

# **VIPA System SLIO**

**SM-DIO || Manual** HB300 | SM-DIO || en | 21-10 Digital signal modules - SM 02x



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### **1.2 About this manual**

Target audience	The manual is targeted at users who have a background in automation technology.		
<b>Structure of the manual</b> The manual consists of chapters. Every chapter provides a self-contained descri specific topic.			
Guide to the document	The following guides are available in the manual:		
<ul> <li>An overall table of contents at the beginning of the manual</li> <li>References with page numbers</li> </ul>			
Availability The manual is available in:			
	<ul> <li>printed form, on paper</li> <li>in electronic form as PDF-file (Adobe Acrobat Reader)</li> </ul>		
Icons Headings	Important passages in the text are highlighted by following icons and headings:		
	<b>DANGER!</b> Immediate or likely danger. Personal injury is possible.		
	<b>CAUTION!</b> Damages to property is likely if these warnings are not heeded.		



Supplementary information and useful tips.

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!

#### 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.



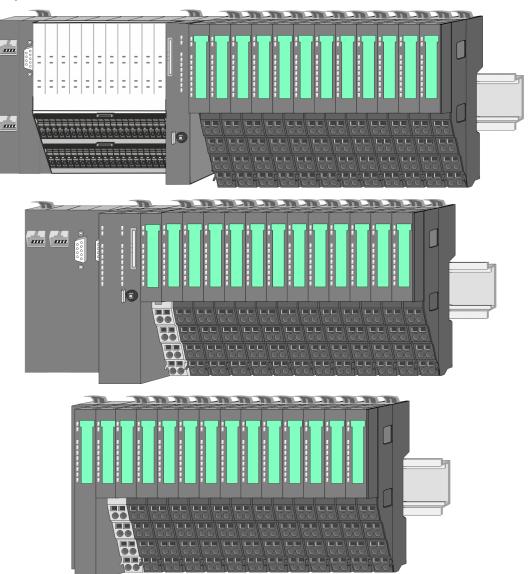
#### CAUTION!

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

### 2.2 System conception

### 2.2.1 Overview

The System SLIO is a modular automation system for assembly on a 35mm mounting rail. By means of the periphery modules with 2, 4, 8 and 16 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 supply 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

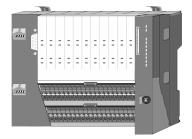
- CPU (head module)
- Bus coupler (head module)
- Line extension
- 8x periphery modules
- 16x periphery modules
- Accessories



### CAUTION!

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

#### CPU 01xC



With the CPU 01xC 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 module for power supply CPU electronic and the I/O components are supplied as well as the electronic of the periphery modules, which are connected via backplane bus. To connect the power supply of the I/O components and for DC 24V power section supply of via backplane bus connected periphery 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, 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 24V 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.

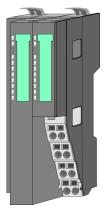


#### **CAUTION!**

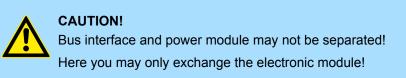
CPU part and power module may not be separated! Here you may only exchange the electronic module!

System conception > Components

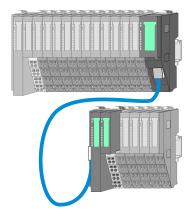
#### **Bus coupler**



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 24V 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.



#### Line extension

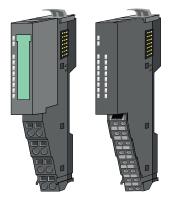


In the System SLIO there is the possibility to place up to 64 modules in on line. By means of the line extension you can divide this line into several lines. Here you have to place a line extension master at each end of a line and the subsequent line has to start with a line extension slave. Master and 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.



Please note that some modules do not support line extensions due to the system. For more information, see the 'System SLIO - Compatibility List' at www.vipa.com

#### **Periphery modules**



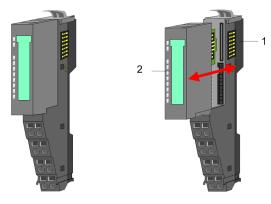
The periphery modules are available in the following 2 versions, whereby of each the electronic part can be replaced with standing wiring:

- 8x periphery module for a maximum of 8 channels.
- 16x periphery module for a maximum of 16 channels.

System conception > Components

#### 8x periphery modules

Each 8x periphery module consists of a terminal and an electronic module.



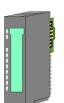
- Terminal module 1
- 2 Electronic module

#### 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 staircaseshaped terminal for wiring. Additionally the terminal module has a locking system for fixing at a mounting rail. By means of this locking system your system may be assembled outside of your switchgear cabinet to be later mounted there as whole system.

#### Electronic module

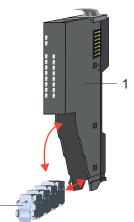


The functionality of a periphery module is defined by the *electronic module*, which is mounted to the terminal module by a sliding mechanism. With an error the defective electronic module may be exchanged for a functional module with standing installation. At the front side there are LEDs for status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

16x periphery modules

Each 16x periphery module consists of an *electronic unit* and a *terminal block*.





- Electronic unit 1 2
- Terminal block

System conception > Accessories

#### Electronic unit



The functionality of a 16x periphery module is defined via the terminal block, which is connected to the *electronic unit* via a secure flap mechanism. In the case of an error you can exchange the defective electronic unit for a functional unit with standing wiring. At the front side there are LEDs for status indication. For easy wiring each electronic unit shows corresponding connection information at the side. The electronic unit provides the slot for the terminal block for the wiring and contains the backplane bus with power supply for the electronic and the connection to the DC 24V power section supply. Additionally the electronic unit has a locking system for fixing it at a mounting rail. By means of this locking system your system may be assembled outside of your switchgear cabinet to be later mounted there as whole system.

Terminal block



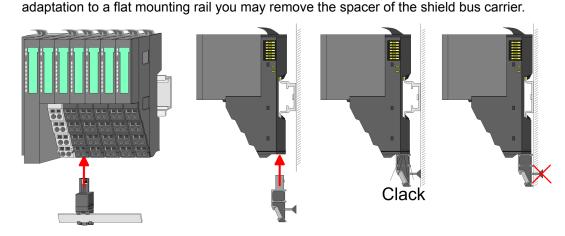
The *terminal block* provides the electrical interface for the signalling and supplies lines of the module. When mounting the terminal block, it is attached to the bottom of the electronic unit and turned towards the electronic unit until it clicks into place. With the wiring a "push-in" spring-clip technique is used. This allows a quick and easy connection of your signal and supply lines. The clamping off takes place by means of a screwdriver.

### 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

Please note that a shield bus carrier cannot be mounted on a 16x

periphery module!



System conception > Hardware revision

#### **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



Please note that a coding pin cannot be installed on a 16x periphery module! Here you have to make sure that the associated terminal block is plugged again when the electronics unit is replaced.

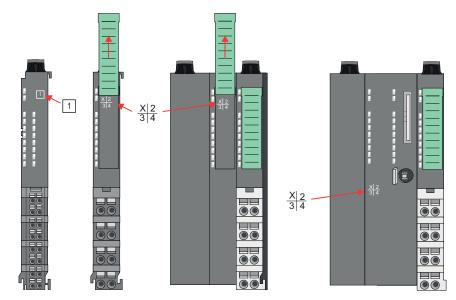
There is the possibility to fix the assignment of electronic and terminal module. Here VIPA coding pins (order number 000-0AC00) can be used. The coding pin consists of a coding jack and a coding plug. By combining electronic and terminal module with coding pin, the coding jack remains in the electronic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

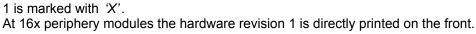
#### 2.2.4 Hardware revision

Hardware revision on the	
front	

- The hardware revision version is printed on every System SLIO module.
- Since a System SLIO 8x periphery module consists of a terminal and electronic 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 and 16x periphery modules, the hardware revision is printed on the front. The following figure shows the 2 variants for the representation of the hardware revision.

Dimensions

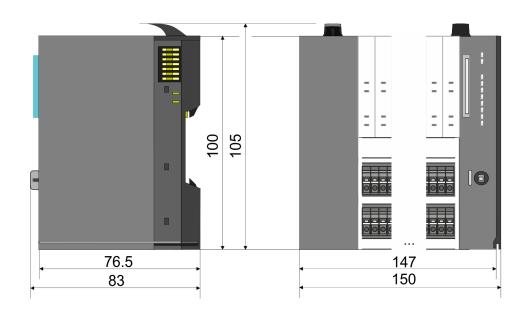




Hardware revision via web<br/>serverOn the CPUs and some bus couplers, you can check the hardware revision 'HW<br/>Revision' via the integrated web server.

# 2.3 Dimensions

Dimensions CPU 01xC

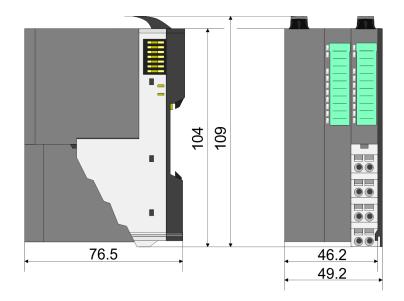


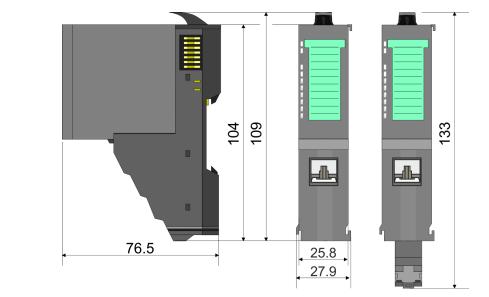
Dimensions

#### **Dimensions CPU 01x**



# Dimensions bus coupler and line extension slave

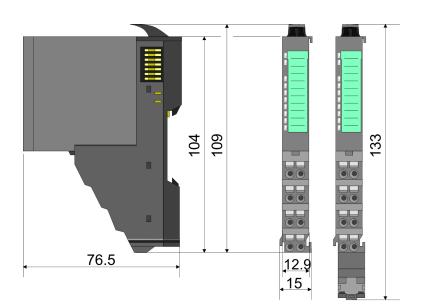




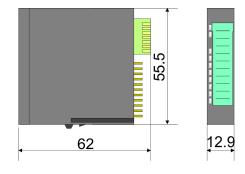
Dimensions line extension master

Dimensions

# Dimensions 8x periphery module

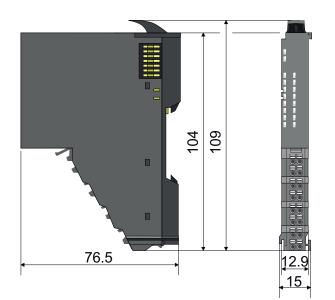


# Dimensions electronic module



Dimensions in mm

# Dimensions 16x periphery module



Mounting 8x periphery modules

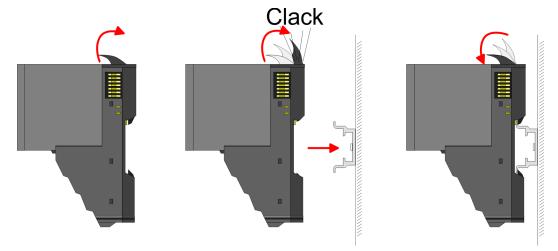
### 2.4 Mounting 8x periphery modules



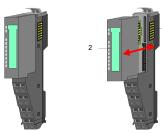
#### Requirements for UL compliance use

- 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.



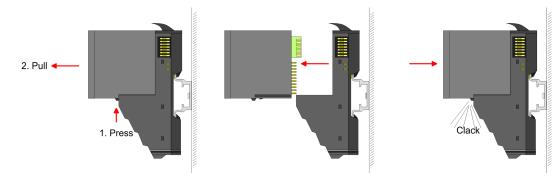
# Terminal and electronic module



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

- 1 Terminal 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.

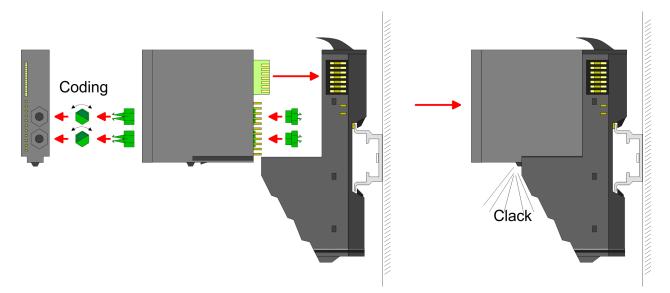


Mounting 8x periphery modules

#### Coding



There is the possibility to fix the assignment of electronic and terminal module. Here VIPA coding pins (order number 000-0AC00) 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



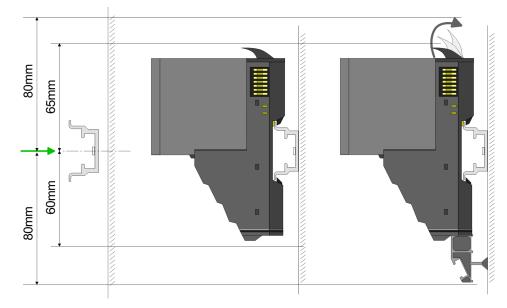
#### CAUTION!

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. YASKAWA assumes no liability for incorrectly attached electronic modules or for damages which arise due to incorrect coding!

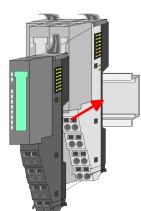
Mounting 8x periphery modules

# Mounting periphery modules



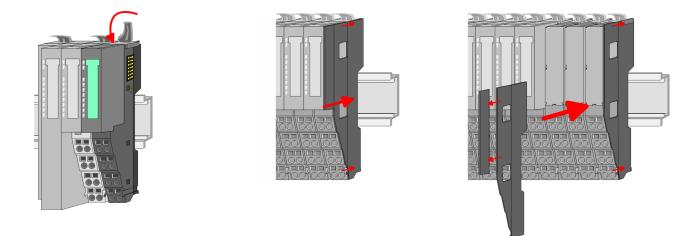
- **1.** Mount the mounting rail! Please consider that a clearance from the middle of the mounting rail of at least 80mm above and 60mm below, respectively 80mm by deployment of shield bus carriers, exist.
- 2. Mount your head module such as CPU or field bus coupler.
- **3.** Before mounting the periphery 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.





- **4.** For mounting turn the locking lever of the module upwards until it engages.
- **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.

Mounting 16x periphery modules



**7.** 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.

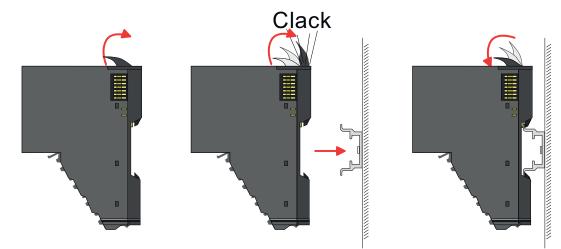
### 2.5 Mounting 16x periphery modules



#### 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.



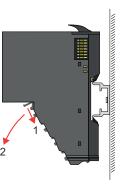
Mounting 16x periphery modules

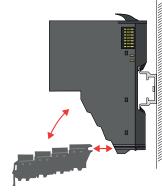
#### Electronic unit and terminal block

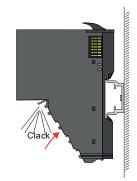
Each 16x periphery module consists of an *electronic unit* and a *terminal block*.

- 1 Electronic unit
- 2 Terminal block

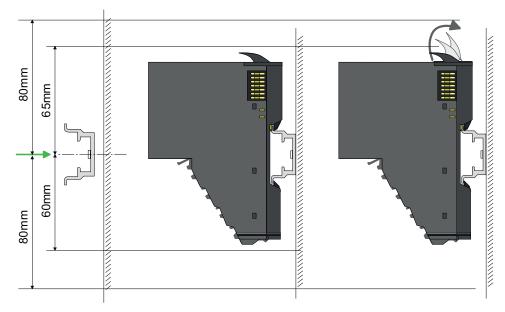
To replace an electronic unit, you can push down and pull off the terminal block after releasing the lock. To mount the terminal block, place it horizontally on the lower side of the electronic unit and push it towards the electronic unit until it clicks into place.







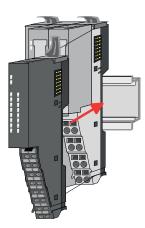
# Mounting periphery module



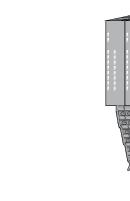
- **1.** Mount the mounting rail! Please consider that a clearance from the middle of the mounting rail of at least 80mm above and 80mm below exist.
- 2. Mount your head module such as CPU or field bus coupler.
- **3.** Before mounting the periphery modules you have to remove the bus cover at the right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

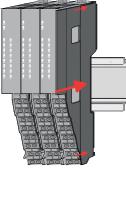
Wiring 8x periphery modules

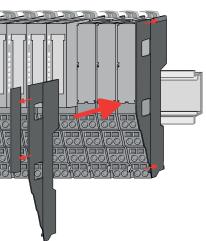




- **4.** For mounting turn the locking lever of the module upwards until it engages.
- **5.** For mounting place the module to the module installed before and push the module to the mounting rail guided by the strips at the upper and lower side of the module.
- **6.** Turn the locking lever of the periphery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



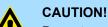




7. After mounting the whole system, to protect the backplane bus connectors at the last module you have to mount the bus cover, now. If the last module is a clamp module, for adaptation the upper part of the bus cover is to be removed.

### 2.6 Wiring 8x periphery modules

### Terminal module terminals



#### 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.



Wiring 8x periphery modules

#### Data

**\_**10mm**↓** 

 U<sub>max</sub>
 240V AC / 30V DC

 I<sub>max</sub>
 10A

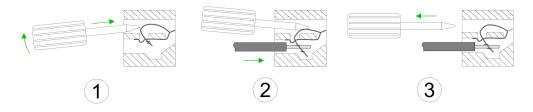
 Cross section
 0.08 ... 1.5mm² (AWG 28 ... 16)

 Stripping length
 10mm

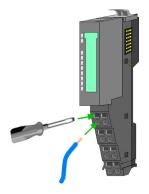
#### Wiring procedure

1 - <sup>2</sup> -	2 3
--------------------	--------

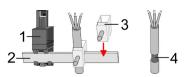
- 1 Pin number at the connector
- 2 Opening for screwdriver
- 3 Connection hole for wire



- **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 0.08mm<sup>2</sup> up to 1.5mm<sup>2</sup>
- **3.** By removing the screwdriver, the wire is securely fixed via the spring contact to the terminal.



Shield attachment

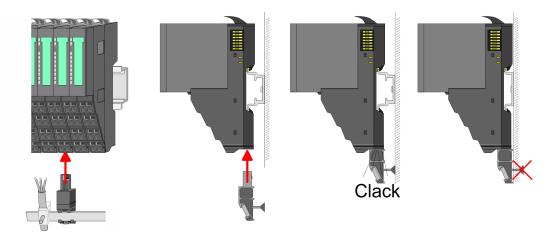


- 1 Shield bus carrier
- 2 Shield bus (10mm x 3mm)
- 3 Shield clamp
- 4 Cable shield

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 8x periphery 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.

Wiring 16x 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 Wiring 16x periphery modules

#### **Terminal block connectors**

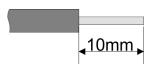


#### CAUTION! Do not connect hazardous voltages!

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

The 16x periphery module has a removable terminal block for wiring. With the wiring of the terminal block a "push-in" spring-clip technique is used. This allows a quick and easy connection of your signal and supply lines. The clamping off takes place by means of a screwdriver.

#### Data



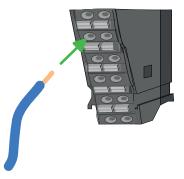
U <sub>max</sub>	30V DC
I <sub>max</sub>	10A
Cross section solid wire	
Cross section with ferrule	0,14 0,75mm <sup>2</sup>
AWG	24 16
Stripping length	10mm

#### Wiring procedure



- 1 Release area
- 2 Connection hole for wire

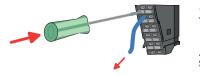
#### Insert wire



The wiring happens without a tool.

- **1.** Determine according to the casing labelling the connection position.
- **2.** Insert through the round connection hole of the according contact your prepared wire until it stops, so that it is fixed.
  - ⇒ By pushing the contact spring opens, thus ensuring the necessary contact pressure.

#### **Remove wire**



The wire is to be removed by means of a screwdriver with 2.5mm blade width.

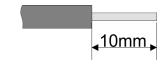
- 1. Press with your screwdriver vertically at the release button.
  - $\Rightarrow$  The contact spring releases the wire.
- **2.** Pull the wire from the round hole.

#### 2.8 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<sub>max</sub>
 30V DC

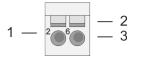
 I<sub>max</sub>
 10A

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

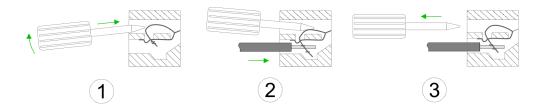
 Stripping length
 10mm

Wiring power modules

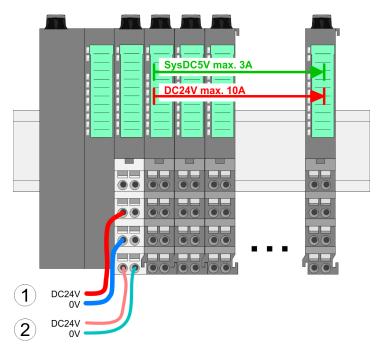
#### Wiring procedure



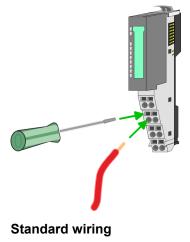
- Pin number at the connector 1
- 2 Opening for screwdriver 3
  - Connection hole for wire



- 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 0.08mm<sup>2</sup> up to 1.5mm<sup>2</sup>
- By removing the screwdriver, the wire is securely fixed via the spring contact to the 3. terminal.



- (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** 

	1—	1 5	—5
	2—	206	—6
	3—	377	—7
	4	4080	-8
DC24V = 0V =	J		
DC24V = 0V =		J	

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

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!

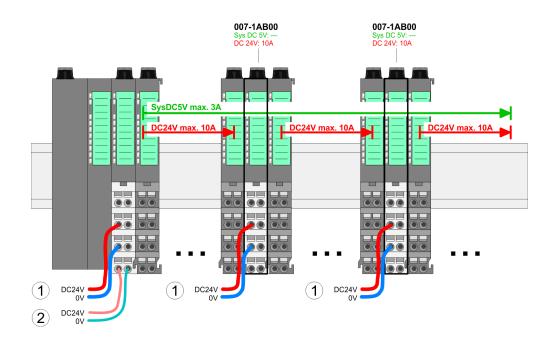
Fusing

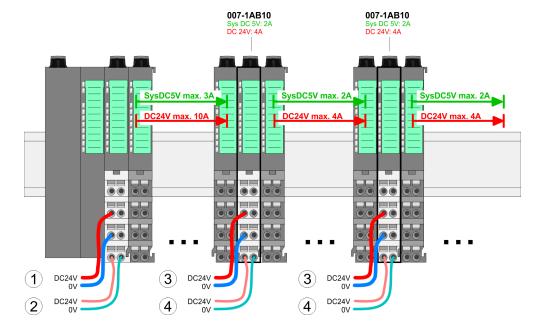
- The power section supply is to be externally protected with a fuse, which corresponds to the maximum current. This means max. 10A is to be protected with a 10A fuse (fast) respectively by a line circuit breaker 10A characteristics Z!
- It is recommended to externally protect the electronic power supply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

- If the 10A for the power section supply is no longer sufficient, you may use the power module 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.





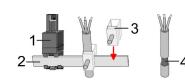
- (1) DC 24V for power section supply I/O area (max. 10A)
  (2) DC 24V for electronic power supply bus coupler and I/O area
- (3) DC 24V for power section supply I/O area (max. 4A)
- (4) DC 24V for electronic power supply I/O area

#### Power module 007-1AB00

Power module 007-1AB10

Demounting 8x periphery modules

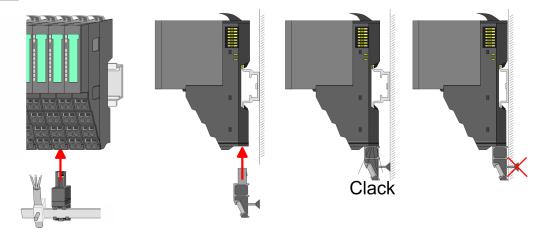
#### Shield attachment



- 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.

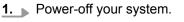
- **1.** Each System SLIO 8x periphery module has a carrier hole for the shield bus carrier. Push the shield bus carrier, until they engage into the module. With a flat mounting rail for adaptation to a flat mounting rail you may remove the spacer of the shield bus carrier.
- 2. Put your shield bus into the shield bus carrier.

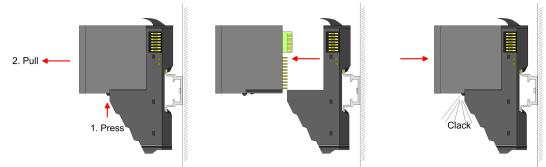


- **3.** Attach the cables with the accordingly stripped cable screen and fix it by the shield clamp with the shield bus.
- 2.9 Demounting 8x periphery modules

#### Proceeding

Exchange of an electronic module

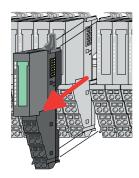




- **2.** For the exchange of a electronic module, the electronic module may be pulled forward after pressing the unlocking lever at the lower side of the module.
- **3.** For installation plug the new electronic module guided by the strips at the lower side until this engages to the terminal module.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

Demounting 8x periphery modules

# Exchange of a periphery module



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

3.

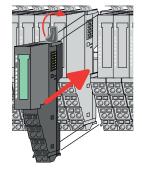


For demounting and exchange of a (head) module or a group of modules, due to mounting reasons you always have to remove the electronic module <u>right</u> beside. After mounting it may be plugged again.

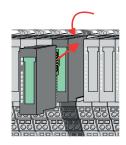
Press the unlocking lever at the lower side of the just mounted right module and pull it forward.

**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.



- 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.
   Turn the looking lover downward, again
- **8.** Turn the locking lever downward, again.

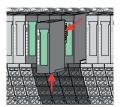


Exchange of a module group

**9.**  $\blacktriangleright$  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.



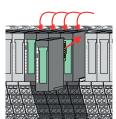
3.

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.

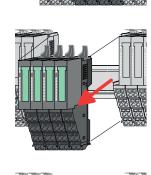
Press the unlocking lever at the lower side of the just mounted right module near the module group and pull it forward.

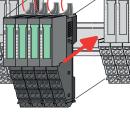
**<u>4.</u>** Turn all the locking lever of the module group to be exchanged upwards.

- **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.



- ${\bf 9.}$   $\blacktriangleright$  Plug again the electronic module, which you have removed before.
- **10.** Wire your module group.
  - $\Rightarrow$  Now you can bring your system back into operation.





Demounting 16x periphery modules

## 2.10 Demounting 16x periphery modules

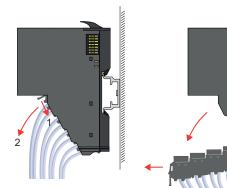
#### Proceeding

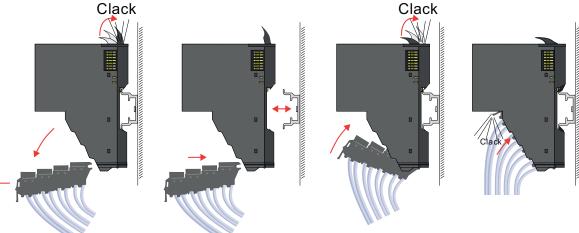
Exchange of an electronic unit

- **1.** Power-off your system.
- **2.** To replace an electronic unit, you can push down and pull off the terminal block after releasing the lock.

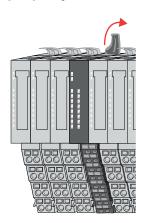
To mount the terminal block, place it horizontally on the lower side of the electronic unit and push it towards the electronic unit until it clicks into place.

 $\Rightarrow$  Now you can bring your system back into operation.





# Exchange of a 16x periphery module



1. Power-off your system.

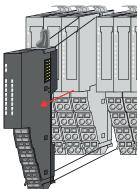
**2.** Remove if exists the wiring of the module respectively the wired terminal block.



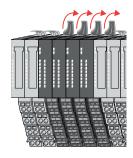
In contrast to 8x periphery modules, you can directly demount and mount 16x periphery modules.

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

Demounting 16x periphery modules



# Exchange of a module group



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

**6.** 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.

- **7.** Turn the locking lever downward, again.
- 8. Wire your module respectively plug the wired terminal block again.
  - ⇒ Now you can bring your system back into operation.

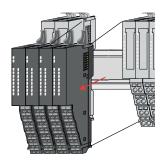
- **1.** Power-off your system.
- **2.** Remove if exists the wiring of the module group respectively the wired terminal blocks.



*In contrast to 8x periphery modules, you can directly demount and mount 16x periphery modules.* 

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

Demounting 16x periphery modules



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

**6.** 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.

- 7. Turn all the locking lever downward, again.
- **8.** Wire your module group respectively plug the wired terminal blocks again.
  - $\Rightarrow$  Now you can bring your system back into operation.

## 2.11 Easy Maintenance

Overview

*Easy Maintenance* means the support for adding and removing modules during operation without having to restart the system. Here the following behavior is shown by the example of a CPU:

- Electronic module is removed
  - The CPU detects a module failure on the backplane bus.
  - Diagnostic message 'System SLIO bus failure' (0x39D0) is triggered.
  - OB 86 is called. If this is not available, the CPU switches to STOP otherwise it remains in RUN.
  - The SF LED of the CPU lights up.
  - The I/O data of all modules become invalid.
- Identical electronic module is plugged
  - The CPU detects the module return on the backplane bus.
  - The SF-LED of the CPU gets off.
  - All RUN LEDs on the modules get on and the MF LEDs get off.
  - Diagnostic message 'System SLIO bus recovery' (0x38D0) is triggered.
  - OB 86 is called. If this is not available, the CPU switches to STOP otherwise it remains in RUN.
  - The I/O data of all modules become valid again.
- Wrong electronic module is plugged
  - The CPU detects the wrong module.
  - Diagnostic message 'System SLIO bus recovery, but expected configuration does not match actual configuration' (0x38D1) is triggered.
  - The SF LED of the CPU remains on.
  - The MF LED of the wrong module flashes.
  - OB 86 is called. If this is not available, the CPU switches to STOP otherwise it remains in RUN.
  - With the exception of the wrong module, the I/O data of all modules become valid again.

Please note that the CPU switches to STOP, if there is no OB 86 configured when adding or removing System SLIO modules!



Please note, that Easy Maintenance is not supported by the 16x periphery modules!

Trouble shooting - LEDs

RUN

MF

RUN 🔲 RUN

MF

MF

RUN

MF

# 2.12 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  $\dot{\heartsuit}$ .

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. 2.8 Wiring power modules' page 27* 

## 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.

RUN

MF

RUN

MF

Remedy: Match configuration and hardware structure.

RUN

MF

RUN 🔲 RUN

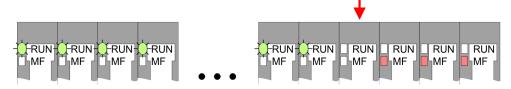
**M**F

MF

RUN

MF

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.

2.13 Installation guidelines	2.13	Installation	quidelines	5
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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 VIPA components 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:					
00000	<ul> <li>Electromagnetic fields (RF coupling)</li> <li>Magnetic fields with power frequency</li> </ul>					
	<ul><li>Magnetic fields with power frequency</li><li>Bus system</li></ul>					
	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					
	<ul> <li>inductive coupling</li> <li>radiant coupling</li> </ul>					
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.					
	<ul> <li>Install a central connection between the ground and the protected earth conductor system.</li> </ul>					
	<ul> <li>Connect all inactive metal extensive and impedance-low.</li> </ul>					
	<ul> <li>Please try not to use aluminium parts. Aluminium is easily oxidizing and is there- fore less suitable for grounding.</li> </ul>					
	When cabling, take care of the correct line routing.					
	<ul> <li>Organize your cabling in line groups (high voltage, current supply, signal and data lines).</li> </ul>					
	<ul> <li>Always lay your high voltage lines and signal respectively data lines in separate channels or bundles.</li> </ul>					
	<ul> <li>Route the signal and data lines as near as possible beside ground areas (e.g. suspension bars, metal rails, tin cabinet).</li> </ul>					

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!



## 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 for the System SLIO

# 2.14 General data for the System SLIO

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		

#### **Basics and mounting**

General data for the System SLIO

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

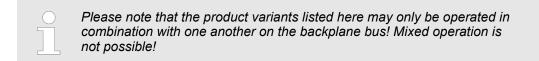
EMC	Standard		Comment	
Emitted interference	EN 61000-6-4		Class A (Industrial area)	
Noise immunity	EN 61000-6-2		Industrial area	
zone B		EN 61000-4-2	ESD	
			8kV at air discharge (degree of severity 3),	
			4kV at contact discharge (degree of severity 2)	
		EN 61000-4-3	HF field immunity (casing)	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

1) 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

System SLIO Product variants for extended application range

# 2.15 System SLIO Product variants for extended application range

The System SLIO product variants listed below only differ from the basic modules only in the extended temperature range and the use under condensation. All other data correspond to those of the basic modules. Information on structure and configuration can be found in the manuals for the basic modules in the service area of <u>www.vipa.com</u>



Basic modules	Product variants	Description
053-1PN01	053-1PN01-C	IM - 053-1PN01 - interface module PROFINET
021-1BF00	021-1BF00-C	SM 021 - digital input - 8xDI - DC 24V
022-1BF00	022-1BF00-C	SM 022 - digital output - 8xDO - DC 24V 0.5A
031-1CD30	031-1CD30-C	SM 031 - analog input - 4xAI - 16bit 0 10V
031-1BD80	031-1BD80-C	SM 031 - analog input - 4xAI - 16bit R/RTD
032-1CD30	032-1CD30-C	SM 032 - analog output - 4xAI - 16bit 0 10V

#### Environmental conditions according to EN 61131-2 for System SLIO basic modules

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

#### Environmental conditions according to EN 61131-2 for System SLIO product variants

Climatic				
Storage / transport	EN 60068-2-14	-25+70°C		
Operation				
Horizontal installation hanging	EN 61131-2	-25 + 60 ° C		
Horizontal installation lying	EN 61131-2	-25+55°C		
Vertical installation	EN 61131-2	-25 + 50 ° C		
Air humidity	EN 60068-2-30	RH1 (without condensation, rel. humidity 1095%)		
Climate	GS 95024-3-1:2010	Condensation		
Pollution	EN 61131-2	Degree of pollution 2		

# 3 Digital input

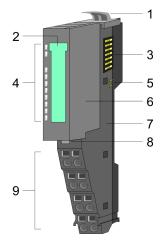
# 3.1 021-1BB00 - DI 2xDC 24V

## **Properties**

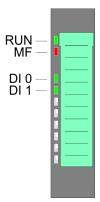
The electronic module collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 2 channels and their status is monitored via LEDs.

- 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



Status indication

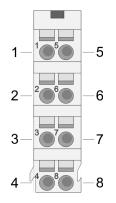


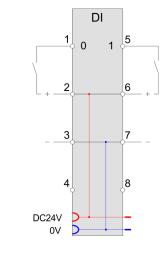
RUN	MF <b>e</b> red	DI x	Description	
_		V	Bus communication is OK	
		Х	Module status is OK	
	-	х	Bus communication is OK	
		^	Module status reports an error	
	_	V	Bus communication is not possible	
	-	Х	Module status reports an error	
		Х	Error at bus power supply	
			Flashing: Error in configuration	
Х	ZHz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38	
			Digital input has signal "1"	
			Digital input has signal "0"	
not relevant: X				

- 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

## Pin assignment

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





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.

021-1BB00 - 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	$\checkmark$
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 confi- guration	2
Number of simultaneously utilizable inputs vertical configu- ration	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**

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

Diagnostics information read-outnoneModule stategreen LEDModule error displayred LEDChannel error displaynonesolation-Setween channels-Between channels of groups to-Between channels and backplane busInsulation tested withDC 500 VSafety-Safety protocol-Secure user address-Nutchdog-Five ochannels-Five ochannels-Otatasizes-Input bytes1Output bytes0Parameter bytes0	
Addule error display       red LED         Channel error display       none         Solation       -         Setween 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       -         Vatchdog       -         Fest pulse outputs       -         Datasizes       1         Input bytes       1         Output bytes       0         Parameter bytes       0	
Channel error displaynonesolation-Setween channels-Between channels of groups to-Between channels and backplane bus✓Insulation tested withDC 500 VSafety-Safety protocol-Secure user address-Secure user address-Vatchdog-Fwo channels-For pulse outputs-Ottasizes-Input bytes1Output bytes0Parameter bytes0	
solation.Between channels-Between channels of groups to-Between channels and backplane busInsulation tested withDC 500 VBafety-Bafety protocol-Bafety requirements-Bafety	
Between channels       -         Between channels of groups to       -         Between channels and backplane bus       ✓         Between channels and backplane bus       ✓         Insulation tested with       DC 500 V         Safety       DC 500 V         Safety protocol       -         Safety requirements       -         Secure user address       -         Vatchdog       -         Fest pulse outputs       -         Datasizes       -         Input bytes       1         Output bytes       0	
Between channels of groups to       -         Between channels and backplane bus       ✓         Insulation tested with       DC 500 V         Safety       DC 500 V         Safety protocol       -         Safety requirements       -         Secure user address       -         Vatchdog       -         Fest pulse outputs       -         Datasizes       1         Input bytes       1         Output bytes       0	
Between channels and backplane bus✓Between channels and backplane busDC 500 VSafetyDC 500 VSafety protocol-Safety requirements-Secure user address-Vatchdog-Two channels-Test pulse outputs-Datasizes1Input bytes1Output bytes0Parameter bytes0	
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Safety protocol	
Safety requirements - Secure user address - Vatchdog - Two channels - Test pulse outputs - Catasizes 1 nput bytes 1 Output bytes 0 Parameter bytes 0	
Secure user address - Vatchdog - Two channels - Test pulse outputs - Datasizes 1 nput bytes 1 Dutput bytes 0 Parameter bytes 0	
Watchdog-Two channels-Test pulse outputs-Datasizes-Input bytes1Output bytes0Parameter bytes0	
Two channels-Test pulse outputs-Datasizes-nput bytes1Output bytes0Parameter bytes0	
Fest pulse outputs     -       Datasizes     -       nput bytes     1       Dutput bytes     0       Parameter bytes     0	
Datasizesnput bytes1Dutput bytes0Parameter bytes0	
nput bytes 1 Dutput bytes 0 Parameter bytes 0	
Dutput bytes     0       Parameter bytes     0	
Parameter bytes 0	
Diagnostic bytes 0	
lousing	
Material PPE / PPE GF1	0
Mounting Profile rail 35 m	n
Mechanical data	
Dimensions (WxHxD) 12.9 mm x 109	mm x 76.5 mm
Net weight57 g	
Weight including accessories57 g	
Gross weight 72 g	
Environmental conditions	
Operating temperature0 °C to 60 °C	
Storage temperature-25 °C to 70 °C	
Certifications	
JL certification yes	
C certification yes	

021-1BB10 - DI 2xDC 24V 2µs...4ms

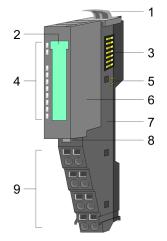
# 3.2 021-1BB10 - DI 2xDC 24V 2µs...4ms

## 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



## Status indication

RUN — 1 MF — 1 DI 0 — 1 DI 1 — 1

RUN	MF <b>e</b> red	DI x	Description
		х	Bus communication is OK
		^	Module status is OK
_	_	х	Bus communication is OK
	-	^	Module status reports an error
	_	x	Bus communication is not possible
		^	Module status reports an error
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz 2Hz	Х	& Chap. 2.12 'Trouble shooting - LEDs' page 38
			Digital input has signal "1"
			Digital input has signal "0"
not relevant	: X		

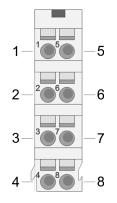
## 1 Locking lever terminal module

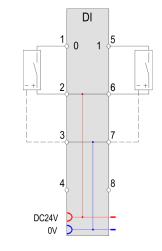
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module8 Locking lever ele
- Locking lever electronic module
- 9 Terminal

021-1BB10 - DI 2xDC 24V 2µs...4ms

#### Pin assignment

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





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.

021-1BB10 - 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	$\checkmark$
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 confi- guration	2
Number of simultaneously utilizable inputs vertical configu- ration	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

Order no.	021-1BB10
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	$\checkmark$
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	
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

021-1BB10 - 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 <sup>1</sup>	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
1) This record set may only be transferred at STOP state						

 DIAG\_EN Diagnostic inter-<br/>rupt
 Byte
 Bit 7 ... 0

 0
 Diagnostic interrupt

 00h: disable<br/>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	e not 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

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 interrupt	parameterizable
Edge 0-1 DI x	Х	-	Х
Edge 1-0 DI x	Х	-	Х
Diagnostics buffer overflow	-	Х	-
Process interrupt lost	-	Х	-

## Hardware interrupt

So you may react to asynchronous events, there is the possibility to activate a hardware interrupt.

- A hardware interrupt interrupts the linear program sequence and jumps depending on the master system to a corresponding Interrupt routine. Here you can react to the hardware interrupt accordingly.
- With CANopen the hardware interrupt data a transferred via an emergency telegram.
- Operating with CPU, PROFIBUS and PROFINET the hardware 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

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 $\mu$ s ticker at the moment of the process interrupt		
	µs ticker			
	In the System SLIO module there is a 32 bit timer ( $\mu$ s ticker). With PowerON the timer starts counting with 0. After 2 <sup>32</sup> -1 $\mu$ s the timer starts with 0 again.			
	PRIT_US represents the lower 2 byte of the $\mu$ s ticker value (0 2 <sup>16</sup> -1).			
Diagnostic data	Via the para	meterization 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 diag- nostic interrupt <sub>going</sub> automatically takes place.			
	All events of a channel between diagnostic interrupt <sub>incoming</sub> and diagnostic interrupt <sub>going</sub> are not stored and get lost.			
	Within this time window (1. diagnostic interrupt <sub>incoming</sub> until last diagnostic interrupt <sub>going</sub> ) 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.			
	<ul> <li>IX - Index for access via CANopen. The access happens by IX 2F01h. Additionally the first 4 bytes may be accessed by IX 2F00h.</li> </ul>			
	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
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 Module informa- tion	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		
U				
	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 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 $\mu$ s ticker at the moment of the diagnostic		
	µs ticker			
	In the System SLIO module there is a 32 bit timer (us ticker). With PowerON the timer			

In the System SLIO module there is a 32 bit timer ( $\mu$ s ticker). With PowerON the timer starts counting with 0. After 2<sup>32</sup>-1 $\mu$ s the timer starts with 0 again.

# 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

Locking lever terminal module

DC 24V power section supply

Locking lever electronic module

Labeling strip

Backplane bus

LED status indication

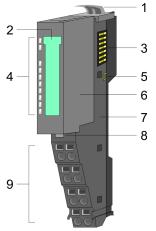
Electronic module

Terminal module

Terminal

 Status indication of the channels via LEDs also with de-activated electronic power supply

## Structure



## 8

1

2

3

4

5

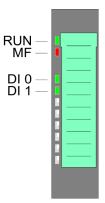
6

7

8

9

## Status indication



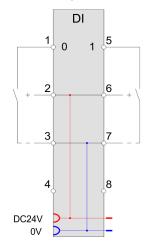
RUN	MF		Description		
green	red	green			
		х	Bus communication is OK		
		~	Module status is OK		
-	-	х	Bus communication is OK		
-	-	^	Module status reports an error		
	_	х	Bus communication is not possible		
	-	^	Module status reports an error		
		Х	Error at bus power supply		
			Flashing: Error in configuration		
Х	ZHz 2Hz	Х	♦ Chap. 2.12 'Trouble shooting - LEDs' page 38		
			Digital input has signal "1"		
			Digital input has signal "0"		
not relevant	not relevant: X				

021-1BB50 - DI 2xDC 24V NPN

#### Pin assignment

 $1 - \frac{1}{5} - 5$   $2 - \frac{2}{5} - 6$   $3 - \frac{3}{7} - 7$   $4 - \frac{4}{5} - 8$ 

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



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	$\checkmark$
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

# **Digital input**

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	$\checkmark$
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

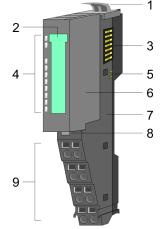
# 3.4 021-1BB70 - DI 2xDC 24V ETS

#### **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 System SLIO  $\mu$ s 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
- 7 Terminal module8 Locking lever electronic module
- 9 Terminal

Status indication

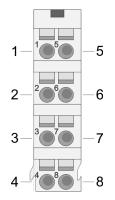
RUN MF

DI 0 DI 1

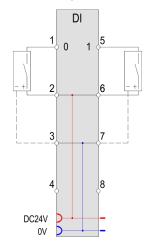
RUN	MF	DI x	Description
		х	Bus communication is OK
			Module status is OK
_		х	Bus communication is OK
	-	^	Module status reports an error
		х	Bus communication is not possible
		^	Module status reports an error
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz 2Hz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38
			Digital input has signal "1"
			Digital input has signal "0"
not relevant	: X		

021-1BB70 - DI 2xDC 24V ETS

## Pin assignment



For wires with a cross section of  $0.08 \text{mm}^2$  up to  $1.5 \text{mm}^2$ .



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	L	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 System SLIO $\mu$ 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:
	<ul> <li>021-1BB70 DI 2xDC24V (20): uses 20byte in the PII for 5 ETS entries</li> <li>021-1BB70 DI 2xDC24V (60): uses 60byte in the PII for 15 ETS entries</li> </ul>
Output area	No byte of the output area is used by the module.
Input area 20byte respec- tively 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
-----------	-------	-----	-------

	Suuclui	Structure of an ETS entry							
	Addr.	Name	Bytes	Function		IX	SX		
	+0	PII	1	State of the in	puts	5430h/s	01h		
	+1	RN	1	Running numb	ber		02h		
	+2	ETS_US	2	µs ticker			03h		
PII	Here the	state of the	inputs a	fter an edge cha	inge is stored.				
	The inpu	it byte has tl	he followi	ng bit assignme	nt:				
	Bit 0: DI	0							
	Bit 1: DI	1							
	Bit 2 7	': 0 (fix)							
RN				a continuous n		', which starts v	vith 1. The RN		
	correspo	corresponds to the chronological order of the edges.							
ETS_US	In the Sv	ustem SLIO	module ti	here is a 32 bit t	imer (us ticker	) With PowerO	N the timer		
210_00				<sup>32</sup> -1µs the timer					
	ETS_US	always cor	ntains the	low word of the	µs ticker (06	65535µs).			
ETS functionality				the value of the vith the state of the					
	-	_	-	e sequence of h	•	-			
	area.	wing ngure	3110 103 111	e sequence of t					
		<b>↓</b> ►							
	Oµs	65	535µs 0	IS	65	535µs			
				7					
				Addr. PII	RN ETS	US			
				► +0 PII-0	RN-0 ETS	-			
				► +4 PII-1	RN-1 ETS				
				► +8 PII-2	RN-2 ETS	-			
				► +12 PII-3	RN-3 ETS				
				► +16 PII-4	RN-4 ETS	_05-4			
Input area				atus message. i is embedded to					
IX - IX = Index for access via CANopen. With s = Subindex the corresponding entry is addressed.						nding ETS			
	SX - Si	bindex for a	access via	a EtherCAT with	Index 6000h -	EtherCAT-Slo	t		
	More car	n be found i	n the acc	ording manual o	of your bus cou	pler.			
Configured as 021-1	BB70 DI 2xDC	24V (20) 20	Obyte - 5	ETS entries					

## **Digital input**

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	$\checkmark$
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 configu- ration	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
2.0.9.10010	
Diagnostic functions	no

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

Module stategreen LEDModule error displayred LEDChannel error displaynonestolation-Between channels-Between channels of groups to-Between channels and backplane bus√SafetySafetySafety protocol-Safety protocol-Safety protocol-Safety requirements-Safety requirements-Watchdog-Tow channels-Sure user address-Tow channels-Safety requirements-Safety requirements- </th <th>Order no.</th> <th>021-1BB70</th>	Order no.	021-1BB70
Channel error display         none           Isolation         .           Between channels         -           Between channels of groups to         -           Between channels and backplane bus         -           Insulation tested with         C500 V           Safety         -           Safety protocol         -           Safety protocol         -           Safety requirements         -           Secure user address         -           Watchdog         -           Two channels         -           Tots pulse outputs         -           Dataszes         -           Input bytes         0           Output bytes         0           Diagnostic bytes         0           Buardial         PPC PPE GF10           Mounting         Profile rail 35 mm           Material         Sag           Mounting         Sag gal           Two songit         Sag gal           Streige temperature         Sag gal           Orburd totage temperature         Sag Gal           Servet temperature         Sag Gal           Diversions (WxHxD)         Sag Gal           Net weight         <	Module state	green LED
IsolationImage: solation of the solat	Module error display	red LED
Between channels-Between channels of groups to-Between channels and backplane busInsulation tested withDC 500 VSafety-Safety-Safety prolocol-Safety requirements-Sacer user address-Watchdog-Two channels-Two channels-Dataizes-Input bytes0Output bytes0Output bytes0Diagnostic bytes20MatrialPPE GF10MatrialPPI PPE GF10Not weight58 gNet weight58 gNet weight58 gNet weight58 gStorage temperature69 GStorage temperature58 gStorage temperature57 C to 70 °CUt certificationyesUt certificationyes	Channel error display	none
Between channels of groups to-Between channels and backplane bus✓Insulation tested withDC 500 VSafetySafetySafety protocol-Safety requirements-Sacer user address-Watchdog-Two channels-Two channels-Datasizes-Input bytes20 / 60Output bytes0Output bytes0Datanice-Parameter bytes10Datanice-MaterialPC / PE GF 10Mounting20 / 90Mounting20 / 90Mounting20 / 90Metweight10Net weight20 / 90Metweight including accessories8 gGross weight3 gOutput bytes3 gStorage temperature0 % C to 60 °CStorage temperature-Uct effication9 % C	Isolation	
Between channels and backplane bus✓Insulation tested withDC 500 VSafetyCSafety protocol-Safety requirements-Safety requirements-Secure user address-Watchdog-Two channels-Toy channels-Toy channels-Dataizes-Input bytes0/60Output bytes0Diagnostic bytes0MaterialPPC/PPE GF10MountingProfile rail 35 mmMethanical data12.9 mm x 10.9 mm x 76.5 mmNet weight58.9 GGross weight-Operating temperature0°C C G O°CStorage temperature-Orenting temperature0°C C G O°CCortification-Ur certification-Ur certification-Ur certification-Storage temperature-Ur certification-Storage temperature-Ur certification-Storage temperature-Storage temperature-<	Between channels	
Insulation tested withDC 500 VSafety-Safety protocol-Safety requirements-Safety requirements-Secure user address-Watchdog-Two channels-Tos channels-Test pulse outputs0Dataizes-Input bytes00 / 60Output bytes0Parameter bytes10Diagnostic bytes9PC / PPE GF10MaterialPPC / PPE GF10Mounting12 mm x 109 mm x 76.5 mmMethanical data-Pinensions (WxHxD)13 gVieght Including accessories63 gGross weight0 °C C C C O °CStorage temperature0 °C C C O O °CCottifications-Ut. certification-Ut. certification-Ut. certification-Storage temperature-Ut. certification-Storage temperature-Ut. certification-Storage temperature-Storage temperature<	Between channels of groups to	
SafetyImage: style styl	Between channels and backplane bus	$\checkmark$
Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Toto channels-Test pulse outputs0Dataizes0Input bytes0/60Output bytes0Output bytes0Diagnostic bytes0MaterialPPE GF10MountingProfile rail 35 mmMetwight58 gNet weight58 gVeight including accessories58 gGross weight-Operating temperature-Orong temperature-Orong temperature-Cartifications-Ut certification-Ut certification-Meterification-Strange temperature-Strange temperature-St	Insulation tested with	DC 500 V
Safety requirements-Secure user address-Watchdog-Two channels-Two channels-Test pulse outputs-Datasizes20 / 60Output bytes0Output bytes0Parameter bytes0Diagnostic bytes0MaterialPE / PPE GF10MoutingPerfore and someMethanical data12.9 mm x 10.9 mm x 76.5 mmNet weight58.9Net weight58.9Gross weight-Operating temperature-Operating temperature0 °C to 60 °CStorage temperature-Certification-Yu Certification-	Safety	
Secure user address-Watchdog-Two channels-Test pulse outputs-Datasizes-Input bytes20 / 60Output bytes0Parameter bytes0Diagnostic bytes0MaterialPE/ PPE GF10MountingPerfilerail 35 mmDinesions (WxHxD)12.9 mm x 76.5 mmNet weight38 gYeight including accessories38 gGross weight-Porerating temperature-Operating temperature-Cottifications-Yu certification-Yu certification <t< td=""><td>Safety protocol</td><td></td></t<>	Safety protocol	
Watchdog-Two channels-Test pulse outputs-Datasizes-Input bytes20 / 60Output bytes0Output bytes10Parameter bytes20Diagnostic bytes20MaterialPPE / PPE GF 10MountingPorfile rail 35 mmMethanized data58 gVieight Including accessories38 gRoss weight73 gPorraing temperature0° C to 60° CStorage temperature-Cuertification-Yu Cuertification-Yu Cuertification-	Safety requirements	-
Two dannels-Test pulse outputs-Datasizes-Input bytes20 / 60Output bytes0Output bytes0Parameter bytes10Diagnostic bytes20Housing-MaterialPPE / PPE GF10MountingPofile rail 35 mmMechanical data58 gVielight including accessories58 gGross weight73 gOperating temperatureo°C to 60 °CStorage temperature-Concelle temperature-Storage temperature-Uncertifications-Uncertification-Uncertification-Storage temperature-Storage temperature- <tr< td=""><td>Secure user address</td><td>-</td></tr<>	Secure user address	-
Test pulse outputs-Datasizes-Input bytes20 / 60Output bytes0Output bytes0Parameter bytes10Diagnostic bytes20MoutingPE / PPE GF10MoutingProfile rail 35 mmMechanical data20Net weight58 gVeight including accessories58 gGross weight-Porrating temperature0°C to 6°CStorage temperature0°C to 70°CCertificationsyes	Watchdog	-
DatasizesInput bytes20 / 60Output bytes0Parameter bytes10Diagnostic bytes20Housing20MaterialPPE / PPE GF 10MountingProfile rail 35 mmMechanical data20Neweight58 gVerdight including accessories58 gGross weight73 gDiperating temperature0°C to 60°CStorage temperature-25°C to 70°CCertificationsyes	Two channels	-
Input bytes20 / 60Output bytes0Parameter bytes10Diagnostic bytes20Housing0MaterialPPE / PPE GF 10MountingPPE / PPE GF 10Mechanical data20Dimensions (WxHxD)12.9 mm x 109 mm x 76.5 mmNet weight58 gYoeght including accessories58 gGross weight73 gDiperating temperature0° C to 60°CStorage temperature-25° C to 70°CCertificationsyes	Test pulse outputs	-
Output bytes0Parameter bytes10Diagnostic bytes20HousingVMaterialPPE / PPE GF10MountingProfile rail 35 mmMechanical data12.9 mm x 109 mm x 76.5 mmDimensions (WxHxD)12.9 mm x 109 mm x 76.5 mmNet weight58 gVeight including accessories58 gGross weight0 °C to 60 °CDiperating temperature-25 °C to 70 °CCertificationsyes	Datasizes	
Parameter bytes10Diagnostic bytes20HousingMaterialPPE / PPE GF10MountingProfile rail 35 mmMechanical dataDimensions (WxHxD)12.9 mm x 109 mm x 76.5 mmNet weight58 gVeight including accessories58 gGross weight73 gEnvironmental conditionsOperating temperature0 °C to 60 °CStorage temperature-25 °C to 70 °CCertificationsyes	Input bytes	20 / 60
Diagnostic bytes20HousingVMaterialPPE / PPE GF10MountingProfile rail 35 mmMechanical dataVDimensions (WxHxD)12.9 mm x 109 mm x 76.5 mmNet weight58 gVeight including accessories58 gGross weight73 gDoperating temperature0°C to 60°CStorage temperature25°C to 70°CCertificationsyes	Output bytes	0
HousingPPE / PPE GF 10MaterialProfile rail 35 mmMountingProfile rail 35 mmMechanical data-Dimensions (WxHxD)12.9 mm x 109 mm x 76.5 mmNet weight58 gVeight including accessories58 gGross weight73 gEnvironmental conditions-Operating temperature0 °C to 60 °CStorage temperature-25 °C to 70 °CCertifications-U. certificationyes	Parameter bytes	10
MaterialPPE / PPE GF10MountingProfile rail 35 mmMechanical dataDimensions (WxHxD)12.9 mm x 109 mm x 76.5 mmNet weight58 gVeight including accessories58 gGross weight73 gEnvironmental conditionsOperating temperature0 °C to 60 °CStorage temperature-25 °C to 70 °CCertificationsUL certificationyes	Diagnostic bytes	20
MountingProfile rail 35 mmMechanical dataProfile rail 35 mmMechanical dataImage: Second Sec	Housing	
Mechanical dataImage: constraint of the second	Material	PPE / PPE GF10
Dimensions (WxHxD)12.9 mm x 109 mm x 76.5 mmNet weight58 gWeight including accessories58 gGross weight73 gEnvironmental conditions-Operating temperature0 °C to 60 °CStorage temperature-25 °C to 70 °CCertifications-UL certificationyes	Mounting	Profile rail 35 mm
Net weight58 gWeight including accessories58 gGross weight73 gEnvironmental conditions-Operating temperature0 °C to 60 °CStorage temperature-25 °C to 70 °CCertifications-UL certificationyes	Mechanical data	
Weight including accessories58 gGross weight73 gEnvironmental conditions0°C to 60 °COperating temperature0 °C to 70 °CStorage temperature-25 °C to 70 °CUL certificationsyes	Dimensions (WxHxD)	12.9 mm x 109 mm x 76.5 mm
Gross weight73 gEnvironmental conditions0°C to 60 °COperating temperature0°C to 60 °CStorage temperature-25 °C to 70 °CCertificationsyes	Net weight	58 g
Environmental conditions0°C to 60°COperating temperature0°C to 60°CStorage temperature-25°C to 70°CCertificationsUL certification	Weight including accessories	58 g
Operating temperature     0 °C to 60 °C       Storage temperature     -25 °C to 70 °C       Certifications     -25 °C to 70 °C       UL certification     yes	Gross weight	73 g
Storage temperature     -25 °C to 70 °C       Certifications     -25 °C to 70 °C       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

021-1BB70 - 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 input data <sup>1, 2</sup>	14h resp.	02h	3100h	01h
			3Ch (fix)			
PIQ_L	1	Length process image output data <sup>2</sup>	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
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		0011	0011	510511	0011

1) This parameter corresponds of the configured variant.

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

Ρ	I	L

Byte	Bit 7 0
0	The length for the process image is fixed adjusted to the length of the para- meterized 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.

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

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

TSER edge 0-1 DI x

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

Edge selectHere the ETS function for DI 0 and DI 1 may be activated. With these 2 bytes you may<br/>define the type of edge of the input signal, to which the current μs timer value is stored in<br/>the process image together with the state of the inputs.

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

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.

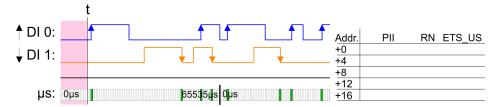
In this example a module is configured, which occupies 20byte for 5 ETS entries.

The following edges for the input channels are preset.

- DI 0: Edge 0-1: ↑
- DI 1: Edge 1-0: ↓

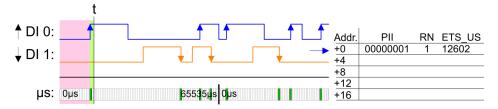
The green area of the diagram indicates the ETS entries, which were available at time "t". ETS entries, which are not (longer) available are marked red.

**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

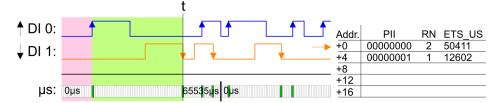
Released by an edge 0-1 from DI 0 the 1. ETS entry is registered starting from address +0.



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

2. ETS entry

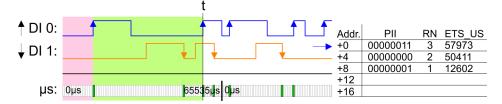
Released by an edge 1-0 from DI 1 the 2. ETS entry is registered starting from address +0 and the 1. ETS entry is shifted 4 byte.



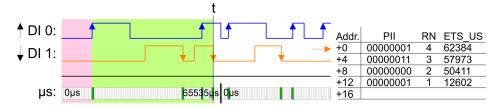
3. ETS entry

4. ETS entry

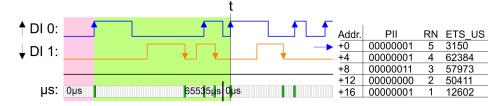
Released by an edge 1-0 from DI 1 the 2. ETS entry is registered starting from address +0 and the 1. ETS entry is shifted 4 byte.



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.

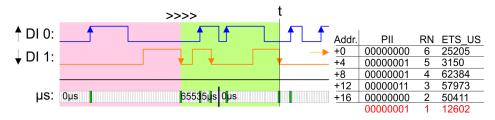


**5. ETS entry** Released by an edge 0-1 from DI 0 the 5. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each. The maximum number of ETS entries is reached.



#### 6. ETS entry

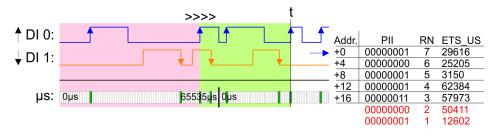
Released by an edge 1-0 from DI 1 the 6. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each. Thereby the 1. ETS entry is deleted and is not available any longer.



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

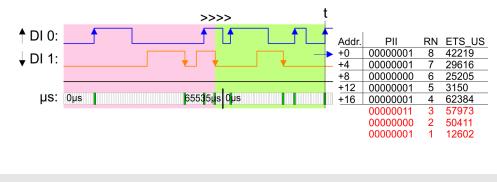
#### 7. ETS entry

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  $\mu$ s ticker. The Ethernet coupler with ModbusTCP 053-1MT00 for example does not have an  $\mu$ s ticker.

## 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.

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

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 Module informa- tion	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)

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 $\mu s$ 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

1

2

3

4

5

6

7

8

9

## 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

Locking lever terminal module

DC 24V power section supply

Locking lever electronic module

Labeling strip

Backplane bus

LED status indication

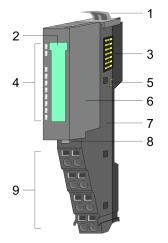
Electronic module

Terminal module

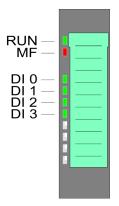
Terminal

 Status indication of the channels via LEDs also with de-activated electronic power supply

## Structure



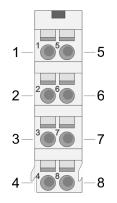
# Status indication

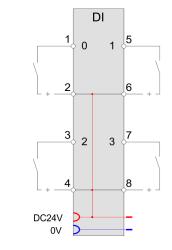


RUN	MF	DI x	Description	
green	<b>red</b>	green	beechpiten	
•		х	Bus communication is OK	
			Module status is OK	
	•	х	Bus communication is OK	
			Module status reports an error	
	-	x	Bus communication is not possible	
	-		Module status reports an error	
		Х	Error at bus power supply	
			Flashing: Error in configuration	
Х	ZHz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38	
			Digital input has signal "1"	
			Digital input has signal "0"	
not relevant: X				

#### Pin assignment

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





Pos.	Function	Туре	Description
1	DI 0	I	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	I	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	+0 PII 1	II 1 State of the inputs 5000h	5000h		
			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.

021-1BD00 - 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	$\checkmark$
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 confi- guration	4
Number of simultaneously utilizable inputs vertical configu- ration	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

## **Digital input**

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

Order no.	021-1BD00
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	$\checkmark$
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

021-1BD10 - DI 4xDC 24V 2µs...4ms

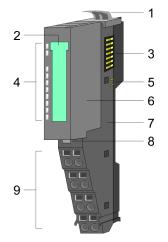
## 3.6 021-1BD10 - DI 4xDC 24V 2µs...4ms

#### 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



#### Status indication

RUN — MF — DI 0 — DI 1 — DI 2 — DI 3 —

RUN	MF	DI x	Description
		x	Bus communication is OK
		^	Module status is OK
	-	х	Bus communication is OK
	-	^	Module status reports an error
	_	х	Bus communication is not possible
	-	^	Module status reports an error
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz 2	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38
			Digital input has signal "1"
			Digital input has signal "0"
not relevant	: X		

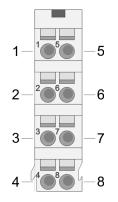
#### 1 Locking lever terminal module

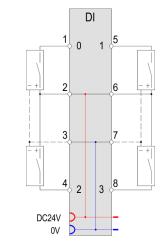
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module8 Locking lever ele
- Locking lever electronic module
- 9 Terminal

021-1BD10 - DI 4xDC 24V 2µs...4ms

#### Pin assignment

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





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	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	+0 PII 1	II 1 State of the inputs 5000h	5000h		
			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	$\checkmark$
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 confi- guration	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	$\checkmark$
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 <sup>1</sup>	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
1) This record set may only b	on transforred at	STOP state				

1) 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.

#### **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	not 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

#### 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	Х	-	Х
Edge 1-0 DI x	Х	-	Х
Diagnostics buffer overflow	-	Х	-
Process interrupt lost	-	Х	-

#### Hardware interrupt

So you may react to asynchronous events, there is the possibility to activate a hardware interrupt.

- A hardware interrupt interrupts the linear program sequence and jumps depending on the master system to a corresponding Interrupt routine. Here you can react to the hardware interrupt accordingly.
- With CANopen the hardware interrupt data a transferred via an emergency telegram.
- Operating with CPU, PROFIBUS and PROFINET the hardware 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

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 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 $\mu$ s ticker at the moment of the process interrupt		
	µs ticker			
		a SLIO module there is a 32 bit timer ( $\mu$ s ticker). With PowerON the timer g with 0. After 2 <sup>32</sup> -1 $\mu$ s the timer starts with 0 again.		
	PRIT_US rep	resents the lower 2 byte of the $\mu$ s ticker value (0 2 <sup>16</sup> -1).		
Diagnostic data	Via the param	neterization you may activate a diagnostic interrupt for the module.		
	With a diagno rupt <sub>incoming</sub> .	ostics interrupt the module serves for diagnostics data for diagnostic inter-		
	As soon as the reason for releasing a diagnostic interrupt is no longer present, the diag- nostic interrupt <sub>going</sub> automatically takes place.			
	All events of a not stored and	a channel between diagnostic interrupt <sub>incoming</sub> and diagnostic interrupt <sub>going</sub> are d get lost.		
		ne window (1. diagnostic interrupt <sub>incoming</sub> until last diagnostic interrupt <sub>going</sub> ) the e module is on.		
		l set for access via CPU, PROFIBUS and PROFINET. The access happens 01h. Additionally the first 4 bytes may be accessed by DS 00h.		
		or access via CANopen. The access happens by IX 2F01h. Additionally the bytes may be accessed by IX 2F00h.		
	SX - Subind	ex for access via EtherCAT with Index 5005h.		
	More can be t	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	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 Module informa- tion	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

CUITVD Channel from		
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)
NUMCH Channels		
NUMCH Channels	Byte	Bit 7 0
	0	Number of channels of the module (here 04h)
CHERR Channel error	Dute	
	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 3: Edge lost at DI 3 Bit 7 4: reserved
		-
CHxERR reserved	Byte	-
CHxERR reserved	<b>Byte</b> 0	Bit 7 4: reserved
CHxERR reserved	-	Bit 7 4: reserved Bit 7 0
CHxERR reserved DIAG_US μs ticker	0	Bit 7 4: reserved Bit 7 0
	0 Byte	Bit 7 4: reserved Bit 7 0 reserved Bit 7 0
	0 <b>Byte</b> 0 3	Bit 7 4: reserved Bit 7 0 reserved
	0 <b>Byte</b> 0 3 μs ticker	Bit 7 0 Reserved Bit 7 0

In the System SLIO module there is a 32 bit timer ( $\mu$ s ticker). With Power starts counting with 0. After 2<sup>32</sup>-1 $\mu$ s the timer starts with 0 again.

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

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#### 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

Locking lever terminal module

DC 24V power section supply

Locking lever electronic module

Labeling strip

Backplane bus

LED status indication

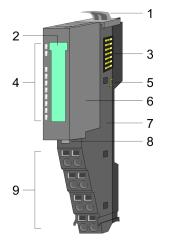
Electronic module

Terminal module

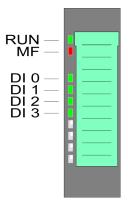
Terminal

 Status indication of the channels via LEDs also with de-activated electronic power supply

#### Structure



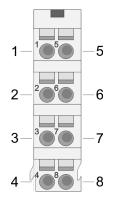
#### Status indication



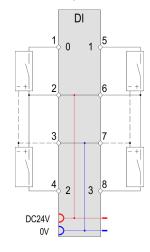
RUN	MF <b>e</b> red	DI x	Description
_		х	Bus communication is OK
		^	Module status is OK
	_	х	Bus communication is OK
	-	^	Module status reports an error
	_	х	Bus communication is not possible
	-	^	Module status reports an error
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38
			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 0.08mm<sup>2</sup> up to 1.5mm<sup>2</sup>.



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

#### 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 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

Order no.	021-1BD40
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	$\checkmark$
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	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

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

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#### 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

Locking lever terminal module

DC 24V power section supply

Locking lever electronic module

Labeling strip

Backplane bus

LED status indication

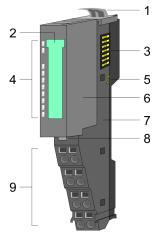
Electronic module

Terminal module

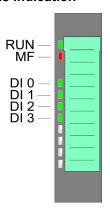
Terminal

 Status indication of the channels via LEDs also with de-activated electronic power supply

#### Structure



## Status indication



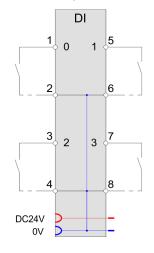
RUN	MF	DI x	Description
green	<b>red</b>	green	Description
_		х	Bus communication is OK
-		^	Module status is OK
_	_	х	Bus communication is OK
-	-	^	Module status reports an error
	_	V	Bus communication is not possible
		Х	Module status reports an error
		Х	Error at bus power supply
			Flashing: Error in configuration
X	ZHz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38
			Digital input has signal "1"
			Digital input has signal "0"
not relevant:	not relevant: X		

021-1BD50 - DI 4xDC 24V NPN

#### Pin assignment

 $1 - \frac{1}{5} - 5$   $2 - \frac{2}{5} - 6$   $3 - \frac{3}{7} - 7$   $4 - \frac{4}{5} - 8$ 

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



Pos.	Function	Туре	Description
1	DI 0	I	Digital input DI 0
2	0V	0	GND
3	DI 2	I	Digital input DI 2
4	0V	0	GND
5	DI 1	I	Digital input DI 1
6	0V	0	GND
7	DI 3	I	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	State of the inputs	5000h	
			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

TypeSM 021Module ID0004 9F84Current consumption/power lossCurrent consumption from backplane bus65 mAPower loss0.6 WTechnical data digital inputsNumber of inputs4Cable length, shielded1000 mCable length, unshielded600 mRated load voltage-Current consumption from load voltage L+ (without load)DC 20.428.8 VInput voltage for signal "0"DC 1528.8 V	
Current consumption/power loss65 mACurrent consumption from backplane bus65 mAPower loss0.6 WTechnical data digital inputs100 mNumber of inputs4Cable length, shielded1000 mCable length, unshielded600 mRated load voltage-Current consumption from load voltage L+ (without load)-Rated valueDC 20.428.8 V	
Current consumption from backplane bus65 mAPower loss0.6 WTechnical data digital inputs4Number of inputs4Cable length, shielded1000 mCable length, unshielded600 mRated load voltage-Current consumption from load voltage L+ (without load)-Rated valueDC 20.428.8 V	
Power loss0.6 WTechnical data digital inputs0.6 WNumber of inputs4Cable length, shielded1000 mCable length, unshielded600 mRated load voltage-Current consumption from load voltage L+ (without load)-DC 20.428.8 V	
Technical data digital inputsHereinstrainNumber of inputs4Cable length, shielded1000 mCable length, unshielded600 mRated load voltage-Current consumption from load voltage L+ (without load)-Rated valueDC 20.428.8 V	
Number of inputs4Cable length, shielded1000 mCable length, unshielded600 mRated load voltage-Current consumption from load voltage L+ (without load)-Rated valueDC 20.428.8 V	
Cable length, shielded1000 mCable length, unshielded600 mRated load voltage-Current consumption from load voltage L+ (without load)-Rated valueDC 20.428.8 V	
Cable length, unshielded600 mRated load voltage-Current consumption from load voltage L+ (without load)-Rated valueDC 20.428.8 V	
Rated load voltage-Current consumption from load voltage L+ (without load)-Rated valueDC 20.428.8 V	
Current consumption from load voltage L+ (without load)       -         Rated value       DC 20.428.8 V	
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 confi- guration 4	
Number of simultaneously utilizable inputs vertical configu- ration 4	
Input characteristic curve -	
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	

021-1BD50 - 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	$\checkmark$
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

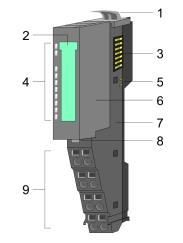
## 3.9 021-1BD70 - DI 4xDC 24V ETS

#### 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 System SLIO  $\mu$ s 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.

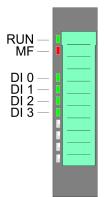
- 4 digital inputs, isolated to the backplane bus
- Configurable ETS functionality for 5 respectively 15 ETS entries (each 4byte)
- Diagnostics function
- Suited for switches and approximate switches
- Status indication of the channels via LEDs also with de-activated electronic power supply

#### Structure



- 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

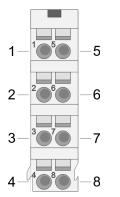
#### Status indication



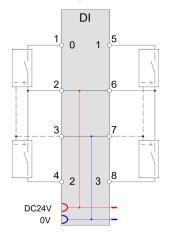
RUN	MF	DI x	Description
•		x	Bus communication is OK Module status is OK
•	•	x	Bus communication is OK Module status reports an error
	•	x	Bus communication is not possible Module status reports an error
		Х	Error at bus power supply
x	ZHz	х	Flashing: Error in configuration
			Digital input has signal "1"
			Digital input has signal "0"
not relevant: X			

021-1BD70 - DI 4xDC 24V ETS

#### Pin assignment



For wires with a cross section of  $0.08 \text{mm}^2$  up to  $1.5 \text{mm}^2$ .



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 System 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:					
	<ul> <li>021-1BD70 DI 4xDC24V (20): uses 20byte in the PII for 5 ETS entries</li> <li>021-1BD70 DI 4xDC24V (60): uses 60byte in the PII for 15 ETS entries</li> </ul>					
Output area	No byte of the output area is used by the module.					
Input area 20byte respec- tively 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.					

021-1BD70 - 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		it byte has th 0 1 2 3	•	fter an edge change is stored ng bit assignment:			
RN				a continuous number 0 12 ical order of the edges.	7, which starts with	1. The RN	
ETS_US				nere is a 32 bit timer (µs ticke <sup>32</sup> -1µs the timer starts with 0		e timer	
	ETS_US	always con	tains the	low word of the µs ticker (0	.65535µs).		
ETS functionality	image as	s ETS_US to	ogether w	the value of the timer is store /ith the state of the inputs PII e sequence of how the ETS e	and the running num	ber RN.	
						<b></b>	
	0				655	L	
	Oh	15		655 <b>3</b> 5µs Ous	6553	50µ5	
				Addr. PI	RN ETS_U	S	
				→ +0 PI			
				+4 PI			
				► +8 PI	-2 RN-2 ETS_U	IS-2	

#### 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.

PII-3

PII-4

+12 +16

RN-3 ETS US-3

RN-4 ETS\_US-4

- 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

	021-1BD70
	SM 021
le ID	0F03 47C2
nt consumption/power loss	
nt consumption from backplane bus	100 mA
rloss	0.95 W
nical data digital inputs	
er of inputs	4
length, shielded	1000 m
length, unshielded	600 m
load voltage	DC 24 V
nt consumption from load voltage L+ (without load)	15 mA
value	DC 20.428.8 V
voltage for signal "0"	DC 05 V
voltage for signal "1"	DC 1528.8 V
voltage hysteresis	-
l logic input	Sinking input
ency range	-
resistance	-
capacitance	-
current for signal "1"	3 mA
ection of Two-Wire-BEROs possible	$\checkmark$
permissible BERO quiescent current	0.5 mA
delay of "0" to "1"	parameterizable 2µs - 3ms
delay of "1" to "0"	parameterizable 2µs - 3ms
er of simultaneously utilizable inputs horizontal confion	4
er of simultaneously utilizable inputs vertical configu-	4
characteristic curve	IEC 61131-2, type 1
data size	60 Byte
s information, alarms, diagnostics	
s display	green LED per channel
upts	no
ss alarm	no
ostic interrupt	no
ostic 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	$\checkmark$
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 <sup>1, 2</sup>	14h resp. 3Ch (fix)	02h	3100h	01h				
PIQ_L	1	Length process image output data <sup>2</sup>	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 percentar correspond	1) This parameter corresponds of the configured variant									

1) This parameter corresponds of the configured variant.

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

PII_L	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.					
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!				

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

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 μs 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.

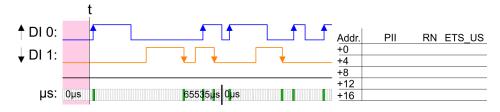
In this example a module is configured, which occupies 20byte for 5 ETS entries.

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

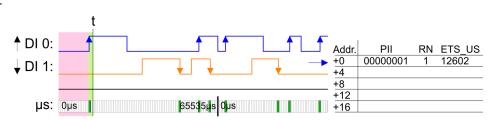
Process image is empty

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



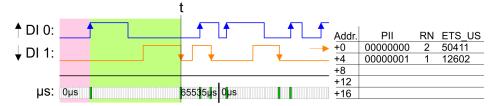
021-1BD70 - DI 4xDC 24V ETS > Parameter data

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



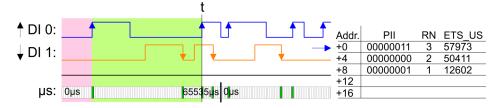
2. ETS entry

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.



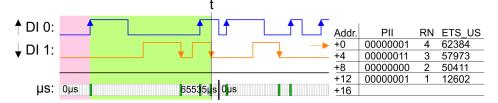
3. ETS entry

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.



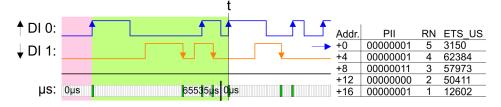
4. ETS entry

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

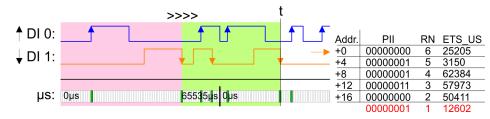
Released by an edge 0-1 from DI 0 the 5. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each. The maximum number of ETS entries is reached.



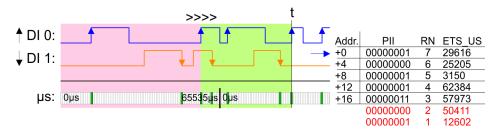
021-1BD70 - DI 4xDC 24V ETS > Diagnostic data

#### 6. ETS entry

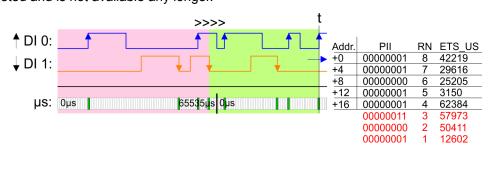
Released by an edge 1-0 from DI 1 the 6. ETS entry is registered starting from address +0 and already existing ETS entries are shifted 4 byte each. Thereby the 1. ETS entry is deleted and is not available any longer.



# **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  $\mu$ s ticker. The Ethernet coupler with ModbusTCP 053-1MT00 for example does not have an  $\mu$ s ticker.

#### 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 Module informa- tion	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 $\mu$ s ticker at the moment of the diagnostic data generation

ERR\_A/C/D CHERR, CHxERR reserved

Byte	Bit 7 0
0	reserved

## 3.10 021-1BF00 - DI 8xDC 24V

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#### **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

Locking lever terminal module

DC 24V power section supply

Locking lever electronic module

Labeling strip

Backplane bus

LED status indication

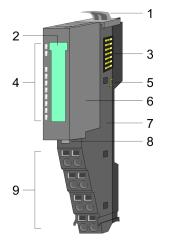
Electronic module

Terminal module

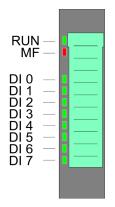
Terminal

 Status indication of the channels via LEDs also with de-activated electronic power supply

#### Structure



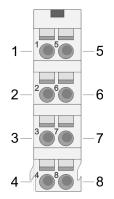
#### Status indication



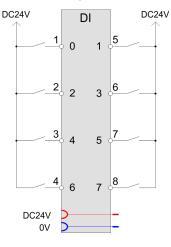
RUN	MF <b>e</b> red	DI x	Description
_		х	Bus communication is OK
-		^	Module status is OK
_	_	х	Bus communication is OK
-		^	Module status reports an error
	_	х	Bus communication is not possible
		^	Module status reports an error
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz 2Hz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38
			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 0.08mm<sup>2</sup> up to 1.5mm<sup>2</sup>.



Pos.	Function	Туре	Description
1	DI 0	I	Digital input DI 0
2	DI 2	L	Digital input DI 2
3	DI 4	I	Digital input DI 4
4	DI 6	I	Digital input DI 6
5	DI 1	I	Digital input DI 1
6	DI 3	I	Digital input DI 3
7	DI 5	I	Digital input DI 5
8	DI 7	I	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	1	State of the inputs	6000h			
			Bit 0: DI 0		01h		
			Bit 1: DI 1		02h		
		Bit 2:	Bit 2: DI 2 Bit 3: DI 3 Bit 4: DI 4 Bit 5: DI 5	Bit 2: DI 2		03h	
						Bit 3: DI 3	
				Bit 4: DI 4		05h	
		Bit 5: DI 5		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	$\checkmark$

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 confi- guration	8
Number of simultaneously utilizable inputs vertical configu- ration	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	$\checkmark$
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

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

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### **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

Locking lever terminal module

DC 24V power section supply

Locking lever electronic module

Labeling strip

Backplane bus

LED status indication

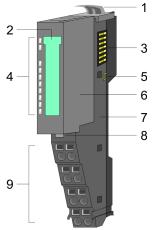
Electronic module

Terminal module

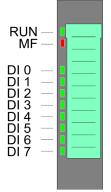
Terminal

Status indication of the channels via LEDs also with de-activated electronic power supply

#### Structure



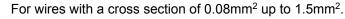
# **Status indication**

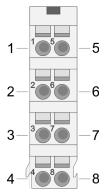


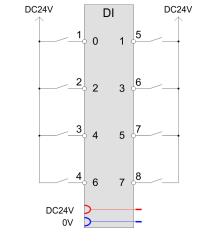
RUN	MF	DI x	Description
green	red	green	· ·
		х	Bus communication is OK
		~	Module status is OK
	-	х	Bus communication is OK
		^	Module status reports an error
	-	х	Bus communication is not possible
		^	Module status reports an error
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38
			Digital input has signal "1"
			Digital input has signal "0"
not relevant: X			

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

### Pin assignment







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

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

Addr.	Name	Bytes	Function	IX	SX		
+0	PII	PII	PII	PII 1	State of the inputs	6000h	
		Bit 0: DI 0	Bit 0: DI 0		01h		
	Bit 1: DI 1 Bit 2: DI 2 Bit 3: DI 3		02h				
			Bit 2: DI 2		03h		
			Bit 3: DI 3 Bit 4: DI 4			Bit 3: DI 3	
					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

nput delay of "0" to "1"max. 500 μshput delay of "1" to "0"max. 500 μsNumber of simultaneously utilizable inputs horizontal configuration8Number of simultaneously utilizable inputs vertical configuration8nput characteristic curveIEC 61131-2, type 1initial data size8 BitStatus information, alarms, diagnostics7Status information, alarms, diagnostics9Status information, alarms, diagnostics100Status information, alarms, diagnostics9Status information, alarms, diagnostics9Status information, alarms, diagnostics9Status information read-outnoDiagnostic interruptnoDiagnostic functionsnoDiagnostic functionsnoneDiagnostic functions10Status information read-outnoneModule error displayed LEDChannel error display0Status information read-out0Status information read-out0Module error display2Channel error display1Status information read-out0Status information rea	Order no.	021-1BF01
nput delay of "1" to "0"max. 500 µsNumber of simultaneously utilizable inputs horizontal configuration8Number of simultaneously utilizable inputs vertical configuration8Input characteristic curveEC 61131-2, type 1Intial data size8 BitStatus information, alarms, diagnostics9Status displaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic information read-outnoneModule stategreen LEDModule stategreen LEDStatus displaynoStatus displaynoDiagnostic information read-outnoneModule error displayced LEDStatem channels-Setween channels of groups to-Setween channels of groups to-Setween channels and backplane bus-Statey protocol-Safety protocol-Safety requirements-Seture user address-Watchdog-Watchdog-Watchdog-Statey of connels-Seture user address-Seture user address<	Max. permissible BERO quiescent current	0.5 mA
Number of simultaneously utilizable inputs horizontal configuration8Number of simultaneously utilizable inputs vertical configuration8Input characteristic curveIEC 61131-2, type 1Initial data size8 BitStatus information, alarms, diagnosticsgreen LED per channelInterruptsnoProcess alarmnoProcess alarmnoDiagnostic functionsnoDiagnostic functionsnoneDiagnostic functionsgreen LEDModule stategreen LEDStatus displaynoStatus displaynoDiagnostic functionsnoneDiagnostic functionsnoneState stategreen LEDState stategreen LEDModule error displayred LEDChannel error displaynoneStatewen channels of groups to-Setween channels of groups to-Setween channels and backplane busStatey protocol-Statey protocol-Statey protocol-Seture user address-Watchdog-Watchdog-Workhannels-Statey protocol-Statey protocol-<	Input delay of "0" to "1"	max. 500 μs
gurationBNumber of simultaneously utilizable inputs vertical configu- tation8Input characteristic curveIEC 61131-2, type 1Input characteristic curve8 BitStatus airformation, alarms, diagnosticsgreen LED per channelInterruptnoStatus displaygreen LED per channelInterruptsnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic information read-outnoneModule error displaygreen LEDChannel error displaynoneStatus on participationnoneStatus on participationnoneStatus on participationnoneChannel error displaycallendomStatus on participationnoneStatus on participationsolutionStatus on participationnoneStatus on participationcallendomChannel error displaycallendomStatus on participationsolutionStatus on participationcallendomStatus on participationcallendomSta	Input delay of "1" to "0"	max. 500 μs
rationIEC 61131-2, type 1input characteristic curveIEC 61131-2, type 1initial data size8 BitStatus information, alarms, diagnosticsStatus displaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic interruptnoneDiagnostic information read-outmoneModule error displaygreen LEDChannel error displaynoneStatus of groups tononeStatus of groups to-Between channels-Between channels of groups to-Between channels of groups to-StationDC 500 VStafty protocol-Safety protocol-Safety requirements-Safety requirements-Safety requirements-Staction-Statchog-Statchog-Statchog-Stafety requirements-Sherup er address-Watchdog-Two channels-Stafety requirements-Stafety requirements-Stafety requirements-Stafety requirements-Stafety requirements-Stafety requirements-Stafety requirements-Stafety requirements-Stafety requirements-Stafety requirements	Number of simultaneously utilizable inputs horizontal configuration	8
Initial data size         8 Bit           Status information, alarms, diagnostics         green LED per channel           Status display         no           Interrupts         no           Process alarm         no           Diagnostic interrupt         no           Diagnostic functions         none           Diagnostic functions         none           Module state         green LED           Module error display         red LED           Channel error display         none           Status of groups to         none           Status of groups to         none           Status of groups to         red LED           Status of groups to         scale           Status of groups to         -           Status of	Number of simultaneously utilizable inputs vertical configu- ration	8
Status information, alarms, diagnosticsinterceptStatus displaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic functionsnoneDiagnostics information read-outnoneModule stategreen LEDModule error displayred LEDChannel error displaynoneStatus of groups tononeBetween channels-Between channels of groups to-Status network withDC 500 VStatey protocol-Stafety protocol-Stafety requirements-Stafety requirements-Stafety requirements-Stafety network-Stafety network-Workhdog-Fivo channels-Stafety network-Stafety network-	Input characteristic curve	IEC 61131-2, type 1
Status displaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic functionsnoDiagnostic functionsnoneDiagnostic information read-outmoneModule stategreen LEDModule error displayred LEDChannel error displaynoneSolation-Between channels-Between channels of groups to-Between channels and backplane busSafety protocolSolo VSafety protocol-Safety requirements-Safety requirements-Secure user address-Watchdog-Fivo channels-Solation-Solation-Safety requirements-Solation-Safety requirements-Safety requirements-Solation-Safety requirements-Safety requirements<	Initial data size	8 Bit
no           Process alarm         no           Diagnostic interrupt         no           Diagnostic interrupt         no           Diagnostic functions         no           Diagnostic information read-out         none           Module state         green LED           Module error display         red LED           Channel error display         none           Stolation         no           Between channels         -           Between channels of groups to         -           Between channels and backplane bus         ✓           Safety         DC 500 ∨           Safety protocol         -           Safety requirements         -           Vatchdog         -	Status information, alarms, diagnostics	
Process alarmnoDiagnostic interruptnoDiagnostic functionsnoDiagnostic functionsnoneDiagnostics information read-outgreen LEDModule stategreen LEDModule error displayred LEDChannel error displaynoneSolation-Between channels-Between channels of groups to-Between channels and backplane busInsulation tested withDC 500 VSafety-Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Subation-Secure user address-Safety requirements-Sherty-Subation-Subation-Subation tested with-Subation tested	Status display	green LED per channel
Diagnostic interruptnoDiagnostic functionsnoDiagnostic functionsnoneDiagnostics information read-outgreen LEDModule stategreen LEDModule error displayred LEDChannel error displaynoneStation-Between channels-Between channels of groups to-Between channels and backplane bus✓Stafety protocolSafetySafety protocol-Safety requirements-Safety requirements-Safety requirements-Safety requirements-Safety requirements-Shethong-Watchdog-Watchdog-The optimitation of the set of the s	Interrupts	no
Diagnostic functionsnoDiagnostic functionsnoneModule stategreen LEDModule error displayred LEDChannel error displaynoneStation-Between channels-Between channels of groups to-Between channels and backplane bus✓Insulation tested withDC 500 VSafety protocol-Safety requirements-Safety requirements-Secure user address-Watchdog-Two channels-Two channels-Stafety Function-Stafety requirements-Safety requirements-S	Process alarm	no
Diagnostics information read-outnoneDiagnostics information read-outnoneModule stategreen LEDModule error displayred LEDChannel error displaynoneStation-Between channels-Between channels of groups to-Between channels and backplane bus✓Insulation tested withDC 500 VSafety-Safety requirements-Secure user address-Watchdog-Watchdog-To channels-States- <t< td=""><td>Diagnostic interrupt</td><td>no</td></t<>	Diagnostic interrupt	no
Module stategreen LEDModule error displayred LEDChannel error displaynoneIsolation-Between channels-Between channels of groups to-Between channels and backplane bus✓Insulation tested withDC 500 VSafety-Safety requirements-Safety requirements-Safety requirements-Safety requirements-Safety requirements-Safety negatives-Safety requirements-Safety requirements-Safety negatives-Safety negatives <td< td=""><td>Diagnostic functions</td><td>no</td></td<>	Diagnostic functions	no
Addule error displayred LEDChannel error displaynoneIsolation-Between channels-Between channels of groups to-Between channels and backplane bus✓Insulation tested withDC 500 VSafety-Safety protocol-Safety requirements-Secure user address-Watchdog-To channels-Safety-Safety-Safety requirements-Safety requirements-Safety-Safety-Safety-Safety-Safety requirements-Safety-<	Diagnostics information read-out	none
Channel error displaynoneisolation-isolation-Between channels-Between channels of groups to-Between channels and backplane bus-Insulation tested withDC 500 VSafety-Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Insulation tested with-Safety requirements-Safety requirements-Safety requirements-Secure user address-Watchdog-Two channels-Insulation tested with-Safety requirements-Safety requirements-	Module state	green LED
IsolationImage: constraint of groups toBetween channels of groups to-Between channels and backplane bus✓Between channels and backplane bus✓Insulation tested withDC 500 VSafety-Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Safety-Safety-Safety-Safety requirements-Safety requirements-Safety- <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 withDC 500 VSafety-Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Safety-Safety-Safety-Safety requirements-Secure user address-Safety<	Channel error display	none
Between channels of groups to-Between channels and backplane bus✓Insulation tested withDC 500 VSafety-Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Safety-Safety-Safety requirements-Secure user address-Safety-<	Isolation	
Between channels and backplane bus✓Insulation tested withDC 500 VSafety-Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-	Between channels	-
Insulation tested with       DC 500 V         Safety       DC 500 V         Safety protocol	Between channels of groups to	-
SafetySafety protocolSafety requirementsSecure user addressWatchdogTwo channels	Between channels and backplane bus	$\checkmark$
Safety protocol       -         Safety requirements       -         Secure user address       -         Watchdog       -         Two channels       -	Insulation tested with	DC 500 V
Safety requirements     -       Secure user address     -       Watchdog     -       Two channels     -	Safety	
Secure user address     -       Watchdog     -       Two channels     -	Safety protocol	-
Watchdog-Two channels-	Safety requirements	
Two channels -	Secure user address	-
	Watchdog	-
Test pulse outputs -	Two channels	-
	Test pulse outputs	-
Datasizes	Datasizes	
nput bytes 1	Input bytes	1
Output bytes 0	Output bytes	0
Parameter bytes 0	Parameter bytes	0
Diagnostic bytes 0	Diagnostic bytes	0
Housing	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

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

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# 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

Locking lever terminal module

DC 24V power section supply

Locking lever electronic module

Labeling strip

Backplane bus

LED status indication

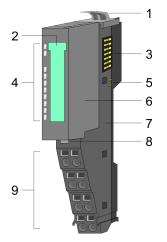
Electronic module

Terminal module

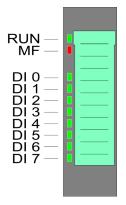
Terminal

 Status indication of the channels via LEDs also with de-activated electronic power supply

### Structure



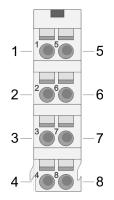
### Status indication



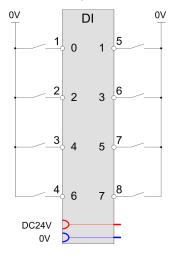
RUN	MF red	DI x	Description
_		V	Bus communication is OK
		Х	Module status is OK
_	_	х	Bus communication is OK
	-	^	Module status reports an error
	_	v	Bus communication is not possible
	-	Х	Module status reports an error
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38
			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 0.08mm<sup>2</sup> up to 1.5mm<sup>2</sup>.



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

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

Addr.	Name	Bytes	Function	IX	SX			
+0	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		04h	
		Bit 4: DI 4 Bit 5: DI 5			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 confi- guration	8
Number of simultaneously utilizable inputs vertical configu- ration	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	$\checkmark$
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

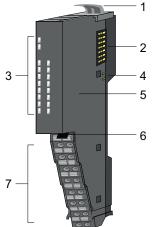
#### 3.13 021-1BH00 - DI 16xDC 24V

### **Properties**

The module detects the binary control signals from the process level and transmits them isolated to the higher-level bus system. It has 16 channels and their status is indicated by LEDs.

- 16 digital Inputs isolated to the backplane bus
- Suitable for switches and proximity switches
- Status indication of the channels via LEDs also with de-activated electronic power supply
- Parameterizable input delay

#### Structure



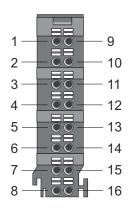
#### 1 Locking lever module

- Backplane bus 2
- 3 LED status indication DC 24V power section supply 4
  - Electronic unit
- 5 6 Locking lever terminal block
- Terminal block 7
- **Status indication** RUN MF ł DI +0.0 DI +0.1 DI +0.2 DI +0.3 DI +0.3 DI +0.4 DI +0.5 DI +0.6 DI +0.7 DI +1.0 DI +1.1 DI +1.2 DI +1.3 DI +1.4 DI +1.5 DI +1.6 DI +1.7

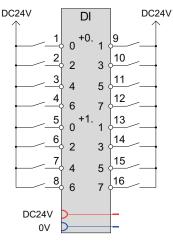
RUN	MF	DI x	Description
green	red	green	beenplien
		х	Bus communication is OK
-		^	Module status is OK
	-	х	Bus communication is OK
	-	^	Module status reports an error
	-	х	Bus communication is not possible
	-	^	Module status reports an error
		Х	Error at bus power supply
			Blinking: Error in configuration
Х	ZHz 2Hz	Х	♦ Chap. 2.12 'Trouble shooting - LEDs' page 38
			Digital input has signal "1"
			Digital input has signal "0"
not relevant	: X		

021-1BH00 - DI 16xDC 24V

#### Pin assignment



For wires with a core cross-section of 0.14 mm<sup>2</sup> up to 0.75 mm<sup>2</sup>. With a core cross-section < 0.25 mm<sup>2</sup>, ferrules must be used.  $\Leftrightarrow$  *'Data' page 26* 



Pos.	Function	Туре	Description
1	DI +0.0	I	Digital input DI +0.0
2	DI +0.2	I	Digital input DI +0.2
3	DI +0.4	I	Digital input DI +0.4
4	DI +0.6	I	Digital input DI +0.6
5	DI +1.0	I	Digital input DI +1.0
6	DI +1.2	I	Digital input DI +1.2
7	DI +1.4	I	Digital input DI +1.4
8	DI +1.6	I	Digital input DI +1.6
9	DI +0.1	I	Digital input DI +0.1
10	DI +0.3	I	Digital input DI +0.3
11	DI +0.5	I	Digital input DI +0.5
12	DI +0.7	I	Digital input DI +0.7
13	DI +1.1	I	Digital input DI +1.1
14	DI +1.3	I	Digital input DI +1.3
15	DI +1.5	I	Digital input DI +1.5
16	DI +1.7	I	Digital input DI +1.7

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

021-1BH00 - DI 16xDC 24V > Technical data

Addr.	Name	Byte	Function	IX	SX <sup>1</sup>
+0	PII	0	Status of the inputs	6000h	
			Bit 0: DI +0.0		01h
			Bit 1: DI +0.1		02h
			Bit 2: DI +0.2		03h
			Bit 3: DI +0.3		04h
			Bit 4: DI +0.4		05h
			Bit 5: DI +0.5		06h
			Bit 6: DI +0.6		07h
			Bit 7: DI +0.7		08h
	1	1	Status of the inputs	6001h	
			Bit 0: DI +1.0		09h
			Bit 1: DI +1.1		0Ah
			Bit 2: DI +1.2		0Bh
			Bit 3: DI +1.3		0Ch
			Bit 4: DI +1.4		0Dh
			Bit 5: DI +1.5		0Eh
			Bit 6: DI +1.6		0Fh
			Bit 7: DI +1.7		10h
1) Can be dis	played as 16 c	hannels with th	e names DI 0 to DI 15.		

# Output area

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

# 3.13.1 Technical data

Order no.	021-1BH00
Туре	SM 021
Module ID	0020 1FC2
Current consumption/power loss	
Current consumption from backplane bus	35 mA
Power loss	1.2 W
Technical data digital inputs	
Number of inputs	16
Cable length, shielded	1000 m
Cable length, unshielded	600 m
Rated load voltage	-
Current consumption from load voltage L+ (without load)	-

021-1BH00 - DI 16xDC 24V > Technical data

Order no.	021-1BH00
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"	2.3 mA
Connection of Two-Wire-BEROs possible	$\checkmark$
Max. permissible BERO quiescent current	0.5 mA
Input delay of "0" to "1"	parameterizable 400µs - 23ms
Input delay of "1" to "0"	parameterizable 400µs - 23ms
Number of simultaneously utilizable inputs horizontal configuration	16
Number of simultaneously utilizable inputs vertical configu- ration	16
Input characteristic curve	IEC 61131-2, type 1
Initial data size	16 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	$\checkmark$
Insulation tested with	DC 500 V
Safety	
Safety protocol	-
Safety requirements	-

021-1BH00 - DI 16xDC 24V > Parameter data

Order no.	021-1BH00
Secure user address	-
Watchdog	-
Two channels	-
Test pulse outputs	-
Datasizes	
Input bytes	2
Output bytes	0
Parameter bytes	1
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	52 g
Weight including accessories	52 g
Gross weight	66 g
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-25 °C to 70 °C
Certifications	
UL certification	in preparation
KC certification	in preparation

### 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

Name	Byte	Function	Default	DS	IX	SX
CHD	1	Input delay DI x	89h	01h	3100h	01h

021-1BH00 - DI 16xDC 24V > Parameter data

#### CHD input delay

Byte	Function	Possible values:	
0	Input delay DI x	06h: 0.4ms	0Ah: 6ms
	Bit 3 0: Values filter	07h: 0.7ms	0Bh: 12ms
		08h: 1.5ms	0Ch: 23ms
		09h: 3ms	
		Other values ar	e not permitted!
	Bit 6 4: reserved		
	Bit 7: Filter (0: block, 1: enable)		

By specifying the *input delay*, you can specify a filter for all channels here. With the help of filters you may e.g. filter signal peaks at a blurred input signal. By default, an input delay of 3ms is set for all channels.

021-1DF00 - DI 8xDC 24V Diagnosis

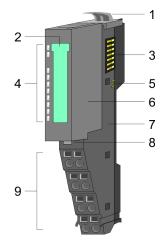
# 3.14 021-1DF00 - DI 8xDC 24V Diagnosis

### Properties

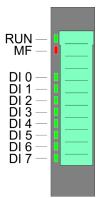
The electronic module with diagnosis collects the binary control signals from the process level and transmits them isolated to the central bus system. It has 8 digital input channels (with parameterizable input delay) and their status is monitored via LEDs.

- 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



#### Status indication



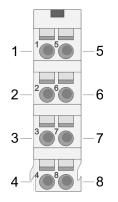
RUN	MF	DI x	Description
		х	Bus communication is OK Module status is OK
	•	x	Bus communication is OK Module status reports an error
	•	х	Bus communication is not possible Module status reports an error
		Х	Error at bus power supply
x	ZHz	x	Flashing: Error in configuration
			Digital input has signal "1"
			Digital input has signal "0"
not relevant:	Х		

#### 1 Locking lever terminal module

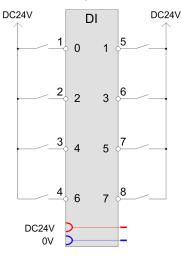
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

021-1DF00 - DI 8xDC 24V Diagnosis

#### Pin assignment



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



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

021-1DF00 - DI 8xDC 24V Diagnosis > 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	
			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.

# 3.14.1 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	$\checkmark$

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

Order no.	021-1DF00
Max. permissible BERO quiescent current	1.5 mA
Input delay of "0" to "1"	parameterizable 100µs - 20ms
Input delay of "1" to "0"	parameterizable 100µs - 20ms
Number of simultaneously utilizable inputs horizontal configuration	8
Number of simultaneously utilizable inputs vertical configu- ration	8
Input characteristic curve	IEC 61131-2, type 3
Initial data size	8 Bit
Status information, alarms, diagnostics	
Status display	green LED per channel
Interrupts	yes
Process alarm	no
Diagnostic interrupt	yes, parameterizable
Diagnostic functions	yes
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	$\checkmark$
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	12
Diagnostic bytes	20
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

# 3.14.2 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 <sup>1</sup>	00h	00h	3100h	01h
WIBRK_EN	1	Wire break recognition <sup>1</sup>	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

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

### DIAG\_EN Diagnostic interrupt

Byte	Bit 7 0
0	<ul> <li>Diagnostic interrupt:</li> <li>00h: disable</li> <li>40h: enable</li> </ul>

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	<ul> <li>Bit 0: Wire break recognition DI 0 (1: on)</li> <li>Bit 1: Wire break recognition DI 1 (1: on)</li> <li></li> </ul>
	<ul> <li>Bit 7: Wire break recognition DI 7 (1: on)</li> </ul>

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 x	1h: 100µs
	Bit 7 4: Filter time DI x+1	2h: 400µs
		3h: 800µs
		4h: 1.6ms
		5h: 3.2ms
		6h: 10ms
		7h: 20ms
		Other values are not permissible!

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

### 3.14.3 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.

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

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	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	<ul> <li>Bit 0: set at module failure</li> <li>Bit 1: set at internal error</li> <li>Bit 2: set at external error</li> <li>Bit 3: set at channel error</li> <li>Bit 4: set at external auxiliary supply missing</li> <li>Bit 6, 5: reserved</li> <li>Bit 7: set at error in parameterization</li> </ul>

MODTYP Module informa- tion	Byte	Bit 7 0
	0	<ul> <li>Bit 3 0: Module class <ul> <li>1111b: Digital module</li> </ul> </li> <li>Bit 4: Channel information present</li> <li>Bit 7 5: reserved</li> </ul>

ERR_C reserved	Byte	Bit 7 0
	0	reserved

ERR_D Diagnostic	ERR_		)iagr	nostic
------------------	------	--	-------	--------

Byte	Bit 7 0
0	<ul> <li>Bit 2 0: reserved</li> <li>Bit 3: set at internal diagnostics buffer overflow</li> <li>Bit 4: set at internal communication error</li> <li>Bit 7 5: reserved</li> </ul>

### HB300 | SM-DIO | | en | 21-10

DIAG\_US µs ticker

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

CHTYP Channel type	Byte	Bit 7 0
	0	<ul> <li>Bit 6 0: Channel type</li> <li>70h: Digital input</li> <li>Bit 7: reserved</li> </ul>
NUMBIT Diagnostic bits	Byte	Bit 7 0
	0	Number of diagnostics bits of the module per channel (here 08h)
NUMCH Channels	Byte	Bit 7 0
	0	Number of channels of the module (here 08h)
CHERR DI x	Byte	Bit 7 0
	0	<ul> <li>Bit 0: Channel error DI 0</li> <li>Bit 1: Channel error DI 1</li> <li></li> <li>Bit 7: Channel error DI 7</li> </ul>
CHxERR	Byte	Bit 7 0
	0	Channel-specific error: DI x:

Byte Bit 7 ... 0

ш.

0 ... 3 Value of the µs ticker at the moment of the diagnostic

Bit 3 ... 1: reserved

Bit 7 ... 5: reserved

Bit 4: set at wire break

µs ticker

In the System SLIO module there is a 32 bit timer ( $\mu$ s ticker). With PowerON the timer starts counting with 0. After 2<sup>32</sup>-1 $\mu$ s the timer starts with 0 again.

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

# 4 Digital output

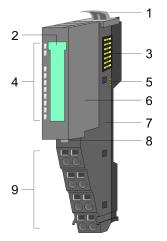
# 4.1 022-1BB00 - DO 2xDC 24V 0.5A

#### **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

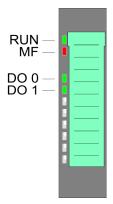


- Locking lever terminal module
- 2 Labeling strip

1

- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module8 Locking lever ele
  - Locking lever electronic module
- 9 Terminal

### Status indication

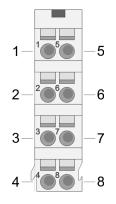


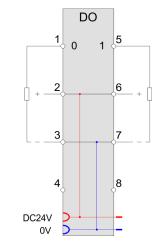
RUN	MF	DO x	Description	
green	red	green		
		х	Bus communication is OK	
		Λ	Module status is OK	
			Bus communication is OK	
		х	Module status reports an error with overload, short circuit or overheat	
			Bus communication is not possible	
	•	Х	Module status reports an error with overload, short circuit or overheat	
		Х	Error at bus power supply	
			Flashing: Error in configuration	
Х	ZHz 2Hz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38	
			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 0.08mm<sup>2</sup> up to 1.5mm<sup>2</sup>.





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 (

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

Input area

Output area

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

IX - Index for access via CANopen

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

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

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

Order no.	022-1BB00
Туре	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
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	$\checkmark$
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

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	$\checkmark$
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

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

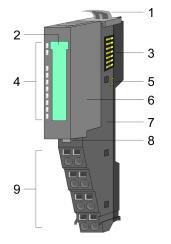
# 4.2 022-1BB20 - DO 2xDC 24V 2A

# **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.

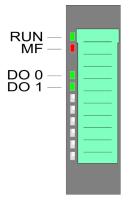
- 2 digital 2A outputs, isolated to the backplane bus
- Status indication of the channels via LEDs

### 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



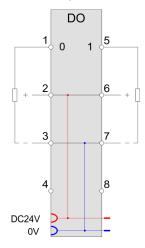
RUN	MF	DO x	Description	
green	red	green	Description	
		х	Bus communication is OK	
		^	Module status is OK	
			Bus communication is OK	
	-	Х	Module status reports an error with overload, short circuit or overheat	
			Bus communication is not possible	
	-	Х	Module status reports an error with overload, short circuit or overheat	
		Х	Error at bus power supply	
			Flashing: Error in configuration	
Х	ZHz 2Hz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38	
			Digital output has "1" signal	
			Digital output has "0" signal	
not relevant: X				

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

#### Pin assignment

 $1 - \frac{1}{5} - 5$   $2 - \frac{2}{5} - 6$   $3 - \frac{3}{5} - 7$   $4 - \frac{4}{5} - 8$ 

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



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



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

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

Output area

Input 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

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	
			Bit 7 2: reserved				

# 4.2.1 Technical data

TypeSM 022Module ID0102 AF90Current consumption/power loss70 mAPower loss0.55 WPower loss0.55 WTechnical data digital outputs2Number of outputs0.00 mCable length, shielded000 mCable length, unshielded000 mCurrent consumption from load voltage L+ (without load)0 ATotal current per group, horizontal configuration, 40°C4 ATotal current per group, horizontal configuration, 60°C4 ATotal current per group, horizontal configuration, 60°C4 AOutput current at signal "1", rated value20 upsOutput dalay of "0" to "1"0.00 µOutput dalay of "0" to "1"0.00 µOutput delay of "1" to "0"0.00 µParalel switching of outputs for increased powe	Order no.	022-1BB20
Current consumption/power lossImage: consumption from backplane busCurrent consumption from backplane bus70 mAPower loss0.55 WTechnical dati digital outputs2Number of outputs00 mCable length, shielded600 mCable length, unshieldedDC 20.428.8 VCurrent consumption from load voltage L+ (without load)10 mATotal current per group, horizontal configuration, 40°C4 ATotal current per group, horizontal configuration, 60°C4 AOutput current at signal "1", rated value2AOutput delay of "0" to "1"20 upsOutput delay of "0" to "1"100 upsOutput delay of "0" to "1"20 upsOutput delay of "0" to "1"20 upsOutput delay of "1" to "0"20 upsParallel switching of outputs for increased powernot possibleActuation of digital input~Actuation of digital input.Switching frequency with inductive loadmax. 100 HzSwitching frequency with inductive loadmax. 0.5 HzSwitching frequency on lamp loadmax. 10 HzLiternal limitation of inductive shut-off voltageL+ (-52 V)	Туре	SM 022
Current consumption from backplane bus70 mAPower loss0.55 WTechnical data digital outputs2Number of outputs2Cable length, shielded1000 mCable length, unshielded600 mRated load voltageDC 20.428.8 VCurrent consumption from load voltage L+ (without load)10 mATotal current per group, horizontal configuration, 40°C4 ATotal current per group, horizontal configuration, 60°C4 AOutput current at signal "1", rated value2 AOutput delay of "0" to "1"100 µsOutput delay of "0" to "1"100 µsOutput delay of "1" to "0"250 µsMinimun load current-Lamp load10 WParallel switching of outputs for increased powernot possibleActuation of digital input×Switching frequency with inductive loadmax. 1000 HzSwitching frequency with inductive loadmax. 1001 HzSwitching frequency on lamp loadmax. 10 HzItermal limitation of inductive shut-off woltagetu (-52 V)	Module ID	0102 AF90
Power loss0.55 WTechnical data digital outputs2Number of outputs2Cable length, shielded000 mCable length, unshielded600 mRated load voltageDC 20.428.8 VCurrent consumption from load voltage L+ (without load)10 mATotal current per group, horizontal configuration, 40°C4 ATotal current per group, horizontal configuration, 60°C4 AOutput current at signal "1", rated value2 ASignal logic outputSourcing outputOutput delay of "1" to "0"250 µsMinimum load current-Lamp load10 WParallel switching of outputs for increased powernot possibleParallel switching of outputs for increased powernot possibleActuation of digital input~Switching frequency with inductive loadmax. 1000 HzSwitching frequency with inductive loadmax. 0.5 HzSwitching frequency on lamp loadmax. 10 HzLiternal limitation of inductive shut-off yoltagethe (-52 V)	Current consumption/power loss	
Technical data digital outputsImage: Constraint of Constraint	Current consumption from backplane bus	70 mA
Number of outputs2Cable length, shielded1000 mCable length, unshielded600 mRated load voltageDC 20.428.8 VCurrent consumption from load voltage L+ (without load)10 mATotal current per group, horizontal configuration, 40°C4 ATotal current per group, horizontal configuration, 60°C4 ATotal current per group, vertical configuration, 60°C4 AOutput current at signal "1", rated value2 AOutput current at signal "1", rated value2 AOutput delay of "0" to "1"100 µsOutput delay of "0" to "1"250 µsNimmun load current100 µSLamp load10 VParallel switching of outputs for increased powernot possibleActuation of digital input~Switching frequency with inductive loadmax. 1000 HzSwitching frequency with inductive loadmax. 101 HzSwitching frequency on lamp loadmax. 0.5 HzLiternal limitation of inductive shut-off voltageL+ (-52 V)	Power loss	0.55 W
Cable length, shielded1000 mCable length, unshielded600 mRated load voltageDC 20428.8 VCurrent consumption from load voltage L+ (without load)10 mATotal current per group, horizontal configuration, 40°C4 ATotal current per group, horizontal configuration, 60°C4 ATotal current per group, vertical configuration, 60°C4 AOutput current at signal "1", rated value2 ASignal logic output20 μsOutput delay of "0" to "1"100 μsOutput delay of "0" to "1"250 μsMinimun load current10 WParallel switching of outputs for redundant control of al ongnot possibleParallel switching of outputs for increased powernot possibleActuation of digital inputSwitching frequency with inductive loadmax. 1000 HzSwitching frequency on lamp loadmax. 10 HzLiternal limitation of inductive shut-off voltageL+ (-52 V)	Technical data digital outputs	
Cable length, unshielded600 mRated load voltageDC 20.428.8 VCurrent consumption from load voltage L+ (without load)10 mATotal current per group, horizontal configuration, 40°C4 ATotal current per group, horizontal configuration, 60°C4 ATotal current per group, vertical configuration4 AOutput current at signal "1", rated value2 ASignal logic outputSourcing outputOutput delay of "0" to "1"100 μsOutput delay of "1" to "0"250 μsMinimum load current-Lamp loadnot possibleParallel switching of outputs for increased powernot possibleActuation of digital input✓Switching frequency with inductive loadmax. 1000 HzSwitching frequency on lamp loadmax. 0.5 HzSwitching frequency on lamp loadL+ (-52 V)	Number of outputs	2
Rated load voltageDC 20.428.8 VCurrent consumption from load voltage L+ (without load)10 mATotal current per group, horizontal configuration, 40°C4 ATotal current per group, horizontal configuration, 60°C4 ATotal current per group, vertical configuration, 60°C4 AOutput current at signal "1", rated value2 ASignal logic outputSourcing outputOutput delay of "0" to "1"100 µsOutput delay of "1" to "0"250 µsMinimum load current-Lamp loadnot possibleParallel switching of outputs for redundant control of a loadnot possibleActuation of digital input✓Switching frequency with inductive loadmax. 1000 HzSwitching frequency on lamp loadmax. 10 HzSwitching frequency on lamp loadmax. 10 Hz	Cable length, shielded	1000 m
Current consumption from load voltage L+ (without load)10 mATotal current per group, horizontal configuration, 40°C4 ATotal current per group, horizontal configuration, 60°C4 ATotal current per group, vertical configuration4 AOutput current at signal "1", rated value2 ASignal logic outputSourcing outputOutput delay of "0" to "1"100 µsOutput delay of "0" to "1"250 µsMinimum load current-Lamp load10 WParallel switching of outputs for redundant control of a loadnot possibleActuation of digital input✓Switching frequency with resistive loadmax. 1000 HzSwitching frequency on lamp loadmax. 10 HzSwitching frequency on lamp loadmax. 10 HzLternal limitation of inductive shut-off voltageL+ (-52 V)	Cable length, unshielded	600 m
Total current per group, horizontal configuration, 40°C4 ATotal current per group, horizontal configuration, 60°C4 ATotal current per group, vertical configuration4 AOutput current at signal "1", rated value2 ASignal logic outputSourcing outputOutput delay of "0" to "1"100 μsOutput delay of "0" to "1"250 μsMinimum load current-Lamp load10 WParallel switching of outputs for redundant control of a loadnot possibleParallel switching of outputs for increased powernot possibleActuation of digital input-Switching frequency with inductive loadmax. 1000 HzSwitching frequency on lamp loadmax. 0.5 HzSwitching frequency on lamp loadmax. 10 HzLiternal limitation of inductive shut-off voltageL+ (-52 V)	Rated load voltage	DC 20.428.8 V
Total current per group, horizontal configuration, 60°C4 ATotal current per group, vertical configuration4 AOutput current at signal "1", rated value2 ASignal logic outputSourcing outputOutput delay of "0" to "1"100 μsOutput delay of "0" to "1"250 μsMinimum load current-Lamp load10 WParallel switching of outputs for redundant control of a loadnot possibleParallel switching of outputs for increased powernot possibleActuation of digital inputSwitching frequency with inductive loadmax. 1000 HzSwitching frequency on lamp loadmax. 0.5 HzSwitching frequency on lamp loadL+ (-52 V)	Current consumption from load voltage L+ (without load)	10 mA
Total current per group, vertical configuration4 AOutput current at signal "1", rated value2 ASignal logic outputSourcing outputOutput delay of "0" to "1"100 μsOutput delay of "1" to "0"250 μsMinimum load current-Lamp load10 WParallel switching of outputs for redundant control of a loadnot possibleParallel switching of outputs for increased powernot possibleActuation of digital input-Switching frequency with resistive loadmax. 1000 HzSwitching frequency on lamp loadmax. 0.5 HzSwitching frequency on lamp loadmax. 10 HzLeng limitation of inductive shut-off voltageL+ (-52 V)	Total current per group, horizontal configuration, 40°C	4 A
Output current at signal "1", rated value2 ASignal logic outputSourcing outputOutput delay of "0" to "1"100 µsOutput delay of "1" to "0"250 µsMinimum load current-Lamp load10 WParallel switching of outputs for redundant control of a loadnot possibleParallel switching of outputs for increased powernot possibleActuation of digital inputSwitching frequency with inductive loadmax. 1000 HzSwitching frequency on lamp loadmax. 0.5 HzSwitching frequency on lamp loadtu t. (-52 V)	Total current per group, horizontal configuration, 60°C	4 A
Signal logic outputSourcing outputOutput delay of "0" to "1"100 μsOutput delay of "1" to "0"250 μsMinimum load current-Lamp load10 WParallel switching of outputs for redundant control of a loadnot possibleParallel switching of outputs for increased powernot possibleActuation of digital input✓Switching frequency with resistive loadmax. 1000 HzSwitching frequency with inductive loadmax. 0.5 HzSwitching frequency on lamp loadtax. 10 HzLinernal limitation of inductive shut-off voltageL+ (-52 V)	Total current per group, vertical configuration	4 A
Output delay of "0" to "1"100 μsOutput delay of "1" to "0"250 μsMinimum load current-Lamp load10 WParallel switching of outputs for redundant control of a loadnot possibleParallel switching of outputs for increased powernot possibleActuation of digital inputSwitching frequency with resistive loadmax. 1000 HzSwitching frequency on lamp loadmax. 0.5 HzSwitching frequency on lamp loadL+ (-52 V)	Output current at signal "1", rated value	2 A
Numerical Output delay of "1" to "0"250 µsMinimum load current-Lamp load10 WParallel switching of outputs for redundant control of a loadnot possibleParallel switching of outputs for increased powernot possibleActuation of digital input✓Switching frequency with resistive loadmax. 1000 HzSwitching frequency on lamp loadmax. 0.5 HzSwitching frequency on lamp loadthe fossibleInternal limitation of inductive shut-off voltageL+ (-52 V)	Signal logic output	Sourcing output
Minimum load current-Lamp load10 WParallel switching of outputs for redundant control of a loadnot possibleParallel switching of outputs for increased powernot possibleActuation of digital inputSwitching frequency with resistive loadmax. 1000 HzSwitching frequency on lamp loadmax. 0.5 HzSwitching frequency on lamp loadmax. 10 HzInternal limitation of inductive shut-off voltageL+ (-52 V)	Output delay of "0" to "1"	100 µs
Lamp load10 WParallel switching of outputs for redundant control of al oadnot possibleParallel switching of outputs for increased powernot possibleActuation of digital inputSwitching frequency with resistive loadmax. 1000 HzSwitching frequency with inductive loadmax. 0.5 HzSwitching frequency on lamp loadmax. 10 HzLuternal limitation of inductive shut-off voltageL+ (-52 V)	Output delay of "1" to "0"	250 µs
Parallel switching of outputs for redundant control of a loadnot possibleParallel switching of outputs for increased powernot possibleActuation of digital inputSwitching frequency with resistive loadmax. 1000 HzSwitching frequency with inductive loadmax. 0.5 HzSwitching frequency on lamp loadmax. 10 HzInternal limitation of inductive shut-off voltageL+ (-52 V)	Minimum load current	-
Parallel switching of outputs for increased powernot possibleActuation of digital inputSwitching frequency with resistive loadmax. 1000 HzSwitching frequency with inductive loadmax. 0.5 HzSwitching frequency on lamp loadmax. 10 HzInternal limitation of inductive shut-off voltageL+ (-52 V)	Lamp load	10 W
Actuation of digital input✓Switching frequency with resistive loadmax. 1000 HzSwitching frequency with inductive loadmax. 0.5 HzSwitching frequency on lamp loadmax. 10 HzInternal limitation of inductive shut-off voltageL+ (-52 V)	Parallel switching of outputs for redundant control of a load	not possible
Switching frequency with resistive loadmax. 1000 HzSwitching frequency with inductive loadmax. 0.5 HzSwitching frequency on lamp loadmax. 10 HzInternal limitation of inductive shut-off voltageL+ (-52 V)	Parallel switching of outputs for increased power	not possible
Switching frequency with inductive loadmax. 0.5 HzSwitching frequency on lamp loadmax. 10 HzInternal limitation of inductive shut-off voltageL+ (-52 V)	Actuation of digital input	$\checkmark$
Switching frequency on lamp loadmax. 10 HzInternal limitation of inductive shut-off voltageL+ (-52 V)	Switching frequency with resistive load	max. 1000 Hz
Internal limitation of inductive shut-off voltage L+ (-52 V)	Switching frequency with inductive load	max. 0.5 Hz
	Switching frequency on lamp load	max. 10 Hz
Short-circuit protection of output yes, electronic	Internal limitation of inductive shut-off voltage	L+ (-52 V)
	Short-circuit protection of output	yes, electronic

# **Digital output**

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	$\checkmark$
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

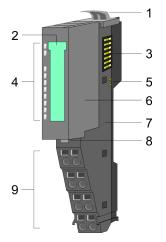
# 4.3 022-1BB50 - DO 2xDC 24V 0.5A NPN

### 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

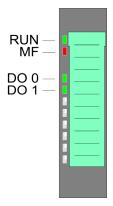


- Locking lever terminal module
- 2 Labeling strip

1

- 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

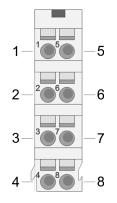


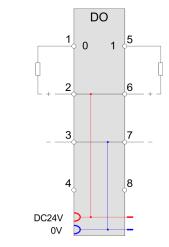
RUN	MF	DO x	Description
	_		Bus communication is OK
	Х	Module status is OK	
			Bus communication is OK
-	-	Х	Module status reports an error with overload, short circuit or overheat
		x	Bus communication is not possible
			Module status reports an error with overload, short circuit or overheat
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz	Х	♦ Chap. 2.12 'Trouble shooting - LEDs' page 38
			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 0.08mm<sup>2</sup> up to 1.5mm<sup>2</sup>.





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



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

Input area

Output area

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

IX - Index for access via CANopen

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

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

Order no.	022-1BB50
Туре	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, 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
Actuation of digital input	$\checkmark$
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

Trigge level1.7 ANumber of operating cycle of relay outputs-Switching capacity of contacts-Oruput data sizeBitStatus information, alarns, diagnostics-Status displaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic functionsnoDiagnostic information read-outnoreStatus displaygreen LEDOutput data sizeNoSupply voltage displaygreen LEDGroup error displayoreStotation-Between channels-Between channels of groups to-Between channels display-PW data-PW data-PW diagnostich-PW diagnostich-Status display-Status display-Status display-Status display-Between channels of groups to-Status display-PW data-PW diagnostic-PW diagnostic-PW diagnostic-Pitty diagnostic-Status diagnostic-Status diagnostic-Pitty diagnostic-Pitty diagnostic-Status diagnostic-Pitty diagnostic-Pitty diagnostic-Pitty diagnostic-Pitty diagnostic-Pitty diagnostic- </th <th>Order no.</th> <th>022-1BB50</th>	Order no.	022-1BB50
Switching capacity of contacts.Output data size2 BitStatus information, alarms, diagnosticsgeen LED per channelStatus information, alarms, diagnosticsmoProcess alarmnoDiagnostic interuptnoDiagnostic functionsnoDiagnostic function read-outnoneStatus information read-outred LEDGroup error displayred LEDGroup error displayred LEDChannel error display.Between channels.Between channels of groups to.Between channels and backplane bus.PWM data.PWM data.PWM data.PWM data.PWM datanels.PWM datanels.Stafety protocol.Stafety protocol.S	Trigger level	1.7 A
Output data size2 BitStatus information, alarms, diagnosticsStatus displaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic functionsnoDiagnostic functionsnoneStatus displaygreen LEDGroup error displaygreen LEDGroup error displayred LEDChannel error displaynoneBetween channels of groups to-Between channels and backplane bus-Insulation tested withC500 VPWM data-PWM channels-PWM therabis-PWM therabis-Staty protocol-Safety protocol-Safety protocol-Safety protocol-Safety requirements-Surg surg surg surg surg surg surg surg s	Number of operating cycle of relay outputs	-
Status information, alarms, diagnosticsgreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic information read-outnoSupply voltage displaygreen LEDGroup error displayred LEDChannel error displaynoneBetween channels-Between channels-Between channels-Between channels-PWM data-PWM data-PWM data-PWM dusplay-Staty protocol-Staty protocol-	Switching capacity of contacts	-
Status displaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic functionsnoDiagnostic functionsnoneSupply voltage displaygreen LEDGroup error displayred LEDChannel error displaynoneBetween channels-Between channels of groups to-Between channels of groups to-Between channels and backplane bus-PWM dataDC 500 VPWM data-PWM data-PWG duty-Staty protocol-Staty protocol- <td>Output data size</td> <td>2 Bit</td>	Output data size	2 Bit
InterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic functionsnoDiagnostic functionsnoneSupply voltage displaygreen LEDGroup error displayred LEDChannel error displaynoneIsolationnoneIsolationsetween channels of groups toBetween channels and backplane bus~Insulation tested withDC 500 VPWM data-PWM data-Pitod length-Stafty-Safety protocol-Safety protocol-Safety protocol-Safety protocol-Safety protocol-Safety protocol-Safety protocol-Surge staft discussion-Surge staft discussion-Safety protocol-Safety protocol-Safety requirements-Surge staft discussion-Surge staft discussion-<	Status information, alarms, diagnostics	
Process alarmnoDiagnostic interruptnoDiagnostic functionsnoDiagnostic information read-outnoneSupply voltage displaygreen LEDGroup error displayred LEDChannel error displaynoneIsolationBetween channels of groups toaBetween channels of groups tovInsulation tested withDC 500 VPWM data2PWM channelsoPWM channelsaPictol engthaStefyoStefy protocolaStefy pro	Status display	green LED per channel
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Diagnostic functionsnoDiagnostics information read-outnoneSupply voltage displaygreen LEDGroup error displayred LEDChannel error displaynoneIsolation.Between channels-Between channels of groups to-Between channels and backplane bus·Insulation tested withDC 500 VPWM data-PWM dhannels-PWM dhannels-Port of uppt-Minimum pulse width-Safety protocol-Safety protocol-Safety protocol-Succur user address-Watchanels-Safety neutron-Safety neutron-Succur user address-Watchdog-Two channels-Succur user address-Succur user address-Succur user address-Suctur user address-Suctur user address-Suctur user address-Succur user address	Process alarm	no
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Supply voltage displaygreen LEDGroup error displayred LEDChannel error displaynoneIsolation-Between channels-Between channels of groups to-Between channels and backplane busInsulation tested withDC 500 VPWM dtan-PWM dtanels-PWM channels-Poil of groups to-PWM dtanels-Pum dtanels-Poil of upty-Poil of upty-Safety protocol-Safety requirements-Safety requirements-Vachandels-Vachandels-Subley to colon-Safety requirements-Substrangling-Vachandeg-Type of upty-Safety requirements-Safety requirements-Substrangling-Substrangling-Substrangling-Substrangling-Type of upty-Safety requirements-Safety requirements-Substrangling-Substrangling-Substrangling-Substrangling-Substrangling-Safety requirements-Substrangling-Substrangling-Substrangling-Substrangling-Substrangling-Substrangling-	Diagnostic functions	no
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Channel error displaynoneIsolationnoneIsolationnoneBetween channels-Between channels of groups to-Between channels and backplane bus-Insulation tested withDC 500 VPWM data-PWM channels-PWM channels-PWM time basis-Poind length-Ninimum pulse width-Type of output-Safety protocol-Safety protocol-Safety requirements-Such annels-Yudchangel-Type datting-Safety requirements-Such annels-Such annels-Such annels-Such annels-Such annels-Such annels-Type length-Type length-Such annels-Such annels-Su	Supply voltage display	green LED
IsolationIsolationBetween channels-Between channels of groups to-Between channels and backplane bus-Insulation tested withDC 500 VPWM dta-PWM channels-PWM channels-PWM time basis-Preiod length-Ninimun pulse width-Type of output-Safety-Safety protocol-Safety requirements-Safety requirements-Watchanels-Yutochanels-Such safet segments-Such safet segments-Staty requirements-Such safet segments-Staty requirements-Safet segments-Safet segments-Staty requirements-Staty requirements-<	Group error display	red LED
Between channels.Between channels of groups to.Between channels and backplane bus.Insulation tested withDC 500 VPWM data.PVM channels.PVM channels.PVM time basis.Preiod length.Ninimun pulse width.Type of output.Safety.Safety protocol.Safety requirements.Secure user address.Watchanels.Type signel function.Safety requirements.Safety notocol.Safety requirements.Subtack address.Subtack address.Subtack address.Staty protocol.Subtack address.Subtack addr	Channel error display	none
Between channels of groups to-Between channels and backplane bus✓Insulation tested withDC 500 VPWM dataPWM channels-PWM the basis-Period length-Minimu pulse width-Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Toy channels-Safety protocol-Safety requirements-Sufety req	Isolation	
Between channels and backplane bus✓Insulation tested withDC 500 VPWM dataPWM channelsPWM the basisPeriod lengthMinimum pulse widthType of outputSafetySafety protocolSafety requirementsSecure user addressWatchdogTwo channelsToy be lengthSufety pulse widthSafety requirementsSafety requirementsSufere user addressFurth pulse lengthToy channelsToy channels <td>Between channels</td> <td>-</td>	Between channels	-
Insulation tested withDC 500 VPWM dataDC 500 VPWM channels-PWM time basis-Period length-Minimum pulse width-Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-Type of output-Safety-Safety requirements-Secure user address-Watchdog-Two channels-Test pulse length-Circuit monitoring-Datasizes-Input bytes0	Between channels of groups to	-
PWM dataPWM channels-PWM time basis-Period length-Minimu pulse width-Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-Toy channels-Test pulse length-Toy channels-Test pulse length-Datasizes-Iput bytes0	Between channels and backplane bus	$\checkmark$
PWM channels-PWM time basis-Period length-Minimur pulse width-Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Test pulse length-Circuit monitoring-Iput bytes0	Insulation tested with	DC 500 V
PWM time basis-Period length-Period length-Minimum pulse width-Type of output-Safety-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Test pulse length-Circuit monitoring-Datasizes-Input bytes0	PWM data	
Period length-Period length-Minimu pulse width-Type of output-Safety-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Circuit monitoring-Datasizes-Input bytes0	PWM channels	-
Minimum pulse width-Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Tots pulse length-Circuit monitoring-Datasizes-Input bytes0	PWM time basis	-
Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Test pulse length-Circuit monitoring-Datasizes-Input bytes0	Period length	-
SafetySafety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Test pulse length-Circuit monitoring-Datasizes-Input bytes0	Minimum pulse width	-
Safety protocol-Safety requirements-Secure user address-Watchdog-Two channels-Test pulse length-Circuit monitoring-Datasizes-Input bytes0	Type of output	-
Safety requirements-Secure user address-Watchdog-Two channels-Test pulse length-Circuit monitoring-Datasizes-Input bytes0	Safety	
Secure user address-Watchdog-Two channels-Tost pulse length-Circuit monitoring-Datasizes-Input bytes0	Safety protocol	-
Watchdog-Two channels-Test pulse length-Circuit monitoring-Datasizes-Input bytes0	Safety requirements	-
Two channels-Test pulse length-Circuit monitoring-Datasizes-Input bytes0	Secure user address	-
Test pulse length-Circuit monitoring-Datasizes-Input bytes0	Watchdog	-
Circuit monitoring-Datasizes-Input bytes0	Two channels	-
Datasizes       Input bytes	Test pulse length	-
Input bytes 0	Circuit monitoring	-
	Datasizes	
Output bytes 1	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

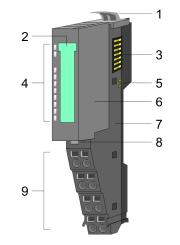
## 4.4 022-1BB70 - DO 2xDC 24V 0.5A ETS

#### 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  $\mu$ s ticker as an ETS entry to the FIFO stack. The FIFO memory serves for space for max. 31 ETS entries.

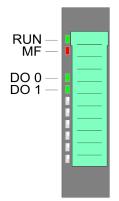
- 2 digital outputs, isolated to the backplane bus
- FIFO stack for 5 respectively 15 ETS entries (each 4byte)
- Diagnostics function
- Controlling by process image respectively handling blocks
- Status indication of the channels via LEDs

#### Structure



- 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

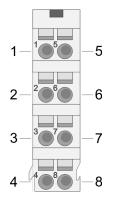
#### Status indication



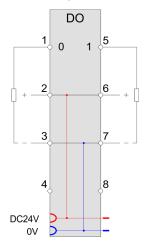
RUN	MF <b></b> red	DO x	Description			
_		х	Bus communication is OK			
		^	Module status is OK			
			Bus communication is OK			
	•	Х	Module status reports an error with overload, short circuit or overheat			
		x	Bus communication is not possible			
	-		Module status reports an error with overload, short circuit or overheat			
		Х	Error at bus power supply			
			Flashing: Error in configuration			
Х	ZHz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38			
			Digital output has "1" signal			
			Digital output has "0" signal			
not relevant:	Х					

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

#### Pin assignment



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



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



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.

#### 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)

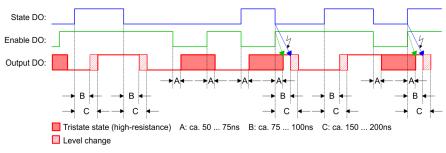
Bit 5: Enable DO 0 (0: disable, 1: enable)

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 (**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.

**ETS\_US** In the System SLIO module there is a 32 bit timer ( $\mu$ s ticker). With PowerON the timer starts counting. After 2<sup>32</sup>-1 $\mu$ 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  $\mu$ s ticker (0...65535 $\mu$ s).

Here please enter a time value in  $\mu$ 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.

DO x:			·											
µs value:	0	μs				6553	5μ	s (	Οµs				6	5535µs
								•		Addr.	PIQ	RN	ETS_	US
									<	+0	PIQ+0	RN+0	ETS_	US+0
									•	+4	PIQ+1	RN+1	ETS_	US+1
									•	+8	PIQ+2	RN+2	ETS_	US+2
									•	+12	PIQ+3	RN+3	ETS_	US+3
	Į								•	+16	PIQ+4	RN+4	ETS_	US+4

Output area 20byteAt CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding<br/>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 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

## **Digital output**

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	$\checkmark$
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

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 <sup>1</sup>	04h (fix)	02h	3100h	01h
PIQ_L	1	Length process image output data <sup>1, 2</sup>	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.

## PII\_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).

#### 4.4.2.2 Example for the principle of operation

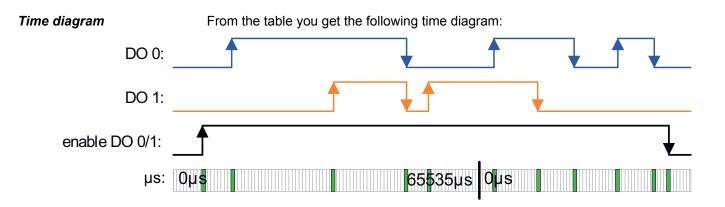
ETS values

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

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

With the following times of the  $\mu s$  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

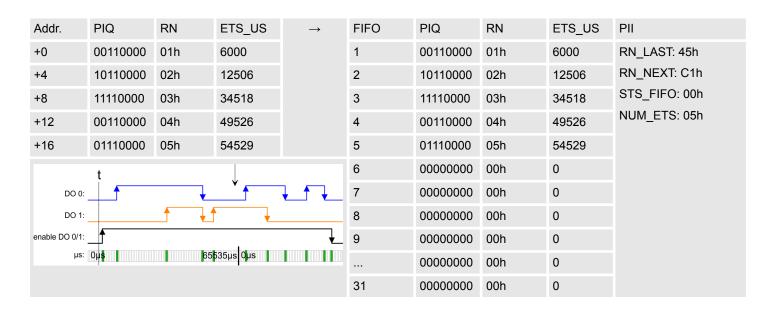


#### Writing 5 ETS entries

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".

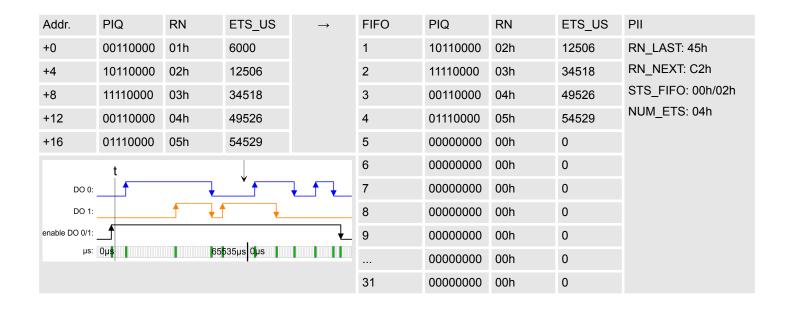
In the PII you will find the status bytes.



#### Executing ETS function for RN = 01h

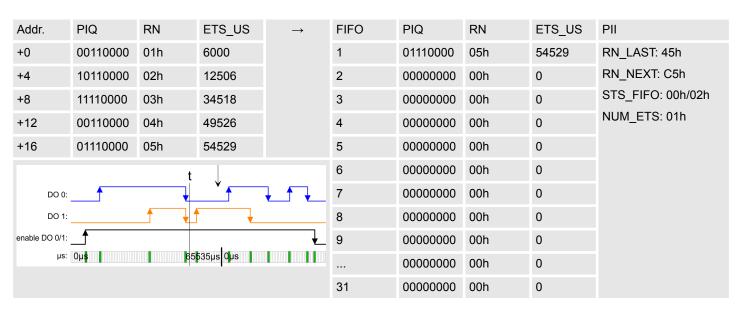
So that the outputs can be controlled, they must be enabled before. In this example both outputs are enabled with the 1. RN.

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



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

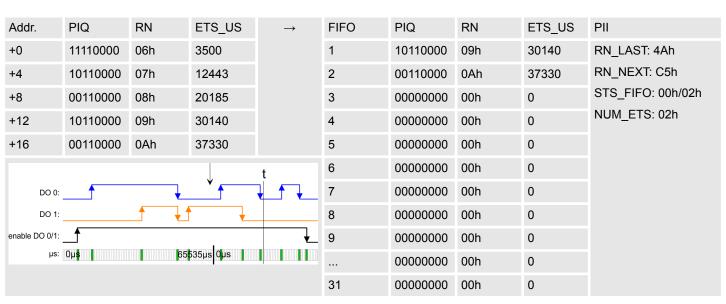
The states of RN = 02h ... RN 04h are successively issued and deleted in the FIFO.



#### 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	$\rightarrow$	FIFO	PIQ	RN	ETS_US	PII
+0	11110000	06h	3500		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	
		t			6	00110000	0Ah	37330	
DO 0:					7	00000000	00h	0	
DO 1:			•		8	00000000	00h	0	
enable DO 0/1: μs: 0μ <b>s</b> 65 <mark>5</mark> 535μs 0μs			9	00000000	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.

#### Writing last ETS entry

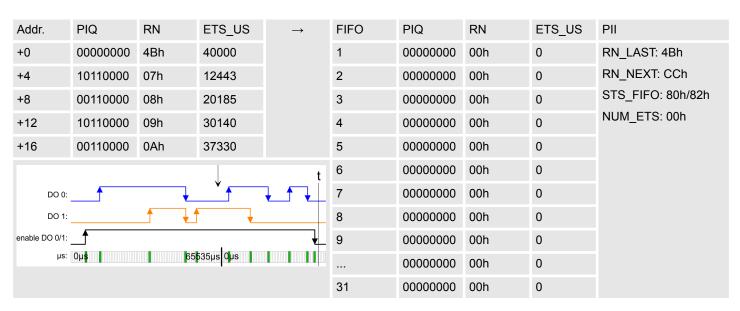
Since less than 5 ETS entries are written, bit 6 of RN of the last ETS entry must always be set. RN = 0Bh becomes 4Bh.

Addr.	PIQ	RN	ETS_US	$\rightarrow$	FIFO	PIQ	RN	ETS_US	PII
+0	0000000	4Bh	40000		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	
				t	6	00000000	00h	0	
				7	00000000	00h	0		
DO 1:			•		8	00000000	00h	0	
enable DO 0/1:				9	00000000	00h	0		
μs: Ομ <b>s</b> 65 <b>5</b> 35μs <mark>Ομs</mark>				00000000	00h	0			
					31	00000000	00h	0	

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

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

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





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

#### 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.

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

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 informa- tion	Byte	Bit 7 0
uon	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		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)
NUMCH Number 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 $\boldsymbol{\mu}s$ 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

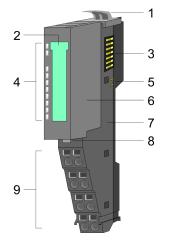
## 4.5 022-1BB90 - DO 2xDC 24V 0.5A PWM

#### 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



#### Status indication

RUN — MF — DO 0 — DO 1 —

RUN	MF	DO x	Description
-		x	Bus communication is OK
		Λ	Module status is OK
			Bus communication is OK
	•	Х	Module status reports an error with overload, short circuit or overheat
			Bus communication is not possible
	•	Х	Module status reports an error with overload, short circuit or overheat
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38
			PWM output has "1" signal
			PWM output has "0" signal
not relevant	: X		

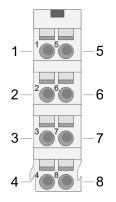
#### 1 Locking lever terminal module

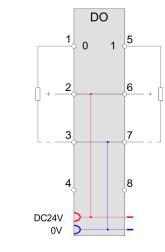
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

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

#### Pin assignment

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





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 <i>period duration</i> , 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 83886	07 (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.			
	Bit	Name	Function	

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

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

Bit	Name	Function
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
Parallel switching of outputs for increased power	not possible
Actuation of digital input	$\checkmark$
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

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

Order no.	022-1BB90
Number of operating cycle of relay outputs	-
Switching capacity of contacts	-
Output data size	12 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
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	$\checkmark$
Insulation tested with	DC 500 V
PWM data	
PWM channels	2
PWM time basis	20.83ns
Period length	12008388607 * time base
Minimum pulse width	1 µs
Type of output	Push pull / highside
Safety	
Safety protocol	-
Safety requirements	-
Secure user address	-
Watchdog	-
Two channels	-
Test pulse length	-
Circuit monitoring	-
Datasizes	
Input bytes	4
Output bytes	12

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

Order no.	022-1BB90
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

#### 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

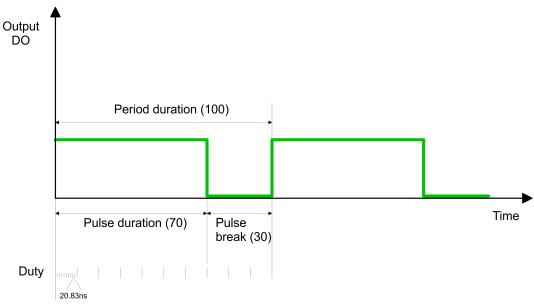
More can be found in the according manual of your bus coupler.

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	MPD_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.



#### 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 informa- tion	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 $\boldsymbol{\mu} s$ ticker at the moment of the diagnostic data generation
ERR_C/D CHERR, CHxERR reserved	Byte	Bit 7 0
	0	reserved

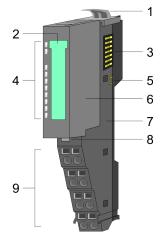
## 4.6 022-1BD00 - DO 4xDC 24V 0.5A

## 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

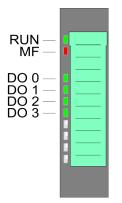
#### Structure



#### 1 Locking lever terminal module

- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
  - Locking lever electronic module
- 8 Locking l 9 Terminal

### Status indication

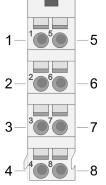


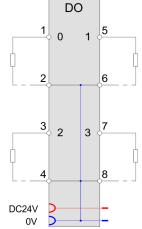
RUN	MF	DO x	Description	
green	red	green	Description	
		х	Bus communication is OK	
		^	Module status is OK	
			Bus communication is OK	
		Х	Module status reports an error with overload, short circuit or overheat	
			Bus communication is not possible	
		Х	Module status reports an error with overload, short circuit or overheat	
		Х	Error at bus power supply	
			Flashing: Error in configuration	
Х	ZHz	Х		
			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 0.08mm<sup>2</sup> up to 1.5mm<sup>2</sup>.





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

Output area

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

IX - Index for access via CANopen

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

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		02h	
				Bit 2: DO 2		03h
			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	$\checkmark$
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

## **Digital output**

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

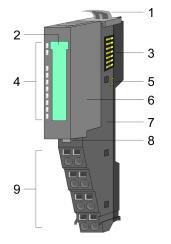
## 4.7 022-1BD20 - DO 4xDC 24V 2A

#### **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.

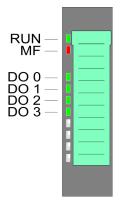
- 4 digital 2A outputs, isolated to the backplane bus
- Status indication of the channels via LEDs

#### 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

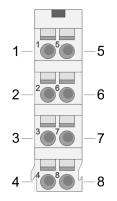


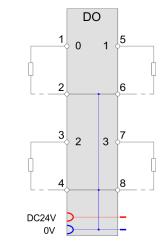
RUN	MF	DO x	Description
green	red red	green	· ·
		х	Bus communication is OK
-			Module status is OK
			Bus communication is OK
		Х	Module status reports an error with overload, short circuit or overheat
			Bus communication is not possible
		Х	Module status reports an error with overload, short circuit or overheat
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38
			Digital output has "1" signal
			Digital output has "0" signal
not relevant: X			

022-1BD20 - DO 4xDC 24V 2A

#### Pin assignment

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





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

Output area

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

IX - Index for access via CANopen

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

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	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			

#### 4.7.1 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	$\checkmark$
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

Order no.	022-1BD20
Internal limitation of inductive shut-off voltage	L+ (-52 V)
Short-circuit protection of output	yes, electronic
Trigger level	2.7 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	$\checkmark$
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	

# **Digital output**

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

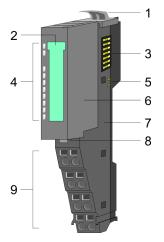
# 4.8 022-1BD50 - DO 4xDC 24V 0.5A NPN

# 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

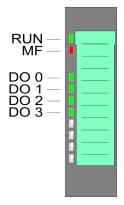


- Locking lever terminal module
- 2 Labeling strip

1

- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module8 Locking lever ele
- B Locking lever electronic module
- 9 Terminal

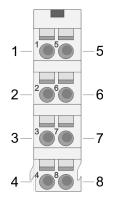
# Status indication



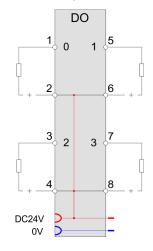
RUN	MF <b>e</b> red	DO x	Description
		х	Bus communication is OK
-		^	Module status is OK
			Bus communication is OK
		Х	Module status reports an error with overload, short circuit or overheat
			Bus communication is not possible
		Х	Module status reports an error with overload, short circuit or overheat
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz 2Hz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38
			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 0.08mm<sup>2</sup> up to 1.5mm<sup>2</sup>.



Pos.	Function	Туре	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

Output area

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

IX - Index for access via CANopen

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

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	PIQ	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

	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

# **Digital output**

Order no.	022-1BD50
Internal limitation of inductive shut-off voltage	+45 V
Short-circuit protection of output	yes, electronic
Trigger level	1.7 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	$\checkmark$
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	

022-1BD50 - 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

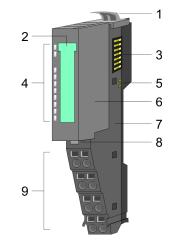
# 4.9 022-1BD70 - DO 4xDC 24V 0.5A ETS

### **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 us ticker as an ETS entry to the FIFO stack. The FIFO memory serves for space for max. 31 ETS entries.

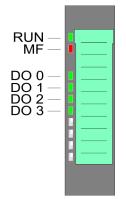
- 4 digital outputs, isolated to the backplane bus
- FIFO stack for 5 respectively 15 ETS entries (each 4byte)
- **Diagnostics function**
- Controlling by process image respectively handling blocks
- Status indication of the channels via LEDs

### 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

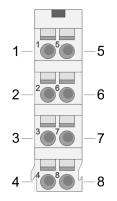


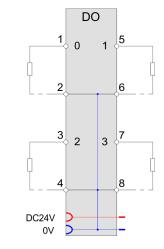
RUN	MF	DO x	Description
•		х	Bus communication is OK Module status is OK
•	•	x	Bus communication is OK Module status reports an error with overload, short circuit or overheat
	•	x	Bus communication is not possible Module status reports an error with overload, short circuit or overheat
		Х	Error at bus power supply
х	ZHz	x	Flashing: Error in configuration
			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 0.08mm<sup>2</sup> up to 1.5mm<sup>2</sup>.





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		the RN of the last ETS entry may be found, which was recognized as n into the FIFO memory of the module.			
	Bit 6: 1 (fix) - se	rves for the identification in the process image			
	Bit 7: 0 (fix) - se	rves for the identification in the process image			
RN_NEXT	Bit 5 0: Here FIFO memory o	the RN of the ETS entry may be found, which will be executed next in the f the module.			
	Please consider	r Bit 6 and 7 of RN_NEXT are always set.			
	Bit 6: 1 (fix) - se	rves for the identification in the process image			
	Bit 7: 1 (fix) - se	rves 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. 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

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

PIQ

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 System SLIO module there is a 32 bit timer ( $\mu$ s ticker). With PowerON the timer starts counting. After 2<sup>32</sup>-1 $\mu$ 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  $\mu$ s ticker (0...65535 $\mu$ 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.

DO x:		-					
µs value:	Oµs	6553	iµs 0µs				65535µs
				Addr.	PIQ	RN	ETS_US
				+0	PIQ+0	RN+0	ETS_US+0
		[		+4	PIQ+1	RN+1	ETS_US+1
				+8	PIQ+2	RN+2	ETS_US+2
				+12	PIQ+3	RN+3	ETS_US+3
		 		+16	PIQ+4	RN+4	ETS_US+4

# Output area 20byteAt CPU, PROFIBUS and PROFINET the output area is embedded to the corresponding<br/>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 4x

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

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 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

OOFconsumption/power loss10consumption from backplane bus10cs0.9I data digital outputs0.9of outputs4gth, shielded10gth, unshielded60d voltageDConsumption from load voltage L+ (without load)25ent per group, horizontal configuration, 40°C27	SM 022 F43 57E2 05 mA .95 W 000 m 000 m 00 m
consumption/power loss10onsumption from backplane bus10as0.5I data digital outputs4of outputs4gth, shielded10gth, unshielded60d voltageDConsumption from load voltage L+ (without load)25ent per group, horizontal configuration, 40°C24	05 mA .95 W 000 m 00 m
I data digital outputs10of outputs4of outputs4gth, shielded10gth, unshielded60d voltageDConsumption from load voltage L+ (without load)25ent per group, horizontal configuration, 40°C24	.95 W 000 m 00 m
iss       0.9         I data digital outputs       1         of outputs       4         igth, shielded       10         igth, unshielded       60         id voltage       DC         consumption from load voltage L+ (without load)       25         ent per group, horizontal configuration, 40°C       24	.95 W 000 m 00 m
I data digital outputs4of outputs4gth, shielded10gth, unshielded60d voltageDConsumption from load voltage L+ (without load)25ent per group, horizontal configuration, 40°C24	000 m 000 m
of outputs4gth, shielded10gth, unshielded60d voltageDConsumption from load voltage L+ (without load)25ent per group, horizontal configuration, 40°C2 /	000 m 00 m
gth, shielded10gth, unshielded60d voltageDConsumption from load voltage L+ (without load)25ent per group, horizontal configuration, 40°C2 /	000 m 00 m
gth, unshielded60d voltageDConsumption from load voltage L+ (without load)25ent per group, horizontal configuration, 40°C2 /	00 m
d voltageDConsumption from load voltage L+ (without load)25ent per group, horizontal configuration, 40°C2 A	
consumption from load voltage L+ (without load)25consumption, horizontal configuration, 40°C2 A	
ent per group, horizontal configuration, 40°C 2 A	JC 20.420.0 V
	5 mA
	A
ent per group, horizontal configuration, 60°C 2 A	A
ent per group, vertical configuration 2 A	A
rrent at signal "1", rated value 0.5	.5 A
ic output So	Sourcing output
elay of "0" to "1" ma	nax. 100 ns
elay of "1" to "0" ma	nax. 100 ns
load current -	
d 10	0 W
witching of outputs for redundant control of a load no	ot possible
witching of outputs for increased power no	ot possible
of digital input 🗸	
frequency with resistive load ma	nax. 40 kHz
frequency with inductive load ma	nax. 40 kHz
frequency on lamp load ma	nax. 40 kHz
nitation of inductive shut-off voltage L+	+ (-52 V)
uit protection of output yes	es, electronic, and only highside
vel 2.5	.5 A
f operating cycle of relay outputs -	
capacity of contacts -	
ta size 60	0 Byte
formation, alarms, diagnostics	
splay gre	reen LED per channel
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	$\checkmark$
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

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 <sup>1</sup>	04h (fix)	02h	3100h	01h
PIQ_L	1	Length process image output data <sup>1, 2</sup>	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.

# PII\_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

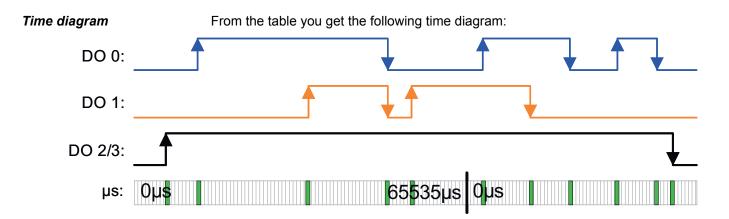
ETS values

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

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

With the following times of the  $\mu s$  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

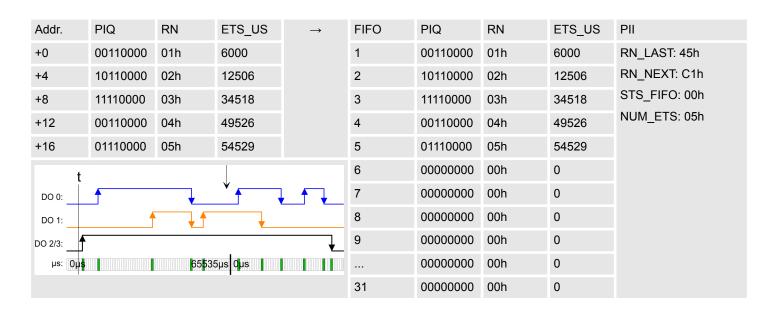


# Writing 5 ETS entries

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".

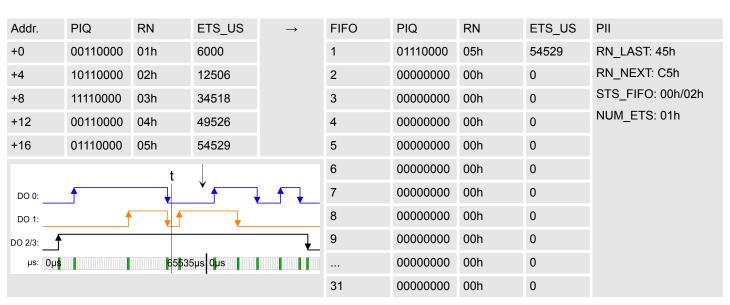
In the PII you will find the status bytes.



### Executing ETS function for RN = 01h

The 1. ETS entry (RN = 01h) is executed and deleted in the FIFO.

Addr.	PIQ	RN	ETS_US	$\rightarrow$	FIFO	PIQ	RN	ETS_US	PII
+0	00110000	01h	6000		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	
t					6	00000000	00h	0	
DO 0:						00000000	00h	0	
DO 1:	DO 1:					00000000	00h	0	
DO 2/3:					9	00000000	00h	0	
μs: Ομ <b>\$</b> β5535μs Ομs						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.

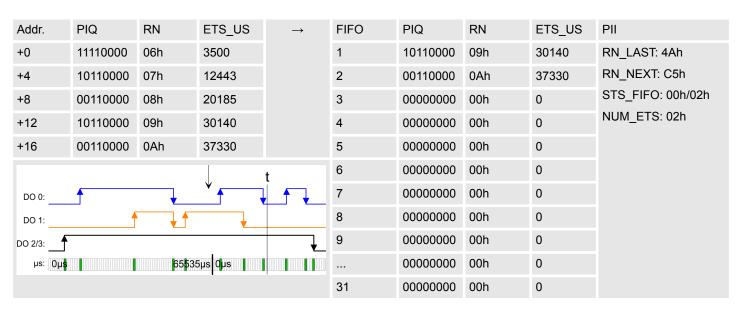
# Writing 5 ETS entries

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	$\rightarrow$	FIFO	PIQ	RN	ETS_US	PII
+0	11110000	06h	3500		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	
		t			6	00110000	0Ah	37330	
DO 0:					7	00000000	00h	0	
DO 1:	f	· · · · · ·	•		8	00000000	00h	0	
DO 2/3:					9	00000000	00h	0	
µs: 0µ <mark>s</mark>		6553	5µs Oµs			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.



## 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	$\rightarrow$	FIFO	PIQ	RN	ETS_US	PII
+0	00000000	4Bh	40000		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	
				t	6	00000000	00h	0	
					7	00000000	00h	0	
DO 1:			•		8	00000000	00h	0	
DO 2/3:					9	00000000	00h	0	
μs: Ομ <b>s</b> 65 <b>5</b> 35μs Ομs						0000000	00h	0	
					31	00000000	00h	0	

022-1BD70 - DO 4xDC 24V 0.5A ETS > Diagnostic data

#### PIQ RN ETS US FIFO PIQ RN ETS US PII Addr. +0 0000000 4Bh 40000 1 0000000 00h 0 RN LAST: 4Bh RN NEXT: CCh 10110000 07h 12443 2 00000000 00h 0 +4 STS\_FIFO: 80h/82h 00110000 08h 20185 00000000 00h +8 3 0 NUM ETS: 00h +12 10110000 09h 30140 4 00000000 00h 0 +16 00110000 0Ah 37330 5 00000000 00h 0 00h 6 00000000 0 7 00000000 00h 0 DO 0: 8 00h 0 00000000 DO 1: 9 00000000 00h 0 DO 2/3: 00000000 00h 0 μs: Ομ**s** 65535μs Ομs ... 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.



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

# 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.

022-1BD70 - DO 4xDC 24V 0.5A ETS > Diagnostic data

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			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 Module informa- tion	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)		
NUMCH Number of chan-	Byte	Bit 7 0		
nels	0	Number of channels of the module (here 04h)		
DIAG_US µs ticker	Byte	Bit 7 0		
	0 3	Value of the $\boldsymbol{\mu}s$ ticker at the moment of the diagnostic data generation		
ERR_A/C/D CHERR,	Byte	Bit 7 0		
CHxERR reserved	0	reserved		

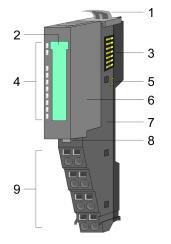
#### 4.10 022-1BF00 - DO 8xDC 24V 0.5A

# **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

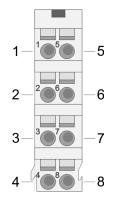
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module 7
- Terminal module 8
  - Locking lever electronic module
- 9 Terminal

RUN — MF —	
DO 0     DO 1     DO 2     DO 3     DO 4     DO 5     DO 6     DO 7	

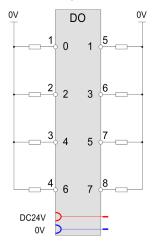
RUN	MF	DO x	Description
green	red	green	Decemption
_		x	Bus communication is OK
		^	Module status is OK
			Bus communication is OK
		Х	Module status reports an error with overload, short circuit or overheat
			Bus communication is not possible
		х	Module status reports an error with overload, short circuit or overheat
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz 2Hz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38
			Digital output has "1" signal
			Digital output has "0" signal
not relevant:	Х		

022-1BF00 - DO 8xDC 24V 0.5A

# Pin assignment



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



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

Output area

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

IX - Index for access via CANopen

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

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	1	State of the outputs	6200h	
			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

# 4.10.1 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	✓

# **Digital output**

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	$\checkmark$
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

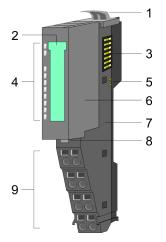
# 4.11 022-1BF50 - DO 8xDC 24V 0.5A NPN

## 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



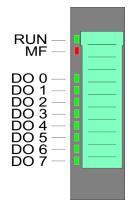
Locking lever terminal module Labeling strip

2 Labeling strip3 Backplane bus

1

- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module
- 8 Locking lever electronic module
- 9 Terminal

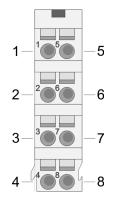
# Status indication



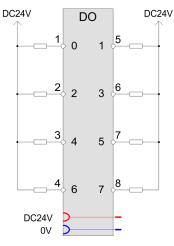
RUN	MF	DO x	Description
green	red	green	Description
		х	Bus communication is OK
		^	Module status is OK
			Bus communication is OK
	-	Х	Module status reports an error with overload, short circuit or overheat
			Bus communication is not possible
		Х	Module status reports an error with overload, short circuit or overheat
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz	Х	
			Digital output has "1" signal
			Digital output has "0" signal
not relevant:	not relevant: X		

022-1BF50 - DO 8xDC 24V 0.5A NPN

## Pin assignment



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



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

Output area

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

IX - Index for access via CANopen

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

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	State of the outputs	6200h	
			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	$\checkmark$

022-1BF50 - DO 8xDC 24V 0.5A NPN > Technical data

Switching frequency with inductive loadmax. 100 HzSwitching frequency on lamp loadmax. 10 HzSwitching frequency on lamp loadmax. 10 HzInternal limitation of inductive shut-off voltageskelectronicTrigger level1.7 ANumber of operating cycle of relay outputsse, electronicSvitching capacity of contacts-Output data sizeBerneStatus displaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic interruptoneStatus displaygreen LEDOutput dage displaygreen LEDBetween channelsnoStatus displaygreen LEDChannel error displaynoBetween channels and backplane bus-Between channels and backplane bus-PWM data-PWM data-PWM data-Staty display-Produptive bus-Produptive bus-Produptive bus-Produptive bus-Produptive bus-Produptive bus-Produptive bus-Produptive bus-Produptive bus-Produptive bus-Statis display-Between channels of groups to-Produptive bus-Produptive bus-Produptive bus-Produptive bus-	Order no.	022-1BF50
Switching frequency on lamp loadmax. 10 HzInternal limitation of inductive shut-off voltage45 VShort-circuit protection of outputyes, electronicTrigger level1.7 ANumber of operating cycle of relay outputs-Output data size8 BitStatus information, alarms, diagnostics-Status displaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic information read-outnoneStatus displaygreen LEDChup data displaygreen LEDDiagnostic information read-outnoneStatus displaygreen LEDStatus displaygreen LEDDiagnostic information read-outnoneStatus displaygreen LEDGroup error displayred LEDChannels-Between channels-Between channels-Insulation tesd withDC 500 VPWM data-PWM data-PWM the basis-PWM dia basis-Prod uput-Stafy protocol-Stafy prot	Switching frequency with resistive load	max. 1000 Hz
Internal limitation of inductive shul-off voltage+45 VShort-circuit protection of outputyes, electronicTrigger level1.7 ANumber of operating cycle of relay outputs-Switching capacity of contacts-Output data sizeB bitStatus information, alarms, diagnostics-Status fisplaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic information read-outnoneDiagnostic information read-outgreen LEDCoroup error displaygreen LEDChannel error displaynoneStatus-Between channels-Between channels-Between channels of groups to-PWM dataDC 500 VPWM data-PWM data-PWM data-PWM data-PWM data-Staty-Staty-Staty-Staty of output-Staty of o	Switching frequency with inductive load	max. 0.5 Hz
Short-circuit protection of outputyes, electronicTrigger level1.7 ANumber of operating cycle of relay outputs-Switching capacity of contacts-Output data size8 BitStatus information, alarms, diagnostics-Status displaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic interruptnoneDiagnostic interruptgreen LEDDiagnostic information read-outnoneStatus displaygreen LEDChannel error displaygreen LEDChannel error displaynoneStatus displayset LEDBetween channels of groups to-Between channels and backplane bus-Insulation tested withC500 VPWM data-PWM data-PWM diannels-Pinnum pulse width-Type of output-Stafety protocol-Stafety protocol-Stafety protocol-Stafety requirements-Stafety requirem	Switching frequency on lamp load	max. 10 Hz
Trigger level1.7 ANumber of operating cycle of relay outputs-Switching capacity of contacts-Output data size8 BitStatus information, alarms, diagnostics-Status information, alarms, diagnostics-Process alarmnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic interruptnoneStatus information read-outreen LEDGroup error displayreen LEDGroup error displaynoneBetween channels of groups to-Between channels and backplane bus-Insulation tested withDC 500 VPWM data-PWM dine basis-Prod length-Minimu pulse width-Type of output-Safety protocl-Safety requirements-Safety requirements-Safety requirements-Safety requirements-Safety requirements-Watchdog-Safety requirements-Safety requirements-Safety requirements-Safety requirements-Safety requirements-Safety requirements-Safety requirements-Safety requirements <td< td=""><td>Internal limitation of inductive shut-off voltage</td><td>+45 V</td></td<>	Internal limitation of inductive shut-off voltage	+45 V
number of operating cycle of relay outputs-Switching capacity of contacts-Output data size& BitStatus information, alarms, diagnostics-Status displaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic interruptnoneDiagnostic information read-outmoneStatus displaygreen LEDGroup error displayred LEDChannel error displaynoneBetween channels-Between channels of groups to-Between channels of groups to-PWM dataC500 VPWM data-PWM data-PWM data-Pidol output-Stafy protocol-Safety protocol-Safety protocol-Safety requirements-Safety requirements-Safe	Short-circuit protection of output	yes, electronic
Switching capacity of contacts-Output data size8 BitStatus information, alarms, diagnosticsgreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic information read-outnoneStatus displaygreen LEDGroup error displayred LEDChannel error displaynoneBetween channels-Between channels of groups to-Between channels of groups to-PWM dataC500 VPWM data-PWM data-PWM data-Pidologith-Storium pulse width-Story	Trigger level	1.7 A
Output data size8 BitStatus information, alarms, diagnosticsgreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic interruptnoneStatus displaygreen LEDDiagnostic information read-outnoneSupply voltage displaygreen LEDGroup error displayred LEDChannel error displaynoneBetween channels-Between channels of groups to-Between channels of groups to-PWM dataVPWM data-PWM totapsis-PWM totapsis-Piolognth-Aliminum pulse width-Type of output-Safety protocol-Safety requirements-Safety requirements-Watchdog-	Number of operating cycle of relay outputs	-
Status information, alarms, diagnosticsgreen LED per channelStatus displaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic functionsnoneSupply voltage displaygreen LEDGroup error displayred LEDChannel eror displaynoneBetween channels-Between channels of groups to-Between channels of groups to02500 VPWM dtat02500 VPWM dtat-PWM dtat-PWI dtanels-Prof output-Animum pulse width-Apple of output-Status display-Status display-Status display-PWA dtat-PWS dtanels-Puried pulse-Status display-Status display-Statu	Switching capacity of contacts	-
Status displaygreen LED per channelInterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic interruptnoDiagnostic functionsnoneSupply voltage displaygreen LEDGroup error displayred LEDChannel error displaynoneBetween channels-Between channels of groups to-Between channels of groups to-Insulation tested withDC 500 VPWM data-PWM channels-Pictol length-Pictol length-Nummu pulse width-Type of output-Safety protocol-Safety requirements-Safety requirements-Safety requirements-Watchdog-Watchdog-Safety requirements-Safety requir	Output data size	8 Bit
InterruptsnoProcess alarmnoDiagnostic interruptnoDiagnostic functionsnoDiagnostic sinformation read-outnoneSupply voltage displaygreen LEDGroup error displayred LEDChannel error displaynoneBetween channels-Between channels of groups to-Insulation tested withDC 500 VPWM data-PWM channels-PWM channels-Pictol length-Nonimum pulse width-Type of output-Safety protocol-Safety protocol-Safety requirements-Safety requirements-Vatchdog-Watchdog-	Status information, alarms, diagnostics	
Process alarmnoDiagnostic interruptnoDiagnostic functionsnoDiagnostic sinformation read-outnoneSupply voltage displaygreen LEDGroup error displayred LEDChannel error displaynone <b>Isolation</b> noBetween channels-Between channels of groups to-Between channels of groups to0Between channels and backplane bus0Insulation tested with0PWM dta-PWM dta-PWM dta-Priod length-Niminum pulse width-Safety protocol-Safety protocol-Safety requirements-Secure user address-Vachdog-Vachdog-	Status display	green LED per channel
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Group error displayred LEDChannel error displaynoneIsolationBetween channels-Between channels of groups to-Between channels and backplane busInsulation tested withDC 500 VPWM data-PWM channels-PWM channels-Period length-Nimimum pulse width-Type of output-Safety protocol-Safety requirements-Secure user address-Watchdog-Watchdog-	Diagnostics information read-out	none
Channel error displaynoneIsolationBetween channels-Between channels of groups to-Between channels and backplane busInsulation tested withDC 500 VPWM data-PVM channels-PVM three basis-Period length-Ninimum pulse width-Type of output-Safety-Safety requirements-Safety requirements-Yetchdog<	Supply voltage display	green LED
isolationBetween channels-Between channels of groups to-Between channels and backplane busBetween channels and backplane busInsulation tested withDC 500 VPWM data-PWM channels-PWM channels-PVM time basis-Period length-Nimum pulse width-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-Watchdog-	Group error display	red LED
Between channels-Between channels of groups to-Between channels and backplane bus✓Insulation tested withDC 500 VPWM data-PWM channels-PWM three basis-Period length-Nimum pulse width-Type of output-Safety-Safety requirements-Secure user address-Watchdog-Watchdog-Watchdog-Safety-Safety-Safety negoriements-Secure user address-Safety-Safety-Safety-Safety-Safety negoriements-Safety-Safety-Safety negoriements-Safety negoriements </td <td>Channel error display</td> <td>none</td>	Channel error display	none
Between channels of groups to-Between channels and backplane bus✓Isulation tested withDC 500 VPWM data-PVM channels-PVM three basis-PVM time basis-Period length-Minimum pulse width-Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-Watchdog-	Isolation	
Between channels and backplane bus✓Insulation tested withDC 500 VPWM dataPWM channelsPWM time basisPWM time basisPeriod lengthMinimun pulse widthType of outputSafetySafety protocolSafety requirementsSecure user addressWatchdogWatchdog	Between channels	-
Insulation tested withDC 500 VPWM dataDC 500 VPWM dataPPWM channels-PWM time basis-Period length-Ninimum pulse width-Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-	Between channels of groups to	-
PWM dataPWM channels-PWM time basis-Period length-Minimum pulse width-Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-Safety-Safety-Secure user address-Safety-Safety-Secure user address-Safety-Safety-Safety-Secure user address-Safety-Safety-Secure user address-Safety-Safety-Safety-Secure user address-Safety-Safety-Secure user address-Safety	Between channels and backplane bus	$\checkmark$
PWM channels-PWM time basis-Period length-Minimum pulse width-Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-	Insulation tested with	DC 500 V
PWM time basis-Period length-Minimum pulse width-Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-	PWM data	
Period length-Minimum pulse width-Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-	PWM channels	-
Ninimum pulse width-Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-	PWM time basis	-
Type of output-Safety-Safety protocol-Safety requirements-Secure user address-Watchdog-	Period length	-
SafetySafety protocolSafety requirementsSecure user addressWatchdog	Minimum pulse width	-
Safety protocol-Safety requirements-Secure user address-Watchdog-	Type of output	-
Safety requirements-Secure user address-Watchdog-	Safety	
Secure user address     -       Watchdog     -	Safety protocol	-
Watchdog -	Safety requirements	-
	Secure user address	-
Two channels -	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

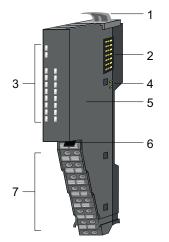
#### 4.12 022-1BH00 - DO 16xDC 24V 0.5A

## **Properties**

The module detects the binary control signals from the higher-level bus system and transports them to the process level via the outputs. It has 16 channels and their status is indicated by LEDs.

- 16 digital outputs isolated to the backplane bus
- **Diagnostic function**
- Status indication of the channels via LEDs

# Structure



#### 1 Locking lever module

- 2 Backplane bus 3
- LED status indication 4
  - DC 24V power section supply
- 5 Electronic unit 6
  - Locking lever terminal block
- 7 Terminal block

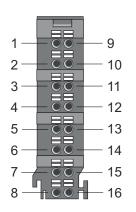
# **Status indication**

RUN — MF —	;	
DO +0.0 — DO +0.1 — DO +0.2 — DO +0.3 — DO +0.4 — DO +0.5 — DO +0.6 — DO +0.7 —		

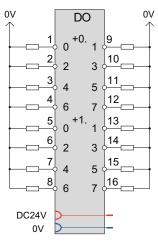
RUN	MF	DO x	Description
green	red	green	Description
_		х	Bus communication is OK
		~	Module status is OK
			Bus communication is OK
		Х	Module status reports an error with overload, short circuit or overheat
			Bus communication is not possible
		х	Module status reports an error with overload, short circuit or overheat
		Х	Error at bus power supply
			Blinking: Error in configuration
Х	ZHz 2Hz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38
			Digital output has "1" signal
			Digital output has "0" signal
not relevant	not relevant: X		

022-1BH00 - DO 16xDC 24V 0.5A

# Pin assignment



For wires with a core cross-section of 0.14mm<sup>2</sup> up to 0.75mm<sup>2</sup>. With a core cross-section < 0.25mm<sup>2</sup>, ferrules must be used.  $\Leftrightarrow$  *'Data' page 26* 



Pos.	Function	Туре	Description
1	DO +0.0	0	Digital output DO +0.0
2	DO +0.2	0	Digital output DO +0.2
3	DO +0.4	0	Digital output DO +0.4
4	DO +0.6	0	Digital output DO +0.6
5	DO +1.0	0	Digital output DO +1.0
6	DO +1.2	0	Digital output DO +1.2
7	DO +1.4	0	Digital output DO +1.4
8	DO +1.6	0	Digital output DO +1.6
9	DO +0.1	0	Digital output DO +0.1
10	DO +0.3	0	Digital output DO +0.3
11	DO +0.5	0	Digital output DO +0.5
12	DO +0.7	0	Digital output DO +0.7
13	DO +1.1	0	Digital output DO +1.1
14	DO +1.3	0	Digital output DO +1.3
15	DO +1.5	0	Digital output DO +1.5
16	DO +1.7	0	Digital output DO +1.7

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.

Addr.	Name	Byte	Function	IX	SX <sup>1</sup>
+0	PIQ	1	Status of the outputs	5200h	
			Bit 0: DO +0.0		01h
			Bit 1: DO +0.1		02h
			Bit 2: DO +0.2		03h
			Bit 3: DO +0.3		04h
			Bit 4: DO +0.4		05h
			Bit 4: DO +0.5		06h
			Bit 4: DO +0.6		07h
			Bit 4: DO +0.7		08h
		1	Status of the outputs	5201h	
			Bit 0: DO +1.0		09h
			Bit 1: DO +1.1		0Ah
			Bit 2: DO +1.2		0Bh
			Bit 3: DO +1.3		0Ch
			Bit 4: DO +1.4		0Dh
			Bit 4: DO +1.5		0Eh
			Bit 4: DO +1.6		0Fh
			Bit 4: DO +1.7		10h

1) Can be displayed as 16 channels with the names DO0 to DO15.

# 4.12.1 Technical data

Order no.	022-1BH00
Туре	SM 022
Module ID	0124 2F50
Current consumption/power loss	
Current consumption from backplane bus	35 mA
Power loss	1 W
Technical data digital outputs	
Number of outputs	16
Cable length, shielded	1000 m

# **Digital output**

Cable length, unshielded600 mRated load voltageDC 20.428.8 VCurrent consumption from load voltage L+ (without load)20 mATotal current per group, horizontal configuration, 40°C8 ATotal current per group, horizontal configuration, 60°C8 ATotal current per group, vertical configuration8 A	
Current consumption from load voltage L+ (without load)20 mATotal current per group, horizontal configuration, 40°C8 ATotal current per group, horizontal configuration, 60°C8 A	
Total current per group, horizontal configuration, 40°C8 ATotal current per group, horizontal configuration, 60°C8 A	
Total current per group, horizontal configuration, 60°C 8 A	
Total current per group, vertical configuration8 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	
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 yes, parameterizable	
Process alarm no	
Diagnostic interrupt yes, parameterizable	
Diagnostic functions yes, parameterizable	
Diagnostics information read-out none	
Supply voltage display green LED	
Group error display red LED	
Channel error display none	
Isolation	
Between channels -	

022-1BH00 - DO 16xDC 24V 0.5A > Technical data

Order no.	022-1BH00
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	2
Parameter bytes	1
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	60 g
Weight including accessories	60 g
Gross weight	74 g
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-25 °C to 70 °C
Certifications	
UL certification	in preparation
KC certification	in preparation

022-1BH00 - DO 16xDC 24V 0.5A > Diagnostic data

#### 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	Diagnostic interrupt <sup>1</sup>	00h	00h	3100h	01h	
1) This record set may only be transferred at STOP state.							

 DIAG\_EN Diagnostic inter Byte
 Bit 7 ... 0

 0
 Diagnostic interrupt
 00h: disable

 00h: disable
 40h: enable

Here you activate respectively de-activate the diagnostic function.

#### 4.12.3 Diagnostic data

Via the parametrization you may activate a diagnostic interrupt for the module. With a diagnostic interrupt the module serves for diagnostic data for diagnostic<sub>incoming</sub>. As soon as the reason for releasing a diagnostic interrupt is no longer present, the diagnostic interrupt<sub>going</sub> automatically takes place.

- 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.

022-1BH00 - DO 16xDC 24V 0.5A > Diagnostic data

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	served 00h			04h
ERR_D	1	reserved	eserved 00h			05h
CHTYP	1	Channel type	72h			06h
NUMBIT	1	reserved	00h			07h
NUMCH	1	reserved	00h			08h
CHERR	1	reserved	00h			09h
CH0ERR	1	reserved	00h			0Ah
CH1ERR	1	reserved	00h			0Bh
CH7ERR	1	reserved	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: reserved
		Bit 4: set at overload at an output
		Bit 6 5: reserved
		Bit 7: set at error in parameterization

MODTYP Module informa- tion	Byte	Bit 7 0
	0	Bit 3 0: module class
		1111b: Digital module
		Bit 7 4: reserved

Byte	Bit 7 0
0	Bit 6 0: channel type
	72h: Digital output
	Bit 7: reserved

022-1BH00 - DO 16xDC 24V 0.5A > Diagnostic data

#### DIAG\_US µs ticker

Byte	Bit 7 0
03	Value of the µs ticker at the moment of the diagnostic

µs ticker

In the System SLIO module there is a timer ( $\mu$ s ticker). With PowerON the timer starts counting with 0. After 2<sup>32</sup>-1 $\mu$ s the timer starts with 0 again.

#### ERR\_C/D, NUMBIT, NUMCH, CHERR, CHxERR reserved

022-1DF00 - DO 8xDC 24V 0.5A Diagnostic

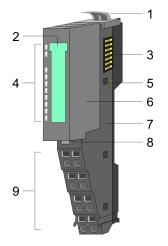
# 4.13 022-1DF00 - DO 8xDC 24V 0.5A Diagnostic

#### Properties

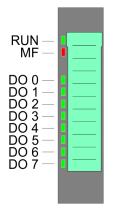
The electronic module with diagnosis accepts binary control signals from the central bus system and transfers them to the process level via outputs. It has 8 channels and their status is monitored via LEDs.

- 8 digital outputs, isolated to the backplane bus
- Monitoring wire-break and short-circuit
- Diagnostics function
- Status indication of the channels via LEDs

#### Structure



#### Status indication

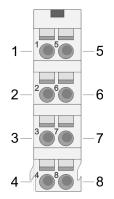


RUN	MF <b>e</b> red	DO x	Description			
-		х	Bus communication is OK			
		^	Module status is OK			
			Bus communication is OK			
	-	Х	Module status reports an error with wire- break and short-circuit			
			Bus communication is not possible			
	•	Х	Module status reports an error with wire- break and short-circuit			
		Х	Error at bus power supply			
			Flashing: Error in configuration			
Х	ZHz 2Hz	Х	Schap. 2.12 'Trouble shooting - LEDs' page 38			
			Digital output has "1" signal			
			Digital output has "0" signal			
not relevant	not relevant: X					

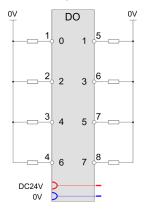
- 1 Locking lever terminal module
- 2 Labeling strip
- 3 Backplane bus
- 4 LED status indication
- 5 DC 24V power section supply
- 6 Electronic module
- 7 Terminal module8 Locking lever ele
  - Locking lever electronic module
- 9 Terminal

022-1DF00 - DO 8xDC 24V 0.5A Diagnostic

#### Pin assignment



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



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



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

Input area

Output area

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

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	+0 PIQ 1	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 Bit 4: DO 4 Bit 5: DO 5	Bit 3: DO 3		04h			
						Bit 4: DO 4		05h
			Bit 5: DO 5		06h			
		E	Bit 6: DO 6		07h			
			Bit 7: DO 7		08h			

# 4.13.1 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	✓

# **Digital output**

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	$\checkmark$
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

### 4.13.2 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	Diagnostics <sup>1</sup>	00h	00h	3100h	01h	
WIBRK_EN	1	Wire-break recognition <sup>1</sup>	00h	00h	3101h	02h	
CH0D_EN	1	Short-circuit recognition <sup>1</sup>	00h	00h	3102h	03h	
1) This record set may only be transferred at STOP state							

1) 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.

## 4.13.3 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.

022-1DF00 - DO 8xDC 24V 0.5A Diagnostic > Diagnostic data

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
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 informa- tion	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

022-1DF00 - DO 8xDC 24V 0.5A Diagnostic > Diagnostic data

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 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 CH7ERR	Byte	Bit 7 0

CH0ERR CH7ERR 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 $\mu$ s ticker at the moment of the diagnostic

#### µs ticker

In the System SLIO module there is a timer ( $\mu$ s ticker). With PowerON the timer starts counting with 0. After 2<sup>32</sup>-1 $\mu$ s the timer starts with 0 again.

#### 022-1HB10 - DO 2xRelay 4.14

#### **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

Labeling strip

Backplane bus

LED status indication

Electronic module

Terminal module

Terminal

1 2

3

4

5

6

7

8

9

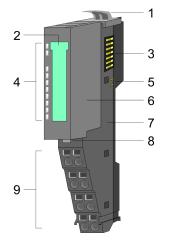
Status indication of the channels via LEDs

Locking lever terminal module

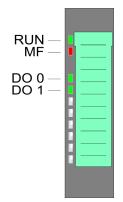
DC 24V power section supply

Locking lever electronic module

#### Structure



#### **Status indication**



RUN	MF	DO x	Description
_		х	Bus communication is OK
		^	Module status is OK
			Bus communication is OK
	•	Х	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
		Х	Error at bus power supply
			Flashing: Error in configuration
Х	ZHz	Х	
			Relay output has "1" signal
			Relay output has "0" signal
not relevant	:: X		



The mixed operation of touch and non touch voltages is not permitted!

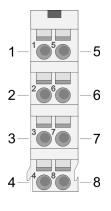
With HW state 04, an interference suppression capacitor (15nF) has been connected parallel to each relay contact in order to improve the EMC resistance.

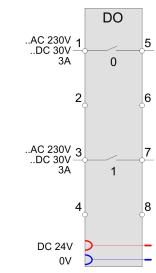
### Please note!

- When using inductive loads, use a suitable protective circuit (see installation guidelines).
- When using loads with a high inrush current, such as electronic ballasts, use a suitable current limiter.

#### Pin assignment

For wires with a cross section of  $0.08 \text{mm}^2$  up to  $1.5 \text{mm}^2$ .





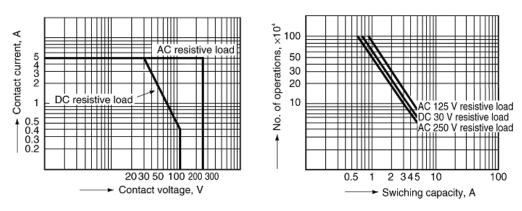
Pos.	Function	Туре	Description
1	DO 0	0	Relay output DO 0
2	—	—	not connected
3	DO 1	0	Relay output DO 1
4	—	—	not connected
5	DO 0	0	Relay output DO 0
6	—	—	not connected
7	DO 1	0	Relay output DO 1
8	—	—	not connected

O: Output

022-1HB10 - DO 2xRelay > Technical data

#### Maximum load

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	PIQ	1	State of the outputs	5200h	
			Bit 0: DO 0		01h
			Bit 1: DO 1		02h
			Bit 7 2: reserved		

#### 4.14.1 Technical data

Order no.	022-1HB10
Туре	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

# **Digital output**

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	$\checkmark$
Between channels of groups to	-
Between channels and backplane bus	$\checkmark$

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

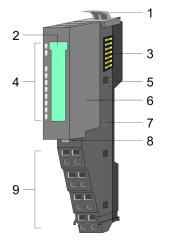
# 4.15 022-1HD10 - DO 4xRelay

#### Properties

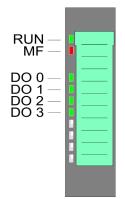
The electronic module accepts binary control signals from the central bus system and transfers them to the process level via relay outputs. It has 4 channels that operate as switches and the status of each channel is monitored via LEDs.

- 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



#### Status indication

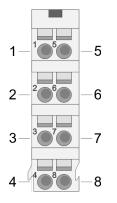


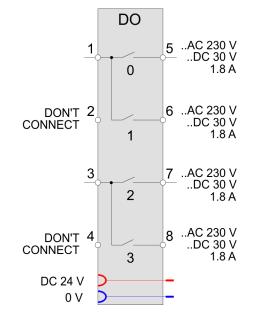
RUN	MF	DO x	Description
		х	Bus communication is OK Module status is OK
•	•	х	Bus communication is OK Module status reports an error with overload, short circuit or overheat
	•	x	Bus communication is not possible Module status reports an error with overload, short circuit or overheat
		Х	Error at bus power supply
x	2Hz	Х	Flashing: Error in configuration
			Relay output has "1" signal
			Relay output has "0" signal
not relevant	: X		

- 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

#### Pin assignment

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





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!

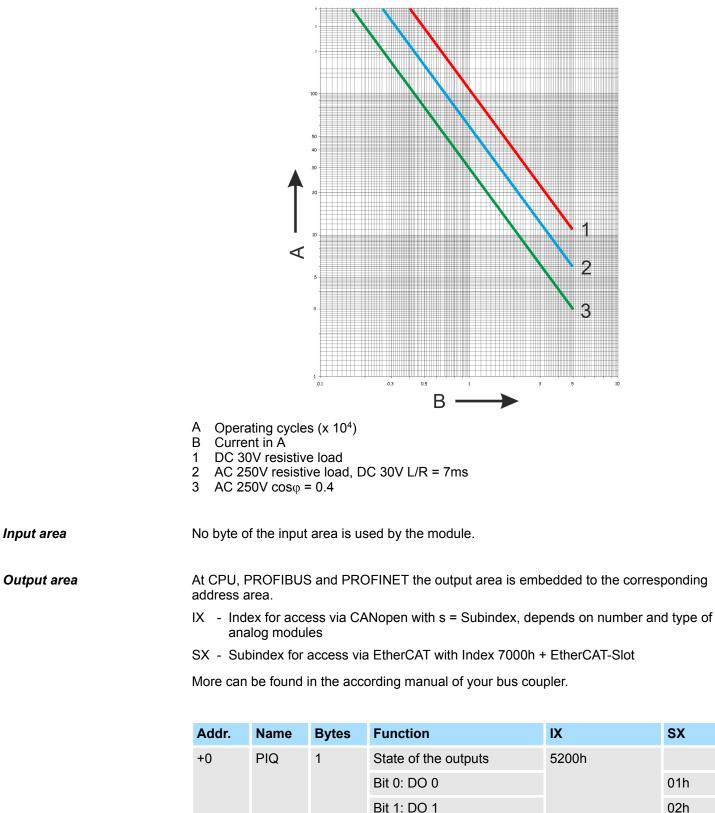
Due to the hardware the pins 2 and 4 must not be connected! The mixed operation of touch and non touch voltages is not permitted!

With HW state 03, an interference suppression capacitor (15nF) has been connected parallel to each relay contact in order to improve the EMC resistance.

#### Please note!

- When using inductive loads, use a suitable protective circuit (see installation guidelines).
- When using loads with a high inrush current, such as electronic ballasts, use a suitable current limiter.





Bit 2: DO 2

Bit 3: DO 3

Bit 7 ... 4: reserved

03h

04h

022-1HD10 - DO 4xRelay > Technical data

# 4.15.1 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

# **Digital output**

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	$\checkmark$
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

# **Digital output**

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