SR 011-1

S-DIAS DC Motor Output Stage

Instruction Manual

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Translation of the Original Instructions

S-DIAS DC Motor Output Stage SR 011-1

with 1 DC motor output stage +50 V/5 A

- **1 brake chopper**
- **1 incremental encoder input switchable RS422/TTL**
- **2 enable inputs +24 V/3 mA/0.5 ms**
- **1 digital output +24 V/0.5 A/short-circuit protected**

Brushed DC motors with up to 5 A phase current can be connected to the S-DIAS DC motor output stage module SR 011-1. The DC motor is controlled by means of a PWM setpoint value.

The integrated brake chopper provides the connection for an external regen resistor, with which excess energy generated by the braking process of the motor and fed back to the motor supply, can be dissipated.

The incremental encoder input, which supports RS422 as well as TTL encoders, is provided for position feedback.

Furthermore, the SR 011-1 has a short-circuit-proof digital output (+24 V/0.5 A). The +24 V supply voltage for the digital output and the incremental encoder supply is monitored for undervoltage.

Contents

1 Introduction

1.1 Target Group/Purpose of this Manual

This operating manual contains all information required for the operation of the product.

This operating manual is intended for:

- Project planners
- Technicians
- Commissioning engineers
- Machine operators
- Maintenance/test technicians

General knowledge of automation technology is required.

Further help and training information, as well as the appropriate accessories can be found on our website www.sigmatek-automation.com.

Our support team is happily available to answer your questions.
Please see our website for our hotline number and business hours.

1.2 Important Reference Documentation

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

1.3 Contents of Delivery

1x SR 011-1

2 Basic Safety Directives

2.1 Symbols Used

The following symbols are used in the operator documentation for warning and danger messages, as well as informational notes:

DANGER

Danger indicates that death or serious injury **will occur**, if the specified measures are not taken.

⇨ To avoid death or serious injuries, observe all guidelines.

Danger indique une situation dangereuse qui, faute de prendre les mesures adéquates, **entraînera** des blessures graves, voire mortelles.

⇨ Respectez toutes les consignes pour éviter des blessures graves, voire mortelles.

WARNING

Warning indicates that death or serious injury **can** occur, if the specified measures are not taken.

⇨ To avoid death or serious injuries, observe all guidelines.

Avertissement d'une situation dangereuse qui, faute de prendre les mesures adéquates, **entraînera** des blessures graves, voire mortelles.

⇨ Respectez toutes les consignes pour éviter des blessures graves, voire mortelles.

CAUTION

Caution indicates that moderate to slight injury **can** occur, if the specified measures are not taken.

⇨ To avoid moderate to slight injuries, observe all guidelines.

Attention indique une situation dangereuse qui, faute de prendre les mesures adéquates, **peut** entraîner des blessures assez graves ou légères.

⇨ Respectez toutes les consignes pour éviter des blessures graves, voire mortelles.

WARNING

Hot Surfaces

Surfaces chaudes

INFORMATION

Information

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

2.2 Disclaimer

INFORMATION

The contents of this operating manual were prepared with the greatest care. However, deviations cannot be ruled out. This operating manual is regularly checked and required corrections are included in the subsequent versions. The machine manufacturer is responsible for the proper assembly, as well as device configuration. The machine operator is responsible for safe handling, as well as proper operation.

The current operating manual can be found on our website. If necessary, contact our support.

Subject to technical changes, which improve the performance of the devices. The following operating manual is purely a product description. It does not guarantee properties under the warranty.

Please thoroughly read the corresponding documents and this operating manual before handling a product.

SIGMATEK GmbH & Co KG is not liable for damages caused through, non-compliance with these instructions or applicable regulations.

2.3 General Safety Directives

The Safety Directives in the other sections of this operating manual must be observed. These instructions are visually emphasized by symbols.

INFORMATION

According to EU Directives, the operating manual is a component of a product.

This operating manual must therefore be accessible in the vicinity of the machine since it contains important instructions.

This operating manual should be included in the sale, rental or transfer of the product, or its online availability indicated.

Regarding the requirements for Safety and health connected to the use of machines, the manufacturer must perform a risk assessment in accordance with machine directives 2006/42/EG before introducing a machine to the market.

Operate the unit with devices and accessories approved by SIGMATEK only.

CAUTION

Handle the device with care and do not drop or let fall.

Prevent foreign bodies and fluids from entering the device.

The device must not be opened!

Manipulez l’appareil avec précaution et ne le laissez pas tomber.

Empêchez les corps étrangers et les liquides de pénétrer dans l’appareil.

L’appareil ne doit pas être ouvert!

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

CE

EU Declaration of Conformity

The SR 011-1 conforms to the following European guidelines:

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

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

Exemplary nameplate (symbol image)

HW: Hardwareversion
SW: Softwareversion

5 Technical Data

5.1 DC Motor Output Specifications

Number	1
Supported motor type	DC brush motor
Operating modes	PWM control
Supply voltage	+18-55 V
PWM frequency	2 kHz
Current controller frequency	2 kHz
Maximum PWM switching ratio	95 % (limited by hardware)
Maximum continuous current	5 A[1)]
Output current over the environmental temperature	maximum 5 A continuous current at 45 °C maximum 3.5 A continuous current at 50 °C maximum 2 A continuous current at 55 °C
Maximum peak current (1 s)	15 A
DC-link capacitance	2.8 µF
Motor current measurement	0-15 A
Voltage measurement	0-65 V
Temperature measurement	0-125 °C with temperature warning at 103 °C with temperature warning at 108 °C
Safety functions	Short circuit cutoff Temperature cut-off I^2t monitor Over and under voltage monitor

[1)] The sign of the current flow can be positive or negative depending on the motor's revolution way.

5.2 Brake Chopper Specifications

Number	1
Output	GND switching
Maximum current	6 A
Short-circuit protection	yes
Regen resistor	external power resistor[1)]
Article number	20-014-061-Z1
Regen resistor switching threshold on/off	60 V/55 V

[1)] Regen braking must be dimensioned according to the application. For most applications, a 15 Ω/100 W resistor is sufficient. If multiple motor modules are driven with one intermediate circuit supply, it is possible to equip only one module with regen braking. The recommended regen resistor is available at SIGMATEK under the article number 20-014-061-Z1. The resistance must be dimensioned based on its maximum power dissipation corresponding to the braking power generated in the application. However, the permissible short-term power generated must be at least $P=U^2/R$, meaning $60^2/R$.

WARNING

Hot surface warning

A burn hazard exists with physical contact!

During operation, the surface of the brake resistor can become very hot and remain hot sometime after operation.

Avertissement de surface chaude

Il existe un risque de brûlure par contact physique !

Pendant le fonctionnement, la surface de la résistance de freinage peut devenir très chaude et rester chaude quelque temps après le fonctionnement.

5.3 Incremental Encoder Input Specifications

Number	1	
Input signals[1)]	Incremental encoder signals RS422 (A, /A, B, /B, R, /R) RS422 signal (120 Ω termination, integrated in module)	Incremental encoder signal TTL (A, B, R) TTL level (1200 Ω Pull-Up, integrated in module)
Input frequency	maximum 125 kHz	maximum 1.25 kHz
Counter frequency	maximum 500 kHz	maximum 5 kHz
Signal analysis	4x	
Counter resolution	16 bits	
Encoder power supply	+5 V/0.2 A short-circuit proof	

[1)] The software switch-over from RS422 to TTL incremental encoder signals is carried out via bit 5 in the motor parameter A-ACME (bit 5 = 0 => RS422 [default]; bit 5 = 1 => TTL)

5.4 Enable Input Specifications

Number	2	
Input voltage	+24 V DC	
Input voltage range	minimum +18 V	maximum +30 V
Signal level	low: ≤ +5 V	high: ≥ +15 V
Switch hysteresis	typically +11 V	
Input current	3 mA at +24 V	
Input delay	typically 0.5 ms	

5.5 Digital Output Specifications

Number	1
Short-circuit proof	yes
Maximum continuous current load allowed	0.5 A
Maximum braking energy of the output (inductive load)	maximum 0.5 joules
Residual current output (off)	≤ 10 µA
Turn-on delay	< 200 µs
Turn-off delay	< 200 µs

5.6 Electrical Requirements

Supply voltage +24 V (X4)	18-30 V	
Current consumption of the +24 V supply (X4)	load-dependent (digital output + digital output supply) maximum 0.6 A	
Motor supply voltage (X2)	+18-55 V	
Current consumption of motor supply (X2)	maximum 5 A (load-dependent)	
Voltage supply from S-DIAS bus	+24 V	
Current consumption on the S-DIAS bus (+24 V supply)	typically 60 mA	maximum 85 mA
Voltage supply from S-DIAS bus	+5 V	
Current consumption on the S-DIAS bus (+5 V supply)	-	-

INFORMATION

The motor supply must be connected with an appropriate DC-link capacitance (at least 2000 µF / 100 V).

Braking a DC motor

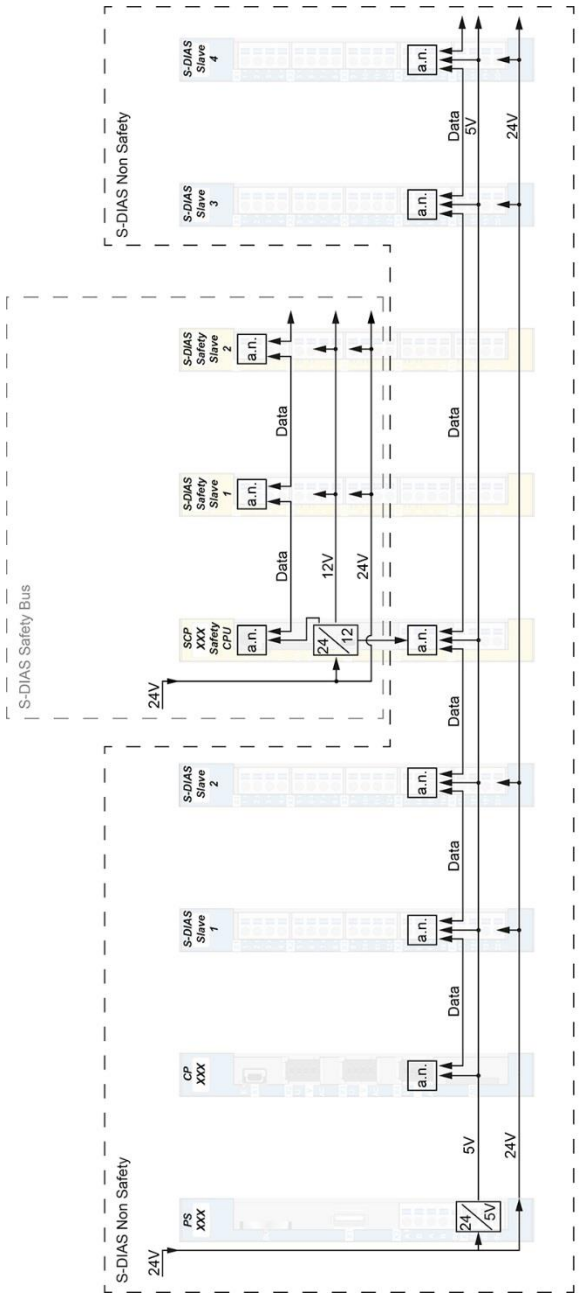
When braking a DC motor, a generative process can occur whereby the
kinetic energy of the motor is converted into electrical energy. The energy of the motor is thereby fed back into the supply of the DC motor output stage; this then increases the supply voltage. It should be noted that the feedback voltage supply voltage of 65 V cannot be exceeded!

The external capacity of the motor supply is maybe needed. If the capacitors in the power supply are insufficient, a regen resistor, which converts the excess energy into heat must be connected to the DC motor output stage. When selecting the power supply, it is important to ensure that it is appropriately feedback-resistant up to the maximum feedback voltage.

Use only conductors that are rated for at least 75 °C!

There is no motor thermostat analysis in the motor output.

Incorrectly set parameter or incorrect wiring can lead to destruction of the motor. It is important that the motor currents and the I^2T settings (A-I2TT, A-I2TERR), which can be defined via the LASAL Class 2 Tool in the DIAS-Drive Editor, must be taken into account.


S-DIAS Non Safety
S-DIAS Safety Bus
S-DIAS Non Safety
24V
PS XXX
CP XXX
S-DIAS Slave 1
S-DIAS Slave 2
SCP XXX Safety CPU
S-DIAS Safety Slave 1
S-DIAS Safety Slave 2
S-DIAS Slave 3
S-DIAS Slave 4
a.n.
Data
5V
12V
24V
24/5
24/12
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

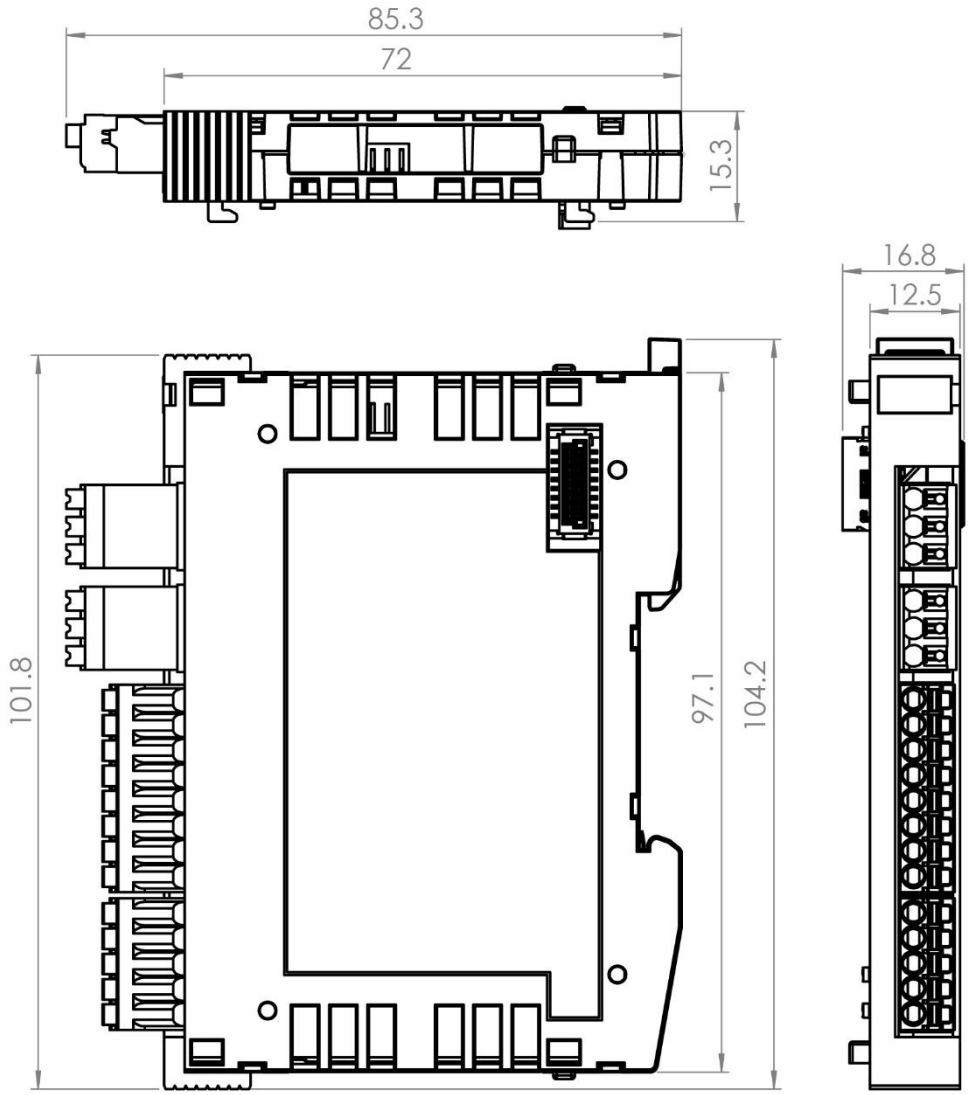
5.7 Miscellaneous

Article number	20-029-011-1
Standard	designed according to UL
Approvals	CE

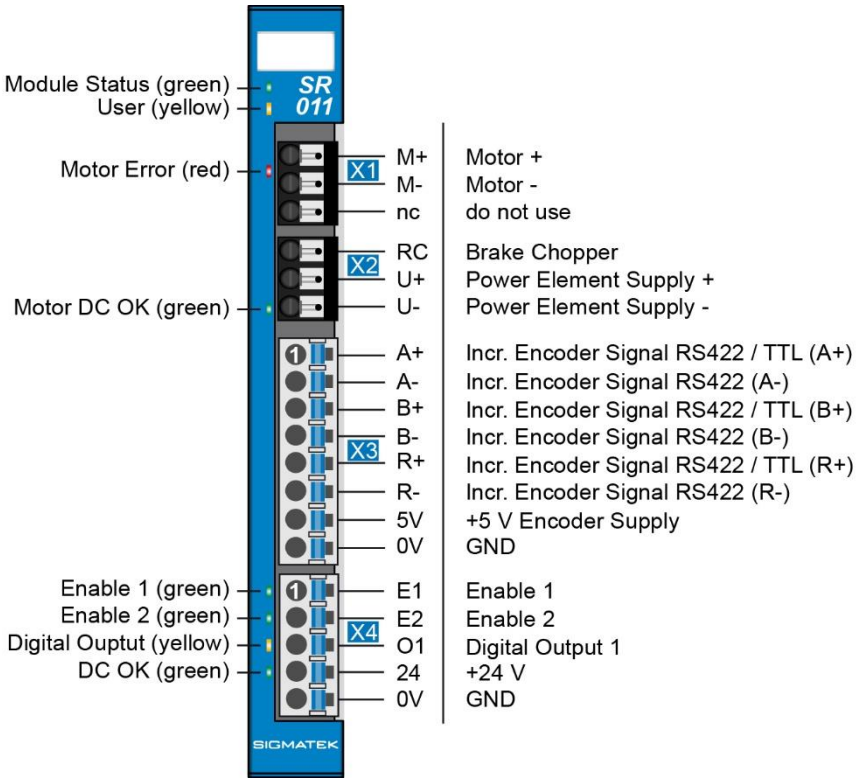
5.8 Environmental Conditions

Storage temperature	-20 ... +85 °C	
Environmental temperature	0 ... +55 °C	
Humidity	0-95 %, non-condensing	
Installation altitude above sea level	0-2000 m without derating, > 2000 m up to a maximum of 5000 m with derating of the maximum environmental temperature by 0.5 °C per 100 m	
Operating conditions	pollution degree 2	
Noise emissions	≤ 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/s^2)
Protection type	EN 60529/NEMA 250	IP20/Type1

6 Mechanical Dimensions



7 Connector Layout



7.1 Status LEDs

Module Status	green	ON	module active
		OFF	no supply available
		BLINKING (5 Hz)	no communication
User	yellow	ON	can be set from the application (e.g. the module LED can be set to blinking through the visualization, so that it is easily found in the control cabinet)
		OFF	
		BLINKING (2 Hz)	
		BLINKING (4 Hz)	
Motor Error	red	BLINKS	motor output stage error
		OFF	normal operation
Motor DC OK	green	ON	power applied and motor active
		BLINKS	power applied, but motor inactive
		OFF	no motor supply voltage
Enable 1	green	ON	enable 1 high
		OFF	enable 1 low
Enable 2	green	ON	enable 1 high
		OFF	enable 1 low
Digital output	yellow	ON	output active
		OFF	output inactive
DC OK	green	ON	+24 V DC supply OK
		BLINKS	+24 V DC voltage supply too high
		OFF	+24 V DC supply missing or voltage too low

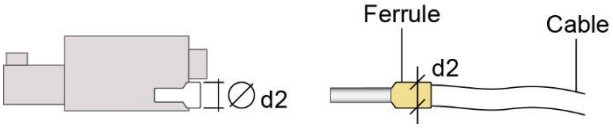
7.2 Applicable Connectors

Connectors:
X1, X2: Weidmüller socket connectors with spring terminals (included in delivery)
X3, X4: Phoenix connector plugs with spring terminals (included in delivery)

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

Weidmüller connector capacity:

Stripping length/sleeve length:	9 mm
Mating direction:	parallel to the conductor axis or circuit board
Conductor cross section rigid: H05(07) V-U	0.14-1.5 mm^2
Conductor cross section flexible: H05(07) V-K	0.14-1.5 mm^2
conductor cross section strands ultrasonically compacted:	0.14-1.5 mm^2
Conductor cross section AWG/kcmil:	26-16
Conductor cross section flexible with ferrule without plastic sleeve (DIN 46228-1):	0.25-1.5 mm^2
Conductor cross section flexible with ferrule with plastic sleeve (DIN 46228-4):	0.25-1 mm^2 (reason for reduction d2 of the ferrule)



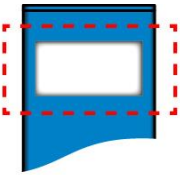
d2 = max. 3.5 mm

Phoenix connector 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 mm^2
Conductor cross section flexible:	0.2-1.5 mm^2
Conductor cross section strands ultrasonically compacted:	0.2-1.5 mm^2
Conductor cross section AWG/kcmil:	24-16
Conductor cross section flexible with ferrule without plastic sleeve:	0.25-1.5 mm^2
Conductor cross section flexible with ferrule with plastic sleeve:	0.25-0.75 mm^2 (reason for reduction d2 of the ferrule)

d2 = max. 2.8 mm

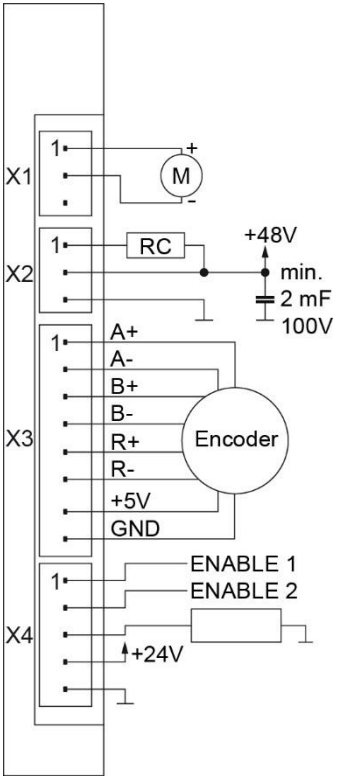
7.3 Label Field



Manufacturer	Weidmüller
Type	MF 10/5 CABUR MC NE WS
Article number Weidmüller	1854510000
Compatible printer	Weidmüller
Type	Printjet Advanced 230V
Article number Weidmüller	1324380000

8 Wiring

8.1 Wiring Example



8.2 Note

- The DIN rail must have an adequate connection to mass.
- To wire the incremental encoder, a shielded cable is required. With an RS422 encoder, the use of shielded, twisted pair cables is recommended. The shield must be placed in front of the module as close as possible.
- For the motor wiring, a shielded cable is required. The shield must be placed as close as possible to the module.
- The shielding must be connected to a shielding bus.

INFORMATION

Connect the ground bus to the control cabinet.

The maximum length of the encoder and motor cables is 30 m.

CAUTION

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

Le module S-DIAS NE PEUT PAS être connecté/déconnecté lorsque la tension est appliquée!

9 Assembly/Installation

9.1 Check Contents of Delivery

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

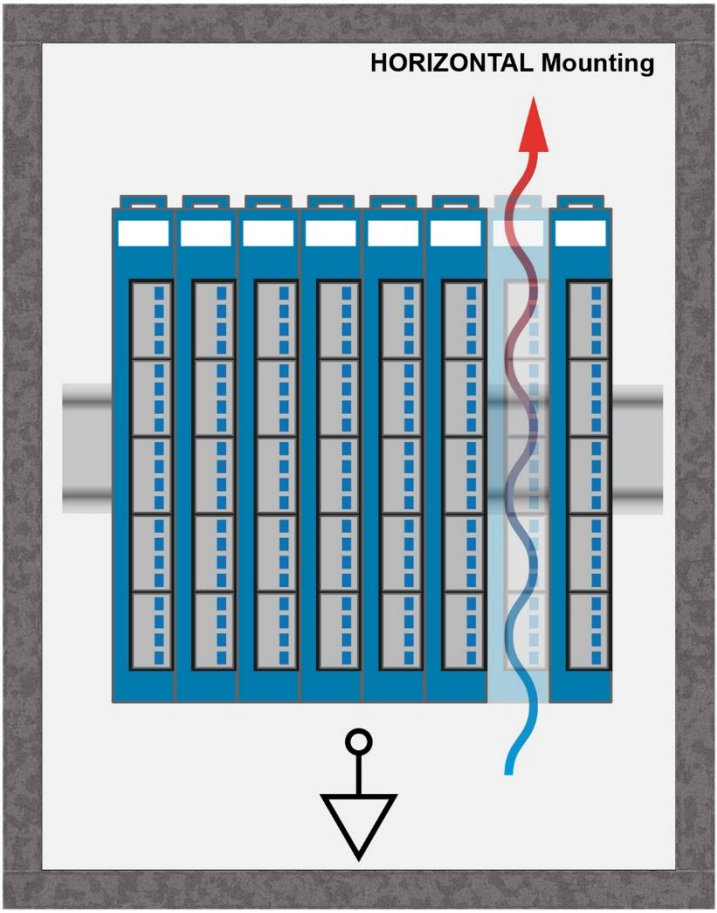
INFORMATION

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.

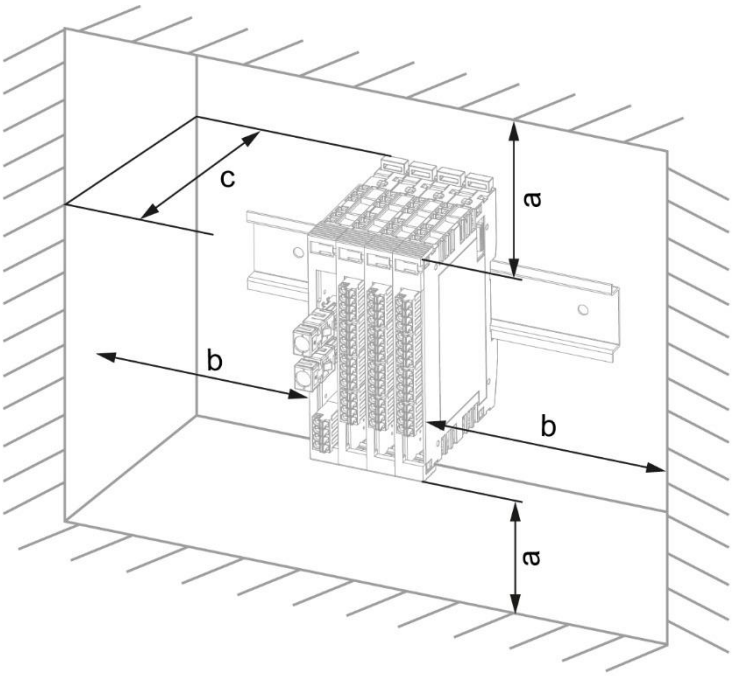
Damaged components can disrupt or damage the system.

9.2 Mounting

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



Recommended minimum distances of the S-DIAS modules to the surrounding components or control cabinet wall:



a	b	c
30 mm (1.18″)	**30 mm** (1.18″)	**100 mm** (3.94″)

a, b, c … distances in mm (inches)

10 Supported Cycle Times

10.1 Cycle Times below 1 ms (in µs)

50	100	125	200	250	500
					x

x= supported

10.2 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

11 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.

12 Storage

INFORMATION

When not in use, store the operating panel according to the storage conditions. See chapter 11.

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

13 Maintenance

INFORMATION

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

13.1 Service

This product was constructed for low-maintenance operation.

13.2 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 11 Transport/Storage.

14 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