CP 112-2

S-DIAS CPU Module

Instruction Manual

Translation of the Original Instructions

S-DIAS CPU Module   CP 112-2

with 2 Ethernet

>   **1 VARAN Out**

>   **1 USB Device**

>   **1 microSD**

>   **1 USB Host**

>   **1 CAN**

The S-DIAS CP 112-2 CPU module is a high-performance processor unit for the S-DIAS I/O modules. Through the various interfaces, such as 2x Ethernet, VARAN, CAN bus, USB and an exchangeable microSD card, this module can be used for a variety of applications. Additionally, a RealTimeClock and zero voltage proof RAM space with buffer battery are provided.

The CPU and I/O modules are supplied by the integrated voltage supply module.
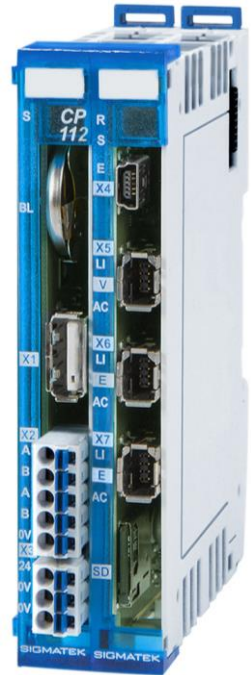
Contents

1   Introduction

1.1   Target Group/Purpose of this Operating Manual

This operating manual contains all information required for the operation of the product.

This operating manual is intended for:

- Project planners
- Technicians
- Commissioning engineers
- Machine operators
- Maintenance/test technicians

General knowledge of automation technology is required.

Further help and training information, as well as the appropriate accessories can be found on our website www.sigmatek-automation.com.

Our support team is happily available to answer your questions.
Please see our website for our hotline number and business hours.

1.2   Important Reference Documentation

This and additional documents can be downloaded from our website or obtained through support.

1.3   Contents of Delivery

1x CP 112-2

2 Basic Safety Directives

2.1 Symbols Used

The following symbols are used in the operator documentation for warning and danger messages, as well as informational notes:

DANGER

Danger indicates that death or serious injury **will occur**, if the specified measures are not taken.

⇨ To avoid death or serious injuries, observe all guidelines.

Danger indique une situation dangereuse qui, faute de prendre les mesures adéquates, **entraînera** des blessures graves, voire mortelles.

⇨ Respectez toutes les consignes pour éviter des blessures graves, voire mortelles.

WARNING

Warning indicates that death or serious injury **can** occur, if the specified measures are not taken.

⇨ To avoid death or serious injuries, observe all guidelines.

Avertissement d'une situation dangereuse qui, faute de prendre les mesures adéquates, **entraînera** des blessures graves, voire mortelles.

⇨ Respectez toutes les consignes pour éviter des blessures graves, voire mortelles.

CAUTION

Caution indicates that moderate to slight injury **can** occur, if the specified measures are not taken.

⇨ To avoid moderate to slight injuries, observe all guidelines.

Attention indique une situation dangereuse qui, faute de prendre les mesures adéquates, **peut** entraîner des blessures assez graves ou légères.

⇨ Respectez toutes les consignes pour éviter des blessures graves, voire mortelles.

INFORMATION

Information

 ⇨ Provides important information on the product, handling or relevant sections of the documentation, which require attention.

2.2 Disclaimer

> **INFORMATION**
>
> The contents of this operating manual were prepared with the greatest care. However, deviations cannot be ruled out. This operating manual is regularly checked and required corrections are included in the subsequent versions. The machine manufacturer is responsible for the proper assembly, as well as device configuration. The machine operator is responsible for safe handling, as well as proper operation.
>
> The current operating manual can be found on our website. If necessary, contact our support.
>
> Subject to technical changes, which improve the performance of the devices. The following operating manual is purely a product description. It does not guarantee properties under the warranty.
>
> Please thoroughly read the corresponding documents and this operating manual before handling a product.
>
> **SIGMATEK GmbH & Co KG is not liable for damages caused through, non-compliance with these instructions or applicable regulations.**

2.3   General Safety Directives

The Safety Directives in the other sections of this operating manual must be observed. These instructions are visually emphasized by symbols.

> **INFORMATION**
>
> According to EU Directives, the operating manual is a component of a product.
>
> This operating manual must therefore be accessible in the vicinity of the machine since it contains important instructions.
>
> This operating manual should be included in the sale, rental or transfer of the product, or its online availability indicated.
>
> Regarding the requirements for Safety and health connected to the use of machines, the manufacturer must perform a risk assessment in accordance with machine directives 2006/42/EG before introducing a machine to the market.
>
> Operate the unit with devices and accessories approved by SIGMATEK only.

CAUTION

Handle the device with care and do not drop or let fall.

Prevent foreign bodies and fluids from entering the device.

The device must not be opened!

Manipulez l'appareil avec précaution et ne le laissez pas tomber.

Empêchez les corps étrangers et les liquides de pénétrer dans l'appareil.

L'appareil ne doit pas être ouvert!

If the device does not function as intended or has damage that could pose a danger, it must be replaced!

En cas de fonctionnement non conforme ou de dommages pouvant entraîner des risques, l'appareil doit être remplacé!

The module complies with EN 61131-2.

In combination with a facility, the system integrator must comply with EN 60204-1 standards.

For your own safety and that of others, compliance with the environmental conditions is essential.

Le module est conforme à la norme EN 61131-2.

En combinaison avec une équipement, l'intégrateur de système doit respecter la norme EN 60204-1.

Pour votre propre sécurité et celle des autres, le respect des conditions environnementales est essential.

2.4   Software/Training

The application is created with the software LASAL CLASS 2 and LASAL SCREEN Editor.

Training for the LASAL development environment, with which the product can be configured, is provided. Information on our training schedule can be found on our website.

3 Standards and Directives

3.1 Directives

The product was constructed in compliance with the following European Union directives and tested for conformity.

3.1.1 EU Conformity Declaration

EU Declaration of Conformity

The product CP 112-2 conforms to the following European directives:

- **2014/35/EU** Low-voltage Directive

- **2014/30/EU** Electromagnetic Compatibility (EMC Directive)

- **2011/65/EU** "Restricted use of certain hazardous substances in electrical and electronic equipment" (RoHS Directive)

The EU Conformity Declarations are provided on the SIGMATEK website. See Products/Downloads or use the search function and the keyword "EU Declaration of Conformity".

4 Type Plate

HW: X.XX
SW: XX.XX.XXX
Safety Version: SXX.XX.XX

SIGMATEK GMBH & CO KG
Sigmatekstrasse 1 A-5112 LAMPRECHTSHAUSEN

Serial No.

Article Number	Product Name Short Name

Exemplary nameplate (symbol image)

HW: 1.00
SW: 01.00.000
Safety Version: S01.00.00

SIGMATEK GMBH & CO KG
Sigmatekstrasse 1 A-5112 LAMPRECHTSHAUSEN

12345678

12-246-133-3	Handbediengerät Wireless HGW 1033-3

HW: Hardware version
SW: Software version

5   Technical Data

5.1   Performance Data

Processor	EDGE2-Technology
Processor cores	1
Internal cache	32-kbyte L1 Instruction Cache 32-kbyte L1 Data Cache 512-kbyte L2 Cache
Addressable I/O/P modules	VARAN Bus: 65.280 CAN participants: > 110 S-DIAS bus: 64
Internal I/O	no
Internal program and data memory (DDR3 RAM)	256 Mbytes
Internal remanent Data memory	256-kbyte SRAM (battery buffered)
Internal storage device (IDE)	4 GB microSD card (3D-TLC pSLC technology)[1]
Interfaces	2x Ethernet 1x VARAN Out (Manager) (maximum cable length: 100 m) 1x CAN 1x USB host 2.0 (high speed 480 Mbit/s) 1x USB-OTG (Host/Device), Type Mini B 1x S-DIAS (with manager)
Status display	no
Status LEDs	yes
Real-time clock	yes (battery buffered)
Cooling	passive (fanless)

[1] The 4 GByte microSD card is formatted to 1 GByte in order to achieve the lifetime of a standard SLC card. A format change to the full 4 GByte is not allowed and will result in a massive reduction of the microSD card's lifetime.

5.2   Standard Configuration

Ethernet 1	X7	IP: 10.10.150.1	Subnet mask: 255.0.0.0
Ethernet 2	X6	Ethernet 2 not configured as default	
CAN bus	X2	Station: 00	Baud rate: 01 = 500 kBaud

INFORMATION

Problems can arise if a control is connected to an IP network, which contains modules that do not run on a SIGMATEK operating system. With such devices, Ethernet packets could be sent to the control with such a high frequency (i.e. broadcasts), that the high interrupt load could cause a real-time runtime error or runtime error. By configuring the packet filter (Firewall or Router) accordingly however, it is possible to connect a network with SIGMATEK hardware to a third party network without triggering the error mentioned above.

5.3   Electrical Requirements

5.3.1   Module Supply (Input)

Supply voltage	+18-30 V DC, typically +24 V DC UL: Class 2 or LVLC[1]
Current consumption of +24 V supply voltage	maximum 2.75 A[2]

[1] Limited Voltage/Limited Current
[2] The current consumption is dependent on the connected load

> **INFORMATION**
>
> For loading the internal capacitors, power consumption may be increased for a short time (in the microsecond range).
>
> This value is dependent of the input voltage and impedance of the power source.
>
> [1] For USA and Canada:
>
> The supply must be limited to:
>
> a) max. 5 A at voltages from 0-20 V DC, or
> b) 100 W at voltages from 20-60 V DC
>
> The limiting component (e.g. transformer, power supply or fuse) must be certified by an NRTL (Nationally Recognized Testing Laboratory).

5.3.2   S-DIAS Bus Supply (Output)

Voltage supply from S-DIAS bus	+5 V
Current consumption on the S-DIAS bus (+5 V supply)	maximum 1.6 A[1]
Voltage supply from S-DIAS bus	+24 V
Current consumption on the S-DIAS bus (+24 V supply)	maximum 1.6 A[1]

[1] The current consumption is dependent on the connected load
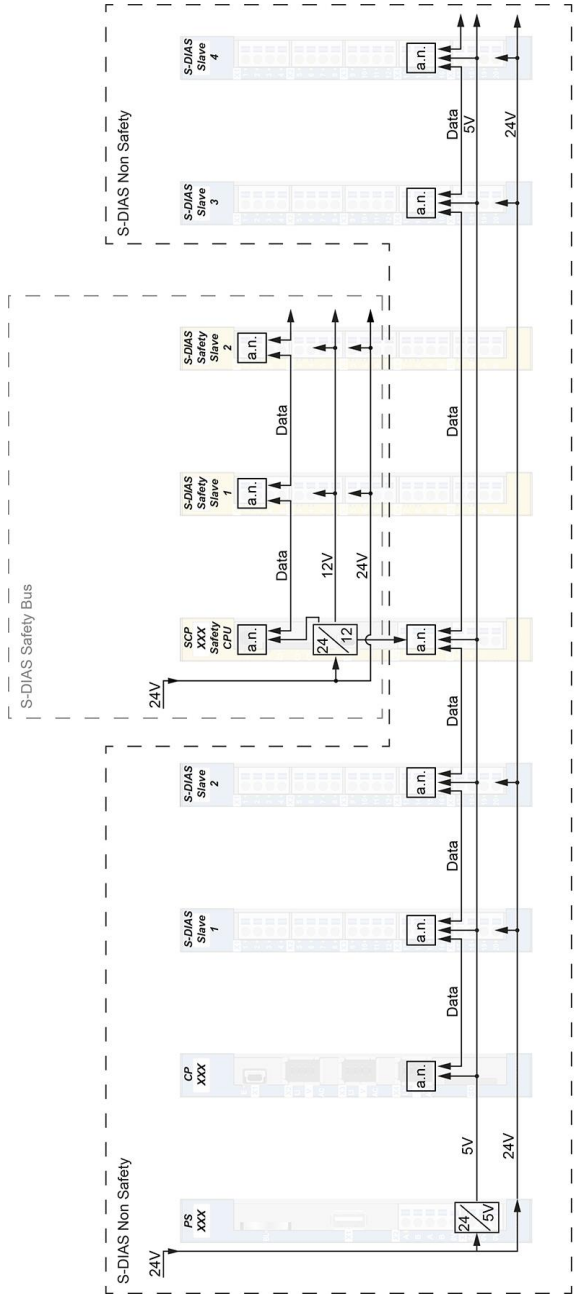
Wiring S-DIAS Safety in S-DIAS System

- each S-DIAS module is an active module (active node)
- Safety CPU is connected to the S-DIAS bus (incl. +5 V supply)
- Safety bus is independent and separated from the S-DIAS bus

a.n. = active node

5.4   Miscellaneous

Article number	20-004-112-2
Operating system	Salamander
Project backup	internally on the microSD card
Standard	UL 508 (E247993)
Approbations	UL, cUL, CE, UKCA

5.5   Environmental Conditions

Storage temperature	-20 ... +85 °C	
Environmental temperature	0 ... +55 °C	
Humidity	0-95 %, non-condensing	
Installation altitude above sea level	0-2000 m without derating > 2000 m up to a maximum of 5000 m with derating of the maximum environmental temperature by 0.5 °C per 100 m	
Operating conditions	pollution degree 2	
Noise emission	≤ 70 dB	
EMC resistance	in accordance with EN 61000-6-2 (industrial area)	
EMC noise generation	in accordance with EN 61000-6-4 (industrial area)	
Vibration resistance	EN 60068-2-6	3.5 mm from 5-8.4 Hz 1 g from 8.4-150 Hz
Shock resistance	EN 60068-2-27	15 g
Protection Type	EN 60529/NEMA 250	IP20/Type 1 (not evaluated by UL)

6   Mechanical Dimensions
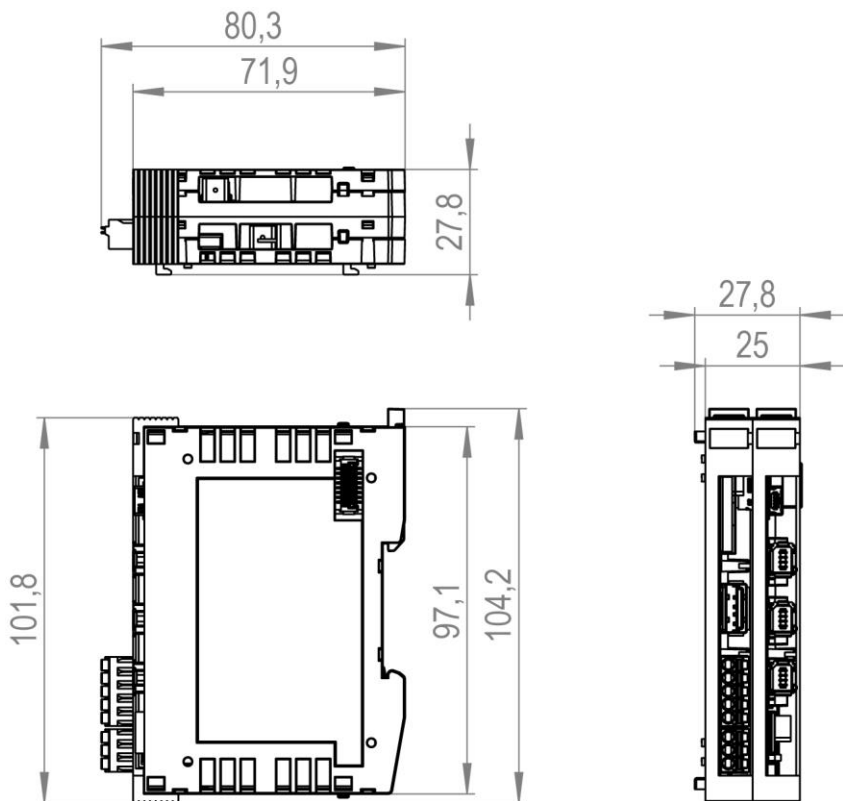
7   Connector Layout
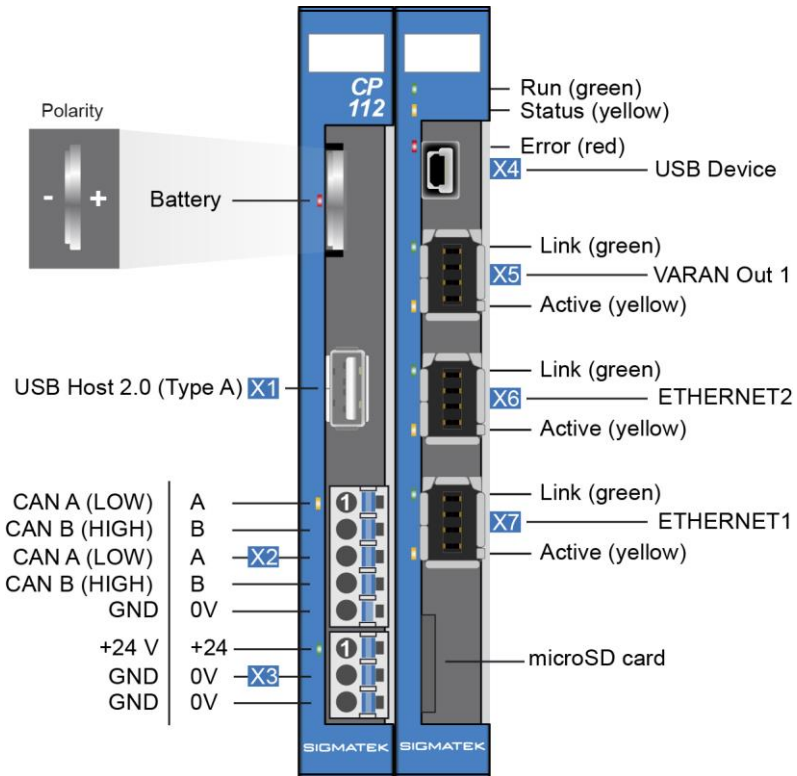
INFORMATION

The GND supply (X3: Pin 2 and Pin 3) is internally bridged. Only one GND pin (pin 2 or pin 3) is required to power the module. The bridged connections may be used for further looping of the GND supply. However, it must be taken into account that a total current of 6 A per connection is not exceeded by the forward looping!

7.1 Status LEDs Interface Part

Run	green	ON	from activation of the voltage supply until processing of the autoexec.lsl
			when the application is running (except when controlled through application differently)
		BLINKS	in the CLI, while processing the autoexec.lsl until the application is running
			during the installation of the operating systems (since OS version 09.03.054)
		OFF	when error occurs
			reset-state
			Permanent from power on: microSD card error[1]
	can be set from the application (ON, BLINKING, OFF)		
Status	yellow	OFF	during start process
			during RUN status (application running)
			when error occurs or reset
			Permanent from power on: microSD card error[1]
	can be set from the application (ON, BLINKING, OFF)		
Error	red	BLINKS	when error occurs or reset
		OFF	during start process
			during RUN status (application running)
			Permanent from power on: microSD card error[1]
	can be set from the application (ON, BLINKING, OFF)		
VARAN Link	green	ON	connection between the two PHYs made
		BLINKS	VARAN In of the primary client has no link
VARAN Active	yellow	ON	data is exchanged over the VARAN bus
Ethernet Link	green	ON	connection between the two PHYs made
Ethernet Active	yellow	ON	data is exchanged over the Ethernet bus

[1] If the microSD card is not properly inserted or if data (operating system, application) is faulty, the RUN, STATUS and Error LEDs do not light up after switching on the power supply. The DC OK LED lights up permanently.

7.2   Status LEDs Supply Part

Module Status	red	ON	CPU is in RESET status
Battery Low	red	ON	battery is empty
CAN Active	yellow	BLINKS	data is being exchanged
DC OK	green	ON	module is supplied with a voltage > 18 V

7.3   Connectors

X1: USB Host 2.0 (Type A)
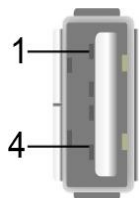
Pin	Function
1	+5 V
2	D-
3	D+
4	GND

INFORMATION

It should be noted that many of the USB devices on the market do not comply with USB specifications; this can lead to device malfunctions. It is also possible that these devices will not be detected at the USB port or function correctly. Therefore, it is recommended that every USB stick be tested before actual use.

X2: CAN Bus
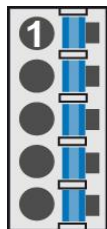
Pin	Function
1	CAN A (LOW)
2	CAN B (HIGH)
3	CAN A (LOW)
4	CAN B (HIGH)
5	GND

X3: Power Supply
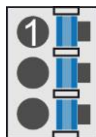
Pin	Function
1	+24 V supply
2	GND
3	GND

X4: USB 2.0 (Type Mini-B) (useable as USB host with OTG cable otherwise USB device for service purposes)
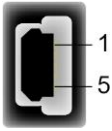
Pin	Function
1	+5 V
2	D-
3	D+
4	ID
5	GND

X5: VARAN-Out (Industrial Mini I/O)
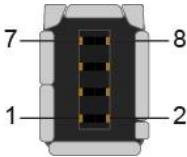
Pin	Function
1	Tx/Rx+
2	Tx/Rx-
3	Rx/Tx+
4-5	n.c.
6	Rx/Tx-
7-8	n.c.

n.c. = do not use

X6, X7: Ethernet (Industrial Mini I/O)
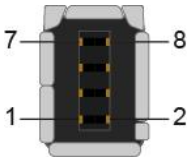
Pin	Function
1	Tx+
2	Tx-
3	Rx+
4-5	n.c.
6	Rx-
7-8	n.c.

microSD card
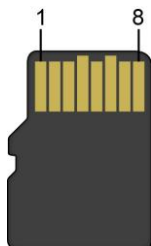
Pin	Function
1	DAT2
2	CD/DAT3
3	CMD
4	+3V3
5	CLK
6	GND
7	DAT0
8	DAT1

INFORMATION

It is recommended that only storage media provided by SIGMATEK (CompactFlash cards, microSD cards etc.) be used.
Order number for 512-Mbyte EDGE2 microSD card: 12-630-055

The number of read and write actions have a significant influence on the lifespan of the storage media.

The microSD card is not meant to be used as a removable media and thus only should be removed from the card holder for maintenance purposes.

7.4 Applicable Connector Cables

VARAN/Ethernet

Cable type	Length	Article number
RJ45 on industrial Mini I/O Type 1, drag chain capable	0.5 m	16-911-005
	1 m	16-911-010
	1.5 m	16-911-015
	2 m	16-911-020
	3 m	16-911-030
	5 m	16-911-050
	10 m	16-911-100
	20 m	16-911-200
	50 m	16-911-500
Industrial Mini I/O Type 1 on industrial Mini I/O Type 1, drag chain capable	0.5 m	16-912-005
	1 m	16-912-010
	1.5 m	16-912-015
	2 m	16-912-020
	3 m	16-912-030
	5 m	16-912-050
	10 m	16-912-100
	20 m	16-912-200

7.5   Applicable Connectors

Connectors:
X1: USB 2.0 (Type A) (not included in delivery)
X2, X3: Connectors with spring terminals (included in delivery)

The spring terminals are suitable connecting ultrasonically compacted (ultrasonically welded) strands.

X4: USB Type Mini-B (not included in delivery)
X5, X6, X7: Industrial Mini I/O Plug Type 1 Lock Extend Version (not included in delivery)

Connections:

|	
Stripping length/Sleeve length:	10 mm
Mating direction:	parallel to the conductor axis or circuit board
Conductor cross section rigid:	0.2-1.5 mm^2
Conductor cross section flexible:	0.2-1.5 mm^2
Conductor cross section ultrasonically compacted:	0.2-1.5 mm^2
Conductor cross section AWG/kcmil:	24-16
Conductor cross section flexible with ferrule without plastic sleeve:	0.25-1.5 mm^2
Conductor cross section flexible with ferrule with plastic sleeve:	0.25-0.75 mm^2 (reason for reduction d2 of the ferrule)

d2 = max. 2.8 mm

INFORMATION

The S-DIAS module cannot be connected/disconnected while voltage is applied!

7.6   Label Field
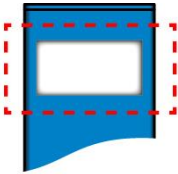
Manufacturer	Weidmüller
Type	MF 10/5 CABUR MC NE WS
Weidmüller article number	1854510000
Compatible printer	Weidmüller
Type	Printjet Advanced 230V
Weidmüller article number	1324380000

8   CAN Bus Setup

This section explains how to correctly configure the CAN bus. The following parameters must first be set: Station number and data transfer rate.

8.1   CAN Bus Station Number

Each CAN bus station is assigned its own station number. With this station number, data can be exchanged with other stations connected to the bus. In a CAN bus system however, each station number can only be assigned once!

8.2   Number of CAN Bus Participants

The maximum number of participants on the CAN bus depends on the cable length, termination resistance, data transfer rate and the drivers used in the participants.

With a termination resistance of 120 Ω, at least 110 participants are possible.

8.3   CAN Bus Data Transfer Rate

Various data transfer rates (baud rates) can be set on the CAN bus. The longer the bus line is, the lower the data transfer rate that must be selected.

Value	Baud Rate	maximum length
00	615 Kbits/s	60 m
01	500 kbits/s	80 m
02	250 Kbits/s	160 m
03	125 Kbits/s	320 m
04	100 Kbits/s	400 m
05	50 Kbits/s	800 m
06	20 kbits/s	1200 m
07	1 Mbits/s	30 m

These values are valid for the following cable: 120 Ω, Twisted Pair.

Note: For the CAN bus protocol: 1 kbits/s = 1 kBaud

8.4   CAN Bus Termination

In a CAN bus system, both end modules must be terminated. This is necessary to avoid transmission errors caused by reflections in the line.
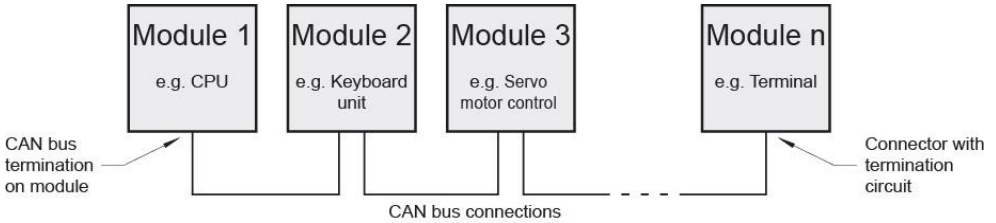
If the PS 101 supply module with a processor module like the CP 112-2 is one of the end modules, it can be terminated by placing a 120 Ω resistor between CAN A (LOW) and CAN B (HIGH).

120 Ω

9   Buffer Battery

The exchangeable buffer battery ensures that programs and data in the expanded memory (SRAM) as well the clock time (RTC) of the CPU module (e.g. CP 112-2) are preserved in the absence of a supply voltage. A lithium battery is installed at the manufacturer.

The battery has enough capacity to preserve data in the absence of a supply voltage for up to 3 years.

We recommend however, that the battery be replaced annually to ensure optimal performance.
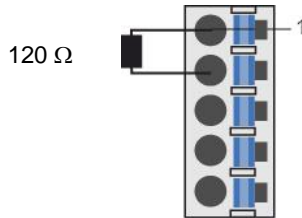
INFORMATION

Battery order number: 01-690-028

	COMPANY	DATA
Lithium battery	RENATA (CR2032)	3.0 V/235 mAh

INFORMATION

The battery can only be exchanged when power is supplied to the terminal; otherwise data loss will occur!

WARNING

Fire and explosion hazard!

Minor to severe injuries may occur due to incorrect use of the battery.

Do not recharge, disassemble or dispose of battery in fire!

A weak battery is first detected by the supervisor circuit on the CPU module and displayed by the control software. When the battery voltage continues to fall, the red LED "Battery Low" lights. The battery must be replaced soon to avoid data loss in case of power failure.

When the battery voltage is in between the supervisor circuit thresholds, it may happen that the battery is detected "good" during operation, but "low" after a power cycle. If this happens, it is recommended to replace the battery.
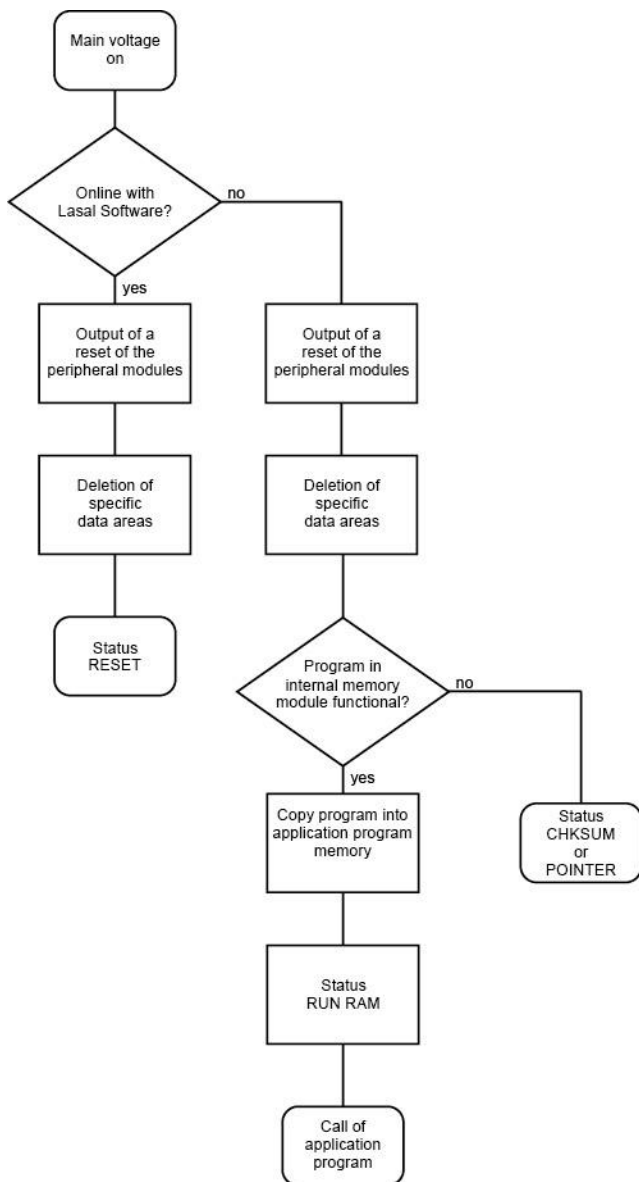
10 Storage Media

INFORMATION

It is recommended that only storage media provided by SIGMATEK (CompactFlash cards, microSD cards etc.) be used.

The number of read and write actions have a significant influence on the lifespan of the storage media.

11 Process Diagram

12 Status and Error Messages

Status and error messages are shown in the status test of the LASAL CLASS software.

Number	Message	Definition	Cause/Solution
00	`RUN RAM`	The user program is currently running in RAM. The display is not affected.	Info
01	`RUN ROM`	The user program stored in the program memory module loaded into the RAM is currently running. The display is not affected.	Info
02	`RUNTIME`	The total time for all cyclic objects exceed the maximum time; the time can be configured using two system variables: - Runtime: time remaining - SWRuntime: pre-selected value for the runtime counter	Solution: - Optimize the application's cyclic task. - Use higher capacity CPU - Configure preset value
03	`POINTER`	Incorrect program pointers were detected before running the user program	Possible Causes: - The program memory module is missing, not programmed or defect. - The program in the user program memory (RAM) is not executable. - The buffering battery has failed. - The user program has overwritten a software error. Solution: - Reprogram the memory module, if the error reoccurs exchange the module. - Exchange the buffering battery - Correct programming error
04	`CHKSUM`	An invalid checksum was detected before running the user program.	Cause/solution: s. POINTER

05	**WATCHDOG**	The program was interrupted via the watchdog logic.	Possible Causes: - User program interrupts blocked over a longer period of time (STI command forgotten) - Programming error in a hardware interrupt. - INB, OUTB, INW, OUTW instructions used incorrectly. - The processor is defect. Solution: - Correct programming error. - Exchange CPU.
06	**GENERAL ERROR**	General error An error has occurred while stopping the application over the online interface.	The error occurs only during the development of the operating system.
07	**PROM DEFECT**	An error has occurred while programming the memory module.	Cause: - The program memory module is defect. - The user program is too large. - The program memory module is missing. Solution: - Exchange the program memory module
08	**RESET**	The CPU has received the reset signal and is waiting for further instructions. The user program is not processed.	Info
09	**WD DEFEKT**	The hardware monitoring circuit (watchdog logic) is defective. After power-up, the CPU checks the watchdog logic function. If an error occurs during this test, the CPU deliberately enters an infinite loop from which no further instructions are accepted.	Solution: - Exchange CPU.
10	**STOP**	The program was stopped by the programming system.	
11	**PROG BUSY**	Reserved	
12	**PROGRAM LENGTH**	Reserved	
13	**PROG END**	A memory module was successfully programmed.	Info

14	**PROG MEMO**	The CPU is currently programming the memory module.	Info
15	**STOP BRKPT**	The CPU was stopped by a breakpoint in the program.	Info
16	**CPU STOP**	The CPU was stopped by the programming software.	Info
17	**INT ERROR**	The CPU has triggered a false interrupt and stopped the user program or has encountered an unknown instruction while running the program.	Cause: - A non-existent operating system was used. - Stack error (uneven number of PUSH and POP instructions). - The user program was interrupted through a software error. Solution: - Correct program error
18	**SINGLE STEP**	The CPU is in single step mode and is waiting for further instructions.	Info
19	**READY**	A module or project was sent to CPU and it is now ready to run the program.	Info
20	**LOAD**	The program is stopped and the CPU is currently receiving a new module or project.	Info
21	**UNZUL. MODULE**	The CPU has received a module that does not belong to the project.	Solution: - Recompile and download the entire project
22	**MEMORY FULL**	The operating system memory /heap) is too small. No memory could be reserved while calling an internal or interface function from the application.	Cause: - Memory is only allocated bun not released. Solution - Clear memory
23	**NOT LINKED**	When starting the CPU, a missing module or a module that does not belong to the project was detected.	Solution: - Recompile and download the entire project
24	**DIV BY 0**	A division error has occurred.	Possible Causes: - Division by 0. - The result of a division does not fit in the result register. Solution: - Correct program error
25	**DIAS ERROR**	While accessing a DIAS module, an error has occurred.	Hardware problem

26	**WAIT**	The CPU is busy.	Info
27	**OP PROG**	The operating system is currently being reprogrammed.	Info
28	**OP INSTALLED**	The operating system has been reinstalled.	Info
29	**OS TOO LONG**	The operating system cannot be loaded; too little memory.	Restart; report error to SIGMATEK.
30	**NO OPERATING SYSTEM**	Boot loader message. No operating system found in RAM.	Restart; report error to SIGMATEK.
31	**SEARCH FOR OS**	The boot loader is searching for the operating system in RAM.	Restart; report error to SIGMATEK.
32	**NO DEVICE**	Reserved	
33	**UNUSED CODE**	Reserved	
34	**MEM ERROR**	The operating system loaded does not match the hardware configuration.	Solution: - Use the correct operating system version
35	**MAX IO**	Reserved	
36	**MODULE LOAD ERROR**	The LASAL Module or project cannot be loaded.	Solution: - Recompile and download the entire project
37	**BOOTIMAGE FAILURE**	A general error has occurred while loading the operating system.	Solution: - Contact SIGMATEK
38	**APPLMEM ERROR**	An error has occurred in the application memory (user heap).	Solution: - Correct allocated memory access error
39	**OFFLINE**	This error does not occur in the control.	This error code is used in the programming system to show that there is no connection to the control.
40	**APPL LOAD**	Reserved	
41	**APPL SAVE**	Reserved	
44	**VARAN MANAGER ERROR**	An error number was entered In the VARAN manager and stopped the program.	Solution: - Read logfile
45	**VARAN ERROR**	A required VARAN client was disconnected or communication error has occurred.	Solution: - Read logfile - Error Tree

46	`APPL-LOAD-ERROR`	An error has occurred while loading the application.	Cause: - Application was deleted. Solution: - Reload the application into the control.
47	`APPL-SAVE-ERROR`	An error has occurred while attempting to save the application.	
50	`ACCESS-EXCEPTION-ERROR`	Read or write access of a restricted memory area. (I.e. writing to the NULL pointer).	Solution: - Correct application errors
51	`BOUND EXCEEDED`	An exception error has occurred when accessing arrays. The memory area was overwritten through accessing an invalid element.	Solution: - Correct application errors
52	`PRIVILEDGED INSTRUCTION`	An unauthorized instruction for the current CPU level was given. For example, setting the segment register.	Cause: - The application has overwritten the application program code. Solution: - Correct application errors
53	`FLOATING POINT ERROR`	An error has occurred during a floating-point operation.	
60	`DIAS-RISC-ERROR`	Error from the Intelligent DIASMaster.	Restart; report error to SIGMATEK.
64	`INTERNAL ERROR`	An internal error has occurred, all applications are stopped.	Restart; report error to SIGMATEK.
65	`FILE ERROR`	An error has occurred during a file operation.	
66	`DEBUG ASSERTION FAILED`	Internal error.	Restart; report error to SIGMATEK.
67	`REALTIME RUNTIME`	The total time for all real time objects exceeds the maximum time allowed. The time cannot be configured. 2 ms for 386 CPUs 1 ms for all other CPUs	Solution: - Optimize the application's real-time task (RtWork). - Reduce the clock time for the real-time task of all objects. - Correct application errors - CPU is overloaded in real-time => use a higher capacity CPU.
68	`BACKGROUND RUNTIME`	The total time for all background objects exceed the maximum time; the time can be configured using two system variables: -BTRuntime: time remaining SWBTRuntime: pre-selected value for the runtime counter	Solution: - Optimize the application's background task (background) - Use higher capacity CPU - Set SWBTRuntime correctly

70	C-DIAS ERROR	A connection error with a C-DIAS module has occurred.	Cause: - The cause of the error is documented in the log file Solution: - This depends on the cause
72	S-DIAS ERROR	A connection error with a S-DIAS module has occurred.	Possible causes: - real network does not match the project - S-DIAS client is defective Solution: - analyze logfile
75	SRAM ERROR	An error occurred while initializing, reading or writing SRam data.	Possible Causes: - SRam configured incorrectly - Battery fort he internal program memory supply is empty Solution: - Analyze log file (Event00.log, Event19.log) - Check configuration - Change internal program memory supply battery
96	USER DEFINED 1	User-definable code.	
97	USER DEFINED 2	User-definable code.	
98	USER DEFINED 3	User-definable code.	
99	USER DEFINED 4	User-definable code.	
100	C_INIT	Initialization start; the configuration is run.	
101	C_RUNRAM	The LASAL project was successfully started from RAM.	
102	C_RUNROM	The LASAL project was successfully started from ROM.	
103	C_RUNTIME		
104	C_READY	The CPU is ready for operation.	
105	C_OK	The CPU is ready for operation.	

106	`C_UNKNOWN_CID`	An unknown object from a stand-alone or embedded object, or an unknown base class was detected.	
107	`C_UNKNOWN_CONSTR`	The operating system class cannot be created; the operating system is probably wrong.	
108	`C_UNKNOWN_OBJECT`	Indicates an unknown object in an interpreter program; more the one DCC080 object.	
109	`C_UNKNOWN_CHNL`	The hardware module number is greater than 60.	
110	`C_WRONG_CONNECT`	No connection to the required channels.	
111	`C_WRONG_ATTR`	Wrong server attributes.	
112	`C_SYNTAX_ERROR`	No specific error, recompile all project components and reload the project.	
113	`C_NO_FILE_OPEN`	An attempt was made to open an unknown table.	
114	`C_OUTOF_NEAR`	Memory allocation error	
115	`C_OUT OF_FAR`	Memory allocation error	
116	`C_INCOMAPTIBLE`	An object with the same name already exists but has a different class.	
117	`C_COMPATIBLE`	An object with the same name and class already exists but must be updated.	
224	`LINKING`	The application is currently linking.	
225	`LINKING ERROR`	An error has occurred while linking. An error messaged is generated in the LASAL status window.	
226	`LINKING DONE`	Linking is complete.	
230	`OP BURN`	The operating system is currently being burned into the Flash memory.	
231	`OP BURN FAIL`	An error has occurred while burning the operating system.	
232	`OP INSTALL`	The operating system is currently being installed.	
240	`USV-WAIT`	The power supply was disconnected; the UPS is active. The system is shutdown.	
241	`REBOOT`	The operating system is restarted.	
242	`LSL SAVE`		

243	LSL LOAD		
252	CONTINUE		
253	PRERUN	The application is started.	
254	PRERESET	The application is ended.	
255	CONNECTION BREAK		

13 Application Exceptions

13.1   The File System Does Not Support Safe Writing via SRAM

If files are stored, modified or written on the microSD card from the user program, these files must always be stored with a fixed maximum size. Since changes in size and the simultaneous shutdown of the voltage supply can corrupt the file system, a later change in the file size is not allowed.

13.2   Data Breakpoint

This CPU does not support the data breakpoint feature.

14 Wiring Guidelines

The input filters, which suppress noise signals, allow operation in harsh environmental conditions. A careful wiring method is also recommended to ensure error-free function.

The following guidelines should be observed:

- Avoid parallel connections between input lines and load-bearing circuits.

- Protective circuits for all relays (RC networks or free-wheeling diodes)

- Correct wiring to ground

> **INFORMATION**
>
> Connect the ground bus to the control cabinet.
>
> The S-DIAS module CANNOT be connected/disconnected while voltage is applied!

14.1 Shielding

The wiring for the CAN and Ethernet must be shielded.

The low-ohm shielding is either connected at the entry to the control cabinet or directly before the CP 112-2 over a large surface (cable grommets, grounding clamps)!

Noise signals can therefore be prohibited from reaching the electronics and affecting the function.

To avoid compensating currents from the PE, which flow over the shielding the conductors, it is recommended that the system components have low-ohm and low impedance connections to one another.
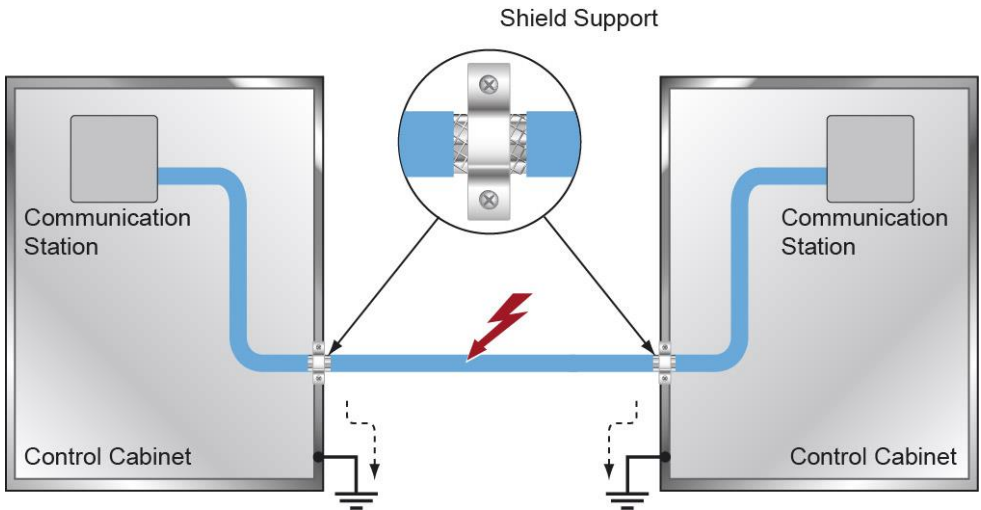
14.2 ESD Protection

CAUTION
Typically, USB devices (keyboard, mouse, etc.) are equipped with non-shielded cables. These devices are disrupted by ESD and in some instances, no longer function.
Before any device is connected to, or disconnected from the product, the potential should be equalized (by touching the control cabinet or ground terminal). Electrostatic loads (through clothing and shoes, etc.) can thereby be dissipated.

14.3 USB Interface Connections

The product has a USB interface. This interface can be used to connect various USB devices (keyboard, mouse, storage media, hubs, etc.). Several USB devices can be connected using a hub, which are then fully functional.

15 Strain Relief
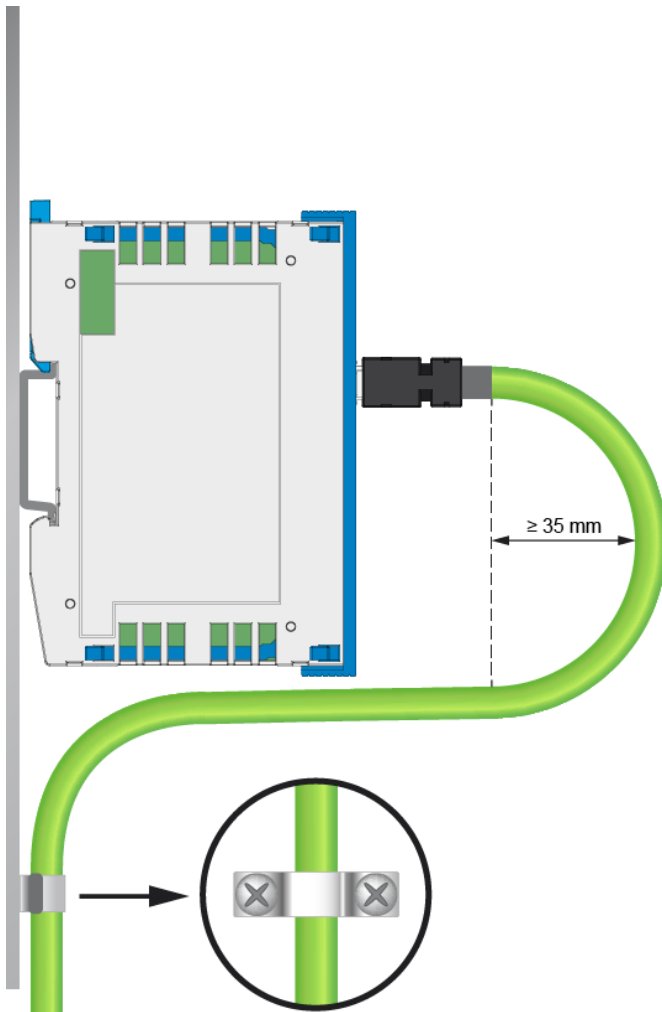
INFORMATION

The VARAN cable must be mounted close to the module (e.g. using a clamp)!

No mechanical stress can be applied to the connection!

16 Recommended Shielding for VARAN

The VARAN real-time Ethernet bus system exhibits a very robust quality in harsh industrial environments. Through the use of IEEE 802.3 standard Ethernet physics, the potentials between an Ethernet line and sending/receiving components are separated. In the event of an error, the VARAN Manager resends messages to a bus participant immediately. The shielding described below is mainly recommended.

For applications in which the bus is operated outside the control cabinet, the correct shielding is required. This is especially important, if due to physical requirements, the bus cables must be placed next to sources of strong electromagnetic noise. It is recommended to avoid placing VARAN bus lines parallel to power cables whenever possible.

SIGMATEK recommends the use of CAT5e industrial Ethernet bus cables.

An S-FTP cable should be used for the shielding.

An S-FTP bus is a symmetric, multi-wire cable with unshielded pairs. For the entire shielding, a combination of foil and braiding is used. A non-laminated variant is recommended.

> **INFORMATION**
>
> The VARAN cable must be secured at a maximum distance of 20 cm from the connector to protect against vibration!

16.1   Wiring from the Control Cabinet to an External VARAN Component

If the Ethernet lines are connected from a VARAN component to a VARAN node located outside the control cabinet, the shielding should be placed at the entry point of the control cabinet housing. All noise can then be dissipated before reaching the electronic components.
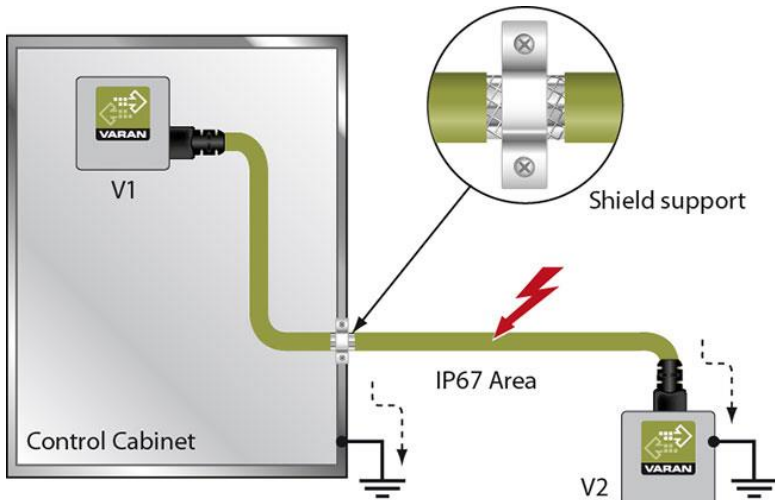
16.2   Wiring Outside of the Control Cabinet

If a VARAN bus line must be connected outside of the control cabinet only, no additional shield support is required. A requirement therefore, is that only IP67 modules and connectors can be used outside the control cabinet. These components are very robust and noise resistant. The shielding for all sockets in IP67 modules are electrically connected internally or over the housing, whereby voltage spikes are not dissipated through the electronics.
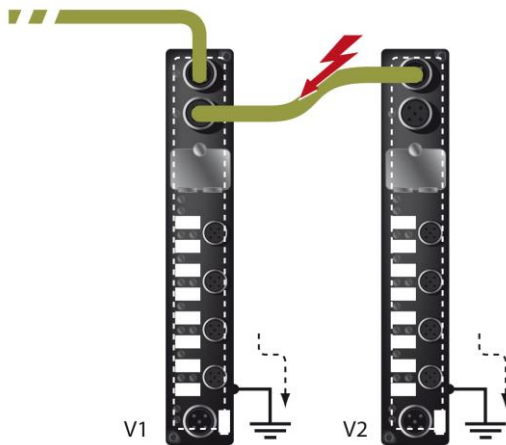
16.3   Shielding for Wiring Within the Control Cabinet

Sources of strong electromagnetic noise located within the control cabinet (drives, Transformers, etc.) can induce interference in a VARAN bus line. Spike voltages are dissipated over the metallic housing of a RJ45 connector. Noise is conducted through the control cabinet housing without further action from the electronic components. To eliminate sources of noise during data exchange, it is recommended that the shielding for all electronic components be connected within the control cabinet.
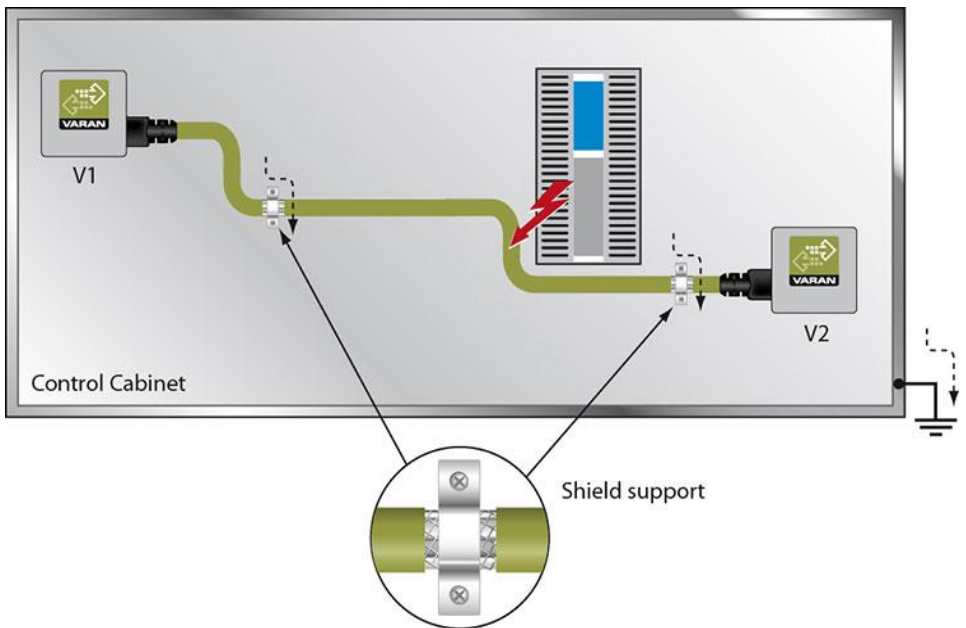
16.4   Connecting Noise Generating Components

With the connection of power components that generate strong electromagnetic interference, it is also critical to ensure correct shielding. The shielding should be placed before a power element (or group of power elements).

Shield support
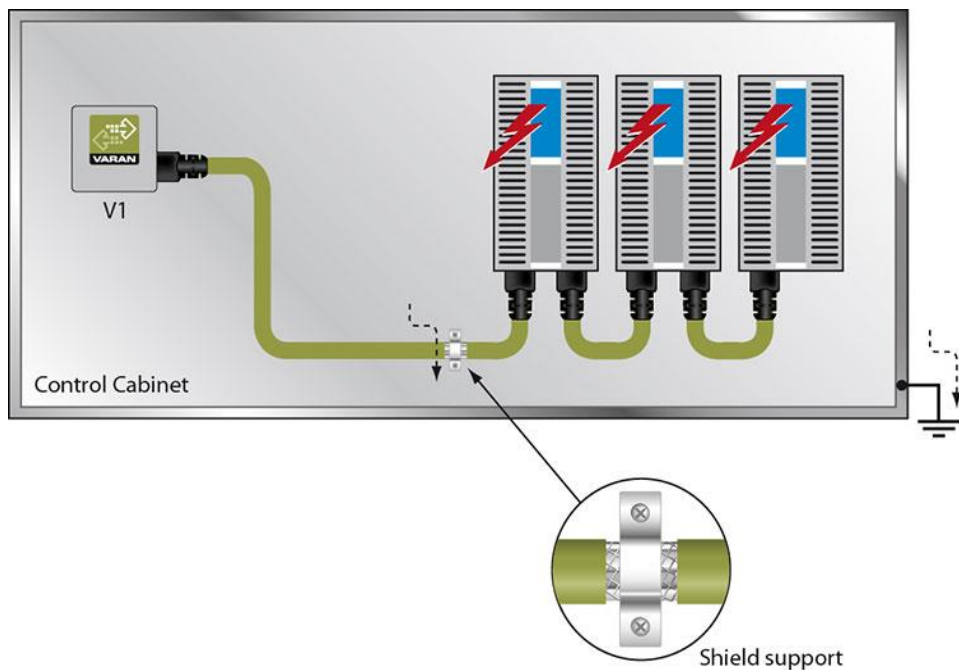
16.5   Shielding Between Two Control Cabinets

If two control cabinets must be connected over a VARAN bus, it is recommended that the shielding be located at the entry points of both cabinets. Noise can be thereby prevented from reaching the electronics within the control cabinet.
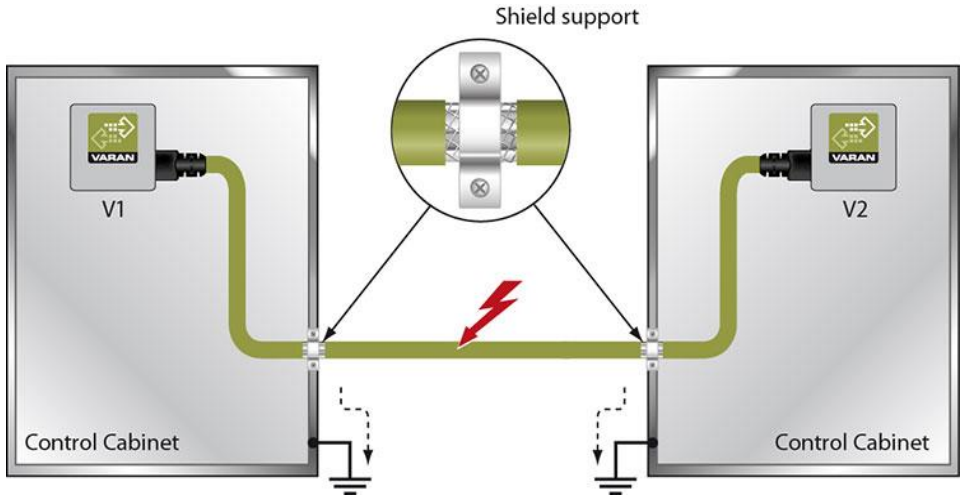
17   Working with and on the CP 112-2

The applicable operating / safety guidelines for personal safety must be observed.

During installation / initial start-up / maintenance of the product, appropriate ESD protection measures must be taken (For example: the employees must ground themselves before working with and on the product.)

18 Assembly/Installation

18.1 Check Contents of Delivery

Ensure that the contents of the delivery are complete and intact. See chapter Contents of Delivery.
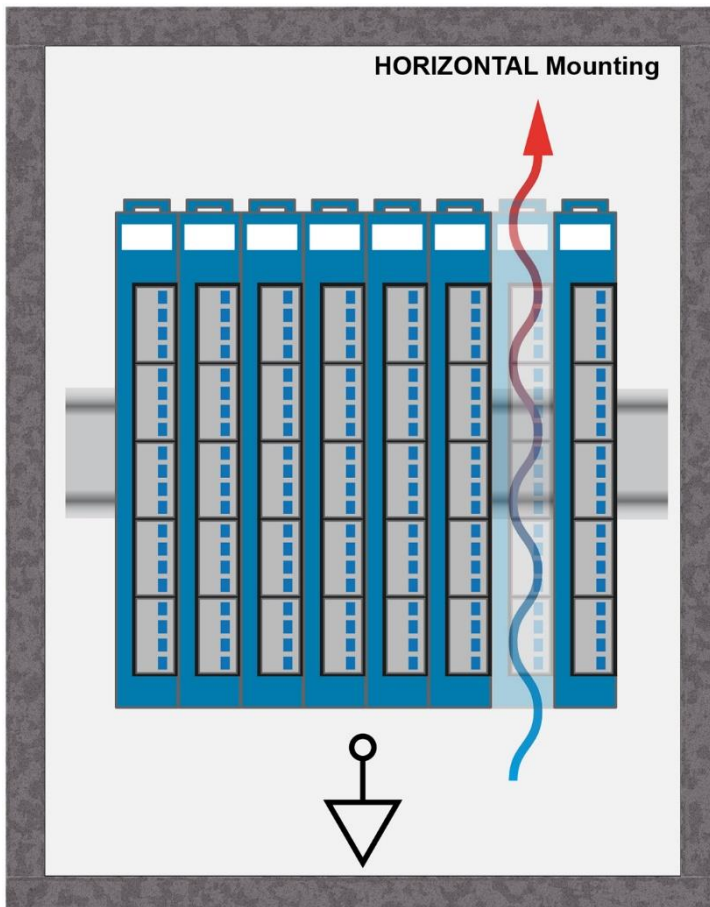
INFORMATION

On receipt and before initial use, check the device for damage. If the device is damaged, contact our customer service and do not install the device in your system.

Damaged components can disrupt or damage the system.

18.2   Mounting

The S-DIAS modules are designed for installation into the control cabinet. To mount the modules a DIN-rail is required. The DIN rail must establish a conductive connection with the back wall of the control cabinet. The individual S-DIAS modules are mounted on the DIN rail as a block and secured with latches. The functional ground connection from the module to the DIN rail is made via the grounding clamp on the back of the S-DIAS modules. The modules must be mounted horizontally (module label up) with sufficient clearance between the ventilation slots of the S-DIAS module blocks and nearby components and/or the control cabinet wall. This is necessary for optimal cooling and air circulation, so that proper function up to the maximum operating temperature is ensured.

Recommended minimum distances of the S-DIAS modules to the surrounding components or control cabinet wall:
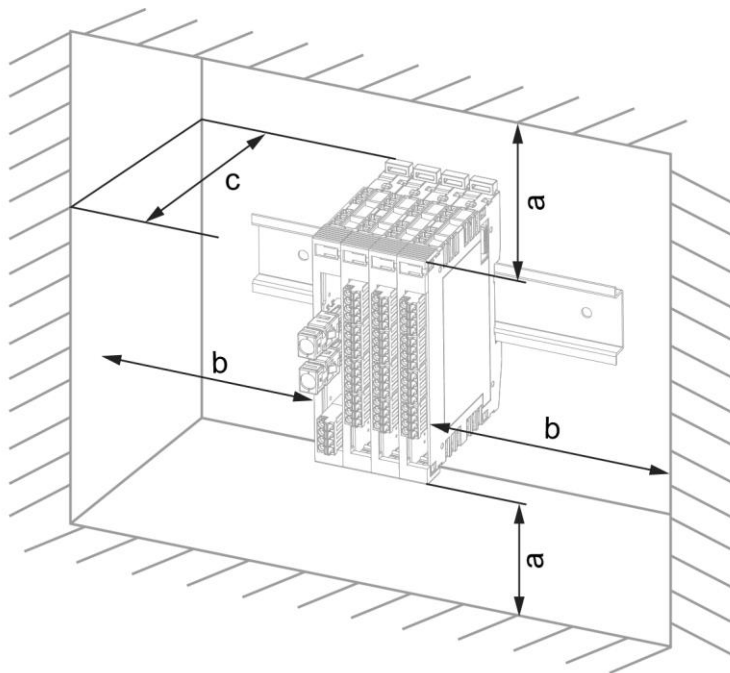
a	b	c
30 mm (1.18˝)	**30 mm** (1.18˝)	**100 mm** (3.94˝)

a, b, c … distances in mm (inches)

19 Transport/Storage

INFORMATION

This device contains sensitive electronics. During transport and storage, high mechanical stress must therefore be avoided.

For storage and transport, the same values for humidity and vibration as for operation must be maintained!

Temperature and humidity fluctuations may occur during transport. Ensure that no moisture condenses in or on the device, by allowing the device to acclimate to the room temperature while turned off.

When sent, the device should be transported in the original packaging if possible. Otherwise, packaging should be selected that sufficiently protects the product from external mechanical influences. Such as cardboard filled with air cushioning.

20 Storage

INFORMATION

When not in use, store the operating panel according to the storage conditions. See chapter 19.

During storage, ensure that all protective covers (if available) are placed correctly, so that no contamination, foreign bodies or fluids enter the device.

21 Maintenance

> **INFORMATION**
>
> During maintenance as well as servicing, observe the safety instructions from chapter 2 Basic Safety Directives.

21.1 Service

This product was constructed for low-maintenance operation.

21.2 Repair

> **INFORMATION**
>
> In the event of a defect/repair, send the device with a detailed error description to the address listed at the beginning of this document.
>
> For transport conditions, see chapter 19 Transport/Storage.

22 Disposal

> **INFORMATION**
>
> Should you need to dispose of the device, the national regulations for disposal must be followed.
>
> The device appliance must not be disposed of as household waste.

Documentation Changes

Change date	Affected page(s)	Chapter	Note