TO 127

S-DIAS Digital Output Module

Operating Manual

Translation of the Original Instructions

S-DIAS Digital Output Module   TO 127

with 12 digital short-circuit proof outputs

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

Contents

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.
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
     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 essential.

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

EU Declaration of Conformity

The product TO 127 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".

4   Type Plate

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

Exemplary nameplate (symbol image)

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

HW: Hardware version
SW: Software version

5   Technical Data

5.1   Digital Output Specifications

Number	12
Short-circuit proof	yes
Maximum continuous current load allowed per channel	1.7 A
Maximum total current (group)	5,1 A at 40 °C ambient temperature 3,4 A at 55 °C ambient temperature
Maximum total current (complete module)	15,3 A at 40 °C ambient temperature 10,2 A at 55 °C ambient temperature
Maximum braking energy of outputs (inductive load)	maximum 0.65 Joules/channel maximum 1.95 Joules/4 channels
Leakage current (output inactive)	≤ 12 µA
Turn-on delay	< 200 µs
Turn-off delay	< 200 µs
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 of voltage supply +24 V /1-3	corresponds to the load on the digital outputs	
Voltage supply from S-DIAS bus	+5 V	
Current consumption on the S-DIAS bus (+5 V supply)	typically 45 mA	maximum 50 mA
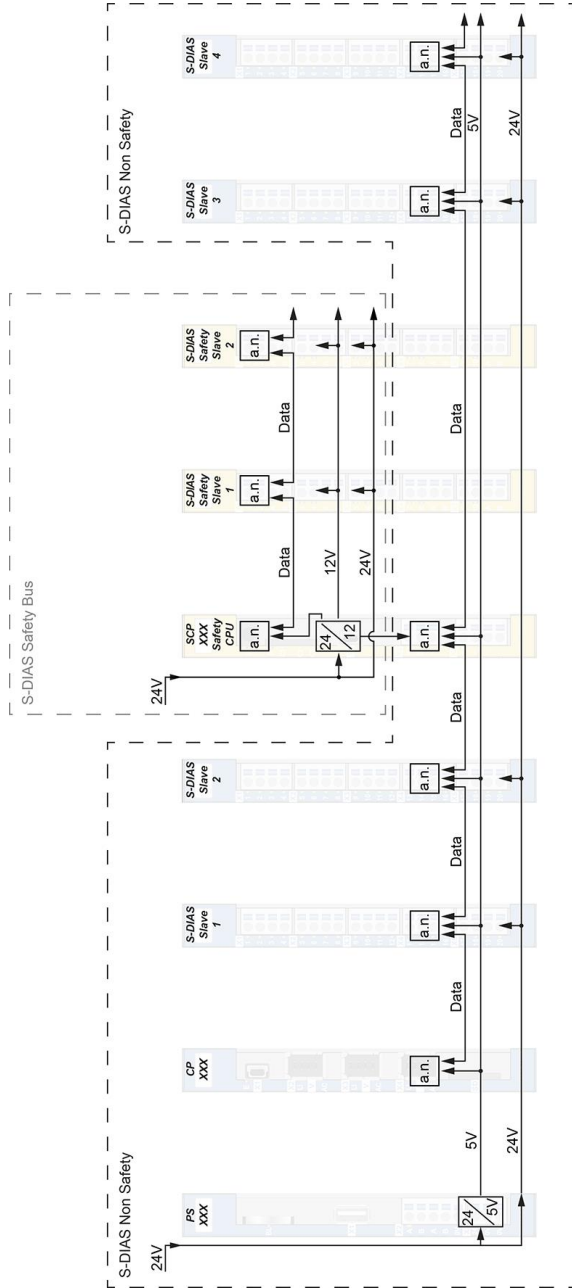
Wiring S-DIAS Safety in S-DIAS System

- 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

5.3   Voltage Monitor

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

5.4   Safety-Relevant Parameters

Calculation base	IEC 61709
	SN 29500
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.	

5.5   Miscellaneous

Article number	20-007-127
Standard	UL 508 (E247993)
Approbations	UL, cUL, CE, UKCA

5.6   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
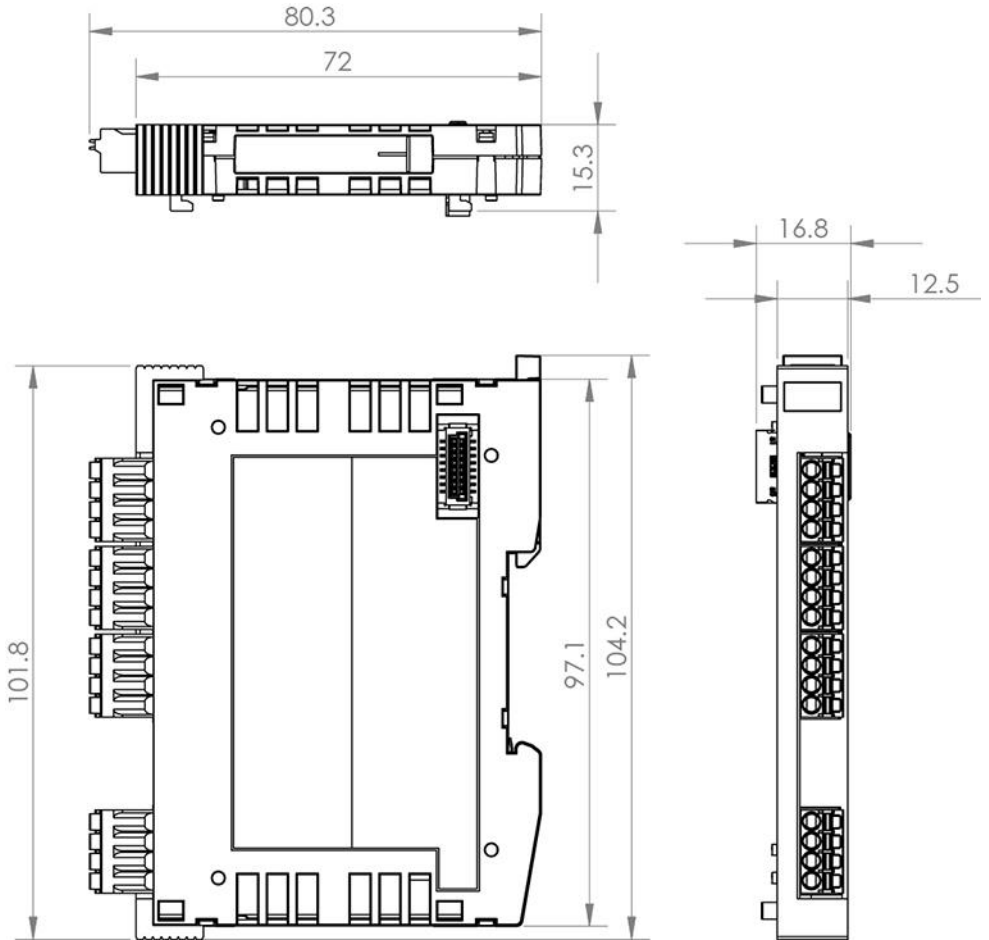
7   Connector Layout
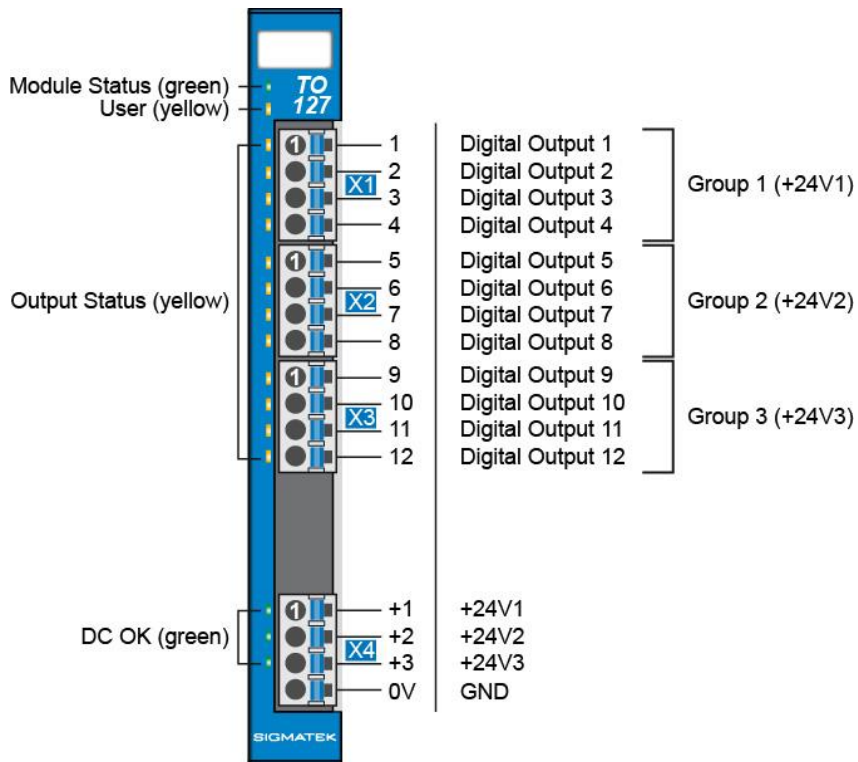
7.1   Status LEDs

Module Status	green	ON	module active
		OFF	no supply available
		BLINKS (5 Hz)	no communication
User	yellow	ON	settable through application
		OFF	(for example, the module LED can be set to blink through the visualization to make finding the module in the control cabinet easier)
		BLINKS (2 Hz)	
Output Status	yellow	ON	output ON
		OFF	output OUT
DC OK	green	ON	corresponding output group is powered

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
Plug-in direction:	parallel to conductor axis or to PCB
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 (ground for reducing d2 of the ferrule)

Ferrule   Cable

$\oslash$ d2   d2

d2 = max. 2.8 mm

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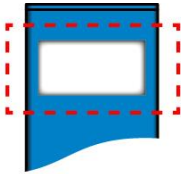
Manufacturer	Weidmüller
Type	MF 10/5 CABUR MC NE WS
Weidmüller article number	1854510000
Compatible printer	Weidmüller
Type	Printjet Advanced 230V
Weidmüller article number	1324380000

8   Wiring

8.1   Note

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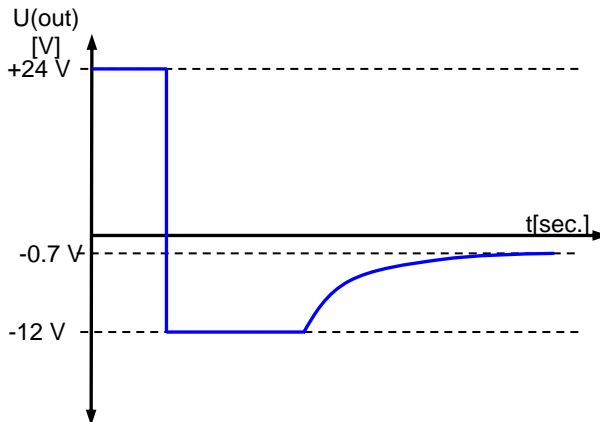
A careful wiring technique is recommended to guarantee failure-free operation.

The following guidelines should be observed:

- Avoid parallel wiring between input lines and load-bearing circuits.

- Protective circuits for all relays (RC networks or free-wheeling diodes)

- Correct wiring to mass

INFORMATION

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

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

8.2   Wiring Example
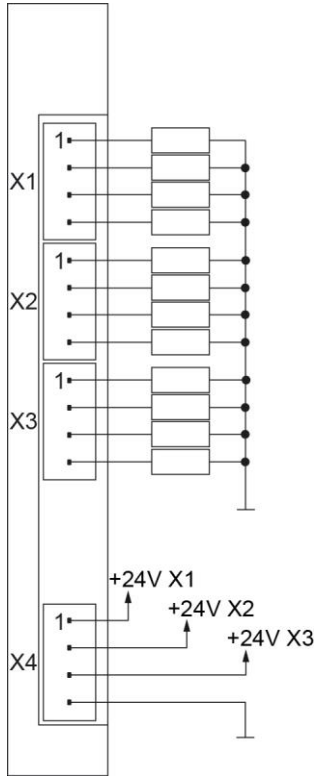
9   Assembly/Installation

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 clamp on the back of the S-DIAS modules. The modules must be mounted horizontally (module label up) with sufficient clearance between the ventilation slots of the S-DIAS module blocks and nearby components and/or the control cabinet wall. This is necessary for optimal cooling and air circulation, so that proper function up to the maximum operating temperature is ensured.
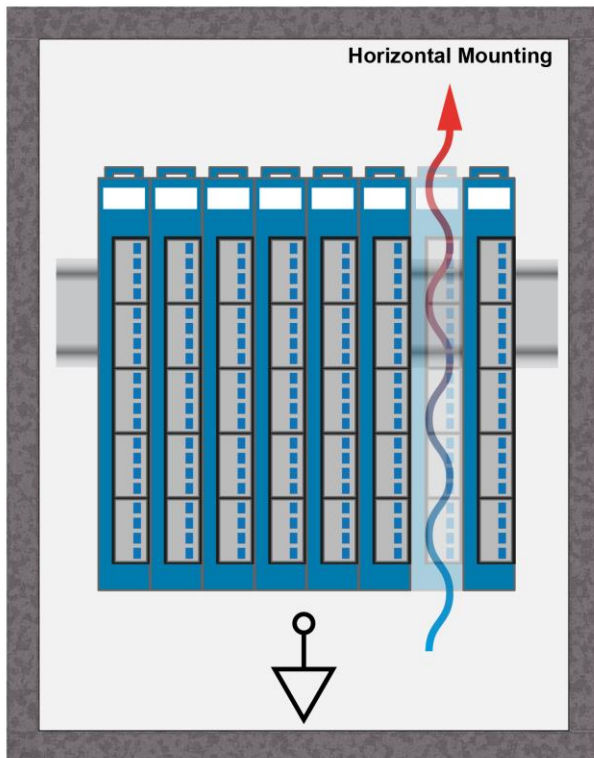
Recommended minimum distances of the S-DIAS modules to the surrounding components or control cabinet wall:
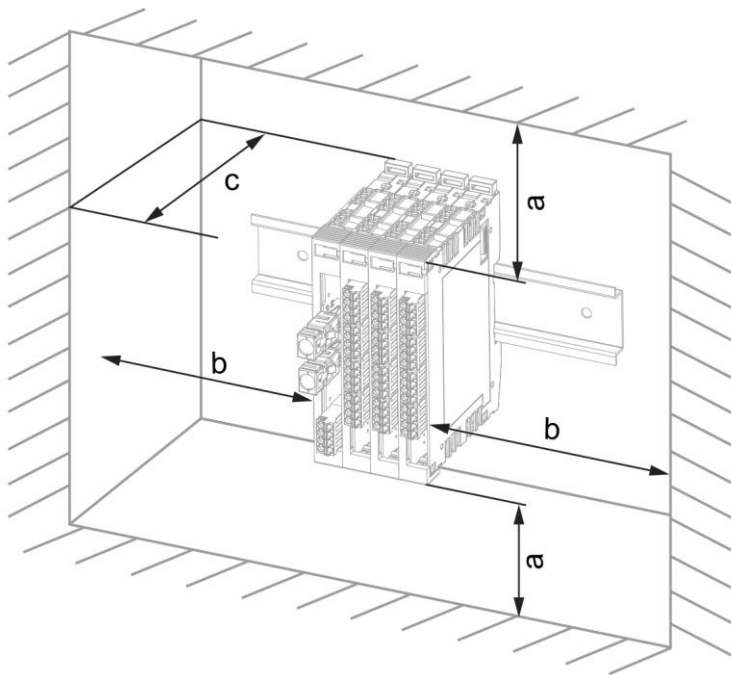
a	b	c
30 mm (1.18˝)	**30 mm** (1.18˝)	**100 mm** (3.94˝)

a, b, c … distances in mm (inches)

10 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.

11 Storage

INFORMATION

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

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

INFORMATION

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

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 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 Bit 0 Output 1 Bit 1 Output 2 … Bit 15 Output 16	0000
0000	2	t	24 V Status Bit 0 DC 24V OK 1 Bit 1 DC 24V OK 2 Bit 2 DC 24V OK 3 Bit 3-15 Reserved	0000

15 Supported Cycle Times

15.1 Cycle Times below 1 ms (in μs)

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	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

16 Hardware Class 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.

16.1 Interfaces

16.1.1 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.

16.1.2 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:	
	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]	0	power supply error
	1	power supply OK
	Bank1: for outputs 1 - 4 Bank1: for output 5 - 8 Bank1: for output 9 - 12	

16.1.3 Communication Interfaces

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

16.2   Example
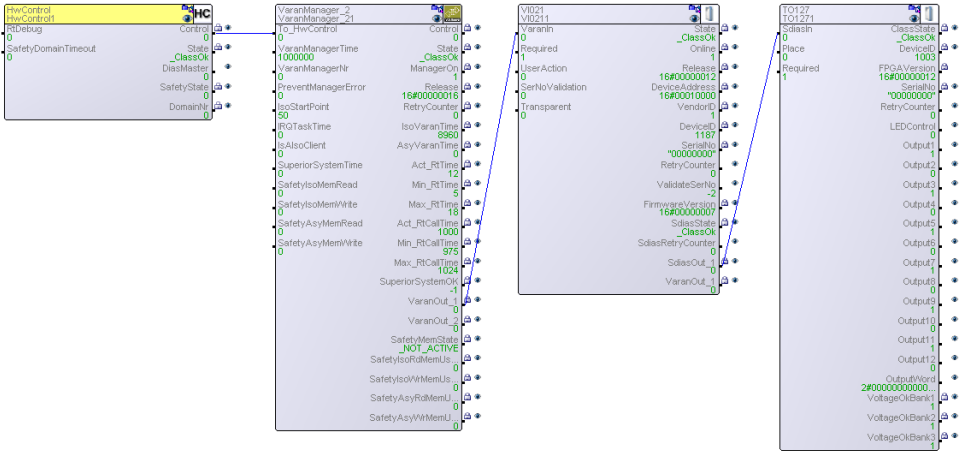
Documentation Changes

Change date	Affected page(s)	Chapter	Note
29.07.2013	9	6	Chapter Mounting added
24.10.2013	4	1.5	Added Vibration resistance
23.12.2013	6	3 Connector Layout	Changed image
	9	4.2 Wiring Example	Added wiring example
10.02.2014	3	1.1 Digital Output Specifications	Added Maximum total current (group)
11.02.2014	6	3 Connector Layout	Changed image
	7	3.2 Applicable Connectors	Connection capacity added French notes added
28.03.2014	4	1.4 Safety-Relevant Parameters	Chapter added
		1.5 Miscellaneous	UL added
	11	5 Mounting	Text updated
30.01.2015	10	4.3 Note	Added note concerning connecting the S-DIAS module while voltage is applied
26.03.2015	7	3.2 Applicable Connectors	Added connections
02.04.2015	3	1.1 Digital Output Specifications	Changed maximum total current (complete module) and (group)
20.01.2016	3	1.1 Digital Output Specifications	Galvanical separation
		1.3 Voltage Monitor	Galvanical separation
	10	4.1 Note	Chapter 4.1 and 4.3 combined and updated
28.04.2016	13	5 Mounting	Graphics distances
17.08.2017	5	1.6 Environmental Conditions	Added operating conditions
	8	3.2 Applicable Connectors	Added sleeve length Added info regarding ultrasonically welded strands
18.10.2017	9	3.3 Label Field	Added chapter
	14	5 Mounting	Graphic replaced
14.11.2019	16	7 Supported Cycle Times	Chapter added

28.02.2020	16	7 Supported Cycle Times	Text adapted
08.09.2020	18	8 Hardware Class TO127	Chapter added
04.11.2020	14	5 Mounting	Expansion functional ground connection
06.12.2022	6	1.5 Miscellaneous	UKCA conformity
26.07.2023		Document	General chapters added, design