

T0 127

S-DIAS Digital Output Module

Publisher: SIGMATEK GmbH & Co KG
A-5112 Lamprechtshausen
Tel.: +43/6274/4321
Fax: +43/6274/4321-18
Email: office@sigmatek.at
WWW.SIGMATEK-AUTOMATION.COM

Copyright © 2013
SIGMATEK GmbH & Co KG

Translation from German

All rights reserved. No part of this work may be reproduced, edited using an electronic system, duplicated or distributed in any form (print, photocopy, microfilm or in any other process) without the express permission.

We reserve the right to make changes in the content without notice. The SIGMATEK GmbH & Co KG is not responsible for technical or printing errors in the handbook and assumes no responsibility for damages that occur through use of this handbook.

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	Technical Data	4
1.1	Digital Output Specifications.....	4
1.2	Electrical Requirements.....	4
1.3	Voltage Monitor.....	6
1.4	Safety-Relevant Parameters	6
1.5	Miscellaneous	6
1.6	Environmental Conditions	6
2	Mechanical Dimensions	7
3	Connector Layout	8
3.1	Status LEDs.....	9
3.2	Applicable Connectors.....	9
3.3	Label Field	10
4	Wiring.....	11
4.1	Note.....	11
4.2	Wiring Example	13
5	Mounting.....	14
6	Addressing.....	16
7	Supported Cycle Times	17
7.1	Cycle Times below 1 ms (in μ s).....	17
7.2	Cycle Times equal to or higher than 1 ms (in ms)	17

8	Hardware Class TO127	18
8.1	Interfaces	19
8.1.1	Clients.....	19
8.1.2	Servers.....	19
8.1.3	Communication Interfaces	19
8.2	Example	20

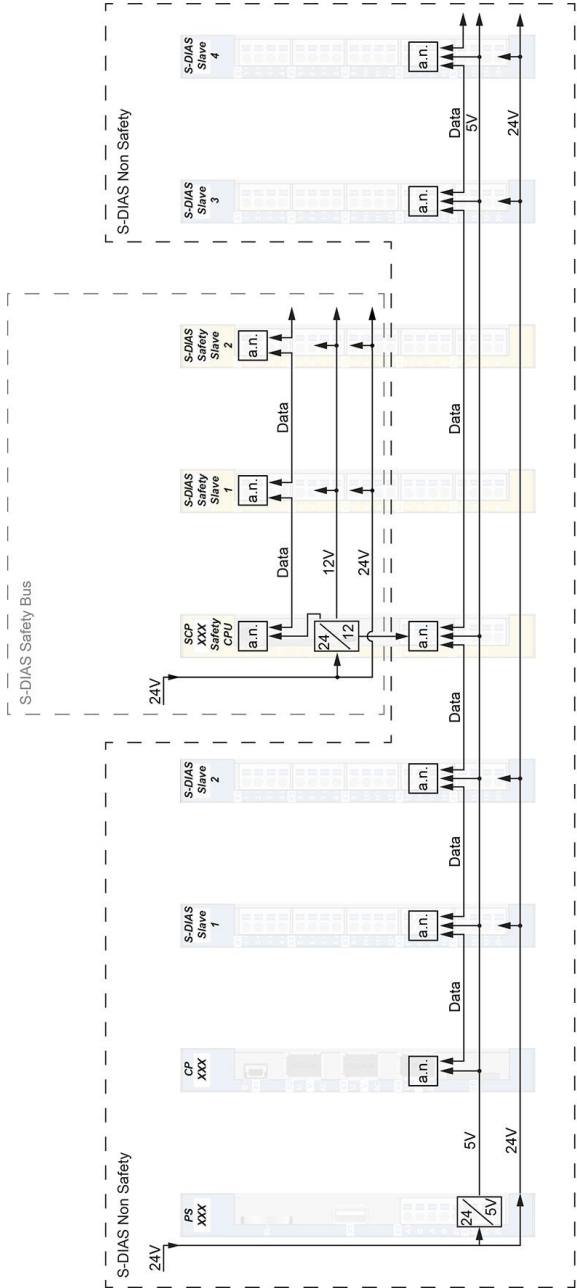
1 Technical Data

1.1 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

1.2 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

a.n. = active node

- 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

1.3 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

1.4 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.	

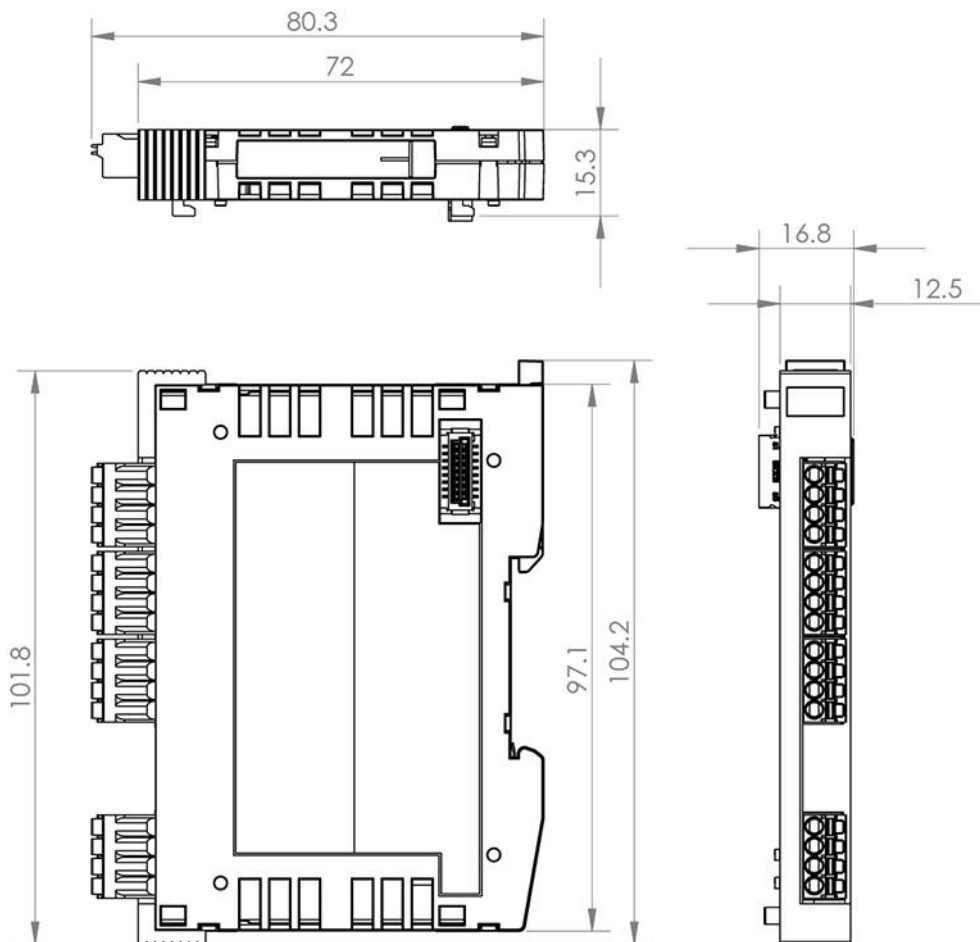
1.5 Miscellaneous

Article number	20-007-127
Hardware version	1.x
Standard	UL 508 (E247993)
Approbations	UL, cUL, CE

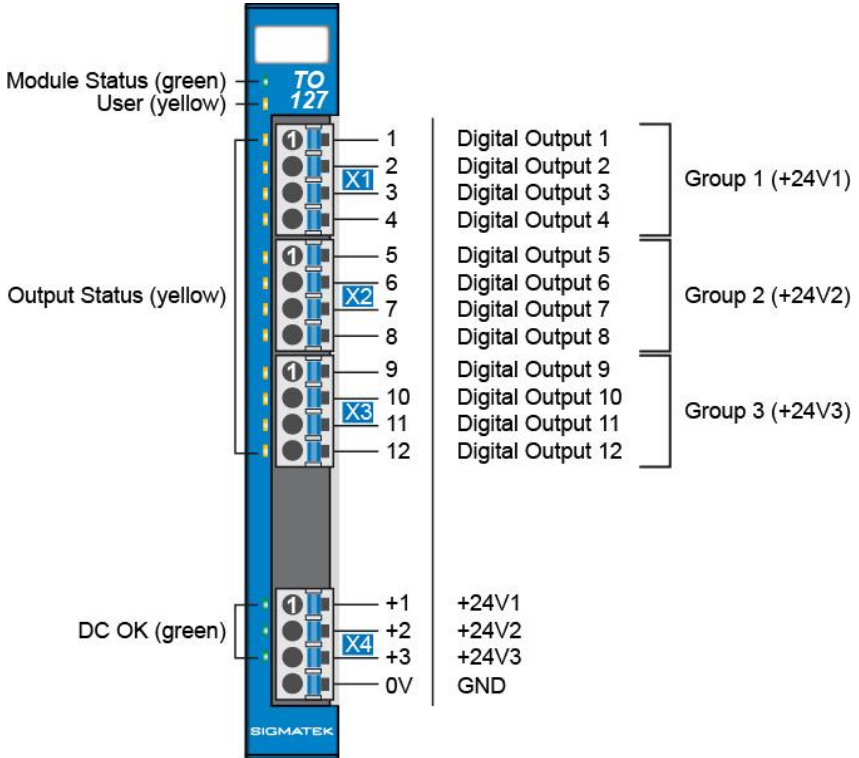
1.6 Environmental Conditions

Storage temperature	-20 ... +85 °C	
Environmental temperature	0 ... +55 °C	
Humidity	0-95 %, non-condensing	
Operating conditions	Pollution degree 2 altitude up to 2000 m	
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

2 Mechanical Dimensions



3 Connector Layout



3.1 Status LEDs

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

3.2 Applicable Connectors

Connectors:

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

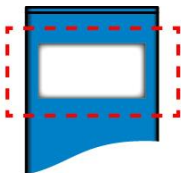
The spring terminals are suitable connecting ultrasonically compacted (ultrasonically welded) strands.

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)



3.3 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

4 Wiring

4.1 Note

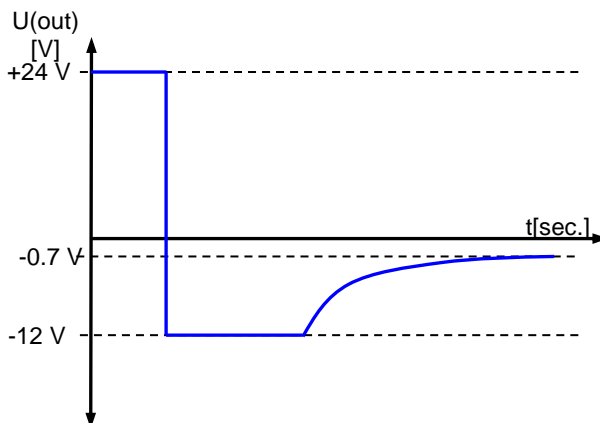
Always 4 outputs are supplied from a +24 V connection.

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

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

Si possible la terre doit être connectée à l'armoire de commande!

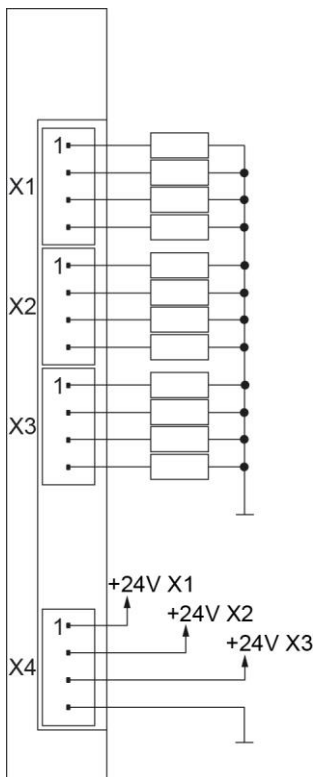
IMPORTANT:

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

IMPORTANT:

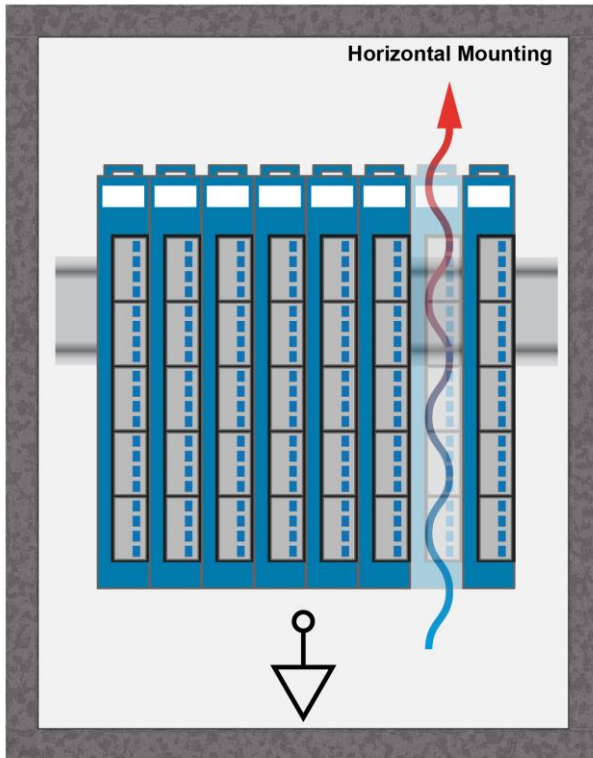
Le module S-Dias NE PEUT PAS être inséré ou retiré sous tension.

4.2 Wiring Example

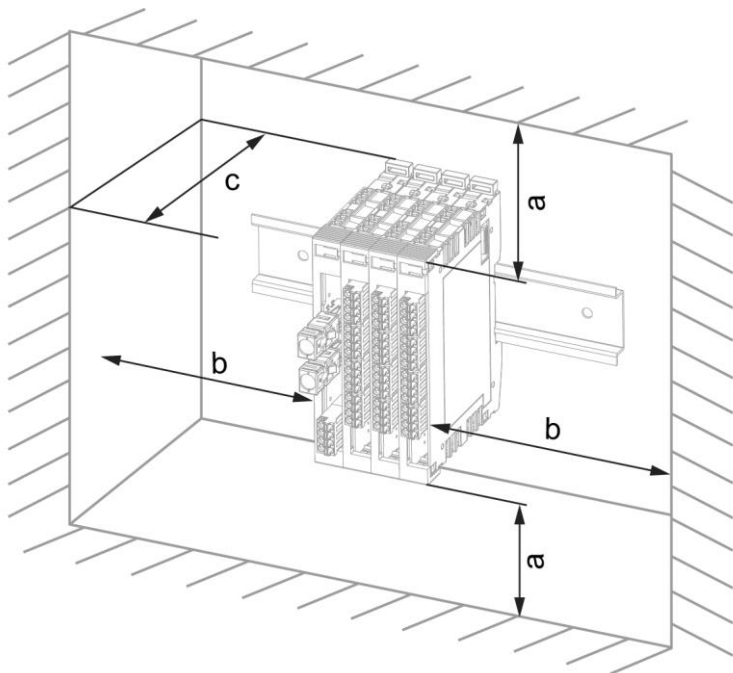


5 Mounting

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)

6 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

7 Supported Cycle Times

7.1 Cycle Times below 1 ms (in μ s)

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

x= supported

7.2 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

8 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.

8.1 Interfaces

8.1.1 Clients

SdiasIn	This 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.

8.1.2 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: <table border="1" style="width: 100%; margin-top: 5px;"> <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 border="1" style="width: 100%; margin-top: 5px;"> <tr> <td>0</td> <td>power supply error</td> </tr> <tr> <td>1</td> <td>power supply OK</td> </tr> </table> <p>Bank1: for outputs 1 - 4 Bank1: for output 5 - 8 Bank1: for output 9 - 12</p>	0	power supply error	1	power supply OK				
0	power supply error								
1	power supply OK								

8.1.3 Communication Interfaces

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

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