VIPA System SLIO

FM | 050-1BS00 | Manual

HB300E_FM | RE_050-1BS00 | Rev. 10/30

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VIPA
art of automation

VIPA, Gesellschaft für Visualisierung und Prozessautomatisierung mbH
Ohmstraße 4, D-91074 Herzogenaurach, Germany
Tel.: +49 (91 32) 744 -0
Fax.: +49 9132 744 1864
EMail: info@vipa.de
http://www.vipa.de

Note

Every effort has been made to ensure that the information contained in this document was complete and accurate at the time of publishing. Nevertheless, the authors retain the right to modify the information. This customer document describes all the hardware units and functions known at the present time. Descriptions may be included for units which are not present at the customer site. The exact scope of delivery is described in the respective purchase contract.

CE Conformity

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

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

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

Conformity Information

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VIPA GmbH, Ohmstraße 4, 91074 Herzogenaurach, Germany

Telefax:+49 9132 744 1204
EMail: documentation@vipa.de

Technical support

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VIPA GmbH, Ohmstraße 4, 91074 Herzogenaurach, Germany

Telephone: +49 9132 744 1150/1180 (Hotline)
EMail: support@vipa.de

Contents

About this manual

This manual describes the function module FM 050-1BS00 of the system SLIO from VIPA. Here you may find besides of a product overview a detailed description of the function module. You'll receive information about the connection and the deployment of the System SLIO module.

Overview

Chapter 1: Basics and Assembly

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

Chapter 2: Hardware description

In this chapter the SSI module 050-1BS00 of the System SLIO is described. Here every information about the hardware components of the module may be found.

The technical data are at the end of the chapter.

Chapter 3: Deployment

In this chapter the deployment of the System SLIO SSI module 050-1BS00 is described. Here every information required for the deployment may be found.

Objective and contents

This manual describes the System SLIO function module 050-1BS00 from VIPA.
It contains a description of the construction, project implementation and usage.

Target audience

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

Structure of the manual

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

Guide to the document

The following guides are available in the manual:

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

Availability

The manual is available in:

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

Icons Headings

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

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

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

Note!
Supplementary information and useful tips.

Safety information

Applications conforming with specifications

The System SLIO is constructed and produced for:

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

Danger!

This device is not certified for applications in

- in explosive environments (EX-zone)

Documentation

The manual must be available to all personnel in the

- project design department
- installation department
- commissioning
- operation

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

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

Disposal

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

Chapter 1 Basics and Assembly

Overview

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

Content

Safety Information for Users

Handling of electrostatic sensitive modules

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

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

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

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

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

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

Shipping of modules

Modules must be shipped in the original packing material.

Measurements and alterations on electrostatic sensitive modules

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

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

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

Attention!

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

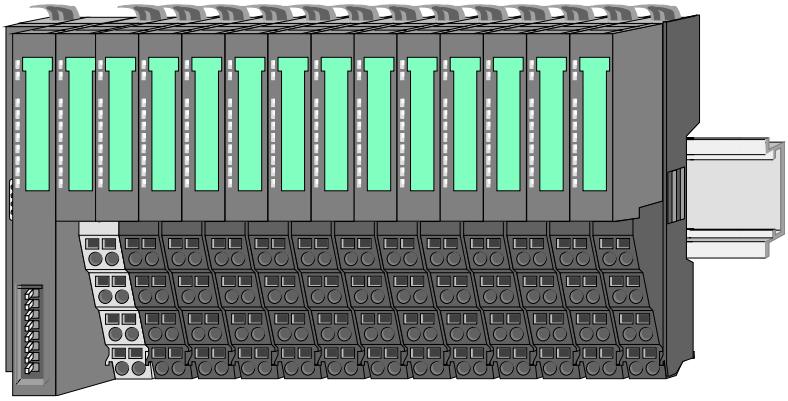
System conception

Overview

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

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

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

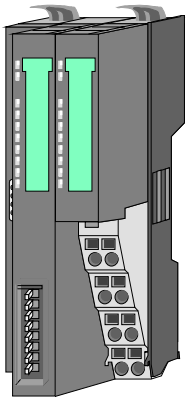


Components

The System SLIO consists of the following components:

- Bus coupler
- Periphery modules
- Power modules
- Accessories

Bus coupler



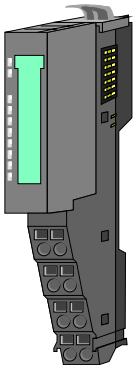
With a bus coupler bus interface and power module is integrated to one casing. With the bus interface you get access to a subordinated bus system.

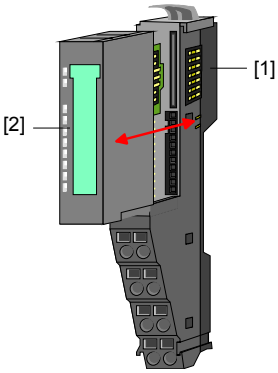
Via the integrated power module for power supply the bus interface is supplied as well as the electronic of the connected periphery modules.

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

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

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

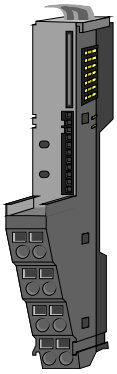




[1] Terminal module

[2] Electronic module

Terminal module

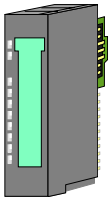


The *terminal module* serves to carry the electronic module, contains the backplane bus with power supply for the electronic, the DC 24V power section supply and the staircase-shaped terminal for wiring.

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

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

Electronic module



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

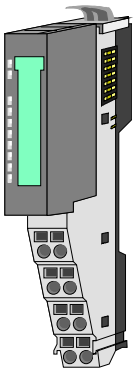
With an error the defective module may be exchanged for a functional module with standing installation.

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

At the front side there are LEDs for status indication.

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

Power module



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

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

Accessories

Shield bus carrier

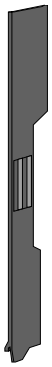
The shield bus carrier serves to carry the shield bus to connect cable shields.

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

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

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

Bus cover

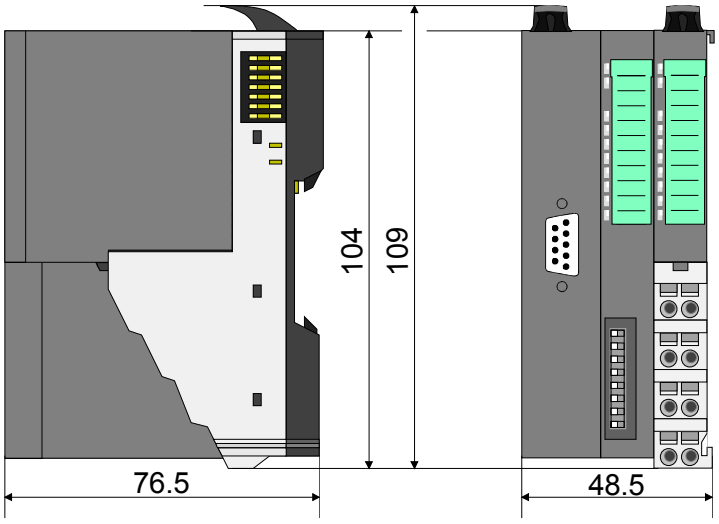


With each bus coupler, to protect the backplane bus connectors, there is a mounted bus cover in the scope of delivery. You have to remove the bus cover of the bus coupler before mounting a SLIO module.

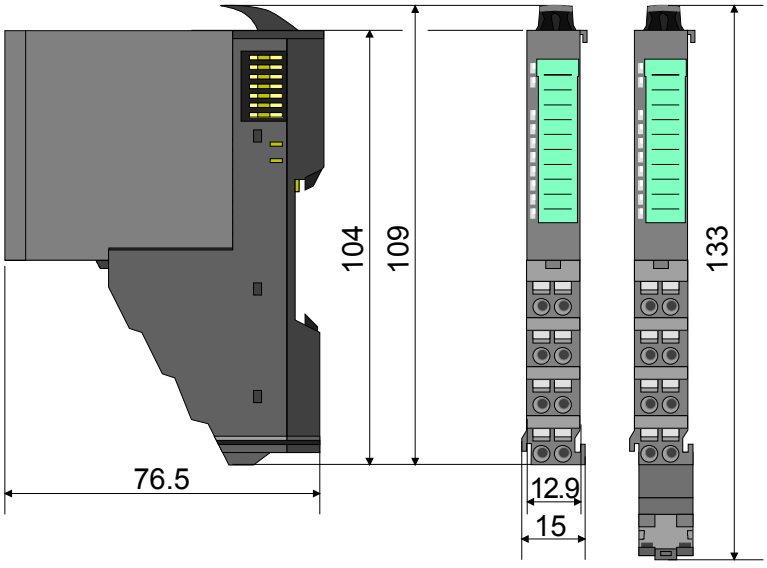
For the protection of the backplane bus connector you should always mount the bus cover at the last module of your system again.

Dimensions

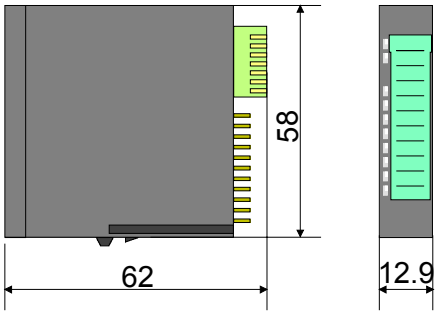
Dimensions bus coupler



Dimensions periphery module



Dimensions electronic module



Dimensions in mm

Installation

Functional principle

Mounting terminal module

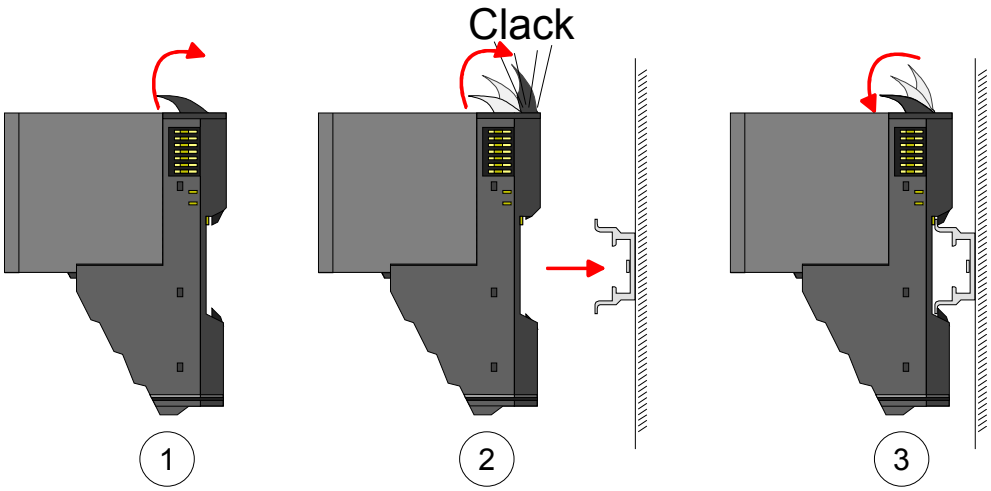
There is a locking lever at the top side of the terminal module. For mounting and de-mounting this locking lever is to turn upwards until this engages audible.

Now the module may be pulled forward.

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

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

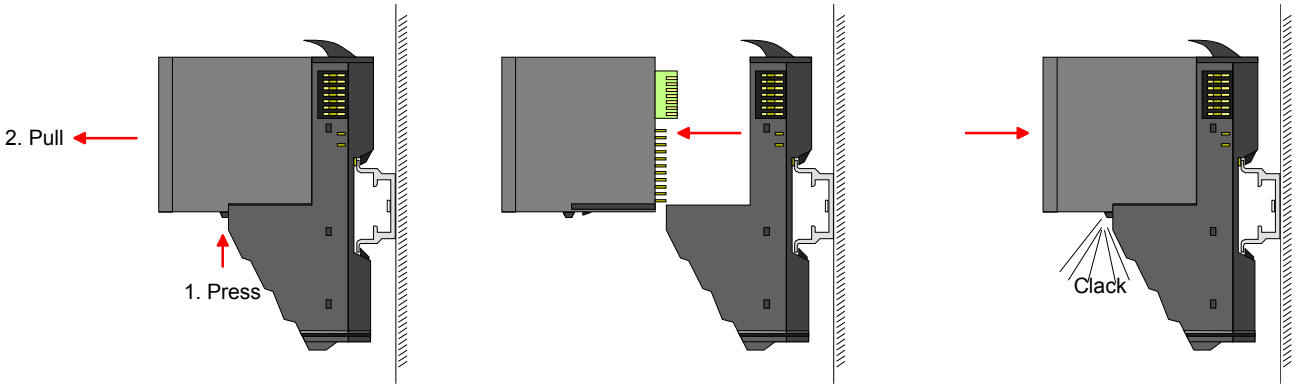
The modules may either separately be mounted to the mounting rail or as block. Here is to be considered that each locking lever is opened.



Mounting electronic module

For mounting between 2 modules and for the exchange of a defective electronic module, the electronic module may be pulled forward after pressing the unlocking lever at the lower side of the module.

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



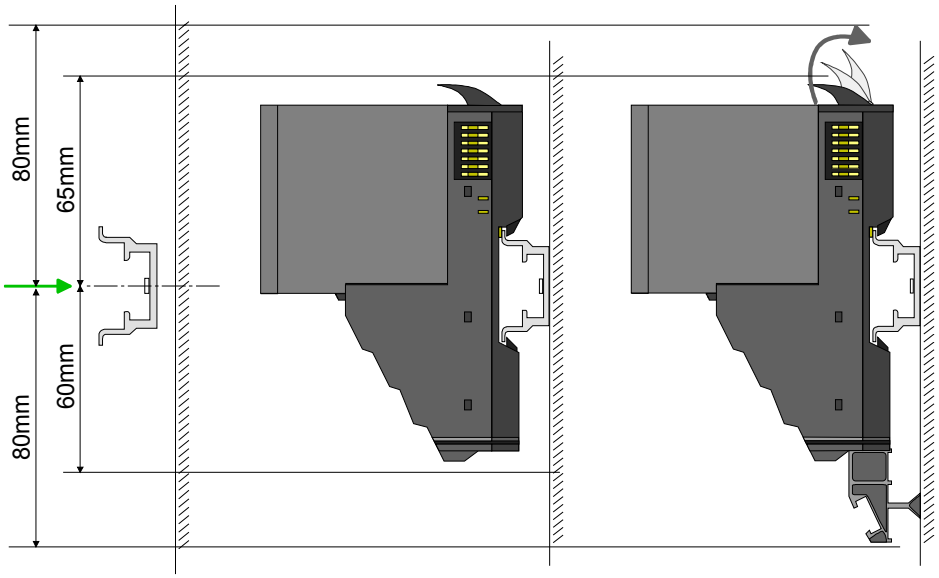
Mounting Proceeding

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

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

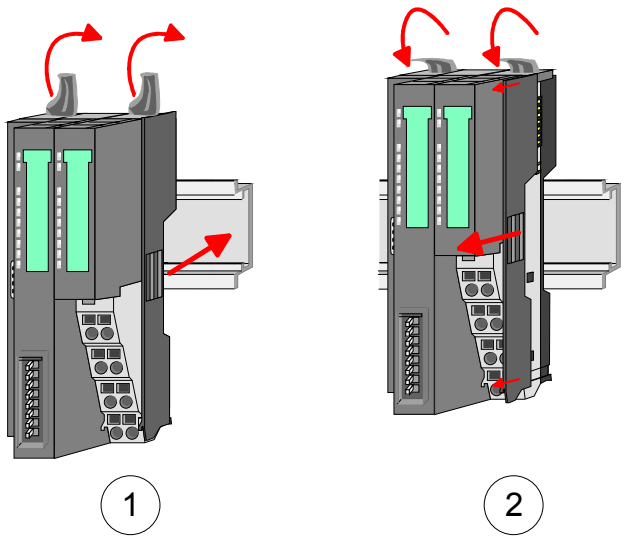
Mounting mounting rail

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



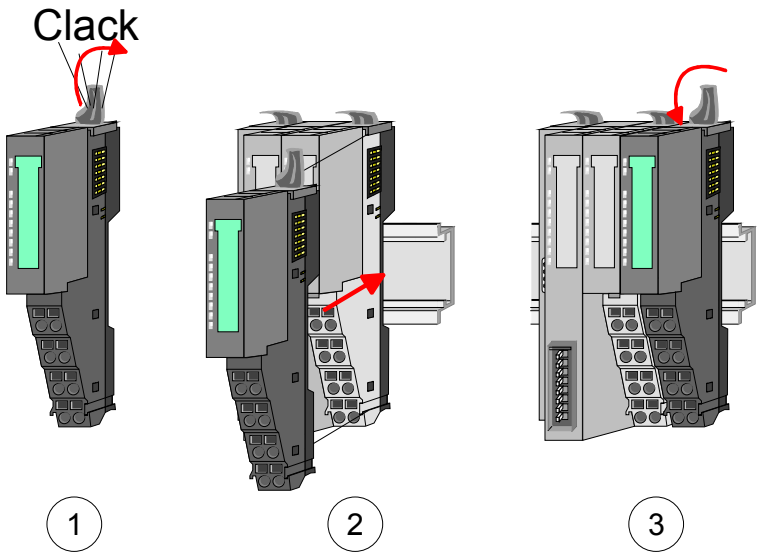
Mounting Head module (e.g. bus coupler)

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



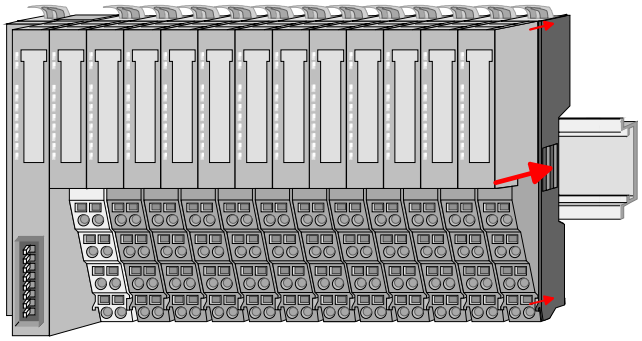
Mounting periphery module

- Mount the periphery modules you want.



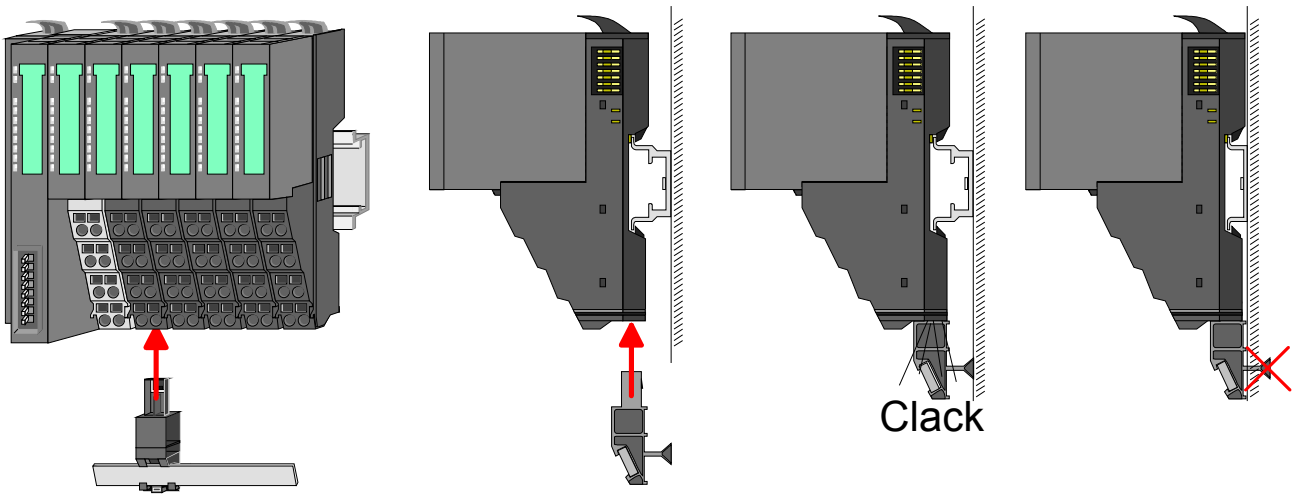
Mounting the bus cover

- After mounting the whole system, to protect the backplane bus connectors the bus cover may now be mounted at the last module



Mounting shield bus carrier

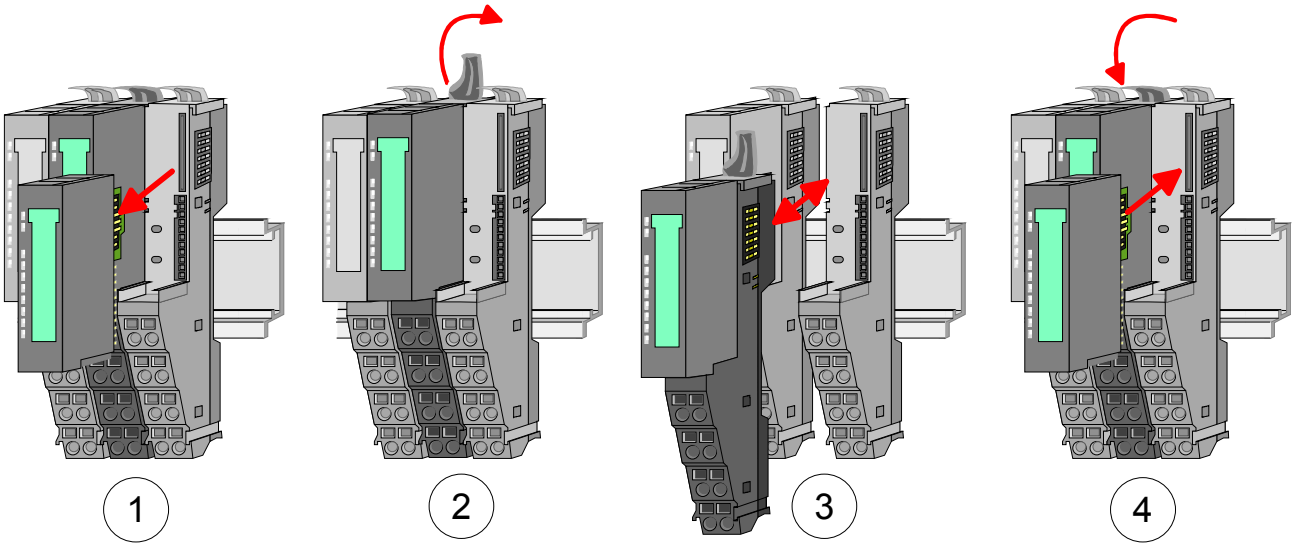
The shield bus carrier (available as accessory) serves to carry the shield bus to connect cable shields. The shield bus carrier is mounted underneath the terminal of the terminal module. With a flat mounting rail for adaption to a flat mounting rail you may remove the spacer of the shield bus carrier.



Mounting between 2 modules

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

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



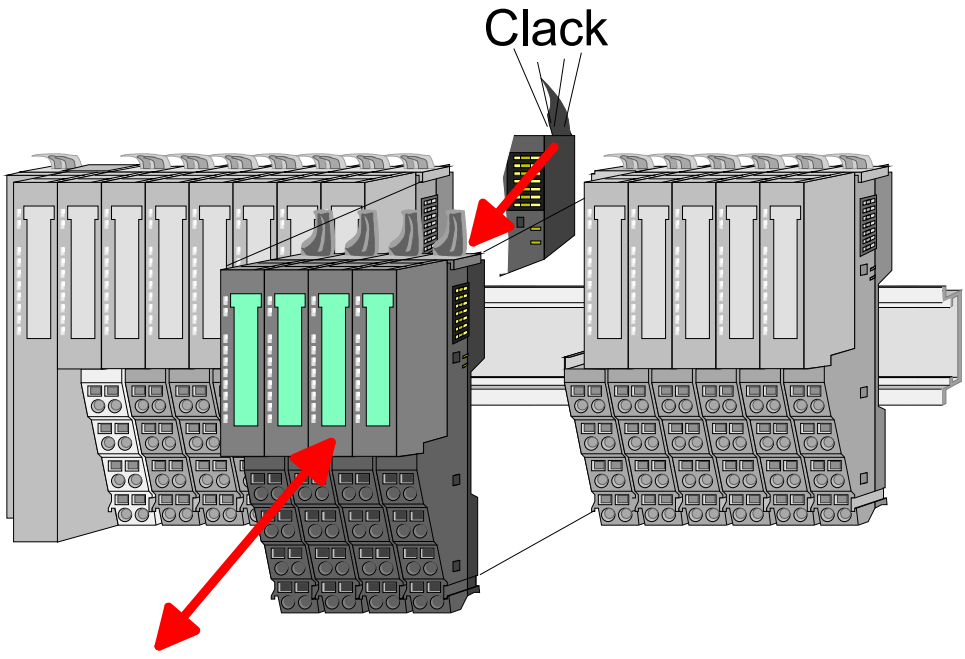
1 module group between 2 modules

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

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

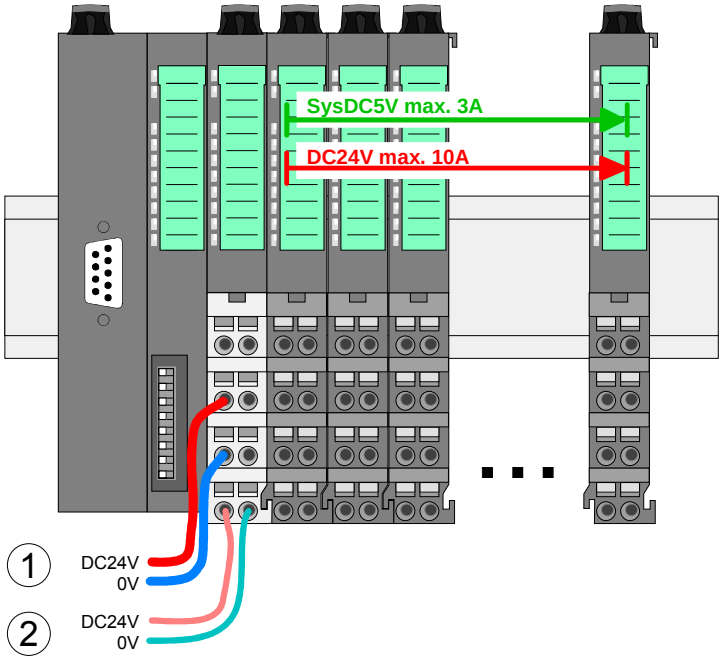
To mount the group of modules put them to the gap between the both modules and push it, guided by the stripes at both sides, to the mounting rail.

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



Wiring

Standard wiring



[1] DC 24V Power section supply I/O area

[2] DC 24V for Electronic power supply bus coupler and I/O area

Note!

Power section and electronic power section supply are internally protected against higher voltage by fuses. The fuses are within the power module. If one fuse released, its electronic module must be exchanged!

It is recommended to externally protect the power section supply with a fast 10A fuse and the electronic power supply with a fast 4A fuse.

State of the electronic power supply via LEDs

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

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

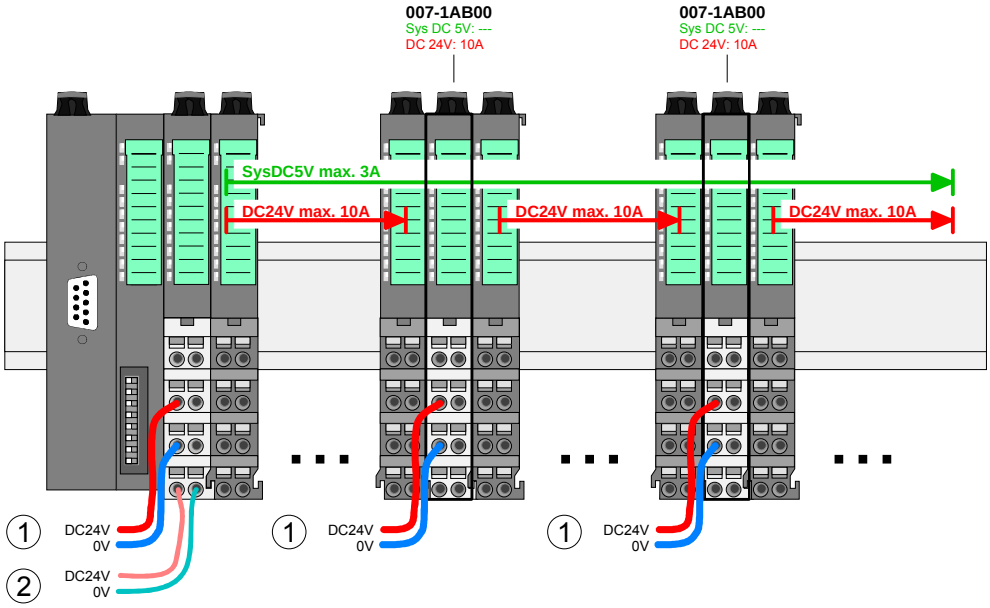
Deployment of the power modules

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

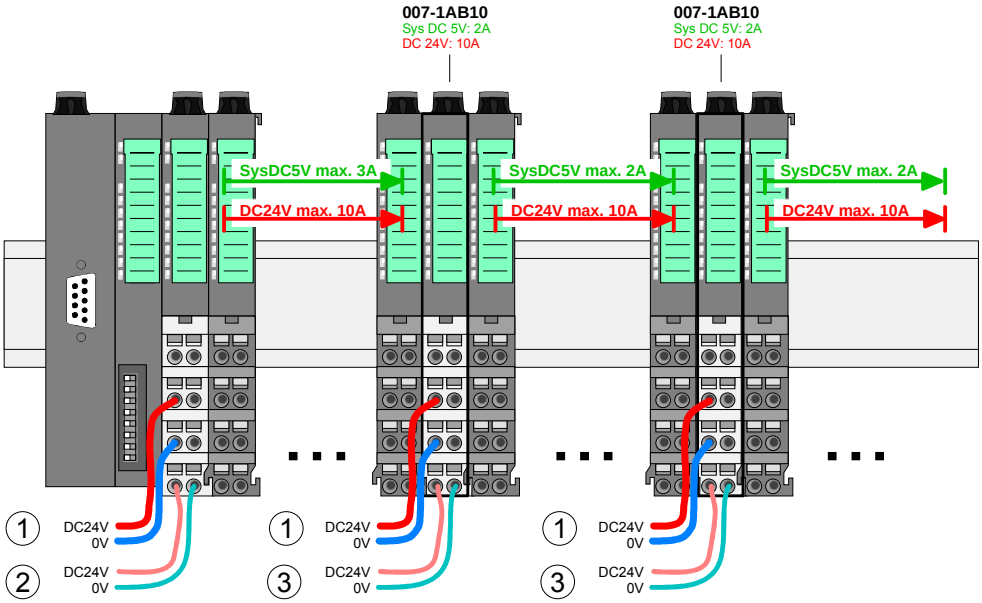
The power module with the order number 007-1AB10 is to be used if the 3A for the electronic power supply at the backplane bus is no longer sufficient.
Additionally you get an isolated group for the DC 24V power section supply with 10A.

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

Power module 007-1AB00



Power module 007-1AB10



[1] DC 24V 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 Electronic power supply I/O area

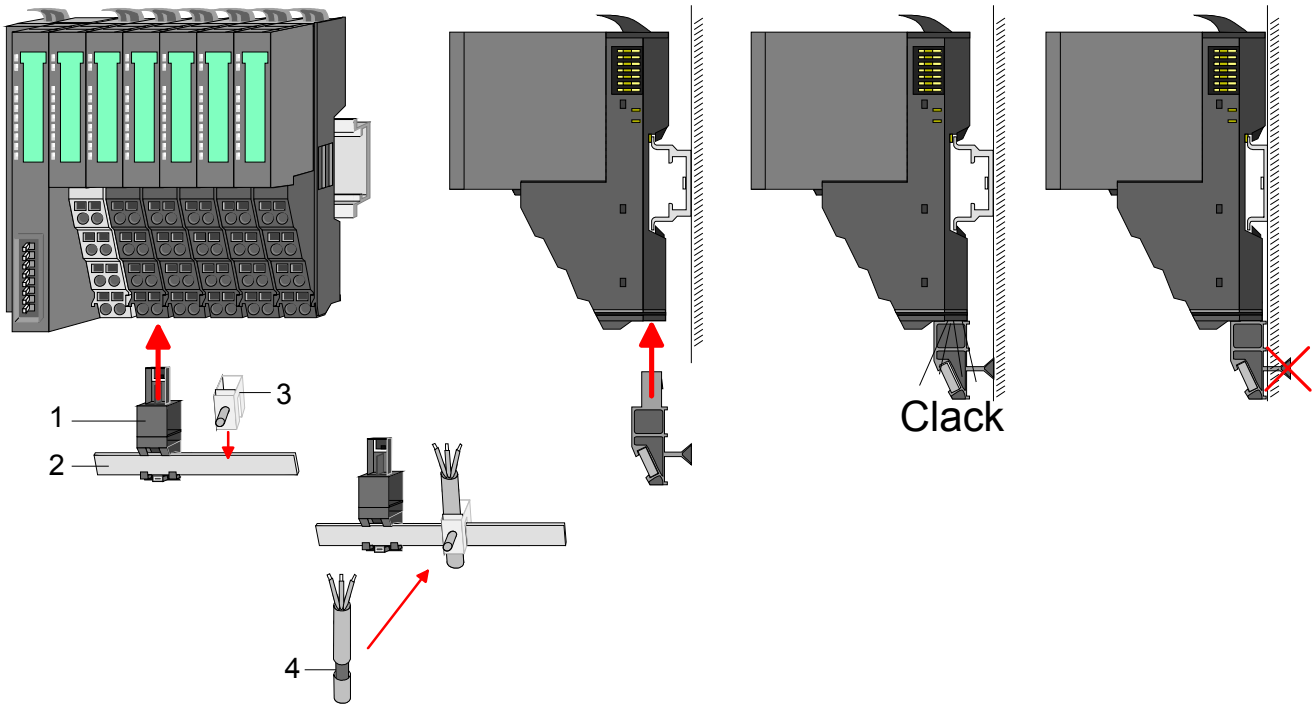
Shield attachment

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

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

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

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



[1] Shield bus carrier
[2] Shield bus
[3] Shield clamp
[4] Cable shield

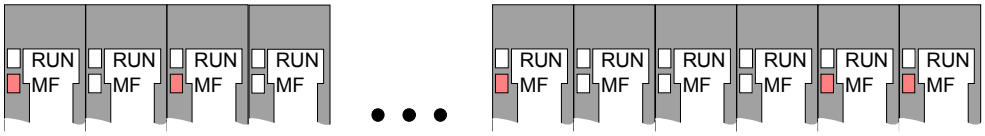
Trouble shooting - LEDs

General

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

In the following illustrations flashing LEDs are marked by ☼.

Sum current of the electronic power supply exceeded

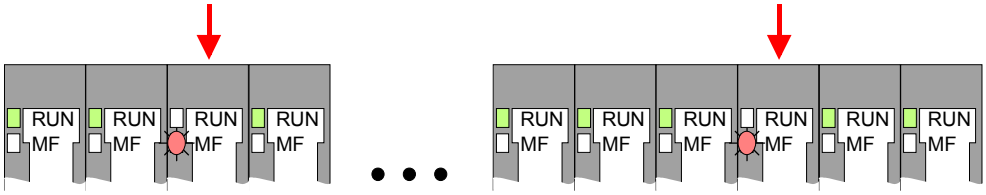


Behavior: After PowerON the RUN LED of each module is off and the MF LED of each module is sporadically on.

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

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

Error in configuration

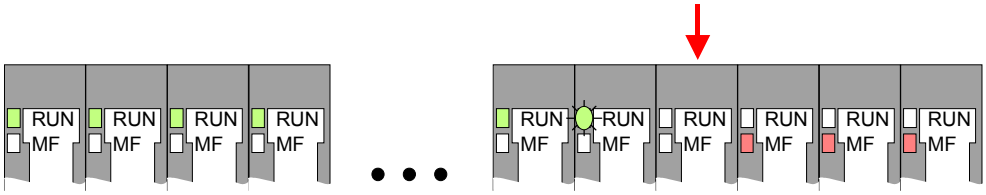


Behavior: After PowerON the MF LED of one module respectively more modules flashes. The RUN LED remains off.

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

Remedy: Match configuration and hardware structure.

Module failure



Behavior: After PowerON the RUN LED flashes at one module. The RUN and MF LEDs of the following module are off. With all following modules the MF LED is on and the RUN LED is off.

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

Remedy: Replace the defective module.

Installation guidelines

General

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

What means EMC?

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

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

Possible interference causes

Electromagnetic interferences may interfere your control via different ways:

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

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

One differs:

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

Basic rules for EMC

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

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

Isolation of conductors

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

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

When isolating cables you have to regard the following:

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

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

Please regard at installation!

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

Remedy: Potential compensation line

General data

Conformity and approval		
Conformity		
CE	73/23/EWG	Low-voltage directive
Approval		
UL	UL 508	Approval for USA and Canada
others		
RoHs	-	Product is unleaded

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

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

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

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

Chapter 2 Hardware description

Overview

In this chapter the SSI module 050-1BS00 of the System SLIO is described. Here every information about the hardware components of the module may be found.

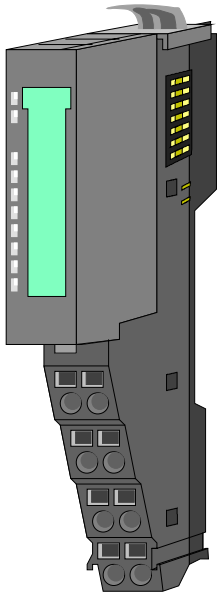
The technical data are at the end of the chapter.

Content

Properties

Features

- 1xSSI for absolute-value encoder with 8...32bit, 125kHz...2MHz
- Connecting by difference signal (RS422)
- Clock output for master mode
- Clock input for listening mode
- Encoder power supply DC 24V
- integrated transformer for gray/dual
- asynchronous encoder evaluation
- Normalization of the encoder value, this means added bits are removed
- Interrupt and diagnostics function with µs time stamp
- µs time stamp for encoder value (e.g. for speed calculation)

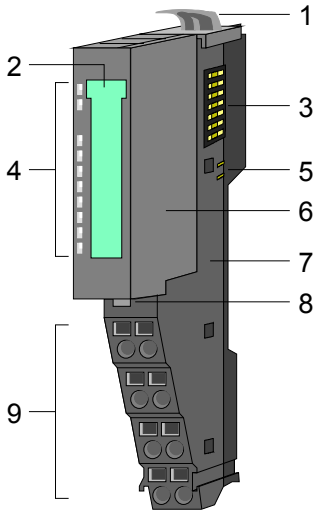


Order data

Type	Order number	Description
FM 050S	VIPA 050-1BS00	SSI module

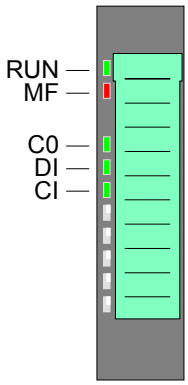
Structure

050-1BS00



[1] Locking lever terminal module
[2] Labeling strip
[3] Backplane bus
[4] LED status indication
[5] DC 24V power section supply
[6] Electronic module
[7] Terminal module
[8] Locking lever electronic module
[9] Terminal

Status indication

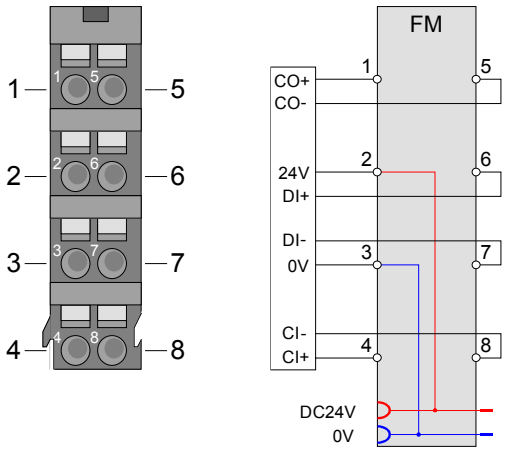


LED	Color	Description		
RUN	green	RUN	MF	
MF	red	●	○	Bus communication is OK Module status is OK
		●	●	Bus communication is OK Module status reports an error
		○	●	Bus communication is not possible Module status reports an error
		○	○	Error at bus power supply
		☼	☼	Error in parameterization (see Basics)
CO	green	●		Clock OUT activity
DI	green	●		Data IN activity
CI	green	●		Clock IN activity

on: ● off: ○ blinks with 2Hz: ☼

Pin assignment

For wires with a cross section of 0.08mm^2 up to 1.5mm^2.



Pos.	Function	Type	Description
1	CO+	O	Clock OUT+ Difference output for Clock OUT (exclusively for master mode)
2	DC 24V	O	DC 24V for encoder
3	0V	O	GND
4	CI+	I	Clock IN+ Difference input for Clock IN (exclusively for listening mode)
5	CO-	O	Clock OUT- Difference output for Clock OUT (exclusively for master mode)
6	DI+	I	Data IN+ Difference input for Data IN
7	DI-	I	Data IN- Difference input for Data IN
8	CI-	I	Clock IN- Difference input for Clock IN (exclusively for listening mode)

I: Input, O: Output

Technical Data

Order number	050-1BS00
Type	FM 050S
Module ID	09C1 7800
Input data size	6Byte
Output data size	-
Current consumption/power loss	
Current consumption from backplane bus	70mA
Current consumption from load voltage L+ (without load)	30mA
Power loss	1W
Technical data SSI	
Connection for SSI encoder	1
Type of interface	RS422
Bit length encoder data	8 ... 32Bit
Encoder clock	125kHz ... 2MHz
Supply voltage of encoder	DC 24V
Modes	Master mode, Listening mode
Coding	binary, gray
Normalizing	yes, parameterizable
Status information, alarms, diagnostics	
Status display	yes
Interrupts	yes, parameterizable
Process alarm	no
Diagnostic interrupt	yes, parameterizable
Diagnostic functions	yes, parameterizable
Diagnostics information read-out	possible
Module state	green LED
Module error display	red LED
Channel error display	none
Isolation	
Between channels and backplane bus	-
Insulation tested with	DC 500V
Mechanical Data	
Dimensions (WxHxD)	12.9mm x 109mm x 76.5mm
Weight	60g
Environmental conditions	
Operating temperature	0°C to 60°C
Storage temperature	-25°C to 70°C
Certifications	
UL508 certifications	in preparation

Chapter 3 Deployment

Overview

In this chapter the deployment of the System SLIO SSI module 050-1BS00 is described. Here every information required for the deployment may be found.

Content

Fast introduction

max. SSI range

Limit	Valid range of values
Lower limit	0
Upper limit	4 294 967 295 (2^{32}-1)*

* This value depends on the type of the encoder.

Address areas

At CPU, Profibus and ProfiNET the input respectively out area is embedded to the corresponding address area.

IX = Index for access via CANopen

SX = Subindex for access via EtherCAT

Input area

Addr.	Name	Bytes	Function	IX	SX
+0	EV_I	4	Encoder value	5400h	01h
+4	C_US	2	16bit µs value	5402h	02h

Output area

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

Parameter data

DS = Data set for access via CPU, Profibus and ProfiNET

IX = Index for access via CANopen

SX = Subindex for access via EtherCAT

Note!

The parameters may only be transferred at STOP state!

Name	Bytes	Function	Default	DS	IX	SX
DIAG_EN	1	Diagnostic interrupt	00h	00h	3100h	01h
IDLE	2	Pause	0C00h	80h	3101h... 3102h	02h
BAUD	2	Transmission rate	0180h	80h	3103h...3104h	03h
CRES	1	reserved	00h	80h	3105h	04h
NORM	1	Normalization	00h	80h	3106h	05h
LGTH	1	Bit length encoder data	18h	80h	3107h	06h
MODE	1	SSI mode	1Eh	80h	3108h	07h
CRES	3	reserved	00h	80h	3109h...310Bh	08h
SSI_EN	1	SSI function	00h	80h	310Ch	09h

Encoder evaluation

As soon as the module is adapted to the encoder and the parameter *SSI function* is activated, the module starts with sending the clock signal and evaluating the encoder values. The received values are stored in the input area.

In-/Output area

Overview

The following in-/output areas are used by the 050-1BS00:

At CPU, Profibus and ProfiNET the input respectively out area is embedded to the corresponding address area.

IX = Index for access via CANopen

SX = Subindex for access via EtherCAT

Input area 6byte

Addr.	Name	Bytes	Function	IX	SX
+0	EV_I	4	Encoder value	5400h	01h
+4	C_US	2	16bit µs value	5402h	02h

Encoder value

Here the current encoder value as double word may always be found. If the SSI function is disabled the encoder value still remains.

Note!

With missing the power supply of the encoder the encoder value F ... Fh as binary code respectively A ... Ah as gray code is returned.

16bit µs value

In the SLIO module there is a timer (µs ticker). With PowerON the timer starts counting with 0. After 65535µs the timer starts with 0 again.

With SSI with each encoder value the value of the timer is stored as 16bit value in the input area. This timer value corresponds to the 1. active clock edge for the encoder and so to the time when the encoder value was stored in the output shift register of the encoder. On this way speed measuring may be realized.

Output area

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

Parameter data

Overview

Via parameterization you may define among others:

- Parameters of the SSI encoder (see data sheet of the encoder)
- Operating mode of the module (master mode/listening mode)
- Activation diagnostic interrupt

DS = Data set for access via CPU, Profibus and ProfiNET
IX = Index for access via CANopen
SX = Subindex for access via EtherCAT

Note!
The parameters may only be transferred at STOP state!

Name	Bytes	Function	Default	DS	IX	SX
DIAG_EN	1	Diagnostic interrupt	00h	00h	3100h	01h
IDLE	2	Pause	0C00h	80h	3101h... 3102h	02h
BAUD	2	Transmission rate	0180h	80h	3103h...3104h	03h
CRES	1	reserved	00h	80h	3105h	04h
NORM	1	Normalization	00h	80h	3106h	05h
LGTH	1	Bit length encoder data	18h	80h	3107h	06h
MODE	1	SSI mode	1Eh	80h	3108h	07h
CRES	3	reserved	00h	80h	3109h...310Bh	08h
SSI_EN	1	SSI function	00h	80h	310Ch	09h

DIAG_EN Diagnostic interrupt

Byte	Bit 7 ... 0
0	Diagnostic interrupt 00h = disable 40h = enable

- Here you activate res. de-activate the diagnostic function.

IDLE Pause

With *pause* also known as *tbs* (time between sends), you may indicate the waiting period, which is to be kept by the module between two encoder values, so that the encoder may preprocess his value.
These data may be found in the data sheet of your encoder.

Range of values:

0030h = 1µs	0300h = 16µs
0060h = 2µs	0600h = 32µs
00C0h = 4µs	0900h = 48µs
0180h = 8µs	0C00h = 64µs

Other values are not allowed!

BAUD
Transmission rate

With the "listening mode" the transmission rate is irrelevant.

Enter the transmission rate here. This corresponds the clock frequency to communicate with the connected encoder.
These data may be found in the data sheet of your encoder.

Range of values:

0018h = 2MHz	0060h = 500kHz
0020h = 1.5MHz	00C0h = 250kHz
0030h = 1MHz	0180h = 125kHz

Other values are not allowed!

NORM
Normalization

Depending on the encoder besides the encoder value further bits were transferred. The number of bits, attached to the encoder value, may be removed by right-shifting the encoder value by means of the *normalization*. The normalization of the encoder value takes place via the module always after a possible gray-binary transformation. More about this may be found in the data sheet of your encoder.

Range of values: 00h ... 0Fh = 0bit ... 15bit

LGTH
Bit length encoder data

Enter here the bit length of the encoder data. Depending on the encoder the encoder data consists of the current value with attached bits. Please enter here the whole length of the data.
These data may be found in the data sheet of your encoder.

Range of values:

Hex	Bit	Hex	Bit	Hex	Bit
07	8	10	17	19	26
08	9	11	18	1A	27
09	10	12	19	1B	28
0A	11	13	20	1C	29
0B	12	14	21	1D	30
0C	13	15	22	1E	31
0D	14	16	23	1F	32
0E	15	17	24		
0F	16	18	25		

Other values are not allowed!

MODE
SSI mode

Byte	Bit 7 ... 0
0	Bit 1 ... 0: Operating mode Bit 2: Shift direction Bit 3: Edge clock signal Bit 4: Code Bit 7 ... 5: 0 (fix)

Operating mode

In the "listening mode" the module serves for listening the data exchange between SSI master and SSI encoder. Here the module receives the clock signal of the master and the data stream of the SSI encoder.

With the *operating mode* "master mode" the module generates a clock signal for the encoder and receives his data stream.

Range of values: 01b = Listening mode
10b = Master mode

Shift direction

Please enter here the direction of the encoder data. These data may be found in the data sheet of your encoder. Normally the SSI encoder uses MSB first.

Range of values: 0 = LSB first (least significant bit is first transferred)
1 = MSB first (most significant bit is first transferred)

Edge clock signal

Here may be indicated with which edge type of the clock signal the encoder reacts to send data. These data may be found in the data sheet of your encoder. Normally the SSI encoder reacts with a rising edge of the clock signal.

Range of values: 0 = edge 1-0
1 = edge 0-1

Code

With "binary code" the received encoder value is not influenced. With "gray code" the received gray-coded value of the encoder is converted to a binary value. The gray code is a different form of binary code. The principle of the gray code is that two neighboring gray numbers will differ in exactly one single bit. When the gray code is used, transmission errors may be detected easily as neighboring characters may only be different in a single location. These data may be found in the data sheet of your encoder.

Range of values: 0 = binary code
1 = gray code

SSI_EN
SSI function

By enabling the *SSI function* the module starts with sending the clock signal and with evaluating the encoder values.

In the *operating mode* "listening mode" the module starts with evaluating the encoder values.

Range of values: 0 = disabled
1 = enabled

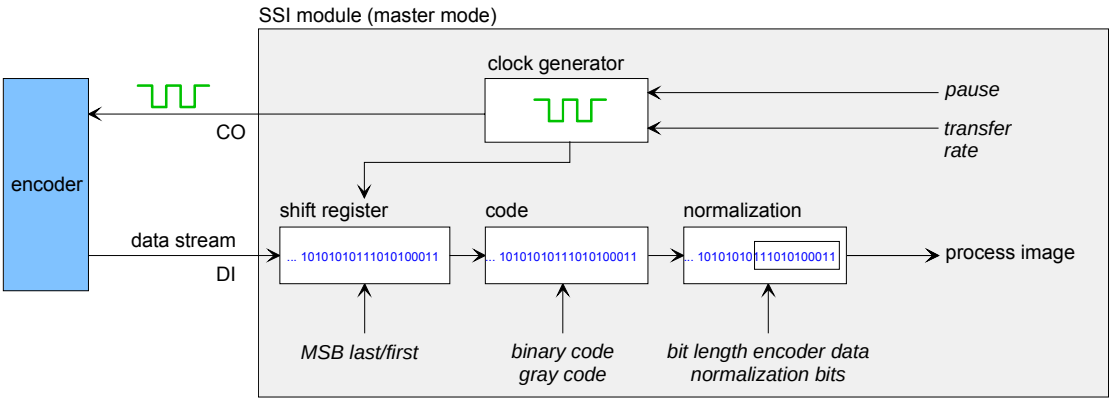
Operating modes

Overview

The module is a SSI interface module for direct connection to a SSI encoder. With a parameterization the module may be adapted to the corresponding SSI encoder. Here interrupts may be activated, which are released when reaching a comparison value respectively limit. The module has the following operating modes:

Master mode

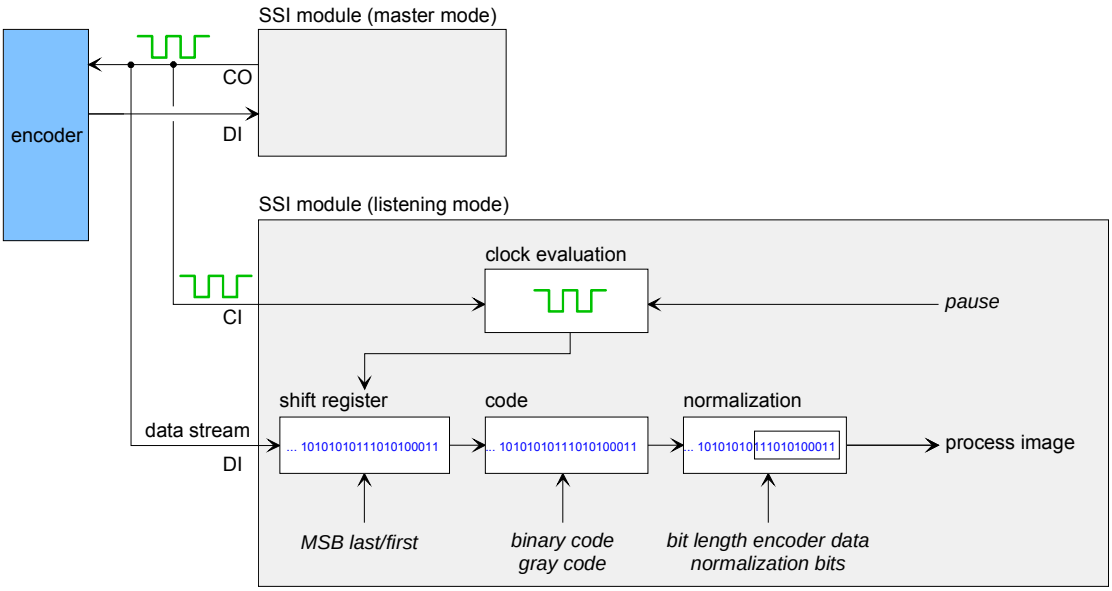
In the "master mode" the module is directly connected to a SSI encoder. Here the SSI encoder is power supplied by the SSI interface.
To get data from the module serves for a clock signal for the encoder and stores the received data stream in the process image.



Listening mode

In the "listening mode" the module, which is listening is passive connected between SSI encoder and master module. For this operating mode the SSI encoder is to be power supplied by the master module. During operation the module listens to the signals of the SSI telegram and stores the received data stream in the process image.

Even here the module is to be adapted to the corresponding counter by parameterization. The parameter *transfer rate* is not relevant.



Diagnostics and interrupt

Overview

Via the parameterization you may activate a diagnostic interrupt for the module.

With a diagnostic interrupt the module serves for diagnostic data for diagnostic interrupt$_{incoming}$. As soon as the reason for releasing a diagnostic interrupt is no longer present, the diagnostic interrupt$_{going}$ automatically takes place.

Within this time window (1. diagnostic interrupt$_{incoming}$ until last diagnostic interrupt$_{going}$) the MF-LED of the module is on.

Event	Process interrupt	Diagnostics interrupt	parameterizable
Encoder power * supply is missing	-	X	X

* The module may only send a diagnostic interrupt in case of missing encoder power supply, if this received its parameters before. If the encoder power supply is already missing during startup, the module does not send an diagnostic interrupt!

Diagnostic data

DS = Record set for access via CPU, Profibus and ProfiNET. The access happens by DS 01h. Additionally the first 4 bytes may be accessed by DS 00h.

IX = Index for access via CANopen. The access happens by IX 2F01h. Additionaly the first 4 bytes may be accessed by IX 2F00h.

SX = Subindex for access via EtherCAT

Name	Bytes	Function	Default	DS	IX	SX
ERR_A	1	Diagnostic	00h	01h	2F01h	02h
MODTYP	1	Module information	18h			03h
ERR_C	1	reserved	00h			04h
ERR_D	1	reserved	00h			05h
CHTYP	1	Channel type	76h			06h
NUMBIT	1	Number diagnostics bits per channel	08h			07h
NUMCH	1	Number channels of the module	01h			08h
CHERR	1	reserved	00h			09h
CH0ERR… CH7ERR	7	reserved	00h			0Ah ... 11h
DIAG_US	4	µs ticker	00h			12h

ERR_A
Diagnostic

Byte	Bit 7 ... 0
0	Bit 0: set at module failure Bit 1: set at internal error Bit 2: set at external error Bit 3: set at channel error Bit 4: set at missing encoder power supply Bit 7 ... 5: reserved

MODTYP
Modul information

Byte	Bit 7 ... 0
0	Bit 3 ... 0: Module class 1000b: Function module Bit 4: set at channel information present Bit 7 ... 5: reserved

ERR_C/D
reserved

Byte	Bit 7 ... 0
0	reserved

CHTYP
Channel type

Byte	Bit 7 ... 0
0	Bit 6 ... 0: Channel type 76h: Counter module Bit 7: reserved

NUMBIT
Diagnostic bits

Byte	Bit 7 ... 0
0	Number of diagnostics bits of the module per channel (here 00h)

NUMCH
Channels

Byte	Bit 7 ... 0
0	Number of channels of the module (here 01h)

CHERR
reserved

Byte	Bit 7 ... 0
0	reserved

CH0ERR ...
CH7ERR
reserved

Byte	Bit 7 ... 0
0	reserved

DIAG_US
µs ticker

Byte	Bit 7 ... 0
0 ... 3	Value of the µs ticker at the moment of the diagnostic