# YASKAWA

# VIPA System MICRO

## SM-DIO | | Manual

HB400 | SM-DIO | | en | 16-47

Digital signal modules - SM M2x

**VIPA CONTROLS**

# Table of contents

# 1    General

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>
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EMail: support@vipa.de

## 1.2  About this manual

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

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

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

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

**Availability**              The manual is available in:

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

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

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

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

> ⓘ *Supplementary information and useful tips.*

## 1.3  Safety information

**Applications conforming with specifications**

The system is constructed and produced for:

- communication and process control
- 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.
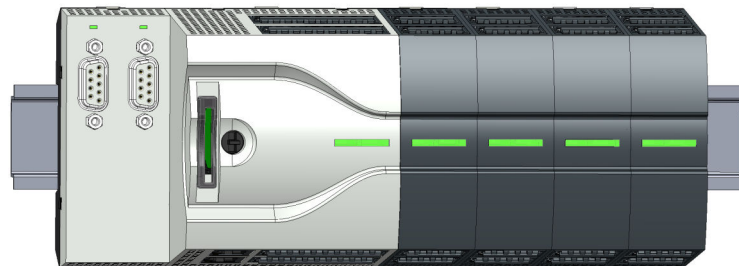
> **CAUTION!**
> Personnel and instruments should be grounded when working on electrostatic sensitive modules.

## 2.2 System conception

**Overview**



The System MICRO is a modular automation system for assembly on a 35mm mounting rail. By means of periphery modules this system may be adapted matching to your automation tasks. In addition, it is possible to expand your CPU by appropriate interfaces. The wiring complexity is low, because the DC 24V electronic section supply is integrated to the backplane bus and defective modules may be replaced with standing wire.

**Components**

- CPU
- Extension module
- Periphery module

**CPU**
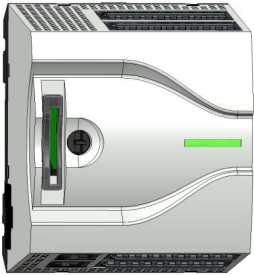
With the CPU electronic, input/output components and power supply are integrated to one casing. In addition, up to 8 periphery modules of the System MICRO can be connected to the backplane bus. As head module via the integrated power module for power supply CPU electronic and the I/O components are supplied 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 electronic power supply of the periphery modules, which are connected via backplane bus, the CPU has removable connectors. By installing of up to 8 periphery modules at the backplane bus of the CPU, these are electrically connected, this means these are assigned to the backplane bus and connected to the DC 24V electronic power supply.

**Extension module**

By using extension modules you can extend the interfaces of the CPU. The attachment to the CPU is made by plugging on the left side of the CPU. You can only connect one extension module to the CPU at a time.
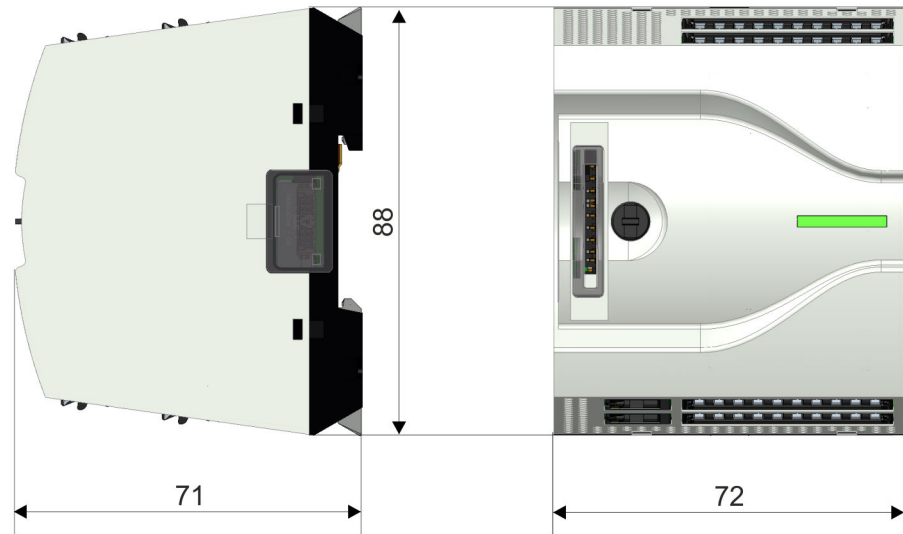
**Periphery module**

By means of up to 8 periphery modules, you can extend the internal I/O areas. The attachment to the CPU is made by plugging them on the right side of the CPU.
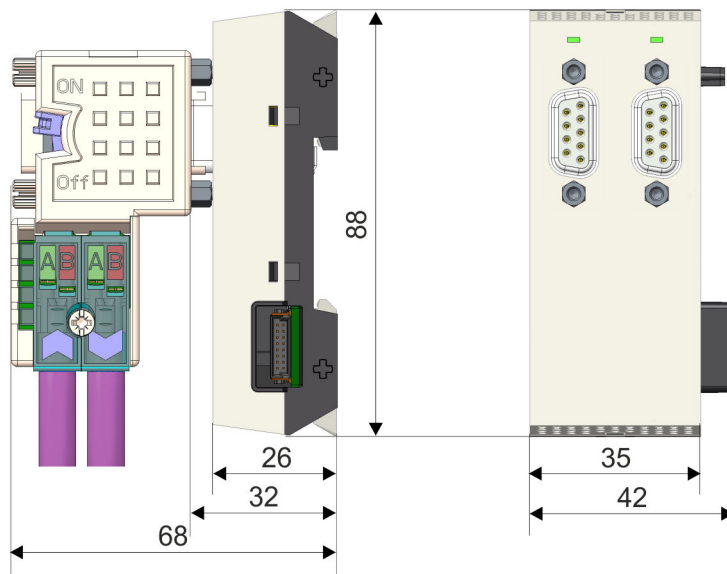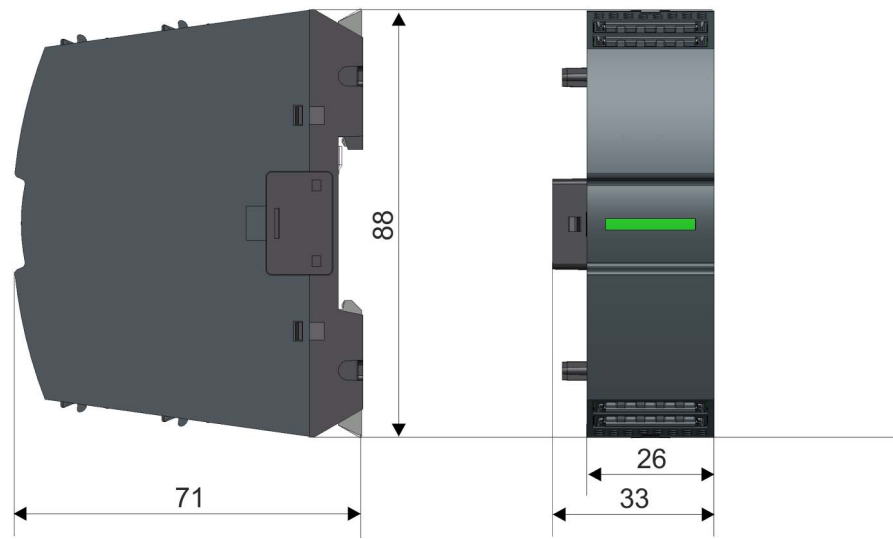
## 2.3 Dimensions

**Dimensions CPU M13C**



Dimensions in mm

**Dimensions extension
module EM M09**



Dimensions in mm

**Dimensions periphery
module SM M2x**

Dimensions in mm

## 2.4  Mounting

## 2.4.1  Mounting CPU

### 2.4.1.1  Mounting CPU without mounting rail

> ⚠ **CAUTION!**
> Mounting without mounting rail is only permitted, if you only want to use the CPU without extension and periphery modules. Otherwise, a mounting rail must always be used for EMC technical reasons.

**Proceeding**                 You can screw the CPU to the back wall by means of screws via the locking levers. The happens with the following proceeding:
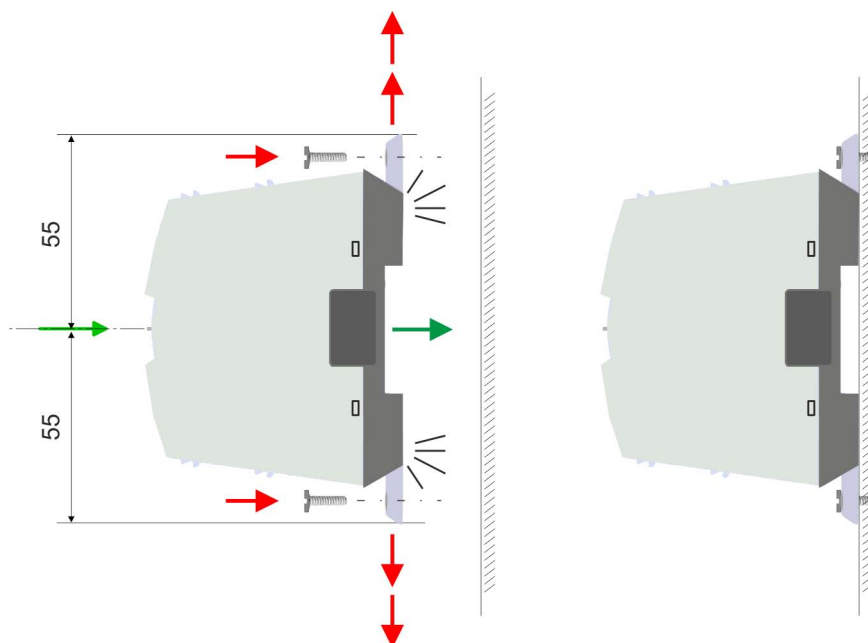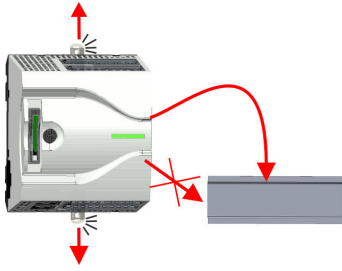
Dimensions in mm

1. ▸ The CPU has a locking lever on the upper and lower side. Pull these levers outwards as shown in the figure, until these engage 2x audible.

    ⇨ By this openings on the locking levers get visible.

2. ▸ Use the appropriate screws to fix your CPU to your back wall. Consider the installation clearances for the CPU.

    ⇨ The CPU is now mounted and can be wired.


**2.4.1.2    Mounting with mounting rail**

**Proceeding**
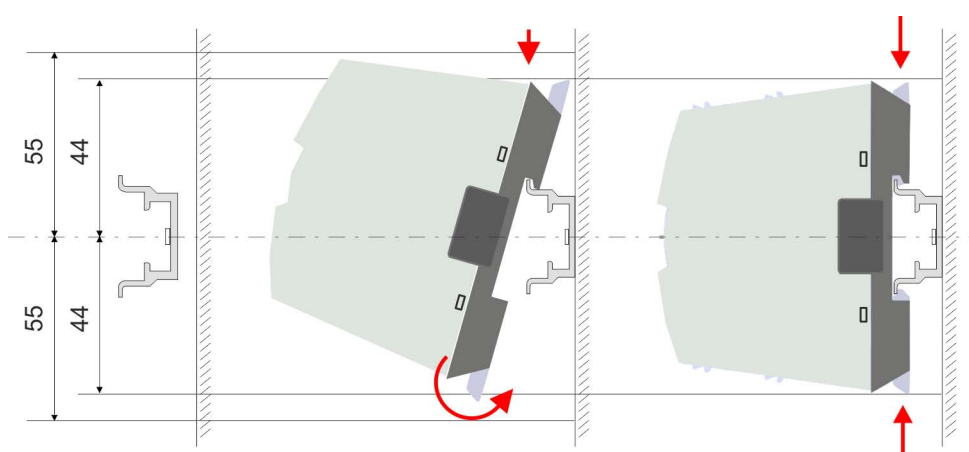
Dimensions in mm

1. ▸ Mount the mounting rail. Please consider that a clearance from the middle of the mounting rail of at least 44mm respectively 55mm above and below exists.
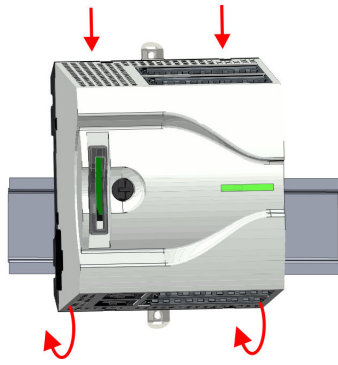
**2.** ► The CPU has a locking lever on the upper and lower side. Pull these levers outwards as shown in the figure, until these engage audible.
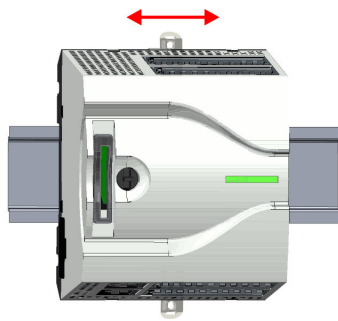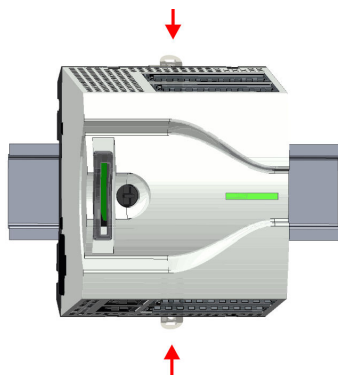
> ⚠ **CAUTION!**
> It is not allowed to mount the module sideways on the mounting rail, as otherwise the module may be damaged.

**3.** ► Plug the CPU from the top onto the mounting rail and turn the periphery module downward until it rests on the mounting rail.

**4.** ► Move the CPU on the mounting rail at its position.

**5.** ► To fix the CPU at the mounting rail, move the locking levers back to the initial position.

⇨ The CPU is now mounted and can be wired.
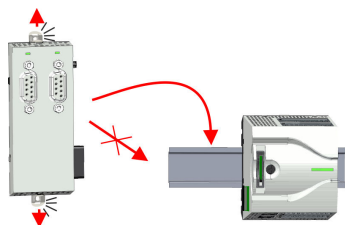
### 2.4.2  Mounting the extension module

**Proceeding**

You have the possibility to extend the interfaces of the CPU by plugging an extension module. For this the extension module is plugged at the left side of the CPU. The mountings happens with the following proceeding:

**1.**  ▶  Remove the bus cover with a screwdriver on the left side of the CPU.
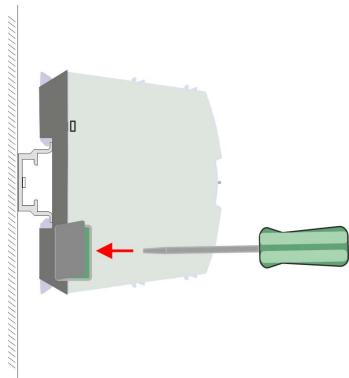
**2.**  ▶  The extension module has a locking lever on the upper and lower side. Pull these levers outwards as shown in the figure, until these engage audible.

> ⚠ **CAUTION!**
> It is not allowed to mount the module sideways on the mounting rail, as otherwise the module may be damaged.

**3.**  ▶  To mount plug the extension module from the top onto the mounting rail and turn the extension module downward until it rests on the mounting rail.
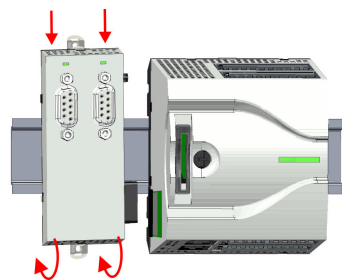
**4.**  ▶  Attach the extension module to the CPU by sliding the extension module on the mounting rail to the right until the interface connector slightly locks into the CPU.
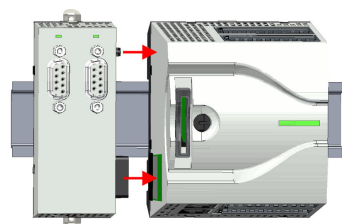
**5.**  ▶  To fix the extension module at the mounting rail, move the locking levers back to the initial position.

### 2.4.3  Mounting periphery module

**Proceeding**

You have the possibility to extend the periphery area of the CPU by plugging up to 8 periphery modules. For this the periphery modules are plugged at the right side of the CPU. The mountings happens with the following proceeding:

**1.** ▶ Remove the bus cover with a screwdriver on the right side of the CPU.

**2.** ▶ Each periphery module has a locking lever on its upper and lower side. Pull these levers outwards as shown in the figure, until these engage audible.

> ⚠ **CAUTION!**
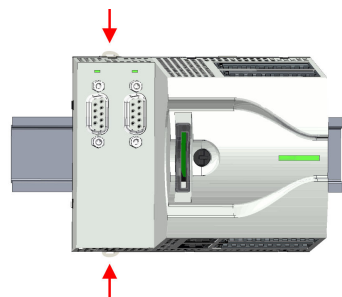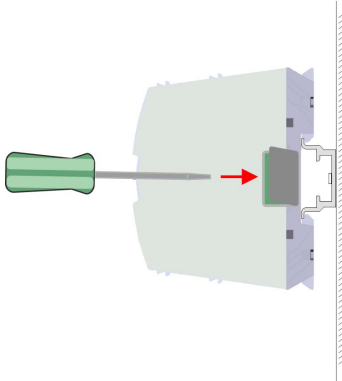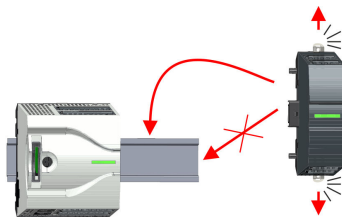> It is not allowed to mount the module sideways on the mounting rail, as otherwise the module may be damaged.

**3.** ▶ To mount plug the periphery module from the top onto the mounting rail and turn the periphery module downward until it rests on the mounting rail.
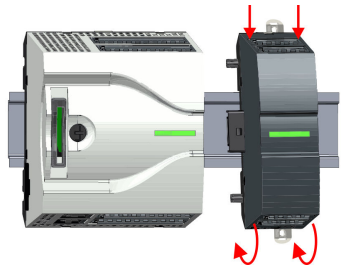
**4.** ▶ Attach the periphery module to the CPU by sliding the periphery module on the mounting rail to the left until the interface connector slightly locks into the CPU.
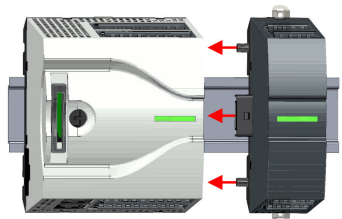
**5.** ▶ To fix the periphery module at the mounting rail, move the locking levers back to the initial position.
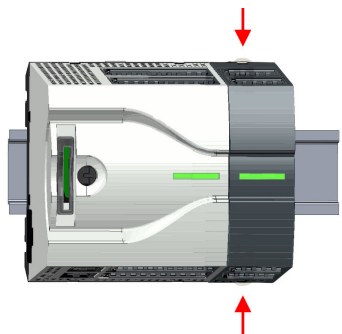
**6.** ▶ Proceed in this way with additional periphery modules.

## 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 theses specifications. Installation and cable routing other than SELV/PELV specification must be separated from the system's equipment!

### 2.5.1  Wiring CPU

**CPU connector**

For wiring the CPU has removable connectors. With the wiring of the connectors 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.

**Data**

| | |
|---|---|
| $U_{max}$ | 240V AC / 30V DC |
| $I_{max}$ | 10A |
| Cross section | 0.2 ... 1.5mm$^2$ (AWG 24 ... 16) |
| Stripping length | 10mm |

Use for wiring rigid wires respectively use wire sleeves. When using stranded wires you have to press the release button with a screwdriver during the wiring.

**Wiring procedure**

1   Labeling on the casing
2   Pin no. at the connector
3   Release area
4   Connection hole for wire

**Insert wire**

The wiring happens without a tool.



▶ Determine according to the casing labelling the connection position and 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.

**Standard wiring**
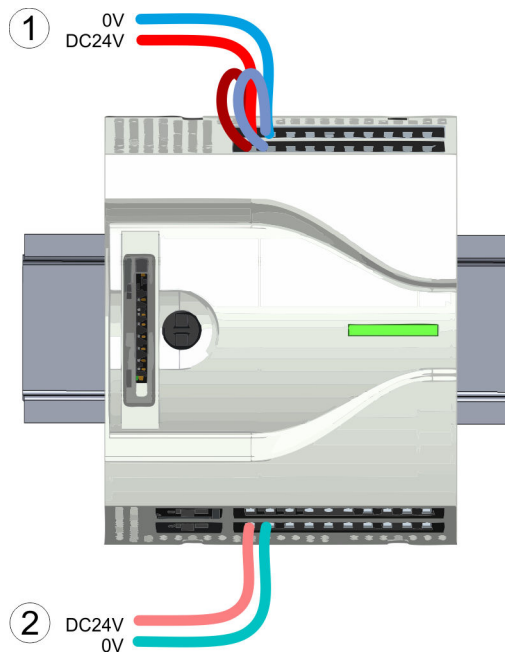


(1) X2: 4L+: DC 24V power section supply for integrated outputs
    X1: 3L+: DC 24V power section supply for integrated inputs
(2) X6: 1L+ DC 24V for electronic power supply

> *The electronic power section supply is internally protected against higher voltage by fuse. The fuse is located inside the CPU and can not be changed by the user.*

**Fusing**

■ It is recommended to externally protect the electronic power supply for CPU and backplane bus with a 3A fuse (fast) respectively by a line circuit breaker 3A characteristics Z.

■ The power section supply of the internal I/Os is to be externally protected with a 6A fuse (fast) respectively by a line circuit breaker 6A characteristics Z.

**Remove connector**

By means of a screwdriver there is the possibility to remove the connectors e.g. for module exchange with a fix wiring. For this each connector has indentations for unlocking at the top. Unlocking takes place by the following proceeding:



**1.** ▶ Remove connector:

Insert your screwdriver from above into one of the indentations.
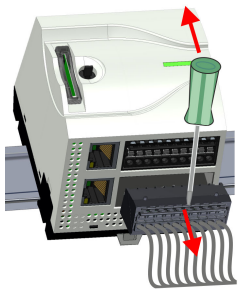


**2.** ▶ Push the screwdriver backwards:

⇨ The connector is unlocked and can be removed.

> **CAUTION!**
> Via wrong operation such as pressing, the screwdriver downward the release lever may be damaged.

**3.** ▶ Plug connector:

The connector is plugged by plugging it directly into the release lever.

## 2.5.2 Wiring periphery module

**Periphery module connector**

For wiring the periphery m module has removable connectors. With the wiring of the connectors 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.

**Data**



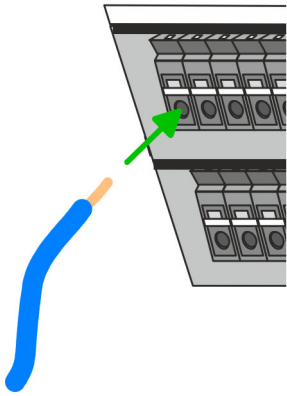| | |
|---|---|
| $U_{max}$ | 240V AC / 30V DC |
| $I_{max}$ | 10A |
| Cross section | 0.2 ... 1.5mm$^2$ (AWG 24 ... 16) |
| Stripping length | 10mm |

Use for wiring rigid wires respectively use wire sleeves. When using stranded wires you have to press the release button with a screwdriver during the wiring.

**Wiring procedure**



1 Labeling on the casing
2 Pin no. at the connector
3 Release area
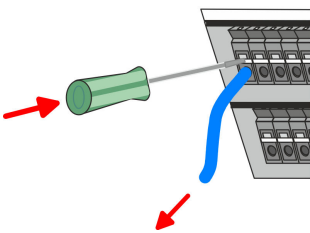4 Connection hole for wire

**Insert wire**

The wiring happens without a tool.



▬▶ Determine according to the casing labelling the connection position and insert through the round connection hole of the according contact your prepared wire until it stops, so that it is fixed.

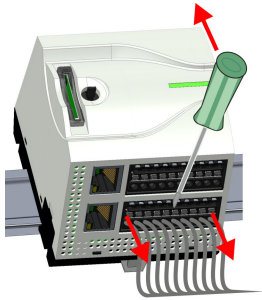⇨ By pushing the contact spring opens, thus ensuring the necessary contact pressure.

**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.

**Remove connector**
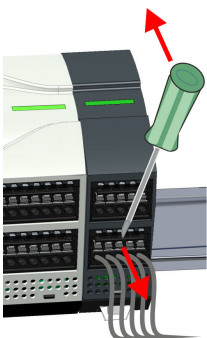
By means of a screwdriver there is the possibility to remove the connectors e.g. for module exchange with a fix wiring. For this each connector has indentations for unlocking at the top. Unlocking takes place by the following proceeding:



**1.** ▶ Remove connector:

Insert your screwdriver from above into one of the indentations.
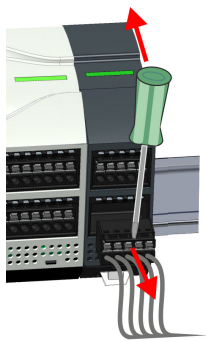
**2.** ▸ Push the screwdriver backwards:

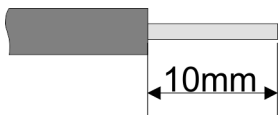⇨ The connector is unlocked and can be removed.

> ⚠ **CAUTION!**
> Via wrong operation such as pressing, the screwdriver down-ward the release lever may be damaged.

**3.** ▸ Plug connector:

The connector is plugged by plugging it directly into the release lever.

## 2.6 Demounting

### 2.6.1 Demounting CPU

**Remove connector**

By means of a screwdriver there is the possibility to remove the connectors e.g. for module exchange with a fix wiring. For this each connector has indentations for unlocking at the top. Unlocking takes place by the following proceeding:

**1.** ▸ Power-off your system.

**2.** ▸ Remove connector:

Insert your screwdriver from above into one of the indentations.
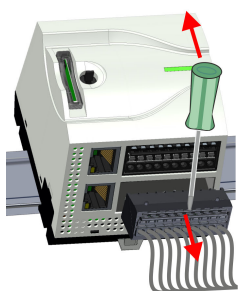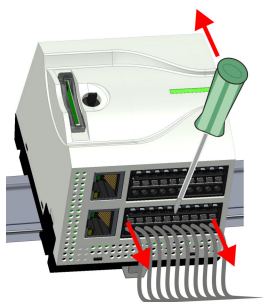
**3.** ▸ Push the screwdriver backwards:

⇨ The connector is unlocked and can be removed.

> ⚠ **CAUTION!**
> Via wrong operation such as pressing, the screwdriver down-ward the connector may be damaged!

**4.** ▸ In this way, remove all plugged connectors on the CPU.

**CPU replacement (stand-alone)**

If more modules are connected to the CPU Ä *'Option: CPU replacement in a system' on page 21*. If no other modules are connected to the CPU, the CPU is replaces according to the following proceeding:

**1.** ▷ Pull the locking levers of the CPU outwards until these engage audible.
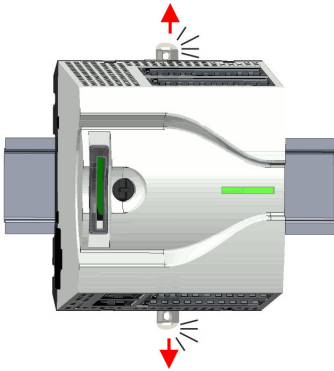
**2.** ▷ Remove the CPU with a rotation upwards from the mounting rail.
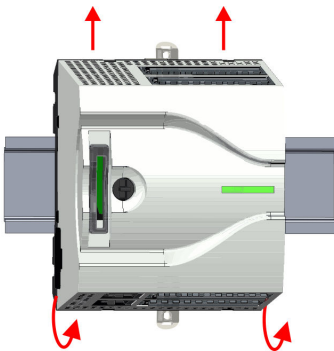
**3.** ▷ Pull the locking levers of the CPU outwards until these engage audible.
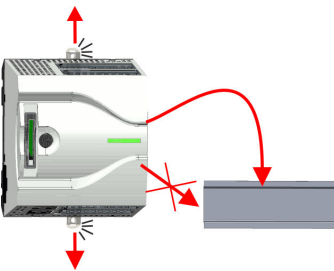
> ⚠ **CAUTION!**
> It is not allowed to mount the module sideways on the mounting rail, as otherwise the module may be damaged!

**4.** ▷ Plug the CPU from the top onto the mounting rail and turn the periphery module downward until it rests on the mounting rail.
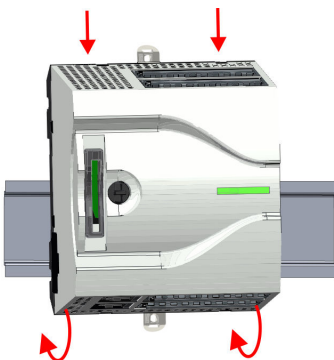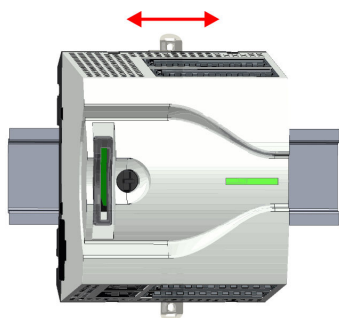
**5.** ▶ Move the CPU on the mounting rail at its position.
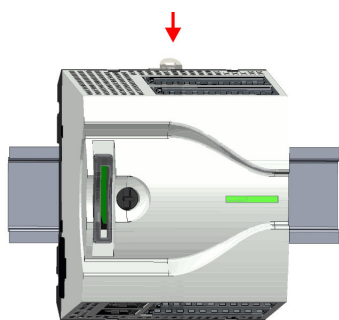


**6.** ▶ To fix the CPU at the mounting rail, move the locking levers back to the initial position.
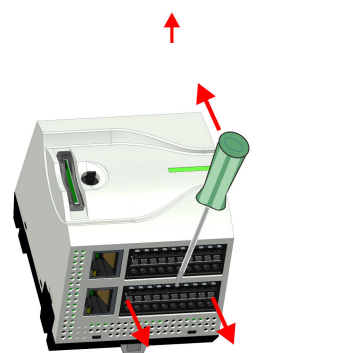


**7.** ▶ Remove the connectors, which are not necessary at the CPU.



**8.** ▶ Plug again the wired connectors.

⇨ Now you can bring your system back into operation.

**Option: CPU replacement in a system**

In the following the replacement of a CPU in a system is shown:
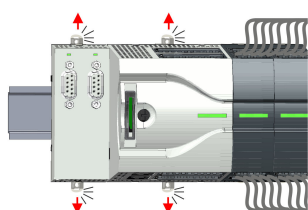


**1.** ▶ If there is an extension module connected to the CPU, you have to remove it from the CPU. For this pull the locking levers of the extension module and CPU outwards until these engage audible.
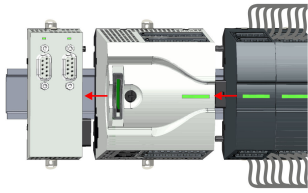
**2.** ▶ Disconnect all the modules, which are connected to the CPU by moving the CPU along with the extension module on the mounting rail.
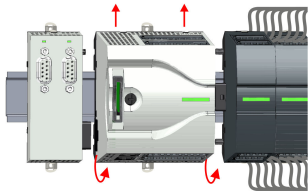
**3.** ▶ Remove the CPU with a rotation upwards from the mounting rail.
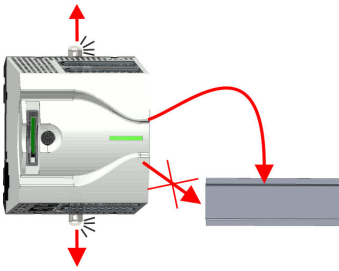
**4.** ▶ Pull the locking levers of the CPU outwards until these engage audible.

> ⚠ **CAUTION!**
> It is not allowed to mount the module sideways on the mounting rail, as otherwise the module may be damaged!
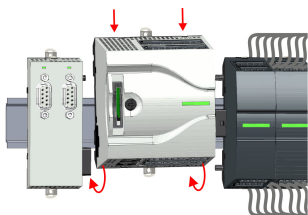
**5.** ▶ For mounting pull the locking levers of the CPU outwards until these engage audible. Plug the CPU from the top onto the mounting rail and turn the periphery module downward until it rests on the mounting rail.
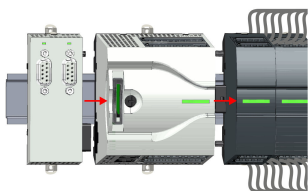
**6.** ▶ Rebind your modules by moving the CPU along with the extension module on the mounting rail.
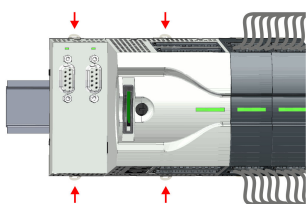
**7.** ▶ To fix the CPU at the mounting rail, move the locking levers back to the initial position.
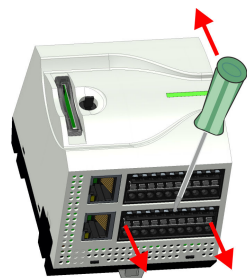
**8.** ▶ Remove the connectors, which are not necessary at the CPU.
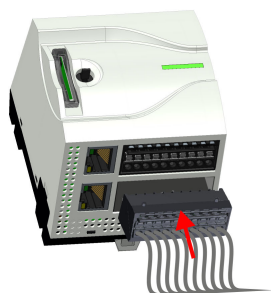
**9.** ▸ Plug again the wired connectors.

⇨ Now you can bring your system back into operation.

## 2.6.2 Demounting the extension module

**Proceeding**
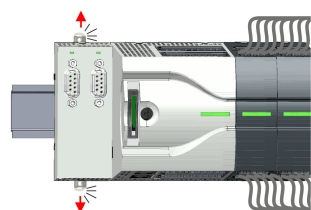
**1.** ▸ Power-off your system.

**2.** ▸ Remove the corresponding bus connectors.

**3.** ▸ Pull the locking levers of the extension module outwards until these engage audible.
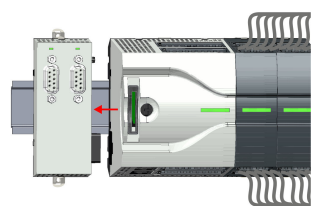
**4.** ▸ Remove the extension module from the CPU by sliding it on the mounting rail.
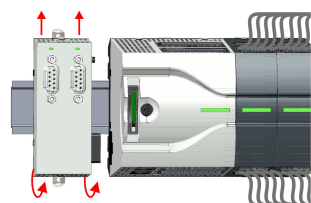
**5.** ▸ Remove the extension module with a rotation upwards from the mounting rail.
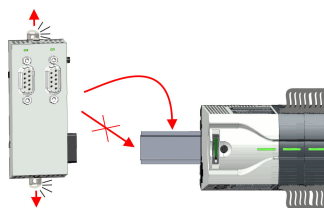
**6.** ▸ Pull the locking levers of the extension module outwards until these engage audible.

⚠ **CAUTION!**
It is not allowed to mount the module sideways on the mounting rail, as otherwise the module may be damaged!
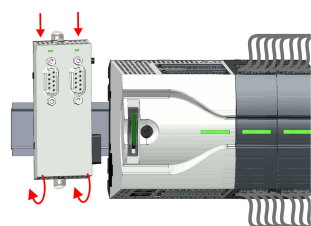
**7.** ▸ Plug the extension module from the top onto the mounting rail and turn the extension module downward until it rests on the mounting rail.
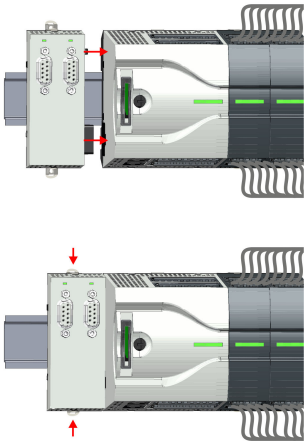
**8.** ▶ Reattach the extension module to the CPU by sliding the extension module on the mounting rail to the right until the interface connector slightly locks into the CPU.

**9.** ▶ Move the locking levers back to the initial position.

**10.** ▶ Plug the corresponding bus connectors.

⇨ Now you can bring your system back into operation.

### 2.6.3 Demounting periphery module

**Remove connector**

By means of a screwdriver there is the possibility to remove the connectors e.g. for module exchange with a fix wiring. For this each connector has indentations for unlocking at the top. Unlocking takes place by the following proceeding:
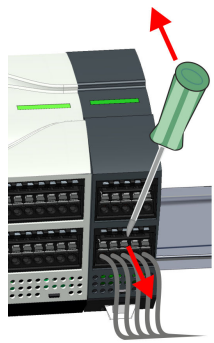
**1.** ▶ Power-off your system.

**2.** ▶ Remove connector:

Insert your screwdriver from above into one of the indentations.
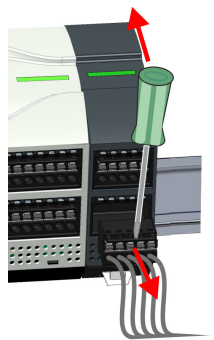
**3.** ▶ Push the screwdriver backwards:

⇨ The connector is unlocked and can be removed.

> ⚠ **CAUTION!**
> Via wrong operation such as pressing, the screwdriver downward the connector may be damaged!

**4.** ▶ In this way, remove all plugged connectors on the periphery module.

**Replace the periphery module**
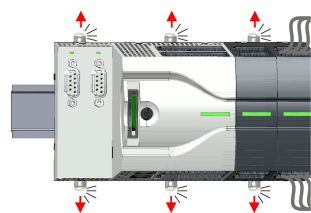
**1.** ▶ Remove the modules that are connected to the module to be replaced by pulling their release levers outwards until these engage audible ...
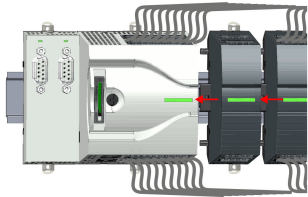
**2.** ▸ ... and move the modules accordingly.
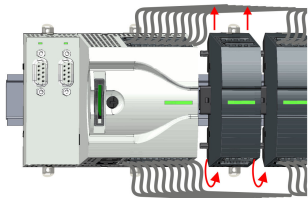
**3.** ▸ Remove the periphery module with a rotation upwards from the mounting rail.
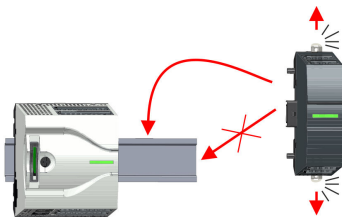
**4.** ▸ Pull the locking levers outwards until these engage audible.

> ⚠ **CAUTION!**
> It is not allowed to mount the module sideways on the mounting rail, as otherwise the module may be damaged!
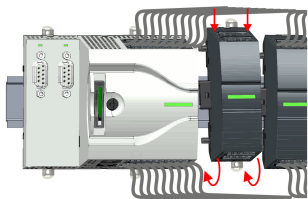
**5.** ▸ Plug the periphery module from the top onto the mounting rail and turn the periphery module downward until it rests on the mounting rail.
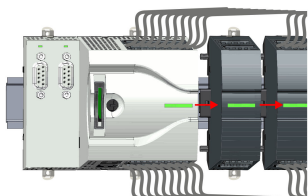
**6.** ▸ Reconnect all modules by pushing them together again on the mounting rail.
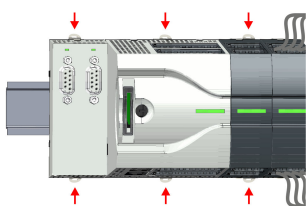
**7.** ▸ Move the locking levers back to the initial position.

**8.** ▸ Remove the connectors, which are not necessary.

**9.** ▶ Plug again the wired connectors.

⇨ Now you can bring your system back into operation.

## 2.7 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

## 2.8  General data

| Conformity and approval | | |
|---|---|---|
| Conformity | | |
| CE | 2014/35/EU | Low-voltage directive |
| | 2014/30/EU | EMC directive |
| Approval | | |
| UL | - | Refer to Technical data |
| others | | |
| RoHS | 2011/65/EU | 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 |

## Environmental conditions to EN 61131-2

| | | |
|---|---|---|
| Horizontal installation lying | EN 61131-2 | 0…+60°C |
| Vertical installation | EN 61131-2 | 0…+60°C |
| Air humidity | EN 60068-2-30 | RH1 (without condensation, rel. humidity 10…95%) |
| Pollution | EN 61131-2 | Degree of pollution 2 |
| Installation altitude max. | - | 2000m |
| Mechanical | | |
| Oscillation | EN 60068-2-6 | 1g, 9Hz ... 150Hz |
| Shock | EN 60068-2-27 | 15g, 11ms |

## Mounting conditions

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

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

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

# 3    Digital in-/output

## 3.1  M21-1BH00 - DI 16xDC 24V

**Properties**        The module detects the binary control signals from the process level and transmits them isolated to the higher-level bus system. It has 16 channels and their status is indicated by LEDs.

- ■  16 digital Inputs isolated to the backplane bus
- ■  Suitable for switches and proximity switches
- ■  Status indication of the channels via LEDs

**Structure**
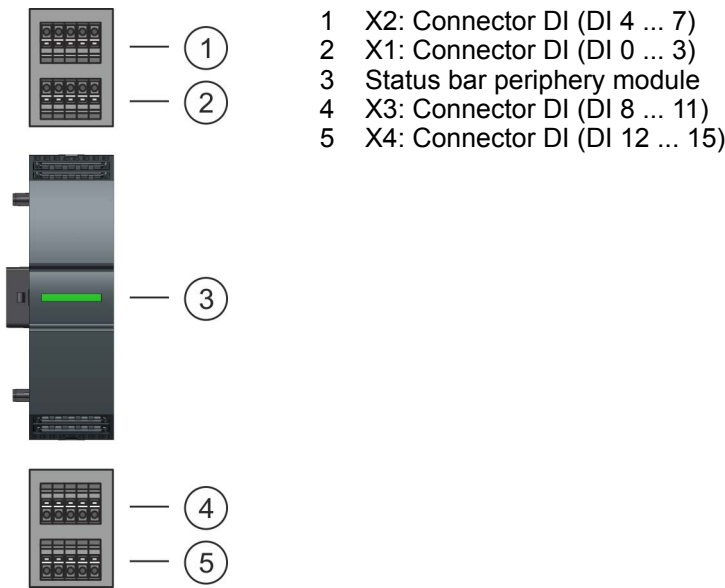


1    X2: Connector DI (DI 4 ... 7)
2    X1: Connector DI (DI 0 ... 3)
3    Status bar periphery module
4    X3: Connector DI (DI 8 ... 11)
5    X4: Connector DI (DI 12 ... 15)

**Status bar**

| LED | Description |
|---|---|
| <span style="color:green">████ ████</span> | LEDs green on: Backplane bus communication and module status are OK |
| <span style="color:red">████</span> | LED red on: Module reports an error |
| <span style="color:red">◥</span> | LED red blinks with 1Hz: Error in configuration |
| <span style="color:green">◥ ◥</span> | LEDs green are blinking with 1Hz: Error backplane bus communication |

**LEDs connectors**

| Digital input | LED | Description |
|---|---|---|
| DI +0.0 DI +0.7 | <span style="color:green">■</span> green | Digital I+0.0 ... 0.7 has "1" signal |
|  | □ | Digital I+0.0 ... 0.7 has "0" signal |
| DI +1.0 ... DI +1.7 | <span style="color:green">■</span> green | Digital input I+1.0 ... 1.7 has "1" signal |
|  | □ | Digital input I+1.0 ... 1.7 has "0" signal |

## Pin assignment

X2: 5 | 4 | 3 | 2 | 1
0.4 | 0.5 | 0.6 | 0.7

X1: 5 | 4 | 3 | 2 | 1
0.0 | 0.1 | 0.2 | 0.3

X3: 1 | 2 | 3 | 4 | 5
1.0 | 1.1 | 1.2 | 1.3

X4: 1 | 2 | 3 | 4 | 5
M24V
1.4 | 1.5 | 1.6 | 1.7
M
DC 24V
L+
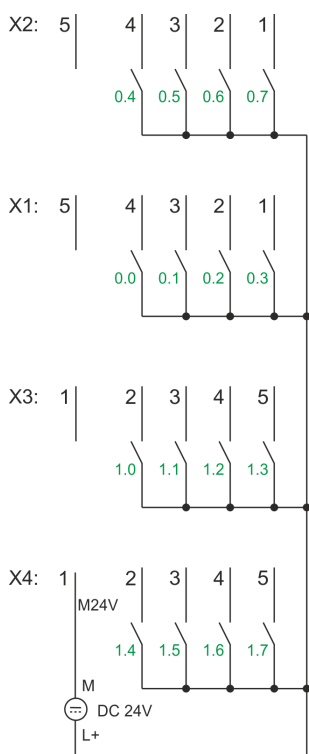
| X | Pin | Function | Type | LED | Description |
|-----|-----|----------|------|----------|-------------|
| X2: | 1 | +0.7 | I | 🟩 green | Digital input DI 7 |
| | 2 | +0.6 | I | 🟩 green | Digital input DI 6 |
| | 3 | +0.5 | I | 🟩 green | Digital input DI 5 |
| | 4 | +0.4 | I | 🟩 green | Digital input DI 4 |
| | 5 | - | - | | reserved |
| X1: | 1 | +0.3 | I | 🟩 green | Digital input DI 3 |
| | 2 | +0.2 | I | 🟩 green | Digital input DI 2 |
| | 3 | +0.1 | I | 🟩 green | Digital input DI 1 |
| | 4 | +0.0 | I | 🟩 green | Digital input DI 0 |
| | 5 | - | - | | reserved |
| X3: | 1 | - | - | | reserved |
| | 2 | +1.0 | I | 🟩 green | Digital input DI 8 |
| | 3 | +1.1 | I | 🟩 green | Digital input DI 9 |
| | 4 | +1.2 | I | 🟩 green | Digital input DI 10 |
| | 5 | +1.3 | I | 🟩 green | Digital input DI 11 |
| X4: | 1 | 0V | I | | Ground DI |
| | 2 | +1.4 | I | 🟩 green | Digital input DI 12 |
| | 3 | +1.5 | I | 🟩 green | Digital input DI 13 |
| | 4 | +1.6 | I | 🟩 green | Digital input DI 14 |
| | 5 | +1.7 | I | 🟩 green | Digital input DI 15 |
| I: Input | | | | | |

**Input area**

At the CPU the input area is embedded to the corresponding address area.

| Addr. | Name | Byte | Function |
|-------|------|------|----------|
| +0 | PII | 0 | Status of the inputs<br><br>■ Bit 0: DI 0<br>■ Bit 1: DI 1<br>■ Bit 2: DI 2<br>■ Bit 3: DI 3<br>■ Bit 4: DI 4<br>■ Bit 5: DI 5<br>■ Bit 6: DI 6<br>■ Bit 7: DI 7 |
|  |  | 1 | Status of the inputs<br><br>■ Bit 0: DI 8<br>■ Bit 1: DI 9<br>■ Bit 2: DI 10<br>■ Bit 3: DI 11<br>■ Bit 4: DI 12<br>■ Bit 5: DI 13<br>■ Bit 6: DI 14<br>■ Bit 7: DI 15 |

**Output area**          No byte of the output area is used by the module.

### 3.1.1 Technical data

| Order no. | M21-1BH00 |
|-----------|-----------|
| Type | SM M21 |
| Module ID | 0014 9FC2 |
| **Current consumption/power loss** | |
| Current consumption from backplane bus | 65 mA |
| Power loss | 0.9 W |
| **Technical data digital inputs** | |
| Number of inputs | 16 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | - |
| Current consumption from load voltage L+ (without load) | 25 mA |
| Rated value | DC 20.4...28.8 V |
| Input voltage for signal "0" | DC 0...5 V |
| Input voltage for signal "1" | DC 15...28.8 V |
| Input voltage hysteresis | - |
| Frequency range | - |
| Input resistance | - |

| Order no. | M21-1BH00 |
|---|---|
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |
| Max. permissible BERO quiescent current | 0.5 mA |
| Input delay of "0" to "1" | 3 ms |
| Input delay of "1" to "0" | 3 ms |
| Number of simultaneously utilizable inputs horizontal configuration | 16 |
| Number of simultaneously utilizable inputs vertical configuration | 16 |
| Input characteristic curve | IEC 61131-2, type 1 |
| Initial data size | 16 Bit |
| **Status information, alarms, diagnostics** | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | no |
| Diagnostic functions | no |
| Diagnostics information read-out | none |
| Module state | none |
| Module error display | red LED |
| Channel error display | none |
| **Isolation** | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| **Datasizes** | |
| Input bytes | 2 |
| Output bytes | 0 |
| Parameter bytes | 0 |
| Diagnostic bytes | 0 |
| **Housing** | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| **Mechanical data** | |
| Dimensions (WxHxD) | 26 mm x 88 mm x 71 mm |
| Net weight | 89 g |

M22-1BH00 - DO 16xDC 24V 0,5A

| Order no. | M21-1BH00 |
|---|---|
| Weight including accessories | 89 g |
| Gross weight | 102 g |
| **Environmental conditions** | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| **Certifications** | |
| UL certification | in preparation |
| KC certification | in preparation |

## 3.2  M22-1BH00 - DO 16xDC 24V 0,5A

**Properties**

The module detects the binary control signals from the higher-level bus system and transports them to the process level via the outputs. It has 16 channels and their status is indicated by LEDs.

- 16 digital outputs isolated to the backplane bus
- Status indication of the channels via LEDs
- Diagnostic function can be parametrized in case of overload

**Structure**



1  X2: Terminal DO (DO 4 ... 7)
2  X1: Terminal DO (DO 0 ... 3)
3  Status bar periphery module
4  X3: Terminal DO (DO 8 ... 11:
5  X4: Terminal DO (DO 12 ... 15)

**Status bar**

| LED | Description |
|---|---|
| | LEDs green on: Backplane bus communication and module status are OK |
| | LED red on: Module reports an error, e.g. on overload at an output |
| | LED red blinks with 1Hz: Error in configuration |
| | LEDs green are blinking with 1Hz: Error backplane bus communication |

## LEDs connectors

| Digital output | LED | Description |
|---|---|---|
| DO +0.0 ... DO +0.7 | 🟩 green | Digital output Q+0.0 ... 0.7 has "1" signal |
| | ⬜ | Digital output Q+0.0 ... 0.7 has "0" signal |
| DO +1.0 ... DO +1.7 | 🟩 green | Digital output Q+1.0 ... 1.7 has "1" signal |
| | ⬜ | Digital output Q+1.0 ... 1.7 has "0" signal |

## Pin assignment



| X | Pin | Function | Type | LED | Description |
|---|---|---|---|---|---|
| X2: | 1 | +0.7 | O | 🟩 green | Digital output DO 7 |
| | 2 | +0.6 | O | 🟩 green | Digital output DO 6 |
| | 3 | +0.5 | O | 🟩 green | Digital output DO 5 |
| | 4 | +0.4 | O | 🟩 green | Digital output DO 4 |
| | 5 | DC 24V | I | | Power supply DC 24V (L+) |
| X1: | 1 | +0.3 | O | 🟩 green | Digital output DO 3 |
| | 2 | +0.2 | O | 🟩 green | Digital output DO 2 |
| | 3 | +0.1 | O | 🟩 green | Digital output DO 1 |
| | 4 | +0.0 | O | 🟩 green | Digital output DO 0 |
| | 5 | - | - | | reserved |
| X3: | 1 | - | - | | reserved |
| | 2 | +1.0 | O | 🟩 green | Digital output DO 8 |
| | 3 | +1.1 | O | 🟩 green | Digital output DO 9 |
| | 4 | +1.2 | O | 🟩 green | Digital output DO 10 |
| | 5 | +1.3 | O | 🟩 green | Digital output DO 11 |
| X4: | 1 | 0V | O | | Power supply ground |
| | 2 | +1.4 | O | 🟩 green | Digital output DO 12 |
| | 3 | +1.5 | O | 🟩 green | Digital output DO 13 |
| | 4 | +1.6 | O | 🟩 green | Digital output DO 14 |
| | 5 | +1.7 | O | 🟩 green | Digital output DO 15 |
| I: Input, O: Output | | | | | |

⚠️ **CAUTION!**

Feeding in voltage at an output is not allowed and can destroy the module!

**Input area**

No byte of the input area is used by the module.

**Output area**

| Addr. | Name | Byte | Function |
|---|---|---|---|
| +0 | PIQ | 0 | Status of the outputs<br><br>■ Bit 0: DO 0<br>■ Bit 1: DO 1<br>■ Bit 2: DO 2<br>■ Bit 3: DO 3<br>■ Bit 4: DO 4<br>■ Bit 5: DO 5<br>■ Bit 6: DO 6<br>■ Bit 7: DO 7 |
| | | 1 | Status of the outputs<br><br>■ Bit 0: DO 8<br>■ Bit 1: DO 9<br>■ Bit 2: DO 10<br>■ Bit 3: DO 11<br>■ Bit 4: DO 12<br>■ Bit 5: DO 13<br>■ Bit 6: DO 14<br>■ Bit 7: DO 15 |

**Parameter data**

The module has the following parameter data, which can be set in the hardware configuration:

■ Diagnostic interrupt
  – When enabled, a diagnostic interrupt is triggered when an output is overloaded.

> *Regardless of the parametrization, the red LED* [red indicator] *of the status bar lights up on overload. The LED lights up as long as there is an overload.*

### 3.2.1 Diagnostic data

Via the parametrization you may activate a diagnostic interrupt for the module. With a diagnostic interrupt the module serves for diagnostic data for diagnostic$_{incoming}$. As soon as the reason for releasing a diagnostic interrupt is no longer present, the diagnostic interrupt$_{going}$ automatically takes place. Via record set 01h the diagnostic data can be accessed.

| Name | Bytes | Function | Default |
|---|---|---|---|
| ERR_A | 1 | Diagnostic | 00h |
| MODTYP | 1 | Module information | 0Fh |
| ERR_C | 1 | reserved | 00h |
| ERR_D | 1 | reserved | 00h |
| CHTYP | 1 | Channel type | 72h |

| Name | Bytes | Function | Default |
|------|-------|----------|---------|
| NUMBIT | 1 | Number diagnostic bits per channel | 00h |
| NUMCH | 1 | Number channels of the module | 00h |
| CHERR | 1 | reserved | 00h |
| CH0ERR…CH7ERR | 8 | reserved | 00h |
| DIAG_US | 4 | µs ticker (32bit) | 00h |

*ERR_A Diagnostic*

| Byte | Bit 7 ... 0 |
|------|-------------|
| 0 | ■ Bit 0: set at module failure <br> ■ Bit 1: set at internal error <br> ■ Bit 2: set at external error <br> ■ Bit 3: reserved <br> ■ Bit 4: set at overload at an output <br> ■ Bit 6 ... 5: reserved <br> ■ Bit 7: set at error in parametrization |

*MODTYP Module information*

| Byte | Bit 7 ... 0 |
|------|-------------|
| 0 | ■ Bit 3 ... 0: module class <br> – 1111b: digital module <br> ■ Bit 7 ... 4: reserved |

*CHTYP Channel type*

| Byte | Bit 7 ... 0 |
|------|-------------|
| 0 | ■ Bit 6 ... 0: Channel type <br> – 72h: Digital output <br> ■ Bit 7: reserved |

*NUMBIT Diagnostic bits*

| Byte | Bit 7 ... 0 |
|------|-------------|
| 0 | Number of diagnostic bits per channel (here 00h) |

*NUMCH Channels*

| Byte | Bit 7 ... 0 |
|------|-------------|
| 0 | Number of channels of the module (here 00h) |

*DIAG_US µs ticker*

| Byte | Bit 7 ... 0 |
|------|-------------|
| 0...3 | Value of the µs ticker at the moment of the diagnostic <br><br> ■ In the System MICRO module there is a timer (µs ticker). With PowerON the timer starts counting with 0. After $2^{32}$-1µs the timer starts with 0 again. |

## 3.2.2  Technical data

| Order no. | M22-1BH00 |
| --- | --- |
| Type | SM M22 |
| Module ID | 0114 2F50 |
| **Current consumption/power loss** | |
| Current consumption from backplane bus | 80 mA |
| Power loss | 0.7 W |
| **Technical data digital outputs** | |
| Number of outputs | 16 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.4...28.8 V |
| Current consumption from load voltage L+ (without load) | 20 mA |
| Total current per group, horizontal configuration, 40°C | 8 A |
| Total current per group, horizontal configuration, 60°C | 8 A |
| Total current per group, vertical configuration | 8 A |
| Output current at signal "1", rated value | 0.5 A |
| Output delay of "0" to "1" | 30 µs |
| Output delay of "1" to "0" | 175 µs |
| Minimum load current | - |
| Lamp load | 10 W |
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | ✓ |
| Switching frequency with resistive load | max. 1000 Hz |
| Switching frequency with inductive load | max. 0.5 Hz |
| Switching frequency on lamp load | max. 10 Hz |
| Internal limitation of inductive shut-off voltage | L+ (-45 V) |
| Short-circuit protection of output | yes, electronic |
| Trigger level | 1 A |
| Number of operating cycle of relay outputs | - |
| Switching capacity of contacts | - |
| Output data size | 16 Bit |
| **Status information, alarms, diagnostics** | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |

| Order no. | M22-1BH00 |
|---|---|
| Diagnostic interrupt | yes, parameterizable |
| Diagnostic functions | yes, parameterizable |
| Diagnostics information read-out | none |
| Supply voltage display | green LED |
| Group error display | red LED |
| Channel error display | none |
| **Isolation** | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| **Datasizes** | |
| Input bytes | 0 |
| Output bytes | 2 |
| Parameter bytes | 0 |
| Diagnostic bytes | 20 |
| **Housing** | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| **Mechanical data** | |
| Dimensions (WxHxD) | 26 mm x 88 mm x 71 mm |
| Net weight | 93 g |
| Weight including accessories | 93 g |
| Gross weight | 106 g |
| **Environmental conditions** | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| **Certifications** | |
| UL certification | in preparation |
| KC certification | in preparation |

## 3.3 M23-1BH00 - DI8/DO8 0,5A

**Properties**

The module is a mixed module. It has 8 input channels and 8 output channels. The status of the channels is indicated by LEDs.

- 8 digital inputs and 8 digital outputs electrically isolated from the backplane bus
- Status indication of the channels via LEDs
- Diagnostic function can be parametrized in case of overload

M23-1BH00 - DI8/DO8 0,5A

**Structure**



| | |
|---|---|
| 1 | X2: Terminal DO (DO 4 ... 7) |
| 2 | X1: Terminal DO (DO 0 ... 3) |
| 3 | Status bar periphery module |
| 4 | X3: Terminal DI (DI 0 ... 3) |
| 5 | X4: Terminal DI (DI 4 ... 7) |

**Status bar**

| LED | Description |
|---|---|
| | LEDs green on: Backplane bus communication and module status are OK |
| | LED red on: Module reports an error, e.g. on overload at an output |
| | LED red blinks with 1Hz: Error in configuration |
| | LEDs green are blinking with 1Hz: Error backplane bus communication |

**LEDs connectors**

| Digital output | LED | Description |
|---|---|---|
| DO +0.0 ... DO +0.7 | green | Digital output Q+0.0 ... 0.7 has "1" signal |
| | | Digital output Q+0.0 ... 0.7 has "0" signal |

| Digital input | LED | Description |
|---|---|---|
| DI +1.0 ... DI +1.7 | green | Digital input I+1.0 ... 1.7 has "1" signal |
| | | Digital input I+1.0 ... 1.7 has "0" signal |

## Pin assignment
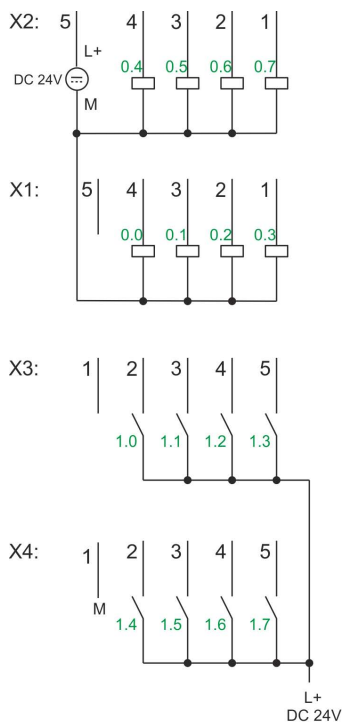


| X | Pin | Function | Type | LED | Description |
|---|---|---|---|---|---|
| X2: | 1 | +0.7 | O | ■ green | Digital output DO 7 |
| | 2 | +0.6 | O | ■ green | Digital output DO 6 |
| | 3 | +0.5 | O | ■ green | Digital output DO 5 |
| | 4 | +0.4 | O | ■ green | Digital output DO 4 |
| | 5 | DC24V | I | | Load voltage DC 24V for DO (L+) |
| X1: | 1 | +0.3 | O | ■ green | Digital output DO 3 |
| | 2 | +0.2 | O | ■ green | Digital output DO 2 |
| | 3 | +0.1 | O | ■ green | Digital output DO 1 |
| | 4 | +0.0 | O | ■ green | Digital output DO 0 |
| | 5 | - | - | | reserved |
| X3: | 1 | - | - | | reserved |
| | 2 | +1.0 | I | ■ green | Digital input DI 4 |
| | 3 | +1.1 | I | ■ green | Digital input DI 5 |
| | 4 | +1.2 | I | ■ green | Digital input DI 6 |
| | 5 | +1.3 | I | ■ green | Digital input DI 7 |
| X4: | 1 | 0V | I | | Ground DI |
| | 2 | +1.4 | I | ■ green | Digital input DI 0 |
| | 3 | +1.5 | I | ■ green | Digital input DI 1 |
| | 4 | +1.6 | I | ■ green | Digital input DI 2 |
| | 5 | +1.7 | I | ■ green | Digital input DI 3 |

## Input area

| Addr. | Name | Byte | Function |
|---|---|---|---|
| +0 | PII | 0 | Status of the inputs<br><br>■ Bit 0: DI 0<br>■ Bit 1: DI 1<br>■ Bit 2: DI 2<br>■ Bit 3: DI 3<br>■ Bit 4: DI 4<br>■ Bit 5: DI 5<br>■ Bit 6: DI 6<br>■ Bit 7: DI 7 |

**Output area**

| Addr. | Name | Byte | Function |
|-------|------|------|----------|
| +0 | PIQ | 0 | Status of the outputs<br><br>■ Bit 0: DO 0<br>■ Bit 1: DO 1<br>■ Bit 2: DO 2<br>■ Bit 3: DO 3<br>■ Bit 4: DO 4<br>■ Bit 5: DO 5<br>■ Bit 6: DO 6<br>■ Bit 7: DO 7 |

**Parameter data**

The module has the following parameter data, which can be set in the hardware configuration:

■ Diagnostic interrupt
  – When enabled, a diagnostic interrupt is triggered when an output is overloaded.

> *Regardless of the parametrization, the red LED ▮▮▮▮▮▮ of the status bar lights up on overload. The LED lights up as long as there is an overload.*

### 3.3.1 Diagnostic data

Via the parametrization you may activate a diagnostic interrupt for the module. With a diagnostic interrupt the module serves for diagnostic data for diagnostic$_{incoming}$. As soon as the reason for releasing a diagnostic interrupt is no longer present, the diagnostic interrupt$_{going}$ automatically takes place. Via record set 01h the diagnostic data can be accessed.

| Name | Bytes | Function | Default |
|------|-------|----------|---------|
| ERR_A | 1 | Diagnostic | 00h |
| MODTYP | 1 | Module information | 0Fh |
| ERR_C | 1 | reserved | 00h |
| ERR_D | 1 | reserved | 00h |
| CHTYP | 1 | Channel type | 72h |
| NUMBIT | 1 | Number diagnostic bits per channel | 00h |
| NUMCH | 1 | Number channels of the module | 00h |
| CHERR | 1 | reserved | 00h |
| CH0ERR…CH7ERR | 8 | reserved | 00h |
| DIAG_US | 4 | µs ticker (32bit) | 00h |

*ERR_A Diagnostic*

| Byte | Bit 7 ... 0 |
|---|---|
| 0 | ■ Bit 0: set at module failure <br> ■ Bit 1: set at internal error <br> ■ Bit 2: set at external error <br> ■ Bit 3: reserved <br> ■ Bit 4: set at overload at an output <br> ■ Bit 6 ... 5: reserved <br> ■ Bit 7: set at error in parametrization |

*MODTYP Module information*

| Byte | Bit 7 ... 0 |
|---|---|
| 0 | ■ Bit 3 ... 0: module class <br> – 1111b: digital module <br> ■ Bit 7 ... 4: reserved |

*CHTYP Channel type*

| Byte | Bit 7 ... 0 |
|---|---|
| 0 | ■ Bit 6 ... 0: Channel type <br> – 72h: Digital output <br> ■ Bit 7: reserved |

*NUMBIT Diagnostic bits*

| Byte | Bit 7 ... 0 |
|---|---|
| 0 | Number of diagnostic bits per channel (here 00h) |

*NUMCH Channels*

| Byte | Bit 7 ... 0 |
|---|---|
| 0 | Number of channels of the module (here 00h) |

*DIAG_US µs ticker*

| Byte | Bit 7 ... 0 |
|---|---|
| 0...3 | Value of the µs ticker at the moment of the diagnostic <br><br> ■ In the System MICRO module there is a timer (µs ticker). With PowerON the timer starts counting with 0. After $2^{32}$-1µs the timer starts with 0 again. |

### 3.3.2 Technical data

| Order no. | M23-1BH00 |
|---|---|
| Type | SM M23 |
| Module ID | 0015 3F49 |
| **Current consumption/power loss** | |
| Current consumption from backplane bus | 80 mA |
| Power loss | 0.7 W |
| **Technical data digital inputs** | |

| Order no. | M23-1BH00 |
|---|---|
| Number of inputs | 8 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 24 V |
| Current consumption from load voltage L+ (without load) | 25 mA |
| Rated value | DC 20.4...28.8 V |
| Input voltage for signal "0" | DC 0...5 V |
| Input voltage for signal "1" | DC 15...28.8 V |
| Input voltage hysteresis | - |
| Frequency range | - |
| Input resistance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |
| Max. permissible BERO quiescent current | 0.5 mA |
| Input delay of "0" to "1" | 3 ms |
| Input delay of "1" to "0" | 3 ms |
| Number of simultaneously utilizable inputs horizontal configuration | 8 |
| Number of simultaneously utilizable inputs vertical configuration | 8 |
| Input characteristic curve | IEC 61131-2, type 1 |
| Initial data size | 8 Bit |
| **Technical data digital outputs** | |
| Number of outputs | 8 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.4...28.8 V |
| Reverse polarity protection of rated load voltage | - |
| Current consumption from load voltage L+ (without load) | 20 mA |
| Total current per group, horizontal configuration, 40°C | 4 A |
| Total current per group, horizontal configuration, 60°C | 4 A |
| Total current per group, vertical configuration | 4 A |
| Output current at signal "1", rated value | 0.5 A |
| Output delay of "0" to "1" | 30 µs |
| Output delay of "1" to "0" | 175 µs |
| Minimum load current | - |
| Lamp load | 10 W |

| Order no. | M23-1BH00 |
|---|---|
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | ✓ |
| Switching frequency with resistive load | max. 1000 Hz |
| Switching frequency with inductive load | max. 0.5 Hz |
| Switching frequency on lamp load | max. 10 Hz |
| Internal limitation of inductive shut-off voltage | L+ (-45 V) |
| Short-circuit protection of output | yes, electronic |
| Trigger level | 1 A |
| Number of operating cycle of relay outputs | - |
| Switching capacity of contacts | - |
| Output data size | 8 Bit |
| **Status information, alarms, diagnostics** | |
| Status display | green LED per channel |
| Interrupts | no |
| Process alarm | no |
| Diagnostic interrupt | yes, parameterizable |
| Diagnostic functions | yes, parameterizable |
| Diagnostics information read-out | none |
| Module state | green LED |
| Module error display | red LED |
| Channel error display | none |
| **Isolation** | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | DC 500 V |
| **Datasizes** | |
| Input bytes | 1 |
| Output bytes | 1 |
| Parameter bytes | 0 |
| Diagnostic bytes | 20 |
| **Housing** | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| **Mechanical data** | |

| Order no. | M23-1BH00 |
|---|---|
| Dimensions (WxHxD) | 26 mm x 88 mm x 71 mm |
| Net weight | 91 g |
| Weight including accessories | 91 g |
| Gross weight | 104 g |
| **Environmental conditions** | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| **Certifications** | |
| UL certification | in preparation |
| KC certification | in preparation |