte of the output area is used by the module.

021-1BD00 - DI 4xDC 24V > Technical data

3.5.1 Technical data

| Order no. | 021-1BD00 |
|---|-----------------------|
| Туре | SM 021 |
| Module ID | 0003 9F84 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 65 mA |
| Power loss | 0.6 W |
| Technical data digital inputs | |
| Number of inputs | 4 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | - |
| Current consumption from load voltage L+ (without load) | - |
| Rated value | DC 20.428.8 V |
| Input voltage for signal "0" | DC 05 V |
| Input voltage for signal "1" | DC 1528.8 V |
| Input voltage hysteresis | - |
| Signal logic input | Sinking input |
| Frequency range | - |
| Input resistance | - |
| Input capacitance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |
| Max. permissible BERO quiescent current | 0.5 mA |
| Input delay of "0" to "1" | 3 ms |
| Input delay of "1" to "0" | 3 ms |
| Number of simultaneously utilizable inputs horizontal configuration | 4 |
| Number of simultaneously utilizable inputs vertical configuration | 4 |
| Input characteristic curve | IEC 61131-2, type 1 |
| Initial data size | 4 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |

021-1BD00 - DI 4xDC 24V > Technical data

| Diagnostics information read-out none Module state green LED Module error display red LED Channel error display none Between channels - Between channels of groups to - Between channels and backplane bus ✓ Insulation tested with DC 500 V Safety Safety protocol Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes 1 Input bytes 1 Output bytes 0 Parameter bytes 0 Diagnostic bytes 0 Housing Profile rail 35 mm Mechanical data PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data 1 Dimensions (WxHxD) 1.2 9 mm x 109 mm x 76.5 mm Met weight 67 g Weight including accessories 67 g Gross weight </th <th>Order no.</th> <th>021-1BD00</th> | Order no. | 021-1BD00 |
|---|------------------------------------|----------------------------|
| Module error display red LED | Diagnostics information read-out | none |
| Channel error display none Isolation - Between channels of groups to - Between channels and backplane bus ✓ Insulation tested with DC 500 V Safety — Safety protocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes - Input bytes 1 Output bytes 0 Parameter bytes 0 Diagnostic bytes 0 Housing PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data PPE / PPE GF10 Net weight 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions O °C to 60 °C Storage temperature 0 °C to 60 °C Certifications UL certification UL certification yes | Module state | green LED |
| Isolation - Between channels - Between channels of groups to - Between channels and backplane bus ✓ Insulation tested with DC 500 V Safety — Safety protocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes 1 Output bytes 0 Parameter bytes 0 Diagnostic bytes 0 Housing PE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight including accessories 57 g Weight including accessories 72 g Environmental conditions Profile rail gemperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications </td <td>Module error display</td> <td>red LED</td> | Module error display | red LED |
| Between channels Between channels of groups to Between channels and backplane bus Insulation tested with DC 500 V Safety Safety Protocol Safety requirements Secure user address - Watchdog - Two channels Test pulse outputs Datasizes Input bytes Input bytes Output bytes Output bytes Diagnostic bytes Housing Material PPE / PPE GF10 Mounting Mechanical data Dimensions (WxHxD) Net weight Weight including accessories Gross weight Environmental conditions Operating temperature O **C to 60 **C Certifications UL certification VS afety DC 500 V | Channel error display | none |
| Between channels of groups to Between channels and backplane bus Insulation tested with DC 500 V Safety Safety Protocol Safety requirements Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes Input by | Isolation | |
| Between channels and backplane bus Insulation tested with DC 500 V Safety Safety protocol Safety requirements Secure user address Watchdog Two channels Test pulse outputs Datasizes Input bytes Output bytes Output bytes Oignansitic bytes Housing Material Mounting PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) Net weight 57 g Weight including accessories Gross weight Tyo Cto 60 °C Storage temperature Oc 50 V Certifications UL certification PSAFELY ACCESTANCE PAGENTAL ACCESTANCE DIC 500 V ACCESTANCE PC | Between channels | - |
| Insulation tested with Safety Safety protocol Safety requirements Secure user address Watchdog Two channels Test pulse outputs Datasizes Input bytes | Between channels of groups to | - |
| Safety Safety protocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes Input bytes 1 Output bytes 0 Parameter bytes 0 Diagnostic bytes 0 Housing PE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification UL certification yes | Between channels and backplane bus | ✓ |
| Safety protocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes Input bytes 1 Output bytes 0 Parameter bytes 0 Diagnostic bytes 0 Housing PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) Net weight 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification UL certification yes | Insulation tested with | DC 500 V |
| Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes Input bytes 0 Parameter bytes 0 Diagnostic bytes 0 Housing - Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data - Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions - Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications yes | Safety | |
| Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes Input bytes 0 Output bytes 0 Parameter bytes 0 Diagnostic bytes 0 Housing PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification UL certification yes | Safety protocol | - |
| Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes 1 Output bytes 0 Parameter bytes 0 Diagnostic bytes 0 Housing PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 57 g Gross weight 72 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certification V | Safety requirements | - |
| Two channels Test pulse outputs Datasizes Input bytes Output bytes 0 Parameter bytes 0 Diagnostic bytes Housing Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) Net weight 57 g Weight including accessories Gross weight Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Secure user address | - |
| Test pulse outputs Datasizes Input bytes 1 Output bytes 0 Parameter bytes 0 Diagnostic bytes Housing Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 57 g Weight including accessories Gross weight 72 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Watchdog | - |
| Input bytes Input | Two channels | - |
| Input bytes Output bytes Output bytes O Parameter bytes O Diagnostic bytes Housing Material Metrial PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions Operating temperature O °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Test pulse outputs | - |
| Output bytes Parameter bytes 0 Diagnostic bytes Housing Material PPE / PPE GF10 Mounting Mechanical data Dimensions (WxHxD) Net weight 57 g Weight including accessories Gross weight Environmental conditions Operating temperature O °C to 60 °C Storage temperature Certifications UL certification 0 O O O O O O O O O O O O O O O O O O | Datasizes | |
| Parameter bytes Diagnostic bytes 0 Housing Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Input bytes | 1 |
| Diagnostic bytes Housing Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Output bytes | 0 |
| Housing Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Parameter bytes | 0 |
| Material PPE / PPE GF10 Mounting Profile rail 35 mm Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Diagnostic bytes | 0 |
| Mounting Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Housing | |
| Mechanical data Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm Net weight 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Material | PPE / PPE GF10 |
| Dimensions (WxHxD) 12.9 mm x 109 mm x 76.5 mm 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Mounting | Profile rail 35 mm |
| Net weight 57 g Weight including accessories 57 g Gross weight 72 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Mechanical data | |
| Weight including accessories Gross weight 72 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Gross weight 72 g Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Net weight | 57 g |
| Environmental conditions Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Weight including accessories | 57 g |
| Operating temperature 0 °C to 60 °C Storage temperature -25 °C to 70 °C Certifications UL certification yes | Gross weight | 72 g |
| Storage temperature -25 °C to 70 °C Certifications UL certification yes | Environmental conditions | |
| Certifications UL certification yes | Operating temperature | 0 °C to 60 °C |
| UL certification yes | Storage temperature | -25 °C to 70 °C |
| • | Certifications | |
| KC certification yes | UL certification | yes |
| | KC certification | yes |

021-1BD10 - DI 4xDC 24V 2µs...4ms

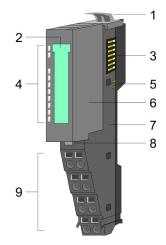
3.6 021-1BD10 - DI 4xDC 24V 2µs...4ms

Properties

The electronic module collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 4 fast digital input channels and their status is monitored via LEDs.

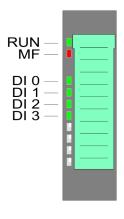
- 4 fast digital inputs, isolated to the backplane bus
- Suited for switches and approximate switches
- Status indication of the channels via LEDs also with de-activated electronic power supply
- Parameterizable input delay
- Interrupt and diagnostics function

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

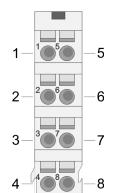
Status indication



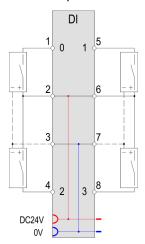
| RUN green | MF ■ red | DI x green | Description |
|-----------------|--------------------|------------|---|
| | | X | Bus communication is OK |
| | | ^ | Module status is OK |
| | | X | Bus communication is OK |
| | | ^ | Module status reports an error |
| | _ | X | Bus communication is not possible |
| | _ | ^ | Module status reports an error |
| | | Χ | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | ⇔ Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital input has signal "1" |
| | | | Digital input has signal "0" |
| not relevant: X | | | |

021-1BD10 - DI 4xDC 24V 2µs...4ms

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



| Pos. | Function | Туре | Description |
|------|----------|------|--------------------|
| 1 | DI 0 | 1 | Digital input DI 0 |
| 2 | DC 24V | 0 | DC 24V for sensor |
| 3 | 0V | 0 | GND |
| 4 | DI 2 | 1 | Digital input DI 2 |
| 5 | DI 1 | 1 | Digital input DI 1 |
| 6 | DC 24V | 0 | DC 24V for sensor |
| 7 | 0V | 0 | GND |
| 8 | DI 3 | 0 | Digital input DI 3 |

I: Input, O: Output

Input area

At CPU, PROFIBUS and PROFINET the input area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|-------|-------|-------------------|---------------------|-----|-----|
| +0 | PII 1 | 1 | State of the inputs | | |
| | | | Bit 0: DI 0 | | 01h |
| | | | Bit 1: DI 1 | | 02h |
| | | | Bit 2: DI 2 | | 03h |
| | | Bit 3: DI 3 | | 04h | |
| | | Bit 7 4: reserved | | | |

Output area

No byte of the output area is used by the module.

021-1BD10 - DI 4xDC 24V 2µs...4ms > Technical data

3.6.1 Technical data

| Order no. | 021-1BD10 |
|---|---------------------------|
| Туре | SM 021 |
| Module ID | 0009 1F04 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 100 mA |
| Power loss | 0.95 W |
| Technical data digital inputs | |
| Number of inputs | 4 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.428.8 V |
| Current consumption from load voltage L+ (without load) | 15 mA |
| Rated value | DC 20.428.8 V |
| Input voltage for signal "0" | DC 05 V |
| Input voltage for signal "1" | DC 1528.8 V |
| Input voltage hysteresis | - |
| Signal logic input | Sinking input |
| Frequency range | - |
| Input resistance | - |
| Input capacitance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |
| Max. permissible BERO quiescent current | 0.5 mA |
| Input delay of "0" to "1" | parameterizable 2µs - 3ms |
| Input delay of "1" to "0" | parameterizable 2µs - 3ms |
| Number of simultaneously utilizable inputs horizontal configuration | 4 |
| Number of simultaneously utilizable inputs vertical configuration | 4 |
| Input characteristic curve | IEC 61131-2, type 1 |
| Initial data size | 4 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | yes, parameterizable |
| Process alarm | yes, parameterizable |
| Diagnostic interrupt | yes, parameterizable |
| Diagnostic functions | yes |

021-1BD10 - DI 4xDC 24V 2µs...4ms > Technical data

| Order no. | 021-1BD10 |
|------------------------------------|----------------------------|
| Diagnostics information read-out | possible |
| Module state | green LED |
| Module error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse outputs | - |
| Datasizes | |
| Input bytes | 1 |
| Output bytes | 0 |
| Parameter bytes | 11 |
| Diagnostic bytes | 20 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 59 g |
| Weight including accessories | 59 g |
| Gross weight | 73 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |
| | |

021-1BD10 - DI 4xDC 24V 2µs...4ms > Parameter data

3.6.2 Parameter data

DS - Record set for access via CPU, PROFIBUS and PROFINET

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 3100h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|---|-------|--|---------|-----|-------|-----|
| DIAG_EN | 1 | Diagnostic interrupt * | 00h | 00h | 3100h | 01h |
| CH0D | 1 | Input delay DI 0 | 02h | 01h | 3101h | 02h |
| CH1D | 1 | Input delay DI 1 | 02h | 01h | 3102h | 03h |
| CH2D | 1 | Input delay DI 2 | 02h | 01h | 3103h | 04h |
| CH3D | 1 | Input delay DI 3 | 02h | 01h | 3104h | 05h |
| INTRE | 1 | Diagnostic interrupt at edge 0-1 of DI x | 00h | 80h | 3105h | 06h |
| INTFE | 1 | Diagnostic interrupt at edge 1-0 of DI x | 00h | 80h | 3106h | 07h |
| *) This record set may only be transferred at STOP state. | | | | | | |

DIAG_EN Diagnostic inter-rupt

| Byte | Bit 7 0 |
|------|----------------------|
| 0 | Diagnostic interrupt |
| | 00h: disable |
| | 40h: enable |

Here you activate res. de-activate the diagnostic function.

CHxD Input delay

| Byte | Function | Possible values | |
|------|------------------|--------------------|-----------------|
| 0 | Input delay DI x | 00h: 1µs | 07h: 86μs |
| | | 02h: 3μs | 09h: 342μs |
| | | 04h: 10μs | 0Ch: 2731µs |
| | | Other values are n | ot permissible! |

Input delay allows you to preset a filter for the corresponding channel. With the help of filters you may e.g. filter signal peaks at a blurred input signal.

INTRE Interrupt edge 0-1

| Byte | Bit 7 0 |
|------|---|
| 0 | Bit 0: Diagnostic interrupt at edge 0-1 of DI 0 |
| | Bit 1: Diagnostic interrupt at edge 0-1 of DI 1 |
| | Bit 2: Diagnostic interrupt at edge 0-1 of DI 2 |
| | Bit 3: Diagnostic interrupt at edge 0-1 of DI 3 |
| | (0: disable, 1: enable) |
| | Bit 7 4: reserved |

021-1BD10 - DI 4xDC 24V 2µs...4ms > Diagnostics and interrupt

INTFE Interrupt edge 1-0

| Byte | Bit 7 0 |
|------|---|
| 0 | Bit 0: Diagnostic interrupt at edge 1-0 of DI 0 |
| | Bit 1: Diagnostic interrupt at edge 1-0 of DI 1 |
| | Bit 2: Diagnostic interrupt at edge 1-0 of DI 2 |
| | Bit 3: Diagnostic interrupt at edge 1-0 of DI 3 |
| | (0: disable, 1: enable) |
| | Bit 7 4: reserved |

3.6.3 Diagnostics and interrupt

| Event | Process interrupt | Diagnostics interrupt | parameterizable |
|-----------------------------|-------------------|-----------------------|-----------------|
| Edge 0-1 DI x | X | - | X |
| Edge 1-0 DI x | X | - | X |
| Diagnostics buffer overflow | - | X | - |
| Process interrupt lost | - | X | - |

Process interrupt

So you may react to asynchronous events, there is the possibility to activate a process interrupt. A process interrupt interrupts the linear program sequence and jumps depending on the master system to a corresponding Interrupt routine. Here you can react to the process interrupt accordingly.

With CANopen the process interrupt data a transferred via an emergency telegram.

Operating with CPU, PROFIBUS and PROFINET the process interrupt data were transferred via diagnostics telegram.

SX - Subindex for access via EtherCAT with Index 5000h

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | SX |
|---------|-------|------------------------|---------|-----------------------------------|
| PRIT_A | 1 | Process interrupt data | 00h | 02h |
| PRIT_B | 1 | State of the inputs | 00h | 03h |
| PRIT_US | 2 | μs ticker | 00h | 04h (high byte) 05h (low byte) |

PRIT_A Process interrupt data

| Byte | Bit 7 0 |
|------|-----------------------------------|
| 0 | Bit 0: Edge at Digital input DI 0 |
| | Bit 1: Edge at Digital input DI 1 |
| | Bit 2: Edge at Digital input DI 2 |
| | Bit 3: Edge at Digital input DI 3 |
| | Bit 7 4: reserved |

021-1BD10 - DI 4xDC 24V 2µs...4ms > Diagnostics and interrupt

PRIT B State of the inputs

| Byte | Bit 7 0 |
|------|---|
| 0 | State of the inputs at the moment of the process interrup |
| | Bit 0: State Input DI 0 |
| | Bit 1: State Input DI 1 |
| | Bit 2: State Input DI 2 |
| | Bit 3: State Input DI 3 |
| | Bit 7 4: reserved |

PRIT_US µs ticker

| Byte | Bit 7 0 |
|------|---|
| 0 1 | Value of the µs ticker at the moment of the process interrupt |

μs ticker

In the SLIO module there is a 32 bit timer (μ s ticker). With PowerON the timer starts counting with 0. After 2^{32} - 1μ s the timer starts with 0 again.

PRIT US represents the lower 2 byte of the µs ticker value (0 ... 2¹⁶-1).

Diagnostic data

Via the parameterization you may activate a diagnostic interrupt for the module.

With a diagnostics interrupt the module serves for diagnostics data for diagnostic interrupt_{incoming}.

As soon as the reason for releasing a diagnostic interrupt is no longer present, the diagnostic interrupt $_{qoinq}$ automatically takes place.

All events of a channel between diagnostic interrupt $_{\text{incoming}}$ and diagnostic interrupt $_{\text{going}}$ are not stored and get lost.

Within this time window (1. diagnostic interrupt $_{incoming}$ until last diagnostic interrupt $_{going}$) the MF-LED of the module is on.

- DS Record set for access via CPU, PROFIBUS and PROFINET. The access happens by DS 01h. Additionally the first 4 bytes may be accessed by DS 00h.
- IX Index for access via CANopen. The access happens by IX 2F01h. Additionally the first 4 bytes may be accessed by IX 2F00h.
- SX Subindex for access via EtherCAT with Index 5005h.

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|--------|-------|--|---------|-----|-------|-----|
| ERR_A | 1 | Diagnostic | 00h | 01h | 2F01h | 02h |
| MODTYP | 1 | Module information | 1Fh | | | 03h |
| ERR_C | 1 | reserved | 00h | | | 04h |
| ERR_D | 1 | Diagnostic | 00h | | | 05h |
| CHTYP | 1 | Channel type | 70h | | | 06h |
| NUMBIT | 1 | Number of diagnostics bits per channel | 00h | | | 07h |

021-1BD10 - DI 4xDC 24V 2μs...4ms > Diagnostics and interrupt

| Name | Bytes | Function | Default | DS | IX | SX |
|------------------|-------|-------------------------------|---------|----|----|---------|
| NUMCH | 1 | Number channels of the module | 04h | | | 08h |
| CHERR | 1 | Channel error | 00h | | | 09h |
| CH0ERR CH7ERR | 8 | reserved | 00h | | | 0Ah 11h |
| DIAG_US | 4 | μs ticker | 00h | | | 13h |

ERR_A Diagnostic

| Byte | Bit 7 0 |
|------|------------------------------|
| 0 | Bit 0: set at module failure |
| | Bit 1: reserved |
| | Bit 2: set at external error |
| | Bit 3: set at channel error |
| | Bit 7 4: reserved |

MODTYP Modul information

| Byte | Bit 7 0 |
|------|------------------------------------|
| 0 | Bit 3 0: Module class |
| | 1111b: Digital module |
| | Bit 4: Channel information present |
| | Bit 7 5: reserved |

ERR_C reserved

| Byte | Bit 7 0 |
|------|----------|
| 0 | reserved |

ERR_D Diagnostic

| Byte | Bit 7 0 |
|------|--|
| 0 | Bit 2 0: reserved |
| | Bit 3: set at internal diagnostics buffer overflow |
| | Bit 5 4: reserved |
| | Bit 6: Process interrupt lost |
| | Bit 7: reserved |

CHTYP Channel type

| Byte | Bit 7 0 |
|------|-----------------------|
| 0 | Bit 6 0: Channel type |
| | 70h: Digital input |
| | Bit 7: reserved |

021-1BD10 - DI 4xDC 24V 2µs...4ms > Diagnostics and interrupt

NUMBIT Diagnostic bits

| Byte | Bit 7 0 |
|------|---|
| 0 | Number of diagnostics bits of the module per channel (here 00h) |

NUMCH Channels

| Byte | Bit 7 0 |
|------|---|
| 0 | Number of channels of the module (here 04h) |

CHERR Channel error

| Byte | Bit 7 0 |
|------|--------------------------|
| 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 |
|------|----------|
| 0 | reserved |

DIAG_US µs ticker

| Byte | Bit 7 0 |
|------|--|
| 0 3 | Value of the µs ticker at the moment of the diagnostic |

µs ticker

In the SLIO module there is a 32 bit timer (μ s ticker). With PowerON the timer starts counting with 0. After 2^{32} - 1μ s the timer starts with 0 again.

021-1BD40 - DI 4xDC 24V 3 wire

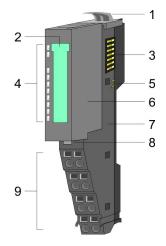
3.7 021-1BD40 - DI 4xDC 24V 3 wire

Properties

The electronic module collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 4 channels and their status is monitored via LEDs.

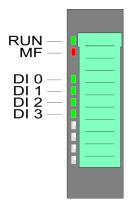
- 4 digital inputs with 3 wire connection, isolated to the backplane bus
- Suited for switches and approximate switches
- Status indication of the channels via LEDs also with de-activated electronic power supply

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

Status indication

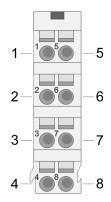


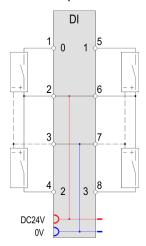
| RUN green | MF red | DI x green | Description |
|-----------------|--------|------------|---|
| | | V | Bus communication is OK |
| | | X | Module status is OK |
| | | x | Bus communication is OK |
| | | | Module status reports an error |
| | | X | Bus communication is not possible |
| | | X | Module status reports an error |
| | | Χ | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital input has signal "1" |
| | | | Digital input has signal "0" |
| not relevant: X | | | |

021-1BD40 - DI 4xDC 24V 3 wire

Pin assignment

For wires with a cross section of 0.08mm² up to 1.5mm².





| Pos. | Function | Туре | Description |
|------|----------|------|--------------------|
| 1 | DI 0 | 1 | Digital input DI 0 |
| 2 | DC 24V | 0 | DC 24V for sensor |
| 3 | 0V | 0 | GND |
| 4 | DI 2 | 1 | Digital input DI 2 |
| 5 | DI 1 | 1 | Digital input DI 1 |
| 6 | DC 24V | 0 | DC 24V for sensor |
| 7 | 0V | 0 | GND |
| 8 | DI 3 | 1 | Digital input DI 3 |

I: Input, O: Output

Input area

At CPU, PROFIBUS and PROFINET the input area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|-------|-------|-------|---------------------|----|-----|
| +0 | PII 1 | 1 | State of the inputs | | |
| | | | Bit 0: DI 0 | | 01h |
| | | | Bit 1: DI 1 | | 02h |
| | | | Bit 2: DI 2 | | 03h |
| | | | Bit 3: DI 3 | | 04h |
| | | | Bit 7 4: reserved | | |

Output area

No byte of the output area is used by the module.

021-1BD40 - DI 4xDC 24V 3 wire > Technical data

3.7.1 Technical data

| Order no. | 021-1BD40 |
|---|-----------------------|
| Туре | SM 021 |
| Module ID | 0008 9F84 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 65 mA |
| Power loss | 0.6 W |
| Technical data digital inputs | |
| Number of inputs | 4 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | - |
| Current consumption from load voltage L+ (without load) | - |
| Rated value | DC 20.428.8 V |
| Input voltage for signal "0" | DC 05 V |
| Input voltage for signal "1" | DC 1528.8 V |
| Input voltage hysteresis | - |
| Signal logic input | Sinking input |
| Frequency range | - |
| Input resistance | - |
| Input capacitance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |
| Max. permissible BERO quiescent current | 0.5 mA |
| Input delay of "0" to "1" | 3 ms |
| Input delay of "1" to "0" | 3 ms |
| Number of simultaneously utilizable inputs horizontal configuration | 4 |
| Number of simultaneously utilizable inputs vertical configuration | 4 |
| Input characteristic curve | IEC 61131-2, type 1 |
| Initial data size | 4 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |

021-1BD40 - DI 4xDC 24V 3 wire > Technical data

| rder no. | 021-1BD40 |
|-----------------------------------|----------------------------|
| iagnostics information read-out | none |
| odule state | green LED |
| odule error display | red LED |
| hannel error display | none |
| olation | |
| etween channels | - |
| etween channels of groups to | - |
| etween channels and backplane bus | ✓ |
| sulation tested with | DC 500 V |
| afety | |
| afety protocol | |
| afety requirements | - |
| ecure user address | - |
| /atchdog | |
| wo channels | - |
| est pulse outputs | - |
| atasizes | |
| put bytes | 1 |
| utput bytes | 0 |
| arameter bytes | 0 |
| iagnostic bytes | 0 |
| ousing | |
| aterial | PPE / PPE GF10 |
| ounting | Profile rail 35 mm |
| echanical data | |
| imensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| et weight | 57 g |
| /eight including accessories | 57 g |
| ross weight | 71 g |
| nvironmental conditions | |
| perating temperature | 0 °C to 60 °C |
| torage temperature | -25 °C to 70 °C |
| ertifications | |
| L certification | yes |
| C certification | yes |

021-1BD50 - DI 4xDC 24V NPN

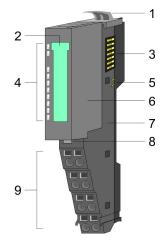
3.8 021-1BD50 - DI 4xDC 24V NPN

Properties

The electronic module collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 4 channels and their status is monitored via LEDs. An input becomes active as soon as it is connected to ground.

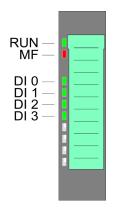
- 4 digital inputs (Sourcing input), isolated to the backplane bus
- Suited for switches and approximate switches
- Status indication of the channels via LEDs also with de-activated electronic power supply

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

Status indication

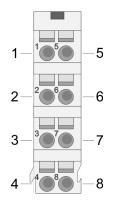


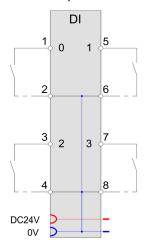
| RUN green | MF red | DI x green | Description | | |
|---------------|--------|------------|---|--|--|
| | | | Bus communication is OK | | |
| | | X | Module status is OK | | |
| | _ | X | Bus communication is OK | | |
| | | X | Module status reports an error | | |
| | _ | V | Bus communication is not possible | | |
| | | X | Module status reports an error | | |
| | | Χ | Error at bus power supply | | |
| | | | Flashing: Error in configuration | | |
| X | ZHz | X | Chap. 2.8 'Trouble shooting - LEDs' page 28 | | |
| | | | Digital input has signal "1" | | |
| | | | Digital input has signal "0" | | |
| not relevant: | Х | | | | |

021-1BD50 - DI 4xDC 24V NPN

Pin assignment

For wires with a cross section of 0.08mm² up to 1.5mm².





| Pos. | Function | Туре | Description |
|------|----------|------|--------------------|
| 1 | DI 0 | 1 | Digital input DI 0 |
| 2 | 0V | 0 | GND |
| 3 | DI 2 | 1 | Digital input DI 2 |
| 4 | 0V | 0 | GND |
| 5 | DI 1 | 1 | Digital input DI 1 |
| 6 | 0V | 0 | GND |
| 7 | DI 3 | 1 | Digital input DI 3 |
| 8 | 0V | 0 | GND |

I: Input, O: Output

Input area

At CPU, PROFIBUS and PROFINET the input area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|-------|-------|-------|---------------------|----|-----|
| +0 | PII 1 | 1 | State of the inputs | | |
| | | | Bit 0: DI 0 | | 01h |
| | | | Bit 1: DI 1 | | 02h |
| | | | Bit 2: DI 2 | | 03h |
| | | | Bit 3: DI 3 | | 04h |
| | | | Bit 7 4: reserved | | |

Output area

No byte of the output area is used by the module.

021-1BD50 - DI 4xDC 24V NPN > Technical data

3.8.1 Technical data

| Order no. | 021-1BD50 |
|---|------------------------|
| Туре | SM 021 |
| Module ID | 0004 9F84 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 65 mA |
| Power loss | 0.6 W |
| Technical data digital inputs | |
| Number of inputs | 4 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | - |
| Current consumption from load voltage L+ (without load) | - |
| Rated value | DC 20.428.8 V |
| Input voltage for signal "0" | DC 1528.8 V |
| Input voltage for signal "1" | DC 05 V |
| Input voltage hysteresis | - |
| Signal logic input | Sourcing input |
| Frequency range | - |
| Input resistance | - |
| Input capacitance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |
| Max. permissible BERO quiescent current | 0.5 mA |
| Input delay of "0" to "1" | 3 ms |
| Input delay of "1" to "0" | 3 ms |
| Number of simultaneously utilizable inputs horizontal configuration | 4 |
| Number of simultaneously utilizable inputs vertical configuration | 4 |
| Input characteristic curve | - |
| Initial data size | 4 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | g.com === per enaminer |
| | no |
| Process alarm | |
| Process alarm Diagnostic interrupt | no |

021-1BD50 - DI 4xDC 24V NPN > Technical data

| Order no. | 021-1BD50 |
|------------------------------------|----------------------------|
| Diagnostics information read-out | none |
| Module state | green LED |
| Module error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | |
| Between channels of groups to | |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| Safety | |
| Safety protocol | |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse outputs | - |
| Datasizes | |
| Input bytes | 1 |
| Output bytes | 0 |
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 58 g |
| Weight including accessories | 58 g |
| Gross weight | 72 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

021-1BD70 - DI 4xDC 24V ETS

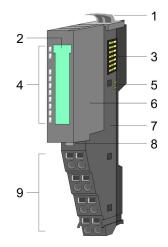
3.9 021-1BD70 - DI 4xDC 24V ETS

Properties

The electronic module collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 4 channels and their status is monitored via LEDs. With configured ETS functionality (ETS = edge time stamp) and the corresponding (rising/falling) edge the current time value of the µs timer is stored together with the state of the inputs in the process image. Depending on the configuration 5 (20byte) respectively 15 (60byte) ETS entries may be stored in the process image one after another.

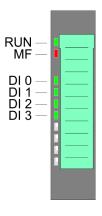
- 4 digital inputs, isolated to the backplane bus
- Configurable ETS functionality for 5 respectively 15 ETS entries (each 4byte)
- Diagnostics function
- Suited for switches and approximate switches
- Status indication of the channels via LEDs also with de-activated electronic power supply

Structure



- Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

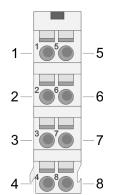
Status indication



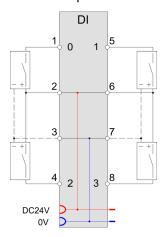
| RUN green | MF red | DI x green | Description |
|---------------|--------|------------|---|
| _ | | X | Bus communication is OK |
| | | A | Module status is OK |
| | _ | Х | Bus communication is OK |
| | - | ^ | Module status reports an error |
| | _ | V | Bus communication is not possible |
| | | X | Module status reports an error |
| | | Χ | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | ♦ Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital input has signal "1" |
| | | | Digital input has signal "0" |
| not relevant: | Χ | | |

021-1BD70 - DI 4xDC 24V ETS

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



| Pos. | Function | Туре | Description |
|------|----------|------|--------------------|
| 1 | DI 0 | I | Digital input DI 0 |
| 2 | DC 24V | 0 | DC 24V for sensor |
| 3 | 0V | 0 | GND |
| 4 | DI 2 | I | Digital input DI 2 |
| 5 | DI 1 | I | Digital input DI 1 |
| 6 | DC 24V | 0 | DC 24V for sensor |
| 7 | 0V | 0 | GND |
| 8 | DI 3 | I | Digital input DI 3 |

I: Input, O: Output

In-/Output area

With configured ETS functionality (ETS=edge time stamp) and the corresponding edge the current time value of the SLIO µs timer is stored together with the state of the inputs and a running number as ETS entry in the process image.

You may configure the following variants:

- 021-1BD70 DI 4xDC24V (20): uses 20byte in the PII for 5 ETS entries
- 021-1BD70 DI 4xDC24V (60): uses 60byte in the PII for 15 ETS entries

Output area

No byte of the output area is used by the module.

Input area 20byte respectively 60byte

Depending on the configured variant, the module serves for an area for 5 resp. 15 ETS entries. Each ETS entry uses 4byte in input area:

Input area

The input range is used for status message. At CPU, PROFIBUS and PROFINET the input respectively output area is embedded to the corresponding address area.

- IX = Index for access via CANopen. With s = Subindex the corresponding ETS entry is addressed.
- SX Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

021-1BD70 - DI 4xDC 24V ETS

Structure of an ETS entry

| Addr. | Name | Bytes | Function | IX | SX |
|-------|--------|-------|---------------------|---------|-----|
| +0 | PII | 1 | State of the inputs | 5430h/s | 01h |
| +1 | RN | 1 | Running number | | 02h |
| +2 | ETS_US | 2 | μs ticker | | 03h |

PII

Here the state of the inputs after an edge change is stored.

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 (fix)

RN

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

ETS_US

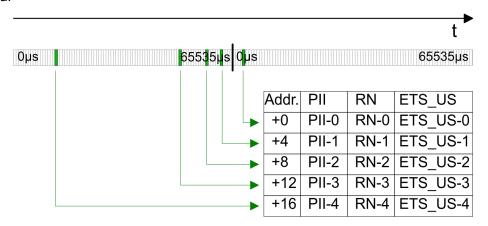
In the SLIO module there is a 32 bit timer (μ s ticker). With PowerON the timer starts counting with 0. After 2^{32} - 1μ s the timer starts with 0 again.

ETS US always contains the low word of the µs ticker (0...65535µs).

ETS functionality

With the corresponding edge the value of the timer is stored as ETS entry in the process image as ETS_US together with the state of the inputs PII and the running number RN.

The following figure shows the sequence of how the ETS entries are stored in the input area.



Input area

The input range is used for status message. At CPU, PROFIBUS and PROFINET the input respectively output area is embedded to the corresponding address area.

- IX IX = Index for access via CANopen. With s = Subindex the corresponding ETS entry is addressed.
- SX Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

021-1BD70 - DI 4xDC 24V ETS

Configured as 021-1BD70 DI 4xDC 24V (20) 20byte - 5 ETS entries

| Addr. | PII | IX=5430h | SX | Addr. | RN | IX=5430h | SX | Addr. | ETS-US | IX=5430h | SX |
|-------|-------|----------|-----|-------|------|----------|-----|-------|----------|----------|-----|
| +0 | PII-0 | s=1 | 01h | +1 | RN-0 | s=1 | 02h | +2 | ETS_US-0 | s=1 | 03h |
| +4 | PII-1 | s=2 | 04h | +5 | RN-1 | s=2 | 05h | +6 | ETS_US-1 | s=2 | 06h |
| +8 | PII-2 | s=3 | 07h | +9 | RN-2 | s=3 | 08h | +10 | ETS_US-2 | s=3 | 09h |
| +12 | PII-3 | s=4 | 0Ah | +13 | RN-3 | s=4 | 0Bh | +14 | ETS_US-3 | s=4 | 0Ch |
| +16 | PII-4 | s=5 | 0Dh | +17 | RN-4 | s=5 | 0Eh | +18 | ETS_US-4 | s=5 | 0Fh |

Configured as 021-1BD70 DI 4xDC 24V (60) 60byte - 15 ETS entries

| Addr. | PII | IX=5430h | SX | Addr. | RN | IX=5430h | SX | Addr. | ETS-US | IX=5430h | SX |
|-------|--------|----------|-----|-------|-------|----------|-----|-------|-----------|----------|-----|
| +0 | PII-0 | s=1 | 01h | +1 | RN-0 | s=1 | 02h | +2 | ETS_US-0 | s=1 | 03h |
| +4 | PII-1 | s=2 | 04h | +5 | RN-1 | s=2 | 05h | +6 | ETS_US-1 | s=2 | 06h |
| +8 | PII-2 | s=3 | 07h | +9 | RN-2 | s=3 | 08h | +10 | ETS_US-2 | s=3 | 09h |
| +12 | PII-3 | s=4 | 0Ah | +13 | RN-3 | s=4 | 0Bh | +14 | ETS_US-3 | s=4 | 0Ch |
| +16 | PII-4 | s=5 | 0Dh | +17 | RN-4 | s=5 | 0Eh | +18 | ETS_US-4 | s=5 | 0Fh |
| +20 | PII-5 | s=6 | 10h | +21 | RN-5 | s=6 | 11h | +22 | ETS_US-5 | s=6 | 12h |
| +24 | PII-6 | s=7 | 13h | +25 | RN-6 | s=7 | 14h | +26 | ETS_US-6 | s=7 | 15h |
| +28 | PII-7 | s=8 | 16h | +29 | RN-7 | s=8 | 17h | +30 | ETS_US-7 | s=8 | 18h |
| +32 | PII-8 | s=9 | 19h | +33 | RN-8 | s=9 | 1Ah | +34 | ETS_US-8 | s=9 | 1Bh |
| +36 | PII-9 | s=10 | 1Ch | +37 | RN-9 | s=10 | 1Dh | +38 | ETS_US-9 | s=10 | 1Eh |
| +40 | PII-10 | s=11 | 1Fh | +41 | RN-10 | s=11 | 20h | +42 | ETS_US-10 | s=11 | 21h |
| +44 | PII-11 | s=12 | 22h | +45 | RN-11 | s=12 | 23h | +46 | ETS_US-11 | s=12 | 24h |
| +48 | PII-12 | s=13 | 25h | +49 | RN-12 | s=13 | 26h | +50 | ETS_US-12 | s=13 | 27h |
| +52 | PII-13 | s=14 | 28h | +53 | RN-13 | s=14 | 29h | +54 | ETS_US-13 | s=14 | 2Ah |



The ETS module may only be accessed by the System SLIO CPU by means of SFC 14 or via the process image.

021-1BD70 - DI 4xDC 24V ETS > Technical data

3.9.1 Technical data

| Order no. | 021-1BD70 |
|---|---------------------------|
| Туре | SM 021 |
| Module ID | 0F03 47C2 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 100 mA |
| Power loss | 0.95 W |
| Technical data digital inputs | |
| Number of inputs | 4 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 24 V |
| Current consumption from load voltage L+ (without load) | 15 mA |
| Rated value | DC 20.428.8 V |
| Input voltage for signal "0" | DC 05 V |
| Input voltage for signal "1" | DC 1528.8 V |
| Input voltage hysteresis | - |
| Signal logic input | Sinking input |
| Frequency range | - |
| Input resistance | - |
| Input capacitance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |
| Max. permissible BERO quiescent current | 0.5 mA |
| Input delay of "0" to "1" | parameterizable 2µs - 3ms |
| Input delay of "1" to "0" | parameterizable 2µs - 3ms |
| Number of simultaneously utilizable inputs horizontal configuration | 4 |
| Number of simultaneously utilizable inputs vertical configuration | 4 |
| Input characteristic curve | IEC 61131-2, type 1 |
| Initial data size | 60 Byte |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |

021-1BD70 - DI 4xDC 24V ETS > Technical data

| Order no. | 021-1BD70 |
|------------------------------------|----------------------------|
| Diagnostics information read-out | possible |
| Module state | green LED |
| Module error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse outputs | - |
| Datasizes | |
| Input bytes | 20 / 60 |
| Output bytes | 0 |
| Parameter bytes | 12 |
| Diagnostic bytes | 20 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 58 g |
| Weight including accessories | 58 g |
| Gross weight | 73 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

021-1BD70 - DI 4xDC 24V ETS > Parameter data

3.9.2 Parameter data

The following variants may be configured:

- 021-1BD70 DI 4xDC24V (20): uses 20byte in the PII for 5 ETS entries
- 021-1BD70 DI 4xDC24V (60): uses 60byte in the PII for 15 ETS entries

3.9.2.1 Parameters

DS - Record set for access via CPU, PROFIBUS and PROFINET

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 3100h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|-------|-------|---|---------------------|-----|-------|-----|
| PII_L | 1 | Length process image input data ^{1, 2} | 14h resp. 3Ch (fix) | 02h | 3100h | 01h |
| PIQ_L | 1 | Length process image output data ² | 00h (fix) | 02h | 3101h | 02h |
| CH0D | 1 | Input delay DI 0 | 02h | 01h | 3102h | 03h |
| CH1D | 1 | Input delay DI 1 | 02h | 01h | 3103h | 04h |
| CH2D | 1 | Input delay DI 2 | 02h | 01h | 3104h | 05h |
| CH3D | 1 | Input delay DI 3 | 02h | 01h | 3105h | 06h |
| TSER | 1 | Raising edge 0-1 at DI x | 00h | 80h | 3106h | 07h |
| TSEF | 1 | Falling edge 1-0 at DI x | 00h | 80h | 3107h | 08h |

¹⁾ This parameter corresponds of the configured variant.

²⁾ This record set may only be transferred at STOP state.

| DII | |
|--------------|--|
| \mathbf{r} | |

| Byte | Bit 7 0 |
|------|--|
| 0 | The length of the process image of the input data is fix set to the configured variant (14h or 3Ch). |

PIQ_L

| Byte | Bit 7 0 |
|------|--|
| 0 | The length of the process image of the output data is fix set to 0 byte. |

021-1BD70 - DI 4xDC 24V ETS > Parameter data

CHxD DI x

| Byte | Description | Possible values | | | | |
|------|------------------|-----------------------------------|-------------|--|--|--|
| 0 | Input delay DI x | 00h: 1μs | 07h: 86μs | | | |
| | | 02h: 3μs | 09h: 342μs | | | |
| | | 04h: 10μs | 0Ch: 2731µs | | | |
| | | Other values are not permissible! | | | | |

With the help of filters you may e.g. filter signal peaks at a blurred input signal.

Edge select

Here the ETS function for DI 0 ... DI 3 may be activated. With these 2 bytes you may define the type of edge of the input signal, to which the current μ s timer value is stored in the process image together with the state of the inputs.

TSER edge 0-1 DI x

| Byte | Bit 7 0 |
|------|--|
| 0 | Bit 0: ETS record at edge 0-1 (rising edge) DI 0 |
| | Bit 1: ETS record at edge 0-1 (rising edge) DI 1 |
| | Bit 2: ETS record at edge 0-1 (rising edge) DI 2 |
| | Bit 3: ETS record at edge 0-1 (rising edge) DI 3 |
| | (0: disable, 1: enable) |
| | Bit 7 4: reserved |

TSEF edge 1-0 DI x

| Byte | Bit 7 0 |
|------|---|
| 0 | Bit 0: ETS record at edge 1-0 (falling edge) DI 0 |
| | Bit 1: ETS record at edge 1-0 (falling edge) DI 1 |
| | Bit 2: ETS record at edge 1-0 (falling edge) DI 2 |
| | Bit 3: ETS record at edge 1-0 (falling edge) DI 3 |
| | (0: disable, 1: enable) |
| | Bit 7 4: reserved |

3.9.2.2 Example of the principle of operation

In the following it is demonstrated by an example, in which order the ETS entries are stored.

In this example a module is configured, which occupies 20byte for 5 ETS entries.

The following edges for the input channels are preset.

- DI 0: Edge 0-1: ↑
- DI 1: Edge 1-0: ↓
- DI 2 and DI 3 are 0 constant

Process image is empty

New ETS entries are always registered starting from address +0. Thereby already existing ETS entries are shifted 4 byte each.

021-1BD70 - DI 4xDC 24V ETS > Parameter data



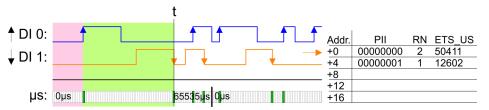
1. ETS entry

Released by an edge 0-1 from DI 0 the 1. ETS entry is registered starting from address +0.



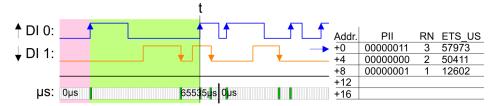
2. ETS entry

Released by an edge 1-0 from DI 1 the 2. ETS entry is registered starting from address +0 and the 1. ETS entry is shifted 4 byte.



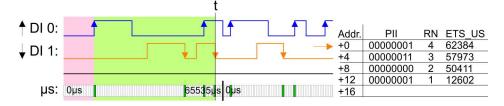
3. ETS entry

Released by an edge 0-1 from DI 0 the 3. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each.



4. ETS entry

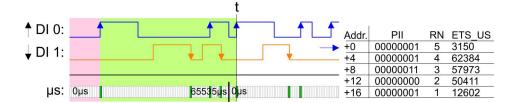
Released by an edge 1-0 from DI 1 the 4. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each.



5. ETS entry

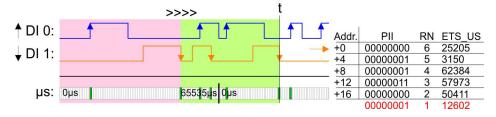
Released by an edge 0-1 from DI 0 the 5. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each. The maximum number of ETS entries is reached.

021-1BD70 - DI 4xDC 24V ETS > Parameter data



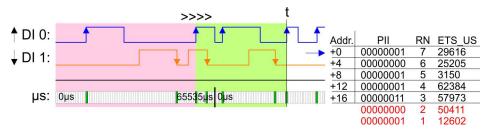
6. ETS entry

Released by an edge 1-0 from DI 1 the 6. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each. Thereby the 1. ETS entry is deleted and is not available any longer.



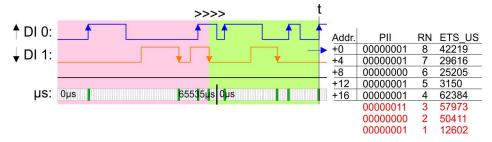
7. ETS entry

Released by an edge 0-1 from DI 0 the 7. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each. Thereby the 2. ETS entry is deleted and is not available any longer.



8. ETS entry

Released by an edge 0-1 from DI 0 the 8. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each. Thereby the 3. ETS entry is deleted and is not available any longer.



Please consider the ETS modules can only effectively be used together with head modules, which have an integrated μs ticker. The Ethernet coupler with ModbusTCP 053-1MT00 for example does not have an μs ticker.

021-1BD70 - DI 4xDC 24V ETS > Diagnostic data

3.9.3 Diagnostic data

So this module does not support interrupt functions, the diagnostic data serve the information about this module.

- DS Record set for access via CPU, PROFIBUS and PROFINET. The access happens by DS 01h. Additionally the first 4 bytes may be accessed by DS 00h.
- IX Index for access via CANopen. The access happens by IX 2F01h. Additionally the first 4 bytes may be accessed by IX 2F00h.
- SX Subindex for access via EtherCAT with Index 5005h.

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|------------------|-------|--|---------|-----|-------|---------|
| ERR_A | 1 | reserved | 00h | 01h | 2F01h | 02h |
| MODTYP | 1 | Module information | 1Fh | | | 03h |
| ERR_C | 1 | reserved | 00h | | | 04h |
| ERR_D | 1 | reserved | 00h | | | 05h |
| CHTYP | 1 | Channel type | 70h | | | 06h |
| NUMBIT | 1 | Number of diagnostics bits per channel | 00h | | | 07h |
| NUMCH | 1 | Number channels of the module | 04h | | | 08h |
| CHERR | 1 | reserved | 00h | | | 09h |
| CH0ERR CH7ERR | 8 | reserved | 00h | | | 0Ah 11h |
| DIAG_US | 4 | μs ticker (32bit) | 00h | | | 13h |

MODTYP Modul information

| Byte | Bit 7 0 |
|------|------------------------------------|
| 0 | Bit 3 0: Module class |
| | 1111b Digital module |
| | Bit 4: Channel information present |
| | Bit 7 5: reserved |

CHTYP Channel type

| Byte | Bit 7 0 | |
|------|-----------------------|--|
| 0 | Bit 6 0: Channel type | |
| | 70h: Digital input | |
| | Bit 7: 0 (fix) | |

NUMBIT Diagnostic bits

| Byte | Bit 7 0 |
|------|--|
| 0 | Number of diagnostics bits of the module per channel |
| | (here 00h) |

021-1BD70 - DI 4xDC 24V ETS > Diagnostic data

NUMCH channels

| Byte | Bit 7 0 |
|------|----------------------------------|
| 0 | Number of channels of the module |
| | (here 04h) |

DIAG_US µs ticker

| Byte | Bit 7 0 |
|------|---|
| 0 3 | Value of the μs ticker at the moment of the diagnostic data generation |

ERR_A/C/D CHERR, CHxERR reserved

| Byte | Bit 7 0 |
|------|----------|
| 0 | reserved |

021-1BF00 - DI 8xDC 24V

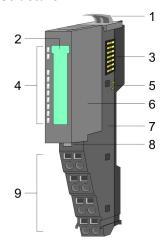
3.10 021-1BF00 - DI 8xDC 24V

Properties

The electronic module collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 8 channels and their status is monitored via LEDs.

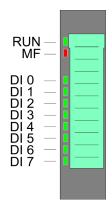
- 8 digital inputs, isolated to the backplane bus
- Suited for switches and approximate switches
- Status indication of the channels via LEDs also with de-activated electronic power supply

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

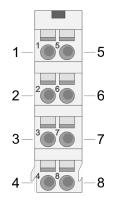
Status indication



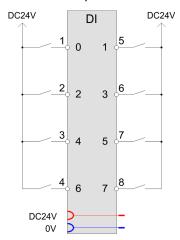
| RUN green | MF red | DI x green | Description |
|-----------------|--------|------------|---|
| | | X | Bus communication is OK |
| | | ^ | Module status is OK |
| _ | _ | X | Bus communication is OK |
| | | ^ | Module status reports an error |
| | _ | X | Bus communication is not possible |
| | | ^ | Module status reports an error |
| | | X | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | ⇔ Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital input has signal "1" |
| | | | Digital input has signal "0" |
| not relevant: X | | | |

021-1BF00 - DI 8xDC 24V

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



| Pos. | Function | Туре | Description |
|------|----------|------|--------------------|
| 1 | DI 0 | 1 | Digital input DI 0 |
| 2 | DI 2 | 1 | Digital input DI 2 |
| 3 | DI 4 | 1 | Digital input DI 4 |
| 4 | DI 6 | 1 | Digital input DI 6 |
| 5 | DI 1 | 1 | Digital input DI 1 |
| 6 | DI 3 | 1 | Digital input DI 3 |
| 7 | DI 5 | 1 | Digital input DI 5 |
| 8 | DI 7 | 1 | Digital input DI 7 |

I: Input

Input area

At CPU, PROFIBUS and PROFINET the input area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

021-1BF00 - DI 8xDC 24V > Technical data

| Addr. | Name | Bytes | Function | IX | SX | | |
|-------|------|---------------------------|-------------------------|--------|-------------|--|-----|
| +0 | PII | PII 1 State of the inputs | 6000h | | | | |
| | | | Bit 0: DI 0 | | 01h | | |
| | | | Bit 1: DI 1 | | 02h | | |
| | | | Bit 2: DI 2 | | 03h | | |
| | | | Bit 3: DI 3 Bit 4: DI 4 | Bit 3: | Bit 3: DI 3 | | 04h |
| | | | | | 05h | | |
| | | | Bit 5: DI 5 | | 06h | | |
| | | | Bit 6: DI 6 | | 07h | | |
| | | | Bit 7: DI 7 | | 08h | | |

Output area

No byte of the output area is used by the module.

3.10.1 Technical data

| Order no. | 021-1BF00 |
|---|---------------|
| Туре | SM 021 |
| Module ID | 0005 9FC1 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 65 mA |
| Power loss | 0.9 W |
| Technical data digital inputs | |
| Number of inputs | 8 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | - |
| Current consumption from load voltage L+ (without load) | - |
| Rated value | DC 20.428.8 V |
| Input voltage for signal "0" | DC 05 V |
| Input voltage for signal "1" | DC 1528.8 V |
| Input voltage hysteresis | - |
| Signal logic input | Sinking input |
| Frequency range | - |
| Input resistance | - |
| Input capacitance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |

021-1BF00 - DI 8xDC 24V > Technical data

| Order no. | 021-1BF00 |
|---|-----------------------|
| Max. permissible BERO quiescent current | 0.5 mA |
| Input delay of "0" to "1" | 3 ms |
| Input delay of "1" to "0" | 3 ms |
| Number of simultaneously utilizable inputs horizontal configuration | 8 |
| Number of simultaneously utilizable inputs vertical configuration | 8 |
| Input characteristic curve | IEC 61131-2, type 1 |
| Initial data size | 8 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | none |
| Module state | green LED |
| Module error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse outputs | - |
| Datasizes | |
| Input bytes | 1 |
| Output bytes | 0 |
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |

021-1BF00 - DI 8xDC 24V > Technical data

| Order no. | 021-1BF00 |
|------------------------------|----------------------------|
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 57 g |
| Weight including accessories | 57 g |
| Gross weight | 71 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

021-1BF01 - DI 8xDC 24V 0.5ms

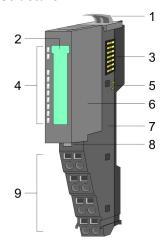
3.11 021-1BF01 - DI 8xDC 24V 0.5ms

Properties

The electronic module collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 8 channels and their status is monitored via LEDs.

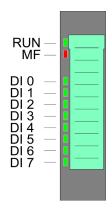
- 8 digital inputs, isolated to the backplane bus
- Suited for switches and approximate switches
- Status indication of the channels via LEDs also with de-activated electronic power supply

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

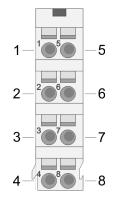
Status indication



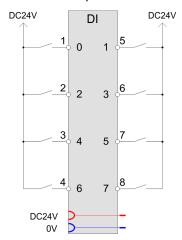
| RUN green | MF red | DI x green | Description | |
|-----------------|--------|------------|---|--|
| | | Х | Bus communication is OK | |
| | | | Module status is OK | |
| | _ | Χ | Bus communication is OK | |
| | | ^ | Module status reports an error | |
| | _ | X | Bus communication is not possible | |
| | | ^ | Module status reports an error | |
| | | X | Error at bus power supply | |
| | | | Flashing: Error in configuration | |
| X | ZHz | X | ⇔ Chap. 2.8 'Trouble shooting - LEDs' page 28 | |
| | | | Digital input has signal "1" | |
| | | | Digital input has signal "0" | |
| not relevant: X | | | | |

021-1BF01 - DI 8xDC 24V 0.5ms

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



| Pos. | Function | Туре | Description |
|------|----------|------|--------------------|
| 1 | DI 0 | 1 | Digital input DI 0 |
| 2 | DI 2 | I | Digital input DI 2 |
| 3 | DI 4 | 1 | Digital input DI 4 |
| 4 | DI 6 | 1 | Digital input DI 6 |
| 5 | DI 1 | 1 | Digital input DI 1 |
| 6 | DI 3 | 1 | Digital input DI 3 |
| 7 | DI 5 | I | Digital input DI 5 |
| 8 | DI 7 | 1 | Digital input DI 7 |

I: Input

Input area

At CPU, PROFIBUS and PROFINET the input area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

021-1BF01 - DI 8xDC 24V 0.5ms > Technical data

| Addr. | Name | Bytes | Function | IX | SX |
|-------|-------|-------------|---------------------|-------|-----|
| +0 | PII 1 | 1 | State of the inputs | 6000h | |
| | | | Bit 0: DI 0 | | 01h |
| | | Bit 1: DI 1 | | 02h | |
| | | Bit 2: DI 2 | | 03h | |
| | | | Bit 3: DI 3 | | 04h |
| | | | Bit 4: DI 4 | | 05h |
| | | | Bit 5: DI 5 | | 06h |
| | | | Bit 6: DI 6 | | 07h |
| | | | Bit 7: DI 7 | | 08h |

Output area

No byte of the output area is used by the module.

3.11.1 Technical data

| Order no. | 021-1BF01 |
|---|---------------|
| Туре | SM 021 |
| Module ID | 0013 9FC1 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 35 mA |
| Power loss | 0.9 W |
| Technical data digital inputs | |
| Number of inputs | 8 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | - |
| Current consumption from load voltage L+ (without load) | - |
| Rated value | DC 20.428.8 V |
| Input voltage for signal "0" | DC 05 V |
| Input voltage for signal "1" | DC 1528.8 V |
| Input voltage hysteresis | - |
| Signal logic input | Sinking input |
| Frequency range | - |
| Input resistance | - |
| Input capacitance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |

021-1BF01 - DI 8xDC 24V 0.5ms > Technical data

| Max. permissible BERO quiescent current 0.5 mA Input delay of "0" to "1" max. 500 μs Input delay of "1" to "0" max. 500 μs Number of simultaneously utilizable inputs horizontal configuration 8 | |
|---|--|
| Input delay of "1" to "0" max. 500 µs Number of simultaneously utilizable inputs horizontal con- | |
| Number of simultaneously utilizable inputs horizontal con- | |
| | |
| figuration | |
| Number of simultaneously utilizable inputs vertical configuration 8 | |
| Input characteristic curve IEC 61131-2, type 1 | |
| Initial data size 8 Bit | |
| Status information, alarms, diagnostics | |
| Status display green LED per channel | |
| Interrupts | |
| Process alarm no | |
| Diagnostic interrupt no | |
| Diagnostic functions no | |
| Diagnostics information read-out none | |
| Module state green LED | |
| Module error display red LED | |
| Channel error display none | |
| Isolation | |
| Between channels - | |
| Between channels of groups to - | |
| Between channels and backplane bus ✓ | |
| Insulation tested with DC 500 V | |
| Safety | |
| Safety protocol - | |
| Safety requirements - | |
| Secure user address - | |
| Watchdog - | |
| Two channels - | |
| Test pulse outputs - | |
| Datasizes | |
| Input bytes 1 | |
| Output bytes 0 | |
| Parameter bytes 0 | |
| Diagnostic bytes 0 | |
| Housing | |

021-1BF01 - DI 8xDC 24V 0.5ms > Technical data

| Order no. | 021-1BF01 |
|------------------------------|----------------------------|
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 57 g |
| Weight including accessories | 57 g |
| Gross weight | 71 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

021-1BF50 - DI 8xDC 24V NPN

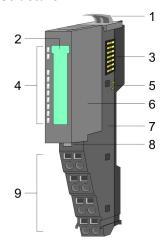
3.12 021-1BF50 - DI 8xDC 24V NPN

Properties

The electronic module collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 8 channels and their status is monitored via LEDs. An input becomes active as soon as it is connected to ground.

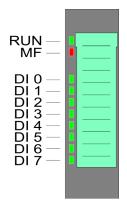
- 8 digital inputs (Sourcing input), isolated to the backplane bus
- Suited for switches and approximate switches
- Status indication of the channels via LEDs also with de-activated electronic power supply

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

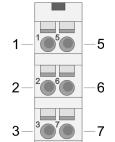
Status indication



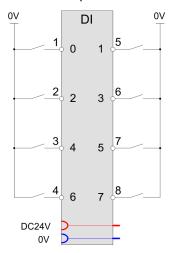
| RUN green | MF red | DI x green | Description | |
|-----------------|--------|------------|---|--|
| | | Х | Bus communication is OK | |
| | | | Module status is OK | |
| | _ | Χ | Bus communication is OK | |
| | | ^ | Module status reports an error | |
| | _ | X | Bus communication is not possible | |
| | | ^ | Module status reports an error | |
| | | X | Error at bus power supply | |
| | | | Flashing: Error in configuration | |
| X | ZHz | X | ⇔ Chap. 2.8 'Trouble shooting - LEDs' page 28 | |
| | | | Digital input has signal "1" | |
| | | | Digital input has signal "0" | |
| not relevant: X | | | | |

021-1BF50 - DI 8xDC 24V NPN

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



| Pos. | Function | Туре | Description |
|------|----------|------|--------------------|
| 1 | DI 0 | 1 | Digital input DI 0 |
| 2 | DI 2 | 1 | Digital input DI 2 |
| 3 | DI 4 | 1 | Digital input DI 4 |
| 4 | DI 6 | I | Digital input DI 6 |
| 5 | DI 1 | I | Digital input DI 1 |
| 6 | DI 3 | 1 | Digital input DI 3 |
| 7 | DI 5 | 1 | Digital input DI 5 |
| 8 | DI 7 | 1 | Digital input DI 7 |

I: Input

Input area

At CPU, PROFIBUS and PROFINET the input area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

021-1BF50 - DI 8xDC 24V NPN > Technical data

| Addr. | Name | Bytes | Function | IX | SX |
|-------|-------|-------------|---------------------|-------|-----|
| +0 | PII 1 | 1 | State of the inputs | 6000h | |
| | | | Bit 0: DI 0 | | 01h |
| | | Bit 1: DI 1 | | 02h | |
| | | Bit 2: DI 2 | | 03h | |
| | | | Bit 3: Di 3 | | 04h |
| | | | Bit 4: DI 4 | | 05h |
| | | | Bit 5: DI 5 | | 06h |
| | | | Bit 6: DI 6 | | 07h |
| | | | Bit 7: DI 7 | | 08h |

Output area

No byte of the output area is used by the module.

3.12.1 Technical data

| Order no. | 021-1BF50 |
|---|----------------|
| Туре | SM 021 |
| Module ID | 0007 9FC1 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 65 mA |
| Power loss | 0.9 W |
| Technical data digital inputs | |
| Number of inputs | 8 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | - |
| Current consumption from load voltage L+ (without load) | - |
| Rated value | DC 20.428.8 V |
| Input voltage for signal "0" | DC 1528.8 V |
| Input voltage for signal "1" | DC 05 V |
| Input voltage hysteresis | - |
| Signal logic input | Sourcing input |
| Frequency range | - |
| Input resistance | - |
| Input capacitance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |

021-1BF50 - DI 8xDC 24V NPN > Technical data

| Order no. | 021-1BF50 |
|---|-----------------------|
| Max. permissible BERO quiescent current | 0.5 mA |
| Input delay of "0" to "1" | 3 ms |
| Input delay of "1" to "0" | 3 ms |
| Number of simultaneously utilizable inputs horizontal configuration | 8 |
| Number of simultaneously utilizable inputs vertical configuration | 8 |
| Input characteristic curve | - |
| Initial data size | 8 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | none |
| Module state | green LED |
| Module error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse outputs | - |
| Datasizes | |
| Input bytes | 1 |
| Output bytes | 0 |
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |

021-1BF50 - DI 8xDC 24V NPN > Technical data

| Order no. | 021-1BF50 |
|------------------------------|----------------------------|
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 57 g |
| Weight including accessories | 57 g |
| Gross weight | 71 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

VIPA System SLIO **Digital Input**

021-1DF00 - DI 8xDC 24V Diagnosis

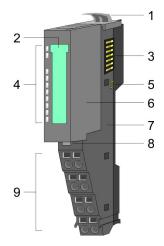
3.13 021-1DF00 - DI 8xDC 24V Diagnosis

Properties

The electronic module with diagnosis collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 8 digital input channels (with parameterizable input delay) and their status is monitored via LEDs.

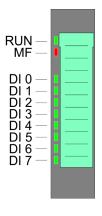
- 8 digital inputs, isolated to the backplane bus
- Suited for switches and approximate switches
- Monitoring wire break
- Parameterizable input delay
- Diagnostics function
- Status indication of the channels via LEDs also with de-activated electronic power supply

Structure



- 1 Locking lever terminal module
- Labeling strip
- 2 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- Locking lever electronic module 8
- 9 Terminal

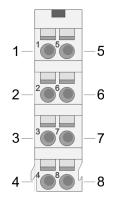
Status indication



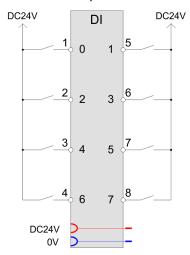
| RUN green | MF ■ red | DI x green | Description |
|-----------------|-------------|------------|---|
| green | Teu | green | |
| | | X | Bus communication is OK |
| _ | | | Module status is OK |
| | | X | Bus communication is OK |
| | | ^ | Module status reports an error |
| | _ | X | Bus communication is not possible |
| | _ | X | Module status reports an error |
| | | X | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | ♦ Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital input has signal "1" |
| | | | Digital input has signal "0" |
| not relevant: X | | | |

021-1DF00 - DI 8xDC 24V Diagnosis

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



| Pos. | Function | Туре | Description |
|------|----------|------|--------------------|
| 1 | DI 0 | I | Digital input DI 0 |
| 2 | DI 2 | I | Digital input DI 2 |
| 3 | DI 4 | 1 | Digital input DI 4 |
| 4 | DI 6 | I | Digital input DI 6 |
| 5 | DI 1 | I | Digital input DI 1 |
| 6 | DI 3 | 1 | Digital input DI 3 |
| 7 | DI 5 | I | Digital input DI 5 |
| 8 | DI 7 | I | Digital input DI 7 |

I: Input



To use wire break detection, there must be a minimum current of 0.5mA with signal state "0". This can be achieved by parallel connecting a resistor ($22k\Omega \dots 47k\Omega$) on your switch.

Input area

At CPU, PROFIBUS and PROFINET the input area is embedded to the corresponding address area.

- IX Index for access via CANopen
- SX Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

021-1DF00 - DI 8xDC 24V Diagnosis > Technical data

| Adr. | Name | Bytes | Function | IX | SX | |
|------|-------|-------|-------------|---------------------|-------|--|
| +0 | 0 PII | PII 1 | 1 | State of the inputs | 6000h | |
| | | | Bit 0: DI 0 | | 01h | |
| | | | Bit 1: DI 1 | | 02h | |
| | | | Bit 2: DI 2 | | 03h | |
| | | | Bit 3: Di 3 | | 04h | |
| | | | Bit 4: DI 4 | | 05h | |
| | | | Bit 5: DI 5 | | 06h | |
| | | | Bit 6: DI 6 | | 07h | |
| | | | Bit 7: DI 7 | | 08h | |

Output area

No byte of the output area is used by the module.

3.13.1 Technical data

| Order no. | 021-1DF00 |
|---|---------------|
| Туре | SM 021 |
| Module ID | 0012 1F41 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 60 mA |
| Power loss | 1.1 W |
| Technical data digital inputs | |
| Number of inputs | 8 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | - |
| Current consumption from load voltage L+ (without load) | - |
| Rated value | DC 20.428.8 V |
| Input voltage for signal "0" | DC 05 V |
| Input voltage for signal "1" | DC 10,828,8 V |
| Input voltage hysteresis | - |
| Signal logic input | Sinking input |
| Frequency range | - |
| Input resistance | - |
| Input capacitance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |

021-1DF00 - DI 8xDC 24V Diagnosis > Technical data

| Input delay of "0" to "1" parameterizable 100µs - 20ms parameterizable paramete | Order no. | 021-1DF00 |
|--|---|------------------------------|
| Input delay of "1" to "0" Number of simultaneously utilizable inputs horizontal congiguration Number of simultaneously utilizable inputs vertical configuration Number | Max. permissible BERO quiescent current | 1.5 mA |
| Number of simultaneously utilizable inputs horizontal configuration Number of simultaneously utilizable inputs vertical configuration Input characteristic curve IEC 61131-2, type 3 Bit Status information, alarms, diagnostics Status information, alarms, diagnostics Status display Interrupts IPC 998 Process alarm Ino Diagnostic interrupt IPC 998 Diagnostic information read-out IPC 998 Module state IPC 998 Green LED IPC 998 | Input delay of "0" to "1" | parameterizable 100µs - 20ms |
| inguration Number of simultaneously utilizable inputs vertical configuration Input characteristic curve Initial data size Status information, alarms, diagnostics Status display Interrupts Process alarm Included information in alarms, diagnostics Process alarm Included information in alarms, diagnostics Interrupts Process alarm Included information in alarms, diagnostics Interrupts Included information in alarms, diagnostics Included information in alarms, di | Input delay of "1" to "0" | parameterizable 100µs - 20ms |
| ration Input characteristic curve IEC 61131-2, type 3 8 Bit Status information, alarms, diagnostics Status display Interrupts Process alarm IDiagnostic interrupt Diagnostic functions Diagnostics information read-out Module state Module error display Isolation Setween channels Setween channels of groups to Between channels and backplane bus Insulation tested with Safety Sety requirements Secure user address Watchdog Two channels Interrupt Interrupt IEC 61131-2, type 3 8 Bit 8 Both 9 Parameterizable 9 Parameterizable 9 Parameterizab | Number of simultaneously utilizable inputs horizontal configuration | 8 |
| Status information, alarms, diagnostics Status display Interrupts Process alarm Incident of the first of the | Number of simultaneously utilizable inputs vertical configuration | 8 |
| Status information, alarms, diagnostics Status display green LED per channel per | Input characteristic curve | IEC 61131-2, type 3 |
| Status display Interrupts Process alarm Process a | Initial data size | 8 Bit |
| Interrupts Process alarm Proce | Status information, alarms, diagnostics | |
| Process alarm Diagnostic interrupt Diagnostic functions Diagnostic functions Diagnostics information read-out Module state Module error display Channel error display Retween channels Between channels of groups to Between channels and backplane bus Insulation tested with DC 500 V Safety Safety requirements Secure user address Watchdog Two channels Test pulse outputs Datasizes Input bytes Possible yes, parameterizable possible possible possible possible | Status display | green LED per channel |
| Diagnostic interrupt Diagnostic functions Diagnostics information read-out Module state Module error display Channel error display Between channels Between channels of groups to Between channels and backplane bus Insulation tested with Bot 500 V Safety Safety requirements Secure user address Watchdog Two channels Test pulse outputs Datasizes Input bytes yes, parameterizable yes, parameterizable yes possible yes green LED red LED none 1 | Interrupts | yes |
| Diagnostics functions Diagnostics information read-out Module state Module error display Channel error display Retween channels Between channels and backplane bus Insulation tested with Safety Safety protocol Safety requirements Secure user address Watchdog Two channels Test pulse outputs Datasizes Input bytes Possible green LED green LED none LED Two shall in the Diagnostics possible green LED Teed LED Too Safety The Diagnostics possible green LED possible green LED The Diagnostics possible green LED | Process alarm | no |
| Diagnostics information read-out Module state Module error display Channel error display Channel error display Between channels Between channels of groups to Between channels and backplane bus Insulation tested with Bafety Safety Safety protocol Safety requirements Secure user address Watchdog For channels Test pulse outputs Datasizes Input bytes Test pulse outputs Test pulse outputs Test pulse outputs Test pulse outputs Datasizes Input bytes Test Datasizes Test D | Diagnostic interrupt | yes, parameterizable |
| Module state green LED Module error display red LED Channel error display none Isolation Between channels Between channels of groups to Between channels and backplane bus Insulation tested with DC 500 V Safety Safety Safety requirements Secure user address Watchdog Two channels Test pulse outputs Datasizes Input bytes Insulation tested Insulation tested Insulation tested with Insulation tes | Diagnostic functions | yes |
| Module error display Channel error display Retween channels Between channels of groups to Between channels and backplane bus Insulation tested with Chantel error display Safety Safety Safety Safety requirements Secure user address Watchdog Two channels Fest pulse outputs Datasizes Input bytes Ret LED red LED red LED red LED red LED none | Diagnostics information read-out | possible |
| Channel error display Isolation Between channels Between channels of groups to Between channels and backplane bus Insulation tested with DC 500 V Safety Safety Safety protocol Safety requirements Secure user address Watchdog Two channels Test pulse outputs Datasizes Input bytes Innut bytes Innut one | Module state | green LED |
| Setween channels Between channels of groups to Between channels and backplane bus Insulation tested with Safety Safety Safety protocol Safety requirements Secure user address Watchdog Two channels Test pulse outputs Datasizes Input bytes Between channels | Module error display | red LED |
| Between channels Between channels of groups to Between channels and backplane bus Insulation tested with DC 500 V Safety Safety Protocol Safety requirements Secure user address Watchdog Two channels Test pulse outputs Datasizes Input bytes | Channel error display | none |
| Between channels of groups to Between channels and backplane bus Insulation tested with DC 500 V Safety Safety protocol Safety requirements Secure user address Watchdog Two channels Test pulse outputs Datasizes Input bytes | Isolation | |
| Setween channels and backplane bus Insulation tested with Safety Safety Safety protocol Safety requirements Secure user address Watchdog Two channels Test pulse outputs Datasizes Input bytes Data 3 | Between channels | - |
| Insulation tested with Safety Safety protocol Safety requirements Secure user address Watchdog Two channels Test pulse outputs Datasizes Input bytes Data Safety Protocol - DC 500 V - - DC | Between channels of groups to | - |
| Safety protocol - Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes 1 | Between channels and backplane bus | ✓ |
| Safety protocol Safety requirements Secure user address - Watchdog - Two channels Test pulse outputs - Datasizes Input bytes - 1 | Insulation tested with | DC 500 V |
| Safety requirements - Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes 1 | Safety | |
| Secure user address - Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes 1 | Safety protocol | - |
| Watchdog - Two channels - Test pulse outputs - Datasizes Input bytes 1 | Safety requirements | - |
| Two channels - Test pulse outputs - Datasizes Input bytes 1 | Secure user address | - |
| Test pulse outputs - Datasizes Input bytes 1 | Watchdog | - |
| Datasizes Input bytes 1 | Two channels | - |
| input bytes 1 | Test pulse outputs | - |
| | Datasizes | |
| Output bytee | Input bytes | 1 |
| Julipul Dyles | Output bytes | 0 |
| Parameter bytes 12 | Parameter bytes | 12 |
| Diagnostic bytes 20 | Diagnostic bytes | 20 |
| Housing | Housing | |

021-1DF00 - DI 8xDC 24V Diagnosis > Parameter data

| Order no. | 021-1DF00 |
|------------------------------|----------------------------|
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 57 g |
| Weight including accessories | 57 g |
| Gross weight | 71 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

3.13.2 Parameter data

DS - Record set for access via CPU, PROFIBUS and PROFINET

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 3100h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|---|-------|--------------------------|---------|-----|-------|-----|
| DIAG_EN | 1 | Diagnostic interrupt * | 00h | 00h | 3100h | 01h |
| WIBRK_EN | 1 | Wire break recognition * | 00h | 00h | 3101h | 02h |
| C0_OptionNo | 1 | Filter time DI 0, DI 1 | 11h | 80h | 3102h | 03h |
| C1_OptionNo | 1 | Filter time DI 2, DI 3 | 11h | 81h | 3103h | 04h |
| C2_OptionNo | 1 | Filter time DI 4, DI 5 | 11h | 82h | 3104h | 05h |
| C3_OptionNo | 1 | Filter time DI 6, DI 7 | 11h | 83h | 3105h | 06h |
| *) This record set may only be transferred at STOP state. | | | | | | |

DIAG_EN Diagnostic interrupt

| Byte | Bit 7 0 |
|------|--|
| 0 | Diagnostic interrupt:– 00h: disable |
| | 40h: enable |

■ Here you activate res. de-activate the diagnostic function.

021-1DF00 - DI 8xDC 24V Diagnosis > Diagnostic data

WIBRK_EN Wire break recognition

| Byte | Bit 7 0 |
|------|---|
| 0 | Bit 0: Wire break recognition DI 0 on "1" |
| | Bit 1: Wire break recognition DI 1 on "1" |
| | |
| | Bit 7: Wire break recognition DI 7 on "1" |

Here you activate res. de-activate the Wire break recognition.

Cx_OptionNo Filter time

| Byte | Function | Possible values |
|------|---|--|
| 0 | Bit 3 0: Filter time DI 0 Bit 7 4: Filter time DI 1 | 1h: 100µs 2h: 400µs |
| 0 | ■ Bit 3 0: Filter time DI 2 ■ Bit 7 4: Filter time DI 3 | 3h: 800µs 4h: 1.6ms |
| 0 | Bit 3 0: Filter time DI 4 Bit 7 4: Filter time DI 5 | 5h: 3.2ms 6h: 10ms |
| 0 | Bit 3 0: Filter time DI 6 Bit 7 4: Filter time DI 7 | 7h: 20ms Other values are not permissible! |

Filter time allows you to preset a input delay for the corresponding channel. With the help of filters you may e.g. filter signal peaks at a blurred input signal.

3.13.3 Diagnostic data

The following errors are listed in the diagnostics data:

- Error project engineering/parameterization
- Wire break (if parameterized)
- Internal communication error
- Internal diagnostics buffer overflow
- External power supply error
- DS Record set for access via CPU, PROFIBUS and PROFINET. The access happens by DS 01h. Additionally the first 4 bytes may be accessed by DS 00h.
- IX Index for access via CANopen. The access happens by IX 2F01h. Additionally the first 4 bytes may be accessed by IX 2F00h.
- SX Subindex for access via EtherCAT with Index 5005h.

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|--------|-------|--------------------|---------|-----|-------|-----|
| ERR_A | 1 | Diagnostic | 00h | 01h | 2F01h | 02h |
| MODTYP | 1 | Module information | 1Fh | | | 03h |
| ERR_C | 1 | reserved | 00h | | | 04h |
| ERR_D | 1 | Diagnostic | 00h | | | 05h |
| CHTYP | 1 | Channel type | 70h | | | 06h |

021-1DF00 - DI 8xDC 24V Diagnosis > Diagnostic data

| Name | Bytes | Function | Default | DS | IX | SX |
|---------|-------|--|---------|----|----|-----|
| NUMBIT | 1 | Number of diagnostics bits per channel | 08h | | | 07h |
| NUMCH | 1 | Number channels of the module | 08h | | | 08h |
| CHERR | 1 | Channel error | 00h | | | 09h |
| CH0ERR | 1 | Channel specific error DI 1 | 00h | | | 0Ah |
| CH1ERR | 1 | Channel specific error DI 2 | 00h | | | 0Bh |
| | | | | | | |
| CH7ERR | 1 | Channel specific error DI 7 | 00h | | | 11h |
| DIAG_US | 4 | μs ticker (32bit) | 00h | | | 13h |

ERR_A Diagnostic

| Byte | Bit 7 0 |
|------|---|
| 0 | Bit 0: set at module failure Bit 1: set at internal error Bit 2: set at external error Bit 3: set at channel error Bit 4: set at external auxiliary supply missing Bit 6, 5: reserved Bit 7: set at error in parameterization |

MODTYP Modul information

| Byte | Bit 7 0 |
|------|--|
| 0 | ■ Bit 3 0: Module class – 1111b: Digital module |
| | Bit 4: Channel information presentBit 7 5: reserved |

ERR_C reserved

| Byte | Bit 7 0 |
|------|----------|
| 0 | reserved |

ERR_D Diagnostic

| Byte | Bit 7 0 |
|------|--|
| 0 | Bit 2 0: reserved Bit 3: set at internal diagnostics buffer overflow Bit 4: set at internal communication error Bit 7 5: reserved |

CHTYP Channel type

| Byte | Bit 7 0 |
|------|--|
| 0 | Bit 6 0: Channel type 70h: Digital input Bit 7: reserved |

VIPA System SLIO **Digital Input**

021-1DF00 - DI 8xDC 24V Diagnosis > Diagnostic data

| NUMBIT Diagnostic bits | Byte | Bit 7 0 |
|----------------------------|-----------|---|
| | 0 | Number of diagnostics bits of the module per channel (here 08h) |
| | | |
| | | |
| NUMCH Channels | Dirto | D:4.7 0 |
| NUMCH Channels | Byte | Bit 7 0 |
| NUMCH Channels | Byte 0 | Number of channels of the module (here 08h) |
| NUMCH Channels | | |
| NUMCH Channels CHERR DI x | | |

| Byte | Bit 7 0 |
|------|---|
| 0 | Bit 0: Channel error DI 0 Bit 1: Channel error DI 1 Bit 7: Channel error DI 7 |

CHxERR

| Byte | Bit 7 0 | | |
|------|---|--|--|
| 0 | Channel-specific error: DI x: | | |
| | Bit 0: set at error in project engineering/parameterization Bit 3 1: reserved Bit 4: set at wire break Bit 7 5: reserved | | |

DIAG_US µs ticker

| Byte | Bit 7 0 |
|------|--|
| 0 3 | Value of the µs ticker at the moment of the diagnostic |

μs ticker

In the SLIO module there is a 32 bit timer (μ s ticker). With PowerON the timer starts counting with 0. After 2^{32} - 1μ s the timer starts with 0 again.

022-1BB00 - DO 2xDC 24V 0.5A

4 Digital Output

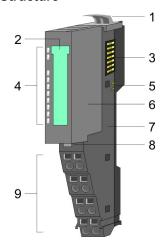
4.1 022-1BB00 - DO 2xDC 24V 0.5A

Properties

The electronic module accepts binary control signals from the central bus system and transfers them to the process level via outputs. It has 2 channels and their status is monitored via LEDs.

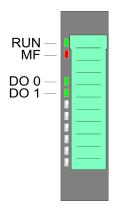
- 2 digital outputs, isolated to the backplane bus
- Status indication of the channels via LEDs

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

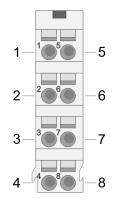
Status indication



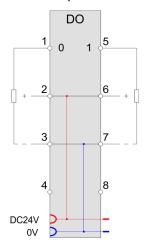
| RUN | MF | DO x | Description |
|-----------------|-----|-------|---|
| green | red | green | Description |
| | | X | Bus communication is OK |
| | | ^ | Module status is OK |
| | | | Bus communication is OK |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | | Bus communication is not possible |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | Χ | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital output has "1" signal |
| | | | Digital output has "0" signal |
| not relevant: X | | | |

022-1BB00 - DO 2xDC 24V 0.5A

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



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

O: Output



CAUTION!

Feeding in voltage at an output is not allowed and can destroy the module!

Input area

No byte of the input area is used by the module.

Output area

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

022-1BB00 - DO 2xDC 24V 0.5A > Technical data

| Addr. | Name | Bytes | Function | IX | SX |
|----------|----------------------|-------|-------------------|----|-----|
| +0 PIQ 1 | State of the outputs | 5200h | | | |
| | | | Bit 0: DO 0 | | 01h |
| | | | Bit 1: DO 1 | | 02h |
| | | | Bit 7 2: reserved | | |

4.1.1 Technical data

| Type SM 022 Module ID 0101 AF90 Current consumption/power loss Current consumption from backplane bus 70 mA Power loss 0.4 W Technical data digital outputs Number of outputs 2 Cable length, shielded 1000 m Cable length, unshielded 600 m Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) 5 mA Total current per group, horizontal configuration, 40°C 1 A Total current per group, horizontal configuration, 60°C 1 A Total current per group, vertical configuration 1 A Output current at signal "1", rated value 0.5 A Signal logic output Sourcing output Sourcing output Output delay of "0" to "1" 30 µs Output delay of "0" to "1" 30 µs Minimum load current | Order no. | 022-1BB00 |
|---|---|-----------------|
| Current consumption/power loss Current consumption from backplane bus Power loss 0.4 W Technical data digital outputs Number of outputs 2 Cable length, shielded 600 m Rated load voltage Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C Total current per group, horizontal configuration, 60°C Total current per group, vertical configuration 1 A Total current per group, vertical configuration 1 A Signal logic output Sourcing output Output delay of "0" to "1" 30 µs Output delay of "0" to "0" 175 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with inductive load Switching frequency on lamp load max. 10 Hz | Туре | SM 022 |
| Current consumption from backplane bus 70 mA Power loss 0.4 W Technical data digital outputs Number of outputs 2 Cable length, shielded 1000 m Cable length, unshielded 600 m Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) 5 mA Total current per group, horizontal configuration, 40°C 1 A Total current per group, horizontal configuration, 60°C 1 A Total current per group, vertical configuration 1 A Output current at signal "1", rated value 0.5 A Signal logic output Sourcing output Output delay of "0" to "1" 30 µs Output delay of "0" to "0" 175 µs Minimum load current - Lamp load 10 W Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power not possible Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Module ID | 0101 AF90 |
| Power loss Technical data digital outputs Number of outputs 2 Cable length, shielded Cable length, unshielded Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C 1 A Total current per group, horizontal configuration, 60°C 1 A Total current per group, vertical configuration 1 A Output current at signal "1", rated value 0.5 A Signal logic output Sourcing output Output delay of "0" to "1" 30 μs Minimum load current - Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load | Current consumption/power loss | |
| Technical data digital outputs 2 Cable length, shielded 1000 m Cable length, unshielded 600 m Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) 5 mA Total current per group, horizontal configuration, 40°C 1 A Total current per group, horizontal configuration, 60°C 1 A Total current per group, vertical configuration 1 A Output current at signal "1", rated value 0.5 A Signal logic output Sourcing output Output delay of "0" to "1" 30 μs Output delay of "1" to "0" 175 μs Minimum load current - Lamp load 10 W Parallel switching of outputs for redundant control of a load not possible Actuation of digital input ✓ Switching frequency with resistive load max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Current consumption from backplane bus | 70 mA |
| Number of outputs 2 Cable length, shielded 1000 m Cable length, unshielded 600 m Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) 5 mA Total current per group, horizontal configuration, 40°C 1 A Total current per group, vertical configuration 1 A Output current at signal "1", rated value 0.5 A Signal logic output Sourcing output Output delay of "0" to "1" 30 μs Output delay of "1" to "0" 175 μs Minimum load current - Lamp load 10 W Parallel switching of outputs for redundant control of a load not possible Parallel switching of outputs for increased power not possible Actuation of digital input ✓ Switching frequency with resistive load max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Power loss | 0.4 W |
| Cable length, shielded Cable length, unshielded Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C 1 A Total current per group, horizontal configuration, 60°C 1 A Total current per group, vertical configuration 1 A Output current at signal "1", rated value 0.5 A Signal logic output Sourcing output Output delay of "0" to "1" 30 µs Output delay of "0" to "0" 175 µs Minimum load current - Lamp load 10 W Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with inductive load Switching frequency on lamp load max. 100 Hz Switching frequency on lamp load max. 10 Hz | Technical data digital outputs | |
| Cable length, unshielded Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) 5 mA Total current per group, horizontal configuration, 40°C 1 A Total current per group, horizontal configuration, 60°C 1 A Total current per group, vertical configuration 1 A Output current at signal "1", rated value 0.5 A Signal logic output Sourcing output Output delay of "0" to "1" 30 µs Output delay of "1" to "0" 175 µs Minimum load current - Lamp load 10 W Parallel switching of outputs for redundant control of a load not possible Parallel switching of outputs for increased power not possible Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency on lamp load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Number of outputs | 2 |
| Rated load voltage Current consumption from load voltage L+ (without load) 5 mA Total current per group, horizontal configuration, 40°C 1 A Total current per group, horizontal configuration, 60°C 1 A Total current per group, vertical configuration 1 A Output current at signal "1", rated value Signal logic output Sourcing output Output delay of "0" to "1" 30 µs Output delay of "1" to "0" 175 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency on lamp load max. 10 Hz | Cable length, shielded | 1000 m |
| Current consumption from load voltage L+ (without load) 5 mA Total current per group, horizontal configuration, 40°C 1 A Total current per group, horizontal configuration, 60°C 1 A Total current per group, vertical configuration 1 A Output current at signal "1", rated value 0.5 A Signal logic output Sourcing output Output delay of "0" to "1" 30 µs Output delay of "1" to "0" 175 µs Minimum load current - Lamp load 10 W Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power not possible Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency on lamp load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Cable length, unshielded | 600 m |
| Total current per group, horizontal configuration, 40°C Total current per group, horizontal configuration, 60°C Total current per group, vertical configuration 1 A Output current at signal "1", rated value Signal logic output Sourcing output Output delay of "0" to "1" Output delay of "1" to "0" 175 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load To A A A A A A A A B A A B A B B | Rated load voltage | DC 20.428.8 V |
| Total current per group, horizontal configuration, 60°C Total current per group, vertical configuration 1 A Output current at signal "1", rated value 0.5 A Signal logic output Output delay of "0" to "1" 30 µs Output delay of "1" to "0" 175 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load Table 1 A A A A A B A B B B B B B B | Current consumption from load voltage L+ (without load) | 5 mA |
| Total current per group, vertical configuration 1 A Output current at signal "1", rated value Sourcing output Output delay of "0" to "1" Output delay of "1" to "0" 175 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load 1 A Output delay of "0" to "1" 30 µs 175 µs Minimum load current - Lamp load 10 W Parallel switching of outputs for redundant control of a load not possible not possible Actuation of digital input ✓ Switching frequency with resistive load max. 1000 Hz Switching frequency on lamp load max. 0.5 Hz Switching frequency on lamp load | Total current per group, horizontal configuration, 40°C | 1 A |
| Output current at signal "1", rated value Signal logic output Output delay of "0" to "1" Output delay of "1" to "0" 175 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load O.5 A Sourcing output 10 W not possible not possible max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Total current per group, horizontal configuration, 60°C | 1 A |
| Signal logic output Output delay of "0" to "1" Output delay of "1" to "0" 175 μs Minimum load current Lamp load 10 W Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load Sourcing output 30 μs 175 μs 10 W not possible not possible max. 1000 Hz Switching frequency with inductive load max. 1000 Hz | Total current per group, vertical configuration | 1 A |
| Output delay of "0" to "1" Output delay of "1" to "0" 175 μs Minimum load current Lamp load 10 W Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load 30 μs 175 μs 175 μs 10 W No possible Not possible Actuation of digital input ✓ Switching frequency with resistive load max. 1000 Hz Switching frequency on lamp load max. 0.5 Hz | Output current at signal "1", rated value | 0.5 A |
| Output delay of "1" to "0" Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load 10 W not possible not possible max. 1000 Hz Switching frequency with inductive load max. 1000 Hz Switching frequency on lamp load max. 0.5 Hz | Signal logic output | Sourcing output |
| Lamp load Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load max. 10 Hz | Output delay of "0" to "1" | 30 µs |
| Lamp load Parallel switching of outputs for redundant control of a load not possible Parallel switching of outputs for increased power not possible Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Output delay of "1" to "0" | 175 μs |
| Parallel switching of outputs for redundant control of a load not possible Parallel switching of outputs for increased power not possible Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Minimum load current | - |
| Parallel switching of outputs for increased power not possible Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Lamp load | 10 W |
| Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load max. 1000 Hz max. 0.5 Hz Switching frequency on lamp load | Parallel switching of outputs for redundant control of a load | not possible |
| Switching frequency with resistive load max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Parallel switching of outputs for increased power | not possible |
| Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Actuation of digital input | ✓ |
| Switching frequency on lamp load max. 10 Hz | Switching frequency with resistive load | max. 1000 Hz |
| | Switching frequency with inductive load | max. 0.5 Hz |
| Internal limitation of inductive shut-off voltage L+ (-45 V) | Switching frequency on lamp load | max. 10 Hz |
| | Internal limitation of inductive shut-off voltage | L+ (-45 V) |
| Short-circuit protection of output yes, electronic | Short-circuit protection of output | yes, electronic |

022-1BB00 - DO 2xDC 24V 0.5A > Technical data

| Order no. | 022-1BB00 |
|--|-----------------------|
| Trigger level | 1 A |
| Number of operating cycle of relay outputs | - |
| Switching capacity of contacts | - |
| Output data size | 2 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | none |
| Supply voltage display | green LED |
| Group error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| PWM data | |
| PWM channels | - |
| PWM time basis | - |
| Period length | - |
| Minimum pulse width | - |
| Type of output | - |
| Safety | |
| Safety protocol | - |
| Safety requirements | |
| Secure user address | - |
| Watchdog | |
| Two channels | - |
| Test pulse length | |
| Circuit monitoring | |
| Datasizes | |
| Input bytes | 0 |
| Output bytes | 1 |

022-1BB00 - DO 2xDC 24V 0.5A > Technical data

| Order no. | 022-1BB00 |
|------------------------------|----------------------------|
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 58 g |
| Weight including accessories | 58 g |
| Gross weight | 72 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

022-1BB20 - DO 2xDC 24V 2A

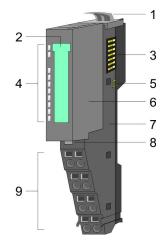
4.2 022-1BB20 - DO 2xDC 24V 2A

Properties

The electronic module accepts binary control signals from the central bus system and transfers them to the process level via outputs. It has 2 channels and their status is monitored via LEDs.

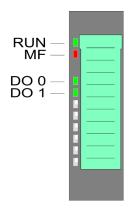
- 2 digital 2A outputs, isolated to the backplane bus
- Status indication of the channels via LEDs

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

Status indication

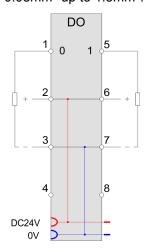


| RUN | MF | DO x | Description |
|-----------------|-----|----------|---|
| green | red | green | |
| | | X | Bus communication is OK |
| | | A | Module status is OK |
| | | | Bus communication is OK |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | | Bus communication is not possible |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | Χ | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | ⇔ Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital output has "1" signal |
| | | | Digital output has "0" signal |
| not relevant: X | | | |

022-1BB20 - DO 2xDC 24V 2A

Pin assignment

For wires with a cross section of 0.08mm² up to 1.5mm².



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

O: Output



CAUTION!

Feeding in voltage at an output is not allowed and can destroy the module!

Input area

No byte of the input area is used by the module.

Output area

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

022-1BB20 - DO 2xDC 24V 2A > Technical data

| Addr. | Name | Bytes | Function | IX | SX |
|----------|----------------------|-------|-------------------|----|-----|
| +0 PIQ 1 | State of the outputs | 5200h | | | |
| | | | Bit 0: DO 0 | | 01h |
| | | | Bit 1: DO 1 | | 02h |
| | | | Bit 7 2: reserved | | |

4.2.1 Technical data

| Type SM 022 Module ID 0102 AF90 Current consumption/power loss Current consumption from backplane bus 70 mA Power loss 0.55 W Technical data digital outputs Number of outputs 2 Cable length, shielded 1000 m Cable length, unshielded 600 m Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) 10 mA Total current per group, horizontal configuration, 40°C 4 A Total current per group, vertical configuration, 60°C 4 A Total current at signal "1", rated value 2 A Signal logic output Sourcing output Output delay of "0" to "1" 100 µs Output delay of "0" to "1" 100 µs Minimum load current Lamp load 10 W Parallel switching of outputs for increased power 10 No Parallel switching of outputs for increased power 10 No Parallel switching frequency with resistive load 10 Max. 10 Hz Switching frequency on lamp load 10 Max. 10 Hz Subtomed limitation of inductive only ut of fundance 10 Max. 10 Hz Switching frequency on lamp load 10 Max. 10 Hz Subtomed limitation of inductive only ut of fundance 10 Max. 10 Hz | Order no. | 022-1BB20 |
|---|---|-----------------|
| Current consumption/power loss Current consumption from backplane bus Power loss Technical data digital outputs Number of outputs 2 Cable length, shielded 1000 m Cable length, unshielded 600 m Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C 4 A Total current per group, horizontal configuration, 60°C Total current per group, vertical configuration 4 A Output current at signal "1", rated value 2 A Signal logic output Output delay of "0" to "1" 100 µs Output delay of "0" to "0" 250 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with inductive load Switching frequency on lamp load max. 10 Hz | Туре | SM 022 |
| Current consumption from backplane bus Power loss Technical data digital outputs Number of outputs Cable length, shielded Cable length, unshielded Rated load voltage Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C 4 A Total current per group, horizontal configuration, 60°C Total current per group, vertical configuration 4 A Output current at signal "1", rated value 2 A Signal logic output Sourcing output Output delay of "0" to "1" 100 µs Output delay of "0" to "1" 250 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with inductive load max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Module ID | 0102 AF90 |
| Power loss 0.55 W Technical data digital outputs 2 Number of outputs 2 Cable length, shielded 1000 m Cable length, unshielded 600 m Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) 10 mA Total current per group, horizontal configuration, 40°C 4 A Total current per group, horizontal configuration, 60°C 4 A Total current per group, vertical configuration 4 A Output current at signal "1", rated value 2 A Signal logic output Sourcing output Output delay of "0" to "1" 100 μs Output delay of "1" to "0" 250 μs Minimum load current - Lamp load 10 W Parallel switching of outputs for increased power not possible Actuation of digital input ✓ Switching frequency with resistive load max. 1000 Hz Switching frequency with inductive load max. 10 Hz | Current consumption/power loss | |
| Technical data digital outputs 2 Cable length, shielded 1000 m Cable length, unshielded 600 m Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) 10 mA Total current per group, horizontal configuration, 40°C 4 A Total current per group, horizontal configuration, 60°C 4 A Total current per group, vertical configuration 4 A Output current at signal "1", rated value 2 A Signal logic output Sourcing output Output delay of "0" to "1" 100 μs Output delay of "1" to "0" 250 μs Minimum load current - Lamp load 10 W Parallel switching of outputs for increased power not possible Actuation of digital input ✓ Switching frequency with resistive load max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Current consumption from backplane bus | 70 mA |
| Number of outputs Cable length, shielded Cable length, unshielded Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C Total current per group, horizontal configuration, 60°C 4 A Total current per group, vertical configuration 4 A Output current at signal "1", rated value Signal logic output Output delay of "0" to "1" 100 µs Output delay of "1" to "0" 250 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load max. 1000 Hz switching frequency on lamp load | Power loss | 0.55 W |
| Cable length, shielded Cable length, unshielded Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C 4 A Total current per group, horizontal configuration, 60°C 4 A Total current per group, vertical configuration 4 A Output current at signal "1", rated value 2 A Signal logic output Sourcing output Output delay of "0" to "1" 100 μs Output delay of "0" to "1" 250 μs Minimum load current Lamp load 10 W Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load max. 1000 Hz Switching frequency on lamp load max. 10 Hz | Technical data digital outputs | |
| Cable length, unshielded Rated load voltage Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C Total current per group, horizontal configuration, 60°C Total current per group, vertical configuration Output current at signal "1", rated value Signal logic output Sourcing output Output delay of "0" to "1" 100 µs Output delay of "1" to "0" 250 µs Minimum load current | Number of outputs | 2 |
| Rated load voltage Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C 4 A Total current per group, horizontal configuration, 60°C 4 A Total current per group, vertical configuration Output current at signal "1", rated value Signal logic output Sourcing output Output delay of "0" to "1" 100 µs Output delay of "1" to "0" 250 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency on lamp load max. 10 Hz | Cable length, shielded | 1000 m |
| Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C Total current per group, horizontal configuration, 60°C Total current per group, vertical configuration 4 A Output current at signal "1", rated value Signal logic output Sourcing output Output delay of "0" to "1" 100 µs Output delay of "1" to "0" 250 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency on lamp load max. 10 Hz | Cable length, unshielded | 600 m |
| Total current per group, horizontal configuration, 40°C Total current per group, horizontal configuration, 60°C 4 A Total current per group, vertical configuration 4 A Output current at signal "1", rated value 2 A Signal logic output Sourcing output Output delay of "0" to "1" 100 Dutput delay of "1" to "0" 250 Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load max. 10 Hz | Rated load voltage | DC 20.428.8 V |
| Total current per group, horizontal configuration, 60°C 4 A Total current per group, vertical configuration 4 A Output current at signal "1", rated value 2 A Signal logic output Sourcing output Output delay of "0" to "1" 100 µs Output delay of "1" to "0" 250 µs Minimum load current - Lamp load 10 W Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power not possible Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency on lamp load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Current consumption from load voltage L+ (without load) | 10 mA |
| Total current per group, vertical configuration 4 A Output current at signal "1", rated value 2 A Signal logic output Output delay of "0" to "1" 100 µs Output delay of "1" to "0" 250 µs Minimum load current Lamp load 10 W Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load M A A A A A A A A A A A A A | Total current per group, horizontal configuration, 40°C | 4 A |
| Output current at signal "1", rated value Signal logic output Output delay of "0" to "1" Output delay of "1" to "0" 250 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load 2 A Sourcing output 100 µs 10 W Parallel switching of outputs for redundant control of a load not possible Actuation of digital input ✓ Switching frequency with resistive load max. 1000 Hz Switching frequency on lamp load max. 0.5 Hz | Total current per group, horizontal configuration, 60°C | 4 A |
| Signal logic output Output delay of "0" to "1" Output delay of "1" to "0" 250 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load Sourcing output 100 µs 10 W not possible not possible Actuation of digital input ✓ Switching frequency with resistive load max. 1000 Hz Switching frequency on lamp load max. 0.5 Hz | Total current per group, vertical configuration | 4 A |
| Output delay of "0" to "1" Output delay of "1" to "0" 250 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load 100 µs 250 µs No W No W No W No Parallel switching of outputs for redundant control of a load not possible No possible Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency on lamp load max. 10 Hz | Output current at signal "1", rated value | 2 A |
| Output delay of "1" to "0" Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load 250 μs 10 W not possible not possible Actuation of digital input ✓ Switching frequency with resistive load max. 1000 Hz Switching frequency on lamp load max. 0.5 Hz | Signal logic output | Sourcing output |
| Minimum load current Lamp load 10 W Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load max. 10 Hz | Output delay of "0" to "1" | 100 μs |
| Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load 10 W not possible not possible max. 1000 Hz | Output delay of "1" to "0" | 250 μs |
| Parallel switching of outputs for redundant control of a load not possible Parallel switching of outputs for increased power not possible Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Minimum load current | - |
| Parallel switching of outputs for increased power not possible Actuation of digital input Switching frequency with resistive load max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Lamp load | 10 W |
| Actuation of digital input Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load max. 1000 Hz max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Parallel switching of outputs for redundant control of a load | not possible |
| Switching frequency with resistive load max. 1000 Hz Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Parallel switching of outputs for increased power | not possible |
| Switching frequency with inductive load max. 0.5 Hz Switching frequency on lamp load max. 10 Hz | Actuation of digital input | ✓ |
| Switching frequency on lamp load max. 10 Hz | Switching frequency with resistive load | max. 1000 Hz |
| | Switching frequency with inductive load | max. 0.5 Hz |
| Internal limitation of industive shut off voltage | Switching frequency on lamp load | max. 10 Hz |
| The mai limitation of inductive Shut-on voltage | Internal limitation of inductive shut-off voltage | L+ (-52 V) |
| Short-circuit protection of output yes, electronic | Short-circuit protection of output | yes, electronic |

022-1BB20 - DO 2xDC 24V 2A > Technical data

| Order no. | 022-1BB20 |
|--|-----------------------|
| Trigger level | 2.7 A |
| Number of operating cycle of relay outputs | - |
| Switching capacity of contacts | |
| Output data size | 2 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | none |
| Supply voltage display | green LED |
| Group error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| PWM data | |
| PWM channels | - |
| PWM time basis | - |
| Period length | - |
| Minimum pulse width | - |
| Type of output | - |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse length | - |
| Circuit monitoring | - |
| Datasizes | |
| Input bytes | 0 |
| Output bytes | 1 |

022-1BB20 - DO 2xDC 24V 2A > Technical data

| Order no. | 022-1BB20 |
|------------------------------|----------------------------|
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 57 g |
| Weight including accessories | 57 g |
| Gross weight | 71 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

022-1BB50 - DO 2xDC 24V 0.5A NPN

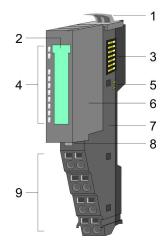
4.3 022-1BB50 - DO 2xDC 24V 0.5A NPN

Properties

The electronic module accepts binary control signals from the central bus system and transfers them to the process level via outputs. It has 2 channels connected to the power supply, which operate as low-side switch and their status is monitored via LEDs. Low-side switches are suited to switch grounds. With a short circuit between switch line and ground the load is activated but the power supply is not influenced.

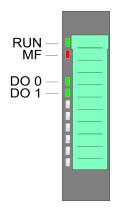
- 2 digital low-side outputs, isolated to the backplane bus
- Status indication of the channels via LEDs.

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

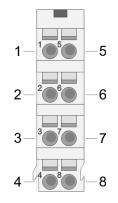
Status indication



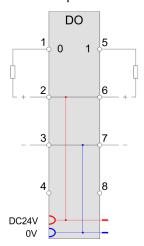
| RUN green | MF red | DO x green | Description |
|-----------------|-----------|------------|---|
| | | X | Bus communication is OK |
| | | X | Module status is OK |
| | | | Bus communication is OK |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | | Bus communication is not possible |
| | | Χ | Module status reports an error with overload, short circuit or overheat |
| | | X | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital output has "1" signal |
| | | | Digital output has "0" signal |
| not relevant: X | | | |

022-1BB50 - DO 2xDC 24V 0.5A NPN

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



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

O: Output



CAUTION!

Feeding in voltage at an output is not allowed and can destroy the module!

Input area

No byte of the input area is used by the module.

Output area

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

022-1BB50 - DO 2xDC 24V 0.5A NPN > Technical data

| Addr. | Name | Bytes | Function | IX | SX |
|-------|------|-------------------|----------------------|-------|-----|
| +0 | PIQ | 1 | State of the outputs | 5200h | |
| | | | Bit 0: DO 0 | | 01h |
| | | | Bit 1: DO 1 | | 02h |
| | | Bit 7 2: reserved | | | |

4.3.1 Technical data

| Type SM 022 Module ID 0103 AF90 Current consumption/power loss Current consumption from backplane bus 70 mA Power loss 0.4 W Technical data digital outputs Number of outputs 2 Cable length, shielded 1000 m Cable length, unshielded 600 m Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) 2.5 mA Total current per group, horizontal configuration, 40°C 1 A Total current per group, vertical configuration, 60°C 1 A Total current at signal "1", rated value 0.5 A Signal logic output Sinking output Output delay of "0" to "1" 30 μs Minimum load current Lamp load 10 W Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power not possible Actuation of digital input | |
|--|--|
| Current consumption/power loss Current consumption from backplane bus Power loss 0.4 W Technical data digital outputs Number of outputs Cable length, shielded Cable length, unshielded Cable length, unshielded Rated load voltage Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C Total current per group, horizontal configuration, 60°C Total current per group, vertical configuration 1 A Output current at signal "1", rated value Signal logic output Output delay of "0" to "1" Output delay of "0" to "1" Output delay of "0" to "0" Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power not possible | |
| Current consumption from backplane bus Power loss 0.4 W Technical data digital outputs Number of outputs Cable length, shielded Cable length, unshielded Rated load voltage Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C Total current per group, horizontal configuration, 60°C Total current per group, vertical configuration Output current at signal "1", rated value Signal logic output Output delay of "0" to "1" Output delay of "1" to "0" Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power 70 mA | |
| Power loss Technical data digital outputs Number of outputs 2 Cable length, shielded 1000 m Cable length, unshielded 600 m Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) 2.5 mA Total current per group, horizontal configuration, 40°C 1 A Total current per group, horizontal configuration, 60°C 1 A Total current per group, vertical configuration 1 A Output current at signal "1", rated value 0.5 A Signal logic output Sinking output Output delay of "0" to "1" 30 μs Output delay of "1" to "0" 100 μs Minimum load current - Lamp load 10 W Parallel switching of outputs for increased power not possible | |
| Number of outputs Cable length, shielded Cable length, unshielded Rated load voltage Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C Total current per group, horizontal configuration, 60°C Total current per group, vertical configuration 1 A Output current at signal "1", rated value Signal logic output Output delay of "0" to "1" Output delay of "1" to "0" Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power | |
| Number of outputs 2 Cable length, shielded 1000 m Cable length, unshielded 600 m Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) 2.5 mA Total current per group, horizontal configuration, 40°C 1 A Total current per group, horizontal configuration, 60°C 1 A Total current per group, vertical configuration 1 A Output current at signal "1", rated value 0.5 A Signal logic output Sinking output Output delay of "0" to "1" 30 μs Output delay of "1" to "0" 100 μs Minimum load current - Lamp load 10 W Parallel switching of outputs for redundant control of a load not possible Parallel switching of outputs for increased power not possible | |
| Cable length, shielded Cable length, unshielded Rated load voltage Current consumption from load voltage L+ (without load) Current consumption from load voltage L+ (without load) Current per group, horizontal configuration, 40°C Total current per group, horizontal configuration, 60°C A Total current per group, vertical configuration A Cutput current at signal "1", rated value Signal logic output Cutput delay of "0" to "1" Cutput delay of "1" to "0" Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power 100 m 100 | |
| Cable length, unshielded Rated load voltage DC 20.428.8 V Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C 1 A Total current per group, horizontal configuration, 60°C 1 A Total current per group, vertical configuration 1 A Output current at signal "1", rated value Signal logic output Output delay of "0" to "1" Output delay of "1" to "0" Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power DC 20.428.8 V 2.5 mA 1 A A OUTPUT 1 A DO 1 A Sinking output 1 O 1 D 1 D 1 D 1 D 1 D 1 D 1 D 1 D 1 D | |
| Rated load voltage Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C Total current per group, horizontal configuration, 60°C Total current per group, vertical configuration 1 A Output current at signal "1", rated value Signal logic output Output delay of "0" to "1" Output delay of "1" to "0" Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power DC 20.428.8 V 2.5 mA 1 A 0 1 A 0 1 A 0 1 D 1 A 0 1 D 1 D 1 D 1 D 1 D 1 D 1 D 1 | |
| Current consumption from load voltage L+ (without load) Total current per group, horizontal configuration, 40°C Total current per group, horizontal configuration, 60°C Total current per group, vertical configuration 1 A Output current at signal "1", rated value Signal logic output Output delay of "0" to "1" 30 µs Output delay of "1" to "0" Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power | |
| Total current per group, horizontal configuration, 40°C Total current per group, horizontal configuration, 60°C Total current per group, vertical configuration 1 A Output current at signal "1", rated value 0.5 A Signal logic output Sinking output Output delay of "0" to "1" 30 µs Output delay of "1" to "0" 100 µs Minimum load current Lamp load 10 W Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power not possible | |
| Total current per group, horizontal configuration, 60°C 1 A Total current per group, vertical configuration 1 A Output current at signal "1", rated value 0.5 A Signal logic output Output delay of "0" to "1" 30 µs Output delay of "1" to "0" 100 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power 1 A 1 A 1 A Output delay of "1" to "0" binking output 30 µs | |
| Total current per group, vertical configuration Output current at signal "1", rated value Signal logic output Sinking output Output delay of "0" to "1" Output delay of "1" to "0" Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power 1 A 0.5 A Sinking output 100 µs 100 µs 100 µs | |
| Output current at signal "1", rated value Signal logic output Output delay of "0" to "1" Output delay of "1" to "0" Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Output delay of "1" to "0" 100 µs 10 W Parallel switching of outputs for redundant control of a load not possible | |
| Signal logic output Output delay of "0" to "1" Output delay of "1" to "0" 100 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power Sinking output 10 µs 100 µs 10 W Parallel switching of outputs for redundant control of a load not possible | |
| Output delay of "0" to "1" Output delay of "1" to "0" 100 µs Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power 30 µs 100 µs 100 µs | |
| Output delay of "1" to "0" Minimum load current Lamp load Parallel switching of outputs for redundant control of a load Parallel switching of outputs for increased power 100 µs 100 µs 100 µs | |
| Minimum load current - Lamp load 10 W Parallel switching of outputs for redundant control of a load not possible Parallel switching of outputs for increased power not possible | |
| Lamp load 10 W Parallel switching of outputs for redundant control of a load not possible Parallel switching of outputs for increased power not possible | |
| Parallel switching of outputs for redundant control of a load not possible Parallel switching of outputs for increased power not possible | |
| Parallel switching of outputs for increased power not possible | |
| | |
| Actuation of digital input ✓ | |
| | |
| Switching frequency with resistive load max. 1000 Hz | |
| Switching frequency with inductive load max. 0.5 Hz | |
| Switching frequency on lamp load max. 10 Hz | |
| Internal limitation of inductive shut-off voltage +45 V | |
| Short-circuit protection of output yes, electronic | |

022-1BB50 - DO 2xDC 24V 0.5A NPN > Technical data

| Order no. | 022-1BB50 |
|--|-----------------------|
| Trigger level | 1.7 A |
| Number of operating cycle of relay outputs | |
| Switching capacity of contacts | |
| Output data size | 2 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | none |
| Supply voltage display | green LED |
| Group error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| PWM data | |
| PWM channels | - |
| PWM time basis | - |
| Period length | - |
| Minimum pulse width | - |
| Type of output | - |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse length | - |
| Circuit monitoring | - |
| Datasizes | |
| Input bytes | 0 |
| Output bytes | 1 |

022-1BB50 - DO 2xDC 24V 0.5A NPN > Technical data

| Order no. | 022-1BB50 |
|------------------------------|----------------------------|
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 57 g |
| Weight including accessories | 57 g |
| Gross weight | 71 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

022-1BB70 - DO 2xDC 24V 0.5A ETS

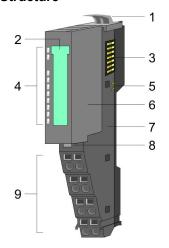
4.4 022-1BB70 - DO 2xDC 24V 0.5A ETS

Properties

The electronic module accepts binary control signals from the central bus system and transfers them time-controlled by means of ETS functionality to the process level via outputs. It has 2 channels and their status is monitored via LEDs. With configured ETS functionality (ETS = edge time stamp) depending on the configuration 5 (20byte) respectively 15 (60byte), you may transfer the states for the outputs together with a time value of the µs ticker as an ETS entry to the FIFO stack. The FIFO memory serves for space for max. 31 ETS entries.

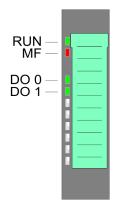
- 2 digital outputs, isolated to the backplane bus
- FIFO stack for 5 respectively 15 ETS entries (each 4byte)
- Diagnostics function
- Controlling by process image respectively handling blocks
- Status indication of the channels via LEDs

Structure



- Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

Status indication

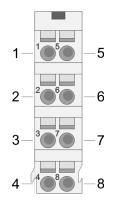


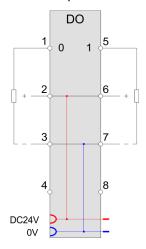
| RUN | MF | DO x | Description |
|---------------|-----|-------|---|
| green | red | green | Description |
| _ | | X | Bus communication is OK |
| _ | | ^ | Module status is OK |
| | | | Bus communication is OK |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | | Bus communication is not possible |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | X | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | ♦ Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital output has "1" signal |
| | | | Digital output has "0" signal |
| not relevant: | Χ | | |

022-1BB70 - DO 2xDC 24V 0.5A ETS

Pin assignment

For wires with a cross section of 0.08mm² up to 1.5mm².





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

O: Output



CAUTION!

Feeding in voltage at an output is not allowed and can destroy the module!

In-/Output area

With configured ETS functionality (ETS=edge time stamp) a time value (ETS_US) together with the state of the outputs (PIQ) and a running number (RN) may be stored as ETS entry in the process image.

You may configure the following variants:

- 022-1BB70 DO 2xDC 24V (20): FIFO with 20byte for 5 ETS entries
- 022-1BB70 DO 2xDC 24V (60): FIFO with 60byte for 15 ETS entries
 - Ĭ

Please consider, with a full FIFO stack no further ETS entries may be accepted. To ensure that your ETS entries are kept, you should always check the state of the FIFO stack by STS_FIFO in the input area before.

022-1BB70 - DO 2xDC 24V 0.5A ETS

Input area 4byte

The input range is used for status message. At CPU, PROFIBUS and PROFINET the input area is embedded to the corresponding address area.

IX - IX = Index for access via CANopen.

SX - Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|-------|----------|-------|---|-------|-----|
| +0 | RN_LAST | 1 | Bit 5 0: | 5440h | 01h |
| | | | RN last FIFO entry | | |
| | | | Bit 6: 1 (fix) | | |
| | | | Bit 7: 0 (fix) | | |
| +1 | RN_NEXT | 1 | Bit 5 0: | | 02h |
| | | | RN next FIFO entry to be processed | | |
| | | | Bit 6: 1 (fix) | | |
| | | | Bit 7: 1 (fix) | | |
| +2 | STS_FIFO | 1 | State of the FIFO stack | | 03h |
| +3 | NUM_ETS | 1 | Number of ETS entries in the FIFO stack | | 04h |

RN LAST

Bit 5 ... 0: Here the RN of the last ETS entry may be found, which was recognized as valid and written into the FIFO memory of the module.

Bit 6: 1 (fix) - serves for the identification in the process image

Bit 7: 0 (fix) - serves for the identification in the process image

RN_NEXT

Bit 5 ... 0: Here the RN of the ETS entry may be found, which will be executed next in the FIFO memory of the module. Please consider Bit 6 and 7 of RN_NEXT are always set.

Bit 6: 1 (fix) - serves for the identification in the process image

Bit 7: 1 (fix) - serves for the identification in the process image

STS FIFO

The State informs about the state of the FIFO stack:

| STS_FIFO | Description |
|----------|--|
| 00h/80h | Everything is OK. You will get this message directly after the storage in the FIFO memory of the module. |
| 01h/81h | There is no following ETS entry in the FIFO. |
| | The RN does not correspond to the expected RN. Please check your RN in the output area. |
| 02h/82h | There are no new ETS entries in the FIFO. |
| 03h/83h | FIFO stack is full. There is no more place for further ETS entries. |

If there are less ETS entries written as possible, additionally bit 6 of the last RN must be set. This is necessary; otherwise you have to overwrite the following entries with a "not valid" entry.

022-1BB70 - DO 2xDC 24V 0.5A ETS

The module ignores entries after an entry with a set bit 6. If there is an ETS entry in the FIFO memory, whose bit 6 is set, STS FIFO is always returned ored with 80h.

NUM_ETS

Here always the current number of the ETS entries in the FIFO memory of the module may be found.

Structure of an ETS entry

Depending on the configuration up to 15 ETS entries may be written via the output area. Each ETS entry uses 4byte in the process image:

| Addr. | Name | Bytes | Function | IX | SX |
|-------|--------|-------|----------------|---------|-----|
| +0 | PIQ | 1 | Output byte | 5640h/s | 01h |
| +1 | RN | 1 | Running number | | 02h |
| +2 | ETS_US | 2 | µs ticker | | 03h |

PIQ

Here the state of the outputs for the corresponding time may be defined and the output channels may be enabled respectively disabled.

The output byte has the following bit allocation:

Bit 3 ... 0: 0 (fix)

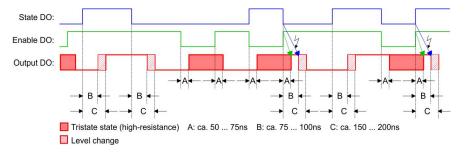
Bit 4: Enable DO 1 (0: disable, 1: enable)
Bit 5: Enable DO 0 (0: disable, 1: enable)

Bit 6: State DO 1 Bit 7: State DO 0

Time characteristics of an output

The simultaneous enabling and state change of an output should be avoided. Due to the different run times (see times A, B and C) up to the change of state this may affect unwanted switching effects.

The following figure shows the time characteristics of an output when using the enable bit



RN

RN (Running Number) is a continuous number 0 ... 63, which has to start with 1. With the RN the chronological order of the ETS entries may be defined. With each ETS entry RN is to be incremented, otherwise the ETS entry may not be recognized by the module.

022-1BB70 - DO 2xDC 24V 0.5A ETS



If there are less ETS entries written as possible, additionally bit 6 of the last RN must be set. This is necessary; otherwise you have to overwrite the following entries with a "not valid" entry. The module ignores entries after an entry with a set bit 6.

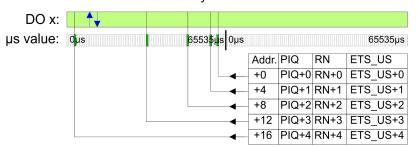
ETS_US

In the SLIO module there is a 32 bit timer (μ s ticker). With PowerON the timer starts counting. After 2^{32} -1 μ s the timer starts with 0 again. For ETS_US of an ETS entry you have to define a time value from the low word of the μ s ticker (0...65535 μ s).

Here please enter a time value in μ s, to which the state of the outputs is to be taken. Range of values: 0 ... 65535

ETS functionality

The following picture shows how the ETS entries are to be preset in the output area, so that these can be stored in the FIFO memory.



Output area 20byte respectively 60byte

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

- IX Index for access via CANopen. With s = Subindex the corresponding ETS entry is addressed.
- SX Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

Configured as 022-1BB70

DO 2xDC 24V (20)

20byte - 5 ETS entries

| Addr. | PIQ | IX=5640h | SX | Addr. | RN | IX=5640h | SX | Addr. | ETS-US | IX=5640h | SX |
|-------|-------|----------|-----|-------|------|----------|-----|-------|----------|----------|-----|
| +0 | PIQ+0 | s=1 | 01h | +1 | RN+0 | s=1 | 02h | +2 | ETS_US+0 | s=1 | 03h |
| +4 | PIQ+1 | s=2 | 04h | +5 | RN+1 | s=2 | 05h | +6 | ETS_US+1 | s=2 | 06h |
| +8 | PIQ+2 | s=3 | 07h | +9 | RN+2 | s=3 | 08h | +10 | ETS_US+2 | s=3 | 09h |
| +12 | PIQ+3 | s=4 | 0Ah | +13 | RN+3 | s=4 | 0Bh | +14 | ETS_US+3 | s=4 | 0Ch |
| +16 | PIQ+4 | s=5 | 0Dh | +17 | RN+4 | s=5 | 0Eh | +18 | ETS_US+4 | s=5 | 0Fh |

022-1BB70 - DO 2xDC 24V 0.5A ETS

Configured as 022-1BB70

DO 2xDC 24V (60)

60byte - 15 ETS entries

| Addr. | PIQ | IX=5640h | SX | Addr. | RN | IX=5640h | SX | Addr. | ETS-US | IX=5640h | SX |
|-------|--------|----------|-----|-------|-------|----------|-----|-------|-----------|----------|-----|
| +0 | PIQ+0 | s=1 | 01h | +1 | RN+0 | s=1 | 02h | +2 | ETS_US+0 | s=1 | 03h |
| +4 | PIQ+1 | s=2 | 04h | +5 | RN+1 | s=2 | 05h | +6 | ETS_US+1 | s=2 | 06h |
| +8 | PIQ+2 | s=3 | 07h | +9 | RN+2 | s=3 | 08h | +10 | ETS_US+2 | s=3 | 09h |
| +12 | PIQ+3 | s=4 | 0Ah | +13 | RN+3 | s=4 | 0Bh | +14 | ETS_US+3 | s=4 | 0Ch |
| +16 | PIQ+4 | s=5 | 0Dh | +17 | RN+4 | s=5 | 0Eh | +18 | ETS_US+4 | s=5 | 0Fh |
| +20 | PIQ+5 | s=6 | 10h | +21 | RN+5 | s=6 | 11h | +22 | ETS_US+5 | s=6 | 12h |
| +24 | PIQ+6 | s=7 | 13h | +25 | RN+6 | s=7 | 14h | +26 | ETS_US+6 | s=7 | 15h |
| +28 | PIQ+7 | s=8 | 16h | +29 | RN+7 | s=8 | 17h | +30 | ETS_US+7 | s=8 | 18h |
| +32 | PIQ+8 | s=9 | 19h | +33 | RN+8 | s=9 | 1Ah | +34 | ETS_US+8 | s=9 | 1Bh |
| +36 | PIQ+9 | s=10 | 1Ch | +37 | RN+9 | s=10 | 1Dh | +38 | ETS_US+9 | s=10 | 1Eh |
| +40 | PIQ+10 | s=11 | 1Fh | +41 | RN+10 | s=11 | 20h | +42 | ETS_US+10 | s=11 | 21h |
| +44 | PIQ+11 | s=12 | 22h | +45 | RN+11 | s=12 | 23h | +46 | ETS_US+11 | s=12 | 24h |
| +48 | PIQ+12 | s=13 | 25h | +49 | RN+12 | s=13 | 26h | +50 | ETS_US+12 | s=13 | 27h |
| +52 | PIQ+13 | s=14 | 28h | +53 | RN+13 | s=14 | 29h | +54 | ETS_US+13 | s=14 | 2Ah |
| +56 | PIQ+14 | s=15 | 2Bh | +57 | RN+14 | s=15 | 2Ch | +58 | ETS_US+14 | s=15 | 2Dh |



The ETS module may only be accessed by the System SLIO CPU by means of SFC 15 or via the process image. Only the input data of the ETS module may be read by individual accesses.

022-1BB70 - DO 2xDC 24V 0.5A ETS > Technical data

4.4.1 Technical data

| Order no. | 022-1BB70 |
|---|------------------------------------|
| Туре | SM 022 |
| Module ID | 0F41 57E1 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 105 mA |
| Power loss | 0.95 W |
| Technical data digital outputs | |
| Number of outputs | 2 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.428.8 V |
| Current consumption from load voltage L+ (without load) | 15 mA |
| Total current per group, horizontal configuration, 40°C | 1 A |
| Total current per group, horizontal configuration, 60°C | 1 A |
| Total current per group, vertical configuration | 1 A |
| Output current at signal "1", rated value | 0.5 A |
| Signal logic output | Sourcing output |
| Output delay of "0" to "1" | max. 100 ns |
| Output delay of "1" to "0" | max. 100 ns |
| Minimum load current | - |
| Lamp load | 10 W |
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | ✓ |
| Switching frequency with resistive load | max. 40 kHz |
| Switching frequency with inductive load | max. 40 kHz |
| Switching frequency on lamp load | max. 40 kHz |
| Internal limitation of inductive shut-off voltage | L+ (-52 V) |
| Short-circuit protection of output | yes, electronic, and only highside |
| Trigger level | 2.5 A |
| Number of operating cycle of relay outputs | - |
| Switching capacity of contacts | - |
| Output data size | 60 Byte |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |

022-1BB70 - DO 2xDC 24V 0.5A ETS > Technical data

| Order no. | 022-1BB70 |
|------------------------------------|----------------------------|
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | possible |
| Supply voltage display | green LED |
| Group error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| PWM data | |
| PWM channels | - |
| PWM time basis | - |
| Period length | - |
| Minimum pulse width | - |
| Type of output | - |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse length | - |
| Circuit monitoring | - |
| Datasizes | |
| Input bytes | 4 |
| Output bytes | 20 / 60 |
| Parameter bytes | 6 |
| Diagnostic bytes | 20 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |

022-1BB70 - DO 2xDC 24V 0.5A ETS > Parameter data

| Order no. | 022-1BB70 |
|------------------------------|-----------------|
| Net weight | 61 g |
| Weight including accessories | 61 g |
| Gross weight | 75 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

4.4.2 Parameter data

4.4.2.1 Parameters

The module has the following parameter data, which were fix set and may not be altered.

- DS Record set for access via CPU, PROFIBUS and PROFINET
- IX Index for access via CANopen
- SX Subindex for access via EtherCAT with Index 3100h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|-------|-------|--|--------------------|-----|-------|-----|
| PII_L | 1 | Length process image input data ¹ | 04h (fix) | 02h | 3100h | 01h |
| PIQ_L | 1 | Length process image output data 1, 2 | 14h bzw. 3Ch (fix) | 02h | 3101h | 02h |

¹⁾ This record set may only be transferred at STOP state.

²⁾ This parameter depends on the configured variant.

| п | |
|--------------|--|
| \mathbf{r} | |
| | |

| Byte | Bit 7 0 |
|------|--|
| 0 | The length of the process image of the input data is fix set to 4byte. |

PIQ_L

| Byte | Bit 7 0 |
|------|---|
| 0 | The length of the process image of the output data is fix set to the configured variant (14h or 3Ch). |

4.4.2.2 Example for the principle of operation

In the following it is demonstrated by an example, in which order the ETS entries are stored and processed.

022-1BB70 - DO 2xDC 24V 0.5A ETS > Parameter data

With this example a module is configured, which uses 20byte for 5 ETS entries in the output area PIQ.

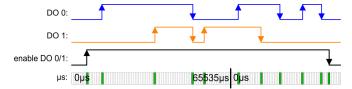
ETS values

With the following times of the μs ticker the following states of the outputs should be taken:

| RN | ETS_US | PIQ DO 0 | PIQ DO 1 | PIQ enable | PIQ enable |
|-----|--------|----------|----------|--------------|--------------|
| | in µs | (Bit 7) | (Bit 6) | DO 0 (Bit 5) | DO 1 (Bit 4) |
| 01h | 6000 | 0 | 0 | 1 | 1 |
| 02h | 12506 | 1 | 0 | 1 | 1 |
| 03h | 34518 | 1 | 1 | 1 | 1 |
| 04h | 49526 | 0 | 0 | 1 | 1 |
| 05h | 54529 | 0 | 1 | 1 | 1 |
| 06h | 3500 | 1 | 1 | 1 | 1 |
| 07h | 12443 | 1 | 0 | 1 | 1 |
| 08h | 20185 | 0 | 0 | 1 | 1 |
| 09h | 30140 | 1 | 0 | 1 | 1 |
| 0Ah | 37330 | 0 | 0 | 1 | 1 |
| 0Bh | 40000 | 0 | 0 | 0 | 0 |

Time diagram

From the table you get the following time diagram:



Writing 5 ETS entries

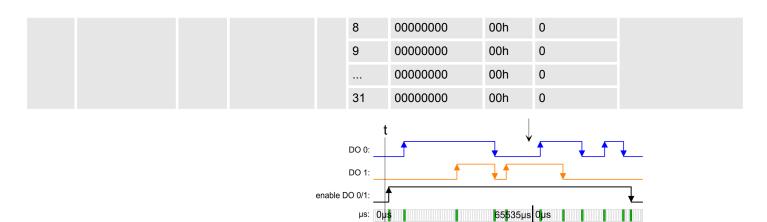
After writing the ETS entries into the process output image they are directly stored in the FIFO memory of the module.

The state of the outputs are shown in the diagram at the time "t".

In the PII you will find the status bytes.

| Addr. | PIQ | RN | ETS_US | \rightarrow | FIFO | PIQ | RN | ETS_US | PII |
|-------|----------|-----|--------|---------------|------|----------|-----|--------|---------------|
| +0 | 00110000 | 01h | 6000 | | 1 | 00110000 | 01h | 6000 | RN_LAST: 45h |
| +4 | 10110000 | 02h | 12506 | | 2 | 10110000 | 02h | 12506 | RN_NEXT: C1h |
| +8 | 11110000 | 03h | 34518 | | 3 | 11110000 | 03h | 34518 | STS_FIFO: 00h |
| +12 | 00110000 | 04h | 49526 | | 4 | 00110000 | 04h | 49526 | NUM_ETS: 05h |
| +16 | 01110000 | 05h | 54529 | | 5 | 01110000 | 05h | 54529 | |
| | | | | | 6 | 00000000 | 00h | 0 | |
| | | | | | 7 | 00000000 | 00h | 0 | |

022-1BB70 - DO 2xDC 24V 0.5A ETS > Parameter data

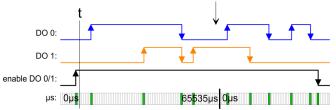


Executing ETS function for RN = 01h

So that the outputs can be controlled, they must be enabled before. In this example both outputs are enabled with the 1. RN.

The ETS entry (RN = 01h) is executed and deleted in the FIFO.

| Addr. | PIQ | RN | ETS_US | | FIFO | PIQ | RN | ETS_US | PII |
|-------|----------|-----|--------|---------------|------|----------|-----|--------|-------------------|
| +0 | 00110000 | 01h | 6000 | \rightarrow | 1 | 10110000 | 02h | 12506 | RN_LAST: 45h |
| +4 | 10110000 | 02h | 12506 | | 2 | 11110000 | 03h | 34518 | RN_NEXT: C2h |
| +8 | 11110000 | 03h | 34518 | | 3 | 00110000 | 04h | 49526 | STS_FIFO: 00h/02h |
| +12 | 00110000 | 04h | 49526 | | 4 | 01110000 | 05h | 54529 | NUM_ETS: 04h |
| +16 | 01110000 | 05h | 54529 | | 5 | 00000000 | 00h | 0 | |
| | | | | | 6 | 00000000 | 00h | 0 | |
| | | | | | 7 | 00000000 | 00h | 0 | |
| | | | | | 8 | 00000000 | 00h | 0 | |
| | | | | | 9 | 00000000 | 00h | 0 | |
| | | | | | | 00000000 | 00h | 0 | |
| | | | | | 31 | 00000000 | 00h | 0 | |
| | | | | | | | | | |



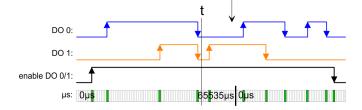
Executing ETS function for RN = 02h ... 04h

The states of RN = 02h ... RN 04h are successively issued and deleted in the FIFO.

| Addr. | PIQ | RN | ETS_US | | FIFO | PIQ | RN | ETS_US | PII |
|-------|----------|-----|--------|---------------|------|----------|-----|--------|-------------------|
| +0 | 00110000 | 01h | 6000 | \rightarrow | 1 | 01110000 | 05h | 54529 | RN_LAST: 45h |
| +4 | 10110000 | 02h | 12506 | | 2 | 0000000 | 00h | 0 | RN_NEXT: C5h |
| +8 | 11110000 | 03h | 34518 | | 3 | 00000000 | 00h | 0 | STS_FIFO: 00h/02h |
| +12 | 00110000 | 04h | 49526 | | 4 | 0000000 | 00h | 0 | NUM_ETS: 01h |

022-1BB70 - DO 2xDC 24V 0.5A ETS > Parameter data

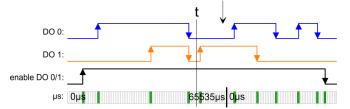
| +16 | 01110000 | 05h | 54529 | 5 | 00000000 | 00h | 0 |
|-----|----------|-----|-------|----|----------|-----|---|
| | | | | 6 | 00000000 | 00h | 0 |
| | | | | 7 | 00000000 | 00h | 0 |
| | | | | 8 | 00000000 | 00h | 0 |
| | | | | 9 | 00000000 | 00h | 0 |
| | | | | | 00000000 | 00h | 0 |
| | | | | 31 | 00000000 | 00h | 0 |



Writing 5 ETS entries

After writing the next 5 ETS entries into the process output image they are directly stored in the FIFO memory of the module.

| Addr. | PIQ | RN | ETS_US | | FIFO | PIQ | RN | ETS_US | PII |
|-------|----------|-----|--------|---------------|------|----------|-----|--------|-------------------|
| +0 | 11110000 | 06h | 3500 | \rightarrow | 1 | 01110000 | 05h | 54529 | RN_LAST: 4Ah |
| +4 | 10110000 | 07h | 12443 | | 2 | 11110000 | 06h | 3500 | RN_NEXT: C5h |
| +8 | 00110000 | 08h | 20185 | | 3 | 10110000 | 07h | 12443 | STS_FIFO: 00h/02h |
| +12 | 10110000 | 09h | 30140 | | 4 | 00110000 | 08h | 20185 | NUM_ETS: 06h |
| +16 | 00110000 | 0Ah | 37330 | | 5 | 10110000 | 09h | 30140 | |
| | | | | | 6 | 00110000 | 0Ah | 37330 | |
| | | | | | 7 | 00000000 | 00h | 0 | |
| | | | | | 8 | 00000000 | 00h | 0 | |
| | | | | | 9 | 0000000 | 00h | 0 | |
| | | | | | | 00000000 | 00h | 0 | |
| | | | | | 31 | 00000000 | 00h | 0 | |



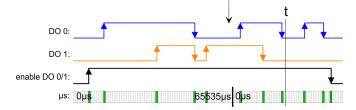
Executing ETS function for RN = 06h ... 08h

The states of RN = 06h ... RN 08h are successively issued and deleted in the FIFO.

| Addr. | PIQ | RN | ETS_US | | FIFO | PIQ | RN | ETS_US | PII |
|-------|----------|-----|--------|---------------|------|----------|-----|--------|--------------|
| +0 | 11110000 | 06h | 3500 | \rightarrow | 1 | 10110000 | 09h | 30140 | RN_LAST: 4Ah |
| +4 | 10110000 | 07h | 12443 | | 2 | 00110000 | 0Ah | 37330 | RN_NEXT: C5h |

022-1BB70 - DO 2xDC 24V 0.5A ETS > Parameter data

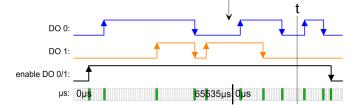
| +8 | 00110000 | 08h | 20185 | 3 | 00000000 | 00h | 0 | STS_FIFO: 00h/02h |
|-----|----------|-----|-------|----|----------|-----|---|-------------------|
| +12 | 10110000 | 09h | 30140 | 4 | 00000000 | 00h | 0 | NUM_ETS: 02h |
| +16 | 00110000 | 0Ah | 37330 | 5 | 00000000 | 00h | 0 | |
| | | | | 6 | 00000000 | 00h | 0 | |
| | | | | 7 | 00000000 | 00h | 0 | |
| | | | | 8 | 00000000 | 00h | 0 | |
| | | | | 9 | 00000000 | 00h | 0 | |
| | | | | | 00000000 | 00h | 0 | |
| | | | | 31 | 00000000 | 00h | 0 | |



Writing last ETS entry

Since less than 5 ETS entries are written, bit 6 of RN of the last ETS entry must always be set. RN = 0Bh becomes 4Bh.

| Addr. | PIQ | RN | ETS_US | | FIFO | PIQ | RN | ETS_US | PII |
|-------|----------|-----|--------|---------------|------|----------|-----|--------|-------------------|
| +0 | 00000000 | 4Bh | 40000 | \rightarrow | 1 | 10110000 | 09h | 30140 | RN_LAST: 4Bh |
| +4 | 10110000 | 07h | 12443 | | 2 | 00110000 | 0Ah | 37330 | RN_NEXT: C9h |
| +8 | 00110000 | 08h | 20185 | | 3 | 00000000 | 4Bh | 40000 | STS_FIFO: 80h/82h |
| +12 | 10110000 | 09h | 30140 | | 4 | 00000000 | 00h | 0 | NUM_ETS: 03h |
| +16 | 00110000 | 0Ah | 37330 | | 5 | 00000000 | 00h | 0 | |
| | | | | | 6 | 00000000 | 00h | 0 | |
| | | | | | 7 | 00000000 | 00h | 0 | |
| | | | | | 8 | 00000000 | 00h | 0 | |
| | | | | | 9 | 00000000 | 00h | 0 | |
| | | | | | | 00000000 | 00h | 0 | |
| | | | | | 31 | 00000000 | 00h | 0 | |

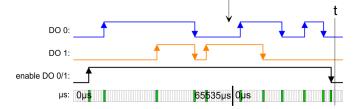


Executing ETS function for RN = 09h ... 4Bh

The states of RN = 09h ... RN 4Bh are successively issued and deleted in the FIFO.

022-1BB70 - DO 2xDC 24V 0.5A ETS > Parameter data

| Addr. | PIQ | RN | ETS_US | | FIFO | PIQ | RN | ETS_US | PII |
|-------|----------|-----|--------|---------------|------|----------|-----|--------|-------------------|
| +0 | 00000000 | 4Bh | 40000 | \rightarrow | 1 | 00000000 | 00h | 0 | RN_LAST: 4Bh |
| +4 | 10110000 | 07h | 12443 | | 2 | 00000000 | 00h | 0 | RN_NEXT: CCh |
| +8 | 00110000 | 08h | 20185 | | 3 | 00000000 | 00h | 0 | STS_FIFO: 80h/82h |
| +12 | 10110000 | 09h | 30140 | | 4 | 00000000 | 00h | 0 | NUM_ETS: 00h |
| +16 | 00110000 | 0Ah | 37330 | | 5 | 00000000 | 00h | 0 | |
| | | | | | 6 | 00000000 | 00h | 0 | |
| | | | | | 7 | 00000000 | 00h | 0 | |
| | | | | | 8 | 00000000 | 00h | 0 | |
| | | | | | 9 | 00000000 | 00h | 0 | |
| | | | | | | 00000000 | 00h | 0 | |
| | | | | | 31 | 00000000 | 00h | 0 | |





Please consider the ETS modules can only effectively be used together with head modules, which have an integrated μs ticker. The Ethernet coupler with ModbusTCP 053-1MT00 for example does not have an μs ticker.

022-1BB70 - DO 2xDC 24V 0.5A ETS > Diagnostic data

4.4.3 Diagnostic data

This module does not support interrupt functions, the diagnostic data serve the information about this module.

- DS Record set for access via CPU, PROFIBUS and PROFINET. The access happens by DS 01h. Additionally the first 4 bytes may be accessed by DS 00h.
- IX Index for access via CANopen. The access happens by IX 2F01h. Additionally the first 4 bytes may be accessed by IX 2F00h.
- SX Subindex for access via EtherCAT with Index 5005h.

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | sx |
|------------------|-------|--|---------|-----|-------|---------|
| ERR_A | 1 | reserved | 00h | 01h | 2F01h | 02h |
| MODTYP | 1 | Module information | 1Fh | | | 03h |
| ERR_C | 1 | reserved | 00h | | | 04h |
| ERR_D | 1 | reserved | 00h | | | 05h |
| CHTYP | 1 | Channel type | 72h | | | 06h |
| NUMBIT | 1 | Number of diagnostics bits per channel | 00h | | | 07h |
| NUMCH | 1 | Number channels of the module | 02h | | | 08h |
| CHERR | 1 | reserved | 00h | | | 09h |
| CH0ERR CH7ERR | 8 | reserved | 00h | | | 0Ah 11h |
| DIAG_US | 4 | μs ticker (32bit) | 00h | | | 13h |

MODTYP Modul information

| Byte | Bit 7 0 |
|------|------------------------------------|
| 0 | Bit 3 0: Module class |
| | 1111b Digital module |
| | Bit 4: Channel information present |
| | Bit 7 5: reserved |

CHTYP Channel type

| Byte | Bit 7 0 |
|------|-----------------------|
| 0 | Bit 6 0: Channel type |
| | 72h: Digital output |
| | Bit 7: 0 (fix) |

NUMBIT Diagnostic bits

| Byte | Bit 7 0 |
|------|---|
| 0 | Number of diagnostics bits of the module per channel (here 00h) |

022-1BB70 - DO 2xDC 24V 0.5A ETS > Diagnostic data

| NUMCH Nu | mber of | chan- |
|----------|---------|-------|
| nels | | |

| Byte | Bit 7 0 |
|------|---|
| 0 | Number of channels of the module (here 02h) |

DIAG_US µs ticker

| Byte | Bit 7 0 |
|------|---|
| 0 3 | Value of the μs ticker at the moment of the diagnostic data generation |

ERR_A/C/D CHERR, CHxERR reserved

| Byte | Bit 7 0 |
|------|----------|
| 0 | reserved |

022-1BB90 - DO 2xDC 24V 0.5A PWM

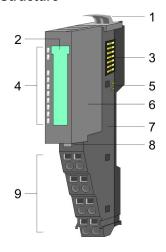
4.5 022-1BB90 - DO 2xDC 24V 0.5A PWM

Properties

The electronic has 2 output channels with PWM functionality (PWM = **p**ulse **w**idth **m**odulation). By presetting of time parameter a pulse sequence with according pulse/break ratio may be issued at the corresponding output channel.

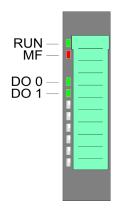
- 2 PWM outputs, isolated to the backplane bus
- PWM outputs switchable between *push/pull* and *high side*
- Diagnostics function
- Status indication of the channels via LEDs
- PWM status
- Variable period duration and pulse duty ratio

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

Status indication

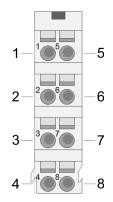


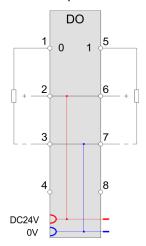
| RUN | MF | DO x | Description |
|---------------|-----|-------|---|
| green | red | green | Description |
| | | X | Bus communication is OK |
| | | ^ | Module status is OK |
| | | | Bus communication is OK |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | | Bus communication is not possible |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | Χ | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | Χ | Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | PWM output has "1" signal |
| | | | PWM output has "0" signal |
| not relevant: | Χ | | |

022-1BB90 - DO 2xDC 24V 0.5A PWM

Pin assignment

For wires with a cross section of 0.08mm² up to 1.5mm².





| Pos. | Function | Туре | Description |
|------|----------|------|------------------|
| 1 | DO 0 | 0 | PWM output DO 0 |
| 2 | DC 24V | 0 | DC 24V |
| 3 | 0V | 0 | GND for actuator |
| 4 | | | not connected |
| 5 | DO 1 | 0 | PWM output DO 1 |
| 6 | DC 24V | 0 | DC 24V |
| 7 | 0V | 0 | GND for actuator |
| 8 | | | not connected |

O: Output



CAUTION!

Feeding in voltage at an output is not allowed and can destroy the module!

Input area 4byte

At CPU, PROFIBUS and PROFINET the input respectively output area is embedded to the corresponding address area.

- IX Index for access via CANopen with s = subindex, depends on number of PWM modules
- SX Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|-------|-----------|-------|---------------|-----------|-----|
| +0 | PWMSTS_I | 2 | PWM 0: Status | 5420h/s | 01h |
| +2 | PWMSTS_II | 2 | PWM 1: Status | 5420h/s+1 | 02h |

022-1BB90 - DO 2xDC 24V 0.5A PWM

Status PWM x

| Bit | Name | Function |
|------|-----------|-------------------------|
| 0 | - | reserved |
| 1 | STS_PWM | Status PWM |
| | | 0: PWM output stopped |
| | | 1: PWM output activated |
| 2 | STS_OUTBV | Status output |
| | | 0: Push/Pull output |
| | | 1: High side output |
| 3 15 | - | reserved |

Output area 12byte

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

- IX Index for access via CANopen with s = subindex, depends on number of PWM modules
- SX Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|-------|------------|-------|--------------------------|-----------|-----|
| +0 | PWMPD_I | 4 | PWM 0: Pulse duration | 5620h/s | 01h |
| +4 | PWMPD_II | 4 | PWM 1: Pulse duration | 5620h/s+1 | 02h |
| +8 | PWMCTRL_I | 2 | PWM 0: Control word | 5621h/s | 03h |
| +10 | PWMCTRL_II | 2 | PWM 1: Control word | 5621h/s+1 | 04h |

PWMPD_I PWMPD_II Pulse duration

Here you have to define the pulse duty ratio for the configured *period duration*, by presetting the high level for the corresponding PWM channel. The pulse duration is to be preset as factor to the base 20.83ns.

Range of values: 48 ... 8388607 (1µs ... ca. 175ms)

PWMCTRL_I PWMCTRL_II Control word

Here for the corresponding channel the PWM output behavior may be preset and the PWM output may be started respectively stopped.

022-1BB90 - DO 2xDC 24V 0.5A PWM > Technical data

| Bit | Name | Function |
|-------|------------|--|
| 0 1 | - | reserved |
| 2 | CTRL_OUTBV | PWM output behavior |
| | | 0: Push/Pull output |
| | | 1: High side output |
| | | With <i>Push/Pull</i> operation it is active switched to high and low level. |
| | | With <i>High side</i> operation it is only active switched 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 |

4.5.1 Technical data

| Order no. | 022-1BB90 |
|---|-----------------|
| Туре | SM 022 |
| Module ID | 0901 4880 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 105 mA |
| Power loss | 0.95 W |
| Technical data digital outputs | |
| Number of outputs | 2 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.428.8 V |
| Current consumption from load voltage L+ (without load) | 15 mA |
| Total current per group, horizontal configuration, 40°C | 1 A |
| Total current per group, horizontal configuration, 60°C | 1 A |
| Total current per group, vertical configuration | 1 A |
| Output current at signal "1", rated value | 0.5 A |
| Signal logic output | Sourcing output |
| Output delay of "0" to "1" | max. 100 ns |
| Output delay of "1" to "0" | max. 100 ns |
| Minimum load current | |
| Lamp load | 10 W |
| Parallel switching of outputs for redundant control of a load | not possible |

022-1BB90 - DO 2xDC 24V 0.5A PWM > Technical data

| 2.5 A | kHz kHz kHz |
|--|----------------------------|
| frequency with resistive load max. 40 frequency with inductive load max. 40 frequency on lamp load max. 40 hitation of inductive shut-off voltage L+ (-52 voltage ves, elected) Let (-52 voltage ves, elected) | kHz kHz /) |
| frequency with inductive load max. 40 frequency on lamp load max. 40 hitation of inductive shut-off voltage L+ (-52 viit protection of output yes, elected the short sho | kHz kHz /) |
| frequency on lamp load max. 40 hitation of inductive shut-off voltage L+ (-52 viit protection of output yes, elected 2.5 A | kHz /) |
| L+ (-52 viit protection of output yes, elected yes) 2.5 A | /) |
| yes, elected yes are determined by the second of the second yes are determined by the second yes are determined yes are determined by the second yes are determined b | |
| el 2.5 A | etronic, and only highside |
| | |
| operating evelo of relevious | |
| operating cycle of relay outputs - | |
| capacity of contacts - | |
| a size 12 Byte | |
| ormation, alarms, diagnostics | |
| play green LE | ED per channel |
| no | |
| arm | |
| interrupt no | |
| functions | |
| s information read-out possible | |
| tage display green LE | ED |
| or display red LED | |
| rror display none | |
| | |
| hannels - | |
| hannels of groups to - | |
| hannels and backplane bus ✓ | |
| tested with DC 500 | V |
| | |
| nnels 2 | |
| basis 20.83ns | |
| gth 12008 | 388607 * time base |
| pulse width 1 μs | |
| tput Push pu | II / highside |
| | |
| tocol - | |
| uirements - | |
| er address - | |

022-1BB90 - DO 2xDC 24V 0.5A PWM > Technical data

| Order no. | 022-1BB90 |
|------------------------------|----------------------------|
| Watchdog | |
| Two channels | - |
| Test pulse length | |
| Circuit monitoring | |
| Datasizes | |
| Input bytes | 4 |
| Output bytes | 12 |
| Parameter bytes | 12 |
| Diagnostic bytes | 20 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 61 g |
| Weight including accessories | 61 g |
| Gross weight | 75 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

022-1BB90 - DO 2xDC 24V 0.5A PWM > Parameter data

4.5.2 Parameter data

DS - Record set for access via CPU, PROFIBUS and PROFINET

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 3100h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|----------|-------|---|---------|-----|------------|-----|
| PWMPD_I | 4 | PWM 0: Period duration (Base time: 20.83ns) | 1F40h | 80h | 3100h 3103 | 01h |
| PWMPD_II | 4 | PWM 1: Period duration (Base time: 20.83ns) | 1F40h | 81h | 3104h 3107 | 02h |

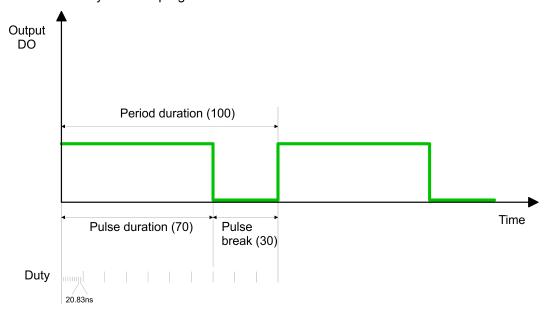
PWMPD_x Period duration

| Byte | Bit 7 0 |
|------|---|
| 0 3 | PWM x Period duration |
| | Here you have to configure the whole time for <i>Pulse duration</i> and Pulse break. The time is to be preset as factor to the base 20.83ns. |
| | Values lower than 25µs are ignored. Is the <i>pulse duration</i> value greater than or equal the value of <i>period duration</i> the output is permanently set. |
| | Range of values: 1200 8388607 (25µs ca. 175ms) |

Principle of operation

By presetting the *period duration* via parameterization and the *pulse duration* via the output area, the pulse duty ratio for the corresponding PWM output channel may be defined.

By changing the pulse duty ration e.g. a drive system, which is connected via PWM may be controlled by the user program.



022-1BB90 - DO 2xDC 24V 0.5A PWM > Diagnostic data

4.5.3 Diagnostic data

So this module does not support process interrupts, the diagnostics data serve for information about this module.

- DS Record set for access via CPU, PROFIBUS and PROFINET. The access happens by DS 01h. Additionally the first 4 bytes may be accessed by DS 00h.
- IX Index for access via CANopen. The access happens by IX 2F01h. Additionally the first 4 bytes may be accessed by IX 2F00h.
- SX Subindex for access via EtherCAT with Index 5005h.

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | sx |
|------------------|-------|--|---------|-----|-------|---------|
| ERR_A | 1 | reserved | 00h | 01h | 2F01h | 02h |
| MODTYP | 1 | Module information | 1Fh | | | 03h |
| ERR_C | 1 | reserved | 00h | | | 04h |
| ERR_D | 1 | reserved | 00h | | | 05h |
| CHTYP | 1 | Channel type | 72h | | | 06h |
| NUMBIT | 1 | Number of diagnostics bits per channel | 00h | | | 07h |
| NUMCH | 1 | Number channels of the module | 02h | | | 08h |
| CHERR | 1 | reserved | 00h | | | 09h |
| CH0ERR CH7ERR | 8 | reserved | 00h | | | 0Ah 11h |
| DIAG_US | 4 | μs ticker (32bit) | 00h | | | 13h |

MODTYP Module information

| Byte | Bit 7 0 |
|------|------------------------------------|
| 0 | Bit 3 0: Module class |
| | 1111b: Digital module |
| | Bit 4: Channel information present |
| | Bit 7 5: reserved |

CHTYP Channel type

| Byte | Bit 7 0 |
|------|-----------------------|
| 0 | Bit 6 0: Channel type |
| | 72h: Digital output |
| | Bit 7: reserved |

NUMBIT Diagnostic bits

| Byte | Bit 7 0 |
|------|---|
| 0 | Number of diagnostics bits of the module per channel (here 00h) |

022-1BB90 - DO 2xDC 24V 0.5A PWM > Diagnostic data

| NUMCH Channels | Byte | Bit 7 0 |
|-----------------------------------|------|---|
| | 0 | Number of channels of the module (here 02h) |
| | | |
| DIAG_US µs ticker | Byte | Bit 7 0 |
| | 0 3 | Value of the μs ticker at the moment of the diagnostic data generation |
| | | |
| ERR_C/D CHERR, CHxERR reserved | Byte | Bit 7 0 |
| | 0 | reserved |

022-1BD00 - DO 4xDC 24V 0.5A

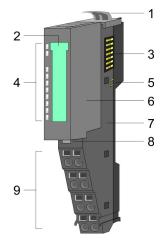
4.6 022-1BD00 - DO 4xDC 24V 0.5A

Properties

The electronic module accepts binary control signals from the central bus system and transfers them to the process level via outputs. It has 4 channels and their status is monitored via LEDs.

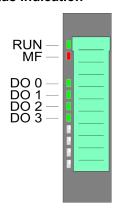
- 4 digital outputs, isolated to the backplane bus
- Status indication of the channels via LEDs

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

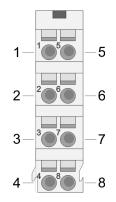
Status indication



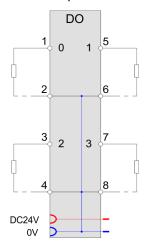
| RUN | MF | DO x | Description |
|---------------|-----|----------|---|
| green | red | green | |
| | | X | Bus communication is OK |
| _ | | A | Module status is OK |
| | | | Bus communication is OK |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | | Bus communication is not possible |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | X | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital output has "1" signal |
| | | | Digital output has "0" signal |
| not relevant: | X | | |

022-1BD00 - DO 4xDC 24V 0.5A

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



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

O: Output



CAUTION!

Feeding in voltage at an output is not allowed and can destroy the module!

Input area

No byte of the input area is used by the module.

Output area

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

022-1BD00 - DO 4xDC 24V 0.5A > Technical data

| Addr. | Name | Bytes | Function | IX | SX |
|-------|-------|----------------------------|-------------------|-----|-----|
| +0 | PIQ 1 | State of the outputs 5200h | | | |
| | | Bit 0: DO 0 | | 01h | |
| | | Bit 1: DO 1 Bit 2: DO 2 | Bit 1: DO 1 | | 02h |
| | | | Bit 2: DO 2 | | 03h |
| | | Bit 3: DO | Bit 3: DO 3 | | 04h |
| | | | Bit 7 4: reserved | | |

4.6.1 Technical data

| Order no. | 022-1BD00 |
|---|-----------------|
| Туре | SM 022 |
| Module ID | 0104 AFA0 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 75 mA |
| Power loss | 0.5 W |
| Technical data digital outputs | |
| Number of outputs | 4 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.428.8 V |
| Current consumption from load voltage L+ (without load) | 10 mA |
| Total current per group, horizontal configuration, 40°C | 2 A |
| Total current per group, horizontal configuration, 60°C | 2 A |
| Total current per group, vertical configuration | 2 A |
| Output current at signal "1", rated value | 0.5 A |
| Signal logic output | Sourcing output |
| Output delay of "0" to "1" | 30 μs |
| Output delay of "1" to "0" | 175 μs |
| Minimum load current | - |
| Lamp load | 10 W |
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | ✓ |
| Switching frequency with resistive load | max. 1000 Hz |
| Switching frequency with inductive load | max. 0.5 Hz |
| Switching frequency on lamp load | max. 10 Hz |

022-1BD00 - DO 4xDC 24V 0.5A > Technical data

| Order no. | 022-1BD00 |
|---|-----------------------|
| Internal limitation of inductive shut-off voltage | L+ (-45 V) |
| Short-circuit protection of output | yes, electronic |
| Trigger level | 1 A |
| Number of operating cycle of relay outputs | - |
| Switching capacity of contacts | - |
| Output data size | 4 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | none |
| Supply voltage display | green LED |
| Group error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| PWM data | |
| PWM channels | - |
| PWM time basis | - |
| Period length | - |
| Minimum pulse width | - |
| Type of output | - |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse length | - |
| Circuit monitoring | - |
| Datasizes | |

022-1BD00 - DO 4xDC 24V 0.5A > Technical data

| Order no. | 022-1BD00 |
|------------------------------|----------------------------|
| Input bytes | 0 |
| Output bytes | 1 |
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 57 g |
| Weight including accessories | 57 g |
| Gross weight | 71 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

022-1BD20 - DO 4xDC 24V 2A

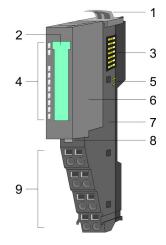
4.7 022-1BD20 - DO 4xDC 24V 2A

Properties

The electronic module accepts binary control signals from the central bus system and transfers them to the process level via outputs. It has 4 channels and their status is monitored via LEDs.

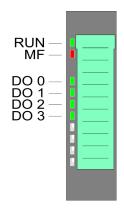
- 4 digital 2A outputs, isolated to the backplane bus
- Status indication of the channels via LEDs

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

Status indication

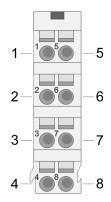


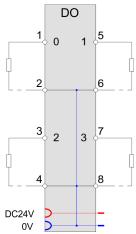
| RUN | MF | DO x | Description |
|---------------|-----|-------|---|
| green | red | green | 2 con paion |
| _ | | X | Bus communication is OK |
| | | ^ | Module status is OK |
| | | | Bus communication is OK |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | | Bus communication is not possible |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | Χ | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital output has "1" signal |
| | | | Digital output has "0" signal |
| not relevant: | Χ | | |

022-1BD20 - DO 4xDC 24V 2A

Pin assignment

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





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

O: Output



CAUTION!

Feeding in voltage at an output is not allowed and can destroy the module!

Input area

No byte of the input area is used by the module.

Output area

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

022-1BD20 - DO 4xDC 24V 2A > Technical data

| Addr. | Name | Bytes | Function | IX | SX |
|-------|-------|----------------------|-------------------|-----|-----|
| +0 | PIQ 1 | State of the outputs | | | |
| | | Bit 0: DO 0 | | 01h | |
| | | Bit 1: DO 1 | | 02h | |
| | | Bit 2: DO 2 | | 03h | |
| | | | Bit 3: DO 3 | | 04h |
| | | | Bit 7 4: reserved | | |

4.7.1 Technical data

| Order no. | 022-1BD20 |
|---|-----------------|
| Туре | SM 022 |
| Module ID | 0108 AFA0 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 75 mA |
| Power loss | 0.8 W |
| Technical data digital outputs | |
| Number of outputs | 4 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.428.8 V |
| Current consumption from load voltage L+ (without load) | 20 mA |
| Total current per group, horizontal configuration, 40°C | 4 A |
| Total current per group, horizontal configuration, 60°C | 4 A |
| Total current per group, vertical configuration | 4 A |
| Output current at signal "1", rated value | 2 A |
| Signal logic output | Sourcing output |
| Output delay of "0" to "1" | 100 μs |
| Output delay of "1" to "0" | 250 μs |
| Minimum load current | - |
| Lamp load | 10 W |
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | ✓ |
| Switching frequency with resistive load | max. 1000 Hz |
| Switching frequency with inductive load | max. 0.5 Hz |
| Switching frequency on lamp load | max. 10 Hz |

022-1BD20 - DO 4xDC 24V 2A > Technical data

| Il limitation of inductive shut-off voltage It irrouit protection of output I level I level I composition of contents I level I composition of contents I data size I data size I data size I data size I display I display | |
|--|---------|
| relevel 2.7 A ref operating cycle of relay outputs reg capacity of contacts data size 4 Bit Information, alarms, diagnostics display green LED per observations static interrupt ref cit information read-out voltage display green LED reror display red LED ref channels ren channels of groups to ren channels and backplane bus ren channels ren | |
| ar of operating cycle of relay outputs Ing capacity of contacts data size 4 Bit Information, alarms, diagnostics display ots s alarm no stic interrupt no stic functions stics information read-out voltage display error display el error display el error display on on on on on on on on on o | |
| ng capacity of contacts data size data size display green LED per test to the first per test per | |
| data size information, alarms, diagnostics display green LED per nots s alarm no stic interrupt no notstic functions stics information read-out voltage display error display error display el error display en channels en channels en channels and backplane bus fon tested with data channels ime basis length im pulse width f output protocol requirements user address - LED none 4 Bit Bit Bit Bit Bit Bit Bit Bit | |
| display green LED per obts no no stice interrupt no no stice interrupt no no no stice interrupt no no no stice information read-out none green LED green display none no | |
| display green LED per obts no no state interrupt no stic interrupt no stic interrupt no no stic information read-out none voltage display green LED error display red LED none en channels of groups to en channels and backplane bus on tested with DC 500 V stata en pulse width en pulse width for output en protocol requirements user address - cuser add | |
| no no stic interrupt no no stic functions no no no stic functions no no none voltage display green LED error display red LED none en channels of groups to en channels and backplane bus on tested with DC 500 V stata en pulse width foutput - channels with the protocol requirements en channels - channels en channels - ch | |
| s alarm stic interrupt no stic functions no stics information read-out voltage display green LED error display el error display none en channels en channels of groups to en channels and backplane bus on tested with DC 500 V Idata channels ime basis length m pulse width f output protocol requirements user address - user address | channel |
| stic interrupt stic functions no stics information read-out voltage display green LED error display el error display none en channels en channels of groups to en channels and backplane bus en channels shannels ine basis length em pulse width f output protocol requirements user address no no no none red LED none | |
| stic functions stics information read-out voltage display error display el error display en channels en channels of groups to en channels and backplane bus on tested with batta channels ime basis length en pulse width f output protocol requirements extra address en channels en channels en channels en channels en channels and backplane bus extra for the state of the | |
| stics information read-out voltage display green LED error display el error display none en channels en channels of groups to en channels and backplane bus en channels en channels en channels en channels en channels of groups to en channels and backplane bus en channels in backplane el error display en channels en channels en channels en channels of groups to en channels and backplane bus en channels en channe | |
| voltage display error display el error display el error display en channels en channels en channels of groups to en channels and backplane bus en channels and backplane bus en channels en channels en channels en channels and backplane bus en channels and backplane bus en channels in channels en channels e | |
| red LED el error display el error display none en channels en channels of groups to en channels and backplane bus on tested with DC 500 V lata channels ime basis length em pulse width f output protocol requirements user address red LED none red LED none red LED none red LED none | |
| el error display on en channels en channels of groups to en channels and backplane bus on tested with DC 500 V lata channels ime basis length m pulse width f output protocol requirements user address none | |
| en channels en channels of groups to en channels and backplane bus | |
| en channels en channels of groups to en channels and backplane bus on tested with DC 500 V | |
| en channels of groups to en channels and backplane bus on tested with DC 500 V lata channels channels channels channels - ime basis length m pulse width f output - protocol requirements user address - user address - - - - - - - - - - - - | |
| en channels and backplane bus on tested with DC 500 V lata channels ime basis length m pulse width f output protocol requirements user address | |
| Ion tested with DC 500 V Iata Channels Ime basis Iength Impulse width Incomput Incomposition of output Protocol Incomposition of output Incomp | |
| channels - | |
| channels - ime basis - length - im pulse width - f output - protocol requirements - user address - | |
| ime basis - length - m pulse width - length - le | |
| length | |
| protocol - requirements - user address - | |
| protocol - requirements - user address - | |
| protocol - requirements - user address - | |
| requirements - user address - | |
| requirements - user address - | |
| user address - | |
| | |
| log | |
| dog - | |
| annels - | |
| llse length - | |
| monitoring - | |
| zes | |

022-1BD20 - DO 4xDC 24V 2A > Technical data

| Order no. | 022-1BD20 |
|------------------------------|----------------------------|
| Input bytes | 0 |
| Output bytes | 1 |
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 58 g |
| Weight including accessories | 58 g |
| Gross weight | 73 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

022-1BD50 - DO 4xDC 24V 0.5A NPN

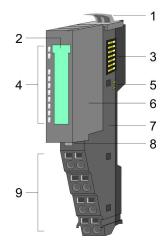
4.8 022-1BD50 - DO 4xDC 24V 0.5A NPN

Properties

The electronic module accepts binary control signals from the central bus system and transfers them to the process level via outputs. It has 4 channels connected to the power supply, which operate as low-side switch and their status is monitored via LEDs. Low-side switches are suited to switch grounds. With a short circuit between switch line and ground the load is activated but the power supply is not influenced.

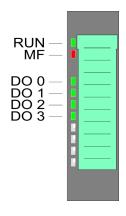
- 4 digital low-side outputs, isolated to the backplane bus
- Status indication of the channels via LEDs

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

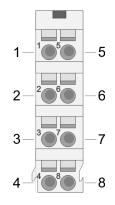
Status indication



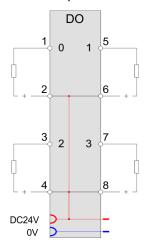
| RUN | MF | DO x | Description | |
|-----------------|-----|-------|---|--|
| green | red | green | | |
| | | X | Bus communication is OK | |
| | | ^ | Module status is OK | |
| | | | Bus communication is OK | |
| | | X | Module status reports an error with overload, short circuit or overheat | |
| | | | Bus communication is not possible | |
| | | X | Module status reports an error with overload, short circuit or overheat | |
| | | Χ | Error at bus power supply | |
| | | | Flashing: Error in configuration | |
| X | ZHz | X | Chap. 2.8 'Trouble shooting - LEDs' page 28 | |
| | | | Digital output has "1" signal | |
| | | | Digital output has "0" signal | |
| not relevant: X | | | | |

022-1BD50 - DO 4xDC 24V 0.5A NPN

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



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

O: Output



CAUTION!

Feeding in voltage at an output is not allowed and can destroy the module!

Input area

No byte of the input area is used by the module.

Output area

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

022-1BD50 - DO 4xDC 24V 0.5A NPN > Technical data

| Addr. | Name | Bytes | Function | IX | SX |
|-------|-------------------|----------------------|----------|-----|----|
| +0 | 0 PIQ 1 | State of the outputs | 5200h | | |
| | Bit 0: DO 0 | | 01h | | |
| | | Bit 1: DO 1 | | 02h | |
| | Bit 2: DO 2 | | 03h | | |
| | | Bit 3: DO 3 | | 04h | |
| | Bit 7 4: reserved | | | | |

4.8.1 Technical data

| Order no. | 022-1BD50 |
|---|----------------|
| Туре | SM 022 |
| Module ID | 0105 AFA0 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 75 mA |
| Power loss | 0.5 W |
| Technical data digital outputs | |
| Number of outputs | 4 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.428.8 V |
| Current consumption from load voltage L+ (without load) | 5 mA |
| Total current per group, horizontal configuration, 40°C | 2 A |
| Total current per group, horizontal configuration, 60°C | 2 A |
| Total current per group, vertical configuration | 2 A |
| Output current at signal "1", rated value | 0.5 A |
| Signal logic output | Sinking output |
| Output delay of "0" to "1" | 30 µs |
| Output delay of "1" to "0" | 100 μs |
| Minimum load current | - |
| Lamp load | 10 W |
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | ✓ |
| Switching frequency with resistive load | max. 1000 Hz |
| Switching frequency with inductive load | max. 0.5 Hz |
| Switching frequency on lamp load | max. 10 Hz |

022-1BD50 - DO 4xDC 24V 0.5A NPN > Technical data

| limitation of inductive shut-off voltage recuit protection of output level 1.7 A r of operating cycle of relay outputs | per channel |
|--|-------------|
| Ilevel 1.7 A r of operating cycle of relay outputs - ng capacity of contacts - data size 4 Bit information, alarms, diagnostics display green LED ts no salarm no stic interrupt no stic functions no stics information read-out none evoltage display green LED error display red LED no no no channels - n channels of groups to - n channels and backplane bus on tested with ata mannels me basis ength m pulse width | per channel |
| r of operating cycle of relay outputs and capacity of contacts data size data size display displa | |
| and capacity of contacts data size information, alarms, diagnostics display ts no salarm no stic interrupt no stics information read-out voltage display error display el error display n channels n channels of groups to n channels and backplane bus on tested with ata mannels me basis ength m pulse width | |
| data size information, alarms, diagnostics display green LEE ts no salarm no stic interrupt no stics information read-out voltage display green LEE error display error display le error display none n channels n channels of groups to n channels and backplane bus on tested with bata mannels me basis ength m pulse width | |
| display green LEE display no distic interrupt no distic functions no distics information read-out none display green LEE display green LEE display red LED display none | |
| display ts no salarm no stic interrupt no stics information read-out voltage display error display error display none n channels n channels of groups to n channels and backplane bus on tested with nannels | |
| no stic interrupt no no stic interrupt no no stic functions no no none stics information read-out none voltage display green LED error display red LED none none none none on channels of groups to none not channels and backplane bus on tested with DC 500 V ata nannels no none none no not stick with none not settled with none none not settled with none none none none none none none non | |
| salarm stic interrupt no stic functions no no stics information read-out voltage display green LED error display none n channels n channels n channels and backplane bus on tested with panannels mannels ne basis ength m pulse width | |
| stic interrupt stic functions no no stics information read-out none voltage display green LED error display el error display none n channels n channels n channels of groups to n channels and backplane bus on tested with ata nannels me basis ength m pulse width | |
| stic functions stics information read-out voltage display green LED error display red LED none n channels n channels of groups to n channels and backplane bus on tested with para basis ength m pulse width no none no none none none none none no | |
| stics information read-out voltage display error display red LED none n channels n channels of groups to n channels and backplane bus on tested with banannels mannels me basis ength m pulse width | |
| voltage display error display el error display none n channels n channels of groups to n channels and backplane bus on tested with pannels mannels me basis ength m pulse width green LED red LED none POD TOD TOD TOD TOD TOD TOD TOD | |
| red LED none If error display none n channels n channels of groups to n channels and backplane bus on tested with DC 500 V ata nannels ne basis ength m pulse width red LED none DC 500 | |
| none n channels n channels of groups to n channels and backplane bus on tested with nannels nannels nannels nannels nannels ne basis ength n pulse width | |
| n channels - n channels of groups to - n channels and backplane bus on tested with DC 500 V ata nannels - me basis - ength - m pulse width - | |
| n channels n channels of groups to n channels and backplane bus on tested with DC 500 V ata nannels ne basis ength m pulse width | |
| n channels of groups to n channels and backplane bus on tested with DC 500 V ata nannels ne basis ength m pulse width | |
| n channels and backplane bus on tested with DC 500 V ata nannels ne basis ength n pulse width - | |
| on tested with DC 500 V ata nannels me basis ength m pulse width DC 500 V | |
| ata nannels - me basis - ength - m pulse width - | |
| nannels - me basis - ength - m pulse width - | |
| me basis - ength - m pulse width - | |
| ength | |
| m pulse width - | |
| · | |
| output - | |
| | |
| | |
| protocol - | |
| requirements - | |
| user address - | |
| og - | |
| annels - | |
| se length - | |
| monitoring - | |
| es | |

022-1BD50 - DO 4xDC 24V 0.5A NPN > Technical data

| Order no. | 022-1BD50 |
|------------------------------|----------------------------|
| Input bytes | 0 |
| Output bytes | 1 |
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 57 g |
| Weight including accessories | 57 g |
| Gross weight | 72 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

022-1BD70 - DO 4xDC 24V 0.5A ETS

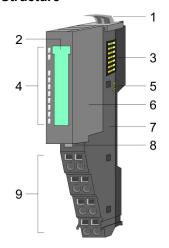
4.9 022-1BD70 - DO 4xDC 24V 0.5A ETS

Properties

The electronic module accepts binary control signals from the central bus system and transfers them time-controlled by means of ETS functionality to the process level via outputs. It has 4 channels and their status is monitored via LEDs. With configured ETS functionality (ETS = edge time stamp) depending on the configuration 5 (20byte) respectively 15 (60byte), you may transfer the states for the outputs together with a time value of the µs ticker as an ETS entry to the FIFO stack. The FIFO memory serves for space for max. 31 ETS entries.

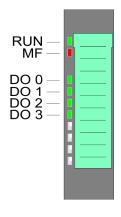
- 4 digital outputs, isolated to the backplane bus
- FIFO stack for 5 respectively 15 ETS entries (each 4byte)
- Diagnostics function
- Controlling by process image respectively handling blocks
- Status indication of the channels via LEDs

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

Status indication

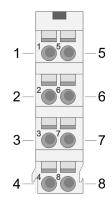


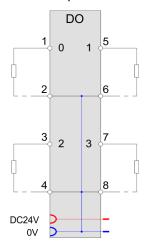
| RUN | MF | DO x | Description |
|---------------|-----|-------|---|
| green | red | green | 3-000 p. 1011 |
| | | Х | Bus communication is OK |
| | | X | Module status is OK |
| | | | Bus communication is OK |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | | Bus communication is not possible |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | X | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital output has "1" signal |
| | | | Digital output has "0" signal |
| not relevant: | : X | | |

022-1BD70 - DO 4xDC 24V 0.5A ETS

Pin assignment

For wires with a cross section of 0.08mm² up to 1.5mm².





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

O: Output



CAUTION!

Feeding in voltage at an output is not allowed and can destroy the module!

In-/Output area

With configured ETS functionality (ETS=edge time stamp) a time value (ETS_US) together with the state of the outputs (PIQ) and a running number (RN) may be stored as ETS entry in the process image.

You may configure the following variants:

- 022-1BD70 DO 4xDC 24V (20): FIFO with 20byte for 5 ETS entries
- 022-1BD70 DO 4xDC 24V (60): FIFO with 60byte for 15 ETS entries



Please consider, with a full FIFO stack no further ETS entries may be accepted.

To ensure that your ETS entries are kept, you should always check the state of the FIFO stack by STS_FIFO in the input area before.

022-1BD70 - DO 4xDC 24V 0.5A ETS

Input area 4byte

The input range is used for status message. At CPU, PROFIBUS and PROFINET the input area is embedded to the corresponding address area.

IX - IX = Index for access via CANopen.

SX - Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|-------|----------|-------|---|-------|-----|
| +0 | RN_LAST | 1 | Bit 5 0: | 5440h | 01h |
| | | | RN last FIFO entry | | |
| | | | Bit 6: 1 (fix) | | |
| | | | Bit 7: 0 (fix) | | |
| +1 | RN_NEXT | 1 | Bit 5 0: | | 02h |
| | | | RN next FIFO entry to be processed | | |
| | | | Bit 6: 1 (fix) | | |
| | | | Bit 7: 1 (fix) | | |
| +2 | STS_FIFO | 1 | State of the FIFO stack | | 03h |
| +3 | NUM_ETS | 1 | Number of ETS entries in the FIFO stack | | 04h |

RN_LAST

Bit $5 \dots 0$: Here the RN of the last ETS entry may be found, which was recognized as valid and written into the FIFO memory of the module.

Bit 6: 1 (fix) - serves for the identification in the process image

Bit 7: 0 (fix) - serves for the identification in the process image

RN_NEXT

Bit 5 ... 0: Here the RN of the ETS entry may be found, which will be executed next in the FIFO memory of the module.

Please consider Bit 6 and 7 of RN_NEXT are always set.

Bit 6: 1 (fix) - serves for the identification in the process image

Bit 7: 1 (fix) - serves for the identification in the process image

STS FIFO

The State informs about the state of the FIFO stack:

| STS_FIFO | Description |
|----------|--|
| 00h/80h | Everything is OK. You will get this message directly after the storage in the FIFO memory of the module. |
| 01h/81h | There is no following ETS entry in the FIFO. |
| | The RN does not correspond to the expected RN. Please check your RN in the output area. |
| 02h/82h | There are no new ETS entries in the FIFO. |
| 03h/83h | FIFO stack is full. There is no more place for further ETS entries. |

022-1BD70 - DO 4xDC 24V 0.5A ETS

If there are less ETS entries written as possible, additionally bit 6 of the last RN must be set. This is necessary; otherwise you have to overwrite the following entries with a "not valid" entry. The module ignores entries after an entry with a set bit 6. If there is an ETS entry in the FIFO memory, whose bit 6 is set, STS_FIFO is always returned ored with 80h.

NUM_ETS

Here always the current number of the ETS entries in the FIFO memory of the module may be found.

Structure of an ETS entry

Depending on the configuration up to 15 ETS entries may be written via the output area. Each ETS entry uses 4byte in the process image:

Output area 20byte respectively 60byte

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

- IX Index for access via CANopen. With s = Subindex the corresponding ETS entry is addressed.
- SX Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|-------|--------|-------|----------------|---------|-----|
| +0 | PIQ | 1 | Output byte | 5640h/s | 01h |
| +1 | RN | 1 | Running number | | 02h |
| +2 | ETS_US | 2 | μs ticker | | 03h |

PIQ

Here the state of the outputs for the corresponding time may be defined and the output channels may be enabled respectively disabled. The output byte has the following bit allocation:

Bit 3 ... 0: 0 (fix)
Bit 4: State DO 3
Bit 5: State DO 2
Bit 6: State DO 1

Bit 7: State DO 0

RN

RN (**R**unning **N**umber) is a continuous number 0 ... 63, which has to start with 1. With the RN the chronological order of the ETS entries may be defined. With each ETS entry RN is to be incremented, otherwise the ETS entry may not be recognized by the module.



If there are less ETS entries written as possible, additionally bit 6 of the last RN must be set. This is necessary; otherwise you have to overwrite the following entries with a "not valid" entry. The module ignores entries after an entry with a set bit 6.

022-1BD70 - DO 4xDC 24V 0.5A ETS

ETS_US

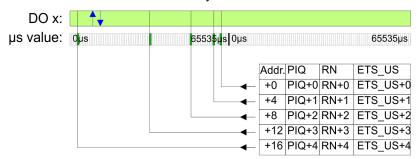
In the SLIO module there is a 32 bit timer (μ s ticker). With PowerON the timer starts counting. After 2^{32} -1 μ s the timer starts with 0 again. For ETS_US of an ETS entry you have to define a time value from the low word of the μ s ticker (0...65535 μ s).

Here please enter a time value in µs, to which the state of the outputs is to be taken.

Range of values: 0 ... 65535

ETS functionality

The following picture shows how the ETS entries are to be preset in the output area, so that these can be stored in the FIFO memory.



Output area 20byte respectively 60byte

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

- IX Index for access via CANopen. With s = Subindex the corresponding ETS entry is addressed.
- SX Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

Configured as 022-1BD70

DO 4xDC 24V (20)

20byte - 5 ETS entries

| Addr. | PIQ | IX=5640h | SX | Addr. | RN | IX=5640h | SX | Addr. | ETS-US | IX=5640h | SX |
|-------|-------|----------|-----|-------|------|----------|-----|-------|----------|----------|-----|
| +0 | PIQ+0 | s=1 | 01h | +1 | RN+0 | s=1 | 02h | +2 | ETS_US+0 | s=1 | 03h |
| +4 | PIQ+1 | s=2 | 04h | +5 | RN+1 | s=2 | 05h | +6 | ETS_US+1 | s=2 | 06h |
| +8 | PIQ+2 | s=3 | 07h | +9 | RN+2 | s=3 | 08h | +10 | ETS_US+2 | s=3 | 09h |
| +12 | PIQ+3 | s=4 | 0Ah | +13 | RN+3 | s=4 | 0Bh | +14 | ETS_US+3 | s=4 | 0Ch |
| +16 | PIQ+4 | s=5 | 0Dh | +17 | RN+4 | s=5 | 0Eh | +18 | ETS_US+4 | s=5 | 0Fh |

022-1BD70 - DO 4xDC 24V 0.5A ETS

Configured as 022-1BD70

DO 4xDC 24V (60)

60byte - 15 ETS entries

| Addr. | PIQ | IX=5640h | SX | Addr. | RN | IX=5640h | SX | Addr. | ETS-US | IX=5640h | SX |
|-------|--------|----------|-----|-------|-------|----------|-----|-------|-----------|----------|-----|
| +0 | PIQ+0 | s=1 | 01h | +1 | RN+0 | s=1 | 02h | +2 | ETS_US+0 | s=1 | 03h |
| +4 | PIQ+1 | s=2 | 04h | +5 | RN+1 | s=2 | 05h | +6 | ETS_US+1 | s=2 | 06h |
| +8 | PIQ+2 | s=3 | 07h | +9 | RN+2 | s=3 | 08h | +10 | ETS_US+2 | s=3 | 09h |
| +12 | PIQ+3 | s=4 | 0Ah | +13 | RN+3 | s=4 | 0Bh | +14 | ETS_US+3 | s=4 | 0Ch |
| +16 | PIQ+4 | s=5 | 0Dh | +17 | RN+4 | s=5 | 0Eh | +18 | ETS_US+4 | s=5 | 0Fh |
| +20 | PIQ+5 | s=6 | 10h | +21 | RN+5 | s=6 | 11h | +22 | ETS_US+5 | s=6 | 12h |
| +24 | PIQ+6 | s=7 | 13h | +25 | RN+6 | s=7 | 14h | +26 | ETS_US+6 | s=7 | 15h |
| +28 | PIQ+7 | s=8 | 16h | +29 | RN+7 | s=8 | 17h | +30 | ETS_US+7 | s=8 | 18h |
| +32 | PIQ+8 | s=9 | 19h | +33 | RN+8 | s=9 | 1Ah | +34 | ETS_US+8 | s=9 | 1Bh |
| +36 | PIQ+9 | s=10 | 1Ch | +37 | RN+9 | s=10 | 1Dh | +38 | ETS_US+9 | s=10 | 1Eh |
| +40 | PIQ+10 | s=11 | 1Fh | +41 | RN+10 | s=11 | 20h | +42 | ETS_US+10 | s=11 | 21h |
| +44 | PIQ+11 | s=12 | 22h | +45 | RN+11 | s=12 | 23h | +46 | ETS_US+11 | s=12 | 24h |
| +48 | PIQ+12 | s=13 | 25h | +49 | RN+12 | s=13 | 26h | +50 | ETS_US+12 | s=13 | 27h |
| +52 | PIQ+13 | s=14 | 28h | +53 | RN+13 | s=14 | 29h | +54 | ETS_US+13 | s=14 | 2Ah |
| +56 | PIQ+14 | s=15 | 2Bh | +57 | RN+14 | s=15 | 2Ch | +58 | ETS_US+14 | s=15 | 2Dh |



The ETS module may only be accessed by the System SLIO CPU by means of SFC 15 or via the process image. Only the input data of the ETS module may be read by individual accesses.

022-1BD70 - DO 4xDC 24V 0.5A ETS > Technical data

4.9.1 Technical data

| Order no. | 022-1BD70 |
|---|------------------------------------|
| Туре | SM 022 |
| Module ID | 0F43 57E2 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 105 mA |
| Power loss | 0.95 W |
| Technical data digital outputs | |
| Number of outputs | 4 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.428.8 V |
| Current consumption from load voltage L+ (without load) | 25 mA |
| Total current per group, horizontal configuration, 40°C | 2 A |
| Total current per group, horizontal configuration, 60°C | 2 A |
| Total current per group, vertical configuration | 2 A |
| Output current at signal "1", rated value | 0.5 A |
| Signal logic output | Sourcing output |
| Output delay of "0" to "1" | max. 100 ns |
| Output delay of "1" to "0" | max. 100 ns |
| Minimum load current | - |
| Lamp load | 10 W |
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | ✓ |
| Switching frequency with resistive load | max. 40 kHz |
| Switching frequency with inductive load | max. 40 kHz |
| Switching frequency on lamp load | max. 40 kHz |
| Internal limitation of inductive shut-off voltage | L+ (-52 V) |
| Short-circuit protection of output | yes, electronic, and only highside |
| Trigger level | 2.5 A |
| Number of operating cycle of relay outputs | - |
| Switching capacity of contacts | - |
| Output data size | 60 Byte |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |

022-1BD70 - DO 4xDC 24V 0.5A ETS > Technical data

| Order no. | 022-1BD70 |
|------------------------------------|----------------------------|
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | possible |
| Supply voltage display | green LED |
| Group error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| PWM data | |
| PWM channels | - |
| PWM time basis | - |
| Period length | - |
| Minimum pulse width | - |
| Type of output | - |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse length | - |
| Circuit monitoring | - |
| Datasizes | |
| Input bytes | 4 |
| Output bytes | 20 / 60 |
| Parameter bytes | 6 |
| Diagnostic bytes | 20 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |

022-1BD70 - DO 4xDC 24V 0.5A ETS > Parameter data

| Order no. | 022-1BD70 |
|------------------------------|-----------------|
| Net weight | 61 g |
| Weight including accessories | 61 g |
| Gross weight | 76 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

4.9.2 Parameter data

4.9.2.1 Parameters

The module has the following parameter data, which were fix set and may not be altered.

- DS Record set for access via CPU, PROFIBUS and PROFINET
- IX Index for access via CANopen
- SX Subindex for access via EtherCAT with Index 3100h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|-------|-------|--|------------------------|-----|-------|-----|
| PII_L | 1 | Length process image input data ¹ | 04h (fix) | 02h | 3100h | 01h |
| PIQ_L | 1 | Length process image output data 1, 2 | 14h resp. 3Ch (fix) | 02h | 3101h | 02h |

¹⁾ This record set may only be transferred at STOP state.

²⁾ This parameter depends on the configured variant.

| Р | Ш | L |
|---|---|---|
| | | |

| Byte | Bit 7 0 |
|------|--|
| 0 | The length of the process image of the input data is fix set to 4byte. |

PIQ_L

| Byte | Bit 7 0 |
|------|---|
| 0 | The length of the process image of the output data is fix set to the configured variant (14h or 3Ch). |

4.9.2.2 Example for the principle of operation

In the following it is demonstrated by an example, in which order the ETS entries are stored and processed.

022-1BD70 - DO 4xDC 24V 0.5A ETS > Parameter data

With this example a module is configured, which uses 20byte for 5 ETS entries in the output area PIQ.

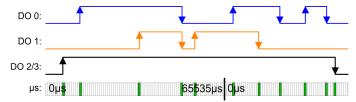
ETS values

With the following times of the μs ticker the following states of the outputs should be taken:

| RN | ETS_US | PIQ DO 0 | PIQ DO 1 | PIQ DO2 | PIQ DO 3 |
|-----|--------|----------|----------|---------|----------|
| | in µs | (Bit 7) | (Bit 6) | (Bit 5) | (Bit 4) |
| 01h | 6000 | 0 | 0 | 1 | 1 |
| 02h | 12506 | 1 | 0 | 1 | 1 |
| 03h | 34518 | 1 | 1 | 1 | 1 |
| 04h | 49526 | 0 | 0 | 1 | 1 |
| 05h | 54529 | 0 | 1 | 1 | 1 |
| 06h | 3500 | 1 | 1 | 1 | 1 |
| 07h | 12443 | 1 | 0 | 1 | 1 |
| 08h | 20185 | 0 | 0 | 1 | 1 |
| 09h | 30140 | 1 | 0 | 1 | 1 |
| 0Ah | 37330 | 0 | 0 | 1 | 1 |
| 0Bh | 40000 | 0 | 0 | 0 | 0 |

Time diagram

From the table you get the following time diagram:



Writing 5 ETS entries

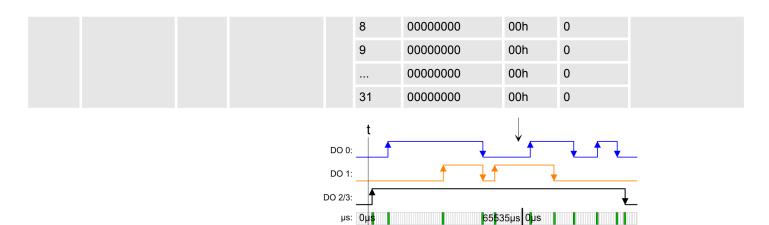
After writing the ETS entries into the process output image they are directly stored in the FIFO memory of the module.

The state of the outputs are shown in the diagram at the time "t".

In the PII you will find the status bytes.

| Addr. | PIQ | RN | ETS_US | \rightarrow | FIFO | PIQ | RN | ETS_US | PII |
|-------|----------|-----|--------|---------------|------|----------|-----|--------|---------------|
| +0 | 00110000 | 01h | 6000 | | 1 | 00110000 | 01h | 6000 | RN_LAST: 45h |
| +4 | 10110000 | 02h | 12506 | | 2 | 10110000 | 02h | 12506 | RN_NEXT: C1h |
| +8 | 11110000 | 03h | 34518 | | 3 | 11110000 | 03h | 34518 | STS_FIFO: 00h |
| +12 | 00110000 | 04h | 49526 | | 4 | 00110000 | 04h | 49526 | NUM_ETS: 05h |
| +16 | 01110000 | 05h | 54529 | | 5 | 01110000 | 05h | 54529 | |
| | | | | | 6 | 00000000 | 00h | 0 | |
| | | | | | 7 | 00000000 | 00h | 0 | |

022-1BD70 - DO 4xDC 24V 0.5A ETS > Parameter data



Executing ETS function for RN = 01h

The 1. ETS entry (RN = 01h) is executed and deleted in the FIFO.

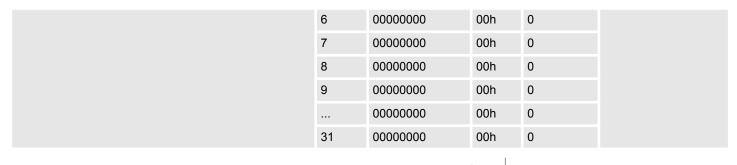
| Addr. | PIQ | RN | ETS_US | | FIFO | PIQ | RN | ETS_US | PII | |
|-------|----------|-----|--------|---------------|-----------------|----------|---------------------|--------|-------------------|--|
| +0 | 00110000 | 01h | 6000 | \rightarrow | 1 | 10110000 | 02h | 12506 | RN_LAST: 45h | |
| +4 | 10110000 | 02h | 12506 | | 2 | 11110000 | 03h | 34518 | RN_NEXT: C2h | |
| +8 | 11110000 | 03h | 34518 | | 3 | 00110000 | 04h | 49526 | STS_FIFO: 00h/02h | |
| +12 | 00110000 | 04h | 49526 | | 4 | 01110000 | 05h | 54529 | NUM_ETS: 04h | |
| +16 | 01110000 | 05h | 54529 | | 5 | 00000000 | 00h | 0 | | |
| | | | | | 6 | 00000000 | 00h | 0 | | |
| | | | | | 7 | 00000000 | 00h | 0 | | |
| | | | | | 8 | 00000000 | 00h | 0 | | |
| | | | | | 9 | 00000000 | 00h | 0 | | |
| | | | | | | 00000000 | 00h | 0 | | |
| | | | | | 31 | 00000000 | 00h | 0 | | |
| | | | | | t | | \downarrow _ | | _ | |
| | DO 0: | | | | | | | | | |
| | DO 1: | | | | | | | | | |
| | | | | | DO 2/3: | | betoe la | | <u></u> | |
| | | | | | µs: 0µ s | | 65 5 35µs 0µ | S | | |

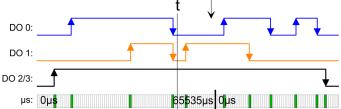
Executing ETS function for RN = 02h ... 04h

The states of RN = 02h ... RN 04h are successively issued and deleted in the FIFO.

| Addr. | PIQ | RN | ETS_US | | FIFO | PIQ | RN | ETS_US | PII |
|-------|----------|-----|--------|---------------|------|----------|-----|--------|-------------------|
| +0 | 00110000 | 01h | 6000 | \rightarrow | 1 | 01110000 | 05h | 54529 | RN_LAST: 45h |
| +4 | 10110000 | 02h | 12506 | | 2 | 0000000 | 00h | 0 | RN_NEXT: C5h |
| +8 | 11110000 | 03h | 34518 | | 3 | 00000000 | 00h | 0 | STS_FIFO: 00h/02h |
| +12 | 00110000 | 04h | 49526 | | 4 | 0000000 | 00h | 0 | NUM_ETS: 01h |
| +16 | 01110000 | 05h | 54529 | | 5 | 00000000 | 00h | 0 | |
| | | | | | | | | | |

022-1BD70 - DO 4xDC 24V 0.5A ETS > Parameter data

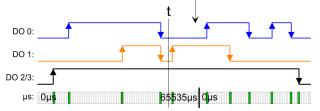




Writing 5 ETS entries

After writing the next 5 ETS entries into the process output image they are directly stored in the FIFO memory of the module.

| Addr. | PIQ | RN | ETS_US | | FIFO | PIQ | RN | ETS_US | PII |
|-------|----------|-----|--------|---------------|------|----------|-----|--------|-------------------|
| +0 | 11110000 | 06h | 3500 | \rightarrow | 1 | 01110000 | 05h | 54529 | RN_LAST: 4Ah |
| +4 | 10110000 | 07h | 12443 | | 2 | 11110000 | 06h | 3500 | RN_NEXT: C5h |
| +8 | 00110000 | 08h | 20185 | | 3 | 10110000 | 07h | 12443 | STS_FIFO: 00h/02h |
| +12 | 10110000 | 09h | 30140 | | 4 | 00110000 | 08h | 20185 | NUM_ETS: 06h |
| +16 | 00110000 | 0Ah | 37330 | | 5 | 10110000 | 09h | 30140 | |
| | | | | | 6 | 00110000 | 0Ah | 37330 | |
| | | | | | 7 | 00000000 | 00h | 0 | |
| | | | | | 8 | 00000000 | 00h | 0 | |
| | | | | | 9 | 00000000 | 00h | 0 | |
| | | | | | | 00000000 | 00h | 0 | |
| | | | | | 31 | 00000000 | 00h | 0 | |



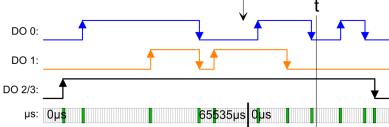
Executing ETS function for RN = 06h ... 08h

The states of RN = $06h \dots RN 08h$ are successively issued and deleted in the FIFO.

| Addr. | PIQ | RN | ETS_US | | FIFO | PIQ | RN | ETS_US | PII |
|-------|----------|-----|--------|---------------|------|----------|-----|--------|-------------------|
| +0 | 11110000 | 06h | 3500 | \rightarrow | 1 | 10110000 | 09h | 30140 | RN_LAST: 4Ah |
| +4 | 10110000 | 07h | 12443 | | 2 | 00110000 | 0Ah | 37330 | RN_NEXT: C5h |
| | | | | | | | | | STS_FIFO: 00h/02h |

022-1BD70 - DO 4xDC 24V 0.5A ETS > Parameter data

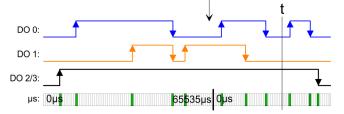
| +8 | 00110000 | 08h | 20185 | 3 | 00000000 | 00h | 0 | NUM_ETS: 02h |
|-----|----------|-----|-------|----|----------|-----|---|--------------|
| +12 | 10110000 | 09h | 30140 | 4 | 00000000 | 00h | 0 | |
| +16 | 00110000 | 0Ah | 37330 | 5 | 00000000 | 00h | 0 | |
| | | | | 6 | 00000000 | 00h | 0 | |
| | | | | 7 | 00000000 | 00h | 0 | |
| | | | | 8 | 00000000 | 00h | 0 | |
| | | | | 9 | 00000000 | 00h | 0 | |
| | | | | | 00000000 | 00h | 0 | |
| | | | | 31 | 00000000 | 00h | 0 | |
| | | | | | | | • | |



Writing last ETS entry

Since less than 5 ETS entries are written, bit 6 of RN of the last ETS entry must always be set. RN = 0Bh becomes 4Bh.

| Addr. | PIQ | RN | ETS_US | | FIFO | PIQ | RN | ETS_US | PII |
|-------|----------|-----|--------|---------------|------|----------|-----|--------|-------------------|
| +0 | 00000000 | 4Bh | 40000 | \rightarrow | 1 | 10110000 | 09h | 30140 | RN_LAST: 4Bh |
| +4 | 10110000 | 07h | 12443 | | 2 | 00110000 | 0Ah | 37330 | RN_NEXT: C9h |
| +8 | 00110000 | 08h | 20185 | | 3 | 00000000 | 4Bh | 40000 | STS_FIFO: 80h/82h |
| +12 | 10110000 | 09h | 30140 | | 4 | 00000000 | 00h | 0 | NUM_ETS: 03h |
| +16 | 00110000 | 0Ah | 37330 | | 5 | 00000000 | 00h | 0 | |
| | | | | | 6 | 00000000 | 00h | 0 | |
| | | | | | 7 | 00000000 | 00h | 0 | |
| | | | | | 8 | 00000000 | 00h | 0 | |
| | | | | | 9 | 00000000 | 00h | 0 | |
| | | | | | | 00000000 | 00h | 0 | |
| | | | | | 31 | 00000000 | 00h | 0 | |

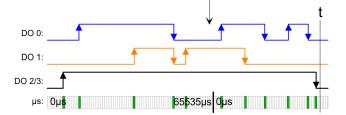


Executing ETS function for RN = 09h ... 4Bh

The states of RN = 09h ... RN 4Bh are successively issued and deleted in the FIFO.

022-1BD70 - DO 4xDC 24V 0.5A ETS > Parameter data

| Addr. | PIQ | RN | ETS_US | | FIFO | PIQ | RN | ETS_US | PII |
|-------|----------|-----|--------|---------------|------|----------|-----|--------|-------------------|
| +0 | 00000000 | 4Bh | 40000 | \rightarrow | 1 | 00000000 | 00h | 0 | RN_LAST: 4Bh |
| +4 | 10110000 | 07h | 12443 | | 2 | 00000000 | 00h | 0 | RN_NEXT: CCh |
| +8 | 00110000 | 08h | 20185 | | 3 | 00000000 | 00h | 0 | STS_FIFO: 80h/82h |
| +12 | 10110000 | 09h | 30140 | | 4 | 00000000 | 00h | 0 | NUM_ETS: 00h |
| +16 | 00110000 | 0Ah | 37330 | | 5 | 00000000 | 00h | 0 | |
| | | | | | 6 | 00000000 | 00h | 0 | |
| | | | | | 7 | 00000000 | 00h | 0 | |
| | | | | | 8 | 00000000 | 00h | 0 | |
| | | | | | 9 | 00000000 | 00h | 0 | |
| | | | | | | 00000000 | 00h | 0 | |
| | | | | | 31 | 00000000 | 00h | 0 | |





Please consider the ETS modules can only effectively be used together with head modules, which have an integrated μ s ticker. The Ethernet coupler with ModbusTCP 053-1MT00 for example does not have an μ s ticker.

022-1BD70 - DO 4xDC 24V 0.5A ETS > Diagnostic data

4.9.3 Diagnostic data

This module does not support interrupt functions, the diagnostic data serve the information about this module.

- DS Record set for access via CPU, PROFIBUS and PROFINET. The access happens by DS 01h. Additionally the first 4 bytes may be accessed by DS 00h.
- IX Index for access via CANopen. The access happens by IX 2F01h. Additionally the first 4 bytes may be accessed by IX 2F00h.
- SX Subindex for access via EtherCAT with Index 5005h.

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|------------------|-------|--|---------|-----|-------|---------|
| ERR_A | 1 | reserved | 00h | 01h | 2F01h | 02h |
| MODTYP | 1 | Module information | 1Fh | | | 03h |
| ERR_C | 1 | reserved | 00h | | | 04h |
| ERR_D | 1 | reserved | 00h | | | 05h |
| CHTYP | 1 | Channel type | 72h | | | 06h |
| NUMBIT | 1 | Number of diagnostics bits per channel | 00h | | | 07h |
| NUMCH | 1 | Number channels of the module | 04h | | | 08h |
| CHERR | 1 | reserved | 00h | | | 09h |
| CH0ERR CH7ERR | 8 | reserved | 00h | | | 0Ah 11h |
| DIAG_US | 4 | μs ticker (32bit) | 00h | | | 13h |

MODTYP Modul information

| Byte | Bit 7 0 |
|------|------------------------------------|
| 0 | Bit 3 0: Module class |
| | 1111b Digital module |
| | Bit 4: Channel information present |
| | Bit 7 5: reserved |

CHTYP Channel type

| Byte | Bit 7 0 | |
|------|-----------------------|--|
| 0 | Bit 6 0: Channel type | |
| | 72h: Digital output | |
| | Bit 7: 0 (fix) | |

NUMBIT Diagnostic bits

| Byte | Bit 7 0 |
|------|---|
| 0 | Number of diagnostics bits of the module per channel (here 00h) |

022-1BD70 - DO 4xDC 24V 0.5A ETS > Diagnostic data

| NUMCH Number | of | chan- |
|--------------|----|-------|
| nels | | |

| Byte | Bit 7 0 |
|------|---|
| 0 | Number of channels of the module (here 04h) |

DIAG_US µs ticker

| Byte | Bit 7 0 |
|------|---|
| 0 3 | Value of the μs ticker at the moment of the diagnostic data generation |

ERR_A/C/D CHERR, CHxERR reserved

| Byte | Bit 7 0 |
|------|----------|
| 0 | reserved |

022-1BF00 - DO 8xDC 24V 0.5A

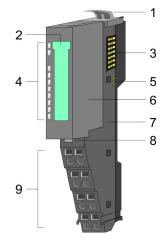
4.10 022-1BF00 - DO 8xDC 24V 0.5A

Properties

The electronic module accepts binary control signals from the central bus system and transfers them to the process level via outputs. It has 8 channels and their status is monitored via LEDs.

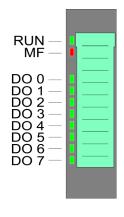
- 8 digital outputs, isolated to the backplane bus
- Status indication of the channels via LEDs

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

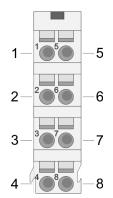
Status indication



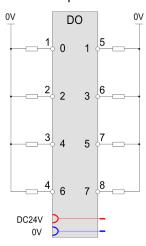
| RUN | MF | DO x | Description | |
|-----------------|-----|----------|---|--|
| green | red | green | | |
| | | X | Bus communication is OK | |
| | | X | Module status is OK | |
| | | | Bus communication is OK | |
| | | X | Module status reports an error with overload, short circuit or overheat | |
| | • | X | Bus communication is not possible | |
| | | | Module status reports an error with overload, short circuit or overheat | |
| | | Χ | Error at bus power supply | |
| | | | Flashing: Error in configuration | |
| X | ZHz | X | ⇔ Chap. 2.8 'Trouble shooting - LEDs' page 28 | |
| | | | Digital output has "1" signal | |
| | | | Digital output has "0" signal | |
| not relevant: X | | | | |

022-1BF00 - DO 8xDC 24V 0.5A

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



| Pos. | Function | Туре | Description |
|------|----------|------|---------------------|
| 1 | DO 0 | 0 | Digital output DO 0 |
| 2 | DO 2 | 0 | Digital output DO 2 |
| 3 | DO 4 | 0 | Digital output DO 4 |
| 4 | DO 6 | 0 | Digital output DO 6 |
| 5 | DO 1 | 0 | Digital output DO 1 |
| 6 | DO 3 | 0 | Digital output DO 3 |
| 7 | DO 5 | 0 | Digital output DO 5 |
| 8 | DO 7 | 0 | Digital output DO 7 |

O: Output



CAUTION!

Feeding in voltage at an output is not allowed and can destroy the module!

Input area

No byte of the input area is used by the module.

Output area

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

022-1BF00 - DO 8xDC 24V 0.5A > Technical data

| Addr. | Name | Bytes | Function | IX | SX |
|-------|------|-------|----------------------|-------------|-----|
| +0 | PIQ | PIQ 1 | State of the outputs | | |
| | | | Bit 0: DO 0 | | 01h |
| | | | Bit 1: DO 1 | | 02h |
| | | | Bit 2: DO 2 | | 03h |
| | | | Bit 3: DO 3 | | 04h |
| | | | Bit 4: DO 4 | | 05h |
| | | | Bit 5: DO 5 | | 06h |
| | | | Bit 6: DO 6 | | 07h |
| | | | 1 | Bit 7: DO 7 | |

4.10.1 Technical data

| Order no. | 022-1BF00 |
|---|-----------------|
| Туре | SM 022 |
| Module ID | 0106 AFC8 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 80 mA |
| Power loss | 0.7 W |
| Technical data digital outputs | |
| Number of outputs | 8 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.428.8 V |
| Current consumption from load voltage L+ (without load) | 15 mA |
| Total current per group, horizontal configuration, 40°C | 4 A |
| Total current per group, horizontal configuration, 60°C | 4 A |
| Total current per group, vertical configuration | 4 A |
| Output current at signal "1", rated value | 0.5 A |
| Signal logic output | Sourcing output |
| Output delay of "0" to "1" | 30 µs |
| Output delay of "1" to "0" | 175 µs |
| Minimum load current | - |
| Lamp load | 10 W |
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | ✓ |

022-1BF00 - DO 8xDC 24V 0.5A > Technical data

| Order no. | 022-1BF00 |
|---|-----------------------|
| Switching frequency with resistive load | max. 1000 Hz |
| Switching frequency with inductive load | max. 0.5 Hz |
| Switching frequency on lamp load | max. 10 Hz |
| Internal limitation of inductive shut-off voltage | L+ (-45 V) |
| Short-circuit protection of output | yes, electronic |
| Trigger level | 1 A |
| Number of operating cycle of relay outputs | - |
| Switching capacity of contacts | - |
| Output data size | 8 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | none |
| Supply voltage display | green LED |
| Group error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| PWM data | |
| PWM channels | ± |
| PWM time basis | ± |
| Period length | ± |
| Minimum pulse width | ± |
| Type of output | - |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |

022-1BF00 - DO 8xDC 24V 0.5A > Technical data

| Order no. | 022-1BF00 |
|------------------------------|----------------------------|
| Test pulse length | - |
| Circuit monitoring | - |
| Datasizes | |
| Input bytes | 0 |
| Output bytes | 1 |
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 58 g |
| Weight including accessories | 58 g |
| Gross weight | 73 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

022-1BF50 - DO 8xDC 24V 0.5A NPN

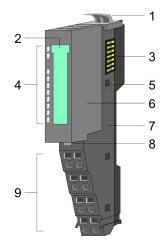
4.11 022-1BF50 - DO 8xDC 24V 0.5A NPN

Properties

The electronic module accepts binary control signals from the central bus system and transfers them to the process level via outputs. It has 8 channels connected to the power supply, which operate as low-side switch and their status is monitored via LEDs. Low-side switches are suited to switch grounds. With a short circuit between switch line and ground the load is activated but the power supply is not influenced.

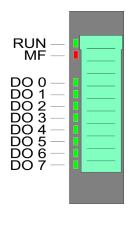
- 8 digital low-side outputs, isolated to the backplane bus
- Status indication of the channels via LEDs.

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

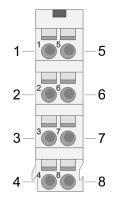
Status indication



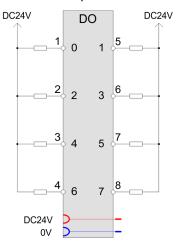
| RUN | MF | DO x | Description |
|-----------------|-----|-------|---|
| green | red | green | Description |
| | | X | Bus communication is OK |
| | | ^ | Module status is OK |
| | | | Bus communication is OK |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | | Bus communication is not possible |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | Χ | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital output has "1" signal |
| | | | Digital output has "0" signal |
| not relevant: X | | | |

022-1BF50 - DO 8xDC 24V 0.5A NPN

Pin assignment



For wires with a cross section of 0.08mm² up to 1.5mm².



| Pos. | Function | Туре | Description |
|------|----------|------|---------------------|
| 1 | DO 0 | 0 | Digital output DO 0 |
| 2 | DO 2 | 0 | Digital output DO 2 |
| 3 | DO 4 | 0 | Digital output DO 4 |
| 4 | DO 6 | 0 | Digital output DO 6 |
| 5 | DO 1 | 0 | Digital output DO 1 |
| 6 | DO 3 | 0 | Digital output DO 3 |
| 7 | DO 5 | 0 | Digital output DO 5 |
| 8 | DO 7 | 0 | Digital output DO 7 |

O: Output



CAUTION!

Feeding in voltage at an output is not allowed and can destroy the module!

Input area

No byte of the input area is used by the module.

Output area

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

022-1BF50 - DO 8xDC 24V 0.5A NPN > Technical data

| Addr. | Name | Bytes | Function | IX | SX |
|-------|-------|-------------|----------------------|-----|-----|
| +0 | PIQ 1 | 1 | State of the outputs | | |
| | | | Bit 0: DO 0 | | 01h |
| | | | Bit 1: DO 1 | | 02h |
| | | | Bit 2: DO 2 | | 03h |
| | | | Bit 3: DO 3 | | 04h |
| | | | Bit 4: DO 4 | | 05h |
| | | | Bit 5: DO 5 | | 06h |
| | | | Bit 6: DO 6 | | 07h |
| | | Bit 7: DO 7 | | 08h | |

4.11.1 Technical data

| Order no. | 022-1BF50 |
|---|----------------|
| Туре | SM 022 |
| Module ID | 0107 AFC8 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 80 mA |
| Power loss | 0.6 W |
| Technical data digital outputs | |
| Number of outputs | 8 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.428.8 V |
| Current consumption from load voltage L+ (without load) | 10 mA |
| Total current per group, horizontal configuration, 40°C | 2.5 A |
| Total current per group, horizontal configuration, 60°C | 2.5 A |
| Total current per group, vertical configuration | 2.5 A |
| Output current at signal "1", rated value | 0.5 A |
| Signal logic output | Sinking output |
| Output delay of "0" to "1" | 30 µs |
| Output delay of "1" to "0" | 100 μs |
| Minimum load current | - |
| Lamp load | 10 W |
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | ✓ |

022-1BF50 - DO 8xDC 24V 0.5A NPN > Technical data

| Switching frequency with resistive load Switching frequency with inductive load Switching frequency on lamp load Internal limitation of inductive shut-off voltage Short-circuit protection of output Trigger level 1.7 A Number of operating cycle of relay outputs Switching capacity of contacts Output data size Status information, alarms, diagnostics Status display Interrupts Process alarm Diagnostic interrupt Diagnostic functions Diagnostic functions max. 1000 Hz max. 0.5 Hz max. 10 Hz max. | |
|--|--|
| Switching frequency on lamp load Internal limitation of inductive shut-off voltage Short-circuit protection of output Trigger level 1.7 A Number of operating cycle of relay outputs Switching capacity of contacts Output data size Status information, alarms, diagnostics Status display Interrupts Process alarm Diagnostic interrupt Diagnostic functions max. 10 Hz #45 V #45 V #8 Section of the process alarm no max. 10 Hz ##8 Process alarm no no max. 10 Hz ##8 Process alarm no no no no no no no no no n | |
| Internal limitation of inductive shut-off voltage Short-circuit protection of output Trigger level 1.7 A Number of operating cycle of relay outputs Switching capacity of contacts Output data size Status information, alarms, diagnostics Status display Interrupts Process alarm Diagnostic interrupt Diagnostic functions +45 V yes, electronic 1.7 A | |
| Short-circuit protection of output Trigger level 1.7 A Number of operating cycle of relay outputs Switching capacity of contacts Output data size Status information, alarms, diagnostics Status display Interrupts Process alarm Diagnostic interrupt Diagnostic functions yes, electronic 1.7 A Number of operating cycle of relay outputs - Switching capacity of contacts - Output data size 8 Bit Status information, alarms, diagnostics green LED per channel no no Diagnostic interrupt no | |
| Trigger level 1.7 A Number of operating cycle of relay outputs - Switching capacity of contacts - Output data size 8 Bit Status information, alarms, diagnostics Status display green LED per channel Interrupts no Process alarm no Diagnostic interrupt no Diagnostic functions no | |
| Number of operating cycle of relay outputs Switching capacity of contacts Output data size 8 Bit Status information, alarms, diagnostics Status display green LED per channel Interrupts no Process alarm no Diagnostic interrupt no Diagnostic functions | |
| Switching capacity of contacts Output data size 8 Bit Status information, alarms, diagnostics Status display green LED per channel Interrupts no Process alarm no Diagnostic interrupt no Diagnostic functions | |
| Output data size Status information, alarms, diagnostics Status display Interrupts Process alarm Diagnostic interrupt Diagnostic functions 8 Bit 8 represented the per channel no no no no no no no | |
| Status information, alarms, diagnostics Status display green LED per channel Interrupts no Process alarm no Diagnostic interrupt no Diagnostic functions no | |
| Status display green LED per channel Interrupts no Process alarm no Diagnostic interrupt no Diagnostic functions no | |
| Interrupts no Process alarm no Diagnostic interrupt no Diagnostic functions no | |
| Process alarm no Diagnostic interrupt no Diagnostic functions no | |
| Diagnostic interrupt no Diagnostic functions no | |
| Diagnostic functions no | |
| - | |
| Diagnostics information road out | |
| Diagnostics information read-out none | |
| Supply voltage display green LED | |
| Group error display red LED | |
| Channel error display none | |
| Isolation | |
| Between channels - | |
| Between channels of groups to - | |
| Between channels and backplane bus ✓ | |
| Insulation tested with DC 500 V | |
| PWM data | |
| PWM channels - | |
| PWM time basis - | |
| Period length - | |
| Minimum pulse width - | |
| Type of output - | |
| Safety | |
| Safety protocol - | |
| Safety requirements - | |
| Secure user address - | |
| Watchdog - | |
| Two channels - | |

022-1BF50 - DO 8xDC 24V 0.5A NPN > Technical data

| Order no. | 022-1BF50 |
|------------------------------|----------------------------|
| Test pulse length | - |
| Circuit monitoring | - |
| Datasizes | |
| Input bytes | 0 |
| Output bytes | 1 |
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 58 g |
| Weight including accessories | 58 g |
| Gross weight | 73 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

022-1DF00 - DO 8xDC 24V 0.5A Diagnostic

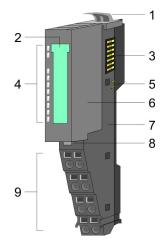
4.12 022-1DF00 - DO 8xDC 24V 0.5A Diagnostic

Properties

The electronic module with diagnosis accepts binary control signals from the central bus system and transfers them to the process level via outputs. It has 8 channels and their status is monitored via LEDs.

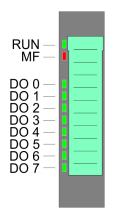
- 8 digital outputs, isolated to the backplane bus
- Monitoring wire-break and short-circuit
- Diagnostics function
- Status indication of the channels via LEDs

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

Status indication

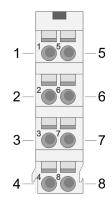


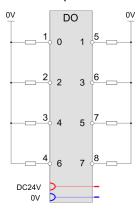
| RUN green | MF ■ red | DO x green | Description |
|-----------------|-------------|------------|--|
| green | Tea | green | December 1 of the 1 of the 1 |
| | | X | Bus communication is OK |
| _ | | | Module status is OK |
| | | | Bus communication is OK |
| | | X | Module status reports an error with wire- break and short-circuit |
| | | | Bus communication is not possible |
| | | X | Module status reports an error with wire- break and short-circuit |
| | | X | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | ⇔ Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Digital output has "1" signal |
| | | | Digital output has "0" signal |
| not relevant: X | | | |

022-1DF00 - DO 8xDC 24V 0.5A Diagnostic

Pin assignment

For wires with a cross section of 0.08mm² up to 1.5mm².





| Pos. | Function | Туре | Description |
|------|----------|------|---------------------|
| 1 | DO 0 | 0 | Digital output DO 0 |
| 2 | DO 2 | 0 | Digital output DO 2 |
| 3 | DO 4 | 0 | Digital output DO 4 |
| 4 | DO 6 | 0 | Digital output DO 6 |
| 5 | DO 1 | 0 | Digital output DO 1 |
| 6 | DO 3 | 0 | Digital output DO 3 |
| 7 | DO 5 | 0 | Digital output DO 5 |
| 8 | DO 7 | 0 | Digital output DO 7 |

O: Output



CAUTION!

Feeding in voltage at an output is not allowed and can destroy the module!

Input area

No byte of the input area is used by the module.

Output area

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

022-1DF00 - DO 8xDC 24V 0.5A Diagnostic > Technical data

| Addr. | Name | Bytes | Function | IX | SX |
|-------|------|-------------------------|----------------------|-------|-----|
| +0 | PIQ | 1 | State of the outputs | 6200h | |
| | | Bit 0: DO 0 Bit 1: DO 1 | Bit 0: DO 0 | | 01h |
| | | | Bit 1: DO 1 | | 02h |
| | | | Bit 2: DO 2 | | 03h |
| | | | Bit 3: DO 3 | | 04h |
| | | | Bit 4: DO 4 | | 05h |
| | | | Bit 5: DO 5 | | 06h |
| | | | Bit 6: DO 6 | | 07h |
| | | | Bit 7: DO 7 | | 08h |

4.12.1 Technical data

| Order no. | 022-1DF00 |
|---|-----------------|
| Туре | SM 022 |
| Module ID | 0113 2F48 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 70 mA |
| Power loss | 1 W |
| Technical data digital outputs | |
| Number of outputs | 8 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.428.8 V |
| Current consumption from load voltage L+ (without load) | 11 mA |
| Total current per group, horizontal configuration, 40°C | 4 A |
| Total current per group, horizontal configuration, 60°C | 4 A |
| Total current per group, vertical configuration | 4 A |
| Output current at signal "1", rated value | 0.5 A |
| Signal logic output | Sourcing output |
| Output delay of "0" to "1" | max. 350 μs |
| Output delay of "1" to "0" | max. 350 µs |
| Minimum load current | - |
| Lamp load | 10 W |
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | ✓ |
| | |

022-1DF00 - DO 8xDC 24V 0.5A Diagnostic > Technical data

| Order no. | 022-1DF00 |
|---|-----------------------|
| Switching frequency with resistive load | max. 1000 Hz |
| Switching frequency with inductive load | max. 0.5 Hz |
| Switching frequency on lamp load | max. 10 Hz |
| Internal limitation of inductive shut-off voltage | L+ (-52 V) |
| Short-circuit protection of output | yes, electronic |
| Trigger level | 1 A |
| Number of operating cycle of relay outputs | - |
| Switching capacity of contacts | - |
| Output data size | 8 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | yes, parameterizable |
| Process alarm | no |
| Diagnostic interrupt | yes, parameterizable |
| Diagnostic functions | yes |
| Diagnostics information read-out | possible |
| Supply voltage display | green LED |
| Group error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| PWM data | |
| PWM channels | - |
| PWM time basis | - |
| Period length | - |
| Minimum pulse width | - |
| Type of output | - |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |

022-1DF00 - DO 8xDC 24V 0.5A Diagnostic > Parameter data

| Order no. | 022-1DF00 |
|------------------------------|----------------------------|
| Test pulse length | - |
| Circuit monitoring | - |
| Datasizes | |
| Input bytes | 0 |
| Output bytes | 1 |
| Parameter bytes | 7 |
| Diagnostic bytes | 20 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 57 g |
| Weight including accessories | 57 g |
| Gross weight | 71 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

4.12.2 Parameter data

DS - Record set for access via CPU, PROFIBUS and PROFINET

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 3100h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|---|-------|----------------------------|---------|-----|-------|-----|
| DIAG_EN | 1 | Diagnostics* | 00h | 00h | 3100h | 01h |
| WIBRK_EN | 1 | Wire-break recognition* | 00h | 00h | 3101h | 02h |
| CH0D_EN | 1 | Short-circuit recognition* | 00h | 00h | 3102h | 03h |
| *) This record set may only be transferred at STOP state. | | | | | | |

022-1DF00 - DO 8xDC 24V 0.5A Diagnostic > Diagnostic data

DIAG_EN Diagnostic interrupt

| Byte | Bit 7 0 |
|------|----------------------|
| 0 | Diagnostic interrupt |
| | 00h: disable |
| | 40h: enable |

Here you activate res. de-activate the diagnostic function.

WIBRK_EN Wire-break recognition

| Byte | Bit 7 0 |
|------|---|
| 0 | Bit 0: Wire-break recognition channel 0 (1: on) |
| | Bit 1: Wire-break recognition channel 1 (1: on) |
| | |
| | Bit 7: Wire-break recognition channel 7 (1: on) |

Here you activate res. de-activate the Wire-break recognition.

CH0D_EN Short-circuit recognition

| Byte | Bit 7 0 |
|------|---|
| 0 | Bit 0: Short-circuit recognition channel 0 (1:on) |
| | Bit 1: Short-circuit recognition channel 1 (1:on) |
| | |
| | Bit 7: Short-circuit recognition channel 7 (1:on) |

Here you activate res. de-activate the Short-circuit recognition.

4.12.3 Diagnostic data

The following errors are listed in the diagnostics data:

- Error in project engineering / parameterization
- Wire-break
- Short-circuit
- Error external auxiliary supply
- DS Record set for access via CPU, PROFIBUS and PROFINET. The access happens by DS 01h. Additionally the first 4 bytes may be accessed by DS 00h.
- IX Index for access via CANopen. The access happens by IX 2F01h. Additionally the first 4 bytes may be accessed by IX 2F00h.
- SX Subindex for access via EtherCAT with Index 5005h.

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|--------|-------|--------------------|---------|-----|-------|-----|
| ERR_A | 1 | Diagnostic | 00h | 01h | 2F01h | 02h |
| MODTYP | 1 | Module information | 1Fh | | | 03h |
| RES2 | 1 | reserved | 00h | | | 04h |
| ERR_D | 1 | Diagnostic | 00h | | | 05h |

022-1DF00 - DO 8xDC 24V 0.5A Diagnostic > Diagnostic data

| Name | Bytes | Function | Default | DS | IX | SX |
|---------|-------|------------------------------------|---------|----|----|-----|
| CHTYP | 1 | Channel type | 72h | | | 06h |
| NUMBIT | 1 | Number diagnostic bits per channel | 08h | | | 07h |
| NUMCH | 1 | Number of channels of a module | 08h | | | 08h |
| CHERR | 1 | Channel error | 00h | | | 09h |
| CH0ERR | 1 | Channel-specific error channel 0 | 00h | | | 0Ah |
| CH1ERR | 1 | Channel-specific error channel 1 | 00h | | | 0Bh |
| | | | | | | |
| CH7ERR | 1 | Channel-specific error channel 7 | 00h | | | 11h |
| DIAG_US | 4 | μs ticker (32bit) | 00h | | | 13h |

ERR_A Diagnostic

| Byte | Bit 7 0 |
|------|---|
| 0 | Bit 0: set at module failure |
| | Bit 1: set at internal error |
| | Bit 2: set at external error |
| | Bit 3: set at channel error |
| | Bit 4: set at external auxiliary supply missing |
| | Bit 5, 6: reserved |
| | Bit 7: set at error in parameterization |

MODTYP Module information

| Byte | Bit 7 0 |
|------|---|
| 0 | Bit 3 0: module class |
| | 1111b: Digital module |
| | Bit 4: set at channel information present |
| | Bit 7 5: reserved |

ERR_D Diagnostic

| Byte | Bit 7 0 | | | |
|------|--|--|--|--|
| 0 | Bit 3 0: reserved | | | |
| | Bit 4: set at internal communication error | | | |
| | Bit 7 5: reserved | | | |

CHTYP Channel type

| Byte | Bit 7 0 | |
|------|-----------------------|--|
| 0 | Bit 6 0: channel type | |
| | 72h: Digital output | |
| | Bit 7: reserved | |

022-1DF00 - DO 8xDC 24V 0.5A Diagnostic > Diagnostic data

NUMBIT Diagnostic bits

| Byte | Bit 7 0 |
|------|---------------------------------------|
| 0 | Number of diagnostic bits per channel |
| | (here 08h) |

NUMCH Channels

| Byte | Bit 7 0 | |
|------|--------------------------------|--|
| 0 | Number of channels of a module | |
| | (here 08h) | |

CHERR Channel error

| Byte | Bit 7 0 |
|------|----------------------------------|
| 0 | Bit 0: set at error in channel 0 |
| | Bit 1: set at error in channel 1 |
| | |
| | Bit 7: set at error in channel 7 |

CH0ERR CH1ERR Channel specific

| Byte | Bit 7 0 |
|------|---|
| 0 | Channel-specific error channel x: |
| | Bit 0: set at configuring- / parameter assignment error |
| | Bit 1: reserved |
| | Bit 2: short-circuit to +DC 24V |
| | Bit 3: short-circuit to M |
| | Bit 4: set at wire-break |
| | Bit 7 5: reserved |

DIAG_US µs ticker

| Byte | Bit 7 0 |
|------|--|
| 03 | Value of the µs ticker at the moment of the diagnostic |

µs ticker

In the SLIO module there is a timer (μ s ticker). With PowerON the timer starts counting with 0. After 2^{32} - 1μ s the timer starts with 0 again.

022-1HB10 - DO 2xRelay

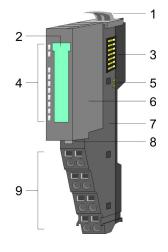
4.13 022-1HB10 - DO 2xRelay

Properties

The electronic module accepts binary control signals from the central bus system and transfers them to the process level via relay outputs. It has 2 channels that operate as switches and the status of each channel is monitored via LEDs.

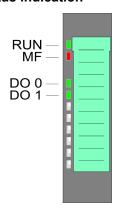
- 2 relay outputs, isolated to the backplane bus
- DC 30V / AC 230V, 3A
- Status indication of the channels via LEDs

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

Status indication



| RUN green | MF red | DO x green | Description |
|-----------------|--------|------------|---|
| | П | X | Bus communication is OK |
| | | | Module status is OK |
| | | | Bus communication is OK |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | | Bus communication is not possible |
| | | X | Module status reports an error with overload, short circuit or overheat |
| | | X | Error at bus power supply |
| | | | Flashing: Error in configuration |
| X | ZHz | X | ⇔ Chap. 2.8 'Trouble shooting - LEDs' page 28 |
| | | | Relay output has "1" signal |
| | | | Relay output has "0" signal |
| not relevant: X | | | |



DANGER!

The mixed operation of touch and non touch voltages is not permitted!

022-1HB10 - DO 2xRelay

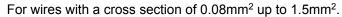


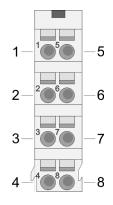
With HW state 04, an interference suppression capacitor (15nF) has been connected parallel to each relay contact in order to improve the EMC resistance.

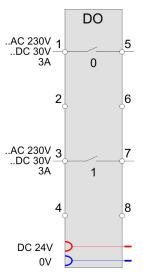


When using inductive load please take a suitable protector (see installation guidelines).

Pin assignment







| Pos. | Function | Туре | Description |
|------|----------|------|-------------------|
| 1 | DO 0 | 0 | Relay output DO 0 |
| 2 | | | not connected |
| 3 | DO 1 | 0 | Relay output DO 1 |
| 4 | | | not connected |
| 5 | DO 0 | 0 | Relay output DO 0 |
| 6 | | | not connected |
| 7 | DO 1 | 0 | Relay output DO 1 |
| 8 | | | not connected |

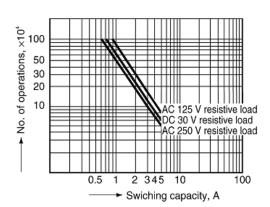
O: Output

022-1HB10 - DO 2xRelay > Technical data

Maximum load

AC resistive load DC resistive load DC resistive load 2030 50 100 200 300 Contact voltage, V

Service life



Input area

No byte of the input area is used by the module.

Output area

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|-------|-------------|-------------|----------------------|-------|----|
| +0 | +0 PIQ 1 | 1 | State of the outputs | 5200h | |
| | | Bit 0: DO 0 | | 01h | |
| | Bit 1: DO 1 | | 02h | | |
| | | | Bit 7 2: reserved | | |

4.13.1 Technical data

| Order no. | 022-1HB10 |
|--|-------------------|
| Type | SM 022 |
| Module ID | 0109 AF90 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 120 mA |
| Power loss | 0.7 W |
| Technical data digital outputs | |
| Number of outputs | 2 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 30 V/ AC 230 V |

022-1HB10 - DO 2xRelay > Technical data

| Order no. | 022-1HB10 |
|---|-----------------------|
| Current consumption from load voltage L+ (without load) | - |
| Total current per group, horizontal configuration, 40°C | 3 A |
| Total current per group, horizontal configuration, 60°C | 3 A |
| Total current per group, vertical configuration | 3 A |
| Output current at signal "1", rated value | 3 A |
| Signal logic output | Isolated |
| Output delay of "0" to "1" | 10 ms |
| Output delay of "1" to "0" | 5 ms |
| Minimum load current | |
| Lamp load | |
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | - |
| Switching frequency with resistive load | max. 0.33 Hz |
| Switching frequency with inductive load | max. 0.33 Hz |
| Switching frequency on lamp load | max. 0.33 Hz |
| Internal limitation of inductive shut-off voltage | - |
| Short-circuit protection of output | - |
| Trigger level | - |
| Number of operating cycle of relay outputs | - |
| Switching capacity of contacts | 3 A |
| Output data size | 2 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | none |
| Supply voltage display | green LED |
| Group error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | ✓ |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |

022-1HB10 - DO 2xRelay > Technical data

| Order no. | 022-1HB10 |
|------------------------------|----------------------------|
| Insulation tested with | AC 2200 V |
| PWM data | |
| PWM channels | - |
| PWM time basis | - |
| Period length | - |
| Minimum pulse width | - |
| Type of output | - |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse length | - |
| Circuit monitoring | - |
| Datasizes | |
| Input bytes | 0 |
| Output bytes | 1 |
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 62 g |
| Weight including accessories | 62 g |
| Gross weight | 76 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

022-1HD10 - DO 4xRelay

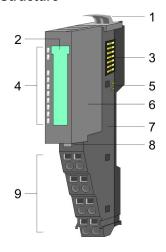
4.14 022-1HD10 - DO 4xRelay

Properties

The electronic module accepts binary control signals from the central bus system and transfers them to the process level via relay outputs. It has 4 channels that operate as switches and the status of each channel is monitored via LEDs.

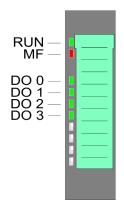
- 4 relay outputs
 - in groups of two, each with a common terminal
 - isolated between channels and backplane bus
 - isolated between channels of groups
- DC 30V / AC 230V, 1.8 A
- Status indication of the channels via LEDs

Structure



- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

Status indication

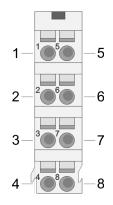


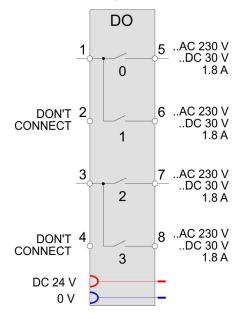
| RUN | MF | DO x | Description |
|-----------------|---------|---|---|
| green | red | green | Description |
| _ | Х | Bus communication is OK | |
| | | ^ | Module status is OK |
| | | | Bus communication is OK |
| | × | | Module status reports an error with overload, short circuit or overheat |
| | x | | Bus communication is not possible |
| | | Χ | Module status reports an error with overload, short circuit or overheat |
| | | X | Error at bus power supply |
| | X 2Hz X | | Flashing: Error in configuration |
| X | | Chap. 2.8 'Trouble shooting - LEDs' page 28 | |
| | | | Relay output has "1" signal |
| | | | Relay output has "0" signal |
| not relevant: X | | | |

022-1HD10 - DO 4xRelay

Pin assignment

For wires with a cross section of 0.08mm² up to 1.5mm².





| Pos. | Function | Туре | Description |
|------|----------|------|----------------------------|
| 1 | DO 0/1 | 0 | Relay output DO 0 and DO 1 |
| 2 | | | must not be connected |
| 3 | DO 2/3 | 0 | Relay output DO 2 and DO 3 |
| 4 | | | must not be connected |
| 5 | DO 0 | 0 | Relay output DO 0 |
| 6 | DO 1 | 0 | Relay output DO 1 |
| 7 | DO 2 | 0 | Relay output DO 2 |
| 8 | DO 3 | 0 | Relay output DO 3 |

O: Output



DANGER!

- Due to the hardware the pins 2 and 4 must not be connected!
- The mixed operation of touch and non touch voltages is not permitted!

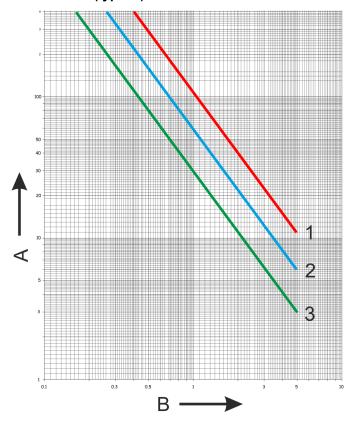
With HW state 03, an interference suppression capacitor (15nF) has been connected parallel to each relay contact in order to improve the EMC resistance.



When using inductive load please take a suitable protector (see installation guidelines).

022-1HD10 - DO 4xRelay

Maximum load / Service life (typical)



- A Operating cycles (x 10⁴)
- B Current in A
- 1 DC 30V resistive load
- 2 AC 250V resistive load, DC 30V L/R = 7ms
- 3 AC 250V $\cos \varphi = 0.4$

Input area

No byte of the input area is used by the module.

Output area

At CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding address area.

- IX Index for access via CANopen with s = Subindex, depends on number and type of analog modules
- SX Subindex for access via EtherCAT with Index 7000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

| Addr. | Name | Bytes | Function | IX | SX |
|-------|------|-------------|----------------------|-------|-----|
| +0 | PIQ | 1 | State of the outputs | 5200h | |
| | | | Bit 0: DO 0 | | 01h |
| | | | Bit 1: DO 1 | | 02h |
| | | | Bit 2: DO 2 | | 03h |
| | | Bit 3: DO 3 | | 04h | |
| | | | Bit 7 4: reserved | | |

022-1HD10 - DO 4xRelay > Technical data

4.14.1 Technical data

| Order no. | 022-1HD10 |
|---|-----------------------|
| Туре | SM 022 |
| Module ID | 010A AFA0 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 120 mA |
| Power loss | 0.7 W |
| Technical data digital outputs | |
| Number of outputs | 4 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 30 V/ AC 230 V |
| Current consumption from load voltage L+ (without load) | - |
| Total current per group, horizontal configuration, 40°C | 3.6 A |
| Total current per group, horizontal configuration, 60°C | 3 A |
| Total current per group, vertical configuration | 3.6 A |
| Output current at signal "1", rated value | 1.8 A |
| Signal logic output | Isolated |
| Output delay of "0" to "1" | 10 ms |
| Output delay of "1" to "0" | 5 ms |
| Minimum load current | - |
| Lamp load | - |
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | - |
| Switching frequency with resistive load | max. 0.33 Hz |
| Switching frequency with inductive load | max. 0.33 Hz |
| Switching frequency on lamp load | max. 0.33 Hz |
| Internal limitation of inductive shut-off voltage | - |
| Short-circuit protection of output | - |
| Trigger level | - |
| Number of operating cycle of relay outputs | - |
| Switching capacity of contacts | 5 A |
| Output data size | 4 Bit |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | no |

022-1HD10 - DO 4xRelay > Technical data

| Order no. | 022-1HD10 |
|------------------------------------|----------------------------|
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | none |
| Supply voltage display | green LED |
| Group error display | red LED |
| Channel error display | none |
| Isolation | |
| Between channels | - |
| Between channels of groups to | 2 |
| Between channels and backplane bus | ✓ |
| Insulation tested with | AC 2200 V |
| PWM data | |
| PWM channels | - |
| PWM time basis | - |
| Period length | - |
| Minimum pulse width | - |
| Type of output | - |
| Safety | |
| Safety protocol | - |
| Safety requirements | - |
| Secure user address | - |
| Watchdog | - |
| Two channels | - |
| Test pulse length | - |
| Circuit monitoring | - |
| Datasizes | |
| Input bytes | 0 |
| Output bytes | 1 |
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |

022-1HD10 - DO 4xRelay > Technical data

| Order no. | 022-1HD10 |
|------------------------------|-----------------|
| Net weight | 69 g |
| Weight including accessories | 69 g |
| Gross weight | 83 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |