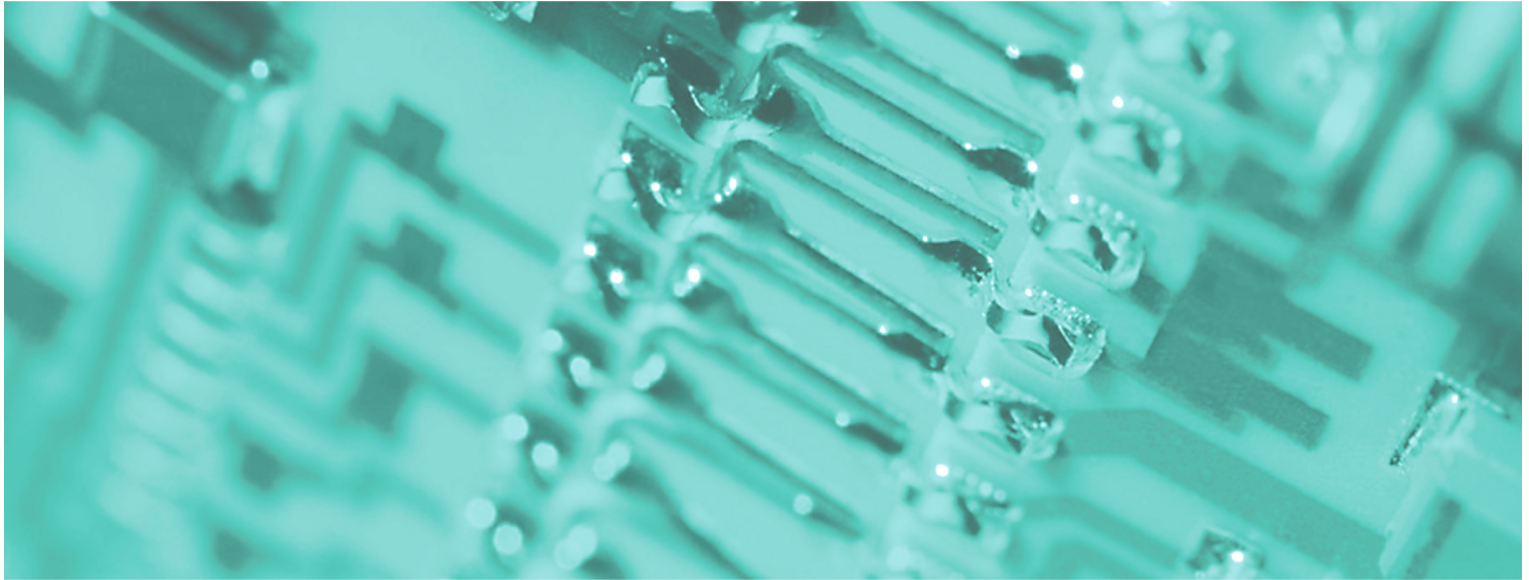




VIPA System SLIO



IM | 053-1DN00 | Manual

HB300E_IM | RE_053-1DN00 | Rev. 11/21

May 2011

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

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About this manual

This manual describes the IM 053-1DN00 DeviceNet coupler 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 053-1DN00 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 053-1DN00 with DeviceNet. After a short introduction you may find here every information for the usage in the System SLIO.

Objective and contents

This manual describes the IM 053-1DN00 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 053DN	VIPA 053-1DN00	01	1.0.0

Target audience

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

Structure of the manual

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

Guide to the document

The following guides are available in the manual:

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

Availability

The manual is available in:

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

Icons Headings

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



Danger!

Immediate or likely danger.
Personal injury is possible.



Attention!

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



Note!

Supplementary information and useful tips.

Safety information

Applications conforming with specifications

The System SLIO is constructed and produced for:

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



Danger!

This device is not certified for applications in

- in explosive environments (EX-zone)

Documentation

The manual must be available to all personnel in the

- project design department
- installation department
- commissioning
- operation



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

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

Disposal

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

Chapter 1 Basics and Assembly

Overview

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

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

Content

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Safety Information for Users

Handling of electrostatic sensitive modules

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

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



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

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

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

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

Shipping of modules

Modules must be shipped in the original packing material.

Measurements and alterations on electrostatic sensitive modules

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

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

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



Attention!

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

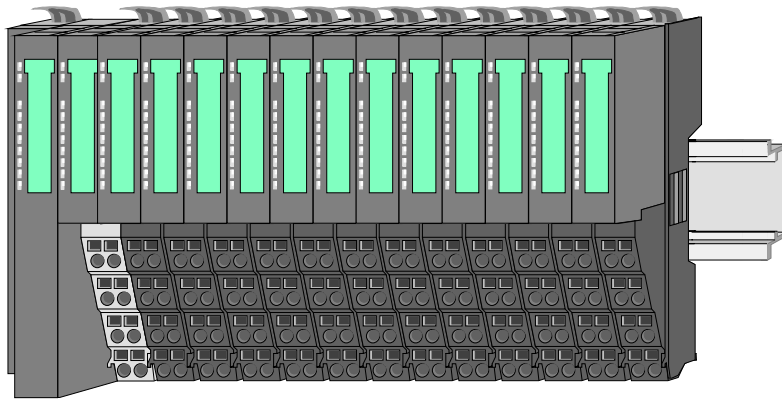
System conception

Overview

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

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

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

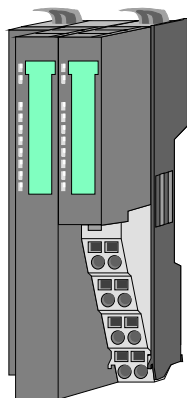


Components

The System SLIO consists of the following components:

- Bus coupler
- Periphery modules
- Power modules
- Accessories

Bus coupler



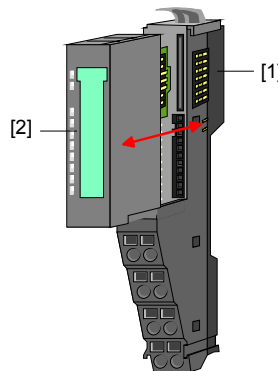
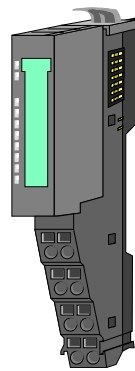
With a bus coupler bus interface and power module is integrated to one casing. With the bus interface you get access to a subordinated bus system.

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

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

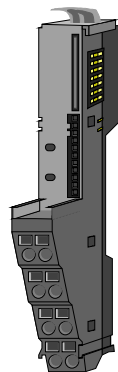
By installing of up to 64 periphery modules at the bus coupler, these are electrically connected, this means these are assigned to the backplane bus, the electronic modules are power supplied and each periphery module is connected to the DC 24V power section supply.

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



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

Terminal module

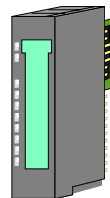


The *terminal module* serves to carry the electronic module, contains the backplane bus with power supply for the electronic, the DC 24V power section supply and the staircase-shaped terminal for wiring.

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

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

Electronic module



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

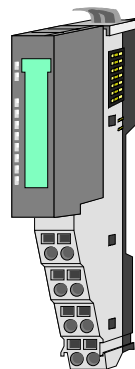
With an error the defective module may be exchanged for a functional module with standing installation.

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

At the front side there are LEDs for status indication.

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

Power module



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

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

Accessories

Shield bus carrier



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

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

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

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

Bus cover

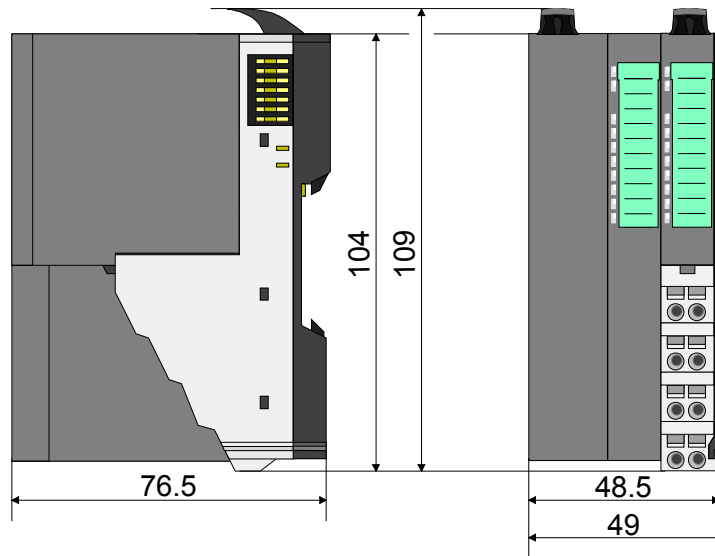


With each bus coupler, to protect the backplane bus connectors, there is a mounted bus cover in the scope of delivery. You have to remove the bus cover of the bus coupler before mounting a SLIO module.

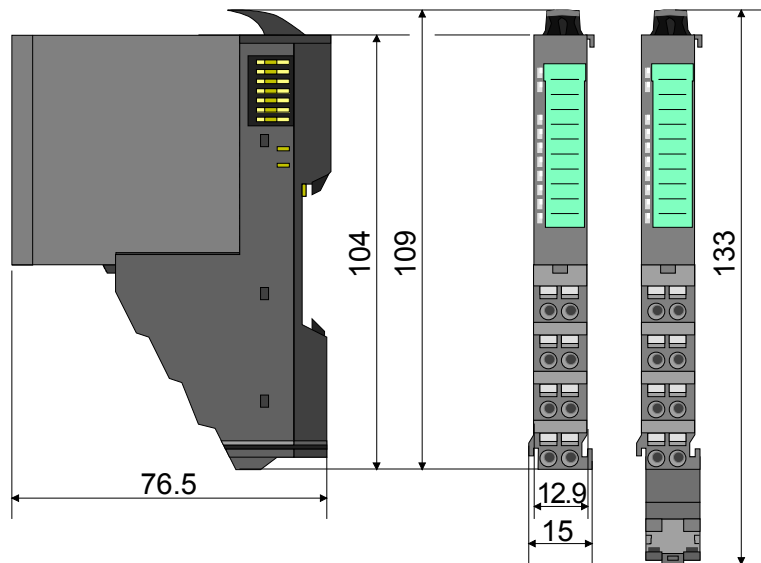
For the protection of the backplane bus connector you always have to mount the bus cover at the last module of your system again.

Dimensions

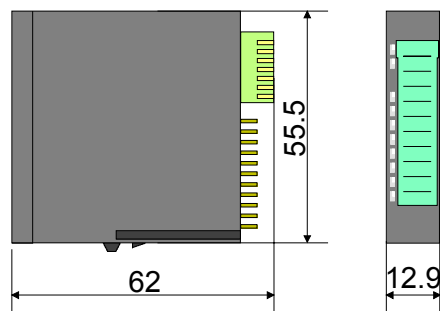
Dimensions bus coupler



Dimensions periphery module



Dimensions electronic module



Dimensions in mm

Installation

Functional principle

Mounting terminal module

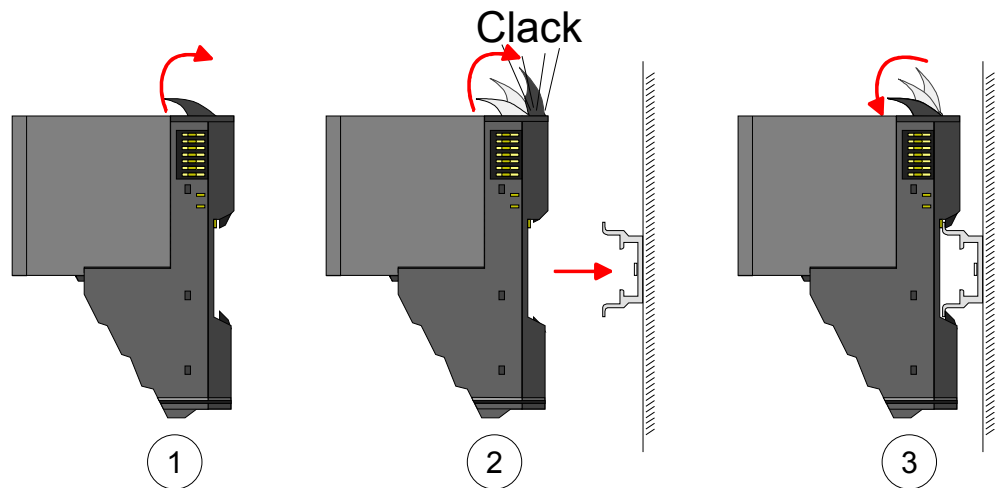
There is a locking lever at the top side of the terminal module. For mounting and de-mounting this locking lever is to turn upwards until this engages audible.

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 downwards the locking lever.

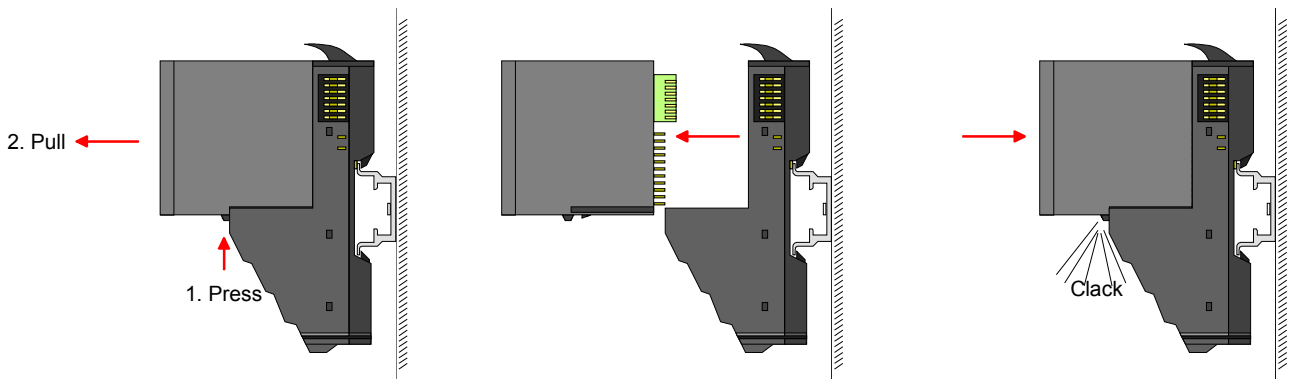
The modules may either separately be mounted to the mounting rail or as block. Here is to be considered that each locking lever is opened.



Mounting electronic module

For mounting between 2 modules and for the exchange of a defective 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.



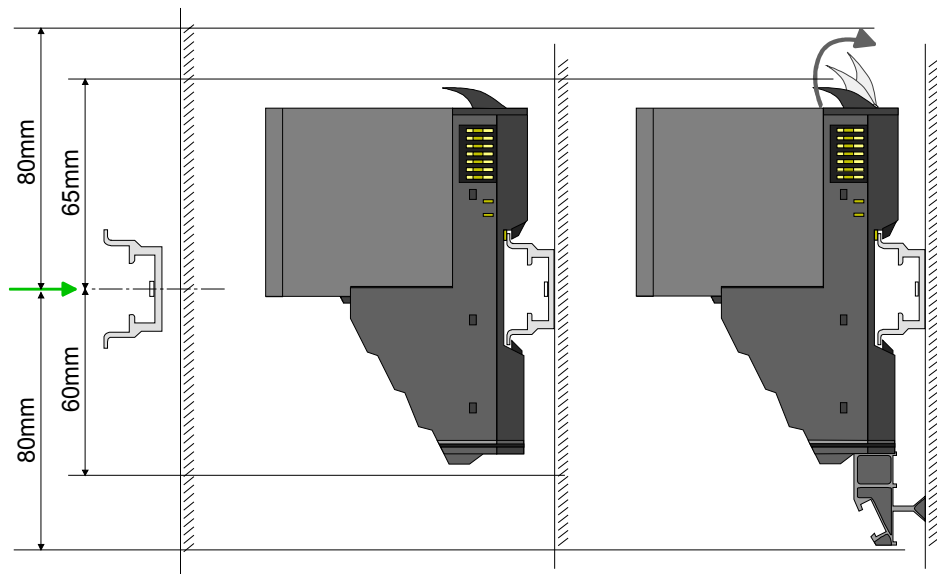
Mounting Proceeding

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".

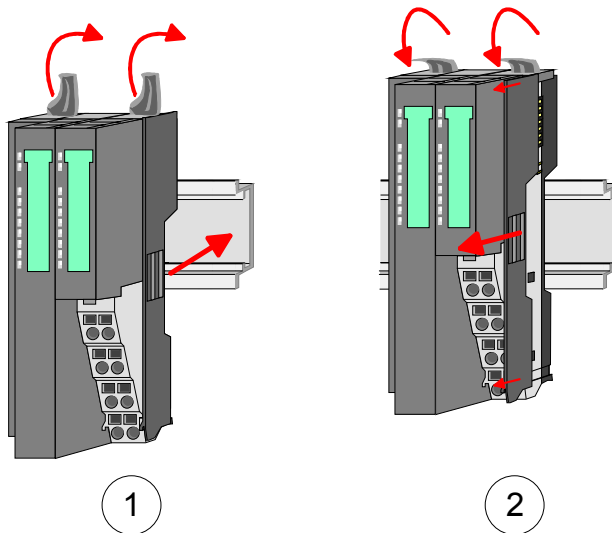
Mounting mounting rail

- 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.



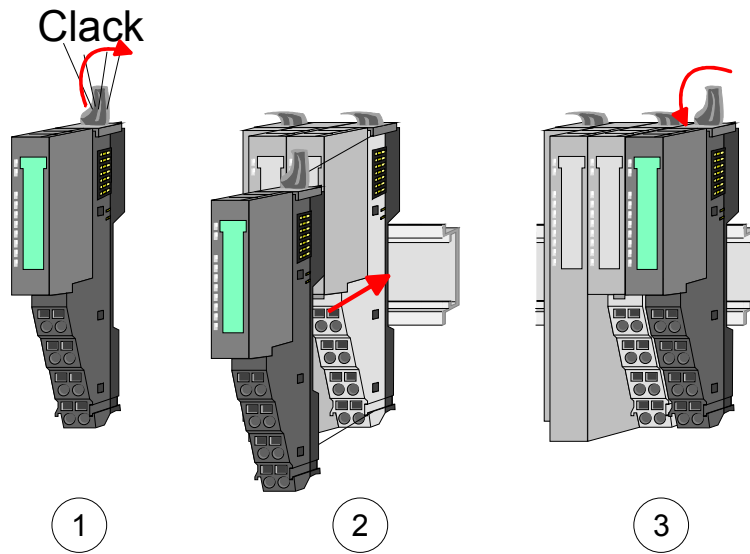
Mounting Head module (e.g. bus coupler)

- 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 downwards.
- 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.



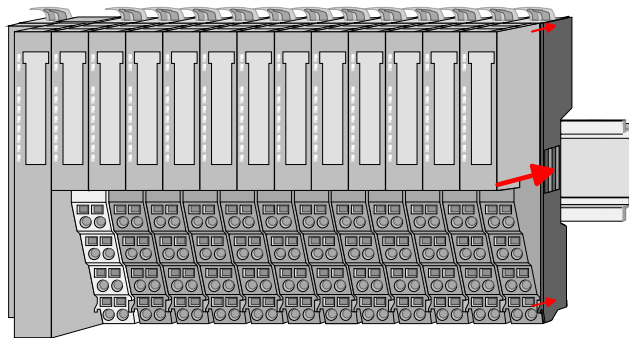
**Mounting
periphery module**

- Mount the periphery modules you want.



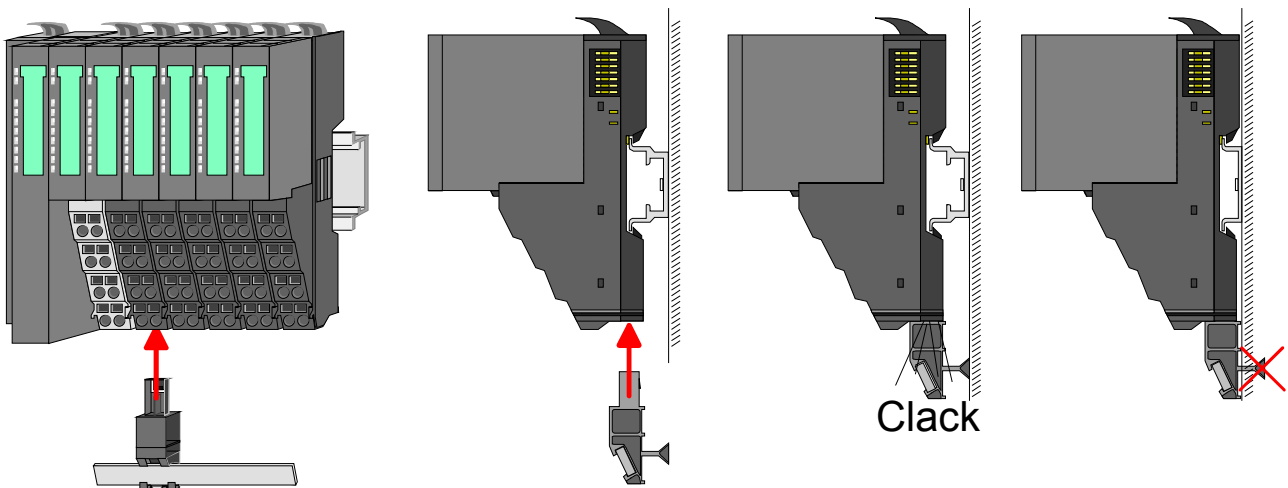
**Mounting the
bus cover**

- 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**

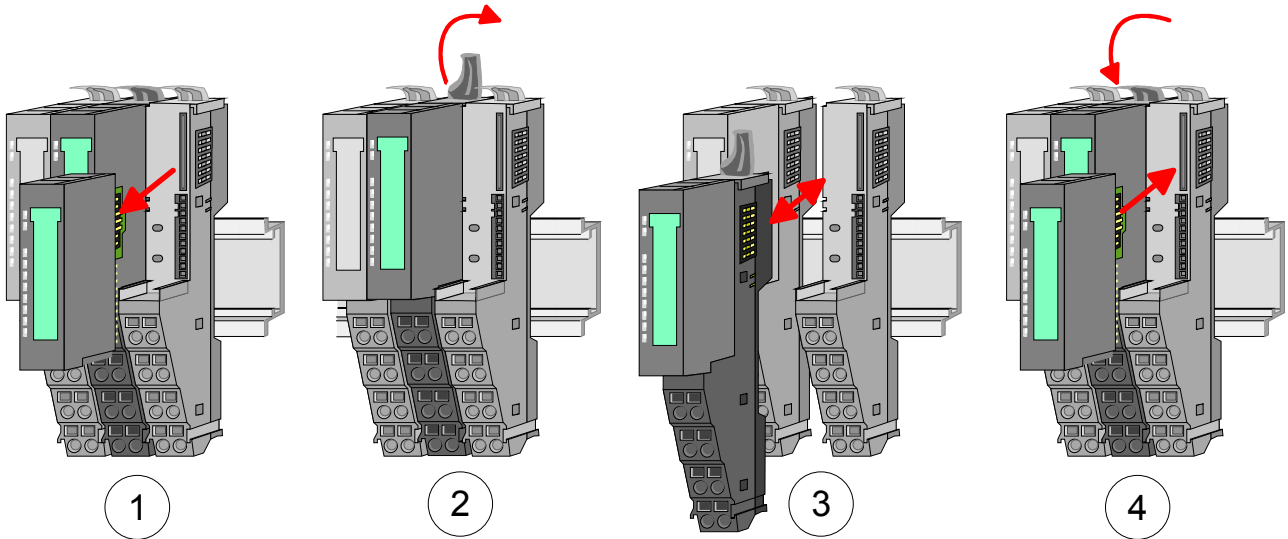
The shield bus carrier (available as accessory) serves to carry the shield bus to connect cable shields. The shield bus carrier is mounted underneath the terminal of the terminal module. With a flat mounting rail for adaption to a flat mounting rail you may remove the spacer of the shield bus carrier.



Mounting between 2 modules

With the mounting of a SLIO module respectively of a group of SLIO modules between two modules for mounting reasons you have always to remove the electronic module of the just mounted right module. After that it may be plugged again.

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.



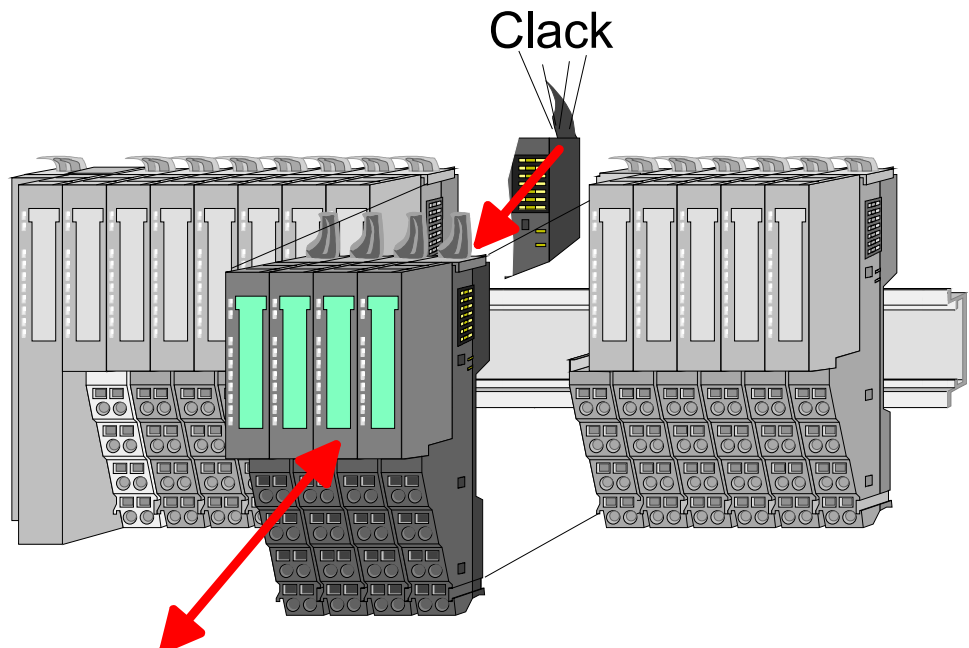
1 module group between 2 modules

With mounting respectively de-mounting of a module group you also have to remove the electronic module of the just mounted right module! After mounting it may be plugged again.

For mounting respectively de-mounting the locking lever of the modules of the block must be turned upwards.

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

After mounting the block turn each locking lever of the modules downwards.



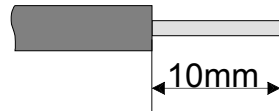
Wiring

Connectors

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

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

Data



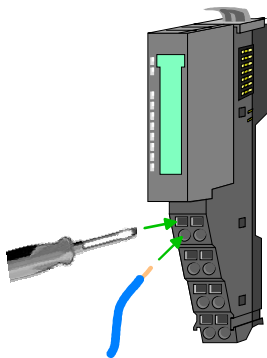
U_{\max} : 240V AC / 30V DC

I_{\max} : 10A

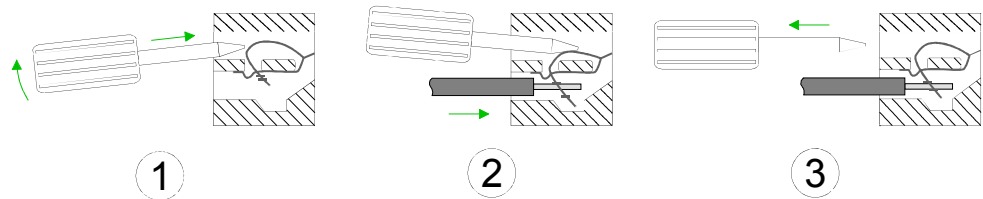
Cross section: 0.08 ... 1.5mm² (AWG 28 ... 16)

Stripping length: 10mm

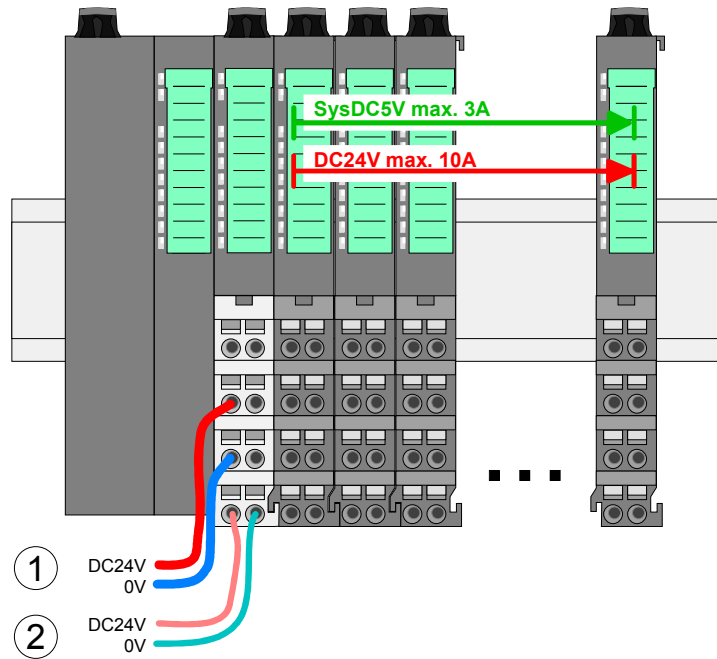
Wiring procedure



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



Standard wiring



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



Note!

Power section and electronic power section supply are internally protected against higher voltage by fuses. The fuses are within the power module. If one fuse released, its electronic module must be exchanged!
It is recommended to externally protect the corresponding supply with a fuse (fast).

Fusing

- The power section supply is to be externally protected with a fuse (fast), which corresponds to the maximum current. This means max. 10A is to be protected with a 10A fuse (fast).
- The electronic power supply for bus coupler and I/O area is to be externally protected with a 4A fuse (fast).
- The electronic power supply for the I/O area of the power module 007-1AB10 is to be externally protected with a 1A fuse (fast).

State of the electronic power supply via LEDs

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

Deployment of the power modules

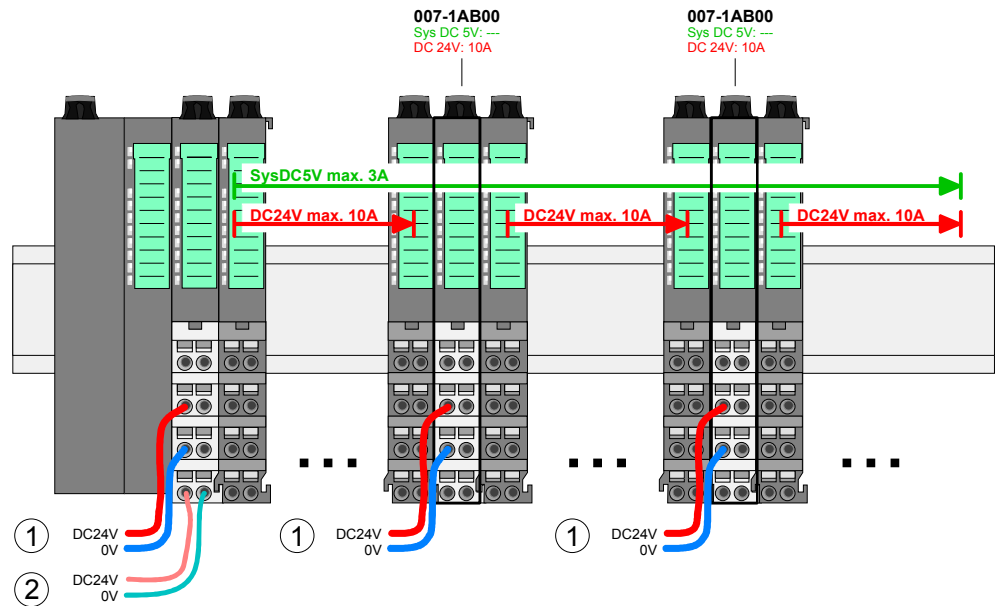
If the 10A for the power section supply is no longer sufficient, you may use the power module from VIPA with the order number 007-1AB00. So you have also the possibility to define isolated groups.

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

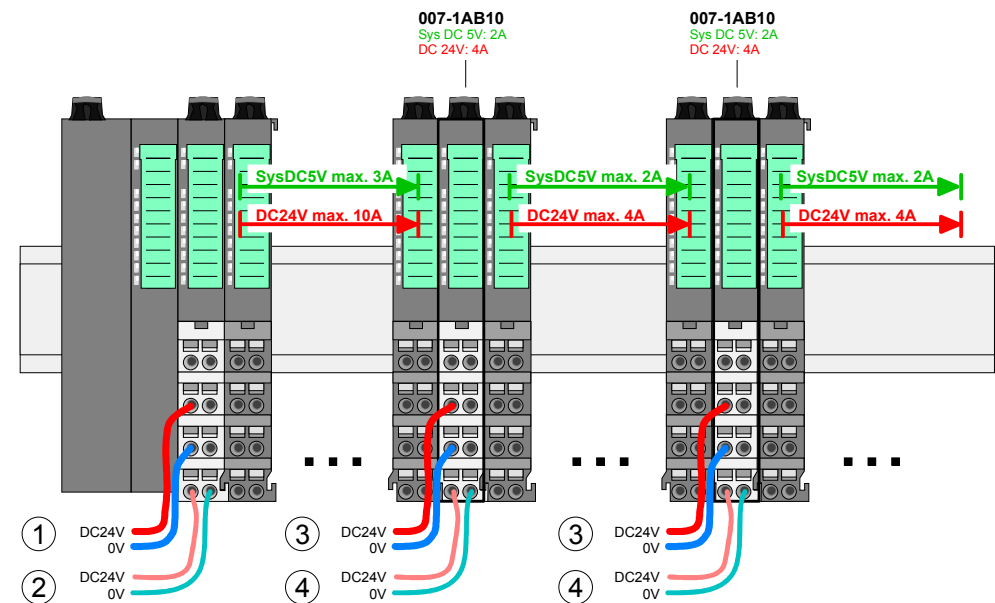
By placing the power module 007-1AB10 at the following backplane bus modules may be placed with a sum current of max. 2A. Afterwards the power module 007-1AB00 is to be placed again.

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

Power module 007-1AB00

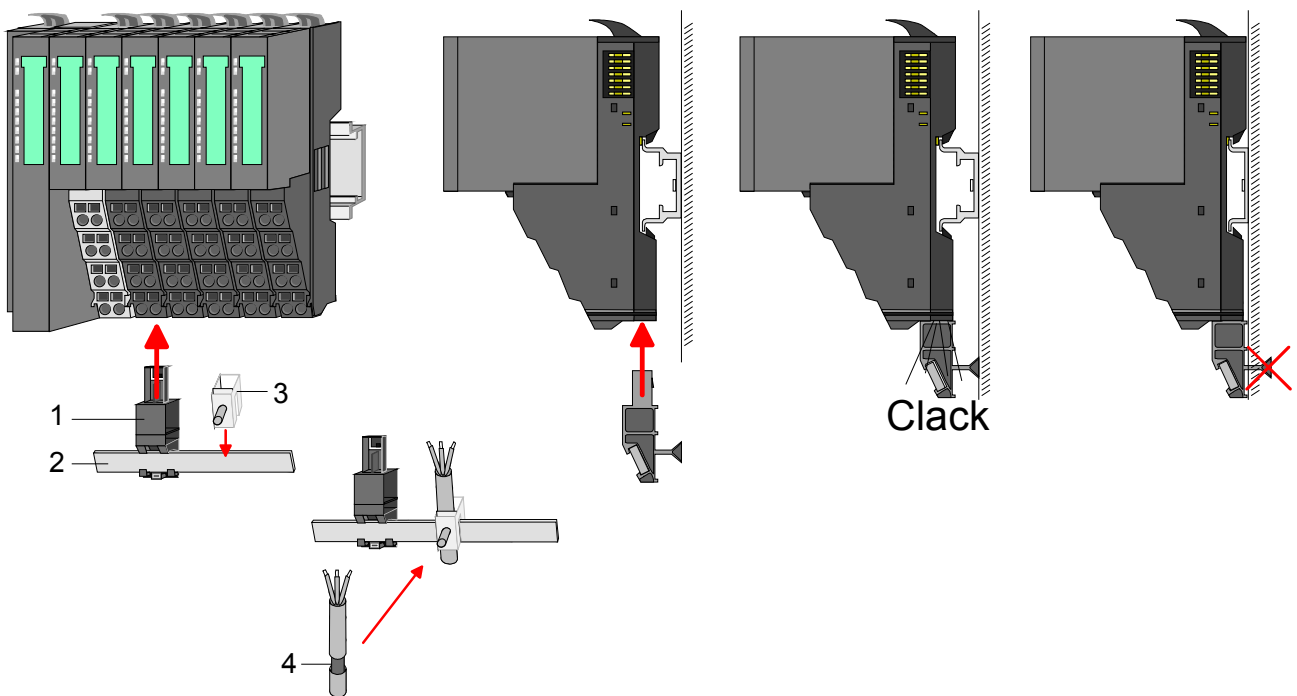


Power module 007-1AB10



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

Shield attachment To attach the shield the mounting of shield bus carriers are necessary. The shield bus carrier (available as accessory) serves to carry the shield bus to connect cable shields. The shield bus carrier is mounted underneath the terminal of the terminal module. With a flat mounting rail for adaption to a flat mounting rail you may remove the spacer of the shield bus carrier. After mounting the shield bus carrier with the shield bus, the cables with the accordingly stripped cable screen may be attached and fixed by the shield clamp.



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

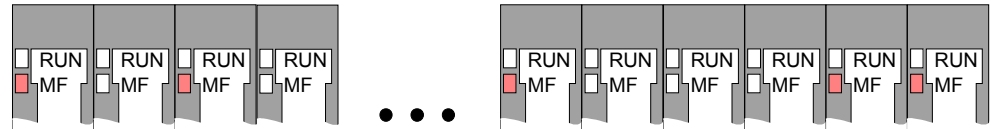
Trouble shooting - LEDs

General

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

In the following illustrations flashing LEDs are marked by ☼.

Sum current of the electronic power supply exceeded

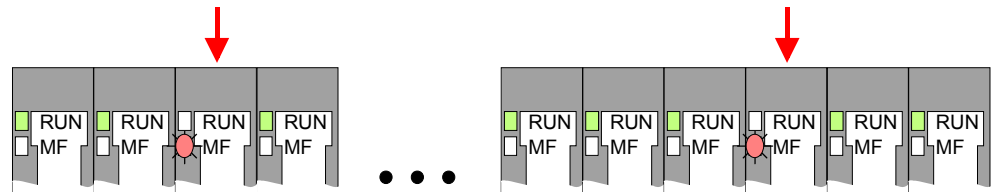


Behavior: After PowerON the RUN LED of each module is off and the MF LED of each module is sporadically on.

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

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

Error in configuration

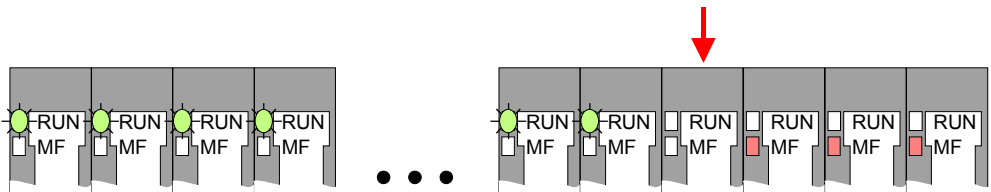


Behavior: After PowerON the MF LED of one module respectively more modules flashes. The RUN LED remains off.

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

Remedy: Match configuration and hardware structure.

Module failure



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

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

Remedy: Replace the defective module.

Installation guidelines

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

What means EMC? Electromagnetic digestibility (EMC) means the ability of an electrical device, to function error free in an electromagnetic environment without being interferenced res. without interfering the environment.
All System SLIO components are developed for the deployment in industrial environments and fulfill high demands on the EMC. Nevertheless you should project an EMC planning before installing the components and take conceivable interference causes into account.

Possible interference causes Electromagnetic interferences may interfere your control via different ways:

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

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

One differs:

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

Basic rules for EMC

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

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

Isolation of conductors

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

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

When isolating cables you have to regard the following:

- If possible, use only cables with isolation tangle.
- The hiding power of the isolation should be higher than 80%.
- Normally you should always lay the isolation of cables on both sides. Only by means of the both-sided connection of the isolation you achieve high quality interference suppression in the higher frequency area.
Only as exception you may also lay the isolation one-sided. Then you only achieve the absorption of the lower frequencies. A one-sided isolation connection may be convenient, if:
 - the conduction of a potential compensating line is not possible
 - analog signals (some mV res. 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/EG	Low-voltage directive
Approval		
UL	UL 508	Approval for USA and Canada
others		
RoHs	-	Product is unleaded

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

Environmental conditions to EN 61131-2		
Climatic		
Storage / transport	EN 60068-2-14	-25...+70°C
Operation		
Horizontal installation	EN 61131-2	0...+60°C
Vertical installation	EN 61131-2	0...+60°C
Air humidity	EN 60068-2-30	RH1 (without condensation, rel. humidity 10 ... 95%)
Pollution	EN 61131-2	Degree of pollution 2
Mechanical		
Oscillation	EN 60068-2-6	1G
Shock	EN 60068-2-27	15G

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

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

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

Chapter 2 Hardware description

Overview Here the hardware components of the IM 053-1DN00 are more described. You will find the technical data at the end of this chapter.

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

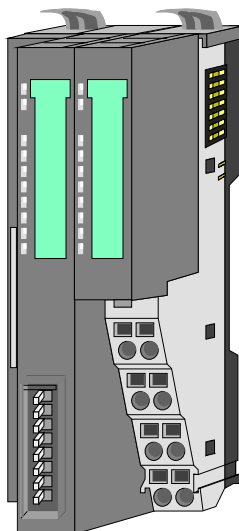
Properties

Features

The interface module IM053-1DN00 is a head station for the SLIO peripheral system with an DeviceNet interface.

Over the DeviceNet interface the input data can be read and output data written, which parameterization system, as well as updates be accomplished.

- Group 2 only Device
 - employs the predefined connection set
 - Poll only Device
 - no BIT STROBE mode support
 - no CHANGE OF STATE support
 - Profile Generic Device
 - Configuration via DIP switch:
 - DeviceNet address (0 ... 63)
 - Attitude of the baud rate for DeviceNet slave
 - supports all baud rates: 125, 250 and 500kbit/s
 - Configuration of 64 peripheral modules
 - max. 255 in-/output data
 - Configuration of the periphery modules is made by a *DeviceNet manager* e.g. RsNetWorx from Allen-Bradley
- For parameterization and for the access to the diagnostics data the data type SHORT_STRING is used. Please consider that your DeviceNet manager supports this type of data.

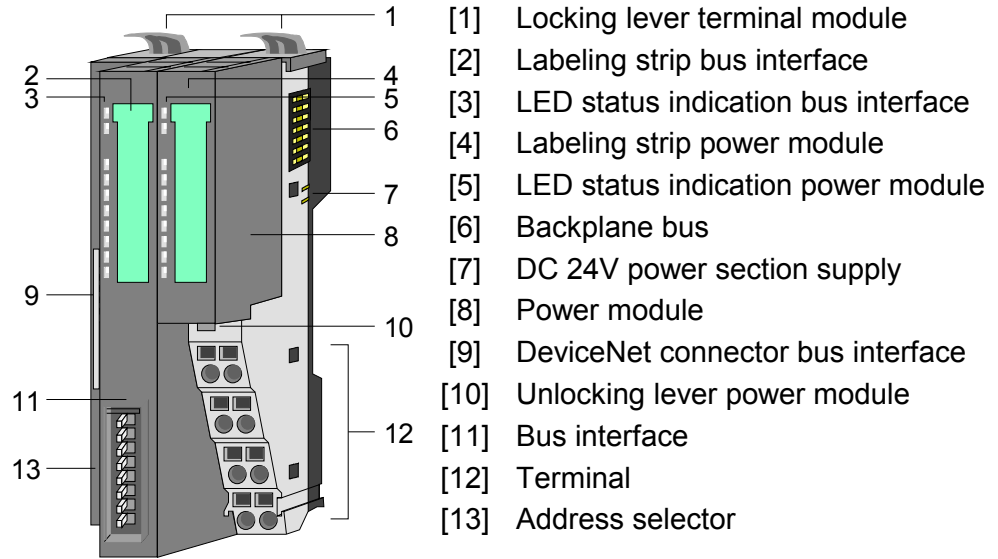


Order data

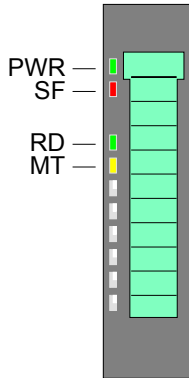
Type	Order number	Description
IM 053DN	VIPA 053-1DN00	DeviceNet coupler for System SLIO

Structure

053-1DN00



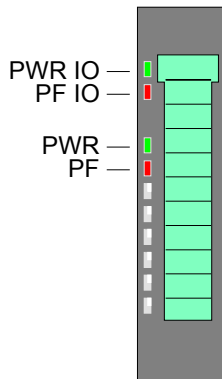
Status indication bus interface



LED	Color	Description
PWR	green	● Bus interface is power supplied
SF	red	● Error on DeviceNet or System SLIO bus
RD	green	● Status System SLIO bus
MT	yellow	● Status DeviceNet

For the fast diagnosis of the current module status 4 LEDs are on the front side.
 You may find a detailed description of the LEDs in the chapter "Deployment" at "Status indication - Diagnostics".

Status indication power module

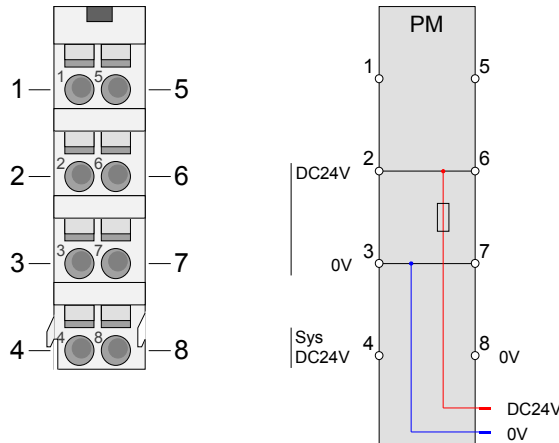


LED	Color	Description
PWR IO	green	● Power section supply OK
PF IO	red	● Fuse power section supply defective (Power fail)
PWR	green	● Electronic section supply OK
PF	red	● Fuse electronic section supply defective

on: ●

Terminal

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

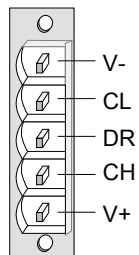


Pos.	Function	Type	Description
1	---	---	not connected
2	DC 24V	I	DC 24V for power section supply
3	0V	I	GND for power section supply
4	Sys DC 24V	I	DC 24V for electronic section supply
5	---	---	not connected
6	DC 24V	I	DC 24V for power section supply
7	0V	I	GND for power section supply
8	Sys 0V	I	GND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

I: Input

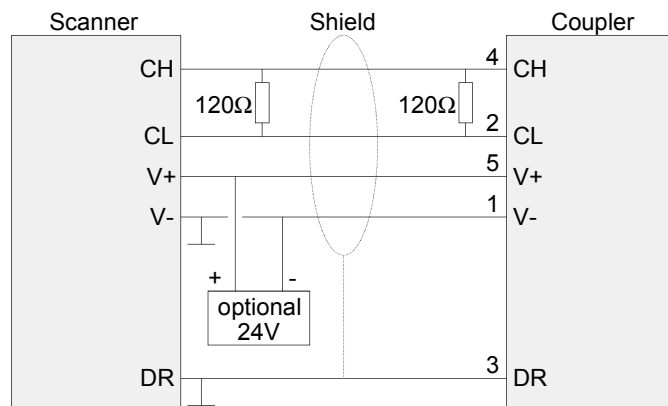
DeviceNet connector bus interface

The DeviceNet connection is provided by a 5pin open style connector. The pin assignment is imprinted on the front of the module. The shield is to be connected to pin 3 (DR) and grounded at one suited place within its network. Members of the bus may optionally be supplied by an external DC 24V power supply. The bus is to be terminated at both of its ends with 120Ω.



Pin	Assignment	Description
1	V-	GND optional power supply
2	CL	CAN Low
3	DR	DRAIN / Shield
4	CH	CAN High
5	V+	DC24V optional power supply

Connecting the bus



Address switch

The address switch serves for the following settings:

- Transfer rate
- DeviceNet address
- Update mode for firmware update

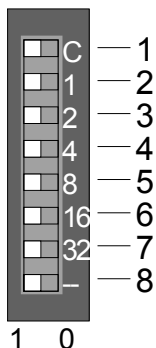


Note!

Changes of the transfer rate respectively of the DeviceNet address were only recognized after PowerON or an automatic reset.

Changes during the normal operation are not recognized.

Settings



Transfer rate			
No.	Description	Example setting	
1	Configuration	1	Transfer rate: 250kbit/s
2	Transfer rate 125kbit/s	0	
3	Transfer rate 250kbit/s	1	
4	Transfer rate 500kbit/s	0	
5	-	-	
6	-	-	
7	-	-	
8	not used	-	
DeviceNet address			
No.	Description	Example setting	
1	Configuration	0	1+2+32=35 Address: 35
2	$2^0 = 1$	1	
3	$2^1 = 2$	1	
4	$2^2 = 4$	0	
5	$2^3 = 8$	0	
6	$2^4 = 16$	0	
7	$2^5 = 32$	1	
8	not used	---	
Update mode for firmware update			
No.	Description	Setting	
1	Configuration	1	
2	-	0	
3	-	0	
4	-	0	
5	-	0	
6	-	0	
7	Update mode	1	
8	not used	---	

Technical Data

Order number	053-1DN00
Type	IM 053DN
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 ² s
Max. current drain at backplane bus	3 A
Max. current drain load supply	10 A
Power loss	3 W
Status information, alarms, diagnostics	
Status display	yes
Interrupts	-
Process alarm	-
Diagnostic interrupt	-
Diagnostic functions	-
Diagnostics information read-out	possible
Supply voltage display	green LED
Group error display	red SF-LED
Channel error display	none
Hardware config	
Racks, max.	1
Modules per rack, max.	64
Number of digital modules, max.	64
Number of analog modules, max.	64
Communication	
Field bus	DeviceNet
Type of interface	CAN
Connector	5pin Open Style Connector
Topology	Linear bus with bus termination at both ends
Electrically isolated	✓
Number of participants, max.	64
Node addresses	0 - 63
Transmission speed, min.	125kbit/s
Transmission speed, max.	500 kbit/s
Address range inputs, max.	256 Byte
Address range outputs, max.	256 Byte
Number of TxPDOs, max.	-
Number of RxPDOs, max.	-
Mechanical data	
Dimensions (WxHxD)	48.5 x 109 x 76.5 mm
Weight	155 g
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-25 °C to 70 °C
Certifications	
UL508 certification	in preparation

Chapter 3 Deployment

Overview This chapter describes the usage of the IM 053-1DN00 with DeviceNet. After a short introduction you may find here every information for the usage in the System SLIO.

Content	Topic	Page
	Chapter 3 Deployment	3-1
	Basics DeviceNet	3-2
	Accessing the System SLIO	3-4
	Transfer rate and DeviceNet address	3-8
	Status indication - Diagnostics	3-10

Basics DeviceNet

General

DeviceNet is an open low-end network that is based upon the physical properties of CAN bus. The bus is also used to supply the devices with the required DC 24V power.

You can use DeviceNet to install direct connections between your control system and simple industrial devices like sensors and switches as well as technologically advanced devices like frequency converters and barcode readers.

Direct interfacing improves communications between the different devices and provides important diagnostic facilities at the device level.

DeviceNet

DeviceNet is an open device net standard that satisfies the user profile for industrial real-time system applications.

The DeviceNet protocol has an open specification that is the property of and administered by the independent vendor organization "Open DeviceNet Vendor Association" ODVA.

This is where standardized device profiles are created to provide compatibility and exchangeability on logical level for simple devices of the same type.

In contrast to the classical source–destination model, DeviceNet uses a modern producer/consumer model that requires data packets with identifier fields for the identification of the data.

This approach caters for multiple priority levels, more efficient transfers of I/O data and multiple consumers for the data.

A device that has data to send *produces* the data on the network together with an identifier. All devices requiring data listen for messages. When devices recognize a suitable identifier, they act and *consume* the respective data.

DeviceNet carries two types of messages:

- *I/O messages*
Messages that are subject to critical timing constraints and that are contain data for control purposes that can be exchanged by means of single or multiple connections and that employ identifiers with a high priority.
- *explicit messages*
These are used to establish multi-purpose point-to-point communication paths between two devices, which are used for the configuration of network couplers and for diagnostic purposes. These functions usually employ identifiers of a low priority.

Messages that are longer than 8byte are subject to the fragmentation service. A set of rules for master/slave, peer-to-peer- and multi-master connections is also available.

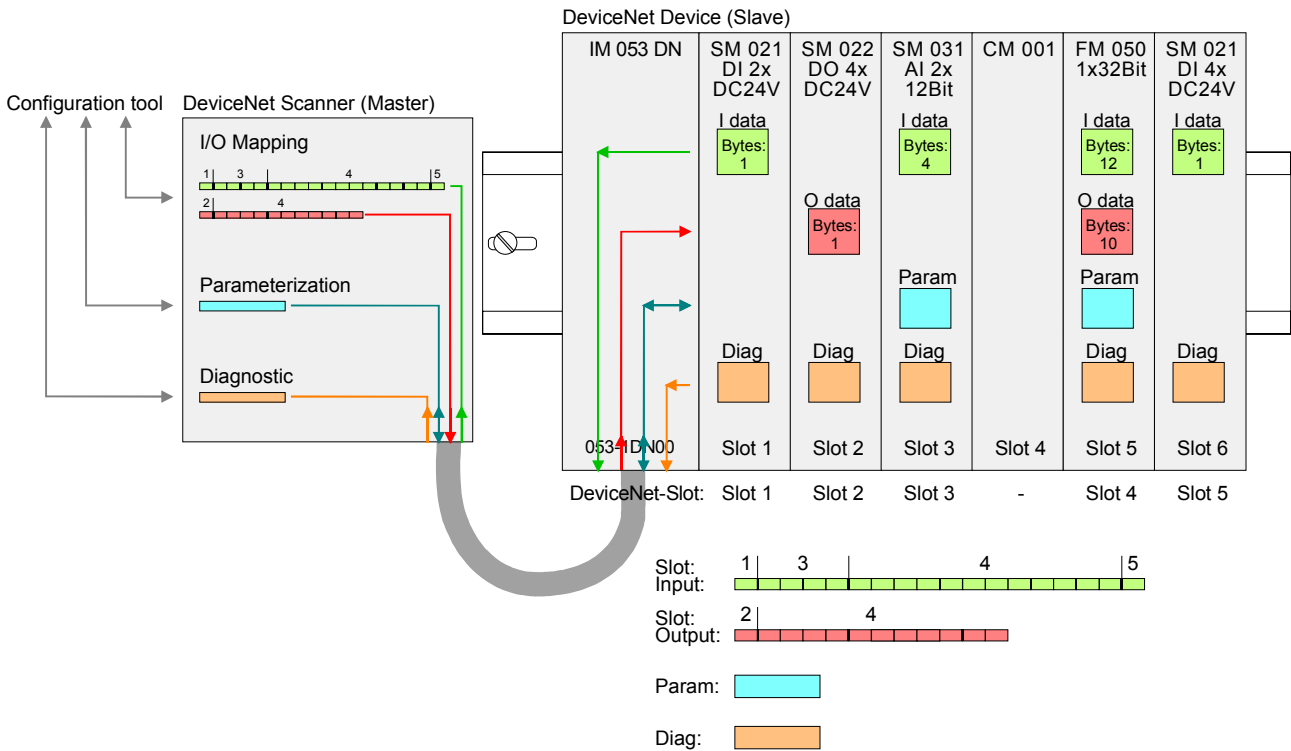
Communication medium	<p>DeviceNet employs a screened five-core cable as data communication medium. DeviceNet uses voltage differences and for this reason it exhibits less sensitivity to interference than a voltage or current based interface.</p> <p>Signals and power supply conductors are included in the same network cable. It is therefore possible to connect devices that obtain the operating voltage via the network as well as devices with an integrated power supply. Furthermore it is possible to connect redundant power supplies to the network that guarantees the power supply when required.</p> <p>DeviceNet employs a master line/tap line topology with up to 64 network nodes. The maximum distance is either 500m at a rate of 125kbit/s, 250m at a rate of 250kbit/s or 100m at a rate of 500kbit/s.</p> <p>The length of the tap lines can be up to 6m while the total length of all tap lines depends on the baud rate.</p> <p>Network nodes can be removed from or inserted into the network without interruption of the network operation. New and failed stations are detected automatically.</p>
Bus access method	<p>DeviceNet operates according to the Carrier-Sense Multiple Access (CSMA) principle, i.e. every station on the network may access the bus when it is not occupied (random access).</p> <p>The exchange of messages is message orientated and not station orientated. Each message is provided with a unique and prioritizing identifier. At any time only one station is able to occupy the bus with its messages.</p> <p>The DeviceNet bus access control is subject to non-destructive, bit-wise arbitration. In this case non-destructive means that the successful station participating in the arbitration doesn't need to re-send its message. The most important station is selected automatically when multiple stations access the bus simultaneously. If a station that is ready to send recognizes that the bus is occupied, its send request is delayed until the current transfer has been completed.</p>
Addressing	<p>All stations on the bus must be uniquely identified by means of an ID address. Every DeviceNet device has addressing facilities.</p>
EDS file	<p>From VIPA there are EDS (Electronic Data Sheet) files for the DeviceNet coupler available. These files may either be found on the supplied storage media or at the download area of www.vipa.de.</p> <p>Please install the EDS file you require in your configuration tool. Details on the installation of the EDS file are available from the manual supplied with your configuration tool.</p>

Accessing the System SLIO

Overview

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

- 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 DeviceNet coupler and so are not listed and considered during slot allocation.

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

EDS file

From VIPA you may receive an appropriate EDS file (**Electronic Data Sheet**) for your DeviceNet coupler, which depends on your configuration (number of modules).

These files may either be found on the supplied storage media or at the download area of www.vipa.de. Please install the required EDS file in your configuration tool. Details on the installation of the EDS file are available in the manual supplied with your configuration tool.

EDS file name	Usage	
VIPA-053-1DN00_16-ext	<i>Maximum number of diagnostics data (slow)</i> - supports maximally 16 System SLIO modules	
VIPA-053-1DN00_32-ext		- supports maximally 32 System SLIO modules
VIPA-053-1DN00_64-ext		- supports maximally 64 System SLIO modules
VIPA-053-1DN00_16	<i>Reduced Diagnose (fast)</i> <i>(DeviceName, Parameter, Diagnostics)</i> - supports maximally 16 System SLIO modules	
VIPA-053-1DN00_32		- supports maximally 32 System SLIO modules
VIPA-053-1DN00_64		- supports maximally 64 System SLIO modules

Accessing I/O area

The DeviceNet coupler determines automatically the modules on the System SLIO bus and generates from this the number of input and output bytes. During the configuration of the DeviceNet scanner the corresponding overall length of the input and the output bytes is to be preset. Information concerning the I/O allocation of a module may be found in the corresponding manual.

The position (offset) of the input respectively output bytes within the input respectively output data results from the order of the modules (DeviceNet-Slot 1 ... 64). By means of the base address, which is to be preset in the DeviceNet scanner for the bus coupler and the offset you may access the input or output data of a module.

During operation the DeviceNet coupler cyclically reads the input data of the peripheral modules and serves for the last state of these data for the DeviceNet scanner. Output data, which the DeviceNet coupler has received from the DeviceNet scanner, were directly transferred to the modules, as soon as they were received.

DeviceNet scanner (master) configuration

- Turn off the power supply of the DeviceNet coupler and preset the transfer rate and the DeviceNet address. More about this may be found below at "Transfer rate and DeviceNet address".
- Start the configuration tool of your DeviceNet scanner.
- Set the DeviceNet scanner to connection type "POLL IO".
- Enter the number of input and output data:
 - Number input data: Produced connection size
 - Number output data: Consumed connection size
- Enter a base address for the input and output data (mapping).
- Activate the System SLIO DeviceNet coupler IM 053DN in the scan list.
- Start the DeviceNet scanner.

When the DeviceNet scanner has been configured, the input and output modules are accessible via the configured addresses.

Accessing the parameter data

The System SLIO modules may also be parameterized by the configuration tool.

For this your DeviceNet couple must be connected active at the bus.

For parameterization and for the access to the diagnostics data the data type SHORT_STRING is used. Please consider that your DeviceNet manager supports this type of data.

In your configuration tool you may parameterize your module by means of a character string.

You also may transfer the current parameters from the module into your configuration tool to adapt them and write them back to the module.

Rules for the parameterization

- Each DeviceNet-Slot is separately be parameterized with a character string.
- Within the character string each parameter consists of a *Type* with attached *Value*.
- The parameters themselves are to be separated by a blank.
- There are only parameter strings with lower case supported.

Depending on the type hexadecimal, decimal or binary values may be preset

Type	Meaning	Value as	Range of values	Character string	Example Number
x	1Byte	hexadecimal	00h ... FFh	<i>xhh</i>	xA2
2x	2Byte	hexadecimal	0000h ... FFFFh	<i>2xhhhh</i>	2x7FFF
4x	4Byte	hexadecimal	00000000h ... FFFFFFFFh	<i>4xhhhhhhhh</i>	4x7FFF80C0
+	1Byte	decimal positive	0 ... 255	<i>+ddd</i>	+255
2+	2Byte	decimal positive	0 ... 65535	<i>2+dddd</i>	2+65535
4+	4Byte	decimal positive	0 ... 4294967295	<i>4+ddddddddd</i>	4+4294967295
-	1Byte	decimal negative	-128 ... -1	<i>-ddd</i>	-128
2-	2Byte	decimal negative	-32768 ... -1	<i>2-ddddd</i>	2-32768
4-	4Byte	decimal negative	-2147483648 ... -1	<i>4-ddddddd</i>	4-2147483648
b	1Byte	binary	00000000 ... 11111111	<i>bbbbbbbbb</i>	b10100101

Example

The analog module 031-1BB90 has 18byte parameter data. For the parameterization with default values this results in the following string:

x00 x00 x00 x00 x00 x02 xC1 x02 2x7FFF 2x8000 xC1 x02 2x7FFF 2x8000



Note!

As soon as the parameter data do not fit to the sequence of the modules on the System SLIO bus, the DeviceNet coupler goes to an error state and signals this with its status LEDs.

Due to the system, modules which are not yet parameterized are supplied with their default parameters as soon as you start a read access from your configuration tool.

Accessing diagnostics data

The DeviceNet coupler only supports passive diagnostics. This means for the diagnostics that there is no alarm activation on module side necessary. You have to request the diagnosis.

For this select in your configuration tool the corresponding DeviceNet-Slot. Then you get the diagnostics data of this module as byte sequence.

Information concerning structure of the diagnostics data may be found in the description of the corresponding System SLIO module.

Accessing firmware information

If this is supported by your configuration tool, via the corresponding DeviceNet-Slot you may get more information about the current version of your System SLIO.

System SLIO
DeviceNet coupler

Class Code: 100 (64h)

No.	Name	Information	Format	Example
1	DeviceName	Name of the device	String	VIPA 053-1DN00
2	HwVersion	Hardware version	String	02
3	SwVersion	Software version	String	V101
4	SerialNumber	Serial number	Unsigned32, String	00000205
5	FpgaVersion	FPGA version	Unsigned16, String	V208
6	MxFile	MX file	String	MX000053.101
7	ProductVersion	Product version	String	01V01.00
8	OrderCode	Order no.	String	053-1DN00

System SLIO
module

Class Code: Slot 1: 101 (65h)
Slot 2: 102 (66h)
...
Slot 64: 164 (A4h)

No.	Name	Information	Format	Example
1	DeviceName	Name of the device	String	VIPA 032-1BD40
2	HwVersion	Hardware version	String	21
3	SwVersion	Software version	String	V202
4	SerialNumber	Serial number	Unsigned32, String	00001143
5	FpgaVersion	FPGA version	Unsigned16, String	V208
6	MxFile	MX file	String	MX000028.130
7	ProductVersion	Product version	String	01V31.001
8	OrderCode	Order no.	String	032-1BD40
20	Parameter	Parameter data	String	x00 x00 x31 x31 x31 x31
21	Diagnostics	Diagnostics data	String	x00 x15 x00 x00 x73 x08 x04 x00 x00 x00 x00 x00 x00 x00 x00 x00 4x000020EB

Transfer rate and DeviceNet address

Overview

With PowerOFF there is the possibility to specify the *Transfer rate* respectively the *DeviceNet-Address* and then to activate these with PowerON.



Note!

Changes of the transfer rate respectively of the DeviceNet address were only recognized after PowerON or an automatic reset. Changes during the normal operation are not recognized.

Setting the transfer rate

Every station on the DeviceNet communicates with the same transfer rate. The setting of the transfer rate happens with the following proceeding:

- Switch the power supply to PowerOFF.
- Set switch 1 to "1" (Configuration).
- Preset the transfer rate with switch 2 ... 4.

No.	Description	Example
1	Configuration	1
2	Transfer rate 125kBit/s	0
3	Transfer rate 250kBit/s	1
4	Transfer rate 500kBit/s	0
5	-	-
6	-	-
7	-	-
8	not used	-

- Switch on the power supply. The preset transfer rate is stored in the EEPROM. Your DeviceNet coupler now uses this transfer rate.

LED indication RD LED SF LED

With an successful storage the RD LED (green) gets on.
With a wrong setting of the transfer rate the SF LED (red) lights up.

Setting the DeviceNet address

All stations on the bus must be uniquely identified by means of an ID address.

The setting of the DeviceNet address happens with the following proceeding:

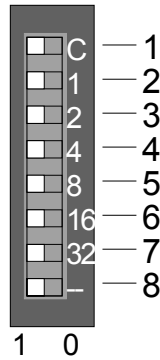
- Switch the power supply to PowerOFF.
- Set switch 1 to "0" (address).
- Preset the DeviceNet address with switch 2 ... 7 as a binary value.



Note!

Please regard each DeviceNet address is taken once at the bus between a number of 0 ... 63!

Settings



No.	Value	Example setting	Address
1	Configuration	0	1+2+32=35 Address: 35
2	$2^0 = 1$	1	
3	$2^1 = 2$	1	
4	$2^2 = 4$	0	
5	$2^3 = 8$	0	
6	$2^4 = 16$	0	
7	$2^5 = 32$	1	
8	not used	---	

- Switch on the Power supply. The preset DeviceNet address is stored in the RAM.

LED indication SF LED

With a wrong or already used address after PowerON the SF LED (red) lights up.

Status indication - Diagnostics

General

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

Here the RD LED corresponds to the System SLIO backplane bus and the MT LED to the DeviceNet bus.

LED indication

SF	RD	MT	Meaning
1	0	0	Setting on the address switch is not valid
0	1	0	The transfer rate was successfully stored
B	B	B	Firmware update running
1	1	1	Firmware update finished successfully
E	1	1	Firmware update finished with error - Error in EDS file - Transfer error - Error in flash
X	X	0	Field bus is offline - no DC 24V on the connector - no further station on the field bus
X	X	B	Field bus ready - no connection established
X	X	1	Field bus connected
1	X	0	Error field bus - field bus address just exists - communication error on the field bus
1	X	B	Inactivity - connection disconnected due to inactivity
X	B	X	System SLIO bus ready, outputs inactive
X	1	X	System SLIO bus active
1	E	X	Error on access the System SLIO bus
E	E	X	Configuration error System SLIO bus - The number of real modules at the bus differs to the configured modules. - The module type of at least one module differs to the type of the configured module.
B	E	E	Device error / internal error Please contact the VIPA support!

on: ● off: ○ not relevant: X

Blinking code *B* at a period duration of 1s: ○●●●

Blinking code *E* (Error) at a period duration of 2s: ○○○○●●●