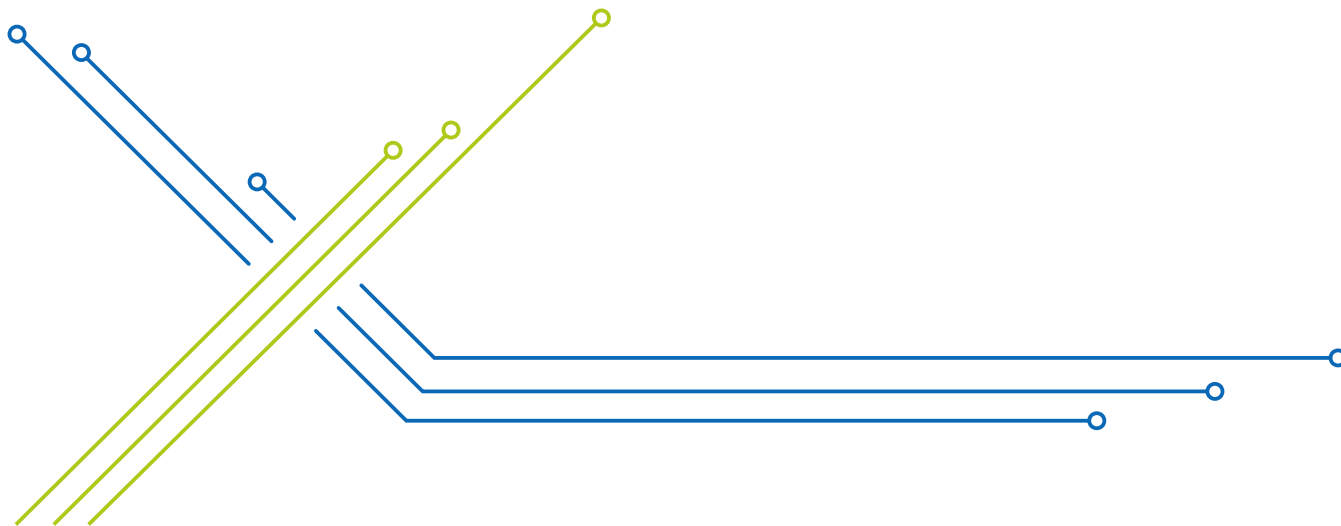


EC 122

S-DIAS Control Module

INSTRUCTION MANUAL

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S-DIAS Control Module

EC 122

1 EtherCAT-IN

1 EtherCAT-OUT

1 S-DIAS-Bus OUT

The S-DIAS Control Module EC 122 is an interface module between an S-DIAS control system and EtherCAT bus. The module provides power supply for up to 32 S-DIAS modules. With an additional power boost module (PSB 001), up to 64 modules can be addressed via the connection module.

The EC 122 automatically detects the connected S-DIAS modules. It provides the EtherCAT slave configuration for the EtherCAT master and handles data exchange between EtherCAT and the S-DIAS bus during operation.

S-DIAS safety modules can also be connected.



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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.sigmatek-automation.com.

Our support team is happily available to answer your questions or assist you in case of any issues. 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 EC 122

1x opposing connector

1.4 Trademarks

EtherCAT® 

Safety over
EtherCAT® 

EtherCAT® and Safety over EtherCAT® are registered trademarks and patented technologies, licensed by Beckhoff Automation GmbH, Germany.

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 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.

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 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 Declaration of Conformity



EU Declaration of Conformity

The product EC 122 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.

Approbations		Standards
QR-Code  BJ: XXXX/XX S/N XXXXXXXX	Short Name Specifications FS: XXX.XX.XX FW: XXX LD: XX.X HW: X.XX	Electrical Ratings  SIGMATEK Sigmatekstraße 1 A-5112 Lamprechtshausen www.sigmatek-automation.com
Article Number		Product Name

- 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

Interfaces	1x EtherCAT-IN (RJ45) 1x EtherCAT-OUT (RJ45) 1x S-DIAS-Bus
------------	--

5.2 EtherCAT Specifications

Configuration	2x shielded RJ45 port		
Cable length	maximum 100 m between stations		
Propagation delay	approximately 1 µs		
Potential separation	500 V (EtherCAT - S-DIAS bus)		
FMMU	3		
Sync manager	4		
Process data RAM	59 Kbytes		
Synchronization	64-bit distributed clock		
Process image	modular device profile		
Asynchronous data exchange	Protocol	Supported functions	Description
	CoE	Complete Access Support SDO Info Support PDO Assign	CANopen over EtherCAT is required for transmitting parameters
	FoE	yes	File over EtherCAT for transferring FW updates and S-DIAS module descriptions
	FSoE	FSoE Master	in conjunction with up to 2 SCP 211
Max. number of S-DIAS modules	up to 32 (64 with PSB 001) S-DIAS modules		

5.3 Electrical Requirements

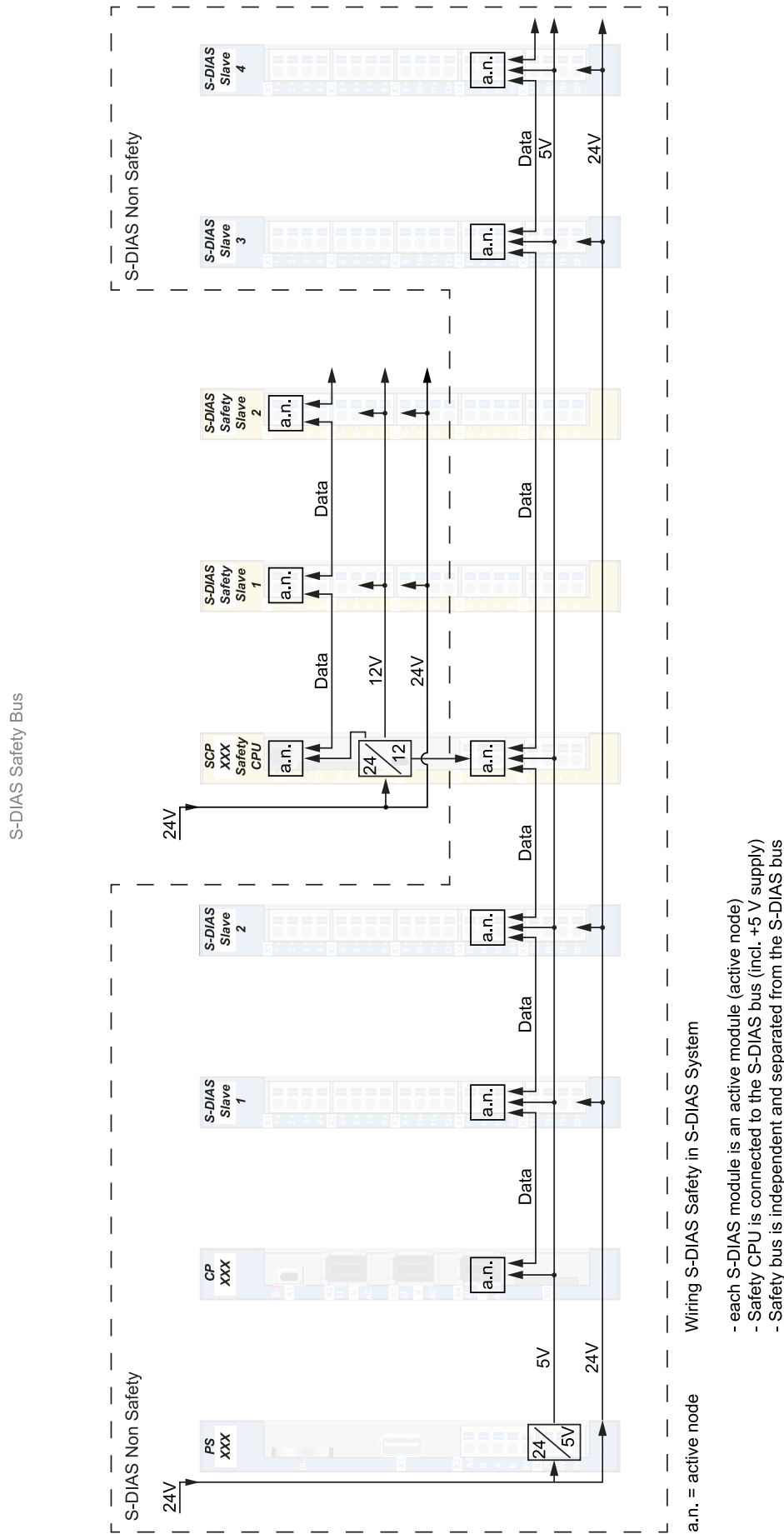
Supply voltage +24 V	typically +24 V DC ±20 % (SELV/PELV) UL: NEC Class 2	
Current consumption of +24 V power supply	the current consumption is dependent on the connected loads (max. 2.75 A)	
Power supply on the S-DIAS bus	by the EC 122	
Current capacity on the S-DIAS bus (power supply for modules)	+5 V	+24 V
	maximum 1.6 A	maximum 1.6 A

INFORMATION

The supply of the module shall be protected by or connected to:

1. Listed fuse (UL 248-14) meeting the requirements of Limited Energy Circuit (table 18) of UL/CSA 61010-1 3rd ed. Cl. 9.4 or
2. The devices are intended to be supplied from an isolated Limited Energy Source per UL 61010-1, 3rd ed. cl. 9.4 or Limited Power Source per UL 60950-1 or Class 2 per NEC.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



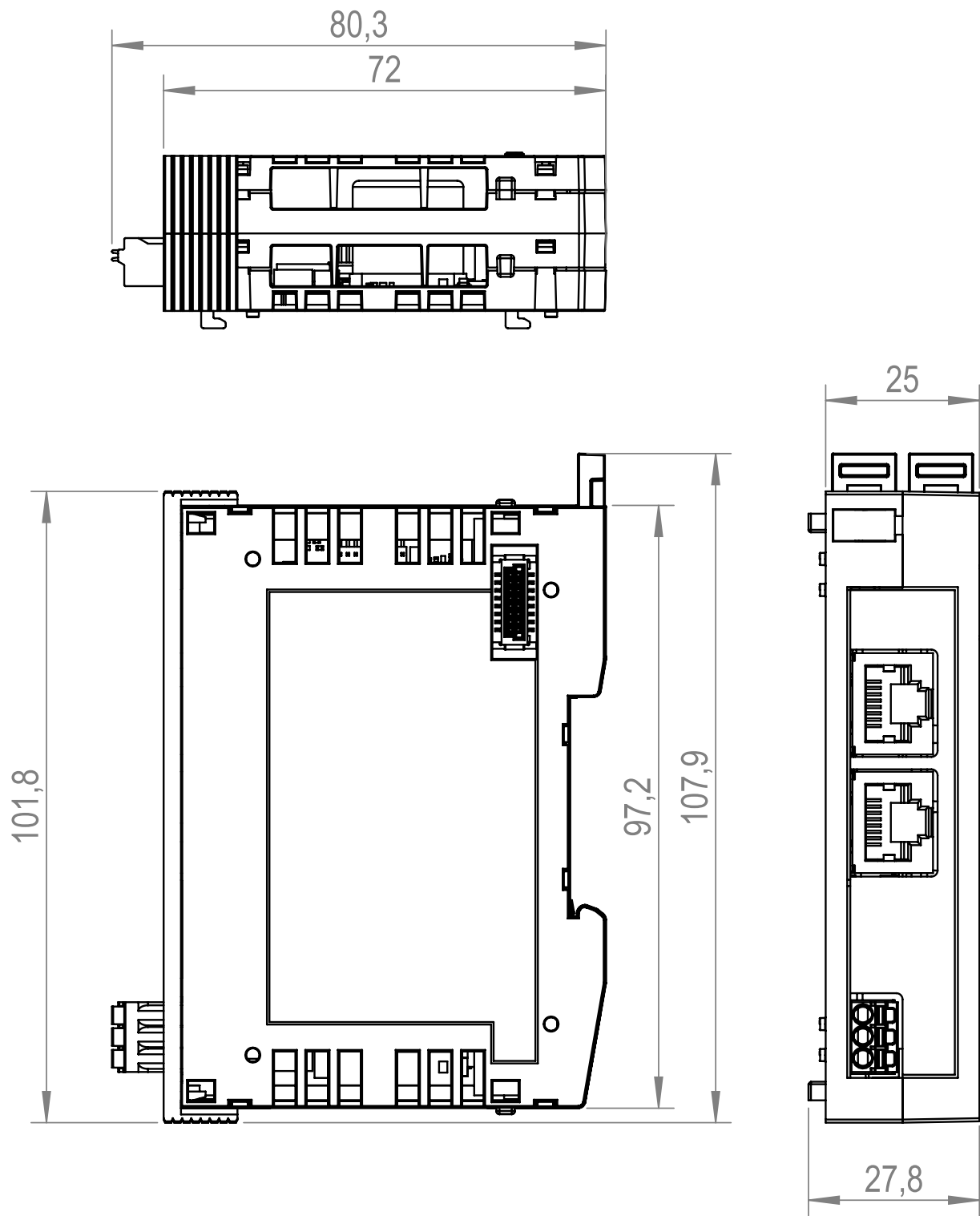
5.4 Miscellaneous

Article number	20-003-122	
Printed circuit board coating	no	
Approvals	CE	yes
	UL	cULus (E247993)
	Functional Safety	no
	UKCA	no

5.5 Environmental Conditions

Storage temperature	-40 ... +85 °C	
Environmental temperature	-25 ... +60 °C	
Humidity	0-95 %, non-condensing	
Installation altitude above sea level	0-2000 m without derating > 2000 m up to a maximum of 5000 m with derating of the maximum environmental temperature by 0.5 °C per 100 m	
Operating conditions	pollution degree 2	
Noise emission	≤ 70 dB	
EMC resistance	EN 61000-6-2 (industrial area)	
EMC noise generation	EN 61000-6-4 (industrial area)	
Vibration resistance	EN 60068-2-6	3.5 mm from 5-8.4 Hz 1 g from 8.4-150 Hz
Shock resistance	EN 60068-2-27	15 g (147.15 m/s²)
Protection type	EN 60529	IP20 (not evaluated by UL)

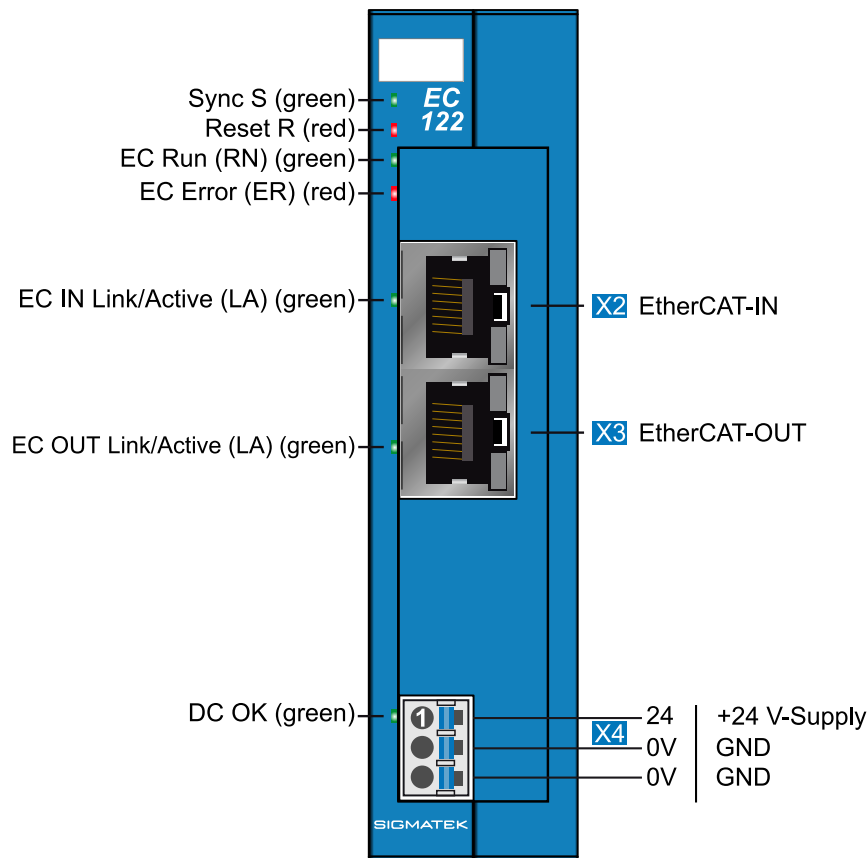
6 Mechanical Dimensions



Measurements

25 x 107.9 x 72 mm (W x H x D)

7 Connector Layout



INFORMATION



The GND supply (X3: Pin 2 and Pin 3) is internally bridged. Only one GND pin (pin 2 or pin 3) needs to be connected to supply the module. The bridged connections may be used to loop through the GND supply. However, it must be ensured that the total current per connection does not exceed 6 A!

7.1 Status LEDs

Sync	green	ON	S-DIAS bus operating synchronously
Reset	red	ON	S-DIAS bus in reset
EC Run	green	ON	status operational
		BLINKS FAST	initialization or bootstrap status
		FAST BLINKING	pre-operational status
		OFF	Init status
EC Error	red	ON	PDI watchdog timeout
		BLINKS FAST	boot error
		DOUBLE FLASH	watchdog process
		SINGLE FLASH	general runtime error
		BLINKS	configuration error
		OFF	no errors
EC IN Link/Active	green	ON	connection to the upstream EtherCAT module established without data communication
		BLINKS	connection to the upstream EtherCAT module established with data communication
		OFF	no connection to the upstream EtherCAT module
EC OUT Link/Active	green	ON	connection to the downstream EtherCAT module established without data communication
		BLINKS	connection to the downstream EtherCAT module established with data communication
		OFF	no connection to the downstream EtherCAT module
DC OK	green	ON	+24 V supply ok
		OFF	+24 V missing or voltage too low

7.2 Applicable Connectors

- X2, X3: RJ45 (not included in delivery)
- X4: Connectors with spring terminals (included in delivery)

The spring terminals are suited for the connection of ultrasonically compacted (ultrasonically welded) stranded wire.

Use copper cables (Cu) rated for at least 75 °C for wiring.

Connection capacity:

Stripping length/sleeve length	10 mm
Mating direction	parallel to conductor axis or to circuit board
Conductor cross section rigid	0.2-1.5 mm²
Conductor cross section flexible	0.2-1.5 mm²
Conductor cross section, ultrasonically compacted	0.2-1.5 mm²
Conductor cross section AWG/kcmil	24-16
Conductor cross section flexible with ferrule without plastic sleeve	0.25-1.5 mm²
Conductor cross section flexible with ferrule with plastic sleeve	0.25-0.75 mm² (reason for reducing d2 of the ferrule)



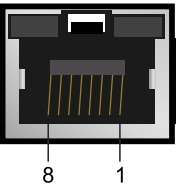
INFORMATION



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

7.3 Connectors

7.3.1 X2: EtherCAT IN (RJ45)



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

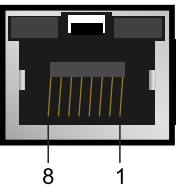
n.c. = do not use

INFORMATION



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

7.3.2 X3: EtherCAT OUT (RJ45)



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

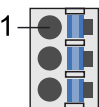
n.c. = do not use

INFORMATION



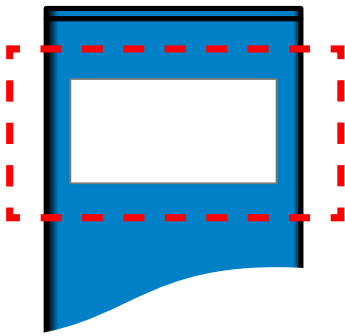
Only for use in LAN, not for connection to telecommunication circuits.

7.3.3 X4: +24 V-Supply



Pin	Signal	Function
1	+24 V	+24 V-Supply
2	GND	GND
3	GND	GND

7.4 Label Field



The labeling field is printed directly on the module.

8 Wiring

8.1 Note

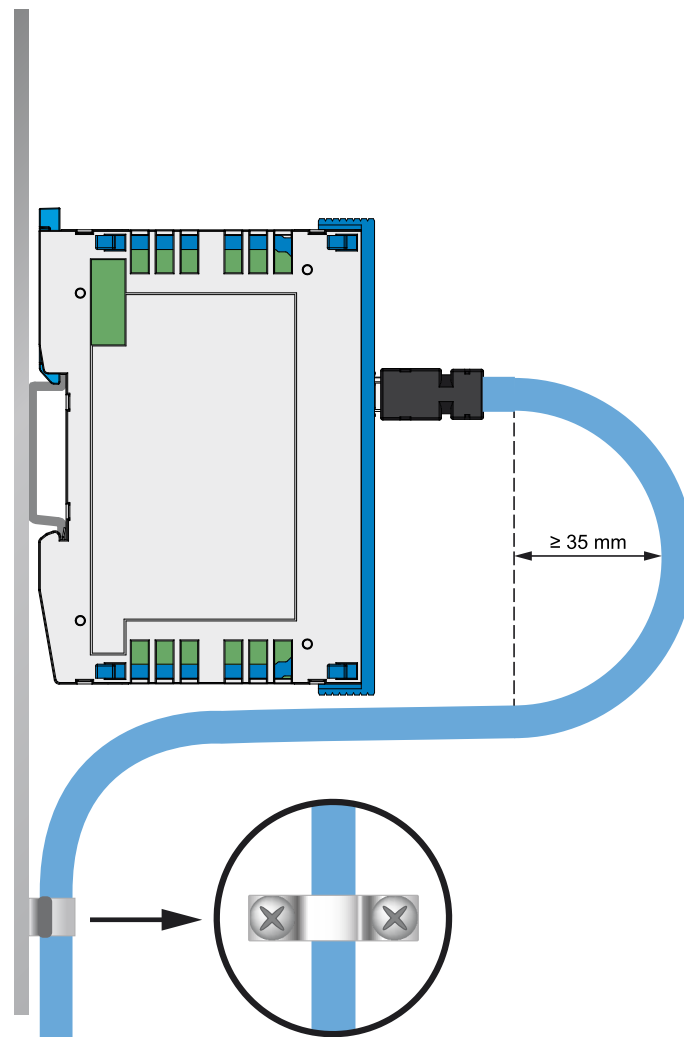
The following installation guidelines should be observed:

INFORMATION



Shielding Recommendation Laying the EtherCAT cables in accordance with the EtherCAT Technologies Group (ETG) specification.

8.2 Strain Relief



INFORMATION



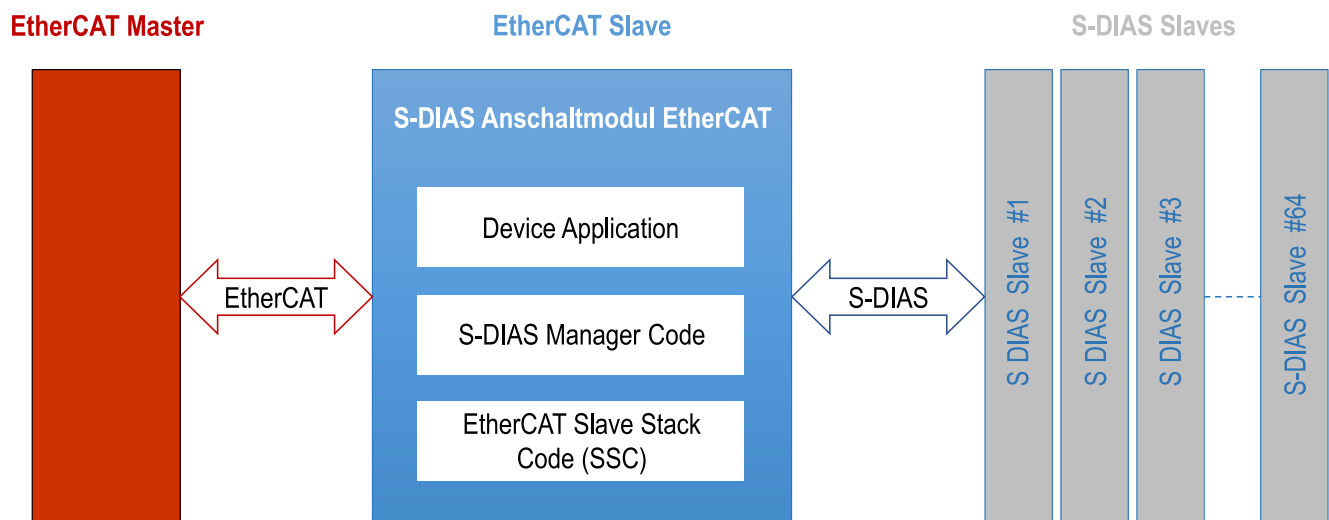
The EtherCAT cable must be mounted close to the module (e.g. using a clamp)!
No mechanical stress can be applied to the connection!

9 System Description

9.1 Architecture

The S-DIAS EtherCAT Control Module functions as an EtherCAT slave and enables communication between an EtherCAT master and selected modules of the S-DIAS control and I/O system. Communication with up to 64 selected S-DIAS participants can be thereby implemented.

The following graphic illustrates the connection of the S-DIAS EtherCAT control module to its corresponding components. The module is designed so that with each EtherCAT master that meets the specifications is compatible and can communicate.



9.2 Supported S-DIAS Modules

The S-DIAS EtherCAT connection module supports the following S-DIAS modules with the listed serial numbers or higher:

Module name	Serial number
AI 022	5939502
AI 043	6060705
AI 075	6064879
AI 084	6056902
AI 088	6095866
AI 088-1	5963592
AM 221	6039568
AM 222	6019430
AM 441	6070032
AM 442	6044310
AO 081	6096202
NC 100	6060801
SR 020	6095746
SR 022	6058839
DI 080	5903091
DI 160	6093972
DI 200	6093772
DI 202	6071963
DI 203	6036131
DI 205	5695936
DM 081	5794579
DM 161	6096698
DM 162	6078257
RO 041	5914846
TO 081	6096778
TO 127	6079257
TO 161	6103003
ICA 011	6082482
ICA 012	6096378
SI 021	5898508

9.3 Initialization

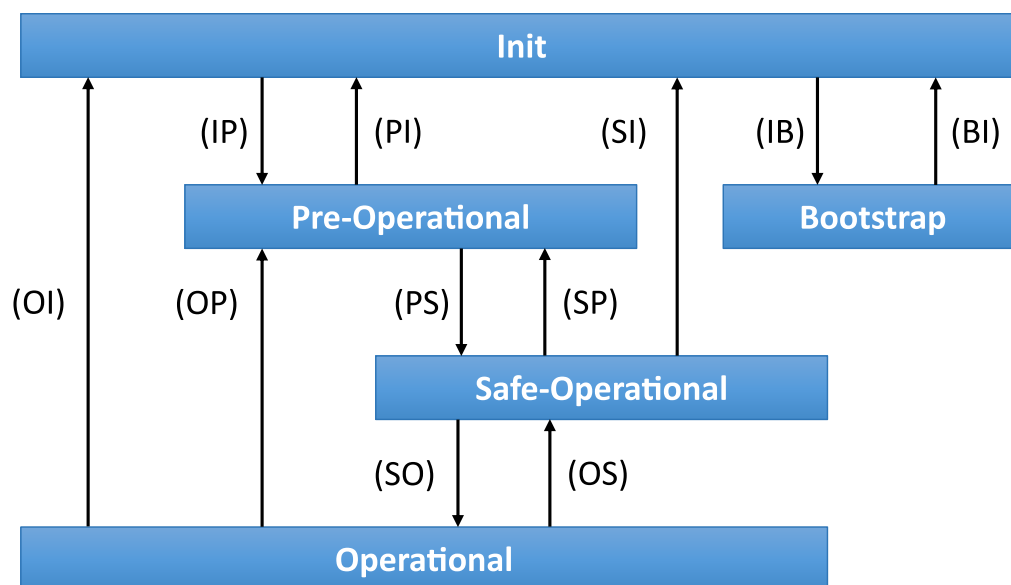
In the EtherCAT protocol different states and state transitions are defined during operation. The S-DIAS control module mirrors these EtherCAT states on the S-DIAS bus or in the S-DIAS slaves.

9.3.1 S-DIAS Manager

1. EC 122 Power-Up
2. The S-DIAS Manager integrated into the EC 122 searches the S-DIAS bus for available modules.
3. Create service and process data configuration for the EtherCAT protocol (for this purpose, info files are required which are stored in the S-DIAS slaves).
4. Generate object list using located S-DIAS modules.
5. S-DIAS initialization is “paused” until the EtherCAT bus changes from the Pre-Operational (PreOp) mode to Safe-Operational (Safe-Op) mode.
6. EtherCAT slave is available on the EtherCAT bus.

9.3.2 EtherCAT

The following graphic shows the possible modes and mode transitions on the EtherCAT bus.



9.3.2.1 Init -> PreOp

- EtherCAT master reads the ID from the EEPROM.
- Mailbox SyncManager (SM) is configured.
- Distributed Clock (DC) is configured.
- Module status LED on the S-DIAS slaves continue to blink.

9.3.2.2 PreOp -> SafeOp

- Module list is read by the EtherCAT master.
- Process data (PDO) SyncManager (SM) are configured.
- Fieldbus Memory Management Units (FMMUs) are configured.
- Process data mapping is written via the master.
- The start-up data written via CoE for the configuration of the S-DIAS modules are accepted.
- S-DIAS bus starts with the process data for the module's inputs.
- EC 121 starts copying the S-DIAS input data with SafeOP status
- After the successful transition to the SafeOp status, the module status LED on the S-DIAS slave lights continuously.

9.3.2.3 SafeOp -> Op

- S-DIAS bus starts with the process data for the module outputs.
- S-DIAS EtherCAT control module starts copying the S-DIAS output data with Op mode.
- Module status LED on the S-DIAS slave lights continually

10 Initial Startup

If the system has been configured according to the architecture description and all components have been correctly connected and linked, the S-DIAS EtherCAT interface module can be started with an EtherCAT master.

INFORMATION



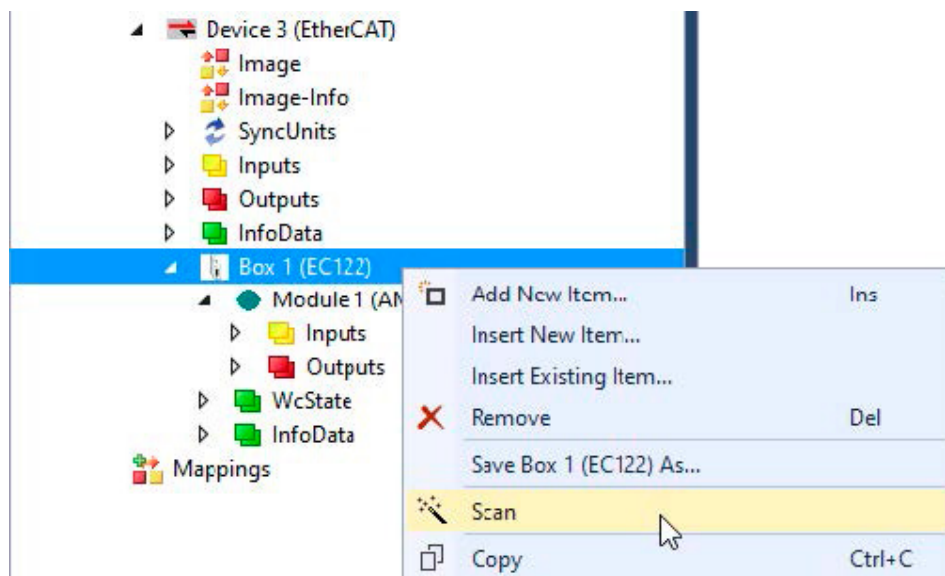
Turn off the voltage supply when you want exchange or replace S-DIAS modules. Otherwise the modules may be destroyed!

For the following example, TwinCAT was selected as the EtherCat bus to demonstrate commissioning the S-DIAS Control Module EtherCAT.

TwinCAT® is a registered and licensed trademark of Beckhoff Automation GmbH.

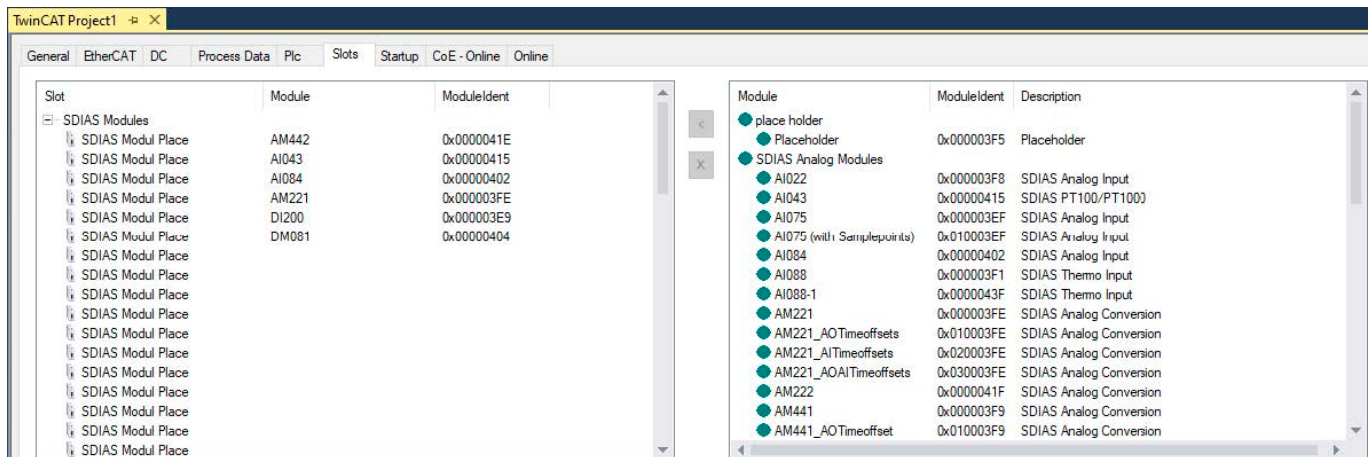
10.1 Automatic S-DIAS Module Configuration

If the assignment of the S-DIAS slave modules should be changed or modules added/removed, the option is available to automatically update the new configuration in the EtherCAT master. This is enabled with a right-click on the Box 1 (EC 122) and then selecting the option Scan. The S-DIAS EtherCAT control module detects the new configuration of the module automatically and lists it correctly.



10.2 Manual S-DIAS Configuration

Alternative to automatically loading the module configuration via the Scan instruction, the user has the option to manually define the module assignment. A double click on Box 1 (EC 122) opens the settings window for the current object. With the Slots menu, all 64 of the available module slots can be occupied. A selection of S-DIAS slaves can be found in the module list shown below.



With a restart command in the EtherCAT master, the selected module configuration is enabled. As can be seen in the graphic above, some S-DIAS slaves have special functions such as “Samplepoints” or “Timeoffsets”. For this reason, different variations are available for several modules in the EtherCAT system. Whereby specific functions of the module can be used.

INFORMATION



Automatic scanning of the S-DIAS slaves always adds the standard variant of the respective S-DIAS module. To use specific functions, the corresponding module must be replaced with the desired variant after an automatic scan.

Each module has a unique module identification number. If the number from the configuration does not match the number of the module in the system (incorrect slot, wrong module etc.) operation is not possible.

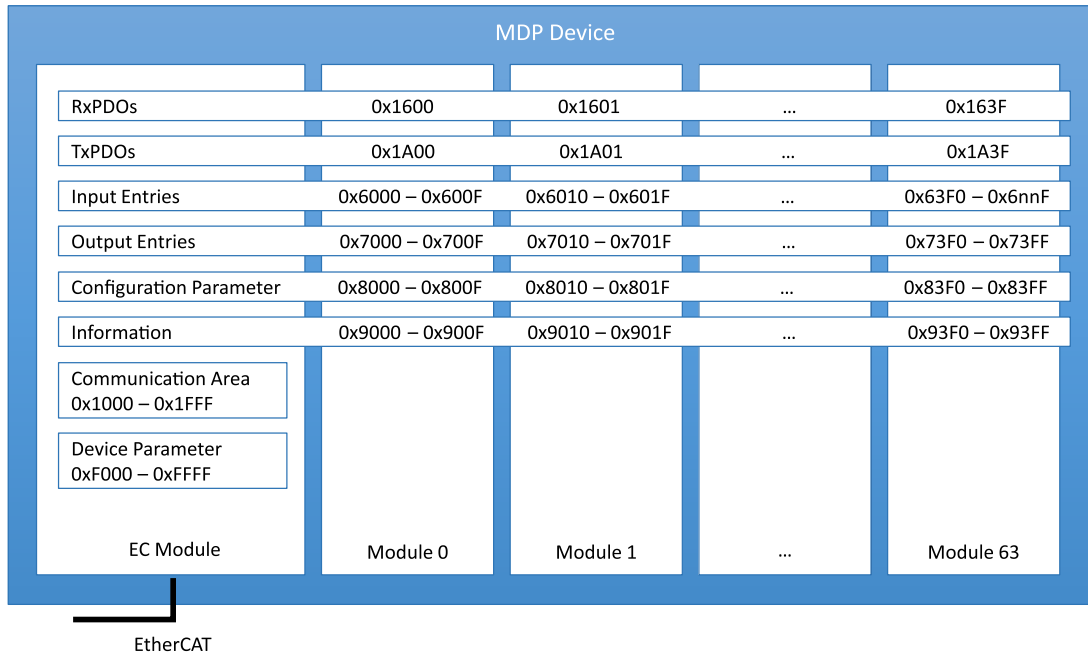
10.3 Operating Mode

The EC 122 currently only supports operation in DC synchronous mode. In DC Synchronous mode, the EC 122 uses the distributed clock as a reference and operates with the specified cycle time. Possible cycle times are 250 µs, 500 µs and between 1 ms and 32 ms in millisecond intervals. Whether operation is possible with the cycle time setting depends on the cycle times supported by the connected S-DIAS Slaves. This information can be found in the product documentation of the corresponding S-DIAS slave. Otherwise the capacity of the system plays a role – depending on the number and configuration of S-DIAS slaves on the EC 122 – the possible cycle time for proper operation can vary.

11 Object Directory

11.1 Overview

The following graphic shows an overview of the objects in the S-DIAS EtherCAT control module.



11.2 S-DIAS Slave Function Group Assignment

xx = module number 0-63

[module at slot 5 -> xx = 5]

11.2.1 TxPDO

Index (TxPDO)	Function Group	Index (TxPDO)	Function Group
0x6xx0	Digital Input	0x6xxA	Status
0x6xx1	Analog Input	0x6xxB	Miscellaneous
0x6xx2	Analog Range	0x6xxC	
0x6xx3	Status Word	0x6xxD	Error Bits
0x6xx4	Counter / Encoder	0x6xxE	Reference Voltage OK
0x6xx5	PWM Period	0x6xxF	Voltage OK
0x6xx6	Timestamp		
0x6xx7			
0x6xx8			
0x6xx9	Measurement Value		

11.2.2 RxPDO

Index (RxPDO)	Function Group	Index (RxPDO)	Function Group
0x7xx0	Digital Output	0x7xxA	Config
0x7xx1	Analog Output	0x7xxB	Miscellaneous
0x7xx2		0x7xxC	
0x7xx3	Control Word	0x7xxD	
0x7xx4	PWM	0x7xxE	
0x7xx5	Time Offset	0x7xxF	
0x7xx6			
0x7xx7			
0x7xx8	DriveCmd		
0x7xx9	Command		

11.2.3 CnfSDO

Index (CnfSDO)	Function Group	Index (CnfSDO)	Function Group
0x8xx0		0x8xxA	Config
0x8xx1	LED Control	0x8xxB	Miscellaneous
0x8xx2		0x8xxC	
0x8xx3		0x8xxD	
0x8xx4	PWM	0x8xxE	
0x8xx5	Time Offset	0x8xxF	
0x8xx6			
0x8xx7			
0x8xx8	DriveCmd		
0x8xx9	Command		

11.3 EtherCAT Object Specifications

INFORMATION



Detailed information on the object directory for the basic structure of individual objects and the module device profile to use can be found in the corresponding EtherCAT specifications “**Part 1: General MDP Device Model**”, short: **ETG.5001.1 S**, and “**Part 3: MDP Fieldbus Gateway Profile Specifications**”, short: **ETG.5001.3 S**.

11.4 Information on the EC 122 Objects

11.4.1 Object 0x1000 Device Type

The object 0x1000 contains the type and function of the S-DIAS EtherCAT control module. The value 0x00001389 indicates a device with “Modular Device Profile”.

Name	Sub-index	Description/Value
Name		Device Type
Object code		VAR
Data type	Sub-index 0x00	UNSIGNED32
Access	Sub-index 0x00	RO
Default value	Sub-index 0x00	0x00001389

11.4.2 Object 0x1008 Device Name

The object 0x1008 contains the manufacturer-specific device names of the S-DIAS EtherCAT Control Module.

Name	Sub-index	Description/Value
Name		Device Type
Object code		VAR
Data type	Sub-index 0x00	Visible String
Access	Sub-index 0x00	RO
Default value	Sub-index 0x00	EC 122

11.4.3 Object 0x1009 Hardware Version

The object 0x1009 contains the hardware version of the EC 122.

Name	Sub-index	Description/Value
Name		Hardware Version
Object code		VAR
Data type	Sub-index 0x00	Visible String
Access	Sub-index 0x00	RO
Default value	Sub-index 0x00	-

11.4.4 Object 0x100A Software Version

The object 0x100A contains the firmware version of the S-DIAS EtherCAT Control Module.

Name	Sub-index	Description/Value
Name		Software Version
Object code		VAR
Data type	Sub-index 0x00	Visible String
Access	Sub-index 0x00	RO
Default value	Sub-index 0x00	-

11.4.5 Object 0x1018 Identity Object

The 0x1008 contains manufacturer-specific information on the S-DIAS EtherCAT Control Module.

Name	Sub-index	Description/Value
Name		Identity Object
Object code		RECORD
Data type	Sub-index 0x00	UNSIGNED8
	Sub-index 0x01 to 0x04	UNSIGNED32
Access	Sub-index 0x00	RO
	Sub-index 0x01 to 0x04	RO
Function	Sub-index 0x00	Number of entries
	Sub-index 0x01	Manufacturer ID
	Sub-index 0x02	Product Code
	Sub-index 0x03	Revision
	Sub-index 0x04	Serial number
Default value	Sub-index 0x00	-
	Sub-index 0x01	0x000088FA
	Sub-index 0x02	0x04000004
	Sub-index 0x03	0
	Sub-index 0x04	0

11.4.6 Object 0x10F1 Error Settings

The object 0x10F1 contains EtherCAT-specific error settings.

Name	Sub-index	Description/Value
Name		Error Settings
Object code		RECORD
Data type	Sub-index 0x00	UNSIGNED8
	Sub-index 0x01	UNSIGNED32
	Sub-index 0x02	UNSIGNED16
Access	Sub-index 0x00	RO
	Sub-index 0x01	RW
	Sub-index 0x02	RW
Function	Sub-index 0x00	Number of entries
	Sub-index 0x01	Local error reaction
	Sub-index 0x02	Counter limit for Sync error
Default value	Sub-index 0x00	2
	Sub-index 0x01	0x00000000
	Sub-index 0x02	0x00C8

11.4.7 Object 0x10F3 Diagnosis History

See "ETG1020 Protocol Enhancements" (chapter 16, Diagnosis handling)

11.4.8 Object 0x10F8 Timestamp Object

See "ETG1020 Protocol Enhancements" (chapter 16, Diagnosis handling)

11.4.9 Object 0x16xx (RxPDO Mapping)/Object 0x1Axx (TxPDO Mapping)

The objects 0x16xx and 0x1Axx contain the corresponding process data mapping of the connected S-DIAS slaves. The content depends on the module configuration.

11.4.10 Object 0x1C00 Sync Manager Type

The object 0x1C00 contains the type for the individual EtherCAT Sync managers.

Name	Sub-index	Description/Value
Name		Sync Manager Type
Object code		ARRAY
Data type	Sub-index 0x00	UNSIGNED8
	Sub-index 0x01 to 0x04	UNSIGNED8
Access	Sub-index 0x00	RO
	Sub-index 0x01 to 0x04	RO
Function	Sub-index 0x00	Number of entries
	Sub-index 0x01	Sub-Index 001
	Sub-Index 001	Sub index 002
	Sub-index 0x03	Sub index 003
	Sub-index 0x04	Sub index 004
Default value	Sub-index 0x00	-
	Sub-index 0x01	0x02 (Mailbox In)
	Sub-index 0x02	0x01 (Mailbox Out)
	Sub-index 0x03	0x04 (Process Data In)
	Sub-index 0x04	0x03 (Process Data Out)

11.4.11 Object 0x1C12 (RxPDO Assign) / Object 0x1C13 (TxPDO Assign)

The objects 0x1C12 and 0x1C13 contains the process data mapping assignment.

11.4.12 Object 0x1C32/0x1C33 SM Output/Input Parameter

These objects contain the Sync Manager Input or Output parameters.

Name	Sub-index	Description/Value
Name		SM output/input parameter
Object code		ARRAY
Data type	Sub-index 0x00	UNSIGNED8
	Sub-index 0x01	UNSIGNED16
	Sub-index 0x02	UNSIGNED32
	Sub-index 0x04	UNSIGNED16
	Sub-index 0x05	UNSIGNED32
	Sub-index 0x06	UNSIGNED32
	Sub-index 0x08	UNSIGNED16
	Sub-index 0x09	UNSIGNED32
	Sub-index 0x0A	UNSIGNED32
	Sub-index 0x0B	UNSIGNED16
	Sub-index 0x0C	UNSIGNED16
	Sub-index 0x20	BOOL
Access	Sub-index 0x00	RO
	Sub-index 0x01	RW
	Sub-index 0x02	RO
	Sub-index 0x04	RO
	Sub-index 0x05	RO
	Sub-index 0x06	RO
	Sub-index 0x08	RW
	Sub-index 0x09	RO
	Sub-index 0x0A	RO
	Sub-index 0x0B	RO
	Sub-index 0x0C	RO
	Sub-index 0x20	RO

Name	Sub-index	Description/Value
Function	Sub-index 0x00	Number of entries
	Sub-index 0x01	Sync Mode
	Sub-index 0x02	Cycle Time
	Sub-index 0x04	Sync modes supported
	Sub-index 0x05	Minimum cycle time
	Sub-index 0x06	Calc and copy time
	Sub-index 0x08	Get cycle time
	Sub-index 0x09	Delay time
	Sub-index 0x0A	Sync0 cycle time
	Sub-index 0x0B	Cycle time small
	Sub-index 0x0C	SM event missed counter
	Sub-index 0x20	Sync error

11.4.13 Object 0xF000 Modular Device Profile

The object 0xF000 contains basic information on the modular device profile used.

Name	Sub-index	Description/Value
Name		Modular Device Profile
Object code		ARRAY
Data type	Sub-index 0x00	UNSIGNED8
	Sub-index 0x01	UNSIGNED16
	Sub-index 0x02	UNSIGNED16
	Sub-index 0x03	UNSIGNED32
	Sub-index 0x04	UNSIGNED32
	Sub-index 0x05	UNSIGNED16
Access	Sub-index 0x00	RO
	Sub-index 0x01 to 0x05	RO
Function	Sub-index 0x00	Number of entries
	Sub-index 0x01	Module Index Distance
	Sub-index 0x02	Maximum number of modules
	Sub-index 0x03	General configuration
	Sub-index 0x04	General information
	Sub-index 0x05	Module PDO device group
Default value	Sub-index 0x00	0x05
	Sub-index 0x01	0x10
	Sub-index 0x02	0x40
	Sub-index 0x03	0x00000001
	Sub-index 0x04	0x00000000
	Sub-index 0x05	0x0000

11.4.14 Object 0xF010 Module Profile List

The object 0xF010 describes the module profile.

11.4.15 Object 0xF030 Configured Module Ident List

The object 0xF030 contains a list of the configured S-DIAS modules with their corresponding module identification number. These are written by the EtherCAT Master when transitioning from INIT to PreOP.

Name	Sub-index	Description/Value
Name		Configured Module Ident List
Object code		ARRAY
Data type	Sub-index 0x00	UNSIGNED8
	Sub-index 0x01 to 0x41	UNSIGNED32
Access	Sub-index 0x00	RW
	Sub-index 0x01 to 0x41	RW
Function	Sub-index 0x00	Number of entries
	Sub-index 0x01 to 0x41	Bit 0-24: Module identification number 0 means no module or module not active. Bit 25-31: Operation mode of the corresponding module, usually 0. Values for these objects according to the field "ModuleIdent" from the module specific ESI file.

11.4.16 Object 0xF050 Detected Module Ident List

The object 0xF050 contains a list of detected S-DIAS modules with their corresponding module identification modules.

Name	Sub-index	Description/Value
Name		Detected Module Ident List
Object code		ARRAY
Data type	Sub-index 0x00	UNSIGNED8
	Sub-index 0x01 to 0x40	UNSIGNED32
Access	Sub-index 0x00	RO
	Sub-index 0x01 to 0x40	RO
Function	Sub-index 0x00	Number of entries
	Sub-index 0x01 to 0x40	Module identification number 0xFFFF means, that either no module was detected or a serious error with this module occurred. More information can be found in the module specific status objects and the ErrorInfo object 0xF111.

11.4.17 Object 0xF100 S-DIAS Versions

The object 0xF100 contains information on the S-DIAS manager.

Name	Sub-index	Description/Value
Name		S-DIAS versions
Object code		RECORD
Data type	Sub-index 0x00	UNSIGNED8
	Sub-index 0x01 to 0x02	UNSIGNED32
	Sub-index 0x03	UNSIGNED16
Access	Sub-index 0x00	RO
	Sub-index 0x01 to 0x03	RO
Function	Sub-index 0x00	Number of entries
	Sub-index 0x01	S-DIAS Manager Protocol Version
	Sub-index 0x02	S-DIAS Manager Option Bits
	Sub-index 0x03	S-DIAS Manager FW Version
Default value	Sub-index 0x00	-
	Sub-index 0x01 to 0x03	0

11.4.18 Object 0xF110 S-DIAS Diagnosis

The object 0xF110 Diagnostics information for the S-DIAS bus.

Name	Sub-index	Description/Value
Name		S-DIAS Diagnosis
Object code		RECORD
Data type	Sub-index 0x00	UNSIGNED8
	Sub-index 0x01	UNSIGNED32
Access	Sub-index 0x00	RO
	Sub-index 0x01	RO
Function	Sub-index 0x00	Number of entries
	Sub-index 0x01	Retry Counter
Default value	Sub-index 0x00	-
	Sub-index 0x01	0

11.4.19 Object 0xF111 ErrorInfo

The object 0xF111 contains information on errors that occurred in the system.

Name	Sub-index	Description/Value
Name		DiagnosisControl
Object code		RECORD

Name	Sub-index	Description/Value
Data type	Sub-index 0x00	UNSIGNED8
	Sub-index 0x01	UNSIGNED32
	Sub-index 0x02	UNSIGNED32
Access	Sub-index 0x00	RO
	Sub-index 0x01	RW
	Sub-index 0x02	RW
Function	Sub-index 0x00	Number of entries
	Sub-index 0x01	Diagnosis level
	Sub-index 0x02	Diagnosis developer
Default value	Sub-index 0x00	2
	Sub-index 0x01	0x00000000
	Sub-index 0x02	0x0000003F

Diagnosis Level (1= enable):

Bit0: Diagnosis message logging level user information mask.

Bit1: Diagnosis message logging level user warning mask.

Bit2: Diagnosis message logging level user error mask.

Bit3: Diagnosis message logging level vendor information mask.

Bit4: Diagnosis message logging level vendor warning mask.

Bit5: Diagnosis message logging level vendor error mask.

11.4.19.1 Reason Codes

Reason Code	Error Information
1	Cause unknown
2	Insufficient available memory
3	File is unusable
4	S-DIAS bus not ready
5	S-DIAS did not confirm the state transition
6	The S-DIAS module configuration could not be checked
7	State transition request has failed on the S-DIAS side.
8	The master tried to change the data objects of the PDO mapping
9	Configuration inconsistent
10	Error during Mutex request
11	Starting SDO communication failed
12	TimeOut
13	Entry not found
14	Module-specific function failed
15	Handshake from base task.
16	PLL.
17	Task status.
18	SPI error.
18	Slave function failed during state transition.
20	Incorrect entry in the S-DIAS slave internal mapping file.
21	No more copy entries available.
22	The transition from ISO-Full to the Read-only task state in the S-DIAS failed.
23	File name too long.
24	Invalid checksum.
25	Unexpected response from S-DIAS base task

11.4.19.2 EtherCAT Error Codes

The following table shows device-specific EtherCAT error codes.

AL Status Code	Error Information
0x8000	An attempt was made to start the EtherCAT state machine when the S-DIAS bus was not initialized.
0x8001	Call for the slave-specific state transition function failed.
0x8002	The requested state transition was not confirmed by the S-DIAS bus in time.
0x8003	A state transition was active or another was activated during the wait time.
0x8004	Inconsistency between the configured/detected modules and mapping. Check settings or check the module status for fatal errors.
0x8005	Slave-specific function call in OP mode failed.
0x8006	Slave-specific function call in the SafeOP mode failed.
0x8007	Copy function between EtherCAT hardware and EtherCAT data object failed.
0x8008	Copy function between EtherCAT hardware and EtherCAT data object failed.
0x8009	State transition on the S-DIAS bus from Idle to Read-only (similar to SafeOP) failed.
0x800A	State transition on the S-DIAS bus from Read-only (similar to SafeOP) to ISO-Full (similar to OP) failed.
0x800B	SPI Access to the S-DIAS interface failed.
0x800C	Undefined error in the S-DIAS ISO-Full state (similar to OP)
0x800D	State transitions in S-DIAS from ISO-Full (similar to OP) to Read-Only (similar to SafeOP)
0x800E	The S-DIAS main task unexpectedly interrupted the handshake with the S-DIAS Iso task.
0x800F	Time-out while waiting for the PLL interrupt.
0x8010	PLL lost the "locked" status.
0x8011	Unexpected response from S-DIAS base task

11.4.20 Object 0xF120 S-DIAS Statistics

The object 0xF120 contains the statistics data for the S-DIAS bus

Name	Sub-index	Description/Value
Name		S-DIAS Statistics
Object code		RECORD
Data type	Sub-index 0x00	UNSIGNED8
	Sub-index 0x01 to 0x04	UNSIGNED32
Access	Sub-index 0x00	RO
	Sub-index 0x01 & 0x03	RO
	Sub-index 0x02 & 0x04	RW
Function	Sub-index 0x00	Number of entries
	Sub-index 0x01	ISO Write task duration
	Sub-index 0x02	Maximum ISO Write task duration
	Sub-index 0x03	ISO Read task duration
	Sub-index 0x04	Maximum ISO Read task duration
Default value	Sub-index 0x00	-
	Sub-index 0x01 to 0x04	0x00000000

11.4.21 Object 0xF500 Device Control

The object 0xF500 contains control options for the EC 122.

Name	Sub-index	Description/Value
Name		Device Control
Object code		RECORD
Data type	Sub-index 0x00	UNSIGNED8
	Sub-index 0x01	UNSIGNED32
Access	Sub-index 0x00	RO
	Sub-index 0x01	RW
Function	Sub-index 0x00	Number of entries
	Sub-index 0x01	Software Restart
Default value	Sub-index 0x01	0x00 (Force Restart = 0x01)

11.4.22 Objekt 0xF900 FSoE Master Parameter

Name	Sub-index	Description/Value
Name		FSoE Master Parameter
Objekt Code		RECORD
Data type	Sub-Index 0x00	UNSIGNED8
	Sub-Index 0x01	UNSIGNED16
	Sub-Index 0x02	UNSIGNED16
	Sub-Index 0x03	UNSIGNED16
	Sub-Index 0x04	UNSIGNED16
	Sub-Index 0x05	UNSIGNED32
Access	Sub-Index 0x00	RO
	Sub-Index 0x01	RO
	Sub-Index 0x02	RO
	Sub-Index 0x03	RO
	Sub-Index 0x04	RO
	Sub-Index 0x05	RO
Function	Sub-Index 0x00	Anzahl der Einträge
	Sub-Index 0x01	Max Safe Input Data per FSoE Master
	Sub-Index 0x02	Max Safe Output Data per FSoE Master
	Sub-Index 0x03	Max Safe Input Data per FSoE Slave
	Sub-Index 0x04	Max Safe Output Data per FSoE Slave
	Sub-Index 0x05	Max Length of Connection Parameter per Slave Connection
Default value	Sub-Index 0x00	1
	Sub-Index 0x01	0x0000
	Sub-Index 0x02	0x0000
	Sub-Index 0x03	0x0000
	Sub-Index 0x04	0x0000
	Sub-Index 0x05	0x00000000

11.4.23 Objekt 0xF980 Device FSoE Slave Address

Name	Sub-index	Description/Value
Name		Device FSoE Slave Address
Object Code		RECORD
Data type	Sub-Index 0x00	UNSIGNED8
	Sub-Index 0x01	UNSIGNED16
Function	Sub-Index 0x00	RO
	Sub-Index 0x01	RO
Data type	Sub-Index 0x00	Number of entries
	Sub-Index 0x01	Safety Address first FSoE SlaveConnection
Function	Sub-Index 0x00	1
	Sub-Index 0x01	0x0000

11.4.24 Object 0x9xx0 [Module Name] Module Information

The object 0x9xx¹⁾0 contains general information on the respective S-DIAS module.

Name	Sub-index	Description/Value
Name		[Module Name] Module information
Object code		RECORD
Data type	Sub-index 0x00	UNSIGNED8
	Sub-index 0x01 to 0x04 & 0x06	UNSIGNED32
	Sub-index 0x05	Visible String
Access	Sub-index 0x00	RO
	Sub-index 0x01 to 0x06	RO
Function	Sub-index 0x00	Number of entries
	Sub-index 0x01	Module Status (0 = Module OK)
	Sub-index 0x02	Device ID
	Sub-index 0x03	FPGA version
	Sub-index 0x04	HW version
	Sub-index 0x05	Serial number
	Sub-index 0x06	Firmware version
Default value	Sub-index 0x00	-
	Sub-index 0x01 to 0x06	0x00000000

¹⁾xx =S-DIAS slot

12 File Handling (FoE)

The File Over EtherCAT (FoE) function is available in the S-DIAS EtherCAT Control Module in BOOTSTRAP mode only and is used to exchange files between the EtherCAT master and the EC 122.

12.1 FoE Password

The file exchange between the EtherCAT master and S-DIAS EtherCAT control module is password-protected. When down as well as uploading a file, the correct password must be entered. The password is a 32-bit hexadecimal value defined for the EC 122 as follows:

FoE Password	0x5CD26BF1
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12.2 File Names

Files transferred to the S-DIAS EtherCAT control module via FoE are subject to a name check. Directory traversal characters ("/", "\", ":") are not allowed in the file name or are not accepted by the EC 122. The number of characters in the file name is limited to a **maximum of 20 characters**. The name of the files provided by SIGMATEK **cannot be changed** when downloading to the EC 122.

13 Assembly/Installation

13.1 Check Contents of Delivery

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

INFORMATION

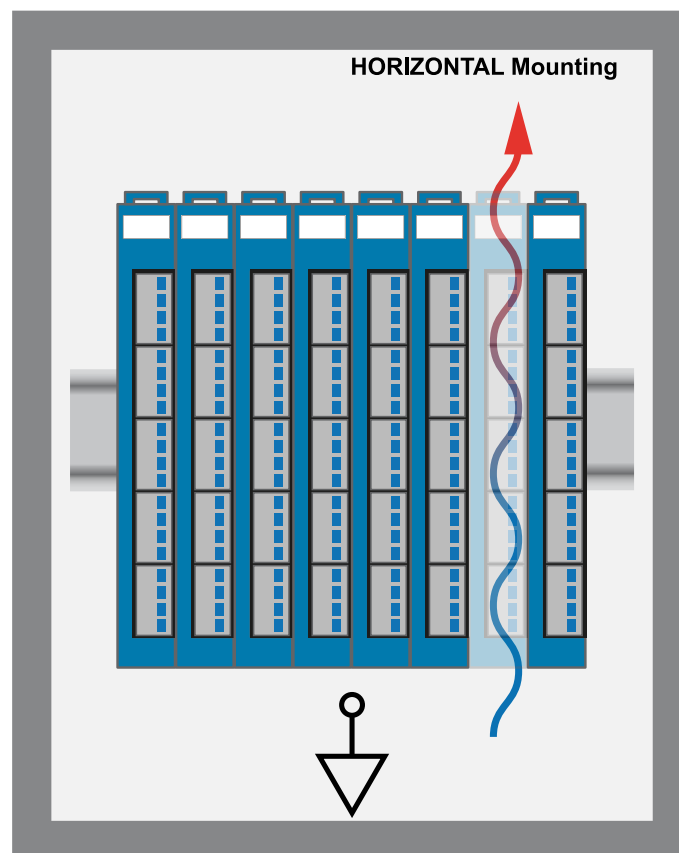


On receipt and before initial use, check the device for damage. If the device is damaged, contact our customer service and do not install the device in your system.

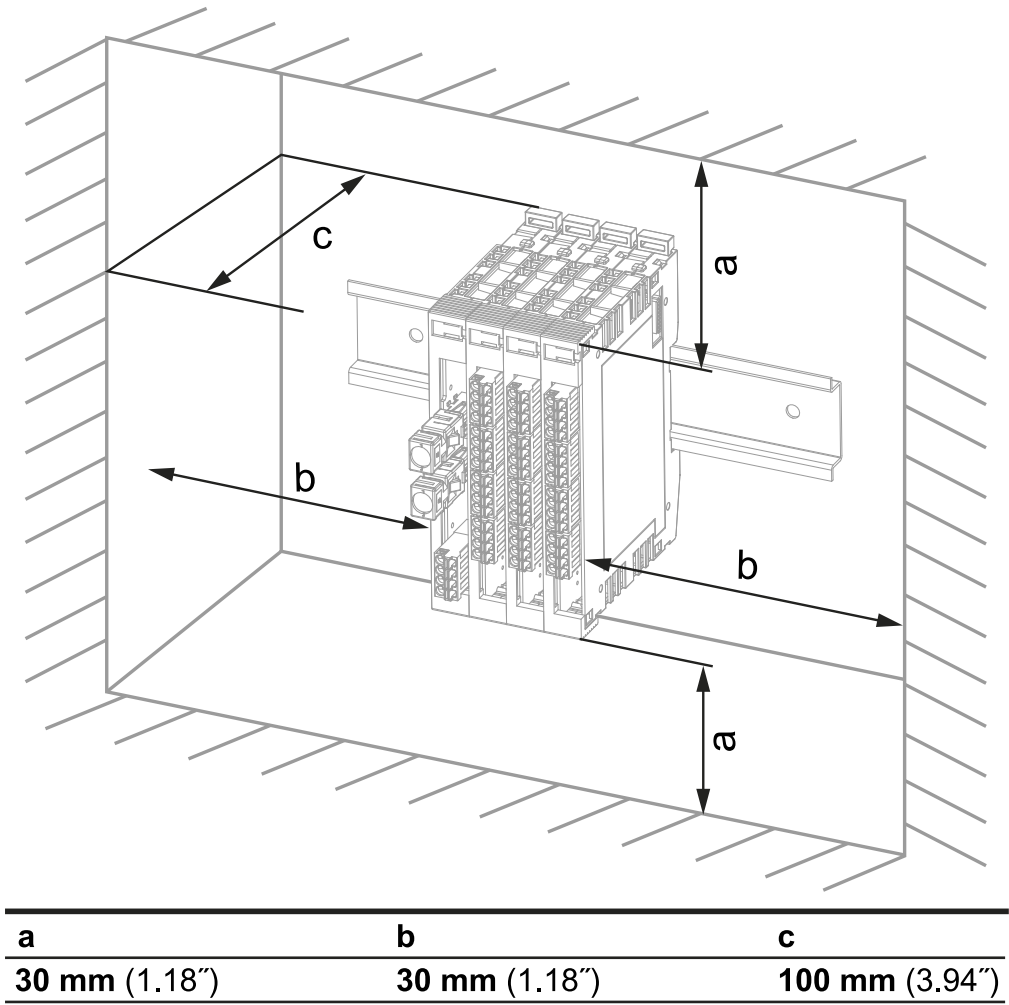
Damaged components can disrupt or damage the system.

13.2 Mounting

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



Recommended minimum distances between the S-DIAS modules and the surrounding components or control cabinet wall:



a, b, c ... distances in mm (inches)

14 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.

15 Storage

When not in use, store the device according to the storage conditions. See chapter 14 Transport/Storage.

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

16 Maintenance

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

16.1 Service

This product was constructed for low-maintenance operation.

16.2 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 14 Transport/Storage.

17 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.



Changes Chart

Change date	Affected page(s)	Chapter	Note
21.07.2026	11	5.3 Electrical Requirements	UL information added
	18	7.2 Applicable Connectors	
	19	7.3 Connectors	