



VIPA System SLIO



IM | 053-1PN00 | Manual

HB300E_IM | RE_053-1PN00 | Rev. 11/28

July 2011

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- 2004/108/EC Electromagnetic Compatibility Directive
- 2006/95/EC Low Voltage Directive

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About this manual

This manual describes the IM 053-1PN00 IO device for PROFINET of the System SLIO from VIPA. Here you may find every information for commissioning and operation.

Overview

Chapter 1: Basics and Assembly

The focus of this chapter is on the introduction of the VIPA System SLIO. Here you will find the information required to assemble and wire a controller system consisting of System SLIO components. Besides the dimensions the general technical data of System SLIO will be found.

Chapter 2: Hardware description

Here the hardware components of the IM 053-1PN00 PROFINET IO device are more described.

You will find the technical data at the end of this chapter.

Chapter 3: Deployment

This chapter describes the usage of the IM 053-1PN00 with PROFINET. After a short introduction you may find here every information for the usage in the System SLIO.

Objective and contents

This manual describes the IM 053-1PN00 of the System SLIO from VIPA. It contains a description of the structure, project engineering and deployment.

This manual is part of the documentation package with order number VIPA HB300E_IM and relevant for:

Product	Order number	as of state:	
		HW	FW
IM 053PN	VIPA 053-1PN00	01	1.0.0

Target audience

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

Structure of the manual

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

Guide to the document

The following guides are available in the manual:

- an overall table of contents at the beginning of the manual
- an overview of the topics for every chapter

Availability

The manual is available in:

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

Icons Headings

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



Danger!

Immediate or likely danger. Personal injury is possible.



Attention!

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



Note!

Supplementary information and useful tips.

Safety information

Applications conforming with specifications

The System SLIO is constructed and produced for:

- communication and process control
- general control and automation applications
- 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



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

- Modification to the process control system should only be carried out when the system has been disconnected from power!
- Installation and 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!

Chapter 1 Basics and Assembly

Overview

The focus of this chapter is on the introduction of the VIPA System SLIO. Here you will find the information required to assemble and wire a controller system consisting of System SLIO components.

Besides the dimensions the general technical data of System SLIO will be found.

Content

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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.



Attention!

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

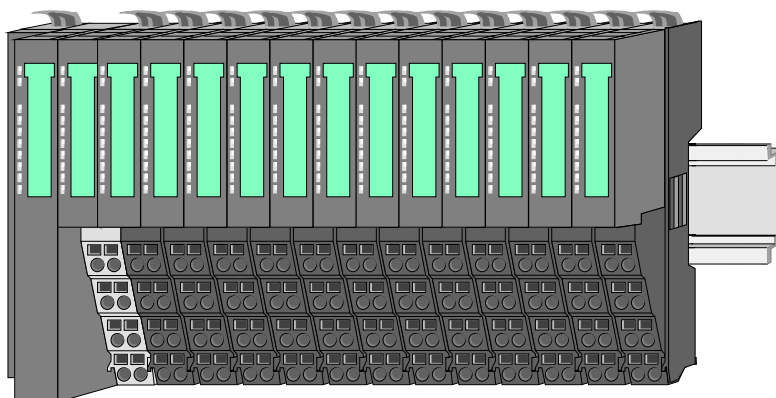
System conception

Overview

System SLIO is a modular automation system for assembly on a 35mm mounting rail. By means of the peripheral modules with 2, 4 or 8 channels this system may properly be adapted matching to your automation tasks.

The wiring complexity is low, because the supply of the DC 24V power section is integrated to the backplane bus and defective modules may be replaced with standing wiring.

By deployment of the power modules in contrasting colors within the system, further isolated areas may be defined for the DC 24V power section supply, respectively the electronic power supply may be extended with 2A.

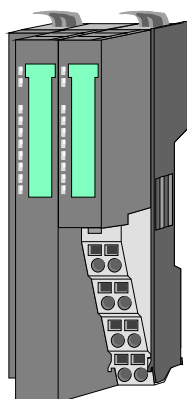


Components

The System SLIO consists of the following components:

- Bus coupler
- Periphery modules
- Power modules
- Accessories

Bus coupler



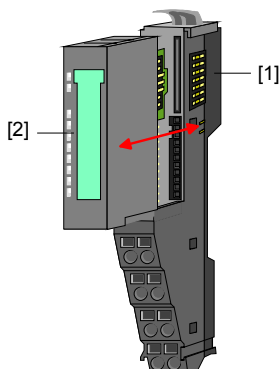
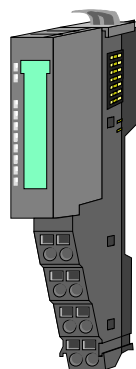
With a bus coupler bus interface and power module is integrated to one casing. With the bus interface you get access to a subordinated bus system.

Via the integrated power module for power supply the bus interface is supplied as well as the electronic of the connected periphery modules.

The DC 24 power section supply for the linked periphery modules is established via a further connection at the power module.

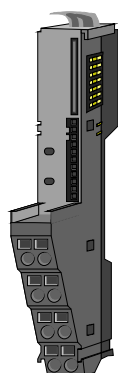
By installing of up to 64 periphery modules at the bus coupler, these are electrically connected, this means these are assigned to the backplane bus, the electronic modules are power supplied and each periphery module is connected to the DC 24V power section supply.

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



- [1] Terminal module
- [2] Electronic module

Terminal module

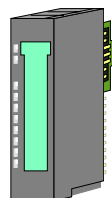


The *terminal module* serves to carry the electronic module, contains the backplane bus with power supply for the electronic, the DC 24V power section supply and the staircase-shaped terminal for wiring.

Additionally the terminal module has a locking system for fixing at a mounting rail.

By means of this locking system your SLIO system may be assembled outside of your switchgear cabinet to be later mounted there as whole system.

Electronic module



The functionality of a SLIO periphery module is defined by the *electronic module*, which is mounted to the terminal module by a safe sliding mechanism.

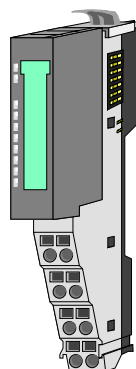
With an error the defective module may be exchanged for a functional module with standing installation.

By an integrated coding only the modules may be plugged, which may be combined.

At the front side there are LEDs for status indication.

For simple wiring each module shows a corresponding connection diagram at the front and at the side.

Power module



In the system SLIO the power supply is established by power modules. These are either integrated to the bus coupler or may be installed between the periphery modules. Depending on the power module isolated areas of the DC 24V power section supply may be defined respectively the electronic power supply may be extended with 2A.

For better recognition the color of the power modules are contrasting to the periphery modules.

Accessories

Shield bus carrier



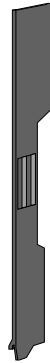
The shield bus carrier serves to carry the shield bus (10mm x 3mm) to connect cable shields.

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 adaption to a flat mounting rail you may remove the spacer of the shield bus carrier.

Bus cover

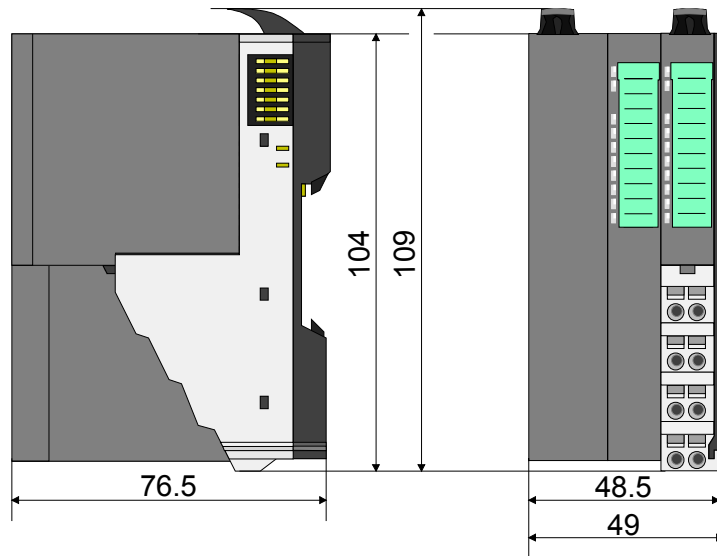


With each bus coupler, to protect the backplane bus connectors, there is a mounted bus cover in the scope of delivery. You have to remove the bus cover of the bus coupler before mounting a SLIO module.

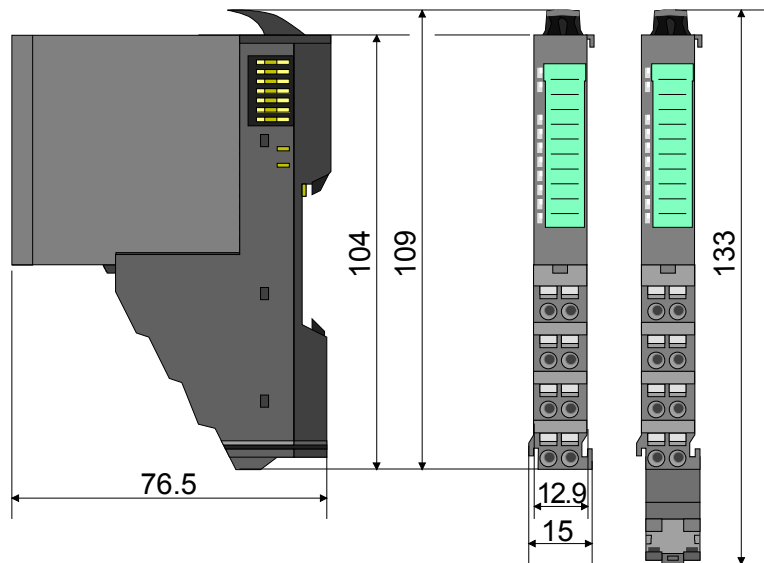
For the protection of the backplane bus connector you always have to mount the bus cover at the last module of your system again.

Dimensions

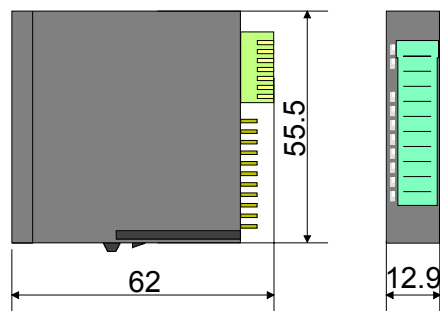
Dimensions bus coupler



Dimensions periphery module



Dimensions electronic module



Dimensions in mm

Installation

Functional principle

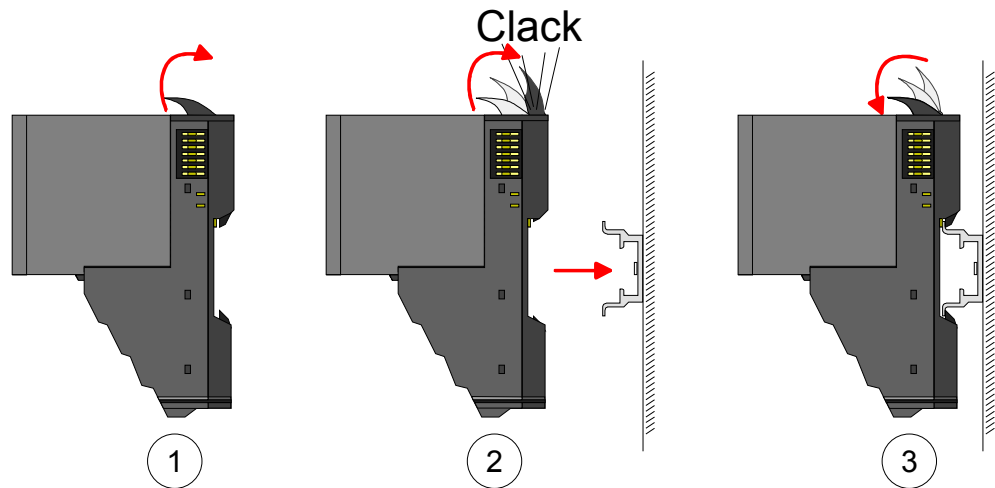
There is a locking lever at the top side of the terminal module. For mounting and demounting this locking lever is to be turned upwards until this engages audible.

Now the module may be pulled forward.

For mounting plug 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.

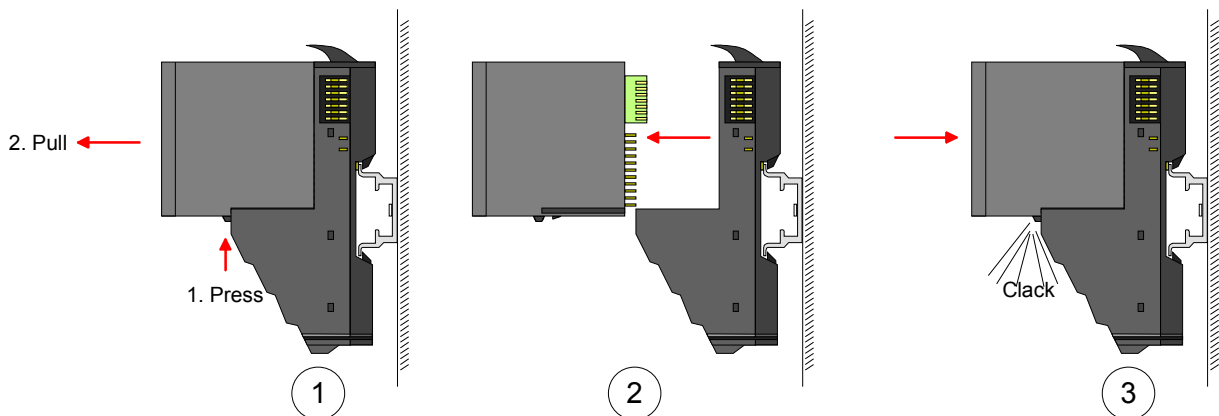
The module is fixed to the mounting rail by pushing downward the locking lever.

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.



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.



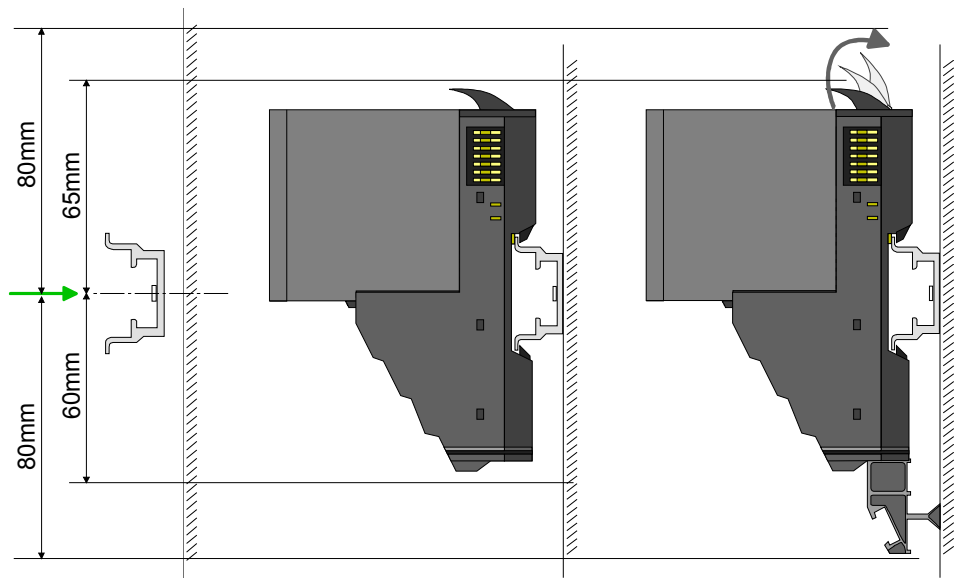
Mounting Proceeding

The modules were directly be mounted to the mounting rail and so connected to the backplane bus and the power supply for the electronic and power section.

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 with 2A. More about this may be found at "Wiring".

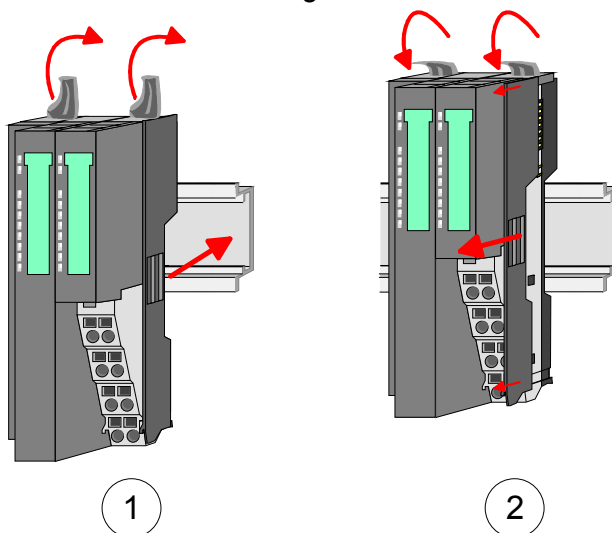
Mounting mounting rail

- 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.



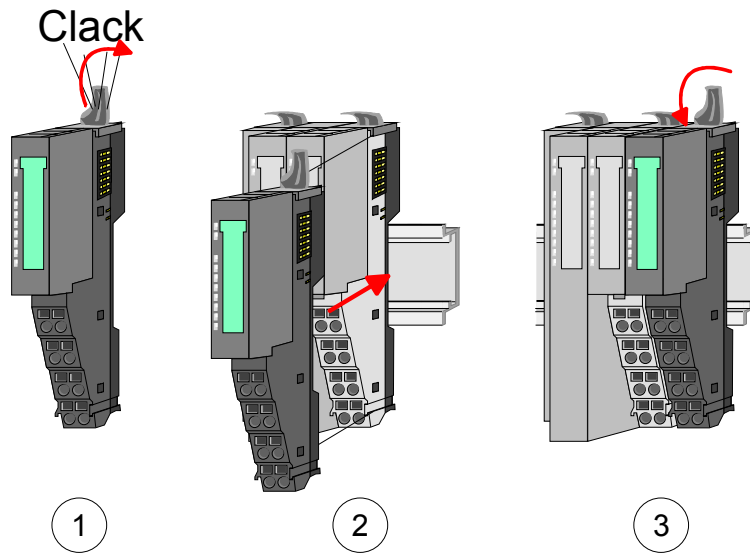
Mounting Head module (e.g. bus coupler)

- Start at the left side with the head module (e.g. bus coupler). For this turn both locking lever upwards, put the head module to the mounting rail and turn both locking lever downward.
- 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.



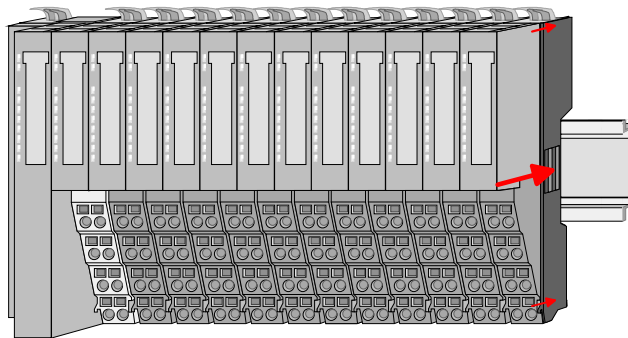
Mounting
periphery modules

- Mount the periphery modules you want.



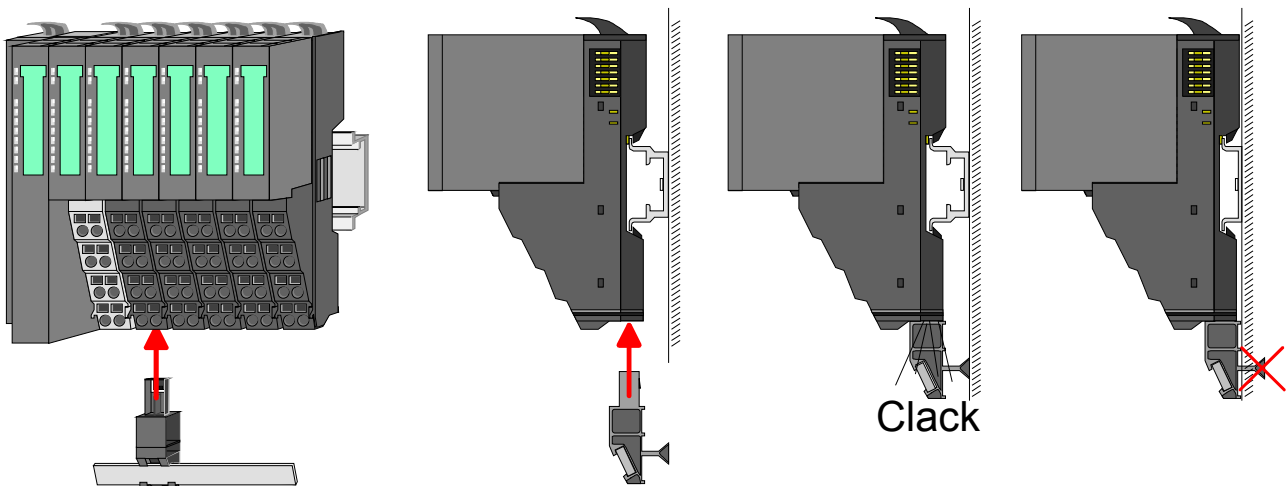
Mounting the
bus cover

- After mounting the whole system, to protect the backplane bus connectors at the last module you have to mount the bus cover, now.



Mounting
shield bus carrier

- The shield bus carrier (available as accessory) serves to carry the shield bus to connect cable shields. The shield bus carrier is mounted underneath the terminal of the terminal module. With a flat mounting rail for adaption to a flat mounting rail you may remove the spacer of the shield bus carrier.

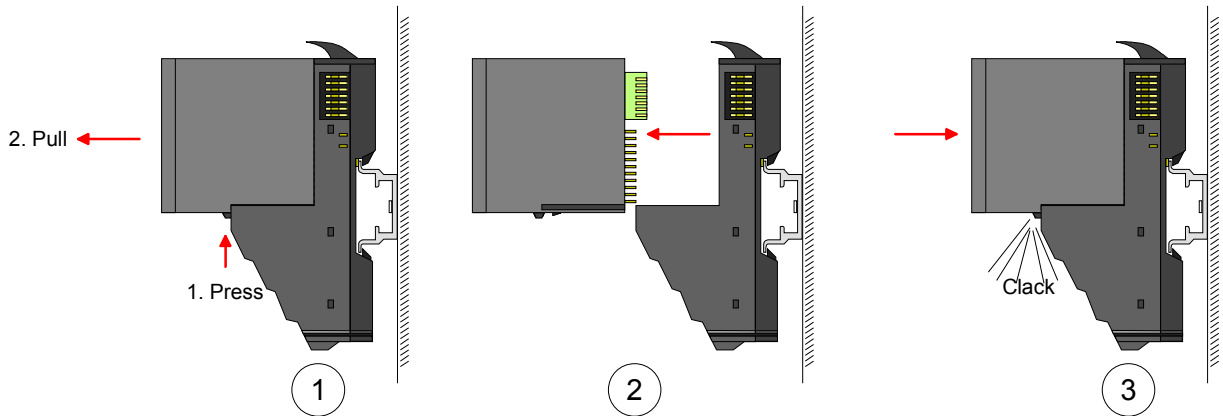


Demounting and module exchange

Proceeding With demounting and exchange of a module, head module (e.g. bus coupler) or a group of modules for mounting reasons you have always to remove the electronic module of the just mounted right module. After the mounting it may be plugged again.

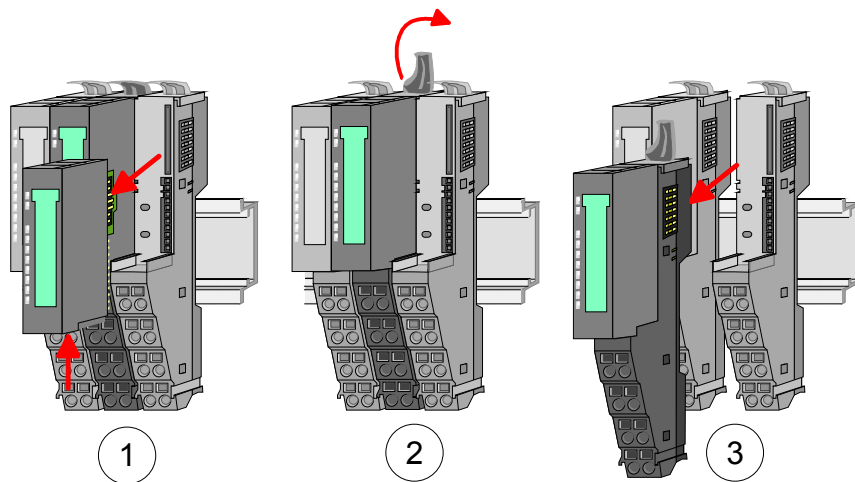
Exchange of an electronic module For the exchange of an electronic module, the electronic module may be pulled forward after pressing the unlocking lever at the lower side of the module.

For installation plug the electronic module guided by the strips at the lower side until this engages audible to the terminal module.

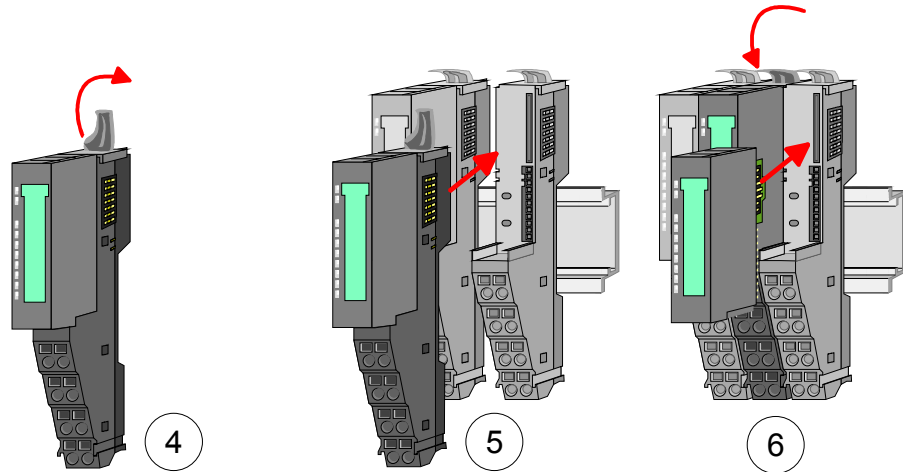


Exchange of a module

- Remove if exists the wiring. More about this may be found at "Wiring".
- Press the unlocking lever at the lower side of the just mounted right module and pull it forward.
- Turn the locking lever of the module to be exchanged upwards.
- Pull the module forward.



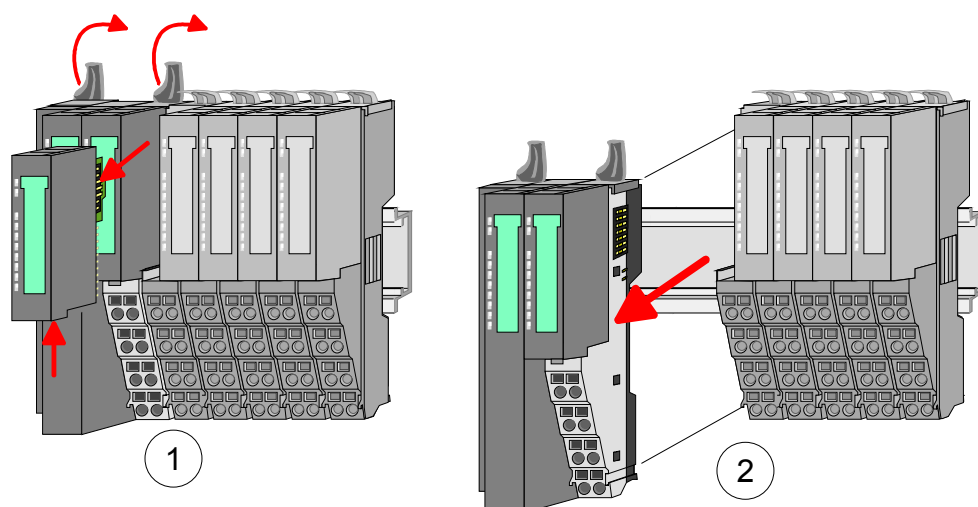
- For mounting turn the locking lever of the module to be mounted upwards.
- To mount the module put it to the gap between the both modules and push it, guided by the stripes at both sides, to the mounting rail.
- Turn the locking lever downward again.
- Plug again the electronic module, which you have removed before.



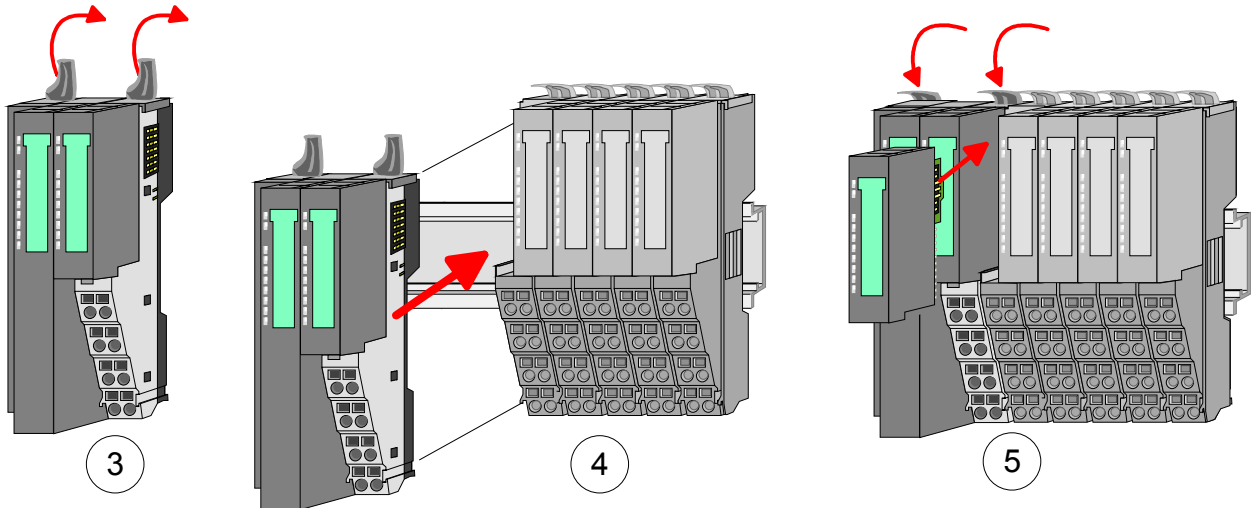
Exchange of a head module
(e.g. bus coupler)

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

- Remove if exists the wiring of the head module. More about this may be found at "Wiring".
- Press the unlocking lever at the lower side of the just mounted right module and pull it forward.
- Turn all the locking lever of the head module to be exchanged upwards.
- Pull the head module forward.

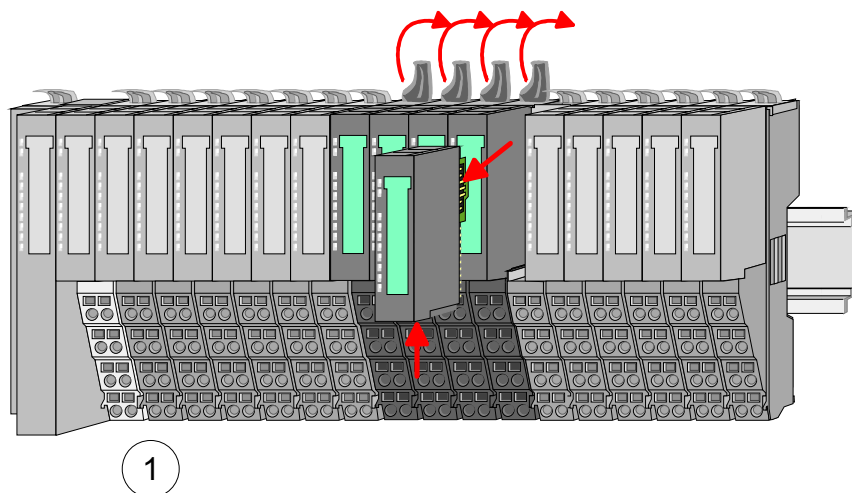


- For mounting turn all the locking lever of the head module to be mounted upwards.
- To mount the head module put it to the left module and push it, guided by the stripes, to the mounting rail.
- Turn all the locking lever downward again.
- Plug again the electronic module, which you have removed before.

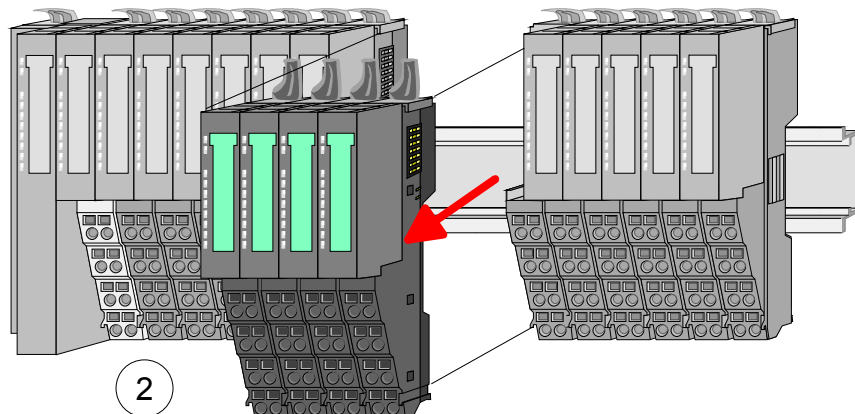


Exchange of a module group

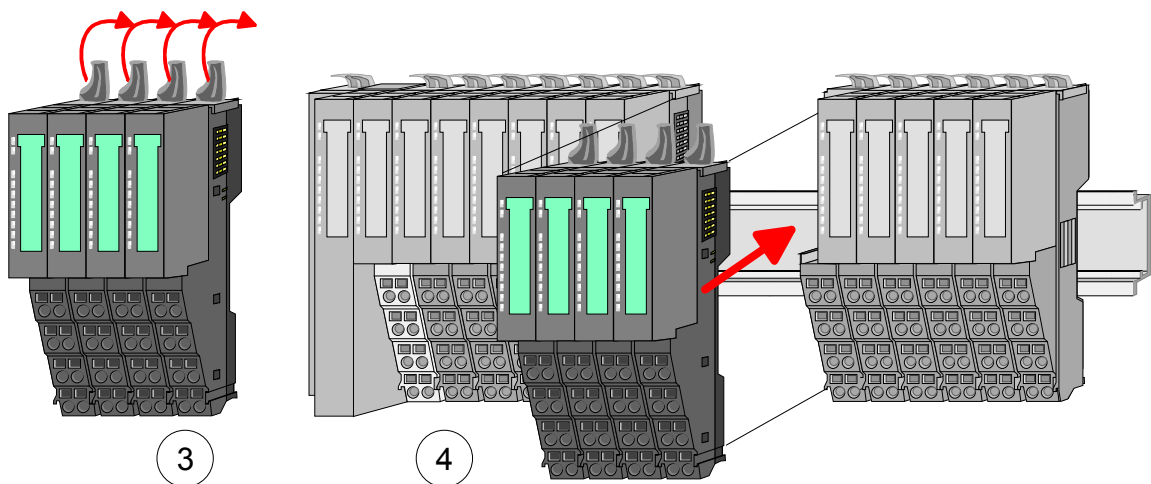
- Remove if exists the wiring of the module group. More about this may be found at "Wiring".
- Press the unlocking lever at the lower side of the just mounted right module of the module group and pull it forward.
- Turn all the locking lever of the module group to be exchanged upwards.



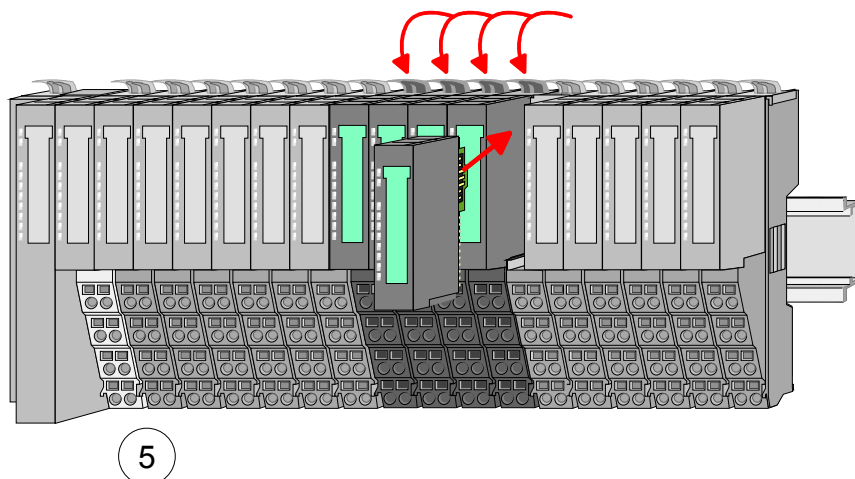
- Pull the module group forward.



- For mounting turn all the locking lever of the module group to be mounted upwards.
- 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.



- Turn all the locking lever downward again.
- Plug again the electronic module, which you have removed before.



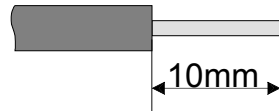
Wiring

Connectors

Terminals with spring clamp technology are used for wiring. The spring clamp technology allows quick and easy connection of your signal and supply lines.

In contrast to screw terminal connections this type of connection is vibration proof.

Data



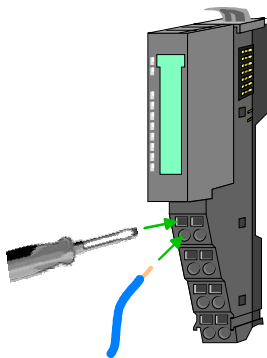
U_{\max} : 240V AC / 30V DC

I_{\max} : 10A

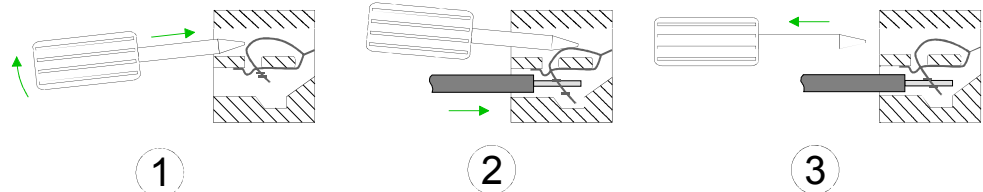
Cross section: 0.08 ... 1.5mm² (AWG 28 ... 16)

Stripping length: 10mm

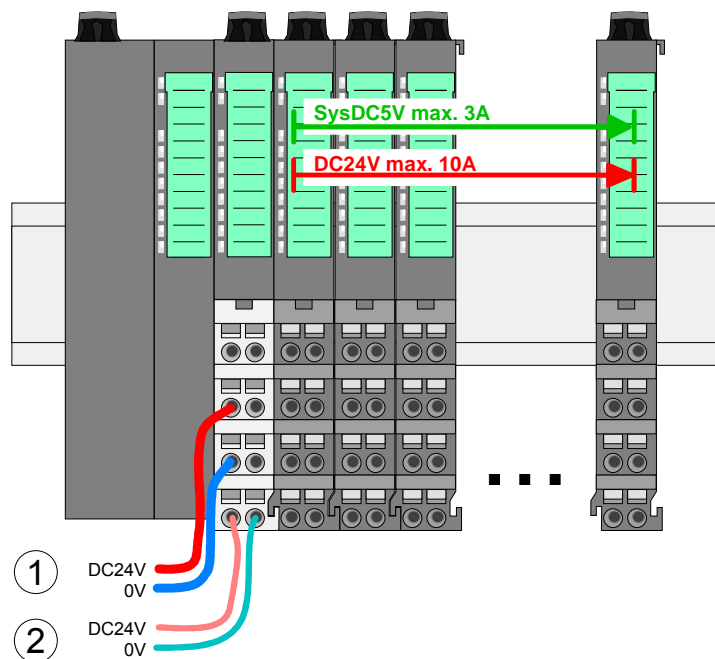
Wiring procedure



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



Standard wiring



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



Attention!

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!



Note!

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 bus coupler 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. More concerning this may be found at the following page.

Deployment of the power modules

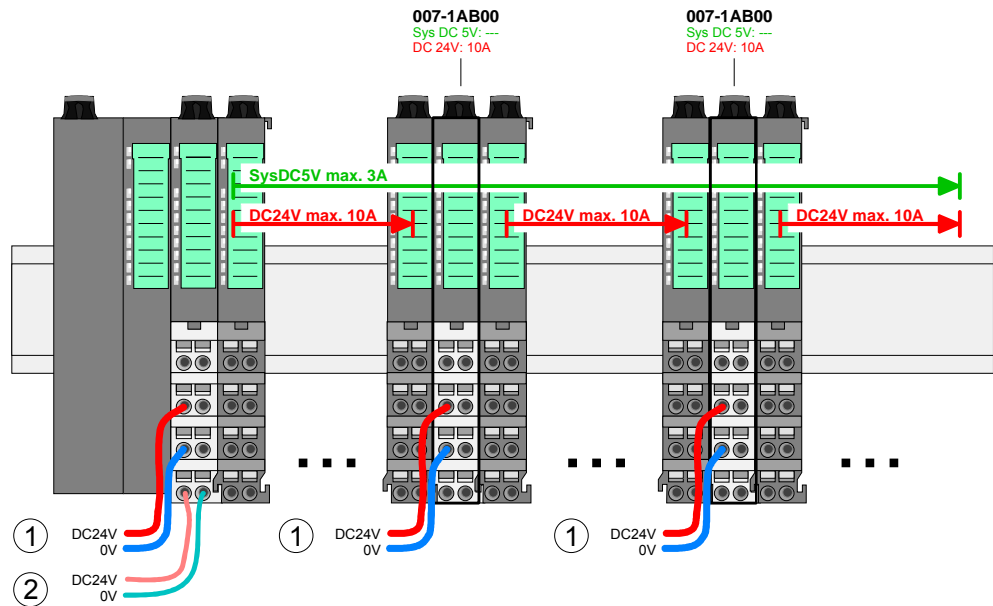
If the 10A for the power section supply is no longer sufficient, you may use the power module from VIPA with the order number 007-1AB00. So you have also the possibility to define isolated groups.

The power module with the order number 007-1AB10 is to be used if the 3A for the electronic power supply at the backplane bus is no longer sufficient. Additionally you get an isolated group for the DC 24V power section supply with 4A.

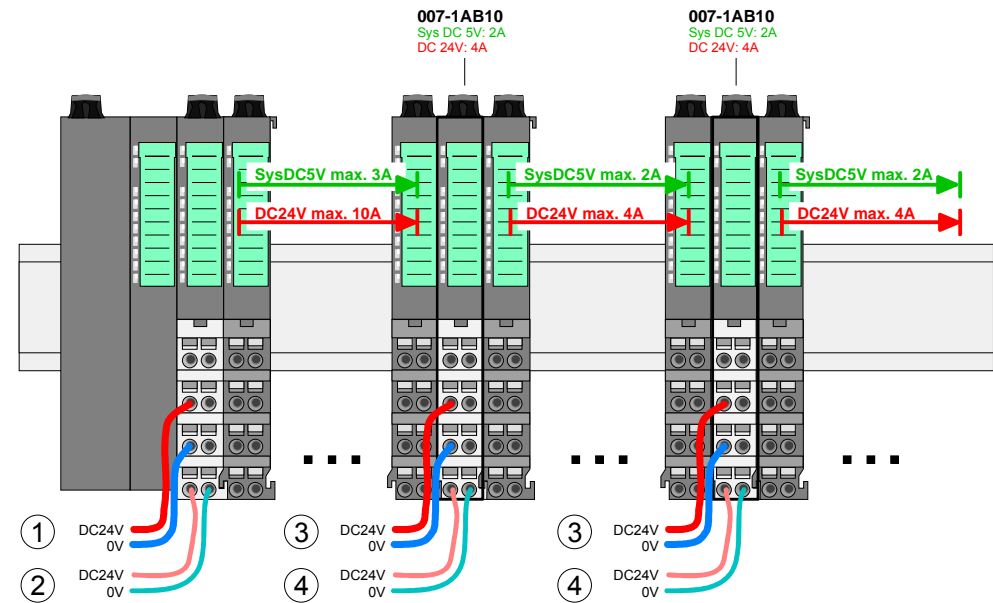
By placing the power module 007-1AB10 at the following backplane bus modules may be placed with a sum current of max. 2A. Afterwards the power module 007-1AB00 is to be placed again.

To secure the power supply, the power modules may be mixed used.

Power module 007-1AB00



Power module 007-1AB10

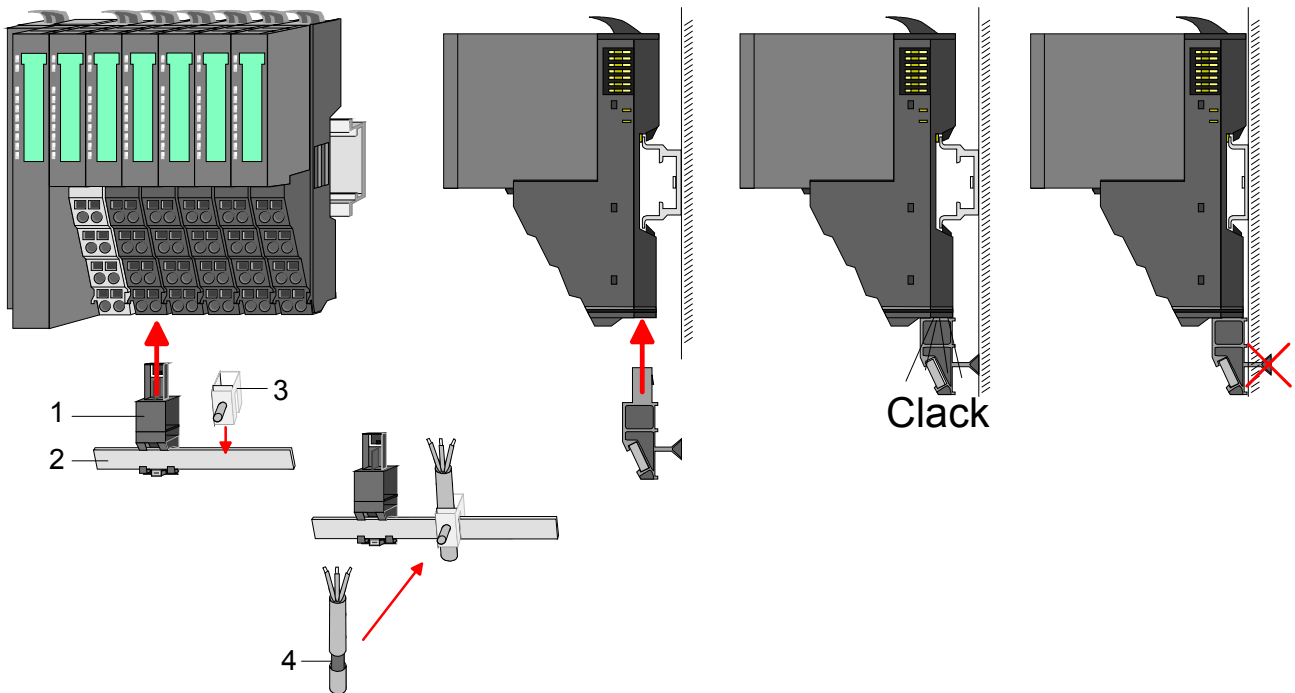


- (1) DC 24V for power section supply I/O area (max. 10A)
- (2) DC 24V for electronic power supply bus coupler and I/O area
- (3) DC 24V for power section supply I/O area (max. 4A)
- (4) DC 24V for electronic power supply I/O area

Shield attachment 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.

The shield bus carrier is mounted underneath the terminal of the terminal module. With a flat mounting rail for adaption to a flat mounting rail you may remove the spacer of the shield bus carrier.

After mounting the shield bus carrier with the shield bus, the cables with the accordingly stripped cable screen may be attached and fixed by the shield clamp.



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

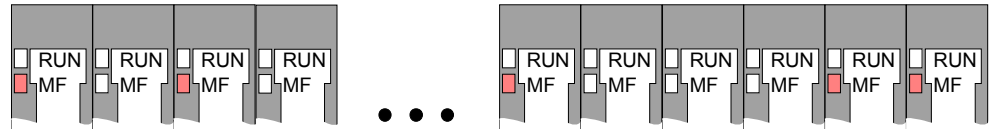
Trouble shooting - LEDs

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 ☼.

Sum current of the electronic power supply exceeded

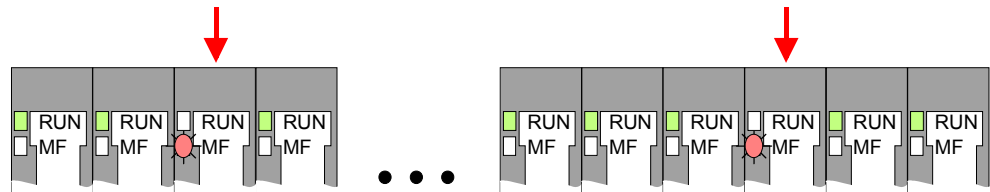


Behavior: After PowerON the RUN LED of each module is off and the MF LED of each module is sporadically on.

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. More concerning this may be found above at "Wiring".

Error in configuration

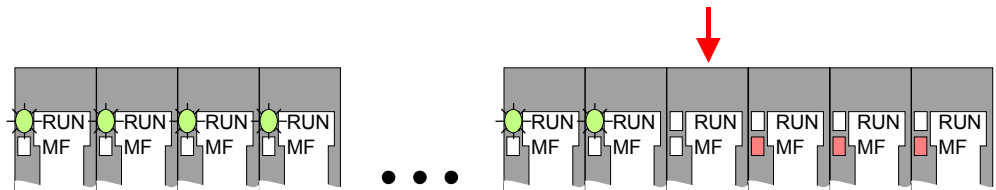


Behavior: After PowerON the MF LED of one module respectively more modules flashes. The RUN LED remains off.

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

Remedy: Match configuration and hardware structure.

Module failure



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

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

Remedy: Replace the defective module.

Installation guidelines

General The installation guidelines contain information about the interference free deployment of System SLIO. There is the description of the ways, interference may occur in your control, how you can make sure the electromagnetic digestibility (EMC), and how you manage the isolation.

What means EMC? Electromagnetic digestibility (EMC) means the ability of an electrical device, to function error free in an electromagnetic environment without being interferenced res. without interfering the environment.
All System SLIO components are developed for the deployment in industrial environments and fulfill 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:

- Fields
- I/O signal conductors
- Bus system
- Current 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.

One differs:

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

Basic rules for EMC

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

- Take care of a correct area-wide grounding of the inactive metal parts when installing your components.
 - Install a central connection between the ground and the protected earth conductor system.
 - Connect all inactive metal extensive and impedance-low.
 - Please try not to use aluminum parts. Aluminum is easily oxidizing and is therefore less suitable for grounding.
- When cabling, take care of the correct line routing.
 - Organize your cabling in line groups (high voltage, current supply, signal and data lines).
 - Always lay your high voltage lines and signal res. data lines in separate channels or bundles.
 - Route the signal and data lines as near as possible beside ground areas (e.g. suspension bars, metal rails, tin cabinet).
- 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 favorable.
 - 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 metalized plug cases for isolated data lines.
- In special use cases you should appoint special EMC actions.
 - Wire all inductivities with erase links, which are not addressed by the System SLIO modules.
 - For lightening cabinets you should prefer incandescent lamps and avoid luminescent lamps.
- 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 is a protection and functionality activity.
 - Connect installation parts and cabinets with the System SLIO in star topology with the isolation/protected earth conductor system. So you avoid ground loops.
 - If potential differences between installation parts and cabinets occur, 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. Hereby you have to make sure, that the connection to the protected earth conductor is impedance-low, 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 res. μ A) are transferred
 - foil isolations (static isolations) are used.
- With data lines always use metallic or metalized 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 the System SLIO module 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

Conformity and approval		
Conformity		
CE	2006/95/EG	Low-voltage directive
Approval		
UL	UL 508	Approval for USA and Canada
others		
RoHs	-	Product is unleaded

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	EN 61131-2	-
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	EN 61131-2	0...+60°C
Vertical installation	EN 61131-2	0...+60°C
Air humidity	EN 60068-2-30	RH1 (without condensation, rel. humidity 10 ... 95%)
Pollution	EN 61131-2	Degree of pollution 2
Mechanical		
Oscillation	EN 60068-2-6	1G
Shock	EN 60068-2-27	15G

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

EMC	Standard	Comment	
Emitted interference	EN 61000-6-4	Class A (Industry area)	
Noise immunity zone B	EN 61000-6-2	Industry area	
		EN 61000-4-2	ESD Degree of severity 3, i.e. 8kV at air discharge, 4kV at contact discharge
		EN 61000-4-3	HF irradiation (casing) 80MHz ... 1000MHz, 10V/m 80% AM (1kHz)
		EN 61000-4-6	HF conducted 150kHz ... 80MHz, 10V/m 80% AM (1kHz)
		EN 61000-4-4	Burst, degree of severity 3
	EN 61000-4-5	Surge, degree of severity 3 *)	

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

Chapter 2 Hardware description

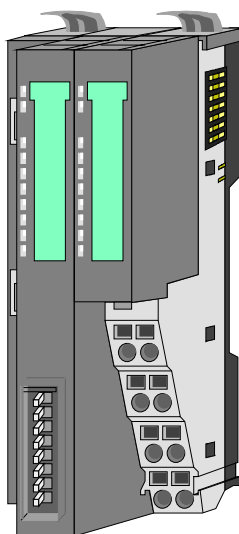
Overview Here the hardware components of the IM 053-1PN00 PROFINET IO device are more described.
You will find the technical data at the end of this chapter.

Content	Topic	Page
	Chapter 2 Hardware description.....	2-1
	Properties.....	2-2
	Structure	2-3
	Technical data.....	2-6

Properties

Features

- Field bus: PROFINET according to IEC 61158-6-10, IEC 61784-2
- PROFINET for max. 64 periphery modules
- Max. 512byte input and 512byte output data
- 2-port switch integrated
- Transfer rate 100Mbit/s full-duplex
- Integrated DC 24V power supply for power and electronic section supply of the periphery modules

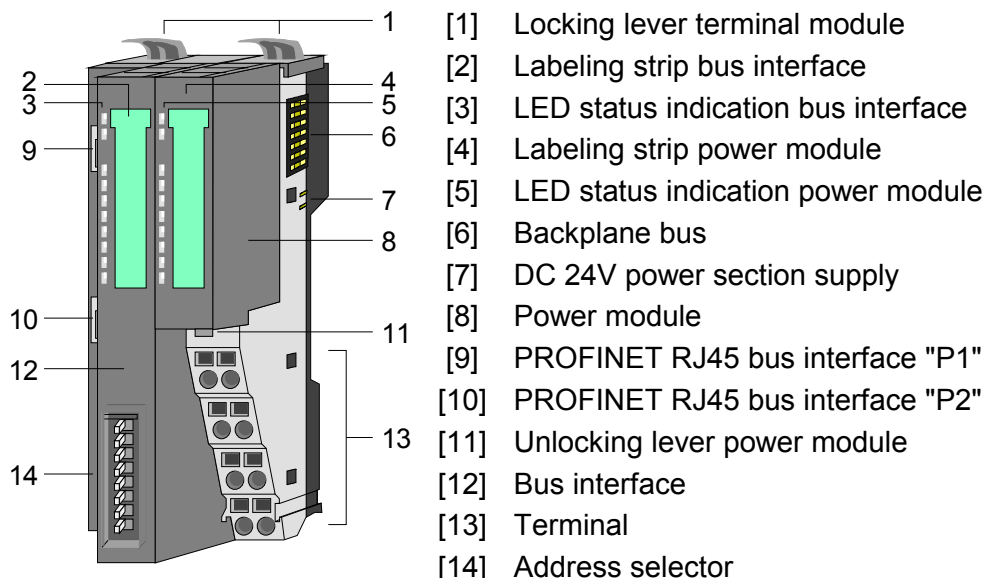


Order data

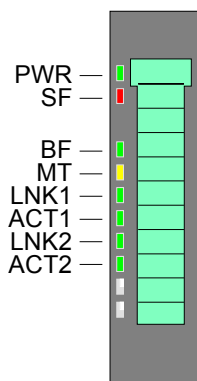
Type	Order number	Description
IM 053PN	VIPA 053-1PN00	PROFINET IO device for System SLIO

Structure

053-1PN00



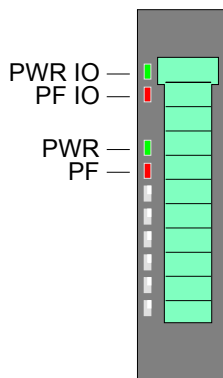
Status indication bus interface



LED	Color	Description
PWR	green	● Bus interface is power supplied
SF	red	● System error: Error at PROFINET or System SLIO bus
BF	green	● Bus error: Error in PROFINET communication
MT	yellow	● Maintenance PROFINET
LNK1/2	green	● Link: Physical link to Ethernet
ACT1/2	green	● Activity: Communication via Ethernet

For the fast diagnosis of the current module status 8 LEDs are on the front side. You may find a detailed description of the LEDs in the chapter "Deployment" at "Status indication".

Status indication power module



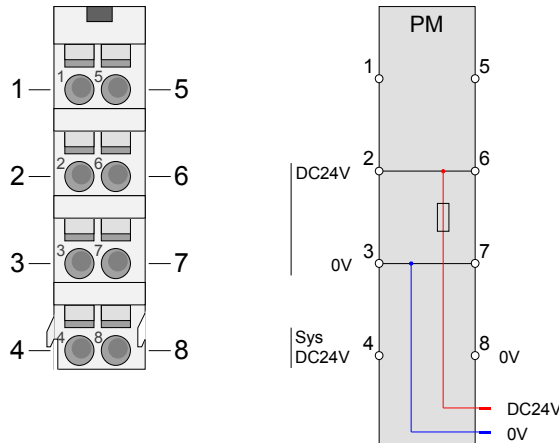
LED	Color	Description
PWR IO	green	● Power section supply OK
PF IO *	red	● Fuse power section supply defective (Power fail)
PWR	green	● Electronic section supply OK
PF	red	● Fuse electronic section supply defective

on: ●

*) This LED is only available on the power module with hardware release 1. Information concerning the hardware release may be found underneath the label strip.

Terminal

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



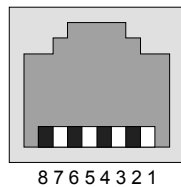
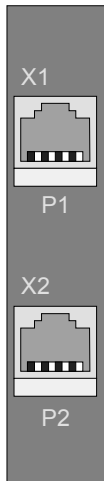
Pos.	Function	Type	Description
1	---	---	not connected
2	DC 24V	I	DC 24V for power section supply
3	0V	I	GND for power section supply
4	Sys DC 24V	I	DC 24V for electronic section supply
5	---	---	not connected
6	DC 24V	I	DC 24V for power section supply
7	0V	I	GND for power section supply
8	Sys 0V	I	GND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

I: Input

PROFINET RJ45 bus interface

The bus interface has a 2-port switch integrated with the following features:

- Ethernet connection via 2 RJ45 jacks
- Auto negotiation (negotiates the transfer parameters)
- Auto crossover (transmission and receipt lines are automatically crossed if necessary)



8pin RJ45 jack:

Pin	Signal
1	Transmit +
2	Transmit -
3	Receive +
4	GND
5	GND
6	Receive -
7	GND
8	GND

Address switch

The address switch serves for the following settings:

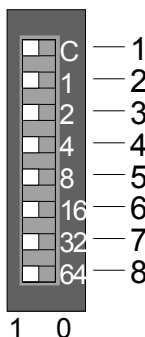
- Selection of the address usage
- Presetting of the PROFINET name



Note!

A PROFINET name may only once exist on the bus! Changes of the address switch were only recognized after PowerON or a Reset!

The PROFINET name preset at the address switch must always be identical to the *device name* in your project!



Position	Description
1	is not used
2	$2^0 = 1$
3	$2^1 = 2$
4	$2^2 = 4$
5	$2^3 = 8$
6	$2^4 = 16$
7	$2^5 = 32$
8	$2^6 = 64$

PROFINET name:
"VIPA053-1PN00-xxx"
with xxx = decimal value of position 2...8

Essential switch settings

Position	State	Behavior at start-up
2 ... 8	0	PROFINET conform (IEC 61158-6-10, IEC 61784-2) PROFINET name (device name) respectively IP address parameter come from flash memory. Here the device name may be free selected. Please regard that you have to assign the device name respectively the IP address to the PROFINET device by means of an initialization.
2 ... 8	[1...127]	PROFINET name (device name): VIPA053-1PN00-xxx with xxx = Decimal value of position 2 ... 8 ($2^0 \dots 2^6$) Enter within your project a PROFINET name into the properties of the PROFINET device and set the same name at the address switch. Here the IP address parameters may also be preset.

Technical data

Order number	053-1PN00
Type	IM 053PN
Module ID	-
Technical data power supply	
Power supply (rated value)	DC 24 V
Power supply (permitted range)	DC 20.4...28.8 V
Reverse polarity protection	✓
Current consumption (no-load operation)	95 mA
Current consumption (rated value)	0.95 A
Inrush current	2.8 A
I^2t	0.25 A ² s
Max. current drain at backplane bus	3 A
Max. current drain load supply	10 A
Power loss	3 W
Status information, alarms, diagnostics	
Status display	yes
Interrupts	yes, parameterizable
Process alarm	yes, parameterizable
Diagnostic interrupt	yes, parameterizable
Diagnostic functions	yes, parameterizable
Diagnostics information read-out	possible
Supply voltage display	green LED
Maintenance display	yellow LED
Group error display	red LED
Channel error display	none
Hardware configuration	
Racks, max.	
Modules per rack, max.	64
Number of digital modules, max.	64
Number of analog modules, max.	64
Communication	
Field bus	PROFINET IO
Type of interface	Ethernet 100 MBit
Connector	2 x RJ45
Topology	
Electrically isolated	✓
Number of participants, max.	
Node addresses	
Transmission speed, min.	100 Mbit/s
Transmission speed, max.	100 Mbit/s
Address range inputs, max.	512 Byte
Address range outputs, max.	512 Byte
Number of TxPDOs, max.	
Number of RxPDOs, max.	
Mechanical data	
Dimensions (WxHxD)	48.5 x 109 x 76.5 mm
Weight	155 g
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-25 °C to 70 °C
Certifications	
UL508 certification	in preparation

Chapter 3 Deployment

Overview This chapter describes the usage of the IM 053-1PN00 with PROFINET. After a short introduction you may find here every information for the usage in the System SLIO.

Content	Topic	Page
	Chapter 3 Deployment	3-1
	Basics PROFINET.....	3-2
	Accessing the System SLIO	3-4
	Project engineering	3-8
	PROFINET installation guidelines	3-11
	I&M data.....	3-13
	Status indication.....	3-15
	Index overview	3-16
	Diagnostic and interrupt.....	3-17

Basics PROFINET

General	<p>PROFINET is an open Industrial Ethernet Standard from PROFIBUS & PROFINET International (PI) for automation. PROFINET is standardized in the IEC 61158.</p> <p>PROFINET uses TCP/IP and IT standards and supplements the PROFIBUS technology for applications, where fast data communication with industrial IT functions is demanded.</p> <p>There are 2 PROFINET function classes:</p> <ul style="list-style-type: none">• PROFINET IO• PROFINET CBA <p>These may be realized in 3 performance steps:</p> <ul style="list-style-type: none">• TCP/IP communication• RT communication• IRT communication
PROFINET IO	<p>With PROFINET IO an I/O data sight to the distributed periphery is described. PROFINET IO describes the whole data transfer between IO controller and IO device. PROFINET is configured like PROFIBUS. PROFINET IO always contains the real time concept.</p> <p>Contrary to the master-slave procedure of PROFIBUS, PROFINET uses the provider-consumer model. This supports the communication relations (AR = Application Relation) between equal participants in the Ethernet. Here the provider sends its data without a request of the communication partner. Apart from the user data exchange also functions for parameterization and diagnostics are supported.</p>
PROFINET CBA	<p>PROFINET CBA means Component Based Automation. This component model describes the communication between autonomously working stations.</p> <p>It makes a simple modularization of complex plants possible, by distributed intelligence by means of graphic configuration for communication of intelligent modules.</p>
TCP/IP Communication	<p>This is the open communication via Ethernet TCP/IP without any demand on real-time.</p>
RT Communication	<p>RT means Real-Time. The RT communication represents the basics for data transfer at PROFINET IO. Here RT data are handled with higher priority.</p>
IRT Communication	<p>IRT means Isochronous Real-Time. With the IRT communication the bus cycle begins clock-exactly i.e. with a maximum permissible tolerance and is again synchronized. Thereby the time-controlled and synchronous transfer of data is guaranteed. Here sync telegrams of a sync master in the network serve for.</p>

Properties of PROFINET	<p>PROFINET of IEC 61158 has the following properties:</p> <ul style="list-style-type: none">• Full-duplex transfer with 100MBit/s via copper respectively fiber optics.• Switched Ethernet• Auto negotiation (negotiates the transfer parameters)• Auto crossover (transmission and receipt lines are crossed automatically if necessary)• Wireless communication via Bluetooth respectively WLAN• UDP/IP is used as overlaid protocol. UDP means User Datagram Protocol und contains the unprotected connectionless broadcast communication within IP.
PROFINET devices	<p>Like PROFIBUS-DP also with PROFINET IO the following devices are classified according to their tasks:</p> <ul style="list-style-type: none">• IO controller• IO device• IO supervisor
IO controller	<p>The <i>IO controller</i> is equivalent to the master of PROFIBUS. This is the PLC with PROFINET connection, in which the PLC program runs.</p>
IO device	<p>The <i>IO device</i> is a distributed I/O field device, which is connected to PROFINET. The IO device is equal to the slave of PROFIBUS.</p>
IO supervisor	<p>The <i>IO supervisor</i> is an engineering station as e.g. programming unit, PC or HMI interface for commissioning and diagnostics.</p>
GSDML file	<p>From VIPA there is a GSDML files for your IO device available. This file may either be found on the supplied storage media or at the download area of www.vipa.de. Please install the GSDML file in your configuration tool. Details on the installation of the GSDML file are available from the manual supplied with your configuration tool.</p> <p>For configuration in your configuration tool every SLIO module may the found in the GSDML file as XML data.</p>
Addressing	<p>In contrast to the PROFIBUS address in PROFINET each device may be identified with its PROFINET interface:</p> <ul style="list-style-type: none">• IP address or MAC address• Device name
Transfer medium	<p>PROFINET is compatible to Ethernet in accordance with the IEEE standards. The connection of the PROFINET IO field devices is exclusively established via switches as network components. This is made either as star via multi-port switches or as line by means of switches, integrated to the field devices.</p>

Accessing the System SLIO

Overview

In the following you will find the description of accessing the following System SLIO areas via PROFINET.

- I/O area
- Parameter data
- Diagnostics data

Information concerning the allocation areas may be found in the description of the corresponding System SLIO module.



Note!

Please consider the System SLIO power and clamp modules do not have any module ID. These may not be recognized by the PROFINET IO device coupler and so are not listed and considered during slot allocation.

Further within PROFINET the slots are designated as *PROFINET-Slot*. The counting always begins with 0.

GSDML file

To configure a device I/O connection in your own configuration tool, you've got all the information about your PROFINET components in form of a GSDML file. Install this GSDML file in you configuration tool. This file may either be found on the supplied storage media or at the download area of www.vipa.de. More information about installing the GSDML file may be found at the manual of the according engineering tool.

Structure and content of the GSDML file are dictated by IEC 61158.

Handling blocks

To set respectively change parameters during runtime there are according handling blocks for record set read/write necessary.

There are the following handling blocks available for CPUs, programmable with Siemens STEP7:

SFB 52	Read record set
SFB 53	Write record set
SFB 54	Read diagnostics data

Here the *Slot* addresses the module and the *Index* addresses the data area of a module.

Acyclic access to the System SLIO

For acyclic reading and writing access PROFINET uses appropriate telegrams. Here the PROFINET coupler respectively the modules are addressed by *Slot* (0 ... 64) and with *Index* the corresponding data area within the module. *Subslot* is always 1.

Read access

Telegram for read request (ReadRequest)

0009h	...	API	Slot	Subslot	Index	Length	...
+0		+24	+28	+30	+34	+36	... +64

Telegram for response with data (ReadResponse)

8009h	...	API	Slot	Subslot	Index	Length	...	Data
+0		+24	+28	+30	+34	+36	... +63	+64 ...
Ethernet-Frame								

Write access

Telegram for write request (WriteRequest)

0008h	...	API	Slot	Subslot	Index	Length	...	Data
+0		+24	+28	+30	+34	+36	... +63	+64 ...
Ethernet-Frame								

Telegram for response with length (WriteResponse)

8008h	...	API	Slot	Subslot	Index	Length	...
+0		+24	+28	+30	+34	+36	... +64

Accessing I/O area

At PROFINET the input respectively output area is automatically embedded to the corresponding address area of the master system.

The I/O area may also be accessed by the following *Index*-No:

- Index = 8028h: Reading the input data (Slot 1 ... 64)
- Index = 8029h: Reading the output data (Slot 1 ... 64)

Accessing parameter data

There is the possibility to set parameter data of the corresponding modules by means of the GSDML file via hardware configuration.

With the startup of the IO device these once were sent from the IO controller to the module.

After writing the parameters these were activated in the module.

Access

Access to	Slot	Index
Every parameter of the PROFINET coupler incl. header (4byte)	0	007Dh
Every parameter of the PROFINET coupler	0	007Eh
Every parameter of a module incl. header (4byte)	1 ... 64	007Dh
Record set DS 00h of the module parameter	1 ... 64	007Eh
Record set DS 01h of the module parameter	1 ... 64	007Fh
Record set DS 80h...90h of the module param.	1 ... 64	0080h ...0090h

Accessing diagnostics data

Hardware and diagnostic interrupt data of System SLIO modules with interrupt capability were automatically sent by an emergency telegram if the interrupt is activated by parameterization.

There is the possibility to request diagnostics data.

Here the PROFINET coupler respectively the modules are addressed by *Slot* (0 ... 64) and with *Index* the corresponding data area within the module.

Diagnostics data PROFINET coupler

With *Slot* = 0 / *Subslot* = 1 the PROFINET coupler is accessed. Depending on the *Index* you will get the following data:

Index = 0000h: 4Byte: Byte 0: Diagnostics byte, Byte 1 ... 3: 0 (fix)

Index = 0001h: 20Byte: Byte 0: Diagnostics byte, Byte 1 ... 19: 0 (fix)

Structure

Byte	Bit 7 ... Bit 0	Default
0	Diagnostics byte Bit 0: Error on the System SLIO bus Bit 1: Parameters could not be written into the Flash memory. Bit 2: General parameterization error PROFINET device. Bit 3: Version error at the System SLIO bus (at least one module at the System SLIO bus is not supported). Bit 4: Unexpected restart Bit 5: Port supervision (Data transmission impossible of PROFINET IEC 61158) Bit 6: Port supervision (Remote mismatch of PROFINET IEC 61158) Bit 7: Configuration error on the System SLIO bus (setpoint/actual-value comparison not equal)	00h
2 ... 3 (19)	00h (fix)	00h

Diagnostics data module

With *Slot* = 1 ... 64 / *Subslot* = 1 the corresponding System SLIO module is accessed. Depending on the *Index* you will get the following data:

Index = 0000h: Record set DS 00h of the diagnostics data

Index = 0001h: Record set DS 01h of the diagnostics data



Note!

Information concerning the allocation areas may be found in the description of the corresponding System SLIO module.

Structure

Byte	Bit 7 ... Bit 0
0	Bit 0: Module malfunction, i.e. a problem has been detected Bit 1: Internal error in the module Bit 2: External error - module no longer addressable Bit 3: Channel error in the module Bit 4: External auxiliary supply missing Bit 5, 6: reserved Bit 7: Parameter assignment error
1	Bit 3 ... 0: Module class 1111: Digital module 0101: Analog module 1000: FM 0111: ETS, CP Bit 4: Channel information available Bit 7 ... 5: 0 (fix)
2	see module description
3	Bit 5 ... 0: reserved Bit 6: Hardware interrupt lost Bit 7: reserved
4	Channel type 70h: Module with digital inputs 71h: Module with analog inputs 72h: Module with digital outputs 73h: Module with analog outputs 74h: Module with analog in-/outputs 76h: Counter
5	Number of diagnostic bits per channel
6	Number of channels per module
7	Position (channel) with diagnostic event
8	Diagnostic event on the channel/channel group 0 Assignment see module description
9	Diagnostic event on the channel/channel group 1 Assignment see module description
...	...
15	Diagnostic event on the channel/channel group 7 Assignment see module description
16 ... 19	Value μ s ticker at the moment of the diagnostic data generation

 μ s ticker

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

Project engineering

General

For project engineering a hardware configuration is established within a PROFINET engineering tool like the Siemens SIMATIC manager. Here you assign the according IO device to the IO controller. A direct assignment takes place via the PROFINET address that you set at the IO device with its address selector and the properties of the IO device.

By installing the corresponding GSDML file the IM 053-1PN00 PROFINET IO device is listed as "VIPA_053-1PN00". You'll find this at:

PROFINET IO > Additional Field devices > I/O > VIPA SLIO System

GSDML file

From VIPA there is a GSDML files for the IO device available. This file may either be found on the supplied storage media or at the download area of www.vipa.de. Please install the GSDML file in your configuration tool. Details on the installation of the GSDML file are available from the manual supplied with your configuration tool.

For configuration in your configuration tool every SLIO module may the found in the GSDML file as XML data.

After the installation of the GSDML file you will find the System SLIO IO device in the hardware catalog from Siemens at:

PROFINET IO > Additional field devices > I/O > VIPA SLIO System > VIPA 053-PN00

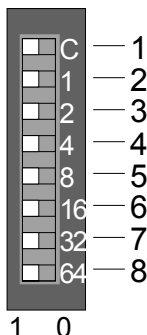
Assigning the device name

So that the PROFINET controller can identify a PROFINET device, you have to assign an appropriate device name to the PROFINET device, before. This name must be always identical to the *device name* in your project!

To assign a device name there is an address switch on the IM 053-1PN00. If all switches are 0, you can freely define a name in your project. This name is to be stored with an "initialization" in the flash memory of the IM 053-1PN00.

Otherwise the device has the following name: VIPA053-1PN00-xxx

with xxx = Decimal value of position 2 ... 8 ($2^0 \dots 2^6$) of the switches. This name is not stored in the flash.



Position	Description
1	is not used
2	$2^0 = 1$
3	$2^1 = 2$
4	$2^2 = 4$
5	$2^3 = 8$
6	$2^4 = 16$
7	$2^5 = 32$
8	$2^6 = 64$
8	$2^6 = 64$

PROFINET name:
"VIPA053-1PN00-xxx"
with xxx = decimal value of position 2...8

**Initialization
(Address switch: 0)**

If all the switches of the address switch of the PROFINET device are 0, with the following proceeding you have to transfer the name of your project in the flash memory of your PROFINET Device on the example of the Siemens SIMATIC manager.

- Check if the switches of the address switch are 0 and perform power on.
- Load your project.
- Choose your PROFINET controller.
- Go to PLC functions > *Edit Ethernet node*.
- Click at "Ethernet node" at [Browse]. Every reachable stations are listed.
- Choose the PROFINET device with the suited MAC address and click on [OK]. The MAC address may be found at the front of the module.
If the device name begins instead with "vipa053-1pn00...", so not all the switches of the address switch are 0! Please correct this.
- Enter at "Assign device name" the device name of your project and click at [Assign Name]. The name is stored in the flash memory of the PROFINET device. With [Reset] at "reset to factory settings" the name in the flash memory may be deleted.

**Project
engineering**

- Mount your PROFINET system.
- Start your project engineering tool with a new project.
- Configure a master system and create a new PROFINET subnet.
- For the project engineering of the IM 053-1PN00 take the "VIPA 053-1PN00" from the hardware catalog and drag it to the PROFINET subnet.
- Open via double click to the inserted symbol the properties dialog of the PROFINET device and enter at "General" the *device name*, which was preset by the address switch. Confirm with [OK].
- For parameterization of the PROFINET device the VIPA specific properties dialog may be opened in the slot overview .
- Insert the peripheral modules from the hardware catalog and parameterize them if necessary.
- Transfer your project to the PLC.

**Parameter data
IM 053-1PN00**

The PROFINET IO device IM 053-1PN00 has the following parameter data:

Byte	Bit 7 ... Bit 0	Default
0	Bit 0: Hardware interrupt 0 = disable 1 = enable Bit 1: Diagnostic interrupt 0 = disable 1 = enable Bit 2: Diagnostic interrupt type 0 = Vendor-specific data 1 = Channel-specific data Bit 3: Auto-Acknowledge 0 = disable 1 = enable Bit 4 ... 6: reserved Bit 7: Data format 0 = Data format Motorola 1 = Data format Intel	
1 ... 6	00h (fix)	00h

Diagnostic interrupt type

Here the structure of the diagnostic interrupt data may be defined, which were sent on error via diagnostic telegram respectively which may be requested by the standard PROFINET Index numbers.

- *Vendor-specific data*: You always will get the record set DS 01h of the diagnostics data of a module.
- *Channel-specific data*: You always will get the record set DS 00h of the diagnostics data of a module.

Auto-Acknowledge

Acknowledgement of interrupts on the System SLIO back plane bus:

- With *Auto-Acknowledge* = 0 you are responsible for the acknowledgement. So you are informed with every interrupt. As soon as an interrupt is not acknowledged other interrupts are blocked
- With *Auto-Acknowledge* = 1 each interrupt is automatically acknowledged by the PROFINET device. In this mode the diagnostics data were always overwritten. Default setting is *Auto-Acknowledge* = 1. For continuous use *Auto-Acknowledge* should be activated.

Data format
Motorola/Intel

This parameter refers to how a value is stored in the CPU address range.

- In the *Motorola format* (default) the bytes were stored in descending significance, i.e. the 1. byte contains the high byte and 2. byte the low byte.
- In the *Intel format* the bytes are stored in ascending significance, i.e. the 1. byte contains the low byte and 2. byte the high byte.

PROFINET installation guidelines

Generals to data security

The topic of data security and access protection have become increasingly important in the industrial environment. The increased networking of entire industrial systems to the network levels within the company together with the functions of remote maintenance have all served to increase vulnerability.

Threats can arise from internal manipulation like technical errors, operator and program errors respectively from external manipulation like software viruses and worms, trojans and password phishing.

Precautions

The most important precautions to prevent manipulation and loss of data security in the industrial environment are:

- Encrypting the data traffic by means of certificates.
- Filtering and inspection of the traffic by means of VPN - "Virtual Private Networks".
- Identification of the nodes by "Authentication" via save channels.
- Segmenting in protected automation cells, so that only devices in the same group can exchange data.

Guidelines for information security

With the "VDI/VDE 2182 sheet 1", Information Security in the Industrial Automation - General procedural model, VDI guidelines, the VDI/VDE society for measuring and automation engineering has published a guide for implementing a security architecture in the industrial environment.

The guideline can be found at www.vdi.de

Profibus & PROFINET International (PI) can support you in setting up security standards by means of the "PROFINET Security Guideline". More concerning this can be found at the corresponding web site e.g. www.profibus.com

Industrial Ethernet

Due to the open standard of PROFINET standard Ethernet components may be used. For industrial environment and due to the high transfer rate of 100MBit/s you PROFINET system should consist of Industrial Ethernet components.

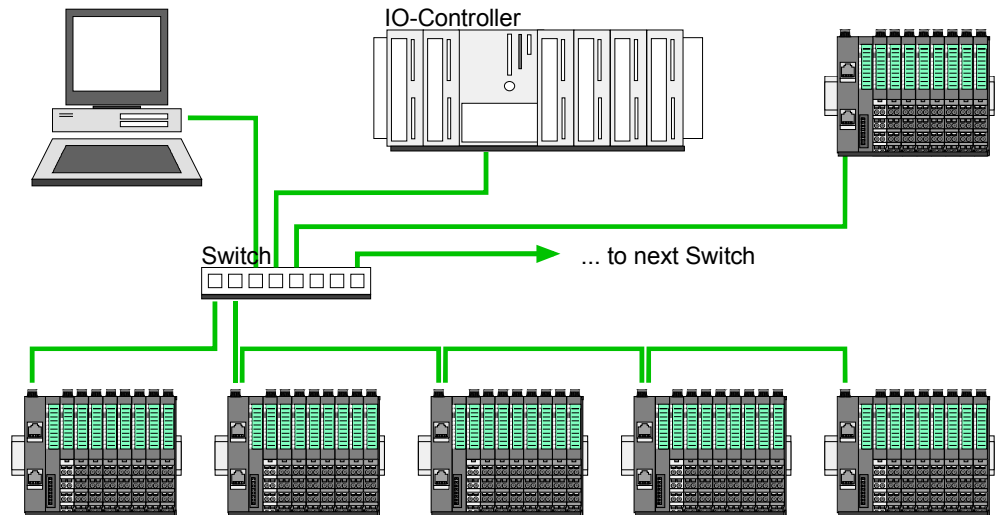
All the devices interconnected by switches are located in one and the same network. All the devices in a network can communicate directly with each other.

A network is physically limited by a router. If devices need to communicate beyond the limits of a network, you have to configure the router so that it allows this communication to take place.

Topology

- Linear** With the linear structure all the communication devices are connected via a linear bus topology. Here the linear bus topology is realized with switches that are already integrated into the PROFINET device.
 If a communication member fails, communication across the failed member is no longer possible.
- Star** If you connect communication devices to a switch with more than 2 PROFINET ports, you automatically create a star network topology.
 If an individual PROFINET device fails, this does not automatically lead to failure of the entire network, in contrast to other structures. It is only if a switch fails that part of the communication network will fail as well.
- Ring** In order to increase the availability of a network the both open ends of a linear bus topology may be connected by a switch.
 By configuring the switch as redundancy manager on a break in the network it ensures that the data is redirected over an intact network connection.
- Tree** If you interconnect several star structures, you obtain a tree network topology.

Example network



I&M data

Overview

Identification and maintenance data (I&M) are stored information in a module which support you at:

- check of the system configuration
- discover of hardware changes
- remove errors in a system

Identification data (I data) are information of the module e.g. order number, serial number, which can be found printed at the module.

I data are manufacturer information and can only be read.

Maintenance data (M data) are information like location and date of installation. M data were produced and stored during project engineering

By means of I&M data the modules can online be identified.

I&M data

Via read record set special identification data may be accessed. Here parts of the identification data are addressed by the corresponding index number.

The record sets have the following structure:

Contents	Length (byte)	Coding (hex)
Header		
- BlockType	2	I&M0: 0020h I&M1: 0021h I&M2: 0022h I&M3: 0023h
- BlockLength	2	I&M0: 0038h I&M1: 0038h I&M2: 0012h I&M3: 0038h
- BlockVersionHigh	1	01h
- BlockVersionLow	1	00h
Identification data (see the following table)	I&M0 / Index AFF0h: 54h I&M1 / Index AFF1h: 54h I&M2 / Index AFF2h: 16h I&M3 / Index AFF3h: 54h	

I&M data
for PROFINET-IO

Identification data	Access	Preset	Explanation
Identification data 0: (Index AFF0h)			
VendorIDHigh	read (1byte)	02h	Name of the manufacturer (555 = VIPA GmbH)
VendorIDLow	read (1byte)	2Bh	
Order_ID	read (20byte)		Order number
IM_SERIAL_NUMBER	read (16byte)	-	Serial number
IM_HARDWARE_REVISION	read (2byte)	1	Hardware revision
IM_SOFTWARE_REVISION	read	Firmware version	Firmware version
- SWRevisionPrefix	(1byte)	V, R, P, U, T	
- IM_SWRevision_Functional_Enhancement	(1byte)	00h ... FFh	
- IM_SWRevision_Bug_Fix	(1byte)	00h ... FFh	
- IM_SWRevision_Internal_Change	(1byte)	00h ... FFh	
IM_REVISION_COUNTER	read (2byte)	0000h	for internal usage
IM_PROFILE_ID	read (2byte)	0000h	for internal usage
IM_PROFILE_SPECIFIC_TYPE	read (2byte)	0005h	for internal usage
IM_VERSION	read	0101h	Version of the I&M data (e.g. 0101h = version 1.1)
- IM_Version_Major	(1byte)		
- IM_Version_Minor	(1byte)		
IM_SUPPORTED	read (2byte)	000Eh	I&M1 ... I&M3 are present
Maintenance data 1: (Index AFF1h)			
IM_TAG_FUNCTION	read/write (32byte)	-	Unique device identification inside the system
IM_TAG_LOCATION	read/write (22byte)	-	Location of installation of the module
Maintenance data 2: (Index AFF2h)			
IM_DATE	read/write (16byte)	YYYY-MM- DD HH:MM	Date of installation of the module
Maintenance data 3: (Index AFF3h)			
IM_DESCRIPTOR	read/write (54byte)	-	Commentary to the module

Status indication

General

The LEDs installed to display the status allow extensive diagnostics during the PowerON procedure as well as during operation. The result of the diagnosis is determined by the combination of the different LEDs and the current operating mode.

PWR	SF	BF	MT	LNK1	ACT1	LNK2	ACT2	Status
green	red	greer	yellow	green	green	green	green	
●	X	X	X	X	X	X	X	The PROFINET IO device is power supplied.
●	○	B	X	[●]	X	[●]	X	There may no connection be established to the IO controller. The switch is connected (no AR active) LNK1 or LNK2 is on.
●	○	●	X	○	○	○	○	There is no physical connection to Ethernet. LNK1 and LNK2 is off.
●	X	○	X	[●]	P	[●]	P	A connection to an IO controller is established (at least 1 AR is active). LNK1 or LNK2 is on.
●	●	X	X	X	X	X	X	<ul style="list-style-type: none"> - A diagnostics message is present but not acknowledged. - Error at the backplane bus (e.g. module is defect, bus is faulty). - Error on firmware update (for short time visible then restart).
●	BBB	●	X	●	X	●	X	Error IP address <ul style="list-style-type: none"> - There was no valid IP address assigned. - The assigned IP address just exists in the system.
●	X	BB	BB	X	X	X	X	A firmware update is just running. Here BF and MT are alternately blinking.
●	X	X	X	[BBB]	X	[BBB]	X	Identification via DCP. Depending upon the connection LNK1 or LNK2 are blinking for 3 seconds with 2Hz.
●	●	X	●	X	X	X	X	Maintenance demanded/requested <ul style="list-style-type: none"> - There was no receipt of a sync telegram after parameterization of the IO device. - Jitter out of the limits (renewed synchronization). - Switch has rejected 10 telegrams (Network overloading). - Error on the System SLIO bus (version error).

on: ● off: ○ Option: [] not relevant: X
 Blinking code: 0.5Hz: B, 1Hz: BB, 2Hz: BBB Pulsing: P

Index overview

General Within a module the I/O, parameter and diagnostics data may be accessed by *Index* numbers.

In PROFINET the *Index* numbers are grouped to the following areas:

0000h ... 7FFFh: Vendor-specific *Index* numbers

8000h ... F7FFh: Standard *Index* numbers from PROFINET.

Information concerning this are to be found in the PROFINET specification. Here for "Index" the designation "record set" is used.

Index numbers In the following there are the *Index* numbers listed, which are supported.

Index	Description
<i>Readable index numbers</i>	
0000h	read DS 00h diagnostic data
0001h	read DS 01h diagnostic data
007Dh	read the whole parameter data
007Eh	read DS 00h of the parameter data
007Fh **	read DS 01h of the parameter data
0080h ... 0090h **	read DS 80h ... DS 90h of the parameter data
8000h / 8001h / 800Ah / 800Bh / 800Ch / 8010h / 8011h / 8012h / 8013h / 801Eh / 802Ah / 802Bh / 802Ch / 802Dh / 802Fh / 8030h / 8031h / 8050h / 8051h / 8052h / 8053h / 8054h / 8060h / 8061h / 8062h / 8070h / 8080h / 8090h	refer to the PROFINET specification
8028h **	read input data from a sub slot
8029h **	read output data from a sub slot
AFF0h	read I&M 0 (serial no., Name, SW/HW version)
AFF1h *	read I&M 1 (identification and location)
AFF2h *	read I&M 2 (date of installation)
AFF3h *	read I&M 3 (comment)
C000h / C001h / C00Ah / C00Bh / C00Ch / C010h / C011h / C012h / C013h / E000h / E001h / E002h / E00Ah / E00Bh / E00Ch / E010h / E011h / E012h / E013h / E030h / E040h / E050h / F000h / F001h / F00Ah / F00Bh / F00Ch / F010h / F011h / F012h / F013h / F020h / F80Ch / F820h / F821h / F830h / F831h / F840h / 8041h / F842h	refer to the PROFINET specification
<i>Writable Index numbers</i>	
007Dh	write the whole parameter data
007Eh	write DS 00h of the parameter data
007Fh **	write DS 01h of the parameter data
0080h ... 0090h **	write DS 80h ... DS 90h of the parameter data
AFF1h *	write I&M 1 (identification and location)
AFF2h *	write I&M 2 (date of installation)
AFF3h *	write I&M 3 (comment)

* Only PROFINET IO device, ** Only System SLIO module

Diagnostic and interrupt

Hardware interrupt

Hardware interrupt data of System SLIO modules with interrupt capability were automatically sent by a diagnostics message if the interrupt is activated by parameterization at the corresponding module respectively at the System SLIO PROFINET IO device.

Byte	Description	Example	Contents
0..1	AlarmMotification (1: High, 2: Low)	0002h	PROFINET interrupt data
2..3	BlockLength	001Eh	
4..5	Version High/Low	0100h	
6..7	AlarmType (1: Diagnostics, 2: Process, 3: Pull)	0002h	
8..11	API	0000h, 0000h	
12..13	Slot	0003h	
14..15	SubSlot	0001h	
16..19	ModuleIdentNumber	0006h, 1F41h	
20..23	SubmoduleIdentNumber	0000h, 0001h	
24..25	DiagnosticsState (PROFINET specific IEC 61158-6-10)	0005h	
26..27	UserStructureIdentifier 0000h ... 7FFFh: UserSpecifiedDiagnostics 1000h: Hardware interrupt (VIPA specific) 8002h: ExtChannelDiag	1000h	Hardware interrupt (VIPA specific)
28..47	VIPA specific: Hardware interrupt data	...	Hardware interrupt data (see module description)

Diagnostics interrupt

Diagnostics interrupt data of System SLIO modules with interrupt capability were automatically sent by a diagnostics message if the interrupt is activated by parameterization at the corresponding module respectively at the System SLIO PROFINET IO device.

The interrupt behavior and the structure of the diagnostics data may be preset by the parameterization of the System SLIO PROFINET IO device.

Among other you have the choice between the following diagnostics data:

- UserSpecifiedDiagnostics (Vendor specific)
- ExtendedChannelDiagnostics (Channel specific)

UserSpecified Diagnostics (Vendor specific) Here all the diagnostics data may be accessed.

Byte	Description	Example	Contents
0..1	AlarmMotification (1: High, 2: Low)	0001h	PROFINET interrupt Data (Header)
2..3	BlockLength	0030h	
4..5	Version High/Low	0100h	
6..7	AlarmType (1: Diagnostics, 2: Process,3: Pull)	0001h	
8..11	API	0000h, 0000h	
12..13	Slot	0001h	
14..15	SubSlot	0001h	
16..19	ModuleIdentNumber	0403h, 1543h	
20..23	SubmoduleIdentNumber	0000h, 0001h	
24..25	DiagnosticsState (PROFINET specific IEC 61158-6-10)	B001h	
26..27	UserStructureIdentifier 0000h ... 7FFFh: UserSpecifiedDiagnostics 8002h: ExtChannelDiag VIPA specific (UserSpecifiserDiagnostics): Offset + ChannelErrorType (see table on following page) Offset: 0000h: Error at PROFINET IO device 01F4h: Error at System SLIO module	01FBh	
28..47	VIPA specific: Diagnostics data (DS 1)	...	Diagnostics data record set 1 (see module description)
48..49	VIPA: Slot/SubSlot	0101h	Slot 1 / SubSlot 1
50..51	VIPA specific: Channel 0000h ... 7FFFh: UserSpecific 8000h: SubSlotSpecific - for every channel	0001h	Channel 1

ExtendedChannel Diagnostics (Channel specific) Here DS 0 of the diagnostics data (4byte) may be accessed. Additional diagnostics data must explicit be requested.

Byte	Description	Example	Contents	
0..1	AlarmMotification (1: High, 2: Low)	0001h	PROFINET interrupt data (Header)	
2..3	BlockLength	0030h		
4..5	Version High/Low	0100h		
6..7	AlarmType (1: Diagnostics, 2: Process, 3: Pull)	0001h		
8..11	API	0000h, 0000h		
12..13	Slot	0001h		
14..15	SubSlot	0001h		
16..19	ModuleIdentNumber	0403h, 1543h		
20..23	SubmoduleIdentNumber	0000h, 0001h		
24..25	DiagnosticsState (PROFINET specific IEC 61158-6-10)	A807h		
26..27	UserStructureIdentifier 0000h ... 7FFFh: UserSpecifiedDiagnostics 8002h: ExtendedChannelDiagnostics	8002h		ExtendedChannelDiagnostics
28..29	Channel 0000h ... 7FFFh: UserSpecific 8000h: SubSlotSpecific - for every channel	0001h		Channel 1
30..31	ChannelProperties (PROFINET specific IEC 61158-6-10)	2805h		Channel properties: Input, 16bit, interrupt _{incoming}
32..33	ChannelErrorType (see table)	0007h	Upper limit violation	
34..35	ExtendedChannelErrorType (VIPA specific) 0000h: Error at PROFINET IO device 01F4h: Error at System SLIO module	01F4h	Error at the System SLIO module	
36..39	ExtendedChannelAddValue VIPA specific: Diagnostics data (DS 0)	0000h 150Dh	Diagnostics data record set (see module description)	

ChannelErrorTypes

Code	Description
0001h	Short circuit
0002h	Undervoltage (supply voltage)
0003h	Overvoltage (supply voltage)
0004h	Output Module is overloaded
0005h	Temperature rise output module
0006h	Wire break sensors or actors
0007h	Upper limit violation
0008h	Lower limit violation
0009h	Error (Load voltage at the output, sensor supply, hardware error)
000Ah	Simulation active
0010h	Error in parameterization
0011h	Sensor or load voltage missing
0012h	Fuse defect
0013h	Communication error
0014h	Ground fault
0015h	Reference channel error
0016h	Hardware interrupt lost
0017h	Threshold interrupt
0018h	Outputs are disabled
0019h	Safety-related shutdown
001Ah	External error
001Bh	Indefinable error - not specified
001Ch	SLIO: Error on System SLIO bus
001Dh	SLIO: Parameter could not be written
001Eh	SLIO: Version error
0101h	IO device: Unexpected restart

