

CP 312

S-DIAS CPU Module

Instruction Manual

Publisher: SIGMATEK GmbH & Co KG
A-5112 Lamprechtshausen
Tel.: +43/6274/4321
Fax: +43/6274/4321-18
Email: office@sigmatek.at
WWW.SIGMATEK-AUTOMATION.COM

Copyright © 2016
SIGMATEK GmbH & Co KG

Translation of the Original Instructions

All rights reserved. No part of this work may be reproduced, edited using an electronic system, duplicated or distributed in any form (print, photocopy, microfilm or in any other process) without the express permission.

We reserve the right to make changes in the content without notice. The SIGMATEK GmbH & Co KG is not responsible for technical or printing errors in the handbook and assumes no responsibility for damages that occur through use of this handbook.

S-DIAS CPU Module

CP 312

with 2 Ethernet

1 VARAN Out

1 USB Device

1 microSD

1 USB Host

1 CAN

The S-DIAS CP 312 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 6**
 - 1.1 Target Group/Purpose of this Operating Manual 6**
 - 1.2 Important Reference Documentation 6**
 - 1.3 Contents of Delivery 6**
- 2 Basic Safety Directives 7**
 - 2.1 Symbols Used 7**
 - 2.2 Disclaimer 9**
 - 2.3 General Safety Directives 10**
 - 2.4 Software/Training 11**
- 3 Standards and Directives 12**
 - 3.1 Directives 12**
 - 3.1.1 EU Conformity Declaration 12
- 4 Type Plate 13**
- 5 Technical Data 14**
 - 5.1 Performance Data 14**
 - 5.2 Standard Configuration 15**
 - 5.3 Electrical Requirements 16**
 - 5.3.1 Module Supply (Input) 16
 - 5.3.2 S-DIAS Bus Supply (Output) 16
 - 5.4 Miscellaneous 18**
 - 5.5 Environmental Conditions 18**

6	Mechanical Dimensions.....	19
7	Connector Layout.....	20
7.1	Status LEDs Interface Part.....	21
7.2	Status LEDs Supply Part.....	22
7.3	Connectors	23
7.4	Applicable Connector Cables	25
7.5	Applicable Connectors.....	26
7.6	Label Field	27
8	CAN Bus Setup.....	28
8.1	CAN Bus Station Number	28
8.2	Number of CAN Bus Participants.....	28
8.3	CAN Bus Data Transfer Rate	28
8.4	CAN Bus Termination.....	29
9	Buffer Battery	30
11	Storage Media.....	31
12	Process Diagram	32
13	Status and Error Messages	33
14	Application Exceptions.....	41
14.1	The File System Does Not Support Safe Writing via SRAM...	41
14.2	Data Breakpoint	41

15 Wiring Guidelines42

15.1 Shielding.....43

15.2 ESD Protection..... 43

16 Strain Relief.....44

17 Recommended Shielding for VARAN.....45

**17.1 Wiring from the Control Cabinet to an External VARAN
 Component..... 46**

17.2 Wiring Outside of the Control Cabinet 47

17.3 Shielding for Wiring Within the Control Cabinet 48

17.4 Connecting Noise Generating Components 49

17.5 Shielding Between Two Control Cabinets 50

18 Working with and on the CP 31250

19 Assembly/Installation51

19.1 Check Contents of Delivery..... 51

19.2 Mounting..... 52

20 Transport/Storage.....54

21 Storage54

22 Maintenance55

22.1 Service 55

22.2 Repair..... 55

23 Disposal 55

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 312

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 essentiel.

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 312 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		
Serial No.	SIGMATEK GMBH & CO KG Sigmatekstrasse 1 A-5112 LAMPRECHTSHAUSEN		
Article Number	Product Name	Short Name	

Exemplary nameplate (symbol image)

	HW: 1.00		
	SW: 01.00.000		
	Safety Version: S01.00.00		
12345678	SIGMATEK GMBH & CO KG Sigmatekstrasse 1 A-5112 LAMPRECHTSHAUSEN		
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 Dual Core
Processor cores	2 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	4 GB microSD card (3D-TLC pSLC technology) ²⁾
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⁾ Attention: When programming (with LASAL) on multicore CPUs, particular focus must be placed on thread security!

²⁾ 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	+18-27 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 1.1 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



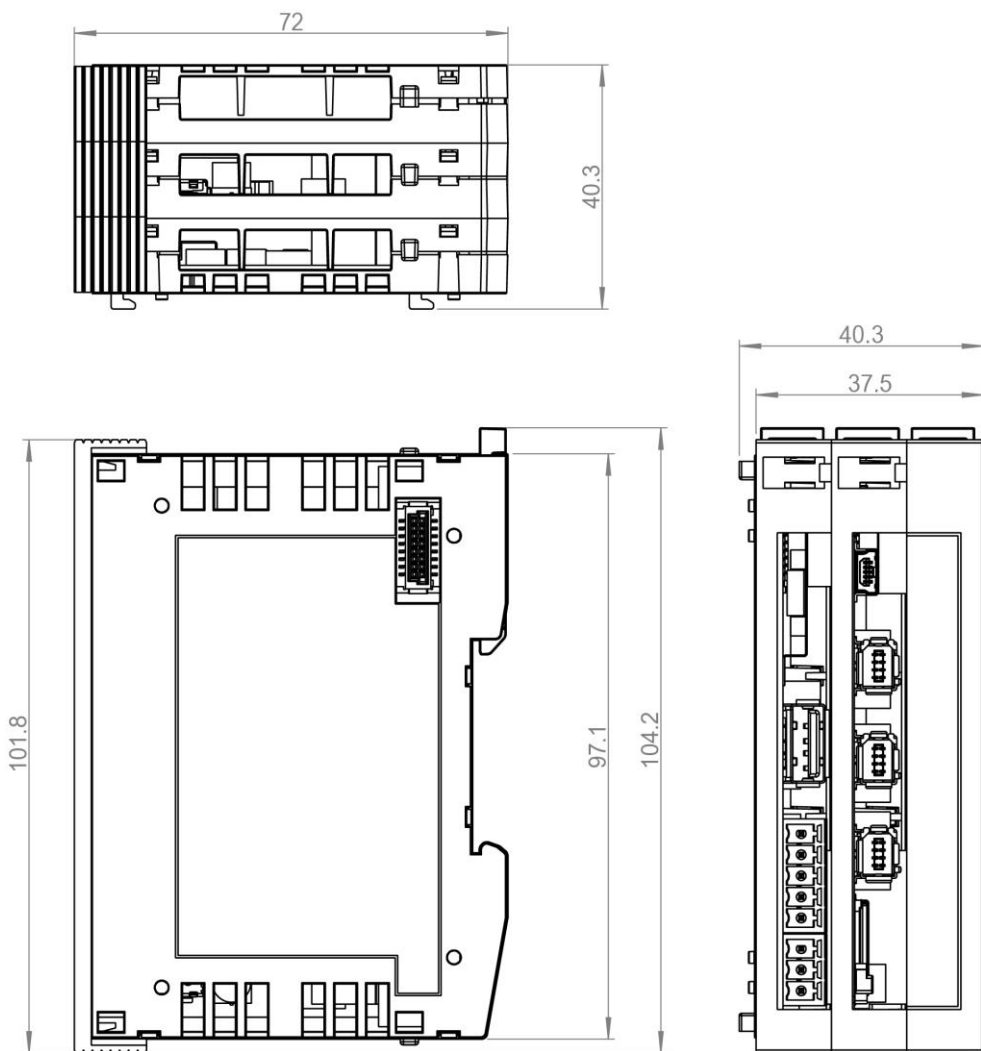
5.4 Miscellaneous

Article number	20-004-312
Operating system	Salamander
Project backup	internally on the microSD card
Standard	UL 508 (E247993)
Approbations	UL, cUL, CE, UKCA

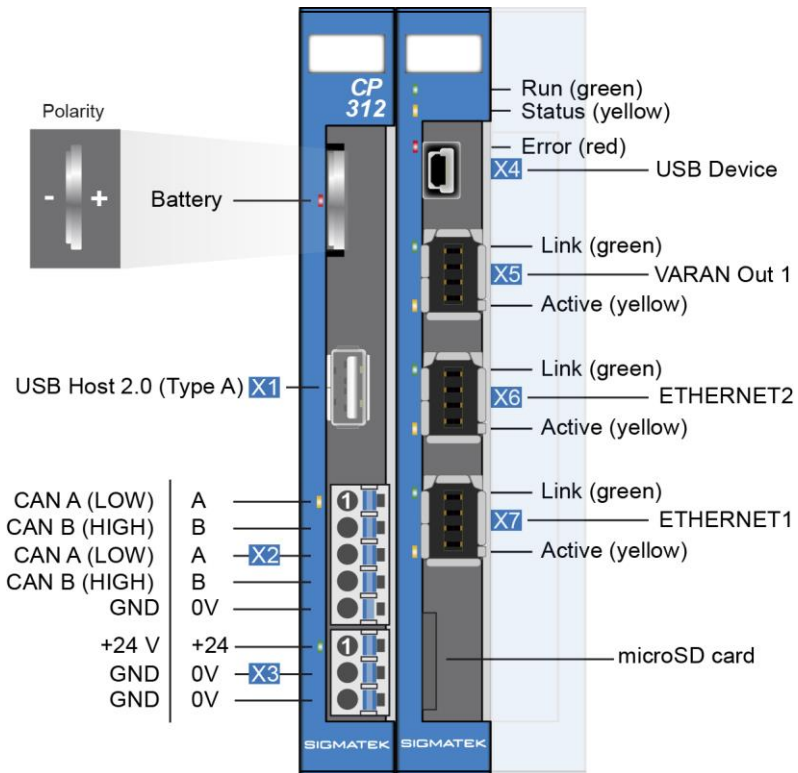
5.5 Environmental Conditions

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	
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	IP20

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

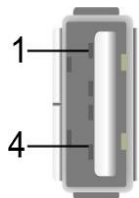
¹⁾ If the microSD card is not properly inserted or if data (operating system, application) is faulty, the RUN, STATUS and Error LEDs do not light up after switching on the power supply. The DC OK LED lights up permanently.

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

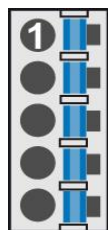
7.3 Connectors

X1: USB Host 2.0 (Type A)



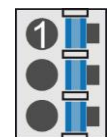
Pin	Function
1	+5 V
2	D-
3	D+
4	GND

X2: CAN Bus



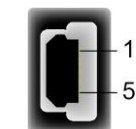
Pin	Function
1	CAN A (LOW)
2	CAN B (HIGH)
3	CAN A (LOW)
4	CAN B (HIGH)
5	GND

X3: Power Supply



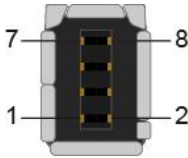
Pin	Function
1	+24 V supply
2	GND
3	GND

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

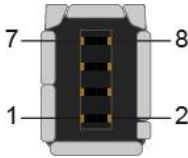
X5: VARAN-Out (Industrial Mini I/O)



Pin	Function
1	Tx/Rx+
2	Tx/Rx-
3	Rx/Tx+
4-5	n.c.
6	Rx/Tx-
7-8	n.c.

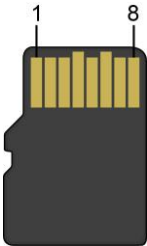
n.c. = do not use

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 4 Gbyte EDGE2 microSD card: 12-630-105

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)

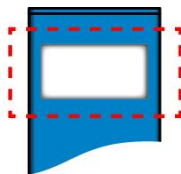


INFORMATION



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 $120\ \Omega$, 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.

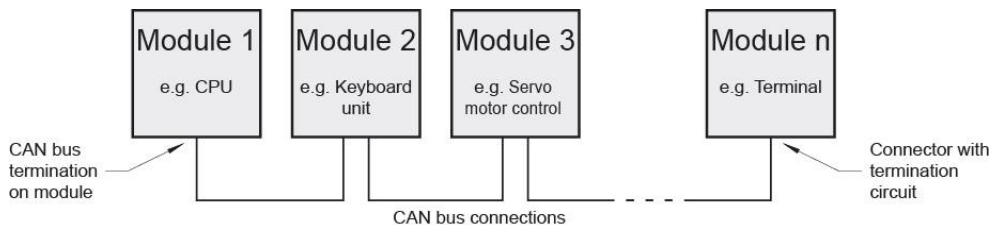
Value	Baud Rate	maximum length
00	615 Kbits/s	60 m
01	500 kbits/s	80 m
02	250 Kbits/s	160 m
03	125 Kbits/s	320 m
04	100 Kbits/s	400 m
05	50 Kbits/s	800 m
06	20 kbits/s	1200 m
07	1 Mbits/s	30 m

These values are valid for the following cable: $120\ \Omega$, Twisted Pair.

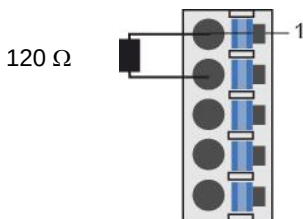
Note: For the CAN bus protocol: 1 kbits/s = 1 kBaud

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 312 is one of the end modules, it can be terminated by placing a $120\ \Omega$ resistor between CAN A (LOW) and CAN B (HIGH).



9 Buffer Battery

The exchangeable buffer battery ensures that programs and data in the expanded memory (SRAM) as well as the clock time (RTC) of the CPU module (e.g. CP 312) 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

11 Storage Media

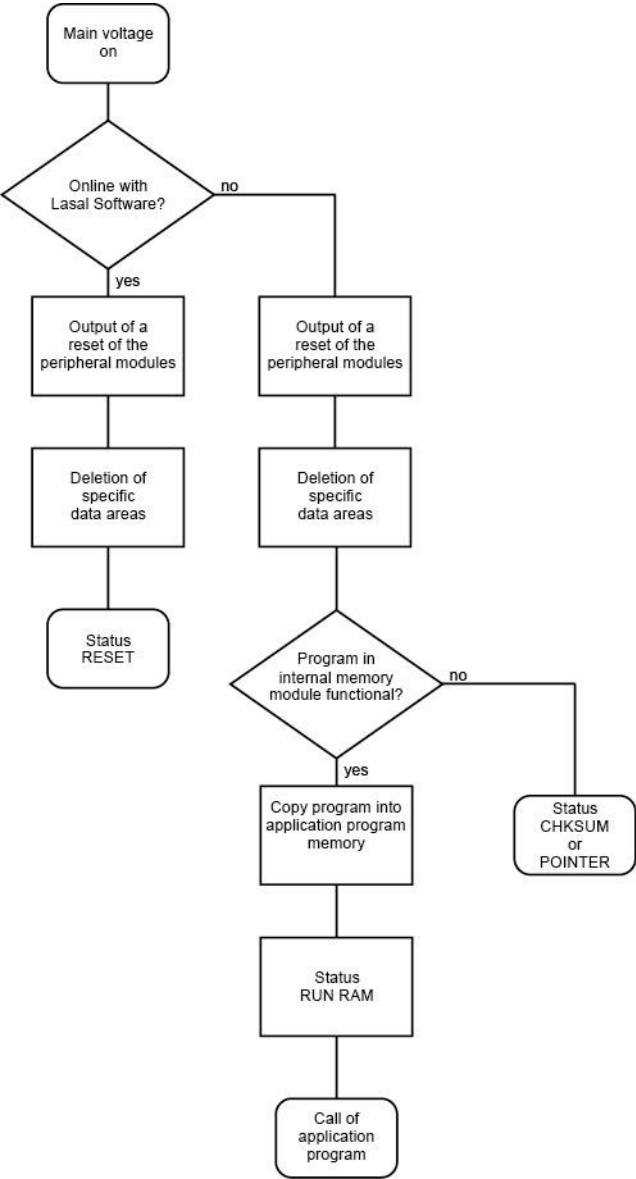
INFORMATION



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.

12 Process Diagram



13 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 but 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	PRIVILEGED 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 for the 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		

14 Application Exceptions

14.1 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.

14.2 Data Breakpoint

This CPU does not support the data breakpoint feature.

15 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!

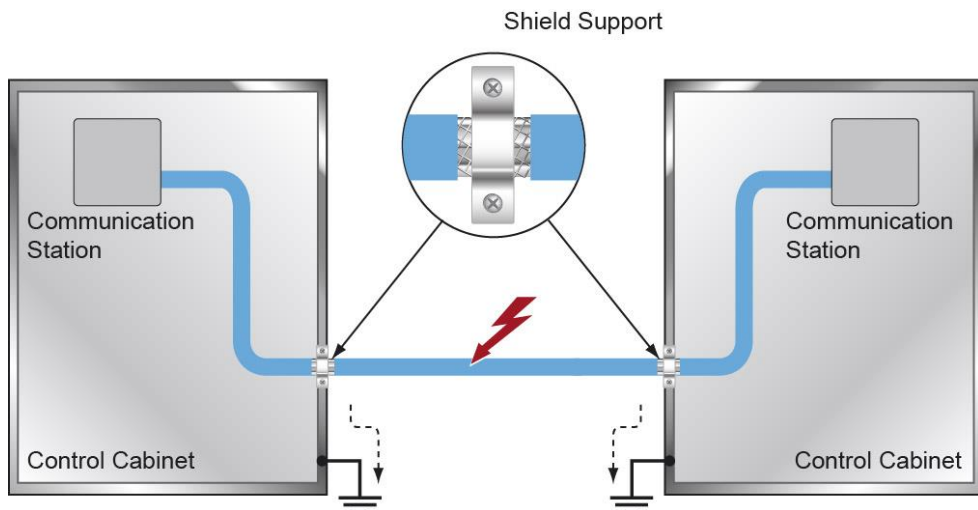
15.1 Shielding

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 312 over a large surface (cable grommets, grounding clamps)!

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

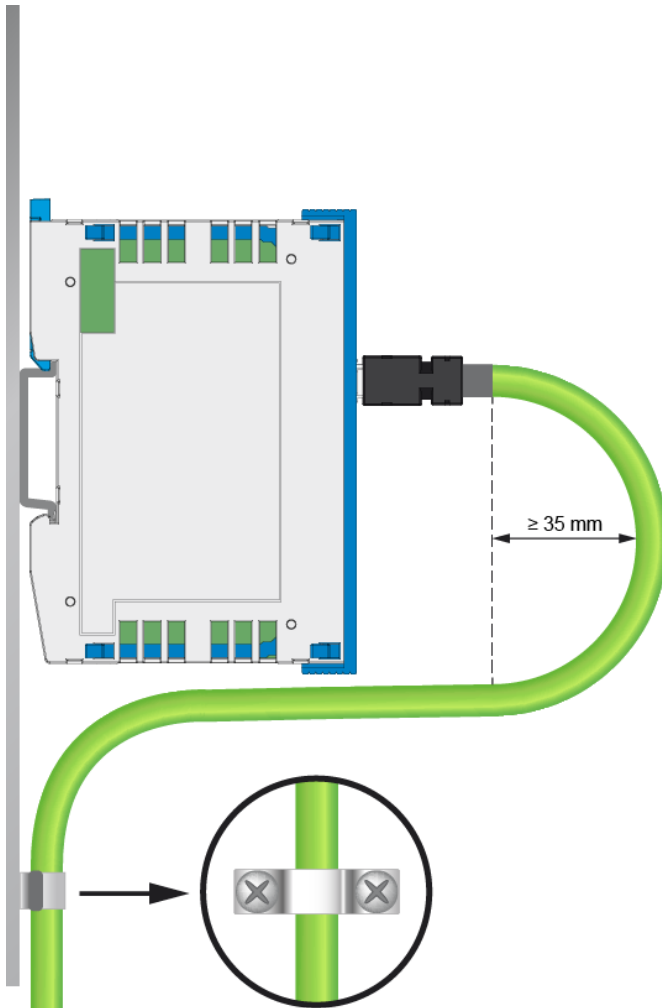
To avoid compensating currents from the PE, which flow over the shielding the conductors, it is recommended that the system components have low-ohm and low impedance connections to one another.



15.2 ESD Protection

Before any device is connected to or disconnected from the CP 312, the potential with ground must be equalized (by touching the control cabinet or ground terminal). This will allow the dissipation of electrostatic loads (caused by clothing/shoes).

16 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!

17 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.

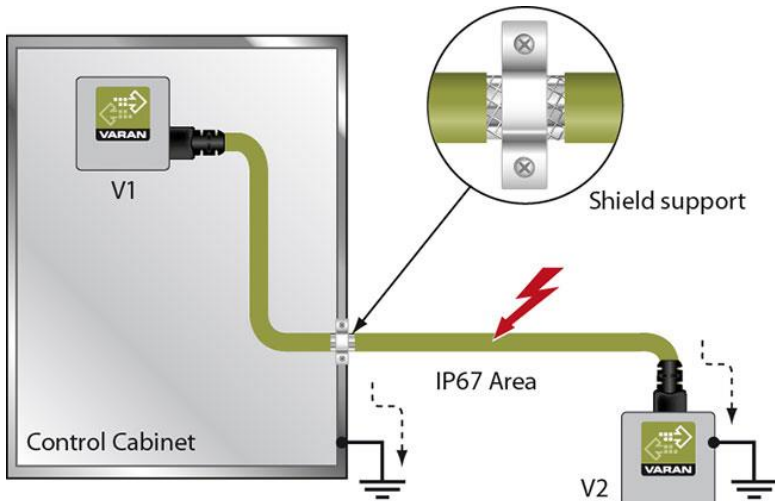
INFORMATION



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

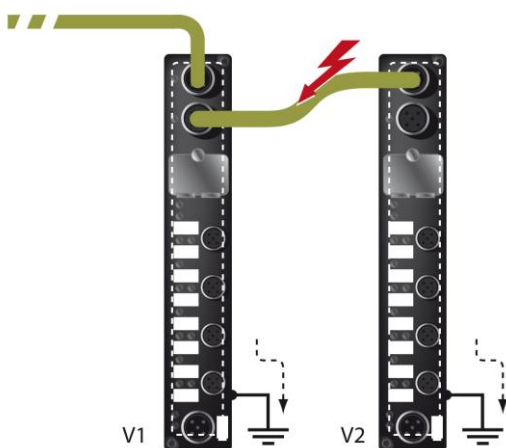
17.1 Wiring from the Control Cabinet to an External VARAN Component

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.



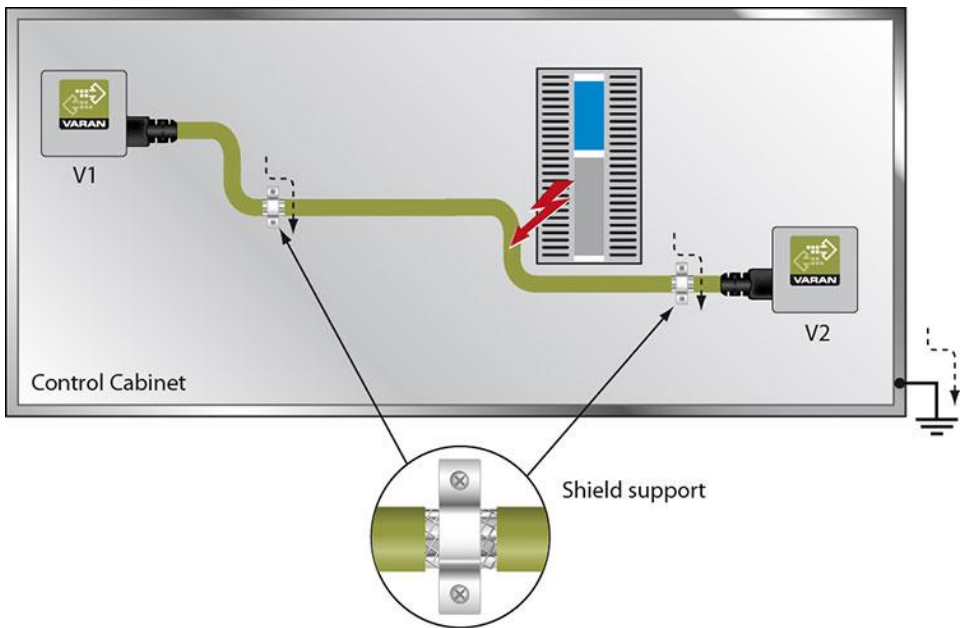
17.2 Wiring Outside of the Control Cabinet

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.



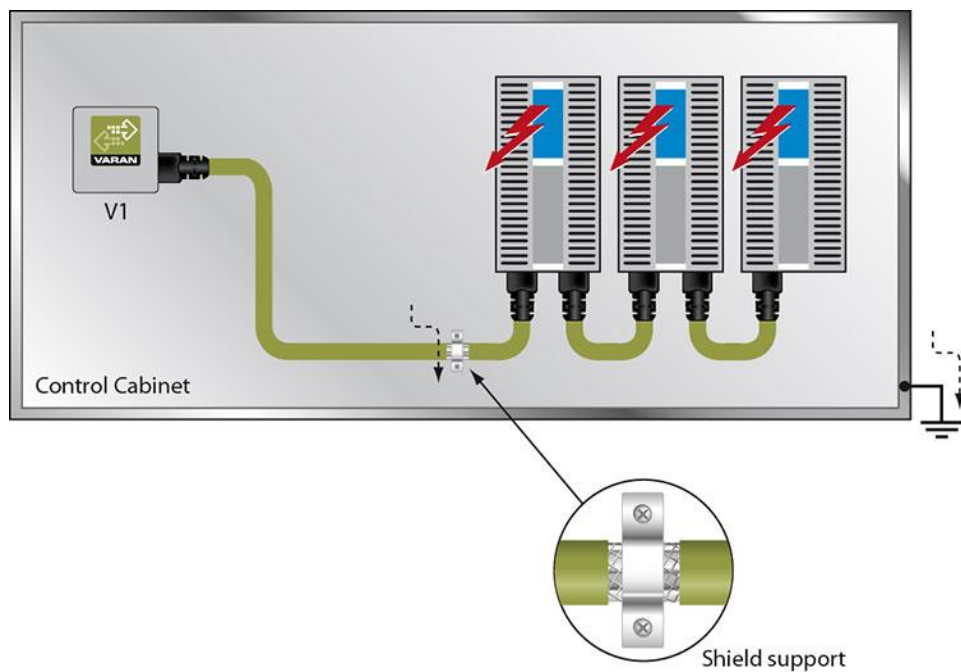
17.3 Shielding for Wiring Within the Control Cabinet

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.



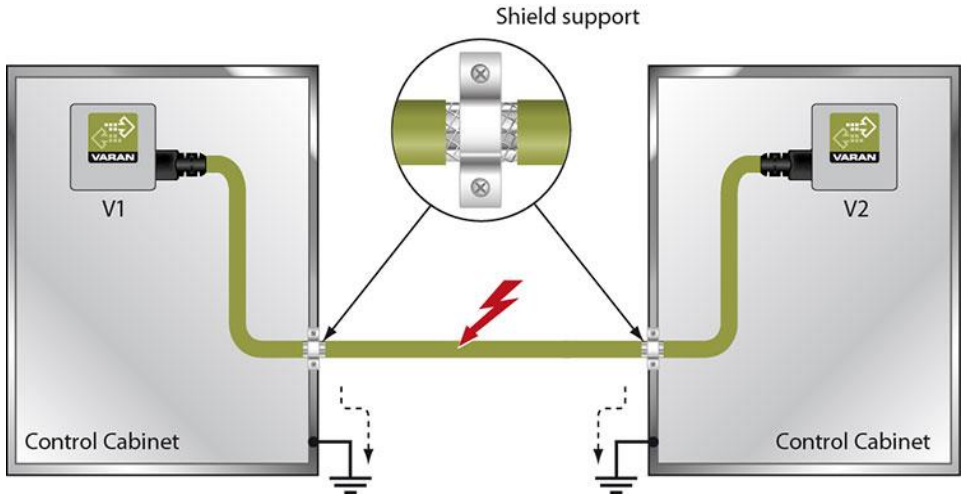
17.4 Connecting Noise Generating Components

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).



17.5 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.



18 Working with and on the CP 312

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.)

19 Assembly/Installation

19.1 Check Contents of Delivery

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

INFORMATION

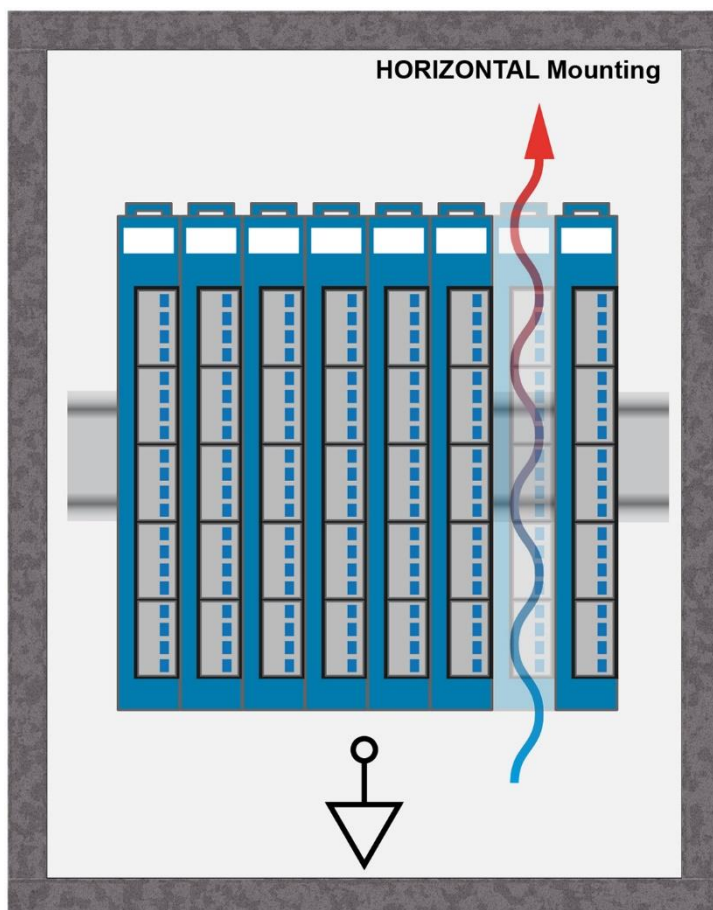


On receipt and before initial use, check the device for damage. If the device is damaged, contact our customer service and do not install the device in your system.

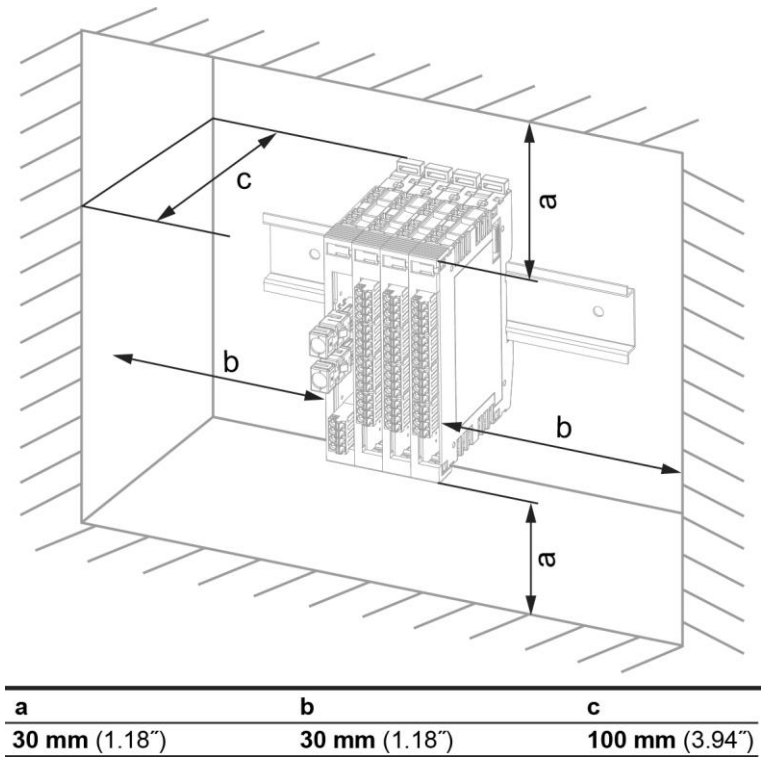
Damaged components can disrupt or damage the system.

19.2 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 ... distances in mm (inches)

20 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.

21 Storage

INFORMATION



When not in use, store the operating panel according to the storage conditions. See chapter 20.

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

22 Maintenance

INFORMATION



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

22.1 Service

This product was constructed for low-maintenance operation.

22.2 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 20 Transport/Storage.

23 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
13.09.2016	13	3.3 Connectors	Note microSD
08.11.2016	27	9 Status and Error Messages	Error code 75 added
30.11.2016	18	5 Buffer Battery	Battery monitoring added
15.12.2016	11	3.1 Status LEDs Interface Part	Run / green / blinks extended
17.08.2017	8	1.5 Environmental Conditions	Pollution Degree
	15	3.5 Applicable Connectors	Sleeve length added Added info regarding ultrasonically welded strands
03.10.2017	5	1.2 Standard Configuration	IP and subnet changed
	14	3.4 Applicable Connector Cables	RJ45 on industrial Mini I/O Type 1, drag chain capable: 50 m cable added
18.10.2017	17	3.6 Label Field	Added chapter
	43	15 Mounting	Graphic replaced
17.05.2018	18	4.2 Number of CAN Bus Participants	Number adjusted
19.06.2018	7	1.3.1 Module Supply	Note UL conditions
05.09.2018	9	1.4 Miscellaneous	Operating System added
20.09.2018		3 Connector Layout	Note added
25.02.2019	20	5 Buffer Battery	Text corrected
26.11.2019	7	1.3.2 S-DIAS Bus Supply (Output)	24 V added
29.05.2020	12	3.1 Status LEDs Interface Part	Text + footnote added
04.11.2020	43	15 Mounting	Expansion functional ground connection
17.11.2020	5	1.1 Performance Data	Footnote cores (programming) added
17.03.2022		1.3.1 Module Supply	Maximum Supply Voltage corrected
		1.5 Environmental Conditions	Maximum Environmental Temperature corrected
22.04.2022		1.5 Environmental Conditions	Environmental temperature from 50 to 55
06.12.2022	9	1.4 Miscellaneous	UKCA conformity

20.04.2023	11	3 Connector Layout	Info box corrected
26.07.2023		Document	General chapters added, design
13.03.2024	14	5.1 Performance Data	microSD card updated
	20	7 Connector Layout	