SIGMATEK

XAI 022

X-DIAS DMS-Input Module

Instruction Manual

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Translation of the Original Instructions

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X-DIAS DMS-Input Module XAI 022

2 analog inputs

The X-DIAS DMS-Input Module XAI 022 is used to analyze measuring bridges (e.g. strain gauge load cells). The module has 2 analog inputs. With a 24-bit resolution, measurement values with an overall accuracy of 0.035 % are provided.

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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

- X-DIAS Designguide

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

1.3 Contents of Delivery

1x XAI 022

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.

CAUTION

Danger for ESD-sensitive components.

Les signes de danger pour les composants sensibles aux décharges électrostatiques.

INFORMATION

INFORMATION

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

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

CE

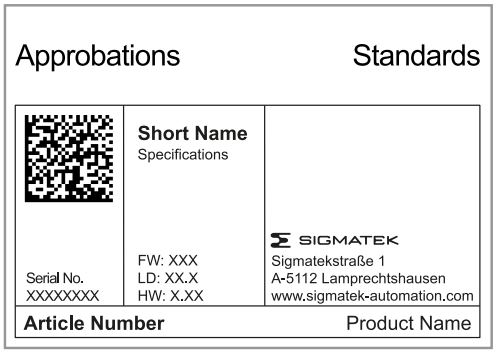
EU Declaration of Conformity

The product XAI 022 conforms to the following European directives:

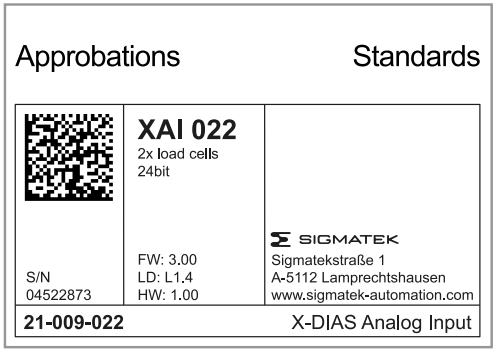
- → **2014/35/EU** Low-voltage Directive
- → **2014/30/EU** Electromagnetic Compatibility (EMC Directive)
- → **2011/65/EU** “Restricted use of certain hazardous substances in electrical and electronic equipment” (RoHS Directive)

The EU Conformity Declarations are provided on the SIGMATEK website. They can be found in the download area of the respective product.

4 Type Plate



Exemplary nameplate (symbol image)



HW: Hardware version
SW: Software version
FW: Firmware version
LD: Logic Device version

5 Technical Data

5.1 Analog Input Specifications

Number of channels	2					
Bridge supply voltage	+5 V					
Load cell rated values	0.25 mV/V	0.5 mV/V	1 mV/V	2 mV/V	16 mV/V	
Measurement range[1)]	±1.875 mV	±3.75 mV	±7.5 mV	±15 mV	±120 mV	
Measurement value	±8388608 d					
	if the input is open, the hardware class supplies -2147483632					
Resolution	24-bit					
Hardware filter	180 Hz, 1st order					
Filter setting, conversion time and noise-free resolution	filter word	2	...	5	...	1023
	filter type	Sinc4	...	Sinc4	...	Sinc4
	Cut-off frequency (-3 dB)	144 Hz	...	57.7 Hz	...	0.282 Hz
	conversion time	4 ms	...	9 ms	...	1702 ms
	noise-free resolution[2)]	15.5-bit	...	16-bit	...	20-bit
Sensor break detection	yes					
Load per channel	75-5000 Ω (using one channel) 150-5000 Ω (using both channels)					
Noise	±0.0031 % referred to the full scale value for filter Word 2					
Temperature drift	±0.001 % / °C related to the measuring range end value					

1) The measurement ranges are defined for a 50 % distention of the load cell.

2) These are typical values with an active Sinc4 filter and measurement range of 2 mV/V.

Overall accuracy[3)]	±0.035 % related to the measuring range end value
Calibration data null-voltage protected	yes
Calibratable	no

5.2 Electrical Requirements

Voltage supply from S-DIAS bus	+24 V DC ±20 % (SELV/PELV) UL: NEC Class 2	
Protection class	III	
Current consumption on the S-DIAS bus (+24 V supply) without load on the measuring bridge supply voltage	typically 28 mA	maximum 36 mA
Current consumption on the S-DIAS bus (+24 V supply) with maximum load on both measuring bridge supply voltages	typically 55 mA	maximum 71 mA

3) To maintain the accuracy of the analog channel measurement, a system calibration with the sensor is required whereby the null point and full-scale deflection are calibrated. The system must be re-calibrated when a sensor is replaced or the measurement range changed. Basically, the null point calibration is performed followed by the calibration for the full-scale deflection. The full-scale deflection can only be calibrated between 50 and 100 % of the positive measurement range.

INFORMATION

For USA and Canada:

The supply must be limited to:
a) max. 5 A at voltages from 0-20 V DC, or
b) 100 W at voltages from 20-60 V DC

The limiting component (e.g. transformer, power supply or fuse) must be certified by an NRTL (Nationally Recognized Testing Laboratory).

If this X-DIAS module is used on an S-DIAS supply module with several S-DIAS and X-DIAS modules, the total currents of the S-DIAS and X-DIAS modules used must be determined and checked. The total current of the +24 V supply must not exceed 1.6 A! The specification for the current can be found in the module-specific documentation under "Electrical Requirements".

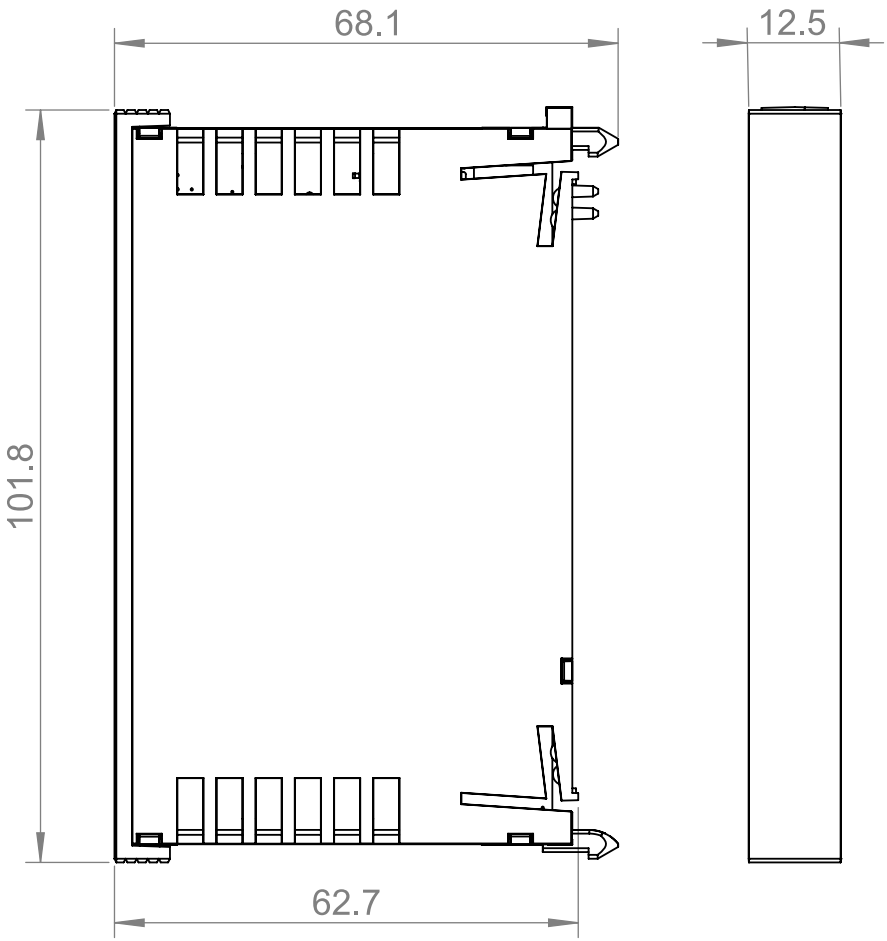
5.3 Environmental Conditions

Storage temperature	-40 ... +85 °C	
Environmental temperature	-25 ... +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	
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/s²)
Protection type	EN 60529/NEMA 250	IP20/Type1

5.4 Miscellaneous

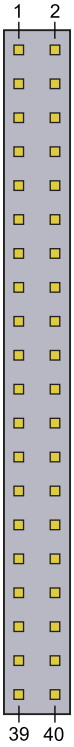
Article number	21-009-022
Printed circuit board coating	no
Standard	designed according to UL
Approvals	CE

6 Mechanical Dimensions

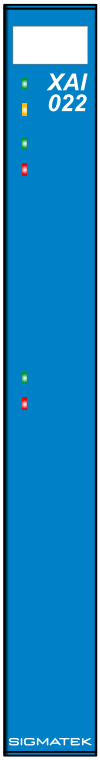


Measurements	12.5 x 101.8 x 62.7 mm (W x H x D)
Weight	0.2 kg

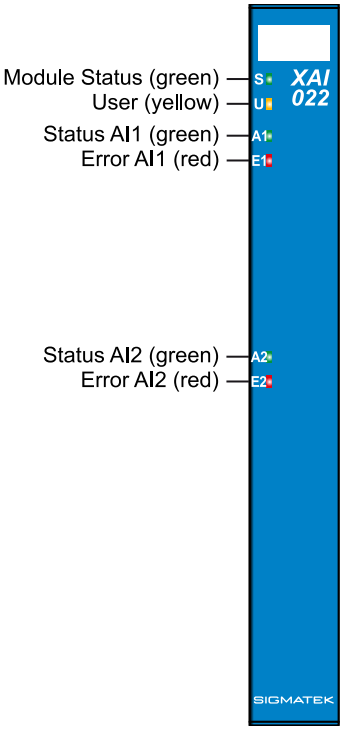
7 Connector Layout



Pin		Signal		Description
1	2	+24 V bus	+24 V bus	S-DIAS bus The +24 V voltage supply is provided by the S-DIAS CPU or the S-DIAS interface module.
3	4	GND	GND	
5	6	RxD- OUT	RxD- IN	
7	8	RxD+ OUT	RxD+ IN	
9	10	GND	GND	
11	12	TxD- IN	TxD- OUT	
13	14	TxD+ IN	TxD+ OUT	
15	16	GND	GND	
17	18	AI1+	AI1-	I/O signals
19	20	REFIN1+	REFIN1-	
21	22	REFOUT1+	REFOUT1-	
23	24	n.c.	n.c.	
25	26	AI2+	AI2-	
27	28	REFIN2+	REFIN2-	
29	30	REFOUT2+	REFOUT2-	
31	32	n.c.	n.c.	
33	34	n.c.	n.c.	
35	36	n.c.	n.c.	
37	38	GND	GND	
39	40	GND	GND	



7.1 Status LEDs

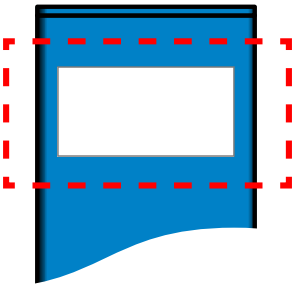


Module status	green	ON	module active
		OFF	no supply available
		BLINKING (5 Hz)	no communication
User	yellow	ON	adjustable by application (e.g. the module LED can be set to blinking through the visualization so that the module is easily found in the control cabinet)
		OFF	
		BLINKING (2 Hz)	
		BLINKING (4 Hz)	
Status AI1/AI2	green	BLINKING (3 Hz)	A/D conversion active
		OFF	A/D conversion inactive
Error AI1/AI2	red	ON	sensor break or overload or short circuit bridge supply
		OFF	no initialization error of the input
		BLINKING (1 Hz)	initialization error of the input

7.2 Applicable Connectors

Connector wiring board: Samtec SSQ-120-01-L-D

8 Label Field



The labeling field is printed directly on the module.

9 Module Coding

X-DIAS modules have module coding by means of coding pins on the module housing. In combination with coding holes on the wiring board, a mismating protection can be realized.

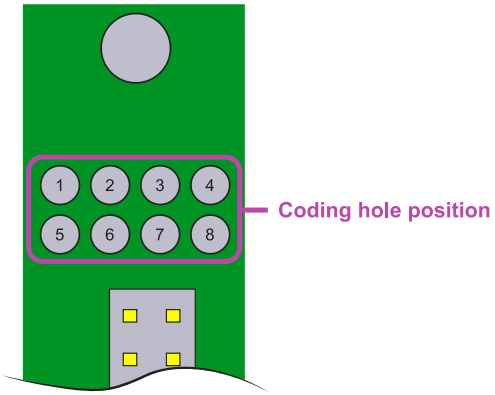
9.1 Module Coding XAI 022

Position 1	Position 2	Position 3	Position 4	Position 5	Position 6	Position 7	Position 8
X	O	X	X	X	O	O	O

X … Coding pin present on the module -> there must be a coding hole on the wiring board

O ... No coding pin present on the module -> there must be no coding hole on the wiring board

9.2 Coding Hole Positions on Wiring Board (TOP View)



10 Wiring

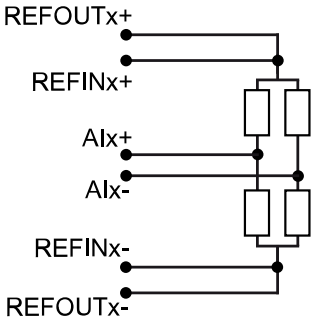
10.1 ESD Protection

CAUTION

The operator must ensure that no ESD interference affects the product.

L'opérateur doit s'assurer qu'aucune interférence due à des décharges électrostatiques n'affecte le produit.

10.2 Wiring Example



10.3 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 functional grounding of the X-DIAS modules is carried out via their GND connection on the wiring board. The wiring board must be connected to the grounded switch cabinet mounting plate with low resistance via the mounting screws.
- 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 analog signal lines must be shielded.
- The shielding of the analog signals must be connected as close as possible to the connector plug of the wiring board with the functional ground of the wiring board or the rear panel of the control cabinet.
- Avoid parallel connections between input lines and load-bearing circuits.
- Protective circuits for all relays (RC networks or free-wheeling diodes).

INFORMATION

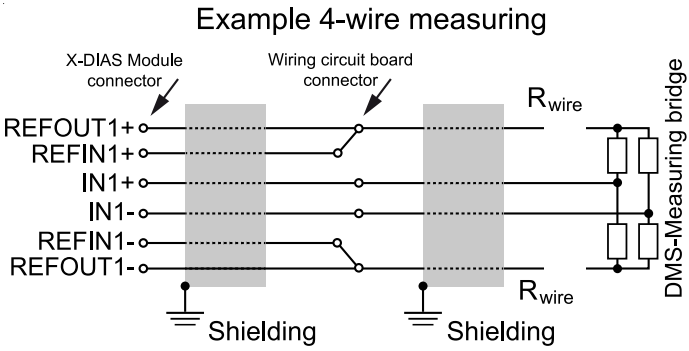
The X-DIAS module CANNOT be connected/disconnected while voltage is applied!
Le module X-DIAS NE PEUT PAS être connecté/déconnecté lorsque la tension est appliquée!

10.4 Connection Variants

Two connection types are possible when measuring with strain gauges:

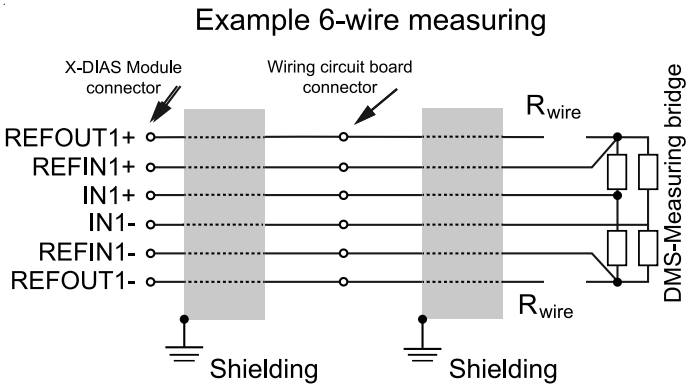
10.4.1 4-wire Measurement

The advantage of this variant is that a 4-pole connection cable to the strain gauge can be used. However, the voltage drop on the line for the bridge supply voltage cannot be compensated.



10.4.2 6-wire Measurement

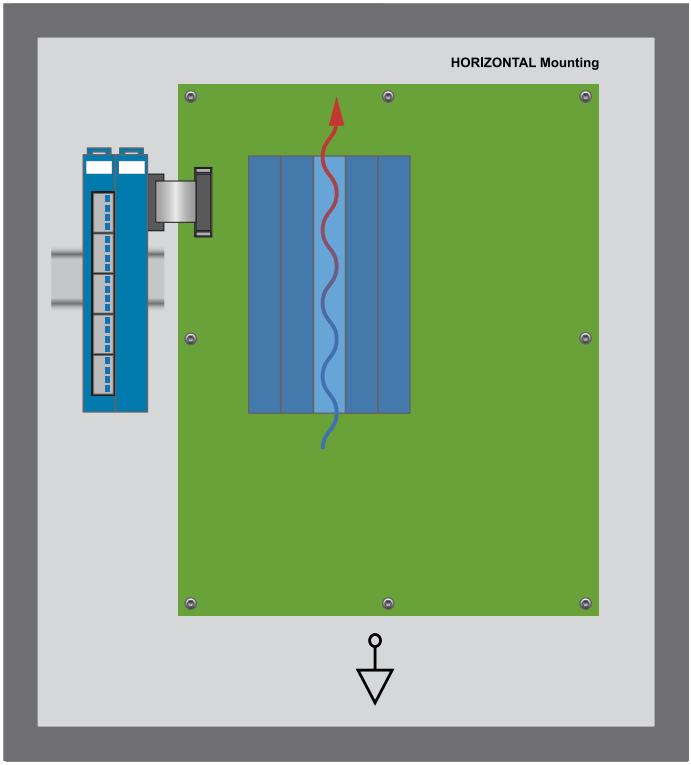
The advantage here is voltage compensation by measuring the bridge supply voltage directly at the strain gauge.



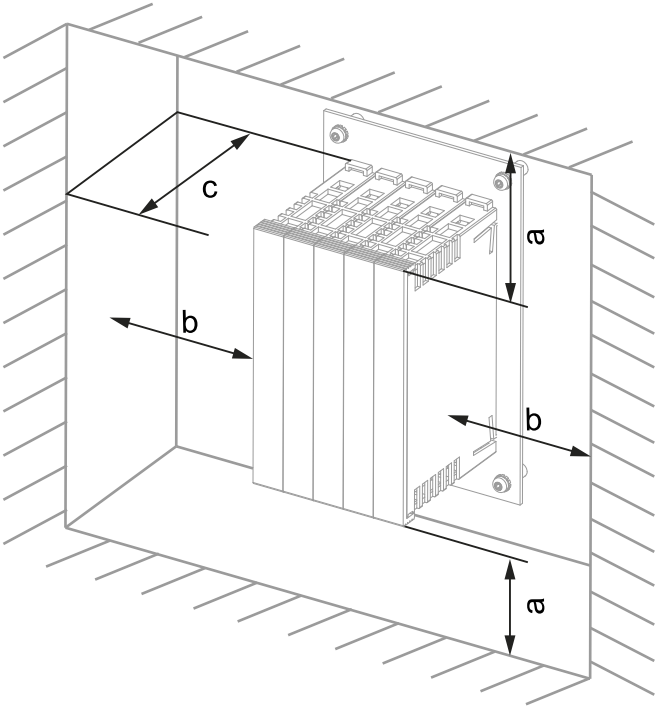
11 Assembly/Installation

11.1 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 rai 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
30 mm (1.18″)	**30 mm** (1.18″)	**90 mm** (3.54″)

a, b, c … distances in mm (inches)

12 Supported Cycle Times

12.1 Cycle Times below 1 ms (in µs)

50	100	125	200	250	500
	x	x	x	x	x

x = supported

12.2 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

13 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.

14 Storage

INFORMATION

When not in use, store the operating panel according to the storage conditions. See chapter 13 Transport/Storage.

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

15 Maintenance

INFORMATION

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

Lors de l'entretien et de la maintenance, respectez les consignes de sécurité du chapitre 2 Basic Safety Directives.

15.1 Service

This product was constructed for low-maintenance operation.

15.2 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 13 Transport/Storage.

16 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.

Change History

Change date	Affected page(s)	Chapter	Note
04.09.2024	1	Introduction	Text extended
30.09.2024		Document	Revision
17.12.2024		Document	Layout changes
03.02.2025		Document	Layout changes
06.02.2025	14	5.3 Environmental Conditions	Environmental and storage temperature changed