

# SR 022

## S-DIAS Current Controller Module

### Instruction Manual

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## **Translation of the Original Instructions**

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## S-DIAS Current Controller Module

**SR 022**

with 1 DC motor driver

**1 incremental encoder input**

**1 digital input +5 V**

**2 digital inputs +24 V**

The S-DIAS SR 022 current controller module is used to operate a DC motor with a 12-30 V supply voltage and a maximum motor current of 3.5 A. Higher starting currents are possible for a short period.

Additionally, the motor contains an incremental encoder input (optional TTL or RS422 signal), as well as three digital inputs (1x +5 V, 2x +24 V).



## Contents

<b>1.</b>	<b>Introduction</b> .....	<b>4</b>
1.1	Target Group/Purpose of this Operating Manual .....	4
1.2	Important Reference Documentation .....	4
1.3	Contents of Delivery .....	4
<b>2</b>	<b>Basic Safety Directives</b> .....	<b>5</b>
2.1	Symbols Used .....	5
2.2	Disclaimer .....	7
2.3	General Safety Directives .....	8
2.4	Software/Training .....	9
<b>3</b>	<b>Standards and Directives</b> .....	<b>10</b>
3.1	Directives .....	10
3.1.1	EU Conformity Declaration .....	10
<b>4</b>	<b>Type Plate</b> .....	<b>11</b>
<b>5</b>	<b>Technical Data</b> .....	<b>12</b>
5.1	Motor Output Specifications .....	12
5.2	Incremental Encoder Input Specifications .....	13
5.3	+5 V Digital Input Specifications .....	14
5.4	+24 V Digital Input Specifications .....	14
5.5	Electrical Requirements .....	14
5.6	Miscellaneous .....	17
5.7	Environmental Conditions .....	17

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<b>6</b>	<b>Mechanical Dimensions</b> .....	<b>18</b>
<b>7</b>	<b>Connector Layout</b> .....	<b>19</b>
7.1	Status LEDs.....	20
7.2	Applicable Connectors.....	21
7.3	Label Field .....	22
<b>8</b>	<b>Wiring</b> .....	<b>23</b>
8.1	Wiring Example .....	23
8.2	Note .....	24
<b>9</b>	<b>Assembly/Installation</b> .....	<b>25</b>
9.1	Check Contents of Delivery .....	25
9.2	Mounting.....	26
<b>10</b>	<b>Addressing</b> .....	<b>28</b>
<b>11</b>	<b>Transport/Storage</b> .....	<b>31</b>
<b>12</b>	<b>Storage</b> .....	<b>31</b>
<b>13</b>	<b>Maintenance</b> .....	<b>32</b>
13.1	Service .....	32
13.2	Repair.....	32
<b>14</b>	<b>Disposal</b> .....	<b>32</b>
<b>15</b>	<b>Hardware Class SR022</b> .....	<b>33</b>

<b>15.1</b>	<b>General.....</b>	<b>34</b>
<b>15.2</b>	<b>DC Motor.....</b>	<b>35</b>
<b>15.3</b>	<b>Incremental Encoder .....</b>	<b>36</b>
<b>15.4</b>	<b>Communication Interfaces.....</b>	<b>37</b>

## 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](http://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 022

## 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!

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

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

The module complies with EN 61131-2.

In combination with a facility, the system integrator must comply with EN 60204-1 standards.

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

Le module est conforme à la norme EN 61131-2.

En combinaison avec une équipement, l'intégrateur de système doit respecter la norme EN 60204-1.

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

## 2.4 Software/Training

The application is created with the software LASAL CLASS 2 and LASAL SCREEN Editor.

Training for the LASAL development environment, with which the product can be configured, is provided. Information on our training schedule can be found on our website.

## 3 Standards and Directives

### 3.1 Directives

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

#### 3.1.1 EU Conformity Declaration



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#### EU Declaration of Conformity

The product SR 022 conforms to the following European directives:

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

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

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## 4 Type Plate

	HW: X.XX
	SW: XX.XX.XXX
	Safety Version: SXX.XX.XX
Serial No.	SIGMATEK GMBH & CO KG Sigmatekstrasse 1 A-5112 LAMPRECHTSHAUSEN
Article Number	Product Name Short Name

### Exemplary nameplate (symbol image)

	HW: 1.00
	SW: 01.00.000
	Safety Version: S01.00.00
12345678	SIGMATEK GMBH & CO KG Sigmatekstrasse 1 A-5112 LAMPRECHTSHAUSEN
12-246-133-3	Handbediengerät Wireless HGW 1033-3

HW: Hardware version

SW: Software version

## 5 Technical Data

### 5.1 Motor Output Specifications

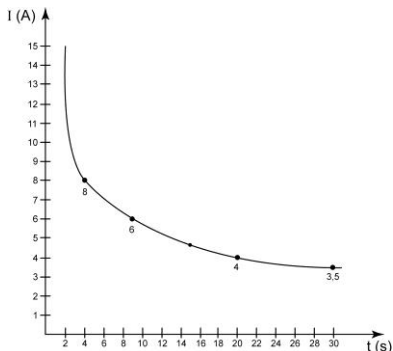
Number	1
Supply voltage	12-30 V DC
Controller frequency	30 kHz
Current	0-2.0 A in S1 mode 0-3.5 A in S3 mode
Output current over the environmental temperature	2.0 A (S1)/3.5 A (S3) up to 45 °C 1.0 A (S1)/1.4 A (S3) up to 55 °C
Motor peak start current	maximum $I^2t$ -value = 16 A <sup>2</sup> s
Operating modes	S1 / 100 % duty cycle S3 / 50 % duty cycle with a maximum on-time of 1.5 min
Intermediate circuit capacity	140 µF
Voltage monitoring	Overvoltage and under voltage monitoring
Motor current measurement	0-3.5 A
Protective function	Short circuit switch-off $I^2t$ switch-off Over temperature switch-off

#### INFORMATION



The motor current should not exceed the defined value of 3.5 (S3) or 2.0 A (S1), this also applies to braking and start-up of the motor. The module can regulate the peak start current of the motor for only a short time. The maximum starting current is determined by the  $I^2T$  value. The  $I^2T$  value is the integral of the current squared over a given time span and a mass for the maximum energy that the motor output can supply.

The EMC response of the total system is significantly affected by the motor used and its wiring. The use of shielded wires is recommended.



## 5.2 Incremental Encoder Input Specifications

Number	1
Input signals	Incremental encoder signals RS422 (A, /A, B, /B, R, /R) RS422 signal (120 Ω termination, integrated in module)
	Incremental encoder signals 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-bit
Encoder power supply	+5 V/0.2 A short-circuit proof

### 5.3 +5 V Digital Input Specifications

Number	1	
Input voltage	typically +5 V	maximum +5.5 V
Signal level	low: < +0.8 V	High: > +2.0 V
Switching threshold	typically +1.4 V	
Input current	1.5 mA at +5 V	
Input delay	typically 5 ms	

### 5.4 +24 V Digital Input Specifications

Number	2	
Input voltage	typically +24 V	maximum +30 V
Signal level	low: < +8 V	high: > +14 V
Switching threshold	typically +11 V	
Input current	3.7 mA at +24 V	
Input delay	typically 5 ms	

### 5.5 Electrical Requirements

Power supply +24 V	18-30 V	
Current consumption of the +24 V external supply	maximum 70 mA (at +24 V)	
Motor supply	12-30 V	
Current consumption of motor supply	depends on the motor	
Voltage supply from S-DIAS bus	+5 V	
Current consumption on the S-DIAS bus (+5 V supply)	typically 85 mA	maximum 95 mA
Voltage supply from S-DIAS bus	+24 V	
Current consumption on the S-DIAS bus (+24 V supply)	typically 20 mA	maximum 25 mA



**INFORMATION**

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

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

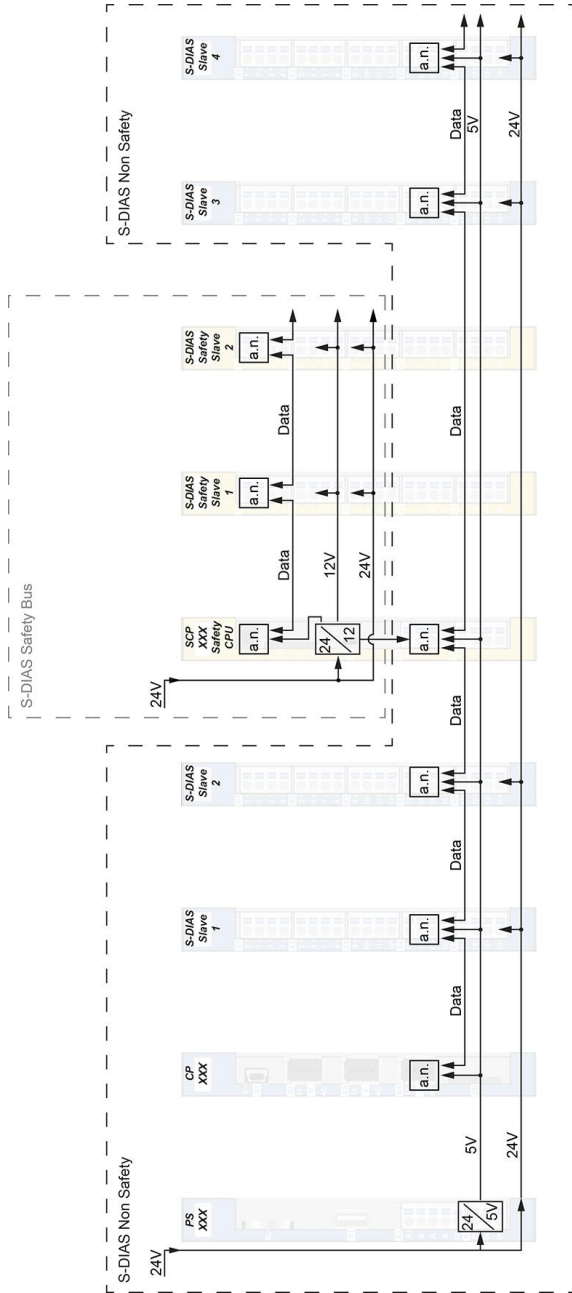
The total current of the +5 V supply cannot exceed 1.6 A!

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

## UL Requirements

**INFORMATION**

The module must be powered by a galvanically separated voltage source.



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

a.n. = active node

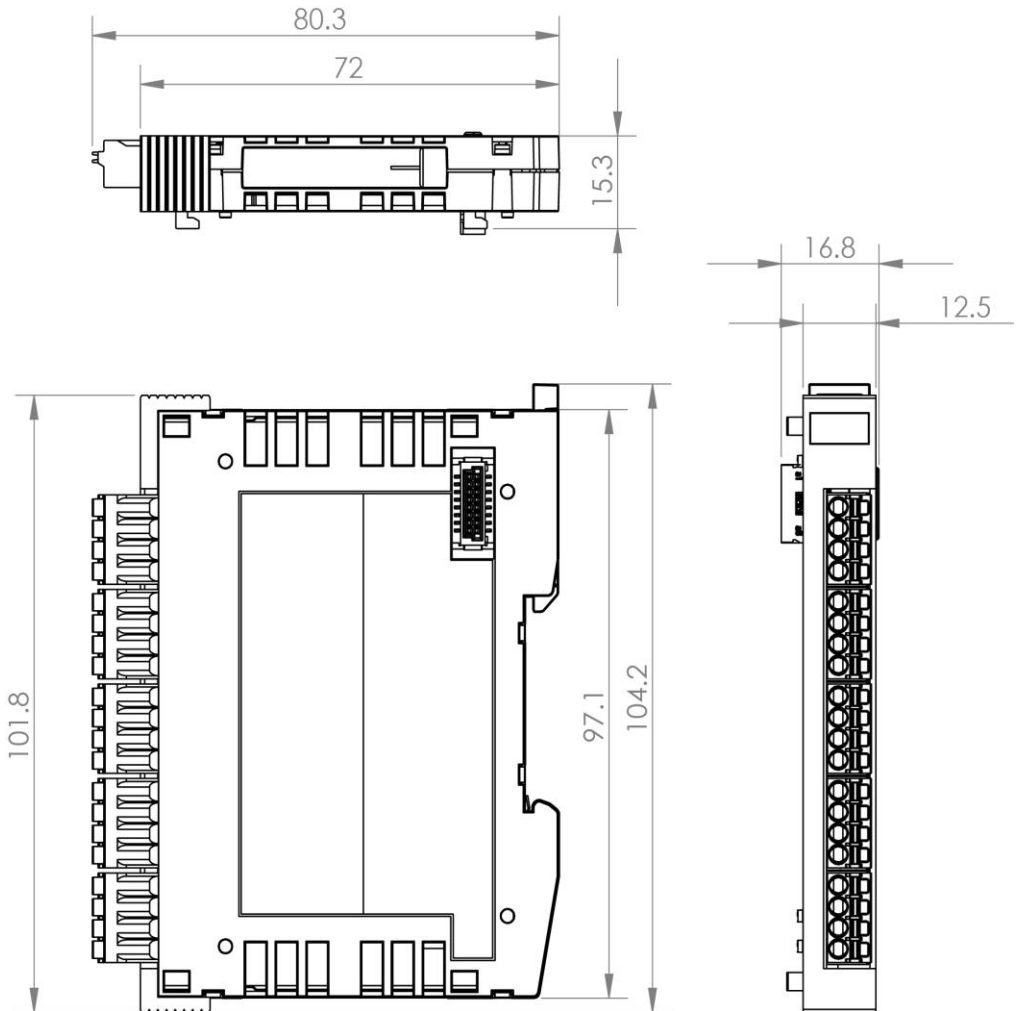
## 5.6 Miscellaneous

Article number	20-029-022
Standard	designed according to UL
Approbations	cUL, CE in preparation, UKCA

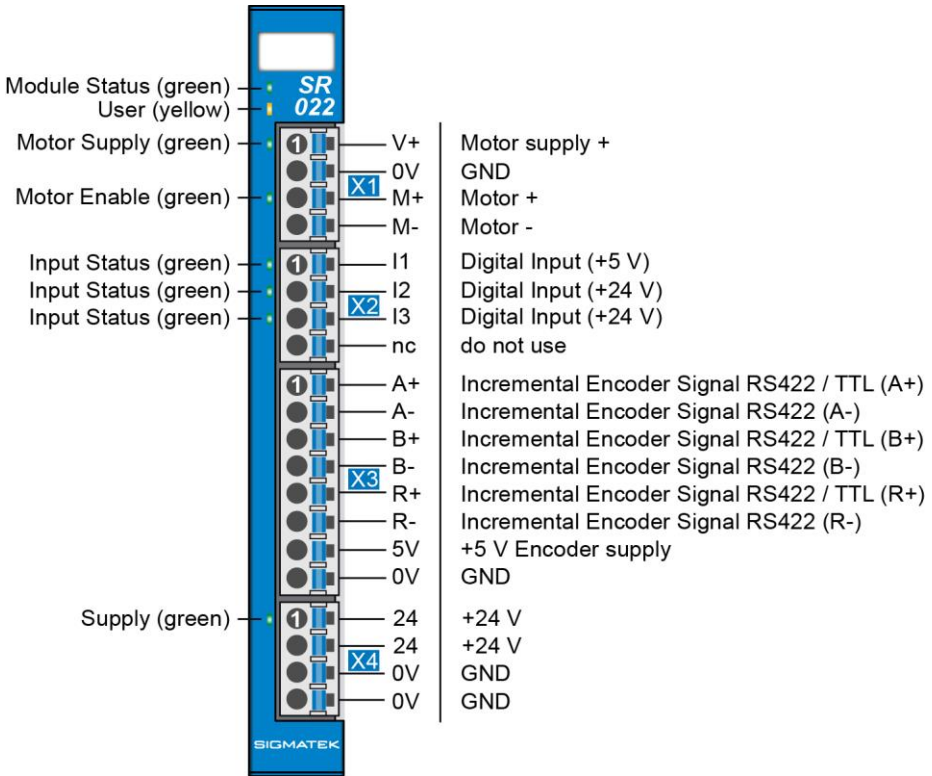
## 5.7 Environmental Conditions

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	
EMC resistance	in accordance with EN 61000-6-2 (industrial area)	
EMC noise generation	in accordance with EN 61000-6-4 (industrial area)	
Vibration resistance	EN 60068-2-6	3.5 mm from 5-8.4 Hz 1 g from 8.4-150 Hz
Shock resistance	EN 60068-2-27	15 g
Protection type	EN 60529	IP20

## 6 Mechanical Dimensions



## 7 Connector Layout



### INFORMATION



The connections of the +24 V supply (X4: pin 1 and pin 2) or the GND supply (X4: 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!

## 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 the module is easily found in the control cabinet)
		OFF	
		BLINKING (2 Hz)	
		BLINKING (4 Hz)	
Motor supply	green	ON	motor supply available
		OFF	motor supply missing
Motor Enable	green	ON	motor controller enable active
		OFF	motor controller enable inactive
Input Status	green	ON	input on
		OFF	input OFF
Power supply	green	ON	supply available
		OFF	supply missing

## 7.2 Applicable Connectors

### Connectors:

**X1-X4:** Connectors with spring terminals (included in delivery)

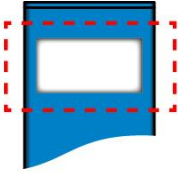
The spring terminals are suitable connecting ultrasonically compacted (ultrasonically welded) strands.

### Connections:

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



### 7.3 Label Field

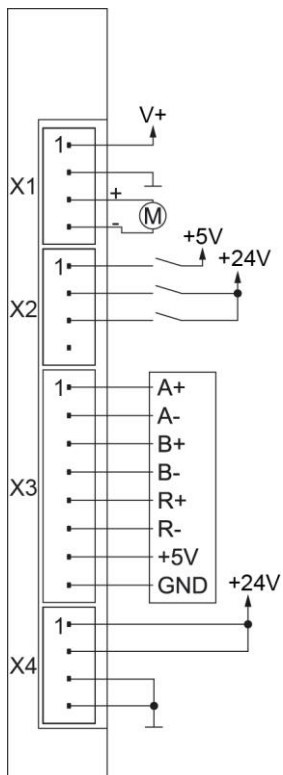


Manufacturer	Weidmüller
Type	MF 10/5 CABUR MC NE WS
Weidmüller article number	1854510000
Compatible printer	Weidmüller
Type	Printjet Advanced 230V
Weidmüller article number	1324380000



## 8 Wiring

### 8.1 Wiring Example



## 8.2 Note

The signals recorded by the analog modules are very small, as compared to the digital signals. To ensure error-free operation, a careful wiring method must be followed:

- The DIN rail must have an adequate mass connection.
- The lines connected to the source of the analog signals must be as short as possible and parallel wiring to digital signal lines must be avoided.
- The signal lines must be shielded.
- The shielding must be connected to a shielding bus.
- Avoid parallel connections between input lines and load-bearing circuits.
- 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.

### INFORMATION



Connect the ground bus to the control cabinet.

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

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

## 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

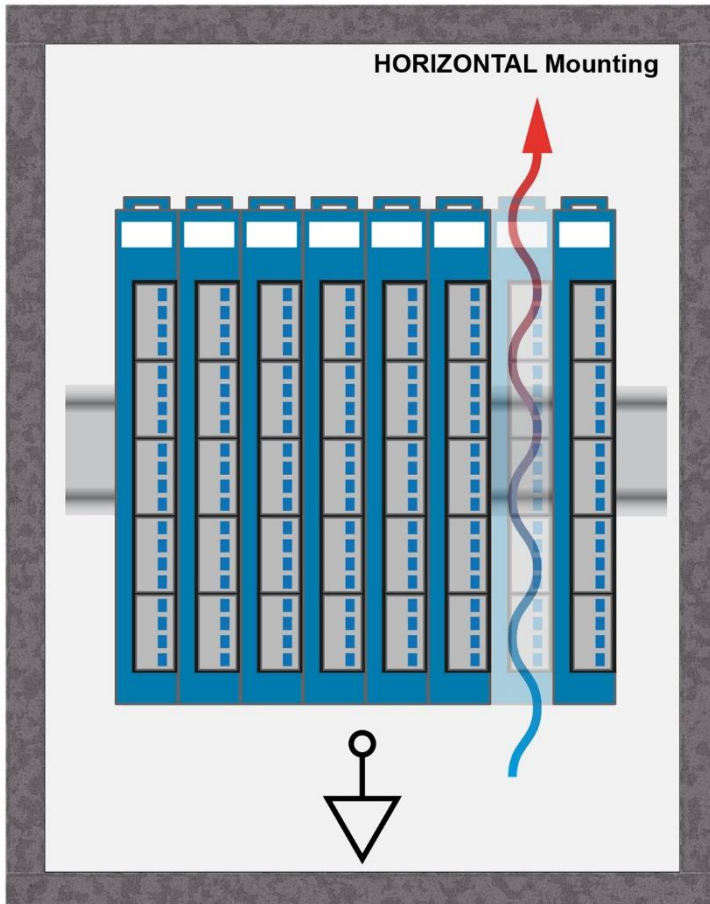


On receipt and before initial use, check the device for damage. If the device is damaged, contact our customer service and do not install the device in your system.

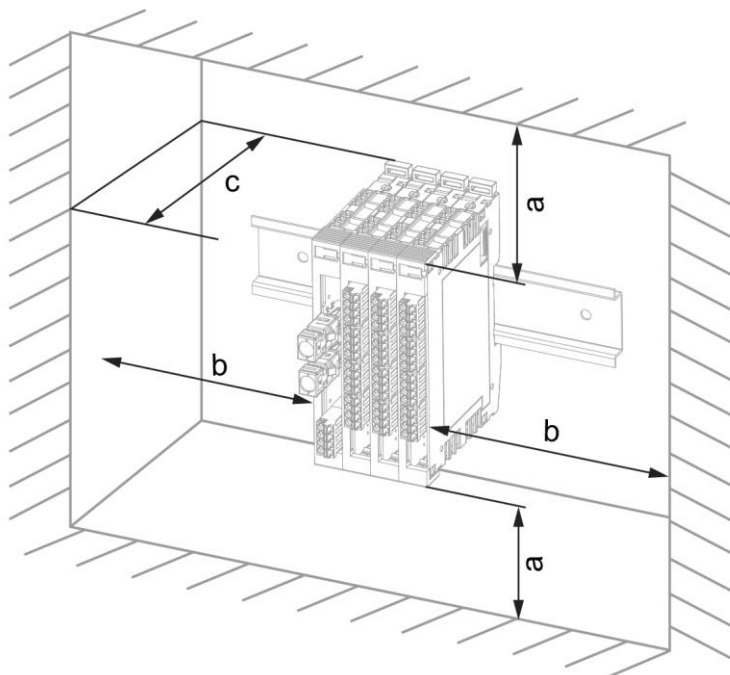
Damaged components can disrupt or damage the system.

## 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:



<b>a</b>	<b>b</b>	<b>c</b>
<b>30 mm (1.18")</b>	<b>30 mm (1.18")</b>	<b>100 mm (3.94")</b>

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

## 10 Addressing

Address (hex)	Size (bytes)	Access Type	Description	Reset value
<b>Cyclic Writing</b>				
0001	1	w	Control register: Bit 0: Sequence activated (note: bit 1 from the latched status register "False sequence occurred" must '0') Bit 2..1: Reserved Bit 3: 1 = Cancel (delete) false sequence occurred Bit 4: 1 = Over temperature - cutoff activated Bit 5: 1 = Cancel (delete) over temperature 100 °C Bit 6: 1 = $\dot{r}$ t error – cutoff activated Bit 7: 1 = Cancel (delete) $\dot{r}$ t error – cutoff activated	0000
0002	2	w16	Sequence 2 data. 16-bit value Bit 10..0: Time value / clock frequency Bit 11: 1 = use absolute time counter 0 = use relative time counter Bit 12: upper left Bit 13: top right Bit 14: bottom left Bit 15: bottom right	0000
0004	2	w16	Sequence 4 data. 16-bit value Bit 10..0: Time value / clock frequency Bit 11: 1 = use absolute time counter 0 = use relative time counter Bit 12: upper left Bit 13: top right Bit 14: bottom left Bit 15: bottom right	0000
<b>Cyclic Reading</b>				
0008	2	r	Status register (Delete when reading excl. bit 1, bit 7, bit 8) Bit 0: DC_ok Motor latched Bit 1: false sequence occurred (setting of the output sequence not allowed) Bit 2: absolute time error (the values of the absolute time must be increased with each sequence) latched Bit 3: high motor current latched Bit 4: motor current too high (additional periphery reset) latched Bit 5: motor periphery reset latched Bit 6: induction voltage from motor too high (additional periphery reset) Bit 7: 1 = over temperature 100 °C latched Bit 8: 1 = $\dot{r}$ t error latched Bit 9: digital input 1 (5 V) Bit 10: digital input 2 Bit 11: digital input 3	0000

			Bit 12: null position R1 Bit 13: null position latced (delete when reading) Bit 15..14: Reserved	
000A	2	r16	Incremental encoder Actual counter value	0000
<b>SDO</b>				
000C	2	r16	incremental encoder latched Latched counter value	0000
000E	2	r16	T the temperature in °K	0000
0010	2	r16	16-bit current value (with sign)	0000
0012	2	r16	FW status register	0000
0014	4	r32	$\hat{f}_t$ - value Bit 20..0: $\hat{f}_t$ - value Bit 31..21: Reserved	00000000
0018	4	r w32	$\hat{f}_t$ - cutoff threshold Bit 20..0: $\hat{f}_t$ - cutoff threshold Bit 31..21: Reserved	00000400
001C	2	r/w	Setup register Bit 0: Reserved Bit 1:TTL/RS422 (0 = TTL, 1 = RS422) Bit 2:null position inversion (1 = inverted) Bit 3:phase B inversion (1 = inverted) Bit 4..5: edge scan 00 = incremental encoder off 01 = 1 edge 10 = 2 edges 11 = 4 edges Bit 6: A/B counter mode 1 edge input curve 0 = signal (A) and direction (B) 1 = true A/B Bit 7: Reserved Bit 9..8: 5 V input latched incremental encoder value 00: inactive 01: rising edge 10: falling edge 11: both edges Bit 11..10: Z-signal latches incremental encoder value 00: inactive 01: rising edge 10: falling edge 11: both edges Bit 15..12 Reserved	0030
<b>DC Sequencer</b>				

0020	2	r16 w16	<p>Sequence 1 data. 16 bit values</p> <p>Bit 10..0: Time value / clock frequency</p> <p>Bit 11: 1 = use absolute time counter 0 = use relative time counter</p> <p>Bit 12: upper left</p> <p>Bit 13: top right</p> <p>Bit 14: bottom left</p> <p>Bit 15: bottom right</p>	0000
0022	2	r16 w16	<p>Sequence 2 data. 16 bit values</p> <p>Bit 10..0: Time value / clock frequency</p> <p>Bit 11: 1 = use absolute time counter 0 = use relative time counter</p> <p>Bit 12: upper left</p> <p>Bit 13: top right</p> <p>Bit 14: bottom left</p> <p>Bit 15: bottom right</p>	0000
0024	2	r16 w16	<p>Sequence 3 data. 16 bit values</p> <p>Bit 10..0: Time value / clock frequency</p> <p>Bit 11: 1 = use absolute time counter 0 = use relative time counter</p> <p>Bit 12: upper left</p> <p>Bit 13: top right</p> <p>Bit 14: bottom left</p> <p>Bit 15: bottom right</p>	0000
0026	2	r16 w16	<p>Sequence 4 data. 16 bit values</p> <p>Bit 10..0: Time value / clock frequency</p> <p>Bit 11: 1 = use absolute time counter 0 = use relative time counter</p> <p>Bit 12: upper left</p> <p>Bit 13: top right</p> <p>Bit 14: bottom left</p> <p>Bit 15: bottom right</p>	0000
0028	2	r16 w16	<p>Timespan Value / clock frequency</p>	0000



## 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.



## 15 Hardware Class SR022

### Hardware Class SR022 for the S-DIAS SR022 module

```
SDIAS:24, SR022 (SR0221)
S Class State (ClassState) <-[]->
S Device ID (DeviceID) <-[]->
S FPGA Version (FPGAVersion) <-[]->
S Hardware Version (HwVersion) <-[]->
S Serial Number (SerialNo) <-[]->
S Retry Counter (RetryCounter) <-[]->
O LED Control (LEDControl) <-[]->
S Firmware Version (FirmwareVersion) <-[]->
S Error Bits (ErrorBits) <-[]->
S Voltage OK Motor (VoltageOkMotor) <-[]->
----- Motor -----
O Enable (Enable) <-[]->
O Set Speed (SetSpeed) <-[]->
O Minimal Pulswidth (MinPulse) <-[]->
I Motor Current (MotorCurrent) <-[]->
I Temperature (Temperature) <-[]->
I I²T (I2T) <-[]->
O Quit Errors (ErrorQuit) <-[]->
----- Encoder -----
I Position (Position) <-[]->
I Position Latch (PositionLatch) <-[]->
----- Digital Inputs -----
I Zero Position (ZPuls) <-[]->
I Zero Position Latched (ZPulsLatched) <-[]->
I Digital Input 1 (Input1) <-[]->
I Digital Input 2 (Input2) <-[]->
I Digital Input 3 (Input3) <-[]->
ALARM:00, Empty
```

This hardware class is used to control the hardware module SR 022 with 1x DC motor driver and 1x incremental encoder (RS422/TTL). More information on the hardware can be found in the module documentation.

## 15.1 General

<b>ClassState</b>	State	This server shows the actual status of the hardware class.								
<b>Device ID</b>	State	The device ID of the hardware module is shown in this server.								
<b>FPGA version</b>	State	FPGA version of the module in 16#XY (e.g. 16#10 = version 1.0).								
<b>Hardware version</b>	State	Hardware version of the module in format 16#XXYY (e.g. 16#0120 = Version 1.20)								
<b>Firmware version</b>	State	The firmware version of the hardware module is shown in this server.								
<b>Serial number</b>	State	The serial number of the hardware module is shown in this server.								
<b>Retry counter</b>	State	This server increments when a transfer fails.								
<b>LED control</b>	Output	<p>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:</p> <table border="1"> <tr> <td>0</td> <td>LED off</td> </tr> <tr> <td>1</td> <td>LED on</td> </tr> <tr> <td>2</td> <td>blinks slowly</td> </tr> <tr> <td>3</td> <td>blinks rapidly</td> </tr> </table>	0	LED off	1	LED on	2	blinks slowly	3	blinks rapidly
0	LED off									
1	LED on									
2	blinks slowly									
3	blinks rapidly									
<b>Required</b>	Property	This setting is active by default, which means that the S-DIAS hardware module at this position is mandatory for the system and can under no circumstances be disconnected or return an error. Otherwise, the entire hardware deactivated. If the hardware module is missing or removed, an S-DIAS error is triggered. If his client is initialized with 0, the hardware module located in this position is not mandatory. This means that it can be inserted or removed at any time. However, which components identified as "not required" should be selected with regard to the safety of the system.								

<b>Error Bits</b>	State	<p>In this server, the status bits of the FW are shown. The respective bits mean the following:</p> <ul style="list-style-type: none"> <li>Bit 0 not defined</li> <li>Bit 1 no Sync available</li> <li>Bit 2 FLASH data CRC error</li> <li>Bit 3 RAM data CRC error</li> <li>Bit 4 invalid EEPROM version</li> <li>Bit 16 supply voltage of the motor is not OK</li> <li>Bit 17 invalid sequence input</li> <li>Bit 18 incorrect absolute time (absolute times are not in ascending order).</li> <li>Bit 19 motor start current is running in the current limit</li> <li>Bit 20 motor current is continuously too high</li> <li>Bit 21 external supply voltage is not OK</li> <li>Bit 22 supply voltage of the motor is not OK</li> <li>Bit 23 periphery reset of the motor: Deactivate the motor control due to:                             <ul style="list-style-type: none"> <li>- Config Clear in S-DIAS</li> <li>- Reset Watchdog in S-DIAS</li> <li>- Reset S-DIAS</li> <li>- Motor control watchdog</li> <li>- Short circuit current</li> <li>- Induction voltage too high</li> </ul> </li> <li>Bit 24 induction voltage too high</li> <li>Bit 25 over temperature error (temperature &gt; 95 °C)</li> <li>Bit 26 I<sup>2</sup>T error (defined threshold exceeded)</li> </ul>
	<b>Extended Data</b>	<p>Property</p> <p>Is used to activate the extended PDO data as initialization value. When activated, also MotorCurrent, Temperature, I<sup>2</sup>T and PositionLatch are sent cyclically.</p> <ul style="list-style-type: none"> <li>0 deactivated</li> <li>1 activated</li> </ul>

## 15.2 DC Motor

<b>Enable</b>	Output	<p>Is used to switch on the motor.</p> <ul style="list-style-type: none"> <li>0 motor switched off</li> <li>1 motor switched on</li> </ul> <p>The server value can be changed over the write() method.                      If the motor is deactivated (server "Enable" set 0) the set speed (server "SetSpeed") is reset to 0.                      The server cannot be set to 1 as long as a short circuit current or too high a motor induction voltage has not been canceled with "QuitError".</p>
	<b>Set Speed</b>	<p>Output</p> <p>This server can be used to set the motor speed. The valid range of values is between -10000 and +10000 (equals +/- 100%) whereas the turn direction is defined by the sign. The server value can be changed over the write() method.</p>

<b>Min Pulse</b>	Output	With this server, the minimum pulse width of the PWM can be defined per mil. The server value can be changed over the write() method. A change is not valid before calling the write() method of the server SetSpeed in the control (default: 7).
<b>Motor Current</b>	Input	Shows the measured bridge current in mA. The relevant total current for the heating of the components both branches is measured. Higher values than the actual motor current are therefore shown in the component load range. The measured current value forms the basis for the I2T calculation. The status is queried over read(). The value is only updated, if "ExtendedData" is 1. As invalid value 16#80000010 is displayed.
<b>Temperature</b>	Input	Shows the temperature in °C. The status is queried over read(). The value is only updated, if "ExtendedData" is 1. As invalid value 16#80000010 is displayed.
<b>I2T</b>	Input	Shows the actual I <sup>2</sup> t value in [(1/160)A <sup>2</sup> s] The value is only updated, if "ExtendedData" is 1. As invalid value 16#80000010 is displayed.
<b>Error Quit</b>		Reset error bits with value 1.
<b>Voltage OK Motor</b>	State	Shows, whether the supply voltage of the motor is OK. 0 not OK 1 OK
<b>PWM Period</b>	Property	Period of the PWM in µs (default: 32). As initialization value
<b>I2T Threshold</b>	Property	With this setting the I2T threshold in percent of the maximum threshold value (the maximum allowed I2T value of the hardware is 78000 [(1/160)A <sup>2</sup> s]) is defined. If exceeded, an I2T error is triggered and the motor output deactivated. As initialization value

### 15.3 Incremental Encoder

<b>Position</b>	Input	Position of the incremental encoder (32-bit signed up/down counter). The status is queried over read().
<b>Position Latch</b>	Input	Latch position of the incremental encoder (32-bit signed up/down counter). The status is queried over read(). The value is only updated, if "ExtendedData" is 1. As invalid value 16#80000010 is displayed.
<b>Z Puls</b>	Input	Reference position of the encoder. 0 actual position does not match the reference position 1 actual position matches the reference position The status is queried over read().
<b>Z Puls Latched</b>	Input	Latched reference position of the encoder 0 reference position has not been reached since last status query 1 reference position has been reached since last status query The status is queried over read(). During the status query, the server is reset to 0.

<b>Digital Input [1-3]</b>	Input	Digital Inputs 1-3 0 off 1 on
<b>Encoder Mode</b>	Property	Encoder mode. 0 switched off 1 TTL mode (default) 2 RS422 mode as initialization value
<b>Encoder Sampling</b>	Property	Here, the setting for the edge evaluation of the encoder can be defined. 0 encoder off 1 1x analysis 2 2x analysis 3 4x analysis (default) as initialization value
<b>Encoder Direction</b>	Property	Direction of the encoder count. 0 normal (default) 1 inverse as initialization value
<b>Invert Zero Position</b>	Property	When this setting is activated, the ZeroPosition and ZeroPositionLatched servers are inverted. This setting is used by the encoder and must therefore be configured so that in the ZeroPosition and ZeroPositionLatched servers, the idle status is shown as "0" and the reference signal as "1". 0 normal (default) 1 inverted as initialization value
<b>ABCntMode</b>	Property	Setting of the counter mode of the encoder. 0 A pulses and B direction 1 true A/B as initialization value

## 15.4 Communication Interfaces

<b>ALARM</b>	Downlink	With this downlink the corresponding alarm class can be placed via the hardware editor.
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## Documentation Changes

Change date	Affected page(s)	Chapter	Note
17.08.2017	12	3.2 Applicable Connectors	Added sleeve length Added info regarding ultrasonically welded strands
23.08.2017	3	1.1 Motor Output Specifications	Changed and extended the table content for a more detailed specification
18.10.2017	14 18	3.3 Label Field 5 Mounting	Added chapter Graphic replaced
20.09.2018		3 Connector Layout	Note added
14.11.2019	23	7 Supported Cycle Times	Chapter added
28.02.2020	23	7 Supported Cycle Times	Text adapted
28.05.2020	23	7 Supported Cycle Times	Chapter removed
08.09.2020	23	7 Hardware Class SR022	Chapter added
04.11.2020	18	5 Mounting	Expansion functional ground connection
01.07.2021	5	1.2 Incremental Encoder Input Specifications	Integrated in module
06.12.2022	10	1.6 Miscellaneous	UKCA conformity
26.07.2023		Document	General chapters added, design