VIPA System SLIO

IM | 053-1DP00 | Manual

HB300E_IM | RE_053-1DP00 | Rev. 12/10

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VIPA art of automation

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Note

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CE Conformity

Hereby, VIPA GmbH declares that the products and systems are in compliance with the essential requirements and other relevant provisions of the following directives:

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

Conformity is indicated by the CE marking affixed to the product.

Conformity Information

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Contents

About this manual

This manual describes the IM 053-1DP00 bus coupler for PROFIBUS DP of the System SLIO from VIPA. Here you may find every information for commissioning and operation.

Overview

Chapter 1: Basics and Assembly

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

Chapter 2: Hardware description

Here the hardware components of the IM 053-1DP00 are more described. You will find the technical data at the end of this chapter.

Chapter 3: Deployment

This chapter describes the usage of the IM 053-1DP00 with PROFIBUS. After a short introduction you may find here every information about assembly and project engineering. The chapter closes with the description of the PROFIBUS installation guidelines and the diagnostic functions.

Objective and contents

This manual describes the IM 053-1DP00 of the System SLIO from VIPA. It contains a description of the structure, project engineering and deployment.

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

Product	Order number	as of state: HW	FW
IM 053DP	VIPA 053-1DP00	01	1.0.0

Target audience

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

Structure of the manual

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

Guide to the document

The following guides are available in the manual:

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

Availability

The manual is available in:

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

Icons Headings

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

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

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

Note!
Supplementary information and useful tips.

Safety information

Applications conforming with specifications

The System SLIO is constructed and produced for:

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

Danger!

This device is not certified for applications in

- in explosive environments (EX-zone)

Documentation

The manual must be available to all personnel in the

- project design department
- installation department
- commissioning
- operation

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

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

Disposal

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

Chapter 1 Basics and Assembly

Overview

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

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

Content

Safety Information for Users

Handling of electrostatic sensitive modules

VIPA modules make use of highly integrated components in MOS-Technology. These components are extremely sensitive to over-voltages that can occur during electrostatic discharges.

The following symbol is attached to modules that can be destroyed by electrostatic discharges.

The Symbol is located on the module, the module rack or on packing material and it indicates the presence of electrostatic sensitive equipment.

It is possible that electrostatic sensitive equipment is destroyed by energies and voltages that are far less than the human threshold of perception. These voltages can occur where persons do not discharge themselves before handling electrostatic sensitive modules and they can damage components thereby, causing the module to become inoperable or unusable.

Modules that have been damaged by electrostatic discharges can fail after a temperature change, mechanical shock or changes in the electrical load.

Only the consequent implementation of protection devices and meticulous attention to the applicable rules and regulations for handling the respective equipment can prevent failures of electrostatic sensitive modules.

Shipping of modules

Modules must be shipped in the original packing material.

Measurements and alterations on electrostatic sensitive modules

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

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

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

Attention!

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

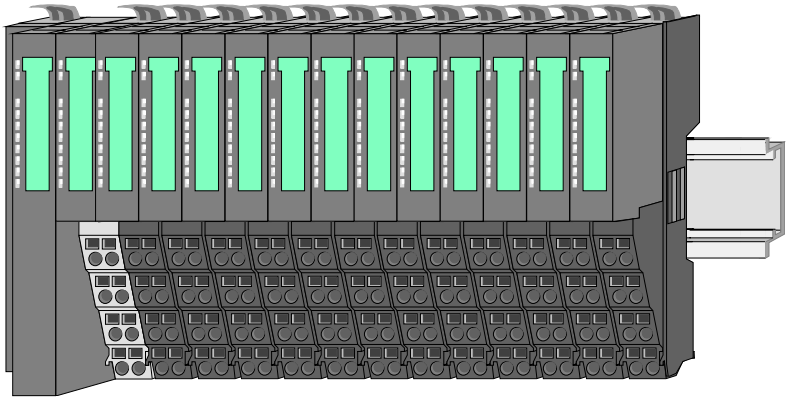
System conception

Overview

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

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

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

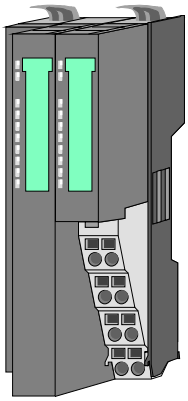


Components

The System SLIO consists of the following components:

- Bus coupler
- Periphery modules
- Power modules
- Accessories

Bus coupler



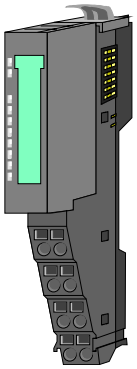
With a bus coupler bus interface and power module is integrated to one casing. With the bus interface you get access to a subordinated bus system.

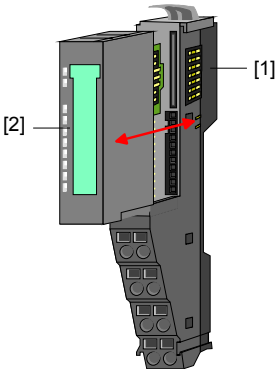
Via the integrated power module for power supply the bus interface is supplied as well as the electronic of the connected periphery modules.

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

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

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

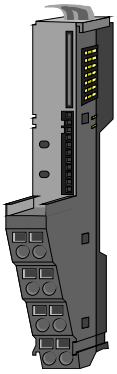




[1] Terminal module

[2] Electronic module

Terminal module

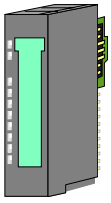


The *terminal module* serves to carry the electronic module, contains the backplane bus with power supply for the electronic, the DC 24V power section supply and the staircase-shaped terminal for wiring.

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

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

Electronic module



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

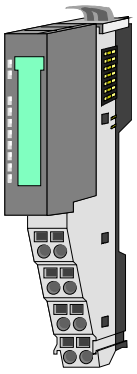
With an error the defective module may be exchanged for a functional module with standing installation.

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

At the front side there are LEDs for status indication.

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

Power module



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

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

Accessories

Shield bus carrier

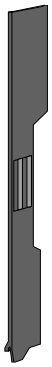
The shield bus carrier serves to carry the shield bus (10mm x 3mm) to connect cable shields.

Shield bus carriers, shield bus and shield fixings are not in the scope of delivery. They are only available as accessories.

The shield bus carrier is mounted underneath the terminal of the terminal module.

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

Bus cover

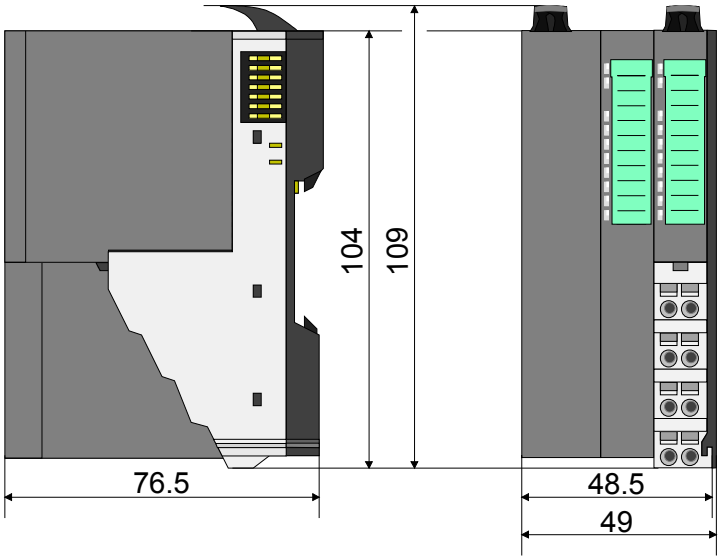


With each bus coupler, to protect the backplane bus connectors, there is a mounted bus cover in the scope of delivery. You have to remove the bus cover of the bus coupler before mounting a SLIO module.

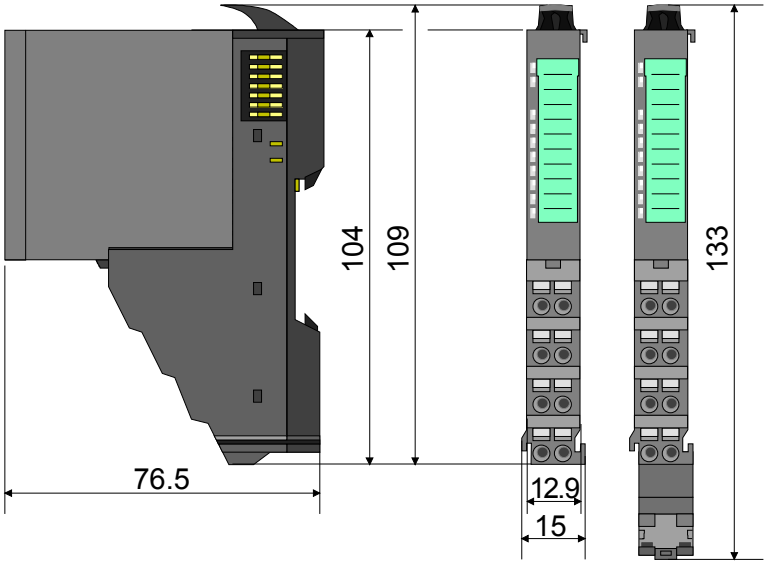
For the protection of the backplane bus connector you always have to mount the bus cover at the last module of your system again.

Dimensions

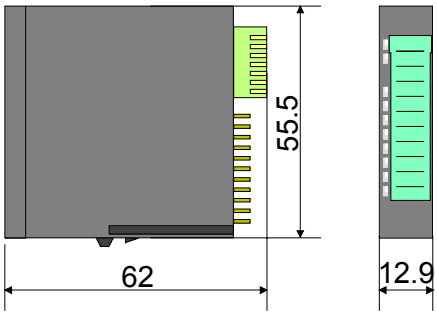
Dimensions bus coupler



Dimensions periphery module



Dimensions electronic module



Dimensions in mm

Installation

Functional principle

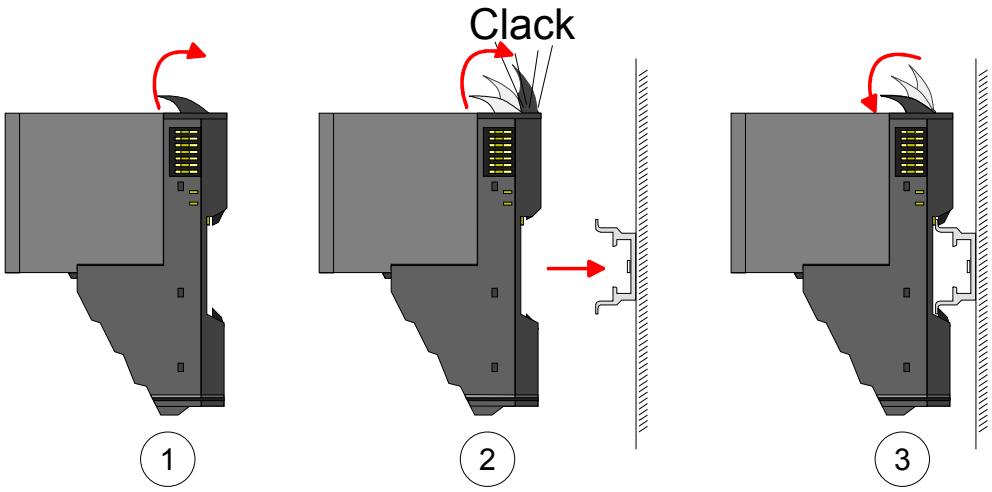
There is a locking lever at the top side of the terminal module. For mounting and demounting this locking lever is to be turned upwards until this engages audible.

Now the module may be pulled forward.

For mounting plug the module to the module installed before and push the module to the mounting rail guided by the strips at the upper and lower side of the module.

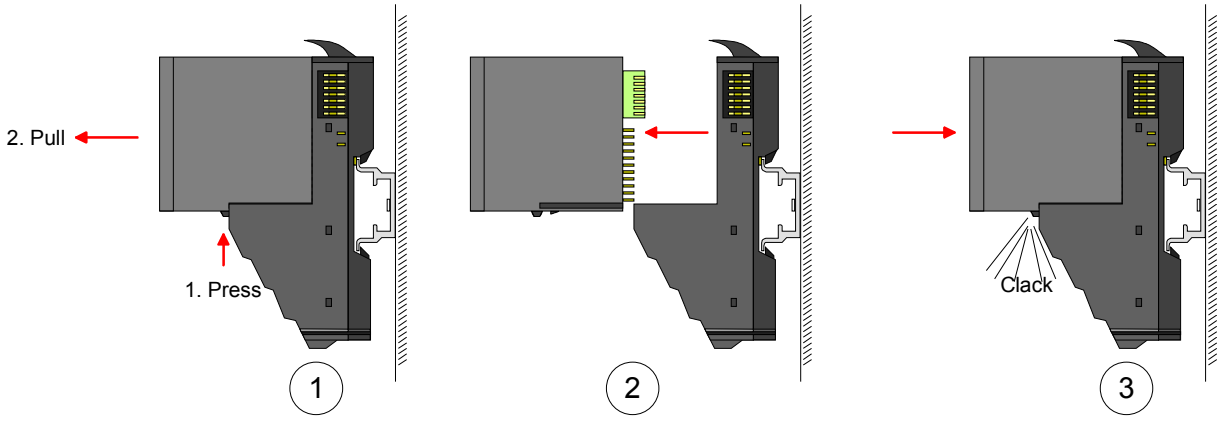
The module is fixed to the mounting rail by pushing downward the locking lever.

The modules may either separately be mounted to the mounting rail or as block. Here is to be considered that each locking lever is opened.



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

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



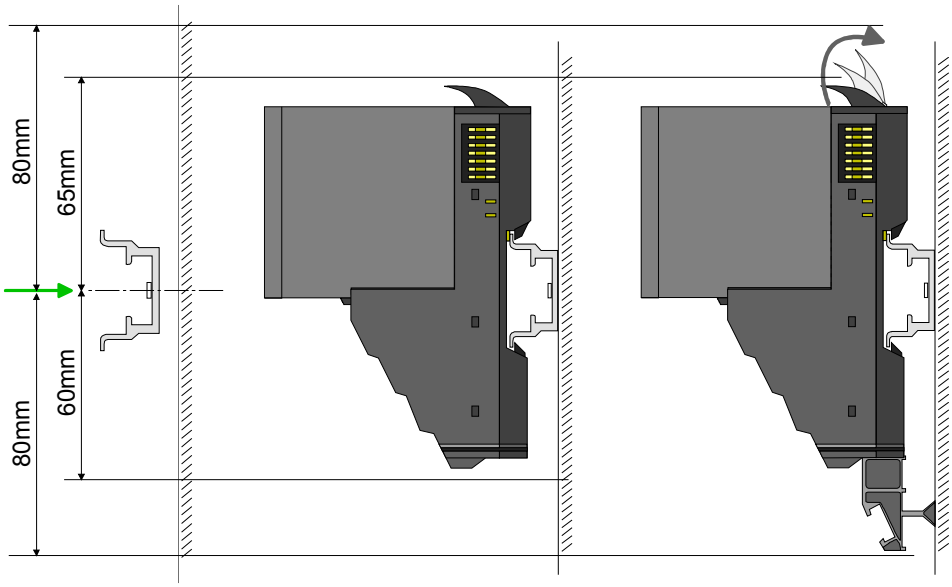
Mounting Proceeding

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

Up to 64 modules may be mounted. Please consider here that the sum current of the electronic power supply does not exceed the maximum value of 3A. By means of the power module 007-1AB10 the current of the electronic power supply may be expanded with 2A. More about this may be found at "Wiring".

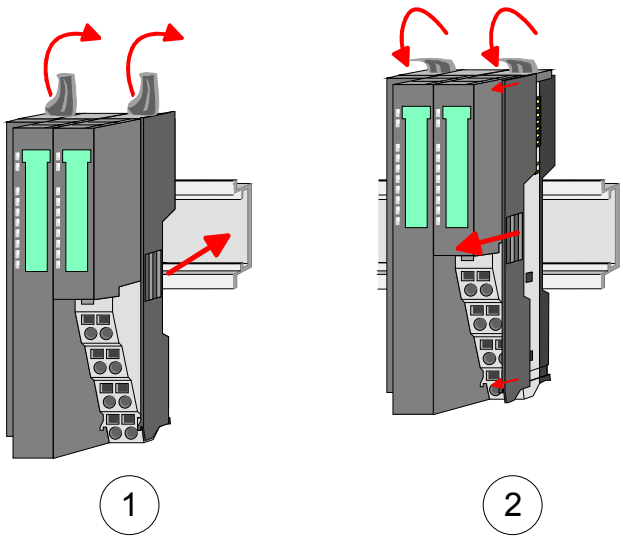
Mounting mounting rail

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



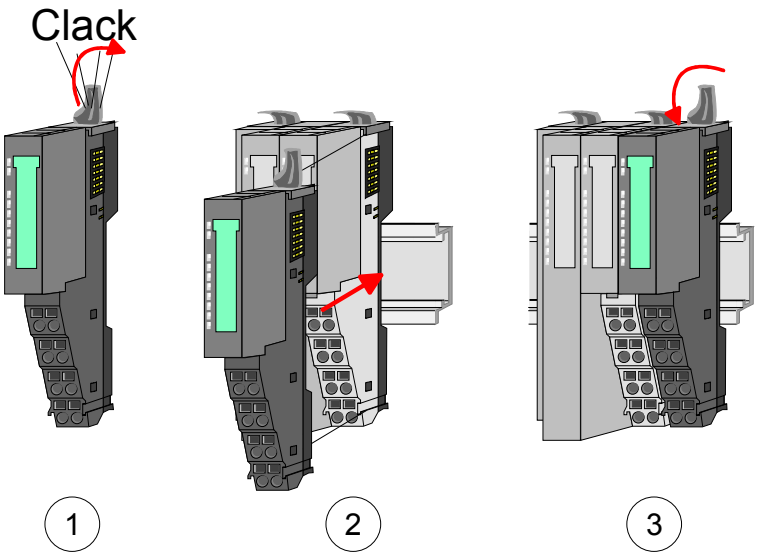
Mounting Head module (e.g. bus coupler)

- Start at the left side with the head module (e.g. bus coupler). For this turn both locking lever upwards, put the head module to the mounting rail and turn both locking lever downward.
- Before mounting the periphery modules you have to remove the bus cover at the right side of the Head module by pulling it forward. Keep the cover for later mounting.



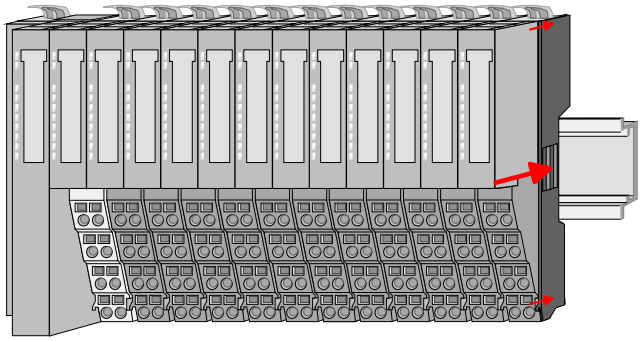
Mounting periphery modules

- Mount the periphery modules you want.



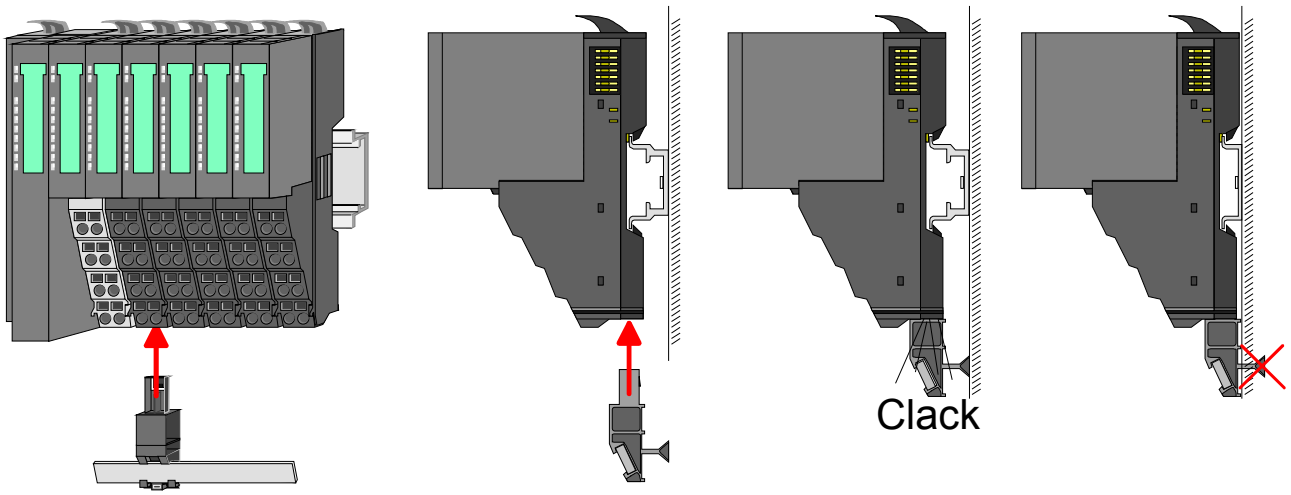
Mounting the bus cover

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



Mounting shield bus carrier

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



Demounting and module exchange

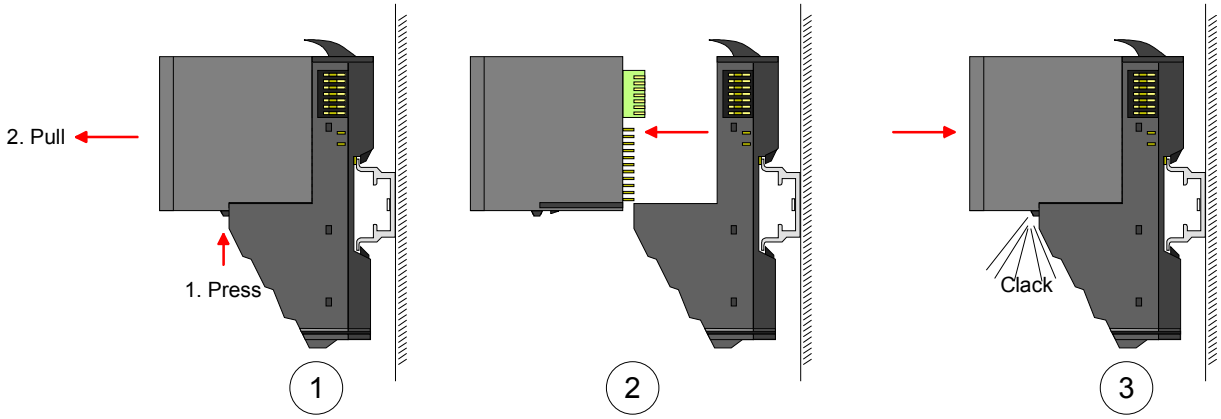
Proceeding

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

Exchange of an electronic module

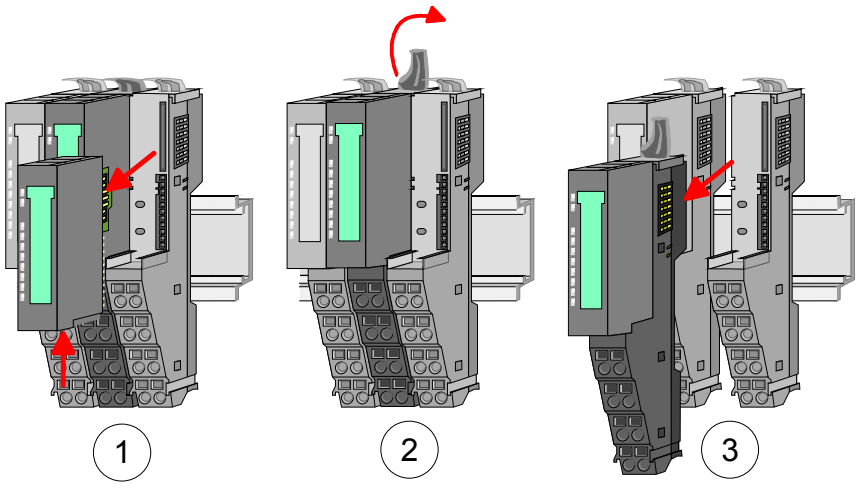
For the exchange of an electronic module, the electronic module may be pulled forward after pressing the unlocking lever at the lower side of the module.

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

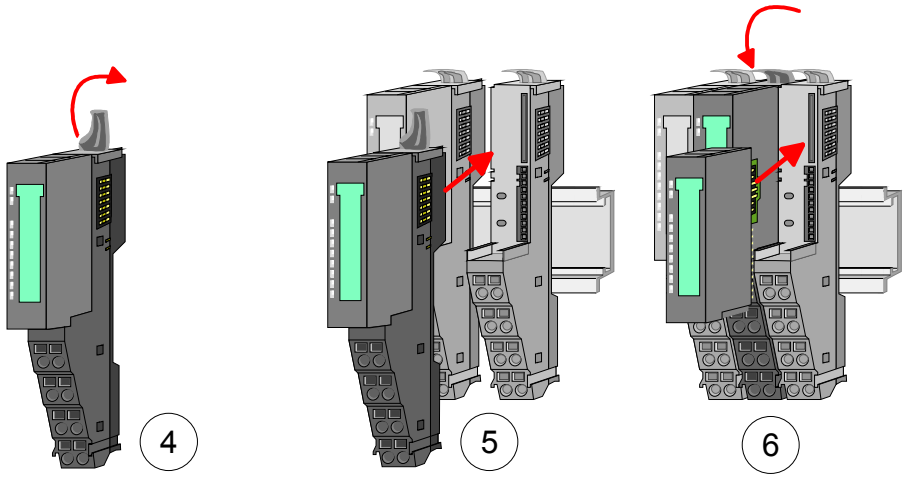


Exchange of a module

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



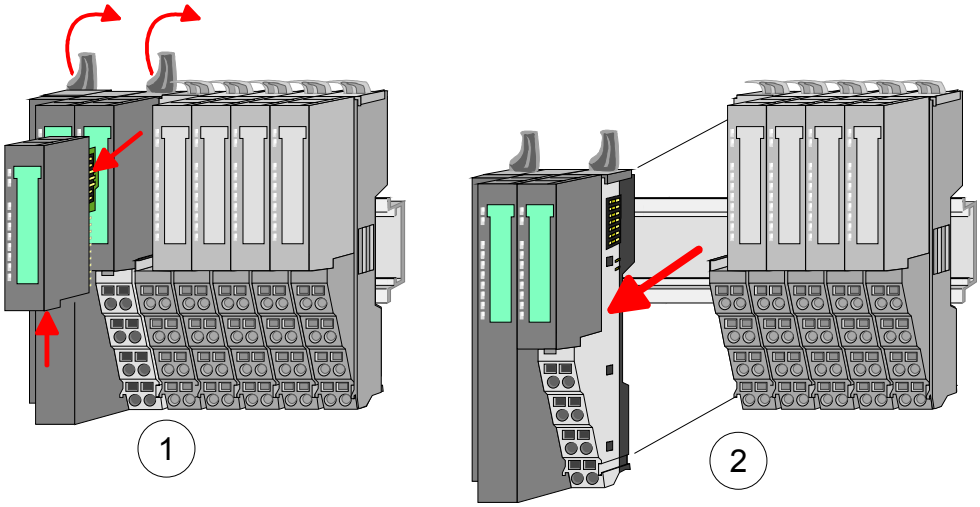
- For mounting turn the locking lever of the module to be mounted upwards.
- To mount the module put it to the gap between the both modules and push it, guided by the stripes at both sides, to the mounting rail.
- Turn the locking lever downward again.
- Plug again the electronic module, which you have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



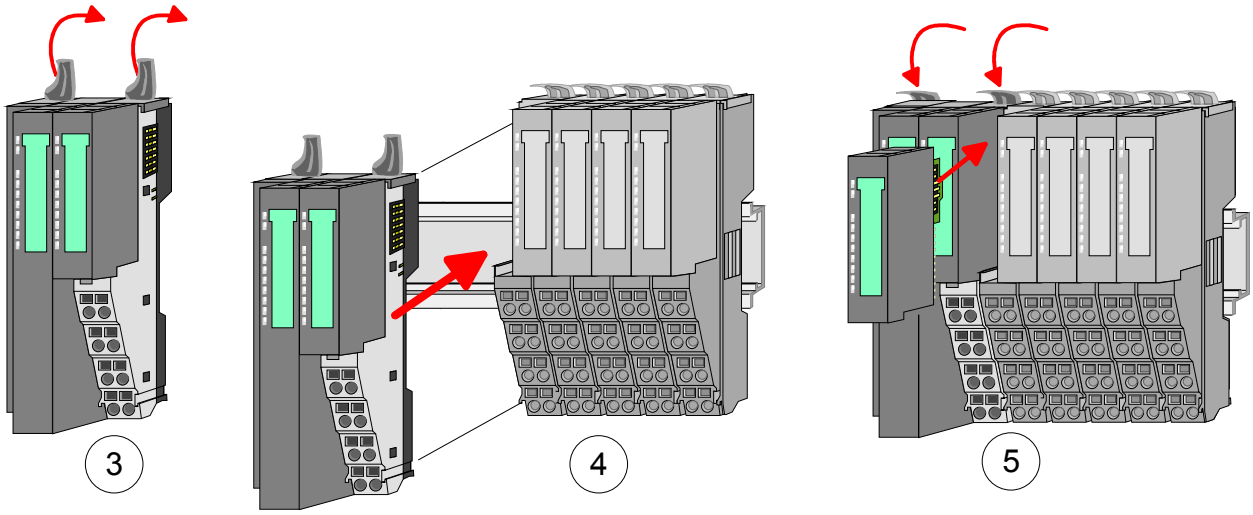
Exchange of a head module (e.g. bus coupler)

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

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

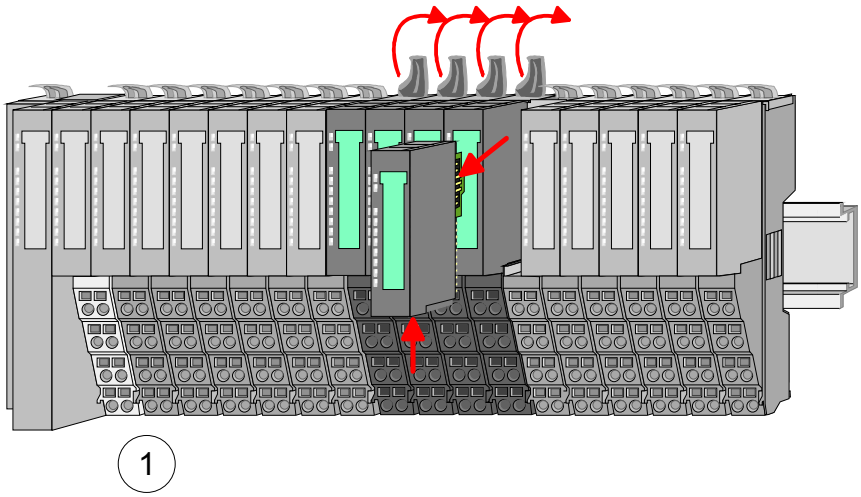


- For mounting turn all the locking lever of the head module to be mounted upwards.
- To mount the head module put it to the left module and push it, guided by the stripes, to the mounting rail.
- Turn all the locking lever downward again.
- Plug again the electronic module, which you have removed before.

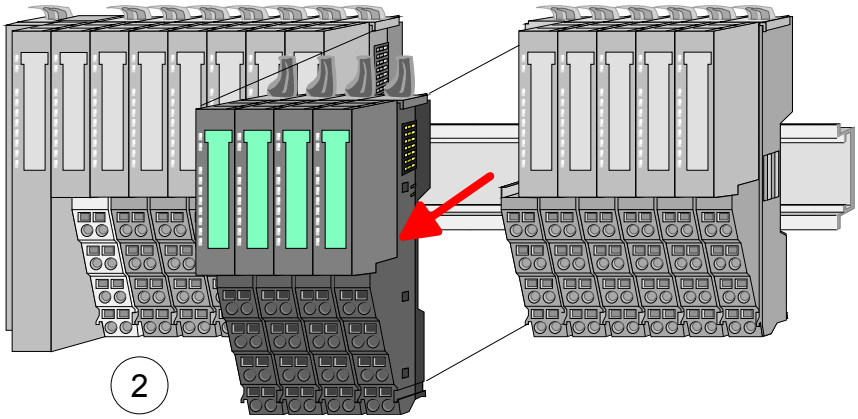


Exchange of a module group

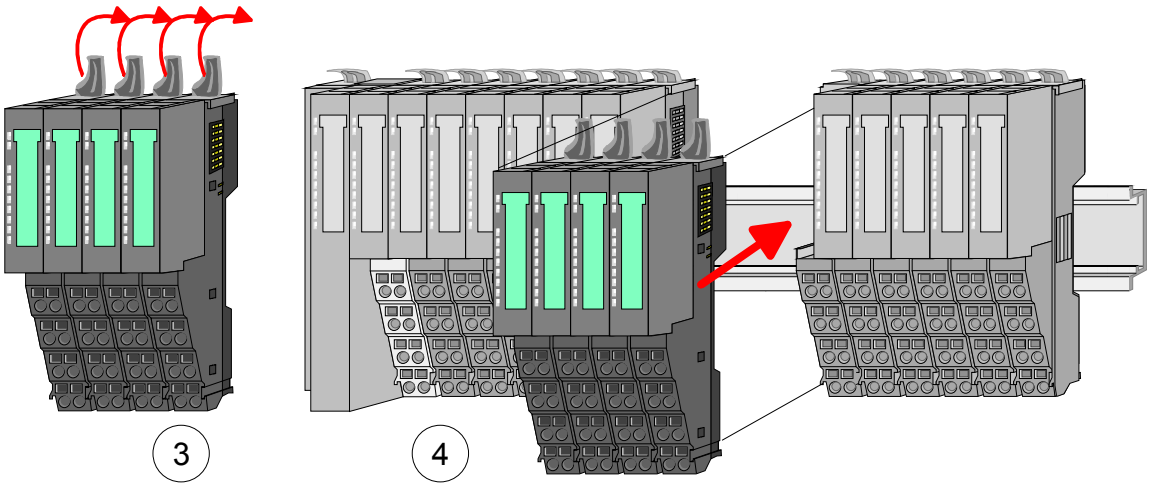
- Remove if exists the wiring of the module group. More about this may be found at "Wiring".
- Press the unlocking lever at the lower side of the just mounted right module of the module group and pull it forward.
- Turn all the locking lever of the module group to be exchanged upwards.



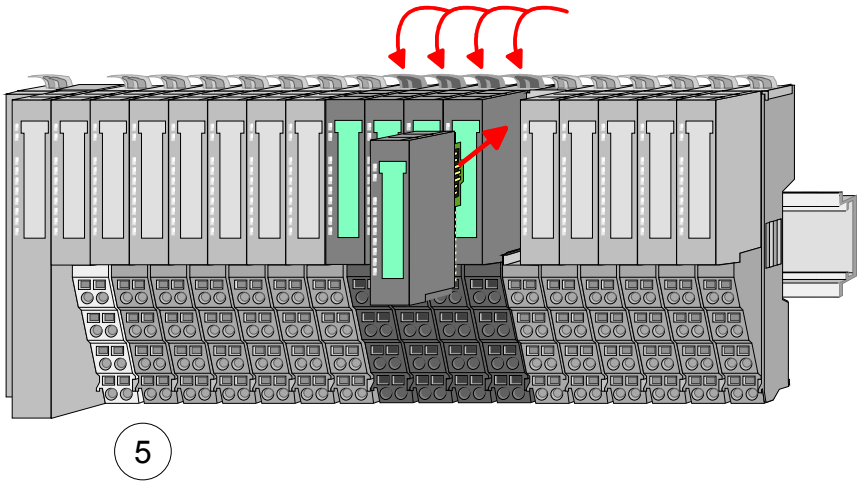
- Pull the module group forward.



- For mounting turn all the locking lever of the module group to be mounted upwards.
- To mount the module group put it to the gap between the both modules and push it, guided by the stripes at both sides, to the mounting rail.



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



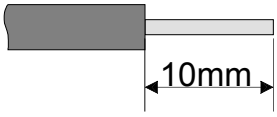
Wiring

Connectors

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

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

Data



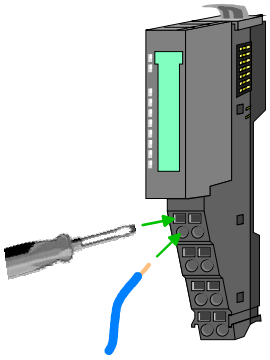
U_{max}: 240V AC / 30V DC

I_{max}: 10A

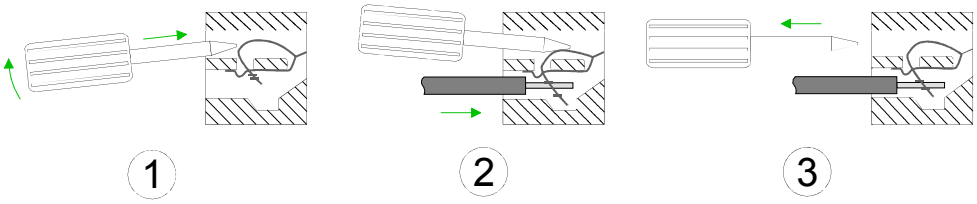
Cross section: 0.08 ... 1.5mm^2 (AWG 28 ... 16)

Stripping length: 10mm

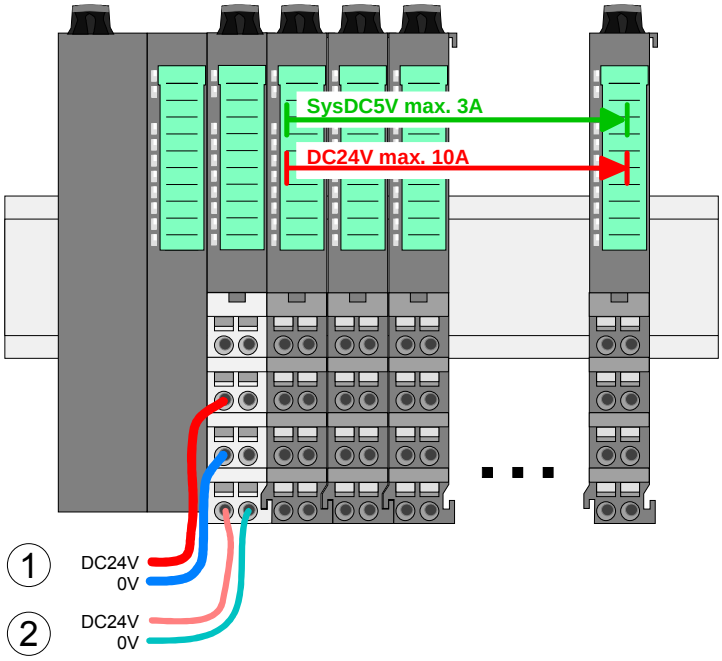
Wiring procedure



- 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.
- Insert the stripped end of wire into the round opening. You can use wires with a cross section of 0.08mm^2 to 1.5mm^2.
- By removing the screwdriver, the wire is securely fixed via the spring contact to the terminal.



Standard wiring



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

Attention!

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

Note!

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

Fusing

- The power section supply is to be externally protected with a fuse, which corresponds to the maximum current. This means max. 10A is to be protected with a 10A fuse (fast) respectively by a line circuit breaker 10A characteristics Z!
- It is recommended to externally protect the electronic power supply for bus coupler and I/O area with a 2A fuse (fast) respectively by a line circuit breaker 2A characteristics Z.
- The electronic power supply for the I/O area of the power module 007-1AB10 should also be externally protected with a 1A fuse (fast) respectively by a line circuit breaker 1A characteristics Z.

State of the electronic power supply via LEDs

After PowerON of the System SLIO the LEDs RUN respectively MF get on so far as the sum current does not exceed 3A.

With a sum current greater than 3A the LEDs may not be activated. Here the power module with the order number 007-1AB10 is to be placed between the peripheral modules. More concerning this may be found at the following page.

Deployment of the power modules

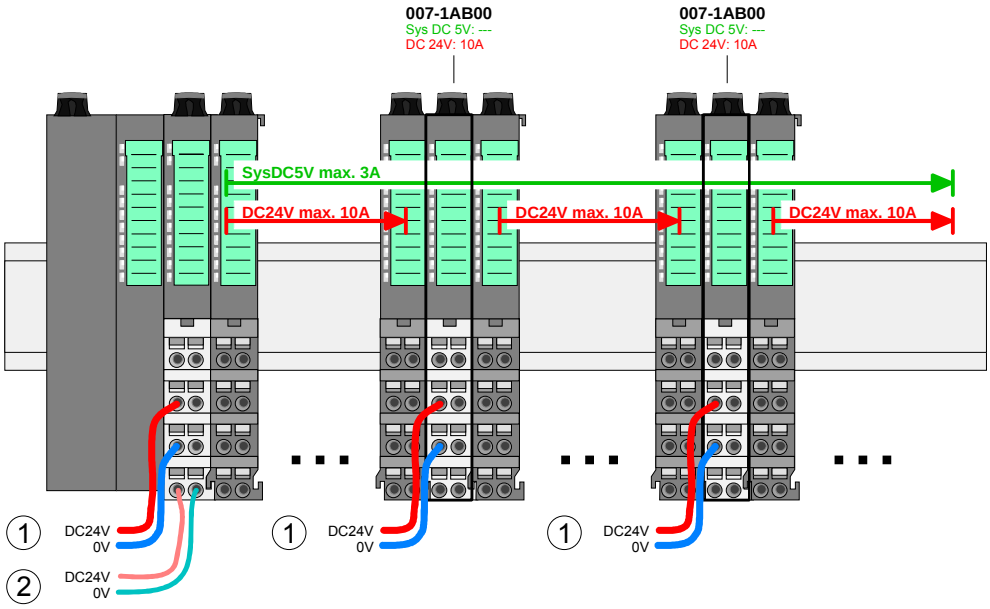
If the 10A for the power section supply is no longer sufficient, you may use the power module from VIPA with the order number 007-1AB00. So you have also the possibility to define isolated groups.

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

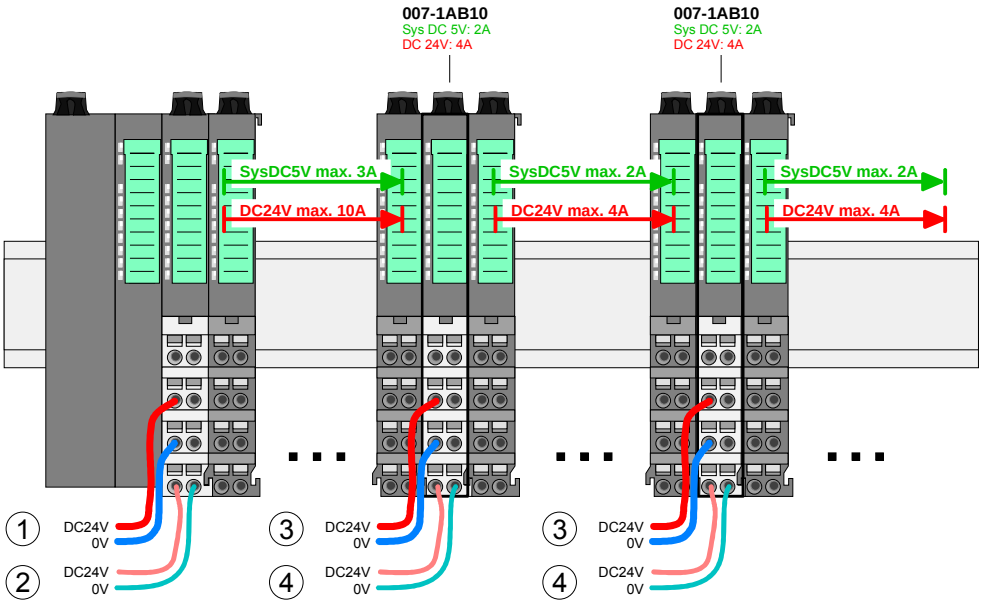
By placing the power module 007-1AB10 at the following backplane bus modules may be placed with a sum current of max. 2A. Afterwards the power module 007-1AB10 is to be placed again.

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

Power module 007-1AB00



Power module 007-1AB10



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

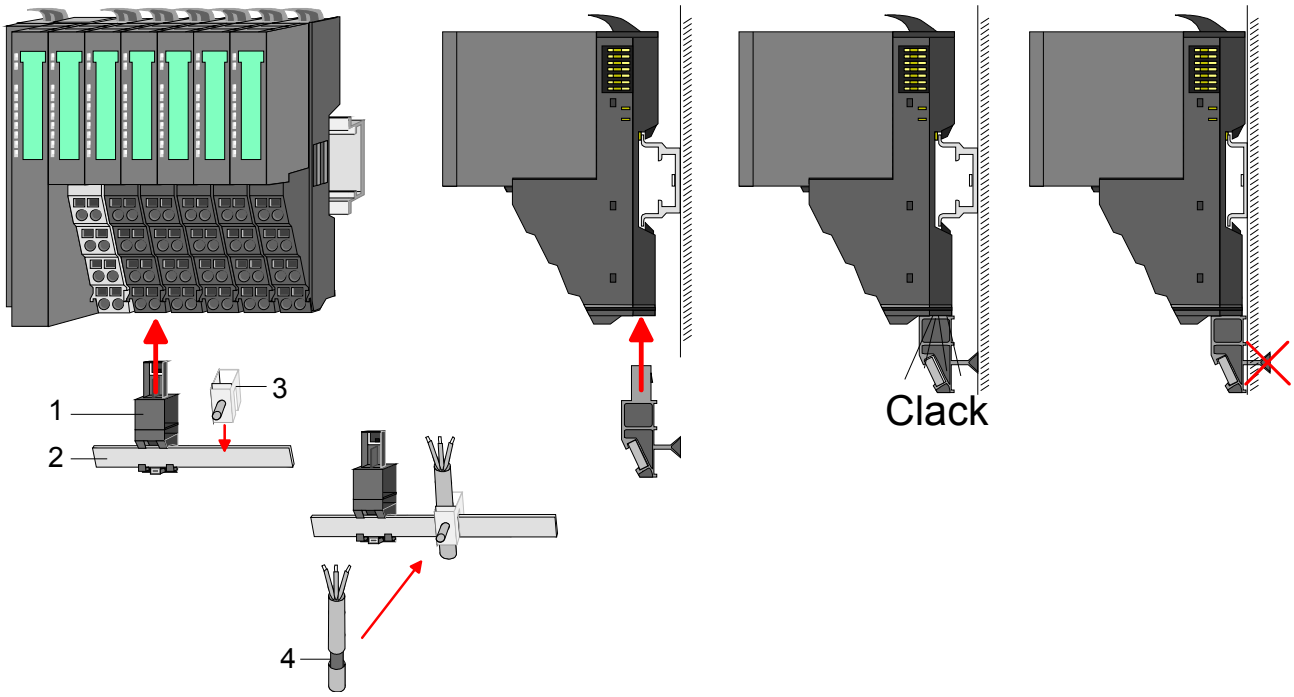
Shield attachment

To attach the shield the mounting of shield bus carriers are necessary.

The shield bus carrier (available as accessory) serves to carry the shield bus to connect cable shields.

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

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



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

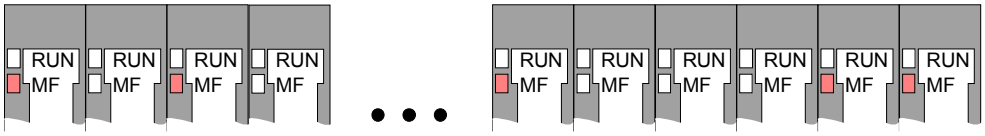
Trouble shooting - LEDs

General

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

In the following illustrations flashing LEDs are marked by ☼.

Sum current of the electronic power supply exceeded

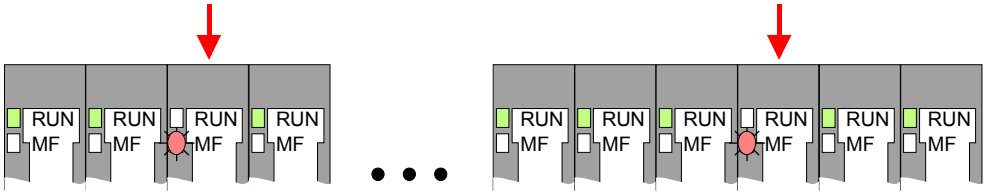


Behavior: After PowerON the RUN LED of each module is off and the MF LED of each module is sporadically on.

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

Remedy: As soon as the sum current of the electronic power supply is exceeded, always place the power module 007-1AB10.
More concerning this may be found above at "Wiring".

Error in configuration

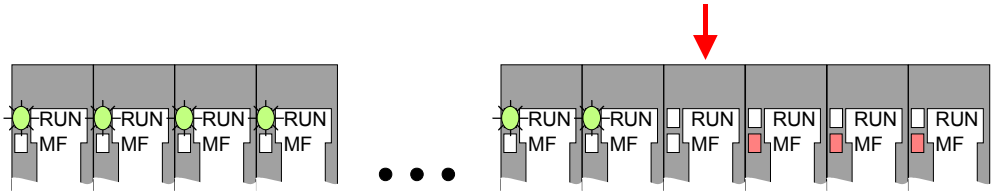


Behavior: After PowerON the MF LED of one module respectively more modules flashes. The RUN LED remains off.

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

Remedy: Match configuration and hardware structure.

Module failure



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

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

Remedy: Replace the defective module.

Installation guidelines

General

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

What means EMC?

Electromagnetic digestibility (EMC) means the ability of an electrical device, to function error free in an electromagnetic environment without being interferenced res. without interferencing the environment.

All System SLIO components are developed for the deployment in industrial environments and fulfill high demands on the EMC. Nevertheless you should project an EMC planning before installing the components and take conceivable interference causes into account.

Possible interference causes

Electromagnetic interferences may interfere your control via different ways:

- Fields
- I/O signal conductors
- Bus system
- Current supply
- Protected earth conductor

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

One differs:

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

Basic rules for EMC

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

- Take care of a correct area-wide grounding of the inactive metal parts when installing your components.
  - Install a central connection between the ground and the protected earth conductor system.
  - Connect all inactive metal extensive and impedance-low.
  - Please try not to use aluminum parts. Aluminum is easily oxidizing and is therefore less suitable for grounding.
- When cabling, take care of the correct line routing.
  - Organize your cabling in line groups (high voltage, current supply, signal and data lines).
  - Always lay your high voltage lines and signal res. data lines in separate channels or bundles.
  - Route the signal and data lines as near as possible beside ground areas (e.g. suspension bars, metal rails, tin cabinet).
- Proof the correct fixing of the lead isolation.
  - Data lines must be laid isolated.
  - Analog lines must be laid isolated. When transmitting signals with small amplitudes the one sided laying of the isolation may be favorable.
  - Lay the line isolation extensively on an isolation/protected earth conductor rail directly after the cabinet entry and fix the isolation with cable clamps.
  - Make sure that the isolation/protected earth conductor rail is connected impedance-low with the cabinet.
  - Use metallic or metalized plug cases for isolated data lines.
- In special use cases you should appoint special EMC actions.
  - Wire all inductivities with erase links, which are not addressed by the System SLIO modules.
  - For lightening cabinets you should prefer incandescent lamps and avoid luminescent lamps.
- Create a homogeneous reference potential and ground all electrical operating supplies when possible.
  - Please take care for the targeted employment of the grounding actions. The grounding of the PLC is a protection and functionality activity.
  - Connect installation parts and cabinets with the System SLIO in star topology with the isolation/protected earth conductor system. So you avoid ground loops.
  - If potential differences between installation parts and cabinets occur, lay sufficiently dimensioned potential compensation lines.

Isolation of conductors

Electrical, magnetically and electromagnetic interference fields are weakened by means of an isolation, one talks of absorption.

Via the isolation rail, that is connected conductive with the rack, interference currents are shunt via cable isolation to the ground. Hereby you have to make sure, that the connection to the protected earth conductor is impedance-low, because otherwise the interference currents may appear as interference cause.

When isolating cables you have to regard the following:

- If possible, use only cables with isolation tangle.
- The hiding power of the isolation should be higher than 80%.
- Normally you should always lay the isolation of cables on both sides. Only by means of the both-sided connection of the isolation you achieve high quality interference suppression in the higher frequency area.

  Only as exception you may also lay the isolation one-sided. Then you only achieve the absorption of the lower frequencies. A one-sided isolation connection may be convenient, if:
  - the conduction of a potential compensating line is not possible
  - analog signals (some mV res. µA) are transferred
  - foil isolations (static isolations) are used.
- With data lines always use metallic or metalized plugs for serial couplings. Fix the isolation of the data line at the plug rack. Do not lay the isolation on the PIN 1 of the plug bar!
- At stationary operation it is convenient to strip the insulated cable interruption free and lay it on the isolation/protected earth conductor line.
- To fix the isolation tangles use cable clamps out of metal. The clamps must clasp the isolation extensively and have well contact.
- Lay the isolation on an isolation rail directly after the entry of the cable in the cabinet. Lead the isolation further on to the System SLIO module and **don't** lay it on there again!

Please regard at installation!

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

Remedy: Potential compensation line

General data

Conformity and approval		
Conformity		
CE	2006/95/EC	Low-voltage directive
	2004/108/EC	EMC directive
Approval		
UL	UL 508	Approval for USA and Canada
others		
RoHS	-	Product is lead-free

Protection of persons and device protection		
Type of protection	-	IP20
Electrical isolation		
to the field bus	-	electrically isolated
to the process level	-	electrically isolated
Insulation resistance	EN 61131-2	-
Insulation voltage to reference earth		
Inputs / outputs	-	AC / DC 50V, test voltage AC 500V
Protective measures	-	against short circuit

Environmental conditions to EN 61131-2		
Climatic		
Storage / transport	EN 60068-2-14	-25…+70°C
Operation		
Horizontal installation	EN 61131-2	0…+60°C
Vertical installation	EN 61131-2	0…+60°C
Air humidity	EN 60068-2-30	RH1 (without condensation, rel. humidity 10…95%)
Pollution	EN 61131-2	Degree of pollution 2
Mechanical		
Oscillation	EN 60068-2-6	1g, 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 irradiation (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.

Chapter 2 Hardware description

Overview

Here the hardware components of the IM 053-1DP00 are more described. You will find the technical data at the end of this chapter.

Content

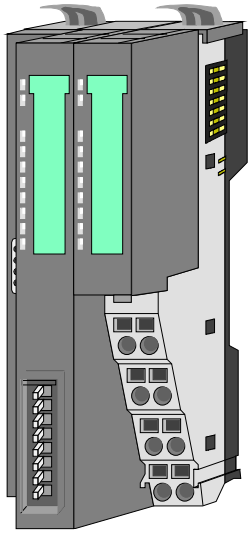
Properties

Features

- Field bus: PROFIBUS (DP-V0, DP-V1)
- PROFIBUS DP slave for max. 64 periphery modules
- Max. 244byte input and 244byte output data
- Supports every PROFIBUS transfer rates
- Integrated DC 24V power supply for power and electronic section supply of the periphery modules.

Use as DP-V1 slave

- 1 MSAC_C1 connection (Read, Write) with 244byte data (4byte DP-V1 header + 240byte user data)
- 3 MSAC_C2 connections (Initiate, Read, Write, DataTransport, Abort) with each 244byte data (4byte DP-V1 header + 240byte user data)

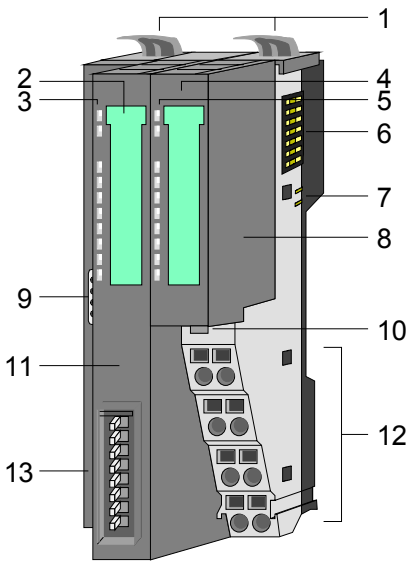


Order data

Type	Order number	Description
IM 053DP	VIPA 053-1DP00	PROFIBUS DP slave for SLIO

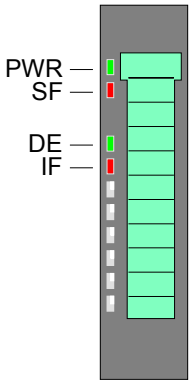
Structure

053-1DP00



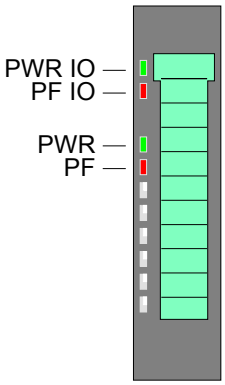
[1] Locking lever terminal module
[2] Labeling strip bus interface
[3] LED status indication bus interface
[4] Labeling strip power module
[5] LED status indication power module
[6] Backplane bus
[7] DC 24V power section supply
[8] Power module
[9] PROFIBUS jack bus interface
[10] Unlocking lever power module
[11] Bus interface
[12] Terminal
[13] Address selector

Status indication bus interface



LED	Color	Description	
PWR	green	●	Bus interface is power supplied
SF	red	●	Station fault, structure is not corresponding to the configuration
DE	green	●	State Data Exchange
		☼	Bus interface is waiting for parameters
IF	red	●	Internal error occurred

Status indication power module



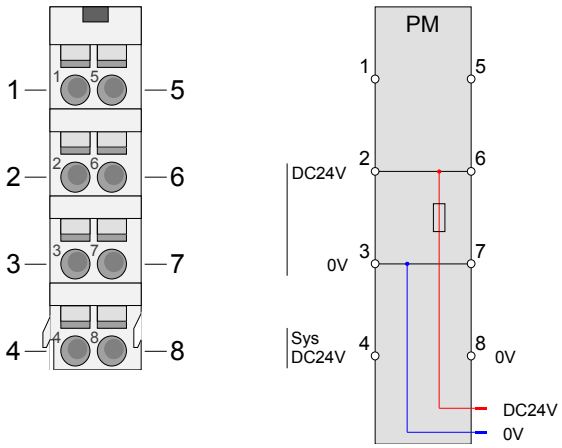
LED	Color	Description	
PWR IO	green	●	Power section supply OK
PF IO *	red	●	Fuse power section supply defective (Power fail)
PWR	green	●	Electronic section supply OK
PF	red	●	Fuse electronic section supply defective

on: ● blinking with 2Hz: ☼

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

Terminal

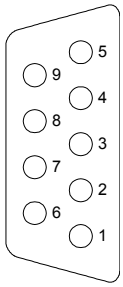
For wires with a core cross-section of 0.08mm² up to 1.5mm².

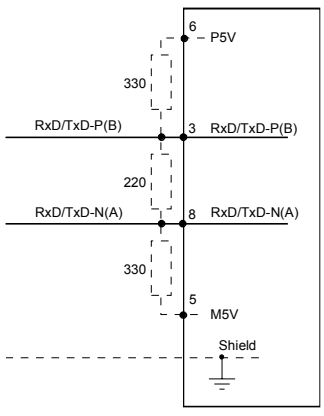


Pos.	Function	Type	Description
1	---	---	not connected
2	DC 24V	I	DC 24V for power section supply
3	0V	I	GND for power section supply
4	Sys DC 24V	I	DC 24V for electronic section supply
5	---	---	not connected
6	DC 24V	I	DC 24V for power section supply
7	0V	I	GND for power section supply
8	Sys 0V	I	GND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

I: Input

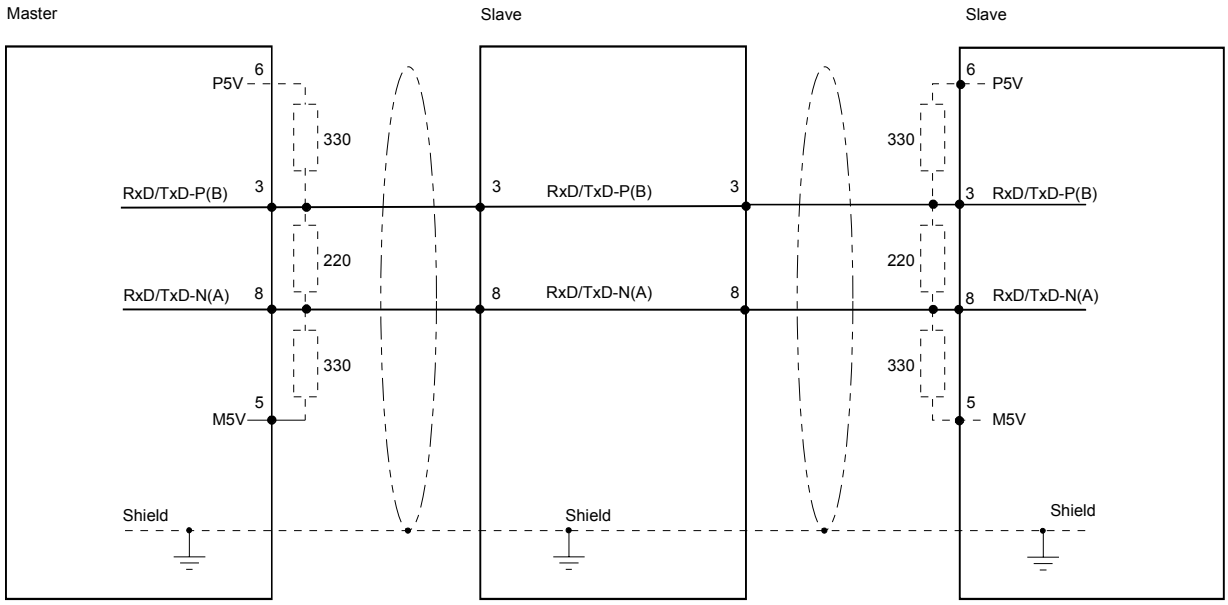
PROFIBUS jack bus interface



Pin	Assignment	Bus termination
1	Shield	
2	not connected	
3	RxD/TxD-P (line B)	
4	RTS	
5	M5V	
6	P5V	
7	not connected	
8	RxD/TxD-N (line A)	
9	not connected	

Connecting the bus

The following picture illustrates the terminating resistors of the respective start and end station.

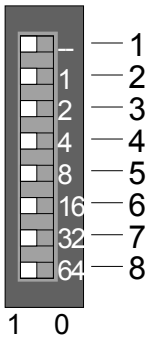


Note!

Please consider to terminate the last participants on the bus at both ends by activating the terminating resistor.

Address selector

Valid address may range from 1 to 125. Addresses must be unique on the bus. The slave address must have been preset before the bus coupler is turned on.



Pos.	Value	Example State	Example Address
1	not used	---	
2	1	1	
3	2	1	
4	4	0	1+2+32=35
5	8	0	Address: 35
6	16	0	
7	32	1	
8	64	0	

Technical data

Order number	053-1DP00
Type	IM 053DP
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)	90 mA
Current consumption (rated value)	0.95 A
Inrush current	2.8 A
I^2t	0.25 A^2s
Max. current drain at backplane bus	3 A
Max. current drain load supply	10 A
Power loss	3 W
Status information, alarms, diagnostics	
Status display	yes
Interrupts	yes, parameterizable
Process alarm	yes, parameterizable
Diagnostic interrupt	yes, parameterizable
Diagnostic functions	yes, parameterizable
Diagnostics information read-out	possible
Supply voltage display	green LED
Group error display	red 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	
Field bus	PROFIBUS-DP to EN 50170
Type of interface	RS485 isolated
Connector	Sub-D, 9-pin, female
Topology	Linear bus with bus termination at both ends
Electrically isolated	✓
Number of participants, max.	125
Node addresses	1 - 125
Transmission speed, min.	9.6 kbit/s
Transmission speed, max.	12 Mbit/s
Address range inputs, max.	244 Byte
Address range outputs, max.	244 Byte
Number of TxPDOs, max.	-
Number of RxPDOs, max.	-
Mechanical data	
Dimensions (WxHxD)	48.5 x 109 x 76.5 mm
Weight	155 g
Housing	
Material	PPE / PPE GF10
Mounting	rail 35 mm
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-25 °C to 70 °C
Certifications	
UL508 certification	yes

Chapter 3 Deployment

Overview

This chapter describes the usage of the IM 053-1DP00 with PROFIBUS. After a short introduction you may find here every information about assembly and project engineering. The chapter closes with the description of the PROFIBUS installation guidelines and the diagnostic functions.

Content

Basics

General

PROFIBUS is an international standard applicable to an open field bus for building, manufacturing and process automation. PROFIBUS defines the technical and functional characteristics of a serial field bus system that can be used to create a low (sensor-/actuator level) or medium (process level) performance network of programmable logic controllers.

Together with other field bus systems, PROFIBUS has been standardized in **IEC 61158** since 1999. *IEC 61158* bears the title "Digital data communication for measurement and control - Field bus for use in industrial control systems".

PROFIBUS comprises an assortment of compatible versions. The following details refer to PROFIBUS DP.

PROFIBUS DP-V0

PROFIBUS DP-V0 *(Decentralized Peripherals)* provides the basic functionality of DP, including cycle data exchange as well as diagnostics functions.

PROFIBUS DP is a special protocol intended mainly for automation tasks in a manufacturing environment. DP is very fast, offers Plug'n'Play facilities and provides a cost-effective alternative to parallel cabling between PLC and remote I/O. PROFIBUS DP was designed for high-speed cyclical data communication between bus master and slave systems.

PROFIBUS DP-V1

The original version, designed DP-V0, has been expanded to include version DP-V1, offering acyclic data exchange between master and slave.

DP-V1 contains enhancements geared towards process automation, in particular acyclic data communication for parameter assignment, operation, visualization and alarm handling of intelligent field devices, parallel to cycle user data communication. This permits online access to station using engineering tools. In addition, DP-V1 defines alarms. Examples for different types of alarms are status alarm, update alarm and a manufacturer-specific alarm.

Please note in operating the DP V1 functionality that your DP master supports DP-V1 as well. For this you find details in the documentation to your DP master.

Master and slaves

PROFIBUS distinguishes between active stations (master) and passive stations (slave).

Master devices

Master devices control the data traffic at the bus. It is also possible to operate with multiple masters on a PROFIBUS. This is referred to as multi-master operation. The protocol on the bus establishes a logical token ring between intelligent devices connected to the bus. Only the master that has the token, can communicate with its slaves.

A master is able to issue unsolicited messages if it is in possession of the access key (token). The PROFIBUS protocol also refers to masters as active participants.

Slave devices

A PROFIBUS slave acquires data from peripheral equipment, sensors, actuators and transducers. The VIPA PROFIBUS couplers are modular slave devices that transfer data between the periphery and the high-level master.

In accordance with the PROFIBUS standards these devices have no bus access rights. They are only allowed to acknowledge messages or return messages to a master when this has issued a request. Slaves are also referred to as passive participants.

Master class 1 MSAC_C1

The master of the class 1 is a central control that exchanges cyclically information with the decentral stations (slaves) in a defined message cycle. Typical MSAC_C1 devices are controls (PLC) or PCs. MSAC_C1 devices gain active bus access, which allows them to read the measuring values (inputs) of the field devices and to write the set points (outputs) of the actuators at a fixed time.

Master class 2 MSAC_C2

MSAC_C2 are employed for service and diagnostic. Here connected devices may be configured, measuring values and parameters are evaluated and device states can be requested. MSAC_C2 devices don't need to be connected to the bus system permanently. These also have active bus access.

Typical MSAC_C2 devices are engineering, project engineering or operator devices.

Communication

The bus transfer protocol provides two alternatives for the access to the bus:

Master with master

Master communication is also referred to as token-passing procedure. The token-passing procedure guarantees the accessibility of the bus. The permission to access the bus is transferred between individual devices in the form of a "token". The token is a special message that is transferred via the bus.

When a master is in possession of the token it has the permission to access the bus and it can communicate with any active or passive device. The token retention time is defined when the system is configured. Once the token retention time has expired, the token is passed to the following master which now has permission to access the bus and may therefore communicate with any other device.

Master-slave procedure

Data communication between a master and the slaves assigned to it is conducted automatically in a predefined and repetitive cycle by the master. You assign a slave to a specific master when you define the project. You can also define which DP slaves are included and which are excluded from the cyclic exchange of data.

Data communication between master and slave can be divided into a parameterization, a configuration and a data transfer phase. Before a DP slave is included in the data transfer phase the master checks whether the defined configuration corresponds with the actual configuration. This check is performed during the definition and configuration phase. The verification includes the device type, format and length information as well as the number of inputs and outputs. In this way a reliable protection from configuration errors is achieved.

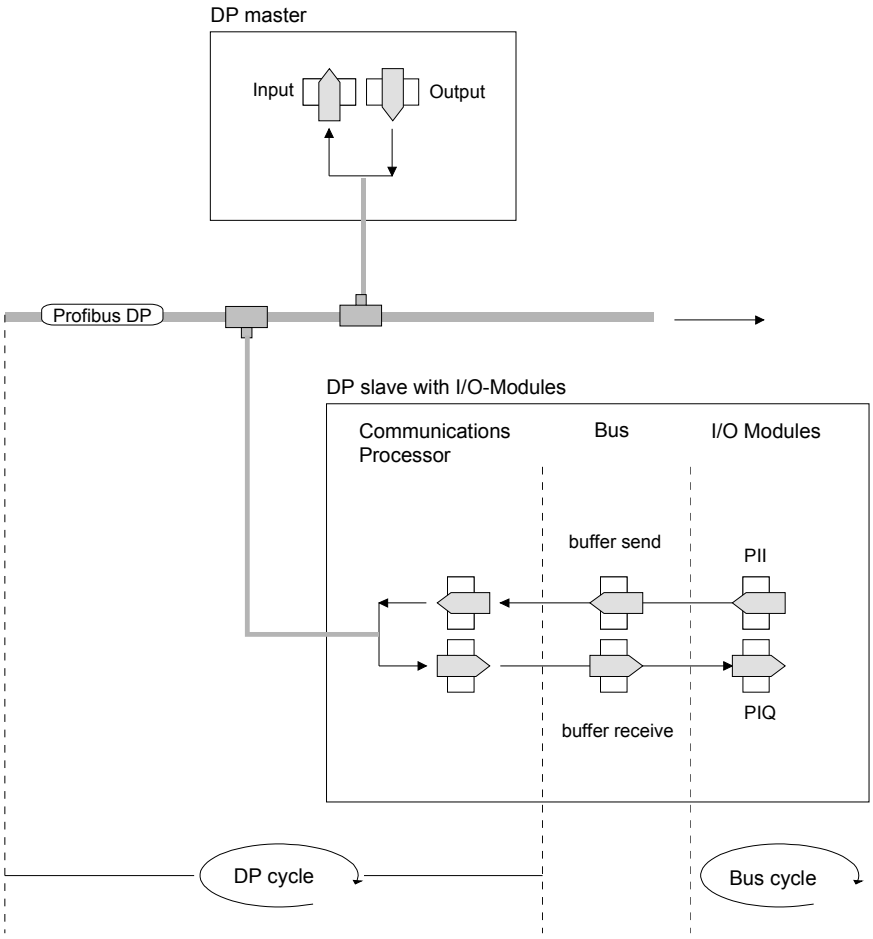
The master handles the transfer of application related data independently and automatically. You can, however, also send new configuration settings to a bus coupler.

When the status of the master is DE "Data Exchange" it transmits a new series of output data to the slave and the reply from the slave contains the latest input data.

Function cyclic data communication (DP-V0)

DP-V0 provides the basic functionality of DP, including cycle data exchange as well as station diagnostic, module diagnostic and channel-specific diagnostic.

Data is transferred cyclically between the DP master and the DP slave by means of transmit and receive buffers.



PII: process image of the inputs

PIQ: process image of the outputs

Bus cycle

A bus cycle saves all the input data from the modules in the PII and all the output data from the PIQ in the output modules. When the data has been saved the PII is transferred into the ”buffer send” and the contents of the ”buffer receive” is transferred into PIQ.

DP cycle

During a PROFIBUS cycle the master addresses all its slaves according to the sequence defined in the data exchange. The data exchange reads and writes data from/into the memory areas assigned to the PROFIBUS.

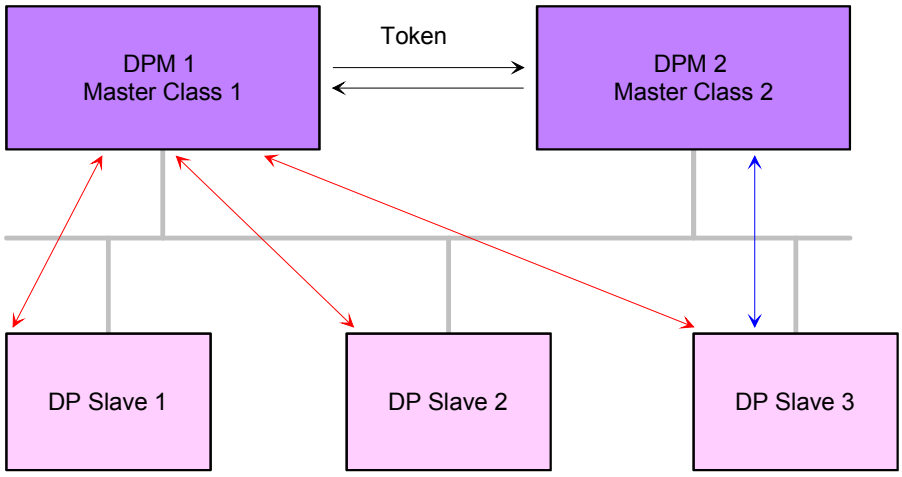
The contents of the PROFIBUS input area is entered into the ”buffer receive” and the data in the ”buffer send” is transferred into the PROFIBUS output area.

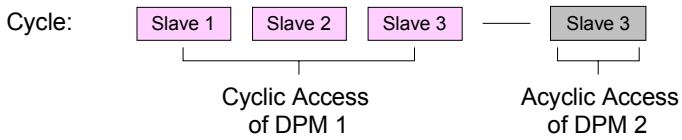
The exchange of data between DP master and DP slave is completed cyclically and it is independent from the bus cycle.

Function acyclic data communication (DP-V1)

The key feature of version DP-V1 is the extended function for acyclic data communication. This forms the requirement for parameterization and calibration of the field devices over the bus during runtime and for the introduction of confirmed alarm messages.

Transmission of acyclic data is executed parallel to cycle data communication, but with lower priority.





The DPM 1 (Master Class 1) has the token and is able to send messages to or retrieve them from slave 1, then slave 2, etc. in a fixed sequence until it reaches the last slave of the current list (MS0 channel); it then passes on the token to the DPM 2 (Master Class 2). This master can then use the remaining available time ("gap") of the programmed cycle to set up an acyclic connection to *any* slave (e.g. slave 3) to exchange records (MS2 channel); at the end of the current cycle time it returns the token to the DPM1.

The acyclic exchange of records can last for several scan cycles on their "gaps"; at the end, the DPM 2 uses the gap to clear the connection. Similarly as well as the DPM 2, the DPM 1 can also execute acyclic data exchange with slaves (MS1 channel).

Note!

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

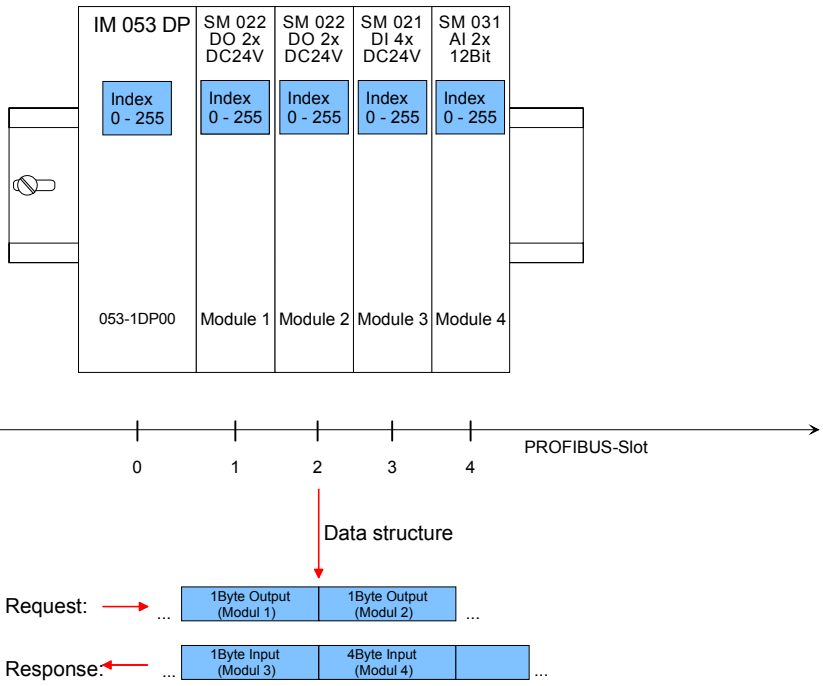
Further within PROFIBUS the slots are designated as *PROFIBUS-Slot*. The counting always begins with 1 as 1. peripheral module.

Addressing with PROFIBUS-Slot and Index

When addressing data, PROFIBUS assumes that the physical structure of the slaves is *modular* or it can be structured internally in logical functional units, so-called *modules*. This model is also used in the basic DP functions for cyclic data communication where each module has a constant number of input-/output bytes that are transmitted in a fixed position in the user data telegram. The addressing procedure is based on identifiers, which characterize a module type as input, output or a combination of both. All identifiers combined produce the configuration of the slave, which is also checked by the DPM when the system starts up.

The acyclic data communication is also based on this model. All record sets enabled for read/write access are also regarded as assigned to the modules and can be addressed using PROFIBUS-Slot and index.

The *PROFIBUS-Slot* addresses the module and the *index* addresses the record sets of a module. The PROFIBUS-Slot = 0 addresses data of the PROFIBUS coupler, PROFIBUS-Slot > 0 addresses the data of the function modules.



Each record set can be up to 240bytes. Compact devices are used as a unit of virtual modules. These can also be addressed with PROFIBUS-Slot and index. Through the length specification in the read/write request, it is also possible to read/write parts of a record set.

Note!

For the addressing at the deployment of the Siemens SIMATIC manager the following conventions are valid:

DP slave coupler: Setting of the *diagnostic address* as ID

Modules of the DP slave coupler: Setting of the *module address* as ID. For an output module you have to set additionally bit 15 of the module address (e.g. address 0004h becomes 8004h). With a combination module you have to set the lower one of the two addresses.

Services acyclic data communication

For the deployment of the DP-V1 services you have to take care that your master system supports DP-V1 communication. More detailed information about this may be found in the description of your master system. There are the following handling blocks available for CPUs, programmable with Siemens STEP7, like SPEED7 CPUs from VIPA:

SFB 52 Read record set from a DP slave

SFB 53 Write record set to a DP slave

SFB 54 Receive interrupt from a DP slave

In the following the services for the acyclic data transfer that are using that function blocks are shown.

More detailed information about the services and the DP-V0/V1 communication may be found in the PROFIBUS norm IEC 61158.

DPM 1
(Master class 1)

Acyclic data communication between DPM 1 and slaves	
Read	The master reads a record set from the slave.
Write	The master writes a record set to the slave.
Alarm	An alarm is transmitted from the slave to the master, which explicitly acknowledges receipt. The slave can only send a new alarm message after it has received this acknowledgment; this prevents any alarms being overwritten.
Alarm_ Acknowledge	The master acknowledges receipt of an alarm to the slave.
Status	A status message is transmitted from the slave to the master. There is no acknowledgment.
Data transmission is connection-oriented over a MS1 connection. This is set up by the DPM 1 and is closely linked to the connection for cyclic data communication. It can be used by the master that has parameterized and configured the respective slave.	

DPM 2
(Master class 2)

Services for acyclic data communication between DPM 2 and slaves	
Initiate / Abort	Setup and termination of a connection for acyclic data communication between DPM 2 and slave.
Read	The master reads a record set from the slave.
Write	The master writes a record set to the slave.
Data_Transport	The master can write application-specific data (specified in profiles) a cyclically to the slave and if required, read data from the slave in the same cycle.
Data transmission is connection-oriented over a MS2 connection. This is set up before the start of the acyclic data communication by the DPM 2 using the Initiate service. The connection is then available for Read, Write and Data_Transport services. The connection is terminated correspondingly. A slave can maintain several active MS2 connections simultaneously. A limitation is given by the resources available in the slave.	

Data transfer medium as RS485 interface

PROFIBUS employs screened twisted pair cable on the basis of the RS485 interface. The data transfer rate of the system is limited to a max. of 12Mbit/s.

The RS485 interface uses differential voltages. For this reason this kind of interface is less susceptible to interference than a plain voltage or current based interface. The network may be configured as linear or as tree structure. Your PROFIBUS coupler carries a 9pin socket. This socket is used to connect the PROFIBUS coupler to the PROFIBUS network as a slave.

Due to the bus structure of RS485, any station may be connected or disconnected without interruptions and a system can be commissioned in different stages. Extensions to the system do not affect stations that have already been commissioned. Any failures of stations or new devices are detected automatically.

Addressing

Every device on the PROFIBUS is identified by an address. This address must be an unique number in the bus system for System SLIO between 1 and 125.

GSD-file

For every PROFIBUS slave from VIPA there is a GSD file available. This file may either be found on the supplied storage media or at the download area of www.vipa.de.

The assignment of the GSD-file to your slave is shown in the following table:

SLIO order number	GSD-file
VIPA 053-1DP00(DP-V0)	VI000C19.gsd
VIPA 053-1DP00(DP-V1)	VI010C19.gsd

Please install the required files into your configuration tool. Details on the installation of the GSD and/or type files are available from the manual supplied with your configuration tool.

After the installation of the GSD file you will find this entry e.g. the DP-V1 slave in the hardware catalog from Siemens at:

PROFIBUS DP > Additional field devices > I/O > VIPA_SLIO > VIPA 053-1DP00 (DPV1)

Accessing the System SLIO

Overview

In the following you will find the description of accessing the following System SLIO areas via PROFIBUS DP:

- I/O area
- Parameter data
- Diagnostics data

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

Note!

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

Further within PROFIBUS the slots are designated as *PROFIBUS-Slot*. The counting always begins with 1 as 1. peripheral module.

GSD file

To configure the slave connections in your own configuration tool, you've got all the information about your VIPA-modules in form of an electronic data sheet file. Install this GSD file in you configuration tool. This file may either be found on the supplied storage media or at the download area of www.vipa.de. More information about installing the GSD may be found at the online help of the according engineering tool.

Structure and content of the GSD file are dictated by the PROFIBUS User Organization (PNO) and may be retrieved there.

Handling blocks

To set respectively change parameters during runtime there are according handling blocks for record set read/write necessary. Please regard with using these DP-V1 services that DP-V1 services are supported by your DP master.

There are the following handling blocks available for CPUs, programmable with Siemens STEP7, like SPEED7 CPUs from VIPA:

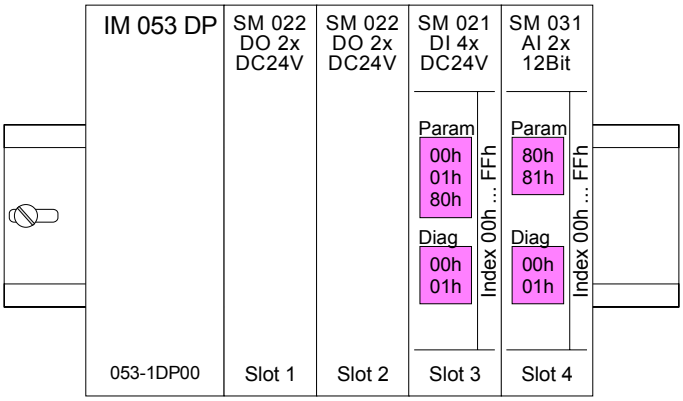
SFB 52 Read record set from a DP slave

SFB 53 Write record set to a DP slave

SFB 54 Receive interrupt from a DP slave

Addressing

Here the *PROFIBUS-Slot* addresses the module and the *index* addresses the record sets of a module (DS).



Accessing I/O area

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

Up to 244byte I/O data may be each transferred via PROFIBUS.

Please consider when using modules with a big address area e.g. analog modules the max. configuration with 64 System SLIO modules may not be reached

Accessing parameter data

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

With the startup of the PROFIBUS couplers these once were sent from the PROFIBUS DP master to the modules.

Read parameter data

Request for reading parameter data (DP-V1 Read.Request)

0x5E 8bit	**PROFIBUS-Slot** 8bit	**Index (DS)** 8bit	**Length (max. 240)** 8bit

Response with parameter data (DP-V1 Read.Response)

0x5E 8bit	**PROFIBUS-Slot** 8bit	**Index (DS)** 8bit	**Length (max. 240)** 8bit	**Data**

Write parameter data

Request for writing parameter data (DP-V1 Write.Request)

0x5F 8bit	**PROFIBUS-Slot** 8bit	**Index (DS)** 8bit	**Length (max. 240)** 8bit	**Data**

Response with length (DP-V1 Write.Response)

0x5F 8bit	**PROFIBUS-Slot** 8bit	**Index (DS)** 8bit	**Length** 8bit

The parameters are activated as soon as they where transferred.

Note!

The parameter record sets 00h respectively 01h are read respectively written with record set 7Eh respectively 7Fh. Write access with index 00h/01h causes an error!

Accessing diagnostics data

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

If your master system supports DP-V1 services, there is the possibility to request diagnostics data.

Request for reading diagnostics data (DP-V1 Read.Request)

0x5E 8bit	**PROFIBUS-Slot** 8bit	**Index (DS)** 8bit	**Length (max. 240)** 8bit

Response with diagnostics data (DP-V1 Read.Response)

0x5E 8bit	**PROFIBUS-Slot** 8bit	**Index (DS)** 8bit	**Length (max. 240)** 8bit	**Data**

Structure diagnostics data

Byte	Bit 7 ... Bit 0
0	Bit 0: Module malfunction, i.e. a problem has been detected Bit 1: Internal error in the module Bit 2: External error - module no longer addressable Bit 3: Channel error in the module Bit 4: External auxiliary supply missing Bit 5, 6: reserved Bit 7: Parameter assignment error
1	Bit 3 ... 0: Module class 1111: Digital module 0101: Analog module 1000: FM 0111: ETS, CP Bit 4: Channel information available Bit 7 ... 5: 0 (fix)
2	see module description
3	Bit 5 ... 0: reserved Bit 6: Hardware interrupt lost Bit 7: reserved
4	Channel type 70h: Module with digital inputs 71h: Module with analog inputs 72h: Module with digital outputs 73h: Module with analog outputs 74h: Module with analog in-/-outputs 76h: Counter
5	Number of diagnostic bits per channel
6	Number of channels per module
7	Position (channel) with diagnostic event
8	Diagnostic event on the channel/channel group 0 Assignment see module description
9	Diagnostic event on the channel/channel group 1 Assignment see module description
...	...
15	Diagnostic event on the channel/channel group 7 Assignment see module description
16 ... 19	32 bit value of the System SLIO µs ticker

Project engineering

General

For project engineering a DP master engineering tool can be used like the Siemens SIMATIC manager. Here you assign the according PROFIBUS DP slave modules to the DP master.
A direct assignment takes place via the PROFIBUS address that you set at the DP slave address selector.

By installing the corresponding GSD file the IM 053-1DP00 is listed at the hardware catalog as "VIPA_053-1DP00 (DP-V0 or DP-V1)".
You'll find this at:

PROFIBUS DP > Additional Field devices > I/O > VIPA_SLIO

GSD-file

For every PROFIBUS slave from VIPA there is a GSD file available. This file may either be found on the supplied storage media or at the download area of www.vipa.de.

The assignment of the GSD-file to your slave is shown in the following table:

SLIO order number	GSD-file
VIPA 053-1DP00(DP-V0)	VI000C19.gsd
VIPA 053-1DP00(DP-V1)	VI010C19.gsd

Please install the required files into your configuration tool. Details on the installation of the GSD and/or type files are available from the manual supplied with your configuration tool.

After the installation of the GSD file you will find this entry e.g. the DP-V1 slave in the hardware catalog from Siemens at:

PROFIBUS DP >Additional field devices > I/O > VIPA_SLIO >
VIPA 053-1DP00 (DPV1)

Project engineering

- Mount your PROFIBUS system.
- Start your project engineering tool with a new project.
- Configure a master system and create a new PROFIBUS subnet.
- For the project engineering of the IM 053-1DP00 take the "VIPA 053-1DP00 (DPV0)" or "VIPA 053-1DP00 (DPV1)" for each functionality from the hardware catalog and drag it to the DP master subnet.
- Enter a PROFIBUS address between 1 and 125 into the properties of the DP slave and set the same address at the address switch.
- Parameterize the DP slave (see parameters).
- Transfer your project to the PLC.

Parameter data IM 053-1DP00 DP-V0

At usage of the IM 053-1DP00 (DP-V0) you have the following parameter data:

Byte	Bit 7 ... Bit 0	Default
0	Bit 2 ... 0: 0 (fix) Bit 3: 0 = WD-Timebase 10ms 1 = WD-Timebase 1ms Bit 4: 0 (fix) Bit 5: 0 = Publisher-Mode not available 1 = Publisher-Mode available	00h
1	00h (fix)	00h
2	08h (fix)	08h
3	0Ah (fix)	0Ah
4	81h (fix)	81h
5	00h (fix)	00h
6	00h (fix)	00h
7	00h (fix)	00h
8	Bit 0: 0 = Identifier-related diagnostic enable 1 = Identifier-related diagnostic disable Bit 1: 0 = Module status enable 1 = Module status disable Bit 2: 0 = Channel-related diagnostic enable 1 = Channel-related diagnostic disable Bit 3: 0 = SLIO-Version in Diagnostic enable 1 = SLIO-Version in Diagnostic disable Bit 4: 0 (fix) Bit 5: 0 = V0: Diagnostic interrupt not available 1 = V0: Diagnostic interrupt available Bit 6: 0 = V0: Hardware interrupt not available 1 = V0: Hardware interrupt available Bit 7: 0 (fix)	78h
9	Bit 6 ... 0: 0 (fix) Bit 7: 0 = Data format Motorola 1 = Data format Intel (only at analog modules)	00h
10 ... 12	00h (fix)	00h

Parameter data IM 053-1DP00 DP-V1

At usage of the IM 053-1DP00 (DP-V1) you have the following parameter data:

Byte	Bit 7 ... Bit 0	Default
0	Bit 2 ... 0: 0 (fix) Bit 3: 0 = WD-Timebase 10ms 1 = WD-Timebase 1ms Bit 4: 0 (fix) Bit 5: 0 = Publisher-Mode not available 1 = Publisher-Mode available Bit 6: 0 = Fail-Safe-Mode not available 1 = Fail-Safe-Mode available Bit 7: 0 = DP-V1 mode disable 1 = DP-V1 mode enable	80h
1	Bit 0: Startup when expected/actual config. differ (must always be 0 else a parameterization error occurs) Bit 3 ... 1: 0 (fix) Bit 4: 0 = V1: Vendor-specific interrupt not available 1 = V1: Vendor-specific interrupt available Bit 5: 0 = V1: Diagnostic interrupt not available 1 = V1: Diagnostic interrupt available Bit 6: 0 = V1: Hardware interrupt not available 1 = V1: Hardware interrupt available Bit 7: 0 (fix)	70h
2	08h (fix)	08h
3	0Ah (fix)	0Ah
4	81h (fix)	81h
5	00h (fix)	00h
6	00h (fix)	00h
7	00h (fix)	00h
8	Bit 0: 0 = Identifier-related diagnostic enable 1 = Identifier-related diagnostic disable Bit 1: 0 = Module status enable 1 = Module status disable Bit 2: 0 = Channel-related diagnostic enable 1 = Channel-related diagnostic disable Bit 3: 0 = SLIO-Version in Diagnostic enable 1 = SLIO-Version in Diagnostic disable Bit 7 ... 4: 0 (fix)	08h
9	Bit 6 ... 0: 0 (fix) Bit 7: 0 = Data format Motorola 1 = Data format Intel (only at analog modules)	00h
10 ... 12	00h (fix)	00h

Data format Motorola/Intel

This parameter is exclusively evaluated with deployment of analog modules and 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 value is switched and it is worked with ascending significance, i.e. the 1. byte contains the low byte and 2. byte the high byte.

DP-V1 services

Overview

For the deployment of the DP-V1 services you have to take care that your master system supports DP-V1 communication. More detailed information about this may be found in the description of your master system. There are the following handling blocks available for CPUs, programmable with Siemens STEP7, like SPEED7 CPUs from VIPA:

SFB 52 Read record set from a DP slave

SFB 53 Write record set to a DP slave

SFB 54 Receive interrupt from a DP slave

Per default, one class-1 master and max 3 class-2 master connection with 244byte data (4byte DP-V1 header plus 240byte user data) are supported.

The class-1 master connection is established together with the cyclic connection and is activated via the parameterization. The class-2 master connection can be used by a C2 master that then communicates with the slave only a cyclical and provides an own connection establishment.

Data from DP-V1 slave

To access the DP-V1 slave with the Siemens SIMATIC manager the *diagnostic address*, which can be set by properties, is used as *ID*.

Using the following record set no. as *Index* you get access for reading (R) res. writing (W) to the listed DP slave elements:

Index/Record set	Access	Description
50h	R	Device name as ASCII code
51h	R	Hardware version as ASCII code
52h	R	Software version as ASCII code
53h	R	Serial number of the device in ASCII unsigned32
54h	R	FPGA version unsigned16
58h	R	Device configuration (list of module types) 1. word: number n of modules 2. ... n. word: Module type
59h	R	FPGA version (list of FPGA versions) 1. word: FPGA version head module 2. ... n. word: FPGA version function modules
5Bh	R	Serial number as ASCII code
FFh	R	I&M functions
	W	I&M functions

Device configuration

Via the index 58h, the module configuration of the DP slave may be monitored. With the 1. word you will get the number of modules. With the next words you will find the *module type* in the installed sequence.

The *module type* corresponds to the first 2 digits of the *module ID*. The *module ID* may be found in the technical data of the periphery module.

Data of the function modules

To access the function modules with the Siemens SIMATIC Manager the *module address*, which can be set by properties, is used as *ID*.

Using the following record set no. as *Index* you get access for reading (R) res. writing (W) to the listed function module elements:

Index/Record set	Access	Description
00h	R	Diagnostic - record set 0
01h	R	Diagnostic - record set 1
04h	R	read module process image
50h	R	Device name as ASCII code
51h	R	Hardware version as ASCII code
52h	R	Software version as ASCII code - is only shown with analog modules
53h	R	Serial number of the device unsigned32
54h	R	FPGA version unsigned16
5Bh	R	Serial number as ASCII code
7Dh	R/W	Every parameters record set 0 ... record set N
7Eh	R/W	Parameter record set 00h
7Fh	R/W	Parameter record set 01h
80h	R	Parameter record set 80h
	W	Parameter record set 80h
81h	R	Parameter record set 81h
	W	Parameter record set 81h
...		
AFh	R	Parameter record set AFh
	W	Parameter record set AFh
FFh	R	I&M Functions (only IM0)
	W	I&M Functions

DP-V1 - I&M data

Overview

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

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

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

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

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

Note!
Only one DP master may access at one time the I&M data.

Structure

The data structure of the I&M data corresponds to the specifications of PROFIBUS guideline - order no. 3.502, version 1.1 from May 2003.

I&M data	Access	Preset	Explanation
Identification data 0: IM_INDEX: 65000			
MANUFACTURER_ID	read (2byte)	022Bh (555)	Name of the manufacturer (555 = VIPA GmbH)
ORDER_ID	read (20byte)	depends on the module	Order number of the module VIPA 053-1DP00
SERIAL_NUMBER	read (16byte)	depends on the module	Serial number of the module for clear identification.
HARDWARE_REVISION	read (2byte)	depends on the module	Hardware revision of the module which is incremented on changes at the firmware.

continued ...

... continue

I&M data	Access	Preset	Explanation
SOFTWARE_REVISION	read (4byte)	Firmware version Vxyz	Firmware version of the module. An increase of the firmware version also increases the hardware revision
REVISION_COUNTER	read (2byte)	0000h	reserved
PROFILE_ID	read (2byte)	F600h	Generic Device
PROFILE_SPECIFIC_TYPE	read (2byte)	0003h 0004h 0005h	I/O modules Communication modules Interface modules
IM_VERSION	read (2byte)	0101h	Information about the version of the I&M data. (0101h = version 1.1)
IM_SUPPORTED	read (2byte)	001Fh	Information about available I&M-Data (IM_INDEX: 650000 ...65004)
Maintenance data 1: IM_INDEX: 65001			
TAG_FUNCTION	read/write (32byte)	_	Clear module ID inside the system
TAG_LOCATION	read/write (22byte)	_	Location of installation of the module
Maintenance data 2: IM_INDEX: 65002			
INSTALLATION_DATE	read/write (16byte)	_	Date and if applicable time of installation of the module
RESERVED	read/write (38byte)	_	reserved
Maintenance data 3: IM_INDEX: 65003			
DESCRIPTOR	read/write (54byte)	_	Commentary to the module
Maintenance data 4: IM_INDEX: 65004			
SIGNATURE	read/write (54byte)	_	Commentary to the module

PROFIBUS installation guidelines

PROFIBUS in general

- A PROFIBUS DP network may only be built up in linear structure.
- PROFIBUS DP consists of minimum one segment with at least one master and one slave.
- A master has always been deployed together with a CPU.
- PROFIBUS supports max. 126 participants.
- Per segment a max. of 32 participants is permitted.
- The max. segment length depends on the transfer rate:

9.6 ... 187.5kbit/s	→	1000m
500kbit/s	→	400m
1.5Mbit/s	→	200m
3 ... 12Mbit/s	→	100m

- Max. 10 segments may be built up. The segments are connected via repeaters. Every repeater counts for one participant.
- All participants are communicating with the same transfer rate. The slaves adjust themselves automatically on the transfer rate.
- The bus has to be terminated at both ends.
- Master and slaves are free combinable.

Transfer medium

As transfer medium PROFIBUS uses an isolated twisted-pair cable based upon the RS485 interface.

The RS485 interface is working with voltage differences. Though it is less irritable from influences than a voltage or a current interface. You are able to configure the network as well linear as in a tree structure.

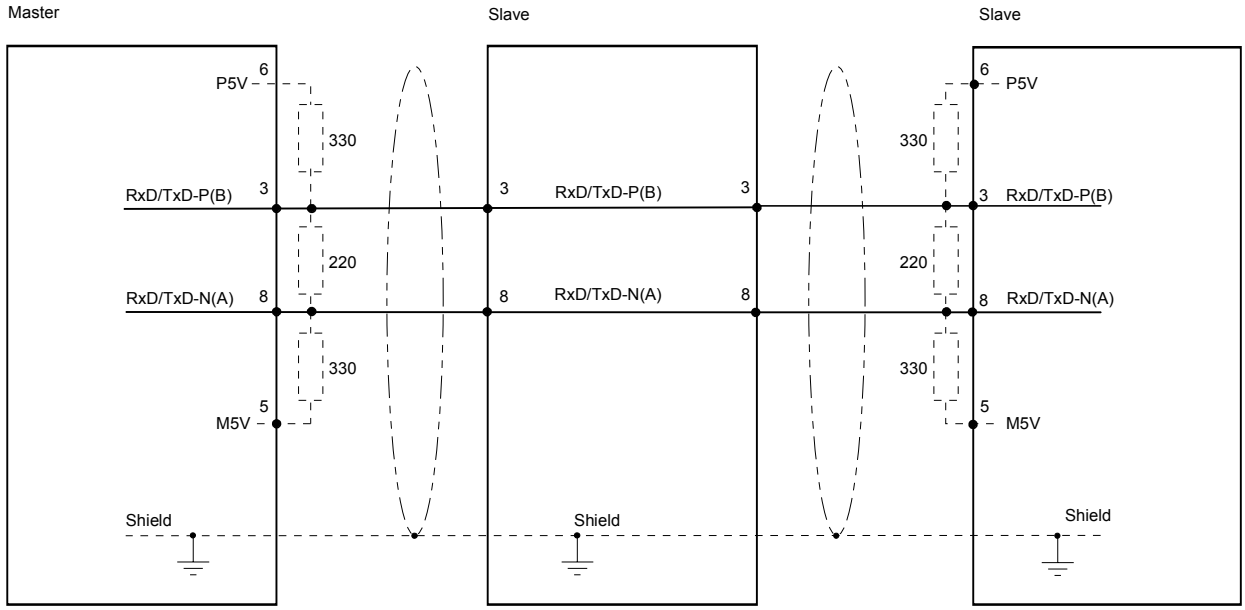
Via the PROFIBUS jack the PROFIBUS coupler is connected to the PROFIBUS network.

Max. 32 participants per segment are permitted. The segments are connected via repeaters. The maximum segment length depends on the transfer rate.

PROFIBUS DP uses a transfer rate between 9.6kbit/s and 12Mbit/s, the slaves are following automatically. All participants are communicating with the same transfer rate.

The bus structure under RS485 allows an easy connection res. disconnection of stations as well as starting the system step by step. Later expansions don’t have any influence on stations that are already integrated. The system realizes automatically if one partner had a fail down or is new in the network.

Bus connection The following picture illustrates the terminating resistors of the respective start and end station.



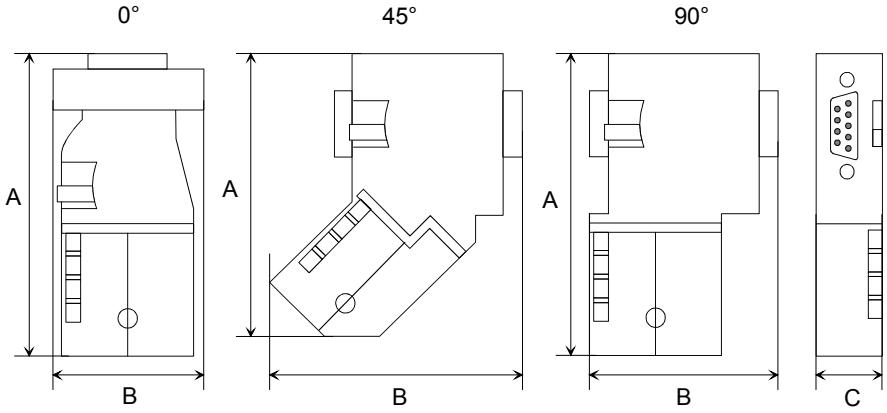
Note!

The PROFIBUS line has to be terminated with its ripple resistor. Please make sure to terminate the last participants on the bus at both ends by activating the terminating resistor.

EasyConn bus connector

In systems with more than two stations all partners are wired in parallel. For that purpose, the bus cable must be feed-through uninterrupted.

Via the order number VIPA 972-0DP10 you may order the bus connector "EasyConn". This is a bus connector with switchable terminating resistor and integrated bus diagnostic.

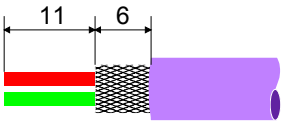


	0°	45°	90°
A	64	61	66
B	34	53	40
C	15.8	15.8	15.8

all in mm

Note!

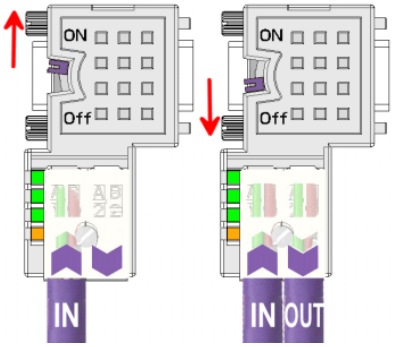
To connect this EasyConn plug, please use the standard PROFIBUS cable type A (EN50170). Starting with release 5 you also can use highly flexible bus cable: Lapp Kabel order no.: 2170222, 2170822, 2170322.
With the order no. 905-6AA00 VIPA offers the "EasyStrip" de-isolating tool that makes the connection of the EasyConn much easier.



Dimensions in mm

Termination with "EasyConn"

The "EasyConn" bus connector is provided with a switch that is used to activate a terminating resistor.



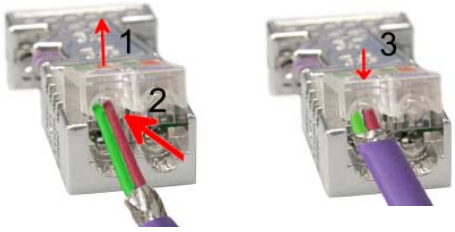
Attention!

The terminating resistor is only effective, if the connector is installed at a slave and the slave is connected to a power supply.

Note!

A complete description of installation and deployment of the terminating resistors is delivered with the connector.

Assembly



- Loosen the screw.
- Lift contact-cover.
- Insert both wires into the ducts provided (watch for the correct line color as below!)
- Please take care not to cause a short circuit between screen and data lines!
- Close the contact cover.
- Tighten screw
  (max. tightening torque 4Nm).

Please note: The green line must be connected to A, the red line to B!

Diagnostic functions

Structure of the 053-1DP00 diagnostic data

PROFIBUS DP provides an extensive set of diagnostic functions for quick error localization. Diagnostic messages are transferred via the bus and collected by the master. There the diagnostic data may be accessed e.g. by your projecting tool.

The diagnostic messages that are created by the PROFIBUS slave have, depending on the parameterization, a length of 122byte.
As soon as the PROFIBUS slave sends a diagnostic to the master, the max. of 122byte diagnostic data are prepended by 6byte standard diagnostic data:

Byte 0 ... 5	Standard diagnostic data: Is only prepended at transfer to the master via PROFIBUS	
x ... x+8	Identifier-related diagnostic	May be enabled or disabled via parameterization
x ... x+19	Module status	
max. 21·(x ... x+2)	Channel-related diagnostic	
x ... x+19	Interrupt	

Standard diagnostic data

At the transfer of a diagnostic to the master the slave standard diagnostic data are prepended to the diagnostic bytes. More detailed information to the structure of the slave standard diagnostic data is to find in the standard papers of the PROFIBUS User Organization.

The slave standard diagnostic data have the following structure:

Standard diagnostic

Byte	Bit 7 ... Bit 0
0	Bit 0: Bit is always at 0 Bit 1: slave is not yet ready for exchange data Bit 2: Configuration data does not correspond to actual configuration Bit 3: External slave diagnostic available Bit 4: Request function is not supported by slave Bit 5: 0 (fix) Bit 6: Wrong parameterization Bit 7: 0 (fix)
1	Bit 0: New parameters have to be assigned to slave Bit 1: Statistic Diagnostic Bit 2: 1 (fix) Bit 3: Response monitoring has been enabled Bit 4: "FREEZE" control command received Bit 5: "SYNC" control command received Bit 6: reserved Bit 7: 0 (fix)
2	Bit 6 ... 0: reserved Bit 7: Diagnostic data overflow
3	Master address after parameterization FFh: Slave has not been parameterized
4	ID number High Byte
5	ID number Low Byte

Identifier-related diagnostic

Via the Identifier-related diagnostic you gain information at which plug-in location (module) an error has occurred.

More detailed information about the error is available via the *Module state* and the *channel-related diagnostic*.

The identifier-related diagnostic can be activated via the parameterization and has the following structure:

Identifier-related diagnostic

Byte	Bit 7 ... Bit 0
X	Bit 5 ... 0: 000101 (fix) Length of the Identifier-related diagnostic Bit 7 ... 6: 01 (fix) Code for Identifier-related diagnostic
X+1	The bit is set if one of the following occurs: - a module is removed - a not configured module is inserted - an inserted module cannot be accessed - a module reports a diagnostic interrupt Bit 0: Entry for module on PROFIBUS-Slot 1 Bit 1: Entry for module on PROFIBUS-Slot 2 Bit 2: Entry for module on PROFIBUS-Slot 3 Bit 3: Entry for module on PROFIBUS-Slot 4 Bit 4: Entry for module on PROFIBUS-Slot 5 Bit 5: Entry for module on PROFIBUS-Slot 6 Bit 6: Entry for module on PROFIBUS-Slot 7 Bit 7: Entry for module on PROFIBUS-Slot 8
X+2	Bit 0: Entry for module on PROFIBUS-Slot 9 Bit 1: Entry for module on PROFIBUS-Slot 10 Bit 2: Entry for module on PROFIBUS-Slot 11 Bit 3: Entry for module on PROFIBUS-Slot 12 Bit 4: Entry for module on PROFIBUS-Slot 13 Bit 5: Entry for module on PROFIBUS-Slot 14 Bit 6: Entry for module on PROFIBUS-Slot 15 Bit 7: Entry for module on PROFIBUS-Slot 16
X+3	Bit 0: Entry for module on PROFIBUS-Slot 17 Bit 1: Entry for module on PROFIBUS-Slot 18 Bit 2: Entry for module on PROFIBUS-Slot 19 Bit 3: Entry for module on PROFIBUS-Slot 20 Bit 4: Entry for module on PROFIBUS-Slot 21 Bit 5: Entry for module on PROFIBUS-Slot 22 Bit 6: Entry for module on PROFIBUS-Slot 23 Bit 7: Entry for module on PROFIBUS-Slot 24
X+4	Bit 0: Entry for module on PROFIBUS-Slot 25 Bit 1: Entry for module on PROFIBUS-Slot 26 Bit 2: Entry for module on PROFIBUS-Slot 27 Bit 3: Entry for module on PROFIBUS-Slot 28 Bit 4: Entry for module on PROFIBUS-Slot 29 Bit 5: Entry for module on PROFIBUS-Slot 30 Bit 6: Entry for module on PROFIBUS-Slot 31 Bit 7: Entry for module on PROFIBUS-Slot 32

continued ...

... continue

Byte	Bit 7 ... Bit 0
X+5	Bit 0: Entry for module on PROFIBUS-Slot 33 Bit 1: Entry for module on PROFIBUS-Slot 34 Bit 2: Entry for module on PROFIBUS-Slot 35 Bit 3: Entry for module on PROFIBUS-Slot 36 Bit 4: Entry for module on PROFIBUS-Slot 37 Bit 5: Entry for module on PROFIBUS-Slot 38 Bit 6: Entry for module on PROFIBUS-Slot 39 Bit 7: Entry for module on PROFIBUS-Slot 40
X+6	Bit 0: Entry for module on PROFIBUS-Slot 41 Bit 1: Entry for module on PROFIBUS-Slot 42 Bit 2: Entry for module on PROFIBUS-Slot 43 Bit 3: Entry for module on PROFIBUS-Slot 44 Bit 4: Entry for module on PROFIBUS-Slot 45 Bit 5: Entry for module on PROFIBUS-Slot 46 Bit 6: Entry for module on PROFIBUS-Slot 47 Bit 7: Entry for module on PROFIBUS-Slot 48
X+7	Bit 0: Entry for module on PROFIBUS-Slot 49 Bit 1: Entry for module on PROFIBUS-Slot 50 Bit 2: Entry for module on PROFIBUS-Slot 51 Bit 3: Entry for module on PROFIBUS-Slot 52 Bit 4: Entry for module on PROFIBUS-Slot 53 Bit 5: Entry for module on PROFIBUS-Slot 54 Bit 6: Entry for module on PROFIBUS-Slot 55 Bit 7: Entry for module on PROFIBUS-Slot 56
X+8	Bit 0: Entry for module on PROFIBUS-Slot 57 Bit 1: Entry for module on PROFIBUS-Slot 58 Bit 2: Entry for module on PROFIBUS-Slot 59 Bit 3: Entry for module on PROFIBUS-Slot 60 Bit 4: Entry for module on PROFIBUS-Slot 61 Bit 5: Entry for module on PROFIBUS-Slot 62 Bit 6: Entry for module on PROFIBUS-Slot 63 Bit 7: Entry for module on PROFIBUS-Slot 64

Module status

The module status gives you detailed information about the error that occurred at a module.

The module status can be activated via the parameterization and has the following structure:

Module status

Byte	Bit 7 ... Bit 0
X	Bit 5 ... 0: 001100 (fix) Length of the Module status Bit 7 ... 6: 00 (fix) Code for Module status
X+1	82h (fix) Status type Module status
X+2	00h (fix)
X+3	00h (fix)
X+4	Follow bits indicates the status of the modules from PROFIBUS-Slot 1 ... 64 00: Module ok - valid data 01: Module error - invalid data (Module defective) 10: Incorrect module - invalid data 11: No module - invalid data Bit 1, 0: Module status module PROFIBUS-Slot 1 Bit 3, 2: Module status module PROFIBUS-Slot 2 Bit 5, 4: Module status module PROFIBUS-Slot 3 Bit 7, 6: Module status module PROFIBUS-Slot 4
X+5	Bit 1, 0: Module status module PROFIBUS-Slot 5 Bit 3, 2: Module status module PROFIBUS-Slot 6 Bit 5, 4: Module status module PROFIBUS-Slot 7 Bit 7, 6: Module status module PROFIBUS-Slot 8
X+6	Bit 1, 0: Module status module PROFIBUS-Slot 9 Bit 3, 2: Module status module PROFIBUS-Slot 10 Bit 5, 4: Module status module PROFIBUS-Slot 11 Bit 7, 6: Module status module PROFIBUS-Slot 12
X+7	Bit 1, 0: Module status module PROFIBUS-Slot 13 Bit 3, 2: Module status module PROFIBUS-Slot 14 Bit 5, 4: Module status module PROFIBUS-Slot 15 Bit 7, 6: Module status module PROFIBUS-Slot 16
X+8	Bit 1, 0: Module status module PROFIBUS-Slot 17 Bit 3, 2: Module status module PROFIBUS-Slot 18 Bit 5, 4: Module status module PROFIBUS-Slot 19 Bit 7, 6: Module status module PROFIBUS-Slot 20
X+9	Bit 1, 0: Module status module PROFIBUS-Slot 21 Bit 3, 2: Module status module PROFIBUS-Slot 22 Bit 5, 4: Module status module PROFIBUS-Slot 23 Bit 7, 6: Module status module PROFIBUS-Slot 24
X+10	Bit 1, 0: Module status module PROFIBUS-Slot 25 Bit 3, 2: Module status module PROFIBUS-Slot 26 Bit 5, 4: Module status module PROFIBUS-Slot 27 Bit 7, 6: Module status module PROFIBUS-Slot 28
X+11	Bit 1, 0: Module status module PROFIBUS-Slot 29 Bit 3, 2: Module status module PROFIBUS-Slot 30 Bit 5, 4: Module status module PROFIBUS-Slot 31 Bit 7, 6: Module status module PROFIBUS-Slot 32

continued ...

... continue

Byte	Bit 7 ... Bit 0
X+12	Bit 1, 0: Module status module PROFIBUS-Slot 33 Bit 3, 2: Module status module PROFIBUS-Slot 34 Bit 5, 4: Module status module PROFIBUS-Slot 35 Bit 7, 6: Module status module PROFIBUS-Slot 36
X+13	Bit 1, 0: Module status module PROFIBUS-Slot 37 Bit 3, 2: Module status module PROFIBUS-Slot 38 Bit 5, 4: Module status module PROFIBUS-Slot 39 Bit 7, 6: Module status module PROFIBUS-Slot 40
X+14	Bit 1, 0: Module status module PROFIBUS-Slot 41 Bit 3, 2: Module status module PROFIBUS-Slot 42 Bit 5, 4: Module status module PROFIBUS-Slot 43 Bit 7, 6: Module status module PROFIBUS-Slot 44
X+15	Bit 1, 0: Module status module PROFIBUS-Slot 45 Bit 3, 2: Module status module PROFIBUS-Slot 46 Bit 5, 4: Module status module PROFIBUS-Slot 47 Bit 7, 6: Module status module PROFIBUS-Slot 48
X+16	Bit 1, 0: Module status module PROFIBUS-Slot 49 Bit 3, 2: Module status module PROFIBUS-Slot 50 Bit 5, 4: Module status module PROFIBUS-Slot 51 Bit 7, 6: Module status module PROFIBUS-Slot 52
X+17	Bit 1, 0: Module status module PROFIBUS-Slot 53 Bit 3, 2: Module status module PROFIBUS-Slot 54 Bit 5, 4: Module status module PROFIBUS-Slot 55 Bit 7, 6: Module status module PROFIBUS-Slot 56
X+18	Bit 1, 0: Module status module PROFIBUS-Slot 57 Bit 3, 2: Module status module PROFIBUS-Slot 58 Bit 5, 4: Module status module PROFIBUS-Slot 59 Bit 7, 6: Module status module PROFIBUS-Slot 60
X+19	Bit 1, 0: Module status module PROFIBUS-Slot 61 Bit 3, 2: Module status module PROFIBUS-Slot 62 Bit 5, 4: Module status module PROFIBUS-Slot 63 Bit 7, 6: Module status module PROFIBUS-Slot 64

Channel-related Diagnostic

With the channel-related diagnostic you gain detailed information about the channel error within a module. For the usage of the channel-related diagnostic you have to release the diagnostic interrupt for every module via the parameterization. The channel-related diagnostic can be activated via the parameterization and has the following structure:

Channel-related diagnostic

Byte	Bit 7 ... Bit 0
X	Bit 5 ... 0: ID number of the module that delivers the channel-specific diagnostic (000000 ... 111111) e.g.: PROFIBUS-Slot 1 has ID no. 0 PROFIBUS-Slot 64 has ID no. 63 Bit 7, 6: 10 (fix) Code for channel-related diagnostic
X+1	Bit 5 ... 0: Number of the channel or the channel group that delivers the diagnostic (00000 .... 11111) Bit 7 ... 6: 01 = Input Module 10 = Output Module 11 = In-/Output Module
X+2	Bit 4 ... 0: *Error messages to PROFIBUS standard* 00001: Short circuit 00010: Undervoltage (supply voltage) 00011: Overvoltage (supply voltage) 00100: Output module is overloaded 00101: Temperature rise output module 00110: Wire break sensors or actors 00111: Upper limit violation 01000: Lower limit violation 01001: Error - Load voltage at the output - Sensor supply - Hardware error in the Module *Error messages - manufacturer-specific* 10000: Parameter assignment error 10001: Sensor or load voltage missing 10010: Fuse defect 10100: Ground fault 10101: Reference channel error 10110: Hardware interrupt lost 11001: Safety-related shutdown 11010: External fault 11010: Indefinable error - not specified Bit 7 ... 5: Channel type 001: bit 010: 2bit 011: 4bit 100: byte 101: word 110: 2words

The maximum number of channel-related diagnostic is limited by the total length of 122byte for diagnostic. By de-activating of other diagnostic ranges you may release these areas for further channel-related diagnostic. For each channel always 3byte are used.

Interrupts

The interrupt section of the slave diagnostic shows information about interrupt type and cause. It consists of max. 20byte. For every slave diagnostic max. 1 interrupt can be send. The interrupt section is always the last part of the diagnostic telegram if activated it in the parameterization.

Structure

Depending on the interrupt type, the interrupt section has the following structure:

Byte	Element	Description
x...x+3	Interrupt status	Contains information about the interrupt type
x+4...x+19	Diagnostic interrupt	The 16byte correspond to the record set 1 of the CPU diagnostic
x+4...x+7	Hardware interrupt	The 4byte are module specific and are described with the according module.

Interrupt status

If there is a diagnostic event for channel/group 0 of a module, there may be a module error as well as a channel error. The entry is made in this case even if you have not enabled the diagnostic for channel (/channel group) 0 of a module.

The interrupt section is structured as follows:

Interrupt status byte x ... x+3

Byte	Bit 7 ... Bit 0
x	Bit 5 ... 0: 010100: Length of the interrupt section incl. byte x Bit 7 ... 6: 00 (fix) Code for Module-related diagnostic
x+1	Bit 6 ... 0: Type of interrupt 0000001: Diagnostic interrupt 0000010: Hardware interrupt Bit 7: Code for interrupt
x+2	Bit 7 ... 0: PROFIBUS-Slot of the module that is producing interrupt 1 ... 64
x+3	Bit 1, 0: 00: Hardware interrupt 01: Diagnostic interrupt $_{incoming}$ 10: Diagnostic interrupt $_{outgoing}$ 11: reserved Bit 2: 0 (fix) Bit 7 ... 3: interrupt sequence number 0 …31

Interrupt status at diagnostic interrupt bytes x+4 to x+19

Byte	Bit 7 ... Bit 0
x+4	Bit 0: Module malfunction, i.e. a problem has been detected Bit 1: Internal error in the module Bit 2: External error - module no longer addressable Bit 3: Channel error in the module Bit 4: External auxiliary supply missing Bit 5, 6: reserved Bit 7: Parameter assignment error
x+5	Bit 3 ... 0: Module class 1111: Digital module 0101: Analog module 1000: FM 0111: ETS, CP Bit 4: Channel information available Bit 7 ... 5: 0 (fix)
x+6	see module description
x+7	Bit 5 ... 0: reserved Bit 6: Hardware interrupt lost Bit 7: reserved
x+8	Channel type 70h: Module with digital inputs 71h: Module with analog inputs 72h: Module with digital outputs 73h: Module with analog outputs 74h: Module with analog in-/-outputs 76h: Counter
x+9	Number of diagnostic bits per channel
x+10	Number of channels per module
x+11	Position (channel) with diagnostic event
x+12	Diagnostic event on the channel/channel group 0 Assignment see module description
x+13	Diagnostic event on the channel/channel group 1 Assignment see module description
...	...
x+19	Diagnostic event on the channel/channel group 7 Assignment see module description

Interrupt status at hardware interrupt bytes x+4 to x+7

More detailed information to the diagnostic data may be found in the concerning module description.

Diagnostics with Siemens STEP®7

In Siemens SIMATIC S7 there are functions integrated for processing diagnostics data.

Here depending on cause the following OBs are called:

- OB 40: Hardware interrupt
- OB 57: Manufacturer specific interrupt
- OB 82: Diagnostics interrupt
- OB 86: Slave failure

With the corresponding OB you may react to the cause. For example you can analyze the relevant record sets by means of handling blocks, which your System SLIO provides. If the OB does not exist the CPU goes to STOP.

With the following handling blocks the record sets may be accessed:

- SFC 13: Read diagnostic data of a DP salve
- SFB 52: Read record set
- SFB 53: Write record set
- SFB 54: Reading interrupt data from a DP-V1 slave

Here among others via *ID* the diagnostics address of your PROFIBUS coupler and via *INDEX* the record set number is to be entered.

Note!

More information about the usage of the handling blocks may be found in the manual Operating list of your CPU.