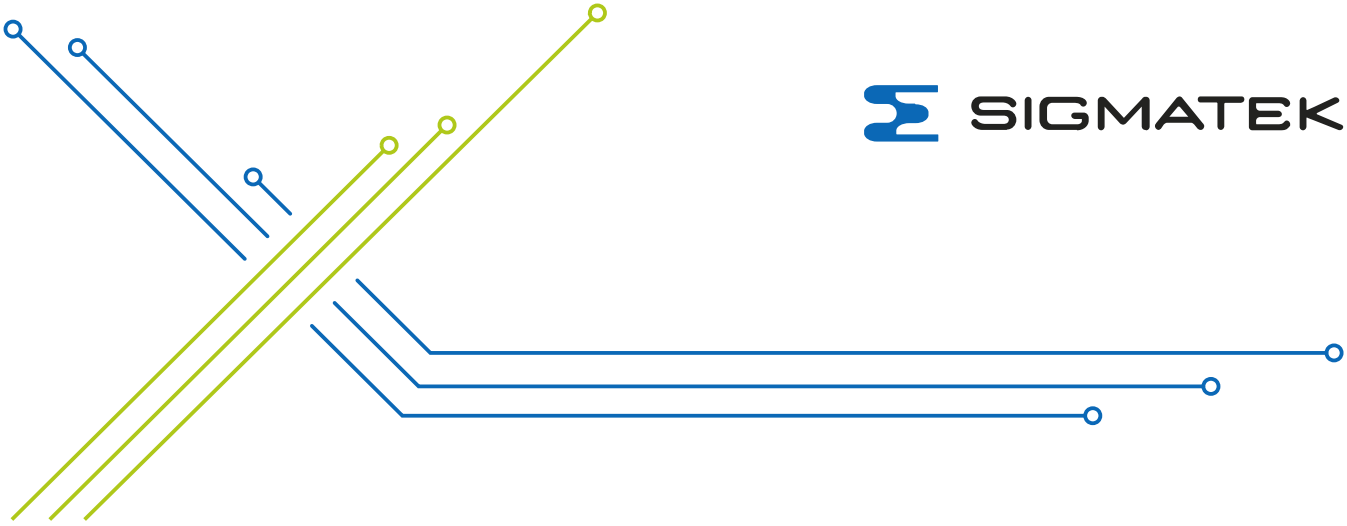

SIGMATEK

SR 011

S-DIAS DC Motor Output Stage

INSTRUCTION MANUAL

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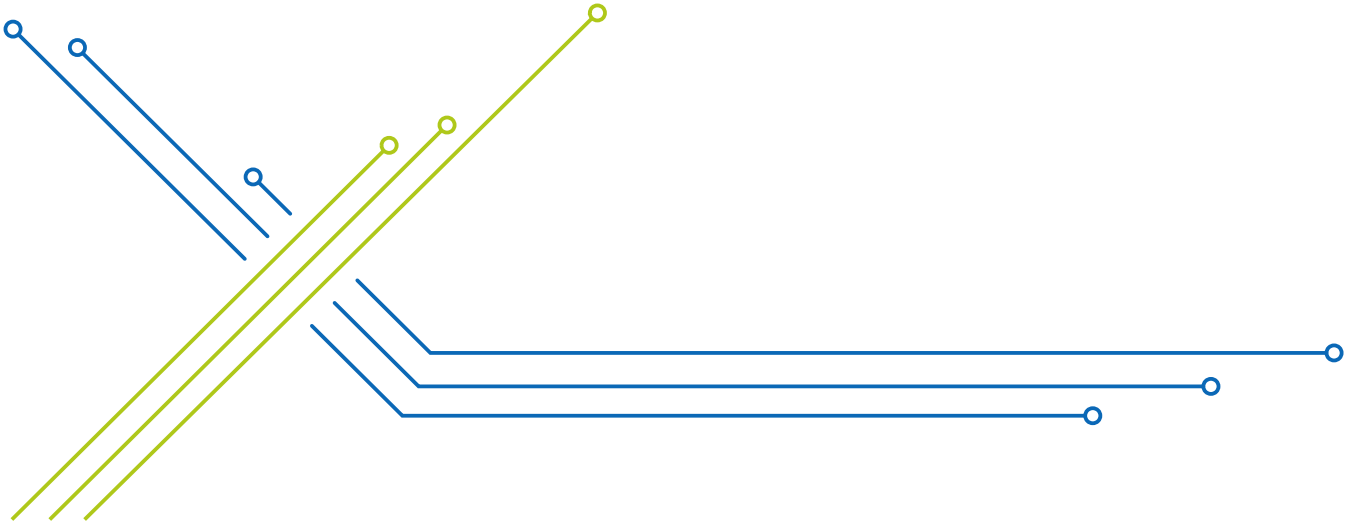

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Translation of the Original Instructions

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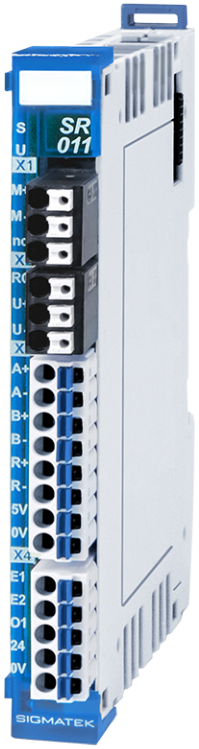
S-DIAS DC Motor Output Stage SR 011



1 DC motor output stage +50 V/5 A

1 brake chopper

1 incremental encoder input RS422/TTL switchable

2 enable inputs +24 V/3 mA/0.5 ms with STO functionality (not EG type-tested!)

1 digital output +24 V/0.5 A/short-circuit protected

The S-DIAS DC Motor Output Stage SR 011 allows the connection of DC brush motors with a phase current up to 5 A. The operating modes PWM control, current and speed regulation via IxR compensation, as well as speed and position regulation via incremental encoder are supported.

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.

With the two Enable inputs, the Safety function STO is implemented (not EG type tested).

The module also has a short-circuit proof digital output (+24 V/0.5 A). The +24 V supply voltage for the digital output, as well as the incremental encoder supply are monitored for under voltage.

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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 SR 011

4x opposing connectors

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.

DANGER

Electrical voltage

Tension électrique

WARNING

Hot Surfaces

Surfaces chaudes

CAUTION

Danger for ESD-sensitive components.

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

INFORMATION

INFORMATION

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

2.2 Disclaimer

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

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

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

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

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

2.3 General Safety Directives

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

According to EU Directives, the operating manual is a component of a product. This operating manual must therefore be accessible in the vicinity of the machine since it contains important instructions. This operating manual should be included in the sale, rental or transfer of the product, or its online availability indicated.

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

INFORMATION

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

CAUTION

Handle the device with care and do not drop or let fall.
Prevent foreign bodies and fluids from entering the device.
The device must not be opened!

Manipulez l’appareil avec précaution et ne le laissez pas tomber.
Empêchez les corps étrangers et les liquides de pénétrer dans l’appareil.
L’appareil ne doit pas être ouvert!

If the device does not function as intended or has damage that could pose a danger, it must be replaced!

En cas de fonctionnement non conforme ou de dommages pouvant entraîner des risques, l'appareil doit être remplacé !

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

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

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 Standards and Directives

3.1 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

3.2 Safety of the Machine or Equipment

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

3.3 Directives

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

3.3.1 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.

3.3.2 EU Declaration of Conformity

EU Declaration of Conformity

The product SR 011 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.

In addition to these directives, the SR 011 has also been designed in accordance with 2006/42/EC and the standards EN ISO 13849-1 EN IEC 62061, but has not been EC type-tested!

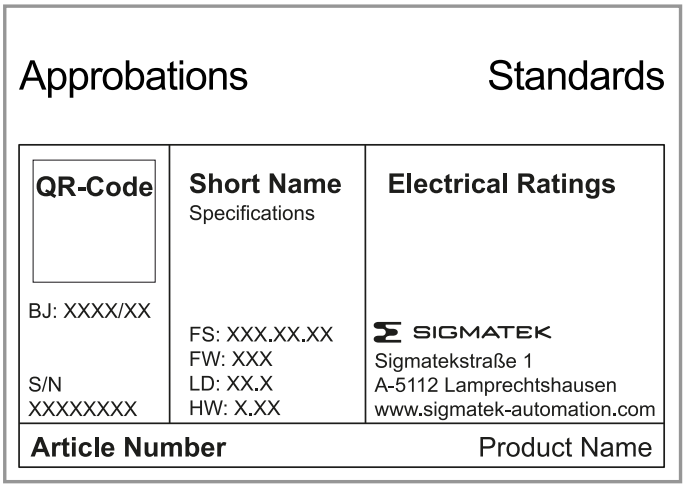
3.4 Safety-Relevant Parameters

The use of the specified parameters requires a risk analysis of the end application.

Safety parameters for two channel operation of the SR 011		
	Safety Parameters	**Safety Level**
EN IEC 62061	PFH = 1.64E-09 (1/h)	SIL 3
	SFF = 99.77 %	
EN ISO 13849-1	$MTTF_D$ = 631 years	PL e / Cat. 4
	DC = 99.11 %	

4 Type Plate

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



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

5 Technical Data

5.1 DC Motor Output Specifications

Number	1
Supported motor type	DC brushed motor
Operating modes	PWM control
	current regulation
	speed regulation via IxR compensation
	speed regulation via incremental encoder
	position regulation via incremental encoder
Supply voltage	+18-55 V
PWM frequency	32 kHz
Current controller frequency	16 kHz
Maximum PWM turn-on 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 capacity	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 overtemperature cut-off at 108 °C
Protective functions	short circuit cut-off
	temperature cut-off
	I^2t monitor
	overvoltage and under voltage monitoring

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[1)]
Short-circuit protection	yes
Regen resistor	external power resistor[2)]
Article number	20-014-061-Z1
Regen resistor switching threshold on/off	60 V/55 V

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.
Avoid physical contact with the surface of the brake resistor, and for a significant time after operation as well.

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.
Eviter tout contact physique avec la surface de la résistance de freinage, ainsi que pendant une longue période après le fonctionnement.

1) Regen braking must be dimensioned according to the application. For most applications, a 15 Ω/100 W resistor is sufficient. If multiple S-DIAS DC Motor Output Stage 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.

2) 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 $60^2/R$.

5.3 Incremental Encoder Input Specifications

Number	1
Input signals[1)]	Incremental encoder signals RS422 (A, /A, B, /B, R, /R)
	RS422 level (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
Counter frequency	maximum 500 kHz
Signal analysis	4x
Counter resolution	16 bits
Encoder power supply	+5 V/0.2 A short-circuit proof

5.4 Digital Output Specifications

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

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).

5.5 Enable Inputs for STO 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	
Safety Level	Complies with the requirements of Category 4, Performance Level "e" according to EN ISO 13849-1 and SIL CL 3 according to EN IEC 62061	
	Not EG type tested!	
Safety function	STO according to EN 61800-5-2, section 4.2.2.2	
	The motor is not supplied with energy, which can cause a turn. The DC motor output stage does not supply energy to the motor, which can generate torque.	
	Not EG type tested!	

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

INFORMATION

1) 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.

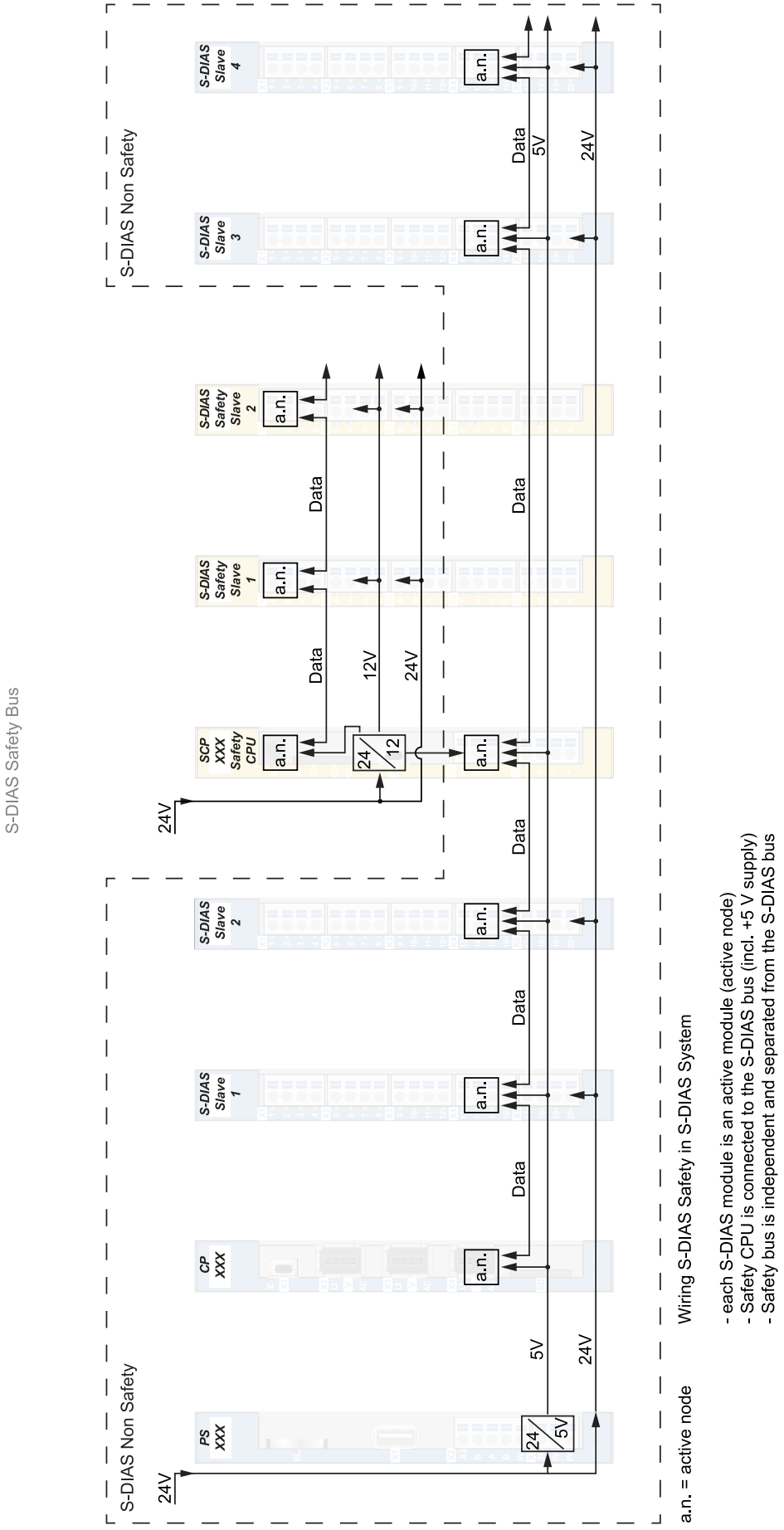
2) The motor supply (X2) must be connected with an intermediate circuit capacitance appropriate for the application (at least 2000 µF/100 V).
Attention must be paid to short cables and appropriate cable cross-sections.(maximum 15 cm between module and capacitor / 1.5 mm²)

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 may be 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 regenerative voltage that occurs.

Use only conductors, which 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. In particular, motor currents and the I^2T settings (A-I2TT, A-I2TERR) must be monitored, which can be parameterized in the DIAS-Drive Editor via the LASAL CLASS 2 tool.
Only motors in a star configuration can be used.


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

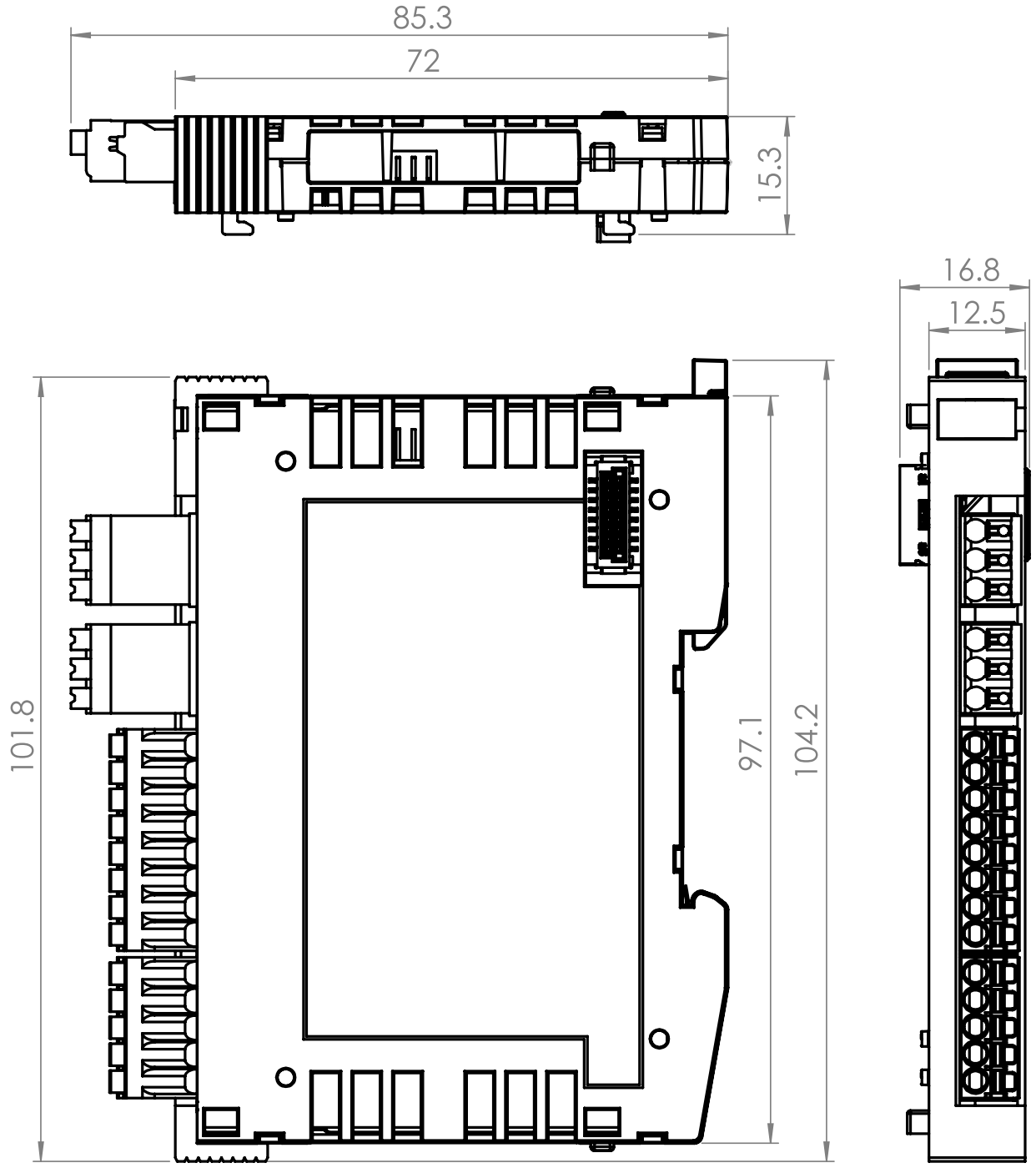
5.7 Miscellaneous

Article number	20-029-011	
Printed circuit board coating	no	
Approvals	CE	yes
	UL	designed according to UL
	Functional Safety	no
	UKCA	no
Mission time	20 years	

5.8 Environmental Conditions

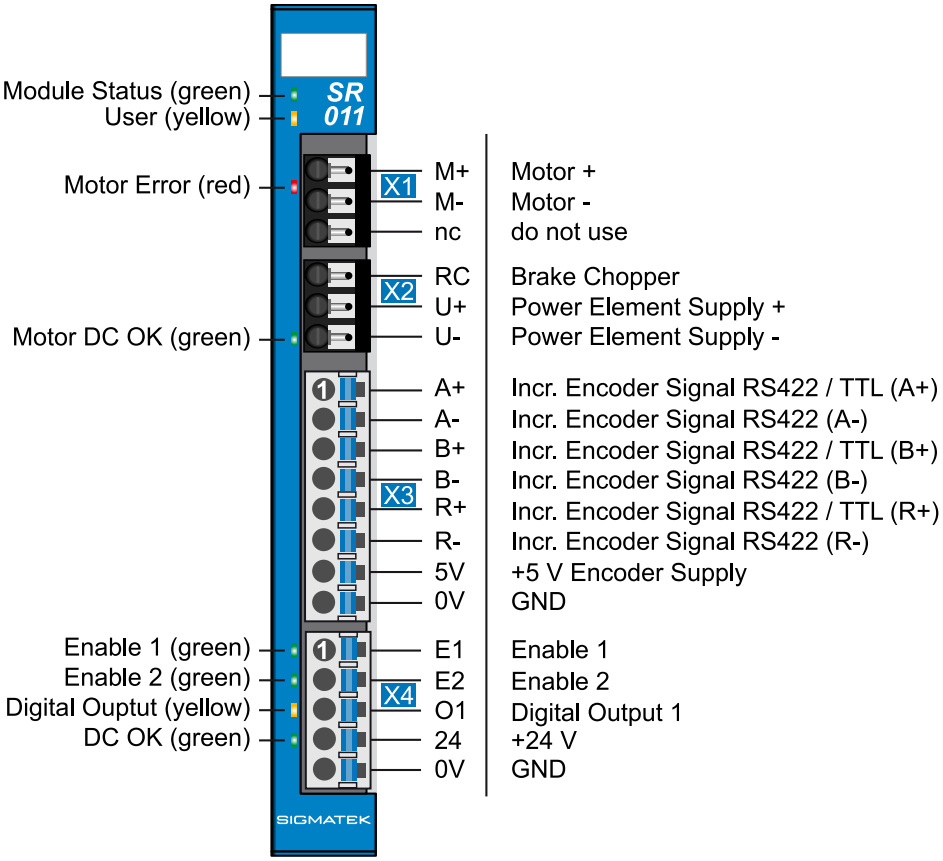
Storage temperature	-20 ... +85 °C	
Environmental temperature	0 ... +55 °C	
Humidity	0-95 %, non-condensing	
Installation altitude above sea level	0-2000 m without derating > 2000 m up to a maximum of 5000 m with derating of the maximum environmental temperature by 0.5 °C per 100 m	
Operating conditions	pollution degree 2	
Noise emission	≤ 70 dB	
EMC resistance	EN 61000-6-2 (industrial area) EN 61000-6-7 (immunity industry functional safety) (increased requirements according to EN IEC 62061)	
EMC noise generation	EN 61000-6-4 (industrial area)	
Vibration resistance	EN 60068-2-6	3.5 mm von 5-8.4 Hz 1 g von 8.4-150 Hz
Shock resistance	EN 60068-2-27	15 g (147.15 m/s²)
Protection type	EN 60529	IP20

6 Mechanical Dimensions



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

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

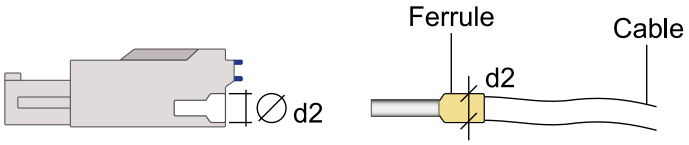
7.2 Applicable Connectors

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.

Connection capacity Phoenix connectors:

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)



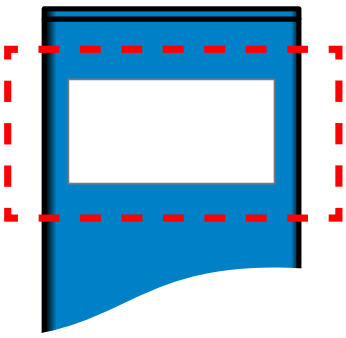
d2 = max. 2.8 mm

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, 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

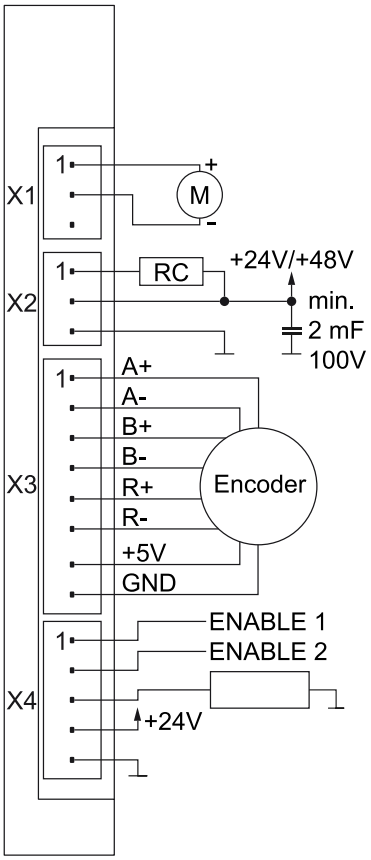
7.3 Label Field



The labeling field is printed directly on the module.

8 Wiring

8.1 Wiring Example



8.2 Note

The following installation guidelines should be observed:

- The DIN rail must have an adequate mass connection.
- The shielding must be connected to a shielding bus.
- 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 as close as possible before the module.
- For the motor wiring, a shielded cable is required. The shield must be placed as close as possible to the module.

INFORMATION

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

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!

9 Additional Safety Information

The Safety function “STO” is an integrated part of the DC motor output stage. It meets all necessary requirements for safe operation in SIL 3 according to EN IEC 62061 and in compliance with PL e. Cat. 4 in accordance with EN ISO 13849-1 (not EG type tested).

CAUTION

The instructions contained in this document must be followed.

- The SR 011 can only be powered by supplies that meet the requirements for SELV or PELV in compliance with EN 60204.
  For error-free operation, proper transport and storage are essential. See chapter 12 Transport/Storage.
- 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 guidelines and standards of safety technology.

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

ATTENTION

Les instructions contenues dans ce document doivent être suivies.

- Pour un fonctionnement sans erreur, le transport et le stockage appropriés sont essentiels. Voir le chapitre 12 Transport/Storage pour plus d’informations.
- 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.

Pour votre propre sécurité et celle des autres, les modules de sécurité ne doivent être utilisés qu’à des fins prévues. Une installation CEM correcte est également incluse dans l’utilisation prevue.

CAUTION

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 manual or the speciation's defined in the technical data (see chapter 5 Technical Data).

The main power supply for the servo amplifier must be disconnected using the main switch for the following instances:

- Cleaning, maintenance or repairs
- Extended still-stand periods

CAUTION

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 (voir chapitre5 Technical Data).

L'alimentation principale du variateur doit être débranchée à l'aide de l'interrupteur principal dans les cas suivants:

- Nettoyage, entretien ou réparation
- périodes d'immobilisation prolongées

DANGER

Failure to follow the above safety measures can lead to severe injuries.

- Only trained personnel are authorized to install the "safe restart lock" STO (Safe Torque off) and set the parameters.
- All control devices (switches, relays, PLC, etc.) and the control cabinet must meet the requirements for EN ISO 13849.
  This includes:
  - Door switches, etc. with at least IP54 protection.
  - Control cabinet with at least IP54 protection.
- Appropriate cables must be used, and proper cable termination on the module side must be ensured (see the chapter “7.2 Applicable Connectors” => Connection capacity).
- All cables that affect safety (e.g. control cables for the ENABLE 1 and ENABLE 2 inputs) must be laid in a cable duct outside of the control cabinet: Short or crossed circuits in the signal lines must be avoided! See EN ISO 13849.

DANGER

Le non-respect des mesures de sécurité ci-dessus peut entraîner des blessures graves.

- Seul un personnel qualifié est autorisé à installer le "blocage de redémarrage sûr" STO (Safe Torque off) et à régler les parameters.
- Tous les appareils de commande (interrupteurs, relais, API, etc.) et l'armoire de commande doivent satisfaire aux exigences de la norme EN ISO 13849.
  Il s'agit des éléments suivants :
  - interrupteurs de porte, etc. avec une protection d'au moins IP54
  - armoire de commande avec une protection d'au moins IP54.
- Il convient d'utiliser des câbles adaptés et de veiller à ce que les extrémités des câbles soient correctement raccordées côté module (voir le chapitre 7.2 Applicable Connectors" => Connection capacity).
- Tous les câbles affectant la sécurité (par ex. les câbles de commande pour les entrées ENABLE 1 et ENABLE 2) doivent être posés dans un conduit de câbles de raccordement à l'extérieur de l'armoire électrique. Eviter les courts-circuits ou les courts-circuits croisés dans les lignes de signalisation! Voir EN ISO 13849.

DANGER

If external forces influence axes that are used with the STO safety function (e.g. hanging load), additional measures must be taken (such as an electromagnetic double-surface spring brake, instead of a permanent magnet brake).

Si des forces externes influencent les axes utilisés avec la fonction de sécurité STO (par ex. charge suspendue), des mesures supplémentaires doivent être prises (par ex. un frein à ressort électromagnétique à double surface au lieu d'un frein à aimant permanent).

WARNING

Hot surface warning!
Physical contact poses a burn hazard!
With unfavorable installation and operating conditions, the surface of the S-DIAS drive module can reach temperatures up to 84 °C and remain hot for some time after operation.

Avertissement de surface chaude !
Le contact physique présente un risque de brûlure !
En cas de conditions d'installation et de fonctionnement défavorables, la surface du module d'entraînement S-DIAS peut atteindre des tempé-ratures allant jusqu'à 84 °C et rester chaude pendant un certain temps après utilisation.

9.1 STO

The SR 011 supports the safety functions STO (Safe Torque Off) and meets the requirements for Category 4 Performance Level "e" according to EN ISO 13849-1 and SIL 3 according to EN IEC 62061.

For his purpose, the servo amplifier has two safe inputs ENABLE 1 and ENABLE 2.

9.2 Function

The safety functions in the SR 011 are controlled over two digital inputs.

The following table shows the status that the ENABLE 1 and ENABLE 2 inputs must assume to enable normal operation or trigger the safety function.

Input Status		Description
ENABLE 1	**ENABLE 2**	
Open	Open	**Safe status of the drive system**
Open	Low	
Low	Open	
Low	Low	
High	High	**Drive system ready**

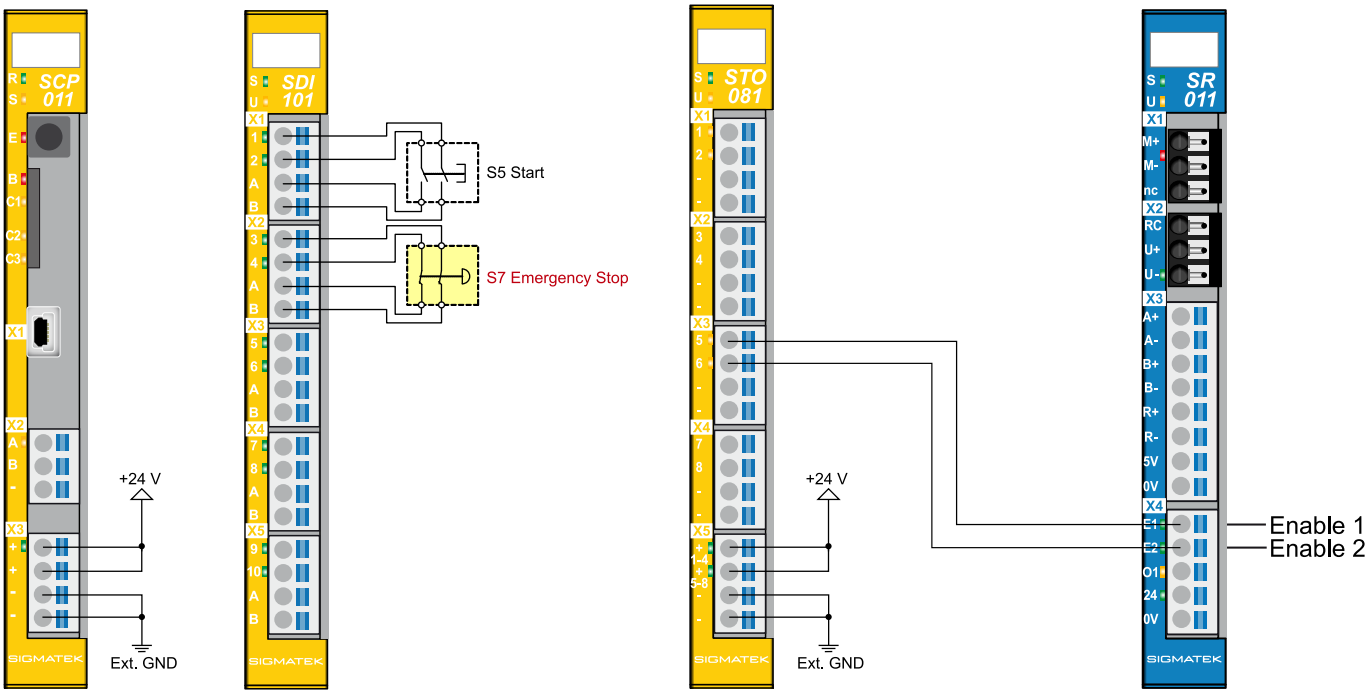
If the ENABLE 1 and ENABLE 2 are changed from any status to the "Drive Ready" status, the servo amplifier is not immediately enabled. In order to set the system to the status “Drive system ready”, a change from “Low-Low” to “High-High” has to be executed. The reason for this is that, for example, sticky contacts of switching devices are detected.

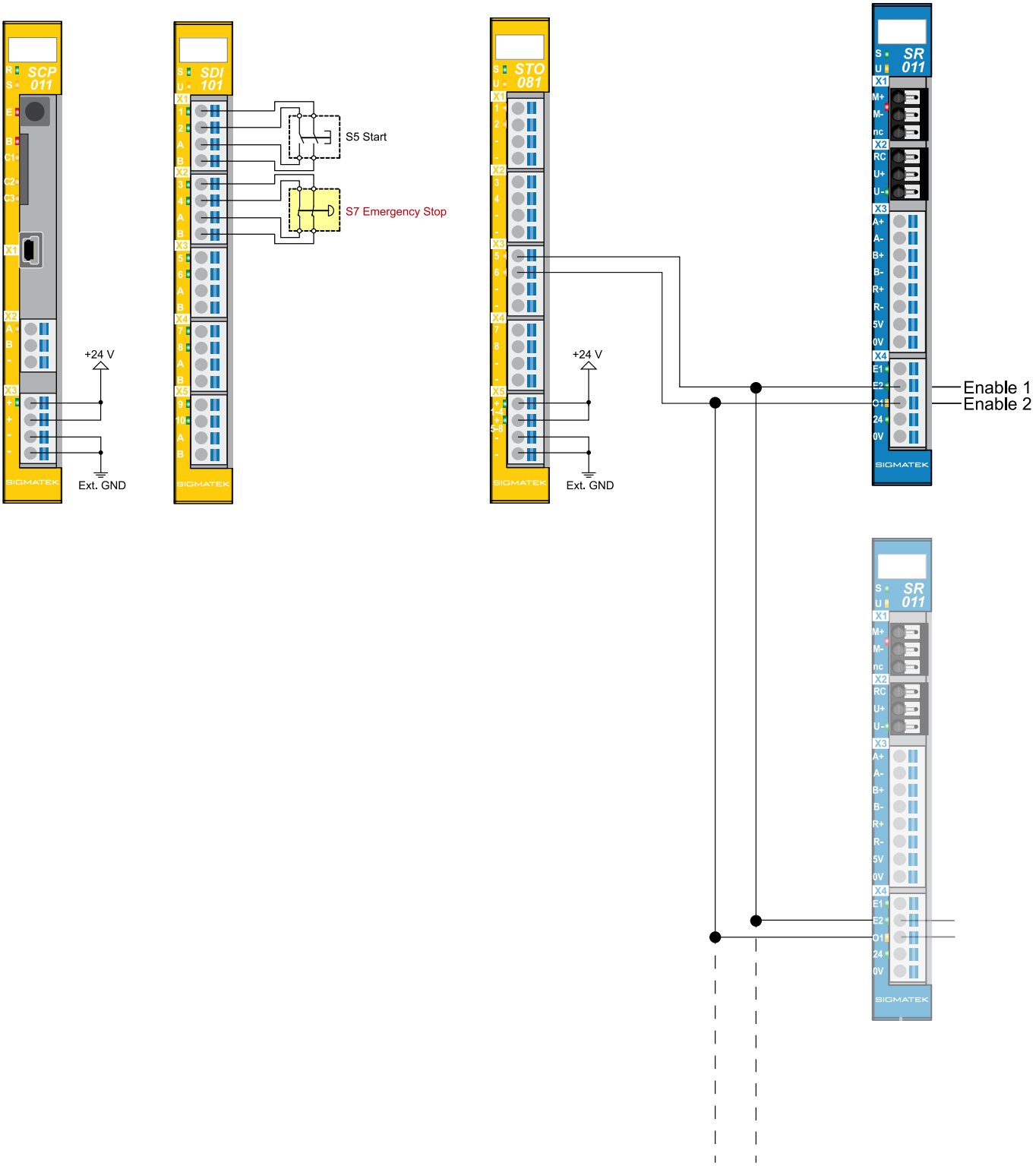
10 Wiring Examples

In the following sub chapters, wiring examples are provided. It must be ensured that all constructive measures etc. are complied with and applied in order to fulfill the requirements of the category used.

10.1 Performance Level e, Category 4 or SIL 3 - Safety PLC

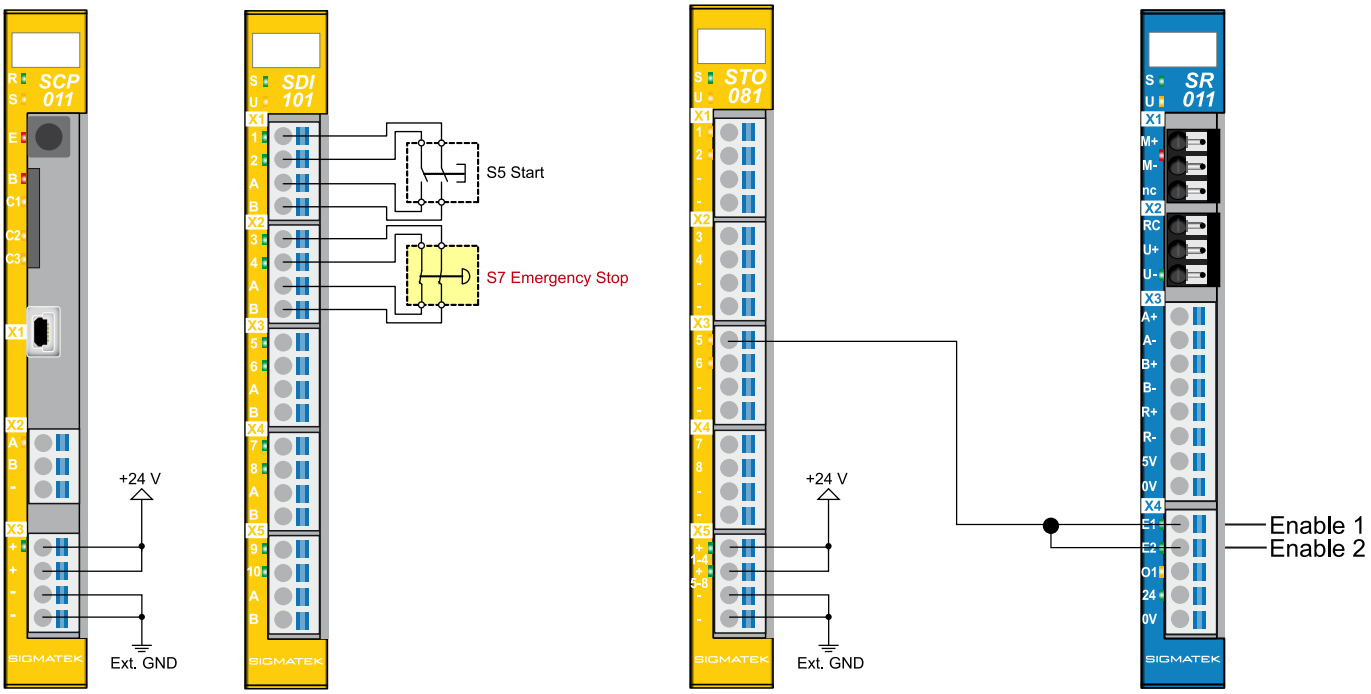
To meet the requirements of category 4, performance Level "e" for EN ISO 13849-1 and SIL 3 according to EN IEC 62061, two error-proof output of a Safety PLC must be used. Cross-circuit detection between the two lines via the output tests of the STO 081 is hereby possible.

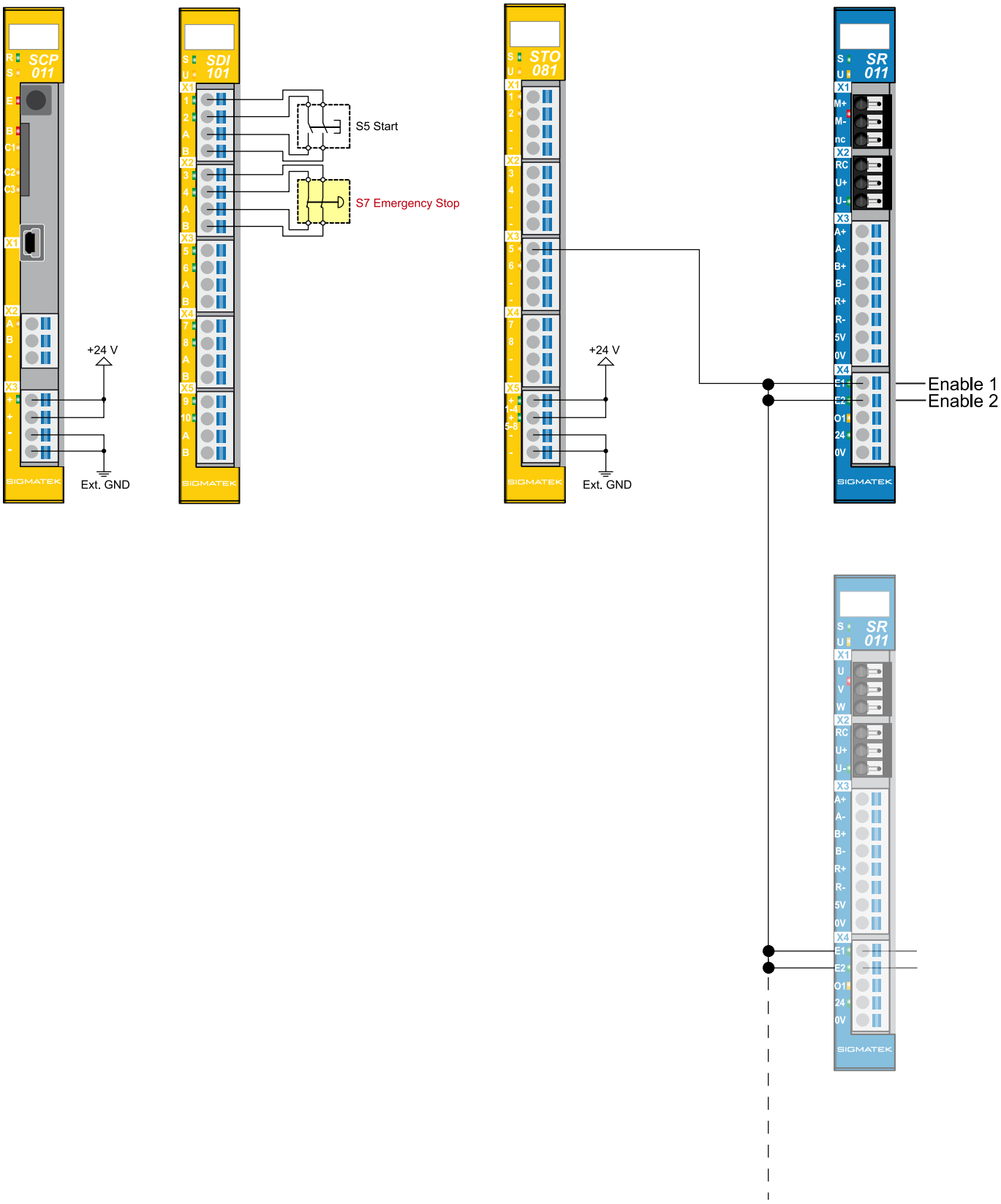



SCP 011
SDI 101
STO 081
SR 011
S5 Start
S7 Emergency Stop
+24 V
Ext. GND
+24 V
Ext. GND
Enable 1
Enable 2
SR 011

10.2 Performance Level e, Category 3 or SIL 3 - Safety PLC

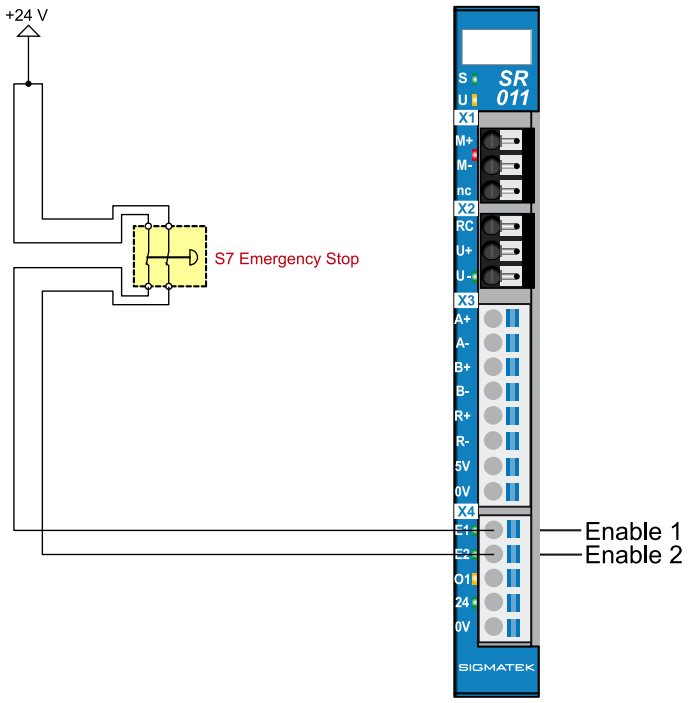
To meet the requirements of safety category 3, performance level "e" for EN ISO 13849-1 and SIL 3 according to EN IEC 62061, an error-proof output of a safety PLC must be used. The reason of category 3 here, is that cross-circuit detection between the two lines is not possible. To achieve the stated performance level, a fault exclusion for the wiring is also necessary for this connection. In addition, the wiring must be within the control cabinet.

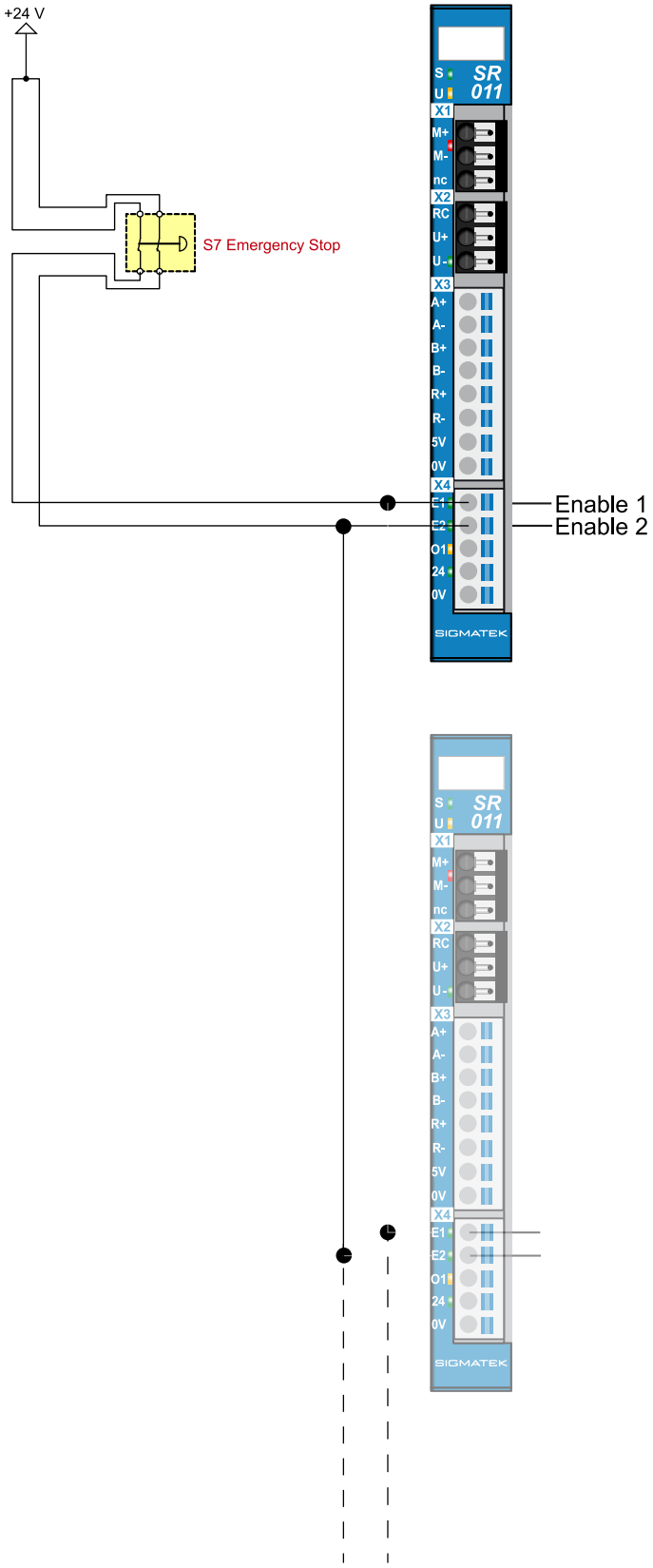



SCP 011
SDI 101
STO 081
SR 011
S5 Start
S7 Emergency Stop
+24 V
Ext. GND
+24 V
Ext. GND
Enable 1
Enable 2
SR 011

10.3 Performance Level e, Category 4 or SIL 3 - Conventional

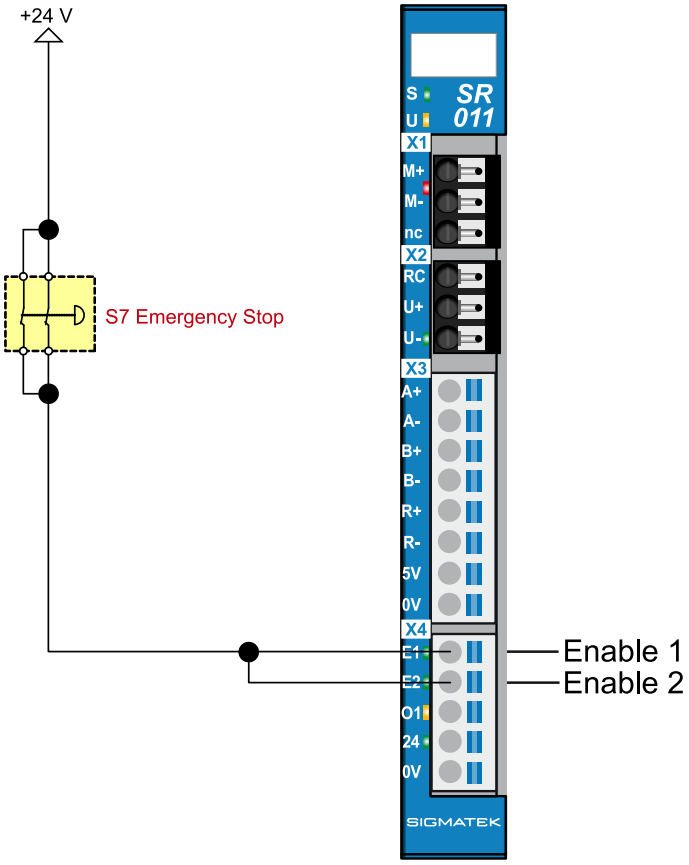
To meet the requirements of safety category 4, performance level "e" for EN ISO 13849-1 and SIL 3 according to EN IEC 62061, the placement of the lines must comply with EN ISO 13849-2, table D.4 (separate placement, prohibiting of error via short circuits between wires) as cross-circuit detection is not possible here.

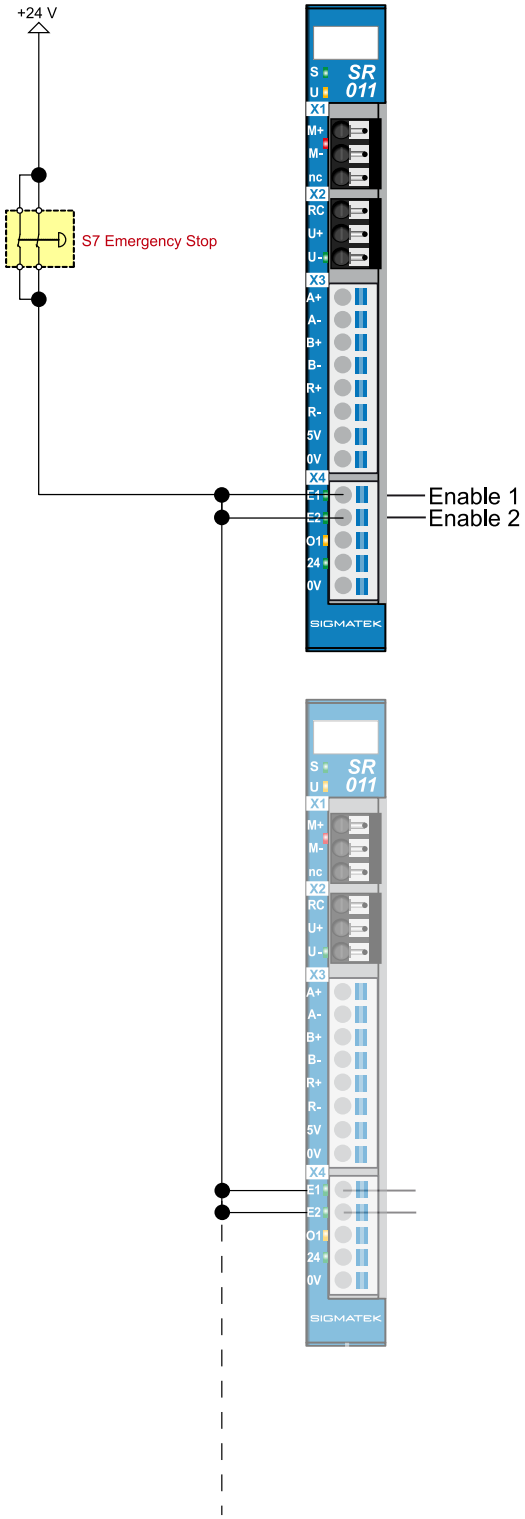



+24 V
S7 Emergency Stop
SR 011
X1
M+
M-
nc
X2
RC
U+
U-
X3
A+
A-
B+
B-
R+
R-
5V
0V
X4
E1
E2
O1
24
0V
SIGMATEK
Enable 1
Enable 2

10.4 Performance Level e, Category 2 or SIL 2 - Conventional

This involves 1-channel wiring, whereby the Enable inputs are tested separately. Here, no cross-circuit detection is possible.




+24 V
S7 Emergency Stop
SR 011
S
U
X1
M+
M-
nc
X2
RC
U+
U-
X3
A+
A-
B+
B-
R+
R-
5V
0V
X4
E1
E2
O1
24
0V
SIGMATEK
Enable 1
Enable 2

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.

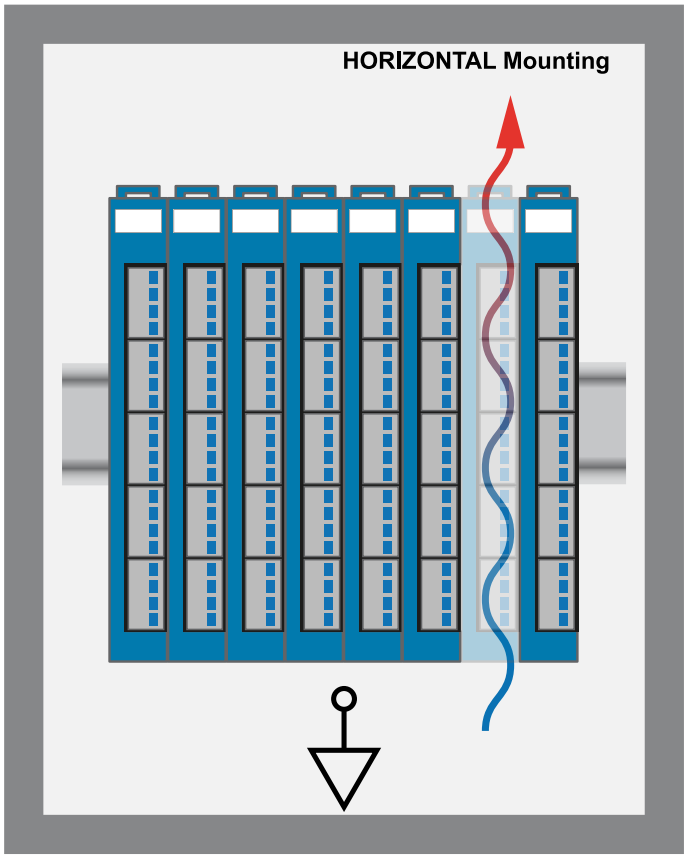
INFORMATION

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.

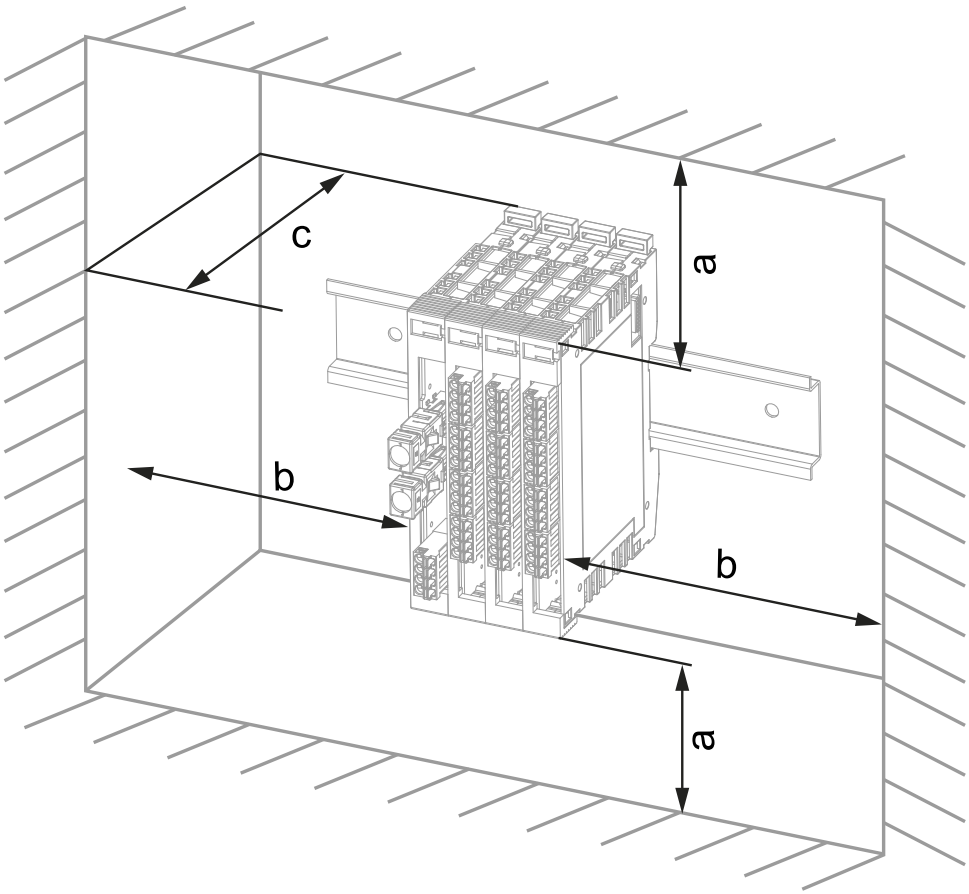
Damaged components can disrupt or damage the system.

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 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.

13 Storage

When not in use, store the device according to the storage conditions. See chapter 12 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.

14 Maintenance

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

14.1 Service

This product was constructed for low-maintenance operation.

14.2 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 12 Transport/Storage.

15 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.

16 Supported Cycle Times

16.1 Cycle Times below 1 ms (in µs)

50	100	125	200	250	500
					x

x = supported

16.2 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

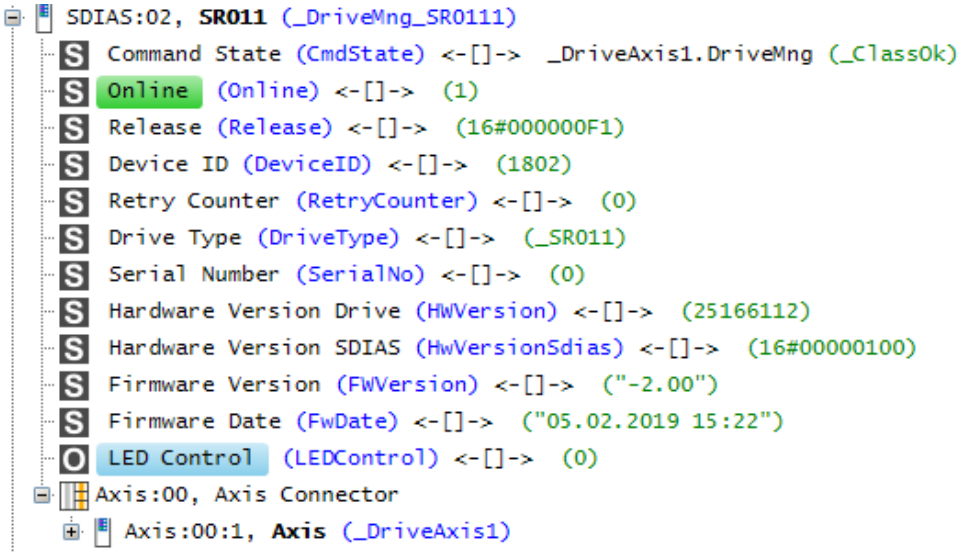
Changes Chart

Change date	Affected page(s)	Chapter	Note
16.08.2019		all	Renamed to DC Motor Output Stage
14.11.2019	45	16 Supported Cycle Times	Chapter added
29.01.2020	15	5.3 Incremental Encoder Input Specifications	Footer inserted
	21	7 Connector Layout	Changed graphic
28.02.2020	45	16 Supported Cycle Times	Text adapted
08.09.2020	42	15 Hardware Class SR 011	Chapter added
04.11.2020	39	11 Assembly/Installation	Expansion functional ground connection
18.12.2020	13	5.1 DC Motor Output Specifications	Footnote inserted at Maximum continuous current
01.07.2021	15	5.3 Incremental Encoder Input Specifications	Integrated in module
15.05.2026	27	9 Additional Safety Information	Info cable changed
23.10.2026	27	9 Additional Safety Information	Chapter Function Test deleted

17 Hardware Class

The HW classes are used to configure the module under LASAL CLASS and this document is available in the LASAL CLASS help.

_DriveMng_SR011



The class _DriveMng_SR011 provides the interface to the S-DIAS DC motor module SR 011. It has 1 motor output 24 V/0.5 A, 2 enable inputs 24 V, 1 brake chopper output, 1 incremental encoder RS422/TTL switchable and 1 digital output 24 V / 0.2 A. More information on the hardware can be found in the module documentation. The default CyWork time is 10 ms.

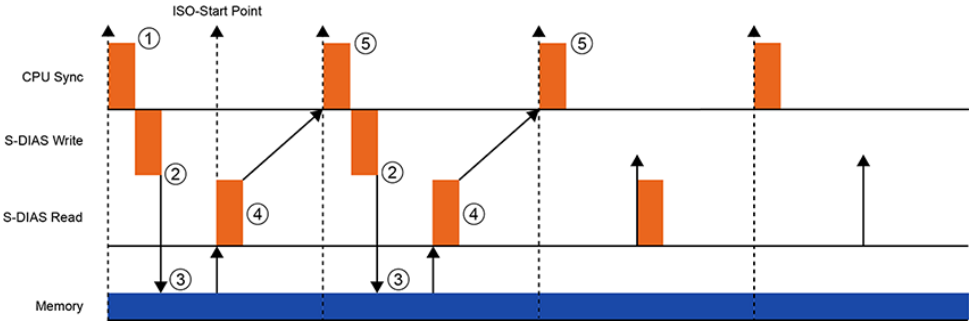
Interfaces

General

Cmd State	State	This server shows the actual status of the hardware class.
Online	State	This server is set as soon as the hardware class is processed properly (when the data are valid, drives synchronized...) The server is reset when an error occurs or when disconnected.
Device ID	State	This server shows the device ID of the hardware module.
Release	State	FPGA version of the module in 16#XY (e.g. 16#10 = version 1.0).
Retry Counter	State	This server increments when a transfer fails.
Drive Type	State	Shows, which hardware is used (SDD 310, SDD 120, DC 061, SR 011,...).
Serial Number	State	The serial number of the hardware module is shown in this server.
Hardware Version DRIVE	State	Hardware version of the drive (parameter I-HC) in the format 16#XXYY (e.g. 16#0120 = version 1.20)
Hardware Version SDIAS	State	Hadrware version of the S-DIAS module in the format 16#XXYY (e.g. 16#0120 = version 1.20)
Firmware Version	State	Shows the firmware version of the drive.
Firmware Date	State	Shows the creation date of the drive firmware.
LED Control	Output	With this server, the application LED of the S-DIAS module can be activated to find the module in the network more quickly. The following status are possible: 0 LED off 1 LED on 2 blinks slowly 3 blinks rapidly
Required	Property	This client is activated by default, i.e. this S-DIAS hardware module at this position is absolutely necessary for the system and may under no circumstances be missing, disconnected or deliver an error, otherwise the entire hardware is switched off. If the hardware module is missing, it returns an error or if it is removed, this triggers an S-DIAS error. If this client is initialized with 0, this hardware module is not mandatory at the position. This means that it can be removed at any time. However, which components identified as "not required" should be selected with regard to the safety of the system.
Time Multiplier	Property	With help from this client, the drive data transfer is run every nth S-DIAS cycle only.

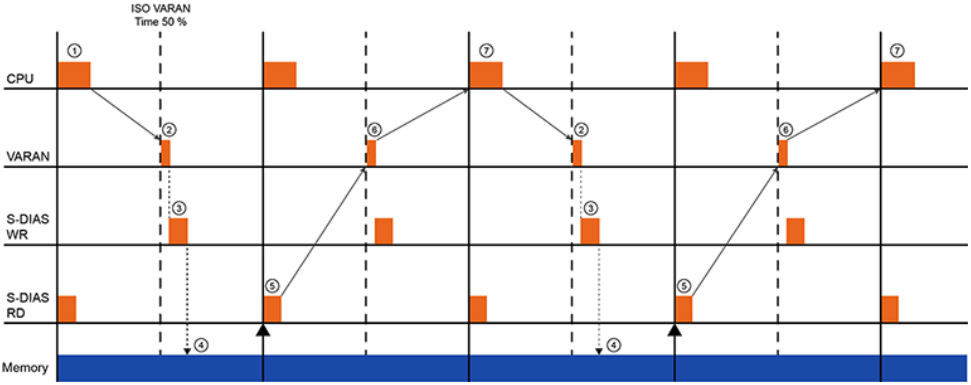
Communication Time Characteristics

S-DIAS local



1. A new set position is calculated in the application.
2. Position is written to the memory through the hardware classes.
3. The new set position is available in the drive. The new set position is used for interpolation of the coming cycle.
4. The actual position is read from memory.
5. The new actual position is available in the application.

S-DIAS via VARAN



1. The new set position is calculated in the application.
2. Position sent via VARAN.
3. Position is written in memory by the hardware classes.
4. New set position is available in the drive. The new set position is used for interpolation of the coming cycle.
5. The actual position is read from the memory.
6. Position sent via VARAN.
7. The new actual position is available in the application.