IIO 041

S-DIAS Interface SDCI Master

Instruction Manual

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Translation of the Original Instructions

S-DIAS SDCI Master Module IIO 041

with 4 SDCI ports and 4 digital inputs

The S-DIAS Single-Drop Digital Communication Interface (SDCI) master module enables the connection of up to 4 intelligent SDCI sensors or SDCI actuators in compliance with the SDCI specification V1.1 according to IEC61131-9. All SDCI ports can also be configured as +24 V digital inputs or +24 V digital outputs. The module has a 24 V supply connection for powering the SDCI ports and connected SDCI devices. Additionally, the module has 4 standard +24 V/3.7 mA/0.5 ms digital inputs.

The SDCI devices are configured with the SDCI configuration tool integrated into LASAL Using the tool, an SDCI configuration file (IODD) can be loaded for each device and their parameters defined.

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 IIO 041

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

CE

EU Declaration of Conformity

The product IIO 041 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 SDCI Interface Specifications

Number of interfaces	4
Specification version	SDCI V1.1
Data transfer rate	4.8 kbit/s, 38.4 kbit/s, 230.4 kbit/s
SDCI supply	24 V (via power switch, short-circuit proof)
SDCI supply current	maximum 500 mA per connection
SDCI switching signal	+24 V and GND switching
SDCI switching current	maximum 500 mA
Connection technology	3-wire (unshielded)
Cable length	maximum 20 m
wire resistance	maximum 6 Ω
wire capacity	maximum 3 nF
Status LEDs	yes

5.2 SDCI Interface as a Digital Output

Output signal	+24 V-switching
Short-circuit proof	yes
Maximum continuous current load/channel allowed	0.25 A
Maximum total current (all channels)	1 A (100 % of on-time)
Maximum braking energy of outputs (inductive load)	maximum 1 Joule/channel
Residual current output (off)	≤ 10 µA
Turn-on delay	< 10 µs
Turn-off delay	< 10 µs

5.3 SDCI Interface as a Digital Input

Input voltage[1]	typically +24 V	maximum +30 V
Signal level	low: < +8 V	high: > +14 V
Switching threshold	typically +11 V	
Input current	6.8 mA at +24 V	
Input delay	typically 0.5 µs	

[1] The input voltage cannot exceed the +24 V SDCI supply.

5.4 Digital Input Specifications

Number	4	
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	

5.5 Electrical Requirements

External +24 V supply	+18-30 V DC	
Current consumption external +24 V supply without actuators or sensors	typically 20 mA at +18 V typically 23 mA at +24 V typically 26 mA at +30 V	maximum 25 mA at +18 V maximum 29 mA at +24 V maximum 33 mA at +30 V
Current consumption external +24 V supply with actuators or sensors	Intrinsic current consumption of the external +24 V supply + current consumption of the connected SDCI actuators or sensors + switching current of the SDCI actuators or sensors (max. 3.0 A)	
Voltage supply from the S-DIAS bus	+24 V	
Current consumption on the S-DIAS bus (+24 V power supply)	typically 33 mA at +18 V typically 27 mA at +24 V typically 23 mA at +30 V	maximum 41 mA at +18 V maximum 34 mA at +24 V maximum 29 mA at +30 V

INFORMATION

If this S-DIAS module is connected to an S-DIAS supply module with several S-DIAS modules, the total current of the S-DIAS modules used must be determined and checked.

The total current of the +24 V supply cannot exceed 1.6 A!

The total current of the +5 V supply cannot exceed 1.6 A!

The specification for the current can be found in the module-specific documentation under "Electrical Requirements".

5.6 Voltage Monitor

Supply voltage +24 V SDCI	supply voltage > 18 V (corresponding DC OK-LED lights green)

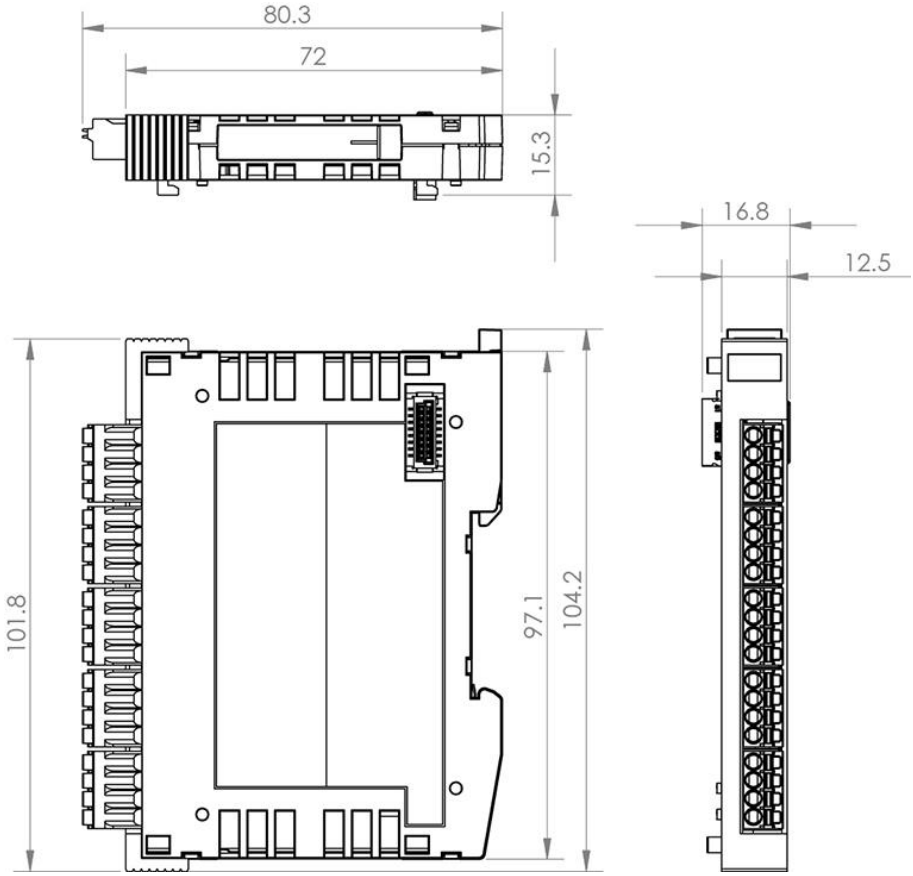
5.7 Miscellaneous

Article number	20-104-041
Standard	UL 508 (in preparation)

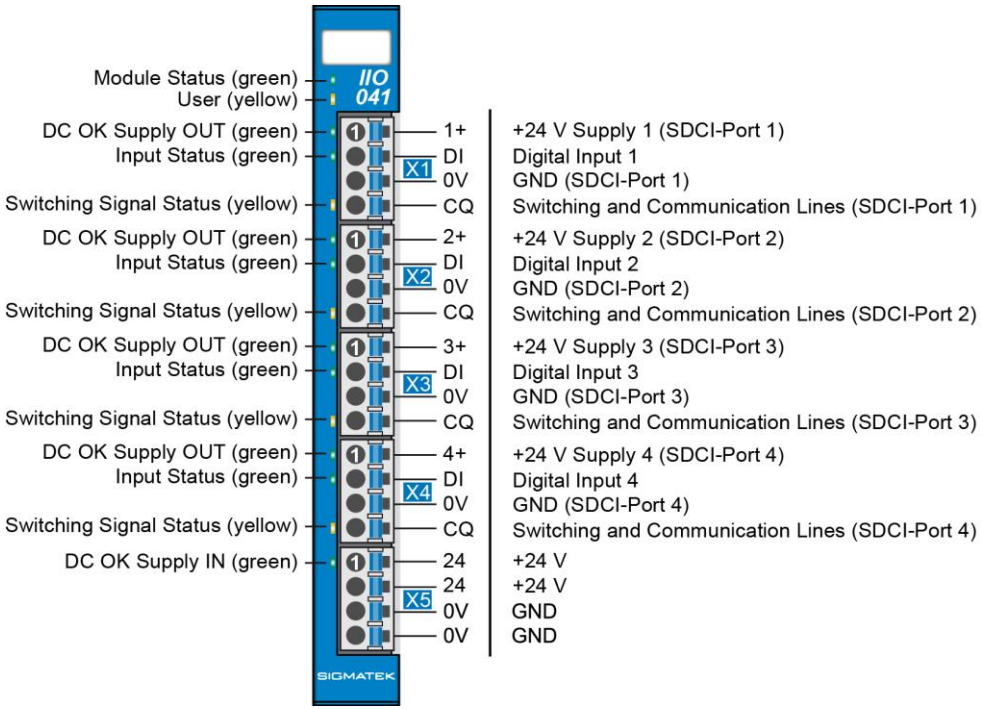
5.8 Environmental Conditions

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 1g from 8.4-150 Hz
Shock resistance	EN 60068-2-27	15 g
Protection type	EN 60529	IP20

6 Mechanical Dimensions



7 Connector Layout



INFORMATION

The connections of the +24 V supply (X5: pin 1 and pin 2) or the GND supply (X5: pin 3 and pin 4) are internally bridged. To supply the module, only one connection to a +24 V pin (pin 1 or pin 2) and a GND pin (pin 3 or pin 4) is required. The bridged connections may be used for further looping of the +24 V supply and the GND supply. However, it must be taken into account that a total current of 6 A per connection is not exceeded by the forward looping!

7.1 Status LEDs

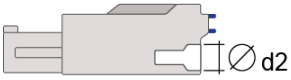
Module Status	green	ON	module active
		OFF	no supply available
		BLINKING (5 Hz)	no communication
User	yellow	ON	can be set from the application (e.g. the module LED can be set to blinking through the visualization so that the module is easily found in the control cabinet)
		OFF	
		BLINKING (2 Hz)	
		BLINKING (4 Hz)	
DC OK Supply OUT	green	ON	+24 V supply SDCI port ON
		OFF	+24 V supply SDCI port OFF or shorted
Input Status	green	ON	input on
		OFF	input OFF
Switching Signal Status	yellow	ON	SDCI switching signal / in/output HIGH
		OFF	SDCI switching signal / in/output LOW
DC OK Supply IN	green	ON	+24 V supply available
		OFF	+24 V supply missing

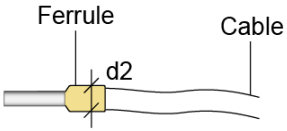
7.2 Applicable Connectors

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

Connections:

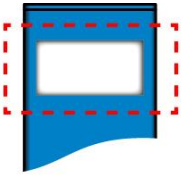
Stripping length/Sleeve length:	10 mm
Mating direction:	parallel to the conductor axis or circuit board
Conductor cross section rigid:	0.2-1.5 mm^2
Conductor cross section flexible:	0.2-1.5 mm^2
Conductor cross section ultrasonically compacted:	0.2-1.5 mm^2
Conductor cross section AWG/kcmil:	24-16
Conductor cross section flexible with ferrule without plastic sleeve:	0.25-1.5 mm^2
Conductor cross section flexible with ferrule with plastic sleeve:	0.25-0.75 mm^2 (reason for reduction d2 of the ferrule)





d2 = max. 2.8 mm

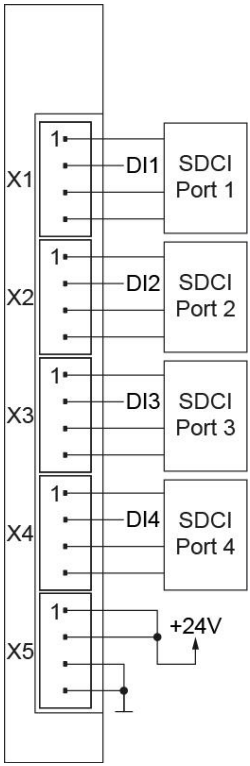
7.3 Label Field



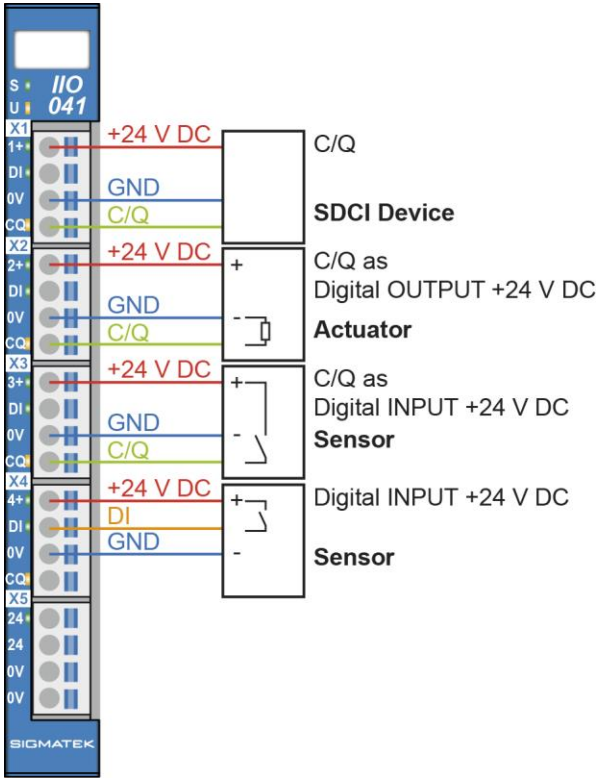
Manufacturer	Weidmüller
Type	MF 10/5 CABUR MC NE WS
Weidmüller article number	1854510000
Compatible printer	Weidmüller
Type	Printjet Advanced 230V
Weidmüller article number	1324380000

8 Wiring

8.1 Wiring Example



8.2 Wiring Versions



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.

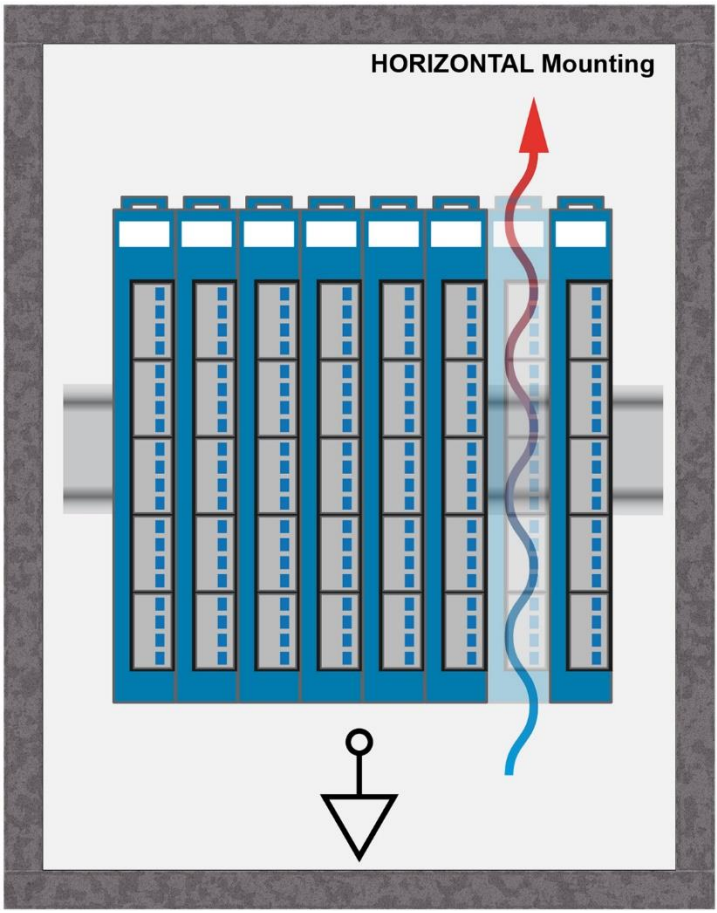
INFORMATION

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.

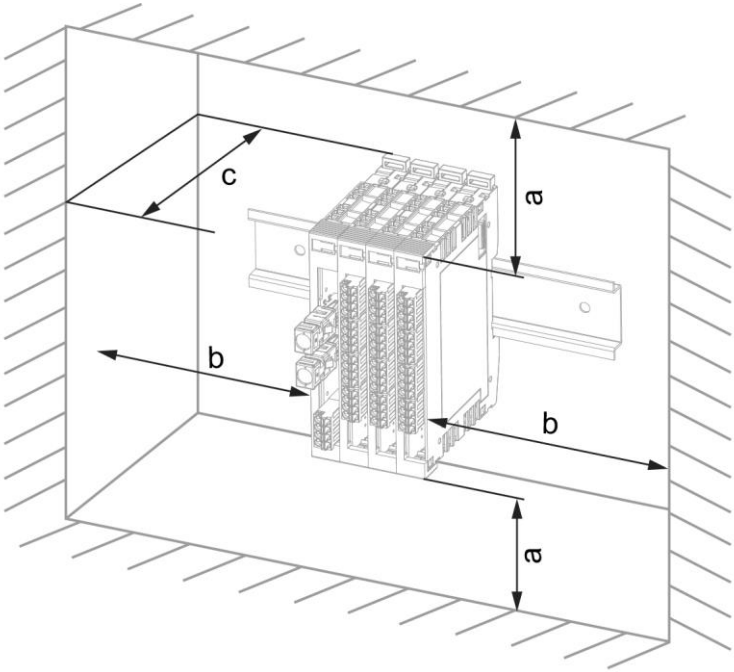
Damaged components can disrupt or damage the system.

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:

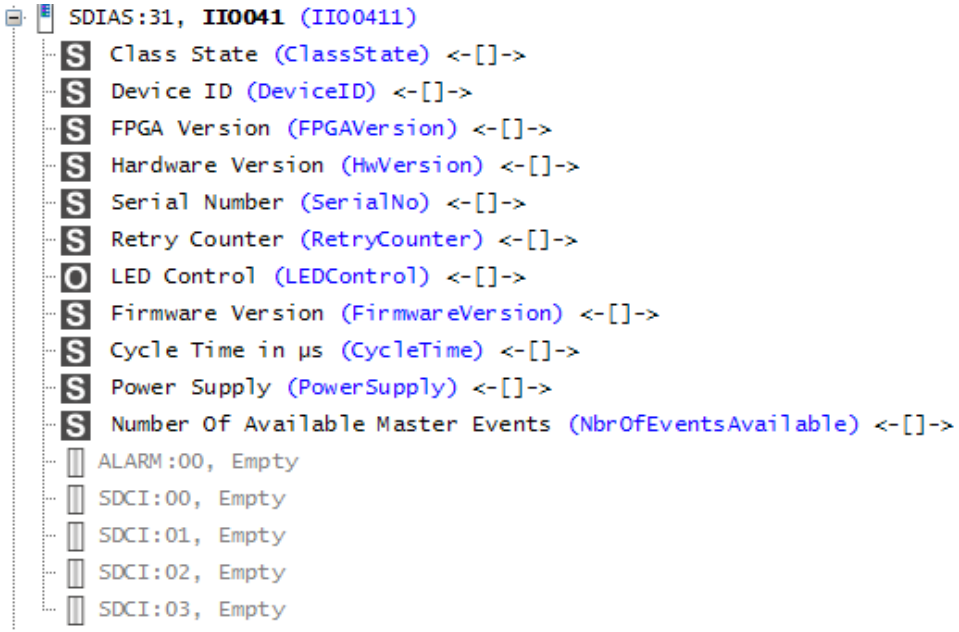


a	b	c
30 mm (1.18˝)	**30 mm** (1.18˝)	**100 mm** (3.94˝)

a, b, c … distances in mm (inches)

10 Hardware Class IIO041

Hardware Class IIO041 for the 4-port S-DIAS master module II041



This hardware class is used to control the the IIO 041 hardware module with 4 ports, which can be used as either a connection for SDCI devices (Single Drop Communication Interface), 24 V digital inputs or 24 V digital outputs. More information on the hardware can be found in the module documentation.

10.1 General

Class State	State	Shows the actual status of the hardware class
Device ID	State	Shows the Device ID of the hardware module
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	Shows the serial number of the hardware module
Retry Counter	State	This server increments when a transfer fails
LED Control	State	With this output, the application LED of the S-DIAS module can be activated to find the module in the network more quickly. 0 LED off 1 LED on 2 blinks slowly 3 blinks rapidly
Firmware Version	State	The firmware version of the hardware module is shown in this server
Cycle Time in µs	State	Calculated cyclic time (in µs) of the SDCI system based on the SDIAS cyclic time. The cyclic time corresponds to the SDIAS cyclic time, when it is 1 ms or greater. If the SDIAS cycle time is less than 1 ms the SDIAS cycle time is set to 1 ms.
Power Supply	State	Voltage supply status. Bit 0 Port 1 Voltage OK Bit 1 Port 2 Voltage OK Bit 2 Port 3 Voltage OK Bit 3 Port 4 Voltage OK Bit 4 External voltage OK (24 V at connector X5)
Number Of Available Master Events	State	The number of master events available The events can (starting with the oldest) be retrieved with the GetEvent method
Required	Property	This property 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.
StartInInit	Property	0 Initialization of the connected sensors/actuators in Cylic task 1 Initialization of the connected sensors/actuators during initialization phase
MaxBufferSize	Property	Size of the FIFO buffer for the asynchronous commands in bytes. The individual entries in the buffer have variable sizes. One entry consists of 24 byte header + 0-232 bytes data.

10.1.1 Communication Interfaces

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

10.2 Global Methods

10.2.1 GetEvent

If the EventsAvailable server shows that master events are available, these can be retrieved via the GetEvent method.

Return parameters	Type	Description
OldestEventAvailable	t_SDCIEventDetails	This structure variable contains the details of the event that occurred. If no event is available, all bytes of the variable are 0 See description according to the table

10.2.2 Data structure t_SDCIEventDetails

EventInfo : t_EventInfo	BINT, by which each of the 4 bits are combined into one of the values described

Instance

0	Unknown
4	Application

Mode

1	Single shot
2	Disappeared
3	Appeared

Type

1	Notification
2	Warning
3	Error

Origin

0	Remote
1	Local

EventCode : t_EventCode	UINT enumeration, which contains the default error codes (each manufacturer can additionally define their own codes) E_EVENT_NO_MALFUNCTION (0) E_EVENT_GENERAL_MALFUNCTION (4096) E_EVENT_EXCESS_AMBIENT_TEMPERATURE (16656) E_EVENT_TOO_LOW_AMBIENT_TEMPERATURE (16672) E_EVENT_EXCESS_DEVICE_TEMPERATURE (16912) E_EVENT_TOO_LOW_DEVICE_TEMPERATURE (16928) E_EVENT_EXCESS_PERIPHERY_TEMPERATURE (17168) E_EVENT_TOO_LOW_PERIPHERY_TEMPERATURE (17184) E_EVENT_HW_COMPONENT_MALFUNCTION (20496) E_EVENT_LOW_SUPPLY_VOLTAGE_15V (20753) E_EVENT_LOW_SUPPLY_VOLTAGE_24V (20754) E_EVENT_LOW_SUPPLY_VOLTAGE_5V (20755) E_EVENT_SHORT_CIRCUIT (20817) E_EVENT_OUTPUT_STAGE (21520) E_EVENT_FUSE_S1 (21585) E_EVENT_FUSE_S2 (21586) E_EVENT_FUSE_S3 (21587) E_EVENT_SW_RESET_WATCHDOG (24592) E_EVENT_LOSS_OF_PARAMETER (25360) E_EVENT_PARAMETER_ERROR (25376) E_EVENT_PARAMETER_NOT_INITIALIZED (25392) E_EVENT_PARAMETER_NON_SPECIFIC (25408) E_EVENT_PARAMETER_CHANGED (25424) E_EVENT_PROCESS_DATA_MONITORING (33040) E_EVENT_EXCESS_PROCESS_VARIABLE_RANGE (35856) E_EVENT_EXCESS_MEASUREMENT_RANGE (35872) E_EVENT_TOO_LOW_PROCESS_VARIABLE_RANGE (35888) E_EVENT_ADVANCE_WARNING (35904) E_EVENT_EXTERNAL_MALFUNCTION (36864) E_EVENT_UV33UNDERVOLTAGE (49409) E_EVENT_OVERTEMPERATURE (49410) E_EVENT_UV24UNDERVOLTAGE (49411) E_EVENT_CQSHORTCUT (49412) E_EVENT_DSACCESSERROR (49665) E_EVENT_NEW_SLAVE (65313) E_EVENT_DEV_COM_LOST (65314) E_EVENT_DS_IDENT_MISMATCH (65315) E_EVENT_DS_BUFFER_OVERFLOW (65316) E_EVENT_DS_ACCESS_DENIED (65317) E_EVENT_DS_INCORRECT_EVENT (65329) E_EVENT_DS_UPLOAD_REQ (65425)

10.3 Internal Properties

10.3.1 Behavior Asynchronous Communication (SDOs)

The asynchronous communication of the SDCIDevices (e.g. SDCIDevice_AsyncPara) is managed by the SDCI master class (e.g. IIO041). It has only one asynchronous channel to the module and can therefore only process the asynchronous accesses in sequence. This means, for example, if the SDCI device communicates asynchronously on port 1, it is blocked on the other ports for this period.

10.3.2 Behavior SDCI Device at Project Start

After the project is uploaded, the enable is set in all ports that should be started in SDCI mode. For this reason, the objects are not immediately ready.
During the process, _NotInitialized is displayed in the ClassState server and in ActualMode, _Inactive is shown.

If the process is completed successfully, the ClassState server displays _ClassOk and in ActualMode _SDCI is shown.

10.3.3 Auto Connect Function of the SDCI Devices

The function of the Auto Connect of SDCI devices is described in the SDCIDevice help.
The Auto Connect function is supported starting with SDCIDevice v1.5 and IIO041 v1.12.

11 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.

12 Storage

INFORMATION

When not in use, store the operating panel according to the storage conditions. See chapter 11.

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

13 Maintenance

INFORMATION

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

13.1 Service

This product was constructed for low-maintenance operation.

13.2 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 11 Transport/Storage.

14 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.

Documentation Changes

Change date	Affected page(s)	Chapter	Note
01.03.2017	12	4.2 Wiring Versions	added
17.08.2017	6	1.8 Environmental Conditions	Pollution Degree
	10	3.2 Applicable Connectors	Sleeve length added Added info regarding ultrasonically welded strands
18.10.2017	11	3.3 Label Field	Added chapter
	15	5 Mounting	Graphic replaced
20.09.2018		3 Connector Layout	Note added
14.11.2019	17	6 Supported Cycle Times	Chapter added
28.02.2020	17	6 Supported Cycle Times	Text adapted
28.05.2020	17	6 Supported Cycle Times	Chapter removed
08.09.2020	17	6 Hardware Class IIO041	Chapter added
04.11.2020	15	5 Mounting	Expansion functional ground connection
26.07.2023		Document	General chapters added, design