

CP 733

S-DIAS CPU Unit

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

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Translation of the Original Instructions

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S-DIAS CPU Unit

CP 733

with 1 Ethernet

2 VARAN Out (2 VARAN Managers)

1 EtherCAT Drive Controller

1 CAN

1 USB 3.0

1 USB Device 2.0 (Micro USB Type B)

1 microSD Card

1 S-DIAS

The S-DIAS CPU unit 733 is an industrial PC with an Intel Atom E3827 processor.

The CPU unit is used to control S-DIAS modules and has various interface connections such as CAN, Gigabit Ethernet, EtherCAT Drive Controller and with two VARAN Out interfaces. 14 status LEDs directly on the CPU unit provide current CPU status information. A microSD card can be used to store program memory. The CP 733 provides two independent VARAN Managers.

The CP 733 does not currently support visualization via VNC, LRM etc.

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.



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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.sigmathek-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 733

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 SIG-MATEK 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 733 conforms to the following European directives:

- **2014/35/EU** Low-voltage Directive
- **2014/30/EU** Electromagnetic Compatibility (EMC Directive)
- **2011/65/EU** “Restricted use of certain hazardous substances in electrical and electronic equipment” (RoHS Directive)

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

4 Type Plate



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

SIGMATEK GMBH & CO KG
Sigmatekstrasse 1 A-5112 LAMPRECHTSHAUSEN

Serial No.

Article Number

Product Name

Short Name

Exemplary nameplate (symbol image)



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

SIGMATEK GMBH & CO KG
Sigmatekstrasse 1 A-5112 LAMPRECHTSHAUSEN

12345678

12-246-133-3

Handbediengerät Wireless HGW 1033-3

HW: Hardware version
SW: Software version

5 Technical Data

5.1 Performance Data

Processor	Intel Atom E3827 DualCore
Processor cores	2
Addressable I/O/P module	VARAN Bus: 65.280 CAN-Bus: > 100 S-DIAS bus: 64
Internal program memory (microSD)	4-Gbyte microSD card (3D-TLC pSLC technology) ¹⁾
Internal data memory (SRAM)	512-kbyte (battery buffered)
Internal memory (DDR3 RAM)	2-GByte DDR3L 1333 MHz
Internal I/O	no
Internal cache	1-Mbyte L2 Cache
Interfaces	1x Ethernet1 10/100/1000 1x EtherCAT 100 2x VARAN Out (Manager) (maximum cable length: 100 m) 1x CAN 1x USB 3.0 1x USB Device 2.0 (Micro USB Type B) 1x S-DIAS
EtherCAT Drive Controller	Class A EtherCAT Drive Controller with distributed clock
Data buffer	yes (SRAM battery buffered)
Status display	no
Status LEDs	yes
Real-time clock	yes
Temperature sensor	yes
Input voltage measurement	yes
Cooling	passive (fanless)

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

5.2 Standard Configuration

Ethernet 1	IP: 10.10.150.1	Subnet mask: 255.0.0.0
CAN bus	Station 00	Baud rate: 01 = 500 kBaud
VARAN-Out 1	always activated, cannot be deactivated	
VARAN-Out 2	is not activated by factory, can be activated via autoexec.lsl	

INFORMATION



Problems can arise if a control is connected to an IP network, which contains devices 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.

For use in local networks only, not in telecommunication circuits!

The second VARAN manager (VARAN-Out 2) is deactivated and can only be used after OS support for multiple VARAN managers has been activated. The activation is done via the file "autoexec.lsl" by the command "SET MULTI_VM ON". For more information on this command, refer to the Command Line Interface (CLI) documentation in the LASAL-OS User Guide.

5.3 Electrical Requirements

Supply voltage	typically +24 V DC (SELV/PELV)	
	minimum +18 V DC	maximum +30 V DC
Supply voltage (UL)	+18-30 V DC (NEC Class 2 or LVLC)	
Supply voltage Current consumption (maximum total current)	maximum 3.0 A at +24 V	
Supply voltage Current consumption without external devices	0.5 A at +24 V	
Inrush current with 24 V /10 A fixed voltage supply	maximum 1.2 A (for 25 ms, load-dependent)	
Inrush current without current-limiting supply	maximum 30 A (for 22.5 μ s, load-dependent)	
Current available for S-DIAS (+5 V)	maximum 1.6 A	
Current available for S-DIAS (+24 V)	maximum 1.6 A	
Available current for USB 3.0 (+5 V)	maximum 0.9 A	

INFORMATION



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).

If this S-DIAS module is connected to an S-DIAS supply module with several S-DIAS modules, the total current of the modules used must be determined and checked.

The total current of the +24 V supply cannot exceed 1.6 A!

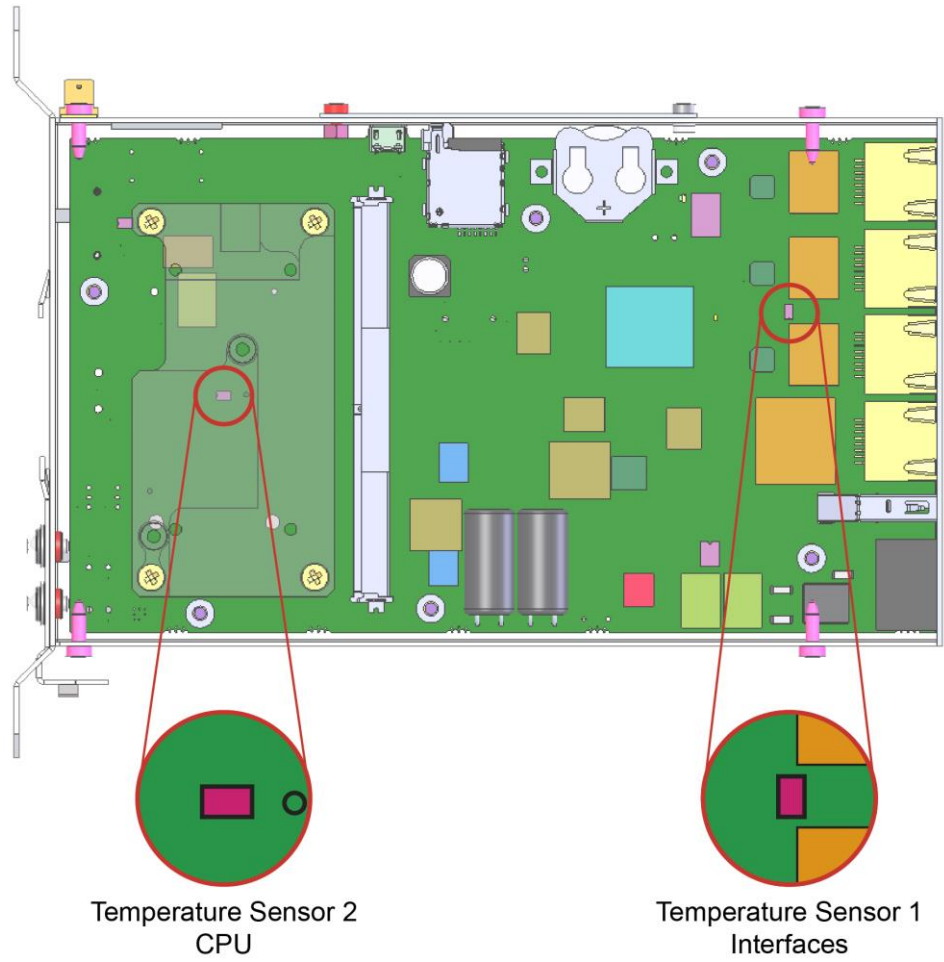
The total current of the +5 V supply cannot exceed 1.6 A!

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

5.4 Temperature Sensor

There are two 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 :

Temperature sensor 1 (environmental temp. interfaces)	90 °C
Temperature sensor 2 CPU	90 °C



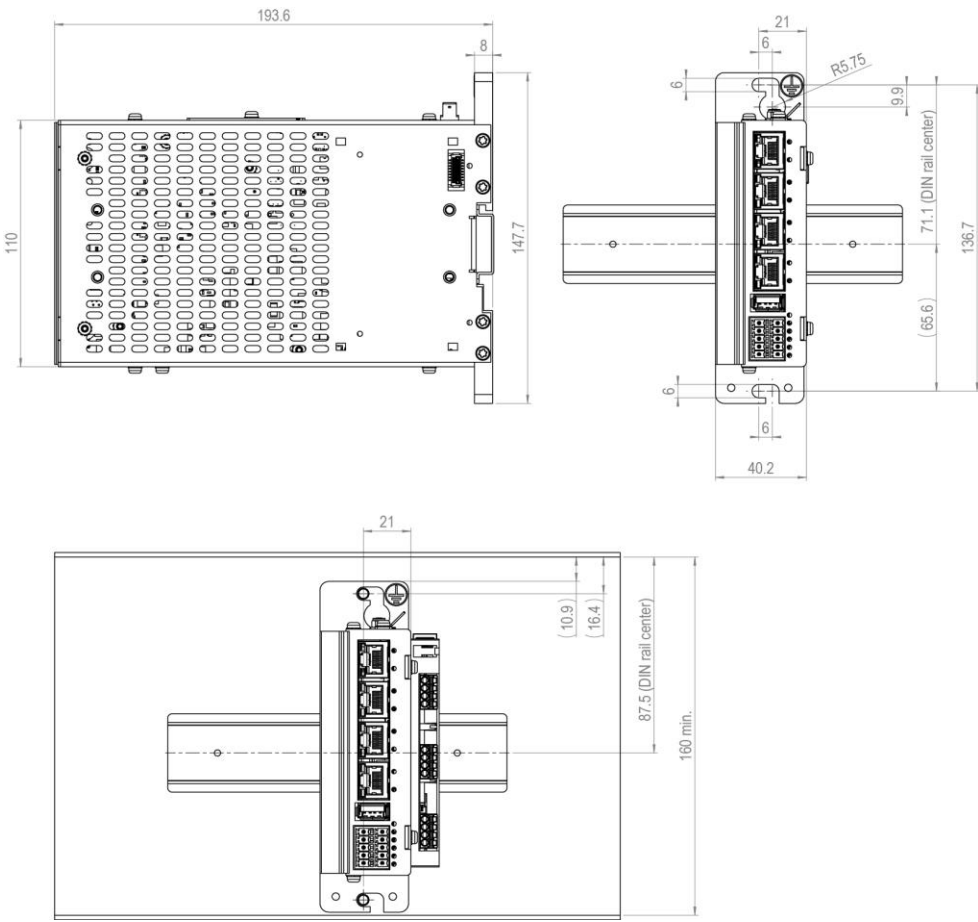
5.5 Miscellaneous

Article number	20-004-733
Operating system	Salamander
Project backup	internally on the microSD card
Approbationen	CE

5.6 Environmental Conditions

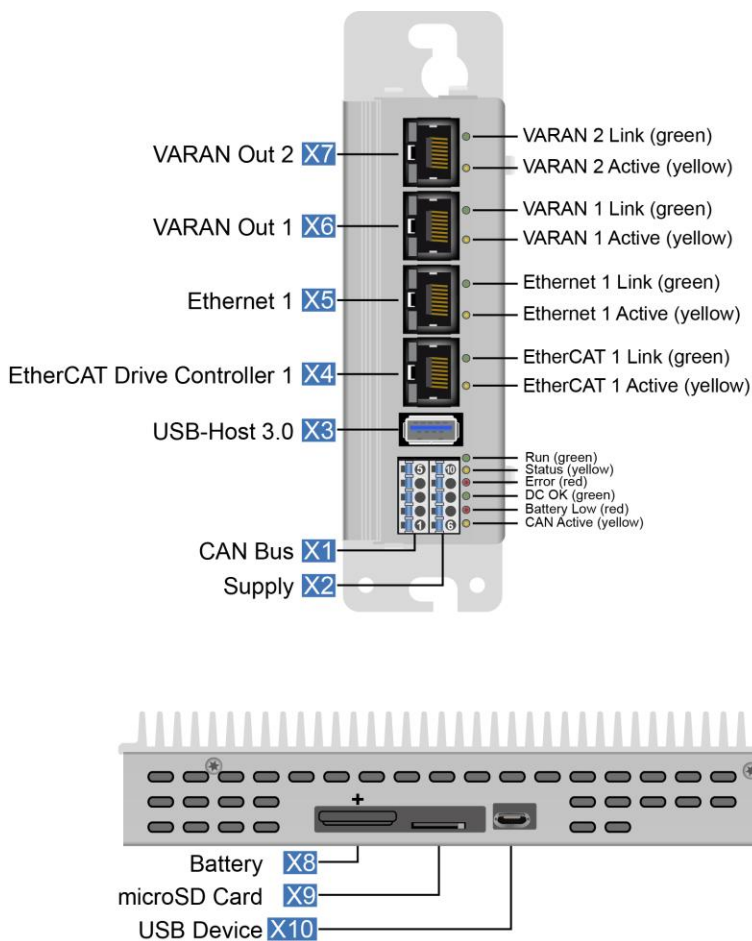
Storage temperature	-20 ... +85 °C	
Environmental temperature	0 ... +55 °C	
Maximum processor temperature	+110 °C (automatic cut-off)	
Humidity	10-95 %, non-condensing	
Installation altitude above sea level	0-2000 m without derating > 2000 m with derating of the maximum environment temperature by 0.5 °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 2-9 Hz 1 g (10 m/s ²) von 9-200 Hz
Shock resistance	EN 60068-2-27	15 g (150 m/s ²) duration 11 ms, 18 shocks
Protection type	EN 60529	IP20

6 Mechanical Dimensions



Dimensions	40.2 x 147.7 x 193.6 mm (W x H x D)
Mounting screws	combination screws ISO7045 (DIN7985) M5x16 - 8.8 - Tx - A2F - Z7
Tightening torque	5 Nm
DIN rail	in accordance with EN 50022, 35 x 7.5 mm

7 Connector Layout



INFORMATION

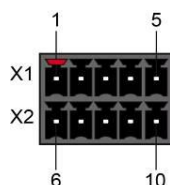


The connections of the +24 V supply (X2: pin 6 and pin 7) or the GND supply (X2: pin 8 and pin 9 and pin 10) are internally bridged. To supply the module, only one connection to a +24 V pin (pin 6 or pin 7) and a GND pin (pin 8 or pin 9 or pin 10) is required. The bridged connections may be used for further looping of the +24 V supply and 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!

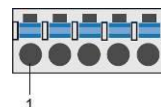
Run	green	ON	from activation of the voltage supply until processing of the autoexec.lsl when the application is running (except when controlled differently via the application)
		BLINKS	In the CLI, while processing the autoexec.lsl until the application is running
		OFF	when an error or reset occurs
	can be set from the application (ON, BLINKING, OFF)		
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)		
Ethernet/VARAN Link	green	ON	connection between the two PHYs made
Ethernet/VARAN Active	yellow	ON	data is exchanged over the Ethernet bus
EtherCAT Link	green	ON	Data is exchanged over the EtherCat bus
EtherCAT Active	yellow	ON	connection between the two PHYs made
Battery Low	red	ON	battery is empty and should be replaced as soon as possible
CAN active	yellow	BLINKS	data is being exchanged
DC OK	green	ON	module is supplied with a voltage > 18 V

7.1 Connectors

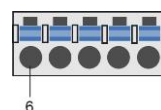
X1: CAN bus/X2: Supply (10-pin Phoenix RM 3.5)



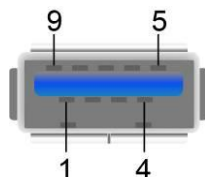
Pin	Function
1	CAN A (LOW) → Encoding
2	CAN B (HIGH)
3	CAN A (LOW)
4	CAN B (HIGH)
5	GND



Pin	Function
6	+24 V supply
7	+24 V supply
8	GND
9	GND
10	GND



X3: USB 3.0 (Type A)



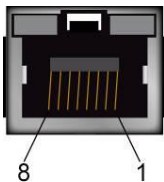
Pin	Function
1	+5 V
2	D
3	D+
4	GND
5	SSRX-
6	SSRX+
7	GND_DRAIN
8	SSTX-
9	SSTX+

INFORMATION



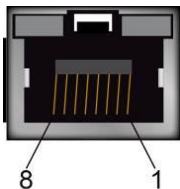
It should be noted that many of the USB devices on the market do not comply with USB specifications; this can lead to device malfunctions. This may cause the device to malfunction. It is also possible that these devices will not be detected at the USB port or function correctly. Therefore, it is recommended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

X4 EtherCAT Drive Controller 1 (RJ45)



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

X5: Ethernet 10/100 (RJ45)

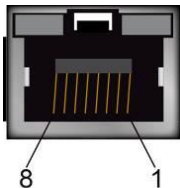


Pin	Function
1	Tx+
2	Tx-
3	Rx+
4	n.c.
5	n.c.
6	Rx-
7	n.c.
8	n.c.

n.c. = do not use

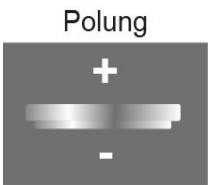
X6: VARAN 1 (RJ45)

X7 VARAN 2 (RJ45)

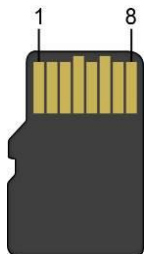


Pin	Function
1	Tx+
2	Tx-
3	Rx+
4	n.c.
5	n.c.
6	Rx-
7	n.c.
8	n.c.

X8 Battery



X9: 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 intended as an exchangeable medium and should therefore be removed from the card holder for maintenance purposes only.

X10: USB Device 2.0 (Micro-USB Type B)



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

7.2 Applicable Connectors

Connectors:

- X1:** 5-pin Phoenix Contact plug with spring terminal
FMC 1.5/ 5-ST-3.5 grey/blue with encoding on pin 1
(Included with delivery)
- X2:** 5-pin Phoenix Contact plug with spring terminal
FMC 1.5/ 5-ST-3.5 grey/blue without encoding
(Included with delivery)
- X3:** USB 3.0 (Type A) (not included in delivery)
- X4, X5, X6, X7:** 8-pin RJ45 (not included in delivery)
- X10:** USB 2.0 (Type microB) (not included in delivery)

8 Wiring Guidelines

8.1 Ground

The CP 733 must be connected to ground via the assembly on the control cabinet or over the connection provided. It is important to create a low-ohm ground connection, only then can error-free operation be guaranteed. The ground connection must be made with the maximum cross section and largest (electrical) surface possible.

Any noise signals that reach the CP 733 over external cables must be dissipated via the ground connection. High frequency noise can also be dissipated over a large (electrical) surface (skin effect).

8.2 Shielding

The CAN, ETH1, ETH2, VAR1 and VAR2 wiring must be shielded. In addition, twisted-pair wires must be used for the CAN bus. For wiring of ETH1 and ETH2 cables according **CAT5e** are recommended. For VAR1 and VAR2, the prefabricated VARAN cables available from SIGMATEK in various lengths are recommended.

The low-ohm shielding must be either connected either at the entry to the control cabinet or directly before CPU unit over a large surface (cable grommets, grounding clamps)!

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

8.3 ESD Protection

Typically, USB keyboards and mice are not wired with shielded cables. These devices are disrupted by ESD and in some instances, no longer function.

Before any device is connected to or disconnected from the CPU unit, the potential should be equalized (by touching the control cabinet or ground terminal). Electrostatic loads (through clothing and shoes) can thereby be dissipated.

9 CAN Bus Setup

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

9.1 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!

9.2 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 $120\ \Omega$, 100 participants are possible.

9.3 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 Mbit/s	30 m

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

Note:

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

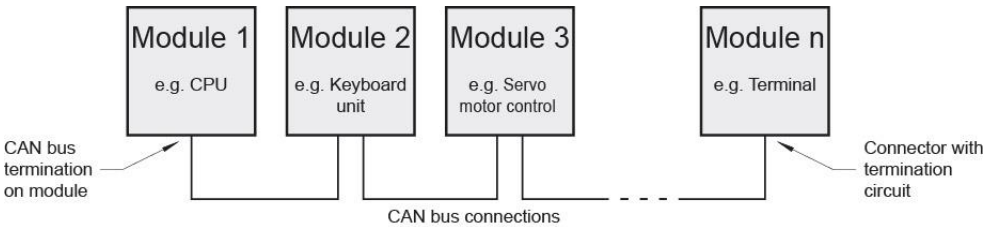
INFORMATION



The Speed setting 00 is for ARM devices and with Intel x86 devices, can lead to CAN communication problems under some circumstances. For error-free operation, it is recommended that x86 devices not use this speed setting.

10 CAN Bus Termination

In a CAN bus system, a line termination must be installed in both end modules. This is necessary to avoid transmission errors caused by reflections in the line.



If the CP 733 processor module is an end module, a terminating resistor is required which in this series, can be activated is the software via the hardware class.

Alternatively, it can be terminated by placing a 120 Ω resistor between CAN-A (Low) and CAN-B (High).

11 EtherCAT Feature Overview

The EtherCAT master fulfills all necessary requirements for a class A master.

In the following the overview of the EtherCAT master features defined according to ETG.1500.

Feature name	Short description	Feature ID	Is supported
Basic Features			
Service Commands	Support of all commands	101	•
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	•
EtherCAT State Machine	Support of ESM special behaviour	104	•
Error Handling	Checking of network or slave errors, e.g. Working Counter	105	•
VLAN	Support VLAN Tagging	106	-
EtherCAT Frame Types	Support EtherCAT Frames	107	•
UDP Frame Types	Support UDP Frames	108	-
Process Data Exchange			
Cyclic PDO	Cyclic process data exchange	201	•
Multiple Tasks	Different cycle tasks Multiple update rates for PDO	202	•
Frame repetition	Send cyclic frames multiple times to increase immunity	203	-
Network Configuration			
Online scanning	Network configuration functionality included in EtherCAT Master	301	•
Reading ENI	Network Configuration taken from ENI file		
Compare Network	Compare configured and existing network configuration	302	•

configuration	during boot-up		
Explicit Device Identification	Identification used for Hot Connect and prevention against cable swapping	303	•
Station Alias Addressing	Support configured station alias in slave, i.e. enable 2nd Address and use it	304	•
Access to EEPROM	Support routines to access EEPROM via ESC register	305	•
Mailbox Support			
Support Mailbox	Main functionality for mailbox transfer	401	•
Mailbox resilient Layer	Support underlying resilient layer	402	•
Multiple Mailbox channels		403	•
Mailbox polling	Polling Mailbox state in slaves	404	•
CAN application layer over EtherCAT (CoE)			
SDO Up/Download	Normal and expedited transfer	501	•
Segmented Transfer	Segmented transfer	502	•
Complete Access	Transfer the entire object (with all sub-indices) at once	503	•
SDO Info service	Services to read object dictionary	504	•
Emergency Message	Receive Emergency messages	505	-
PDO in CoE	PDO services transmitted via CoE	506	•
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	•
Continuous Propagation Delay compensation	Continuous Calculation of the propagation delay	1102	•
Sync window monitoring	Continuous monitoring of the Synchronization difference in the slaves	1103	•
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	-

- is supported
- is not supported

12 Buffer Battery

The exchangeable buffer battery ensures that the clock time (RTC) and SRAM data of the CP 733 is preserved in the absence of a supply voltage. A lithium battery is installed at the manufacturer.

After delivery of the CP 733 and storage period of one year, the lifespan of the battery reaches at least 10 years, if it can be assumed that the module is continually in operation (connected to supply voltage).

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

INFORMATION



If the device is not powered for two years, the battery empties and should be replaced.

Battery order number: 01-690-028

	COMPANY	DATA
Lithium battery	RENATA CR2032	3.0 V/225 mAh

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!

13 Exchanging the Battery

13.1 Exchanging the Battery: Option 1

1. Supply the device with +24 V for at least 5 s and keep it powered.



2. Loosen the screws in the battery cover with a TX8 Torx screw driver.

3. You can now remove the battery from the holder. Install the new battery. Ensure the polarity is correct (plus-side toward heat sink)!



4. Next, rotate the cover downward and tighten the screws.

INFORMATION



When exchanging the battery, caution must be taken to avoid a short circuit since it could cause a defect in the terminal!

13.2 Exchanging the Battery: Option 2

1. The SRAM data are saved to the microSD card via the CLI command SRAM Save.

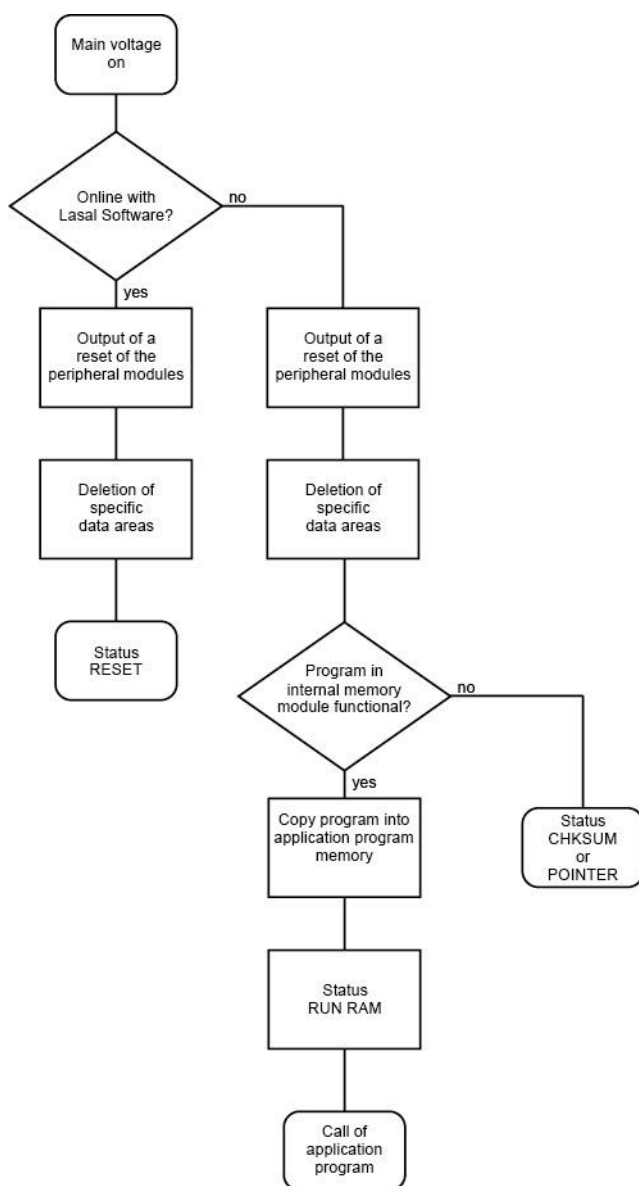
INFORMATION



If the data is not previously saved, the settings in the CPU unit are lost

2. Disconnect the ICP 733 power supply.
3. Now follow the instructions for exchanging the battery in option 1, starting from step 2.
4. Load the SRAM data from the Flash using the CLI command SRAM Load and set the time. The time and date can be set through Time and Date.

14 Process Diagram



15 Recommended Shielding

The VARAN real-time Ethernet bus system exhibits a very robust quality in harsh industrial environments. In the event of an error, the VARAN Manager resends messages to a bus participant immediately.

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 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.

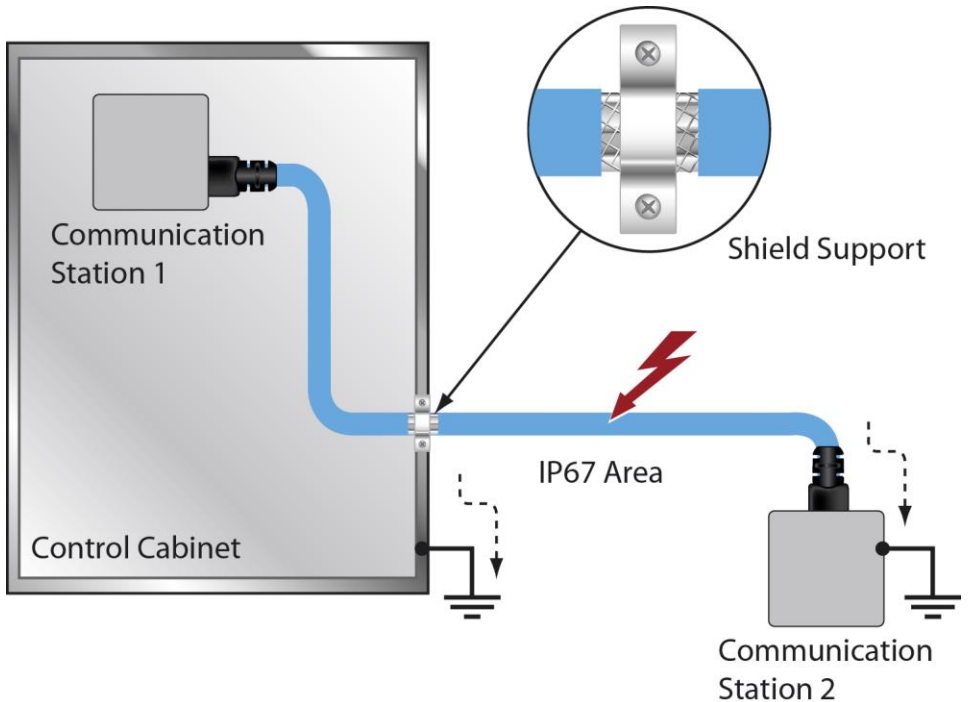
INFORMATION



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

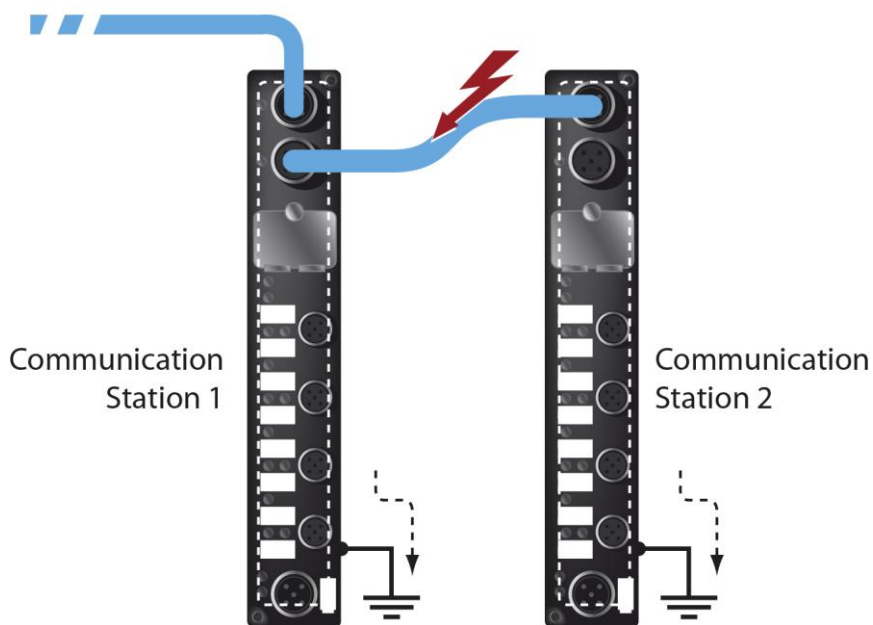
15.1 Wiring from the Control Cabinet to an External Component

If the Ethernet lines are connected from a component to a 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.



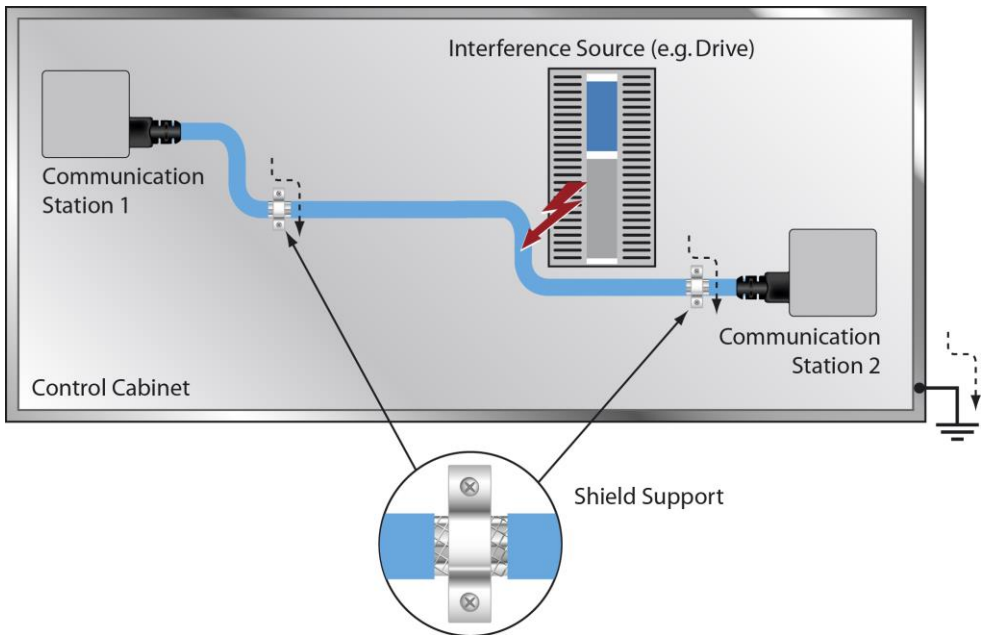
15.2 Wiring Outside of the Control Cabinet

If a 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.



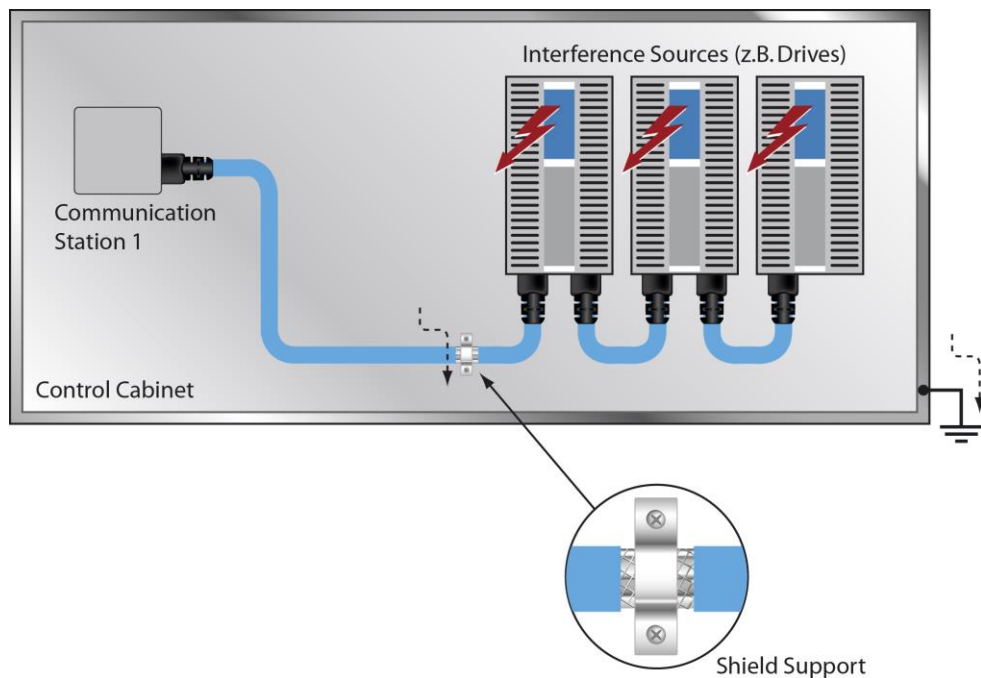
15.3 Shielding for Wiring Within the Control Cabinet

With sources of strong electromagnetic noise with the control cabinet (drives, transformers and similar), noise can be induced in a bus line. Spike voltages are deflected 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.



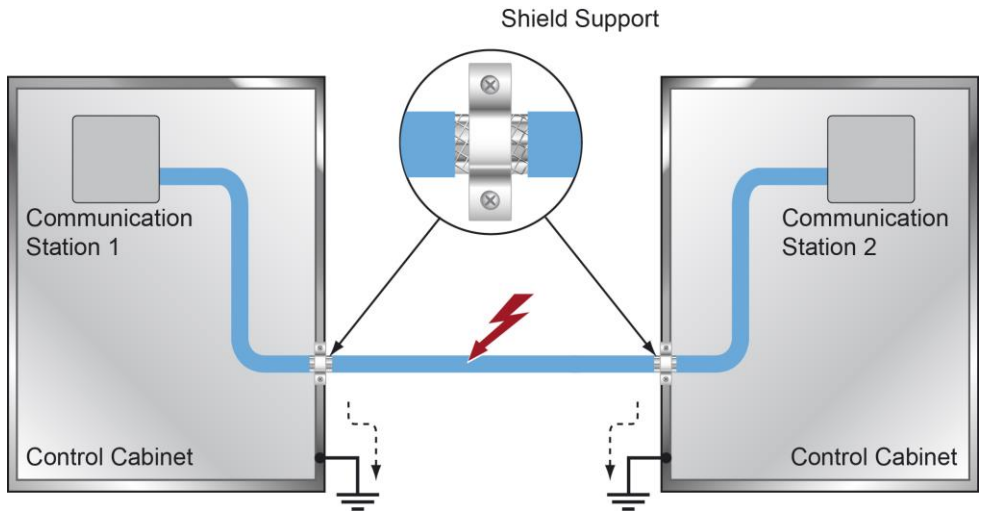
15.4 Connecting Noise Generating Components

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).



15.5 Shielding Between Two Control Cabinets

If two control cabinets must be connected over a 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.



16 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 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	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 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
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 over 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
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.
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	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
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	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 DIAS Master.	Restart, report error to SIGMA TEK.
64	INTERNAL ERROR	An internal error has occurred, all applications are stopped.	Restart, report error to SIGMA TEK.
65	FILE ERROR	An error has occurred during a file operation.	
66	DEBUG ASSERTION FAILED	Internal error	Restart, report error to SIGMA TEK.
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: Remaining time -SWBTRuntime: Preset value for 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 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
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	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.	
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		

17 Assembly/Installation

17.1 Check Contents of Delivery

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

INFORMATION

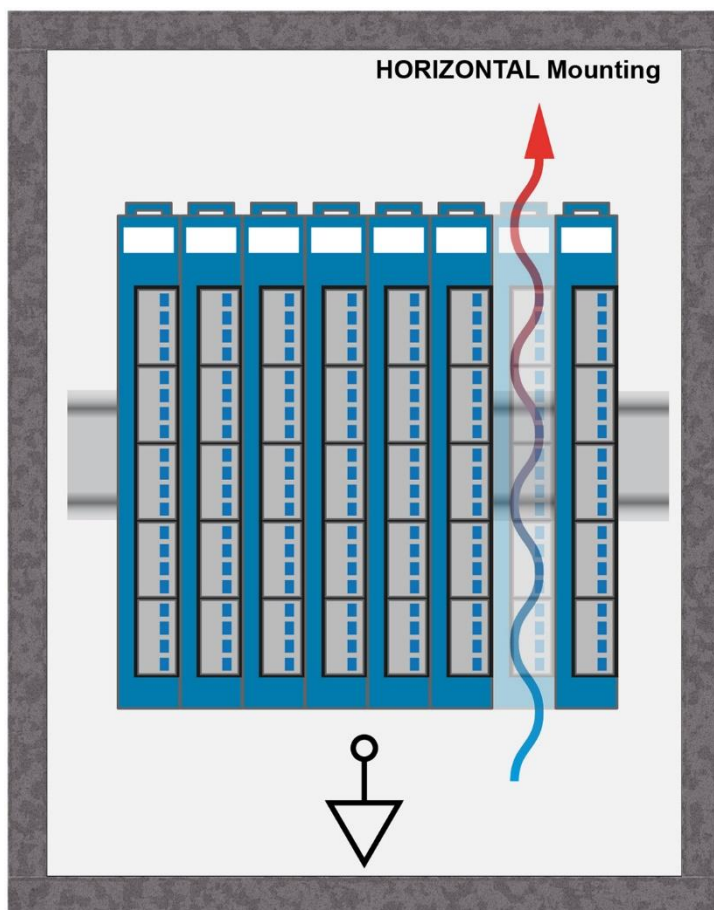


On receipt and before initial use, check the device for damage. If the device is damaged, contact our customer service and do not install the device in your system.

Damaged components can disrupt or damage the system.

17.2 Mounting

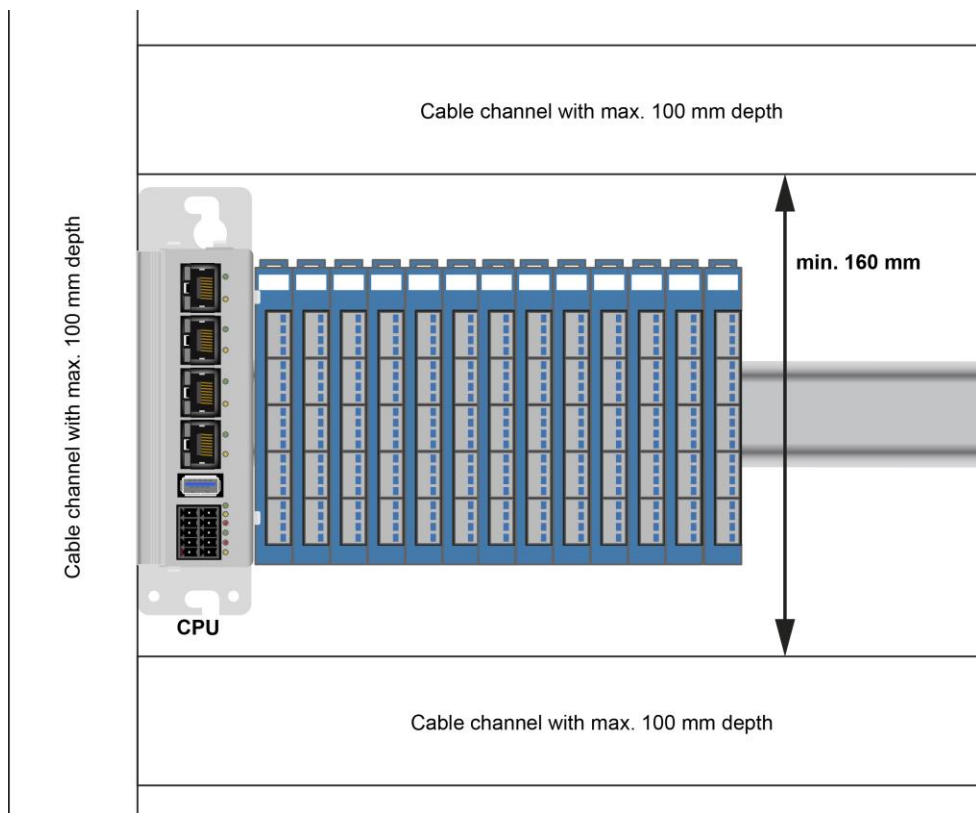
To mount the CPU unit, a DIN rail is required. The DIN rail must establish a conductive connection with the back wall of the control cabinet. The individual S-DIAS modules are mounted on the DIN rail as a block and secured with latches. The functional ground connection from the module to the DIN rail is made via the grounding clamp on the back of the S-DIAS modules. The modules must be mounted horizontally (module label facing 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 required to provide optimal cooling and air circulation so that functionality is ensured at the maximum operating temperature.



CAUTION

It must be noted that the heat dissipated from the ventilation slots (depending on the ambient temperature) can reach up to 70 °C.

Il est à noter que la chaleur dissipée par les fentes d'aération (en fonction de la température ambiante) peut atteindre jusqu'à 70 °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 the optimal cooling.

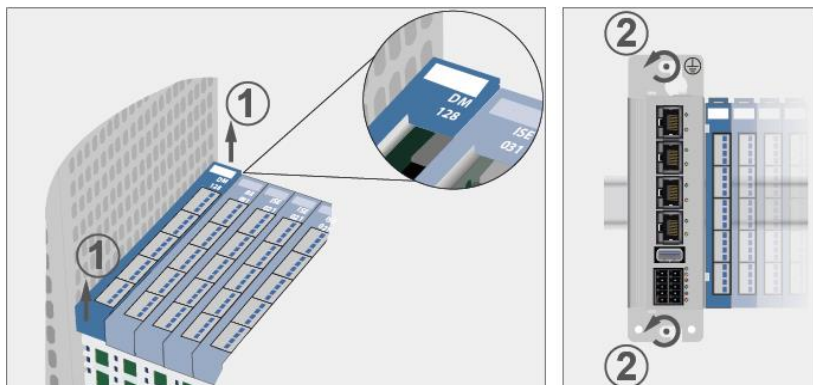
WARNING**Risk of burn injury!**

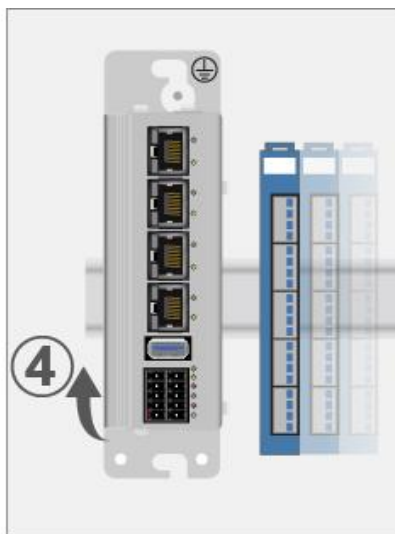
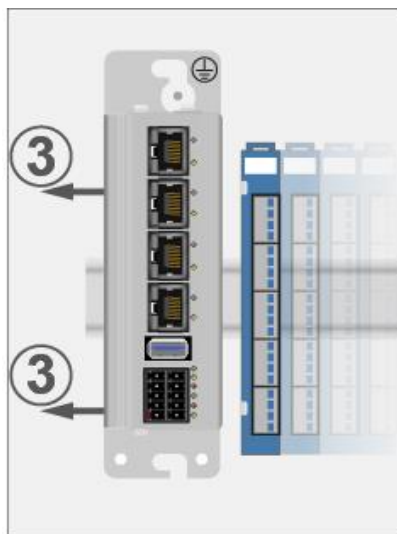
At the maximum permissible ambient temperature, the outer temperature of the heat sink can reach 85 °C!

Risque de brûlures !

A la température ambiante maximale admissible, la température extérieure du radiateur peut atteindre 85 °C !

17.3 Dismounting





18 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.

19 Storage

INFORMATION



When not in use, store the operating panel according to the storage conditions. See chapter 18.

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

20 Maintenance

INFORMATION



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

20.1 Service

This product was constructed for low-maintenance operation.

20.2 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 18 Transport/Storage.

21 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
24.06.2020	1		Added note about EtherCAT Drive
14.07.2020		10 EtherCAT Feature Overview	Chapter added
04.11.2020	45	17 Mounting	Expansion functional ground connection
01.07.2021	11	4.2 Standard Configuration	Note for VARAN-Out 2 in table and hint
02.02.2022			Textual corrections
26.07.2023		Document	General chapters added, design
13.03.2024	13	5.1 Performance Data	microSD card updated
	19	7 Connector Layout	
18.07.2024	13	5.1 Performance Data	EtherCAT to 100
04.11.2024	31	12 Buffer Battery	Battery data changed

