

AI 0812

S-DIAS Analog Input Module

Instruction Manual

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Translation of the Original Instructions

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S-DIAS Analog Input Module

AI 0812

with 8 inputs PT1000/KTY

The S-DIAS analog input module AI 0812 has eight PT1000/KTY inputs.

As temperature sensors PT1000, KTY10-62, KTY11-62, KTY81-110, KTY81-120, KTY81-150, KTY81-121, and KTY81-122 are supported.



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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 AI 0812

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 AI 0812 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 Input Specifications Resistance/Temperature

Number of inputs	8	
Measurement range	see the following measurement range table	
Resolution	0,1 °C or 0,1 Ohm	
Conversion time for all channels	1 ms	
Input resistance	> 30 KΩ	
Typical input current	< 0.33 mA	
Input filter hardware	typically 1 kHz	Low pass 3 rd order
Input filter software	configurable (10, 25, 50, 100 Hz, or switched off)	
Measurement precision	0.75 % of maximum measurement value	
Potential isolation S-DIAS bus to inputs	no	

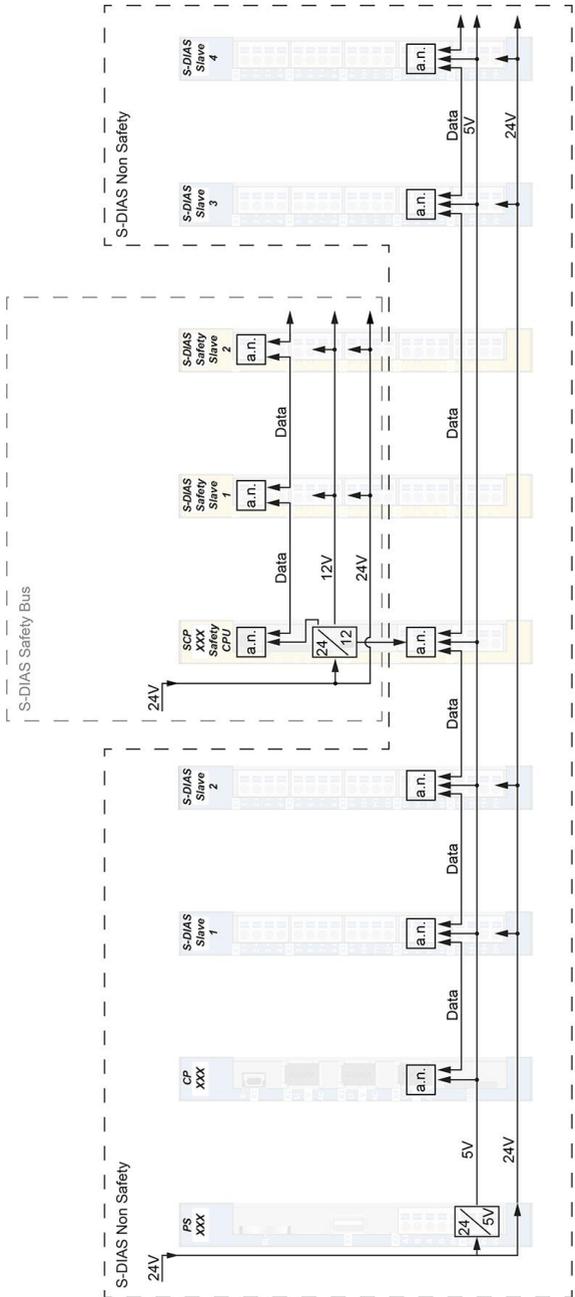
5.2 Measurement Range of Temperature Inputs

Type	Temperature range	Resistance range	Measurement value ⁽¹⁾
PT1000	-50 ... +150 °C	803.1-1573.3 Ω	-500 ... -1500
PT1000 extended (since FW V01.20)	-150 ... +850 °C	397,2-3904,8 Ω	-1500 ... +8500
KTY10-62 KTY11-62	-50 ... +150 °C	1035.9-4575.3 Ω	-500 ... -1500
KTY81-110 KTY81-120 KTY81-150	-55 ... +150 °C	490.0-2211.0 Ω	-550 ... -1500
KTY81-121	-55 ... +150 °C	485.1-2189.1 Ω	-550 ... -1500
KTY81-122	-55 ... +150 °C	494.9-2233.0 Ω	-550 ... -1500
Resistance	-	350-4600 Ω	3500 ... 46000

⁽¹⁾ An open or shorted input returns -2147483632 in the hardware class.

5.3 Electrical Requirements

Voltage supply from S-DIAS bus	+24 V	
Current consumption on the S-DIAS bus (+24 V power supply)	typically 24 mA at +18 V	maximum 27 mA at +18 V
	typically 22 mA at +24 V	maximum 24 mA at +24 V
	typically 20 mA at +30 V	maximum 23 mA at +30 V



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

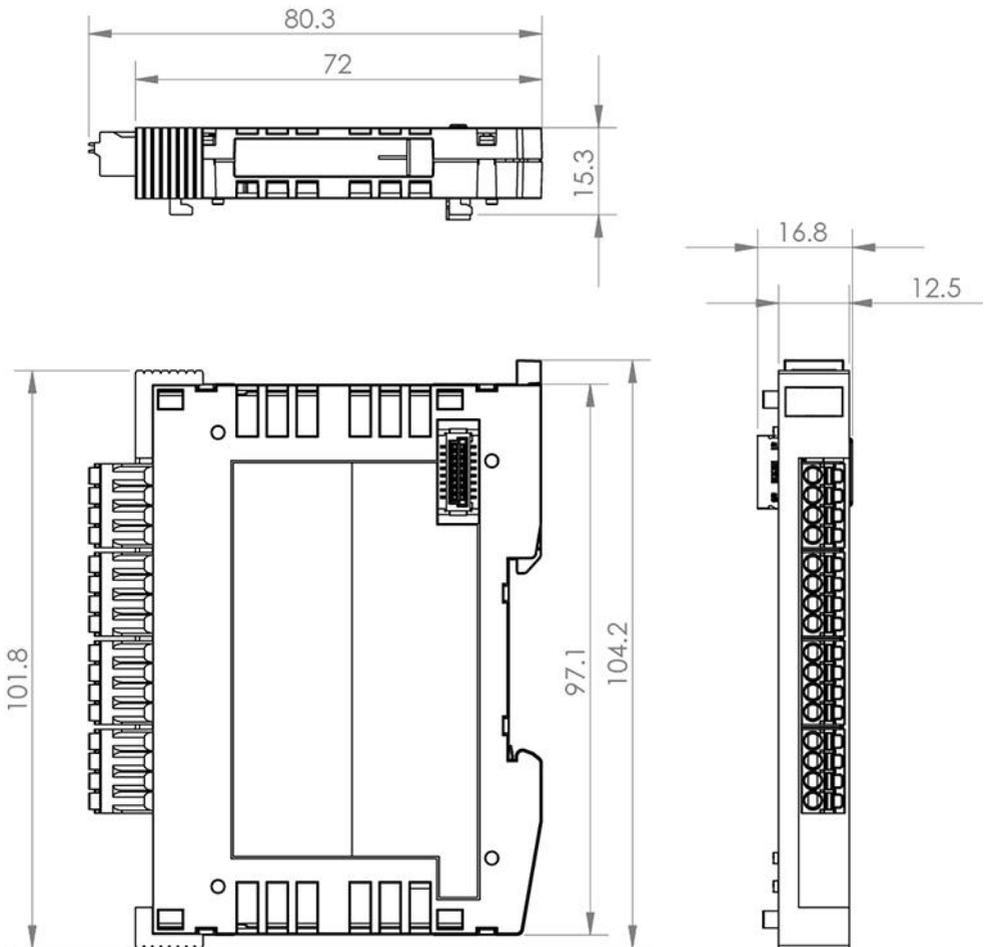
5.4 Miscellaneous

Article number	20-009-0812
Standard	UL 508 (E247993)
Approbations	UL, cUL, CE, UKCA

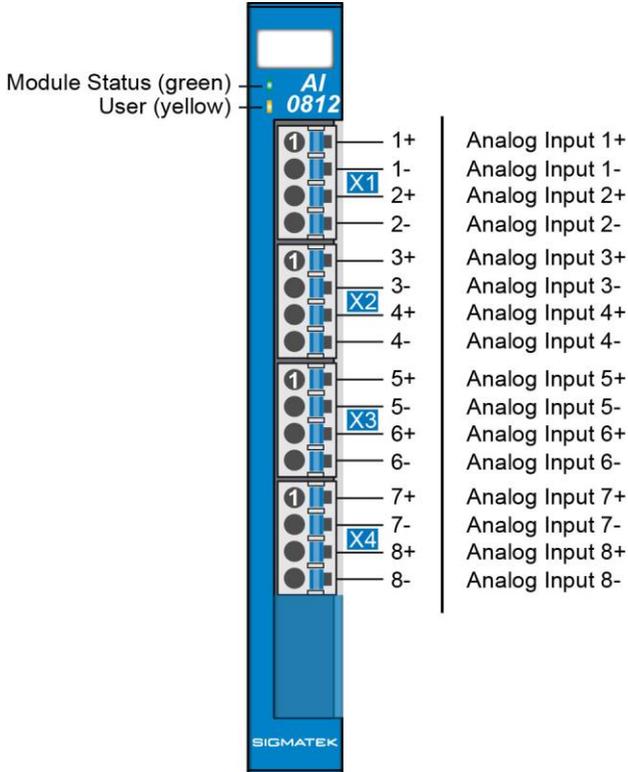
5.5 Environmental Conditions

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 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
		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)	

7.2 Applicable Connectors

Connectors:

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

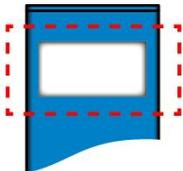
The spring terminals are suitable connecting ultrasonically compacted (ultrasonically welded) strands.

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 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 reduction d2 of the ferrule)



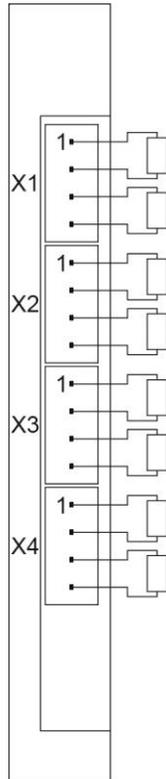
7.3 Label Field



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

INFORMATION



Connect the ground bus to the control cabinet.

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 Contents of Delivery.

INFORMATION

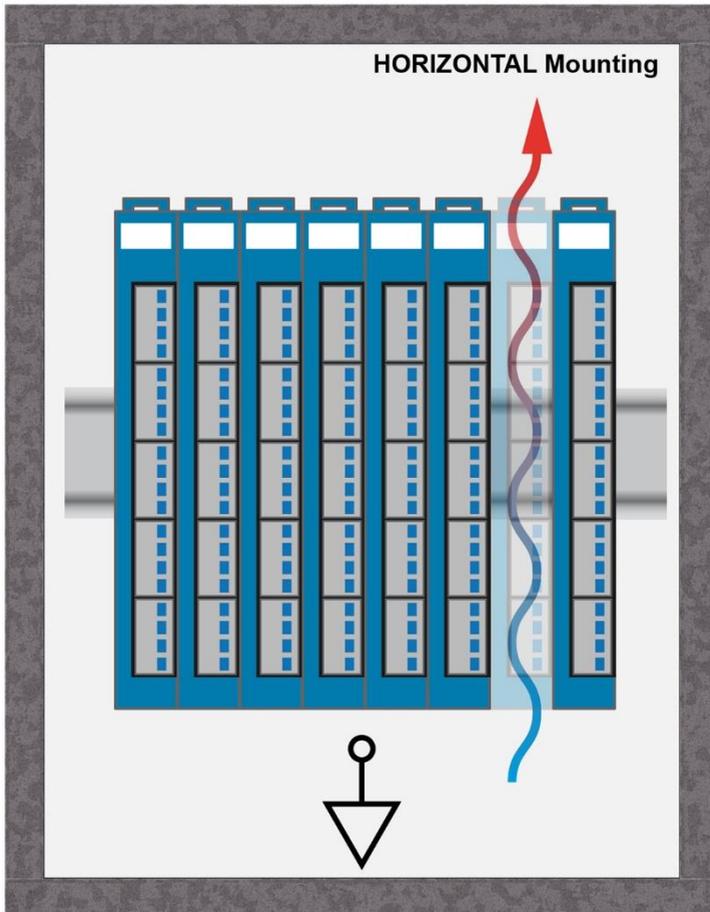


On receipt and before initial use, check the device for damage. If the device is damaged, contact our customer service and do not install the device in your system.

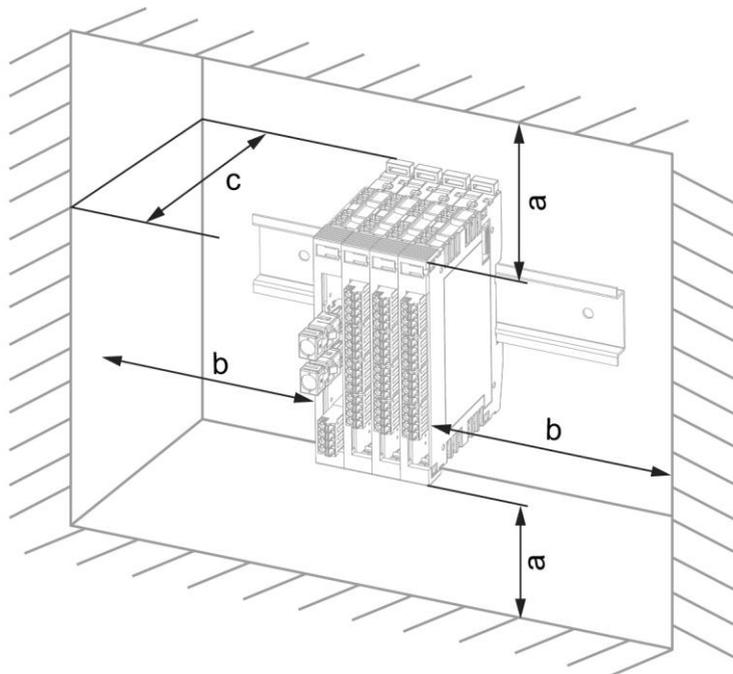
Damaged components can disrupt or damage the system.

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

10.1 Address Mapping Overview

Address (hex)	Size (bytes)	Description
0000	128	Cyclic Data for Firmware
0080	128	cCyclic Data for the HW class
0100	128	CFG for the Firmware
0180	128	CFG/version for the HW class
0300	128	SDO request
0380	128	SDO Response

10.2 Detailed Address Mapping

Cyclic Data for Firmware (memory address range)		
0000	0	-
Cyclic Data for the HW Class (memory address range)		
0080	2	status Bit 0 tbd. Bit 1 no sync Bit 2 FLASH data CRC error Bit 3 RAM data CRC error Bit 4 unsafe FLASH data
0082	2	Analog input 1 (signed, in 1/10 °C)
0084	2	Analog input 2 (signed, in 1/10 °C)
0086	2	Analog input 3 (signed, in 1/10 °C)
0088	2	Analog input 4 (signed, in 1/10 °C)
008A	2	Analog input 5 (signed, in 1/10 °C)
008C	2	Analog input 6 (signed, in 1/10 °C)
008E	2	Analog input 7 (signed, in 1/10 °C)
0090	2	Analog input 8 (signed, in 1/10 °C)
0092	2	cable break detection Bit0 input AI1 Bit7 input AI8 Bit8-15 not used

Cyclic Data for Firmware (memory address range)		
0100	2	Checksum
0102	2	data length
0104	1	info (special-purpose or status bits) Bit 0 PMB mode Bit 1 boot loader/update request
0105	1	reserved
Standard Mode (info-register bit 0 = 0)		
0106	2	Modus AI1 (only for PT1000/KTY): 0 PT1000 1 KTY10-62 2 KTY81-110 3 KTY81-121 4 KTY81-122 5 KTY84-1x0 6 resistance 7 do not use 8 PT1000 extended (since FW V01.20)
		Modus AI2 (only for PT1000/KTY): 0 PT1000 1 KTY10-62 2 KTY81-110 3 KTY81-121 4 KTY81-122 5 KTY84-1x0 6 resistance 7 do not use 8 PT1000 extended (since FW V01.20)
0108	2	Mode AI3
		Mode AI4
010A	2	Mode AI5
		Mode AI6
010C	2	Mode AI7
		Mode AI8
010E	2	cutoff frequency low pass filter input 1 Valid values: 0 (filter off), 10, 25, 50, 100
0110	2	cutoff frequency low pass filter input 2
0112	2	cutoff frequency low pass filter input 3
0114	2	cutoff frequency low pass filter input 4
0116	2	Cutoff frequency low pass filter input 5

0118	2	Cutoff frequency low pass filter input 6
011A	2	Cutoff frequency low pass filter input 7
011C	2	Cutoff frequency low pass filter input 8
011E	PMB mode (Info register bit 0 = 1)	
CFG/version for HW class (mem – address area)		
0180	2	CRC16
0182	2	data length
0184	2	firmware version

11 Supported Cycle Times

11.1 Cycle Times below 1 ms (in μ s)

FW	50	100	125	200	250	500
V1.40		x	x	x	x	x

x = supported

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
V1.40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

x = supported

FW	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
V1.40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

x = supported

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 AI0812

Hardware Class AI0812 for the S-DIAS Analog Input Module AI0812

This hardware class is used to control the AI0812 hardware module with 8 temperature inputs. More information on the hardware can be found in the module documentation.

```
SDIAS:14, AI0812 (AI08121)
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) <-[]->
----- Temperature Inputs -----
I Temperature Input 1 (TMP_1) <-[]->
I Temperature Input 2 (TMP_2) <-[]->
I Temperature Input 3 (TMP_3) <-[]->
I Temperature Input 4 (TMP_4) <-[]->
I Temperature Input 5 (TMP_5) <-[]->
I Temperature Input 6 (TMP_6) <-[]->
I Temperature Input 7 (TMP_7) <-[]->
I Temperature Input 8 (TMP_8) <-[]->
S Cable Break (CableBreak) <-[]->
ALARM:00, Empty
```

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.</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.</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											
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 Inputs [1-8]

CableBreak	State	Cable break detection: Bit 0 cable break at input TMP_1 Bit 1 cable break at input TMP_2 Bit 2 cable break at input TMP_3 Bit 3 cable break at input TMP_4 Bit 4 cable break at input TMP_5 Bit 5 cable break at input TMP_6 Bit 6 cable break at input TMP_7 Bit 7 cable break at input TMP_8
Temperature input [1-8]	Input	Analog input 1-8, status query over read(). Temperature values in 1/10 °C. Resistance values in 1/10 W. An open or shortened input returns -2147483632 in the hardware class.
Temperature sensor selection [1-8]	Property	The desired sensor type and its range are selected in this client. Possible values: 0 PT1000 (range: -50 ... +150 °C) 1 KTY1x-62 (range: -50 ... 150 °C) 2 KTY81-110 (range: -55 ... 150 °C) 3 KTY81-121 (range: -55 ... 150 °C) 4 KTY81-122 (range: -55 ... 150 °C) 5 KTY84-1x0 (range: -40 ... 300 °C) 6 Resistance (range: 350 ... 4600 W) 7 PT1000 (range: -50 ... +850 °C)
Filter cut off frequency [1-8]	Property	In this client, the cutoff frequency for the software low pass filter is set. Value setting options are: 0 no filter 1 10 Hz 2 25 Hz 3 50 Hz 4 100 Hz

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
27.03.2017	3	1.2 Measurement Range of Temperature Inputs	Added value for short circuit monitoring
17.08.2017	6 9	1.5 Environmental Conditions 3.2 Applicable Connectors	Added operating conditions Added sleeve length Added info regarding ultrasonically welded strands
08.09.2017	3 15	1.2 Measurement Range of Temperature Inputs 6.2 Detailed Address Mapping	PT1000 extended added
18.10.2017	10 14	3.3 Label Field 5 Mounting	Added chapter Graphic replaced
16.01.2020	3	1.1 Analog Input Specifications Resistance/Temperature	Resolution changed
30.03.2020	17	7 Supported Cycle Times	Chapter 7 inserted
08.09.2020		8 Hardware Class 0812	Chapter added
04.11.2020	14	5 Mounting	Expansion functional ground connection
06.12.2022	7	1.4 Miscellaneous	UKCA conformity
28.04.2023	7	1.4 Miscellaneous	UL corrected
26.07.2023		Document	General chapters added, design
17.04.2024	16	5.4 Miscellaneous	Standards adjusted