SIGMATEK

# DI 202

## S-DIAS Digital Input Module with Counter Function

## Instruction Manual

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## Translation of the Original Instructions

# S-DIAS Digital Input Module with Counter Function DI 202

**with 16 digital inputs**

**4 digital inputs with counter function**


The S-DIAS DI 202 digital input module is equipped with 20 inputs and a +24 V signal for reading the signal states “0“ and “1“. To suppress noise in the signal lines, input filters are provided. In addition, digital inputs 1-4 have a counter function.

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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 DI 202

# 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 202 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

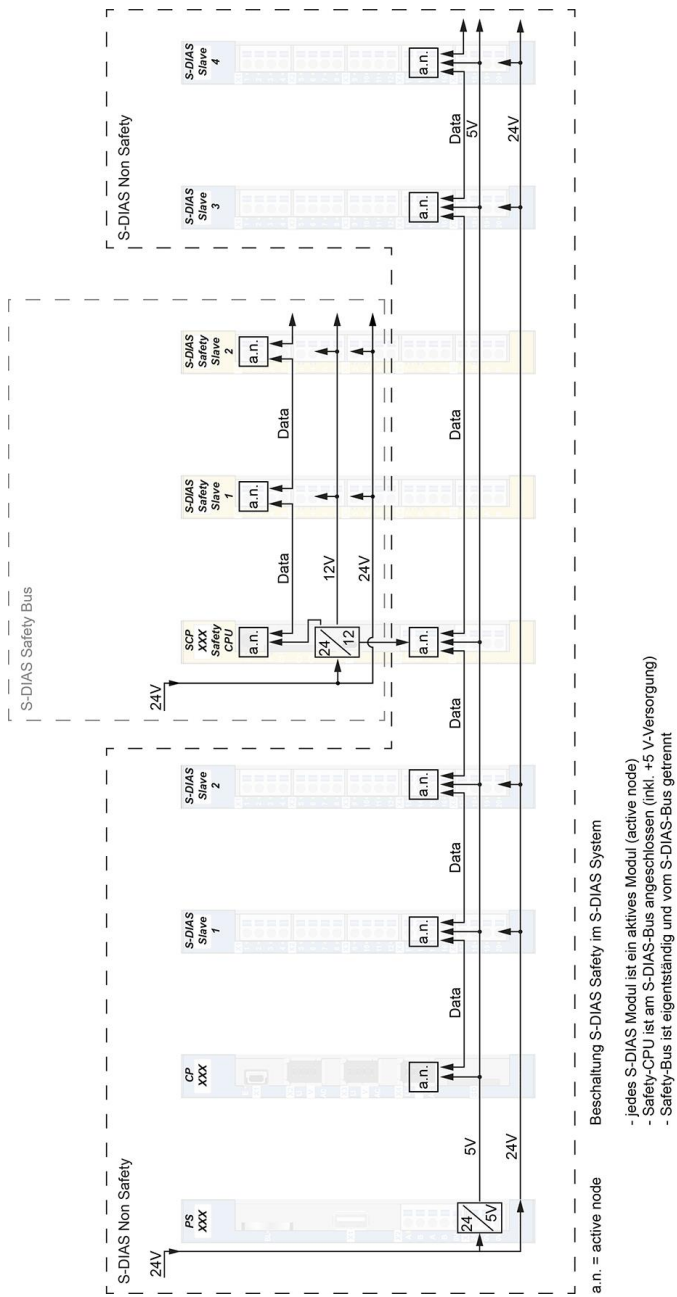
| | | |
|---|---|---|
| Number | 20 | |
| Input voltage | typically +24 V | maximum +30 V |
| Signal level<br>(up to HW version 2.10) | low: < +8 V | high: > +14 V |
| Signal level<br>(starting with HW version 2.20) | low: < +5 V | high: > +15 V |
| Input current | 3.7 mA at +24 V | |
| Input delay | input 1-4: 10 µs<br>input 5-20: 0.5 ms | |
| Input frequency, inputs 1-4 | 25 kHz in normal counter mode or<br>in incremental counter mode with 4-edge analysis | |
| Counter frequency input 1-4 | 25 kHz in normal counter mode<br>100 kHz in incremental counter mode with 4-edge analysis | |

## 5.2 Electrical Requirements

| | | |
|---|---|---|
| Voltage supply from S-DIAS bus | +5 V | |
| Current consumption on the S-DIAS bus (+5 V supply) | typically 40 mA | maximum 45 mA |

## 5.3 Safety-Relevant Parameters

| | |
|---|---|
| Calculation base | IEC 61709<br>SN 29500 |
| Conditions | +40 °C |
| MTBF | 1036 years |
| The MTBF is a calculated value, which represents the failure probability and must not be confused with the product lifespan. | |


S-DIAS Non Safety
S-DIAS Non Safety
S-DIAS Safety Bus
24V
PS XXX
CP XXX
S-DIAS Slave 1
S-DIAS Slave 2
SCP XXX Safety CPU
S-DIAS Safety Slave 1
S-DIAS Safety Slave 2
S-DIAS Slave 3
S-DIAS Slave 4
a.n.
Data
5V
12V
24V
24/5V
24/12
a.n. = active node
Beschaltung S-DIAS Safety im S-DIAS System
- jedes S-DIAS Modul ist ein aktives Modul (active node)
- Safety-CPU ist am S-DIAS-Bus angeschlossen (inkl. +5 V-Versorgung)
- Safety-Bus ist eigentständig und vom S-DIAS-Bus getrennt

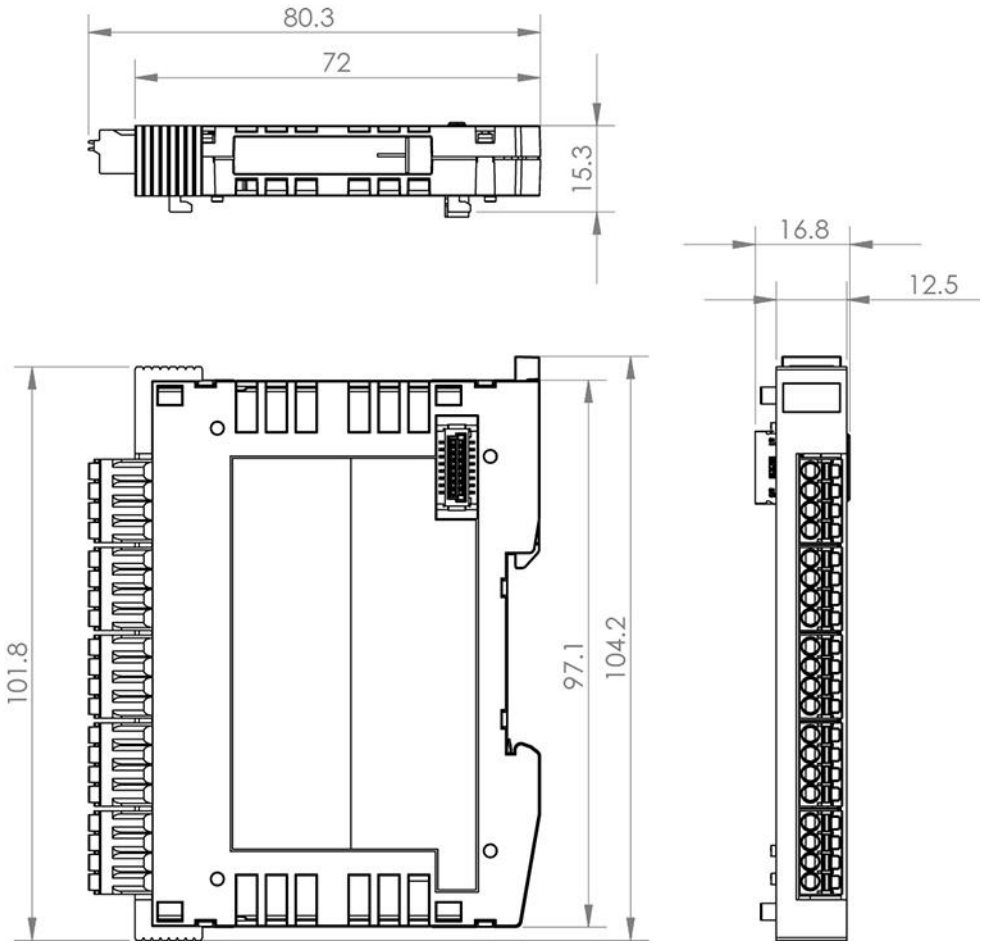
## 5.4 Miscellaneous

| | |
|---|---|
| Article number | 20-006-202 |
| Standard | UL 508 (E247993) |
| Approbations | UL, cUL, CE, UKCA |

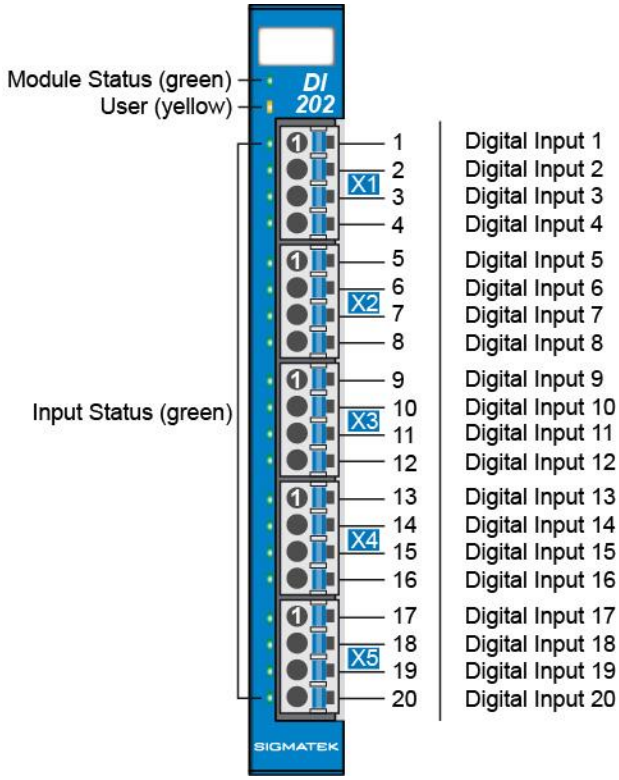
## 5.5 Environmental Conditions

| | | |
|---|---|---|
| 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<br>> 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<br>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

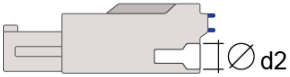
| | | | |
|---|---|---|---|
| Module Status | green | ON | module active |
| | | OFF | no supply available |
| | | BLINKING (5 Hz) | no communication |
| User | yellow | ON | can be set from the application<br>(e.g. the module LED can be set to blinking through the visualization so that the module is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

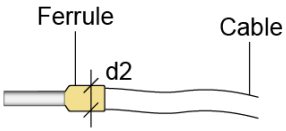
## 7.2 Applicable Connectors

**Connectors:**
**X1-X5:** Connectors with spring terminals (included in delivery)
The spring terminals are suitable connecting ultrasonically compacted (ultrasonically welded) strands.

**Connections:**

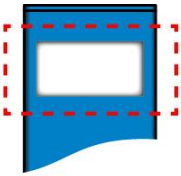
| | |
|---|---|
| Stripping length/Sleeve length: | 10 mm |
| Plug-in direction: | parallel to conductor axis or to PCB |
| Conductor cross section, rigid: | 0.2-1.5 $mm^2$ |
| Conductor cross section, flexible: | 0.2-1.5 $mm^2$ |
| Conductor cross section, ultrasonically compacted: | 0.2-1.5 $mm^2$ |
| Conductor cross section AWG/kcmil: | 24-16 |
| Conductor cross section flexible, with ferrule without plastic sleeve: | 0.25-1.5 $mm^2$ |
| Conductor cross section flexible, with ferrule with plastic sleeve: | 0.25-0.75 $mm^2$ (ground for reducing d2 of the ferrule) |




d2 = max. 2.8 mm

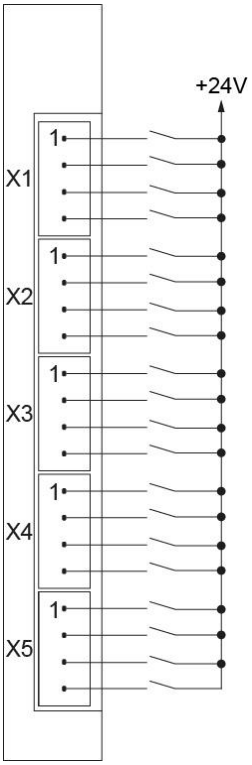
## 7.3 Label Field



| | |
|---|---|
| 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.

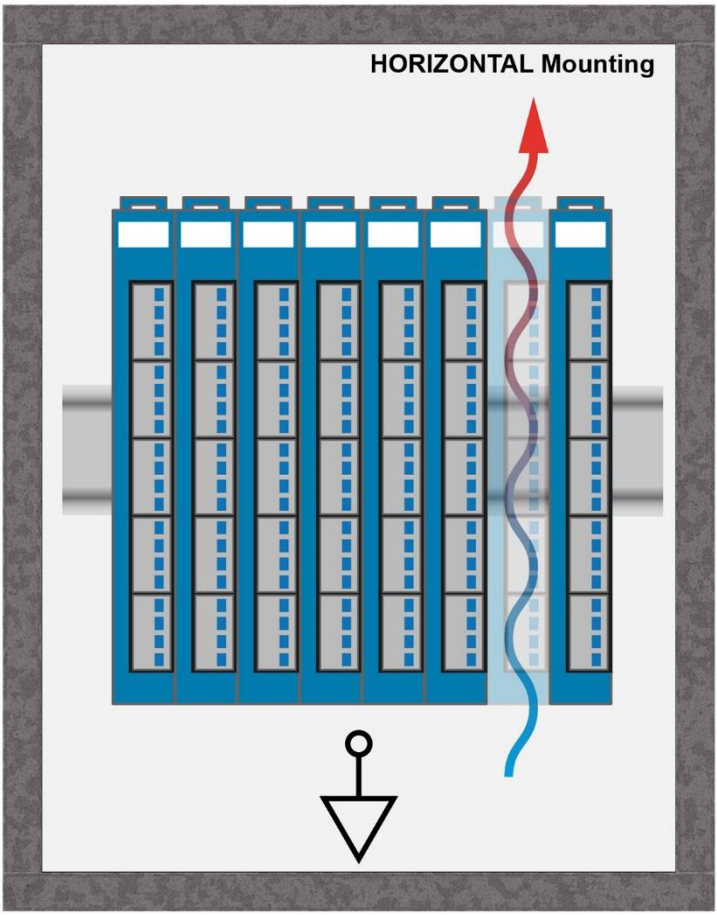
**INFORMATION**

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.

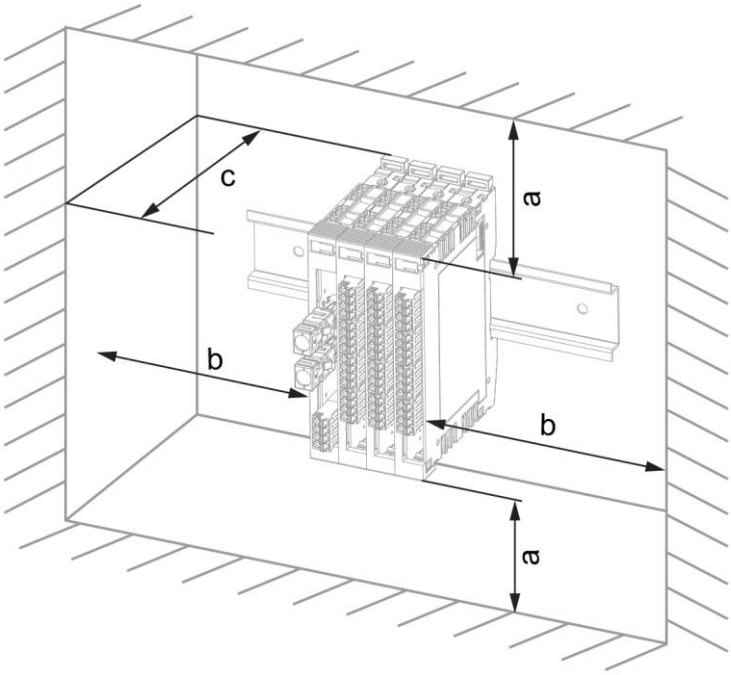
Damaged components can disrupt or damage the system.

## 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 functional ground connection from the module to the DIN rail is made via the grounding clamp on the back of the S-DIAS modules. The modules must be mounted horizontally (module label up) with sufficient clearance between the ventilation slots of the S-DIAS module blocks and nearby components and/or the control cabinet wall. This is necessary for optimal cooling and air circulation, so that proper function up to the maximum operating temperature is ensured.



Recommended minimum distances of the S-DIAS modules to the surrounding components or control cabinet wall:




| a | b | c |
|---|---|---|
| **30 mm** (1.18″) | **30 mm** (1.18″) | **100 mm** (3.94″) |

a, b, c … distances in mm (inches)

# 10 Addressing

| Address (hex) | Size (bytes) | Access Type | Description | Reset value |
|---|---|---|---|---|
| **Memory** | | | | |
| 0000 | 3 | r | Input register<br><br>Bit 0 input 1<br>Bit 1 input 2<br>…<br>Bit 19 input 20<br>Bit 20-23 reserved | 000000 |
| 0003 | 1 | r/w | Counter mode register [1]<br><br>Bit 0 counter mode 1+2<br>Bit 1 counter mode 3+4<br>Bit 2-7 reserved<br>(0 = normal counter mode, 1 = incremental counter mode) | 00 |
| 0004 | 1 | r | Counter 1 [2]<br>8-bit counter for input 1 | 00 |
| 0004 | 2 | r16 | Incremental encoder 1 [3]<br>16-bit encoder counter | 0000 |
| 0005 | 1 | r | Counter 2 [2]<br>8-bit counter for input 2 | 00 |
| 0006 | 1 | r | Counter 3 [2]<br>8-bit counter for input 3 | 00 |
| 0006 | 2 | r16 | Incremental encoder 2 [3]<br>16-bit encoder counter | 0000 |
| 0007 | 1 | r | Counter 4 [2]<br>8-bit counter for input 4 | 00 |

[1] Writing to this register clears all counter values (if performed while counting, the first edge could be missed).
[2] If mode register is set to counter mode.
[3] If mode register is set to incremental encoder mode

# 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

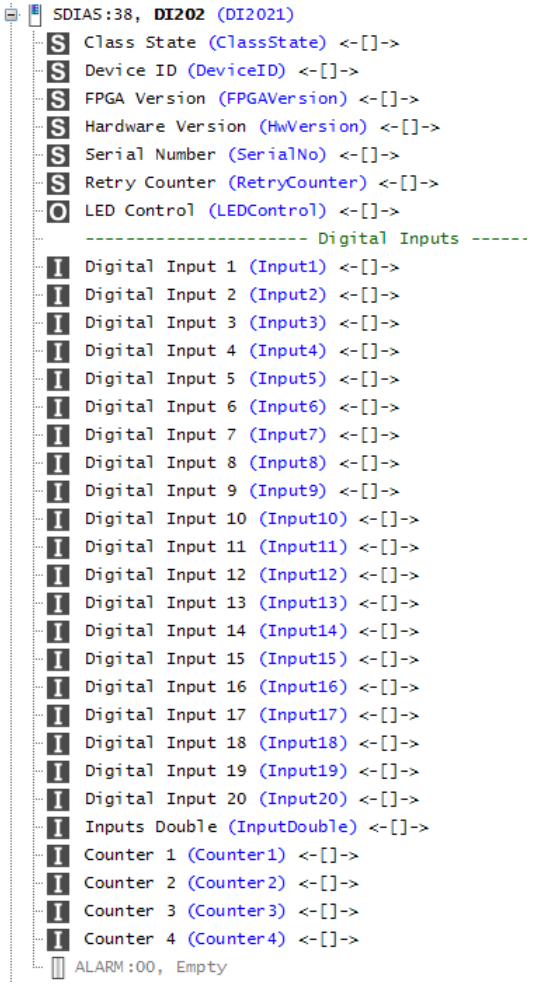
**INFORMATION**

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 DI202

**Hardware Class DI202 for the S-DIAS DI202 digital input module**




This hardware class is used to control the DI 202 hardware module with 20 digital inputs and 4 counters. More information on the hardware can be found in the module documentation.

## 16.1 Interfaces

### 16.1.1 Clients

| | |
|---|---|
| **SdiasIn** | The client must be connected to an S-DIAS port, an "SdiasOut"_[x]" server. |
| **Place** | The physical location of the hardware module is entered in this client. Up to 64 modules, 0 to 63, can be assigned. |
| **Required** | 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. |
| **CounterMode[1,2]** | Setting the counter 1 or 2.<br>0 – no counter<br>1 – counter counts with rising edge from Input1 and 2 or Input3 and 4<br>2 – incremental encoder (Input1 and 2 or Input3 and 5)<br>as initialization value |

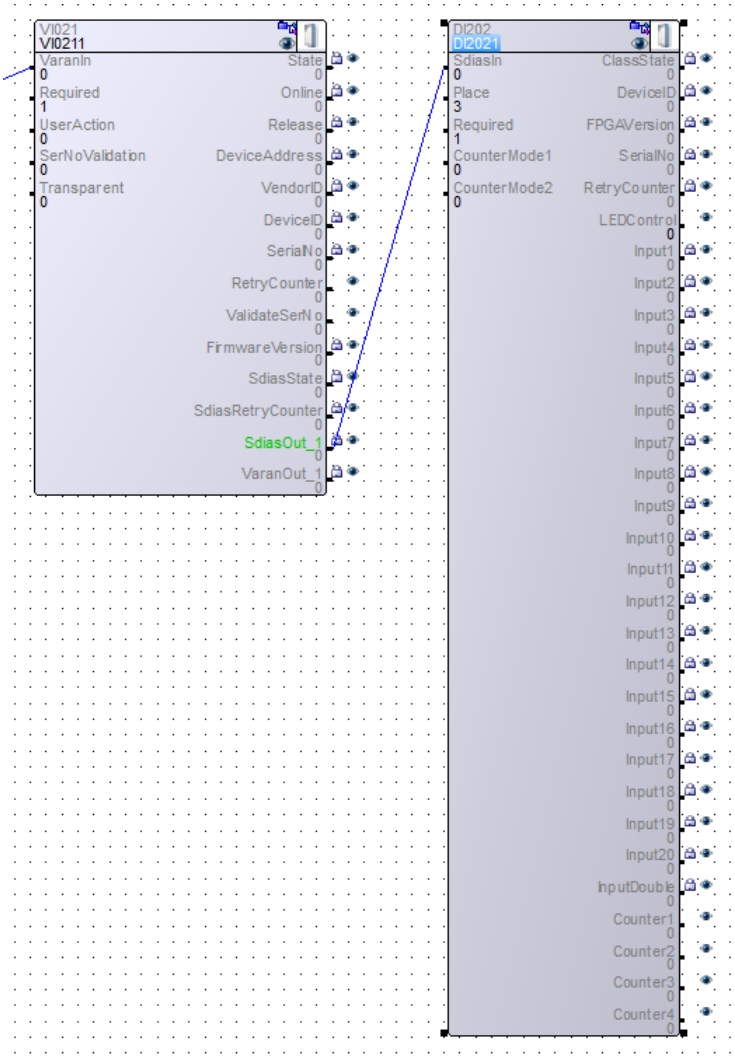
### 16.1.2 Servers

| | |
|---|---|
| **ClassState** | This server shows the actual status of the hardware class. |
| **DeviceID** | The device ID of the hardware module is shown in this server. |
| **FPGAVersion** | FPGA version of the module in 16#XY (e.g. 16#10 = version 1.0). |
| **SerialNo** | The serial number of the hardware module is shown in this server. |
| **RetryCounter** | This server increments when a transfer fails. |
| **LEDControl** | 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:<br>0 LED off<br>1 LED on<br>2 blinks slowly<br>3 blinks rapidly |
| **Input[1-20]** | Status of input 1-20 |
| **InputDouble** | In this server, the digital outputs are shown in a 32-bit field. Bits 0 to 19 are assigned to inputs 1 to 20 in this double word. |
| **Counter1** | CounterMode1<br>0 disabled<br>1 normal counter input 1<br>2 incremental encoder input 1 and 2<br>Counter can be reset with the write method of the server. |
| **Counter2** | CounterMode1<br>0 disabled<br>1 normal counter input 2<br>2 disabled<br>Counter can be reset with the write method of the server. |
| **Counter3** | CounterMode2<br>0 disabled<br>1 normal counter input 3<br>2 normal counter input 3 and 4<br>Counter can be reset with the write method of the server. |
| **Counter4** | CounterMode2<br>0 disabled<br>1 normal counter input 4<br>2 disabled<br>Counter can be reset with the write method of the server. |

### 16.1.3 Communication Interfaces

| | | |
|---|---|---|
| **ALARM** | Downlink | With this downlink the corresponding alarm class can be placed via the hardware editor. |

## 16.2 Example


VI021
VI0211
VaranIn
0
Required
1
UserAction
0
SerNoValidation
0
Transparent
0
State
0
Online
0
Release
0
DeviceAddress
0
VendorID
0
DeviceID
0
SerialNo
0
RetryCounter
0
ValidateSerNo
0
FirmwareVersion
0
SdiasState
0
SdiasRetryCounter
0
SdiasOut_1
0
VaranOut_1
0
DI202
DI2021
SdiasIn
0
Place
3
Required
1
CounterMode1
0
CounterMode2
0
ClassState
0
DeviceID
0
FPGAVersion
0
SerialNo
0
RetryCounter
0
LEDControl
0
Input1
0
Input2
0
Input3
0
Input4
0
Input5
0
Input6
0
Input7
0
Input8
0
Input9
0
Input10
0
Input11
0
Input12
0
Input13
0
Input14
0
Input15
0
Input16
0
Input17
0
Input18
0
Input19
0
Input20
0
InputDouble
0
Counter1
0
Counter2
0
Counter3
0
Counter4
0

# Documentation Changes

| Change date | Affected page(s) | Chapter | Note |
|---|---|---|---|
| 24.10.2013 | 3 | 1.1 | Input frequency 1-4 and counter frequency input 1-4 added |
| 23.12.2013 | 6 | 3 Connector Layout | Changed image |
| 11.02.2014 | 6<br>7<br> | 3 Connector Layout<br>3.2 Applicable Connectors<br>4.1 Wiring Example | Changed image<br>Connection capacity added, French notes added<br>Added wiring schematic |
| 01.04.2014 | 3<br>9 | 1.3 Miscellaneous<br>5 Mounting | UL added<br>Text updated |
| 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 |
| 15.06.2015 | 3 | 1.2 Electrical Requirements | Changed values in table Current consumption on the<br>S-DIAS bus (+5 V supply) |
| 28.04.2016 | 12 | 5 Mounting | Graphics distances |
| 17.08.2017 | 5<br>8 | 1.4 Environmental Conditions<br>3.2 Applicable Connectors | Pollution Degree<br>Sleeve length added<br>Added info regarding ultrasonically welded strands |
| 18.10.2017 | 9<br>13 | 3.3 Label Field<br>5 Mounting | Added chapter<br>Graphic replaced |
| 13.02.2018 | 3 | 1.3 Safety-Relevant Parameters | Chapter added |
| 14.11.2019 | 15 | 7 Supported Cycle Times | Chapter added |
| 28.02.2020 | 15 | 7 Supported Cycle Times | Text adapted |
| 08.09.2020 | 17 | 8 Hardware Class DI202 | Chapter added |
| 04.11.2020 | 13 | 5 Mounting | Expansion functional ground connection |
| 24.08.2021 | 4 | 1.1 Digital Input Specifications | Signal level and Switching threshold |
| 03.06.2022 | 6 | 1.4 Miscellaneous | HW version |

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|---|---|---|---|
| 06.12.2022 | 6 | 1.4 Miscellaneous | UKCA conformity |
| 26.07.2023 | | Document | General chapters added, design |