System SLIO

IM | 053-1DN00 | Manual

HB300 | IM | 053-1DN00 | en | 18-10

Interface module DeviceNet - IM 053DN

www.vipa.com/en/service-support/manuals
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1 General

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1.2 About this manual

Objective and contents: This manual describes the IM 053-1DN00 of the System SLIO from VIPA. It contains a description of the structure, project engineering and deployment.

<table>
<thead>
<tr>
<th>Product</th>
<th>Order number</th>
<th>as of state:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>HW</td>
</tr>
<tr>
<td>IM 053DN</td>
<td>053-1DN00</td>
<td>01</td>
</tr>
</tbody>
</table>

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

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

Guide to the document: The following guides are available in the manual:

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

Availability: The manual is available in:

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

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

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

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

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

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

Shipping of modules

Modules must be shipped in the original packing material.

Measurements and alterations on electrostatic sensitive modules

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

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

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

CAUTION!

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

2.2.1 Overview

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

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

**CAUTION!**

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

---

**CPU 01xC**

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

**CAUTION!**

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

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

CAUTION!

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

Line extension

In the System SLIO there is the possibility to place up to 64 modules in on line. By means of the line extension you can divide this line into several lines. Here you have to place a line extension master at each end of a line and the subsequent line has to start with a line extension slave. Master and slave are to be connected via a special connecting cable. In this way, you can divide a line on up to 5 lines. 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.

Periphery modules

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

1 Terminal module
2 Electronic module
Terminal module

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

Electronic module

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

2.2.3 Accessories

Shield bus carrier

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

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

**Coding pins**

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

### 2.3 Dimensions

**Dimensions CPU 01xC**

![Dimensions Diagram](image)
Dimensions CPU 01x

Dimensions bus coupler and line extension slave
Dimensions

Dimensions line extension master

Dimensions periphery module

Dimensions electronic module

Dimensions in mm
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 backplane bus. Please consider here that the sum current of the electronic power supply does not exceed the maximum value of 3A. By means of the power module 007-1AB10 the current of the electronic power supply may be expanded accordingly.

![Diagram of bus coupler mounting process]

1. Mount the mounting rail! Please consider that a clearance from the middle of the mounting rail of at least 80mm above and 60mm below, respectively 80mm by deployment of shield bus carriers, exist.
2. Turn the locking lever upwards, place the bus coupler at the mounting rail and turn the lever downward.

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

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

2.5 Wiring

**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**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_{\text{max}}$</td>
<td>30V DC</td>
</tr>
<tr>
<td>$I_{\text{max}}$</td>
<td>10A</td>
</tr>
<tr>
<td>Cross section</td>
<td>0.08 ... 1.5mm$^2$ (AWG 28 ... 16)</td>
</tr>
<tr>
<td>Stripping length</td>
<td>10mm</td>
</tr>
</tbody>
</table>
Wiring procedure

1. Insert a suited screwdriver at an angle into the square opening as shown. Press and hold the screwdriver in the opposite direction to open the contact spring.

2. Insert the stripped end of wire into the round opening. You can use wires with a cross section of 0.08mm² 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
For wires with a core cross-section of 0.08mm$^2$ up to 1.5mm$^2$.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Function</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>---</td>
<td>---</td>
<td>not connected</td>
</tr>
<tr>
<td>2</td>
<td>DC 24V</td>
<td>I</td>
<td>DC 24V for power section supply</td>
</tr>
<tr>
<td>3</td>
<td>0V</td>
<td>I</td>
<td>GND for power section supply</td>
</tr>
<tr>
<td>4</td>
<td>Sys DC 24V</td>
<td>I</td>
<td>DC 24V for electronic section supply</td>
</tr>
<tr>
<td>5</td>
<td>---</td>
<td>---</td>
<td>not connected</td>
</tr>
<tr>
<td>6</td>
<td>DC 24V</td>
<td>I</td>
<td>DC 24V for power section supply</td>
</tr>
<tr>
<td>7</td>
<td>0V</td>
<td>I</td>
<td>GND for power section supply</td>
</tr>
<tr>
<td>8</td>
<td>Sys 0V</td>
<td>I</td>
<td>GND for electronic section supply</td>
</tr>
</tbody>
</table>

I: Input

---

**CAUTION!**

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

---

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

---

**Fusing**

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

---

**State of the electronic power supply via LEDs**

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

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

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

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

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

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

2.5.2 Wiring periphery modules

Terminal module terminals

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

- $U_{\text{max}}$ 240V AC / 30V DC
- $I_{\text{max}}$ 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 0.08mm$^2$ up to 1.5mm$^2$
3. By removing the screwdriver, the wire is securely fixed via the spring contact to the terminal.

Shield attachment

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

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

1. Each System SLIO module has a carrier hole for the shield bus carrier. Push the shield bus carrier, until they engage into the module. With a flat mounting rail for adaptation to a flat mounting rail you may remove the spacer of the shield bus carrier.
2. Put your shield bus into the shield bus carrier.
3. Attach the cables with the accordingly stripped cable screen and fix it by the shield clamp with the shield bus.

2.5.3 Wiring power modules

Terminal module terminals

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

Data

- \( U_{\text{max}} \) 30V DC
- \( I_{\text{max}} \) 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
For wires with a core cross-section of 0.08mm² up to 1.5mm².

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<td>DC 24V for power section supply</td>
</tr>
<tr>
<td>3</td>
<td>0V</td>
<td>I</td>
<td>GND for power section supply</td>
</tr>
<tr>
<td>4</td>
<td>Sys DC 24V</td>
<td>I</td>
<td>DC 24V for electronic section supply</td>
</tr>
<tr>
<td>5</td>
<td>---</td>
<td>---</td>
<td>not connected</td>
</tr>
<tr>
<td>6</td>
<td>DC 24V</td>
<td>I</td>
<td>DC 24V for power section supply</td>
</tr>
<tr>
<td>7</td>
<td>0V</td>
<td>I</td>
<td>GND for power section supply</td>
</tr>
<tr>
<td>8</td>
<td>Sys 0V</td>
<td>I</td>
<td>GND for electronic section supply</td>
</tr>
</tbody>
</table>

I: Input

**CAUTION!**

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

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

**Fusing**

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

**State of the electronic power supply via LEDs**

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

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

**Power module 007-1AB00**

![Diagram of power module 007-1AB00]

**Power module 007-1AB10**

![Diagram of power module 007-1AB10]

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

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

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

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

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

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

2.6 Demounting

2.6.1 Demounting bus coupler

Proceeding

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

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

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

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

5. Pull the bus coupler forward.

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

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

8. Turn all the locking lever downward, again.
9. Plug again the electronic module, which you have removed before.
10. Wire your bus coupler.
   ⇒ Now you can bring your system back into operation.

2.6.2 Demounting periphery modules

Proceeding

**Exchange of an electronic module**

1. Power-off your system.

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

3. For installation plug the new electronic module guided by the strips at the lower side until this engages to the terminal module.
   ⇒ Now you can bring your system back into operation.

**Exchange of a periphery module**

1. Power-off your system.
2. Remove if exists the wiring of the module.
3. For demounting and exchange of a (head) module or a group of modules, due to mounting reasons you always have to remove the electronic module right beside. After mounting it may be plugged again.
   Press the unlocking lever at the lower side of the just mounted right module and pull it forward.
4. Turn the locking lever of the module to be exchanged upwards.

5. Pull the module.

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

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

8. Turn the locking lever downward, again.

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

10. Wire your module.

   Now you can bring your system back into operation.

---

Exchange of a module group

1. Power-off your system.

2. Remove if exists the wiring of the module group.

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

Press the unlocking lever at the lower side of the just mounted right module near the module group and pull it forward.
4. Turn all the locking lever of the module group to be exchanged upwards.

5. Pull the module group forward.

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

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

8. Turn all the locking lever downward, again.

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

10. Wire your module group.

⇒ Now you can bring your system back into operation.
2.7 Trouble shooting - LEDs

**General**

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

In the following illustrations flashing LEDs are marked by ☼.

---

**Sum current of the electronic power supply exceeded**

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

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

**Remedy:** As soon as the sum current of the electronic power supply is exceeded, always place the power module 007-1AB10. ☼ *Chapter 2.5.3 ‘Wiring power modules’ on page 22*

---

**Error in configuration**

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

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

**Remedy:** Match configuration and hardware structure.

---

**Module failure**

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

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

**Remedy:** Replace the defective module.
2.8 Installation guidelines

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

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

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

Possible interference causes
Electromagnetic interferences may interfere your control via different ways:
- Electromagnetic fields (RF coupling)
- Magnetic fields with power frequency
- Bus system
- Power supply
- Protected earth conductor

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

There are:
- galvanic coupling
- capacitive coupling
- inductive coupling
- radiant coupling

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

- Take care of a correct area-wide grounding of the inactive metal parts when installing your components.
  - Install a central connection between the ground and the protected earth conductor system.
  - Connect all inactive metal extensive and impedance-low.
  - Please try not to use aluminium parts. Aluminium is easily oxidizing and is therefore less suitable for grounding.

- When cabling, take care of the correct line routing.
  - Organize your cabling in line groups (high voltage, current supply, signal and data lines).
  - Always lay your high voltage lines and signal respectively data lines in separate channels or bundles.
  - Route the signal and data lines as near as possible beside ground areas (e.g. suspension bars, metal rails, tin cabinet).
Proof the correct fixing of the lead isolation.
- Data lines must be laid isolated.
- Analog lines must be laid isolated. When transmitting signals with small amplitudes the one sided laying of the isolation may be favourable.
- Lay the line isolation extensively on an isolation/protected earth conductor rail directly after the cabinet entry and fix the isolation with cable clamps.
- Make sure that the isolation/protected earth conductor rail is connected impedance-low with the cabinet.
- Use metallic or metallised plug cases for isolated data lines.

In special use cases you should appoint special EMC actions.
- Consider to wire all inductivities with erase links.
- Please consider luminescent lamps can influence signal lines.

Create a homogeneous reference potential and ground all electrical operating supplies when possible.
- Please take care for the targeted employment of the grounding actions. The grounding of the PLC serves for protection and functionality activity.
- Connect installation parts and cabinets with your PLC in star topology with the isolation/protected earth conductor system. So you avoid ground loops.
- If there are potential differences between installation parts and cabinets, lay sufficiently dimensioned potential compensation lines.

Isolation of conductors

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

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

CAUTION!

Please regard at installation!

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

Remedy: Potential compensation line
2.9 General data

### Conformity and approval

<table>
<thead>
<tr>
<th>Conformity</th>
<th>Approval</th>
<th>UL</th>
<th>others</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 2014/35/EU</td>
<td>Low-voltage directive</td>
<td>-</td>
<td>Refer to Technical data</td>
</tr>
<tr>
<td>2014/30/EU</td>
<td>EMC directive</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

### Protection of persons and device protection

<table>
<thead>
<tr>
<th>Type of protection</th>
<th>Electrical isolation</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>IP20</td>
</tr>
</tbody>
</table>

- **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

<table>
<thead>
<tr>
<th>Mounting place</th>
<th>In the control cabinet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting position</td>
<td>Horizontal and vertical</td>
</tr>
</tbody>
</table>

### EMC

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

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

3.1 Properties

The interface module 053-1DN00 is a head station for the System SLIO with a 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

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM 053DN</td>
<td>053-1DN00</td>
<td>DeviceNet coupler for System SLIO</td>
</tr>
</tbody>
</table>
3.2 Structure

053-1DN00

1. Locking lever terminal module
2. Labeling strip bus interface
3. LED status indication bus interface
4. Labelling strip power module
5. LED status indication power module
6. Backplane bus
7. DC 24V power section supply
8. Power module
9. DeviceNet connector bus interface
10. Unlocking lever power module
11. Bus interface
12. Terminal power module
13. Address switch

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

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Function</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>---</td>
<td>---</td>
<td>not connected</td>
</tr>
<tr>
<td>2</td>
<td>DC 24V</td>
<td>I</td>
<td>DC 24V for power section supply</td>
</tr>
<tr>
<td>3</td>
<td>0V</td>
<td>I</td>
<td>GND for power section supply</td>
</tr>
<tr>
<td>4</td>
<td>Sys DC 24V</td>
<td>I</td>
<td>DC 24V for electronic section supply</td>
</tr>
<tr>
<td>5</td>
<td>---</td>
<td>---</td>
<td>not connected</td>
</tr>
<tr>
<td>6</td>
<td>DC 24V</td>
<td>I</td>
<td>DC 24V for power section supply</td>
</tr>
<tr>
<td>7</td>
<td>0V</td>
<td>I</td>
<td>GND for power section supply</td>
</tr>
<tr>
<td>8</td>
<td>Sys 0V</td>
<td>I</td>
<td>GND for electronic section supply</td>
</tr>
</tbody>
</table>

I: Input

- 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 VIPA with the order number VIPA 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!

Transfer rate

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Example Setting</th>
<th>Setting</th>
<th>Example Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Configuration</td>
<td>1</td>
<td>Transfer rate: 250kbit/s</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Transfer rate 125kbit/s</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Transfer rate 250kbit/s</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Transfer rate 500kbit/s</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DeviceNet address

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Example Setting</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Configuration</td>
<td>0</td>
<td>1+2+32=35 Address: 35</td>
</tr>
<tr>
<td>2</td>
<td>2⁰ 1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2¹ = 2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2² = 4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2³ = 8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2⁴ = 16</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2⁵ = 32</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Auto configuration</td>
<td>0 / 1</td>
<td></td>
</tr>
</tbody>
</table>

- 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

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Configuration</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Update mode</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

3.2.3 LEDs

LEDs power module

<table>
<thead>
<tr>
<th>PWR IO</th>
<th>PWR</th>
<th>PF</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>green</td>
<td>green</td>
<td>red</td>
<td>Power section supply OK</td>
</tr>
<tr>
<td>green</td>
<td>X</td>
<td></td>
<td>Electronic section supply OK</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>red</td>
<td>Fuse electronic section supply defective</td>
</tr>
</tbody>
</table>

Not relevant: X

Status indication bus interface

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWR</td>
<td>green Bus interface is power supplied</td>
</tr>
<tr>
<td>SF</td>
<td>red Error on DeviceNet or System SLIO bus</td>
</tr>
<tr>
<td>RD</td>
<td>green Status System SLIO bus</td>
</tr>
<tr>
<td>BA</td>
<td>yellow Status DeviceNet</td>
</tr>
</tbody>
</table>

Chapter 4.4 ‘Status indication - Diagnostics’ on page 51
### 3.3 Technical data

<table>
<thead>
<tr>
<th>Order no.</th>
<th>053-1DN00</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>IM 053DN</td>
</tr>
<tr>
<td><strong>Module ID</strong></td>
<td>-</td>
</tr>
<tr>
<td><strong>Technical data power supply</strong></td>
<td></td>
</tr>
<tr>
<td>Power supply (rated value)</td>
<td>DC 24 V</td>
</tr>
<tr>
<td>Power supply (permitted range)</td>
<td>DC 20.4...28.8 V</td>
</tr>
<tr>
<td>Reverse polarity protection</td>
<td>✓</td>
</tr>
<tr>
<td>Current consumption (no-load operation)</td>
<td>90 mA</td>
</tr>
<tr>
<td>Current consumption (rated value)</td>
<td>0.95 A</td>
</tr>
<tr>
<td>Inrush current</td>
<td>3.9 A</td>
</tr>
<tr>
<td>$I^2t$</td>
<td>0.14 A²s</td>
</tr>
<tr>
<td>Max. current drain at backplane bus</td>
<td>3 A</td>
</tr>
<tr>
<td>Max. current drain load supply</td>
<td>10 A</td>
</tr>
<tr>
<td>Power loss</td>
<td>3 W</td>
</tr>
<tr>
<td><strong>Status information, alarms, diagnostics</strong></td>
<td></td>
</tr>
<tr>
<td>Status display</td>
<td>yes</td>
</tr>
<tr>
<td>Interrupts</td>
<td>-</td>
</tr>
<tr>
<td>Process alarm</td>
<td>-</td>
</tr>
<tr>
<td>Diagnostic interrupt</td>
<td>-</td>
</tr>
<tr>
<td>Diagnostic functions</td>
<td>-</td>
</tr>
<tr>
<td>Diagnostics information read-out</td>
<td>possible</td>
</tr>
<tr>
<td>Supply voltage display</td>
<td>green LED</td>
</tr>
<tr>
<td>Service Indicator</td>
<td>-</td>
</tr>
<tr>
<td>Group error display</td>
<td>red SF LED</td>
</tr>
<tr>
<td>Channel error display</td>
<td>none</td>
</tr>
<tr>
<td><strong>Hardware configuration</strong></td>
<td></td>
</tr>
<tr>
<td>Racks, max.</td>
<td>1</td>
</tr>
<tr>
<td>Modules per rack, max.</td>
<td>64</td>
</tr>
<tr>
<td>Number of digital modules, max.</td>
<td>64</td>
</tr>
<tr>
<td>Number of analog modules, max.</td>
<td>64</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td></td>
</tr>
<tr>
<td>Fieldbus</td>
<td>DeviceNet</td>
</tr>
<tr>
<td>Type of interface</td>
<td>CAN</td>
</tr>
<tr>
<td>Connector</td>
<td>5-pin Open Style Connector</td>
</tr>
<tr>
<td>Topology</td>
<td>Linear bus with bus termination at both ends</td>
</tr>
<tr>
<td>Electrically isolated</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Order no.</strong></td>
<td><strong>053-1DN00</strong></td>
</tr>
<tr>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Number of participants, max.</td>
<td>64</td>
</tr>
<tr>
<td>Node addresses</td>
<td>0 - 63</td>
</tr>
<tr>
<td>Transmission speed, min.</td>
<td>125 kbit/s</td>
</tr>
<tr>
<td>Transmission speed, max.</td>
<td>500 kbit/s</td>
</tr>
<tr>
<td>Address range inputs, max.</td>
<td>256 Byte</td>
</tr>
<tr>
<td>Address range outputs, max.</td>
<td>256 Byte</td>
</tr>
<tr>
<td>Number of TxPDOs, max.</td>
<td>-</td>
</tr>
<tr>
<td>Number of RxPDOs, max.</td>
<td>-</td>
</tr>
<tr>
<td><strong>Datasizes</strong></td>
<td></td>
</tr>
<tr>
<td>Input bytes</td>
<td>-</td>
</tr>
<tr>
<td>Output bytes</td>
<td>-</td>
</tr>
<tr>
<td>Parameter bytes</td>
<td>-</td>
</tr>
<tr>
<td>Diagnostic bytes</td>
<td>-</td>
</tr>
<tr>
<td><strong>Housing</strong></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>PPE / PPE GF10</td>
</tr>
<tr>
<td>Mounting</td>
<td>Profile rail 35 mm</td>
</tr>
<tr>
<td><strong>Mechanical data</strong></td>
<td></td>
</tr>
<tr>
<td>Dimensions (WxHxD)</td>
<td>48.5 mm x 109 mm x 76.5 mm</td>
</tr>
<tr>
<td>Net weight</td>
<td>152.5 g</td>
</tr>
<tr>
<td>Weight including accessories</td>
<td>160 g</td>
</tr>
<tr>
<td>Gross weight</td>
<td>177.5 g</td>
</tr>
<tr>
<td><strong>Environmental conditions</strong></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 °C to 60 °C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-25 °C to 70 °C</td>
</tr>
<tr>
<td><strong>Certifications</strong></td>
<td></td>
</tr>
<tr>
<td>UL certification</td>
<td>yes</td>
</tr>
<tr>
<td>KC certification</td>
<td>yes</td>
</tr>
</tbody>
</table>
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 adminis-
tered 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 pro-
ducer/consumer model that requires data packets with identifier fields for the identifi-
cation 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 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 priorizing 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

- From VIPA there are EDS (Electronic Data Sheet) files for the DeviceNet coupler available. These file may be found at the ‘Service / Support ➔ Downloads ➔ Config files’ of www.vipa.com.
- Please install the EDS file you require in your configuration tool. Details on the installation of the EDS file are available from the manual supplied with your configuration tool.
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.

**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)
From VIPA there are EDS (Electronic Data Sheet) files for the DeviceNet coupler available. These files may be found at the ‘Service / Support ➔ Downloads ➔ Config files’ of www.vipa.com.

Please install the EDS file you require in your configuration tool. Details on the installation of the EDS file are available from the manual supplied with your configuration tool.

<table>
<thead>
<tr>
<th>EDS file name</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of diagnostics data - slow</td>
<td></td>
</tr>
<tr>
<td>VIPA-053-1DN00_16-ext</td>
<td>- supports maximally 16 System SLIO modules</td>
</tr>
<tr>
<td>VIPA-053-1DN00_32-ext</td>
<td>- supports maximally 32 System SLIO modules</td>
</tr>
<tr>
<td>VIPA-053-1DN00_64-ext</td>
<td>- supports maximally 64 System SLIO modules</td>
</tr>
<tr>
<td>Reduced diagnostics - deviceName, parameter, diagnostics - fast</td>
<td></td>
</tr>
<tr>
<td>VIPA-053-1DN00_16</td>
<td>- supports maximally 16 System SLIO modules</td>
</tr>
<tr>
<td>VIPA-053-1DN00_32</td>
<td>- supports maximally 32 System SLIO modules</td>
</tr>
<tr>
<td>VIPA-053-1DN00_64</td>
<td>- supports maximally 64 System SLIO modules</td>
</tr>
</tbody>
</table>

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.

1. Turn off the power supply of the DeviceNet coupler and preset the transfer rate and the DeviceNet address. ➔ Chapter 4.3 ‘Transfer rate and DeviceNet address’ on page 49

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:

<table>
<thead>
<tr>
<th>Type</th>
<th>Meaning</th>
<th>Value as</th>
<th>Range of values</th>
<th>Character string</th>
<th>Example number</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>1byte</td>
<td>hexadecimal</td>
<td>00h ... FFh</td>
<td>xhh</td>
<td>xA2</td>
</tr>
<tr>
<td>2x</td>
<td>2byte</td>
<td>hexadecimal</td>
<td>0000h ... FFFFh</td>
<td>2xhhhh</td>
<td>2x7FFF</td>
</tr>
<tr>
<td>4x</td>
<td>4Byte</td>
<td>hexadecimal</td>
<td>00000000h ... FFFFFFFFh</td>
<td>4xhhhhhhhh</td>
<td>4x7FFF80C0</td>
</tr>
<tr>
<td>+</td>
<td>1byte</td>
<td>decimal positive</td>
<td>0 ... 255</td>
<td>+ddd</td>
<td>+255</td>
</tr>
<tr>
<td>2+</td>
<td>2byte</td>
<td>decimal positive</td>
<td>0 ... 65535</td>
<td>2+dddddd</td>
<td>2+65535</td>
</tr>
<tr>
<td>4+</td>
<td>4byte</td>
<td>decimal positive</td>
<td>0 ... 4294967295</td>
<td>4+dddddddd</td>
<td>4+4294967295</td>
</tr>
<tr>
<td>-</td>
<td>1byte</td>
<td>decimal negative</td>
<td>-128 ... -1</td>
<td>-ddd</td>
<td>-128</td>
</tr>
<tr>
<td>2-</td>
<td>2byte</td>
<td>decimal negative</td>
<td>-32768 ... -1</td>
<td>2-ddddd</td>
<td>2-32768</td>
</tr>
<tr>
<td>4-</td>
<td>4byte</td>
<td>decimal negative</td>
<td>-2147483648 ... -1</td>
<td>4-dddddddd</td>
<td>4-2147483648</td>
</tr>
<tr>
<td>b</td>
<td>1byte</td>
<td>binary</td>
<td>00000000 ... 1111111</td>
<td>bbbbbbbb</td>
<td>b10100101</td>
</tr>
</tbody>
</table>

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 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 (6Ah)

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

System SLIO module - Class Code: Slot 1: 101 (65h), Slot 2: 102 (66h), ... , Slot 64: 164 (A4h)

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Information</th>
<th>Format</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DeviceName</td>
<td>Name of the device</td>
<td>String</td>
<td>VIPA 032-1BD40</td>
</tr>
<tr>
<td>2</td>
<td>HwVersion</td>
<td>Hardware version</td>
<td>String</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>SwVersion</td>
<td>Software version</td>
<td>String</td>
<td>V202</td>
</tr>
<tr>
<td>4</td>
<td>SerialNumber</td>
<td>Serial number</td>
<td>Unsigned32, String</td>
<td>00001143</td>
</tr>
<tr>
<td>5</td>
<td>FpgaVersion</td>
<td>FPGA version</td>
<td>Unsigned16, String</td>
<td>V208</td>
</tr>
<tr>
<td>6</td>
<td>MxFile</td>
<td>Mx file</td>
<td>String</td>
<td>MX000028.130</td>
</tr>
<tr>
<td>7</td>
<td>ProductVersion</td>
<td>Product version</td>
<td>String</td>
<td>01V31.001</td>
</tr>
<tr>
<td>8</td>
<td>OrderCode</td>
<td>Order no.</td>
<td>String</td>
<td>032-1BD40</td>
</tr>
<tr>
<td>20</td>
<td>Parameter</td>
<td>Parameter data</td>
<td>String</td>
<td>x00 x00 x31 x31 x31 x31</td>
</tr>
<tr>
<td>21</td>
<td>Diagnostics</td>
<td>Diagnostics data</td>
<td>String</td>
<td>x00 x15 x00 x00 x73 x08 x04 x00 x00 x00 x00 x00 x00 x00 x00 x00 x00 x00 x00 x00 x00 x00 x4x000020EB</td>
</tr>
</tbody>
</table>
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. 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.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Configuration</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Transfer rate 125kbit/s</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Transfer rate 250kbit/s</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Transfer rate 500kbit/s</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>not used</td>
<td>-</td>
</tr>
</tbody>
</table>

Transfer rate: 250kbit/s
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!

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Configuration</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>$2^0 = 1$</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>$2^1 = 2$</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>$2^2 = 4$</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>$2^3 = 8$</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>$2^4 = 16$</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>$2^5 = 32$</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Auto configuration</td>
<td>0 / 1</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>SF</th>
<th>RD</th>
<th>BA</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Setting on the address switch is not valid</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>The transfer rate was successfully stored</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Firmware update running</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Firmware update finished successfully</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Firmware update finished with error</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Field bus is offline</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>no DC 24V on the connector</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>no further station on the field bus</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Field bus ready</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>no connection established</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Field bus connected</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Error field bus</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Field bus address just exists</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Communication error on the field bus</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Inactivity</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>connection disconnected due to inactivity</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>System SLIO bus ready, outputs inactive</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>System SLIO bus active</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Error on access the System SLIO bus</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Configuration error System SLIO bus</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>The number of real modules at the bus differs to the configured modules.</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>The module type of at least one module differs to the type of the configured module.</td>
</tr>
<tr>
<td>![red]</td>
<td>![green]</td>
<td>![yellow]</td>
<td>Device error / internal error - please contact the VIPA support!</td>
</tr>
</tbody>
</table>

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

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