SIGMATEK

DI 169

S-DIAS Digital Input Module

Instruction Manual

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Translation of the Original Instructions

S-DIAS Digital Input Module DI 169

with 16 counter inputs

The S-DIAS digital input module DI 169 is equipped with 16 counter inputs for Open-Collector outputs. The actual input signal can be read (use as digital input - earthing switching).

To suppress noise in the signal lines, input filters are provided.

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 DI 169

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 DI 169 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

Exemplary nameplate (symbol image)

HW: Hardware version
SW: Software version

5 Technical Data

5.1 Digital Input Specifications

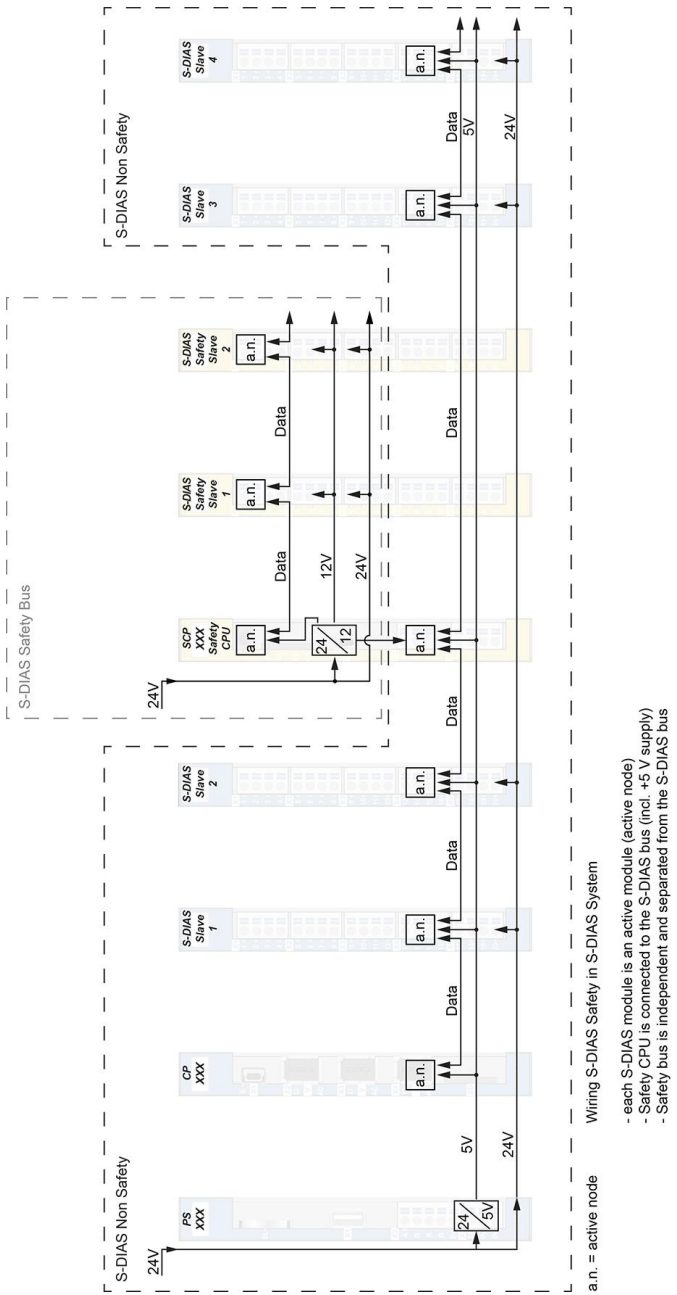
Number	16	
Input signal	GND switching	
Pull-up voltage	typically +24 V	maximum +30 V
Collector current	typically 2.5 mA	maximum 3.5 mA
Saturation voltage	maximum 1 V at 3 mA	
Residual current	maximum 200 µA	
Input delay	50 µs low pass 1. order	
Input frequency	maximum 1 kHz	
Counter frequency	1 kHz in normal counter mode resp. 4 kHz in incremental counter mode with 4-edge analysis	
Status display	LED (green) lights when the input signal < 1 V	

5.2 Counter Function

Channel	16	8
Operating modes	counter mode	1-/4-edge analysis
Resolution	8-bit	

5.3 Electrical Requirements

Voltage supply from S-DIAS bus	+5 V		+24 V	
Current consumption on the S-DIAS bus	typically 38 mA	maximum 43 mA	typically 40 mA (at +24 V)	maximum 56 mA (at +30 V)


S-DIAS Non Safety
24V
PS XXX
24/5V
5V
24V
CP XXX
a.n.
Data
S-DIAS Slave 1
S-DIAS Slave 2
S-DIAS Safety Bus
SCP XXX Safety CPU
24/12
12V
24V
S-DIAS Safety Slave 1
S-DIAS Safety Slave 2
S-DIAS Non Safety
S-DIAS Slave 3
S-DIAS Slave 4
a.n. = active node
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

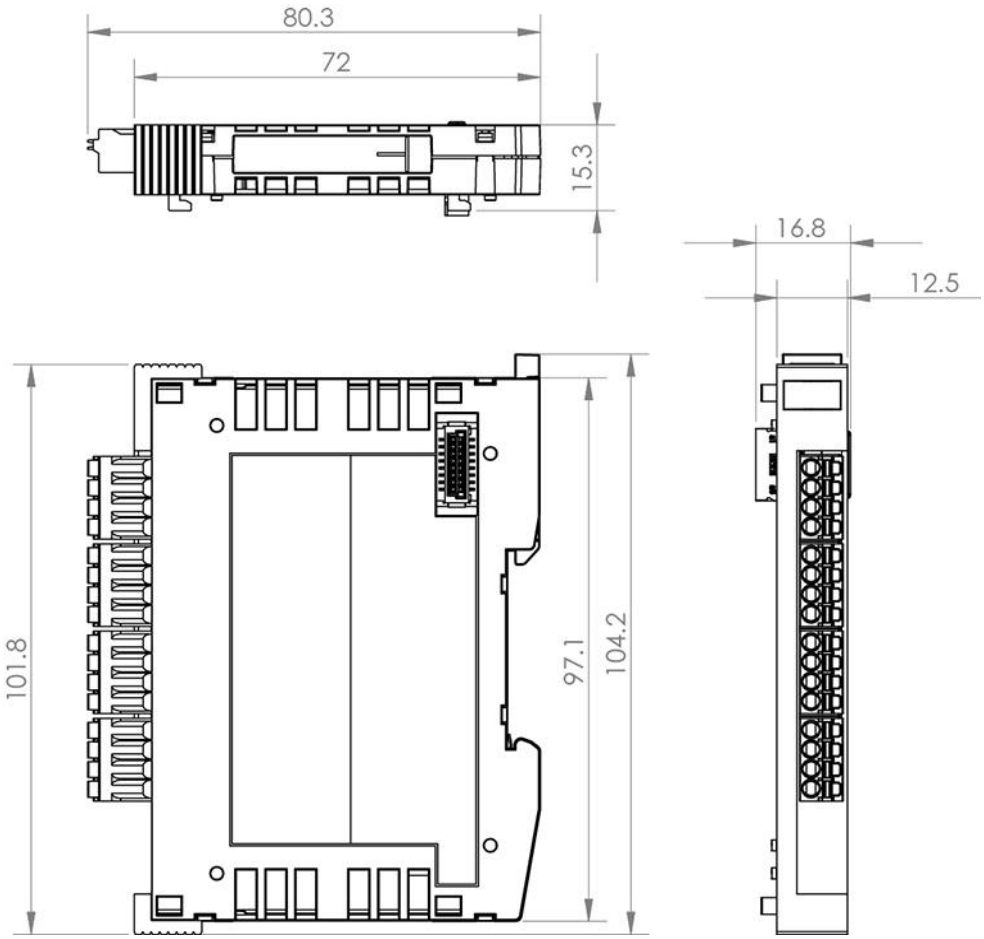
5.4 Miscellaneous

Article number	20-006-169
Standard	UL 508 (E247993)
Approbations	UL, cUL, CE, UKCA

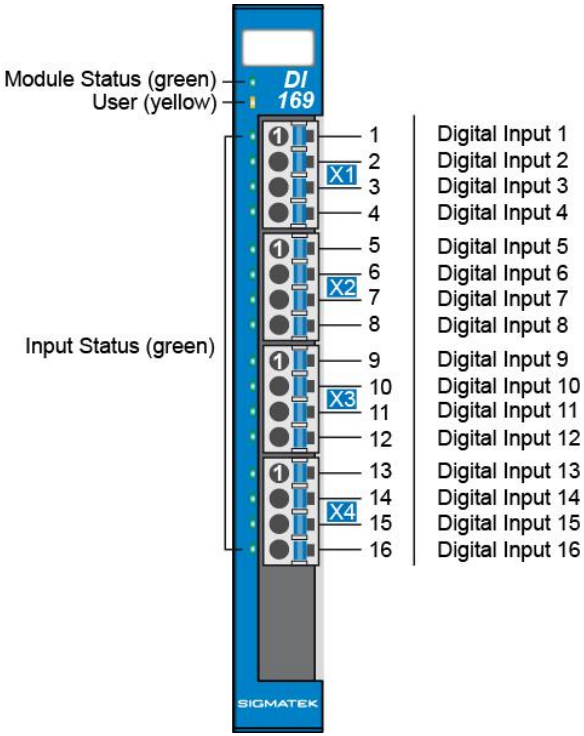
5.5 Environmental Conditions

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

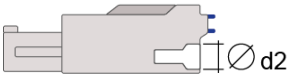
Module Status	green	ON	module active
		OFF	no supply available
		BLINKING (5 Hz)	no communication
User	yellow	ON	can be set from the application (e.g. the module LED can be set to blinking through the visualization so that the module is easily found in the control cabinet)
		OFF	
		BLINKING (2 Hz)	
		BLINKING (4 Hz)	
Input Status	green	ON	input connected to ground (1)
		OFF	input open (0)

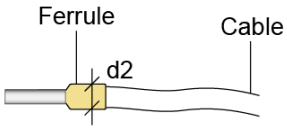
7.2 Applicable Connectors

Connectors:
X1-X4: Connectors with spring terminals (included in delivery)
The spring terminals are suitable connecting ultrasonically compacted (ultrasonically welded) strands.

Connections:

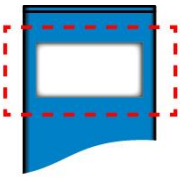
Stripping length/Sleeve length:	10 mm
Mating direction:	parallel to the connector axis resp. to the connector board
Conductor cross section rigid:	0.2-1.5 mm^2
Conductor cross section flexible:	0.2-1.5 mm^2
Conductor cross section ultrasonically compacted:	0.2-1.5 mm^2
Conductor cross section AWG/kcmil:	24-16
Conductor cross section flexible with ferrule without with 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)





d2 = max. 2.8 mm

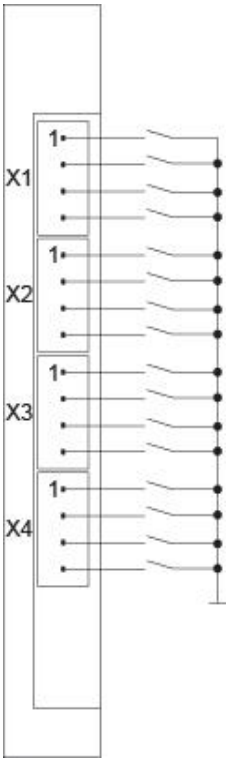
7.3 Label Field



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 Wiring Example



8.2 Note

The input filters, which suppress noise signals, allow operation in harsh environmental conditions. A careful wiring method is also recommended to ensure error-free function.

The following guidelines should be observed:

- Avoid parallel connections between input lines and load-bearing circuits.
- Protective circuits for all relays (RC networks or free-wheeling diodes)
- Correct wiring to ground

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 1.3 Contents of Delivery.

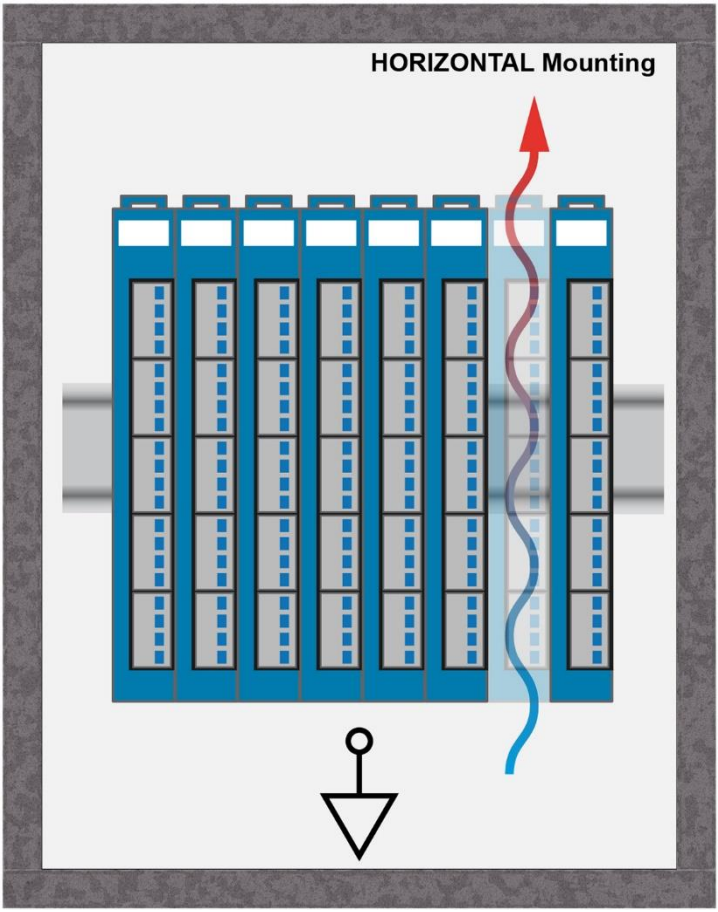
INFORMATION

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.

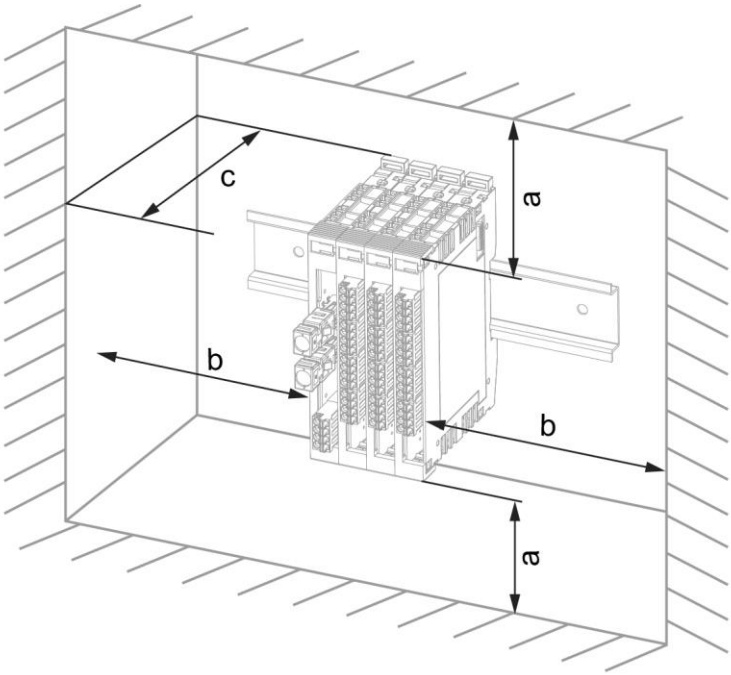
Damaged components can disrupt or damage the system.

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 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	Reset value
Read PDO				
0000	2	r	Digital input status register	0000
0002	2	r	Latched input signal register Latched input signal (reading deletes latched edge)	0000
0004	1	r/w	Counter 1 status register (Counter status register channel 1 for mode 2 and 3)	00
0005	1	r/w	Counter 2 status register	00
0006	1	r/w	Counter 3 status register (Counter status register channel 2 for mode 2 and 3)	00
0007	1	r/w	Counter 4 status register	00
0008	1	r/w	Counter 5 status register (Counter status register channel 3 for mode 2 and 3)	00
0009	1	r/w	Counter 6 status register	00
3 m	1	r/w	Counter 7 status register (Counter status register channel 4 for mode 2 and 3)	00
3 m	1	r/w	Counter 8 status register	00
3 m	1	r/w	Counter 9 status register (Counter status register channel 5 for mode 2 and 3)	00
3 m	1	r/w	Counter 10 status register	00
3 m	1	r/w	Counter 11 status register (Counter status register channel 6 for mode 2 and 3)	00
3 m	1	r/w	Counter 12 status register	00
0010	1	r/w	Counter 13 status register (Counter status register channel 7 for mode 2 and 3)	00
0011	1	r/w	Counter 14 status register	00
0012	1	r/w	Counter 15 status register (Counter status register channel 8 for mode 2 and 3)	00
0013	1	r/w	Counter 16 status register	00

SDO				
0014	2	r/w	Latched input signal control register 1 Enable register rising edge Bit 0: Input 0 ‘1‘ is latched Bit 1: Input 1-	g_rising _edge_intr
0016	2	r/w	Latched input signal control register 2 Enable register falling edge Bit 0: Input 0 ‘1‘ is latched Bit 1: Input 1-	g_falling _edge_intr
0018	2	r/w	Counter control register 1 Enable register rising edge Bit 0: Input 0 '1' = rising edge triggers a counting impulse Bit 1: Input 1-	g_rising _edge_cnt
3 m	2	r/w	Counter control register 2 Enable register falling edge Bit 0: Input 0 '1' = fallinge dge triggers a counting impulse Bit 1: Input 1-	g_falling _edge_cnt
3 m	2	r/w	Counter control register 3 Counting direction (only mode 1) Bit0: '0' = increment counter 1 '1' = decrement counter 1, Bit1: ‘0' = increment counter 2 '1' = decrement counter 2, Bit2:…	g_cnt_dir

3 m	2	r/w	Counter mode: Bit 1…0: Channel 1 mode (input 1 + 2) Bit 3…2: Channel 2 mode (input 3 + 4) Bit 5…4: Channel 3 mode (input 5 + 6) Bit 7…6: Channel 4 mode (input 7 + 8) Bit 9…8: Channel 5 mode (input 9 + 10) Bit 11…10: Channel 6 mode (input 11 + 12) Bit 13…12: Channel 7 mode (input 13 + 14) Bit 15…14: Channel 8 mode (input 15 + 16) With a mode change the according channel is deleted Mode: “00” counter for each input will be increased or decreased depending on the configured control register 1 -3 (mode 1, counter mode). “10” counter will be increased or decreased with each rising edge of the first input of the channel. With the second input of the channel the counting direction is defined (mode 2, single edge analysis). “11” counter will be increased or decreased (depending on the direction) for each rising and falling edge of the two inputs (mode 3, 4 edge analysis).	g_mode_set

11 Supported Cycle Times

11.1 Cycle Times below 1 ms (in µs)

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

x= supported

11.2 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

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 DI169

Hardware Class DI169 for the S-DIAS DI169 digital input module

- SDIAS:36, **DI169** (DI1691)
  - 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 Input 1 ----------
  - I Digital Input 1 (Input1) <-[]->
  - I Digital Input 1 Latched (Input1Latched) <-[]->
  - I Counter Input 1 (Counter1) <-[]->
  - ---------- Digital Input 2 ----------
  - I Digital Input 2 (Input2) <-[]->
  - I Digital Input 2 Latched (Input2Latched) <-[]->
  - I Counter Input 2 (Counter2) <-[]->
  - ---------- Digital Input 3 ----------
  - I Digital Input 3 (Input3) <-[]->
  - I Digital Input 3 Latched (Input3Latched) <-[]->
  - I Counter Input 3 (Counter3) <-[]->
  - ---------- Digital Input 4 ----------
  - I Digital Input 4 (Input4) <-[]->
  - I Digital Input 4 Latched (Input4Latched) <-[]->
  - I Counter Input 4 (Counter4) <-[]->
  - ---------- Digital Input 5 ----------
  - I Digital Input 5 (Input5) <-[]->
  - I Digital Input 5 Latched (Input5Latched) <-[]->
  - I Counter Input 5 (Counter5) <-[]->
  - ---------- Digital Input 6 ----------
  - I Digital Input 6 (Input6) <-[]->
  - I Digital Input 6 Latched (Input6Latched) <-[]->
  - I Counter Input 6 (Counter6) <-[]->
  - ---------- Digital Input 7 ----------
  - I Digital Input 7 (Input7) <-[]->
  - I Digital Input 7 Latched (Input7Latched) <-[]->
  - I Counter Input 7 (Counter7) <-[]->
  - ---------- Digital Input 8 ----------
  - I Digital Input 8 (Input8) <-[]->
  - I Digital Input 8 Latched (Input8Latched) <-[]->
  - I Counter Input 8 (Counter8) <-[]->

```
---------------------- Digital Input 9 -------------
Digital Input 9 (Input9) <-[]->
Digital Input 9 Latched (Input9Latched) <-[]->
Counter Input 9 (Counter9) <-[]->
---------------------- Digital Input 10 ------------
Digital Input 10 (Input10) <-[]->
Digital Input 10 Latched (Input10Latched) <-[]->
Counter Input 10 (Counter10) <-[]->
---------------------- Digital Input 11 ------------
Digital Input 11 (Input11) <-[]->
Digital Input 11 Latched (Input11Latched) <-[]->
Counter Input 11 (Counter11) <-[]->
---------------------- Digital Input 12 ------------
Digital Input 12 (Input12) <-[]->
Digital Input 12 Latched (Input12Latched) <-[]->
Counter Input 12 (Counter12) <-[]->
---------------------- Digital Input 13 ------------
Digital Input 13 (Input13) <-[]->
Digital Input 13 Latched (Input13Latched) <-[]->
Counter Input 13 (Counter13) <-[]->
---------------------- Digital Input 14 ------------
Digital Input 14 (Input14) <-[]->
Digital Input 14 Latched (Input14Latched) <-[]->
Counter Input 14 (Counter14) <-[]->
---------------------- Digital Input 15 ------------
Digital Input 15 (Input15) <-[]->
Digital Input 15 Latched (Input15Latched) <-[]->
Counter Input 15 (Counter15) <-[]->
---------------------- Digital Input 16 ------------
Digital Input 16 (Input16) <-[]->
Digital Input 16 Latched (Input16Latched) <-[]->
Counter Input 16 (Counter16) <-[]->
Inputs Word (InputWord) <-[]->
ALARM:OO, Empty
```

This hardware class is used to control the DI 169 valve output module with 16 counter input. The input signals can be read (used as digital input). 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	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
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 Digital Inputs 1-16 and Counter

Input[1-16]	Input	Digital input 1-16, status queried over read().
Input[1-16] Latched	Input	Latched digital input 1-16 0 – input was not set since the last reading 1 – input was set since the last reading When the read() method of the server is called, the server is then reset in the next cycle.
Counter[1 – 16]	Input	Counter 1-16, values starting from the last reset (reset directly written to server)
InputWord	Input	In this server, the digital inputs are shown in a 16-bit field. Bits 0 to 15 are allocated to inputs 1 to 16 in this word.
CounterModeChannel [1-8]	Property	CounterModeCh settings: Channel 1 Input 1 & 2 Channel 2 Input 3 & 4 .... Channel 7 Input 14 & 15 Channel 8 Input 15 & 16 0 – respective settings in the clients CounterDirection and CounterEdge starts the counter. 1 – incremental encoder on 1 edge Result is displayed on channel 1 in counter 1, for channel 2 in counter 3 ...channel 7 in counter 13, for channel 8 in counter 15.) 2 – incremental encoder on 4 edges Result is displayed on channel 1 in counter 1, for channel 2 in counter 3 ...channel 7 in counter 13, for channel 8 in counter 15.)
Input[1-16] Latch	Property	Here, the edge detection mode can be set for the latch function of the respective input. 0 – no edge detection 1 – the respective counter counts with a rising edge 2 – the respective counter counts with a falling edge 3 – the respective counter counts with a rising and falling edge
CounterEdge [1 - 16]	Property	Here, the edge detection mode for the counter of the respective input can be set: 0 – no edge detection 1 – the respective counter counts with a rising edge 2 – the respective counter counts with a falling edge 3 – the respective counter counts with a rising and falling edge **Important**: If "Counter Mode Channel" is set to 1 or 2, 0 cannot be set here. Otherwise, no edges are counted.
Counter Direction [1-16]	Property	Counter direction 0 – counter counts upward 1 – counter counts downward

16.2.1 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
28.04.2016	12	5 Mounting	Graphics distances
09.12.2016	5	1.4 Miscellaneous	UL added
17.08.2017	5 8	1.5 Environmental Conditions 3.2 Applicable Connectors	Pollution Degree Sleeve length added Added info regarding ultrasonically welded strands
18.10.2017	9 13	3.3 Label Field 5 Mounting	Added chapter Graphic replaced
14.11.2019	17	7 Supported Cycle Times	Chapter added
28.02.2020	17	7 Supported Cycle Times	Text adapted
08.09.2020	19	8 Hardware Class DI169	Chapter added
04.11.2020	13	5 Mounting	Expansion functional ground connection
06.12.2022	6	1.4 Miscellaneous	UKCA conformity
26.07.2023		Document	General chapters added, design