EN



SMI2

RS485 Display

User guide

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CE

akYtec GmbH · Vahrenwalder Str. 269 A · 30179 Hannover · Germany · Tel.: +49 (0) 511 16 59 672-0 · www.akytec.de

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1 Safety guidelines

Please read through the user guide carefully before commissioning the device. Damages that arise from non-observance of the guidelines in the user guide shall be devoid of any liability.

- The device may only be used in the manner described in this user guide.
- No technical modifications may be made to the device.
- The device may not be used if the environmental conditions (temperature, humidity etc.) are not within the limits indicated in the specification.
- The device may not be used in explosive areas and there may be no chemically active substances in the atmosphere.
- The device should only be cleaned with a damp cloth. No abrasives or solvent-based cleaners should be used.

Non-observance of the safety guidelines may result in damage to the device and injury to users

2 Intended use

The device is intended for use in a RS485 network and supports the protocols Modbus RTU, Modbus ASCII and akYtec. It can operate either as a slave or a master.

The field of application of the device includes the control and monitoring of industrial processes. The device can be used in automated systems as a primary or secondary display.

The device may only be operated

- properly installed and
- in accordance with the specification.

Improper use

- The SMI2 may not be used for medical devices that sustain, monitor or otherwise affect human life or health.
- The device may not be used in potentially explosive environment.
- The device may not be used in an atmosphere with chemically active agents.

3 Specification

SMI2 can be ordered in two versions. They differ in the display color. Ordering key:

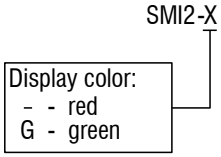
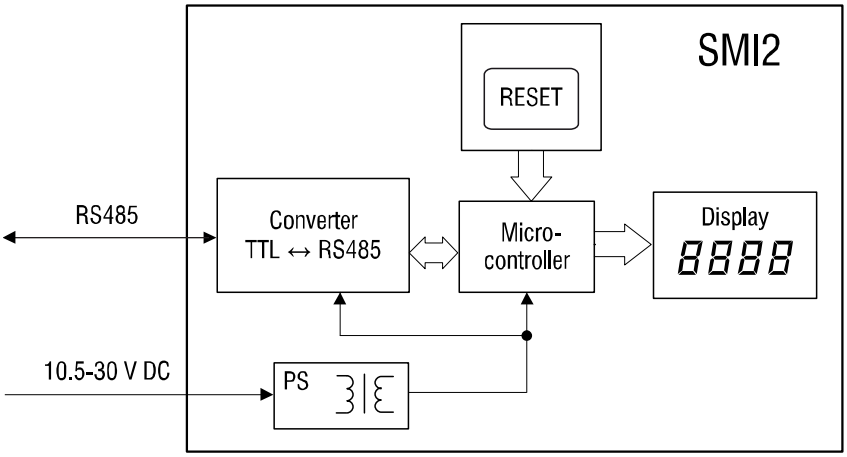


Table 3.1 Specification

Power supply	12 / 24 (10.5…30) V DC
Power consumption, max.	1.5 W
Protocol	Modbus RTU/ASCII, akYtec
Interface	RS485 (2-wire bus)
Baud rate	2.4…115.2 kbit/s
Display	LED, 7-segment display, 4-digit
Character height	14 mm
Display colour	red or green
IP Code	front IP65, rear IP20
Dimensions	48 x 26 x 65 mm
Weight	approx. 30 g
Protection class	III

Ambient temperature	-40…+70 °C
Storage temperature	-25…+70 °C
Humidity	up to 80% (non-condensing)
Galvanic isolation	yes

4 Functional description



PS – Power supply

Fig. 4.1 Block diagram

A 4-digit, 7-segment LED display (red) with 14 mm character height displays data received from the RS485 network, error messages and/or configuration parameters of the device.

The secondary voltage source with galvanic isolation guarantees a stable power supply to the device and offers protection against polarity reversal.

The **RESET** button is positioned on the cylindrical surface of the device. The button enables to retrieve the configuration parameters and to restore factory settings, if necessary.

The device has the following functions:

– receiving data from a master device in the slave mode
– querying data from a slave device in the master mode
– processing received data according to the set parameters
– displaying transmitted value
– displaying transmitted value of a type Int or Word with the set number of decimal points
– optional flashing function
– displaying errors if the data transfer is faulty or the received value cannot be displayed (see 6.5)
– displaying configuration parameters of the device
– modifying configuration parameters according to data received from the master

5 Installation and commissioning

5.1 Installation

The SMI2 is designed for switch panel mounting in a borehole of Ø22.5 mm (see Appendix A for dimensions).

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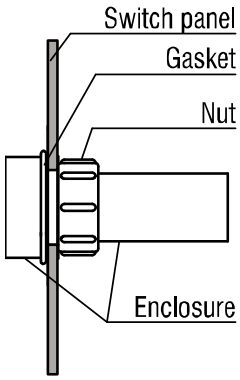


Fig. 5.1 Mounting

Carefully position the supplied gasket on the display rear surface. Insert the cylindrical part of the device into the borehole and tighten the nut from the rear side of the switch panel. Connect the device to the auxiliary voltage and signal cables in accordance with Appendix B.

The factory settings can be changed before assembly if necessary (see Appendix D.3). For this purpose the device must be connected to the RS485 interface of the programming device (PC) and to the auxiliary power supply. For further details see 5.3.

5.2 Programming

The display may only be programmed in the RS485 network with the communications protocol Modbus RTU/ASCII or akYtec in the slave mode. The protocol type is specified in the parameter *Protocol type* (**t.Pro**) (see Table D3).

The configuration software „Konfigurator SMI2“ allows to configure the device via the akYtec protocol. The CD with the configuration software is supplied with the device. Further steps are given in 5.3.

The parameters are divided into two main groups: the configuration parameters and transmitted data.

The configuration parameters are device information, network parameters and operating parameters. The latter determine how the device processes the received information.

The configuration parameters are constants and are saved in the permanent memory (Table D3).

The transmitted data are variable data exchanged between the master and slave. These are not saved (Table D4).

Each parameter has a name consisting of Latin letters (up to four), which can be separated by points.

5.3 Configuration

Required steps for configuration:

– Connect a USB/RS485 or RS232/RS485 converter (not supplied) to the PC
– Connect the display to the 24 V DC power supply and to the RS485 terminals of the converter according to Fig. B1
– Switch on auxiliary voltage
– Install and start SMI2 configuration software
– In the menu select “*Device -> Port configuration*…“ and set the parameters to the device factory settings (see 5.5)
– Check connection with the device (menu “*Device -> Check connection*”)
– A new device can be configured immediately.

As soon as the parameter *Protocol type* (**t.Pro**) is changed and saved, the communication with the device is interrupted. To enable the SMI2 configuration software to communicate with the device again, the “Factory settings” mode must be temporarily activated.

5.4 Configuration check

After the **RESET** button is pressed for a short time, the display extinguishes for 3 seconds, and all current parameters of the device are then displayed.

The parameters are presented in the following way:

– Parameter name (2 seconds),
– Parameter value (2 seconds),
– Pause (1 second),
– Next parameter.

The display order corresponds to the register number from the Table D3, column 2.

The **RESET** button must be pressed for a short time again to terminate the display of parameters.

5.5 Factory settings" mode

In this mode the device works within the factory settings, whereby the parameters configured by the user are saved and **not overwritten.** This function can be useful if the device must be configured and its network parameters are unknown.

To activate this mode, press the **RESET** button for more than 2 s. The flashing word **Fact** is displayed and the device accepts the factory settings (see Appendix D.1).

To disable the mode, the **RESET** button must be pressed again for more than 2 s or the command **APLY** must be sent by the master. The flashing word **Fact** then fades out and the device resumes the user parameters. The factory settings are effective as long as **Fact** is displayed.

▶ **NOTICE**

If the network parameters are queried in this mode, the values of the saved user network parameters are returned, not the factory setting.

6 Operation

The operating mode is automatically enabled as soon as the device is supplied with power.

The device supports master and slave modes. The mode can be set in the parameter **dEv.r** (see Table D3). The factory setting is 0 (slave).

6.1 Slave mode

In the slave mode the SMI2 receives the data from the master and processes it in accordance with the operating parameters. The results are shown on the display.

6.2 Master mode

To enable the master mode, the parameter **dEv.r** must be set to 1. To do this the "Factory settings" mode must be temporarily activated (see 5.5).

In the master mode the SMI2 sends requests to the slave device in the set cycle (parameter **SLA.P**). The following parameters must be configured:

– **SLA.A** - Address of the slave in the network
– **SLA.r** - Register number for the request
– **SLA.P** - Query cycle with increment of 100 ms, standard value – 10 (= 1 s)
– **SLA.F** - Modbus reading function (0x0003 or 0x0004)

The transmitted values are displayed in the same way in both modes in accordance with the set operating parameters.

▶ **NOTICE**

The master mode supports only the protocol Modbus RTU/ASCII

The device cannot be programmed in the master mode. To do this the "Factory settings" mode must be temporarily activated (see 5.5).

6.3 Operating parameters

The complete parameter list is provided in the Table D3.

The data type (Int, Word, Float, String, Image) for the data transmission is set in the parameter **dAtA**.

For data types Int and Word the transmitted values are displayed with the set decimal point position (parameter **dP**).

Table 6.1 Decimal point position

Parameter dP	Display	Factor
0	**----**	1
1	**----.**	1
2	**---.-**	10^{-1}
3	**--.--**	10^{-2}
4	**-.---**	10^{-3}

The transmitted value is displayed with or without flashing, depending on whether the value lies within or outside the alarm limits, and the set alarm logic. The flashing interval is set in the parameter **PF**.

6.4 Alarm logic

Any exceedance of the alarm limits is displayed by flashing LEDs in accordance with the alarm logic.

∩-Logic (parameter **AL.t** = 1) – the display flashes if the current value lies within the interval $(T - \Delta) < t < (T + \Delta)$,

whereby T – is the setpoint of the monitored process value (parameter **C.SP**) and Δ – is the hysteresis (parameter **HYST**).

U-Logic (parameter **AL.t** = 2) – the display flashes if the current value lies outside the interval
$(T - \Delta) < t < (T + \Delta)$.

If the parameter **AL.t** = 0, the function is deactivated.

For the String (**dAtA** = 3) and Image (**dAtA** = 4) data types alarm logic is not implemented.

6.5 Error display

Table 6.2 Error display

Display	Cause
/- -/	There is no data packet within the defined time (parameter **t.out)**.
dt.LL	Transmitted value is too small, e.g. the number is smaller than -999
dt.hh	Transmitted value is too high, e.g. the number is larger than 9999

▶ **NOTICE** ***When using string type data, non-representable symbols are displayed as spaces.***

7 Maintenance

The maintenance includes:

– cleaning the housing and the terminals from dust, dirt and debris
– checking the fastening of the device
– checking the wiring (connecting leads, fastenings, mechanical damage)

The device should be cleaned with a damp cloth only. No abrasives or solvent-containing cleaners may be used.

The safety guidelines in Section 1 must be observed when carrying out maintenance.

8 Transportation and storage

Pack the device in such a way as to protect it reliably against impact for storage and transportation. The original packaging provides optimum protection.

If the device is not taken immediately after delivery into operation, it must be carefully stored at a protected location. The device should not be stored in an atmosphere with chemically active substances.

Permitted storage temperature: -25…+70 °C

NOTICE

The device may have been damaged during transportation.

Check the device for transport damage and completeness!

Report the transport damage immediately to the shipper and akYtec GmbH!

9 Scope of delivery

–	SMI2	1
–	Gasket	1
–	Mounting nut	1
–	User guide	1
–	CD with configuration software	1

Appendix A. Dimensions

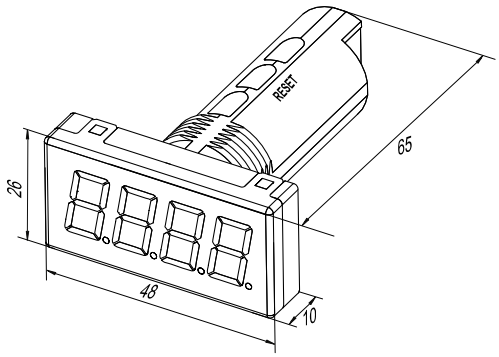


Fig. A1

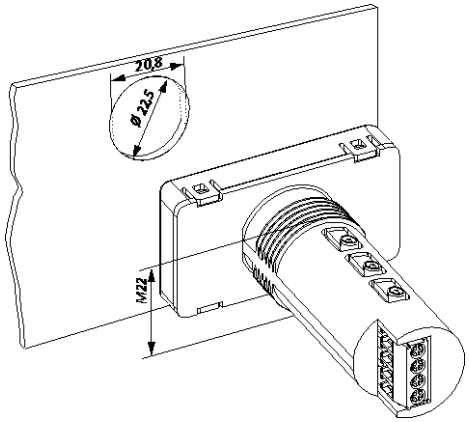


Fig. A2

To prevent the device spinning, the borehole in the front panel must correspond to the dimensions in Fig. A.2.

Appendix B Electrical connection

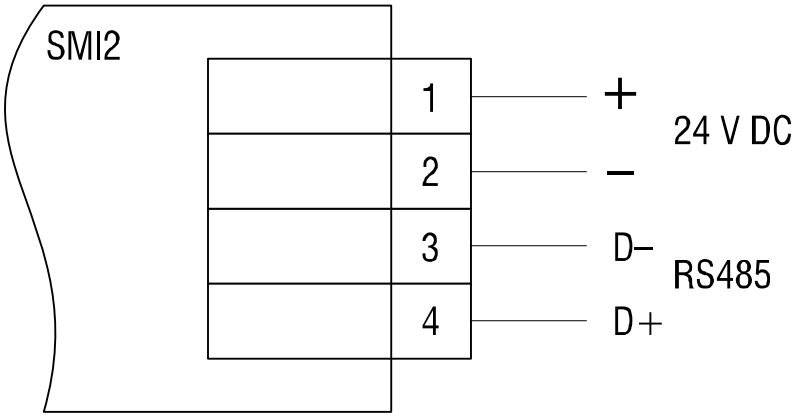


Fig. B1

Appendix C Communication protocol

The device supports the following protocols: Modbus RTU, Modbus ASCII and akYtec. The protocol akYtec is an internal protocol and is used by the configuration software.

C.1 Addressing

The device receives an individual address so that it can be addressed selectively.

The broadcast address is a reserved address that can be used to address all devices.

The individual addresses are from 1 to 247; the address 0 is reserved as a broadcast address.

If the device has the address 0, it is addressed with every address, but does not send a response.

The device address is set in the parameter **Addr**. The factory setting is 16.

C.2 Master

Every participant may send messages. However, these are normally initiated by the master and answered by an addressed slave.

A PLC or a PC with an RS232/485 converter and/or USB/RS485 converter can serve as a master in the RS485 network.

There may only be one master in a RS485 network.

Appendix D Functions and data transfe

The following functions are supported in the Modbus protocol:

– 03, 04 (read registers) – read one or more registers
– 06 (write single register) – write one register
– 16 (write multiple registers) – write block of registers
– 17 (report server ID) – read the device name and the firmware version.

Example. Function 17 (Report Server ID)

This function is used to read the device name and the firmware version. The example with the device address 12 is shown in Tables D1 and D2

Table D1 Format of the request (Master -> Slave)

Address	Function code	Checksum
12	17	ZZ

Table D2 Format of the response (Slave -> Master)

Address	Function code	Data length (byte)	Data	Checksum
12	17	14	SMI2 VX.YY	ZZ

Comments

The values X and YY are set by the manufacturer.

D.1 Parameter

Comment: Default values are printed in bold.

Table D3 Configuration parameters

Parameter	Register no. (dec)	Values	Data type	Comment
Device information				
Device name **dEv**	0-1	SMI2	Char[8] (8 bytes)	read only **not displayed**
Software version **vEr**	2-3	X.YY	Char[4] (8 bytes)	read only
Network parameters				
Baud rate **bPS**	4	0 – 2.4 kBit/s 1 – 4.8 kBit/s **2 – 9.6** kBit/s 3 – 14.4 kBit/s 4 – 19.2 kBit/s 5 – 28.8 kBit/s 6 – 38.4 kBit/s 7 – 57.6 kBit/s 8 – 115.2 kBit/s	Byte	read/write
Data bits **Len**	5	7 **8**	Byte	read/write

Parameter	Register no. (dec)	Values	Data type	Comment
Parity **PrtY**	6	**0 - none** 1 - even 2 - odd	Byte	read/write
Stop bits **Sbit**	7	**1 – one** 2 – two	Byte	read/write
Response delay **rS.dL**	8	0…**45**…255 ms	Byte	read/write
Time-out **t.out**	9	0…**600** s	UInt16 (2 Bytes)	read/write
Device address **Addr**	10	Modbus: 1…**16**…247 akYtec: 0…**16**…2047	UInt16 (2 Bytes)	read/write
Protocol **t.Pro**	11	0 – Modbus ASCII 1 – Modbus RTU **2 – akYtec**	Byte	read/write
Address bits (only akYtec protocol) **A.Len**	12	**8 – 8 bit** 11 – 11 bit	Byte	read/write
Last error code **n.Err**	13	**0**…255 At switch on always 0	Byte	read only **not displayed** see Table D5
Broadband offset **Ad.Ad**	16	0…**1000**…65535	UInt16 (2 Bytes)	read/write
Master/Slave mode **dEv.r**	40	**0 – Slave** 1 – Master	Byte	read/write
Slave address *) **SLA.A**	41	1…**16**…247	UInt16 (2 Bytes)	read/write
Start address *) **SLA.r**	42	**0**…65535	UInt16 (2 Bytes)	read/write
Query cycle*) **SLA.P**	43	0…**10**…255	Byte	read/write x100 ms
Modbus function *) **SLA.F**	44	**3 – 0x0003** 4 – 0x0004	Byte	read/write
Operating parameters				
Data type **dAtA**	17	**0 – Int** 1 – Word 2 – Float 3 – String[8] 4 – Image	Byte	read/write
Decimal point position **dP**	18	**0 (- - - -)** 1 (- - - -.) 2 (- - -.-) 3 (- -.- -) 4 (-.- - -)	Byte	read/write
Flash interval **PF**	19	**200** … 9999 ms	UInt16 (2 Bytes)	read/write
Alarm logic **AL.t**	20	**0 – aus** 1 – ∩-Logik 2 – U-Logik	Byte	read/write
Setpoint **C.SP**	21-22	-999…**0.0**…+9999	Single (4 Bytes)	read/write
Hysteresis (Δ) **HYST**	23-24	0…**10.0**…9999	Single (4 Bytes)	read/write

Table D4 Transmitted data

Comment: not displayed during the Configuration check (see 5.4).

Parameter	Register no. (dec)	Values	Data type	Comment
Status byte **Stat**	14	**0**…255	byte	Read only Bit 0 – EEPROM error

Parameter	Register no. (dec)	Values	Data type	Comment
				Bit 1 – Parameter error
Data type Int value **val.I**	25	-32768…**0**…32767	Int16 (2 bytes)	read/write
Data type Word value **val.W**	26	**0**…65535	UInt16 (2 bytes)	read/write
Data type Float value **val.F**	27-28	**0.0**	Single (8 bytes)	read/write
Data type String value **val.S**	29-32	see **) default – (**- - - -**)	Char [8] (8 bytes)	read/write
Data type Image value **val.P**	33-34	see **) default – ( )	Char [4] (4 bytes)	read/write
Display mode for data type String and Image **ind.M**	35	**0 – flashing off** 1 – flashing on	byte	read/write
Actual state of the display segments **O.Str**	36-37	see ***)	Char [4] (4 bytes)	read only
Standard display mode **O.mod**	38	**0×00 – flashing off** 0×BB – flashing on	byte	read only
Command **Aply**	15	0x81 default – **0**	byte	Save changed parameters

Comments

*) Available only in master mode

**) The display supports the following characters:

– Figures 0 … 9;
– Upper and lower case letters of the Latin alphabet;
– Symbols " ", "_", "**–**", "**.**"
Examples: 1) char[8] = "**A.B.C.D**"; 2) char[8] = "**ABCD**"; 3) char[8] = "**ABCD.**"

***) 4 bytes data shows the status of each display segment. The first byte is reserved for the first digit from the right. The allocation of bits for the individual segments is described in Table D6.

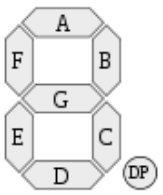
D.2 Error codes

Table D5

0	Error-free frame transmission
1	Illegal function
2	Set decimal point position larger than 4
3	Write access to read-only memory
33	Framing error
39	Incorrect checksum
40	Descriptor not found
49	Actual memory area smaller than indicated

D.3 Segment addressing

Table D6



Segment	Bit
A	7
B	6
C	5
D	4
E	3
F	2
G	1
DP	0

D.4 Symbol presentation

Table D7 ASCII code and the symbol presentation

ASCII- Code	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	.A	.B	.C	.D	.E	.F
2.														–	.	
3.	0	1	2	3	4	5	6	7	8	9						
4.		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5.	P	Q	R	S	T	U	V	W	X	Y	Z					_
6.		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7.	p	q	r	s	t	u	v	w	x	y	z					

D.5 Example

Example 1

The device with the address 100 should display the text **WORD**.

Request:

64 10 00 1D 00 02 04 57 4F 52 44 C0 07

Device address:	0x64 (100)
Function code:	0x10 (16)
Starting address:	0x1D (29)
Number of registers:	0x02 (2)
Data length (byte):	0x04 (4)
Data:	0x57(W) 0x4F(O) 0x52(R) 0x44(D)
CRC:	0xC0 0x07

Example 2

The device with the address 100 should display the text **W.O.R.D.**.

Request:

64 10 00 1D 00 04 08 57 2E 4F 2E 52 2E 44 2E 90 31

Device address:	0x64 (100)
Function code:	0x10 (16)
Starting address:	0x1D (29)
Number of registers:	0x04 (4)
Data length (byte):	0x08 (8)
Data:	0x57(W) 0x2E(.) 0x4F(O) 0x2E(.) 0x52(R) 0x2E(.) 0x44(D) 0x2E(.)
CRC:	0x90 0x31