

ISE 031

S-DIAS Interface Module RS232 / RS485 / TTY

Instruction Manual

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Translation of the Original Instruction

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S-DIAS Interface Module

ISE 031

with 1 RS232 interface with handshake lines

or 2 RS232 interfaces without handshake lines⁽¹⁾

1 RS485 interface with switchable termination and spread resistors

1 TTY

The S-DIAS ISE 031 interface module has an RS232 interface with the handshake signals RTS and CTS, an RS485 and active TTY interface. Alternatively to the handshake signals, these signals can be configured as a second RS232 interface. In this configuration, two independent RS232 interfaces without handshake lines are available. Both RS232 interfaces support data rates up to 115200 Baud.

The ISE 031 also has an RS485 interface with switchable 120 Ω termination and spread resistors (switchable via software). The RS485 interface is overvoltage-proof up to 15 V and can be operated with data rates up to 921600 Baud.

⁽¹⁾ switchable via software starting with HW version 4.20



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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 ISE 031

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



EU Declaration of Conformity

The product ISE 031 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

	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 Performance Data

Interfaces	1x RS232 or 2x RS232 ⁽¹⁾ 1x RS485 1x TTY (20 mA)		
Adjustable data transfer rates	RS232	2400 Baud, 4800 Baud, 9600 Baud, 19200 Baud, 38400 Baud, 57600 Baud, 62500 (starting from HW-Version 1.1), 115200 Baud	
	RS485	2400 Baud, 4800 Baud, 9600 Baud, 19200 Baud, 38400 Baud, 57600 Baud, 62500 Baud (starting with HW-Version 1.1), 115200 Baud 230400 Baud, 460800 Baud, 921600 Baud ⁽²⁾ (starting with HW-Version 4.10)	
	TTY	2400 Baud, 4800 Baud, 9600 Baud	
Over voltage protection	RS232	pin RxD	±30 V
		pin TxD	±15 V
	RS485	pin A/B	-9 ... +14 V
	TTY	pin 20 mA	70 V
Spread resistor	RS485 (starting from HW-Version 3.0)	1 kΩ => 5 V 1 kΩ => GND internally settable	
Terminating resistor		120 Ω internally settable	
TTY voltage drop	Rx < 3 V	Tx < 2 V	
Maximum connectable TTY participants	depends on the voltage drop on the participants, cables and connectors (up to a maximum of 6)		
Short-circuit proof	yes		
Status LEDs	yes		
Send buffer	120 Byte (up to HW-Version 4.10) 240 Byte (starting with HW-Version 4.10)		
Receive buffer	120 Byte (up to HW-Version 4.10) 784 Byte (starting with HW-Version 4.10)		

⁽¹⁾Starting with HW-Version 4.20 the RS232 interface can be configured via the software, so that instead of using the handshake signals, a second RS232 interface is used at the position of the RTS and CTS handshake lines. For both interfaces, only the receiving lines TxD and RxD are available.

⁽²⁾Other configurable baud rates are possible. Details can be found in the hardware class documentation.

5.2 Electrical Requirements

Power supply +24 V	18-30 V DC UL: Class 2 or LVLC ⁽¹⁾	
Current consumption of the +24 V supply	maximum 100 mA	
Voltage supply from S-DIAS bus	+5 V	
Current consumption on the S-DIAS bus (+5 V supply)	typically 60 mA	maximum 76 mA

⁽¹⁾ Limited Voltage/Limited Current

INFORMATION



⁽¹⁾ Device shall be supplied by a secondary isolated source rated 24 V DC. Fuse in accordance with UL 249, rated max. 4 A shall be provided between the supply and device terminal.

INFORMATION

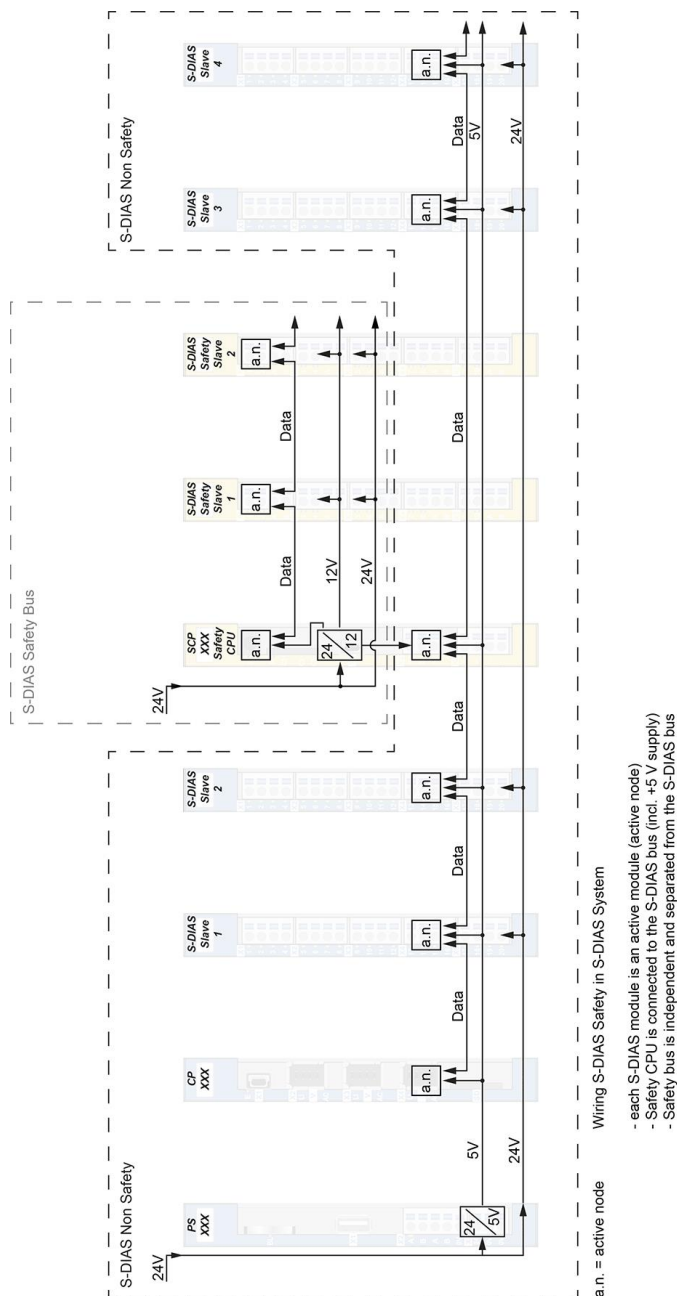


If this S-DIAS module is connected to an S-DIAS supply module with several S-DIAS modules, the total current of the modules used must be determined and checked.

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".



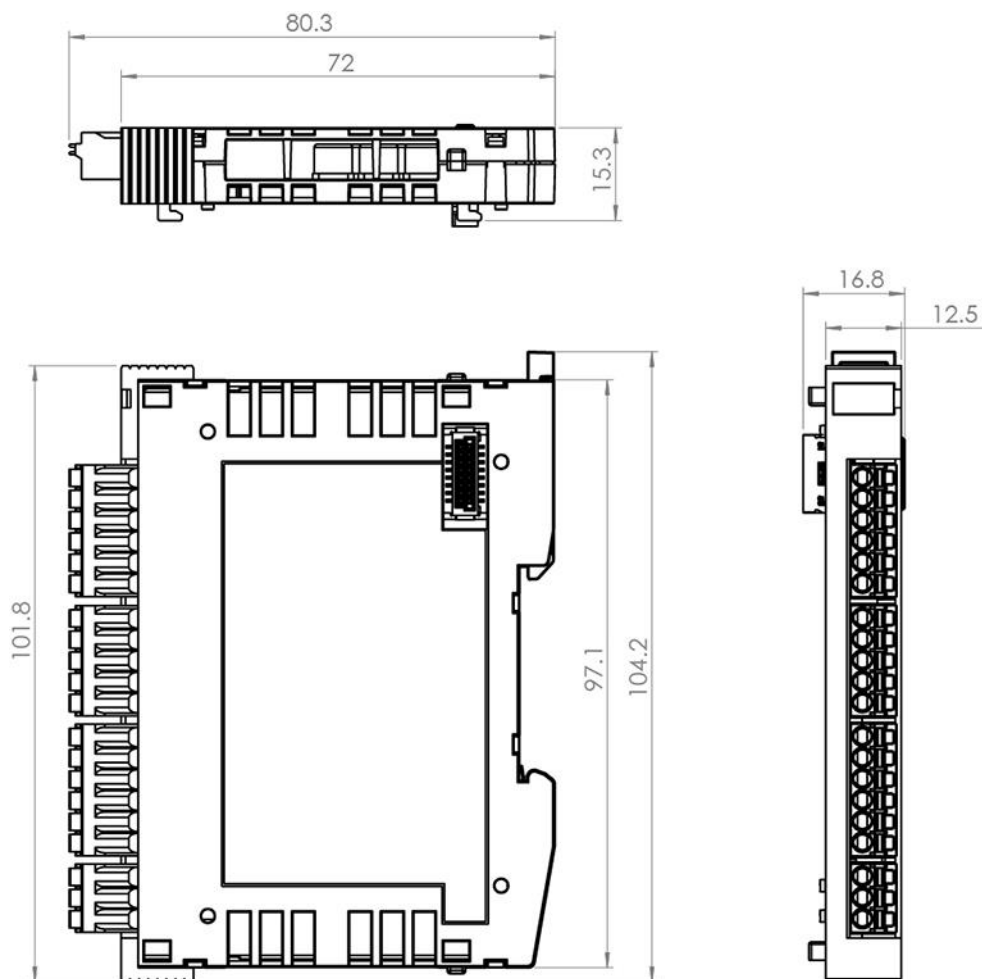
5.3 Miscellaneous

Article number	20-101-031
Standard	UL 508 (E247993)
Approbations	UL, cUL, CE

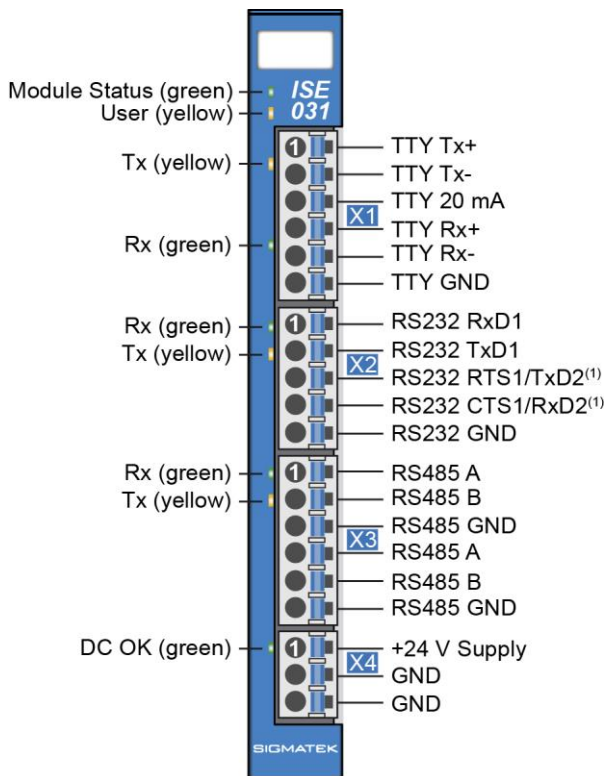
5.4 Environmental Conditions

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



⁽¹⁾starting with HW Version 4.20

INFORMATION



The GND supply (X4: Pin 2 and Pin 3) is internally bridged. Only one GND pin (pin 2 or pin 3) is required to power the module. The bridged connections may be used for further looping of 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
		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)	
TTY Tx	yellow	BLINKS	sending data
TTY Rx	green	BLINKS	receiving data
RS232 Rx	green	BLINKS	receiving data ⁽¹⁾
RS232 Tx	yellow	BLINKS	sending data ⁽¹⁾
RS485 Rx	green	BLINKS	receiving data
RS485 Tx	yellow	BLINKS	sending data
DC OK	green	ON	module is supplied with +24 V

⁽¹⁾only the first RS232 interface has Rx/Tx LEDs!

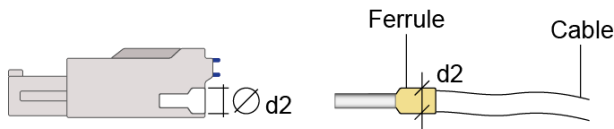
7.2 Applicable Connectors

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
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)



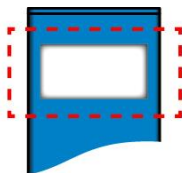
d2 = max. 2.8 mm

INFORMATION



The S-DIAS module CANNOT be connected or disconnected while voltage is applied!

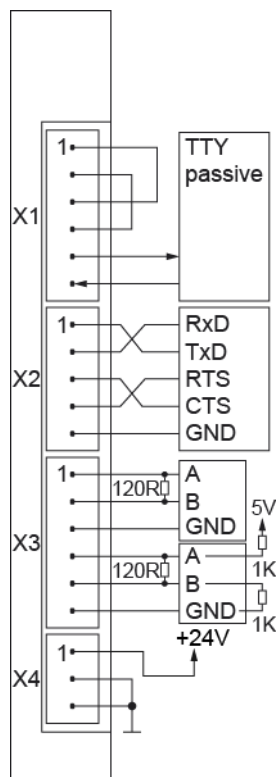
7.3 Label Field



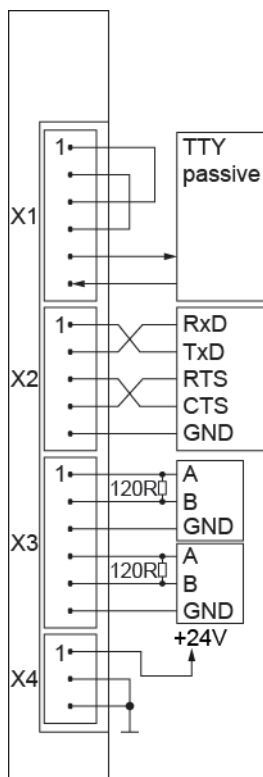
Manufacturer	Weidmüller
Type	MF 10/5 CABUR MC NE WS
Weidmüller article number	1854510000
Compatible printer	Weidmüller
Type	Printjet Advanced 230V
Weidmüller article number	1324380000

8 Wiring

8.1 Example Connection



8.2 Example Connection (starting from HW-Version 3.0)

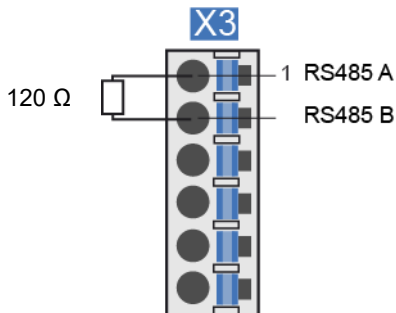


8.3 RS485 Guidelines

8.3.1 General Data / Specifications

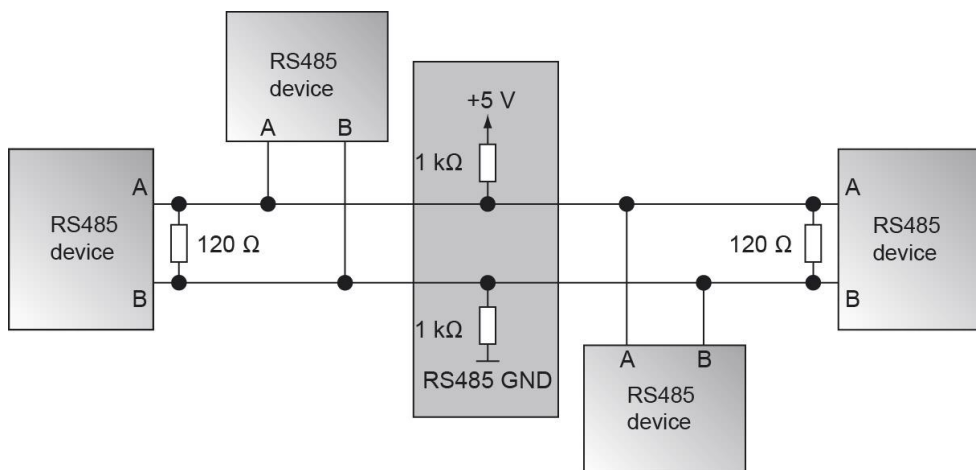
- For wiring data cables, twisted pair cables with shielding must be used!
- Spread resistors provided internally, which can be set via the application (starting from HW-Version 3.0).
- Terminating resistors provided internally, which can be set via the application (starting from HW-Version 3.0)
- Maximum bus participants: 32 participants
- Maximum length: 500 m (ISO Norm 8482) (cable length is the complete length including the stubs)
- External spread and terminating resistors can be used, however, the internally provided resistors can no longer be activated via the application.

8.3.2 Connection to ISE 031 (up to HW-Version 3.0)

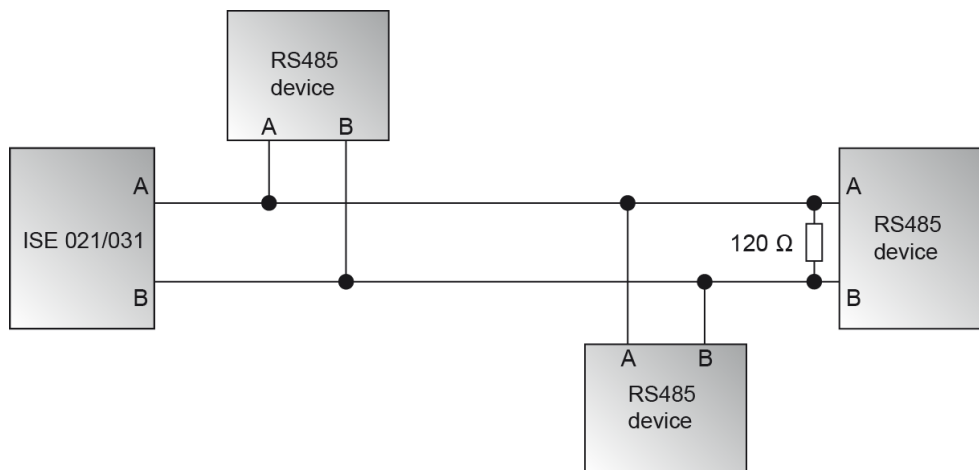


8.3.3 Wiring

- Because the RS485 requires a defined quiescent point, a pull-up and pull-down resistor is required in addition to the termination resistor. These resistors can be placed at any location. The +5 V supply shown in the diagram above is generated externally.
- The 120 Ω terminating resistors must be placed at each bus end.
- Star wiring should be avoided.



8.3.3.1 Starting from HW-Version 3.0



8.4 RS232 Guidelines

8.4.1 General Data / Specifications

- For RS232 connections, shielded data cables must be used!
- Maximum bus participants: 2 participants
- Maximum length: 15 m

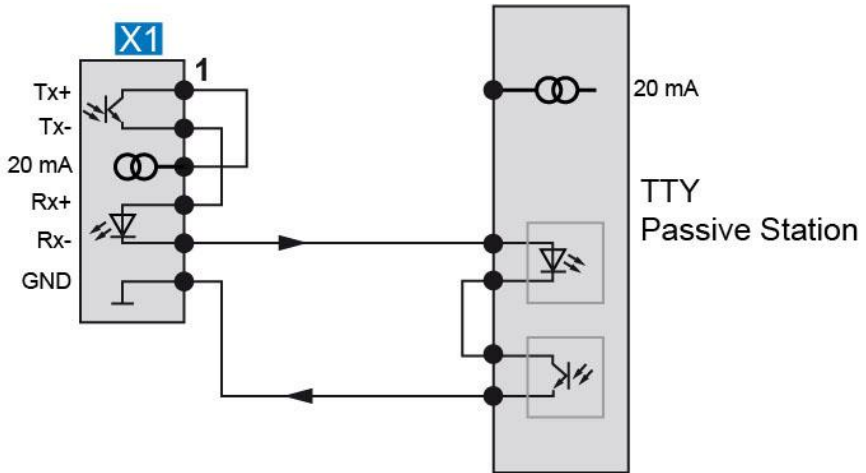
8.5 TTY Guidelines

8.5.1 General Data / Specifications

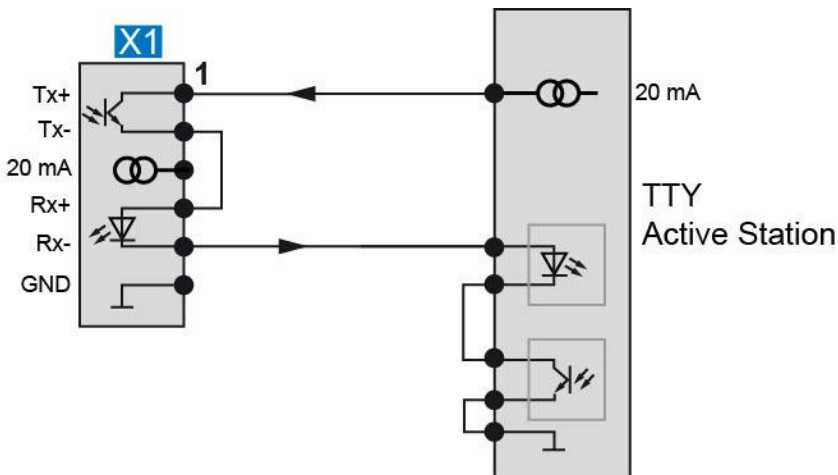
- For wiring data cables, twisted pair cables with shielding must be used!
- Maximum bus participants during active operation: The sum of the voltage drop of all participants (Rx, Tx) including on cables and connectors should not exceed 30 V (this corresponds in practice to 3-6 participants).
- maximum cable length: 300 m
- Sender / receiver IC: Optic coupler

8.5.2 Wiring and Configuration

8.5.2.1 ACTIVE



8.5.2.2 PASSIVE



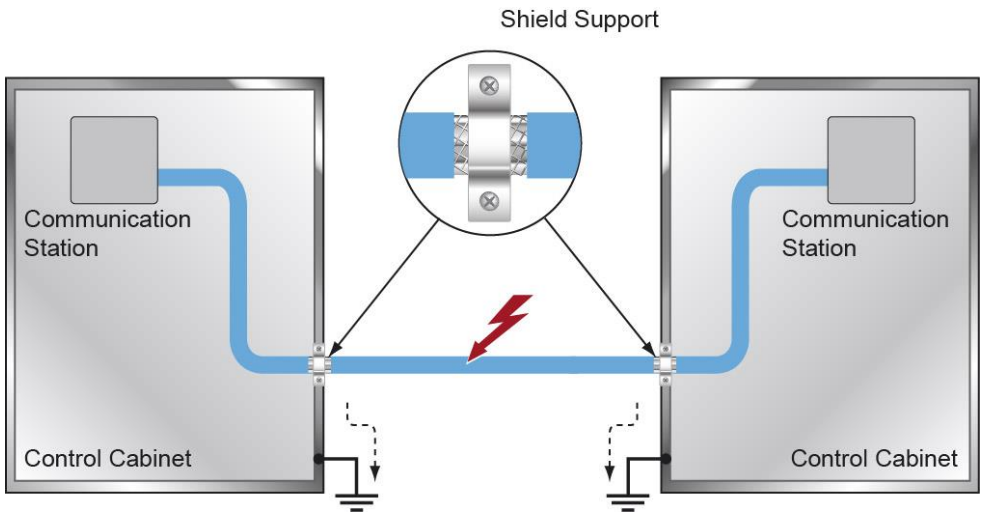
8.6 Shielding

The wiring for the RS232, RS485, and TTY must be shielded.

The low-ohm shielding is either connected at the entry to the control cabinet or directly before the ISE 031 over a large, low-ohm surface (cable grommets, grounding clamps)!

Noise signals can therefore be prohibited from reaching the electronics and affecting the function.

To avoid compensating currents from the PE, which flow over the shielding the conductors, it is recommended that the system components have low Ohm and low impedance connections to one another.



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

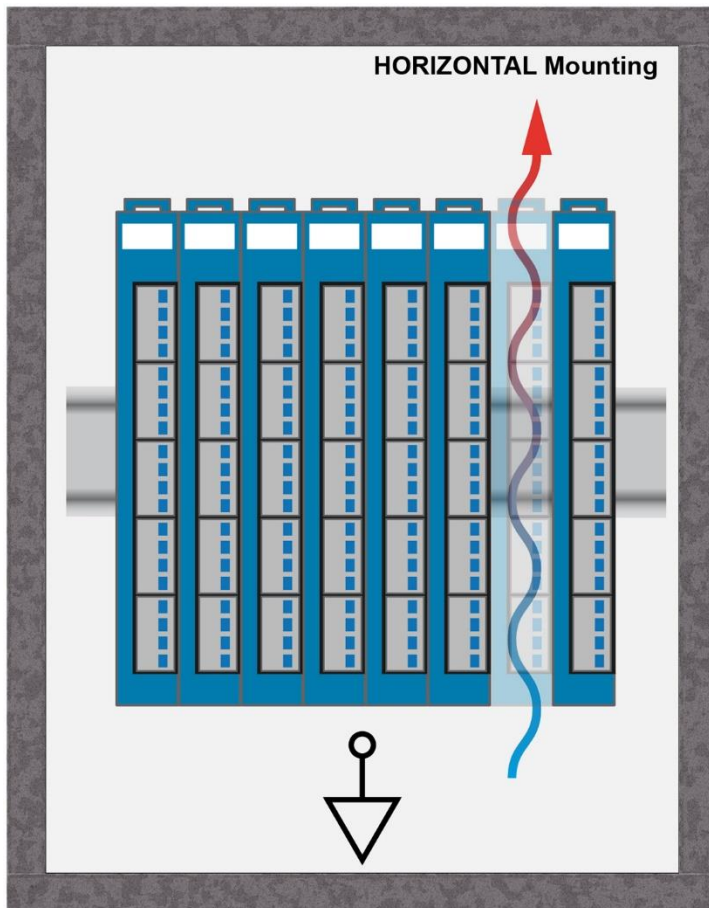


On receipt and before initial use, check the device for damage. If the device is damaged, contact our customer service and do not install the device in your system.

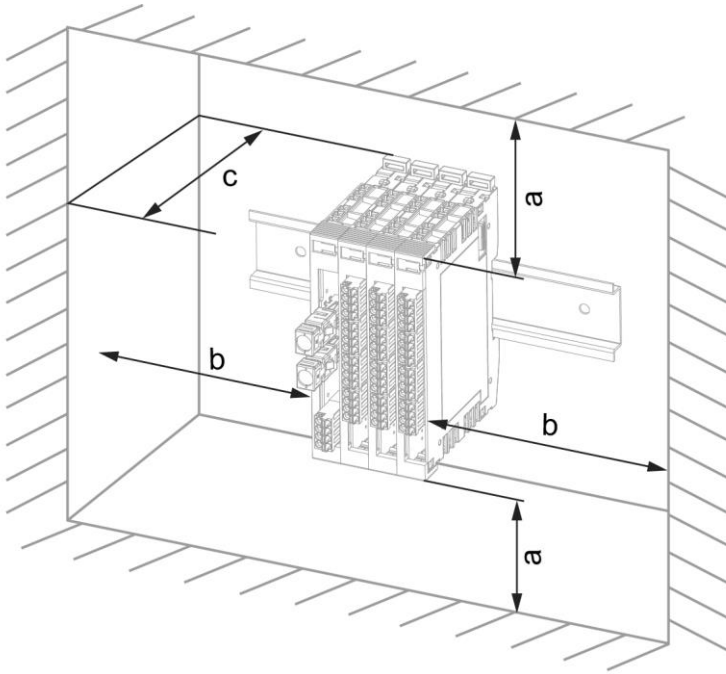
Damaged components can disrupt or damage the system.

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 Supported Cycle Times

10.1 Cycle Times below 1 ms (in μs)

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

x= supported

10.2 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

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.



15 Hardware Class ISE031

Hardware Class ISE031 for the S-DIAS ISE031 module

```
SDIAS:33, ISE031 (ISE0311)
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) <-[]->
I Voltage Ok (VoltageOk) <-[]->
I Over Voltage (OverVoltage) <-[]->
----- Serial Interface 1: TTY -----
I Serial Interface 1 (TTY) (SerInterface1) <-[]->
I Invalid Data Error Counter 1 (InvalidDataErrorCnt1) <-[]->
I Receive Buffer Overflow Error Counter 1 (RecBufOverflowErrorCnt1) <-[]->
----- Serial Interface 2: RS232 -----
I Serial Interface 2 (RS232) (SerInterface2) <-[]->
I Invalid Data Error Counter 2 (InvalidDataErrorCnt2) <-[]->
I Receive Buffer Overflow Error Counter 2 (RecBufOverflowErrorCnt2) <-[]->
----- Serial Interface 3: RS485 -----
I Serial Interface 3 (RS485) (SerInterface3) <-[]->
I Invalid Data Error Counter 3 (InvalidDataErrorCnt3) <-[]->
I Receive Buffer Overflow Error Counter 3 (RecBufOverflowErrorCnt3) <-[]->
ALARM:00, Empty
```

Properties	
 	
Object of class ISE031	ISE0312
Place	0
Required	Module is not required
⊕ Settings for 'ISE0312'	
⊖ Voltage 5000 [mV]	
Supply	0 [mA]
Drain	60 [mA]
UseParentBus	false
⊖ Voltage 24000 [mV]	
Supply	0 [mA]
Drain	0 [mA]
UseParentBus	false

Properties	
 	
Channel	SerInterface4
Maximal Read Length	16
Maximal Write Length	16
Activate Interface 4	activate

This hardware class is used to control the ISE 031 hardware module with 4 serial interfaces (TTY, RS232 1, 2 and RS485). Starting with FPGA version 2.0 the second RS232 interface can be activated. The pins RTS/CTS of the first RS232 interface are used as Tx/D 2 / Rx/D 2. More information on the hardware can be found in the module documentation.

15.1 Interfaces

15.1.1 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 the format 16#XY (e.g. 16#10 = version 1.0).
Hardware Version	State	Hardware version of the module in the 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 doesn't have to be available or error-free. However, which components that are to be identified as "not required" should be selected with regard to the safety of the system.

15.1.2 Serial Outputs 1-4

Voltage Ok	State	This server shows the voltage supply of the module. 0 no supply voltage 1 supply voltage OK
Over Voltage	State	This server shows an over voltage at the TTY interface. 0 no overvoltage 1 overvoltage detected
Serial Interface [1-4]	State	Object channel to call the _SerLib methods (see Global Methods).
Invalid Data Error Counter [1-4]	State	This server increments when a framing or parity error occurs.
Receive Buffer Overflow Error Counter [1-4]	State	This server increments, when the receive buffer overflows.

Max Read Length Interface [1-4]	Property	Here, the maximum read-length in bytes via S-DIAS per cycle is entered.	
		0	no transfer - If Rd and Wr = 0 the interface is deactivated
		16	standard value
		120	maximum size
Max Write Length Interface [1-4]	Property	Here, the maximum write-length in bytes via S-DIAS per cycle is entered.	
		0	no transfer - If Rd and Wr = 0 the interface is deactivated
		16	standard value
		120	maximum size
Activate Interface 4	Property	Here, the fourth interface (RS232 2) can be activated.	
		0	deactivated
		1	activated (supported since FPGA version 2.0)
RS485_Spread	Property	Here the internal spread of the RS485 can be activated or deactivated. This feature is available starting from HW version 3.0.	
		0	Spread not active
		1	Spread active
		-1	Feature is not available on this hardware
RS485_Term	Property	Here the internal terminating resistance of the RS485 can be activated or deactivated. This feature is available starting from HW version 3.0.	
		0	Terminating resistance not active
		1	Terminating resistance active
		-1	Feature is not available on this hardware

15.1.3 Communication Interfaces

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

The following methods are from the base class of the UART component (`_SerLib`) and can be called via the `SerInterface[1-4]` server.

15.2.1 StartUser

This function initializes the serial interface according to the input parameters.

Transfer parameters	Type	Description																						
Baud	DINT	Baudrate <table><tr><td>0</td><td>300</td></tr><tr><td>1</td><td>600</td></tr><tr><td>2</td><td>1200</td></tr><tr><td>3</td><td>2400</td></tr><tr><td>4</td><td>4800</td></tr><tr><td>5</td><td>9600</td></tr><tr><td>6</td><td>14400</td></tr><tr><td>7</td><td>19200</td></tr><tr><td>8</td><td>38400</td></tr><tr><td>9</td><td>57600</td></tr><tr><td>10</td><td>115200</td></tr></table>	0	300	1	600	2	1200	3	2400	4	4800	5	9600	6	14400	7	19200	8	38400	9	57600	10	115200
0	300																							
1	600																							
2	1200																							
3	2400																							
4	4800																							
5	9600																							
6	14400																							
7	19200																							
8	38400																							
9	57600																							
10	115200																							
Wordl	DINT	Word length: 5, 6, 7, 8 and 9 bits. 9-bit data mode (only available from FPGA version 1.2). Parity bit is used as a data bit. 1 bit of 2nd byte is used as 9 bit.																						
Parity	DINT	Parity <table><tr><td>0</td><td>NONE</td></tr><tr><td>1</td><td>ODD</td></tr><tr><td>2</td><td>EVEN</td></tr><tr><td>3</td><td>MARK</td></tr><tr><td>4</td><td>SPACE</td></tr></table>	0	NONE	1	ODD	2	EVEN	3	MARK	4	SPACE												
0	NONE																							
1	ODD																							
2	EVEN																							
3	MARK																							
4	SPACE																							
StopB	DINT	Stop bits: 1 = 1 stop bit, 2 = 2 stop bits for word lengths 6, 7 or 8 bits or 1.5 stop bits for a word length of 5 bits.																						
FifoOnOff	DINT	Not used here (relevant for _SerLib).																						
Return parameters	Type	Description																						
ErrorCode	DINT	<table><tr><td>0</td><td>OK</td></tr><tr><td>-3</td><td>invalid value for the baud rate</td></tr><tr><td>-4</td><td>invalid value for the parity setting</td></tr><tr><td>-5</td><td>invalid value for the stop bit setting</td></tr><tr><td>-6</td><td>invalid value for the word length</td></tr></table>	0	OK	-3	invalid value for the baud rate	-4	invalid value for the parity setting	-5	invalid value for the stop bit setting	-6	invalid value for the word length												
0	OK																							
-3	invalid value for the baud rate																							
-4	invalid value for the parity setting																							
-5	invalid value for the stop bit setting																							
-6	invalid value for the word length																							

If the function is called in the Init method, the availability of the 9-bit mode cannot be verified, because the FPGA version of the module is read out later.

The 9-bit mode can therefore only be called in the Init method if the user is sure that the module has an FPGA version of 1.2 or higher. When the function is called after the Init method, then the FPGA version is checked for compatibility.

15.2.2 StopUser

This function is not used here (relevant for `_SerLib`).

Transfer parameters	Typ	Description
none		
Return parameters	Typ	Description
ErrorCode	DINT	0 OK

15.2.3 SerSend

This function is needed to send data via the serial interface.

Transfer parameters	Type	Description
Buffer	pVoid	Pointer to the data buffer
Bufferlength	UDINT	Number of bytes to send
WrLen	^UDINT	Bytes actually sent. If this function is not required, NIL should be input.
Return parameters	Type	Description
ErrorCode	DINT	0 OK -15 length 0 or NIL pointer -20 no space available in the internal data buffer => Send less frequently!

15.2.4 SerClose

This function is not used here (relevant for `_SerLib`).

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
none		

15.2.5 SetOnline

This function is not used here (relevant for _SerLib).

Transfer parameters	Type	Description
State	DINT	Status 0 disable LASAL communication 1 enable LASAL communication
Return parameters	Type	Description
ErrorCode	DINT	-12 This function is not available here

15.2.6 RecvBlock

Reads a defined number of bytes from the receive buffer. The bytes read are then deleted from the receive buffer after the process.

Transfer parameters	Type	Description
Buffer	pVoid	Pointer to the data buffer
rdlength	UDINT	Number of bytes to read
rdlen	^UDINT	Pointer to the UDINT, to retrieve the number of bytes read that were read from the receive buffer.
Return parameters	Type	Description
ErrorCode	DINT	0 OK -15 length 0 or NIL pointer -19 no data in the buffer => Check buffer allocation via GetRecvState!

15.2.7 RecvChar

Reads a character from the receive buffer, The character read is deleted from the receive buffer after the procedure.

Transfer parameters	Type	Description
Buffer	pVoid	Pointer to the data buffer
Return parameters	Type	Description
ErrorCode	DINT	0 OK -15 NIL pointer -19 no data in the buffer => Check buffer allocation via GetRecvState!

15.2.8 GetRecvState

Returns the number of bytes in the receive buffer.

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
length	UDINT	Number of characters in the receive buffer

15.2.9 GetSendState

Returns the number bytes in the send buffer, which still have to be sent.

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
to_send	UDINT	Number of characters in the send buffer

15.2.10 GetError

Returns the actual error status. Calling this function resets the error status, so that new errors can be detected.

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
ErrorCode	DINT	See the the list of error codes for descriptions of the methods.

15.2.11 IsInitialized

Returns the actual status of the initialization (whether access to the S-DIAS bus is enabled).

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
Initialization	DINT	0 no initialized
		1 initialized

15.2.12 GetInfo

This function is not used here (relevant for _SerLib).

Transfer parameters	Type	Description
Info	^LSLAPI_SERIALINFO	Provides information over the serial interface.
Return parameters	Type	Description
ErrorCode	DINT	-12 This function is not available here.

15.2.13 SetBufferRecv

The default receive buffer size of the hardware class is 1024 bytes. With the help of this function, a larger buffer can be used. The user enters the pointer and buffer length, which is then used by the hardware class instead of the default buffer.

Transfer parameters	Type	Description
RecvBuffer	pVoid	Pointer to a new receive buffer
BufferLenght	UDINT	Size of the receive buffer
Return parameters	Type	Description
ErrorCode	DINT	0 OK
		-15 length 0 or NIL pointer

15.2.14 ClearRecvBuffer

The function deletes the receive buffer in the serial interface. This does not delete the characters in the receive buffer, but sets the read pointer equal to the write pointer.

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
ErrorCode	DINT	0 OK

15.2.15 RtsOnOff

This function sets or deletes RTS at the serial interface (Request to Send).

Transfer parameters	Type	Description
State	BOOL	Status 0 LOW (sending not allowed) 1 HIGH (default: sending allowed)
Return parameters	Type	Description
ErrorCode	DINT	See error codes.

15.2.16 rdRts

This function reads the status of the RTS pin (Request to Send).

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
State	BOOL	Status 0 LOW (sending not allowed) 1 HIGH (default: sending allowed)

15.2.17 rdCts

This function reads the status of the CTS pin (Clear to Send).

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
State	BOOL	Status 0 LOW 1 HIGH

15.2.18 DtrOnOff

This function is not used here (relevant for _SerLib).

Transfer parameters	Type	Description
State	BOOL	Status 0 LOW 1 HIGH
Return parameters	Type	Description
ErrorCode	DINT	See error codes -12 This function is not available here.

15.2.19 rdDtr

This function is not used here (relevant for _SerLib).

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
State	BOOL	Status -12 This function is not available here.

15.2.20 rdDcd

This function is not used here (relevant for _SerLib).

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
State	BOOL	Status -12 This function is not available here.

15.2.21 rdDsr

This function is not used here (relevant for _SerLib).

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
State	BOOL	Status -12 This function is not available here.

15.2.22 rdRI

This function is not used here (relevant for _SerLib).

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
State	BOOL	Status -12 This function is not available here.

15.2.23 SetRSMode

With this method, the mode of the serial interface can be changed in the RS485 interface.

Transfer parameters	Type	Description
Mode	UDINT	422 RS422 (this mode is not available) 485 RS485 with echo (default) 4850 RS485 without echo
Return parameters	Type	Description
ErrorCode	DINT	0 OK -12 mode change not possible with TTY and RS232 -15 invalid mode for RS485 interface

15.2.24 GetRSMode

This function reads the current interface mode.

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
Mode	DINT	232 RS232 (default) 422 RS422 (this mode is not available) 485 RS485 with echo (default) 4850 RS485 without Echo -12 TTY (no RS mode)

15.2.25 RecvTimingBlock

This function is not used here (relevant for _SerLib).

Transfer parameters	Type	Description
Buffer	pVoid	Pointer to the data buffer (buffer contains the time stamp of each byte received)
rdlengtht	UDINT	Number of bytes to read (time stamp)
rdlen	^UDINT	Pointer to UDINT for retrieving the number of bytes (time stamp), which were read from the receive buffer.
Return parameters	Type	Description
ErrorCode	DINT	-12 This function is not available here.

15.2.26 RecvTimingChar

This function is not used here (relevant for _SerLib).

Transfer parameters	Type	Description
Buffer	pVoid	Pointer to the data buffer (buffer contains the time stamp of the recommended bytes).
Return parameters	Type	Description
ErrorCode	DINT	-12 This function is not available here.

15.2.27 SetTimingBufferRecv

This function is not used here (relevant for _SerLib).

Transfer parameters	Type	Description
RecvBuffer	pVoid	Pointer to the new receive buffer (buffer contains the time stamp for each byte received)
BufferLength	UDINT	Size of the receive buffer
Return parameters	Type	Description
ErrorCode	DINT	-12 This function is not available here.

15.2.28 ClearTimingBuffer

This function is not used here (relevant for _SerLib).

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
State	DINT	Status -12 This function is not available here.

15.2.29 GetInterfaceTypee

The function returns the interface type.

Transfer parameters	Type	Description
none		
Return parameters	Type	Description
Retcode	DINT	2 InterfaceType S-DIAS

15.2.30 SetBaudrate

This function is used to set the desired baud rate. If this function is called once, then the baud rate setting via the StartUser method has no effect on the baud rate. It can then only be changed by calling the SetBaudrate method again.

Transfer parameters	Type	Description
BaudRate	DINT	Desired baud rate.
Return parameters	Type	Description
Retcode	DINT	-3 Baud rate not possible 0 Everything OK

Possible frequencies are:

- 1.8432 MHz
- In addition since FPGA version $\geq 1.2 \Rightarrow 1 \text{ MHz}, 7.3728 \text{ MHz}, 14.7456 \text{ MHz}$

Formula for the internal calculation:

Divisor = frequency / (baud rate * 16). The result must be an integer value for the divisor.

The method tries, depending on the FPGA version, the possible frequencies internally. If for the divisor, an integer value less than 16 # 4000 (14 bit) results, it is set in the FPGA register.

This results in the following possible baud rates:

8	50	192	576	1 600	4 800	15 360	62 500
9	60	200	600	1 800	5 120	15 625	76 800
10	64	225	625	1 920	5 760	18 432	92 160
12	72	240	640	2 048	6 144	19 200	102 400
15	75	250	720	2 304	6 250	20 480	115 200
16	80	256	768	2 400	6 400	23 040	153 600
18	90	288	800	2 500	7 200	25 600	184 320
20	96	300	900	2 560	7 680	28 800	230 400
24	100	320	960	2 880	9 216	30 720	307 200
25	120	360	1 024	3 072	9 600	31 250	460 800
30	125	384	1 152	3 125	10 240	36 864	921 600
32	128	400	1 200	3 200	11 520	38 400	
36	144	450	1 250	3 600	12 288	46 080	
40	150	480	1 280	3 840	12 500	51 200	
45	160	500	1 440	4 096	12 800	57 600	
48	180	512	1 536	4 608	14 400	61 440	

If the function is called in the init method, the availability of the extended baud rate mode cannot be checked, because the FPGA version of the module is read later.

The extended baud rate mode can therefore only be called in the init method, if the user is sure, that the module has an FPGA version of 1.2 or higher. Only if the function is called after the init method, the FPGA version can be checked for compatibility.

15.2.31 Meaning of the ErrorCodes

No.	Message	Definition
0	SERERROR_NONE	OK
-3	SERERROR_BAUDRATE	Baud rate <> 0-10, when calling the function SetBaudrate, the error code means that the given baud rate is not adjustable.
-4	SERERROR_PARITY	Parity <> 0-4
-5	SERERROR_STOPBIT	StStop bits <> 1-2
-6	SERERROR_WORDLENGTH	Invalid word length.
-12	SERERROR_NOTAVAILABLE	This function is not available.
-15	SERERROR_PARAMETER	Wrong parameter
-16	SERERROR_RECEIVE_BUFFER_FULL	The receive buffer is full.
-17	SERERROR_SEND_BUFFER_POINTER	A NIL pointer was passed to the send buffer or a data length of 0.
-19	SERERROR_RECEIVE_BUFFER_EMPTY	RecvChar or RecvBlock was called, however, there is NO data in the receive buffer.
-20	SERERROR_SEND_BUFFER_EMPTY	The send process could not be completed.
-22	SERERROR_PARITY_ERROR	Received character has the wrong parity
-23	SERERROR_FRAMING_ERROR	Received character has no valid stop bit

15.3 Internal Properties

15.3.1 Maximum Transfer Rates

If the set baud rate is higher than can be fetched per cycle, the receive buffer overflows. Starting with FPGA version 1.5 the receive buffer (from 120 to 784 bytes) and the send buffer (from 120 to 240 bytes) of the hardware have been increased.

Example 1

Baud rate ... 7 = 115200 bits/s this results in ~ 11.5 bytes per millisecond

Cycle time 1 ... 1 ms -> receive buffer does not overflow with local SDIAS and behind VARAN.

Cycle time 2 ... 8 ms -> receive buffer overflows with local SDIAS and behind VARAN.

With a cycle time of 1 ms, the received data can be retrieved.

Data is lost from a cycle time of 8 ms and a data packet larger than 120 bytes.

FPGA version 1.5: In this case, the receive buffer never overflows for a cycle time of 8 ms at the local SDIAS and behind VARAN from a data packet size of 5022 bytes upwards.

Example 2

Setting the baud rate via "SetBaudrate()" ... 460800 bits/s this results in ~ 46 bytes per millisecond

Cycle time 1 ... 1 ms -> receive buffer does not overflow with local SDIAS but it does behind VARAN.

Cycle time 2 ... 2 ms -> receive buffer overflows with local SDIAS and behind VARAN.

With a cycle time of 1 ms, the received data can be collected at the local SDIAS. The receive buffer overflows via VARAN from a data packet size of 517 bytes upwards.

With a cycle time of 2 ms and a data packet larger than 120 bytes, data is lost.

FPGA version 1.5: In this case, the receive buffer never overflows with a cycle time of 2 ms at the local SDIAS and behind VARAN it does starting from a data packet size of 5022 bytes.

Documentation Changes

Change date	Affected page(s)	Chapter	Note
18.07.2014	8	3 Connector Layout	Added wiring notice
21.11.2014	4	1.1 Performance Data	Adjustable data transfer rates
30.01.2015	9	3.2 Applicable Connectors	Added note concerning connecting the S-DIAS module while voltage is applied
05.03.2015	4	1.1 Performance Data	Added spread resistor and terminating resistor
	11	4.2 Example Connection (starting from ...)	Added Example Connection (starting from HW-Version 3.0)
	12	4.3.1 General Data/ Specifications	General Data/ Specifications edited
	14	4.3.3.1 Starting from HW-Version 3.0	Added wiring
26.03.2015	9	3.2 Applicable Connectors	Added connections
21.01.2016	4	1.2 Electrical Requirements	Norms changed
26.01.2016	4	1.2 Electrical Requirements	Graphics added
28.04.2016	21	5 Mounting	Graphics distances
17.02.2017	9	3 Connector Layout	LED colors
17.08.2017	7	1.4 Environmental Conditions	Pollution Degree
	11	3.2 Applicable Connectors	Sleeve length added Added info regarding ultrasonically welded strands
18.10.2017	12	3.3 Label Field	Added chapter
	22	5 Mounting	Graphic replaced
31.01.2018	4	1.1 Performance Data	New HW version
20.09.2018		3 Connector Layout	Note added
10.07.2019		Document	second RS232 added
14.11.2019	23	6 Supported Cycle Times	Chapter added
28.02.2020	23	6 Supported Cycle Times	Text adapted
08.09.2020	25	7 Hardware Class ISE031	Chapter added
04.11.2020	22	5 Mounting	Expansion functional ground connection

11.07.2022	6	1.2 Electrical Requirements	Current consumption +5 V corrected
20.04.2023	10	3 Connector Layout	Info box corrected
26.07.2023		Document	General chapters added, design

