VIPA System SLIO

IM | 053-1PN00 | Manual

HB300 | IM | 053-1PN00 | GB | 16-15

Interface module PROFINET - IM 053PN

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053-1PN00_000_IM 053PN,1,GB -

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1 General

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1.2 About this manual

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.

Product	Order number	as of state:	
		HW	FW
IM 053PN	053-1PN00	04	V1.5.7

Target audience

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

Structure of the manual

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

Guide to the document

The following guides are available in the manual:

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

Availability

The manual is available in:

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

Icons Headings

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

DANGER!
Immediate or likely danger. Personal injury is possible.

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

Supplementary information and useful tips.

1.3 Safety information

Applications conforming with specifications

The system is constructed and produced for:

- communication and process control
- 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 Basics and mounting

2.1 Safety information for users

Handling of electrostatic sensitive modules

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

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

Shipping of modules

Modules must be shipped in the original packing material.

Measurements and alterations on electrostatic sensitive modules

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

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

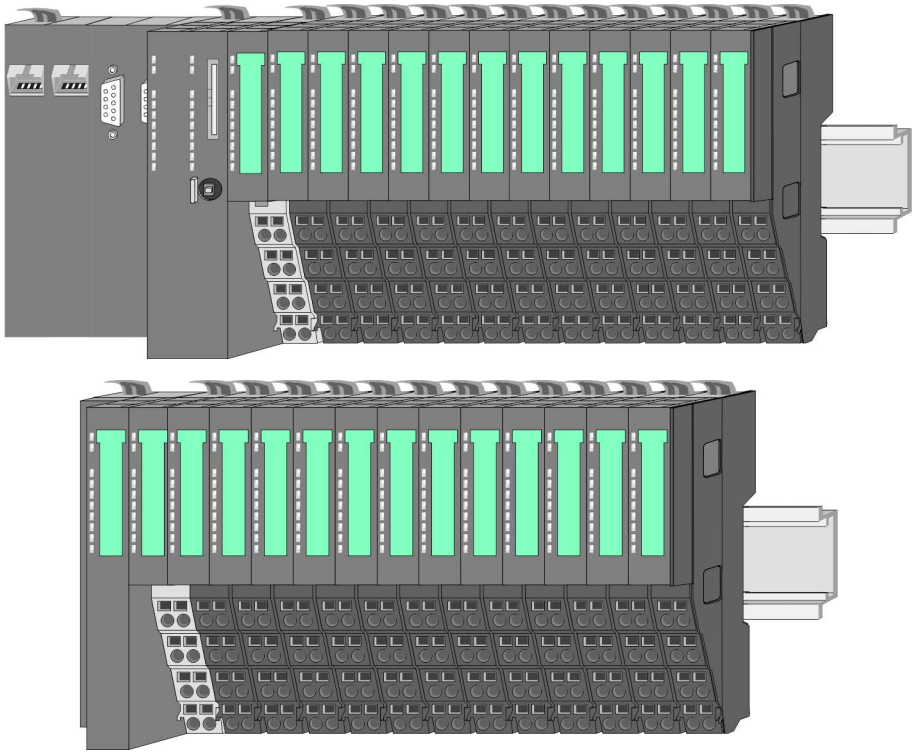
Modifying electrostatic sensitive modules you should only use soldering irons with grounded tips.

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

2.2 System conception

2.2.1 Overview

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



2.2.2 Components

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

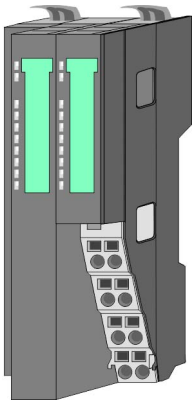
CAUTION!
Only modules of VIPA may be combined. A mixed operation with third-party modules is not allowed!

CPU 01x

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

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

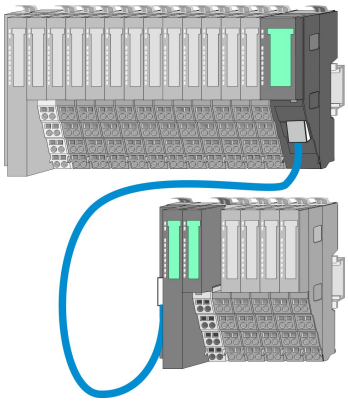
Bus coupler



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

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

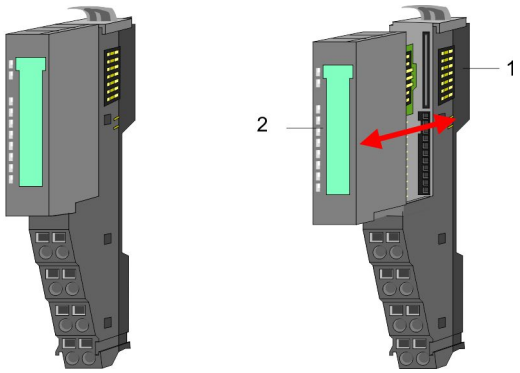
Line extension



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. To use the line extension no special configuration is required.

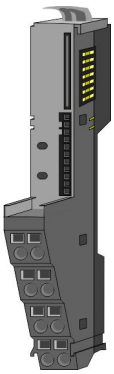
Periphery modules

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



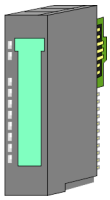
1 Terminal module
2 Electronic module

Terminal module



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

Electronic module

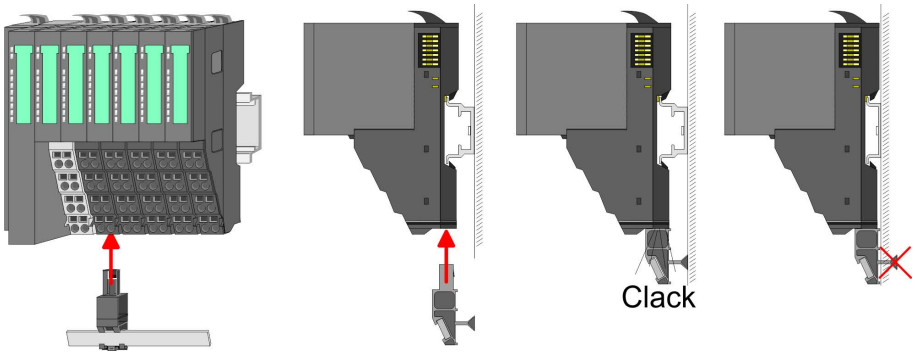


The functionality of a SLIO periphery module is defined by the *electronic* module, which is mounted to the terminal module by a sliding mechanism. With an error the defective module may be exchanged for a functional module with standing installation. At the front side there are LEDs for status indication.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

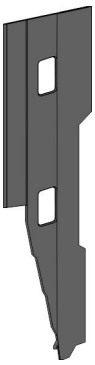
2.2.3 Accessories

Shield bus carrier

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



Bus cover



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

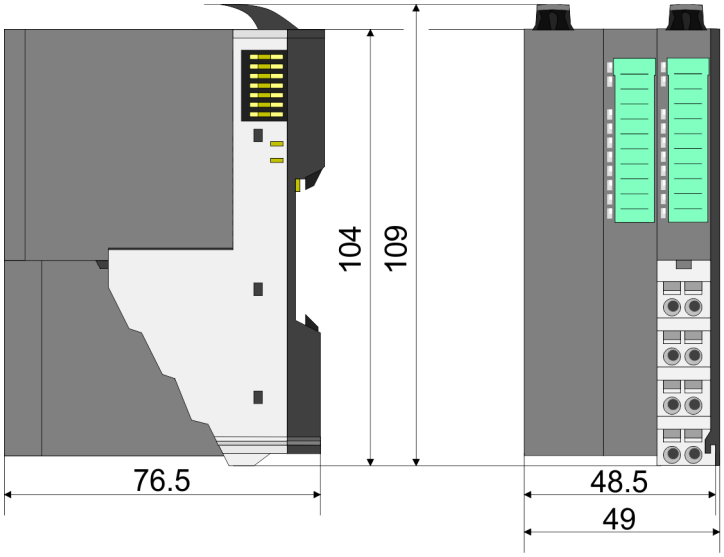
Coding pins

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

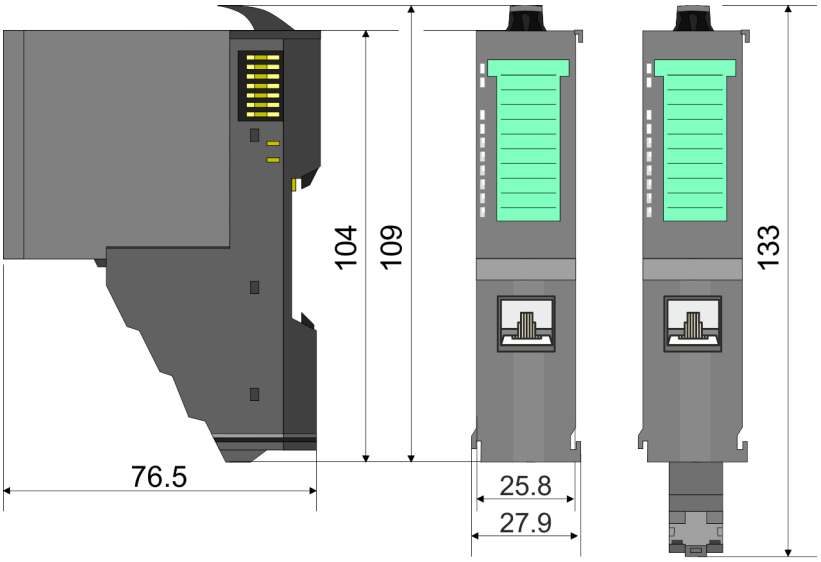
2.3 Dimensions

Dimensions CPU 01x

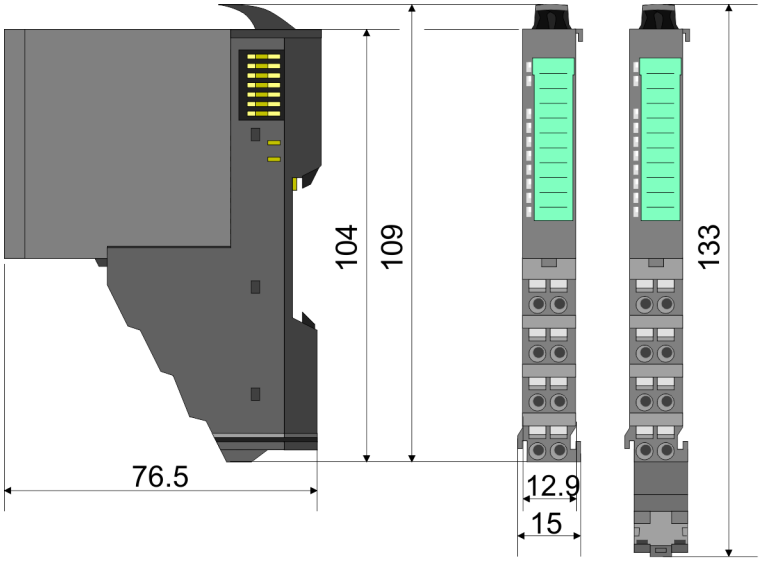
Dimensions bus coupler and line extension slave



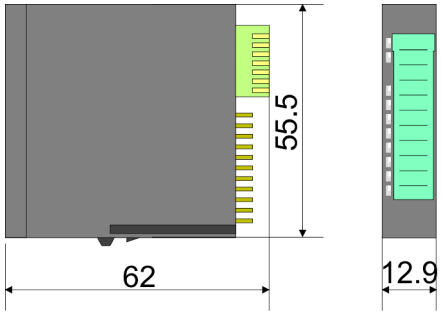
Dimensions line extension master



Dimension periphery module



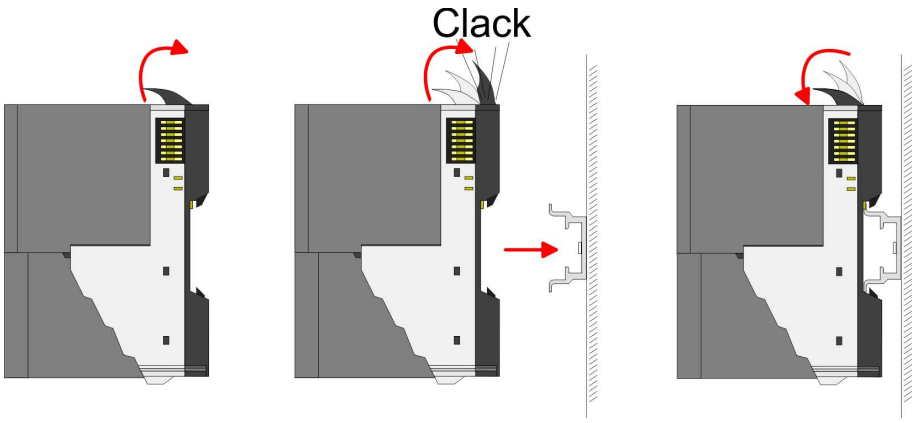
Dimensions electronic module



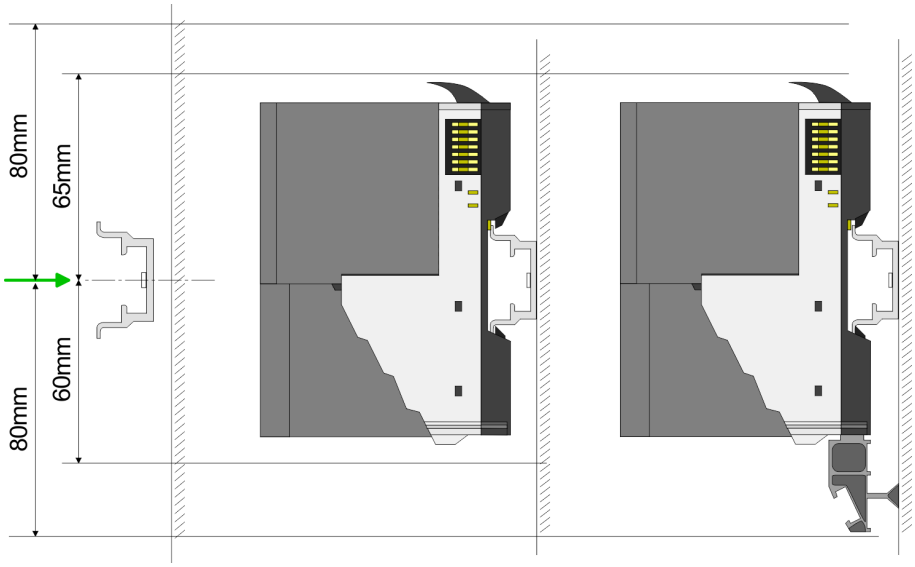
Dimensions in mm

2.4 Mounting bus coupler

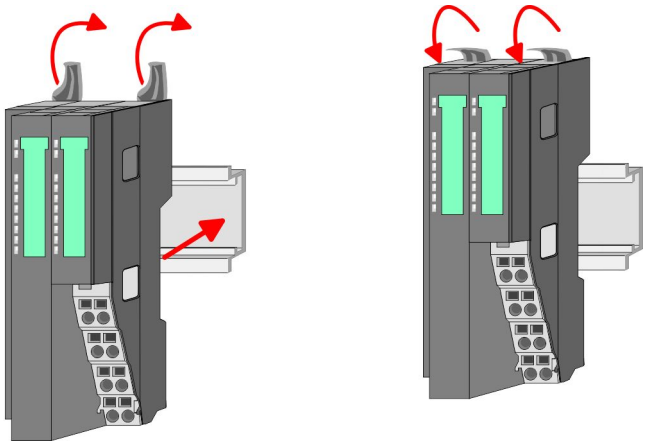
There are locking lever at the top side of the bus coupler. For mounting and demounting these locking lever are to be turned upwards until these engage. Place the bus coupler at the mounting rail. The bus coupler is fixed to the mounting rail by pushing downward the locking levers. The bus coupler is directly mounted at a mounting rail. Up to 64 modules may be mounted. The electronic and power section supply are connected via the backplane bus. 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.



Proceeding

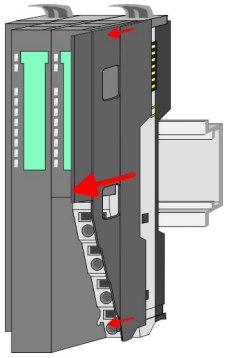


1. Mount the mounting rail! Please consider that a clearance from the middle of the mounting rail of at least 80mm above and 60mm below, respectively 80mm by deployment of shield bus carriers, exist.

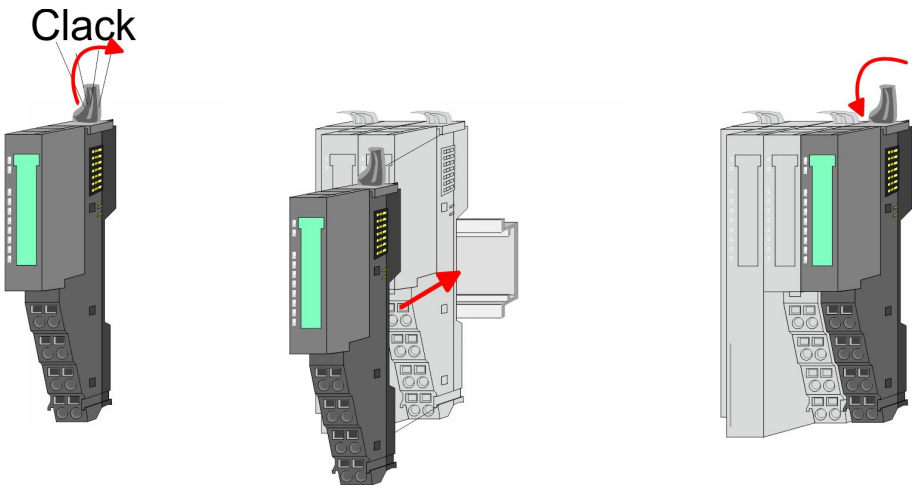


2. Turn the locking lever upwards, place the bus coupler at the mounting rail and turn the lever downward.

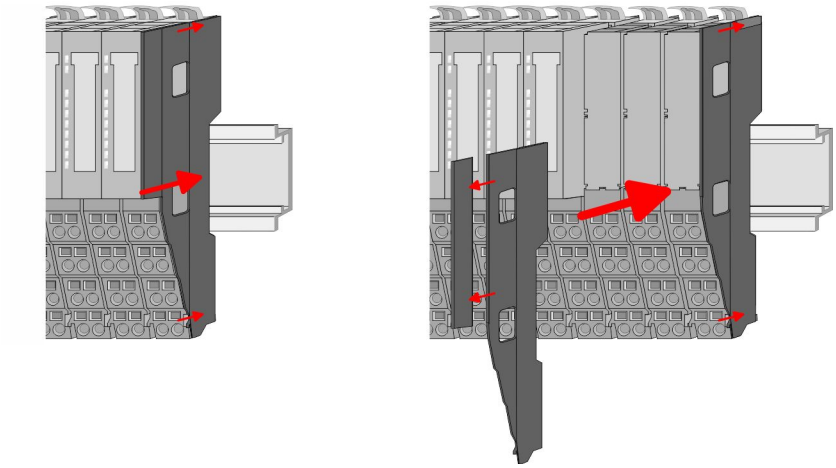
Mounting periphery modules



1. Before mounting the periphery modules you have to remove the bus cover at the right side of the bus coupler by pulling it forward. Keep the cover for later mounting.



2. Mount the periphery modules you want.



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

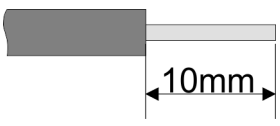
2.5 Wiring

2.5.1 Wiring bus coupler

Terminal module terminals

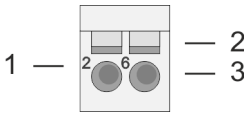
The System SLIO bus coupler have a power module integrated. Terminals with spring clamp technology are used for wiring. The spring clamp technology allows quick and easy connection of your signal and supply lines. In contrast to screw terminal connections this type of connection is vibration proof.

Data

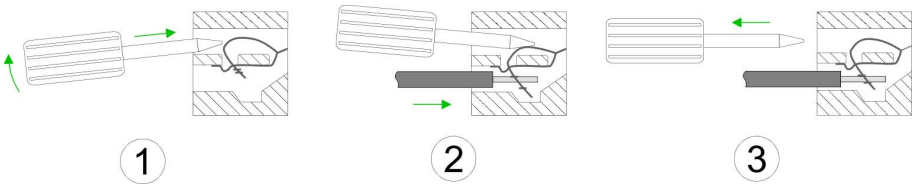


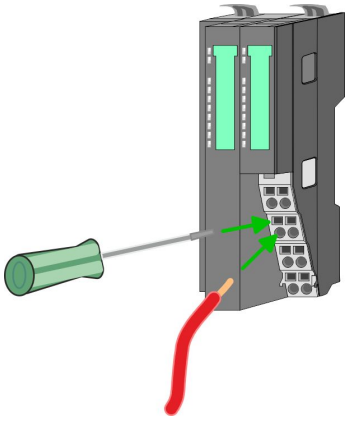
U_{max}	240V AC / 30V DC
I_{max}	10A
Cross section	0.08 ... 1.5mm^2 (AWG 28 ... 16)
Stripping length	10mm

Wiring procedure



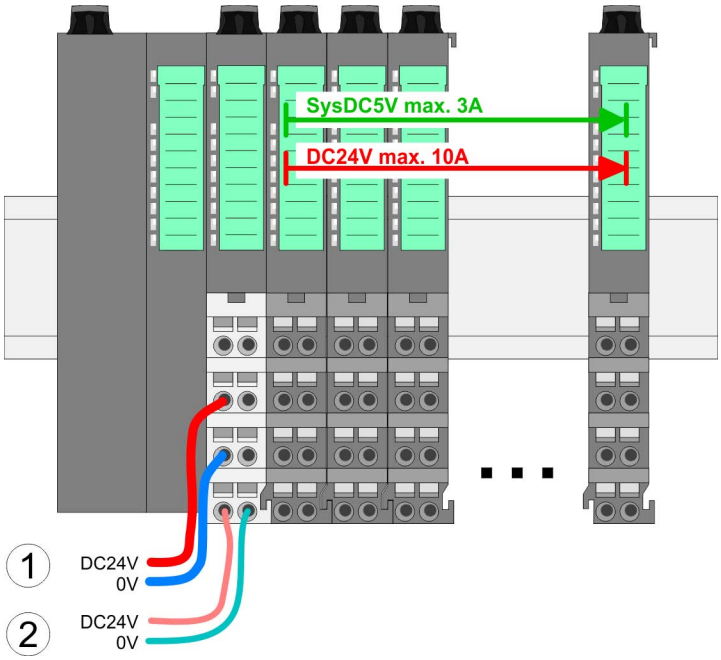
1 Pin number at the connector
2 Opening for screwdriver
3 Connection hole for wire





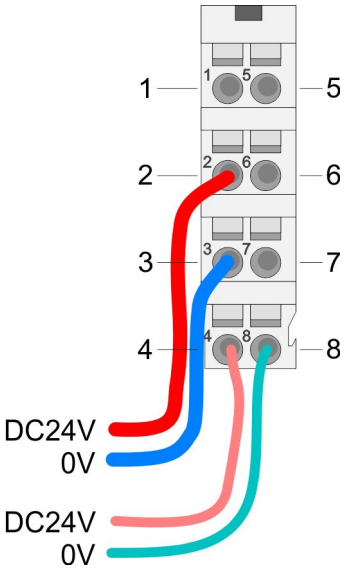
1. Insert a suited screwdriver at an angel into the square opening as shown. Press and hold the screwdriver in the opposite direction to open the contact spring.
2. Insert the stripped end of wire into the round opening. You can use wires with a cross section of 0.08mm^2 up to 1.5mm^2
3. By removing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

PM - Power module



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

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!

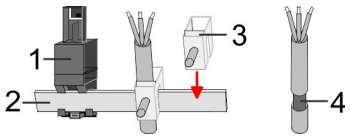
Fusing

- 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 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.

Shield attachment

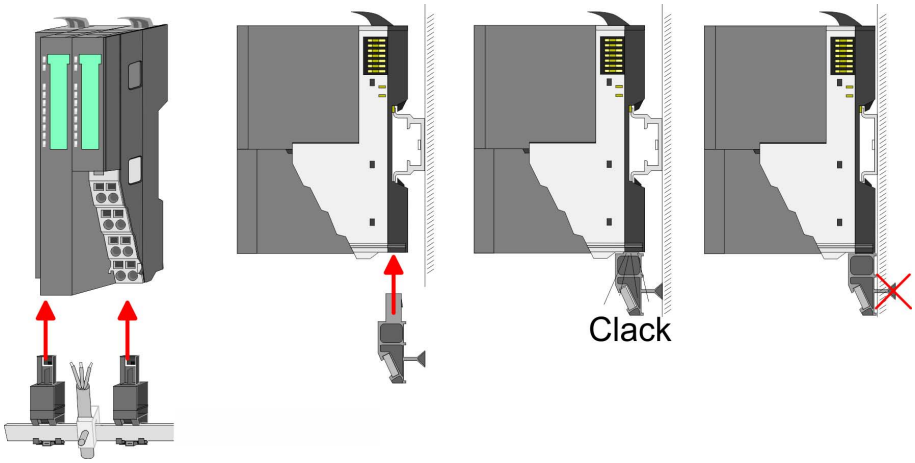


1 Shield bus carrier
2 Shield bus (10mm x 3mm)
3 Shield clamp
4 Cable shield

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

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

2. Put your shield bus into the shield bus carrier.



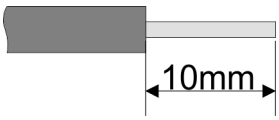
3. Attach the cables with the accordingly stripped cable screen and fix it by the shield clamp with the shield bus.

2.5.2 Wiring periphery modules

Terminal module terminals

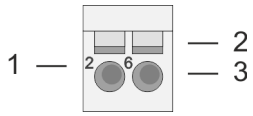
With wiring the terminal modules, terminals with spring clamp technology are used for wiring. The spring clamp technology allows quick and easy connection of your signal and supply lines. In contrast to screw terminal connections this type of connection is vibration proof.

Data

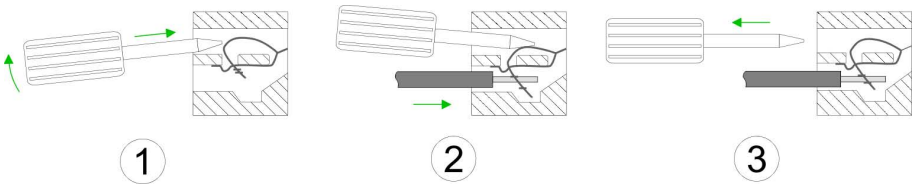


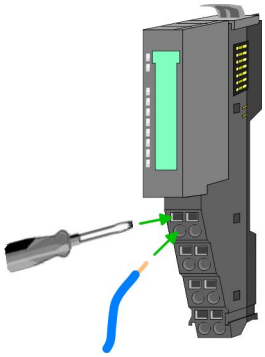
U_{max}	240V AC / 30V DC
I_{max}	10A
Cross section	0.08 ... 1.5mm² (AWG 28 ... 16)
Stripping length	10mm

Wiring procedure



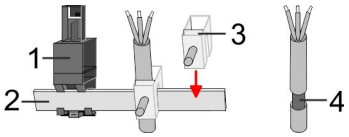
1 Pin number at the connector
2 Opening for screwdriver
3 Connection hole for wire





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

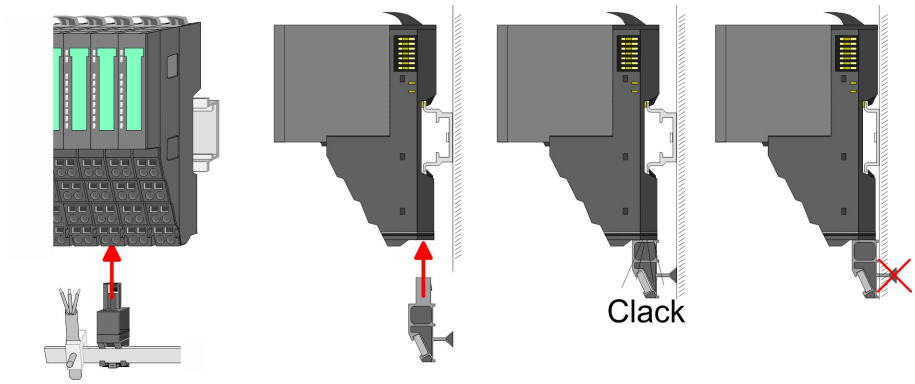
Shield attachment



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

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

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



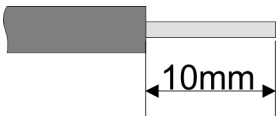
3. Attach the cables with the accordingly stripped cable screen and fix it by the shield clamp with the shield bus.

2.5.3 Wiring power modules

Terminal module terminals

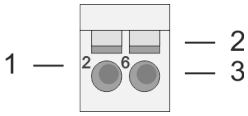
Power modules are either integrated to the head module or may be installed between the periphery modules. With power modules, terminals with spring clamp technology are used for wiring. The spring clamp technology allows quick and easy connection of your signal and supply lines. In contrast to screw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

Data

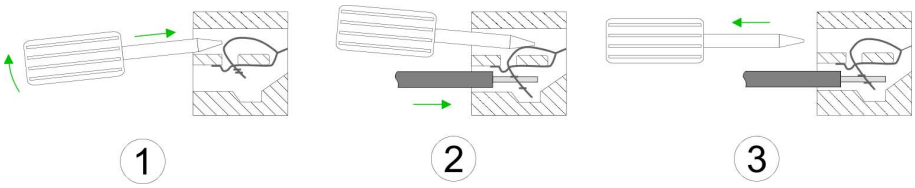


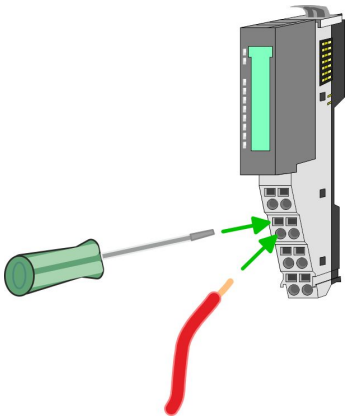
U_{max}	240V AC / 30V DC
I_{max}	10A
Cross section	0.08 ... 1.5mm^2 (AWG 28 ... 16)
Stripping length	10mm

Wiring procedure



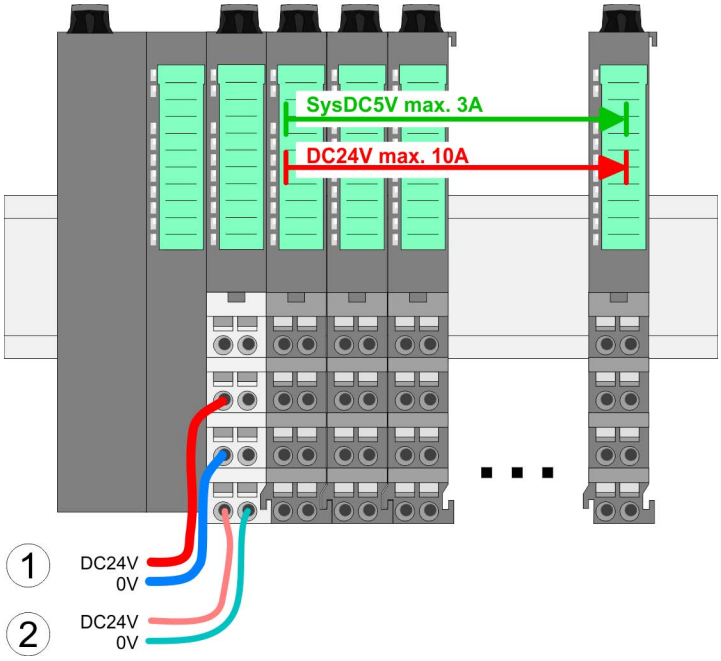
1 Pin number at the connector
2 Opening for screwdriver
3 Connection hole for wire





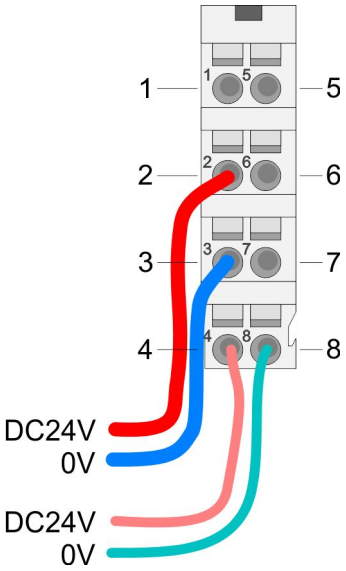
1. Insert a suited screwdriver at an angel into the square opening as shown. Press and hold the screwdriver in the opposite direction to open the contact spring.
2. Insert the stripped end of wire into the round opening. You can use wires with a cross section of 0.08mm^2 up to 1.5mm^2
3. By removing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

PM - Power module



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

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.

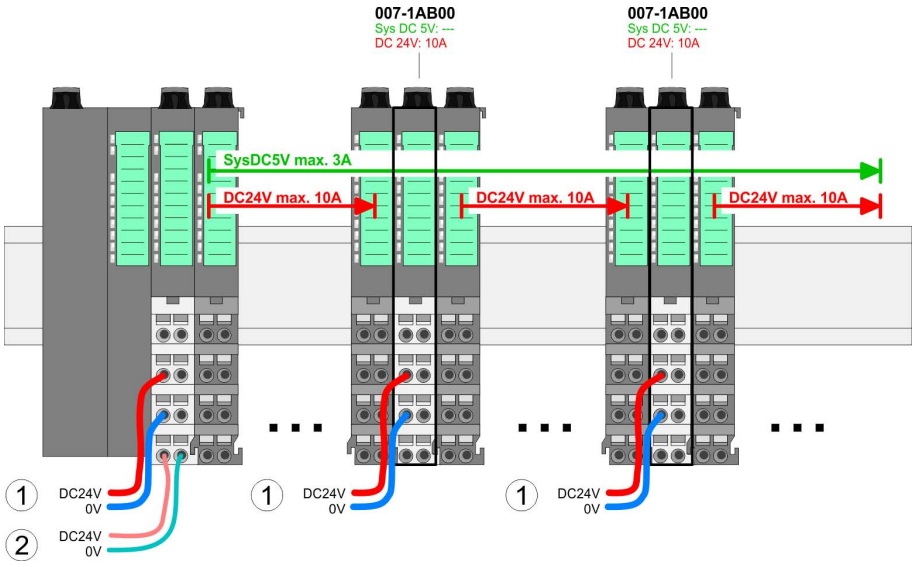
State of the electronic power supply via LEDs

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.

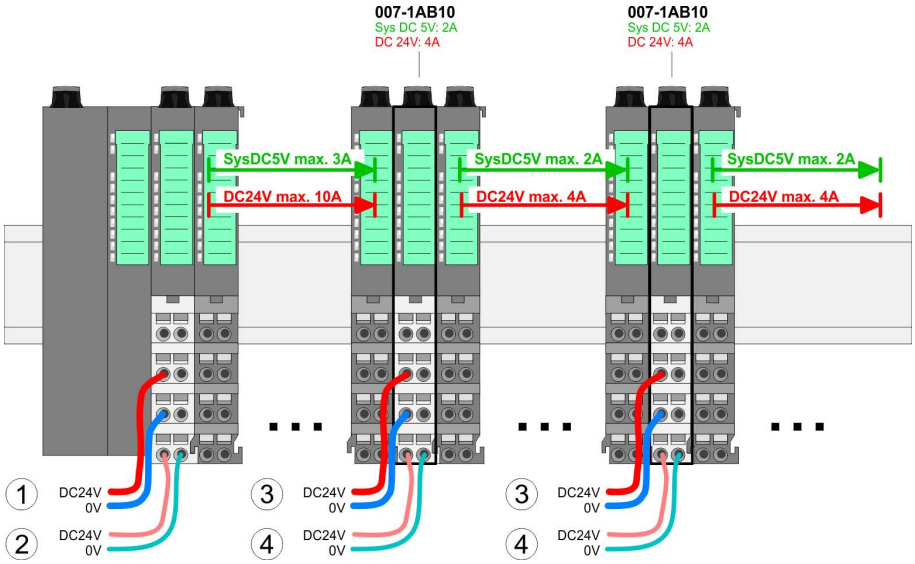
Deployment of the power modules

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

Power module 007-1AB00

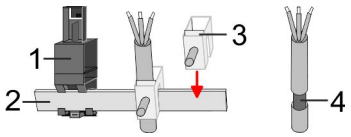


Power module 007-1AB10



(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

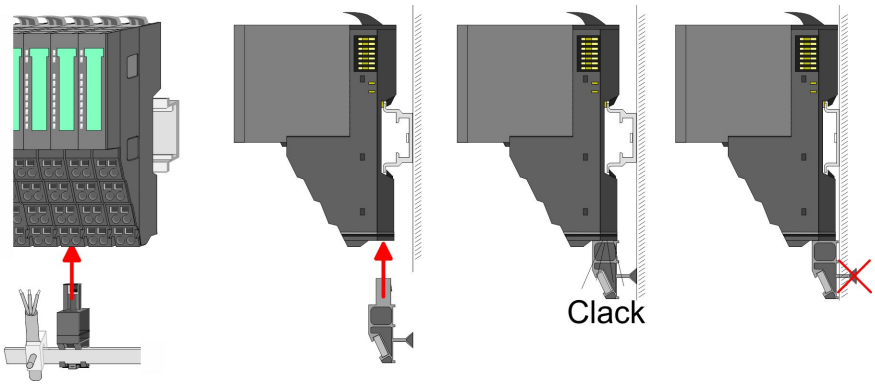


1 Shield bus carrier
2 Shield bus (10mm x 3mm)
3 Shield clamp
4 Cable shield

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

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

2. Put your shield bus into the shield bus carrier.



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

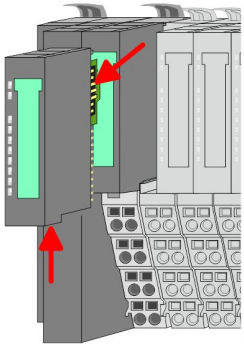
2.6 Demounting

2.6.1 Demounting bus coupler

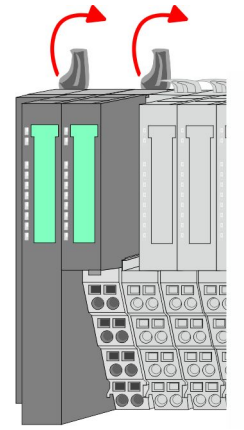
Proceeding

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

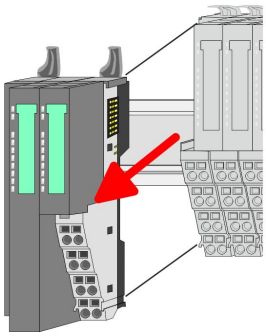
1. Power-off your system.
2. Remove if exists the wiring of the bus coupler.
3. *For demounting and exchange of a (head) module or a group of modules, due to mounting reasons you always have to remove the electronic module right beside. After mounting it may be plugged again.*



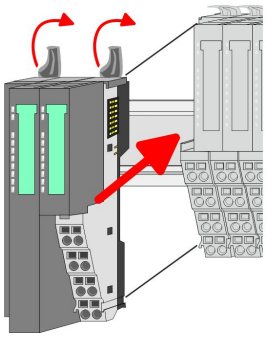
Press the unlocking lever at the lower side of the just mounted right module near the bus coupler and pull it forward.



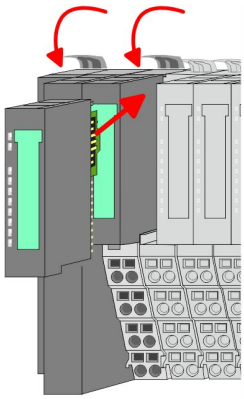
4. Turn all the locking lever of the bus coupler to be exchanged upwards.



5. Pull the bus coupler forward.
6. For mounting turn all the locking lever of the bus coupler to be exchanged upwards.



7. To mount the bus coupler put it to the left periphery module and push it, guided by the stripes, to the mounting rail.
8. Turn all the locking lever downward, again.



9. Plug again the electronic module, which you have removed before.
10. Wire your bus coupler.

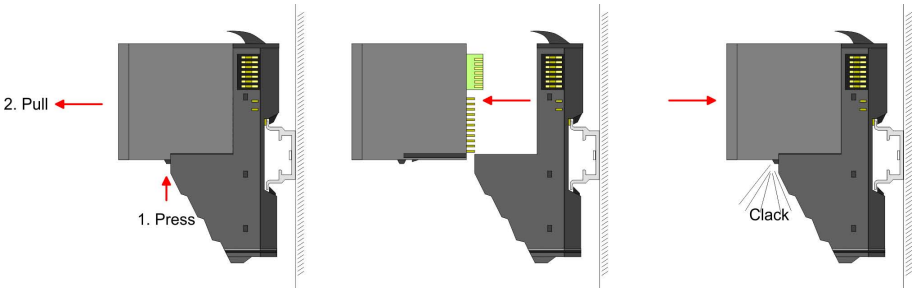
⇨ Now you can bring your system back into operation.

2.6.2 Demounting periphery modules

Proceeding

Exchange of an electronic module

1. Power-off your system.

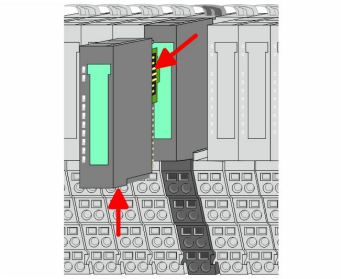


2. For the exchange of a electronic module, the electronic module may be pulled forward after pressing the unlocking lever at the lower side of the module.
3. For installation plug the new electronic module guided by the strips at the lower side until this engages to the terminal module.

⇨ Now you can bring your system back into operation.

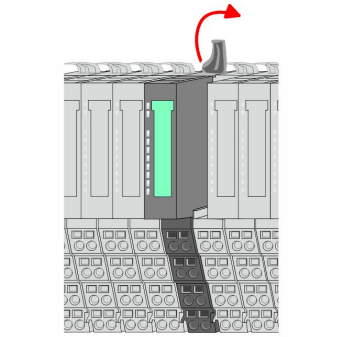
Exchange of a periphery module

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

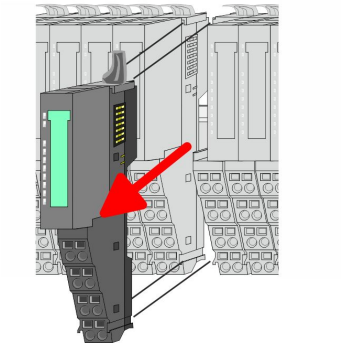


3. *For demounting and exchange of a (head) module or a group of modules, due to mounting reasons you always have to remove the electronic module right beside. After mounting it may be plugged again.*

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

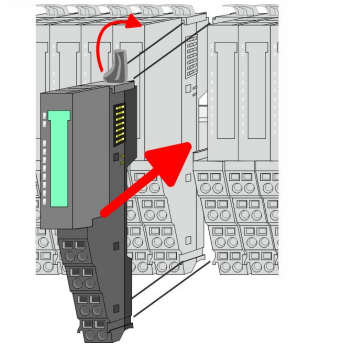


4. Turn the locking lever of the module to be exchanged upwards.



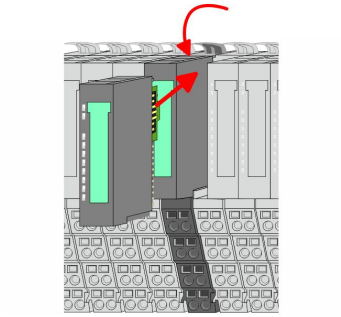
5. Pull the module.

6. For mounting turn the locking lever of the module to be mounted upwards.



7. To mount the module put it to the gap between the both modules and push it, guided by the stripes at both sides, to the mounting rail.

8. Turn the locking lever downward, again.

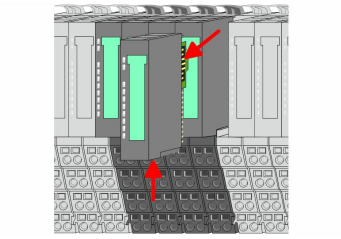


9. Plug again the electronic module, which you have removed before.

10. Wire your module.

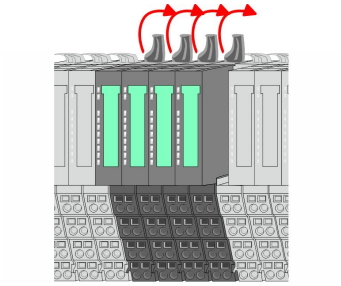
⇨ Now you can bring your system back into operation.

Exchange of a module group

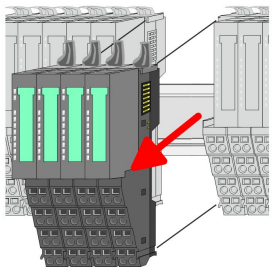


1. Power-off your system.
2. Remove if exists the wiring of the module group.
3. *For demounting and exchange of a (head) module or a group of modules, due to mounting reasons you always have to remove the electronic module right beside. After mounting it may be plugged again.*

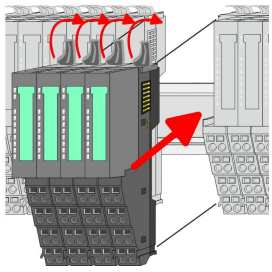
   Press the unlocking lever at the lower side of the just mounted right module near the module group and pull it forward.



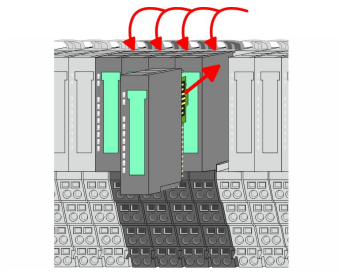
4. Turn all the locking lever of the module group to be exchanged upwards.



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



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



9. Plug again the electronic module, which you have removed before.
10. Wire your module group.

    ⇨ Now you can bring your system back into operation.

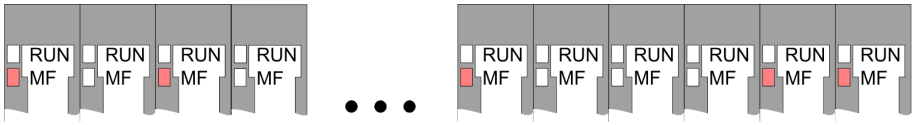
2.7 Trouble shooting - LEDs

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

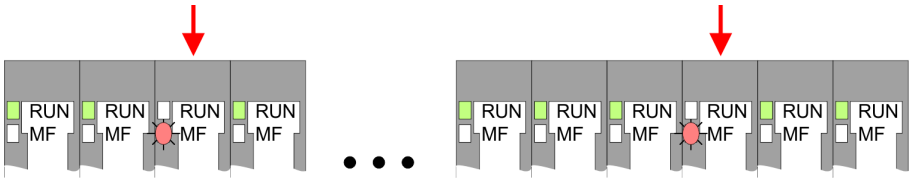


Behaviour: After PowerON the RUN LED of each module is off and the MF LED of each module is sporadically on.

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. ↳ *'Wiring power modules' on page 21*

Error in configuration

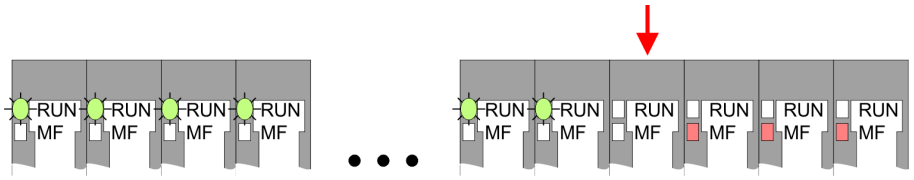


Behaviour: After PowerON the MF LED of one module respectively more modules flashes. The RUN LED remains off.

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

Remedy: Match configuration and hardware structure.

Module failure



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

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

Remedy: Replace the defective module.

2.8 Installation guidelines

General

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

What does EMC mean?

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

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

Possible interference causes

Electromagnetic interferences may interfere your control via different ways:

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

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

There are:

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

Basic rules for EMC

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

- Take care of a correct area-wide grounding of the inactive metal parts when installing your components.
  - Install a central connection between the ground and the protected earth conductor system.
  - Connect all inactive metal extensive and impedance-low.
  - Please try not to use aluminium parts. Aluminium is easily oxidizing and is therefore less suitable for grounding.
- When cabling, take care of the correct line routing.
  - Organize your cabling in line groups (high voltage, current supply, signal and data lines).
  - Always lay your high voltage lines and signal respectively data lines in separate channels or bundles.
  - Route the signal and data lines as near as possible beside ground areas (e.g. suspension bars, metal rails, tin cabinet).
- 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 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 respectively µA) are transferred.
  - foil isolations (static isolations) are used.
- With data lines always use metallic or metallised plugs for serial couplings. Fix the isolation of the data line at the plug rack. Do not lay the isolation on the PIN 1 of the plug bar!
- At stationary operation it is convenient to strip the insulated cable interruption free and lay it on the isolation/protected earth conductor line.
- To fix the isolation tangles use cable clamps out of metal. The clamps must clasp the isolation extensively and have well contact.
- Lay the isolation on an isolation rail directly after the entry of the cable in the cabinet. Lead the isolation further on to your PLC and don't lay it on there again!

CAUTION!

Please regard at installation!

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

Remedy: Potential compensation line

2.9 General data

Conformity and approval		
Conformity		
CE	2014/35/EU	Low-voltage directive
	2014/30/EU	EMC directive
Approval		
UL		Refer to Technical data
others		
RoHS	2011/65/EU	Product is lead-free; 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 10… 95%)
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

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 zone B	EN 61000-6-2		Industrial area
		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) 2GHz ... 2.7GHz, 1V/m, 80% AM (1kHz)
		EN 61000-4-6	HF conducted 150kHz … 80MHz, 10V, 80% AM (1kHz)
		EN 61000-4-4	Burst, degree of severity 3
		EN 61000-4-5	Surge, installation class 3 *

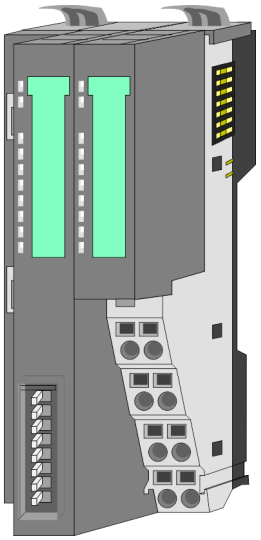
*) Due to the high-energetic single pulses with Surge an appropriate external protective circuit with lightning protection elements like conductors for lightning and overvoltage is necessary.

3 Hardware description

3.1 Properties

Features

- Field bus: PROFINET according IEC 61158-6-10, IEC 61784-2
- PROFINET for max. 64 periphery modules
- Max. 512byte input and 512byte output data
- Integrated 2-port switch
- Transfer rate 100Mbit/s full-duplex
- Integrated DC 24V power supply for power and electronic section supply of the periphery modules
- Supports MRP slave (**M**edia **R**edundancy **P**rotocol) as MRP client
- Supports shared device with up to 3 connections
- Supports FMM (**F**ree **M**odule **M**apping)
- Supports multiple and single write (acyclic communication)
- Integrated Web server
- Integrated DHCP client

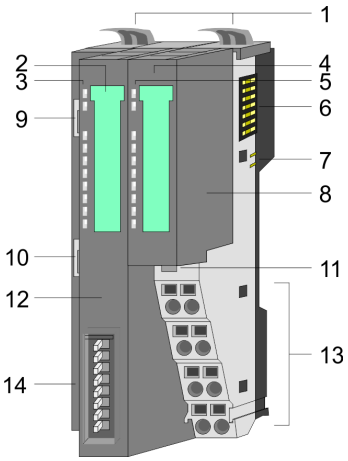


Ordering data

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

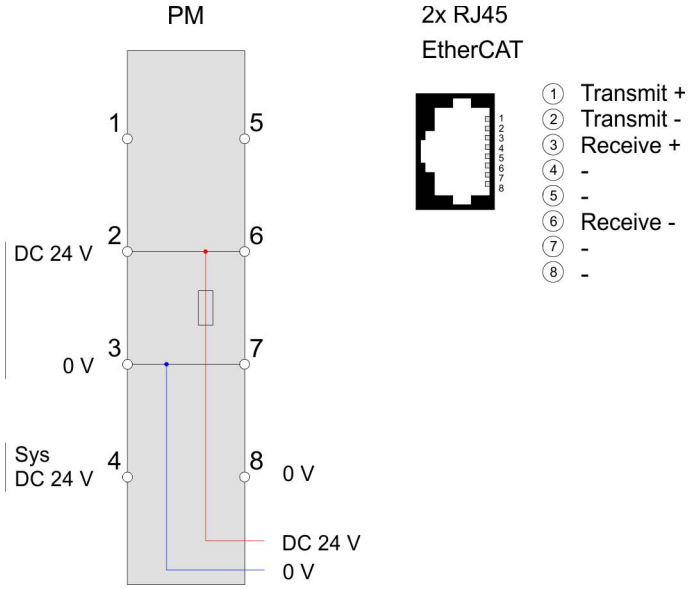
3.2 Structure

053-1PN00



1 Locking lever terminal module
2 Labeling strip bus interface
3 LED status indication bus interface
4 Labeling strip power module
5 LED status indication power module
6 Backplane bus
7 DC 24V power section supply
8 Power module
9 X1: PROFINET RJ45 bus interface "P1"
10 X2: PROFINET RJ45 bus interface "P2"
11 Unlocking lever power module
12 Bus interface
13 Terminal
14 Address selector

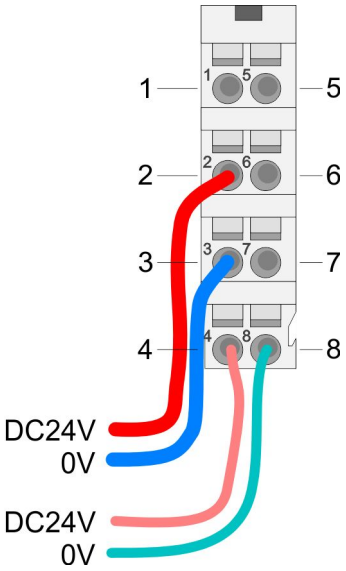
3.2.1 Interfaces



CAUTION!
Bus interface and power module of the bus coupler may not be separated!

Here you may only exchange the electronic module!

PM - Power module



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

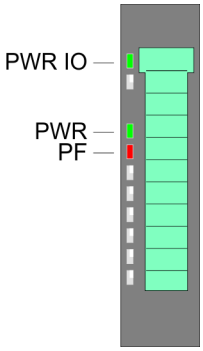
X1/X2: PROFINET interface

RJ45 jacks

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

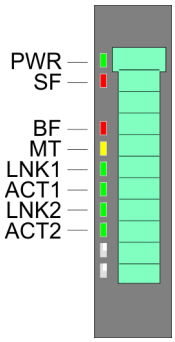
3.2.2 LEDs

LEDs power module



PWR IO	PWR	PF	Description
green	green	red	
●	X	○	Power section supply OK
●	●	○	Electronic section supply OK
X	X	●	Fuse electronic section supply defective
on: ● | off: ○ | not relevant: X			

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	red	●	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

PWR	SF	BF	MT	LNK1	ACT1	LNK2	ACT2	Description
green	rod	rod	yellow	green	green	green	green	
●	X	X	X	X	X	X	X	The PROFINET IO device is power supplied.
●	○	B	X	[●]	X	[●]	X	No connection can be established to the PROFINET IO controller, but there is a connection to the switch (no AR is 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 a PROFINET IO controller is established (at least one AR is active) LNK1 or LNK2 is on.
●	●	X	X	X	X	X	X	■ An unacknowledged diagnostic message is available. ■ Error on the backplane bus (e.g. module failure, bus faulted). ■ Error during firmware update (shortly visible, then restart).
●	BBB	●	X	●	X	●	X	Error IP address ■ There was not assigned a valid IP address. ■ The assigned IP address already exists in the system.
●	X	BB	BB	X	X	X	X	A firmware update is in progress. Here BF and MT flash alternately.

PWR	SF	BF	MT	LNK1	ACT1	LNK2	ACT2	Description
●	X	X	X	[BBB]	X	[BBB]	X	Identification via DCP. Depending on the connection LNK1 or LNK2 are flashing with 2Hz for 3 seconds.
●	●	X	●	X	X	X	X	Maintenance request ■ After parametrization of the IO device no sync telegram was received. ■ Jitter outside the limits (resynch-ronization). ■ Switch has discarded 10 frames (network congestion). ■ Error to the System SLIO bus (version error).

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

3.2.3 Address switch

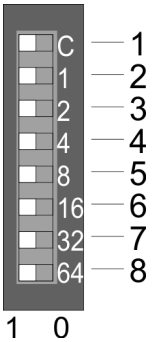
Address switch

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!

The address switch serves for the following settings:

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



Position	Description	
1	DHCP client ■ 0 = disabled ■ 1 = enabled	
2	$2^0 = 1$	PROFINET name:
3	$2^1 = 2$	"VIPA053-1PN00-xxx"
4	$2^2 = 4$	with xxx = decimal value of position 2 ... 8
5	$2^3 = 8$	
6	$2^4 = 16$	
7	$2^5 = 32$	
8	$2^6 = 64$	

Essential switch settings

Position	State	Behavior at start-up
1	1	■ DHCP client is activated. ■ The IP address data are requested via DHCP. ■ The IP address data are not stored in the flash, respectively 1. DHCP offer is used. ■ DHCP client is disabled if the 1. new IP settings were received via DCP or the 1. PROFINET connection was established.
1	0	■ DHCP client is disabled
2 ... 8	0	■ PROFINET compliant (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. Otherwise, this can not be found by the PROFINET controller.
2 ... 8	[1...127]	■ PROFINET name (device name): – VIPA053-1PN00-xxx with xxx = decimal value of position 2 ... 8 (2^0 ... 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.

3.3 Technical Data

Order no.	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	3.9 A
I^2t	0.14 A^2s
Max. current drain at backplane bus	3 A

Order no.	053-1PN00
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
Service Indicator	yellow LED
Group error display	red SF LED
Channel error display	none
Hardware configuration	
Racks, max.	1
Modules per rack, max.	64
Number of digital modules, max.	64
Number of analog modules, max.	64
Communication	
Fieldbus	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.	-
Housing	
Material	PPE / PPE GF10
Mounting	Profile rail 35 mm
Mechanical data	

Order no.	053-1PN00
Dimensions (WxHxD)	48.5 mm x 109 mm x 76.5 mm
Weight	155 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 Deployment

4.1 Basics PROFINET

General

- PROFINET is an open Industrial Ethernet Standard from PROFIBUS & PROFINET International (PI) for automation.
- PROFINET is standardized in the IEC 61158.
- PROFINET uses TCP/IP and IT standards and supplements the PROFIBUS technology for applications, where fast data communication with industrial IT functions is demanded.

There are 2 PROFINET function classes:

- PROFINET IO
- PROFINET CBA

These may be realized in 3 performance steps:

- TCP/IP communication
- RT communication
- IRT communication

PROFINET IO

- 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.
- 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 parametrization and diagnostics are supported.

PROFINET CBA

- PROFINET CBA means **C**omponent **B**ased **A**utomation.
- This component model describes the communication between autonomously working stations.
- It makes a simple modularization of complex plants possible, by distributed intelligence by means of graphic configuration for communication of intelligent modules.

TCP/IP communication

This is the open communication via Ethernet TCP/IP without any demand on real-time.

RT Communication

- RT means **R**eal-**T**ime.
- The RT communication represents the basics for data transfer at PROFINET IO.
- Here RT data are handled with higher priority.

IRT Communication

- IRT means **I**sochronous **R**eal-**T**ime.
- 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.

Properties of PROFINET

PROFINET of IEC 61158 has the following properties:

- Full-duplex transfer with 100MBit/s via copper respectively fibre optics.
- Switched Ethernet
- Auto negotiation (negotiates the transfer parameters)
- Auto crossover (transmission and receipt lines are crossed automatically if necessary)
- Wireless communication via WLAN
- UDP/IP is used as overlaid protocol. UDP means **U**ser **D**atagram **P**rotocol and contains the unprotected connectionless broadcast communication within IP.

PROFINET devices

Like PROFIBUS DP also with PROFINET IO the following devices are classified according to their tasks:

- IO controller
  - The *IO controller* is equivalent to the master of PROFIBUS.
  - This is the PLC with PROFINET connection, in which the PLC program runs.
- IO device
  - The *IO device* is a distributed I/O field device, which is connected to PROFINET.
  - The IO device is equal to the slave of PROFIBUS.
- IO supervisor
  - The *IO supervisor* is an engineering station as e.g. programming unit, PC or HMI interface for commissioning and diagnostics.

AR

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

API

- API means **A**pplication **P**rocess **I**dentifier and defines besides *Slot* and *Subslot* a further addressing level.
- With this additional addressing mode with using of different applications, the overlapping of data areas can be prevented.
- Currently PROFINET IO devices from VIPA support API 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. This file may be found in the download area of www.vipa.com.
- Please install the GSDML file in your configuration tool.
- 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 defined by IEC 61158.

Addressing

In contrast to the PROFIBUS address, in PROFINET each device may be definitely identified with its PROFINET interface:

- Device name
- IP address respectively MAC address

Transfer medium

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.

4.2 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 tan 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.

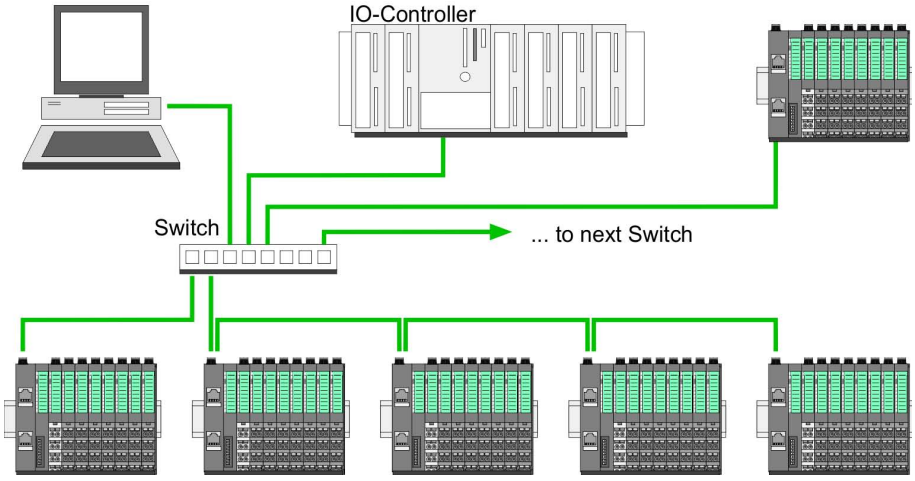
Ring

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



4.3 Accessing the System SLIO

4.3.1 Overview

Information concerning the allocation of these areas may be found in the description of the corresponding System SLIO module. In the following you will find the description of accessing the following System SLIO areas via PROFINET:

- I/O area
- Parameter data
- Hardware interrupt data
- Diagnostic data

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 and so are not listed respectively considered during slot allocation.

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. This file may be found in the download area of www.vipa.com.
- Please install the GSDML file in your configuration tool.
- 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 defined 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 - RDREC - read Record set (index)
  – SFB 53 - WRREC - write record set
  – SFB 54 - RALARM - read diagnostics data

  Here the *Module slot* respectively *Slot* is addressed by the logic *start address* an a *record set* via the corresponding *Index*.

Acyclic access to the System SLIO

- The acyclic access to the PROFINET IO device happens by reading respectively writing a record set via *Index* from respectively to the wanted API, slot or subslot.
- Currently the PROFINET IO device supports API 0. More about the frame structure can be found in the current PROFINET specification.

Overview of all via PROFINET IO device addressable index numbers ↪ Chapter 4.9 'Index overview' on page 66

4.3.2 Accessing the I/O area

- At PROFINET the input respectively output area is automatically embedded to the corresponding address area of the master system.
- By means of the handling block SFB 52 - RDREC the I/O area can be acyclically accessed via the following index numbers:
  – Index = 8028h: Reading input data (slot 1 ... 64 / subslot 1)
  – Index = 8029h: Reading output data (slot 1 ... 64 / subslot 1)

4.3.3 Accessing the parameter data

- With each connection setup parameter data for modules and IO device are written from the IO controller to the device, as defined in the GSDML file.
- After a connection setup there is the possibility to read parameters from a module with SFC 52 - RDREC and to write parameters to a module with SFC 53 - WRREC.
- The parameters are activated as soon as they where written.

Access	Slot (subslot always 1)	Index
All parameters of the PROFINET IO device incl. header (4byte)	0	007Dh can also be addressed via 007Eh
All parameters of the module incl. header (4byte)	1 ... 64	007Dh can also be addressed via 007Eh

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

4.3.4 Accessing diagnostics data

- Hardware interrupt data
  - Hardware interrupt data of System SLIO modules with interrupt capability were automatically sent by a diagnostics message if the interrupt is activated by parametrization at the corresponding module respectively at the System SLIO PROFINET IO device.
  - On an hardware interrupt your master system jumps into an interrupt routine. There you can read the hardware interrupt data by means of the block SFB 54 - RALARM

Chapter 4.7.1 'Hardware interrupt' on page 57

- Diagnostic interrupt data
  - Diagnostics interrupt data of System SLIO modules with interrupt capability were automatically sent by a diagnostics message if the interrupt is activated by parametrization at the corresponding module respectively at the System SLIO PROFINET IO device.
  - On an diagnostics interrupt your master system jumps into an interrupt routine. There you can read the diagnostics interrupt data by means of the block SFB 54 - RALARM.
  - The interrupt behavior and the structure of the diagnostics data may be preset by the parametrization of the System SLIO PROFINET IO device.
  - By means of the handling block SFB 52 - RDREC the last sent diagnostics data can acyclically be read from the module.

Chapter 4.7.2 'Diagnostic interrupt' on page 58

4.4 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 device name 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" at:
  'PROFINET IO ➔ Additional field devices ➔ I/O ➔ VIPA SLIO System'

GSDML file

- From VIPA there is a GSDML files for your IO device available. This may be found in the service area of www.vipa.com.
- Please install the GSDML file in your configuration tool. More information about installing the GSDML file may be found at the manual of the according engineering tool.
- For configuration in your configuration tool every System SLIO module may be 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 053-1PN00'

Name of the device

- 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 PROFINET device.
- If all switches are 0, you can freely define a name in your project. Via an "initialization" a name is to be assigned to the PROFINET IO device and remanent stored there. Otherwise the device has the following name: VIPA053-1PN00-xxx with xxx = Decimal value of position 2 ... 8 (2^0 ... 2^6) of the switch.

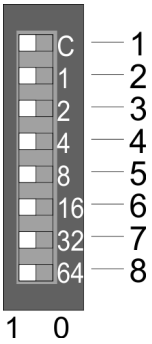
Address switch

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!

The address switch serves for the following settings:

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



Position	Description	
1	DHCP client ■ 0 = disabled ■ 1 = enabled	
2	$2^0 = 1$	PROFINET name: "VIPA053-1PN00-xxx" with xxx = decimal value of position 2 ... 8
3	$2^1 = 2$	
4	$2^2 = 4$	
5	$2^3 = 8$	
6	$2^4 = 16$	
7	$2^5 = 32$	
8	$2^6 = 64$	

Essential switch settings

Position	State	Behavior at start-up
1	1	■ DHCP client is activated. ■ The IP address data are requested via DHCP. ■ The IP address data are not stored in the flash, respectively 1. DHCP offer is used. ■ DHCP client is disabled if the 1. new IP settings were received via DCP or the 1. PROFINET connection was established.
1	0	■ DHCP client is disabled
2 ... 8	0	■ PROFINET compliant (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. Otherwise, this can not be found by the PROFINET controller.
2 ... 8	[1...127]	■ PROFINET name (device name): – VIPA053-1PN00-xxx with xxx = decimal value of position 2 ... 8 (2^0 ... 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.

Initialization - device name assignment

If all the switches of the address switch of the PROFINET device are 0, on the example of the Siemens SIMATIC Manager with the following proceeding you can assign a name to your PROFINET IO device, which is remanent stored there.

1. Check if the switches of the address switch of the PROFINET device are 0 and perform PowerON.
2. Load your project.
3. Choose your PROFINET controller.
4. Go to *'PLC functions ➔ Edit Ethernet node'*.
5. Click at "Ethernet node" at [Browse]. Every reachable stations are listed.
6. 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.
7. Enter at "Assign device name" the device name of your project and click at [Assign Name]. The name is remanent stored in the PROFINET IO device. With [Reset] at "reset to factory settings" the name may be deleted.

Reset to factory settings

1. Start the Siemens SIMATIC Manager
2. Go to *'PLC functions ➔ Edit Ethernet node'*.
3. Click at "Ethernet node" at [Browse]. Every reachable stations are listed.
4. Choose the PROFINET device with the suited MAC address and click on [OK].
5. With [Reset] at "reset to factory settings" the PROFINET IO device is reset to factory setting

Project engineering

1. Mount your PROFINET system.
2. Start your project engineering tool with a new project.
3. 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.
4. 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].
5. For parametrization of the PROFINET device the VIPA specific properties dialog may be opened in the slot overview .
6. Insert the peripheral modules from the hardware catalog and parametrize them if necessary.
7. Transfer your project to the PLC.

4.4.1 Parameter data

PROFINET IO device

Byte	Bit 7 ... Bit 0	Default
0	■ Bit 0: Process 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: reserved ■ Bit 5: Web server – 0: disable – 1: enable ■ Bit 6: reserved ■ Bit 7: Data format – 0: Data format Motorola – 1: Data format Intel	0Fh
1 ... 4	00h (fix)	00h
5	■ Bit 0: FMM - Activation – 0: disable – 1: enable ■ Bit 1: FMM - automatic restart – 0: disable – 1: enable ■ Bit 7 ... 2: reserved	00h
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 diagnostic data of a module.
  – *Channel-specific data:*
    You always will get the record set DS 00h of the diagnostic 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 by the PROFINET controller, other interrupts of the module are blocked.
  – With *Auto-Acknowledge* = 1 each interrupt is automatically acknowledged by the PROFINET device. In this mode the diagnostics data were always overwritten by new interrupts. 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.

4.5 Web server

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 and so are not listed respectively considered during slot allocation.

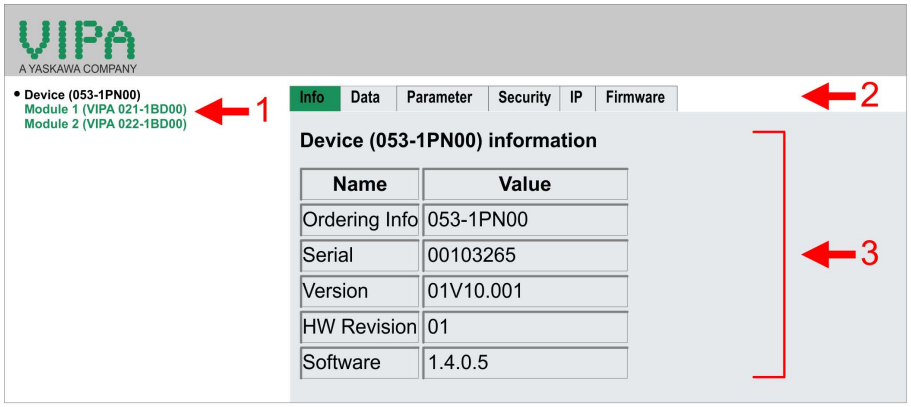
Access via IP address

On delivery the PROFINET IO device has no IP address. So that you can access the web server you have to assign IP address data to this. There are the following possibilities:

- Activate the DHCP client via DIP switch 1 of the address switch and get an IP address from your DHCP server in the network.
- Assign IP address data by means of a DCP tool.
- Assign via an IO controller IP address data. It gives you access to the Web server to accordingly change the IP address data there.

Structure of the Web page

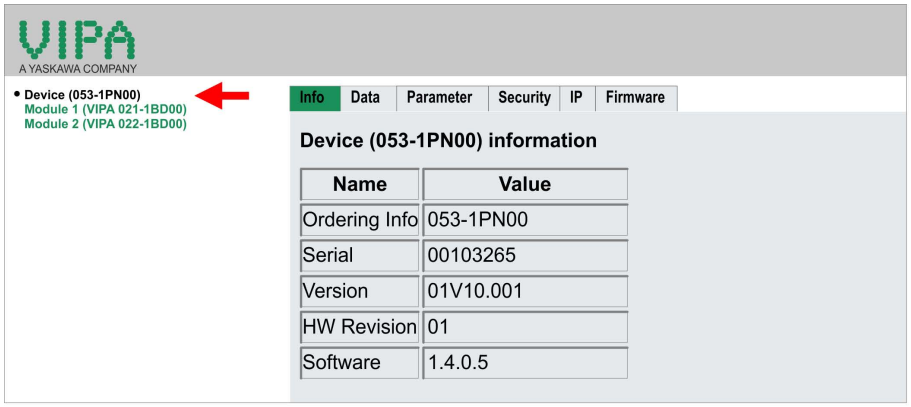
The Web page is built dynamically and depends on the number of modules, which are connected to the PROFINET IO device.



[1] Module list: PROFINET IO device and System SLIO module in the plugged sequence
[2] Functions for the module, which is selected in the *module list*
[3] Information respectively input field for the according function

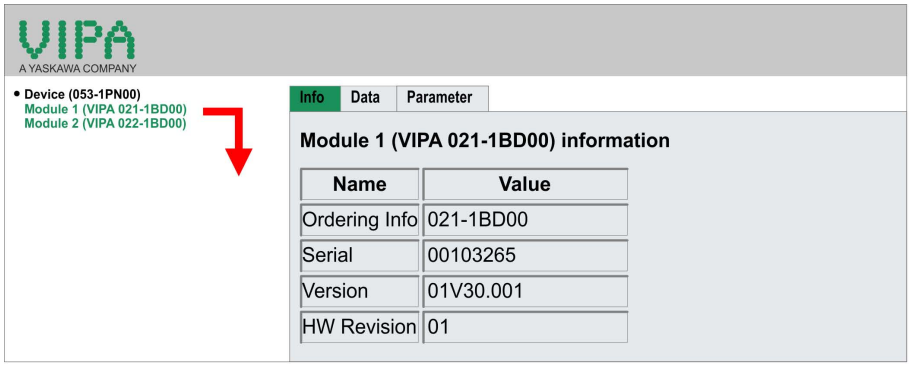
For fast diagnostic missing or incorrectly configured modules are shown after updating the Web page in the module list in red.

Web page with selected PROFINET IO device



- Info
  - Here order number, serial number and the version of firmware and hardware of the PROFINET IO device are listed.
- Data
  - The PROFINET IO device hast no data.
- Parameter
  - Here you can see the current parameters of the PROFINET IO device.
- Security
  - All functions for the writing access to the PROFINET IO device can be secured by a password.
- IP
  - Here you can see the current IP address data of the PROFINET IO device.
- Firmware
  - With this function you can bring in a firmware update. You can get the appropriate firmware file from VIPA.

Web page with selected module



- Info
  - Here product name, order number, serial number, firmware version and hardware state number of the according module are listed.
- Data
  - At Data the states of the inputs respectively outputs are listed.
- Parameter
  - If available the parameter data of the corresponding module may be shown.

4.6 FMM - Free Module Mapping

Overview

- FMM means **F**ree **M**odule **M**apping. FMM is a function of VIPA and is only supported by PROFINET IO device from VIPA.
- With *FMM* you can run the same application program with one standard hardware configuration at different hardware settings without a set-current difference in the hardware is diagnosed.
- To use the FMM mappings, you have to activate FMM in the parametrization of the PROFINET IO device.
  ↳ *further information on page 51*
- For the *FMM* the mapping of the slots is to be specified via the record set 0x7F.
- For commissioning, you have to activate the parameter *'Startup when expected/actual configuration differs'* because during the commissioning without FMM, the IO device responds to the CPU with a 1:1 mapping.

Configuration

- The mapping of the modules is defined as configuration by the 64byte record set 0x7F.
- The record set is remanent stored in the PROFINET IO device, but not sent from the PROFINET controller to the IO device during the connection setup.
- Read and write access to the configuration is only possible if you have activated FMM in the parametrization of the PROFINET IO device, before.
- The record set must be transferred from the user program to the PROFINET IO device by a write command.
- With the record set read command parts of the active configuration can be read. You have always to write the complete record set.
- Each written and valid configuration is only saved if a difference to the existing configuration exists.

- Only after a restart the configuration gets activated.
- In the parametrization of the PROFINET IO device you can set that the IO device is restarted with the receipt of a configuration. Otherwise you have to manually reboot your IO device after the transfer of your configuration.

Record set 0x7F

Record set 0x7F						
Byte	0	1	2	3	...	63
Map-ping						

The following values can be entered at *Mapping*:

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

Behaviour of a *virtual module*:

- The input area always has the value 0, regardless of its size.
- The writing to the output area has no effect.
- The following record sets can be read:
  - 0x8028: Read input data - always 0 is read.
  - 0x8029: Read output data - always 0 is read.
  - 0xAFF0: IM0 data - a name determined of the module ID is returned. To identify the virtual module, the name consists of the first 3 digits of the module type and the added "-XXXXX" (e.g.: 031-XXXXX). As SW/HW version you get these of the IO device.

  Other record sets are negatively acknowledged. The connection setup remains unaffected by this.

Commissioning

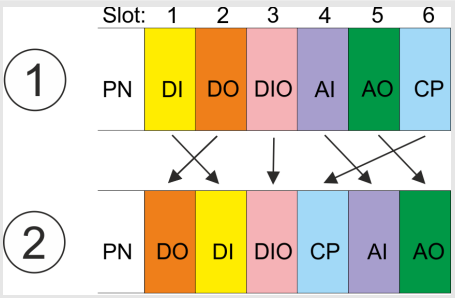
In the following it is shown how to start-up your PLC with one hardware configuration but with different hardware settings:

1. Configure your system with a hardware configuration with maximum setup (expected configuration).
2. Configure in your PROFINET IO device the FMM functionality:
   - Activate FMM
   - Activate if you want the automatic restart of the IO device with the receipt of a configuration. Otherwise you have to manually restart it.
3. For commissioning, you have to activate the parameter *'Startup when expected/actual configuration differs'* because during the commissioning without FMM, the IO device responds to the CPU with a 1:1 mapping.
4. Create in your machine application for the configuration record set a memory area, which can be accordingly manipulated by the user program and transferred to your IO device. This can be realized e.g via a MMI in a protected area.
5. Create the configuration by defining the deviation of the actual and expected configuration for the current hardware configuration in record set 0x7F.

6. Transfer this record set via write command to your IO device.
   ⇨ The configuration is stored permanently in the IO device and active with the next restart.

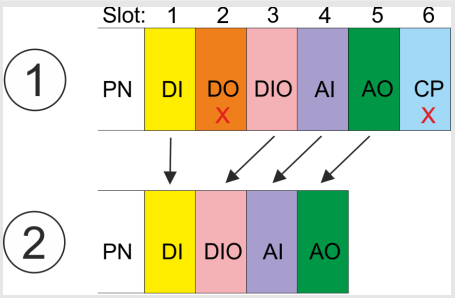
Examples of configuration

Scenario 1

Same type and number of modules but reversed slots	Slot	Hardware configuration		FMM
		Expected (1)	Actual (2)	
	1	DI	DO	2
	2	DO	DI	1
	3	DIO:	DIO:	3
	4	AI	CP	5
	5	AO	AI	6
	6	CP	AO	4

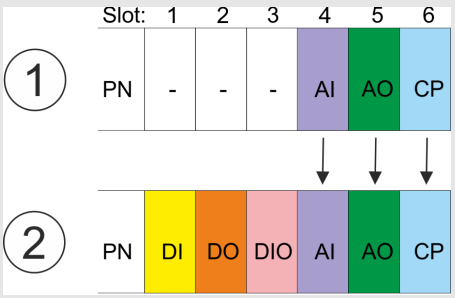
Record set 0x7F										
Mapping	2	1	3	5	6	4	0	0	...	0

Scenario 2

Reversed slots and modules are missing	Slot	Hardware configuration		FMM
		Expected (1)	Actual (2)	
	1	DI	DI	1
	2	DO	DIO	255
	3	DIO	AI	2
	4	AI	AO	3
	5	AO		4
	6	CP		255

Record set 0x7F										
Mapping	1	255	2	3	4	255	0	0	...	0

Scenario 3

Gaps (empty slots)	Slot	Hardware configuration		FMM
		Expected (1)	Actual (2)	
	1	-	DI	0
	2	-	DO	0
	3	-	DIO	0
	4	AI	AI	4
	5	AO	AO	5
	6	CP	AO	6

Record set 0x7F										
Mapping	0	0	0	4	5	6	0	0	...	0

The configuration of gaps is not allowed in the System SLIO! But you can place modules and define them via the configuration as empty slot for the expected hardware configuration.

4.7 Hardware and diagnostic interrupt

4.7.1 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 parametrization at the corresponding module respectively at the System SLIO PROFINET IO device.
- On an hardware interrupt your master system jumps into an interrupt routine. There you can read the hardware interrupt data by means of the block SFB 54 - RALARM.

Hardware interrupt data

Byte	Description	Example	Content
0..1	AlarmNotification (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	

Byte	Description	Example	Content
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)

4.7.2 Diagnostic interrupt

- Diagnostics interrupt data of System SLIO modules with interrupt capability were automatically sent by a diagnostics message if the interrupt is activated by parametrization at the corresponding module respectively at the System SLIO PROFINET IO device.
- On an diagnostics interrupt your master system jumps into an interrupt routine. There you can read the diagnostics interrupt data by means of the block SFB 54 - RALARM.
- The interrupt behavior and the structure of the diagnostics data may be preset by the parametrization of the System SLIO PROFINET IO device. Among other you have the choice between the following diagnostics data:
  – UserSpecifiedDiagnostics
    Here all the diagnostics data can be accessed.
  – ExtendedChannelDiagnostics (channel-specific)
    Here record set 0 of the diagnostics data (4byte) may be accessed. Additional diagnostics data must explicit be requested.

UserSpecified Diagnostics *(vendor specific)*

Byte	Description	Example	Content
0..1	AlarmNotification ■ 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	

Byte	Description	Example	Content
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 – VIPA specific (UserSpecifierDiagnostics): Offset + ChannelErrorType – Offset: 0000h: Error at PROFINET IO device 01F4h: Error at System SLIO module ■ 8002h: ExtChannelDiag – (refer to the table below)	01FBh	UserSpecifiedDiagnostics 01FBh = 01F4h + 7h Error at System SLIO module, ChannelErrorType: 7 (Upper limit violation)
28..47	VIPA specific: Diagnostic interrupt data (DS 1)	…	Diagnostic record set 1 (see module description)
48..49	VIPA specific: 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)*

Byte	Description	Example	Content
0..1	AlarmNotification ■ 1: High ■ 2: Low	Example	PROFINET interrupt data (header)
2..3	BlockLength	Example	
4..5	Version High/Low	Example	
6..7	AlarmType ■ 1: Diagnostics ■ 2: Process ■ 3: Pull	Example	
8..11	API	0000h, 0000h	
12..13	Slot	0001h	
14..15	Subslot	0001h	
16..19	ModuleIdentNumber	0403h, 1543h	
20..23	SubmoduleIdentNumber	0000h, 0001h	

Byte	Description	Example	Content
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	VIPA specific: ExtendedChannelErrorType ■ 0000h: Error at PROFINET IO device ■ 01F4h Error at System SLIO module	01F4h	Error at System SLIO module
36..39	VIPA specific: ExtendedChannelAddValue ■ Diagnostic data (DS 0)	0000h 150Dh	Diagnostic data record set 0 (see module description)

ChannelErrorTypes

Code	Description
0001h	Short circuit
0002h	Under-voltage (supply voltage)
0003h	Over-voltage (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	Parametrization error
0011h	Sensor or load voltage missing
0012h	Fuse defect
0013h	Communication errors
0014h	Ground fault
0015h	Reference channel error
0016h	Hardware interrupt lost

Code	Description
0017h	Threshold interrupt
0018h	The 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
0108h	Shared device error - shared device is not supported by this hardware version.
0109h	FMM configuration was changed - manual restart necessary.

4.7.2.1 Acyclic access to the diagnostic data

By means of the handling block SFB 52 - RDREC the last sent diagnostics data can acyclically be read from the module.

4.7.2.1.1 Diagnostic PROFINET IO device

Access

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

- *Index* = 0000h: 4byte
  - Byte 0: Diagnostic byte 1
  - Byte 1: Diagnostic byte 2
  - Byte 2 ... 3: 0 (fix)
- *Index* = 0001h: 20byte
  - Byte 0: Diagnostic byte 1
  - Byte 1 ... 19: 0 (fix)

Structure

Byte	Bit 7 ... Bit 0
0	Diagnostic byte 1 ■ Bit 0: Error on System SLIO bus ■ Bit 1: Parameter could not be written into the IO device. ■ Bit 2: General parameter error IO device. ■ Bit 3: Version error at the System SLIO bus (at least one module is not supported at the System SLIO bus). ■ Bit 4: Unexpected restart was performed. ■ Bit 5: Port monitoring (data transmission impossible according PROFINET IEC 61158). ■ Bit 6: Port monitoring (remote mismatch according PROFINET IEC 61158). ■ Bit 7: Configuration error System SLIO bus (Actual configuration differs from expected configuration).
1	Diagnostic byte 2 ■ Bit 0: Module was removed. ■ Bit 1: Shared device error. Shared device is not supported by this hardware version. ■ Bit 2: FMM configuration was changed - manual restart necessary. *Chapter 4.6 'FMM - Free Module Mapping' on page 54* ■ Bit 7 ... 3: 00h (fix)
2 ... 3 (19)	00h (fix)

4.7.2.1.2 Diagnostics data module

Access

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

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

Structure

Name	Bytes	Function
ERR_A	1	Diagnostic
MODTYP	1	Module information
ERR_C	1	reserved
ERR_D	1	Diagnostic
CHTYP	1	Channel type

Name	Bytes	Function
NUMBIT	1	Number diagnostics bits per channel
NUMCH	1	Number channels of the module
CHERR	1	Channel error
CHxERR	8	Channel-specific error channel x
DIAG_US	4	µs ticker

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 4: set at external auxiliary supply missing ■ Bit 6 ... 5: reserved ■ Bit 7: set at error in parameterization

MODTYP Module information

Byte	Bit 7 ... 0
0	■ Bit 3 ... 0: module class – 0101b analog module ■ Bit 4: set at 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 5 ... 0: reserved ■ Bit 6: set at hardware interrupt lost ■ Bit 7: reserved

CHTYP Channel type

Byte	Bit 7 ... 0
0	■ Bit 6 ... 0: Channel type – 70h: Digital input – 71h: Analog input – 72h: Digital output – 73h: Analog output – 74h: Analog input/-output – 76h: Counter ■ Bit 7: reserved

NUMBIT Diagnostic bits

Byte	Bit 7 ... 0
0	Number of diagnostic bits per channel.

NUMCH Channels

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

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 2: set at error in channel 2 ■ Bit 3: set at error in channel 3 ■ Bit 4: set at error in channel 4 ■ Bit 5: set at error in channel 5 ■ Bit 6: set at error in channel 6 ■ Bit 7: set at error in channel 7

CHxERR Channel specific error

Byte	Bit 7 ... 0
0	Information concerning the allocation may be found in the description of the corresponding System SLIO module.

DIAG_US µs ticker

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

µs ticker

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

4.8 I&M data

Overview

- I&M data are **I**dentification and **M**aintenance data. These data are stored in the module which support you at:
  - Check of the system configuration
  - Discover of hardware changes of a plant
  - Remove errors in a plant
- By means of I&M data the modules can online be identified.
- I data (**I**dentification data are vendor information, which only can be read and which are printed in part at the module such as:
  - Order number
  - Serial number
- M data (**M**aintenance data) are plant dependent information. These are created during configuration and stored in the module such as:
  - Installation location
  - Installation data

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)	Length (byte)
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

Identification data	Access	Preset	Explanation
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

4.9 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.
- The Index can be accessed via your master system by means of handling blocks to read and write record sets. ↳ *'Handling blocks' on page 46*. More can be found in the operation list of your CPU.

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

Index number

Index	Description
Readable index numbers	
0000h	read DS 00h diagnostic data (4byte)
0001h	read DS 01h diagnostic data (20byte)
007Dh	read the whole parameter data
007Eh	read DS 00h of the parameter data
007Fh *	read FMM Configuration ↳ *Chapter 4.6 'FMM - Free Module Mapping' on page 54*

Index	Description
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
Writable Index numbers	
007Dh	Write the whole parameter data
007Eh	write DS 00h of the parameter data
007Fh*	write FMM configuration ↳ *Chapter 4.6 'FMM - Free Module Mapping' on page 54*
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