

# DI 204

## S-DIAS Digital Input Module with 2 Incremental Encoder Inputs

### Instruction Manual

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## **Translation of the Original Instructions**

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## S-DIAS Digital Input Module with 2 Incremental Encoder Inputs

**DI 204**

with 14 digital inputs

### 2 Incremental encoder inputs

The S-DIAS digital input module DI 204 is equipped with two incremental inputs with a TTL signal and 14 inputs with a +24 V signal for reading the signal states "0" and "1". To suppress noise in the signal lines, input filters are provided. The incremental encoder values can be latched.



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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](http://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 204

## 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



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#### EU Declaration of Conformity

The product DI 204 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”.

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## 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 Incremental Encoder Input Specifications

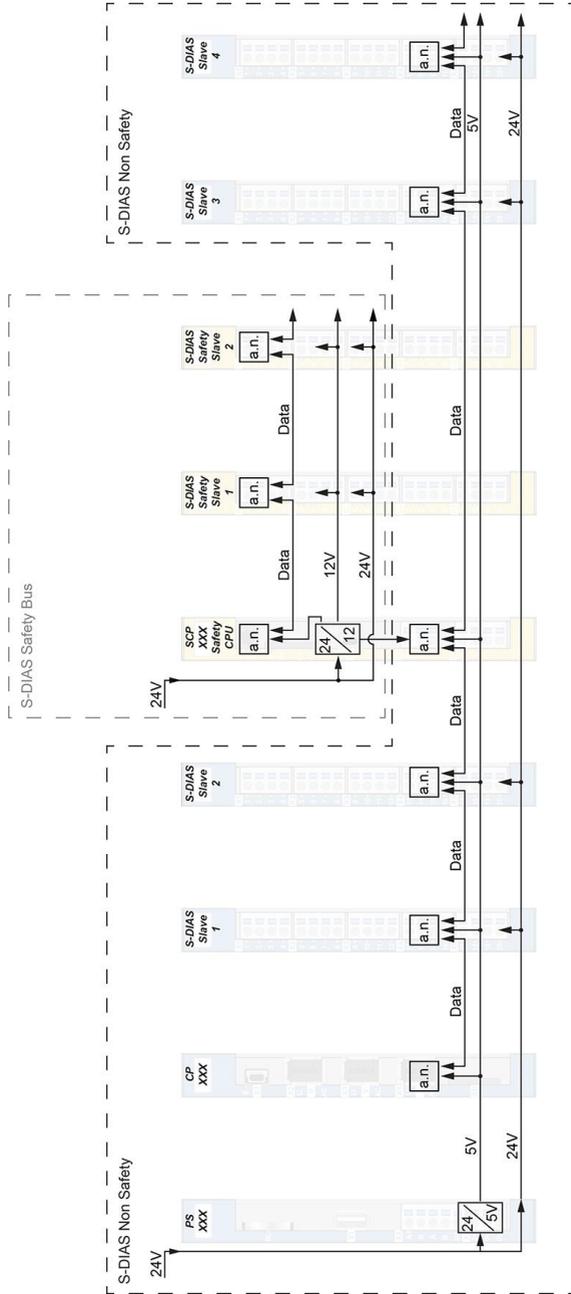
Number	2	
Input voltage	typically 5.0 V	maximum 5.5 V
Signal level	low 0.8 V	high 2.0
Switching threshold	typically 1.4 V	
Input current	1.5 mA at +5 V	
Input delay	typically 10 $\mu$ s	
Input frequency	maximum 25 kHz	
Counter frequency	maximum 100 kHz in incremental counter mode with 4-edge analysis	

### 5.2 Input Specifications

Number	14	
Input voltage	typically +24 V	maximum +30 V
Signal level	low: < +8 V	high: > +14 V
Switching threshold	typically +11 V	
Input current	3.7 mA at +24 V	
Input delay	typically 0.5 ms	

### 5.3 Electrical Requirements

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

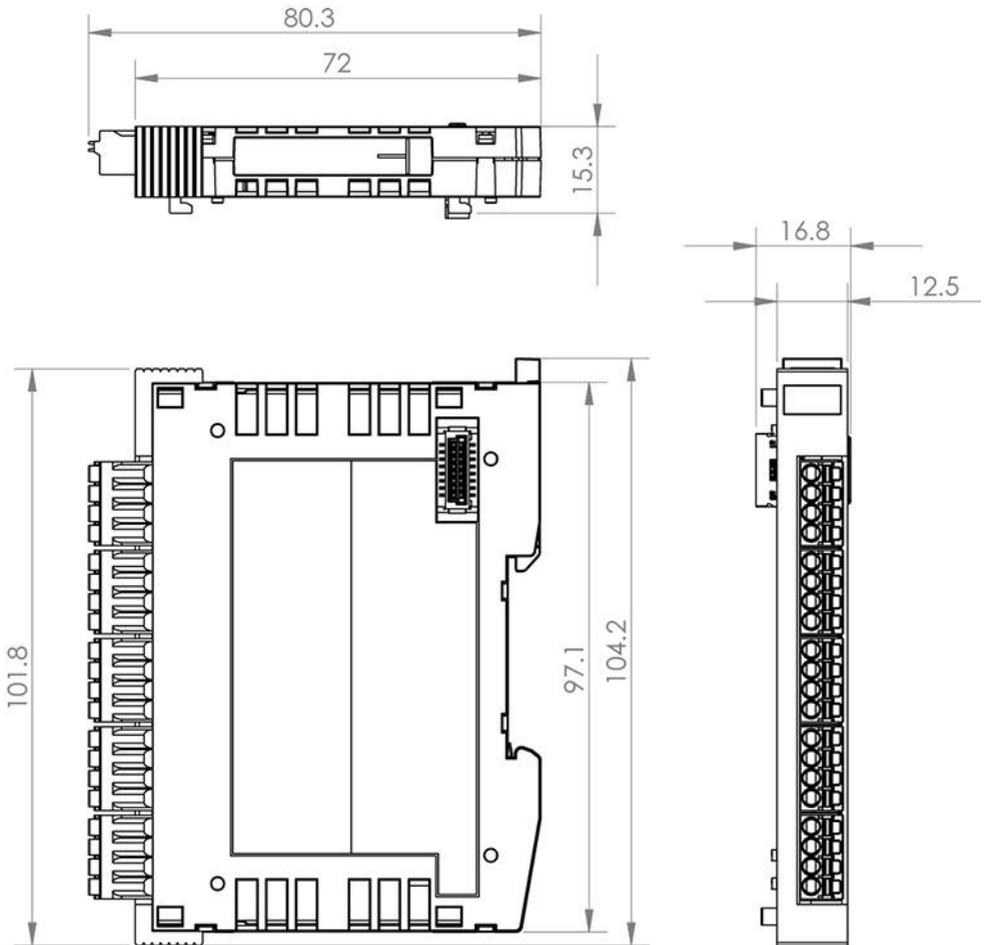
## 5.4 Miscellaneous

Article number	20-006-204
Standard	UL 508 (E247993)
Approbations	UL, cUL, CE, UKCA

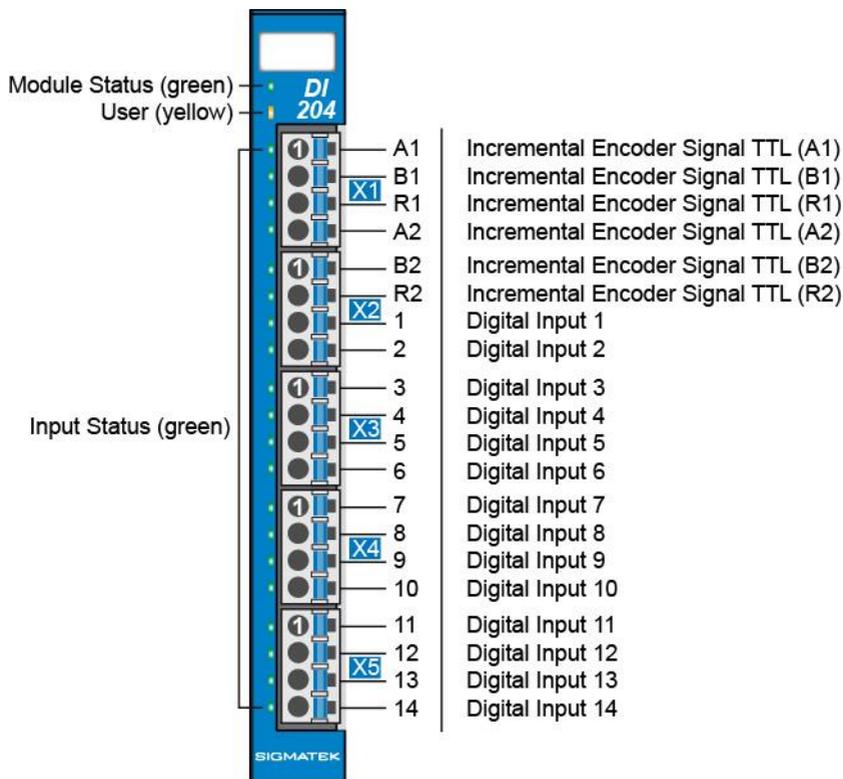
## 5.5 Environmental Conditions

Storage temperature	-20 ... +85 °C	
Environmental temperature	0 ... +55 °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)	
Input Status	green	ON	input ON
		OFF	input OFF

## 7.2 Applicable Connectors

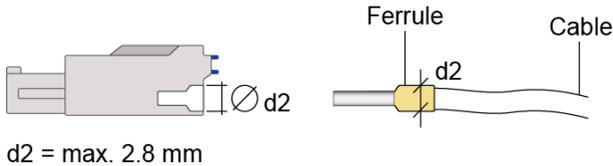
### Connectors:

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

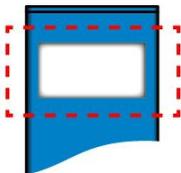
The spring terminals are suitable connecting ultrasonically compacted (ultrasonically welded) strands.

### 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 <sup>2</sup>
Conductor cross section, flexible:	0.2-1.5 mm <sup>2</sup>
Conductor cross section, ultrasonically compacted:	0.2-1.5 mm <sup>2</sup>
Conductor cross section AWG/kcmil:	24-16
Conductor cross section flexible, with ferrule without plastic sleeve:	0.25-1.5 mm <sup>2</sup>
Conductor cross section flexible, with ferrule with plastic sleeve:	0.25-0.75 mm <sup>2</sup> (ground for reducing d2 of the ferrule)



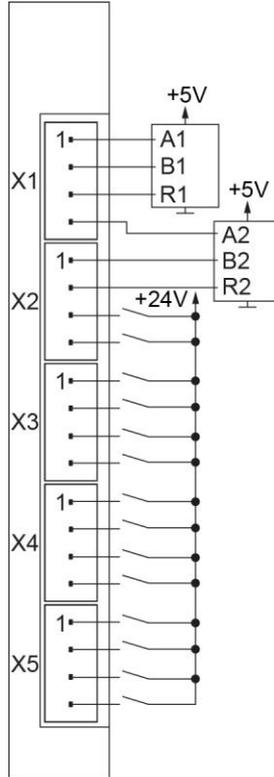
### 7.3 Label Field



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 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

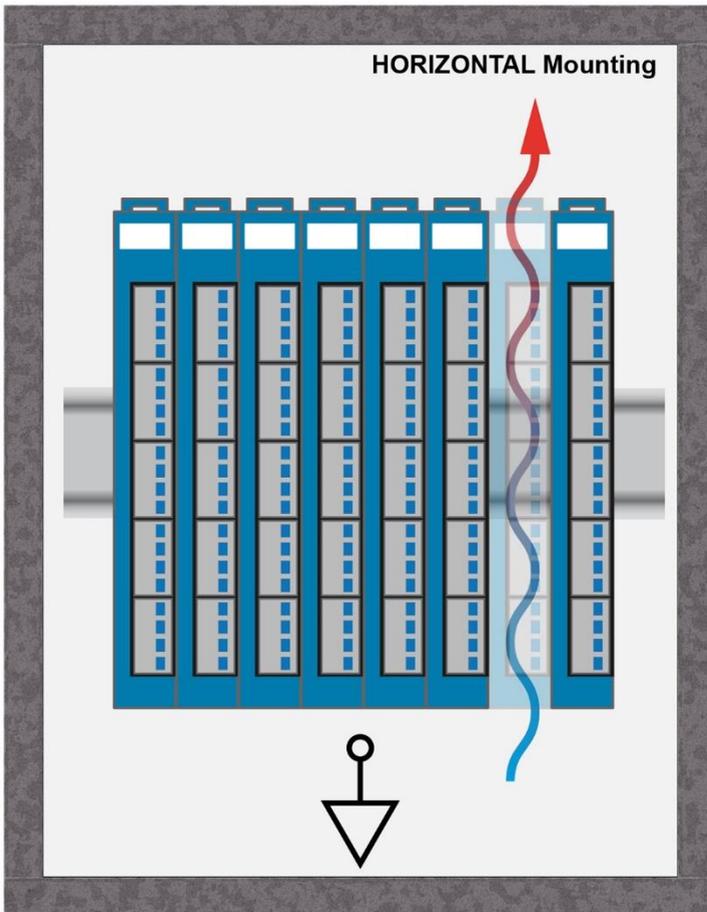


On receipt and before initial use, check the device for damage. If the device is damaged, contact our customer service and do not install the device in your system.

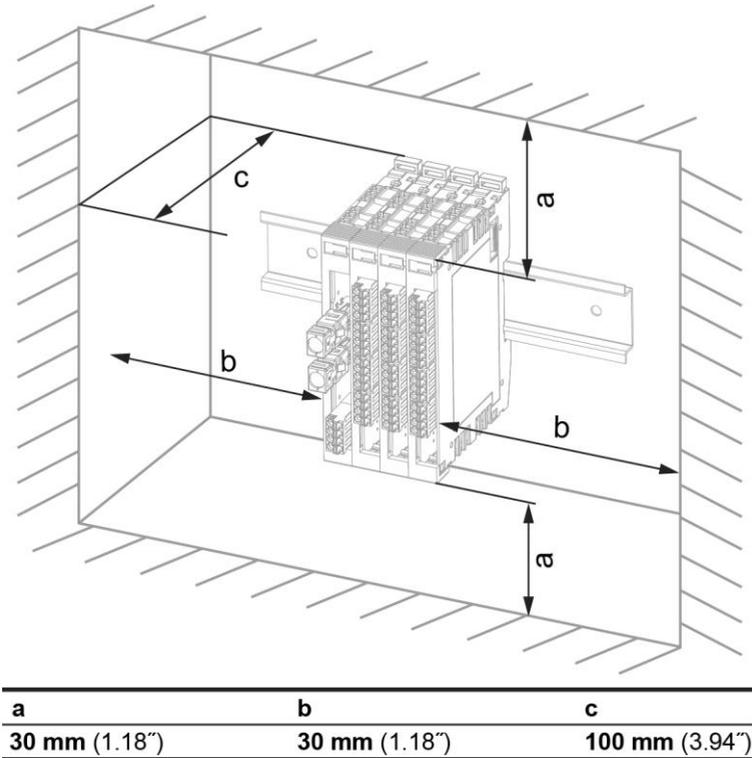
Damaged components can disrupt or damage the system.

## 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 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 ... distances in mm (inches)

## 10 Addressing

### 10.1 Address mapping overview

Address (hex)	Size (bytes)	Access Type	Description
<b>Read Cyclic Data (PDO)</b>			
0000	2	r	Input register Bit 0 input 1 Bit 1 input 2 ... Bit 13 input 14 Bit 14-15 reserved
0002	2	r16	Incremental encoder counter 1 Actual counter value
0004	2	r16	Incremental encoder counter 1 latched Latched counter value
4000	2	r16	Incremental encoder counter 2 Actual counter value
0008	2	r16	Incremental encoder counter 2 latched Latched counter value
1x	1	r	Incremental encoder status register 1 Bit 0-1 reserved Bit 2 Input A1 Bit 3 Input B1 Bit 4 Null position R1 Bit 5 Null position latched (reset when read) Bit 6-7 reserved
1x	1	r	Incremental encoder status register 2 Bit 0-1 reserved Bit 2 Input A2 Bit 3 Input B2 Bit 4 Null position R2 Bit 5 Null position latched (reset when read) Bit 6-7 reserved

Read/Write Configuration (SDO)			
000C	1	w	Incremental encoder command register 1 <sup>(1)</sup> Bit 0-1 reserved Bit 2 Null position inversion (1 = inverted) Bit 3 Phase B inversion (1 = inverted) Bit 4-5 Edge sampling time 00 = incremental encoder off 01 = 1 edge 10 = 2 edges 11 = 4 edges Bit 6 A/B counter mode 1 edge input curve 0 = signal (A) and direction (B) 1 = true A/B Bit 7 reserved
1x	1	r/w	Incremental encoder command register 2 <sup>(1)</sup> Bit 0-1 reserved Bit 2 Null position inversion (1 = inverted) Bit 3 Phase B inversion (1 = inverted) Bit 4-5 Edge sampling time 00 = incremental encoder off 01 = 1 edge 10 = 2 edges 11 = 4 edges Bit 6 A/B counter mode 1 edge input curve 0 = signal (A) and direction (B) 1 = true A/B Bit 7 reserved

<sup>(1)</sup> Writing to this register clears all counter values (if performed while counting, the first edge could be missed).

## 11 Supported Cycle Times

### 11.1 Cycle Times below 1 ms (in $\mu\text{s}$ )

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 DI204

### Hardware Class DI204 for the DIAS DI204 digital input module

```

SDIAS:40, DI204 (DI2041)
[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 Inputs -----
[I] Digital Input 1 (Input1) <-[]->
[I] Digital Input 2 (Input2) <-[]->
[I] Digital Input 3 (Input3) <-[]->
[I] Digital Input 4 (Input4) <-[]->
[I] Digital Input 5 (Input5) <-[]->
[I] Digital Input 6 (Input6) <-[]->
[I] Digital Input 7 (Input7) <-[]->
[I] Digital Input 8 (Input8) <-[]->
[I] Digital Input 9 (Input9) <-[]->
[I] Digital Input 10 (Input10) <-[]->
[I] Digital Input 11 (Input11) <-[]->
[I] Digital Input 12 (Input12) <-[]->
[I] Digital Input 13 (Input13) <-[]->
[I] Digital Input 14 (Input14) <-[]->
[I] Inputs Double (InputDouble) <-[]->
----- Encoder 1 -----
[I] Encoder 1 (Encoder1) <-[]->
[I] Encoder 1 Latched (Encoder1Latched) <-[]->
[I] Zero Position 1 (ZPuls1) <-[]->
[I] Zero Position Latched 1 (ZPulsLatch1) <-[]->
----- Encoder 2 -----
[I] Encoder 2 (Encoder2) <-[]->
[I] Encoder 2 Latched (Encoder2Latched) <-[]->
[I] Zero Position 2 (ZPuls2) <-[]->
[I] Zero Position Latched 2 (ZPulsLatch2) <-[]->
[ ] ALARM:00, Empty

```

This hardware class is used to control the DI 204 hardware module with 14 digital inputs and 2 rotary incremental encoders. More information on the hardware can be found in the module documentation.

## 16.1 Interfaces

### 16.1.1 General

<b>ClassState</b>	Input	This server shows the actual status of the hardware class.								
<b>DeviceID</b>	Input	The device ID of the hardware module is shown in this server.								
<b>FPGAVersion</b>	Input	FPGA version of the module in 16#XY (e.g. 16#10 = version 1.0).								
<b>SerialNumber</b>	Input	The serial number of the hardware module is shown in this server.								
<b>RetryCounter</b>	Input	This server increments when a transfer fails.								
<b>LEDControl</b>	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" data-bbox="381 491 992 624"> <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									
<b>Required</b>	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 doesn't have to be available or error-free. However, which components identified as "not required" should be selected with regard to the safety of the system.								

## 16.1.2 Digital Inputs

<b>Input[1-14]</b>	Input	Status of input 1-14
<b>InputDouble</b>	Input	In this server, the digital outputs are shown in a 32-bit field. Bits 0 to 13 are assigned to inputs1 to input14 in this double word.

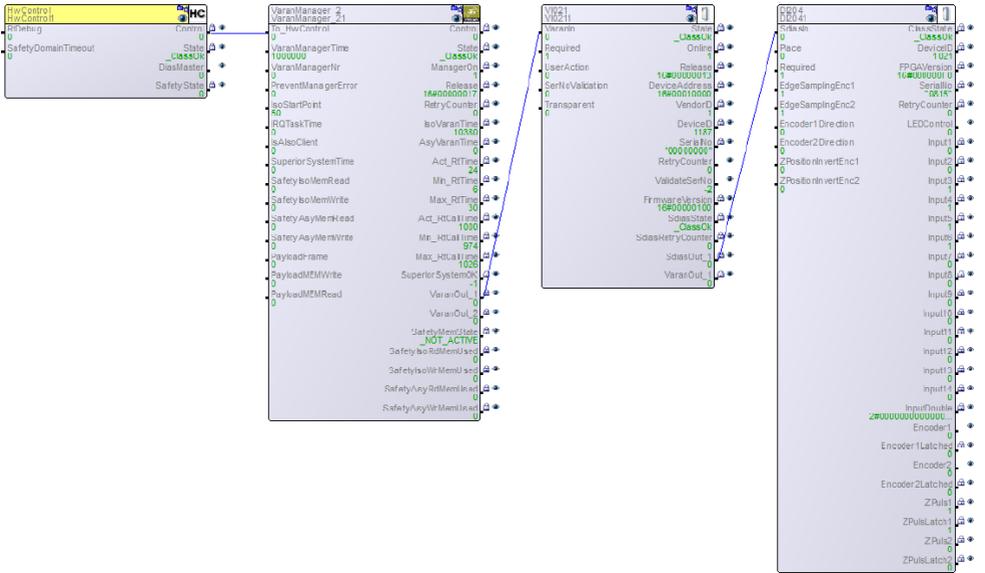
### 16.1.3 Encoder

<b>Encoder[1,2]</b>	Input	Position of incremental encoder 1 or 2 (32-bit signed up/down counter) The encoder can be reset with the write method of the server. The status is queried over read().
<b>EncoderLatched[1,2]</b>	Input	Latch position of incremental encoder 1 or 2 (32-bit signed up/down counter) The status is queried over read().
<b>ZPuls[1,2]</b>	Input	Reference position of encoder 1 or 2. 0 actual position does not match the reference position 1 actual position matches the reference position The status is queried over read().
<b>ZPulsLatched[1,2]</b>	Input	Latched position of encoder 1 or 2. 0 reference position has not been reached since last status query 1 reference position has been reached since last status query The status is queried over read(). During the status query, the server is reset to 0.
<b>EdgeSamplingEnc[1,2]</b>	Property	Edge sampling rate setting in encoder 1 or 2: 0 Encoder off 1 1 edge is counted 2 2 edges are counted 3 4 edges are counted as initialization value
<b>EncoderDirection[1,2]</b>	Property	Count direction setting in encoder 1 or 2: 0 Normal 1 Inverse as initialization value
<b>ZpositionInvertEnc[1,2]</b>	Property	When this client is activated, the ZeroPosition and ZeroPositionLatched servers of encoder 1 or 2 are inverted. This setting is used by the encoder and must therefore be configured so that in the ZeroPosition and ZeroPositionLatched servers, the idle status is shown as "0" and the reference signal as "1". 0 normal (default) 1 inverted as initialization value
<b>ABCntMode[1,2]</b>	Property	Setting of the counter mode of the encoder 1 resp. 2 with 2-edge scanning =1. 0 A pulses und B direction 1 true A/B as initialization value

### 16.1.4 Communication Interfaces

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

### 16.2 Example



## Documentation Changes

Change date	Affected page(s)	Chapter	Note
10.02.2014	7	3.2 Applicable Connectors	Connection capacity added French notes added
01.04.2014	9	5 Mounting	Text updated
08.09.2014	4	1.4 Miscellaneous	Added Standard
30.01.2015	8	4.2 Note	Added note concerning connecting the S-DIAS module while voltage is applied
26.03.2015	7	3.2 Applicable Connectors	Added connections
28.04.2016	12	5 Mounting	Graphics distances
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	16	7 Supported Cycle Times	Chapter added
28.02.2020	16	7 Supported Cycle Times	Text adapted
08.09.2020	18	8 Hardware Class DI204	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