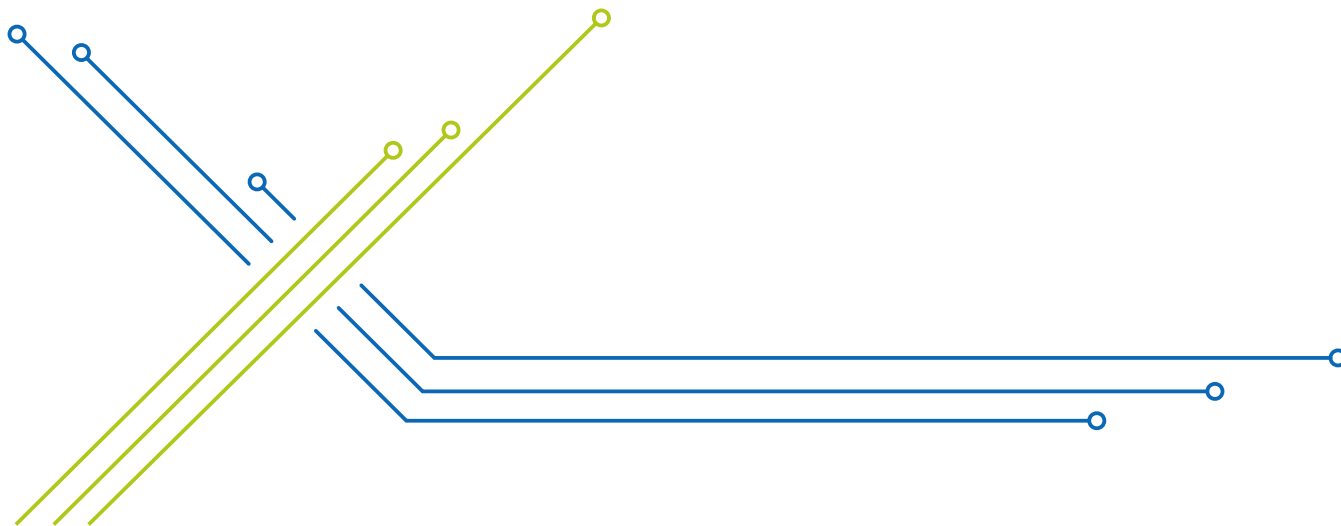


TO 127

S-DIAS Digital Output Module

INSTRUCTION MANUAL

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S-DIAS Digital Output Module

TO 127

12 digital short-circuit proof outputs

The S-DIAS Digital Output Module TO 127 has 12 short-circuit proof digital outputs in three groups (+24 V/1.7 A). The power supply for each group is monitored for under voltage.

In compliance with the safety-relevant requirements of the BG Institute for Occupational Safety (BIA), the outputs on the primary (+5 V) and the secondary (+24 V) sides are isolated using optic couplers (according to application class 3, pollution degree 2).

In the monitoring circuits of the voltage supply for each channel group, the primary and secondary sides are also isolated with optic couplers.



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1 Introduction

1.1 Target Group/Purpose of this Operating Manual

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

This operating manual is intended for:

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

General knowledge of automation technology is required.

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

Our support team is happily available to answer your questions or assist you in case of any issues. Please see our website for our hotline number and business hours.

1.2 Important Reference Documentation

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

1.3 Contents of Delivery

1x TO 127

2 Basic Safety Directives

2.1 Symbols Used

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

DANGER



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

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

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

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

WARNING



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

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

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

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

CAUTION



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

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

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

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

INFORMATION



INFORMATION

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

2.2 Disclaimer

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

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

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

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

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

2.3 General Safety Directives

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

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

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 essentiel.

2.4 Software/Training

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

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

3 Standards and Directives

3.1 Directives

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

3.1.1 EU Declaration of Conformity



EU Declaration of Conformity

The product TO 127 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.

3.2 Safety-Relevant Parameters

Conditions	+40 °C
MTBF	751 years
The MTBF is a calculated value, which represents the failure probability and must not be confused with the product lifespan.	

4 Type Plate

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

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

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

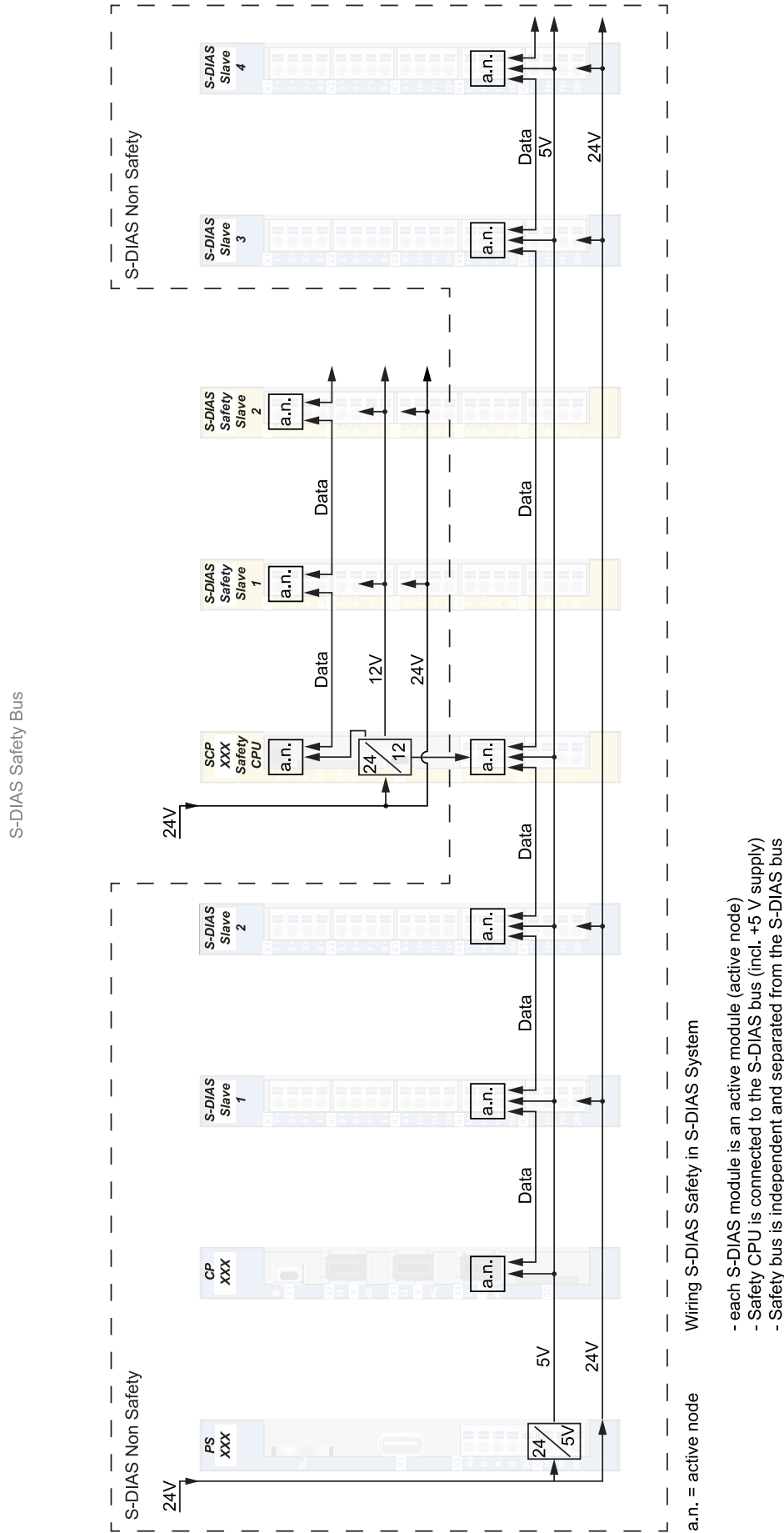
5 Technical Data

5.1 Digital Output Specifications

Number	12
Short-circuit proof	yes
Maximum continuous current/channel	1.7 A
Maximum total current (group)	5.1 A up to 40 °C ambient temperature 3.4 A up to 55 °C ambient temperature
Maximum total current (entire module)	15.3 A up to 40 °C ambient temperature 10.2 A up to 55 °C ambient temperature
Maximum braking energy of outputs (inductive load)	maximum 0.65 Joules/channel maximum 1.95 Joules/4 channels
Residual current (off)	$\leq 12 \mu\text{A}$
Turn-on delay	$< 200 \mu\text{s}$
Turn-off delay	$< 200 \mu\text{s}$
Galvanic isolation	Optic coupler, GND/EXTGND not galvanically isolated

5.2 Electrical Requirements

Supply voltage +24 V/1-3	+18-30 V DC	
Current consumption supply voltage +24 V (X5)/1-3	corresponds to the load of the digital outputs	
Supply from S-DIAS bus	+5 V	
Current consumption on the S-DIAS bus +5 V supply	typically 45 mA	maximum 50 mA



5.3 Voltage Monitoring

Supply voltage +24 V/1-3	supply voltage > +18 V (according DC OK-LED lights green)
Galvanic isolation	Optic coupler, GND/EXTGND not galvanically isolated

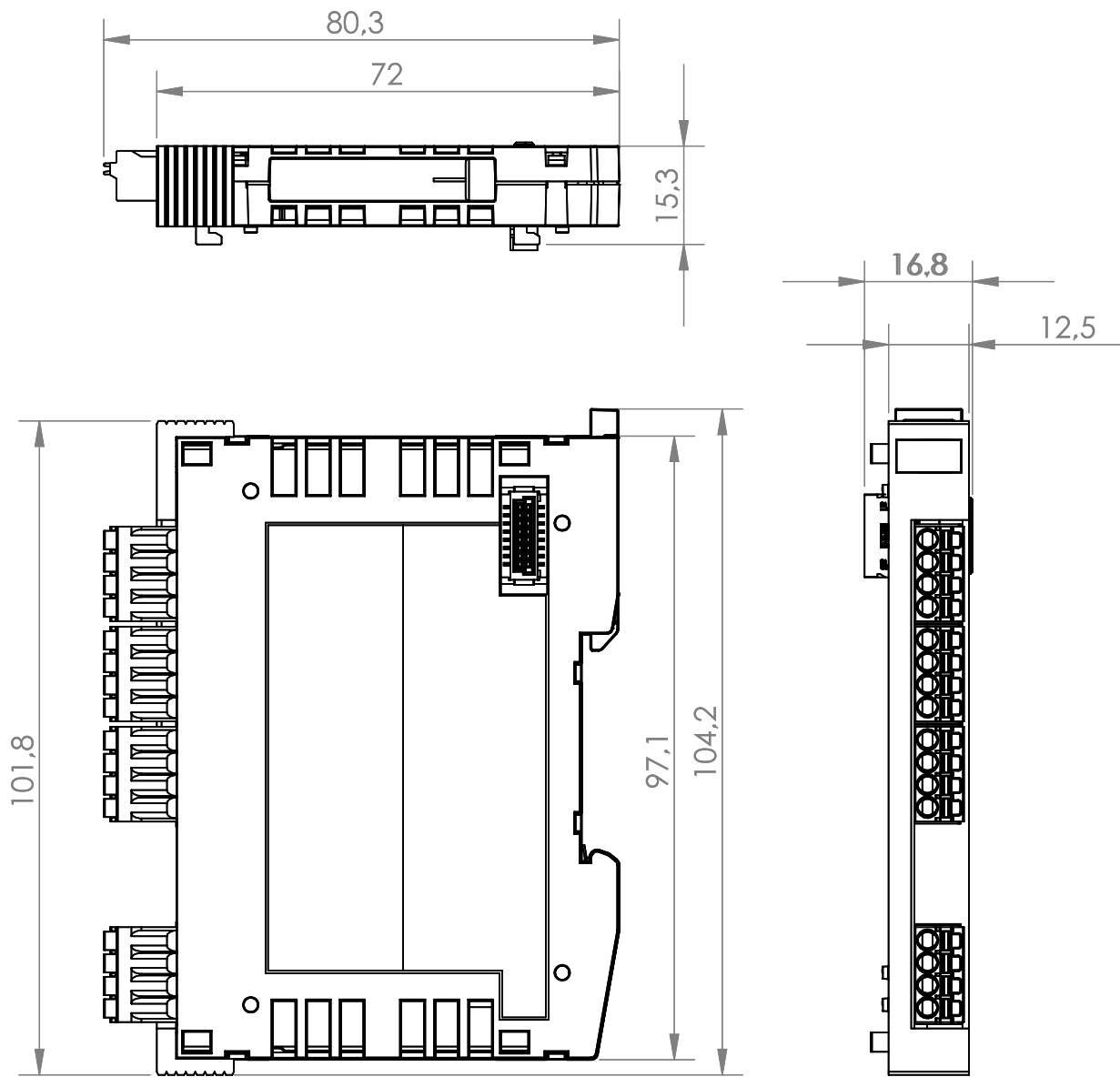
5.4 Miscellaneous

Article number	20-007-127	
Printed circuit board coating	no	
Approvals	CE	yes
	UL	cULus (E247993)
	Functional Safety	no
	UKCA	yes

5.5 Environmental Conditions

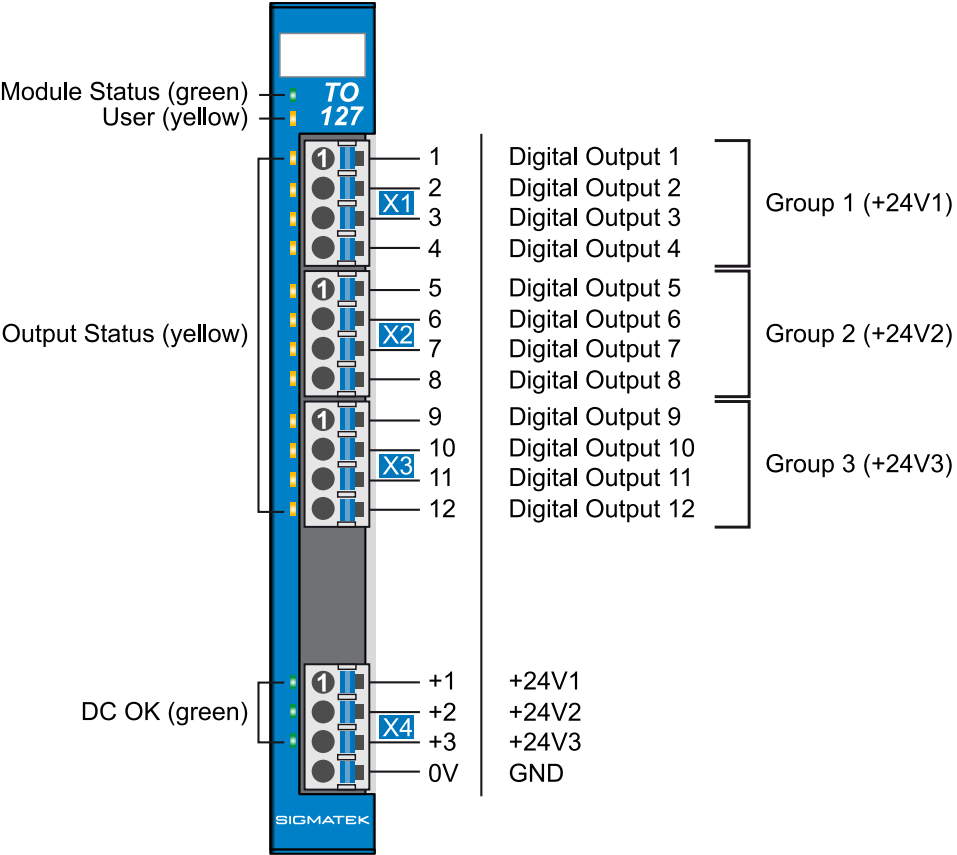
Storage temperature	-20 ... +85 °C	
Environmental temperature	0 ... +55 °C	
Humidity	0-95 %, non-condensing	
Installation altitude above sea level	0-2000 m without derating > 2000 m up to a maximum of 5000 m with derating of the maximum environmental temperature by 0.5 °C per 100 m	
Operating conditions	pollution degree 2	
Noise emission	≤ 70 dB	
EMC resistance	EN 61000-6-2 (industrial area)	
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	IP20 (not evaluated by UL)

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)	
Output status	yellow	ON	output ON
		OFF	output OFF
DC OK	green	ON	voltage is supplied to the output group

7.2 Applicable Connectors

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

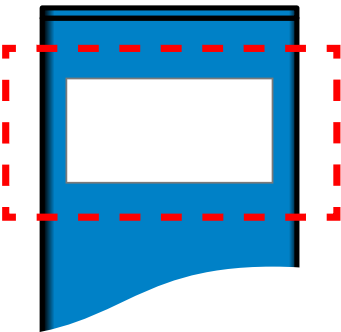
The spring terminals are suited for the connection of ultrasonically compacted (ultrasonically welded) stranded wire.

Connection capacity:

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



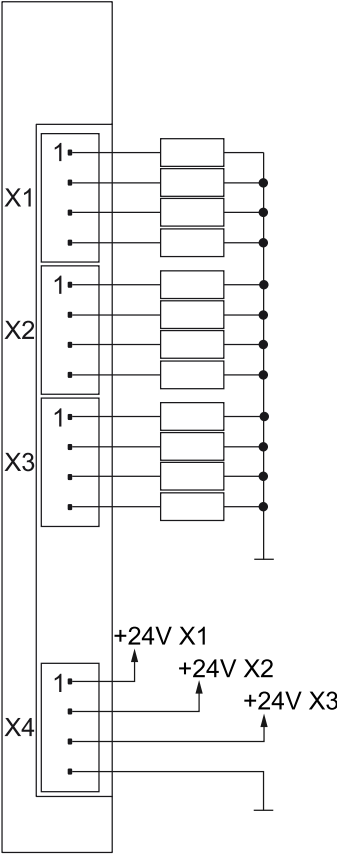
7.3 Label Field



The labeling field is printed directly on the module.

8 Wiring

8.1 Wiring Example



8.2 General Information on the Digital Outputs

Always 4 outputs are supplied from a +24 V connection.

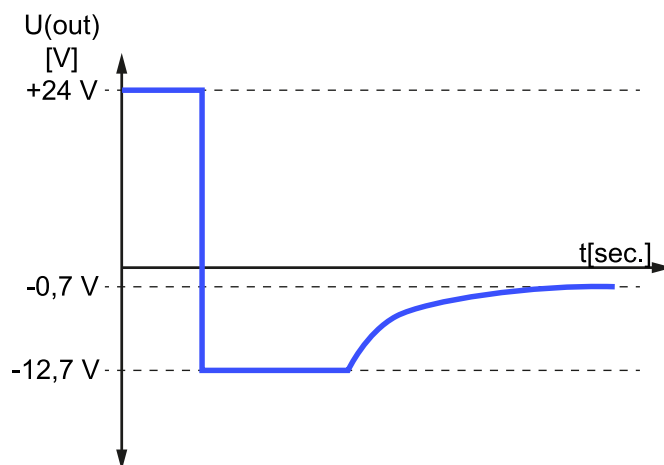
The cross section of the +24 V and 0 V supply must be designed for the maximum output current drawn by a group.

The outputs can be turned off by disconnecting the +24 V supply voltage.

Applying power to an output whose supply voltage exceeds 0.7 V is not allowed.

Always 4 outputs are internally protected against +24 V1 resp. +24 V2. Braking of inductive loads is limited to -12.7 V as shown in the graph below.

However, an additional protection circuit directly on inductive loads is recommended (freewheeling diode) to avoid a system failure caused by voltage spikes (cross talk on analog lines). However, this results in the internal voltage limit being effective up to -0.7 V only.



A careful wiring technique is recommended to guarantee failure-free operation.

8.3 Note

The following installation guidelines should be observed:

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

INFORMATION



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

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

9 Assembly/Installation

9.1 Check Contents of Delivery

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

INFORMATION

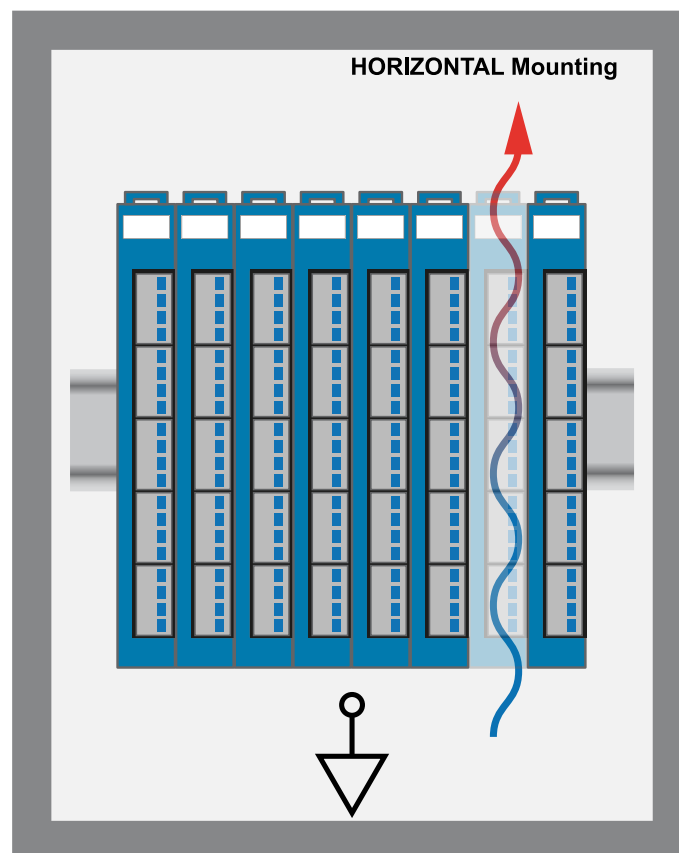


On receipt and before initial use, check the device for damage. If the device is damaged, contact our customer service and do not install the device in your system.

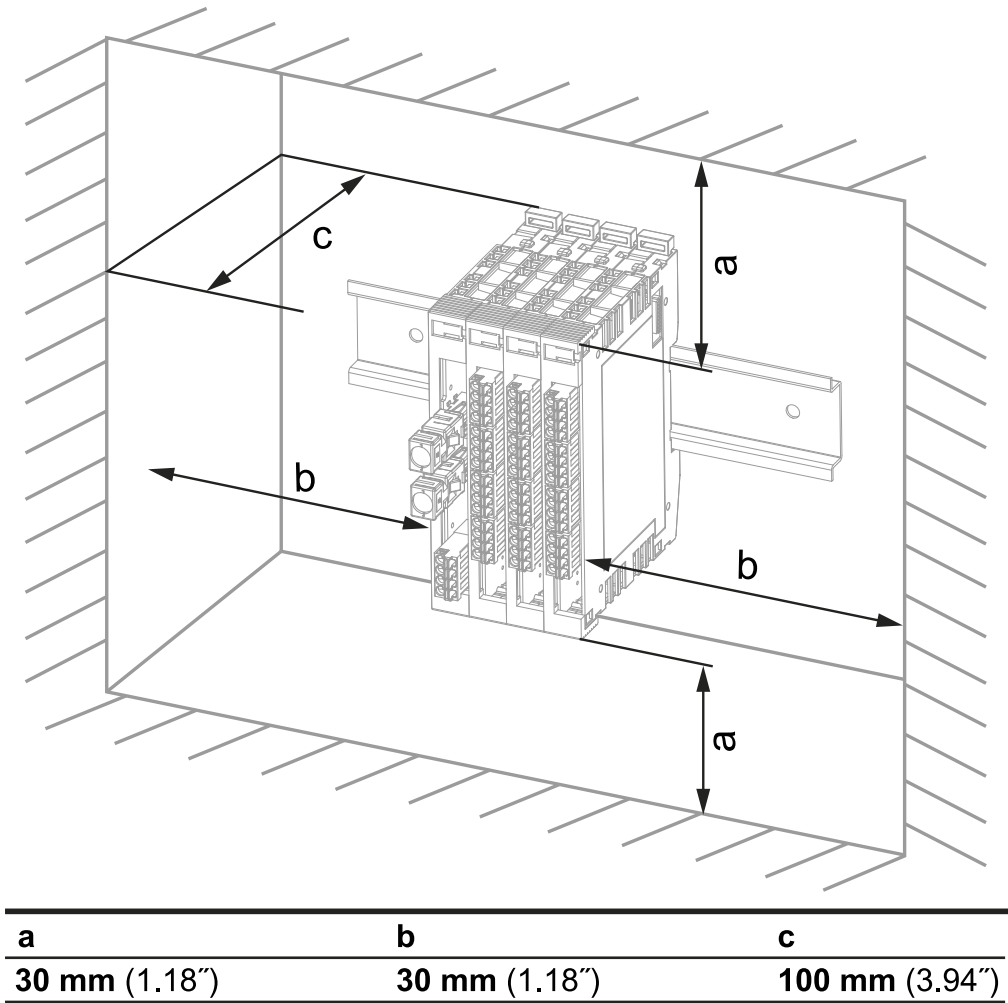
Damaged components can disrupt or damage the system.

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 lug on the back of the S-DIAS modules. The modules must be mounted horizontally (module label up) with sufficient clearance between the ventilation slots of the S-DIAS module blocks and nearby components and/or the control cabinet wall. This is necessary for optimal cooling and air circulation to ensure proper function up to the maximum operating temperature.



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



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

10 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.

11 Storage

When not in use, store the device according to the storage conditions. See chapter 10 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.

12 Maintenance

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

12.1 Service

This product was constructed for low-maintenance operation.

12.2 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 10 Transport/Storage.

13 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.



14 Addressing

Address (hex)	Size (bytes)	Access type	Description	Reset value
Memory				
0000	2	w	Output register	0000
			Bit 0	
			Bit 1	
			...	
			Bit 15	
0002	2	r	24 V status	0000
			Bit 0	
			Bit 1	
			Bit 2	
			Bit 3-15	

15 Supported Cycle Times

15.1 Cycle Times below 1 ms (in μ s)

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

x = supported

15.2 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	18	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
29.07.2013	20	9 Assembly/Installation	chapter "Mounting" added
24.10.2013	14	5.5 Environmental Conditions	Added Vibration resistance
23.12.2013	16	7 Connector Layout	Changed image
	18	8.1 Wiring Example	Added wiring example
10.02.2014	12	5.1 Digital Output Specifications	Added Maximum total current (group)
11.02.2014	16	7 Connector Layout	Changed image
	17	7.2 Applicable Connectors	Connection capacity added
28.03.2014	10	3.2 Safety-Relevant Parameters	Chapter added
	14	5.4 Miscellaneous	UL added
	20	9 Assembly/Installation	Text updated
30.01.2015	19	8.3 Note	Note regarding connecting/disconnecting the S-DIAS module under voltage added.
26.03.2015	17	7.2 Applicable Connectors	Added connections
02.04.2015	12	5.1 Digital Output Specifications	Changed maximum total current (complete module) and (group)
20.01.2016	12	5.1 Digital Output Specifications	Galvanic isolation
	14	5.3 Voltage Monitoring	Galvanic isolation
	19	8.3 Note	Chapter 4.1 and 4.3 combined and updated
28.04.2016	20	9 Assembly/Installation	Graphics distances
17.08.2017	14	5.5 Environmental Conditions	Pollution degree
	17	7.2 Applicable Connectors	Added info regarding ultrasonically welded strands
18.10.2017	17	7.3 Label Field	Added chapter
	20	9 Assembly/Installation	Graphic replaced
14.11.2019	27	15 Supported Cycle Times	Chapter added
28.02.2020	27	15 Supported Cycle Times	Text adapted
08.09.2020		Hardware Class TO 127	Chapter added
04.11.2020	20	9 Assembly/Installation	Expansion functional ground connection
06.12.2022	14	5.4 Miscellaneous	UKCA conformity
26.07.2023		Document	General chapters added, design
22.07.2026	10	3.2 Safety-Relevant Parameters	Values deleted

16 Hardware Class

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

TO127

TO127 Hardware Class for the TO 127 S-DIAS digital module

```

SDIAS:60, TO127 (TO1271)
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) <-[]->
----- Digital Outputs -----
O Digital Out 1 (Output1) <-[]->
O Digital Out 2 (Output2) <-[]->
O Digital Out 3 (Output3) <-[]->
O Digital Out 4 (Output4) <-[]->
O Digital Out 5 (Output5) <-[]->
O Digital Out 6 (Output6) <-[]->
O Digital Out 7 (Output7) <-[]->
O Digital Out 8 (Output8) <-[]->
O Digital Out 9 (Output9) <-[]->
O Digital Out 10 (Output10) <-[]->
O Digital Out 11 (Output11) <-[]->
O Digital Out 12 (Output12) <-[]->
O Output Word (OutputWord) <-[]->
S Voltage OK Output 1-4 (VoltageOkBank1) <-[]->
S Voltage OK Output 5-8 (VoltageOkBank2) <-[]->
S Voltage OK Output 9-12 (VoltageOkBank3) <-[]->
ALARM:00, Empty

```

This hardware class is used to control the TO 127 hardware module with 12 digital outputs. More information on the hardware can be found in the module documentation.

Interfaces

Clients

SdiasIn	The client must be connected to an S-DIAS port, an "SdiasOut"_[x]" server.
Place	The physical location of the hardware module is entered in this client. Up to 64 modules, 0 to 63, can be assigned.
Required	This client 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 doesn't have to be available or error-free. However, which components identified as "not required" should be selected with regard to the safety of the system.

Servers

ClassState	This server shows the actual status of the hardware class.								
DeviceID	The device ID of the hardware module is shown in this server.								
FPGAVersion	FPGA version of the module in the format 16#XY (e.g. 16#10 = Version 1.0).								
SerialNo	The serial number of the hardware module is shown in this server.								
RetryCounter	This server increments when a transfer fails.								
LEDControl	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 statuses are possible: <table> <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								
Output[1-12]	Output 1 -12, set output through the write() method.								
OutputWord	In this server, the digital outputs are shown in a 12-bit field. Bits 0 to 11 in this word are assigned to Outputs1 to Output12. A write() instruction to this server writes the bit pattern to these outputs.								
VoltageOkBank [1-3]	<table> <tr> <td>0</td><td>power supply error</td></tr> <tr> <td>1</td><td>power supply OK</td></tr> </table> Bank1: for outputs 1 - 4 Bank1: for output 5 - 8 Bank1: for output 9 - 12	0	power supply error	1	power supply OK				
0	power supply error								
1	power supply OK								

Communication Interfaces

ALARM	Downlink	With this downlink the corresponding alarm class can be placed via the hardware editor.
--------------	----------	---

Example

