SIGMATEK

CP 833

S-DIAS CPU Unit

Instruction Manual

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Translation of the Original Instructions

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S-DIAS CPU Unit CP 833

The S-DIAS CPU unit CP 833 is equipped with an Intel® Atom x6413E. The CPU unit is used to control S-DIAS modules and has various interface connections.

Status LEDs directly on the CPU unit provide current CPU status information.

The CPU unit is mounted directly on the DIN rail.

Table of 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 9
2.4 Software/Training 10
3 Standards and Directives **11**
3.1 Directives 11
3.1.1 EU Conformity Declaration 11
4 Type Plate **12**
5 Technical Data **13**
5.1 Performance Data 13
5.2 Electrical Requirements 14
5.3 Temperature Sensors 15
5.4 Default Configuration 16
5.5 Environmental Conditions 17
5.6 Miscellaneous 17
6 Interfaces **18**
6.1 Connector Layout 18
6.1.1 X1: Supply, X2: CAN-Bus (10-pin Phoenix RM 3.5) 19
6.1.2 X3: EtherCAT Drive Controller (RJ45) 20
6.1.3 X4: Ethernet (10/100/1000 Mbit/s) (RJ45) 20
6.1.4 X5, X6: VARAN 1/2 (RJ45) 21

6.1.5 X7, X8: USB 2.0, Host (Type A) 21
6.1.6 X9: USB 3.2 Gen 1, Host (Type C, 5 GBit/s) 22
6.1.7 X11: Fan (4-pin Phoenix RM 3.5) (connection of optional fan module) 22
6.2 Applicable Connectors 23
6.3 Status LEDs 24
6.4 7-Segment 25
7 Mechanical Dimensions 26
7.1 Version without Fan 26
7.2 Version with Fan 27
8 Assembly/Installation 28
8.1 Check Contents of Delivery 28
8.2 Installation 28
8.3 Mounting Instructions 29
8.3.1 Mounting 31
8.3.2 Disassembly 32
8.4 Mounting Material 33
8.5 Cooling 34
9 Wiring 35
9.1 Grounding 35
9.2 Shielding 36
9.3 ESD Protection 36
9.4 USB Interface 36
9.5 CAN Bus 37
9.5.1 CAN Bus Station Number 37
9.5.2 Number of CAN Bus Participants 37
9.5.3 CAN Bus Data Transfer Rate 37
9.5.4 CAN Bus Termination 38

9.6 Recommended Shielding for VARAN 38
9.6.1 Wiring from the Control Cabinet to an External VARAN Component 39
9.6.2 Wiring Outside of the Control Cabinet 40
9.6.3 Shielding for Wiring Within the Control Cabinet 41
9.6.4 Connecting Noise Generating Components 42
9.6.5 Shielding Between Two Control Cabinets 42
10 Operation/Start-up 43
10.1 Configuration 43
11 Process Diagram 45
12 Status and Error Messages 46
13 Transport/Storage 56
14 Storage 57
15 Maintenance 58
15.1 Service 58
15.2 Exchanging the SDD 58
15.3 Fan Replacement 59
15.4 Repair 60
16 Buffer Battery 61
16.1 Data Retention Battery Change 62
16.2 Exchanging the Battery 62
17 EtherCAT Feature Overview 63
18 Disposal 66
19 Accessories 67
19.1 Battery 67
19.2 Replacement Fan 67
20 Application Information 68
20.1 Storage Media 68

20.2 Screensaver to prevent Display Burn-In 68

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

- HW IP Address Settings

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

1.3 Contents of Delivery

1x CP 833
1x Mating connectors
2x mounting screws

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.

WARNING

Hot Surfaces

Surfaces chaudes

CAUTION

Danger for ESD-sensitive components.

Les signes de danger pour les composants sensibles aux décharges électrostatiques.

INFORMATION

INFORMATION

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

2.2 Disclaimer

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.

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.

INFORMATION

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 !

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

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

INFORMATION

Hardware and software features (application-specific data) can be found in chapter20 Application Information.

2.4 Software/Training

The application is created with the software LASAL CLASS 2 and LASAL SCREEN Editor / VISUDesigner (HTML5).

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

CE

EU Declaration of Conformity

The product CP 833 conforms to the following European directives:

- 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. They can be found in the download area of the respective product.

4 Type Plate

The type plate provides information about the product's features. The type plate shown here is only an example.

HW: Hardware version
FS: Safety version number
FW: Firmware version
LD: Logic device version
QR-Code: Serial number

5 Technical Data

5.1 Performance Data

Processor	Intel® Atom x6413E
Processor cores	4[1)]
Processor clock	1.5 GHz
Internal program and data memory (RAM)	4-Gbyte DDR4, 3200 MHz
Internal remnant data memory	1-Mbyte MRAM
Internal storage device	128-Gbyte M.2 SATA SSD
Optional memory expansion	no
Graphic	Intel® UHD Graphics
Addressable I/O/P modules	VARAN Bus: 65.280 CAN Bus: > 100 S-DIAS Bus: 64
Interfaces	1x EtherCAT Drive Controller (100) 1x Ethernet (10/100/1000) 2x VARAN Out Manager 1x CAN 2x USB 2.0 Type A 1x USB 3.2 Gen 1 Type C (only host) 1x S-DIAS
Internal interfaces and devices	M.2 Slot 2280 Key M (SATA 3 / PCIe 3.0 x1, occupied by main memory) Expansion module slot
EtherCAT Drive Controller	Class A EtherCAT Drive Controller with distributed clock
Controls	2x button (SET/RESET)
Status LEDs	14x Status LEDs 2x 7-Segment Displays
Real-time clock	yes (battery buffered)
Temperature sensors	7 (2x ambient, 5x core temperature sensors)
Input voltage measurement	yes

1) Attention: When programming on multi-core CPUs (with LASAL), particular focus must be placed on thread security!

Cooling	passive

5.2 Electrical Requirements

Supply voltage	+24 V DC ±20 % (SELV)	
Protection class	III	
Current consumption of (+24 V) power supply	typically 0.7 A (with no external devices connected)	maximum 3.5 A (with external devices connected)
Inrush current without current-limiting supply	maximum 45 A (for 153 µs, load-dependent)	
Inrush current with 24 V/10 A fixed voltage supply	maximum 1.5 A (for 6 ms, load-dependent)	
USB host current load (Type A & Type C)	maximum 0.9 A per USB	
Available current for S-DIAS (+5 V)	maximum 1.6 A	
Available current for S-DIAS (+24 V)	maximum 1.6 A	

INFORMATION

If several S-DIAS modules are connected, the total current of the modules used must be determined and checked.

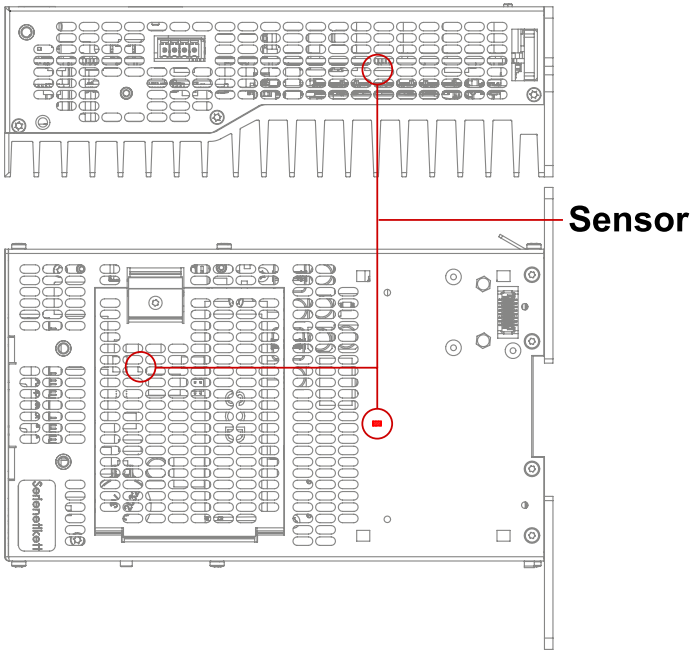
The total current of the +24 V supply/ +5 V supply on the S-DIAS bus cannot exceed 1.6 A!

The specification for the current can be found in the module-specific documentation under "Electrical Requirements".

5.3 Temperature Sensors

There are seven temperature sensors built into the CPU unit, which can be read via the HW class. In the temperature sensors, the following temperatures cannot be exceeded:

- Core temperature FPGA (max. 100 °C)
- Core temperature CPU Core (max. 100 °C)
- Environment temperature CPU board (max. 85 °C)
- Environment temperature interfaces (max. 85 °C)



Position of the 2 ambient temperature sensors

5.4 Default Configuration

Ethernet 1	IP: 10.10.150.1 Subnetmask: 255.0.0.0
CAN Bus	Station: 00 Baudrate: 01 = 500 kBaud
VARAN Out 1	always enabled, cannot be disabled
VARAN Out 2	initialized as second manager by default, configurable via autoexec.lsl as second port for first manager

INFORMATION

Problems can arise if a control is connected to an IP network, which contains modules that are not running with 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.

INFORMATION

The second VARAN manager (VARAN Out 2) is activated ex works in the "autoexec.lsl".
If the VARAN Out 2 port is used as the second port for the first VARAN manager, the "SET MULTI_VM ON" command must be deleted from the "autoexec.lsl".
The Multicore Objects are also activated ex works.
These can be deactivated by removing the "SET MULTICOREOBJS 1" command.

5.5 Environmental Conditions

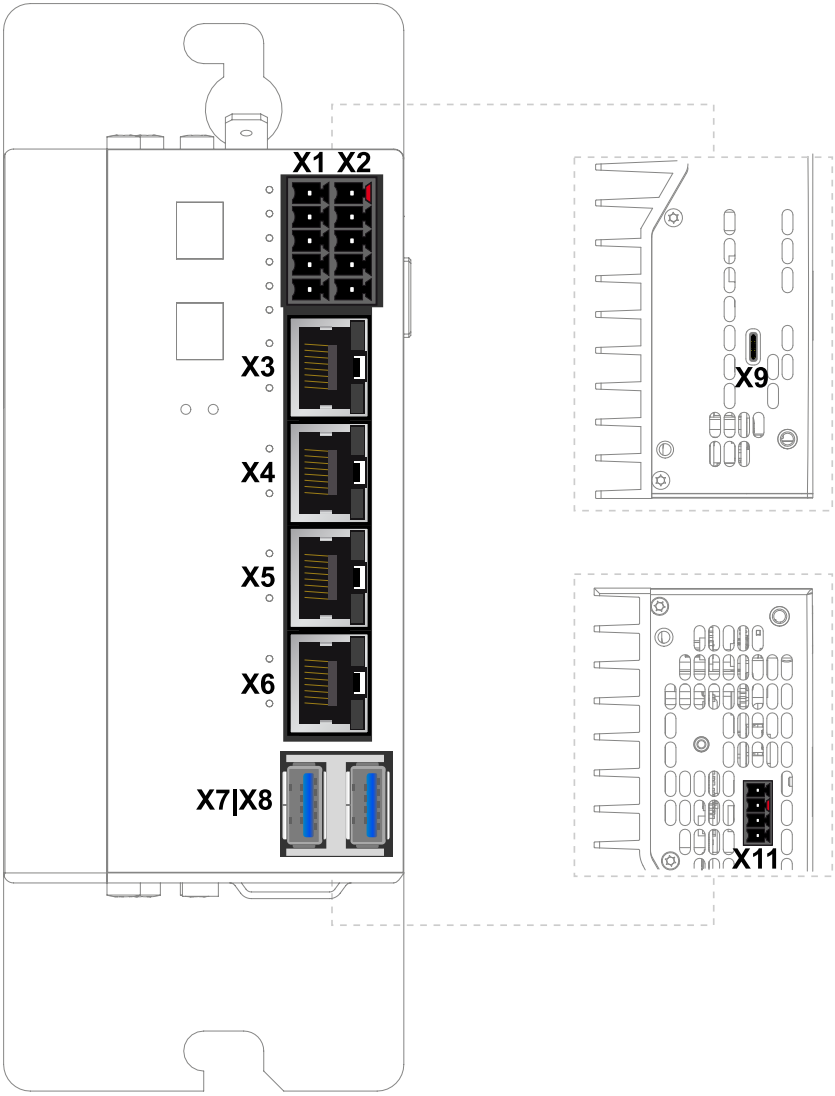
Storage temperature	-10 … +70 °C	
Environmental temperature	UL: 0-50 °C (CE: 65 °C with opt. fan module)	
Humidity	10-95 %, non-condensing	
Installation altitude above sea level	0-2000 m without derating > 2000 m up to a maximum of 5000 m with derating of the maximum environmental temperature by 0.5 °C per 100 m	
Operating conditions	pollution degree 2	
Noise emissions	≤ 70 dB	
EMC resistance	EN 61000-6-2 (industrial area)	
EMC noise generation	EN 61000-6-4 (industrial area) EN 61000-6-3 (residential 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 (147.15 m/s²)
Protection type	EN 60529/NEMA 250	IP20/Type1 (not evaluated by UL)

5.6 Miscellaneous

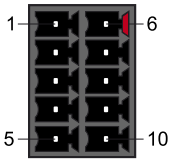
Article number	20-004-833	
Operating system	Salamander	
Default IP address	10.10.150.1	
Printed circuit board coating	no	
Approvals	CE	yes
	UL	cULus (E247993)
	Functional Safety	no
	UKCA	no

6 Interfaces

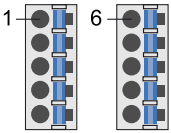
6.1 Connector Layout



6.1.1 X1: Supply, X2: CAN-Bus (10-pin Phoenix RM 3.5)



Pin	Function
1	+24 V (supply voltage)
2	+24 V (supply voltage)
3	GND
4	GND
5	GND
6	CAN A (LOW) -> coding
7	CAN B (HIGH)
8	CAN A (CAN LOW)
9	CAN B (HIGH)
10	GND



INFORMATION

X1 Supply, bridge

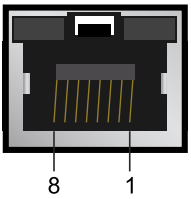
→ The connections for the +24 V supply (X1: Pin 1 and Pin 2) or the GND supply (X1: Pin 3, 4, 5) are bridged internally. To power the module, only one connection to a +24 V pin (pin 1 or 2) and a GND pin (3, 4 or 5) is required. The bridged connections may be used for further looping if the total load (including CP 833) of 8 A is not exceeded.

INFORMATION

CAN Bus Termination

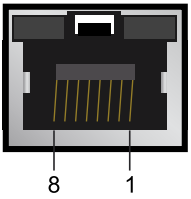
→ The resistor can be switched on or off through a hardware class.

6.1.2 X3: EtherCAT Drive Controller (RJ45)



Pin	Function
1	DA+
2	DA-
3	DB+
4	DC+
5	DC-
6	DB-
7	DD+
8	DD-

6.1.3 X4: Ethernet (10/100/1000 Mbit/s) (RJ45)



Pin	Function
1	DA+
2	DA-
3	DB+
4	DC+
5	DC-
6	DB-
7	DD+
8	DD-

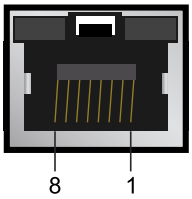
INFORMATION

Only for use in LAN, not for connection to telecommunication circuits.

INFORMATION

Problems can arise if a control is connected to an IP network, which contains modules that are not running with 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.

6.1.4 X5, X6: VARAN 1/2 (RJ45)

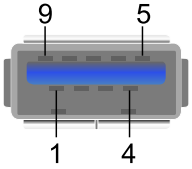


Pin	Function
1	Tx+
2	Tx-
3	Rx+
4	n.c.
5	n.c.
6	Rx-
7	n.c.
8	n.c.
n.c. = do not use	

INFORMATION

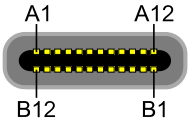
Only for use in LAN, not for connection to telecommunication circuits.

6.1.5 X7, X8: USB 2.0, Host (Type A)



Pin	Function
1	+5 V, $I_{out,max}$ = 900 mA
2	D-
3	D+
4	GND
5	n.c.
6	n.c.
7	GND_DRAIN
8	n.c.
9	n.c.
n.c. = do not use	

6.1.6 X9: USB 3.2 Gen 1, Host (Type C, 5 GBit/s)

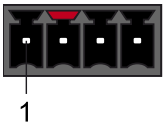


Pin	Function
A1, B1	GND
A2, B2	SSTx+
A3, B3	SSTx-
A4, B4	VBUS
A5, B5	CC1, CC2
A6, B6	USB2.0 D+
A7, B7	USB2.0 D-
A8, B8	SBU1, SBU2
A9, B9	VBUS
A10, B10	SSRx-
A11, B11	SSRx+
A12, B12	GND

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. This may cause the device to malfunction. It is also possible that these devices will not be detected at the USB port or function correctly. It is therefore recommended that every USB stick or USB supply be tested before actual use.

6.1.7 X11: Fan (4-pin Phoenix RM 3.5) (connection of optional fan module)



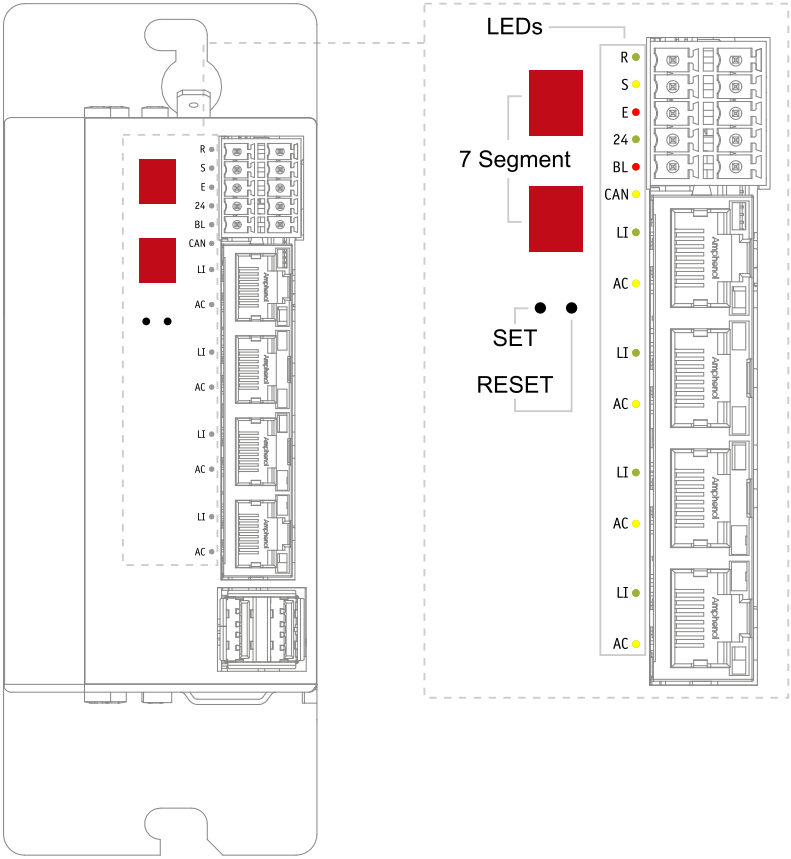
Pin	Function
1	GND
2	+12 V DC (max. 500 mA)
3	Tacho
4	PWM

6.2 Applicable Connectors

X1, X2: 5-pin Phoenix connector with spring terminal FK-MCP 1.5/ 5-ST-3.5 (included with delivery)
X3, X4: 8-pin RJ45 (not included with delivery)
X5, X6: 8-pin RJ45 (not included with delivery)
X7, X8: USB Type A (not included in delivery)
X9: USB Type C (not included in delivery)

Use copper cables (Cu) rated for at least 60 °C for wiring the module.

6.3 Status LEDs



Status	Color	Status	Description
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)
		OFF	when an error or reset occurs
		can be set from the application (ON, BLINKING, OFF)	

Status	Color	Status	Description
Status	yellow	OFF	during start process during RUN status (application running) when an error or reset occurs
		can be set from the application (ON, BLINKING, OFF)	
Error	red	ON	when error occurs
		BLINKS	when an error or reset occurs
		OFF	during start process during RUN status (application running)
		can be set from the application (ON, BLINKING, OFF)	
LI EtherCAT Link	green	ON	connection between the two PHYs made
AC EtherCAT Active	yellow	ON	data is exchanged over the EtherCAT bus
LI Ethernet/VARAN Link	green	ON	connection between the two PHYs made
AC Ethernet/VARAN Active	yellow	ON	data is exchanged over the Ethernet bus
Battery **L**ow	red	ON	battery is empty and should be replaced as soon as possible
CAN active	yellow	BLINKS	data is being exchanged
24 DC OK	green	ON	Module is supplied with a voltage > 19.2 V

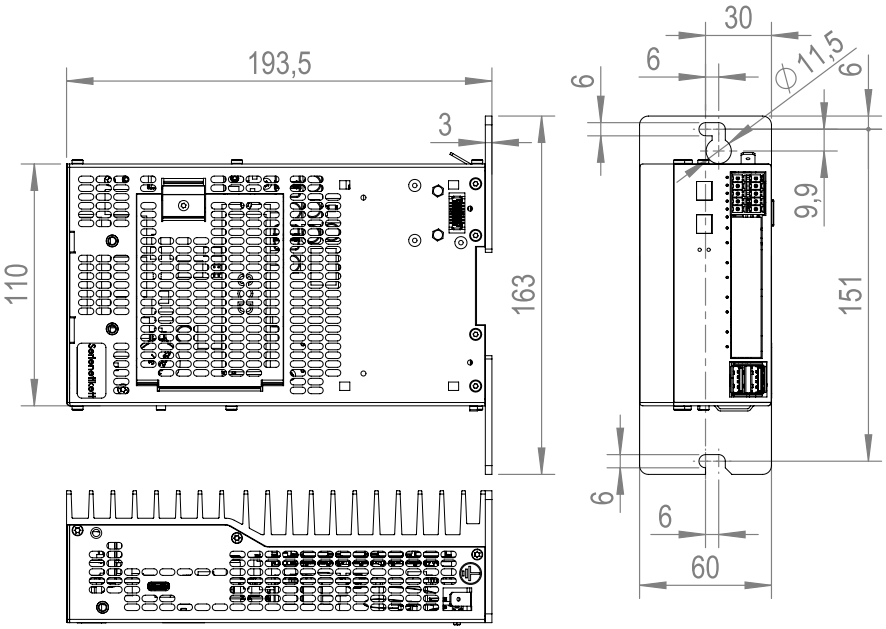
6.4 7-Segment

The CPU CP 833 has a 2-digit decimal display (7-segment display) for the following functions:

- During configuration, the parameters are shown on the display.
- During the startup process the postcodes of the BIOS are output.
- If an error occurs while running the program or no valid user program is found, the display shows an error message (the first number is on top and the second is on the bottom). Thereby, "Er" (= Error) and the error code are alternatingly displayed. The same error code is shown in the LASAL status line.
- While running the program, the display can be used to show digits using the system variable “_cpuDisplay”. Valid values are 0 to 255; values over 99 are truncated, only the last two numbers are displayed (e.g. "123" is displayed as "23").

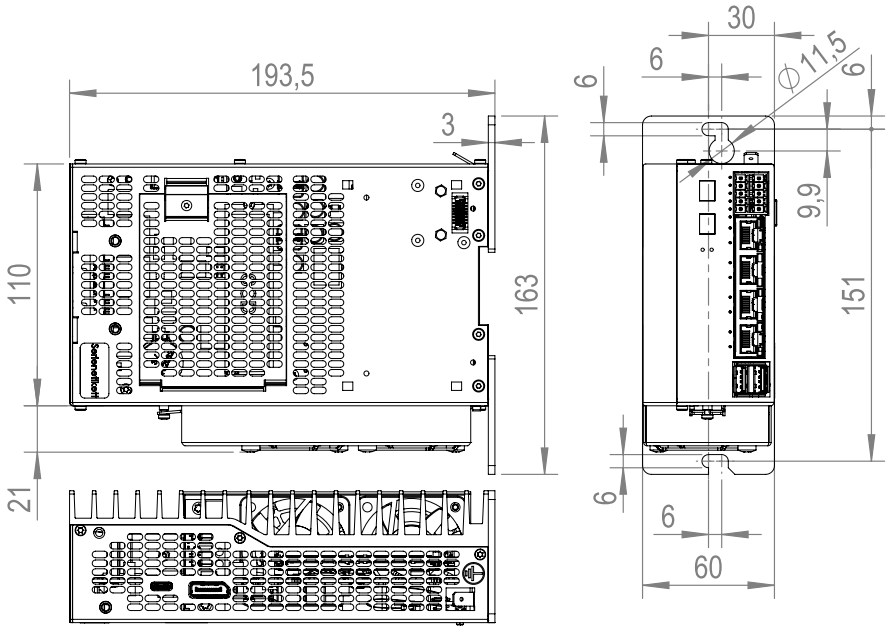
7 Mechanical Dimensions

7.1 Version without Fan



Dimensions	60 x 110 x 193.5 mm (W x H x D)
Weight	1.35 kg

7.2 Version with Fan



Dimensions	60 x 131 x 193.5 mm (W x H x D)
Weight	1.51 kg

8 Assembly/Installation

8.1 Check Contents of Delivery

Ensure that the contents of the delivery are complete and intact. See chapter 1.3 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.

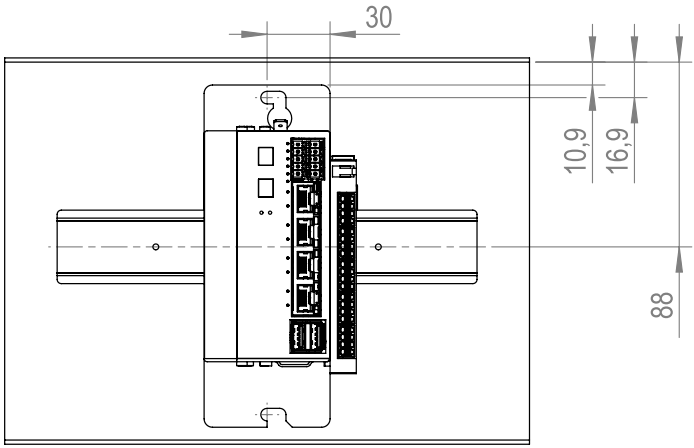
Damaged components can disrupt or damage the system.

8.2 Installation

The device's power loss can reach up to 25 Watts. To ensure the necessary air circulation for cooling, the mounting instructions must be followed!

8.3 Mounting Instructions

The CP 833 is hung onto a DIN rail. The CP 833 can also be mounted in other positions using the optimal mounting angle. Only vertical mounting is allowed.



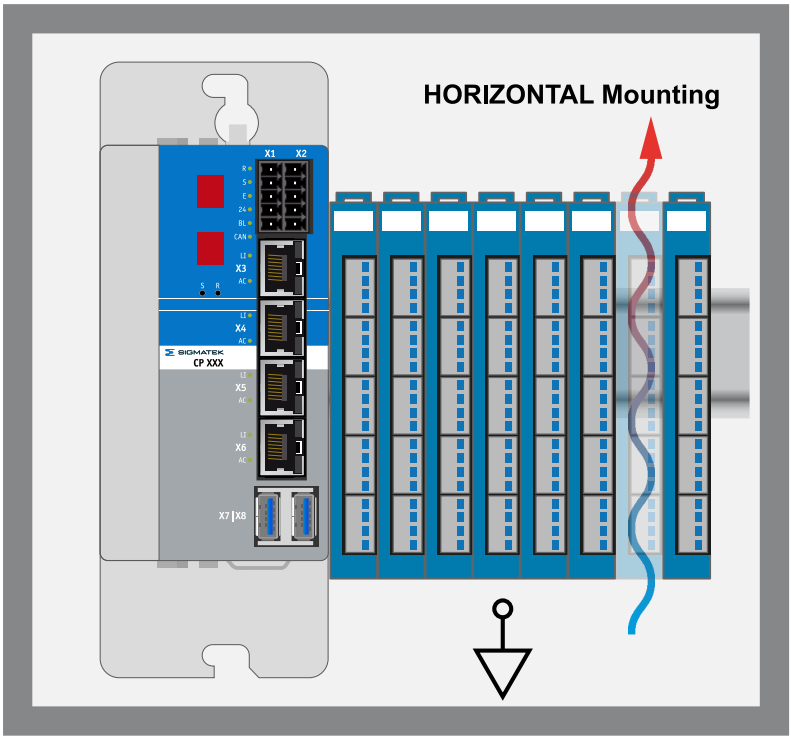
To mount the CPU unit, a DIN rail is required. The DIN rail must establish a conductive connection with the back wall of the control cabinet. The individual S-DIAS modules are mounted on the DIN rail as a block and secured with latches.

The grounding is done either by screws on the control cabinet wall or by the grounding lug.

INFORMATION

CP with S-DIAS Modules

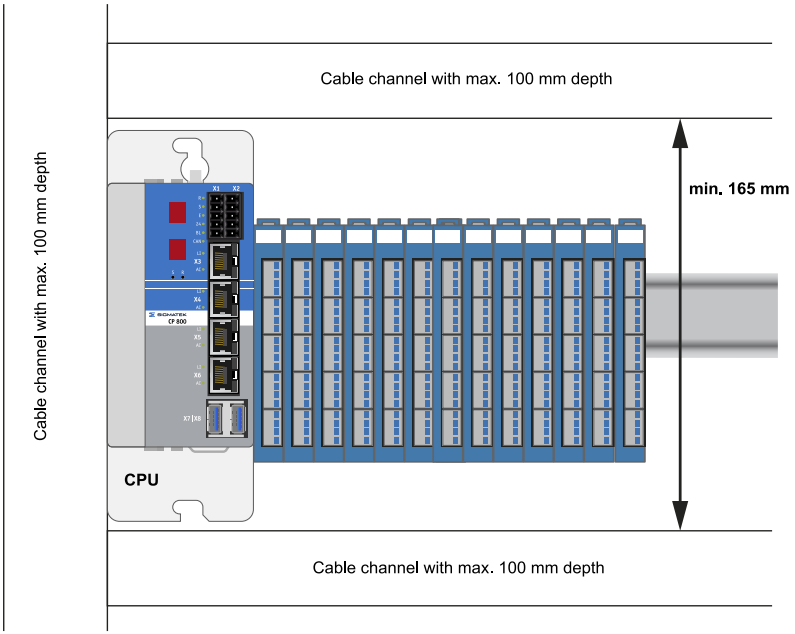
→ The modules must be mounted horizontally (module label up) with sufficient clearance between the ventilation slots of the S-DIAS module blocks and nearby components and/or the control cabinet wall.



WARNING

It must be noted that the heat dissipated from the ventilation slots (depending on the ambient temperature) can reach up to 80 °C.

Despite the low minimum clearances of the CPU unit, the greatest possible clearance between the heat sink of the CPU unit and the other objects in the control cabinet is recommended to ensure optimal cooling.

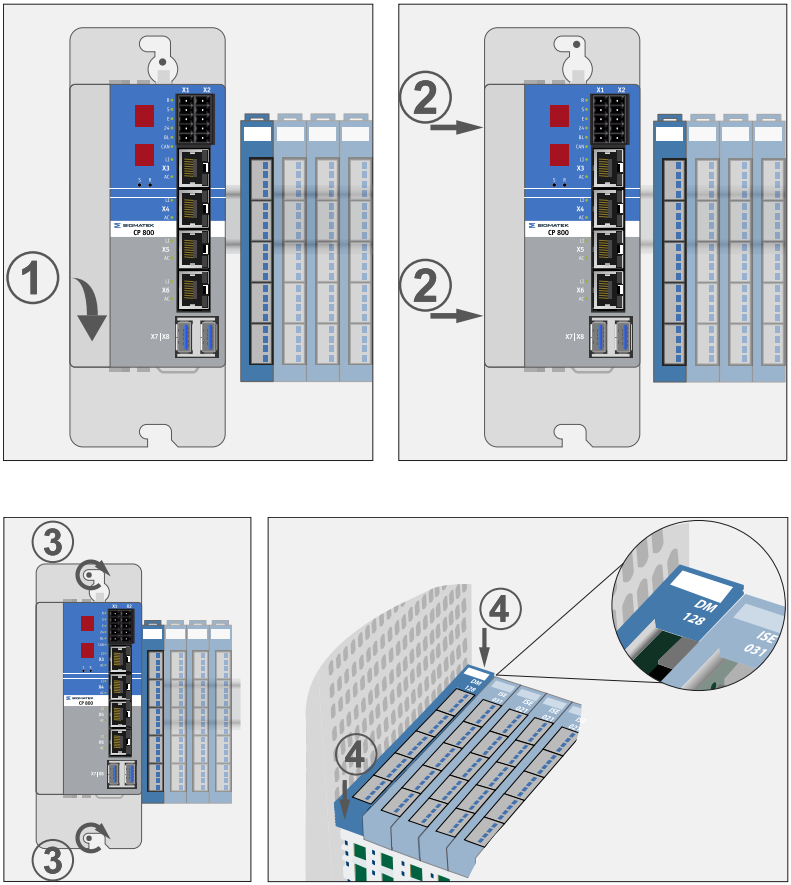


WARNING

Burn hazard! At the maximum permissible ambient temperature, the outer temperature of the heat sink can reach 85 °C

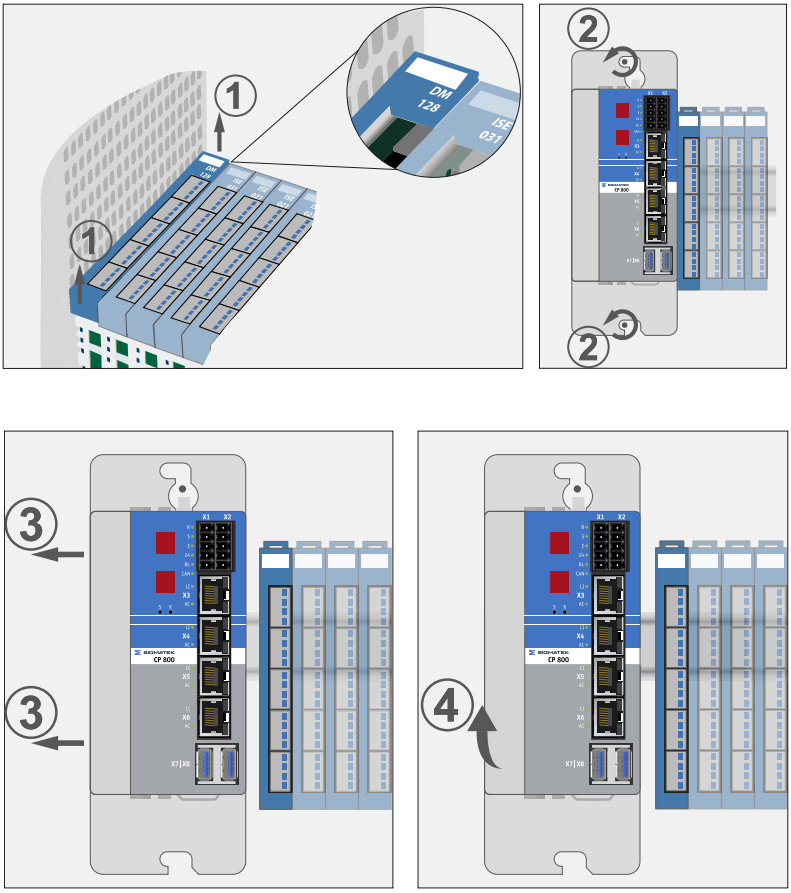
8.3.1 Mounting

- Lift the snap-in hook of the first S-DIAS module.
- Hook the CP into the DIN rail from above.
- Then push the CP to the right to the S-DIAS modules.
- Tighten the mounting screws of the CP.
- Close the snap-in hook of the first S-DIAS module.



8.3.2 Disassembly

- Lift the snap-in hook of the first S-DIAS module.
- Loosen the mounting screws of the CP.
- Then push the CP to the left away from the S-DIAS modules.
- Remove the CP from the DIN rail from below.



8.4 Mounting Material

- Combination screw EN ISO 7045 (DIN 7985)
- Mounting screws M5x16-8.8-Tx-A2F-Z7 (included in delivery)
- Torque: 5 Nm
- DIN rail in accordance with EN 50022, 35 x 7.5 mm

8.5 Cooling

The optional fan module is semi-passive and has several temperature-dependent control stages. If the ambient temperature and CPU load are low, the fans switch off completely to extend their service life. This may already be the case when the system is started, so that the fans do not run when the power is supplied. At higher temperatures, the fans are activated and the speed is increased in stages depending on the temperature up to the maximum speed.

A fan is with a very high life expectancy is installed.

Life expectancy (continuous operation, fan)	
L10 at 40 °C	70,000 h = circa 8 years

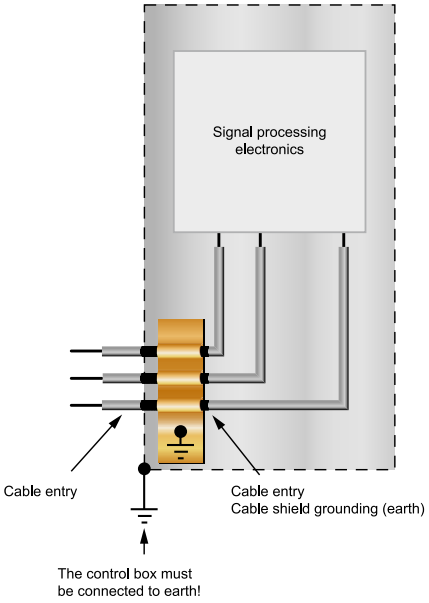
9 Wiring

9.1 Grounding

The device must be grounded over a broad surface. This can be accomplished via the following measures:

- Installation in the control cabinet
- Ground connection
- Mounting holes etc.

It is important to establish a low-Ohm earth connection to ensure fault-free operation. The ground connection must be made with the maximum cross section and largest (electrical) surface possible. Any noise signals that reach the device over external cables must be filtered through the ground connection. High frequency noise can also be dissipated over a large (electrical) surface (skin effect).



Example: control cabinet grounding

9.2 Shielding

For Ethernet, CAT5e (STP - Shielded Twisted Pair) cables are recommended. The cable shielding is connected to ground via the connector. Noise signals can then be prevented from reaching the electronics and affecting the function.

9.3 ESD Protection

CAUTION

The operator must ensure that no ESD interference affects the product.

L'opérateur doit s'assurer qu'aucune interférence due à des décharges électrostatiques n'affecte le produit.

9.4 USB Interface

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.

9.5 CAN Bus

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

9.5.1 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!

9.5.2 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 100 participants are possible.

9.5.3 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.
These values apply to the following cable: 120 Ω Twisted Pair.

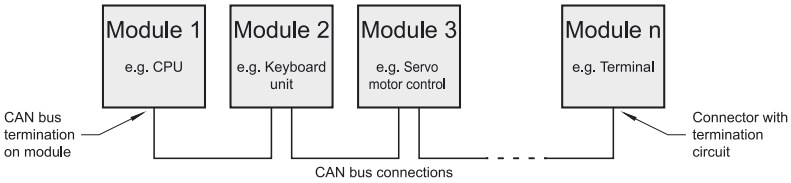
Value	Baud Rate	Maximum Length
0	615 kbit/s	60 m
1	500 kbit/s	80 m
2	250 kbit/s	160 m
3	125 kbit/s	320 m
4	100 kbit/s	400 m
5	50 kbit/s	800 m
6	20 kbit/s	1200 m
7	1 Mbit/s	30 m

INFORMATION

For the CAN bus protocol: 1 kbit/s = 1 kBaud

9.5.4 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.



Example

INFORMATION

The termination is made by an internal 120 Ω resistor between CAN A (LOW) and CAN B (HIGH).

9.6 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.

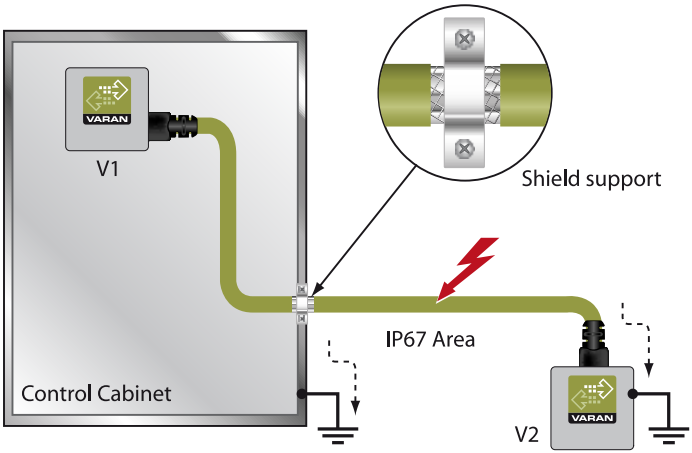
An S-FTP bus is a symmetric, multi-wire cable with unshielded pairs. For the entire shielding, a combination of foil and braiding is used. A non-laminated variant is recommended.

INFORMATION

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

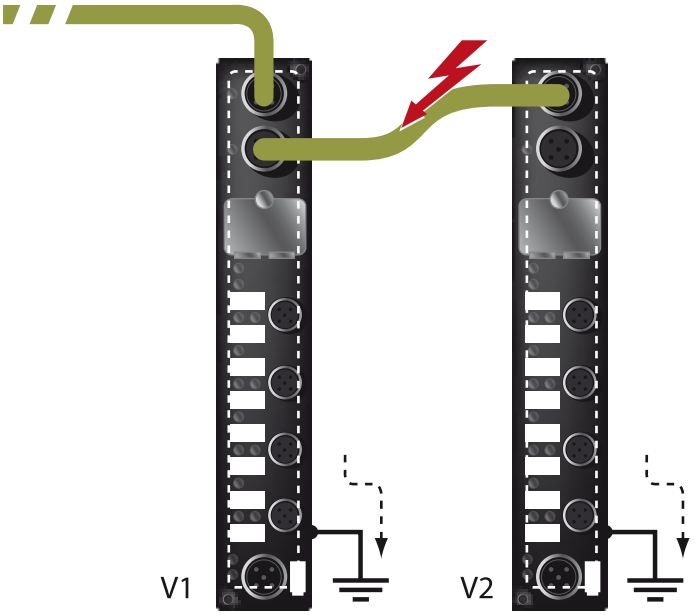
9.6.1 Wiring from the Control Cabinet to an External VARAN Component

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 deflected from the electronic components before reaching the module.



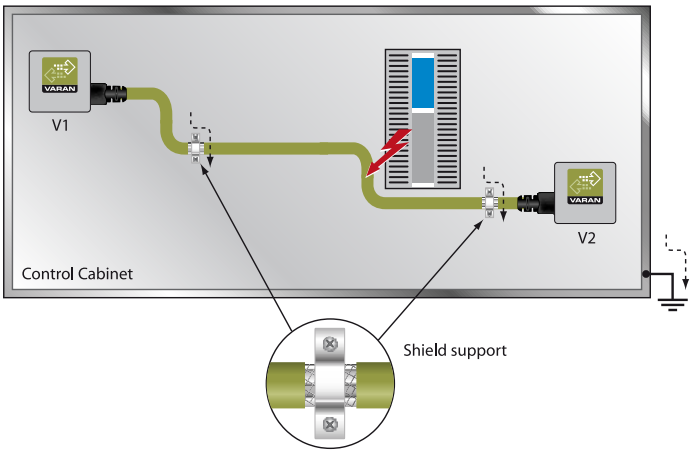
9.6.2 Wiring Outside of the Control Cabinet

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.



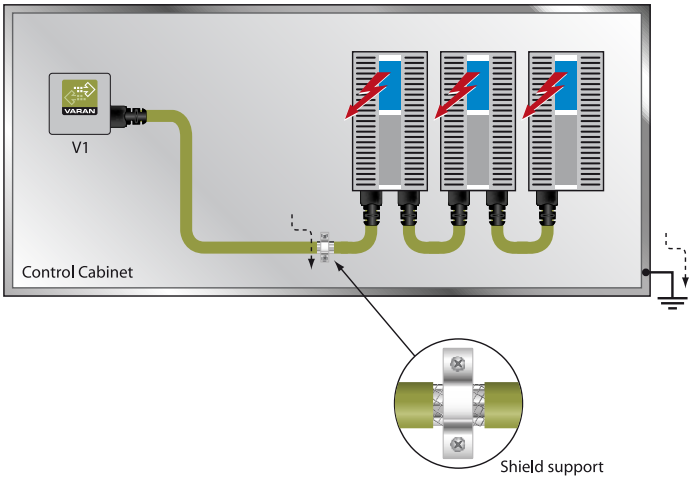
9.6.3 Shielding for Wiring Within the Control Cabinet

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.



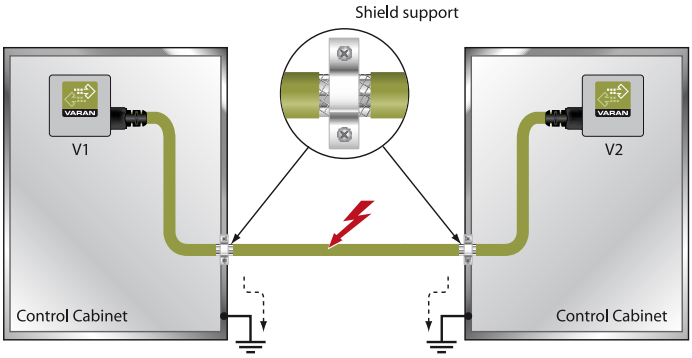
9.6.4 Connecting Noise Generating Components

With the connection of power components, which 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).



9.6.5 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.



10 Operation/Start-up

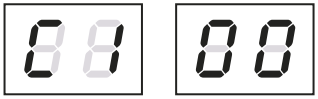
10.1 Configuration

The device is configured using the SET and RESET buttons. SET button functional via later OS update.

To enter the mode for setting changes, press and hold the SET button while the C-IPC is booting. As soon as

appears on the display, the button can be released.

After releasing the SET button, the first menu appears in the display.



With several short presses of the SET button, it is possible to scroll through the various menu items.

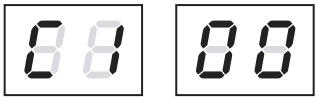
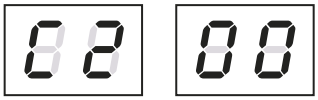
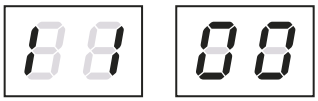
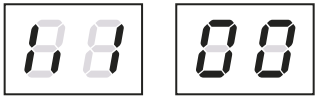
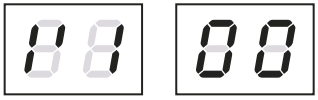
By pressing the SET button for approximately 1.5 s, the menu opens and the settings can be made with a series of short presses. Once the desired changes are made, press the SET button for about 5 seconds to end the process.

If the changes are to be discarded, press the RESET button to restart the C-IPC.

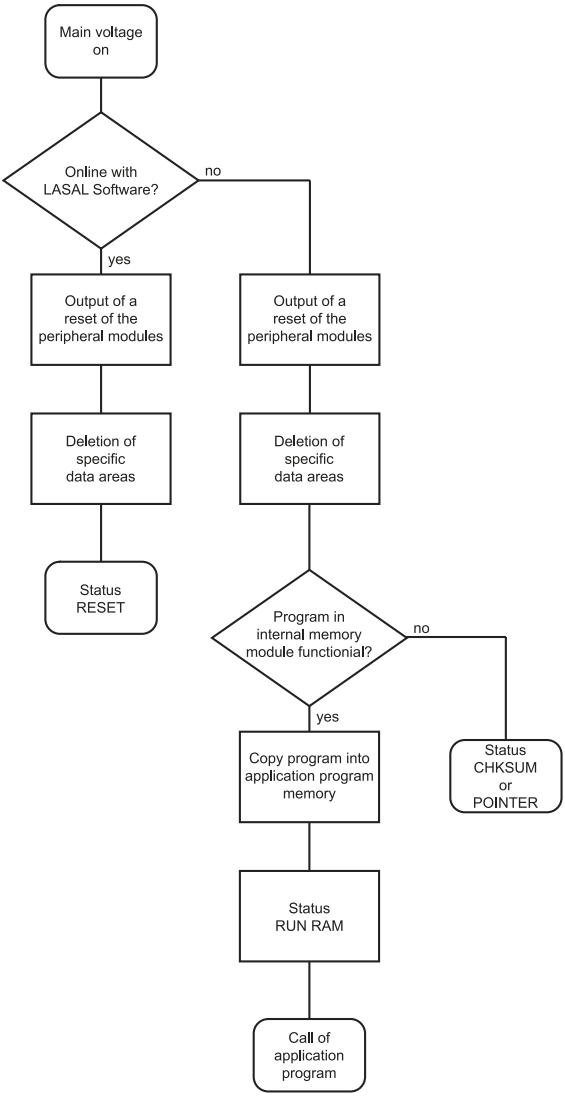
Briefly pressing the reset button triggers a restart of the controller. However, if the device does not react at all or if the Salamander OS has not yet booted up, a restart can be forced by keeping the reset button pressed for > 1 second.

The settings for the IP address, subnet mask and gateway are hexadecimal, whereas in the left and right digits, 0 - F must be entered separately. The switch occurs when the SET button is pressed for about 1.5 s.

The values from AUTOEXEC.LSL are used as the standard settings; changes are written back to this file. Before this, the original content of the file is written to AUTOEXEC.BAK.

C1 ... CAN-PLC-Station 00-30 ... Station number	
C2 ... CAN PLC Baudrate 00 ... 615,000 01 … 500,000 02 … 250,000 03 … 125,000 04 … 100,000 05 … 50,000 06 … 20,000 07 … 1,000,000	
I1, I2, I3, I4 IP address I1.I2.I3.I4, hexadecimal 00 - FF each	
S1,S2,S3,S4 Subnet Mask S1.S2.S3.S4, hexadecimal 00 - FF each	
G1,G2,G3,G4 Gateway G1,G2.G3.G4, hexadecimal 00 - FF each	

11 Process Diagram



12 Status and Error Messages

Status and error messages are shown in the status test of the LASAL CLASS software. POINTER or CHKSUM messages can also be shown on the screen.

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 was loaded into the RAM and is currently running. The display is not affected.	Info
02	`RUNTIME`	The total time for all cyclic objects exceeds the maximum time; the time can be configured using 2 system variables: ■ Runtime: Remaining time ■ SWRuntime: Preset value for runtime counter	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 defective. ■ The program in the user program memory (RAM) is not executable. ■ The buffer 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

Number	Message	Definition	Cause/Solution
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 defective. Solution: ■ Correct programming error. ■ Exchange CPU
06	**GENERAL ERROR**	General error An error has occurred while stopping the application via the online interface.	This error occurs only during the development of the operating system.
07	**PROM DEFECT**	An error has occurred while programming the memory module.	Causes: ■ The program memory module is defective. ■ 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

Number	Message	Definition	Cause/Solution
09	**WD DEFECT**	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.	Causes: ■ A nonexistent operating system was used. ■ Stack error (uneven number of PUSH and POP instructions). ■ The user program was interrupted by a software error. Solution: ■ Correct programming error.

Number	Message	Definition	Cause/Solution
18	**SINGLE STEP**	The CPU is in single step mode and is waiting for further instructions.	Info
19	**READY:**	A module or project has been sent to the CPU and it is 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	**INVALID 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 function or an interface function is called from the application.	Causes: ■ 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 programming error.
25	**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 programming error.

Number	Message	Definition	Cause/Solution
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.	Contact SIGMATEK
38	**APPLMEM ERROR**	An error has occurred in the application memory (user heap).	Solution: ■ Correct allocated memory access error

Number	Message	Definition	Cause/Solution
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 a 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 while accessing arrays. The memory area was overwritten by 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

Number	Message	Definition	Cause/Solution
53	FLOATING POINT ERROR	An error has occurred during a floating-point operation.	
60	DIAS-RISC-ERROR	Error from the Intelligent DIAS Master.	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 duration of all real-time objects exceeds the maximum time; 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 exceeds the maximum time; the time can be configured using 2 system variables: - BTRuntime: - 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

Number	Message	Definition	Cause/Solution
72	S-DIAS ERROR	A connection error with an S-DIAS module has occurred.	Possible Causes: ■ Real network does not match the project, S-DIAS client is defective Solution: ■ Analyze log file
75	SRAM ERROR	An error occurred while initializing, reading or writing SRAM data.	Possible Causes: ■ SRAM configured incorrectly ■ Battery for powering the internal program memory is empty Solution: ■ Analyze log file (Event00.log, Event19.log) ■ Check configuration ■ Exchange battery for powering the internal program memory
95	USER DEFINED 0	User-definable code.	
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.	

Number	Message	Definition	Cause/Solution
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	Non-specific error. Recompile and download all project sections.	
113	C_NO_FILE_OPEN	An attempt was made to open an unknown table.	
114	C_OUTOF_NEAR	Memory allocation failed	
115	C_OUT OF_FAR	Memory allocation failed	
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 exists but must be updated.	
224	LINKING	The application is currently linking.	
225	LINKING ERROR	An error has occurred while linking.	

Number	Message	Definition	Cause/Solution
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 Transport/Storage

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.

14 Storage

When not in use, store the device according to the storage conditions. See chapter 13 Transport/Storage.

INFORMATION

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

The existing battery in the device must be replaced after approx. 10 year/s. If the device is to be stored longer, the battery must be removed to prevent leakage.

15 Maintenance

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

15.1 Service

This product was constructed for low-maintenance operation.

15.2 Exchanging the SDD

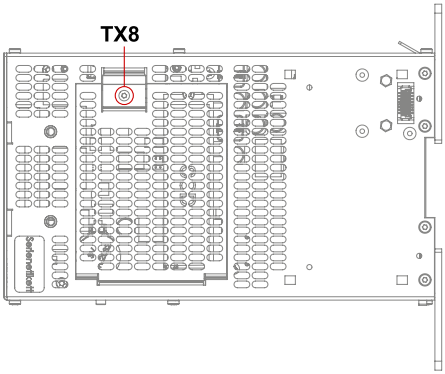
CAUTION

Danger for ESD-sensitive components.

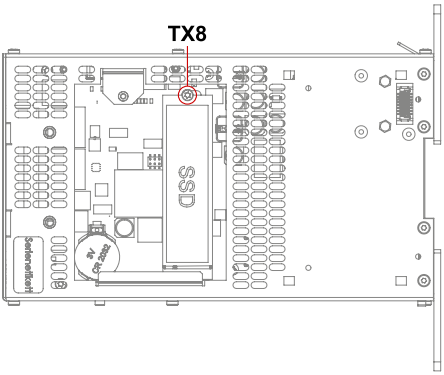
Les signes de danger pour les composants sensibles aux décharges électrostatiques.

INFORMATION

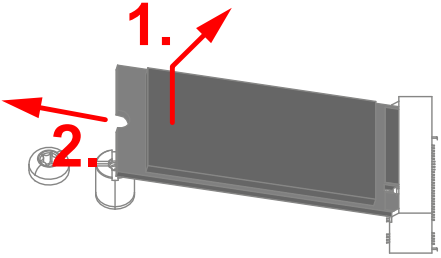
An SSD cannot be exchanged while voltage is applied!
Disconnect the 24 V DC supply!



1. Turn off the device supply.
2. Create ESD-compliant conditions.
3. Remove the locking screws with a Torx screwdriver.



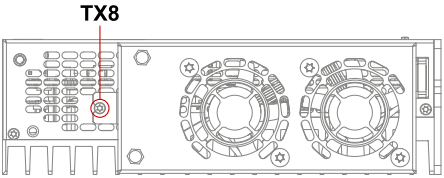
4. Remove the SSD mounting screw. Carefully lift the SSD upwards and remove it.



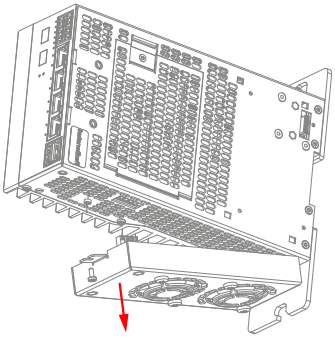
5. Insert the new SSD into the M.2 slot and carefully press it down.
6. Reassemble in the reverse order.

15.3 Fan Replacement

The fan module (optional) is replaceable. It can be removed and replaced or cleaned by loosening the fastening screw on the underside.



1. Switch off the power supply to the device.
2. Remove the fastening screw with a Torx screwdriver.



3. Pull fan module down and replace.

15.4 Repair

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 13 Transport/Storage.

16 Buffer Battery

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 circa 10 year/s.

	COMPANY	DATA
Lithium battery	RENATA	3.0 V/225 mAh

INFORMATION

Battery order number: 01-690-055

Use type CR2032 batteries from RENATA only.

Disconnect the device from the supply before changing the battery.

WARNING

Danger of fire and explosion!

→ Battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire.

→ Replace battery with cat. no. CR2032 manufactured by RENATA only. Use of another battery may present a risk of fire or explosion. See instruction manual for safety instructions.

Danger d'incendie et d'explosion !

→ La batterie peut exploser si elle n'est pas manipulée correctement.

→ Ne pas la recharger, la démonter ou la jeter au feu. Ne remplacez la pile que par la référence CR2032, fabriquée par RENATA. L'utilisation d'une autre pile présente un risque d'incendie ou d'explosion. Vous trouverez les consignes de sécurité dans le mode d'emploi.

16.1 Data Retention Battery Change

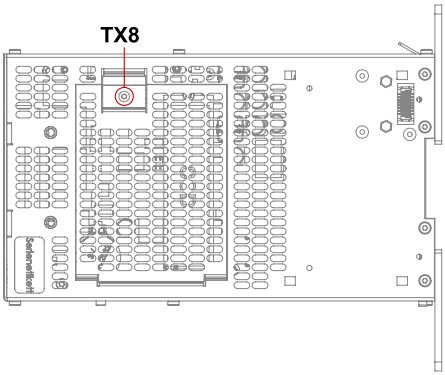
The exchangeable buffer battery ensures that the following data is preserved in the absence of a supply voltage:

- Time

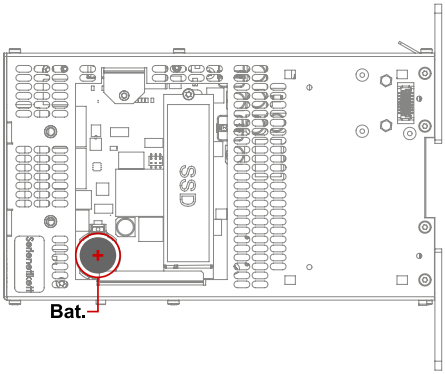
If the battery is empty, the following settings are reset or data is deleted:

- Time (reset to default value)

16.2 Exchanging the Battery



1. Turn off the device supply (data is retained for approx. 15 minutes after disconnection).
2. Create ESD-compliant conditions.
3. Remove the locking screw(s) with a Torx screwdriver.
4. Carefully remove the cover (careful not to damage the connector cable).



5. Remove the battery from the holder.
6. Insert the new battery with correct polarity.
7. Close the cover and retighten the fixing screw(s) (0.7 Nm).

17 EtherCAT Feature Overview

Feature name	Short description	Feature ID	is supported
Basic Features			
Service Commands	Support of all commands	101	X
IRQ field in datagram	Use IRQ information from Slave in datagram header	102	-
Slaves with Device Emulation	Support Slaves with and without application controller	103	X
EtherCAT State Machine	Support of ESM special behaviour	104	X
Error Handling	Checking of network or slave errors, e.g. Working Counter	105	X
VLAN	Support VLAN Tagging	106	-
EtherCAT Frame Types	Support EtherCAT Frames	107	X
UDP Frame Types	Support UDP Frames	108	-
Process Data Exchange			
Cyclic PDO	Cyclic process data exchange	201	X
Multiple Tasks	Different cycle tasks Multiple update rates for PDO	202	X
Frame repetition	Send cyclic frames multiple times to increase immunity	203	-
Network Configuration			
Online scanning	Network configuration functionality included in EtherCAT Master	301	X
Reading ENI	Network Configuration taken from ENI file		
Compare Network configuration	Compare configured and existing network configuration during boot-up	302	X
Explicit Device Identification	Identification used for Hot Connect and prevention against cable swapping	303	X
Station Alias Addressing	Support configured station alias in slave, i.e. enable 2nd Address and use it	304	X
Access to EEPROM	Support routines to access EEPROM via ESC register	305	X

Mailbox Support			
Support Mailbox	Main functionality for mailbox transfer	401	X
Mailbox resilient Layer	Support underlying resilient layer	402	X
Multiple Mailbox channels		403	X
Mailbox polling	Polling Mailbox state in slaves	404	X
CAN application layer over EtherCAT (CoE)			
SDO Up/Download	Normal and expedited transfer	501	X
Segmented Transfer	Segmented transfer	502	X
Complete Access	Transfer the entire object (with all sub-indices) at once	503	X
SDO Info service	Services to read object dictionary	504	X
Emergency Message	Receive Emergency messages	505	-
PDO in CoE	PDO services transmitted via CoE	506	X
Ethernet over EtherCAT (EoE)			
EoE protocol	Services for tunneling Ethernet frames. includes all specified EoE services	601	-
Virtual Switch	Virtual Switch functionality	602	-
EoE Endpoint to Operation Systems	Interface to the Operation System on top of the EoE layer	603	-
File access over EtherCAT (FoE)			
FoE Protocol	Support FoE Protocol	701	-
Firmware Up- /Download	Password, FileName should be given by the application	702	-
Boot State	Support Boot-State for Firmware Up/Download	703	-
Serverdrive-Profile over EtherCAT (SoE)			
SoE Services	Support SoE Services	801	-
ADS over EtherCAT (AoE)			
AoE Protocol	Support AoE Protocol	901	-
Vendor over EtherCAT (VoE)			
VoE Protocol	External Connectivity supported	1001	-
Synchronization with Distributed Clock (DC)			
DC support	Support of Distributed Clock	1101	X
Continuous Propagation Delay compensation	Continuous Calculation of the propagation delay	1102	X
Sync window monitoring	Continuous monitoring of the Synchronization difference in the slaves	1103	X

Slave-to-Slave Communication			
via Master	Information is given in ENI file or can be part of any other network configuration Copying of the data can be handled by master stack or master's application	1201	-
Master Information			
Master Object Dictionary	Support of Master Object Dictionary (ETG.5001 MDP sub profile 1100)	1301	-

An ESI file is required for the use of a new EtherCAT Drive in the LASAL software. Please contact SIGMATEK support to clarify whether the used EtherCAT drive is already supported.

18 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.

19 Accessories

19.1 Battery

Description	Order Number
Lithium battery RENATA	01-690-055

19.2 Replacement Fan

Description	Order Number
Replacement fan CP	20-004-831-Z1

20 Application Information

20.1 Storage Media

The operating system and customer application are stored on the internal storage device.

INFORMATION

At least 1 Gbyte of the total memory must be reserved for the update process (packages).

To ensure longevity of the memory, writing cyclic data to the internal storage medium should be avoided (lifespan drastically reduced). For cyclic writing, an external storage medium (e.g. microSD Card or USB stick, depending on the respective device) from SIGMATEK must be used.

Errors resulting from the use of storage media from other manufacturers are excluded from support.

20.2 Screensaver to prevent Display Burn-In

The “Burn-In” effect describes a pattern burned into the display after displaying the same contents over a longer period of time (e.g. a single screen).

To avoid "burn-in" effects on connected displays, a screen saver is set on delivery which is automatically activated after 60 minutes. The time until the screen saver is activated can be changed by adding the following CLI command to "autoexec.lsl", where "x" is the inactivity time in seconds:

```
screensaver x
```

The following values for x are permitted:

- 1 to 32767 ... Time in seconds until the screensaver is activated
- 0 ... resets the screensaver to the default value (60 minutes)
- -999 ... deactivates the screensaver completely

If the screensaver is deactivated, SIGMATEK accepts no liability or guarantee for the occurrence of "burn-in" effects on displays.

Changes Chart

Change date	Affected page(s)	Chapter	Note
18.07.2024	13	5.1 Performance Data	EtherCAT to 100
28.08.2024	13	5.1 Performance Data	USB type A added
19.09.2024	13	5.1 Performance Data	DisplayPort omitted
	18	6.1 Connector Layout	
08.04.2025	14	5.2 Electrical Requirements	UL certification
	17	5.6 Miscellaneous	
22.05.2025	23	6.2 Applicable Connectors	Temperature 60 °C added
25.08.2025	27	7.2 Version with Fan	Dimensions with fan added
	34	8.5 Cooling	Chapter added