

System SLIO

IM | 053-1DN00 | Manual

HB300 | IM | 053-1DN00 | en | 22-30

Interface-Modul DeviceNet - IM 053DN



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1 General

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1.2 About this manual

Objective and contents

This manual describes the IM 053DN of the System SLIO.

- It describes the structure, configuration and application.
- The manual is targeted at users who have a background in automation technology.
- The manual consists of chapters. Each chapter describes a completed topic.
- For guidance, the manual provides:
 - An overall table of contents at the beginning of the manual.
 - References with pages numbers.

Validity of the documentation

Product	Order no.	as of state:	
IM 053DN	053-1DN00	HW: 01	FW: V1.2.5

Icons Headings

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



DANGER!

Immediate or likely danger. Personal injury is possible.



CAUTION!

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



Supplementary information and useful tips.

1.3 Safety information

Applications conforming with specifications

The system is constructed and produced for:

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



DANGER!

This device is not certified for applications in

- in explosive environments (EX-zone)

Documentation

The manual must be available to all personnel in the

- project design department
- installation department
- commissioning
- operation

**CAUTION!**

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

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

Disposal

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

2 Basics and mounting

2.1 Safety information for users

Handling of electrostatic sensitive modules

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



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

Shipping of modules

Modules must be shipped in the original packing material.

Measurements and alterations on electrostatic sensitive modules

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

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

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



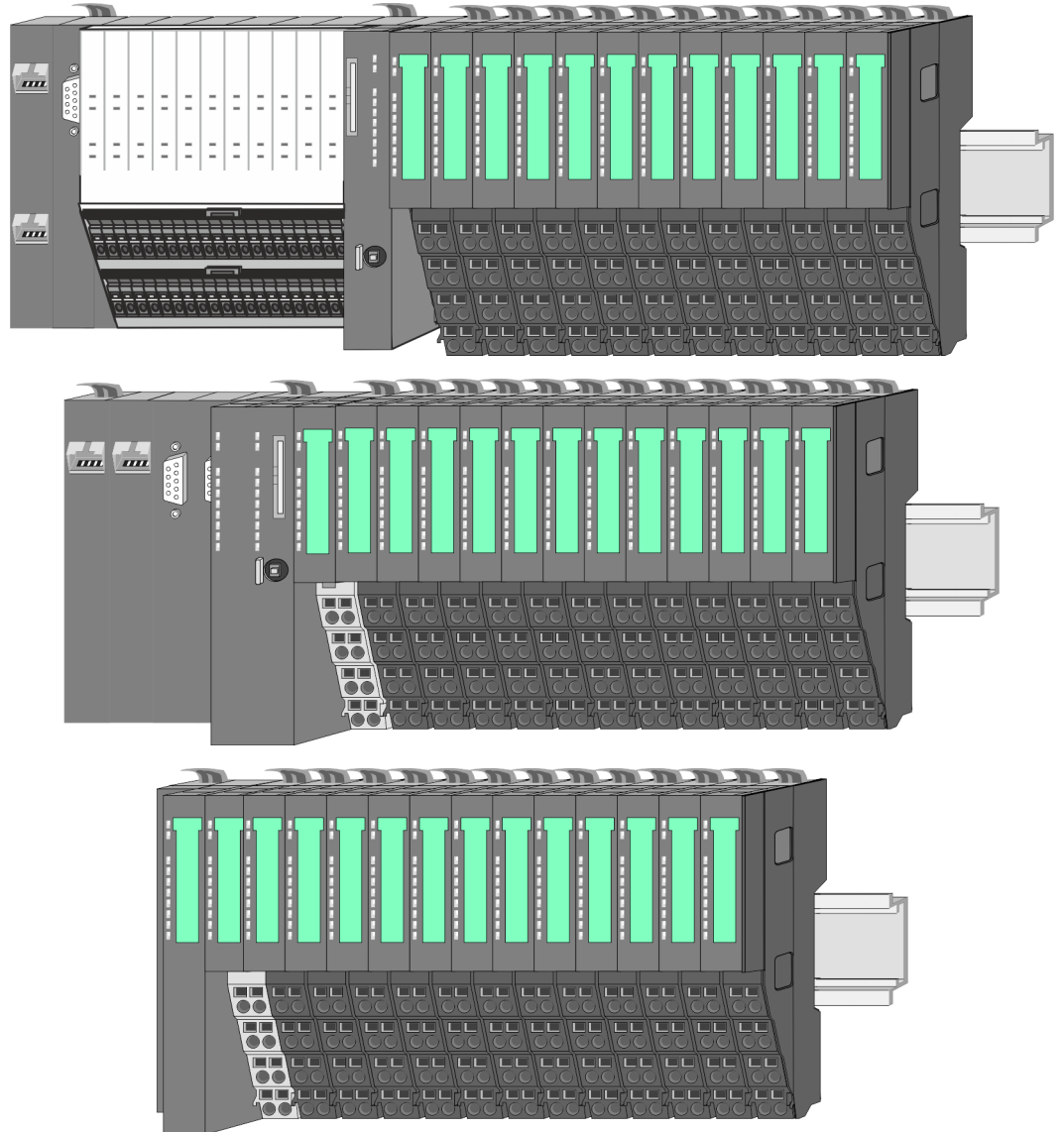
CAUTION!

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

2.2 System conception

2.2.1 Overview

The System SLIO is a modular automation system for assembly on a 35mm mounting rail. By means of the periphery modules with 2, 4, 8 and 16 channels this system may properly be adapted matching to your automation tasks. The wiring complexity is low, because the supply of the DC 24V power section supply is integrated to the backplane bus and defective modules may be replaced with standing wiring. By deployment of the power modules in contrasting colors within the system, further isolated areas may be defined for the DC 24V power section supply, respectively the electronic power supply may be extended with 2A.



2.2.2 Components

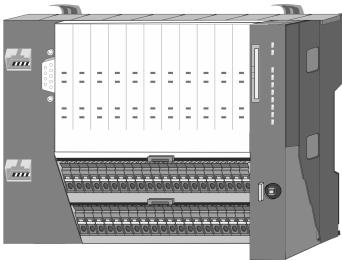
- CPU (head module)
- Bus coupler (head module)
- Line extension
- 8x periphery modules
- 16x periphery modules
- Power modules
- Accessories



CAUTION!

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

CPU 01xC



With the CPU 01xC electronic, input/output components and power supply are integrated to one casing. In addition, up to 64 periphery modules of the System SLIO can be connected to the backplane bus. As head module via the integrated power module for power supply CPU electronic and the I/O components are supplied as well as the electronic of the periphery modules, which are connected via backplane bus. To connect the power supply of the I/O components and for DC 24V power section supply of via backplane bus connected periphery modules, the CPU has removable connectors. By installing of up to 64 periphery modules at the backplane bus, these are electrically connected, this means these are assigned to the backplane bus, the electronic modules are power supplied and each periphery module is connected to the DC 24V power section supply.

CPU 01x



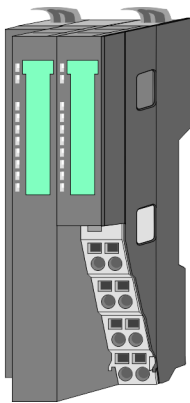
With this CPU 01x, CPU electronic and power supply are integrated to one casing. As head module, via the integrated power module for power supply, CPU electronic and the electronic of the connected periphery modules are supplied. The DC 24V power section supply for the linked periphery modules is established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



CAUTION!

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

Bus coupler



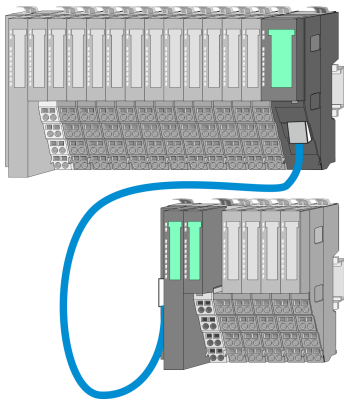
With a bus coupler bus interface and power module is integrated to one casing. With the bus interface you get access to a subordinated bus system. As head module, via the integrated power module for power supply, bus interface and the electronic of the connected periphery modules are supplied. The DC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



CAUTION!

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

Line extension

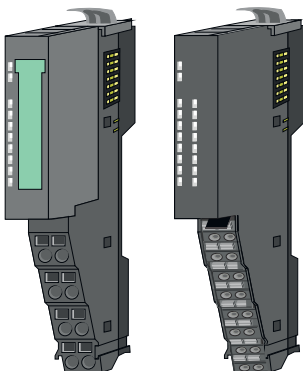


In the System SLIO there is the possibility to place up to 64 modules in on line. By means of the line extension you can divide this line into several lines. Here you have to place a line extension master at each end of a line and the subsequent line has to start with a line extension slave. Master and slave are to be connected via a special connecting cable. In this way, you can divide a line on up to 5 lines. For each line extension the maximum number of pluggable modules at the System SLIO bus is decreased by 1. To use the line extension no special configuration is required.



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

Periphery modules

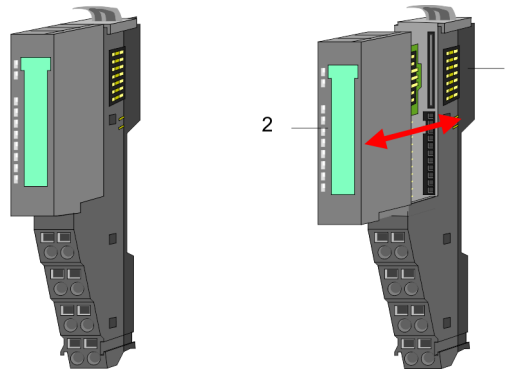


The periphery modules are available in the following 2 versions, whereby of each the electronic part can be replaced with standing wiring:

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

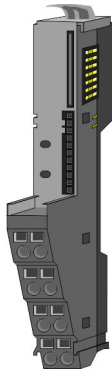
8x periphery modules

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



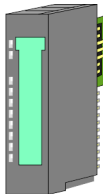
- 1 Terminal module
- 2 Electronic module

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 system may be assembled outside of your switchgear cabinet to be later mounted there as whole system.

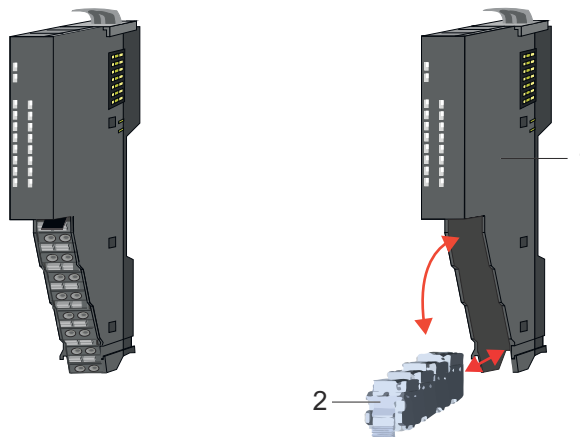
Electronic module



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

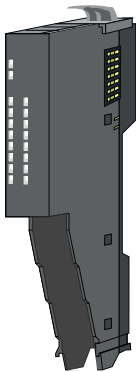
16x periphery modules

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



- 1 Electronic unit
- 2 Terminal block

Electronic unit



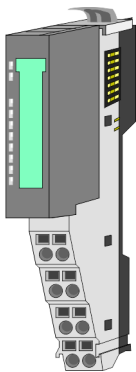
The functionality of a 16x periphery module is defined via the terminal block, which is connected to the *electronic unit* via a secure flap mechanism. In the case of an error you can exchange the defective electronic unit for a functional unit with standing wiring. At the front side there are LEDs for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

Terminal block



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

Power module



In the System SLIO the power supply is established by power modules. These are either integrated to the head module 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 colour of the power modules are contrasting to the periphery modules.

2.2.3 Accessories

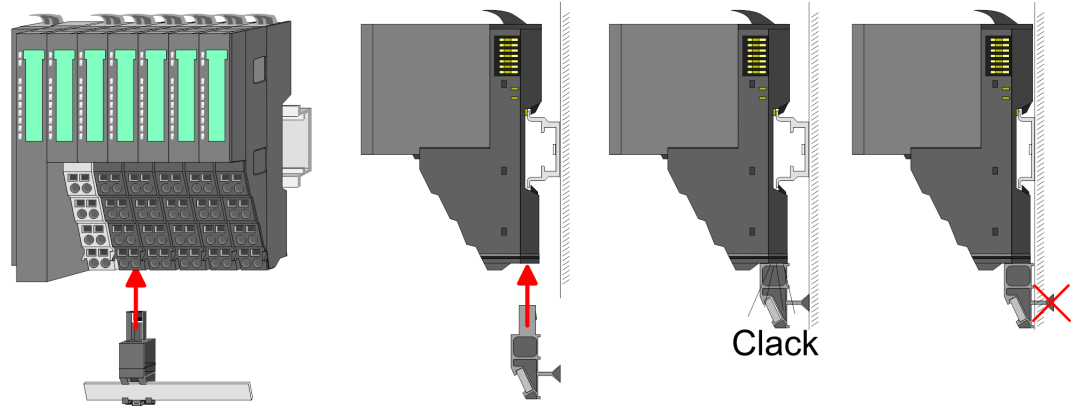
Shield bus carrier



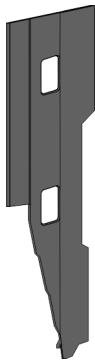
Please note that a shield bus carrier cannot be mounted on a 16x periphery module!



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



Bus cover



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

Coding pins



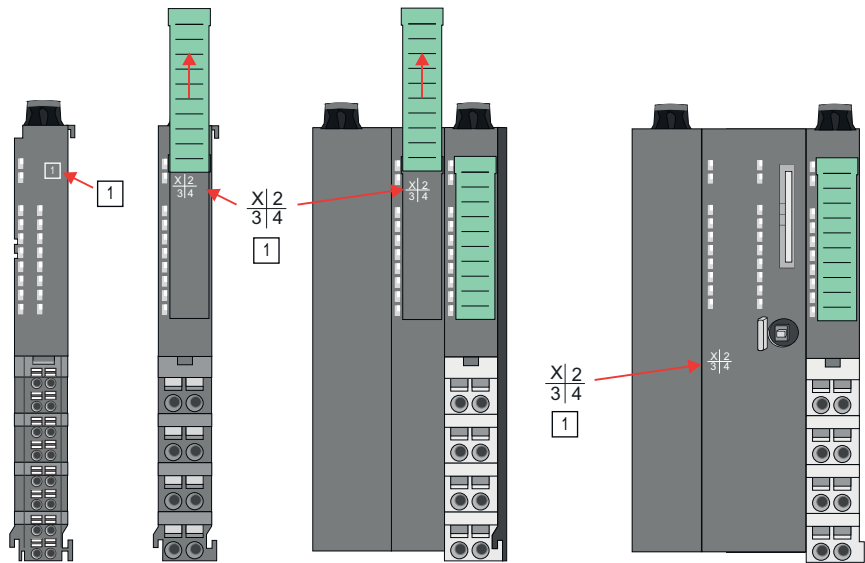
Please note that a coding pin cannot be installed on a 16x periphery module! Here you have to make sure that the associated terminal block is plugged again when the electronics unit is replaced.

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

2.2.4 Hardware revision

Hardware revision on the front

- The hardware revision is printed on every System SLIO module.
- Since a System SLIO 8x peripheral module consists of a terminal and electronic module, you will find a hardware revision printed on each of them.
- Authoritative for the hardware revision of a System SLIO module is the hardware revision of the electronic module. This is located under the labeling strip of the corresponding electronic module.
- Depending on the module type, there are the following 2 variants e.g. to indicate hardware revision 1:
 - Current modules have a 1 on the front.
 - With earlier modules, the 1 is marked with 'X' on a number grid.



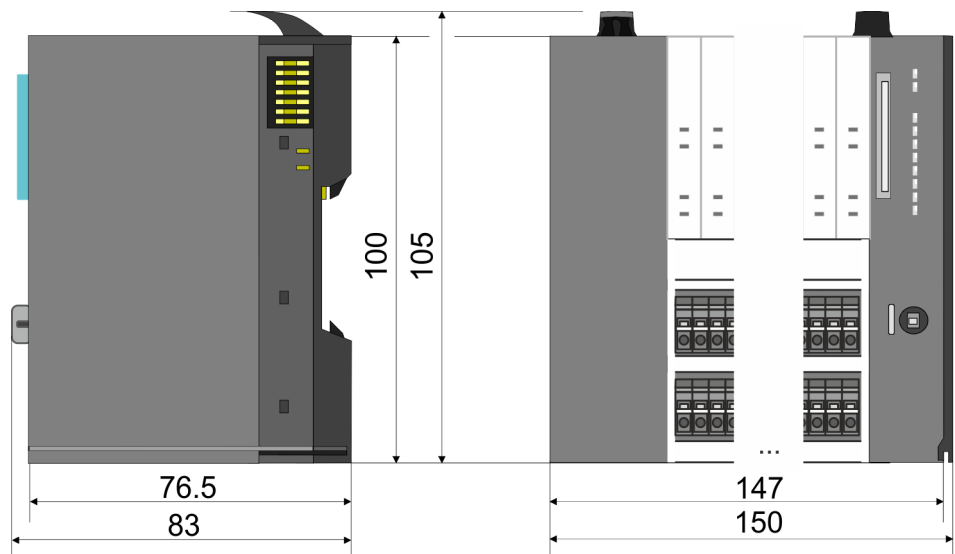
Hardware revision via web server

On the CPUs and some bus couplers, you can check the hardware revision 'HW Revision' via the integrated web server.

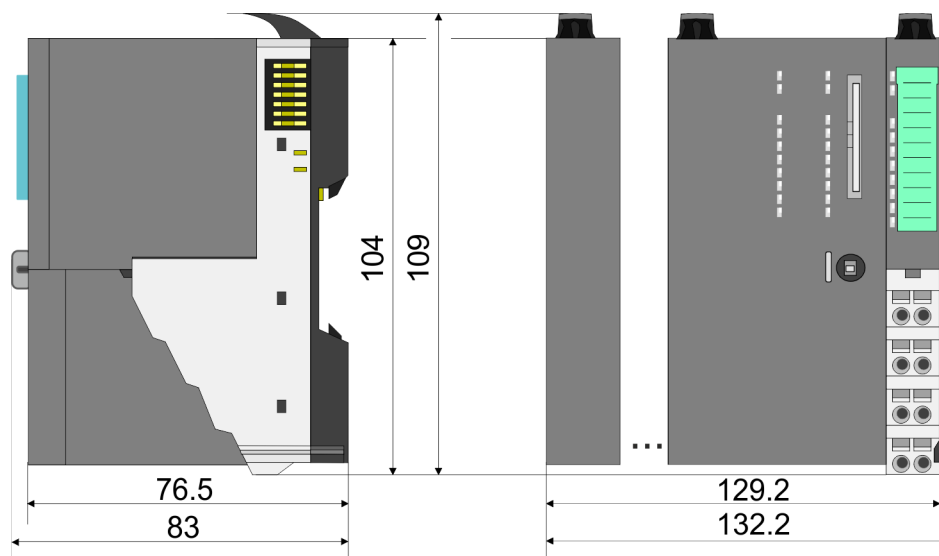
2.3 Dimensions

CPU 01xC

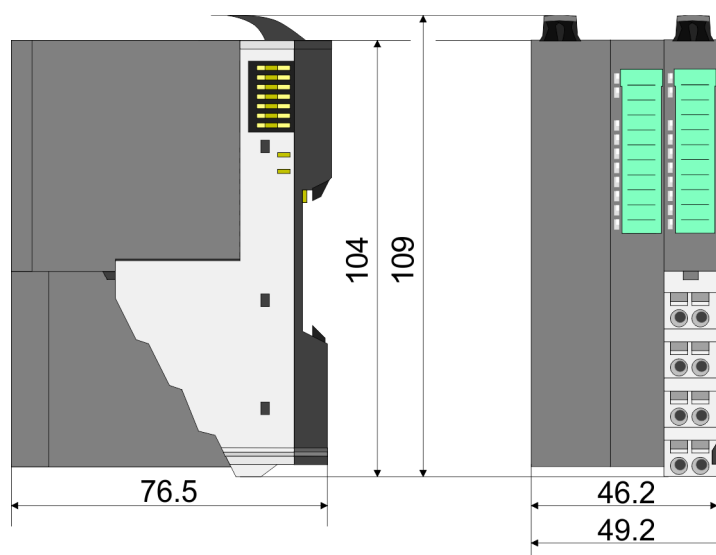
All dimensions are in mm.



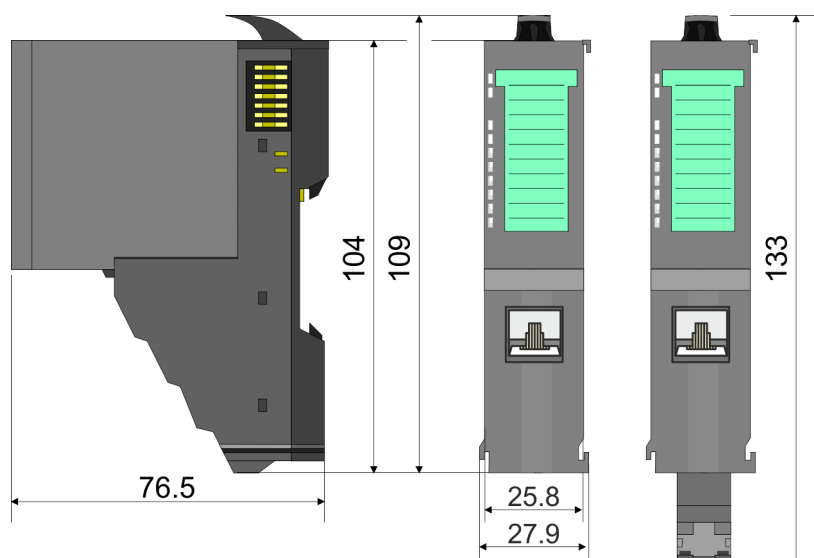
CPU 01x



Bus coupler and line extension slave

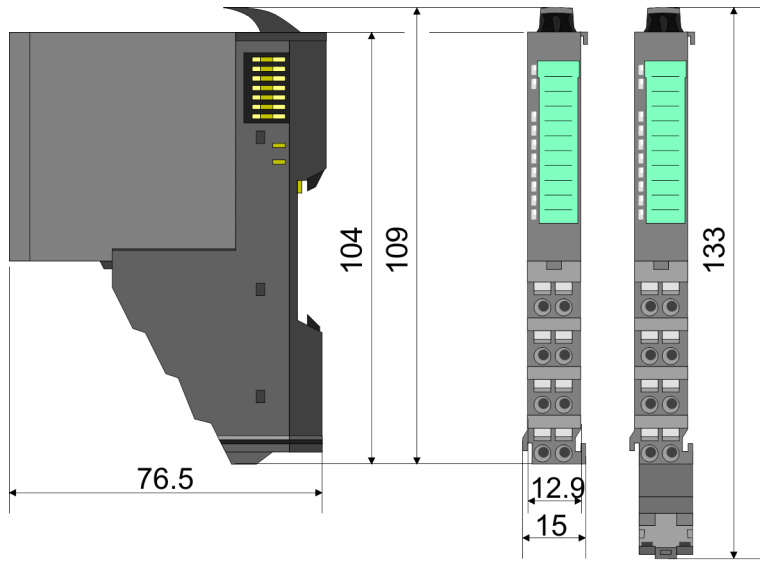


Line extension master

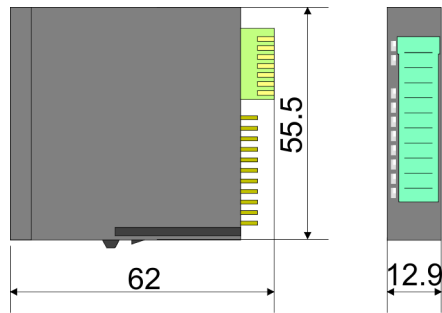


Dimensions

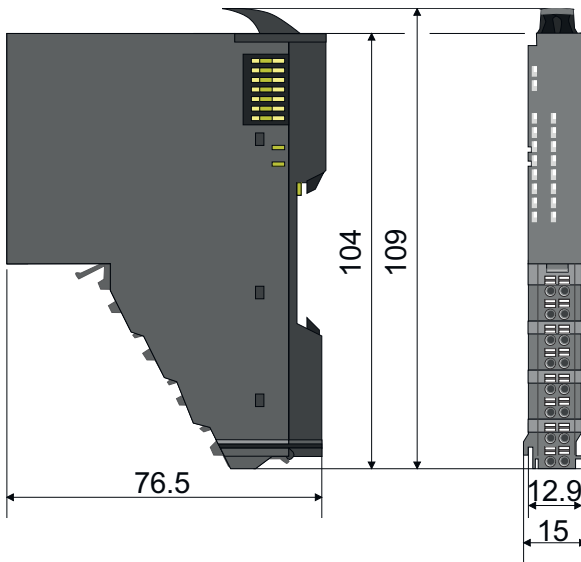
8x periphery module



Electronic module



16x periphery module



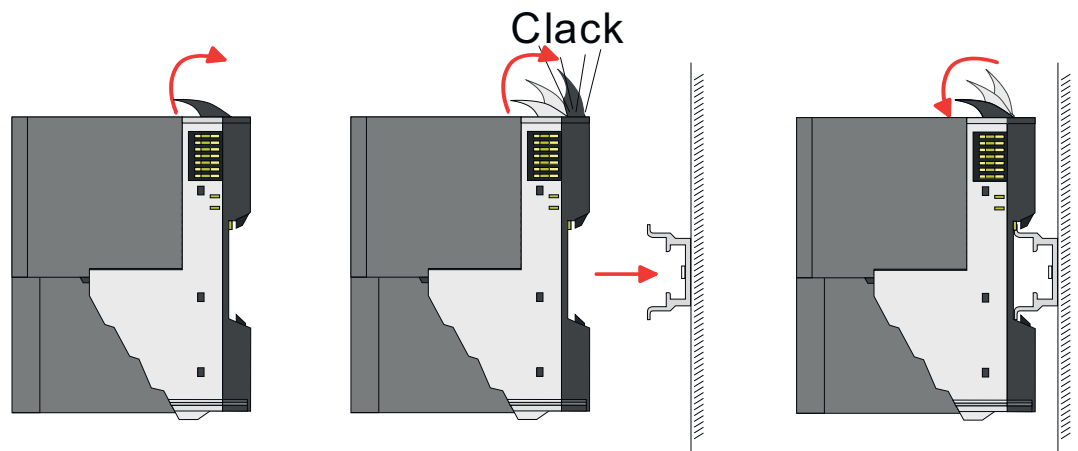
2.4 Mounting bus coupler



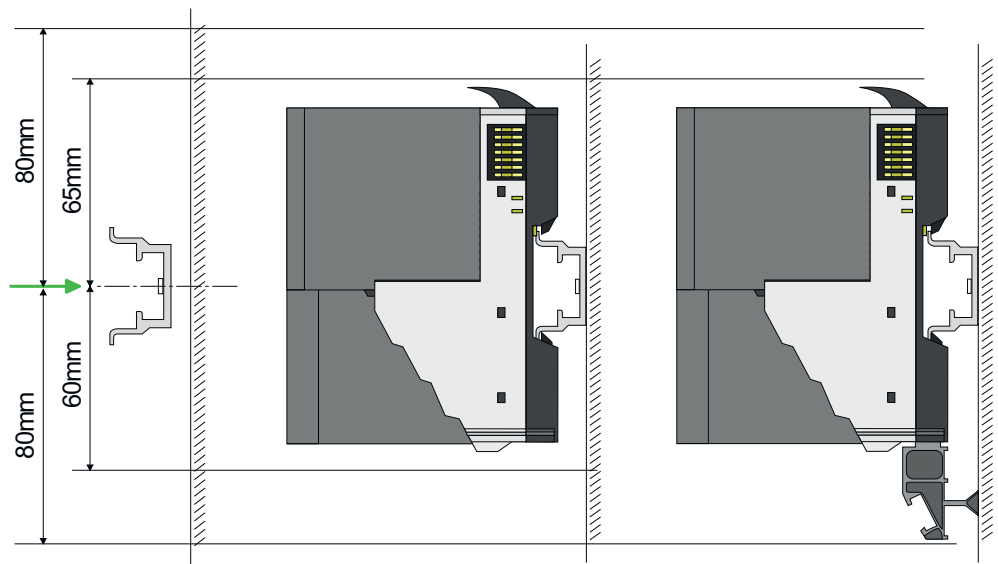
Requirements for UL compliance use

- Use for power supply exclusively SELV/PELV power supplies.
- The System SLIO must be installed and operated in a housing according to IEC 61010-1 9.3.2 c).

There are locking lever at the top side of the bus coupler. For mounting and demounting these locking lever are to be turned upwards until these engage. Place the bus coupler at the mounting rail. The bus coupler is fixed to the mounting rail by pushing downward the locking levers. The bus coupler is directly mounted at a mounting rail. Up to 64 modules may be mounted. The electronic and power section supply are connected via the back-plane bus. Please consider here that the sum current of the electronic power supply does not exceed the maximum value of 3A. By means of the power module 007-1AB10 the current of the electronic power supply may be expanded accordingly.

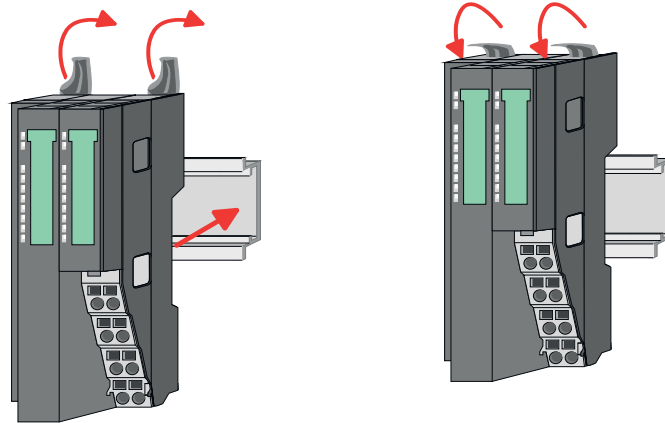


Proceeding



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

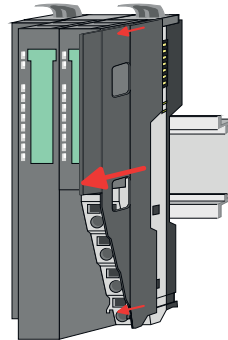
Mounting bus coupler



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

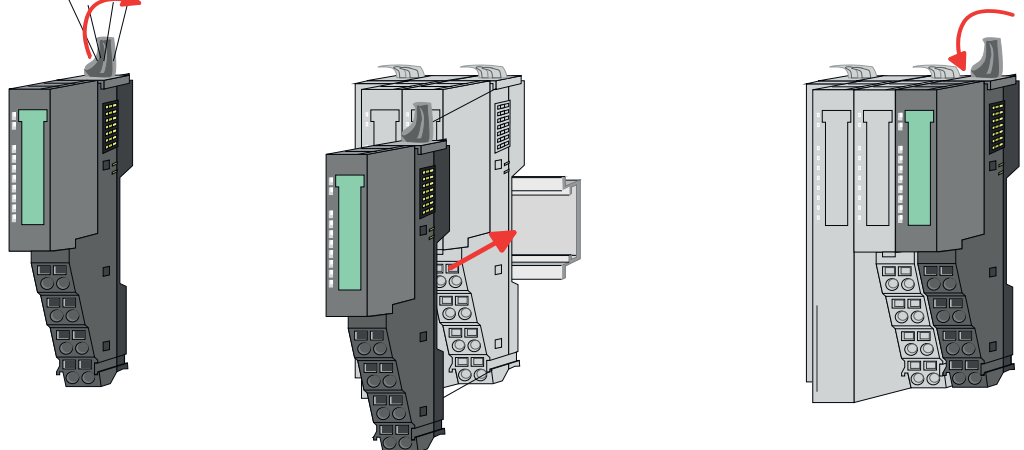
Mounting periphery modules

The procedure is identical for 8x and 16x periphery modules.

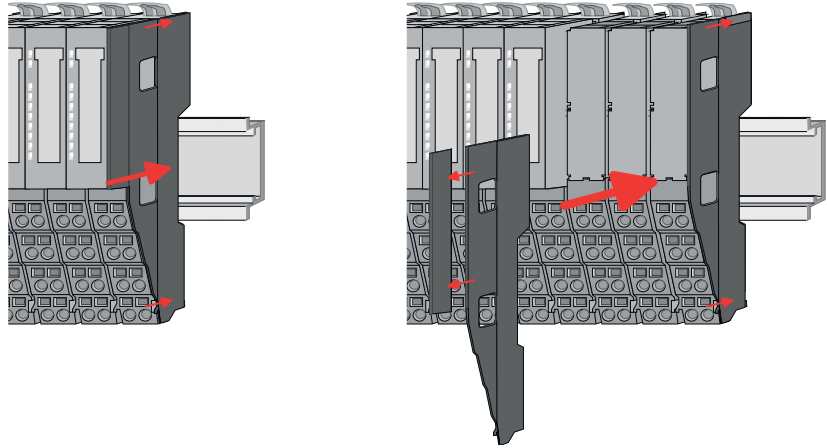


1. Before mounting the periphery modules you have to remove the bus cover at the right side of the bus coupler by pulling it forward. Keep the cover for later mounting.

Clack



2. Mount the periphery modules you want.



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

2.5 Wiring



CAUTION!

Consider temperature for external cables!

Cables may experience temperature increase due to system heat dissipation. Thus the cabling specification must be chosen 5°C above ambient temperature!



CAUTION!

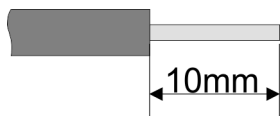
Separate insulation areas!

The system is specified for SELV/PELV environment. Devices, which are attached to the system must meet these specifications. Installation and cable routing other than SELV/PELV specification must be separated from the system's equipment!

2.5.1 Wiring bus coupler

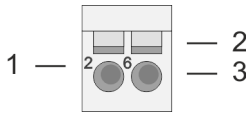
Terminal module terminals The System SLIO bus coupler have a power module integrated. Terminals with spring clamp technology are used for wiring. The spring clamp technology allows quick and easy connection of your signal and supply lines. In contrast to screw terminal connections this type of connection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

Data

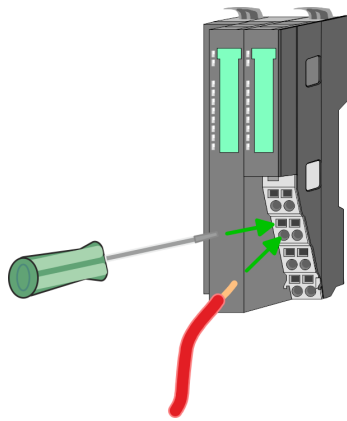
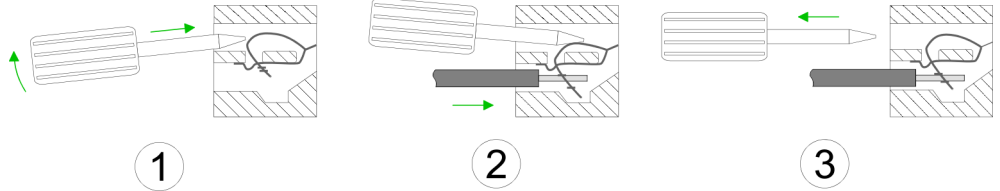


U_{max}	30V DC
I_{max}	10A
Cross section	0.08 ... 1.5mm ² (AWG 28 ... 16)
Stripping length	10mm

Wiring procedure

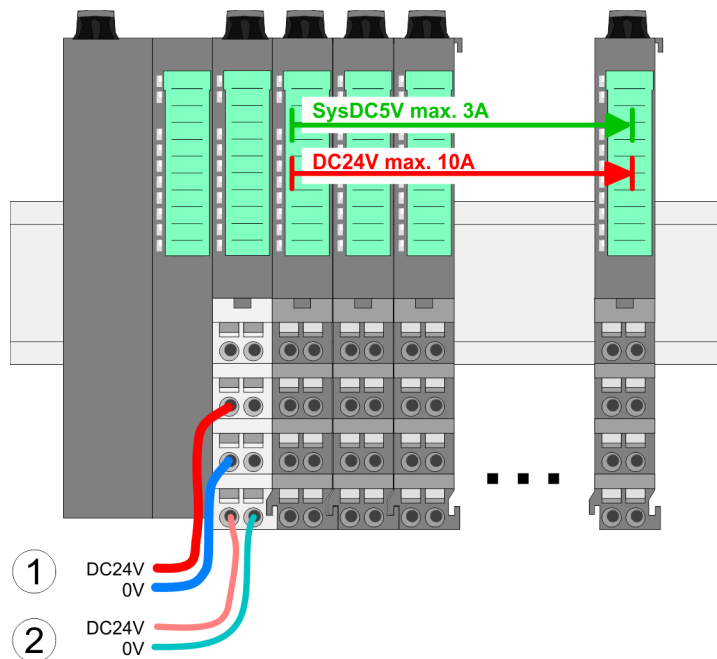


- 1 Pin number at the connector
- 2 Opening for screwdriver
- 3 Connection hole for wire

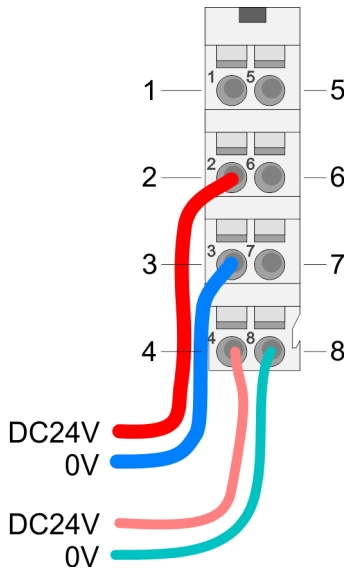


- 1. Insert a suited screwdriver at an angle into the square opening as shown. Press and hold the screwdriver in the opposite direction to open the contact spring.
- 2. Insert the stripped end of wire into the round opening. You can use wires with a cross section of 0.08mm² up to 1.5mm²
- 3. By removing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

PM - Power module

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

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

I: Input

**CAUTION!**

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



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

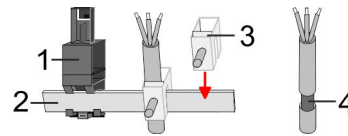
Fusing

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

State of the electronic power supply via LEDs

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

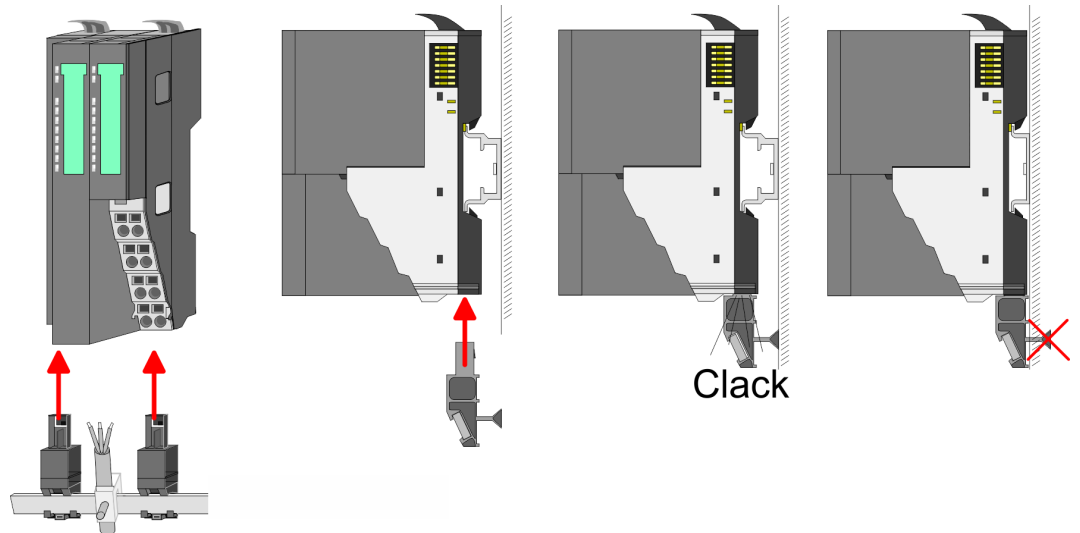
Shield attachment



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

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

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



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

2.5.2 Wiring 8x periphery modules

Terminal module terminals



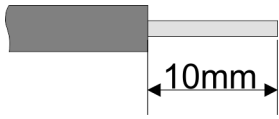
CAUTION!

Do not connect hazardous voltages!

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

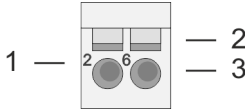
- With wiring the terminal modules, terminals with spring clamp technology are used for wiring. The spring clamp technology allows quick and easy connection of your signal and supply lines. In contrast to screw terminal connections this type of connection is vibration proof.

Data

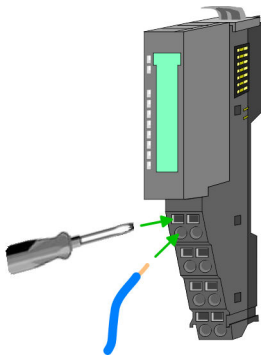
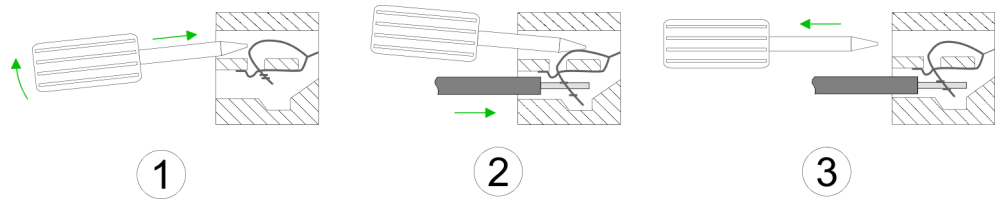


U_{max} 240V AC / 30V DC
 I_{max} 10A
 Cross section 0.08 ... 1.5mm² (AWG 28 ... 16)
 Stripping length 10mm

Wiring procedure

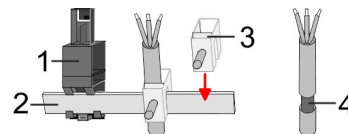


- 1 Pin number at the connector
- 2 Opening for screwdriver
- 3 Connection hole for wire



1. Insert a suited screwdriver at an 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 up to 1.5mm²
3. By removing the screwdriver, the wire is securely fixed via the spring contact to the terminal.

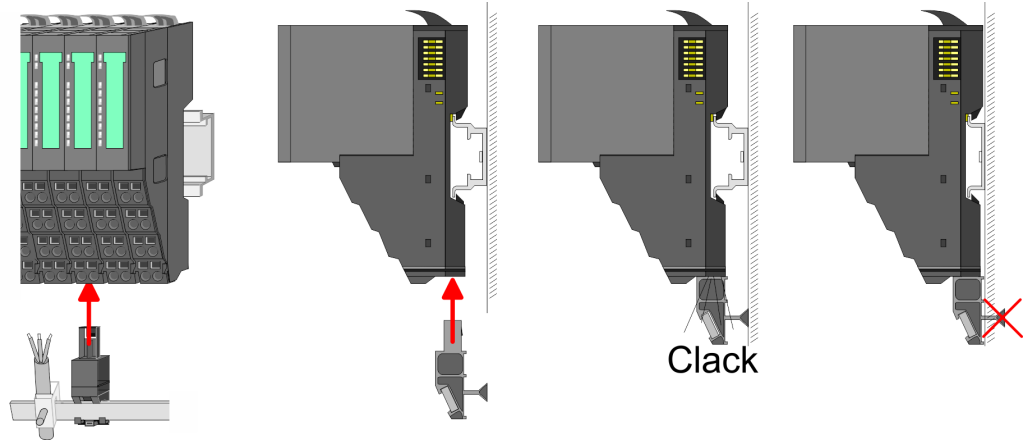
Shield attachment



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

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

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



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

2.5.3 Wiring 16x periphery modules

Terminal block connectors



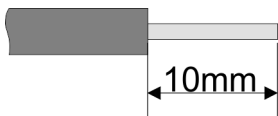
CAUTION!

Do not connect hazardous voltages!

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

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

Data

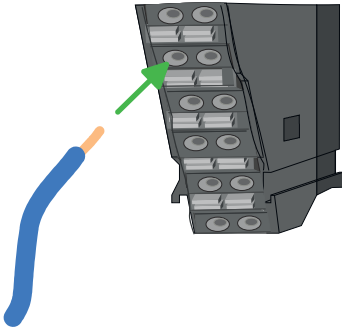


U_{max}	30V DC
I_{max}	10A
Cross section solid wire	0.25 ... 0.75mm ²
Cross section with ferrule	0.14 ... 0.75mm ²
Wire type	CU
AWG	24 ... 16
Stripping length	10mm

Wiring procedure

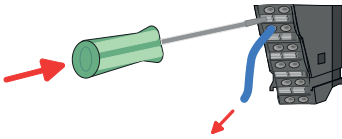


- 1 Release area
- 2 Connection hole for wire

Insert wire

The wiring happens without a tool.

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

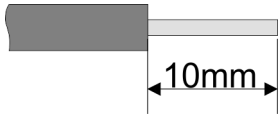
Remove wire

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

1. ➤ Press with your screwdriver vertically at the release button.
 - ⇒ The contact spring releases the wire.
2. ➤ Pull the wire from the round hole.

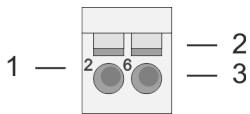
2.5.4 Wiring power modules**Terminal module terminals**

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

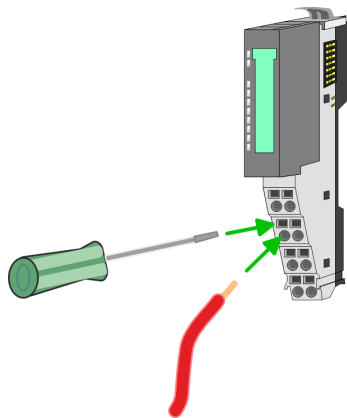
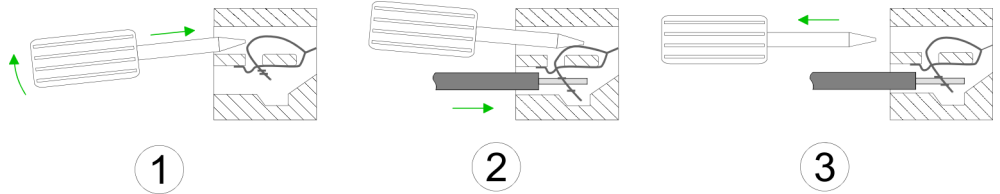
Data

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

Wiring procedure

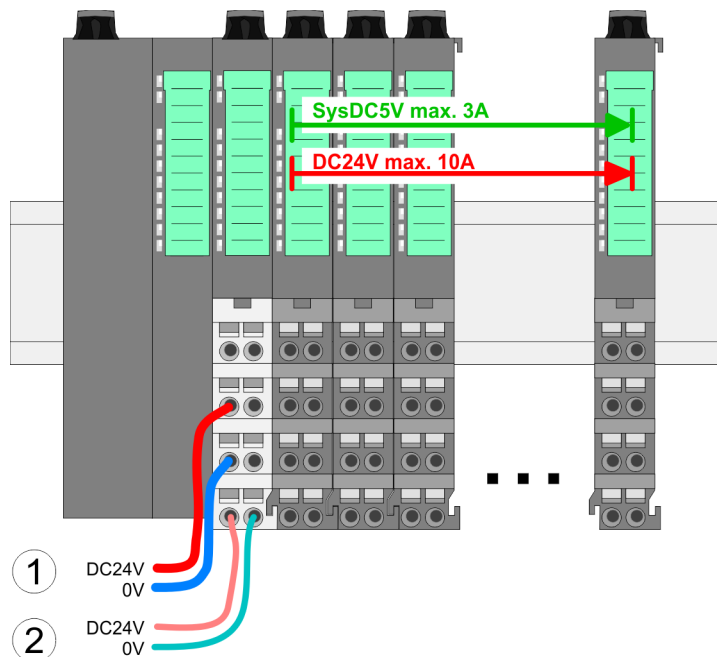


- 1 Pin number at the connector
- 2 Opening for screwdriver
- 3 Connection hole for wire

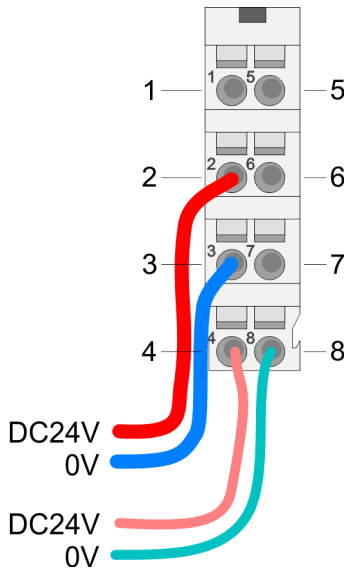


- 1. Insert a suited screwdriver at an angle into the square opening as shown. Press and hold the screwdriver in the opposite direction to open the contact spring.
- 2. Insert the stripped end of wire into the round opening. You can use wires with a cross section of 0.08mm² up to 1.5mm²
- 3. By removing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

PM - Power module

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

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

I: Input

**CAUTION!**

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



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

Fusing

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

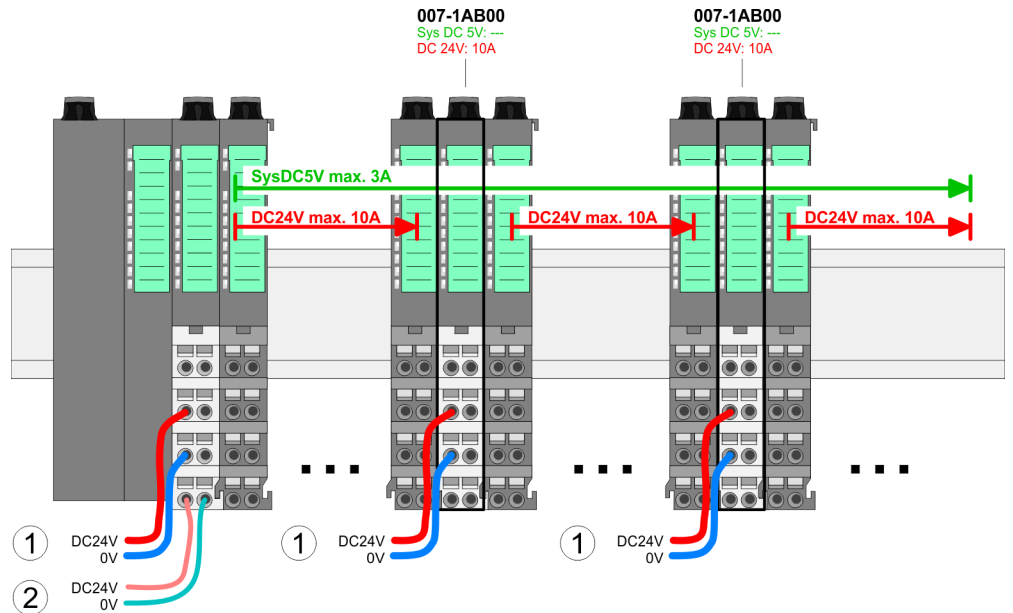
State of the electronic power supply via LEDs

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

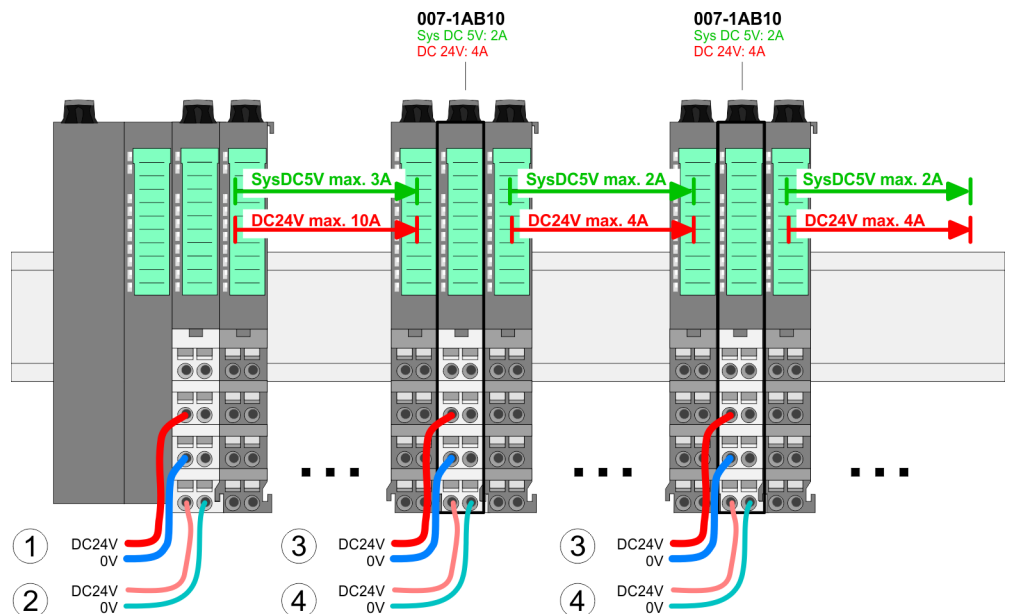
Deployment of the power modules

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

Power module 007-1AB00

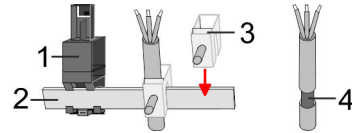


Power module 007-1AB10



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

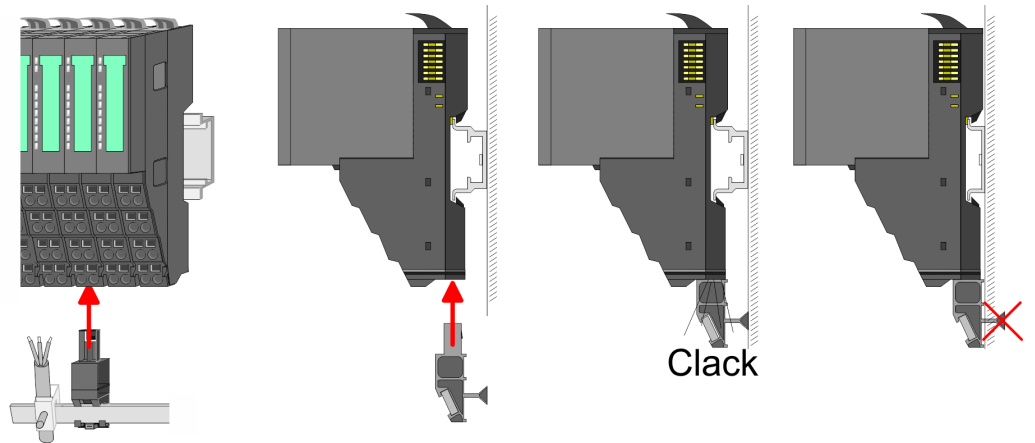
Shield attachment



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

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

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



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

2.6 Demounting

2.6.1 Demounting bus coupler

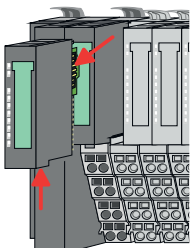
Proceeding



CAUTION!

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

1. ➤ Power-off your system.
2. ➤ Remove if exists the wiring of the bus coupler.

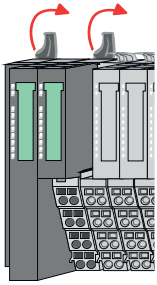


3. ➤

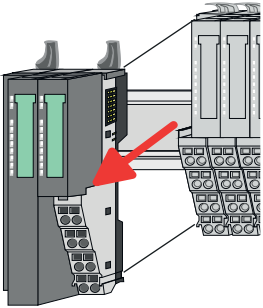


For demounting and exchange of a (head) module or a group of modules, due to mounting reasons you always have to remove the electronic module right beside. After mounting it may be plugged again.

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

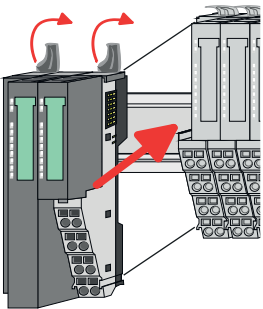


4. Turn all the locking lever of the bus coupler to be exchanged upwards.



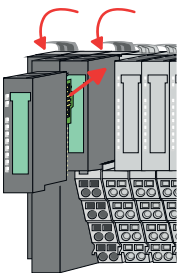
5. Pull the bus coupler forward.

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



7. To mount the bus coupler put it to the left periphery module and push it, guided by the stripes, to the mounting rail.

8. Turn all the locking lever downward, again.



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

10. Wire your bus coupler.

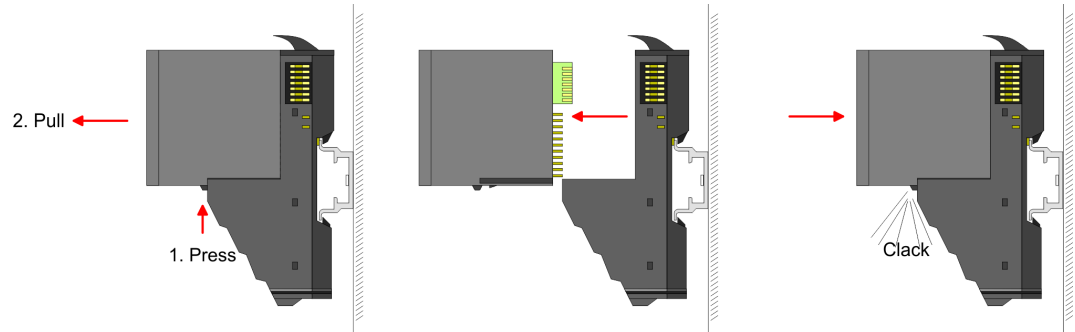
⇒ Now you can bring your system back into operation.

2.6.2 Demounting 8x periphery modules

Proceeding

Exchange of an electronic module

1. ➤ Power-off your system.



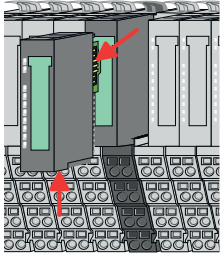
2. ➤ For the exchange of a electronic module, the electronic module may be pulled forward after pressing the unlocking lever at the lower side of the module.
3. ➤ For installation plug the new electronic module guided by the strips at the lower side until this engages to the terminal module.
 - ⇒ Now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



Easy Maintenance

'Easy Maintenance' means the support for adding and removing electronic modules during operation without having to restart the system. If this is supported by your head module, you will find more detailed information on this in the "Deployment" chapter.

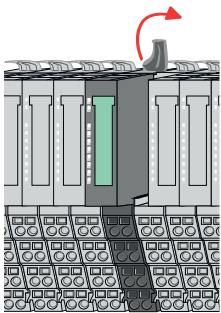
Exchange of a periphery module



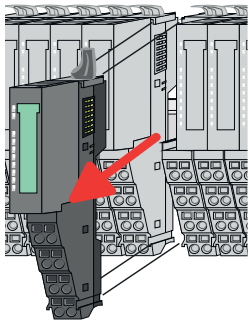
1. ➤ Power-off your system.
2. ➤ Remove if exists the wiring of the module.
3. ➤

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

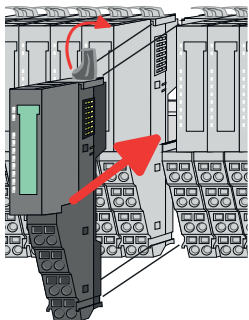
Press the unlocking lever at the lower side of the just mounted right module and pull it forward.



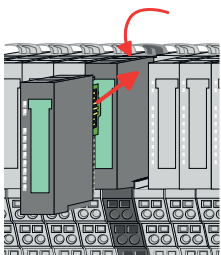
4. ➤ Turn the locking lever of the module to be exchanged upwards.



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

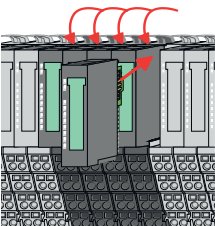
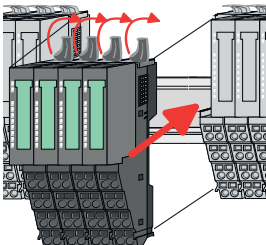
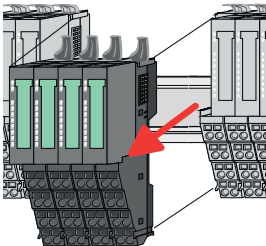
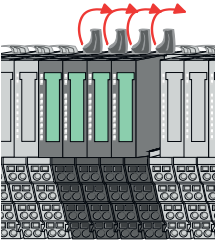
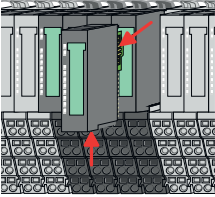


7. ➤ To mount the module put it to the gap between the both modules and push it, guided by the stripes at both sides, to the mounting rail.
8. ➤ Turn the locking lever downward, again.



9. ➤ Plug again the electronic module, which you have removed before.
10. ➤ Wire your module.
 - ⇒ Now you can bring your system back into operation.

Exchange of a module group



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

3. ➤



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

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

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

5. ➤ Pull the module group forward.

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

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

8. ➤ Turn all the locking lever downward, again.

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

10. ➤ Wire your module group.

⇒ Now you can bring your system back into operation.

2.6.3 Demounting 16x periphery modules

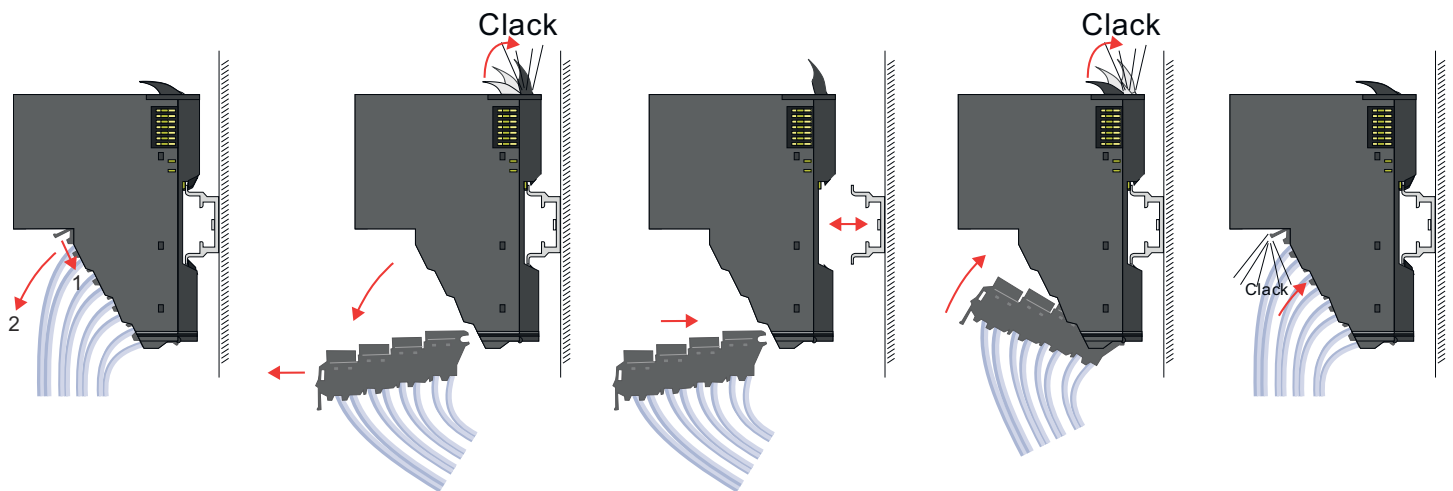
Proceeding

Exchange of an electronic unit

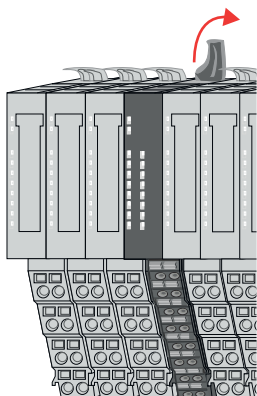
1. ➤ Power-off your system.
2. ➤ To replace an electronic unit, you can push down and pull off the terminal block after releasing the lock.

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

⇒ Now you can bring your system back into operation.



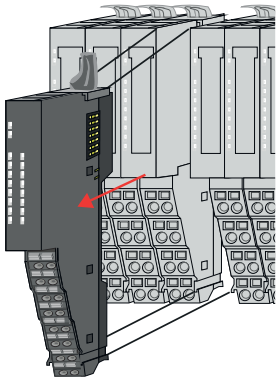
Exchange of a 16x periphery module



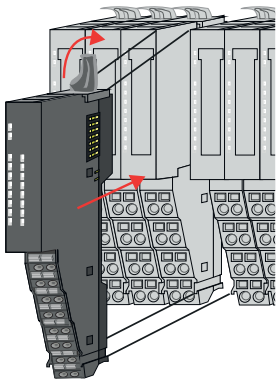
1. ➤ Power-off your system.
2. ➤ Remove if exists the wiring of the module respectively the wired terminal block.
3. ➤

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

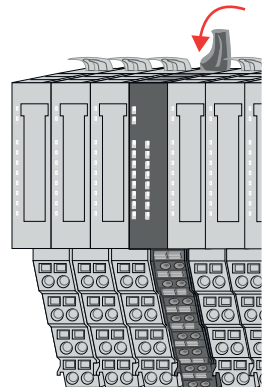
Turn the locking lever of the module to be exchanged upwards.



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

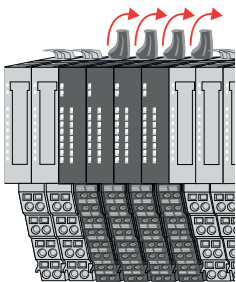


6. ➤ To mount the module put it to the gap between the both modules and push it, guided by the stripes at both sides, to the mounting rail.



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

Exchange of a module group

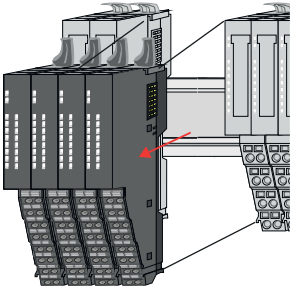


1. ➤ Power-off your system.
2. ➤ Remove if exists the wiring of the module group respectively the wired terminal blocks.
3. ➤

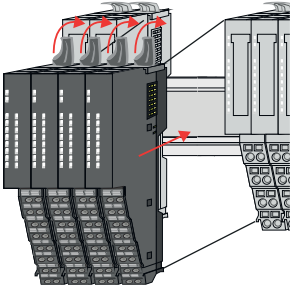
i *In contrast to 8x periphery modules, you can directly demount and mount 16x periphery modules.*

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

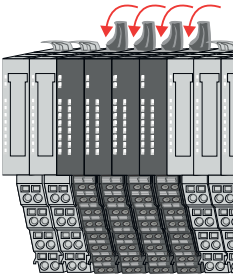
Demounting > Demounting 16x periphery modules



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



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



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

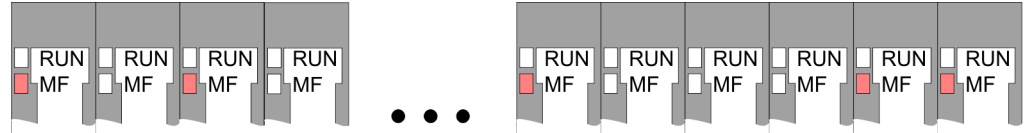
2.7 Trouble shooting - LEDs

General

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

In the following illustrations flashing LEDs are marked by ☼.

Sum current of the electronic power supply exceeded

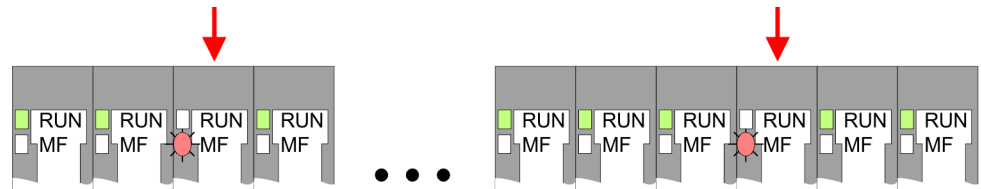


Behaviour: After PowerON the RUN LED of each module is off and the MF LED of each module is sporadically on.

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

Remedy: As soon as the sum current of the electronic power supply is exceeded, always place the power module 007-1AB10. ↪ Chap. 2.5.4 'Wiring power modules' page 25

Error in configuration

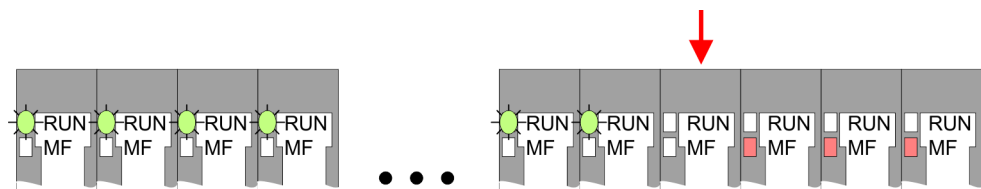


Behaviour: After PowerON the MF LED of one module respectively more modules flashes. The RUN LED remains off.

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

Remedy: Match configuration and hardware structure.

Module failure



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

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

Remedy: Replace the defective module.

2.8 Industrial security and installation guidelines

2.8.1 Industrial security in information technology

Latest version

This chapter can also be found as a guide '*Industrial IT Security*' at www.yaskawa.eu.com

Hazards

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

- Internal manipulation such as technical errors, operating and program errors and deliberate program or data manipulation.
- External manipulation such as software viruses, worms and Trojans.
- Human carelessness such as password phishing.

Precautions

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

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

Further Information

You can find more information about the measures on the following websites:

- Federal Office for Information Technology www.bsi.bund.de
- Cybersecurity & Infrastructure Security Agency us-cert.cisa.gov
- VDI / VDE Society for Measurement and Automation Technology www.vdi.de

2.8.1.1 Protection of hardware and applications

Precautions

- Do not integrate any components or systems into public networks.
 - Use VPN "Virtual Private Networks" for use in public networks. This allows you to control and filter the data traffic accordingly.
- Always keep your system up-to-date.
 - Always use the latest firmware version for all devices.
 - Update your user software regularly.
- Protect your systems with a firewall.
 - The firewall protects your infrastructure internally and externally.
 - This allows you to segment your network and isolate entire areas.
- Secure access to your plants via user accounts.
 - If possible, use a central user management system.
 - Create a user account for each user for whom authorization is essential.
 - Always keep user accounts up-to-date and deactivate unused user accounts.
- Secure access to your plants via secure passwords.
 - Change the password of a standard login after the first start.
 - Use strong passwords consisting of upper/lower case, numbers and special characters. The use of a password generator or manager is recommended.
 - Change the passwords according to the rules and guidelines that apply to your application.
- Deactivate inactive communication ports respectively protocols.
 - Only the communication ports that are used for communication should be activated.
 - Only the communication protocols that are used for communication should be activated.
- Consider possible defence strategies when planning and securing the system.
 - The isolation of components alone is not sufficient for comprehensive protection. An overall concept is to be drawn up here, which also provides defensive measures in the event of a cyber attack.
 - Periodically carry out threat assessments. Among others, a comparison is made here between the protective measures taken and those required.
- Limit the use of external storage media.
 - Via external storage media such as USB memory sticks or SD memory cards, malware can get directly into a system while bypassing a firewall.
 - External storage media or their slots must be protected against unauthorized physical access, e.g. by using a lockable control cabinet.
 - Make sure that only authorized persons have access.
 - When disposing of storage media, make sure that they are safely destroyed.
- Use secure access paths such as HTTPS or VPN for remote access to your plant.
- Enable security-related event logging in accordance with the applicable security policy and legal requirements for data protection.

2.8.1.2 Protection of PC-based software

Precautions

Since PC-based software is used for programming, configuration and monitoring, it can also be used to manipulate entire systems or individual components. Particular caution is required here!

- Use user accounts on your PC systems.
 - If possible, use a central user management system.
 - Create a user account for each user for whom authorization is essential.
 - Always keep user accounts up-to-date and deactivate unused user accounts.
- Protect your PC systems with secure passwords.
 - Change the password of a standard login after the first start.
 - Use strong passwords consisting of upper/lower case, numbers and special characters. The use of a password generator or manager is recommended.
 - Change the passwords according to the rules and guidelines that apply to your application.
- Enable security-related event logging in accordance with the applicable security policy and legal requirements for data protection.
- Protect your PC systems by security software.
 - Install virus scanners on your PC systems to identify viruses, trojans and other malware.
 - Install software that can detect phishing attacks and actively prevent them.
- Always keep your software up-to-date.
 - Update your operating system regularly.
 - Update your software regularly.
- Make regular backups and store the media at a safe place.
- Regularly restart your PC systems. Only boot from storage media that are protected against manipulation.
- Use encryption systems on your storage media.
- Perform security assessments regularly to reduce the risk of manipulation.
- Use only data and software from approved sources.
- Uninstall software which is not used.
- Disable unused services.
- Activate a password-protected screen lock on your PC systems.
- Always lock your PC systems as soon as you leave your PC workstation.
- Do not click any links that come from unknown sources. If necessary ask, e.g. on e-mails.
- Use secure access paths such as HTTPS or VPN for remote access to your PC system.

2.8.2 Installation guidelines

General

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

What does EMC mean?

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

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

Possible interference causes

Electromagnetic interferences may interfere your control via different ways:

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

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

There are:

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

Basic rules for EMC

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

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

Isolation of conductors

Electrical, magnetically and electromagnetic interference fields are weakened by means of an isolation, one talks of absorption. Via the isolation rail, that is connected conductive with the rack, interference currents are shunt via cable isolation to the ground. Here you have to make sure, that the connection to the protected earth conductor is impedance-low, because otherwise the interference currents may appear as interference cause.

When isolating cables you have to regard the following:

- If possible, use only cables with isolation tangle.
- The hiding power of the isolation should be higher than 80%.
- Normally you should always lay the isolation of cables on both sides. Only by means of the both-sided connection of the isolation you achieve high quality interference suppression in the higher frequency area. Only as exception you may also lay the isolation one-sided. Then you only achieve the absorption of the lower frequencies. A one-sided isolation connection may be convenient, if:
 - the conduction of a potential compensating line is not possible.
 - analog signals (some mV respectively μA) are transferred.
 - foil isolations (static isolations) are used.
- With data lines always use metallic or metallised plugs for serial couplings. Fix the isolation of the data line at the plug rack. Do not lay the isolation on the PIN 1 of the plug bar!
- At stationary operation it is convenient to strip the insulated cable interruption free and lay it on the isolation/protected earth conductor line.
- To fix the isolation tangles use cable clamps out of metal. The clamps must clasp the isolation extensively and have well contact.
- Lay the isolation on an isolation rail directly after the entry of the cable in the cabinet. Lead the isolation further on to your PLC and don't lay it on there again!



CAUTION!

Please regard at installation!

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

Remedy: Potential compensation line

2.9 General data for the System SLIO

Conformity and approval		
Conformity		
CE	2014/35/EU	Low-voltage directive
	2014/30/EU	EMC directive
Approval		
UL	-	Refer to Technical data
Others		
RoHS	2011/65/EU	Restriction of the use of certain hazardous substances in electrical and electronic equipment

Protection of persons and device protection

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

Environmental conditions to EN 61131-2

Climatic		
Storage / transport	EN 60068-2-14	-25...+70°C
Operation		
Horizontal installation hanging	EN 61131-2	0...+60°C
Horizontal installation lying	EN 61131-2	0...+55°C
Vertical installation	EN 61131-2	0...+50°C
Air humidity	EN 60068-2-30	RH1 (without condensation, rel. humidity 10...95%)
Pollution	EN 61131-2	Degree of pollution 2
Installation altitude max.	-	2000m
Mechanical		
Oscillation	EN 60068-2-6	1g, 9Hz ... 150Hz
Shock	EN 60068-2-27	15g, 11ms

Mounting conditions

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

General data for the System SLIO > Use in difficult operating conditions

EMC	Standard	Comment	
Emitted interference	EN 61000-6-4	Class A (Industrial area)	
Noise immunity zone B	EN 61000-6-2	Industrial area	
		EN 61000-4-2	ESD 8kV at air discharge (degree of severity 3), 4kV at contact discharge (degree of severity 2)
		EN 61000-4-3	HF field immunity (casing) 80MHz ... 1000MHz, 10V/m, 80% AM (1kHz) 1.4GHz ... 2.0GHz, 3V/m, 80% AM (1kHz) 2GHz ... 2.7GHz, 1V/m, 80% AM (1kHz)
		EN 61000-4-6	HF conducted 150kHz ... 80MHz, 10V, 80% AM (1kHz)
		EN 61000-4-4	Burst, degree of severity 3
	EN 61000-4-5	Surge, degree of severity 3 ¹	

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

2.9.1 Use in difficult operating conditions



Without additional protective measures, the products must not be used in locations with difficult operating conditions; e.g. due to:

- *dust generation*
- *chemically active substances (corrosive vapors or gases)*
- *strong electric or magnetic fields*

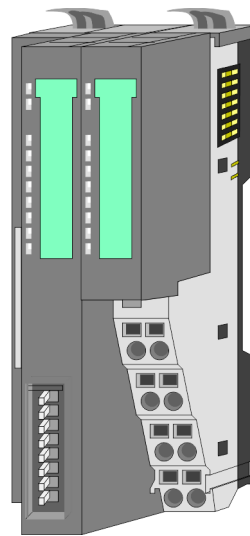
3 Hardware description

3.1 Properties

Features

The interface module 053-1DN00 is a head station for the System SLIO with an DeviceNet interface. With 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)
 - Transfer rate for the DeviceNet coupler
- Supports all baud transfer rates: 125, 250 and 500kbit/s
- Configuration of up to 64 peripheral modules
- max. 255 byte in-/output data
- Configuration of the periphery modules is made by a *DeviceNet manager* e.g. RsNet-Worx from Allen-Bradley. For parameterization and for the access to the diagnostics data the data type SHORT_STRING is used. Please consider that your configuration tool supports this type of data.

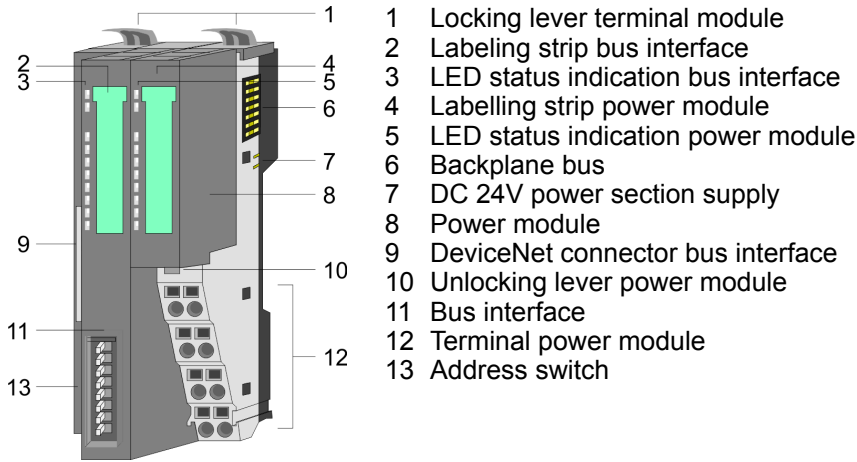


Ordering data

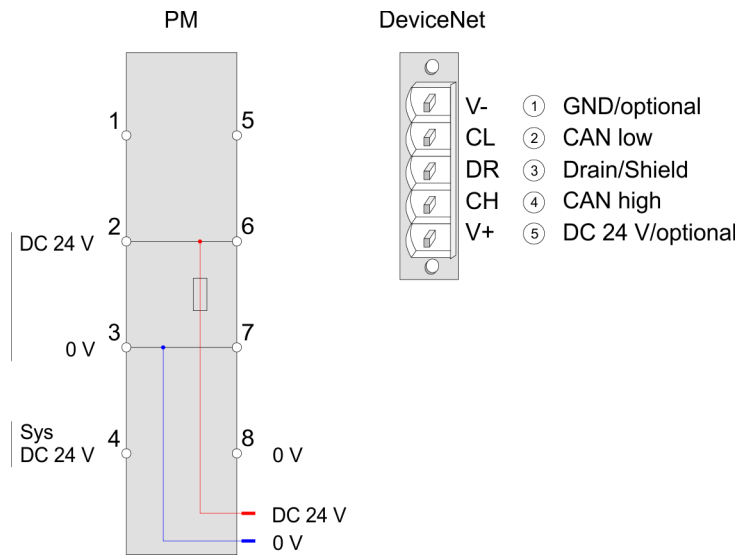
Type	Order number	Description
IM 053DN	053-1DN00	DeviceNet coupler for System SLIO

3.2 Structure

053-1DN00



3.2.1 Interfaces

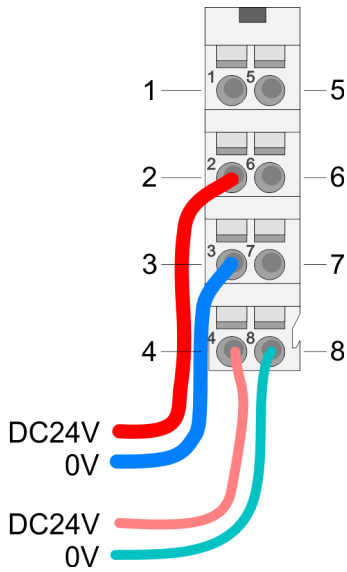


CAUTION!

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

Here you may only exchange the electronic module!

PM - Power module



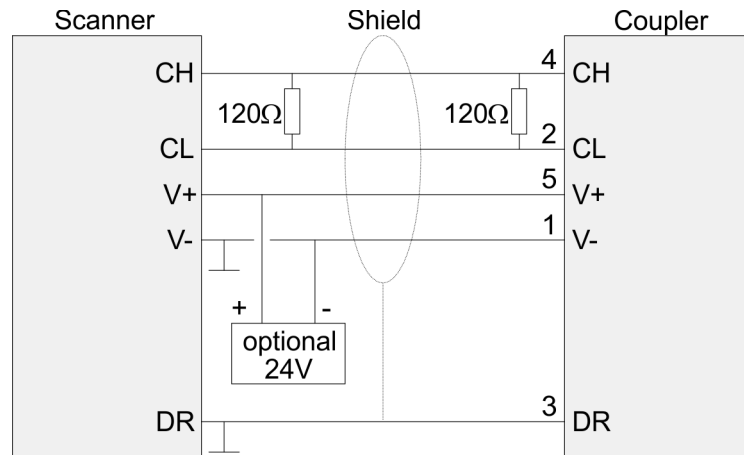
For wires with a core cross-section of 0.08mm² up to 1.5mm².

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

I: Input

Interface for DeviceNet communication

- 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.
- You receive a suited plug from Yaskawa with the order number 000-0DN00.
- 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.



3.2.2 Address switch

Overview

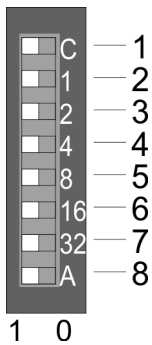
The address switch serves for the following settings:

- Transfer rate
- DeviceNet address
- Automatic module configuration
- Update mode for firmware update



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	-	-	

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	Auto configuration	0 / 1	

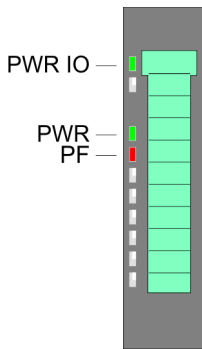
- Auto configuration
 - On start-up with *Auto configuration* = "1" the current module configuration is always kept without acknowledge from the engineering tool.
 - When after start-up from the coupler the *Auto configuration* is deactivated "0" again, the current module configuration is fix stored.

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	-	-

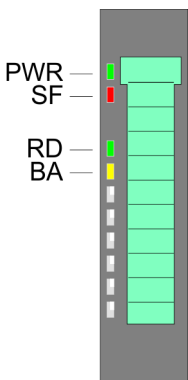
3.2.3 LEDs

LEDs power module



PWR IO	PWR	PF	Description
<input checked="" type="checkbox"/> green	<input checked="" type="checkbox"/> green	<input checked="" type="checkbox"/> red	
<input checked="" type="checkbox"/>	X	<input type="checkbox"/>	Power section supply OK
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Electronic section supply OK
X	X	<input checked="" type="checkbox"/>	Fuse electronic section supply defective
not relevant: X			

Status indication bus interface



LED	Description
PWR <input checked="" type="checkbox"/> green	Bus interface is power supplied
SF <input checked="" type="checkbox"/> red	Error on DeviceNet or System SLIO bus
RD <input checked="" type="checkbox"/> green	Status System SLIO bus
BA <input checked="" type="checkbox"/> yellow	Status DeviceNet
🔗 Chap. 4.4 'Status indication - Diagnostics' page 60	

3.3 Technical data

Order no.	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	3.9 A
I^2t	0.14 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
Service Indicator	-
Group error display	red SF LED
Channel error display	none
Hardware configuration	
Racks, max.	1
Modules per rack, max.	64
Number of digital modules, max.	64
Number of analog modules, max.	64
Communication	
Fieldbus	DeviceNet
Type of interface	CAN
Connector	5-pin Open Style Connector
Topology	Linear bus with bus termination at both ends
Electrically isolated	✓

Order no.	053-1DN00
Number of participants, max.	64
Node addresses	0 - 63
Transmission speed, min.	125 kbit/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.	-
Datasizes	
Input bytes	-
Output bytes	-
Parameter bytes	-
Diagnostic bytes	-
Housing	
Material	PPE / PPE GF10
Mounting	Profile rail 35 mm
Mechanical data	
Dimensions (WxHxD)	48.5 mm x 109 mm x 76.5 mm
Net weight	152.5 g
Weight including accessories	160 g
Gross weight	177.5 g
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-25 °C to 70 °C
Certifications	
UL certification	yes
KC certification	yes

4 Deployment

4.1 Basics 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 diagnostics 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

- 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.
- 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.
- 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.
- The length of the tap lines can be up to 6m while the total length of all tap lines depends on the transfer rate.
- Network nodes can be removed from or inserted into the network without interruption of the network operation. New and failed stations are detected automatically.

Bus access method

- 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).
- 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.
- 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.

Addressing

- All stations on the bus must be uniquely identified by means of an ID address.
- Every DeviceNet device has addressing facilities.

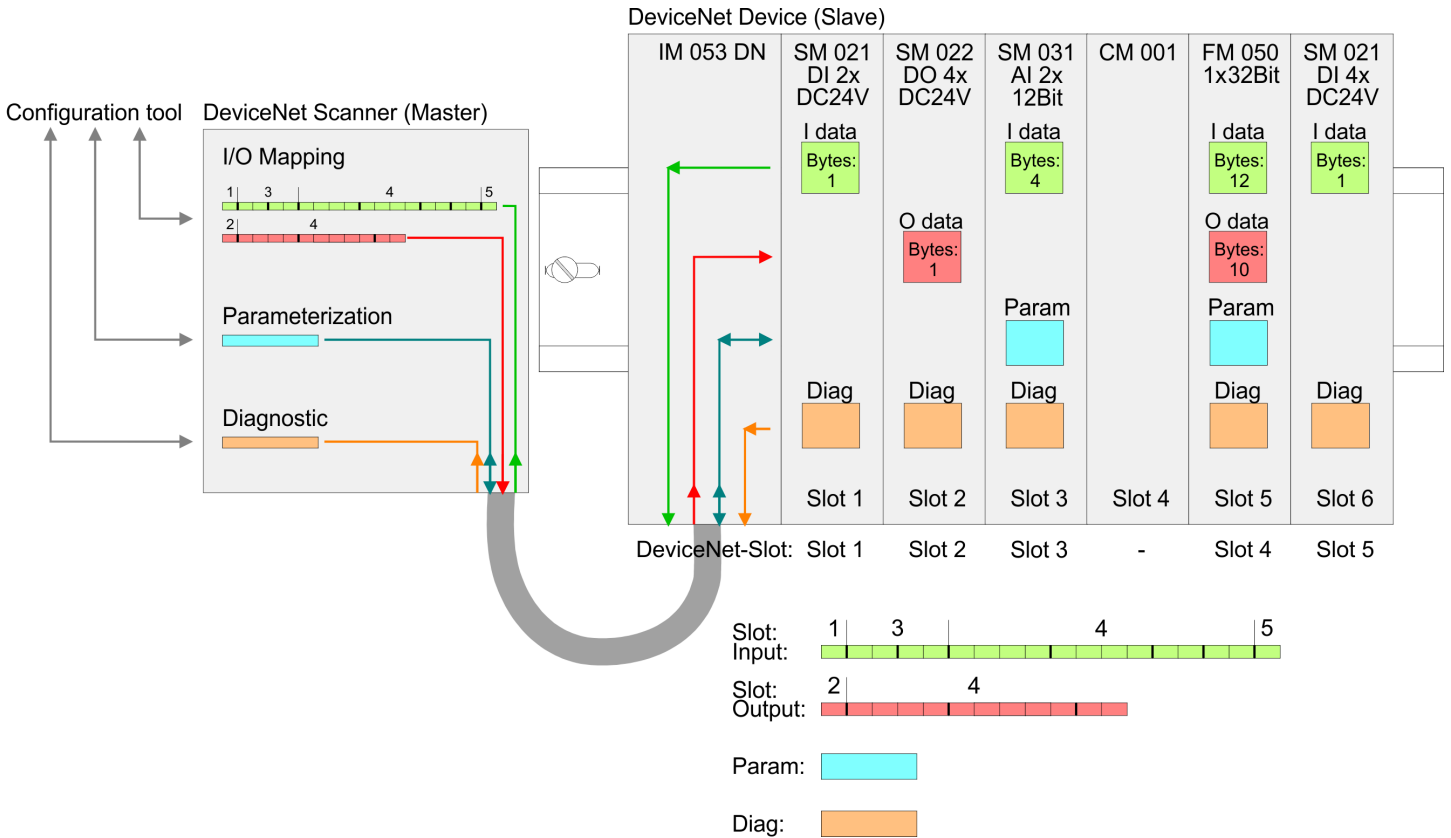
EDS file

You get an EDS file from Yaskawa for the DeviceNet coupler. For System SLIO this file can be found in the 'Download Center' of www.yaskawa.eu.com at 'EDS 053-1DN00'. Install the EDS file in your configuration tool. Details on the installation of the EDS file are available from the manual supplied with your configuration tool.

4.2 Accessing the System SLIO

4.2.1 Overview

In the following you will find the description of accessing I/O area, parameter data and diagnostics data of the System SLIO via DeviceNet.



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



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.

Note to the assignment of the module configuration

If you do not use a DeviceNet scanner from Allen-Bradley as long as you change the System SLIO module configuration, you should activate the auto configuration. To activate the Auto configuration switch the DIP switch A of the address switch to "1" before switching on the power supply. To store the module configuration, switch the DIP switch A of the address switch to "0".

When used with a DeviceNet scanner from Allen-Bradley if the configuration of the modules has been changed, the coupler must be advised to take the new configuration. For this one of the following actions must be executed otherwise an error is reported:

- Reading the device name of a installed module (Class Code 101 ... 164, Instance 1)
- Reading respectively writing of a parameter character of a installed module (Class Code 101 ... 164, Instance 20)

EDS file

You get an EDS file from Yaskawa for the DeviceNet coupler. For System SLIO this file can be found in the 'Download Center' of www.yaskawa.eu.com at 'EDS 053-1DN00'. Install the EDS file in your configuration tool. Details on the installation of the EDS file are available from the manual supplied with your configuration tool.

EDS file name	Usage
Maximum number of diagnostics data - slow	
VIPA-053-1DN00_16-ext	- 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
Reduced diagnostics - deviceName, parameter, diagnostics - fast	
VIPA-053-1DN00_16	- 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

4.2.2 Accessing the 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

1. ➤ Turn off the power supply of the DeviceNet coupler and preset the transfer rate and the DeviceNet address. ↪ *Chap. 4.3 'Transfer rate and DeviceNet address' page 58*
2. ➤ Start the configuration tool of your DeviceNet scanner.
3. ➤ Set the DeviceNet scanner to connection type "POLL IO".
4. ➤ Enter the number of input and output data:
 - Number input data: Produced connection size
 - Number output data: Consumed connection size
5. ➤ Enter a base address for the input and output data (mapping).
6. ➤ Activate the System SLIO DeviceNet coupler IM 053DN in the scan list.
7. ➤ Start the DeviceNet scanner.
 - ⇒ When the DeviceNet scanner has been configured, the input and output modules are accessible via the configured addresses.

4.2.3 Accessing 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 parametrization

- 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	xhh	xA2
2x	2byte	hexadecimal	0000h ... FFFFh	2xhhhh	2x7FFF
4x	4Byte	hexadecimal	00000000h ... FFFFFFFFh	4xhhhhhhhh	4x7FFF80C0
+	1byte	decimal positive	0 ... 255	+ddd	+255
2+	2byte	decimal positive	0 ... 65535	2+dddd	2+65535
4+	4byte	decimal positive	0 ... 4294967295	4+dddddddd	4+4294967295
-	1byte	decimal negative	-128 ... -1	-ddd	-128
2-	2byte	decimal negative	-32768 ... -1	2-ddddd	2-32768
4-	4byte	decimal negative	-2147483648 ... -1	4-ddddddddd	4-2147483648
b	1byte	binary	00000000 ... 11111111	bbbbbbbb	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



As soon as the parameter data do not fit to the sequence of the modules on the System SLIO bus, the IM 053DN 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.

4.2.4 Accessing diagnostics data

The IM 053DN only supports passive diagnostics. This means for the diagnostics that there is no alarm activation on module side necessary. You have to request the diagnostics. For this select in your configuration tool the diagnostics data of 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	... 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	... 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

4.3 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 in the module.



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!

4.3.1 Setting the transfer rate

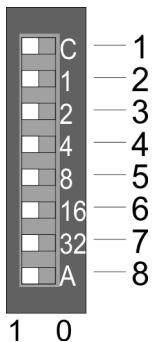
Proceeding

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

1. Turn off the power supply.
2. Set switch 1 to "1" (Configuration).
3. Preset the transfer rate with switch 2 ... 4.
4. 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, SF): With an successful storage the RD LED (green) gets on. With a wrong setting of the transfer rate the SF LED (red) lights up.



Pos.	Description	Example	
		Setting	Description
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	-	

4.3.2 Setting the DeviceNet address

Proceeding

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:

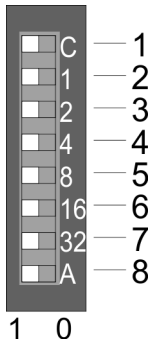
1. Turn off the power supply.
2. Set switch 1 to "0" (Address).
3. Preset the DeviceNet address with switch 2 ... 7 as a binary value.
4. Switch on the power supply.

⇒ The preset DeviceNet address is stored in the RAM.

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



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



Pos.	Description	Example	
		Setting	Description
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	Auto configuration	0 / 1	

































- Auto configuration
 - On start-up with *Auto configuration* = "1" the current module configuration is always kept without acknowledge from the engineering tool.
 - When after start-up from the coupler the *Auto configuration* is deactivated "0" again, the current module configuration is fix stored.

4.4 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 diagnostics 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 BA LED to the DeviceNet bus.

LED indication

SF	RD	BA	Meaning
 red	 green	 yellow	
			Setting on the address switch is not valid
			The transfer rate was successfully stored
			Firmware update running
			Firmware update finished successfully
			Firmware update finished with error <ul style="list-style-type: none"> ■ Error in EDS file ■ Transfer error ■ Error in flash
X	X		Field bus is offline <ul style="list-style-type: none"> ■ no DC 24V on the connector ■ no further station on the field bus
X	X		Field bus ready <ul style="list-style-type: none"> ■ no connection established
X	X		Field bus connected
	X		Error field bus <ul style="list-style-type: none"> ■ Field bus address just exists ■ Communication error on the field bus
	X		Inactivity <ul style="list-style-type: none"> ■ connection disconnected due to inactivity
X		X	System SLIO bus ready, outputs inactive
X		X	System SLIO bus active
		X	Error on access the System SLIO bus
		X	Configuration error System SLIO bus <ul style="list-style-type: none"> ■ 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.
			Device error / internal error - please contact the Yaskawa support!

not relevant: X

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

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