

A0 081

S-DIAS Analog Output Module

Instruction Manual

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Translation of the Original Instructions

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S-DIAS Analog Output Module

AO 081

with 8 analog outputs

The S-DIAS AO 081 analog output module has eight, ± 10 V analog outputs with a resolution of 12 bits.



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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.
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 AO 081

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 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



EU Declaration of Conformity

The product AO 081 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

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

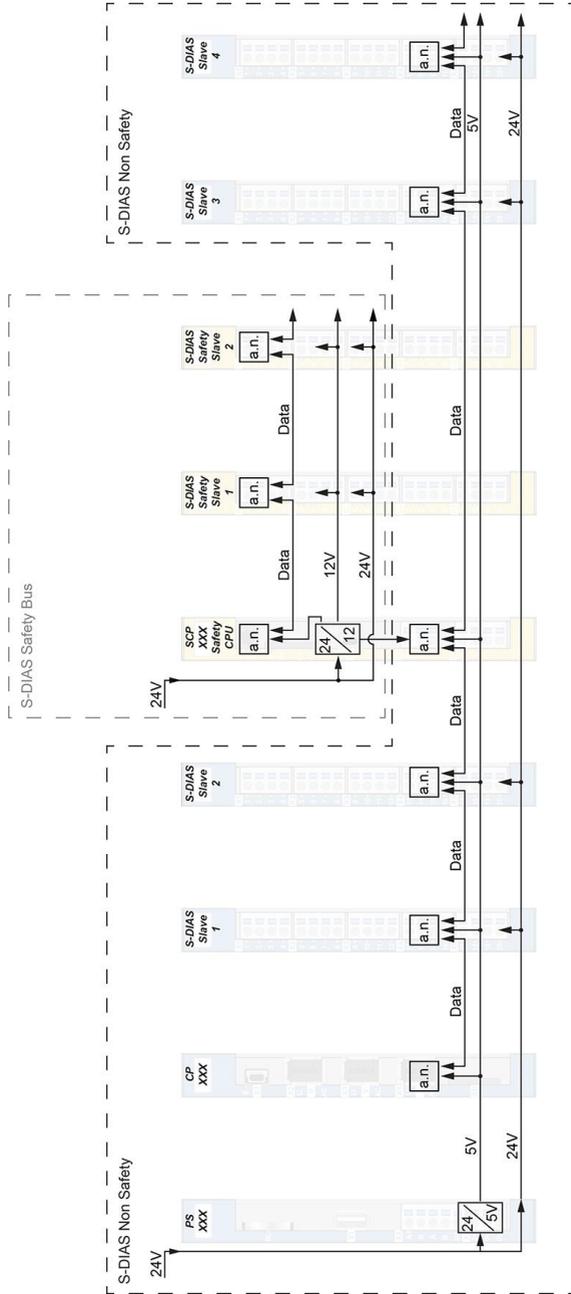
5 Technical Data

5.1 Analog Output Specifications

Number of channels	8
Output range	-10 ... +10 V
Output value	-10.000 ... +10.000
Resolution	12-bit (ca. 5 mV/LSB)
Refresh time for all channels	1 ms
Output voltage capacity	> 5 kOhm
Allowable capacitive load	maximum 100 nF
Short circuit protection	yes (1 min.)
Settling time	50 μ s (63 % of the end value) 100 μ s (86 % of the end value) 250 μ s (99 % the end value)
Analog precision	\pm 0,5 % of maximum output value

5.2 Electrical Requirements

External +24 V supply	+18-30 V DC	
Current consumption of the +24 V supply without load on the analog outputs	typically 36 mA at +18 V typically 31 mA at +24 V typically 28 mA at +30 V	maximum 40 mA at +18 V maximum 35 mA at +24 V maximum 32 mA at +30 V
Current consumption of the +24 V supply with maximum load on the analog outputs	typically 54 mA at +18 V typically 44 mA at +24 V typically 39 mA at +30 V	maximum 60 mA at +18 V maximum 49 mA at +24 V maximum 44 mA at +30 V
Current consumption of +24 V during short-circuit	typically an additional 25 mA per analog output	
Voltage supply from S-DIAS bus	+5 V	
Current consumption on the S-DIAS bus (+5 V supply)	typically 55 mA	maximum 60 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

5.3 Voltage Monitor External +24 V Supply

+24 V supply voltage	Supply voltage > 18 V (DC OK-LED lights green)
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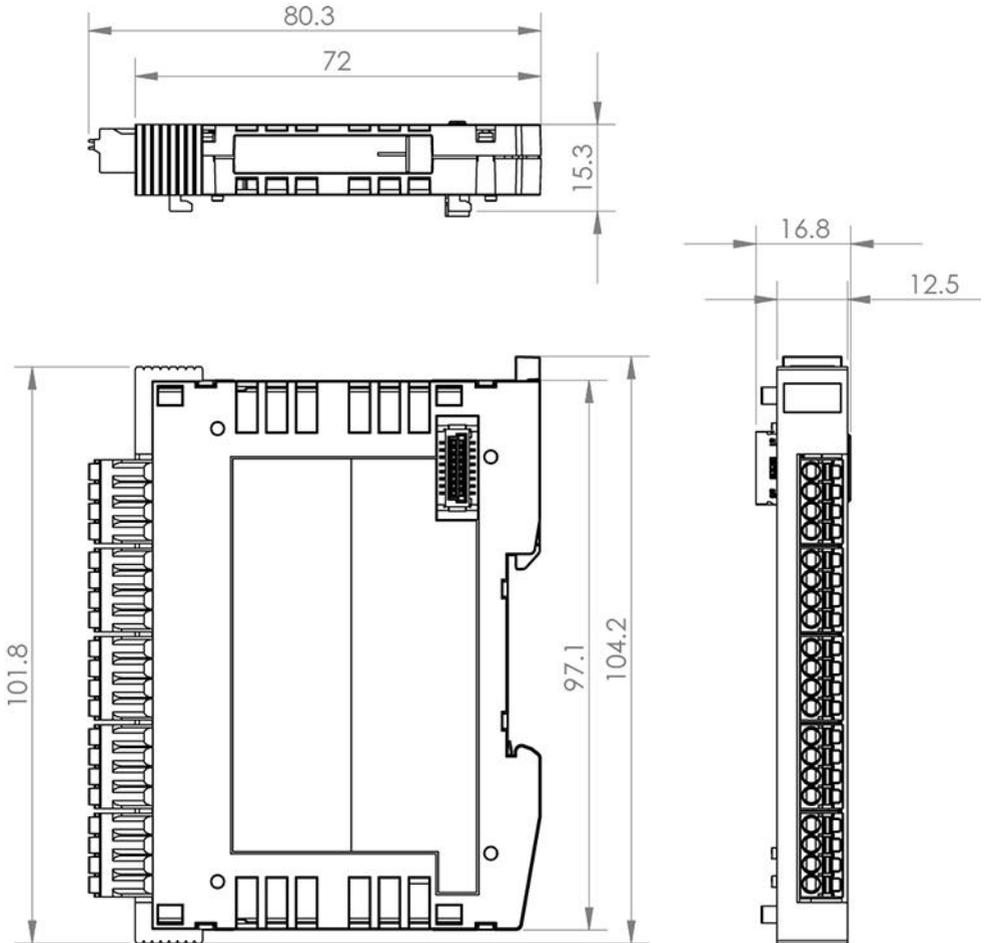
5.4 Miscellaneous

Article number	20-010-081
Standard	UL 508 (E247993)
Approbations	UL, cUL, CE, UKCA

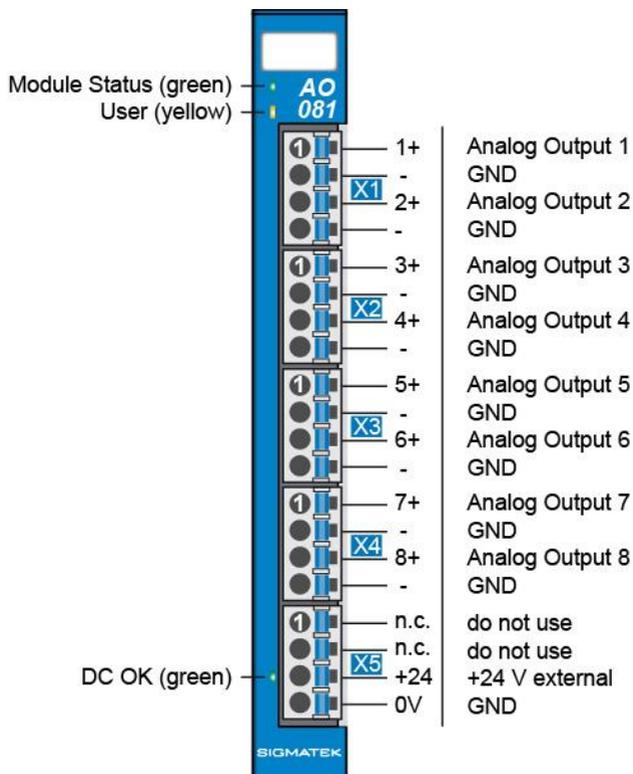
5.5 Environmental Conditions

Storage temperature	-20 ... +85 °C	
Environmental temperature	0 ... +60 °C	
Humidity	0-95 %, non-condensing	
Installation altitude above sea level	0-2000 m without derating > 2000 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 61000-6-2:2007 (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
		BLINKING (5 Hz)	no communication
User	yellow	ON	can be set from the application
		OFF	(e.g. the module LED can be set to blinking through the visualization so that the module is easily found in the control cabinet)
		BLINKING (2 Hz)	
		BLINKING (4 Hz)	
DC OK	green	ON	+24 V supply provided for analog output

7.2 Applicable Connectors

Connectors:

X1-X5: Connectors with spring terminals (included in delivery)

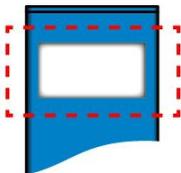
The spring terminals are suitable connecting ultrasonically compacted (ultrasonically welded) strands.

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)



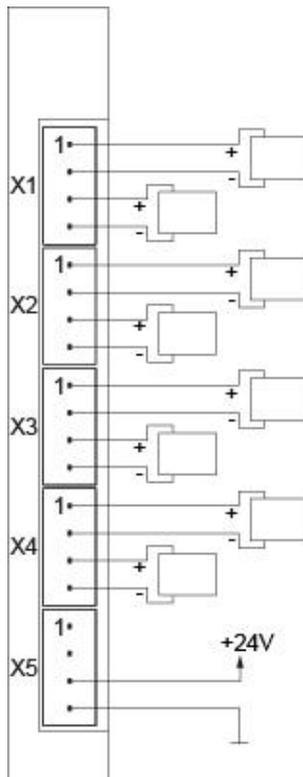
7.3 Label Field



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 Notes

To ensure error-free operation, a careful wiring method must be followed:

- The 0 V connection of the supply voltage must be connected with the 0 V collection point over the shortest route possible.
- The DIN rail must have an adequate mass connection.
- The lines connected to the source of the analog components 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.
- Protective circuits for all relays (RC networks or free-wheeling diodes).
- Correct wiring to mass.

INFORMATION



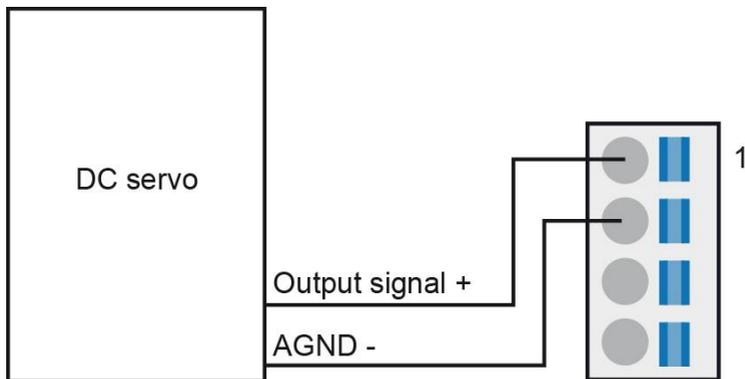
Connect the ground bus to the control cabinet.

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

8.3 Connection Variants

8.3.1 Connecting the Analog Outputs

Example application: Axis control for a DC servo, frequency converter.



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

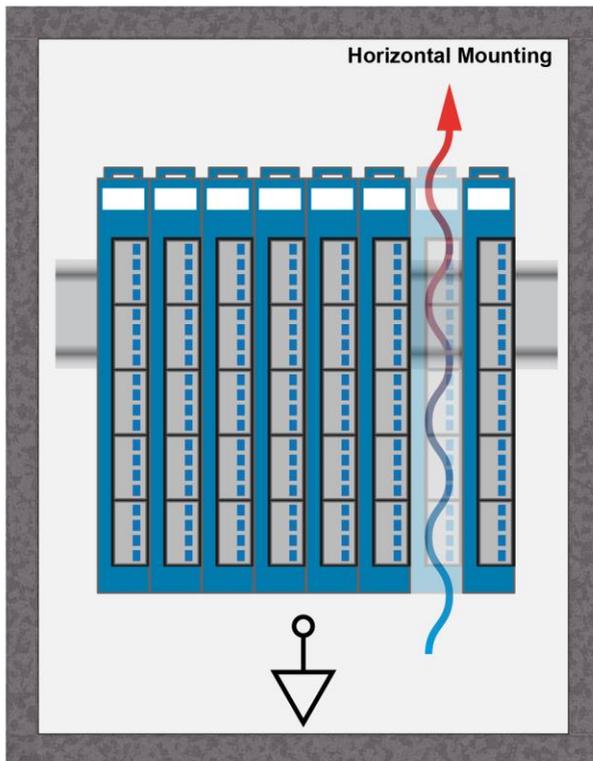


On receipt and before initial use, check the device for damage. If the device is damaged, contact our customer service and do not install the device in your system.

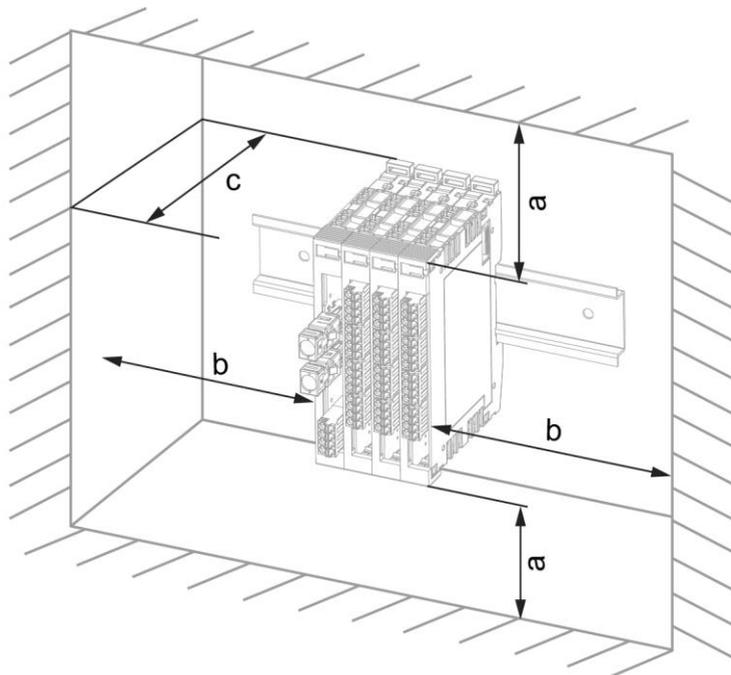
Damaged components can disrupt or damage the system.

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:



a	b	c
30 mm (1.18")	30 mm (1.18")	100 mm (3.94")

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

10 Addressing

Address (hex)	Size (bytes)	Access Type	Description
0000	128	w	Cyclic Data for Firmware
0000	2	w	Analog output 1
0000	2	w	Analog output 2
0004	2	w	Analog output 3
0006	2	w	Analog output 4
0008	2	w	Analog output 5
000A	2	w	Analog output 6
000C	2	w	Analog output 7
000E	2	w	Analog output 8
0080	128	r	Cyclic Data for HW class
0080	2	r	Status Bit 0 24V DC not OK Bit 1 no sync Bit 2 FLASH data CRC error Bit 3 RAM data CRC error Bit 4 unsafe FLASH data
0100	128	w	CFG for Firmware
0100	2	w	CRC
0102	2	w	Data length
0104	1	w	Info (special purpose or status bits) Bit 0 PMB mode 0 ... normal mode 1 ... PMB Mode, value specification with RAW data Bit 1 boot loader/update request
0105	1	w	reserved
0180	128	r	CFG/Version for HW class
0180	2	r	CRC
0182	2	r	Data length
0184	2	r	Firmware version

11 Supported Cycle Times

11.1 Cycle Times below 1 ms (in μs)

FW	50	100	125	200	250	500
V1.20			x	x	x	x

11.2 Cycle Times equal to or above 1 ms (in ms)

FW	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
V1.20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

FW	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
V1.20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

12 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.

13 Storage

INFORMATION



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

During storage, ensure that all protective covers (if available) are placed correctly, so that no contamination, foreign bodies or fluids enter the device.

14 Maintenance

INFORMATION



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

14.1 Service

This product was constructed for low-maintenance operation.

14.2 Repair

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 12 Transport/Storage.

15 Disposal

INFORMATION



Should you need to dispose of the device, the national regulations for disposal must be followed.

The device appliance must not be disposed of as household waste.



16 Hardware Class AO081

Hardware Class AO081 for the S-DIAS AO081 analog output module

```
SDIAS:21, AO081 (A00811)
  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 Firmware Status (FWErrorBits) <-[]->
  S Extern Voltage Ok (ExternVoltageOk) <-[]->
  ----- Analog Outputs -----
  O Analog Output 1 (A01) <-[]->
  O Analog Output 2 (A02) <-[]->
  O Analog Output 3 (A03) <-[]->
  O Analog Output 4 (A04) <-[]->
  O Analog Output 5 (A05) <-[]->
  O Analog Output 6 (A06) <-[]->
  O Analog Output 7 (A07) <-[]->
  O Analog Output 8 (A08) <-[]->
  ALARM:00, Empty
  SDIAS:22, Empty
```

This hardware class is used to control the AO 081 hardware module. The module has 6 x ± 10 V analog outputs. More information on the hardware can be found in the module documentation.

16.1 General

Class State	State	This server shows the actual status of the hardware class.										
Device ID	State	The device ID of the hardware module is shown in this server.										
FPGA Version	State	FPGA version of the module in 16#XY (e.g. 16#10 = version 1.0).										
Hardware Version	State	Hardware version of the module in format 16#XXYY (e.g. 16#0120 = Version 1.20)										
Serial Number	State	The serial number of the hardware module is shown in this server.										
Retry Counter	State	This server increments when a transfer fails.										
LED Control	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 statuses 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											
Firmware Version	State	The Firmware version of the hardware module is shown in this server.										
Firmware Status	State	<p>In this server, the status bits of the FW are shown. The respective bits mean the following:</p> <table border="1"> <tr> <td>Bit 0</td> <td>DC not OK</td> </tr> <tr> <td>Bit 1</td> <td>No Sync available</td> </tr> <tr> <td>Bit 2</td> <td>Flash Data CRC Error</td> </tr> <tr> <td>Bit 3</td> <td>Ram Data CRC Error</td> </tr> <tr> <td>Bit 4</td> <td>Invalid EEPROM version</td> </tr> </table>	Bit 0	DC not OK	Bit 1	No Sync available	Bit 2	Flash Data CRC Error	Bit 3	Ram Data CRC Error	Bit 4	Invalid EEPROM version
Bit 0	DC not OK											
Bit 1	No Sync available											
Bit 2	Flash Data CRC Error											
Bit 3	Ram Data CRC Error											
Bit 4	Invalid EEPROM version											
Extern Voltage OK	State	This server indicates whether the external module supply is ok.										
Required	Property	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 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.										

16.2 Analog Outputs

AO[1-8] minimal value	Property	Minimum output value AO[1-8]. If this value is written to the respective channel server, the module outputs -10 V
AO[1-8] maximal value	Property	Maximum output value AO [1-8]. If this value is written to the respective channel server, the module outputs +10 V.
Analog Output [1-8]	Output	Analog output [1-8]

16.3 Communication Interfaces

ALARM	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
23.10.2013	4	1.4	Vibration resistance added
23.12.2013	6	3 Connector Layout	Changed image
	7	4.1 Wiring example	Wiring example added
11.02.2014	6	3 Connector Layout	Changed image
	7	3.2 Applicable Connectors	Connection capacity added French notes added
01.04.2014	3	1.3 Miscellaneous	UL added
	10	5 Mounting	Text updated
30.01.2015	8	4.2 Notes	Added note concerning connecting the S-DIAS module while voltage is applied
26.03.2015	7	3.2 Applicable Connectors	Added connections
09.07.2015	3	1.2 Electrical Requirements	Changed electrical requirements
09.07.2015	4	1.3 Voltage Monitor external +24 V supply	Added voltage monitor external +24 V supply
18.02.2016	3	1.2 Electrical Requirements	Graphics added
28.04.2016	13	5 Mounting	Graphics distances
11.01.2017	3	1.1 Analog Output Specifications	Wording of analog precision
17.08.2017	5	1.5 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
18.07.2019	16	7 Supported Cycle Times	Chapter added
08.09.2020		8 Hardware Class AO081	Chapter added
04.11.2020	14	5 Mounting	Expansion functional ground connection
06.12.2022	6	1.4 Miscellaneous	UKCA conformity
26.07.2023		Document	General chapters added, design

