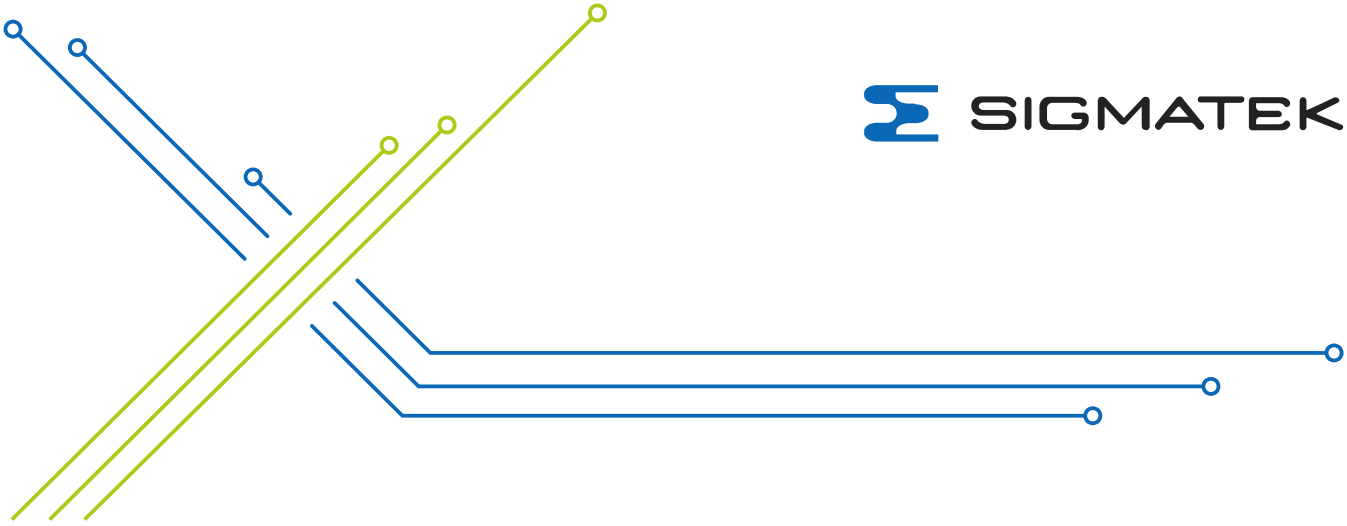

SIGMATEK

SCP 111(-X)

S-DIAS Safety CPU Module

INSTRUCTION MANUAL

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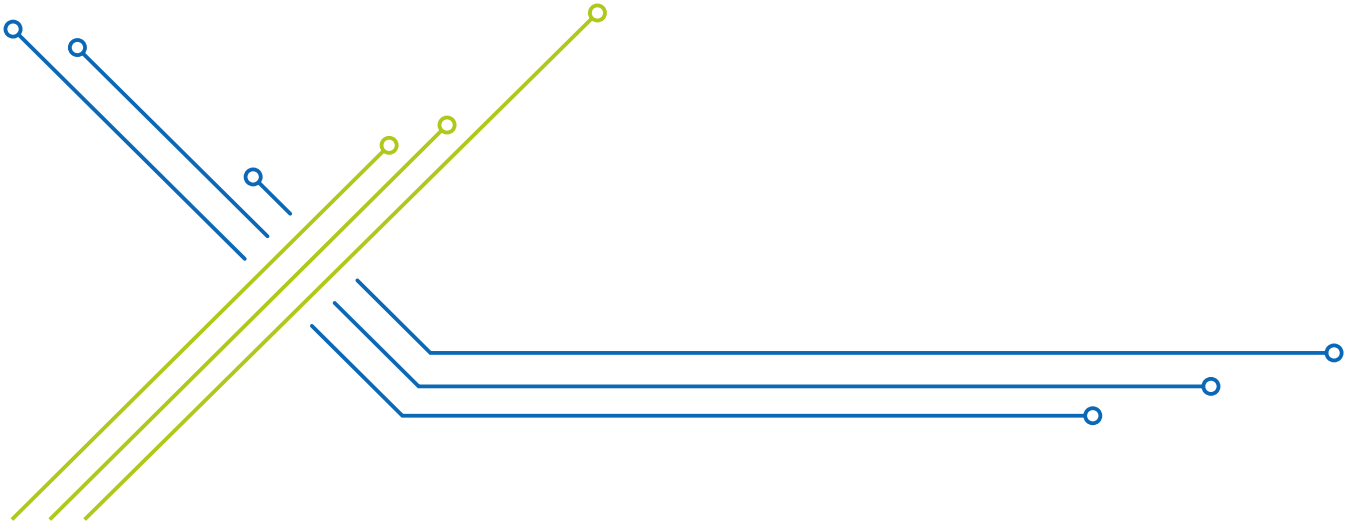

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Translation of the Original Instructions

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S-DIAS Safety CPU Module SCP 111(-X)

The S-DIAS Safety CPU module SCP 111(-X) supports up to 16 Safe I/O modules. In addition, the SCP 111(-X) can operate handheld devices with Emergency Stop and/or confirmation switches.

The Safety CPU component has the safety integrity level SIL3 (EN IEC 62061) or Performancelevel e (PL e) (EN ISO 13849).

The safety-related SCP 111(-X) is ideal for use in systems with optional modules and interface variables according to Safety System Handbook, see homepage.[1)]

With the SCP 111(-X), the safe process data is transmitted with its own safety protocol (FSoE). Therefore, the SCP 111(-X) cannot be used with a CSCP 011/012, SCP 010/011 in a Safety project.

The SCP 111(-X) alone is already a minimal system of a safety control.

In addition, the SCP 111(-X) regulates the synchronized communication with the remote safety modules through safe bus telegrams. Among their jobs are:

- Processing the safe application and
- The distribution of configuration data to remote safety modules

This instruction manual also applies to the product SCP 111-X (main board and S-DIAS connectors coated in Purocoat (Certonal), which is no longer explicitly mentioned in the following).

1) Using the search function with the keyword “Safety System Handbook”

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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

- Safety System Handbook

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

1.3 Contents of Delivery

1x SCP 111(-X)

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.

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.

2.4 Designated Use

The Safety functions implemented in the product are designed for use with safety applications in a PLC control and meet the required conditions for safe operation.

CAUTION

The instructions contained in this operating manual must be followed. For error-free operation, proper transport and storage are essential.
Installation, mounting, programming, initial start-up, operation, maintenance and decommissioning can only be performed by qualified personnel.
Qualified personnel in this context are people, who have completed training or have trained under supervision of qualified personnel and have been authorized to operate and maintain safety-related equipment, systems and facilities in compliance with the strict directives and standards of safety technology (Functional Safety).

Les instructions contenues dans ce manuel technique doivent être suivies.
Pour un fonctionnement sans erreur, le transport et le stockage appropriés sont essentiels.
L'installation, le montage, la programmation, la mise en service initiale, l'exploitation, la maintenance et la mise hors service ne peuvent être effectués que par une personne qualifiée.
Dans ce contexte, on entend par personnel qualifié les personnes qui ont suivi une formation ou qui ont été formées sous la supervision d'un personnel qualifié et qui ont été autorisées à utiliser et à entretenir l'équipement, les systèmes et les installations de sécurité conformément aux directives et aux normes strictes de la technique de sécurité (Sécurité fonctionnelle).

For your own safety and that of others, the product should be used for their designated purpose only.
Correct EMC installation is also included under designated use.

Pour votre propre sécurité et celle des autres, le produit ne doivent être utilisés qu'à des fins prévues.
Une installation CEM correcte est également incluse dans l'utilisation prévue.

Non-designated use consists of:

- any changes made to the module or the use of damaged modules.
- use of the module inconsistent with the technical margins described in this operating manual or the specifications defined in the technical data.

L'utilisation non désignée consiste en:

- toute modification apportée au module ou l'utilisation des modules endommagés.
- utilisation du module non conforme aux marges techniques décrites dans ce manuel ou aux spécifications définies dans les données techniques.

2.5 Software/Training

The application is created with the software LASAL CLASS 2 and LASAL SCREEN Editor, the Safety application is created using the SAFETYDesigner. Basic information on Safety (Functional Safety) can be found in the Safety System Handbook.

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 IT Security

S-DIAS safety modules were developed for integration into a network protected against unauthorized access.

For example, the following dangers can affect the network:

- Unauthorized access
- Data manipulation
- and many other IT security violations

It is the responsibility of the integrator or operator to carry out a risk analysis of the connections between S-DIAS modules and the integration into the overall infrastructure. The following measures, for example, may result from this (if necessary):

- Separation of IT/OT networks (VLANs or physical)
- Firewalls
- Password-protected user accounts
- Data encryption
- and much more

With regard to the functional safety objective, in this case the STO safety function, no direct effects on the function or its integrity are possible, since the function cannot be influenced via communication-based interfaces.

The availability of the overall system (as with all safety functions) can be compromised by external attacks, hence the above measures are necessary.

4 Standards and Directives

4.1 Residual Risks

CAUTION

The following residual risks for the product must be included in the system integrator's risk assessment:

- Release of non-environmentally safe substances, emissions and unusual temperatures
- Hazardous contact voltages
- Effects of operational electrical, magnetic and electromagnetic fields
- Possible effects of information technology devices

Les risques résiduels suivants pour le produit doivent être inclus dans l'évaluation des risques de l'intégrateur de système :

- Libération de substances non respectueuses de l'environnement, émissions et températures inhabituelles
- Tensions de contact dangereuses
- Effets des champs électriques, magnétiques et électromagnétiques opérationnels
- Effets possibles des dispositifs de technologie de l'information

4.2 Safety of the Machine or Equipment

Observe all on-site rules and regulations for accident prevention and occupational safety.

4.3 Directives

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

4.3.1 Functional Safety Standards

EN IEC 62061	Safety of machinery - Functional safety of safety-related control systems
EN ISO 13849-1	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
EN ISO 13849-2	Safety of machinery - Safety-related parts of control systems - Part 2: Validation
EN IEC 61508-1	Functional safety - Part 1: General requirements
EN IEC 61508-2	Functional safety - Part 2: Requirements for electrical / electronic / programmable electronic safety-related systems
EN IEC 61508-3	Functional safety - Part 3: Software requirements

The issue status of the applied standards can be found in the EU declaration of conformity.

4.3.2 EU Declaration of Conformity

EU Declaration of Conformity

The product SCP 111(-X) conforms to the following European directives:

- → 2006/42/EG Machine 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. They can be found in the download area of the respective product.

5 Safety-Relevant Parameters

5.1 Mounting Position Horizontal 0-55 °C Ambient Temperature

CPU Module	Safety Parameters	Safety Levels
SCP 111(-X)	PFH = 1.80E-10 (1/h) SFF = 99 % $MTTF_D$ = 2242 years DC = 99 %	SIL 3 according to EN IEC 62061 PL e / Cat. 4 according to EN ISO 13849

Structure: Two-channel redundant (diverse)

5.2 Mounting Position Horizontal 55-60 °C Ambient Temperature

CPU Module	Safety Parameters	Safety Levels
SCP 111(-X)	PFH = 2.30E-10 (1/h) SFF = 99 % $MTTF_D$ = 1862 years DC = 99 %	SIL 3 according to EN IEC 62061 PL e / Cat. 4 according to EN ISO 13849

Structure: Two-channel redundant (diverse)

5.3 Compatibility

The safety-related module SCP 111(-X) is supported with firmware version V423 or build no. 1348 of the SAFETYDesigner and higher.

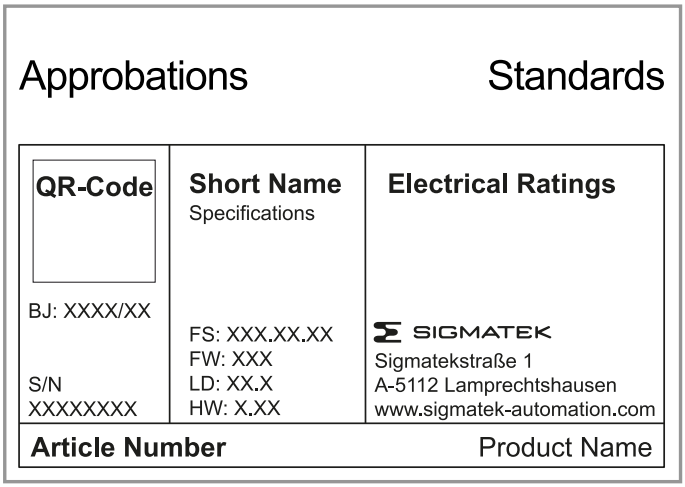
INFORMATION

Compatibility

For compatibility of the S-DIAS Safety modules, see section "Compatibility of S-DIAS Safety Modules" in the system handbook.

6 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

7 Technical Data

7.1 Performance Data

CPU	ARM Cortex M µController	
Addressable safety I/O modules	S-DIAS safety bus: 16	
Data memory	Type	SRAM
	Memory	24 Kbyte
Program memory	Type	Flash
	Memory	224 Kbyte
Remnant memory for parameter lists	-	
Remnant memory for variables	-	
Interfaces	1x microSD card holder for microSD card for loading Safety projects to the Safety CPU 1x Safety interface, Phoenix MC1,5/3-G-3,5 1x USB device, Typ B Mini (Online & programming interface) 1x S-DIAS IN/OUT 1x Safety bus OUT	
Bus connection possible	yes	
Status LEDs	yes	

7.2 Electrical Requirements

7.2.1 Module Supply (Input)

Supply voltage	+18-30[5] V DC, typically +24 V DC (SELV/PELV) UL: Class 2 or LVLC				
Current consumption, energy consumption	typically 90 mA internal consumption				
	maximum 1.4 A[2) 3)]				
Current consumption from the S-DIAS bus		+5 V		+24 V	
	with missing +24 V connection (X3)	typically 170 mA	maximum 200 mA	0 A	0 A
	with available +24 V connection (X3)	0 A	0 A	0 A	0 A

INFORMATION

The module is designed to detect and safely manage electrical faults such as overvoltage or undervoltage of the +24 V supply voltage. Corresponding protective mechanisms are integrated into the module. Therefore, the module does not require any external protective measures for the supply voltage (e.g., a backup fuse) in the event of the aforementioned electrical faults.
The design of the 24 V power supply, including the power source, cable sizing, fusing, and selectivity, is the responsibility of the plant or machine manufacturer. According to EN 60204-1, overcurrent protection is part of the installation. Depending on the power supply unit used, the wiring, and other loads, additional fusing of the supply voltage may be necessary

7.2.2 S-DIAS Bus/Safety Supply (Output)

Current supply	in the S-DIAS Safety bus	+5 V	+24 V
		0 A	0 A
	in the S-DIAS Safety bus (supply of I/O modules)	+12 V	+24 V
		max. 0.8 A[2) 4)]	max. 0.8 A[2) 4)]

INFORMATION

For USA and Canada:

Only suitable for connection to secondary isolated power supply rated 24 V DC, class 2 or fuse rated max. 4 A in accordance with UL 248 shall be connected in the field between the supply source and device terminals.

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

INFORMATION

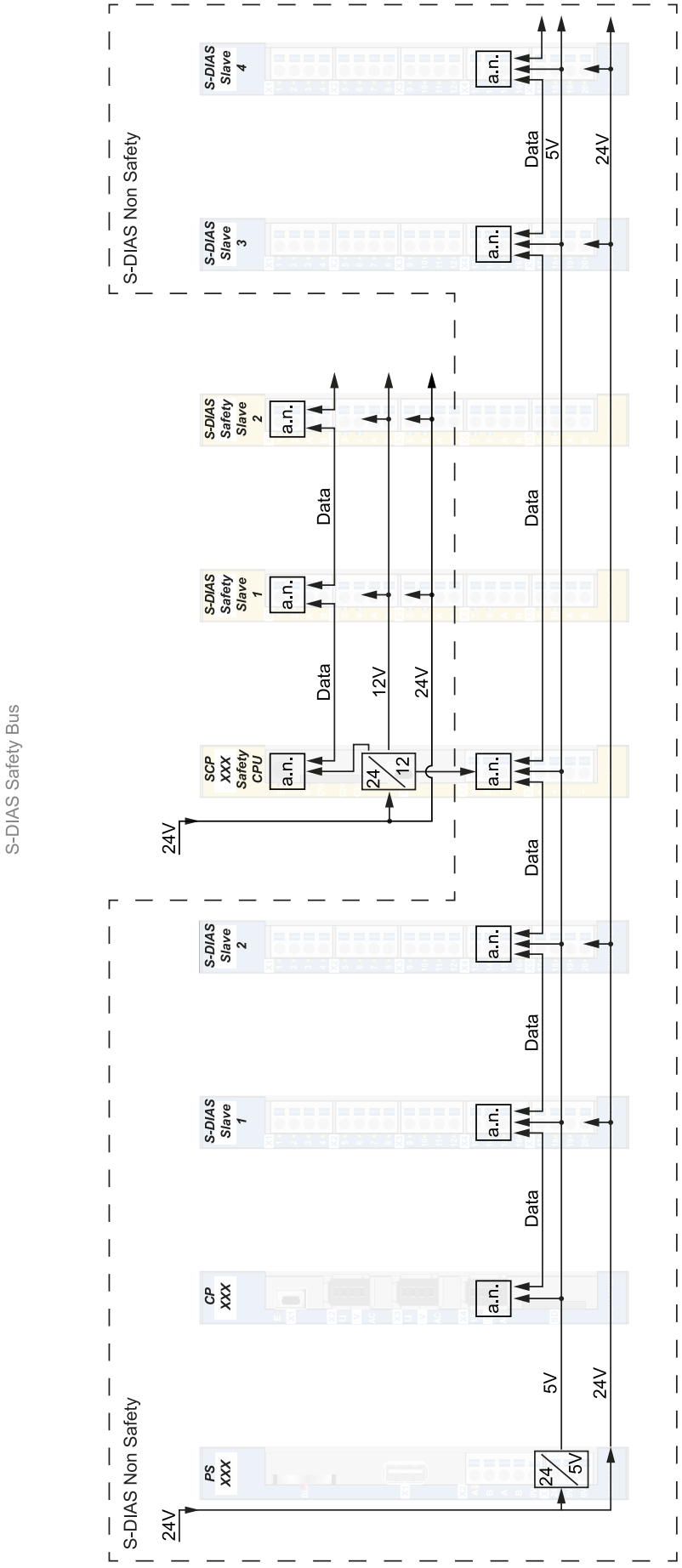
[2] Dependent on the number of modules connected on the S-DIAS Safety bus.

[3] For loading the internal capacitors, power consumption may be increased for a short time (in the microsecond range). This value is dependent on the input voltage and impedance of the power source.

[4] If this S-DIAS Safety module is connected to several modules, the total current for the +24 V and + 12 V must be mathematically determined via the module documentation of the S-DIAS Safety CPU modules used! The total current of the +24 V supply must not exceed 800 mA. The total current of the +12 V supply cannot exceed 800 mA.

[5] With increased ambient temperature > 55 °C the maximum permissible supply voltage is reduced from +30 V to +28.8 V.

If the SCP 111(-X) with a firmware version lower than V355 resp. with a Safety number lower than S01.03.01 is integrated with Safety I/O modules in the S-DIAS system (blue modules), the voltage increase of the +24 V supply of the SCP 111(-X) must not happen later than 100 ms after the voltage supply of the S-DIAS supply modules, otherwise it can happen, that the SCP 111(-X) does not recognize the Safety I/O modules on the Safety bus. This results in a Safety error (error code 1009, reason code 15 in the SAFETYDesigner) and thus the Safety application is not started.



a.n. = active node

Wiring S-DIAS Safety in S-DIAS System

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

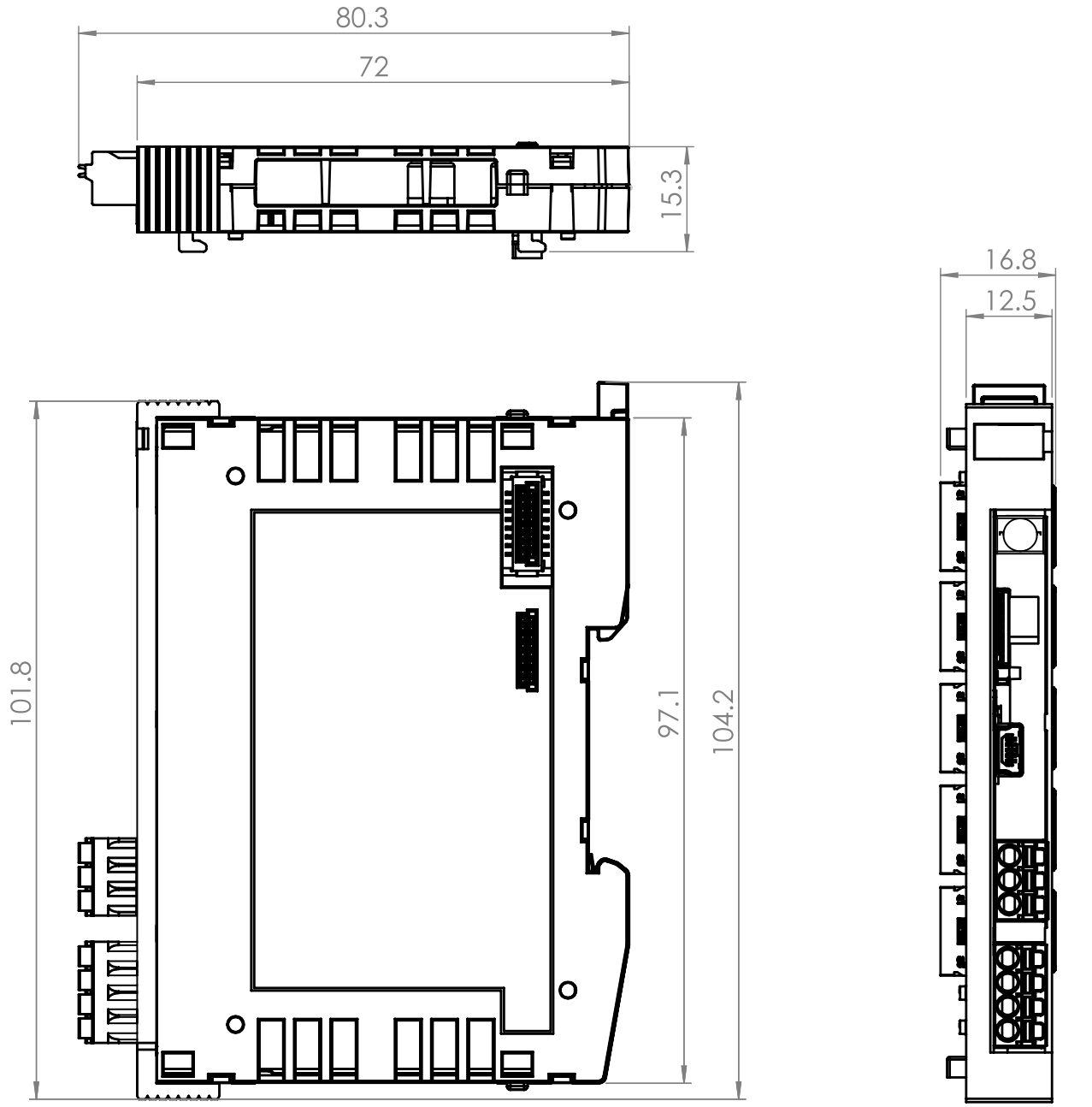
7.3 Miscellaneous

Article number	20-890-111	
Printed circuit board coating	20-890-111-X (polymer coated printed circuit board)	
Approvals	CE	yes
	UL	cULus (E247993)
	Functional Safety	yes, EG-type-examined
	UKCA	no
Mission time	20 years	

7.4 Environmental Conditions

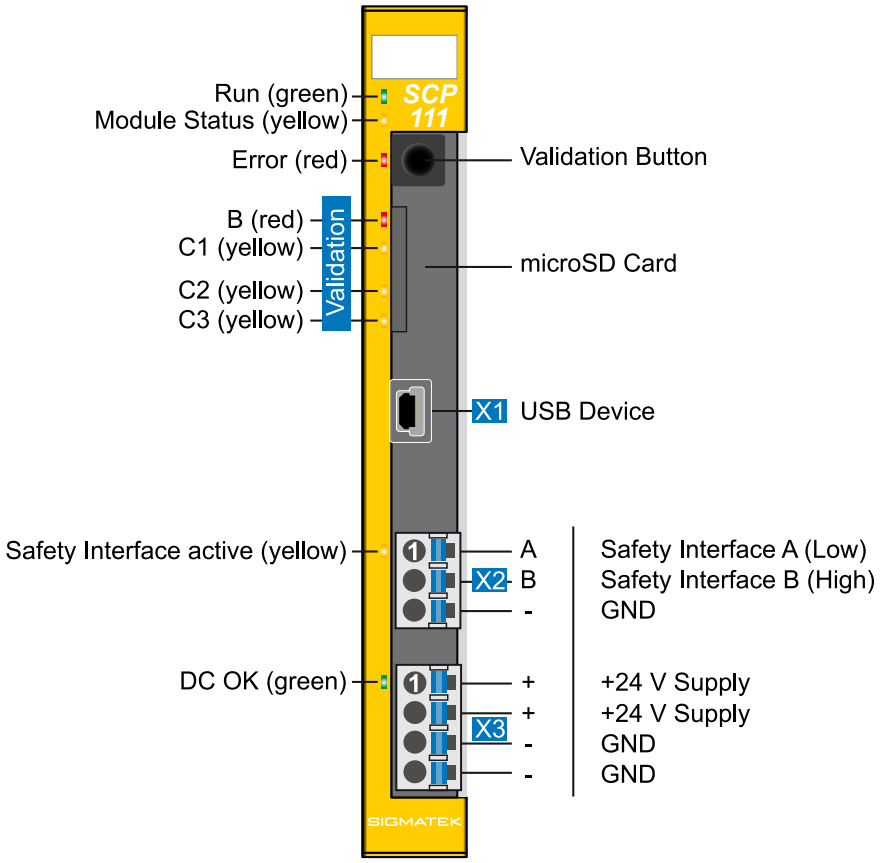
Storage temperature	-20 ... +85 °C	
Environmental temperature	0 ... +55 °C (UL) 0 … +60 °C starting with HW version 1.10 (CE)	
Humidity	0-95 %, non-condensing	
Installation altitude above sea level	0-2000 m without derating > 2000 m up to a maximum of 5000 m with derating of the maximum environmental 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) EN 61000-6-7 (noise immunity industry functional safety) (increased requirements in accordance with EN IEC 62061)	
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)

8 Mechanical Dimensions



Measurements	12.5 x 104 x 72 mm (W x H x D)

8.1 Connector Layout



INFORMATION

The connections of the +24 V supply (X3: pin 1 and pin 2) or the GND supply (X3: pin 3 and pin 4) are internally bridged. To supply the module, only one connection to a +24 V pin (pin 1 or pin 2) and a GND pin (pin 3 or pin 4) 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!

8.2 Status LEDs

The LED display lights continuously to indicate that the in- and outputs are active.

Run	green	Run	indicates • the time-limited (LED "S" on) operation mode or • unlimited time ("S" LED off) operation mode.
Module status	yellow	status	• lights permanently: the module is in service mode • slow blinking frequency: the module is currently in Idle or Check Configuration mode (distribution of the configuration)
Error	red	Error	• lights permanently: the module is in error mode • slow blinking frequency: the maximum age has been exceeded for a removed input (can be read with the SAFETYDesigner) • fast blinking frequency: serious error; communication with the module is no longer possible (CANNOT be read with the SAFETYDesigner)
B	red	Display validation button S1	see chapter "Validation Button" for description
C1	yellow	Command 1	see chapter "Validation Button" for description
C2	yellow	Command 2	see chapter "Validation Button" for description
C3	yellow	Command 3	see chapter "Validation Button" for description
Safety interface active	yellow	Safety interface connection	indicates an active Safety interface
DC OK	green	DC OK +24 V	signals the availability of the supply voltage

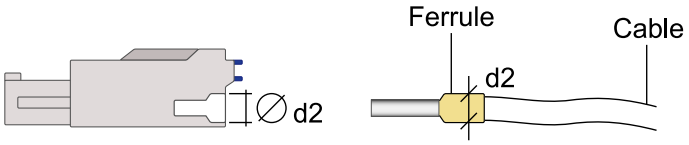
8.3 Applicable Connectors

X1: USB Type Mini-B (not included with delivery)
X2, X3: Connectors with spring terminals (included in delivery)

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

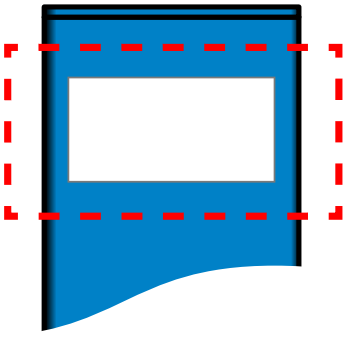
Connection capacity:

Stripping length/sleeve length	10 mm
Mating direction	parallel to the conductor axis or 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 reduction d2 of the ferrule)



d2 = max. 2.8 mm

8.4 Label Field



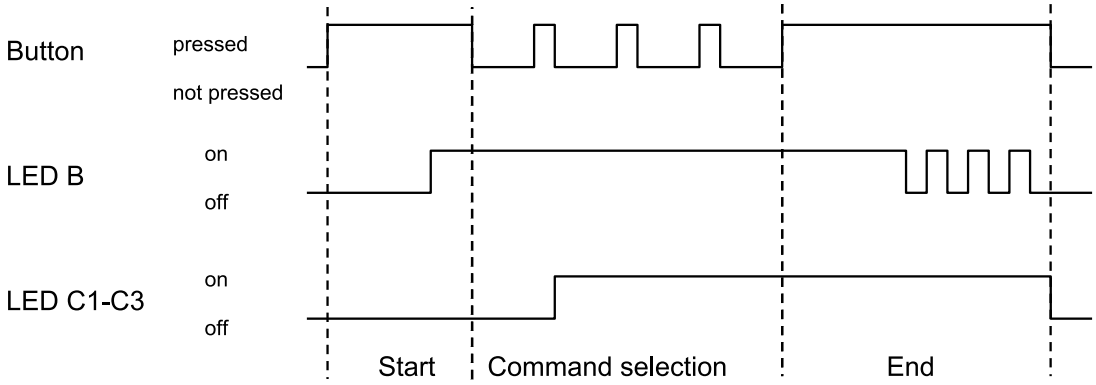
The labeling field is printed directly on the module.

9 Validation Button

With the validation button S1, several commands as well as the validation can be executed:

- Acknowledging an error and exiting the error status
- Deleting a configuration in the Safety CPU
- Validating the safety system configuration

Inputting commands with the validation button consists of 3 sequential components; the start and end sequence, and the sequence for selecting a command (see the following diagram).



9.1 Explanation of the Individual Sequences

9.1.1 Start Sequence

The button must be pushed until LED B lights (approximately 3 seconds). If the button is pushed too long (longer the approximately 10 seconds), an Error sequence is initiated (see "Error sequence"). The same applies when the button is released too soon (before LED B lights) or it is pushed immediately after being released (time between 2 button presses shorter than 200 ms).

9.1.2 Command Selection Sequence

After the Start sequence, the desired command is selected. This selection is made with button presses in the following time intervals: Minimum press duration is 200 ms, maximum is approximately 3 seconds; the minimum pause between individual button presses is 200 ms, the maximum is 10 seconds. After each correct button press (incl. The minimum pause of approx. 200 ms), the selected command is shown with LEDs C1, C2 and C3. If an invalid command is selected (see "valid commands"), the Error sequence is initiated; as with not correctly observing the time intervals. LED B lights continuously during this sequence.

9.1.3 End Sequence

This sequence is used to confirm the selected command. Here, the button is pressed until LED starts to blink (approx. 3 seconds, blinks in a slow interval). The number of light pulses in LED B depends on the previously selected command (see "valid commands").

After the LED turns off, the button must be released. After the minimum pause of approximately 200 ms, in which the button must not be pressed, the service mode is imitated and the command is executed. If the button pressed for longer than approximately 3 seconds, the selected command is not accepted and the Error sequence is displayed. The same applies when the button is released too soon or the minimum pause of 200 ms is not observed. After executing the command, the corresponding mode is initiated depending on the command (see "Valid Commands").

If executing the command leads to an error (e.g. because SET_VERIFIED should be executed although no valid configuration data is available in the Safety CPU), the Error sequence is initiated.

9.1.4 Error Sequence

If an invalid button press occurs, as in the sequences described above, the Error sequence is initiated. This sequence is visualized by LED B flashing rapidly. LED B indicates this sequence with fast blinking, which lasts for at least 3 seconds.

If the button is still pressed after 3 seconds, LED B will continue to blink until the button is released and a minimum pause of approximately 200 ms has elapsed. The Start sequence cannot be reinitiated until LED B stops blinking.

After ending the Error sequence, the mode is changed as described in "Overview of Module Statuses". If turned on, LEDs C1, C2 and C3 are turned off after ending the Error sequence.

9.2 Overview of Commands

The number of button presses corresponds to the number of light pulses in LED B during the End sequence.

Commands	Number of button presses	LED C1	LED C2	LED C3
QUIT_ERROR	1	X		
CLR_CFG	2	X	X	
SET_VERIFIED	3	X	X	X

9.3 Overview of Module States and Commands

The following tables show a sample of the states in which the system can be found, the commands that can be active during the respective status and their functions (see the Safety System Handbook for the module states).

	Command		
System status	**QUIT_ERROR**	**CLR_CFG**	**SET_VERIFIED**
Check-Configuration		**X**	
Time-restricted operational mode		**X**	**X**
Operational Mode		**X**	
Service Mode		**X**	
Error	**X**		

Executed command	**Command function**	**Status after command execution**
QUIT_ERROR	A possible error is cancelled in the Safety CPU and all Safety CPU modules required by the Safety CPU and the error mode is then ended.	SW-RESET [1)]
CLR_CFG	The configuration in the Safety CPU is deleted. After executing the instruction, the Safety CPU changes to the service mode.	Service Mode
SET_VERIFIED	The configuration status is set to "verified".	Operational Mode

[1)] A SW-RESET is performed. If the error still exists, the Safety CPU remains in the error mode. Otherwise, the Safety CPU starts correctly.

General note: If a command was entered incorrectly, the Safety CPU initiates the error sequence (see above). After ending the Error sequence, the command can be reentered.

9.4 Handling the microSD Card

An microSD card can only be written on with the Safety Designer. A detailed description can be found in the Safety System handbook (Link: https://www.sigmatek-automation.com/fileadmin/user_upload/downloads/Safety-Systemhandbuch-eng.pdf).

A Safety project, which was programmed with the SafetyDesigner, can be stored on an microSD card. The stored Safety project can then be loaded into an additional SCP Safety CPU. Providing that the module's Flash memory is empty (cleared).

If the configuration on the microSD card is different from that on the Safety CPU Flash, the system switches to the error status (error message 87). The microSD card cannot be inserted into the Safety CPU during normal operation (operational or temporary operational mode). If the microSD card is inserted during normal operation, the Safety CPU switches to the error status (error message 88). However, an microSD card can be removed during normal operation.

9.5 Configuring a Safety CPU with the microSD Card

The configuration is loaded from an microSD card as follows:

- **Delete the configuration of the Safety CPU to be programmed**

  To load the configuration from the microSD card, the configuration in the Safety CPU must first be deleted. This can be done with either the SAFETYDesigner or with help from the CLR_CFG command using validation button on the Safety CPU. Once the configuration in the Safety CPU is deleted, the Safety CPU can no longer return to the operational or temporary operational mode. The Safety CPU remains in the service mode.

- **Insert the microSD card and deactivate the system**

  In the next step, an microSD card with the valid configuration must be inserted in the Safety CPU and the system shut down.

- **Restart the system with the microSD card**

  When the system is restarted, the configuration is loaded from the microSD card into the Flash of the Safety CPU. This is only possible if a valid configuration is stored on the microSD card. If the microSD card has an incorrect format (error message 86) or the Safety CPU's Flash has not been cleared (error message 87), the Safety CPU goes into the error status. If the configuration does not match the available real modules, the distribution process of the configuration triggers an error (error message 9) and the Safety CPU also goes into safe mode.

- If an error occurs during the restart, see the following chapter " Restart Error".

INFORMATION

A **microSD card** with a memory capacity of 1 Gbyte is available from SIGMATEK under the article number **12-630-101**.

Only microSD cards that support version 2.0 or higher of the "SDA Physical Layer Specification" (SDA=SD Card Association) can be used.

It is recommended that only microSD cards provided by SIGMATEK be used.

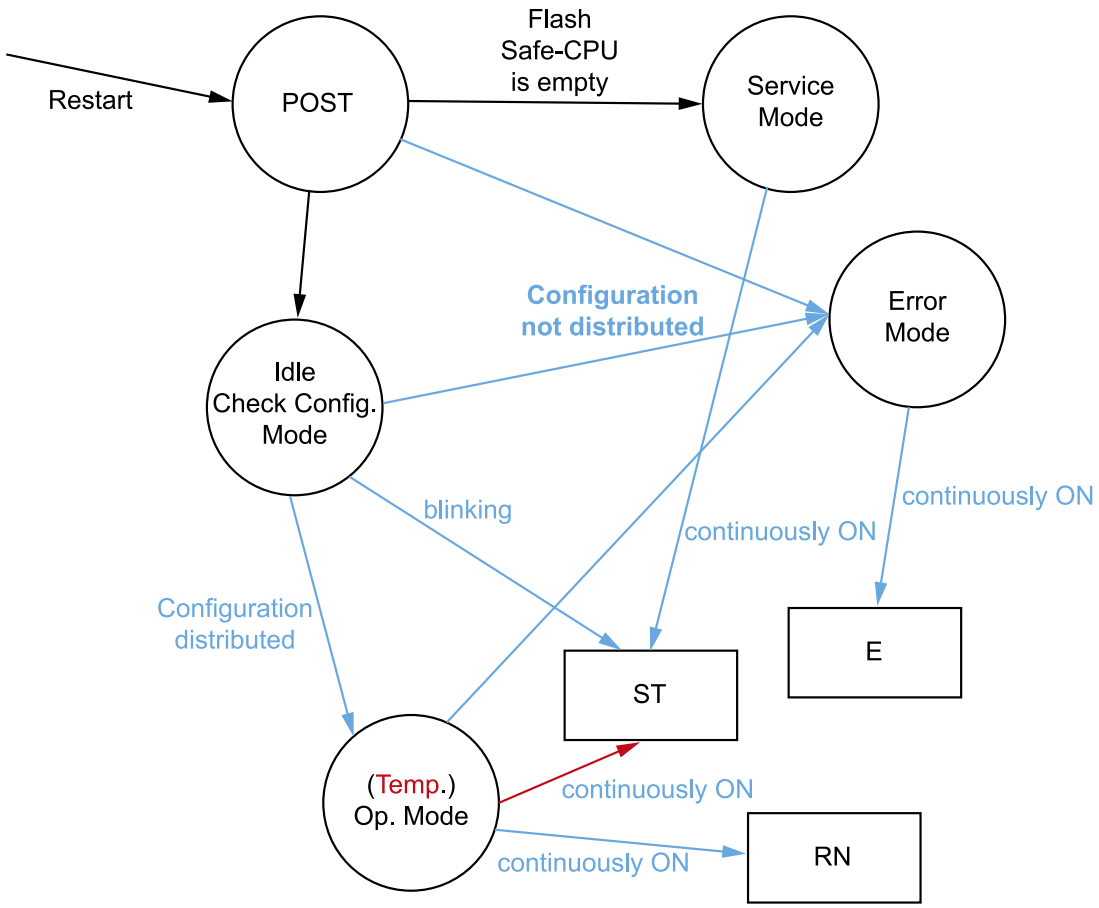
The number of read and write actions have a significant influence on the lifespan of the storage media.

10 Response to Errors

In the event of an error, please consult the chapter 8.2 Status LEDs, as important information on the runtime status of the system can be derived from the status an error display. Since errors in general are of a complex nature, do not perform a diagnosis based on the LEDs alone (consult the corresponding chapter in the Safety System Handbook as well). For an exact error analysis, the SafetyDesigner must be used.

10.1 Restart Errors

The following diagram shows the response of the Safety CPU module during restart.



1. During restart, the Safety CPU first runs the **POST** (Power On Self Test). In the POST, whether the Safety CPU is configured or not is determined. If the Flash memory in the Safety CPU is empty, it changes to the service mode and switches the status LED (ST) to continuously on.
2. If the Flash memory of the Safety CPU contains a configuration, it goes into the **idle / Check Configuration Mode**. Thereby, an attempt is made to distribute the configuration; the ST-LED blinks during this process.
3. If the configuration is successfully distributed, the Safety CPU either goes into the **Operational mode** or the **Temporary Operational mode** depending on whether or not the configuration has already been validated. If the System was already validated, the ST-LED turns off and the RN-LED lights. If the system has not been validated, both LEDs light simultaneously.
4. If for whatever reason the distribution of the configuration is still not successful, the Safety CPU switches to the **Error mode** and the E-LED lights
5. When the Safety CPU remains in the **idle / Check Configuration Mode** for a long period of time (ST-LED blinking) without switching to the **Error mode**, it is an indication that the bus communication is malfunctioning. In this case, the PLC will remain in the error status and must be restarted.
6. A change to the error status can also occur from the **POST** and **(Temp.) OP mode** if other (internal) errors are detected or errors in remote modules occur. The analysis of these errors, however, requires the use of the SAFETYDesigner.

10.2 Configuration Distribution Error

If the Safety CPU fails to distribute the configuration, the cause can be traced to one or more of the following errors.

- The configuration and the physical topology do not match
- One or more modules are missing
- More than one module was exchanged
- Communication error with a remote module
- The module to be configured is in error status

10.3 Troubleshooting

- Check all modules in the system for completeness and type conformity
- Check that all modules are error-free
- Check all connector cables
- Cancel the error with the **QUIT_ERROR** command

If the Safety CPU remains in the error status after the **QUIT_ERROR** command has been executed, it must be retested using the SAFETYDesigner.

10.4 Troubleshooting with the SAFETYDesigner

Connect the SAFETYDesigner

Debug the system using the SAFETYDesigner.

10.5 Correcting a Wiring Error

INFORMATION

When a wiring error is determined, a controlled deactivation of the system is required, which must then be turned off. Wiring and mounting can only be performed when no power is applied.

10.6 Note

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

The following installation guidelines should be observed:

- Avoid parallel connections between input lines and load-bearing circuits.
- Protective circuits for all relays (RC networks or free-wheeling diodes)
- Correct wiring to ground

INFORMATION

The ground bus should be connected to the control cabinet when possible!

The wiring and assembly must be performed when no voltage is applied!

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

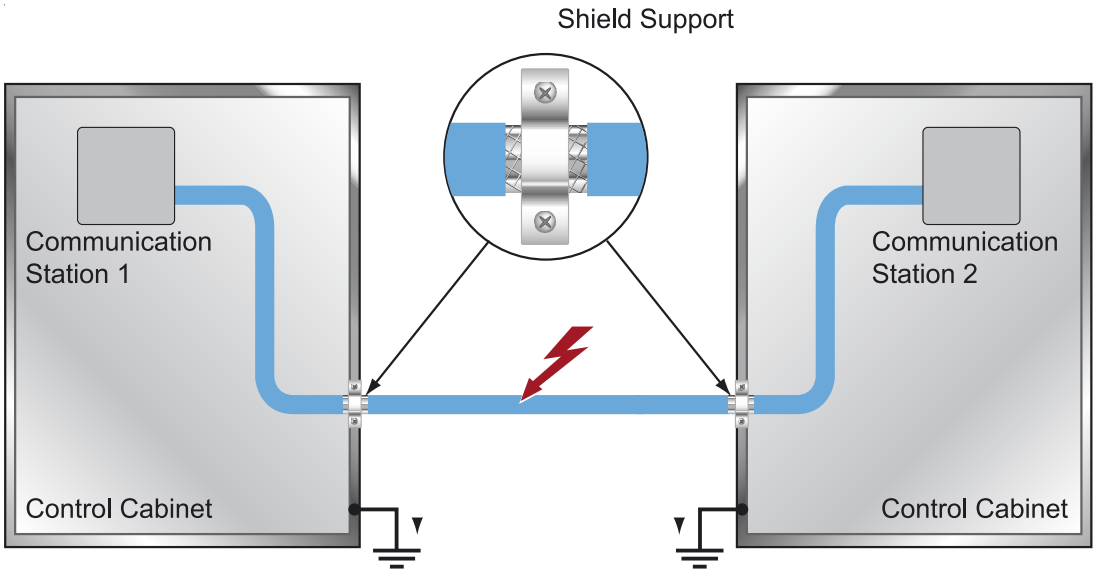
10.7 Shielding

The wiring of SafetyBus must be shielded.

The low-ohm shielding must be either connected either at the entry to the control cabinet or directly before the SCP 111(-X) over a large surface (cable grommets, grounding clamps)!

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

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



10.8 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.

11 Assembly/Installation

11.1 Check Contents of Delivery

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

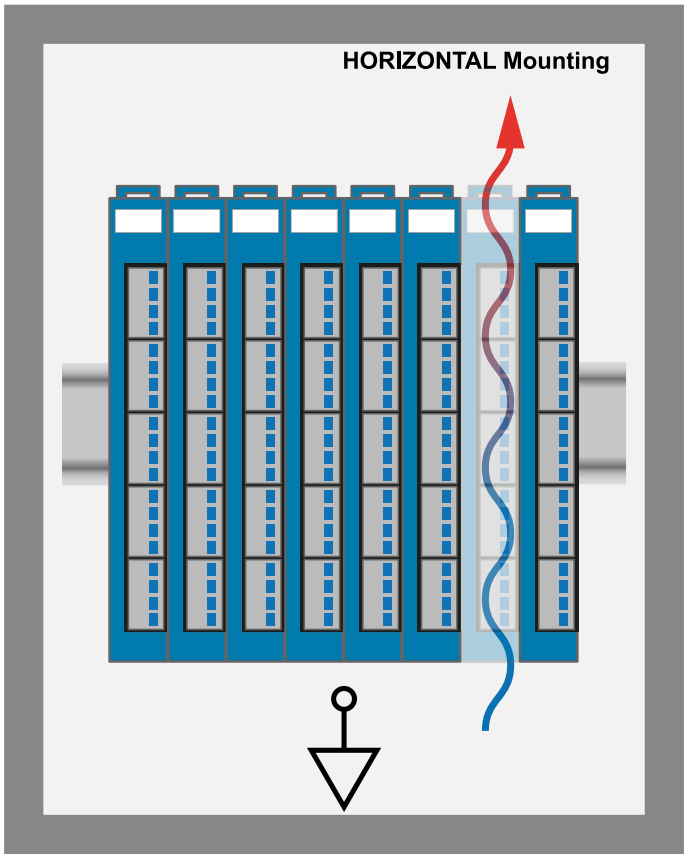
INFORMATION

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.

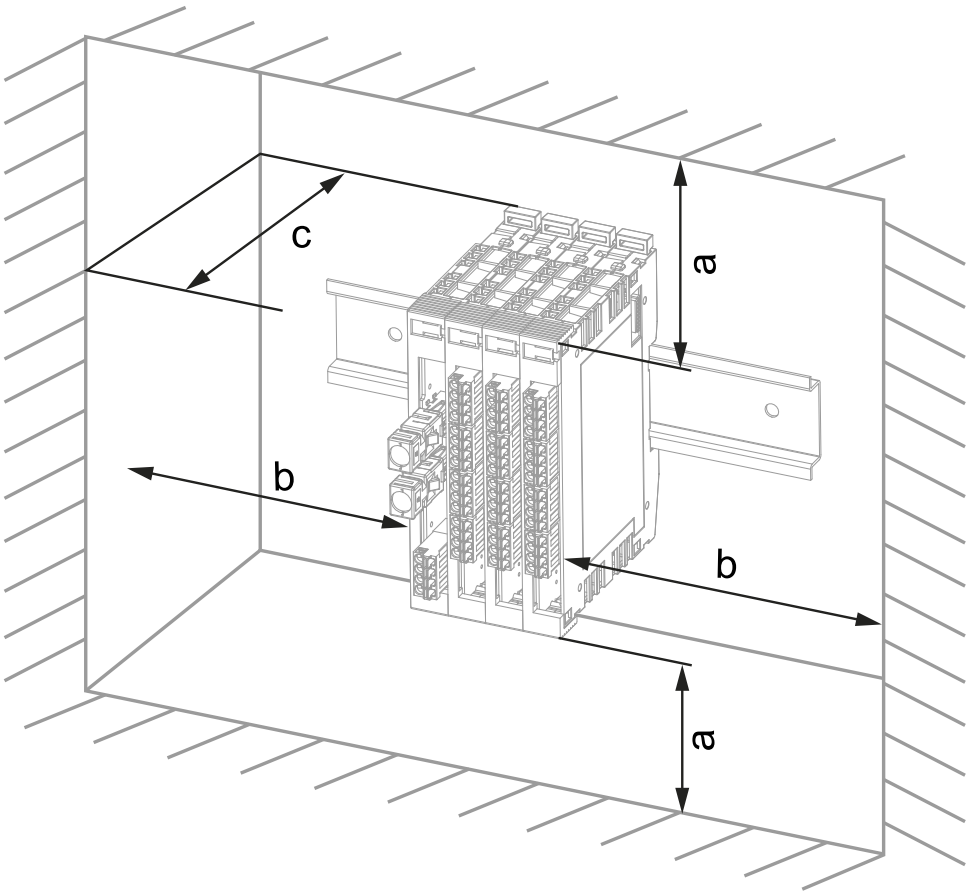
Damaged components can disrupt or damage the system.

11.2 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 rai 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
30 mm (1.18″)	**30 mm** (1.18″)	**100 mm** (3.94″)

a, b, c … distances in mm (inches)

12 Supported Cycle Times

The SCP 111(-X) can be accessed via the S-DIAS bus with different bus cycle times.

12.1 Cycle Times below 1 ms (in µs)

50	100	125	200	250	500
x	x	x	x	x	x

x = supported

12.2 Cycle Times equal to or higher than 1 ms (in ms)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

x = supported

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

x = supported

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.

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 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 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
08.07.2015	16	7.2 Electrical Requirements	Added mnemotechnic verse
04.08.2015			Info Cover Translation from German added
15.10.2015	16	7.2 Electrical Requirements	Table split
20.01.2016	16	7.2 Electrical Requirements	updated
21.01.2016	19	7.3 Miscellaneous	Standard changed
11.03.2016	16	7.2 Electrical Requirements	Note Safety error added
28.04.2016	33	11 Assembly/Installation	Graphics distances
27.06.2016			CAN -> Safety Interface
17.08.2017	19	7.4 Environmental Conditions	Pollution degree
	23	8.3 Applicable Connectors	Sleeve length added Added info regarding ultrasonically welded strands
18.10.2017	23	8.4 Label Field	Chapter added
	33	11 Assembly/Installation	Graphic replaced
19.06.2018	16	7.2 Electrical Requirements	Note UL conditions
20.09.2018	21	8.1 Connector Layout	Added note
02.04.2019	13	5 Safety-Relevant Parameters 7.4 Environmental Conditions	Correction of the safety-relevant parameters
	19	7.4 Environmental Conditions	Corrections environmental conditions Corrections due to CE
30.07.2019	19	7.4 Environmental Conditions	Indoor use deleted
01.10.2019	16	7.2.2 S-DIAS Bus/Safety Supply (Output)	Footnote 4 updated
14.11.2019	35	12 Supported Cycle Times	Chapter added
02.12.2019	13	5 Safety-Relevant Parameters	Values updated
28.02.2020	35	12 Supported Cycle Times	Text adapted
20.07.2020			Up to 60 °C ambient temperature
02.09.2020	16	7.2 Electrical Requirements	For footnote (5) text “horizontal mounting position and” removed
08.09.2020		12 Hardware ClassSCP 111(-X)	Chapter added
03.11.2020		12.2 Safety	Changes to Fast Unsafe Inputs and Fast Unsafe Outputs Chapter added
		12.5 Importance of ClassState and SafetyState	New chapter added
04.11.2020	33	11 Assembly/Installation	Expansion functional ground connection

Change date	Affected page(s)	Chapter	Note
05.03.2021	19	7.4 Environmental Conditions	Standards added
04.05.2021	19	7.3 Miscellaneous	added -X to the article number
19.10.2021	15	7.1 Performance Data	Extended
05.12.2023	11	3 IT Security	Chapter added
	19	7.3 Miscellaneous	Mission time added
	19	7.4 Environmental Conditions	Noise emissions added
	35	12 Supported Cycle Times	Description added
		12 Hardware Class SCP 111(-X)	Chapter removed
01.02.2024	13	4.3.2 EU Declaration of Conformity	Note on download adjusted
	13	5 Safety-Relevant Parameters	The safety indicators (PFH, $MTTF_D$) were adjusted slightly with the recertification.
21.02.2024			Product names adjusted
18.03.2025		Document	Layout corrected
01.09.2026	16	7.2 Electrical Requirements	Information changed