



VIPA System SLIO



FM | 050-1BB30 | Manual

HB300E_FM | RE_050-1BB30 | Rev. 10/30

July 2010

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

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About this manual

This manual describes the function module FM 050-1BB30 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 counter module 050-1BB30 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 counter module 050-1BB30 is described. Here every information required for the deployment may be found.

Objective and contents	This manual describes the System SLIO function module 050-1BB30 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	Topic	Page
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Safety Information for Users

Handling of electrostatic sensitive modules

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

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



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

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

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

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

Shipping of modules

Modules must be shipped in the original packing material.

Measurements and alterations on electrostatic sensitive modules

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

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

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



Attention!

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

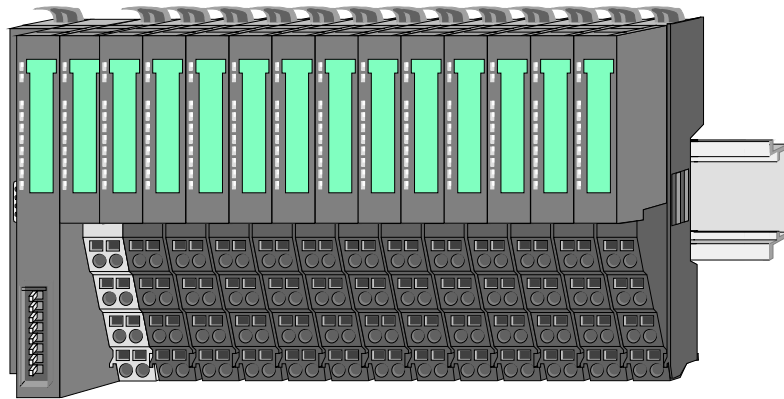
System conception

Overview

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

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

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

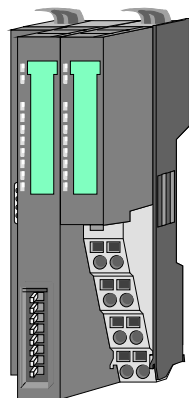


Components

The System SLIO consists of the following components:

- Bus coupler
- Periphery modules
- Power modules
- Accessories

Bus coupler



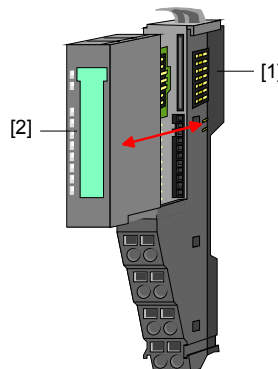
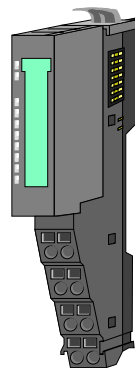
With a bus coupler bus interface and power module is integrated to one casing. With the bus interface you get access to a subordinated bus system.

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

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

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.

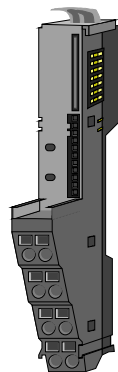
Periphery modules Each periphery module consists of a *terminal* and an *electronic* module.



[1] Terminal module

[2] Electronic module

Terminal module

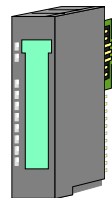


The *terminal module* serves to carry the electronic module, contains the backplane bus with power supply for the electronic, the DC 24V power section supply and the staircase-shaped terminal for wiring.

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.

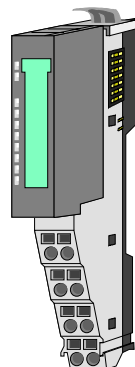
With an error the defective module may be exchanged for a functional module with standing installation.

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

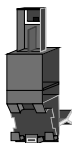


In the system SLIO the power supply is established by power modules. These are either integrated to the bus coupler or may be installed between the periphery modules. Depending on the power module isolated areas of the DC 24V power section supply may be defined respectively the electronic power supply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

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

Accessories

Shield bus carrier



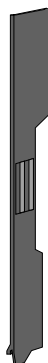
The shield bus carrier serves to carry the shield bus to connect cable shields.

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.

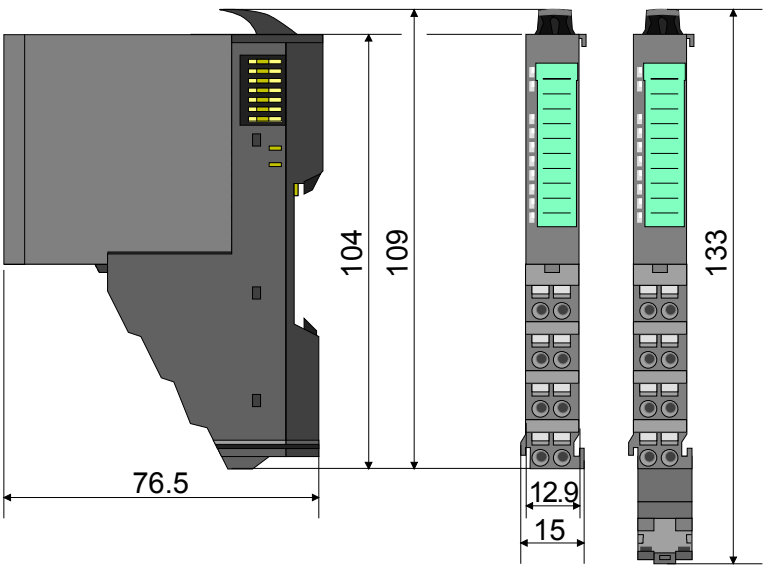
For the protection of the backplane bus connector you should always mount the bus cover at the last module of your system again.

Dimensions

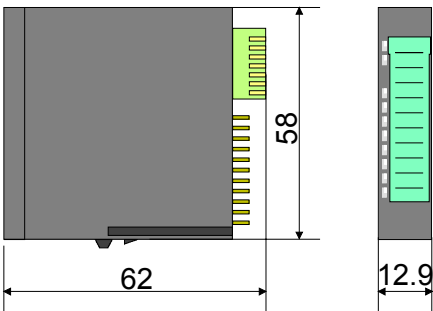
Dimensions
bus coupler



Dimensions
periphery module



Dimensions
electronic module



Dimensions in mm

Installation

Functional principle

Mounting terminal module

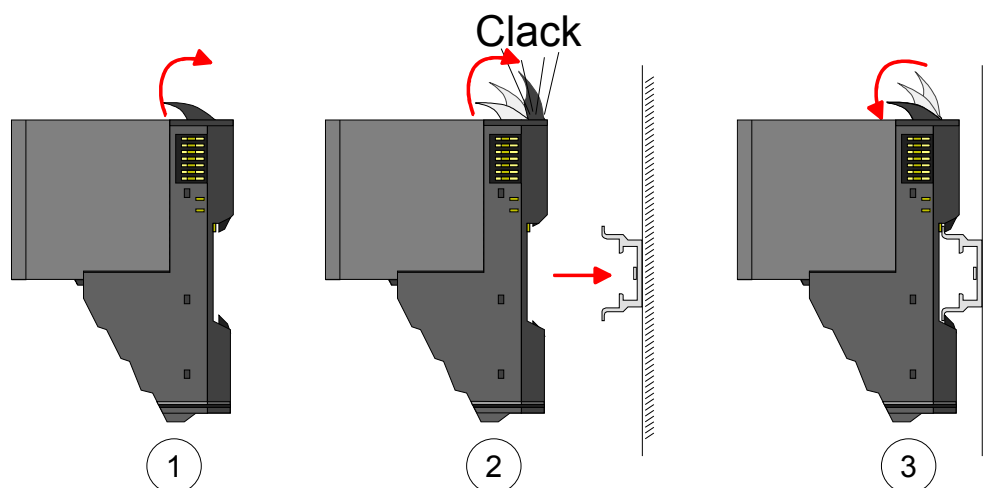
There is a locking lever at the top side of the terminal module. For mounting and de-mounting this locking lever is to turn upwards until this engages audible.

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.

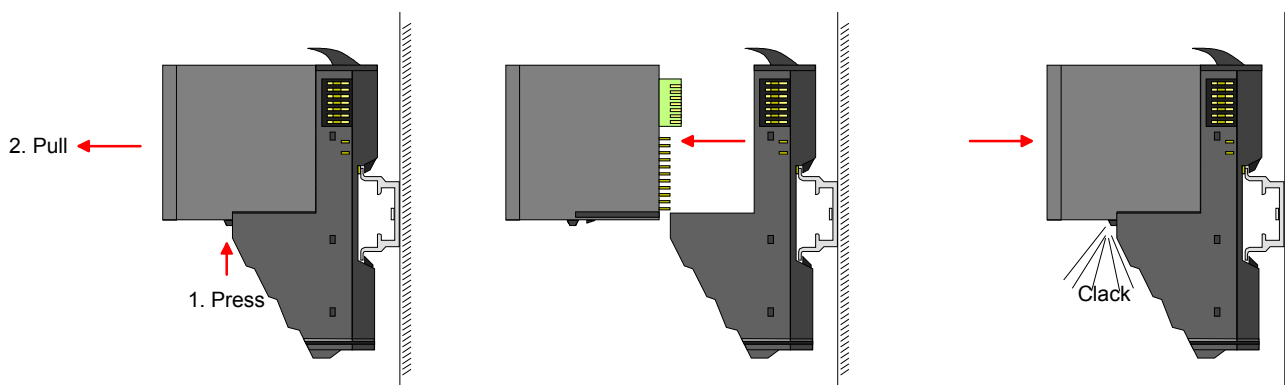
The modules may either separately be mounted to the mounting rail or as block. Here is to be considered that each locking lever is opened.



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.



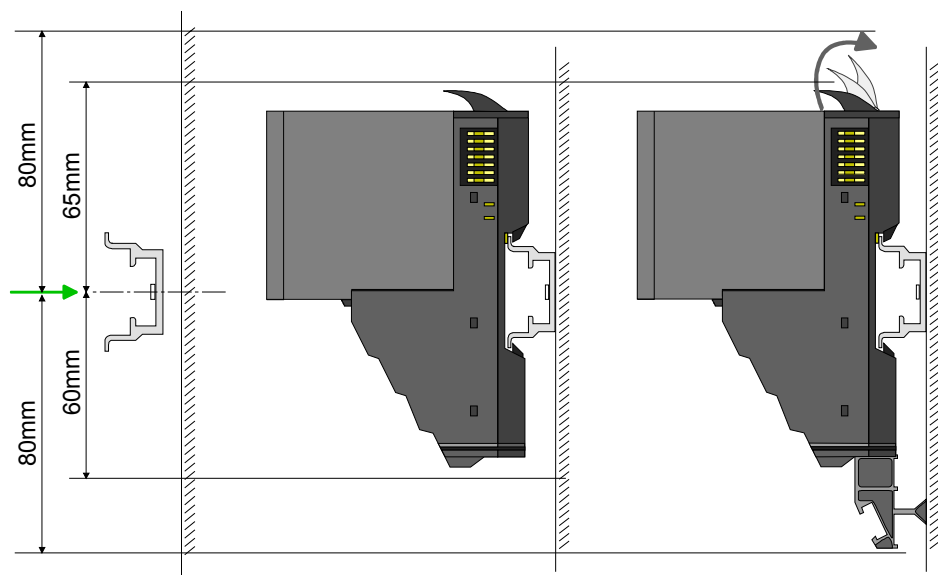
Mounting Proceeding

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".

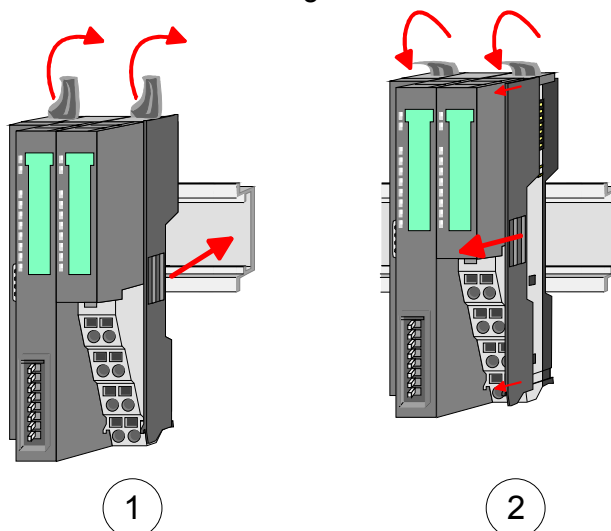
Mounting mounting rail

- 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.



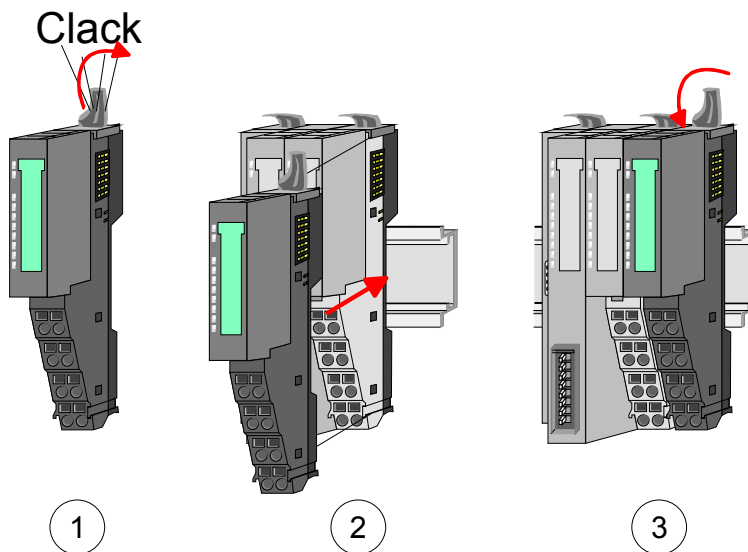
Mounting Head module (e.g. bus coupler)

- 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.



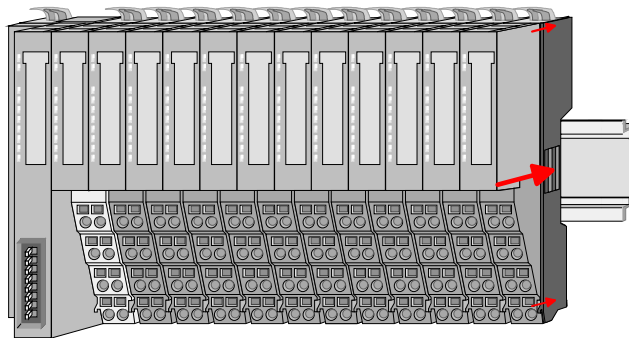
Mounting periphery module

- Mount the periphery modules you want.



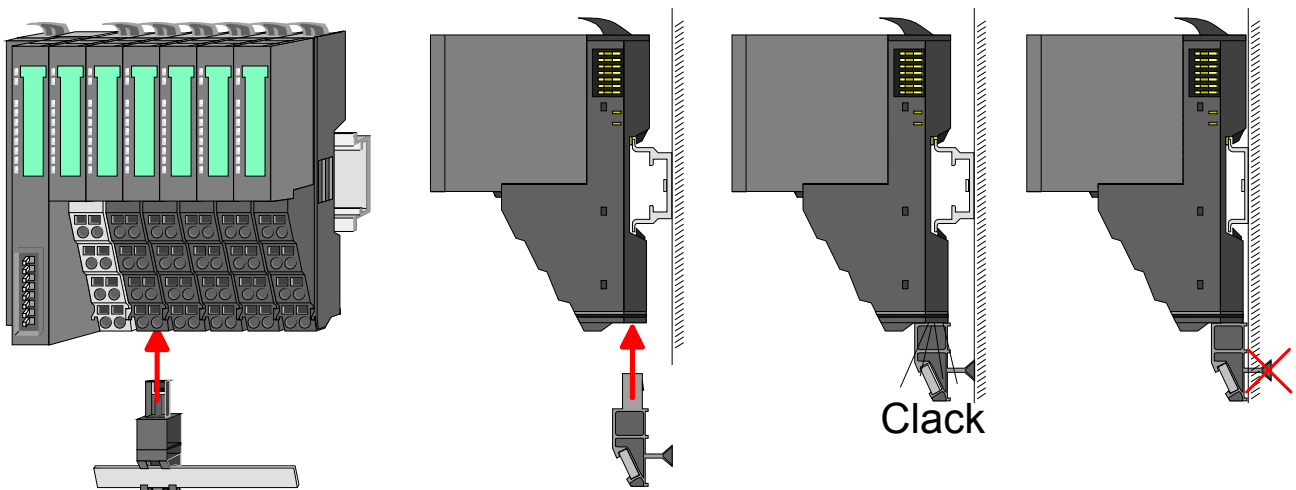
Mounting the bus cover

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



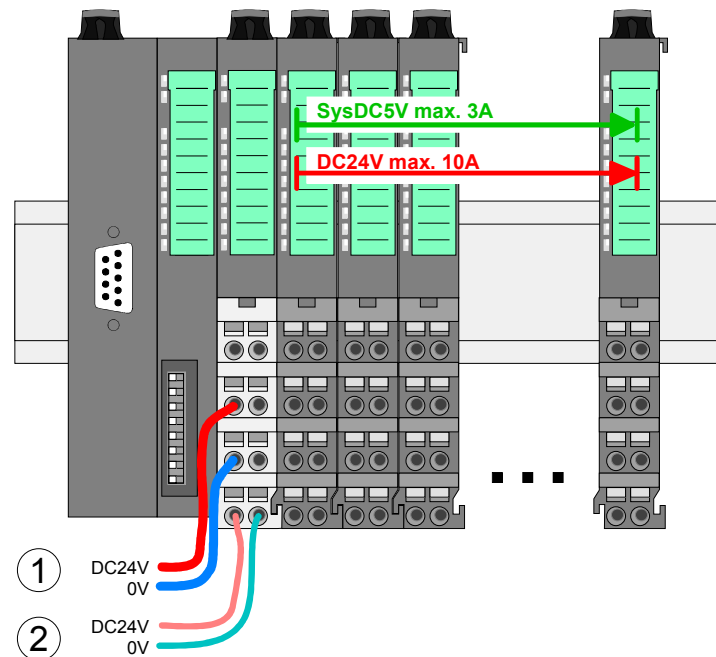
Mounting shield bus carrier

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.



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

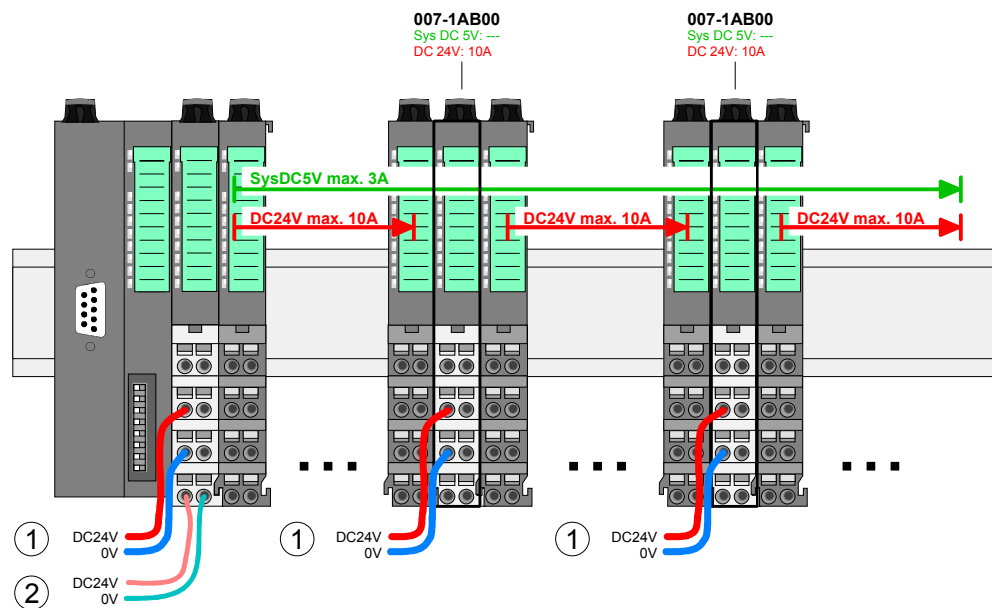
If the 10A for the power section supply is no longer sufficient, you may use the power module from VIPA with the order number 007-1AB00. So you have also the possibility to define isolated groups.

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.

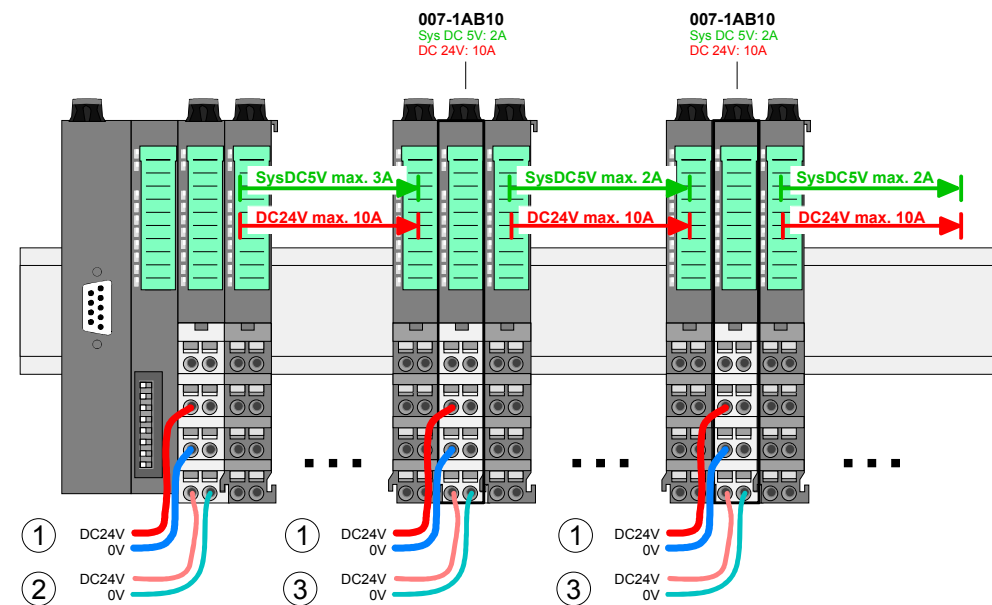
Additionally you get an isolated group for the DC 24V power section supply with 10A.

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

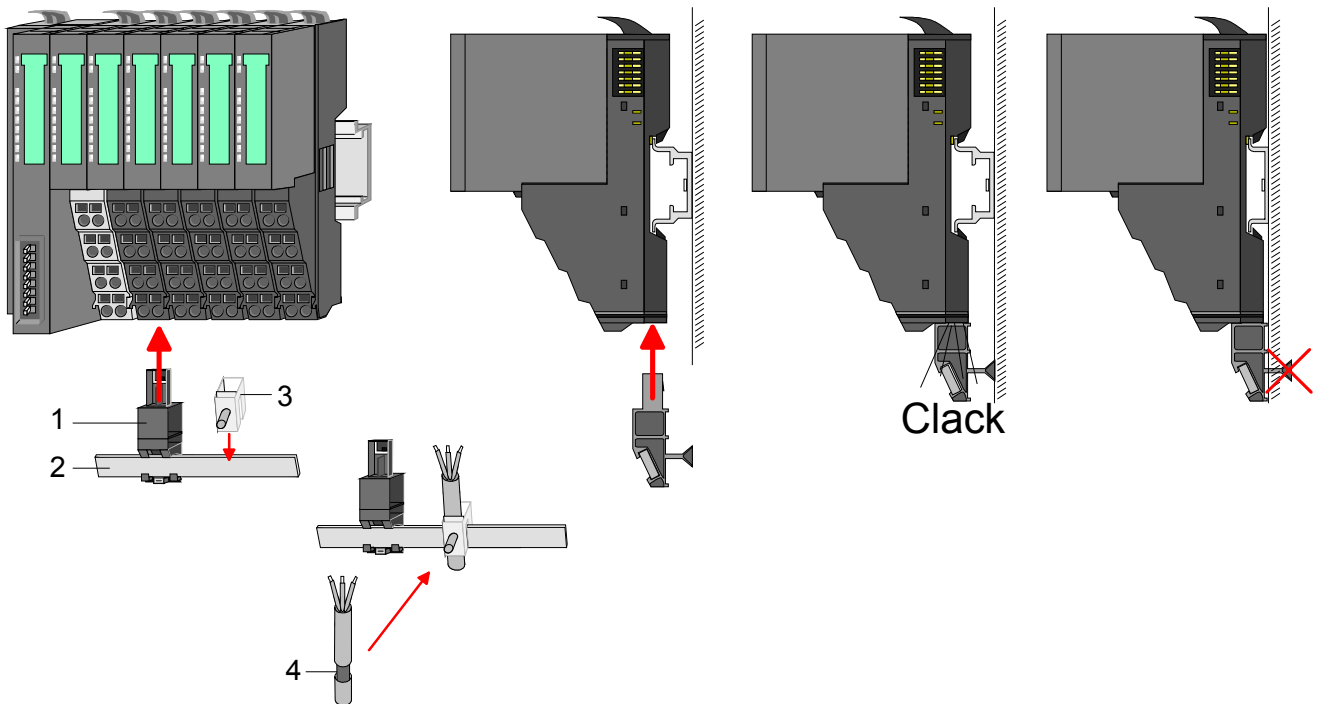
Shield attachment

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

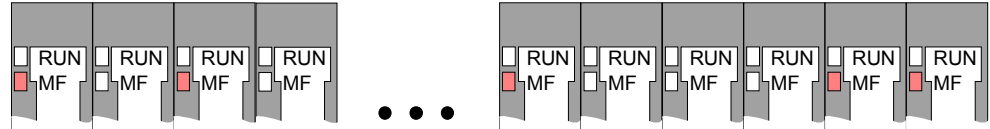
Trouble shooting - LEDs

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

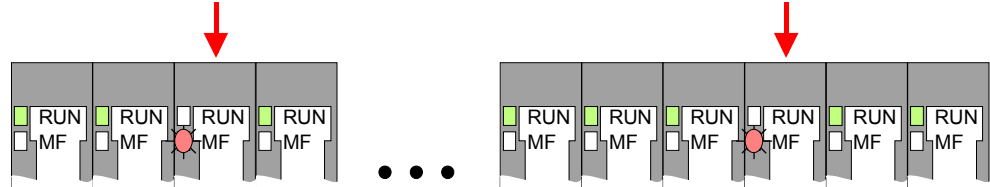


Behavior: After PowerON the RUN LED of each module is off and the MF LED of each module is sporadically on.

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

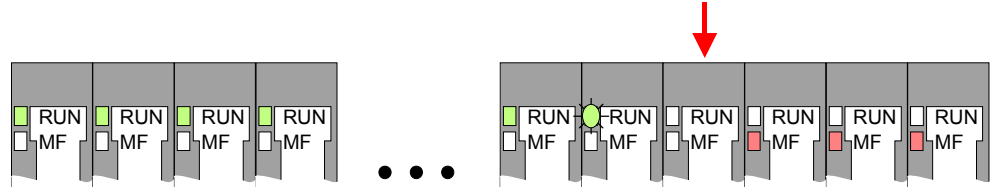


Behavior: After PowerON the MF LED of one module respectively more modules flashes. The RUN LED remains off.

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 interfering 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

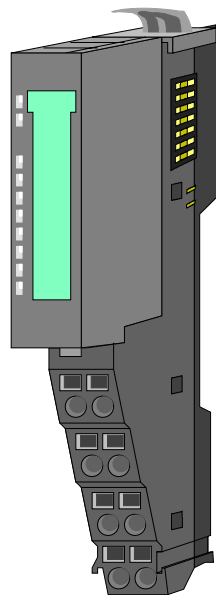
Overview In this chapter the counter module 050-1BB30 of the System SLIO is described. Here every information about the hardware components of the module may be found.
The technical data are at the end of the chapter.

Content	Topic	Page
	Chapter 2 Hardware description.....	2-1
	Properties.....	2-2
	Structure	2-3
	Technical Data	2-5

Properties

Features

- 2 counter 32bit (AB) invertible, DC 24V
- Counting frequency max. 400kHz
(AB 1/2/4-fold evaluation or pulse and direction)
- Input filter (configurable)
- Diagnostics function

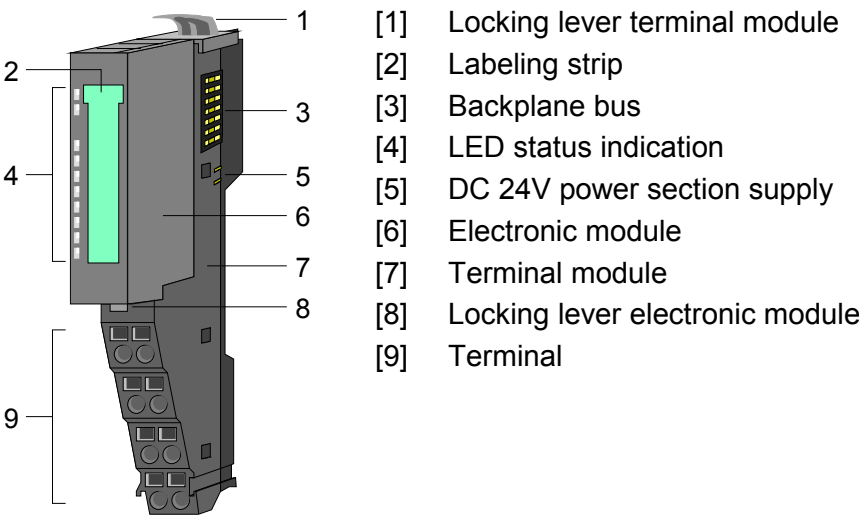


Order data

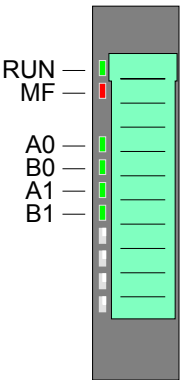
Type	Order number	Description
FM 050	VIPA 050-1BB30	Counter module eco 2x32Bit DC 24V

Structure

050-1BB30

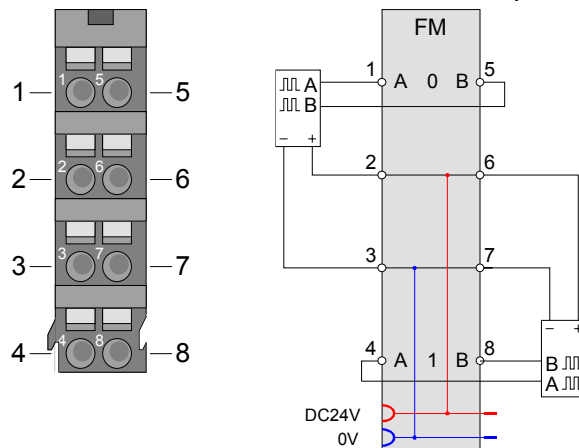


Status indication



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)
A0	green	●	Counter 0: Digital input 1 A0/pulse is set	
B0	green	●	Counter 0: Digital input 5 B0/direction is set	
A1	green	●	Counter 1: Digital input 4 A1/pulse is set	
B1	green	●	Counter 1: Digital input 8 B1/direction is set	

on: ● off: ○ blinks with 2Hz: ☼

Pin assignmentFor wires with a cross section of 0.08mm² up to 1.5mm².

Pos.	Function	Type	Description
1	A0	I	Counter 0: A / pulse Pulse input for counter signal respectively track A of an encoder for 1-, 2- or 4-fold evaluation.
2	DC 24V	O	DC 24V for encoder
3	0V	O	GND
4	A1	I	Counter 1: A / pulse Pulse input for counter signal respectively track A of an encoder for 1-, 2- or 4-fold evaluation.
5	B0	I	Counter 0: B / direction direction signal respectively track B of an encoder (invertible via parameterization).
6	DC 24V	O	DC 24V for encoder
7	0V	O	GND
8	B1	I	Counter 1: B / direction direction signal respectively track B of an encoder (invertible via parameterization).

I: Input, O: Output

Technical Data

Order number	050-1BB30
Type	FM 050
Module ID	08C4 388B
Current consumption/power loss	
Current consumption from backplane bus	75mA
Power loss	0.9W
Technical data digital inputs	
Number of inputs	4
Cable length, shielded	100m
Current consumption from load voltage L+ (without load)	15mA
Nominal value	-
Input voltage for signal "1"	DC 20.4...28.8V
Input voltage for signal "0"	DC 0...5V
Input current for signal "1"	3mA
Connection of Two-Wire-BERO possible	✓
max. permissible BERO quiescent current	0.5mA
Input delay of "0" to "1"	0.8µs
Input delay of "1" to "0"	0.8µs
Number of simultaneously utilizable horizontal	4
Number of simultaneously utilizable vertical	4
Input characteristic	IEC 61131, type 1
Input data size	12Byte
Technical data digital outputs	
Number of outputs	-
Cable length, shielded	-
Cable length, unshielded	-
Rated load voltage	-
Output delay of "0" to "1"	-
Output delay of "1" to "0"	-
Lamp load	-
Parallel switching of outputs for redundant control of a load	-
Parallel switching of outputs for increased power	-
Actuation of digital input	-
Switching frequency with resistive load	-
Switching frequency with inductive load	-
Switching frequency on lamp load	-
Internal limitation of inductive shut-off voltage	-
Short-circuit protection of output	-
Trigger level	-
Output data size	4Byte
Technical data Counters	
Number of counters	2
Counter width per counter	32Bit
maximum input frequency	100kHz
Maximum count frequency	400kHz
Mode incremental encoder	✓
Mode pulse/direction	✓
Gate input available	-
Latch input available	-
Reset input available	-
Counter output available	-

Order number	050-1BB30
Status information, alarms, diagnostics	
Status display	yes
Interrupts	no
Process alarm	no
Diagnostic interrupt	no
Diagnostic functions	no
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 counter module 050-1BB30 is described. Here every information required for the deployment may be found.

Content	Topic	Page
	Chapter 3 Deployment	3-1
	Fast introduction.....	3-2
	In-/Output area	3-4
	Parameter data	3-5
	Counter functions	3-6
	Diagnostic data	3-7

Fast introduction

Counter range

Limits	Valid range of values
Lower counter limit	-2 147 483 648 (-2^{31})
Upper counter limit	+2 147 483 647 ($2^{31}-1$)

The maximum counter frequency is 400kHz.

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 with s = Subindex, depends on number and type of counter

SX = Subindex for access via EtherCAT

Input area

Addr.	Name	Bytes	Function	IX	SX
+0	CV_I	4	Counter 0: Counter value	5400h/s	01h
+4	CV_II	4	Counter 1: Counter value	5401h/s+1	02h
+8	CSTS_I	2	Counter 0: Counter status	5402h/s	03h
+10	CSTS_II	2	Counter 1: Counter status	5403h/s+1	04h

Output area

Addr.	Name	Bytes	Function	IX	SX
+0	CCTRL_I	2	Counter 0: Control word	5602h/s	01h
+2	CCTRL_II	2	Counter 1: Control word	5602h/s+1	02h

CSTS_I
CSTS_II
Counter status

Bit	Name	Function
0 ... 1	-	reserved
2	STS_SW-GATE	Status software gate (set when <i>SW gate</i> is active)
3 ... 4	-	reserved
5	STS_GATE	Status internal gate (set when internal gate is active)
6	-	reserved
7	STS_C_DN	Status set at counter direction backward
8	STS_C_UP	Status set at counter direction forward
9 ... 10	-	reserved
11	STS_OFLW*	Status is set at overflow
12	STS_UFLW*	Status is set at underflow
13	STS_ZP*	Status is set at zero run
14 ... 15	-	reserved

* The bits remain set until reset with RES_SET (bit 6 control word).

CCTRL_I
CCTRL_II
Control word

Bit	Name	Function
0 ... 1	-	reserved
2	SW_GATE_SET	sets the software gate
3 ... 5	-	reserved
6	RES_SET	resets the bits STS_OFLW, STS_UFLW and STS_ZP with edge 0-1
7 ... 9	-	reserved
10	SW_GATE_RESET	resets the software gate
11 ... 15	-	reserved

Parameter data

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

IX = Index for access via CANopen

SX = Subindex for access via EtherCAT

Name	Bytes	Function	Default	DS	IX	SX
CH0A	1	C0: Input frequency track A	02h	01h	3100h	01h
CH1B	1	C0: Input frequency track B	02h	01h	3101h	02h
CH2A	1	C1: Input frequency track A	02h	01h	3102h	03h
CH3B	1	C1: Input frequency track B	02h	01h	3103h	04h
MODE2_I	1	C0: Counter mode 2*	00h	80h	3104h	05h
MODE3_I	1	C0: Counter mode 3*	00h	80h	3105h	06h
MODE2_II	1	C1: Counter mode 2*	00h	82h	3106h	07h
MODE3_II	1	C1: Counter mode 3*	00h	82h	3107h	08h

* This parameter may only be transferred at STOP state.

Control counter

The counter is controlled via the internal gate (I gate). The I gate corresponds to the software gate (SW gate).

SW gate: Open (activate): in user program by edge 0-1
SW_GATE_SET in the *control word*

Close (deactivate): in user program by edge 0-1
SW_GATE_RESET in the *control word*

In-/Output area

Overview

The following in-/output areas are used by the 050-1BB30:

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

IX = Index for access via CANopen with s = subindex, depends on number and type of counter

SX = Subindex for access via EtherCAT

Input area 12byte

Addr.	Name	Bytes	Function	IX	SX
+0	CV_I	4	Counter 0: Counter value	5400h/s	01h
+4	CV_II	4	Counter 1: Counter value	5401h/s+1	02h
+8	CSTS_I	2	Counter 0: Counter status	5402h/s	03h
+10	CSTS_II	2	Counter 1: Counter status	5403h/s+1	04h

CV_I
CV_II
Counter value

The *counter value* always contains the current value of the corresponding counter.

CSTS_I
CSTS_II
Counter status

Bit	Name	Function
0 ... 1	-	reserved
2	STS_SW-GATE	Status software gate (set when <i>SW gate</i> is active)
3 ... 4	-	reserved
5	STS_GATE	Status internal gate (set when internal gate is active)
6	-	reserved
7	STS_C_DN	Status set at counter direction backward
8	STS_C_UP	Status set at counter direction forward
9 ... 10	-	reserved
11	STS_OFLW*	Status is set at overflow
12	STS_UFLW*	Status is set at underflow
13	STS_ZP*	Status is set at zero run
14 ... 15	-	reserved

* The bits remain set until reset with RES_SET (bit 6 control word).

Output area 4byte

Addr.	Name	Bytes	Function	IX	SX
+0	CCTRL_I	2	Counter 0: Control word	5602h/s	01h
+2	CCTRL_II	2	Counter 1: Control word	5602h/s+1	02h

CCTRL_I
CCTRL_II
Control word

Bit	Name	Function
0 ... 1	-	reserved
2	SW_GATE_SET	sets the software gate
3 ... 5	-	reserved
6	RES_SET	resets the bits STS_OFLW, STS_UFLW and STS_ZP edge 0-1
7 ... 9	-	reserved
10	SW_GATE_RESET	resets the software gate
11 ... 15	-	reserved

Parameter data

Overview

Via parameterization you may define among others:

- Input filter
- Counter operating mode res. behavior

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

IX = Index for access via CANopen

SX = Subindex for access via EtherCAT

Name	Bytes	Function	Default	DS	IX	SX
CH0A	1	C0: Input frequency track A	02h	01h	3100h	01h
CH1B	1	C0: Input frequency track B	02h	01h	3101h	02h
CH2A	1	C1: Input frequency track A	02h	01h	3102h	03h
CH3B	1	C1: Input frequency track B	02h	01h	3103h	04h
MODE2_I	1	C0: Counter mode 2*	00h	80h	3104h	05h
MODE3_I	1	C0: Counter mode 3*	00h	80h	3105h	06h
MODE2_II	1	C1: Counter mode 2*	00h	82h	3106h	07h
MODE3_II	1	C1: Counter mode 3*	00h	82h	3107h	08h

* This parameter may only be transferred at STOP state.

CHxx

Input frequency

Byte	Function	Possible values
0	Input frequency C0 track A	02h: 100kHz 07h: 5kHz
1	Input frequency C0 track B	03h: 60kHz 08h: 2kHz
2	Input frequency C1 track A	04h: 30kHz 09h: 1kHz
3	Input frequency C1 track B	06h: 10kHz Other values are not permissible!

- *Input frequency* allows you to preset a filter for I1, I4, I5 and I8. With the help of filters you may e.g. filter signal peaks at a blurred input signal.

MODE2_I/II

C0/C1:

Counter mode 2

Byte	Bit 7 ... 0
0	<i>Bit 2 ... 0: 0 (fix)</i> <i>Bit 3: Count direction track B inverted</i> 0 = No (not inverted) 1 = Yes (inverted) <i>Bit 7 ... 4: 0 (fix)</i>

MODE3_I/II

C0/C1:

Counter mode 3

Byte	Bit 7 ... 0
0	<i>Bit 2 ... 0: Signal evaluation</i> 000b = Counter de-activated 001b = Rotary encoder single (at A and B) 010b = Rotary encoder double (at A and B) 011b = Rotary encoder quadruple (at A and B) 100b = Direction (pulse at A and direction at B) <i>Bit 7 ... 3: 0 (fix)</i>

- At de-activated counter the further parameter settings are ignored.

Counter functions

Overview

The counters of the 050-1BB30 are continuous counter, whose direction may be preset by the parameterization. The counters serve e.g. for distance measuring with incremental encoder.

The activation res. de-activation of the counter happens via an internal gate (I gate). The I gate corresponds to the software gate (SW gate).

The *SW gate* is opened (activated) via your user application by an edge 0-1 of the bit `SW_GATE_SET` of the *control word* in the *output area*. The software gate is closed (de-activated) by an edge 0-1 of the bit `SW_GATE_RESET`. With an edge 0-1 at *SW gate* the counter is reset to 0.

The following states influence the I gate:

SW gate	influences I gate
0	0
1	1
with edge 0-1	1

Count continuously

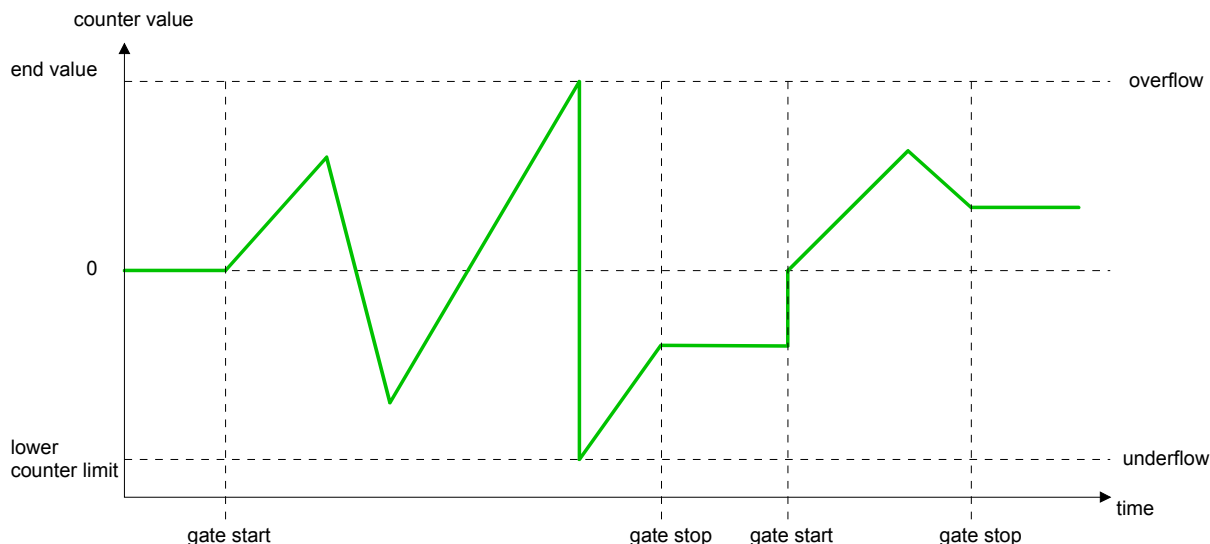
Each counter always starts at 0. When the counter counts forward and reaches the upper count limit and another counting pulse in positive direction arrives, it jumps to the lower count limit and counts from there on.

When the counter counts backwards and reaches the lower count limit and another counting pulse in negative direction arrives, it jumps to the upper count limit and counts from there on.

The count limits are set to the maximum count range.

Limits	Valid value range
Lower count limit	-2 147 483 648 (-2^{31})
Upper count limit	+2 147 483 647 ($2^{31}-1$)

With overflow or underflow the status bits `STS_OFLW` respectively `STS_UFLW` are set. These bits remain set until these are reset with `RES_SET` in the *control word*.



Diagnostic data

Overview

So this module does not support process interrupts, the diagnostics data serve for information about this module.

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. Additionally 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	reserved	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	00h			07h
NUMCH	1	Number channels of the module	02h			08h
CHERR	1	reserved	00h			09h
CH0ERR... CH7ERR	7	reserved	00h			0Ah ... 11h
DIAG_US	4	µs ticker	00h			12h

MODTYP
Module 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

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 02h)

DIAG_US
µs ticker

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

ERR_A/C/D
CHERR, CHxERR
reserved

Byte	Bit 7 ... 0
0	reserved

