MOELLER

Hardware, Configuration and Functional Description

ZB4-501-UM3/-UM4 Interface Converter S40-AM-UM3/-UM4 Application Module Telecontrol Modules

05/00 AWB2700-1371GB

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See list of modifications on page II

Author: Peter Roersch
Editor: Thomas Kracht
Translator: Dominik Kreuzer

Warning!
Dangerous electrical voltage!

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit.
- Cover or enclose neighbouring units that are live.
- Follow the engineering instructions (AWA) of the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 Part 100) may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE) must be connected to the protective earth (PE) or to the potential equalisation. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference do not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the low voltage for the 24 volt supply. Only use power supply units complying with IEC 60364-4-41 (VDE 0100 Part 410) or HD 384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.
- Wherever faults in the automation system may cause damage to persons or property, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks etc.).

List of modifications to the manual AWB2700-1371GB

Edition date	Page	Description	New	Modification	Omitted
05/00	General	Complete revision by the addition of ZB4-501-UM4	×		

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About This Manual

PLCs and devices with a serial interface communicate with each other via the ZB4-501-UM3-UM4 serial interface converter. To use the interface converter, the S40-AM-UM3/-UM4 application module is required.

The next chapter describes:

- the system environment in which the application module can be used, and how to incorporate the module in a user program;
- the settings that need to be made to ensure successful data transmission;
- the behaviour of the converter and the application module during operation.

This documentation is intended for those involved in engineering, programming and commissioning the converter and application module to establish a communication link from the PLC to a partner device with a serial interface.

The reader is assumed to have a general knowledge of control and communication systems.

A clear overview of the manual is provided by the section headings in the header on the left pages and the current subsection on the right pages.

The symbols used in this manual have the following meanings:

▶ Indicates actions to be taken.

Provides useful tips and additional information.

Caution!
Indicates the possibility of minor material damage.

Warning!
Indicates the possibility of serious material damage and minor injury.

1 About the Modules

Purpose of the ZB4-501-UM3/-UM4

The ZB4-501-UM3/-UM4 interface converters are used in conjunction with a PS4 (not PS4-100/-400). The -UM4 can also work with a PS416. They are slaves on the Suconet K bus and are connected to the PLCs via the bus.

They are equipped with a serial RS232 interface for connecting other devices, such s PCs, printers, terminals and modems.

To allow the PS4/PS416 to communicate with other devices, the S40-AM-UM3/-UM4 application module must be incorporated in the user program (see software requirements). The application module is available as a function block.

The -UM3 is connected to the PS4's Suconet K interface via the built-in cable. Bus address "2" is permanently assigned to the module.

The -UM4 is connected to the Suconet K interface of the PS4 or PS416 via a separate cable. A bus address from 2 to 15 can be selected using DIP switches. The bus terminating resistors can also be enabled or disabled with two DIP switches.

Power for the module is provided by an external 24 V DC power supply unit.

To achieve sufficient noise immunity and minimize emitted interference, you should include the LT308.092.2 mains filter in the 24 V line. The filter should be fitted as close as possible to the module.

Table 1: Differences between -UM3 and -UM4

	ZB4-501-UM3	ZB4-501-UM4
Master control	PS4 (not PS4-100/-400)	PS4 (not PS4-100/-400) and PS416
Connection	Via built-in cable to the Suconet K interface of the PS4	Via separate cable[1)] to the PS4/ PS416
Power supply	From the PS4	24 V DC from a separate power supply unit
Bus address	Fixed address: 2	User-definable address: 2 to 15

1) Use Suconet K/K1 data cable LT309.096 or equivalent

Hardware and software requirements

Table 2 provides an overview of the hardware and software requirements.

Table 2: Hardware and software requirements

	ZB4-501-UM3	ZB4-501-UM4
Software		
Programming software	S40 from V4.0	S40 from V4.1[1)]
Application modules	S40-AM-UM3	S40-AM-UM4
Bus system	Suconet K	Suconet K
Hardware		
Control	PS4 (not PS4-100/-400)	PS4/PS416 (not PS4-100/-400)

1) To configure the ZB4-501-UM4, you need current CFG and BMP files. These files are available on the Internet at http:\\www.moeller.net under "Service → Automation Support → Updates → 1. Service Packs/Update Files Sucosoft".

Setup ZB4-501-UM3

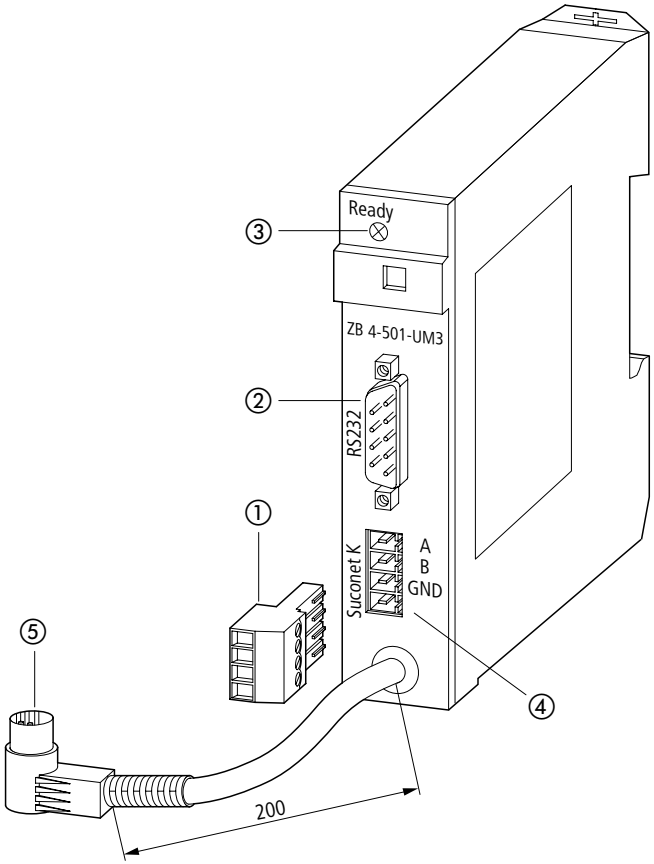


Figure 1: ZB4-501-UM3 interface converter

① Plug-in screw terminal for cable cross-section ≦ 1.5 mm^2

② RS232 interface

③ LED

④ Suconet K interface for continuation of the bus

⑤ Suconet K interface for master control

ZB4-501-UM4

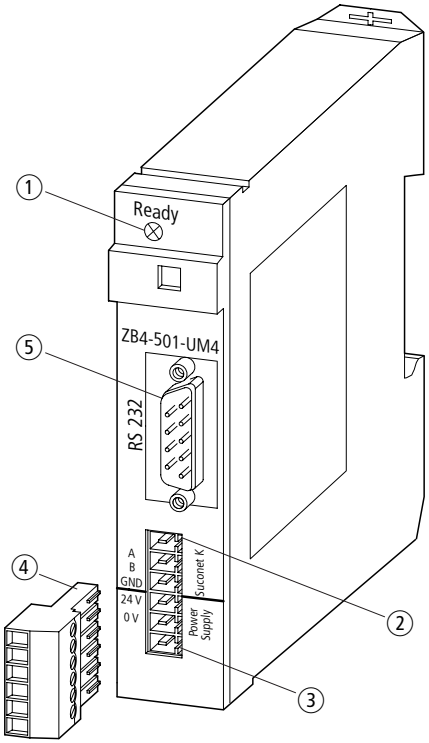


Figure 2: ZB4-501-UM4 interface converter

① LED
② Suconet K interface
③ 24 V DC power supply (not from PS4)
④ Plug-in screw terminal for cable cross-section ≦ 1.5 mm^2
⑤ RS232 interface

2 Engineering

ZB4-501-UM3/-UM4 in the Suconet K network

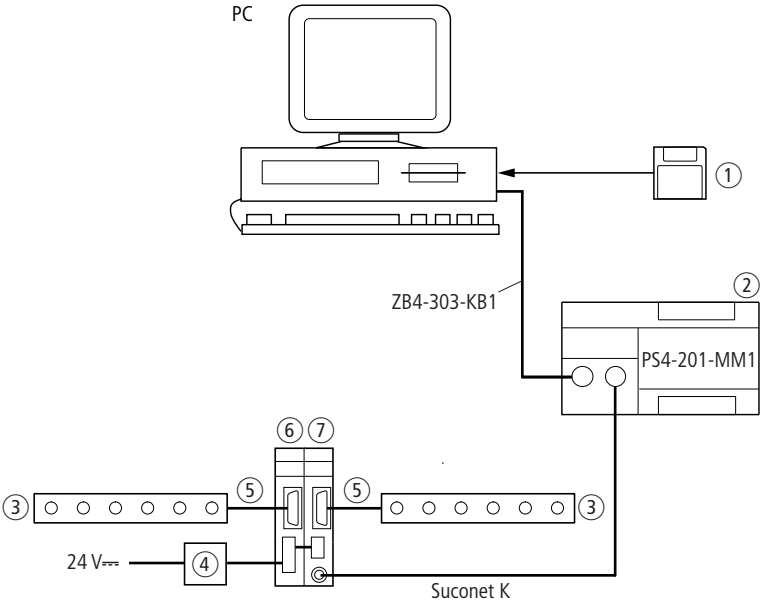


Figure 3: Interface converter in the Suconet K network

① S40-AM-UM3/-UM4 application modules
② Master
③ Device with RS232 interface
④ LT308.092.2 mains filter
⑤ ZB4-254-KB1 modem cable
⑥ Slave 2 (ZB4-501-UM4)
⑦ Slave 1 (ZB4-501-UM3)

The modules work as slaves in the Suconet K network. The length of the send and receive data of the Suconet messages is 36 bytes, 30 of which are user data.

Transparent messages with a user data length of up to 250 bytes can be sent or received through the RS232 interface.

Power supply

ZB4-501-UM3

The module is supplied with power through the Suconet K interface of the compact PLC. No external supply voltage is required.

ZB4-501-UM4

The module requires a separate supply voltage of 24 V DC. Power can not be drawn from the PS4. The technical specifications contain detailed voltage requirement data.

To achieve sufficient noise immunity and minimize emitted interference, you should include the LT308.092.2 mains filter in the 24 V line. The filter should be fitted as close as possible to the module.

Connections

Caution!
To protect the components from static electricity discharges, operators must discharge themselves on an earthed surface before touching the modules or the elements on the front panel.

Suconet K connections

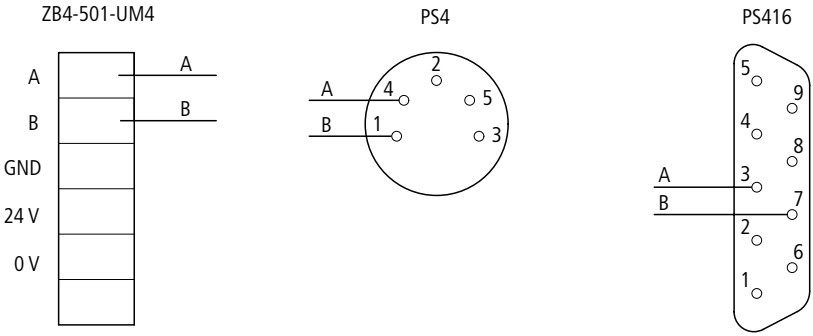


Figure 4: Suconet K connection assignment

RS232 port

The RS232 port supports full duplex mode, i. e. data can be sent and received at the same time.

Caution!
The module's RS232 and RS485 interfaces are not electrically isolated from each other. Incorrect configuration can therefore lead to potential equalizing currents, resulting in component damage.

Cable assignment and signals
Table 3 below shows

- the pin assignment of the 9-pin SUB-D front connector,
- the signal numbering according to CCITT Recommendation V24/V28,
- the signal name according to RS232C,
- the signal flow.

Table 3: Connector specifications

Pin No.	Signal name	Signal flow
1	DCD (Data Carrier Detect)	←
2	RxD (Receive Data)	←
3	TxD (Transmit Data)	→
4	DTR (Data Terminal Ready)	→
5	SGND (Signal Ground)	–
6	DSR (Data Set Ready)	←
7	RTS (Request To Send)	→
8	CTS (Clear To Send)	←
9	– (not used)	–

If you intend to use partner devices that do not support DSR, DTR and DCD control lines, these control lines must be bridged.

Table 4: Meaning of signals

Signal	Meaning
TxD output	Transmit Data, in idle state ≦ 3 V
RxD input	Receive Data
SGND	Signal Ground
RTS output	The partner device is set to transmit state and remains in this state as long as the ON state is active. RTS is active ≧ 3 V. (Request To Send)
CTS input	The partner device is ready to send data signals or receive handshake/ connection signals. CTS is active ≧ 3 V. (Clear To Send)
DTR output	Activate data transmission device (for modems only) DTR is active ≧ 3 V, CPU in RUN. (Data Terminal Ready)
DSR input	Data transmission unit is ready for operation (only for modems) DSR is active ≧ 3 V. (Data Set Ready)
DCD input	The data transmission device is reporting that the transmission route for receiving data is ready. DCD is active ≧ 3 V. (Data Carrier Detection)

Electromagnetic compatibility

For information about EMC, see the next headings in this section. In addition, please observe the engineering instructions in the manual "EMC Guidelines for Automation Systems" (AWB27-1287-GB) and in the EMC manual "Electromagnetic Compatibility of Machines and Systems" (TB0200-022GB).

- ▶ To reduce inductive and capacitive interference from electromagnetic fields, appropriate screening must be fitted carefully as specified.
- ▶ Connect the screen of the data line with the protective ground by attaching both sides of the screen to a potential equalization bar (see Page 16).

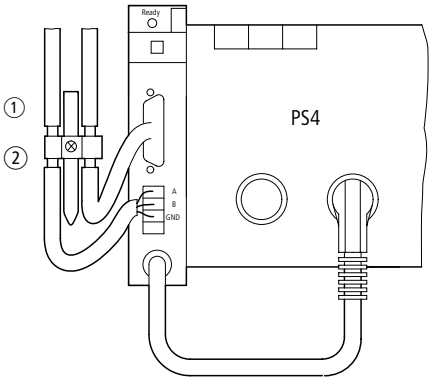


Figure 5: Earthing the data cable when using ZB4-501-UM3

① Installation with top-hat rail on mounting plate

② Mounting on mounting plate

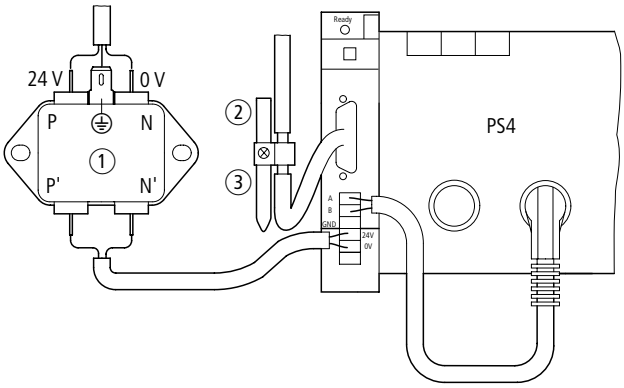


Figure 6: Earthing the data cable when using ZB4-501-UM4

① Mains filter
② Installation with top-hat rail on mounting plate
③ Mounting on mounting plate

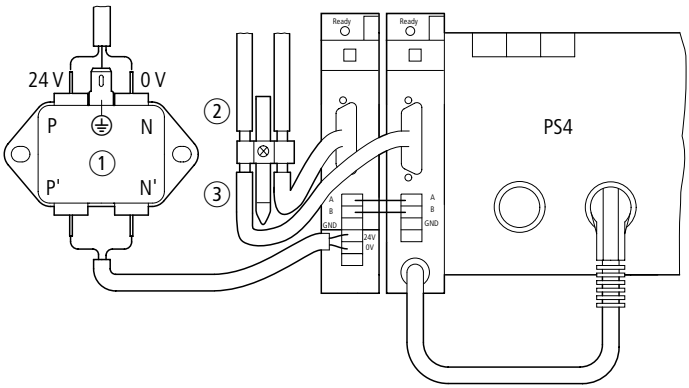


Figure 7: Earthing the data cable when using ZB4-501-UM3 and ZB4-501-UM4

① Mains filter
② Installation with top-hat rail on mounting plate
③ Mounting on mounting plate

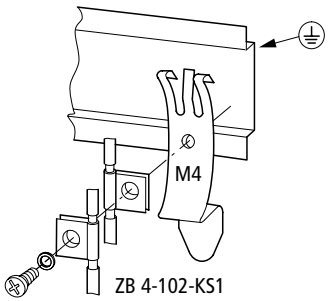
Earthing the data cables

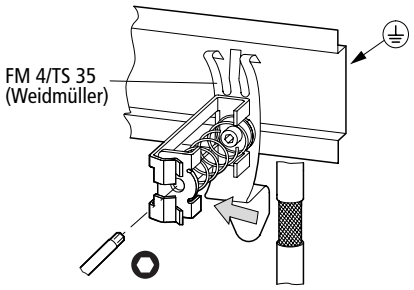
- ▶ Strip the cable sheathing near the contact clip. There should be no breaks in the screen braid.
- ▶ Place a contact clip around the stripped section of each data wire or press the stripped section into the snap-on mounting of the terminal clip.
- ▶ Make a low-impedance connection between the contact clip or terminal clip and the top-hat rail or mounting plate.
- ▶ Fit the top-hat rail to the mounting plate.

Caution!
Make sure that all connections are protected against corrosion and – if painted mounting plates are used – the paint is removed from the contact areas.

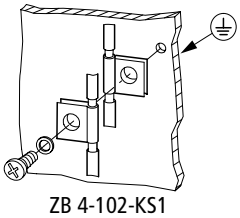
- ▶ Ground the top-hat rail with a large contact area.

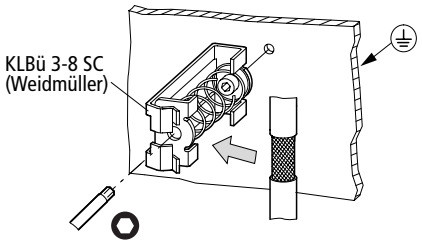
Assembly with mounting rail on mounting plate:





Assembly on mounting plate:





3 Configuration

Configuring the software

Before data can be exchanged with the PS4/PS416, you must configure the module via the Topology Configurator.

- ▶ Run the Sucosoft S40 Topology Configurator.
- ▶ Extend your configuration remotely with the module:
  - – ZB4-501-UM3
    Make sure that the module is permanently set to the Suconet K address 2 (first slave).
  - – ZB4-501-UM4
    Set the bus address (see also "Hardware Configuration").

Configuring the ZB4-501-UM4 hardware

The following information applies only for the ZB4-501-UM4. The hardware configuration of the ZB4-501-UM3 is fixed and cannot be changed.

Hardware configuration is limited to two sets of DIP switches. The DIP switches labelled S2control the bus terminating resistors. The DIP switches labelled S1define the unit's address.

To access the DIP switches, you must open the unit.

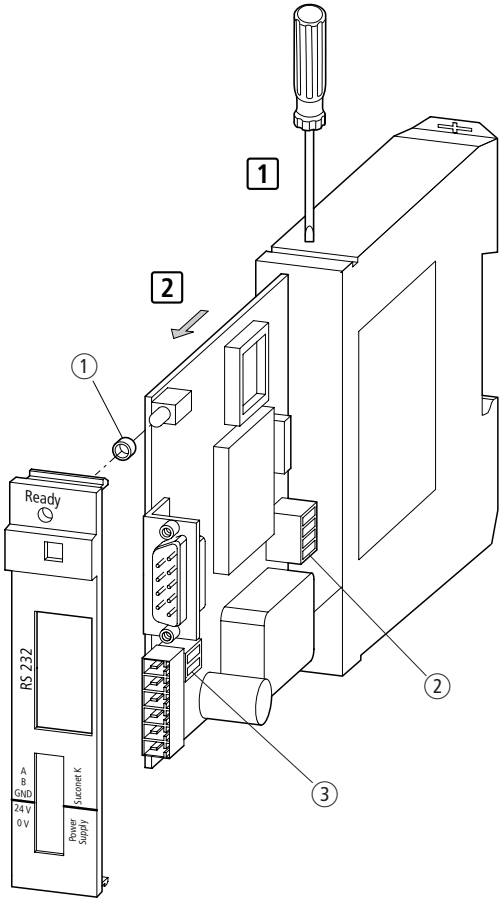


Figure 8: DIP switches S1, S2

① LED sleeve
② Address coding S1
③ Switch S2 for bus terminating resistors

Activating/deactivating bus terminating resistors

Bus terminating resistors prevent signal interference caused by reflections at the end of the bus cables.

The unit is shipped with the bus terminating resistors activated.

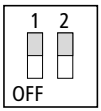


Figure 9: Default setting of switch block S2

The bus terminating resistor must be activated if your unit is located at the beginning or end of the line.

▶ To activate the bus terminating resistor, switch both DIP switches of switch block S2 to ON.

The bus terminating resistor of units that are not located at the ends of the data line must be deactivated.

▶ To deactivate the bus terminating resistor, switch both DIP switches on switch block S2 to OFF.

Setting the address

By default, the DIP switches are set as follows (= address 2):

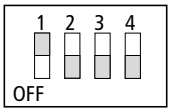


Figure 10: Default setting of switch block S1

Assign an address to the unit so that the master can recognize and scan the installed module.

- ▶ Switch off the power supply to the controller.
- ▶ From the table, select a station address and set this address by changing the DIP switch settings of switch block S2.

Make sure that the address has not already been assigned to another device, otherwise the master cannot correctly assign the data to the unit (station number + 1 = address).

Table 5: DIP switches S1 – address coding

Station	DIP switch			
	1	2	3	4
1	0	0	0	0
1	1	0	0	0
1	0	1	0	0
2	1	1	0	0
3	0	0	1	0
4	1	0	1	0
5	0	1	1	0
6	1	1	1	0
7	0	0	0	1
8	1	0	0	1
9	0	1	0	1
10	1	1	0	1
11	0	0	1	1
12	1	0	1	1
13	0	1	1	1
14	1	1	1	1

1 = ON, 0 = OFF

4 Operation

Operating phase

During the operating phase, the module uses the parameters defined in the function block. If you have changed the parameters during operation, you must perform a reset or a cold or warm start before the changes take effect.

Startup behaviour

Each time the power supply is switched on, the default settings are loaded. The PLC automatically transmits the parameters defined in the function block to the module.

Shutdown behaviour

When the power supply to the unit is switched off, data exchange is interrupted. All data in the module is deleted.

5 Diagnostics

LED function at startup

When supply voltage is applied, the module automatically performs a hardware test. If the result of the test is positive, the LED lights up. If the test result is negative, the LED flashes to signal a hardware fault.

LED function during operation

During operation of the unit, the LED indicates the status of the bus interface.

Table 6: LED function during operation

LED status	Bus interface status
on	– Module is connected and operating – Master is in "Run"
flashing	– Module is not connected
off	– Module is connected and operating – Master is in "Stop"

Failure Codes

The failure codes are indicated via function block output "fail_code". Outputs "rec_fail" and "tra_fail" provide information about whether the error occurred while transmitting or while receiving data.

→ For a description of the function block's inputs and outputs, see Page 27 (S40-AM-UM3) or Page 33 (S40-AM-UM4).

The table below shows the possible error messages.

Table 7: Error messages

Failure code		Description
Hex	**Dec**	
00	00	The module is ready for operation
01	1	The module is not ready for operation
02	2	UM4: Parameter errors (baud rate, data format)
03	3	UM3: The set value at the function block's "mode" input is invalid or a parameter is not logical. UM4: Mode invalid
04	4	The value set at input "tra_length" of the function block is invalid
05	5	A timeout has occurred while sending data
06	6	The received message is of a different message type than defined at function block input "mode"
07	7	The length of the received message is incorrect
08	8	The message start character contains a character error
09	9	The message end character contains a character error
0A	10	The DSR control line is missing
0B	11	The DCD control line is missing.
0C	12	Error in checksum or in the test polynomial
0D	13	UM4: Segment error
0E	14	Timeout in control line CTS (CTS timeout) or control line missing
0F	15	Character error

6 Application Module

The S40-AM-UM3 and -UM4 application modules provide a convenient means of setting up the unit.

Software requirements

Table 8: Software requirements

	ZB4-501-UM3	ZB4-501-UM4
Application module	S40-AM-UM3	S40-AM-UM4
Programming software	S40 from V4.0	S40 from V4.1 [1)]

1) To configure the ZB4-501-UM4, you need current CFG and BMP files. These files are available on the Internet at http:\\www.moeller.net under "Service → Automation Support → Updates → 1. Service Packs/Update Files Sucosoft".

Installation

Different installation procedures must be carried out for the S40-AM-UM3 and the -UM4 application modules. These are described below.

After its installation, the function block is available among the user-specific function blocks when you edit your program.

Note that user-specific function blocks in your user program must be called in every program cycle.

S40-AM-UM3

- ▶ Copy function block UM3-COM.POE into the Source directory for your project.
- ▶ Register the function block in the Project Manager with menu item Project → Register Sources.

S40-AM-UM4

Each control type has an associated library file, which contains the UM4_COM function block.

Type	Function block
PS4-200	AM_UM4_2.LIB
PS4-300	AM_UM4_3.LIB
PS416	AM_UM4_4.LIB

To import a (library) file into your current project, use the S40 Navigator as follows:

- ▶ In the selection window, select the control type on the Navigator's toolbar.
- ▶ On the toolbar, select "Tools → Library → Import" and select the LIB file (e. g. on drive A) and confirm with OK.

A message appears, confirming that the file was successfully imported.

The remaining declaration and integration is the same as for other function blocks. (The name of the function block does not appear in the File View window.)

For further information about using the LIB files, see manual "User Interface S40, Programming Software" (AWB2700-1305-GB), Section "Using Libraries".

Function block UM3_COM

Inputs and outputs

When you call the function block in Sucosoft S40, the following listing is displayed:

```
Cal com(
  reset:=,
  strobe:=,
  dtr:=,
  mode:=,
  tra_length:=,
  baudrate:=,
  character_fmt:=,
  tra_data:=
  |
  :=dcd,
  :=dsr,
  :=tra_active,
  :=tra_fail,
  :=rec_active,
  :=rec_fail,
  :=rec_length,
  :=rec_data,
  :=fail_code
  )
```

Table 9: Inputs and outputs of function block UM3_COM.POE

Name	Data type	Value range	Description
Inputs			
reset	BOOL	0/1	Change from 0 → 1: The function block and the module are reset to their default state. Static 1: Transmit and receive readiness is deactivated. Change from 1 → 0: Define module parameters
strobe	BOOL	0/1	Starts data transfer with the message format defined in "mode".
dtr	BOOL	0/1	DTR control line of the serial interface is switched.
mode	USINT	See Table 10 on Page 30.	Message type preselection. Each message type requires different parameters. When modifications are made online, the parameters are reloaded only after a RESET sequence or a PLC first cycle (see also section "Setting parameters" on Page 31).
tra_length	USINT	1 to 250 (127)	Data length of the transmit message
baudrate	UINT	→	Baud rate of the serial RS232 interface. Available baud rates: 600, 1200, 2400, 4800, 9600, or 19200 bit/s. Default: 9600 bit/s
character_ fmt	STRING	→	The following character formats are available: 8O1, 8E1, 8N1, 8N2, 7O2, 7E2, 7N2, 7E1. Default: 8E1
tra_data	ARRAY OF BYTE	1 to 250 (127)	Transmit data field

Name	Data type	Value range	Description
Outputs			
dcd	BOOL	–	Connection status signal, e. g. DCD line of a modem
dsr	BOOL	–	Data transmission device is switched on.
tra_active	BOOL	–	Indicates that a transmit message is being processed.
tra_fail	BOOL	–	This output becomes active when an error has occurred while a transmit message was being processed.
rec_active	BOOL	–	Indicates that a receive message is being processed.
rec_fail	BOOL	–	This output becomes active when an error has occurred while a receive message was being processed.
rec_length	USINT	–	Data length of receive message
rec_data	ARRAY OF BYTE	1 to 250 (127)	Receive data field
fail_code	USINT	–	Failure codes (see Page 23)

To define the address of the transmit and receive data, you must enter the following information in the POU's variable declaration of the type "Program":

```
VAR_GLOBAL
  UM3_tdata     AT %SDB1.1.0.0 : ARRAY[1..36] OF BYTE ;
  UM3_rdata     AT %RDB1.1.0.0 : ARRAY[1..36] OF BYTE ;
END_VAR
```

You can set message types via the "mode" input of the function block. Table 10 on Page 30 shows the possible settings, which can work with or without RTS/CTS control lines. Default: 00.

If 7-bit character formats are being used, only codes 00 to 05 can be applied to function block "mode". If codes 02 and 03 are used, the maximum length is reduced from 127 to 63 bytes.

Table 10: Message types (mode)

Description Message type/structure	Code Without control lines	 With control lines
Message transparent [1, 2, ... 250]	00	01
FT1.1 message The first place contains the message length (1 to 127) [LEN][1, 2, ... 127] Note: bit 0 of the length byte is always 0.	02	03
Message with frame stx/etx [STX][1, 2, ... 250][ETX]	04	05
Message with CRC 8 test value[1)] [1, 2, ... 250][CRC8]	06	07
Message with CRC 16 test value[1)] [1, 2, ... 250][CRC16]	08	09
Message with modulo 8 checksum [1, 2, ... 250][PSUM]	10	11
Message with stx/etx frame and CRC 8[1)] [STX][1, 2, ... 250][CRC8][ETX]	12	13
Message with stx/etx frame and CRC 16[1)] [STX][1, 2, ... 250][CRC16][ETX]	14	15
Message with stx/etx frame and modulo 8 checksum [STX][1, 2, ... 250][PSUM][ETX]	16	17

1) For messages with a test polynomial, you can define the poylnomial and the starting value. For further information, see section "Setting parameters" on Page 31.

Setting parameters

You can set the parameters in the declarations section of the function block: To do this, open function block UM3_COM.

The adjustable parameters are contained in the declarations section:

```
VAR CONSTANT (*variable constants*)
   rts_delay_on           : TIME  :=T#10ms
   rts_delay_off          : TIME  :=T#10ms
   tout_zeit              : TIME  :=T#10s
   cts_timeout            : TIME  :=T#500ms
   frame_stx              : BYTE  :=16#02
   frame_etx              : BYTE  :=16#03
   crc_polynom            : WORD  :=16#8408
   crc_start_value        : BOOL  :=0
END_VAR
```

Adjust the parameters to the application. Carry out a syntax check.

Table 11: Parameter

Con-stants	Type	Default setting	Description
rts_delay_on	TIME	T#10ms	Data transmission can be delayed by increasing the value of the constants. This may be necessary if there is a delay after transmission before the partner device is ready to receive.
rts_delay_off	TIME	T#10ms	When a message is received, the module's receive buffer is locked for 10 ms. This prevents interference from the transmitter being received as an error message.
tout_zeit	TIME	T#10s	All transmit calls (data, reset, parameterization) are timeout controlled. If a fault occurs in the module, the procedure is cancelled after time "tout_zeit", the module and the function block are reset to their default state and fail_code = 5 is generated.
cts_timeout	TIME	T#500ms	When using control lines, the CTS signalling line is monitored. If no CTS signal is recognized with RTS = 1 after time "cts_timeout", the transmit procedure is cancelled with fail_code = 14.
frame_stx	BYTE	02	Definable start character for messages with frames.
frame_etx	BYTE	03	Definable end character for messages with frames.
crc_polynom	WORD	16#8408	Definable test polynomial for messages with CRC test. For message types that use the "CRC8" test method (mode = 06, 07, 12, 13), the least significant byte (08 in this case) is used.
crc_start_value	BOOL	0	Definable start value for messages with CRC test.

The module parameters are set automatically when the function block is first called or after a RESET. The parameter values are read from the function block inputs or from the constants section.

Function block UM4_COM

Inputs and outputs

In Sucosoft S40, the module appears as follows:

```
Cal com4(
  reset:=,
  strobe:=,
  dtr:=,
  NKD-syn:=,
  Bus_mode:=,
  mode:=,
  tra_length:=,
  baudrate:=,
  character_fmt:=,
  Rts_delay_on:=,
  Rts_delay_off:=,
  Tra_timeout:=,
  Cts_gap_time:=,
  Frame_stx:=
  Frame_etx:=
  Crc_polynom:=,
  Crc_start_value:=,
  tra_data:=
  Um4_tdata:=,
  Um4_rdata:=,
  |
  :=dcd,
  :=dsr,
  :=tra_active,
  :=tra_fail,
  :=rec_active,
  :=rec_fail,
  :=rec_length,
  :=rec_data,
  :=fail_code
  )
```

Table 12: Inputs/outputs of function block UM4_COM

Name	Data type	Value range	Description
Inputs			
reset	BOOL	0/1	Change from 0 → 1: The function block and the module are reset to their default state. static 1: Transmit/receive readiness is deactivated. Change from 1 → 0: Define module parameters
strobe	BOOL	0/1	Starts data transfer with the message format defined in "mode".
dtr	BOOL	0/1	DTR control line of the serial interface is switched.

NKD_syn	BOOL	0/1	Synchronization pulse
			Depending on the assignment of input "Bus_mode", the following program entries must be added before the function block:
			(xxx = name of function block)
			Bus_mode = 0 (synchronous):
			`LD NKD_1`
			`PLC_Message`
			`ST xxx.NKD_syn`
			Bus_mode = 1 (asynchronous):
			`LD 1`
			`ST xxx.NKD_syn`

Bus_mode	BOOL	0/1	0 = synchronous, e. g. for PS4-200, PS4-300 (adjustable) 1 = asynchronous, e. g. for PS416, PS4-300 (adjustable)
mode	USINT	Table 13, Page 39	Message type selection. Each message type requires different parameters. When changes are made online, the parameters are reloaded only after a RESET sequence or a PLC first cycle.
tra_length	USINT	1 to 250 (127)	Data length of transmit message

Name	Data type	Value range	Description
Parameter inputs for defining message types			
baudrate	UINT	→	Baud rate of the serial RS232 interface: Available baud rates: 600, 1200, 2400, 4800, 9600, or 19200 bit/s; Default: 9600 bit/s
character_fmt	STRING	→	The following character formats are available: 8O1, 8E1, 8N1, 8N2, 7O2, 7E2, 7N2, 7E1. Default: 8E1
Rts_delay_on	TIME	10 to 2550 ms	With this constant, data transmission can be delayed. This may be necessary if there is a delay after transmission before the partner device is ready to receive. Default setting: T#10ms
Rts_delay_off	TIME	10 to 2550 ms	When a message is received, the module's receive buffer is locked for the set time. Default setting: T#10ms
Tra_timeout (tout_zeit)	TIME	–	All transmit calls (data, reset, parameterization) are timeout controlled. If a fault occurs in the module, the procedure is cancelled after time "tra_timeout", the module and the function block are reset to their default state and fail_code = 5 is generated. Default setting: T#10s
Cts_gap_time	TIME	10 to 2550 ms	See section "cts_gap_time" on Page 37. Values in 10 ms steps
Frame_stx	BYTE	–	Definable start character for messages with frames. Default setting: 02
Frame_etx	BYTE	–	Definable end character for messages with frames. Default setting: 03
crc_polynom	WORD		Definable test polynomial for messages with CRC test. For message types that use the "CRC8" test method (mode = 06, 07, 12, 13), the least significant byte (08 in this case) is used. Default setting: 16#8408
crc_start_ value	BOOL	0/1	Definable start value for messages with CRC test. Default setting: 0

Name	Data type	Value range	Description
Inputs			
tra_data	ARRAY OF BYTE	1 to 250 (127)	Transmit data field
UM4_tdata	ARRAY OF BYTE	1 to 36	See section "UM4_tdata, UM4_rdata" on Page 37.
UM4_rdata	ARRAY OF BYTE	1 to 36	See section "UM4_tdata, UM4_rdata" on Page 37.
Outputs			
dcd	BOOL	–	Connection status signal, e. g. DCD line of a modem
dsr	BOOL	–	Data transmission device is switched on.
tra_active	BOOL	–	Indicates that a transmit message is being processed.
tra_fail	BOOL	–	This output becomes active when an error has occurred while a transmit message was being processed.
rec_active	BOOL	–	Indicates that a receive message is being processed.
rec_fail	BOOL	–	This output becomes active when an error has occurred while a receive message was being processed.
rec_length	USINT	–	Data length of receive message
rec_data	ARRAY OF BYTE	1 to 250 (127)	Receive data field
fail_code	USINT	–	Failure codes (see Page 23)

cts_gap_time

The CTS gap time consists of two functions. The "cts_timeout" time – familiar from the UM3 module – and the "gap_time", which is new to the –UM4 module.

The set time applies for both functions. The default setting is T#50ms. Data type: TIME

Cts_timeout: When using control lines, the CTS signalling line is monitored. If, with RTS=1, no signal is recognized after time "cts_timeout", the transmit procedure is cancelled with fail_code = 14. Data type: TIME

Gap_time: The gap time has the purpose of bridging delays during reception of the characters of a message (message gaps). The gap time is active in modes 128 to 209. In these modes, a time of 50 ms is always set, which can be increased up to 2550 ms in 10 ms steps.

UM4_tdata, UM4_rdata

At these inputs, you must create an ARRAY type variable for UM4. The arrays act as an internal buffer for transmit and receive data to which you have no access. The arrays must be declared in the POU (Program type).

The direct variable contains the Suconet K address. In the example below, the UM4 is the first station (address 2) on line 1.

Example:

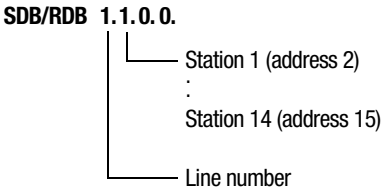
Declaration:

```
VAR
  Test_tdata_1    AT%SDB1.1.0.0 ARRAY[1..36] OF BYTE;
  Test_rdata_1    AT%RDB1.1.0.0 ARRAY[1..36] OF BYTE;
END_VAR
```

Program:

```
  CAL abc (
  reset:=;
  .
  .
  UM4_tdata:= Test_tdata_1
  UM4_rdata:= Test_rdata_1
  .
  .
  :=fail_code
  )
```

Address setting:



You can set message types via the "mode" input of the function block. Table 13 on Page 39 shows the possible settings, which can work with or without RTS/CTS control lines. Default: 00.

The following limitations apply when 7-bit data formats are used:

- STX/ETX character: 00 to 7F hex
- Length of the FT1.1 message: 1 to 63
- No CRC16 messages.

Table 13: Message types (mode)

Description	Code					
Messages	Slip-free			With slip		
Control lines	Without	With		Without	With	
Message type/structure	–	Standard	RTSselect **	–	Standard	RTSselect **
Transparent [1, 2, ... 250]	00	01	65	128	129	193
FT1.1 message 1st character: message length 1 to n [LEN][1, 2, ... n], n = 63/127 Bit 0 of length byte = 0.	02	03	67	130	131	195
With frame stx/etx [STX][1, 2, ... 250][ETX]	04	05	69	132	133	197
With CRC 8 test value* [1, 2, ... 250][CRC8]	06	07	71	134	135	199
With CRC 16 test value* [1, 2, ... 250][CRC16]	08	09	73	136	137	201
With modulo 8 checksum [1, 2, ... 250][PSUM]	10	11	75	138	139	203
With frame stx/etx and CRC 8* [STX][1, 2, ... 250][CRC8][ETX]	12	13	77	140	141	205
With stx/etx frame and CRC 16* [STX][1, 2, ... 250][CRC16][ETX]	14	15	79	142	143	207
With stx/etx frame and modulo 8 checksum [STX][1, 2, ... 250][PSUM][ETX]	16	17	81	144	145	209

* For messages with a test polynomial, you can define the poylnomial and the start value at the module input.

**Activate the RTSselect function if you are using a radio modem and the modem and module are connected with a ZB4-254-KB1 cable. In this case, the RTS signal is internally set to "1". The DSR input has no effect and the CTS input is internally connected to the DSR input.

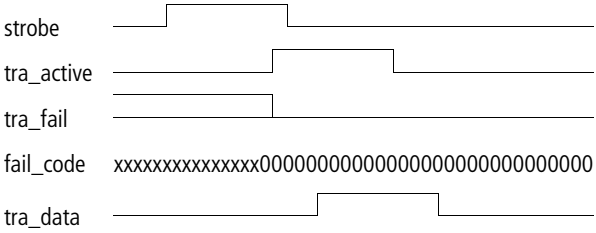
Data transfer

Sending data

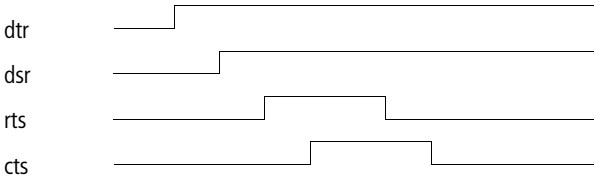
To send data to a partner device, enter the desired values at inputs "mode" and "tra_length". If you are not working with the default baud rate and character format settings, adjust the values and perform a reset.

Data transmission is started with a positive edge at input "strobe". Output "tra_active" indicates the data transmission status. If an error occurs during transmission, "tra_fail" becomes active and the associated failure code is shown under "fail_code".

Error-free transmit operation



With control/signalling lines



Transmit operation with errors

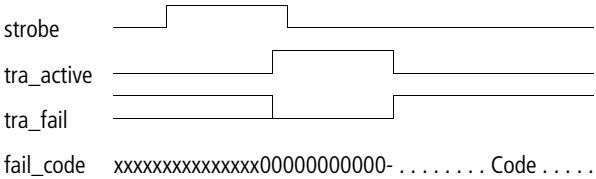
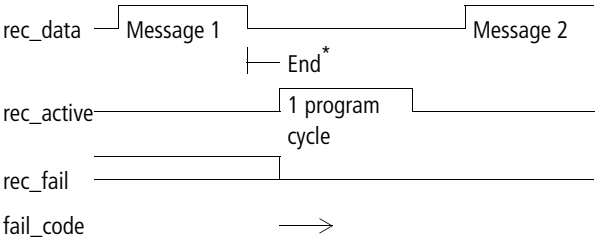


Figure 11: Status of function block inputs and outputs during transmit operation

Receiving data

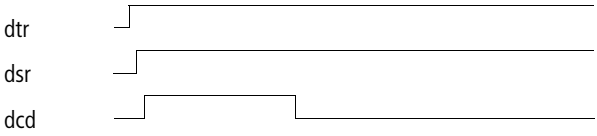
When data is received from the partner device, this is shown at output "rec_active". If the received data is valid, output "rec_fail" remains reset. If the received data is invalid, output "rec_fail" becomes active and the failure code is indicated at output "fail_code". Each time data is received, the contents of data buffer "rec_data" is deleted before new data is written to the buffer. For further information on this subject, see the appendix.

Error-free receive operation



* 3 characters pause or cts_gap_time in mode 128 to 209

With control/signalling lines:



Receive operation with errors

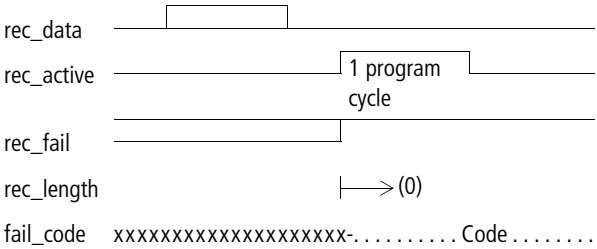


Figure 12: Status of function block inputs and outputs during receive operation

Reset

When a rising edge is applied at input "reset", the function block and the module are reset to their default state.

While input "reset" is static "1", transmit and receive readiness is deactivated.

If a negative edge is applied at input "reset", the parameters are transmitted to the module.

Error-free reset operation

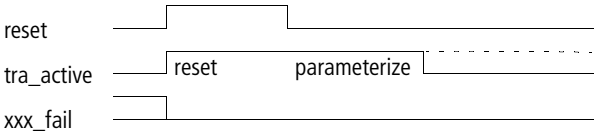
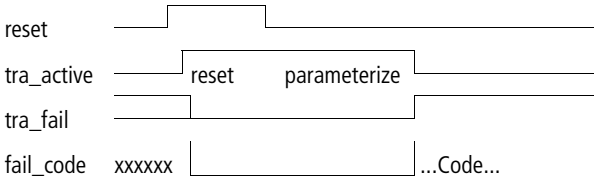
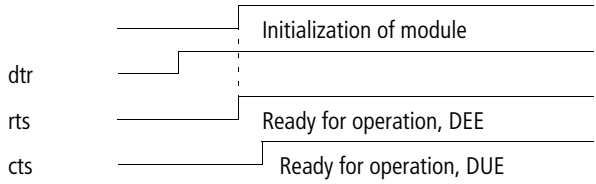


Figure 13: Status of inputs and outputs during reset

Reset operation with errors



Transmit and receive operation with control lines and RTSSelect



Appendix

Receiving data

Received messages are split up by the module into data blocks of 30 bytes each, which are sent one by one to the master via the Suconet K bus. The function block in the PLC compiles the individual blocks and saves the data in the defined input area. While the message is being processed, no further messages can be received.

The processing time depends on the following factors:

- Suconet K
  - Synchronous/asynchronous operation
  - Cycle time
  - Baud rate
- Program cycle time
- Message length
- Message transfer rate (baud rate)

To process a 250 byte message transmitted at 9600 bit/s, the PS4-200 needs 20 program cycles. If the cycle time is 20 ms, the time needed is 20 x 20 ms = 400 ms.

Precondition:

- Suconet K cycle = 10 ms
- Baud rate = 187.5 Kbit/s.

If the Suconet cycle time is shorter than the program cycle time in synchronous modus of the PS4-200, the Suconet cycle time is of no consequence.

Technical data	ZB4-501-UM3
Number of modules per PS4 master control	1
Network address	2 (fixed)
Suconet send data	36 bytes (30 bytes user data)
Suconet receive data	36 bytes (30 bytes user data)
Interfaces	Two RS485: Suconet K – One 5-pin DIN plug for connecting to the master PLC – One screw terminal for continuation of the Suconet bus – The bus terminating resistors are permanently installed One RS232: – 9-pin SUB-D plug for connecting partner devices
Control and signalling lines	RTS, CTS, DCD, DTR, DSR
Message formats	Transparent (see section "Function block UM3_COM" on Page 27)
Maximum size of user data in the message	250 bytes/127 bytes
Data transfer rate	600, 1200, 2400, 4800, 9600, 19200 bit/s
Power supply	9 V through PLC, no external supply required
Isolation	RS485/RS232: no
Recommended cable	RS485 (Suconet K): Cable, 2 × 0.5 mm^2, screened and twisted for assembly of Suconet cables by the user, Moeller type LT 309.096 or equivalent. The connecting cable to the CPU module is supplied with the module. It must not be replaced with another cable.
Mounting	For snap-fitting on DIN 50 022 mounting rail
Ambient temperature	0 to +55 °C

Transport and storage temperature	–25 to +70 °C
Degree of protection	IP 20
EMC	See Page 46
Weight	Approx. 180 g

ZB4-501-UM4

Number of modules per PS4/PS416 master control	14
Network address	2 to 15, adjustable via DIP switch
Suconet send data	36 bytes (30 bytes user data)
Suconet receive data	36 bytes (30 bytes user data)
Interfaces	One RS485: Suconet K – Plug-in screw terminal for cable cross-section $\leqq$ 1.5 mm^2 – Bus terminating resistors adjustable via DIP switches One RS232: – 9-pin SUB-D plug for connecting partner devices
Control and signalling lines	RTS, CTS, DCD, DTR, DSR
Message formats	Transparent (see section "Function block UM3_COM" on Page 27) or "Function block UM4_COM" on Page 33.
Maximum size of user data in the message	250 bytes/127 bytes
Data transfer rate	600, 1200, 2400, 4800, 9600, 19200 bit/s
Isolation	RS485/RS232: no
Recommended cable	RS485 (Suconet K): Cable, 2 × 0.5 mm^2, screened and twisted, for assembly of Suconet cables by the user, Moeller type LT 309.096 or equivalent.
Mounting	For snap-fit on DIN 50 022 mounting rail
Ambient temperature	0 to +55 °C
Transport and storage temperature	–25 to +70 °C

Degree of protection	IP 20
EMC	See below
Weight	Approx. 180 g
Power supply	
Rated voltage U_e	24 V DC
Permissible range	20.4 to 28.8 V DC
Residual ripple	5 %
Reverse polarity protection	Yes
Rated current I_e	100 mA
Inrush current and duration	1 A/< 5 ms
Power dissipation	2.4 W
Protection class	1
Potential isolation between 24 V supply voltage and interfaces:	Yes
Terminals	Plug-in screw terminal, cable cross-section ≦ 1.5 mm^2

General EMC specifications for automation equipment

Emission	DIN EN 55 011/22 Class A		
Interference immunity			
ESD	DIN EN 61 000-4-2	Contact discharge Air discharge	4 kV 8 kV
RFI	DIN/EN 61 000-4-3	AM/PM	10 V/m
Burst	DIN EN 61 000-4-4	Mains/digital I/O Analog I/O, fieldbus	2 kV 1 kV
Surge	DIN EN 61 000-4-5	Mains DC, unsymmetrical Mains DC, symmetrical	1 kV 0.5 kV
Immunity to line-conducted interference	DIN EN 61 000-4-6	AM	10 V

Dimensions ZB4-501-UM3

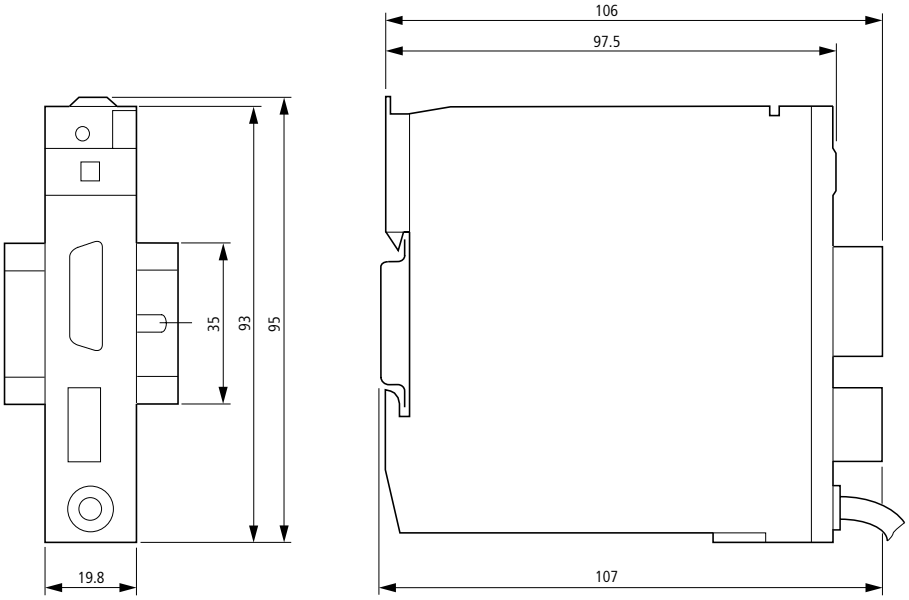


Figure 14: Dimensions of ZB4-501-UM3

ZB4-501-UM4

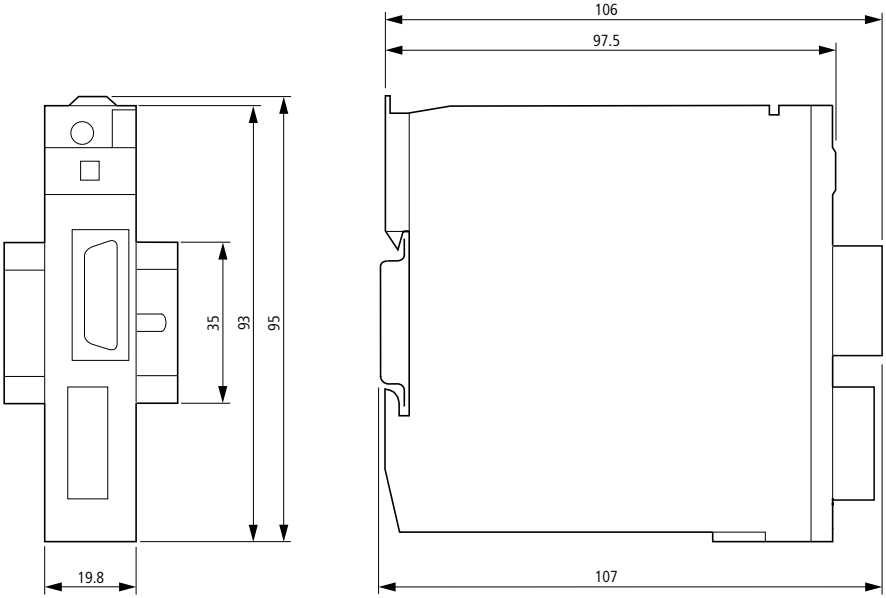


Figure 15: Dimensions of ZB4-501-UM4

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