Manual

SSM-BG4xD

Order-no.: HB26E

Rev. 00/12

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About this manual

This manual describes the utilisation and application of the communication processor SSM-BG41D/42D/43D (abbreviated: BG4xD). The modular communication processor SSM consists of an intelligent main board that has provisions for the installation of a number of input- / output- and communication adapters.

Depending on the type of main board you may install up to 3 plug-in adapters in any combination.

The unit is compatible with programmable logic controllers PLC-115 (without fan module) through PLC-185.

Outline   **Chapter 1:   Introduction**

The chapter starts with a summary of all available BG4xD main boards and the respective plug-in adapters. This is followed by some notes on the handling of electrostatically sensitive modules and information on applications for the BG4xD modules. The chapter also contains information about the features of the system.

Chapter 2:   Main boards

This chapter introduces the main boards BG41D, BG42D and BG43D. Here you can find details on the data communication principle, power supply and the adjustment options provided by the board.

Chapter 3:   Interface adapters

Chapter 3 contains details of the adapters that are currently available. Various tables provide a functional summary of the different adapters.

In addition to general handling instructions for the adapters this chapter also contains a description of the construction, operation and the pin assignment of each adapter.

Chapter 4:   Software

This chapter contains a description of the recommended configuration procedure.

Here you can find specifications on status- and error messages. The major part of this chapter relates to protocols and procedures and itheir utilisation.

A sample configuration concludes the chapter.

Chapter 5:   Installation

This chapter contains a description of the main board configuration. It also provides details the combination options for plug-in adapters, address selection and the required power supply. Here you can also find information on the start-up properties, as well as trouble shooting hints. The chapter concludes with an installation guide and the technical data.

Contents

User Considerations

Purpose and contents	This manual contains a description of the BG4xD main boards BG41D, BG42D and BG43D as well as the respective adapters, the construction, project design and application.
	The BG4xD main board and the respective adapters are configured by means handler modules and they may be installed in all programmable logic controllers (PLC-115U ... PLC-185U).
Target audience	The manual is intended for users with a basic knowledge of automation technology and PLC programming.
Structure of the manual	The manual is divided into 5 chapters. Each chapter contains a comprehensive description of a specific topic in no more than 48 pages.
Guide to the document	The following guides are available in the manual:

- a complete table of contents at the beginning of the manual
- a summary of the topics at the beginning of each chapter
- cross-reference index at the end of the manual

Availability   The manual is available as follows:

- in printed form
- as an electronic document in a PDF-file (Adobe Acrobat Reader)

Icons and announcements   The following icons and announcements indicate important sections of text:

Danger!
Immediate or implied danger.
Personnel may be endangered.

Attention!
Material damage may result if these recommendations are not observed.

Note!
Additional information and useful tips.

Safety Information

Appropriate utilisation

The BG4xD main boards and adapters were constructed and manufactured for

- communications and process control
- general control and automation applications
- industrial applications
- operation within the environmental limitations specified in the technical data
- installation in a fully enclosed, RF-proof metallic enclosure

Danger!
This device is not certified for applications in an

- explosive environment (EX-zone)

Documentation

Manual must be available to all staff members concerned with

- Project design
- Installation
- Commissioning
- Operation

The following must be noted and understood before the components described in this manual are commissioned or placed into operation:

- Modifications to the automation system must never be carried out when the system is connected to the power supply!

- Connections and modifications should only be carried out by fully qualified electrical technicians

- The national rules and regulations that are in force in the respective country must be satisfied (installation, safety, EMC ...)

Disposal   **You must comply with applicable national rules and regulations when disposing of the module!**

Part 1   Principles

Outline   This introduction presents recommendations for handling electrostatically
                     sensitive modules and information on the utilisation and applications for the
                     CP-module.

                     Below follows a description of:

                     • Scope of supply and hardware versions

                     • Safety information for users

                     • Typical applications

                     • Performance characteristics

Contents   **Topic**   **Page**

Module overview

Type	Order number	Description
BG41D	VIPA SSM-BG41D	Main board with 1 adapter location
BG42D	VIPA SSM-BG42D	Main board with 2 adapter locations
BG43D	VIPA SSM-BG43D	Main board with 3 adapter locations

Adapter overview

Type	Order number	Description
MD25D	VIPA SSM-MD25D	20mA Current Loop
MD22D	VIPA SSM-MD22D	RS232C
MD26D	VIPA SSM-MD26D	20mA C.L.-/ RS232C-combination
MD21D	VIPA SSM-MD21D	RS422 / RS485 dc-coupled
MD33D	VIPA SSM-MD33D	RS422P-adapter (isolated)
MD35D	VIPA SSM-MD35D	RS422HP-adapter (with handshake, isolated)
MD34D	VIPA SSM-MD34D	RS485P-adapter (isolated)

Safety Information for Users

Handling of electrostatically sensitive modules

VIPA-modules make use of highly integrated components in MOS-technology. These components are extremely sensitive to over-voltages that can occur during electrostatic discharges.

Electrostatically sensitive module!

This symbol is attached to modules that can be destroyed by electrostatic discharges:

The symbol is located on the module, the module rack or on packing material and it indicates the presence of electrostatically sensitive equipment.

Background

It is possible that electrostatically sensitive equipment is destroyed by energies and voltages that are far less than the human threshold of perception. These voltages can occur where persons do not discharge themselves before handling electrostatically sensitive modules and they can damage components thereby causing the module to become inoperable or unusable.

Behaviour of damaged modules

Modules that have been damaged by electrostatic discharge are usually not detected immediately. The respective failure can only become apparent after a period of operation.

Components damaged by electrostatic discharges can fail after a temperature change, mechanical shock or changes in the electrical load.

Precautions

Only the consistent implementation of protective devices and meticulous attention to the applicable rules and regulations for handling the respective equipment can prevent failures of electrostatically sensitive modules.

Shipping of electrostatically sensitive modules

Modules must be shipped in the original packing material. You can provide additional protection by wrapping the modules in conductive bags before they are shipped. Conductive material is manufactured from antistatic foil or metallized plastic containers.

Attention!

The CP-module carries a battery to sustain the real-time clock. You must make sure that the conductive packing material does not come into contact with or short out the battery connections.

Measurements and alterations on electrostatically sensitive modules

When you are conducting measurements on electrostatically sensitive modules you should take the following precautions:

- Floating instruments must be discharged before use.
- Instruments must be grounded.

You should only use soldering irons with grounded tips when you are making modifications on electrostatically sensitive modules.

Attention!

People, tools and instruments should be grounded when working on electrostatically sensitive modules.

General

CP-module installed in CP-plug-in location

In contrast to the earlier version BG41...BG43 the D-version BG41D...BG43D is a CP-module. You may only install it into CP-plug-in locations.

Physical characteristics of the interfaces

As for the earlier version, we differentiate between three types of modules depending on the number of interface adapter locations. The interfaces may be adapted to the different physical communication properties and the respective functions by means of VIPA-interface adapters. These adapters provide the connection for various peripheral devices that require the respective communication properties.

Diagnostic interface

Every VIPA interface module (BG41D, BG42D, BG43D) is provided with an additional diagnostic interface for connection to a diagnostic adapter.

Applications

The VIPA interface module is used in PLC systems as input- and output interface for data. Data is communicated via page frames using standard CPU handler modules.

The 25-pin D-type sockets located on the module are pin-compatible with the CP525 when the serial communication adapters are employed.

Sample application

The interface module is provides the connection between external equipment with serial interfaces and your PLC. Equipment may consist of drives, weighers, barcode-readers, etc. You can also use the interface module to communicate with other processors.

The module is configured by means of standard handler modules.

Transmit data and receive data is stored in the data module of the PLC.

The following figure is intended to illustrate typical applications.
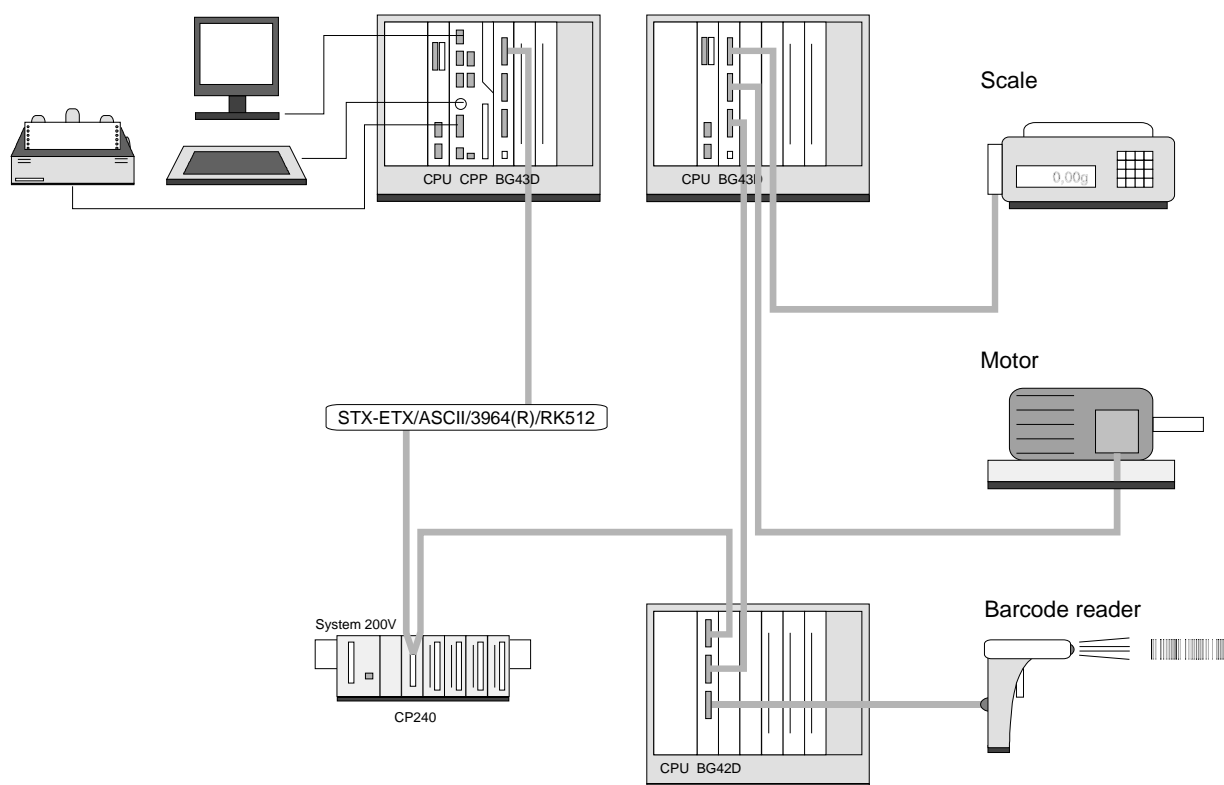
Standard parameters

Without configuration the following default settings for serial communications are assigned to every interface:

- No protocol
- Communication rate   9600 Baud
- Start bit   1
- Data bits   8
- Parity check   even parity
- Stop bits   2

Performance Characteristics

CP-module
- Serial process interface
- Diagnostic socket
- Physical interface by means of plug-in adapters
- Interfaces: RS232C, RS422/RS485 and 20mA current loop

Communication
- Supports the protocols: ASCII, STX/ETX, 3964(R) and RK512
- Page frame communication by means of CPU-specific handler modules
- Simple configuration options by means of send job numbers
- Data communication rates up to 57kBit/s

Individuality
- Pin-assignment for serial interfaces in accordance with customer requirements
- Scalable performance

Part 2   Interface Modules

2-1

Outline   Interface modules are available in three different versions that are described in this chapter.

The following information is provided

- Principles of data communications
- Construction of the interface module
- Jumper, switches and connectors

Contents

Module overview

| Type	Order number	Description
BG41D	VIPA SSM-BG41D	Main board with 1 adapter location
BG42D	VIPA SSM-BG42D	Main board with 2 adapter location
BG43D	VIPA SSM-BG43D	Main board with 3 adapter location

Principles of data communications

In contrast to the earlier version of this board the data communications of the new SSM module is routed via page frames (Dualport-RAM). You must define the page frame on the modules that this should use for data communications. Data communications is easily controlled by means of the handler modules of your CPU.

**Data transfer
BG43D**

```
┌─────────────────────────────────────────────────────────────────┐
│                                        ┌────────────────────┐     │
│                                        │ Diagnostic Interface│     │
│                                        │   RJ45 socket      │     │
│                                        └────────────────────┘     │
│                                                 ↕                 │
│   ┌──────┐      ┌──────────────┐      ┌────────────────┐          │
│   │ back-│      │              │      │                │          │
│   │plane-│ ↔    │  Dualportram │  ↔   │   Processor    │          │
│   │ bus  │      │              │      │                │          │
│   └──────┘      └──────────────┘      └────────────────┘          │
│                                                 ↕                 │
│                                        ┌────────────────┐         │
│                                        │   Adapter-     │         │
│                                        │    socket      │         │
│                                        └────────────────┘         │
└─────────────────────────────────────────────────────────────────┘
```
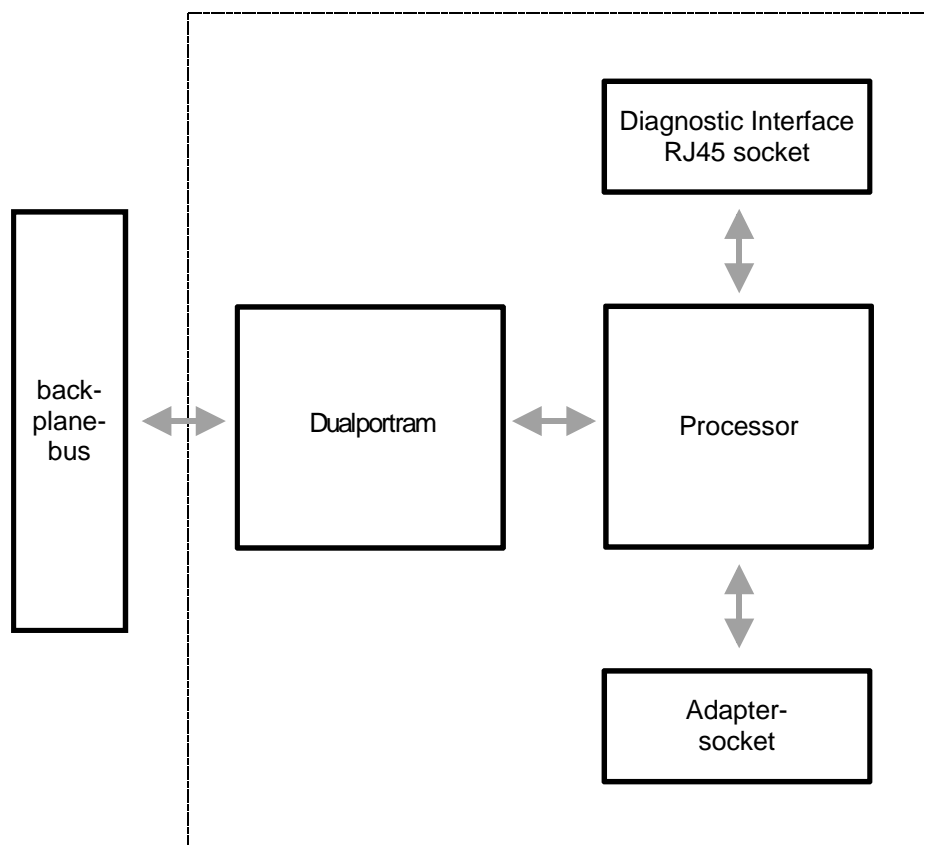
Construction of the Interface Module BG4xD

Plugs and sockets
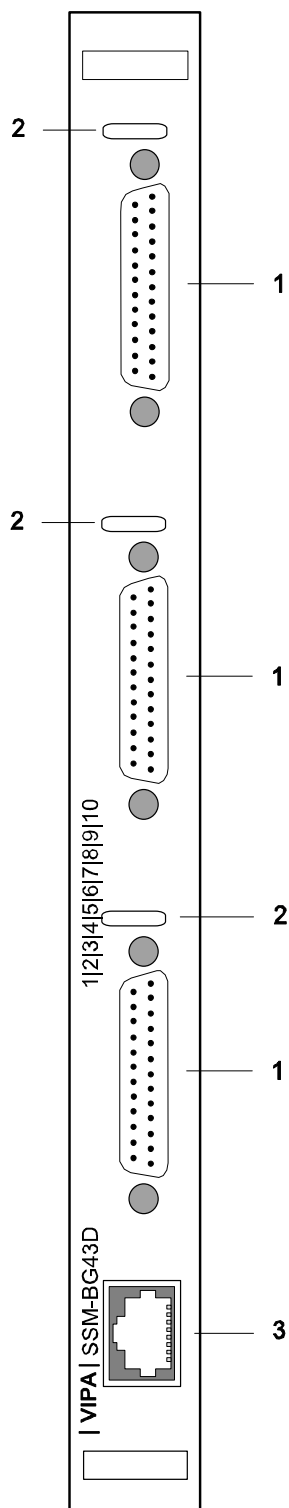
The interface modules BG41D...BG43D consist of a PC-board in double-sized eurocard format with two 48-pole connectors.

The required width is 1 1/3 standard plug-in locations (SEP).

Three different versions of the module are available, depending on the number of interfaces:

- BG41D   1 interface
- BG42D   2 interfaces
- BG43D   3 interfaces

You can configure the interfaces for different physical modes of data communications by means of interface adapters.

The front of the BG41D...BG43D module carries the following:

[1] up to three 25-pole D-type sockets for the different interfaces

[2] openings for the LEDs located on the adapters that provide an indication of the status and about the respective adapter.

[3] one RJ45-socket as a diagnostic interface

**Jumpers and
switches BG43D**
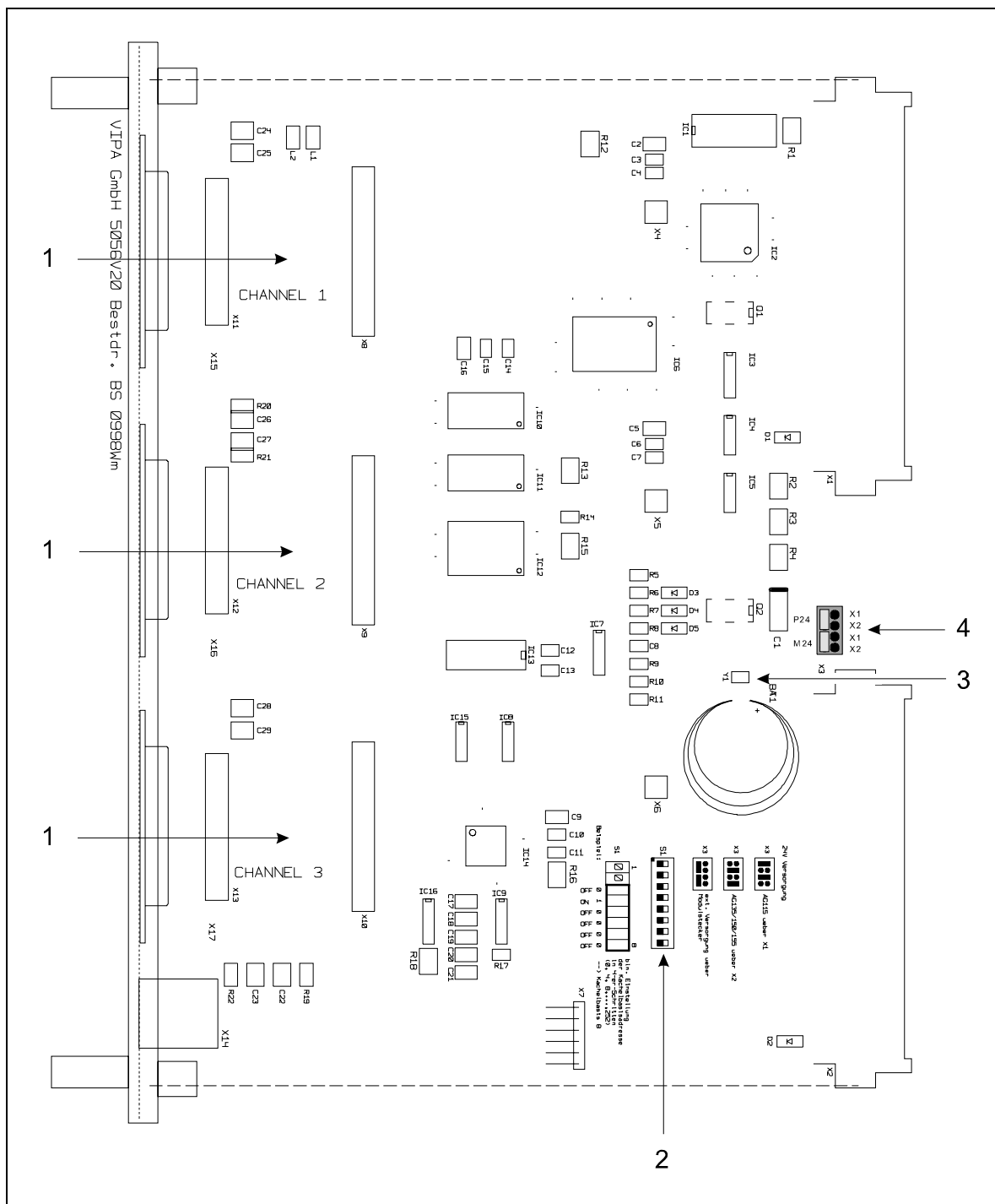
[1]   Channel 1...3   plug-in location for interface adapters
[2]   DIP-switch S1   page frame base address configuration
[3]   Soldered link Y1   battery backup of parameters
[4]   Jumper X3   power supply for adapters

Plug-in location for interface adapters channel 1...3

Depending on the type of module you may have up to a maximum of 3 channels.

The interface located on the front is related directly to the respective channel plug-in location behind it.

You can configure the different interfaces for the various physical communication modes by means of plug-in adaers inserted into the channels.

The adapters may receive power via the back plane bus or from the plug located on the front.

You must ensure that jumper X3 is positioned in accordance with the power supply!

**Page frame base address configuration by means of DIP-switch S1**

DIP-switch S1 is used to determine the page frame base address. This address does **not** depend on the plug-in location!

You must define a binary coded address for the adapter by means of DIP switch S1.

Addresses are defined in steps of 4. This means that the first two switches (1 and 2) must always be in position zero. A sample switch-setting is silk-screened onto the board.

You can obtain a more detailed description of the page frame base address configuration in the "Installation" chapter.

DIP-switch S1

ON = 1

OFF = 0

ON

1 2 3 4 5 6 7 8
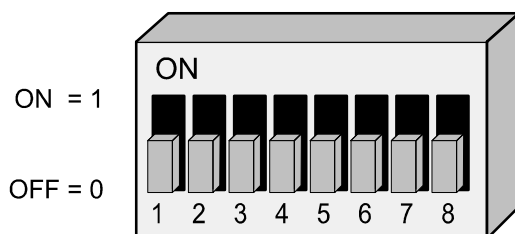
Set these switches in accordance with the page frame base address in steps of 4 (0, 4, 8, ..., 252).

Switches S1-1 and S1-2 must always be set to 0

⚠ **Attention!**

You must turn off the power before changing DIP-switches!

Make sure that you have grounded yourself properly before you handle the module!

Long-term backup of parameters

The BG4xD carries a battery that provides the backup voltage for maintaining parameters when main power is turned off. This battery-backup is disabled when the module is delivered.
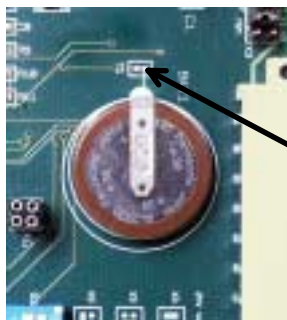
Y1

The battery is connected when soldered link Y1 is installed.

This ensures that parameters are not lost when the module is disconnected and removed.

Attention!

You must ensure that you as well as your tools are grounded sufficiently when working on electrostatically sensitive components.

Power supply for adapters

Socket X3 located on the BG4xD is used to connect the 24V supply from the back plane bus. If the module receives power from an external source it is essential that these links are located in the position shown as *Parkposition*. The module is delivered with the links in this position:

X1 X2 X1 X2

X3

P24   M24
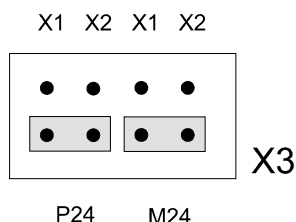
Where an adapter is connected to an external power supply this must gbe connected to the plug located on the front.

You can obtain a more detailed description of the power supply options in the "Installation" chapter.

**Circuit diagram
24V power supply
BG43D**

Channel 1

Channel 2

Channel 3

X1

115U

+   **24V**
-

P24
X3
M24

X2

135U
150U
155U

+   **24V**
-
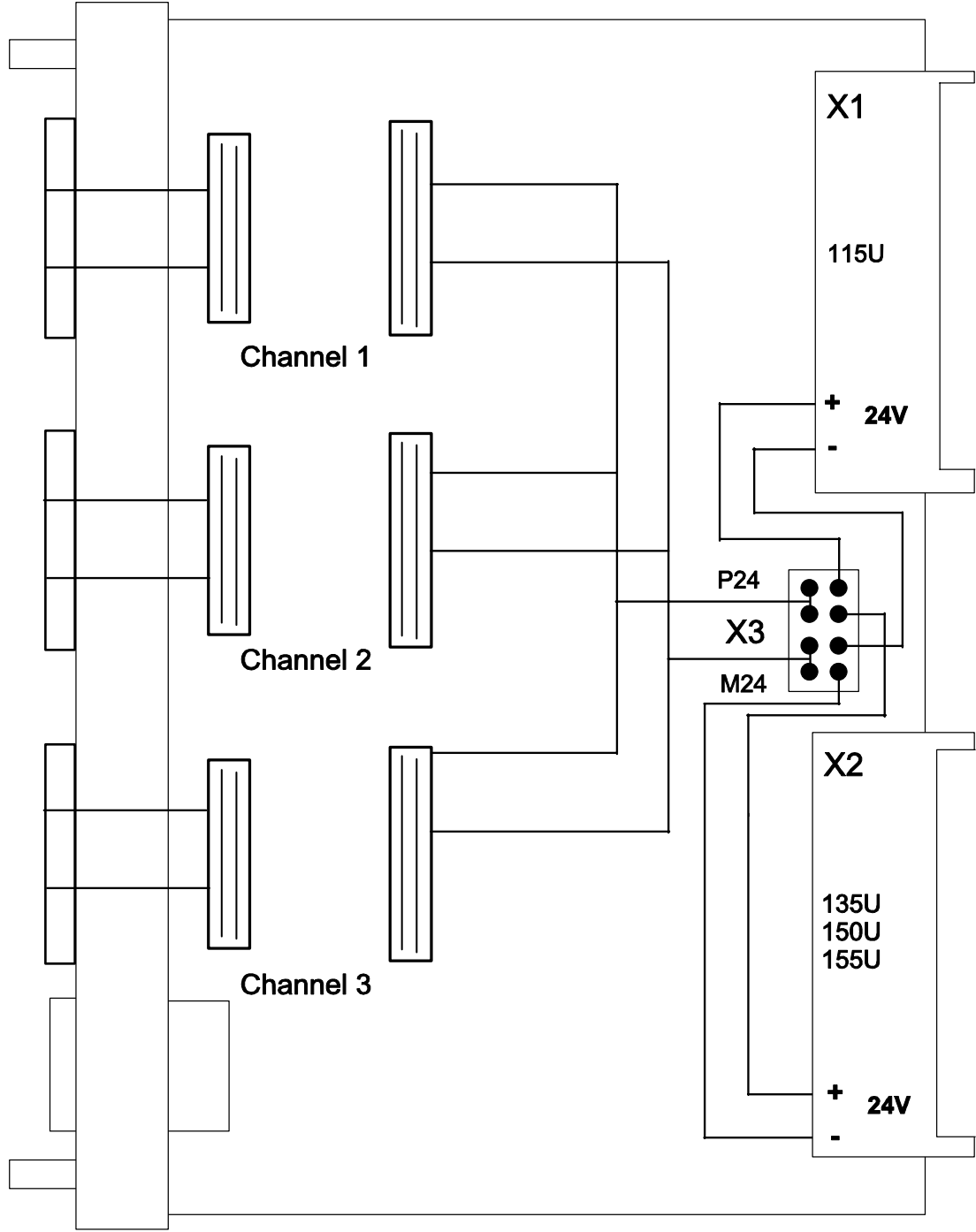
Pin assignments

Base connector X1

	d	b	z
2	n.c.	M	+5V
4	UBAT	PESP	n.c.
6	ADB12	ADB00	/CPKL
8	ADB13	ADB01	/MEMR
10	ADB14	ADB02	/MEMW
12	ADB15	ADB03	/RDY
14	n.c.	ADB04	DB0
16	n.c.	ADB05	DB1
18	n.c.	ADB06	DB2
20	n.c.	ADB07	DB3
22	n.c.	ADB08	DB4
24	n.c.	ADB09	DB5
26	n.c.	ADB10	DB6
28	n.c.	ADB11	DB7
30	+24V	BASP	M24V
32	/BASPA	M	n.c.

Base connector X2

	d	b	z
2	n.c.	M	+5V
4	n.c.	n.c.	n.c.
6	n.c.	n.c.	n.c.
8	n.c.	n.c.	n.c.
10	n.c.	n.c.	n.c.
12	n.c.	n.c.	n.c.
14	n.c.	n.c.	n.c.
16	n.c.	n.c.	n.c.
18	n.c.	n.c.	n.c.
20	n.c.	n.c.	n.c.
22	n.c.	n.c.	n.c.
24	n.c.	n.c.	n.c.
26	n.c.	n.c.	n.c.
28	n.c.	n.c.	n.c.
30	n.c.	n.c.	M24V
32	n.c.	M	+24V

Part 3   Interface Adapters

Outline   The following chapter contains a description of the adapters that are currently available for the interface module BG4xD.

Additional modules are under development.

Below follows a description of:

- General information about the adapters
- An overview of LED-indicators
- Selection table for suitable adapters
- Overview of the required FBs
- Functional description and pin assignment

Contents   Topic   Page

Adapter overview

Type	Order number	Description
MD25D	VIPA SSM-MD25D	20mA current loop
MD22D	VIPA SSM-MD22D	RS232C
MD26D	VIPA SSM-MD26D	20mA C.L.-/ RS232C-combination
MD21D	VIPA SSM-MD21D	RS422 / RS485
MD33D	VIPA SSM-MD33D	RS422P-adapter (isolated)
MD35D	VIPA SSM-MD35D	RS422HP-adapter (with handshake, isolated)
MD34D	VIPA SSM-MD34D	RS485P-adapter (isolated)

Important Note

> ⚠️ **Attention!**
>
> Use only D-version adapters in conjunction with the modules of the D-version! Other adapters can cause permanent damage to the module or the adapter!
>
> Please take care that you order the correct version!

General

The modular communication processor SSM consists of an intelligent main board that has sockets for a number of input- / output- and communication adapters.

Depending on the type of main board you can install up to 3 different combinations of interface adapters.

The communication processor SSM can be used for:

- data communications with programmable controllers and processors
- connecting keyboards, terminals or printers
- real-time data and clock-pulse acquisition (under development)
- input and output of analogue process data (under development).

Power supply, 5V and 24V

The 5 V supply connected via the back plane bus should suffice as the power supply for the module.

The 20mA current loop adapter or the combination 20mA current loop adapter requires 24V when it should be used as the active component in a 20mA current loop with the internal power supply. You can obtain more detailed information on the power supply requirements from chapter 5.

LED-Indicators on the Adapters

The interface adapters are provided with LEDs. The colour of the LED indicates the type of adapter installed on the main board even when the main board has been inserted into its plug-in location.

This chapter contains a description of the significance of the LED-indicators in conjunction with the respective adapter.

Adapter type	Order-no.	LED 1	2		
20mA	MD25D	red (receive)	red (transmit)		
20mA/RS232C	MD26D	red (receive)	red (transmit)		
RS232C	MD22D	green (receive)	green (transmit)		
RS422 / RS485	MD21D	yellow (receive)	yellow (transmit)		
RS422P	MD33D	yellow (receive)	yellow (transmit)		
RS422HP	MD35D	red (RTS)	green (CTS)	yellow (transmit)	yellow (receive)
RS485P	MD34D	yellow (receive)	yellow (transmit)		

Selection Tables

Function - adapter

Functions	Module that is required or may be used
serial functions without procedure	MD21D, MD22D, MD25D, MD26D, MD33D, MD34D, MD35D
STX-/ETX-procedure	MD21D, MD22D, MD25D, MD26D, MD33D, MD34D
3964(R)-procedure	MD22D, MD25D, MD26D, MD33D
3964(R) with RK 512-procedure	MD22D, MD25D, MD26D, MD33D

Function modules   The following function modules are required:

Modules/PLC	PLC115	PLC135	PLC155
Synchronous	FB249	FB125	FB125
Send-Direct	FB244	FB120	FB120
Send-ALL	FB244	FB120/FB126	FB120/FB126
Recv-Direct	FB245	FB121	FB121
Recv-ALL	FB245	FB121/FB127	FB121/FB127
Control	FB247	FB123	FB123
Reset	FB248	FB124	FB124

Please refer to the description of your CPU for more detailed information on the function modules.

20mA Current Loop Adapter (MD25D)

General

The RS232C interface can not operate reliably in an environment with a high level of electrical interference. The 20mA current loop interface was developed for this purpose. On this interface a logical "1" is represented by a current of 20mA and a "0" by 0mA. The respective currents are produced by the active interface and returned to the originator via a loop. This operation only requires two pairs of conductors.

20mA interface

Characteristics of the 20mA adapter:
- Logical conditions represented by current levels
- Depending on the baudrate the maximum data communication distance can reach 1000m
- Data communication rate up to 19,2kBaud
- Point-to-point links (active/passive)
- Bus connection

Options for the 20mA operating mode:
- When the module is the active interface it is the current source
- When the module is the passive interface the remote interface is the current source

**Construction
MD25D**

[1]	Jumper X5	Power supply int/ext
[2]	Jumper X3	Power supply int/ext
[3]	LEDs	for internal purposes
[4]	Connector X2	Connections to the module
[5]	Connector X1	Connections to the module
[6]	LEDs	Status-LEDs, visible on the module if installed
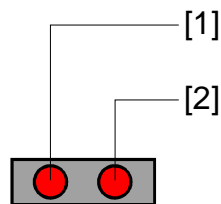
LEDs

[1]	Receive data (red)
[2]	Transmit data (red)

LED status

Steady:	no data traffic (dormant condition)
Blinking:	data transfer active

Power supply selection jumper X3, X5	If the MD25D must be the active interface on the current loop the voltage for the 20mA current source interface can be supplied internally or externally:

- internally via the back plane bus (base connector X1 or X2)
- externally via the 25-pin D-type socket (pin 11 and pin 22)

internal

Module BG4x jumper X3
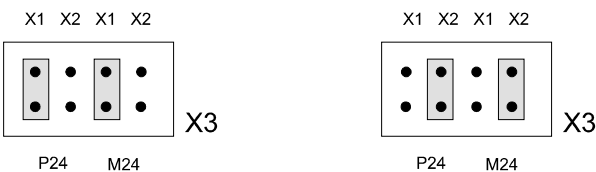
via X1 for PLC-115U via X2 for PLC-135U, PLC-150U, PLC-155U

Adapter MD25D jumper X3, X5	This jumper setting derives the supply voltage for the current source on the adapter from the back panel bus. It is also possible to supply 24V from a PLC that has this facility via pin 11 (+24V) and pin 22 (common).
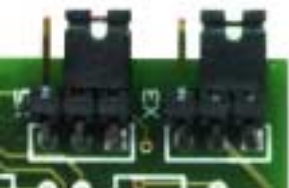
external (default)
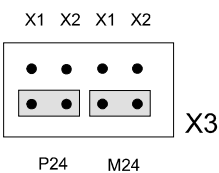
Module BG4x jumper X3	This jumper setting derives the supply voltage for the current source on the adapter from the plug located on the front. Pin 11: +24V Pin 22: 24V common

Adapter   MD25D   jumper X3, X5
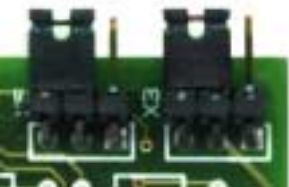
20mA current source

Current sources require a supply voltage between 10 and 36 V (typically 24 V) and they have the following characteristics:

[1]   ideal curve

[2]   curve showing a 20mA-connection between two VIPA modules

[3]   Line resistance 200Ω

[4]   Line resistance 1000Ω
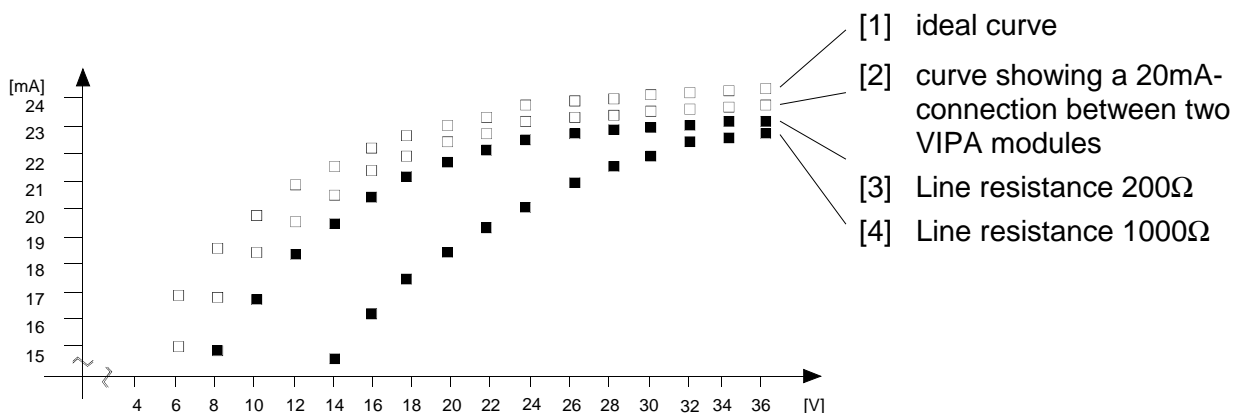
Pin assignment MD25D
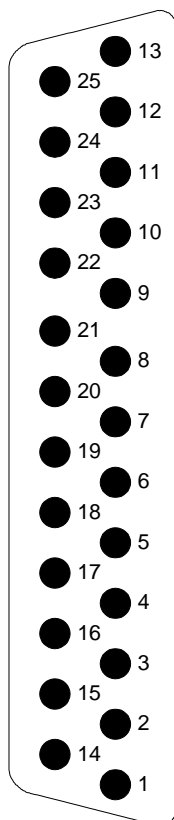
Pin-no.	Signal
1	screen
2	not connected
3	not connected
4	not connected
5	not connected
6	not connected
7	ground
8	not connected
9	not connected
10	TxD+
11	+24V [1]
12	20mA +(Tx) current source
13	RxD+
14	RxD-
15	5V
16	20mA +(Rx) current source
17	ground
18	not connected
19	TxD-
20	not connected
21	20mA -(Rx) current source
22	24V common [1]
23	not connected
24	20mA -(Tx) current source
25	not connected

[1]   +24V and the resp. common can be obtained from these pins if available from the PLC. Connect 24V to these pins when an external supply is used.

**Active 20mA
current loop
interface**

The serial interface operates as the active part, the peripheral equipment as the passive part of the communication link.
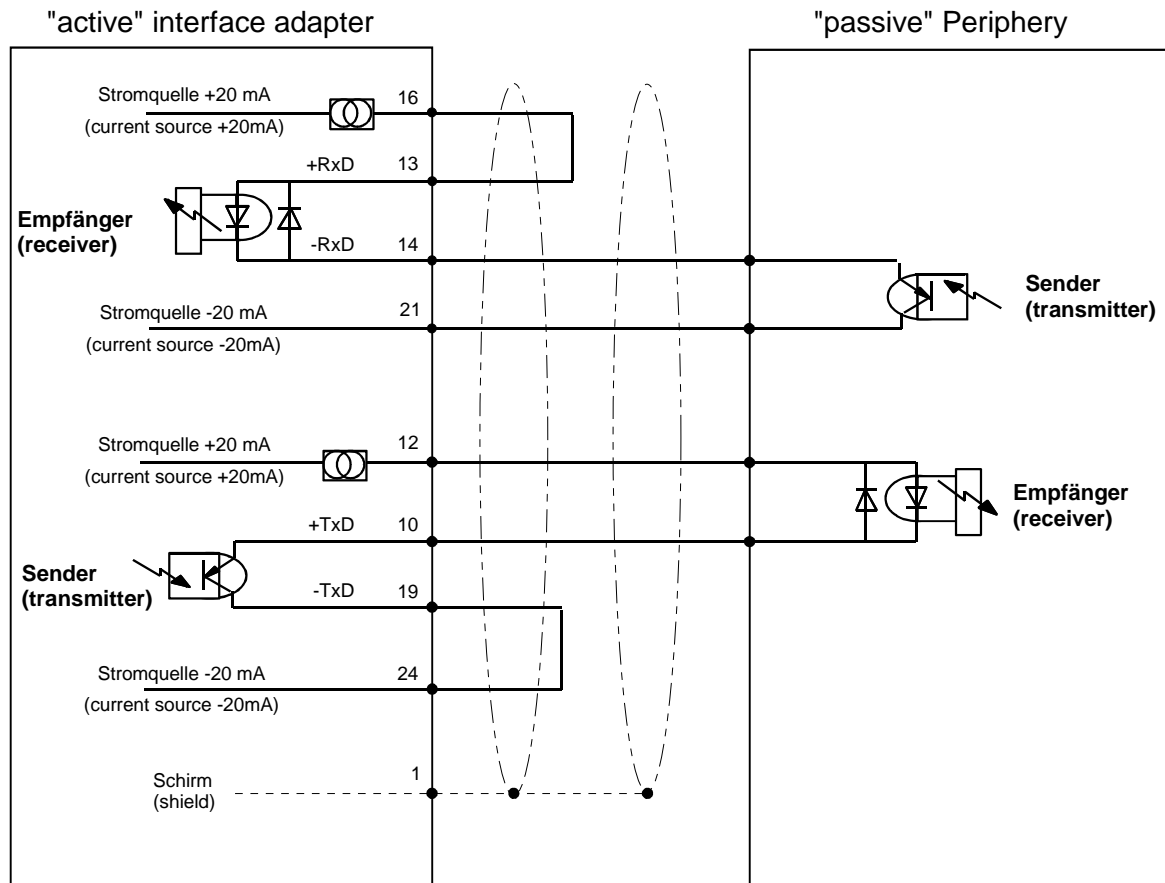
Note!

When the MD25D is used with a Baudrate of 38,4KBaud a twisted-pair cable is required to prevent crosstalk between the different pairs when the length of the cables exceeds 50m.

Passive 20mA current loop interface

When peripheral equipment (e.g. printers) is used as active unit it can supply the voltage required for the 20mA link. In this manner the serial interface can be used as the passive entity. Then the adapter does not require a 24V supply.

"passive" interface adapter   "active" Periphery

+RxD 13

Empfänger (receiver)

-RxD 14   +TxD

-TxD   **Sender (transmitter)**

-20mA

+20mA

+RxD

-RxD   **Empfänger (receiver)**

+TxD 10

Sender (transmitter)   -TxD 19   -20mA

+20mA

Schirm (shield)
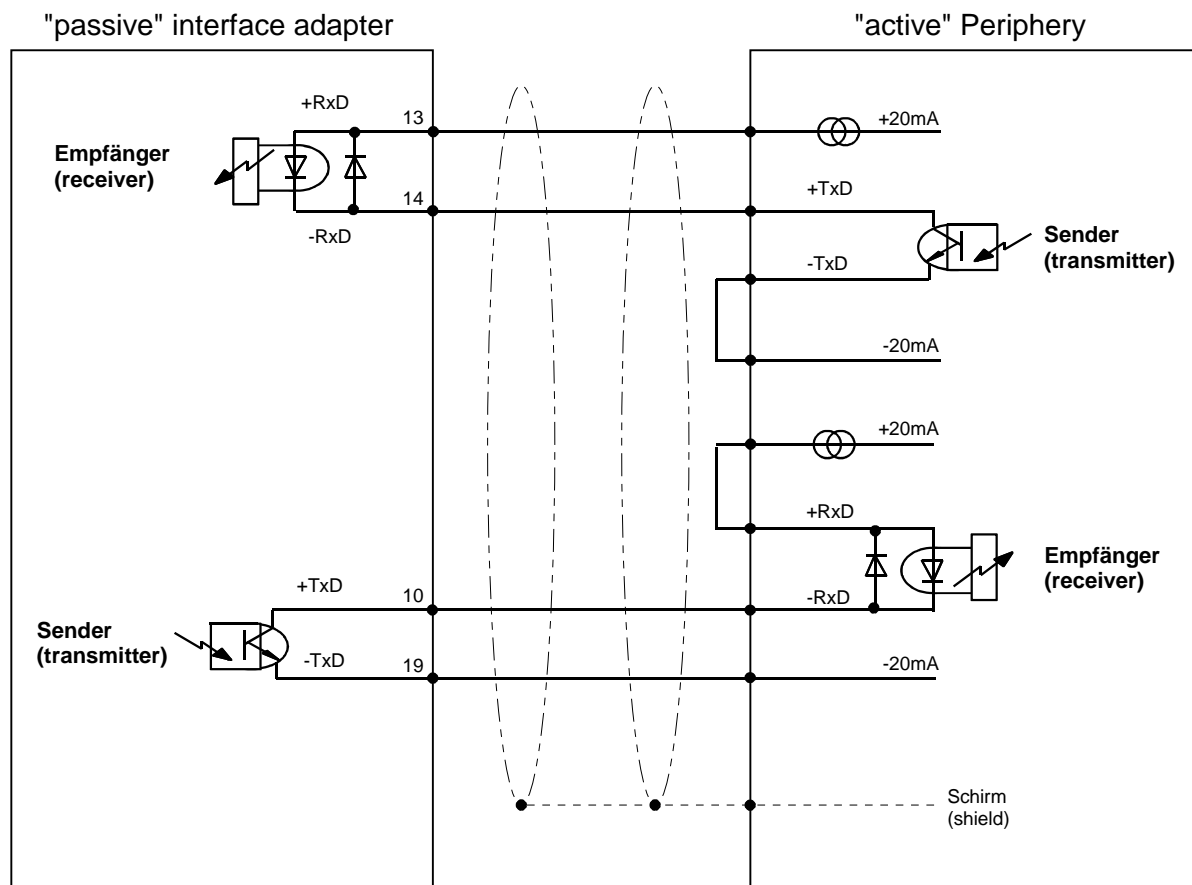
RS232C-Adapter (MD22D)

General

The specifications for the RS232C interface define a maximum distance of 15m and a rate of up to 38,4kBaud. Data communications is controlled by means of data, handshake and control lines.

The MD22D is used for point-to-point links on the basis of the RS232C standard. This adapter requires no default settings before it is installed.

RS232C interface

Characteristics of the RS232C interface located on the adapter:

- Logical conditions represented as voltage levels
- Point-to-point links with serial full-duplex communications in 2-wire technology
- Data communications up to a max. distance of 15m
- Data communication rate up to a max. of 115kBaud

Construction MD22

[1] connector X2   adapter connections
[2] connector X1   adapter connections
[3] LEDs   Status-LEDs visible on the
                      adapter, if installed

LEDs
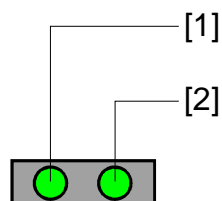
[1] Receive data (green)
[2] Transmit data (green)

Status   Steady: no data traffic (dormant condition)

                    Blinking: data transfer active

**Pin assignment
MD22D**
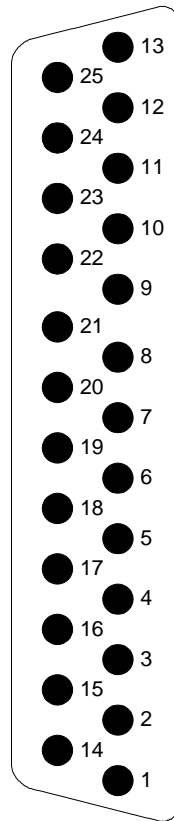
Pin-no.	Signal
1	screen
2	TxD
3	RxD
4	RTS
5	CTS
6	DSR
7	ground
8	DTR
9	not connected
10	not connected
11	+24V [1]
12	not connected
13	not connected
14	not connected
15	5V
16	not connected
17	ground
18	not connected
19	not connected
20	not connected
21	not connected
22	24V common [1]
23	not connected
24	not connected
25	not connected

[1] 24V can be obtained here if available from the PLC

Connections with RTS-/CTS handshake   Connections via the RS232C interface can be established with or without handshake.

An RS232C - interface is used in conjunction with a hardware-handshake via RTS and CTS. These handshake signals must be supported by the peripheral equipment.

Should the peripheral equipment operate with a DTR/DSR-handshake instead of the RTS/CTS-handshake the respective signals for the control of the RTS/CTS-pins of the serial interface must be used.
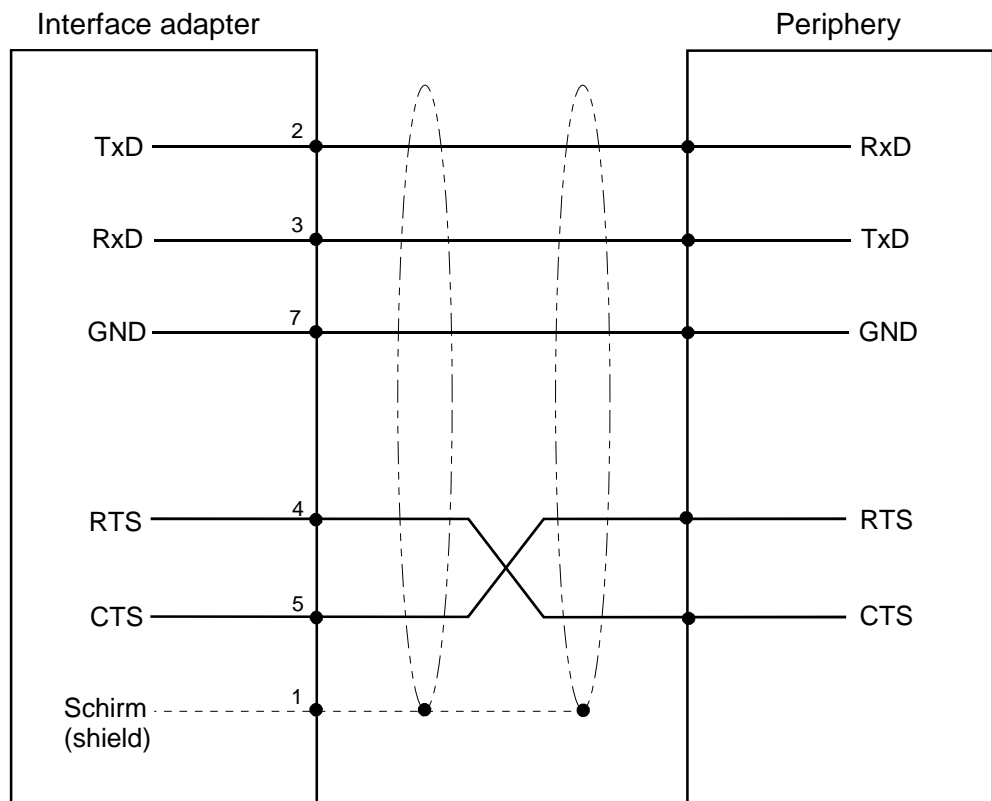
Attention!
Ensure proper electrical screening! Refer to installation guidelines!

**Connections
without
handshake**

It is possible to operate without hardware handshake where the peripheral equipment can not provide handshake signals. In this case you must install a link between RTS-CTS on the VIPA-adapter!

Attention!

In case of a connection without Handshake then the RTS (Pin 4) and CTS (Pin 5) must always be bridged inside the plug!

Security

On these types of links it is essential that the protocol ensures that characters are never lost or destroyed. This is achieved by means of the following:

- lower baudrate or faster character acquisition by the peripheral equipment
- faster processing of the PLC receive buffer

Interface adapter   Periphery

TxD	2	RxD
RxD	3	TxD
GND	7	GND
RTS	4	
CTS	5	
Schirm (shield)	1	
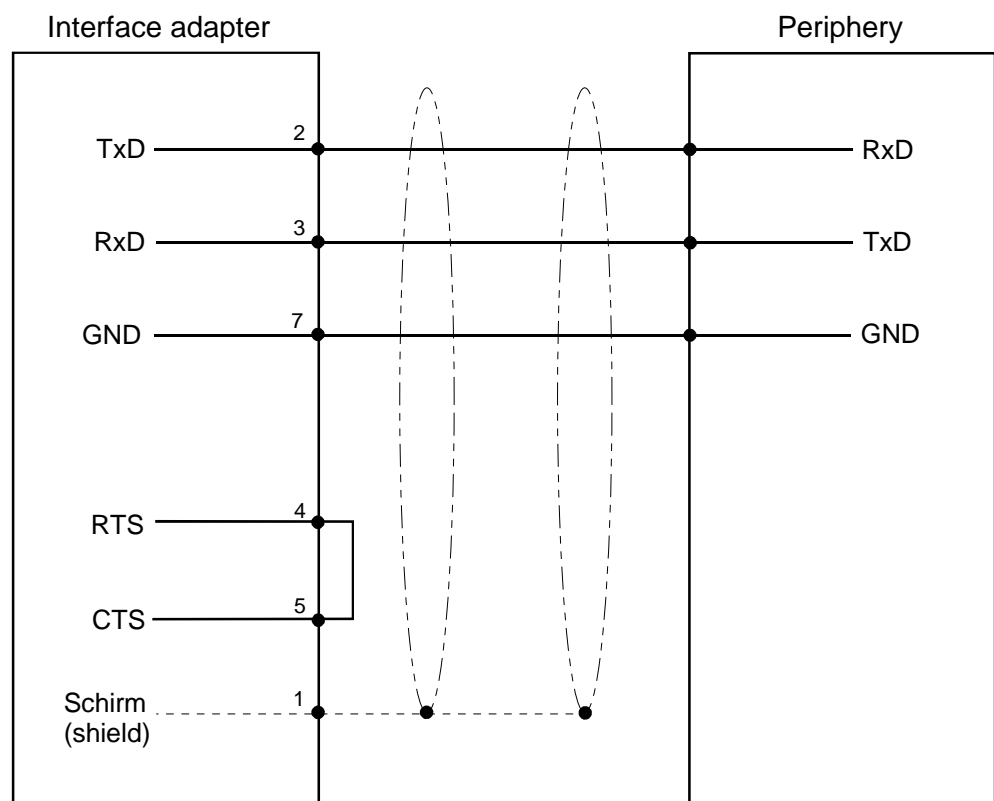
Attention!

Ensure proper electrical screening! Refer to installation guidelines!

20mA Current Loop-/RS232C-Combination Adapter (MD26D)

General

The combination adapter is used for pint-to-point or for bus connections and it provides two current loop interfaces for transmission and reception. In bus-mode the adapter will bypass all loops when it is not connected to any supply power thereby ensuring that the remainder of the system can operate properly.

The RS232C-mode only supports point-to-point connections.

The default setting of the MD26D is that power is supplied internally from the back plane bus when the adapter is used as 20mA current loop interface. If you wish to change over to the external power source (25-pin D-type socket) for the 20mA current source you must exchange jumpers X3 and X5.

Note!

LED-indicators are only active when the combination adapter is employed as 20mA current loop adapter.

20mA interface

Characteristics of the 20mA interface on the adapter:

- Logical conditions defined by current levels
- Depending on the baudrate the maximum data communication distance can reach 1000m
- Data communication rate up to 19,2kBaud
- Point-to-point links (active/passive)
- Bus connection

Options for the 20mA operating mode:

- When the module is the active interface it is the current source
- When the module is the passive interface the remote interface is the current source

RS232C interface

Characteristics of the RS232C interface located on the adapter:

- Logical conditions represented as voltage levels
- Point-to-point links with serial full-duplex communications in 2-wire technology
- Data communications up to a max. distance of 15m
- Data communication rate up to a max. of 115kBaud

Construction MD26D

[1]	Jumper X5	Power supply int/ext
[2]	Jumper X3	Power supply int/ext
[3]	LEDs	for internal purposes
[4]	Connector X2	Connections to the module
[5]	Connector X1	Connections to the module
[6]	LEDs	Status-LEDs, visible on the module if installed
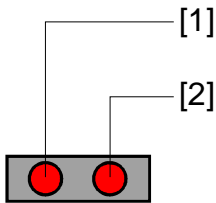
LEDs

[1]	Receive data (red)
[2]	Transmit data (red)

LED status

Steady:	no data traffic (dormant condition)
Blinking:	data transfer active

Power supply selection jumper X3, X5

If the MD26D should be configured as the active interface on the current loop the voltage required by 20mA current source interface can be supplied internally or externally:

- internally via the back plane bus (base connector X1 or X2)
- externally via the 25-pin D-type socket (pin 11 and pin 22)

internal

Module BG4x jumper X3
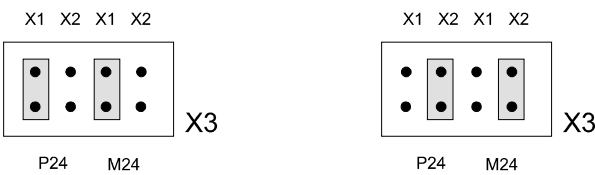
via X1 for PLC-115U via X2 for PLC-135U, PLC-150U, PLC-155U

Adapter MD26D jumper X3, X5
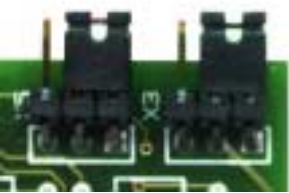
This jumper setting derives the supply voltage for the current source on the adapter from the back panel bus.

It is also possible to supply 24V from a PLC that has this facility via pin 11 (+24V) and pin 22 (common).

external (default)

Module BG4x jumper X3
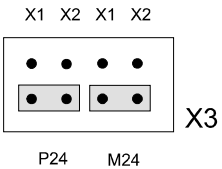
This jumper setting derives the supply voltage for the current source on the adapter from the plug located on the front.

Pin 11: +24V

Pin 22: 24V common

Adapter MD26D jumper X3, X5
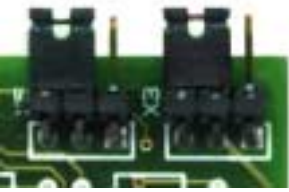
**Pin assignment
MD26D**
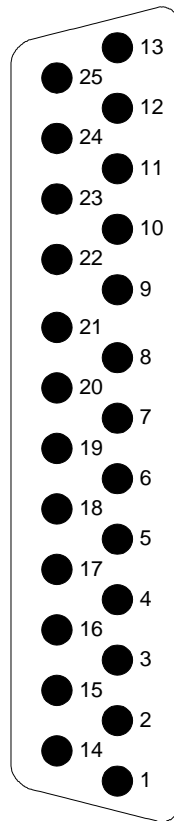
Pin-no.	20mA	RS232C
1	screen	screen
2	do not use	TxD
3	do not use	RxD
4	do not use	RTS
5	do not use	CTS
6	do not use	DSR
7	ground	ground
8	do not use	DTR
9	do not use	do not use
10	TxD+	do not use
11	+24V [1]	+24V [1]
12	20mA +(Tx) curr. source	do not use
13	RxD+	do not use
14	RxD-	do not use
15	5V	5V
16	20mA +(Rx) curr. source	do not use
17	ground	ground
18	do not use	do not use
19	TxD-	do not use
20	Selection: 20mA/RS232C	
21	20mA -(Rx) curr. source	do not use
22	24V common [1]	24V common [1]
23	do not use	do not use
24	20mA -(Tx) curr. source	do not use
25	do not use	do not use

[1]   +24V and the resp. common can be obtained
from these pins if available from the PLC.
Connect 24V to these pins when an external
supply is used.

Interface selection   The **interface selection** of one of the two interfaces is controlled by means
of pin 20 of the 25-pin D-type socket:

- Pin 20 at ground   →   RS232C operation
- Pin 20 open   →   20mA current loop operation

Active 20mA current loop interface

The serial interface is the active interface, the peripheral equipment the passive interface on the data communication link.

"active" Interface adapter   "passive" periphery

Stromquelle +20 mA (current source +20mA)	16	
+RxD	13	
Empfänger (receiver)		
-RxD	14	**Sender (transmitter)**
Stromquelle -20 mA (current source -20mA)	21	
Stromquelle +20 mA (current source +20mA)	12	
+TxD	10	**Empfänger (receiver)**
Sender (transmitter)		
-TxD	19	
Stromquelle -20 mA (current source -20mA)	24	
Schirm (shield)	1	
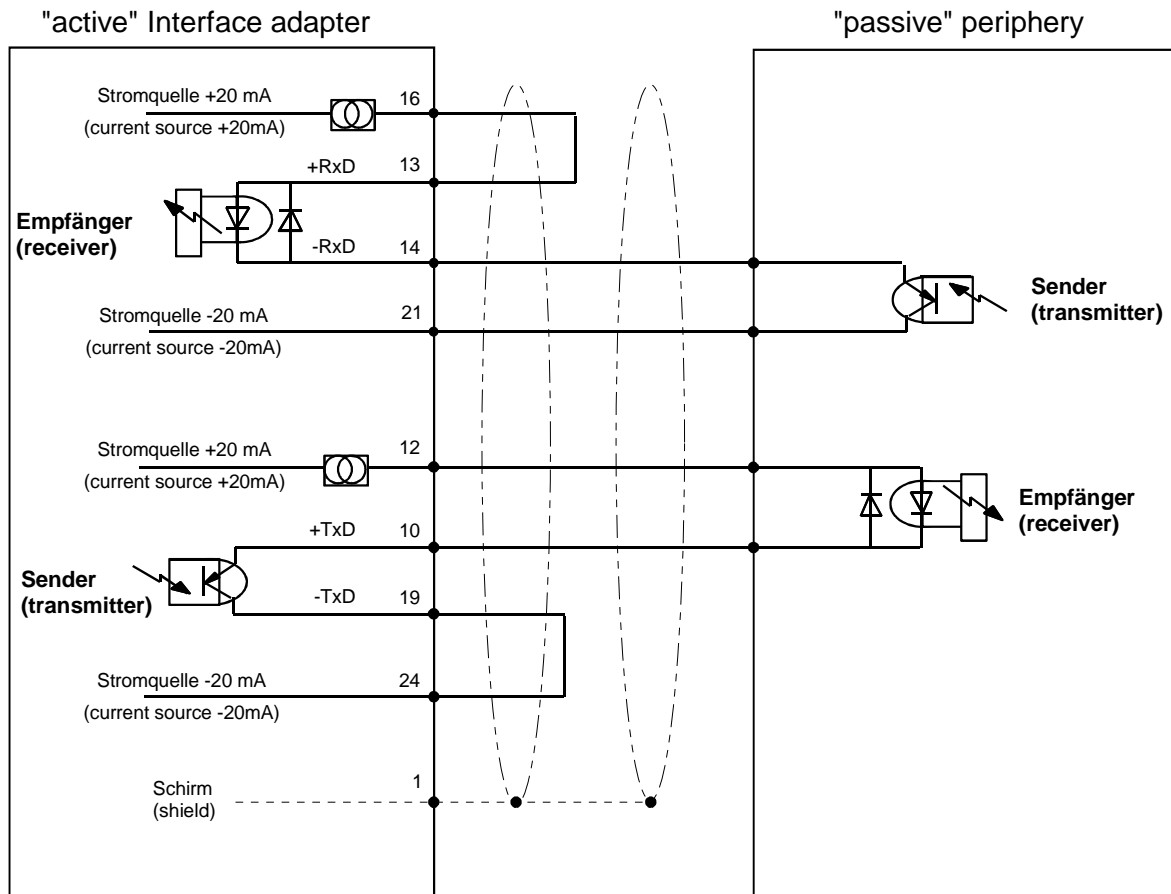
Note!

When the MD26D is used with a Baudrate of 38,4KBaud a twisted-pair cable is required to prevent crosstalk between the different pairs when the length of the cables exceeds 50m.

Passive 20mA current loop interface

When peripheral equipment (e.g. printers) is used as active unit it can supply the voltage required for the 20mA link. In this manner the serial interface can be used as the passive entity. Then the adapter does not require a 24V supply.

"passive" Interface adapter   "active" periphery

```
            +RxD    13                          +20mA
Empfänger                                          +TxD
(receiver)          14
            -RxD                                -TxD      Sender
                                                          (transmitter)

                                                -20mA

                                                   +20mA

                                                +RxD
                                                -RxD      Empfänger
            +TxD    10                                    (receiver)
Sender
(transmitter)       -TxD  19                     -20mA

                                                          Schirm
                                                          (shield)
```

Note!

When the 20mA current loop adapter is used with a Baudrate of 38,4KBaud a twisted-pair cable is required to prevent crosstalk between the different pairs when the length of the cable exceeds 50m.

RS232C with RTS-/CTS handshake

Connections via the RS232C interface can be established with or without handshake.

An RS232C - interface is used in conjunction with a hardware-handshake via RTS and CTS. These handshake signals must be supported by the peripheral equipment.

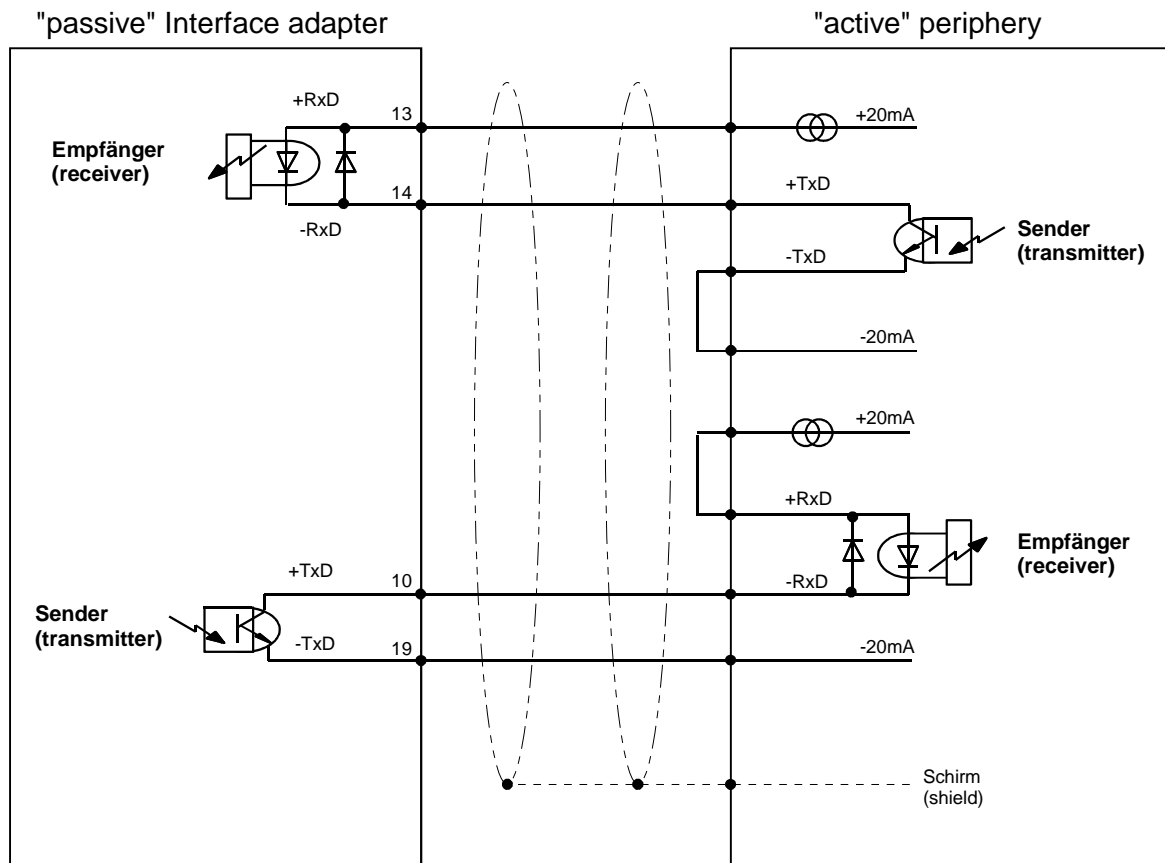Should the peripheral equipment operate with a DTR/DSR-handshake instead of the RTS/CTS-handshake the respective signals for the control of the RTS/CTS-pins of the serial interface must be used.

Interface adapter   Periphery

TxD	2	RxD
RxD	3	TxD
GND	7	GND
RS232C/20mA selection	20	
RTS	4	RTS
CTS	5	CTS
Schirm (shield)	1	

Selection

One of the two available operating modes is **selected** by means of pin 20 of the 25-pin D-type socket:

- Pin 20 at ground   →   RS232C operation
- Pin 20 open   →   20mA current loop operation

Attention!
Ensure proper electrical screening! Refer to installation guidelines!

RS232C without handshake

It is possible to operate without hardware handshake where the peripheral equipment can not provide handshake signals. In this case you must install a link between RTS-CTS on the VIPA-adapter!

Security

On these types of links it is essential that the protocol ensures that characters are never lost or destroyed. This is achieved by means of the following:

- lower baudrate or faster character acquisition by the peripheral equipment
- faster processing of the PLC receive buffer

Interface adapter   Periphery

TxD ──── 2 ──────────────────────────── RxD

RxD ──── 3 ──────────────────────────── TxD

GND ──── 7 ──────────────────────────── GND

RS232C/20mA selection ──── 20

RTS ──── 4

CTS ──── 5

Schirm (shield) ──── 1

Selection

One of the two available operating modes is **selected** by means of pin 20 of the 25-pin D-type socket:

- Pin 20 at ground   →   RS232C operation
- Pin 20 open   →   20mA current loop operation

Attention!

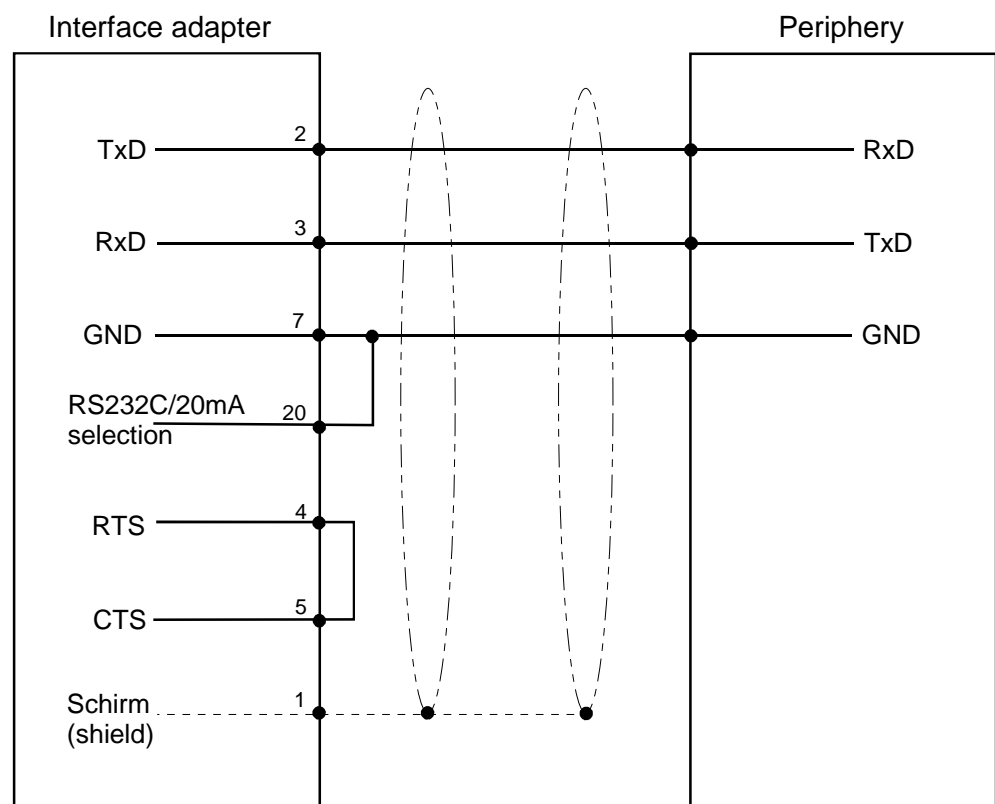Ensure proper electrical screening! Refer to installation guidelines!

RS422/485 Adapter (MD21D)

General   This interface can either be employed for point-to-point links (RS422) or for a bus system where transmission and reception occurs via the same line (RS485).

Activation:

The required operating mode (RS422 or RS485) is determined by the appropriate connection at the plug.

A jumper is provided to connect a 100Ω termination resistor for long data lines or for high data communication speeds and for situations where the adapter is located at the physical end of the bus.

The RS422/RS485-adapter is delivered with the jumper for the 100Ω termination resistor in location OFF.

RS422 interface   Characteristics of the RS422 interface on the adapter:

- Logical conditions represented by differential voltages on the twisted cores
- Point-to-point links with serial full-duplex communications in 4-wire technology
- Multidrop links
- High immunity to interference
- Supports up to a maximum of 16 stations
- Data communications over a maximum distance of 1000m
- Data communication rates up to 115kBaud

RS485 interface   Characteristics of the RS485 interface on the adapter:

- Logical conditions represented by differential voltages on the twisted cores
- Serial bus connections in two-wire technology using a half-duplex communication mode
- Multidrop connection
- High immunity to interference
- Supports a maximum of 32 stations
- Data communications over a maximum distance of 500m
- Data communication rates up to 115kBaud

**Construction
MD21D**

[1]   Jumper X6   100Ω termination resistor
[2]   Connector X2   Connections to the module
[3]   Connector X1   Connections to the module
[4]   LEDs   Status-LEDs visible on the
                         adapter, if installed
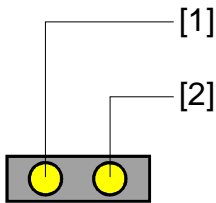
LEDs

[1]   Receive data (yellow)
[2]   Transmit data (yellow)

LED status   Steady: no data traffic (dormant condition)
                      Blinking: data transfer active

Termination resistor   You can use jumper X6 to connect a termination resistor of 100Ω between the RxD-lines.

                                  This may be necessary for long lines or high data communication speeds when the adapter is located at the physical end of the bus.

Termination resistor OFF (default)   *Adapter MD21D jumper X6*   This jumper setting deactivates the termination resistor.
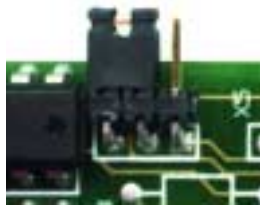
Termination resistor ON   Adapter MD21D jumper X6   This jumper setting connects a termination resistor of 100Ω between the RxD lines.
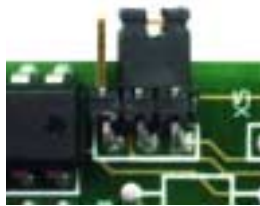
**Pin assignment
MD21D**
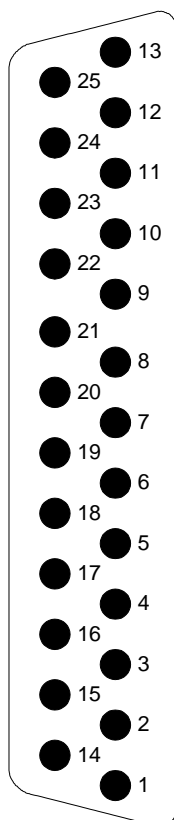
Pin-no.	Signal
1	screen
2	not connected
3	not connected
4	TxD-
5	TxD+
6	RxD-
7	ground
8	RxD+
9	not connected
10	not connected
11	+24V [1]
12	not connected
13	not connected
14	not connected
15	5V
16	not connected
17	ground
18	not connected
19	not connected
20	not connected
21	not connected
22	24V common [1]
23	not connected
24	not connected
25	not connected

[1]   +24V and the resp. common can be obtained
      from these pins if available from the PLC.
      Connect 24V to these pins when an external
      supply is used.

Selection   The required operating mode (RS422 or RS485) is determined by the
                       connections to the plug.

**RS422/RS485
Point-to-point
connections**

Characteristics:

- 4-wire technology
- Full-duplex operation for RS422
- Half-duplex operation for RS485

The Tx-line and the Rx-line must consist of two separate twisted-pair cables with separate screens.

You can connect 100 Ω termination resistor between the Rx-lines by means of jumper X6 located on the MD21D adapter. This is necessary for long lines or high data communication speeds.
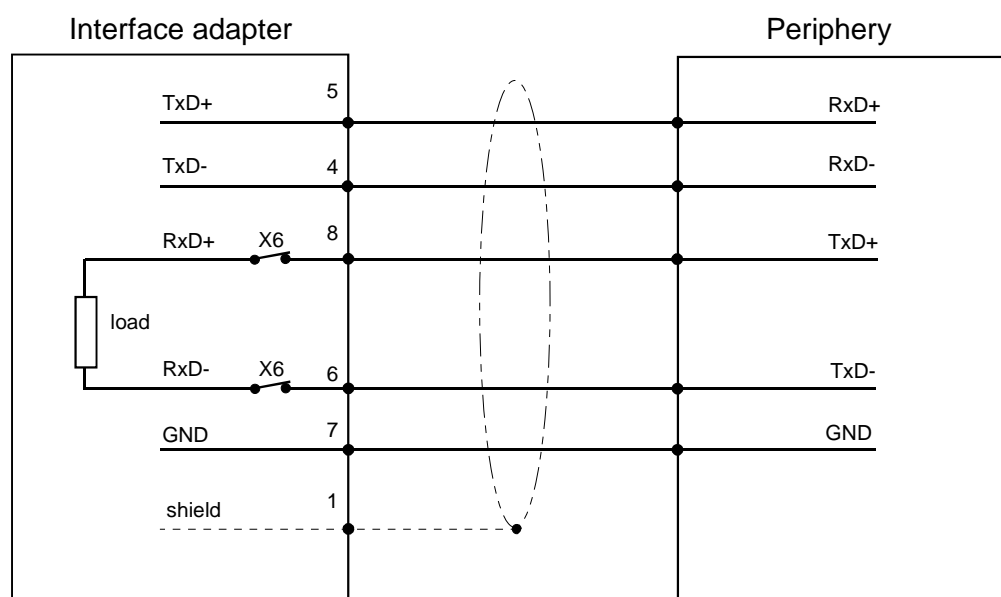
Note!

Please note that the receiver on the MD21D is turned off when the adapter is transmitting data in RS485 mode, i.e. in this mode the adapter can only be used for half-duplex operation.

RS422/RS485 multidrop connections

If it is necessary to connect multiple external devices operating as receivers to the interface adapter you should select the multidrop connection.

Interface adapter

TxD+

TxD-

Periphery 1

RxD+

RxD-

Periphery 2

RxD+

RxD-

Periphery 3

RxD+

RxD-
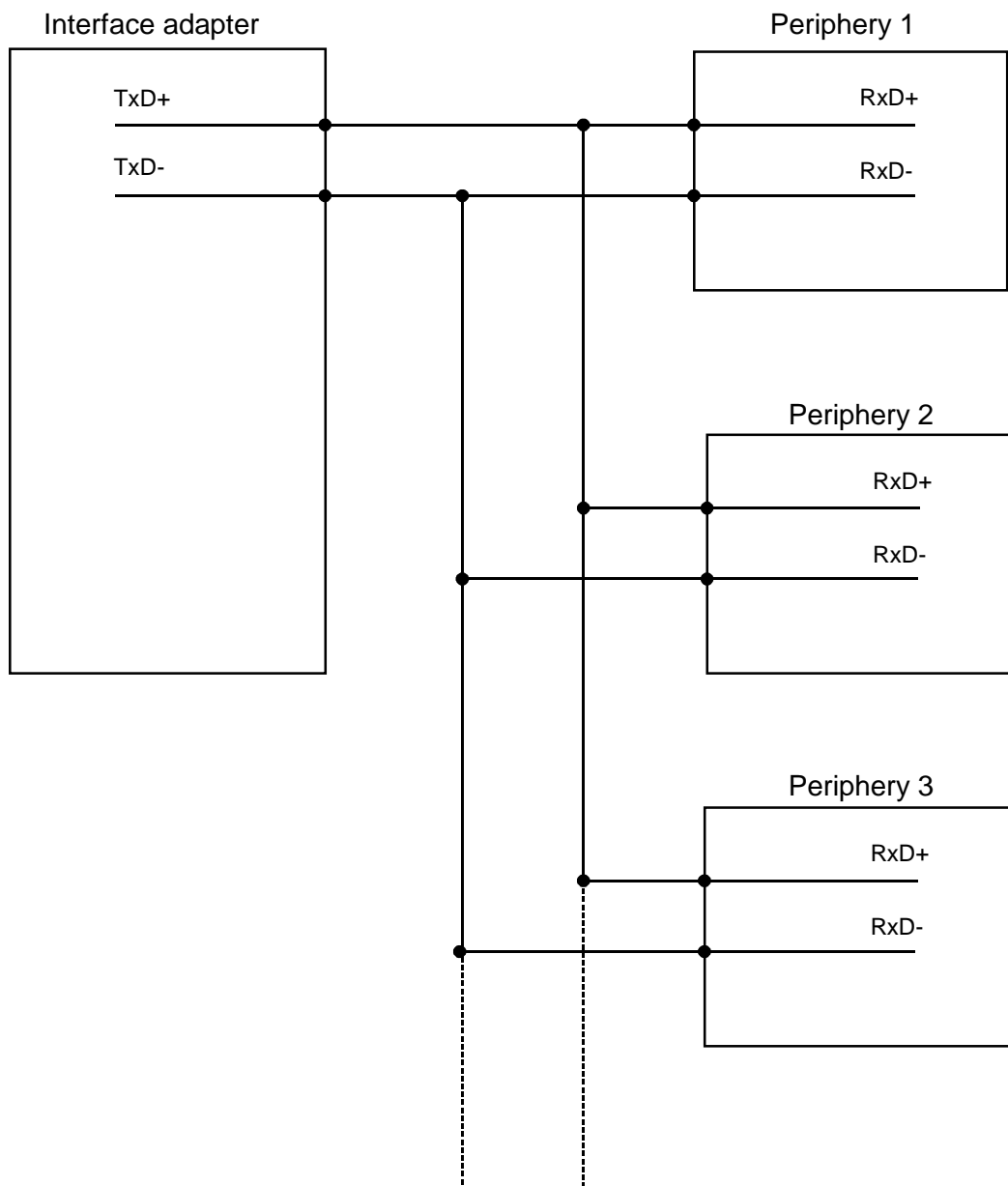
The number of slave-connections depends on the type of interface. You can connect

15 slaves to RS422 or
31 slaves to RS485.

RS422P (MD33D)

General   The interface is designed for point-to-point links using serial full-duplex
                     protocols as well as multidrop-links.

                     These are isolated interfaces.

                     The transmitter and the receiver of the MD33D are always active. This
                     adapter can issue a "Break" signal.

                     A jumper is provided to connect a 100Ω termination resistor for long data
                     lines or for high data communication speeds and for situations where the
                     adapter is located at the physical end of the bus.

                     The RS422-adapter is delivered with the jumper for the 100Ω termination
                     resistor in location OFF.

RS422 interface Characteristics of the RS422 interface on the adapter:

                     • Electrically isolated interface

                     • Logical conditions represented by differential voltages on the twisted
                       pair

                     • Point-to-point link supporting serial full-duplex communications with 4-
                       wire connections

                     • Multidrop connection

                     • High immunity to interference

                     • Supports a maximum of 16 stations

                     • Data communications over a maximum distance of 1000m

                     • Data communication rates up to 115kBaud

**Construction
MD33D**

[1]	Connector X2	Connections to the module
[2]	Connector X1	Connections to the module
[3]	DIP-switch S1	100Ω termination resistor
[4]	LEDs	Status-LEDs visible on the adapter, if installed

LEDs

[1]	Receive data (yellow)
[2]	Transmit data (yellow)

LED status   Steady: no data traffic (dormant condition)
                    Blinking: data transfer active

Termination resistor
You can connect 100 Ω termination resistor between the RxD-lines by means of DIP-switch S1.

This is necessary for long lines or high data communication speeds where the adapter is located at the physical end of the bus.

Termination resistor OFF (default)

Adapter MD33D DIP-switch S1

In this position of the switch the termination resistor is deactivated.

Termination resistor ON

Adapter MD33D DIP-switch S1

In this position of the switch a 100Ω termination resistor is connected between the RxD lines.

Note!
Please ensure that both switches (S1-1 and S1-2) must always be in the same position!

**Pin assignment
MD33D**

Pin-no.	Signal
1	screen
2	not connected
3	+5V$_{iso}$
4	TxD-
5	TxD+
6	RxD-
7	5V common$_{iso}$
8	RxD+
9	not connected
10	not connected
11	+24V [1]
12	not connected
13	not connected
14	not connected
15	5V
16	not connected
17	ground
18	not connected
19	not connected
20	not connected
21	not connected
22	24V common [1]
23	not connected
24	not connected
25	not connected

[1]   +24V and the resp. common can be obtained
from these pins if available from the PLC.
Connect 24V to these pins when an external
supply is used.

RS422
point-to-point
connection

Characteristics:

- 4-wire connection
- Full-duplex operation

The Tx-line and the Rx-line must consist of two separate twisted-pair cables with separate screens.

You can connect 100 Ω termination resistor between the Rx-lines by means of DIP-switch S1 located on the MD33D adapter. This is necessary for long lines or high data communication speeds.

Interface adapter   Periphery

Interface adapter		Periphery
+5V$_{iso}$	3	
TxD+	5	RxD+
TxD-	4	RxD-
RxD+ S1	8	TxD+
load		
RxD- S1	6	TxD-
GND$_{iso}$	7	GND$_{iso}$
shield	1	
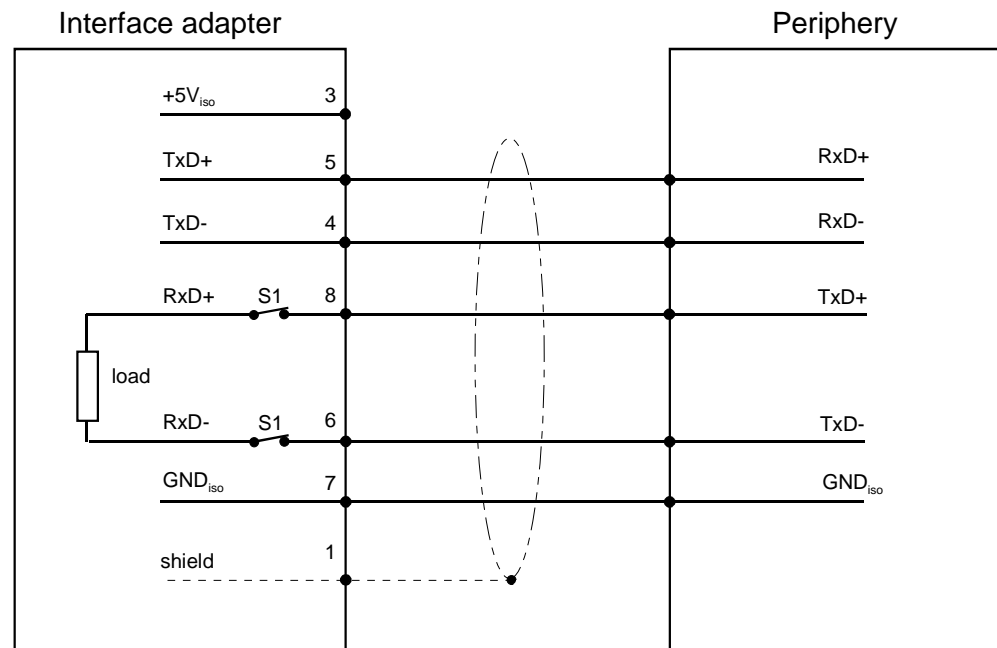
RS422 point-to-point connections with stable levels

Some systems require highly stable signal levels for secure data communications.

You can provide stable signal levels by connecting pull-up and pull-down resistors between the data line and the $5V_{iso}$-voltage and the respective ground. Here you must use resistors that have a value between 500Ω and 600Ω.

The following figure illustrates this.
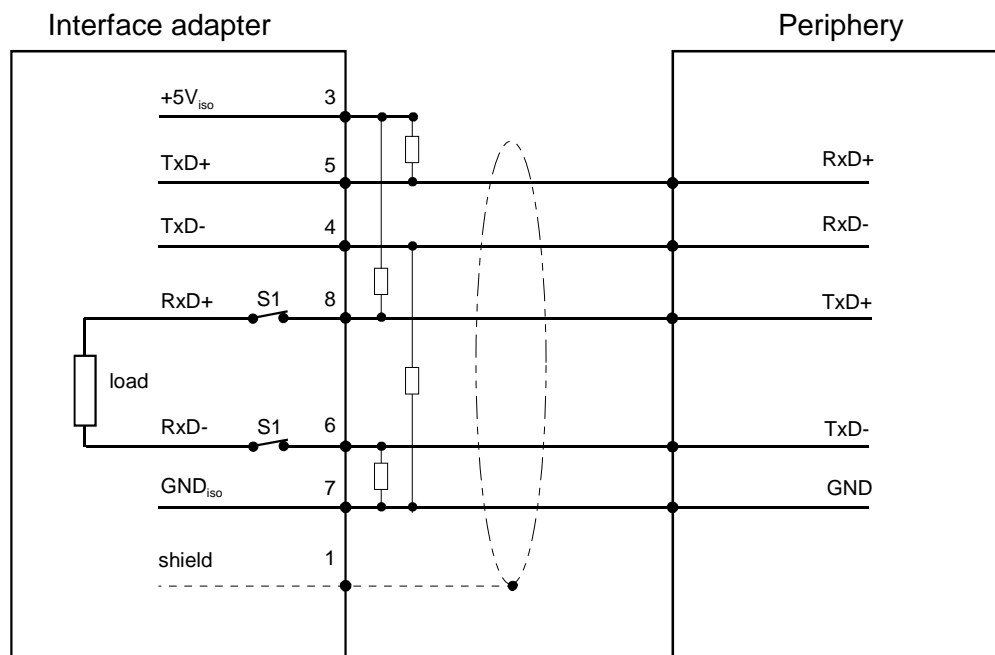
**RS422
multidrop
connection**

If it is necessary to connect multiple external devices operating as receivers to the interface adapter you should select the multidrop connection.

Interface adapter   Periphery 1

TxD+   RxD+

TxD-   RxD-

Periphery 2

RxD+

RxD-

Periphery 3

RxD+

RxD-
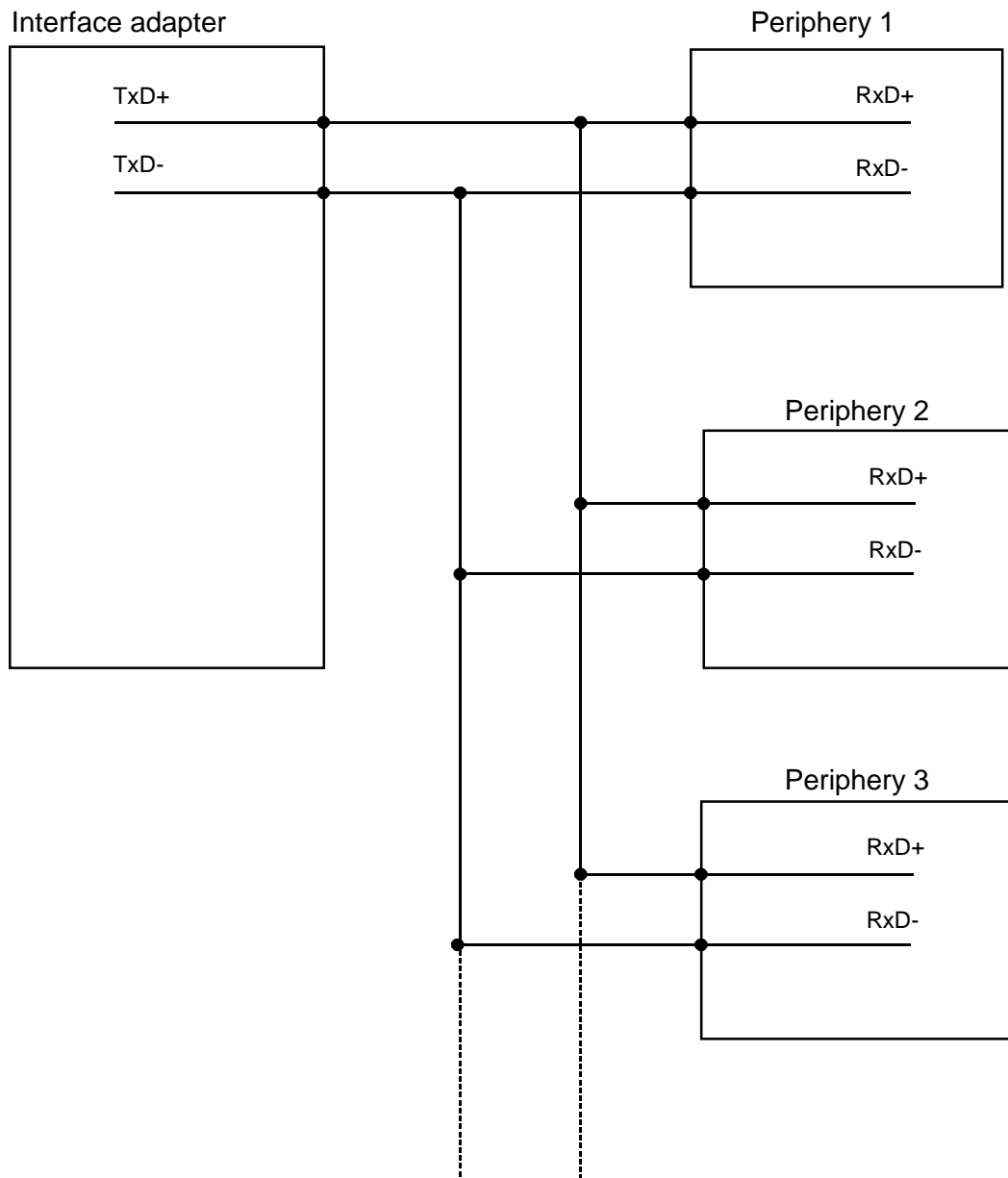
You can connect up to 15 slaves to the RS422 interface.

RS422HP (MD35D)

General

The operational characteristics of this adapter are the same as those for the RS422P-adapter (MD33D) described in the previous chapter.

In addition, this adapter is equipped with hardware handshake lines (RTS/CTS).

Construction identical to MD33D

This paragraph only contains details about the pin assignment for the interface and the respective wiring requirements.

For additional information please refer to the previous chapter on the RS422P (MD33D) adapter.

LEDs
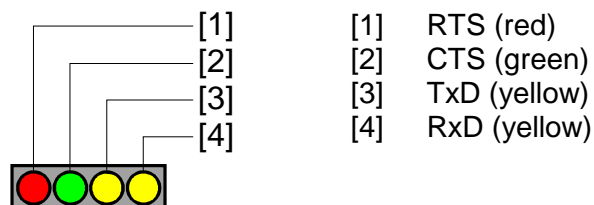
[1]   [1]   RTS (red)
[2]   [2]   CTS (green)
[3]   [3]   TxD (yellow)
[4]   [4]   RxD (yellow)

LED status

Steady: no data traffic (dormant condition)
Blinking: data transfer active

**Pin assignment
MD35D**
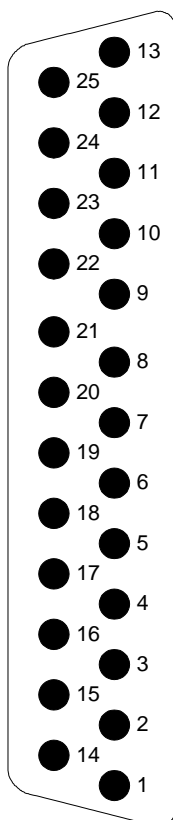
Pin-no.	Signal
1	screen
2	not connected
3	$+5V_{iso}$
4	TxD-
5	TxD+
6	RxD-
7	5V common$_{iso}$
8	RxD+
9	RTS-
10	RTS+
11	+24V [1]
12	CTS-
13	CTS+
14	not connected
15	5V
16	not connected
17	ground
18	not connected
19	not connected
20	not connected
21	not connected
22	24V common [1]
23	not connected
24	not connected
25	not connected

[1] +24V and the resp. common can be obtained from these pins if available from the PLC.

Connect 24V to these pins when an external supply is used.

RS422
point-to-point
connection with
hardware
handshake

Characteristics:

- 4-wire system with handshake lines
- Full-duplex operation

The Tx-line and the Rx-line must consist of two separate twisted-pair cables with separate screens.

As for the MD33D you can connect 100 Ω termination resistor between the Rx-lines of the MD35D adapter. This is necessary for long lines or high data communication speeds.
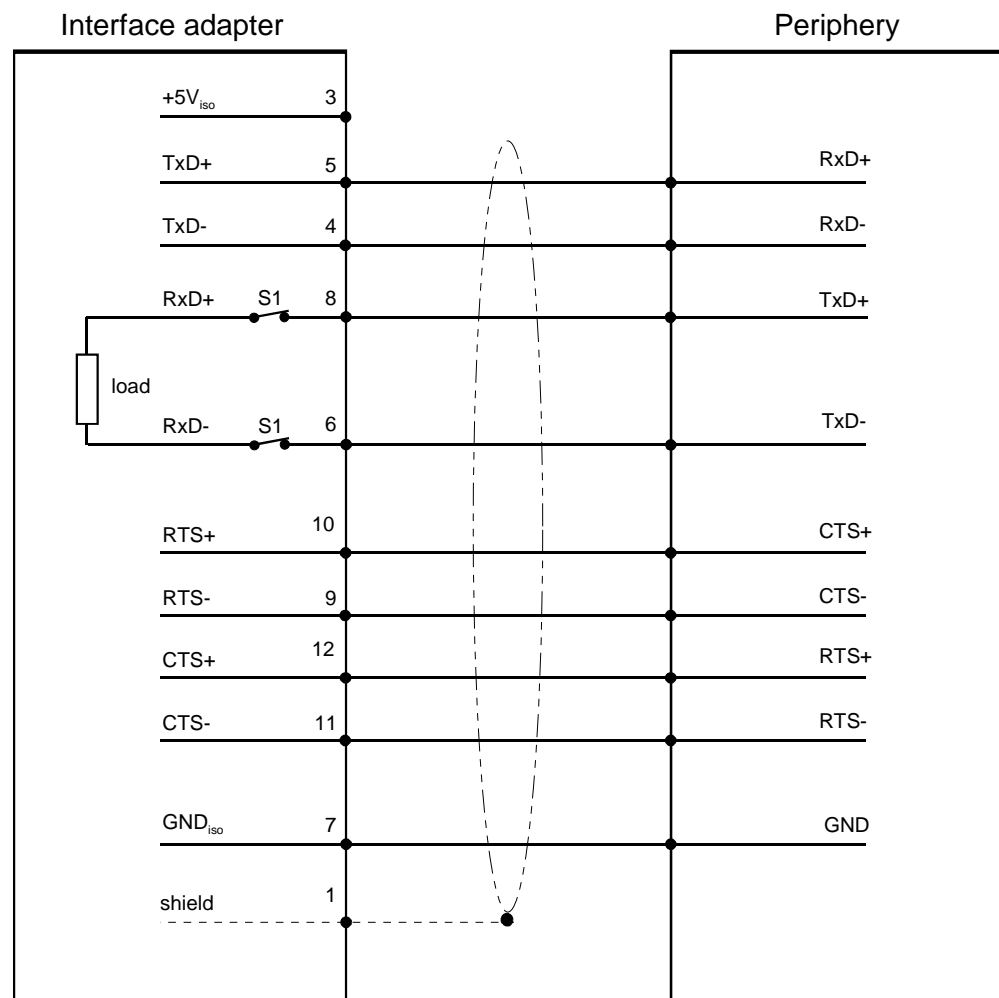
Interface adapter			Periphery
+5V$_{iso}$	3		
TxD+	5		RxD+
TxD-	4		RxD-
RxD+	S1	8	TxD+
load			
RxD-	S1	6	TxD-
RTS+	10		CTS+
RTS-	9		CTS-
CTS+	12		RTS+
CTS-	11		RTS-
GND$_{iso}$	7		GND
shield	1		

Note!

Please note that the receiver on this adapter, similar to the MD33D, is also not turned off during transmission!

RS422 point-to-point connection without handshake

Characteristics:

- 4-wire system
- Handshake lines in the plug are shorted out
- Full-duplex operation

The Tx-line and the Rx-line must consist of two separate twisted-pair cables with separate screens.

Interface adapter   Periphery

+5V$_{iso}$	3	
TxD+	5	RxD+
TxD-	4	RxD-
RxD+ S1	8	TxD+
load		
RxD- S1	6	TxD-
RTS+	10	
RTS-	9	
CTS+	12	
CTS-	11	
GND$_{iso}$	7	GND
shield	1	

> **Note!**
>
> Please note that the receiver on this adapter, similar to the MD33D, is also not turned off during transmission!

RS485P (MD34D)

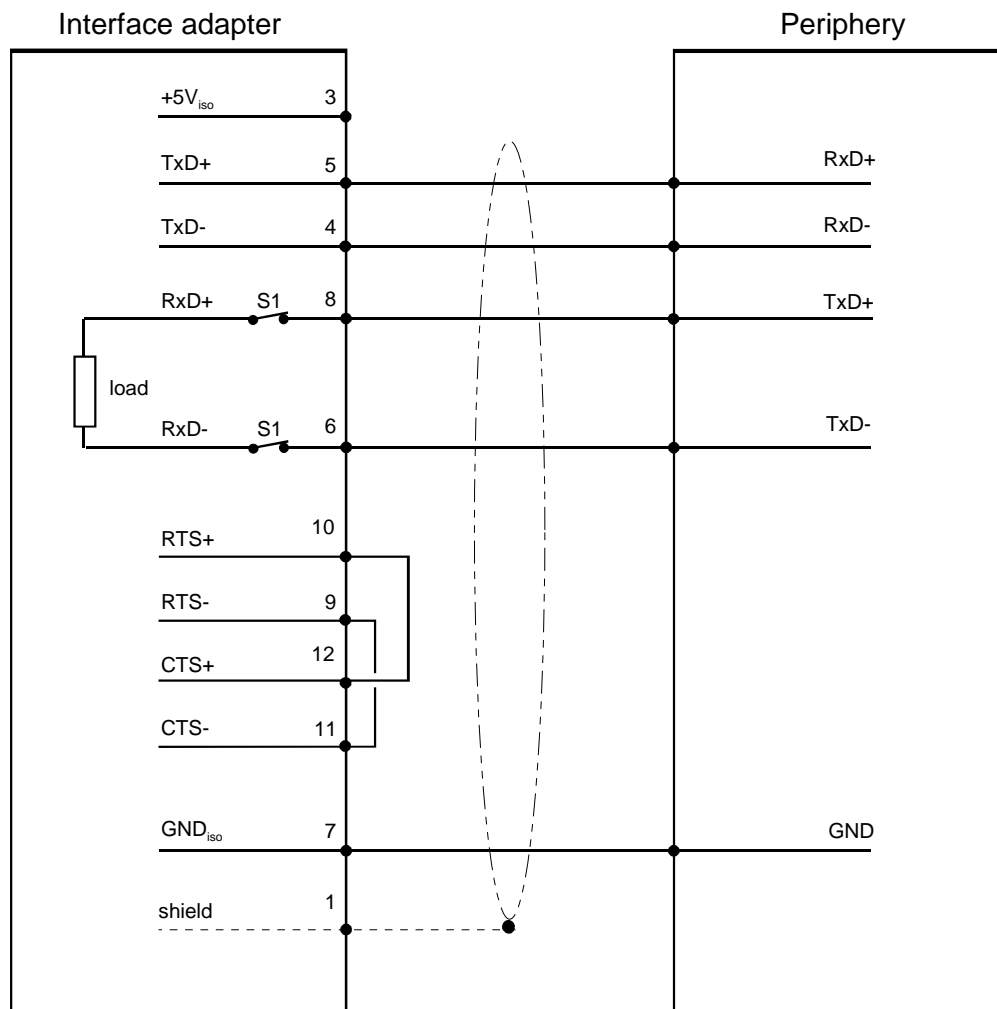**General**   This interface can be employed for a bus system in accordance with RS485. The adapter can be used for point-to-point links using serial half-duplex data communications via 2-wire connections and for 2- or 4-wire bus systems.

This interface is electrically isolated.

This adapter turns the receiver off during data transmissions, i.e. the adapter can only receive data when it is not transmitting. The adapter can not issue "Break" signals.

A 100Ω termination resistor can be connected where long data lines or high data communication speeds require termination and for situations where the adapter is located at the physical end of the bus.

The RS422/RS485-adapter is delivered with the jumper for the 100Ω termination resistor in location OFF.

RS485 interface   Characteristics of the RS485 interface located on the adapter:

- Logical conditions represented by differential voltages on the twisted pair
- Serial two-wire bus connection supporting a half-duplex procedure
- Multidrop connection
- High immunity to interference
- Supports a maximum of 32 stations
- Data communications over a maximum distance of 500m
- Data communication rates up to 115kBaud

Construction
MD34D

[1]   Connector X2   Connections to the module
[2]   Connector X1   Connections to the module
[3]   DIP-switch S1   100Ω termination resistor
[4]   LEDs   Status-LEDs visible on the
                        adapter, if installed

LEDs

[1]   Receive data (yellow)
[2]   Transmit data (yellow)

LED status   Steady: no data traffic (dormant condition)
                      Blinking: data transfer active

Termination resistor

You can connect 100 Ω termination resistor between the RxD-lines by means of DIP-switch S1.

This is necessary for long lines or high data communication speeds where the adapter is located at the physical end of the bus.

Termination resistor OFF (default)

Adapter MD34D DIP-switch S1

With this DIP-switch setting the termination resistor is deactivated.

Termination resistor ON

Adapter MD34D DIP-switch S1

This DIP-switch setting connects a termination resistor of 100Ω between the RxD lines.

Note!

Please ensure that both switches (S1-1 and S1-2) must always be in the same position!

**Pin assignment
MD34D**

Pin-no.	Signal
1	screen
2	not connected
3	$+5V_{iso}$
4	TxD-
5	TxD+
6	RxD-
7	5V common$_{iso}$
8	RxD+
9	not connected
10	not connected
11	+24V [1]
12	not connected
13	not connected
14	not connected
15	5V
16	not connected
17	ground
18	not connected
19	not connected
20	not connected
21	not connected
22	24V common [1]
23	not connected
24	not connected
25	not connected

[1] +24V and the resp. common can be obtained
from these pins if available from the PLC.
Connect 24V to these pins when an external
supply is used.

**RS485
point-to-point
connection**

Characteristics:

- 2-wire system
- Half-duplex operation

You can implement a two-wire connection by linking Rx+ to Tx+ and Rx- to Tx-. The RS485-interface uses a two-wire connection.

The MD34D disables the receiver during transmission to prevent feedback.
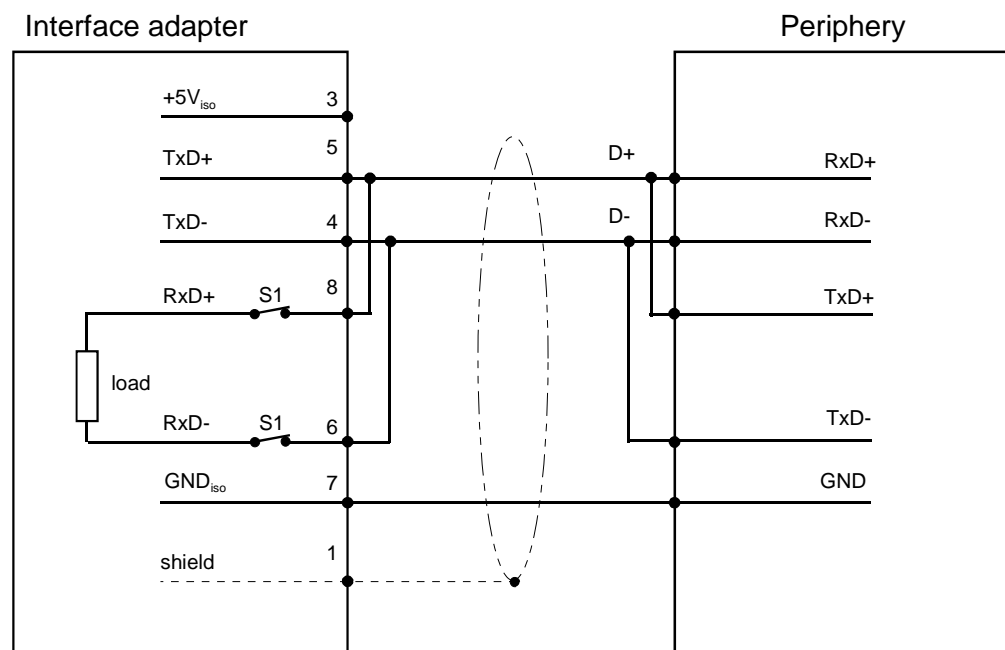
**RS485
point-to-point
connection with
stable levels**

Some systems require highly stable signal levels for secure data communications.

You can provide stable signal levels by connecting pull-up and pull-down resistors between the data line and the $5V_{iso}$-voltage and the respective ground. Here you must use resistors that have a value between 500Ω and 600Ω.

The following figure illustrates this.

Interface adapter   Periphery

Interface adapter		Periphery
+5V$_{iso}$	3	
TxD+	5	D+ → RxD+
TxD-	4	D- → RxD-
RxD+ S1	8	TxD+
load		
RxD- S1	6	TxD-
GND$_{iso}$	7	GND
shield	1	

RS485 multidrop connections

If it is necessary to connect multiple external devices operating as receivers to the interface adapter you should select the multidrop connection.

Interface adapter

TxD+

TxD-

Periphery 1

RxD+

RxD-

Periphery 2

RxD+

RxD-

Periphery 3

RxD+

RxD-
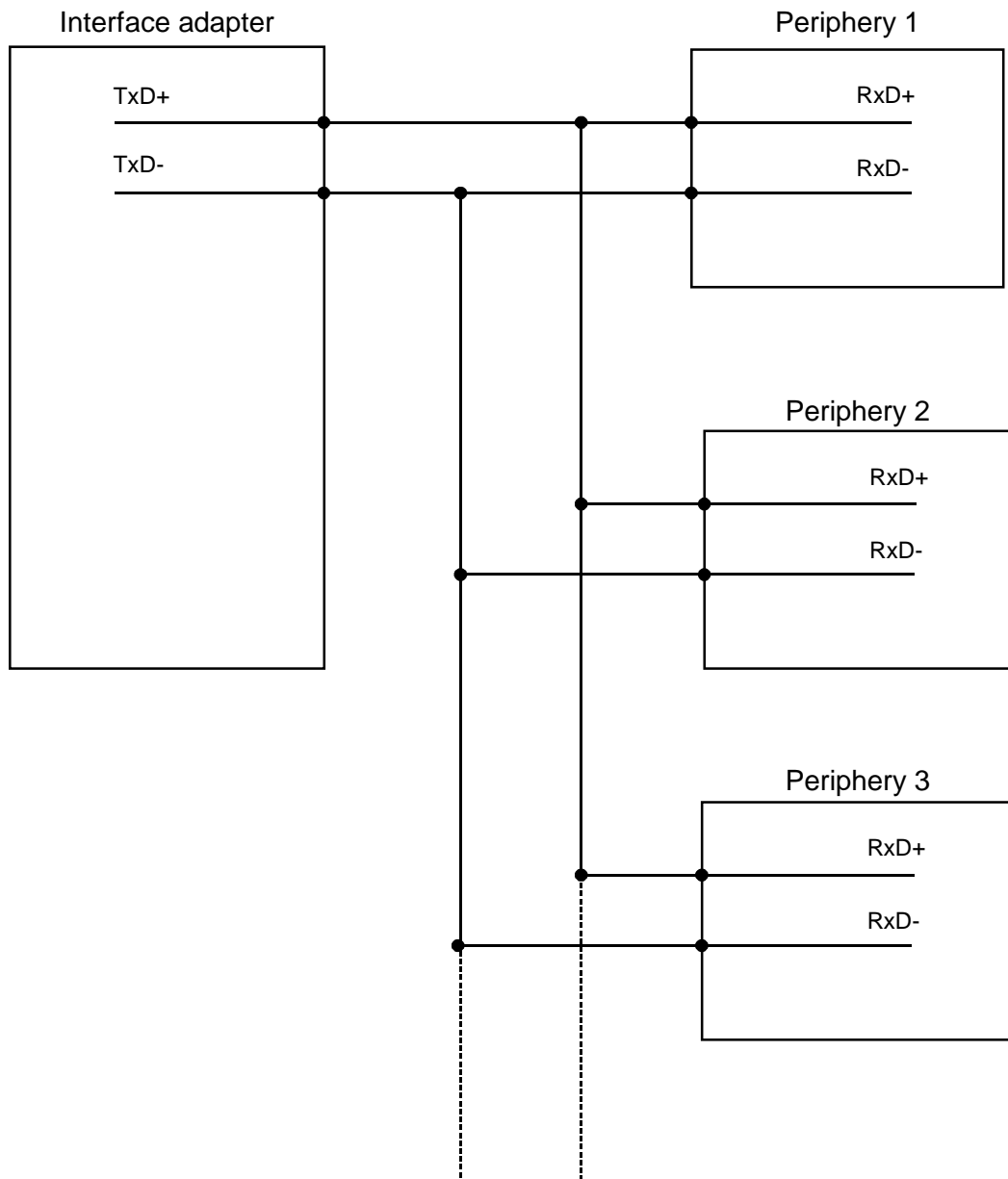
You can connect up to 31 slaves to an RS485 interface.

**RS485
four-wire bus-
connection**

You should select the four-wire bus connection for situations where it is necessary to connect multiple external devices to a single bus.

Interface adapter   Periphery 1

Periphery 31
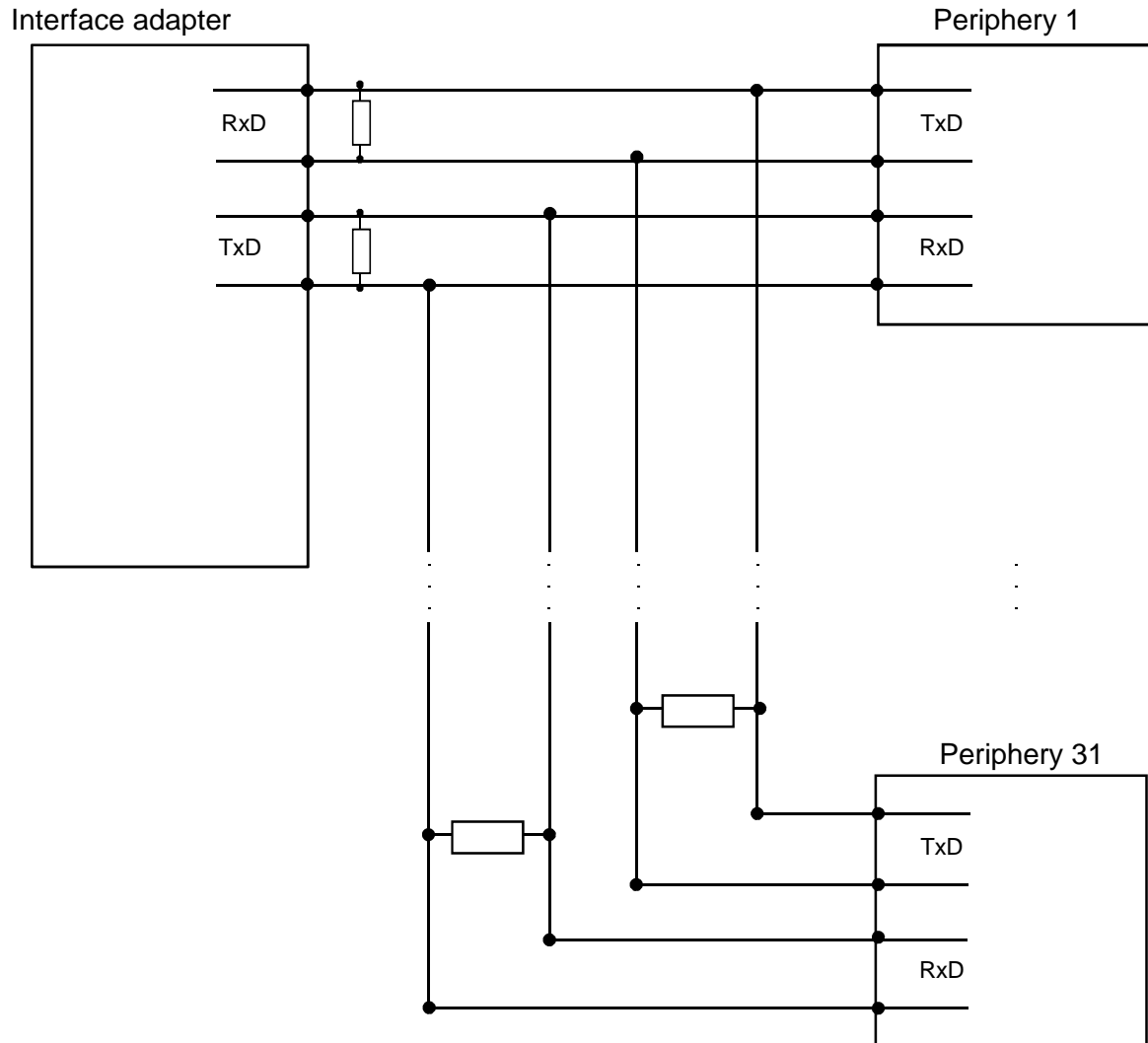
You can connect up to 31 slaves to the RS485 interface.

**RS485
two-wire bus-
connection**

You can implement a two-wire connection by linking Rx+ to Tx+ and Rx- to Tx-. The RS485-interface uses a two-wire connection.

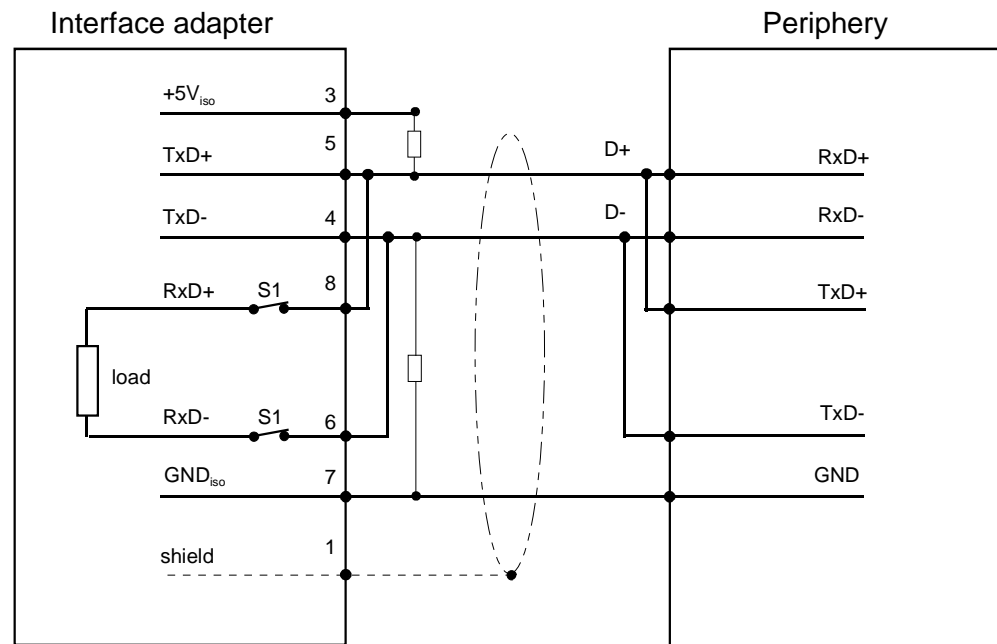The RS485P-adapter disables the receiver during transmission to prevent feedback.
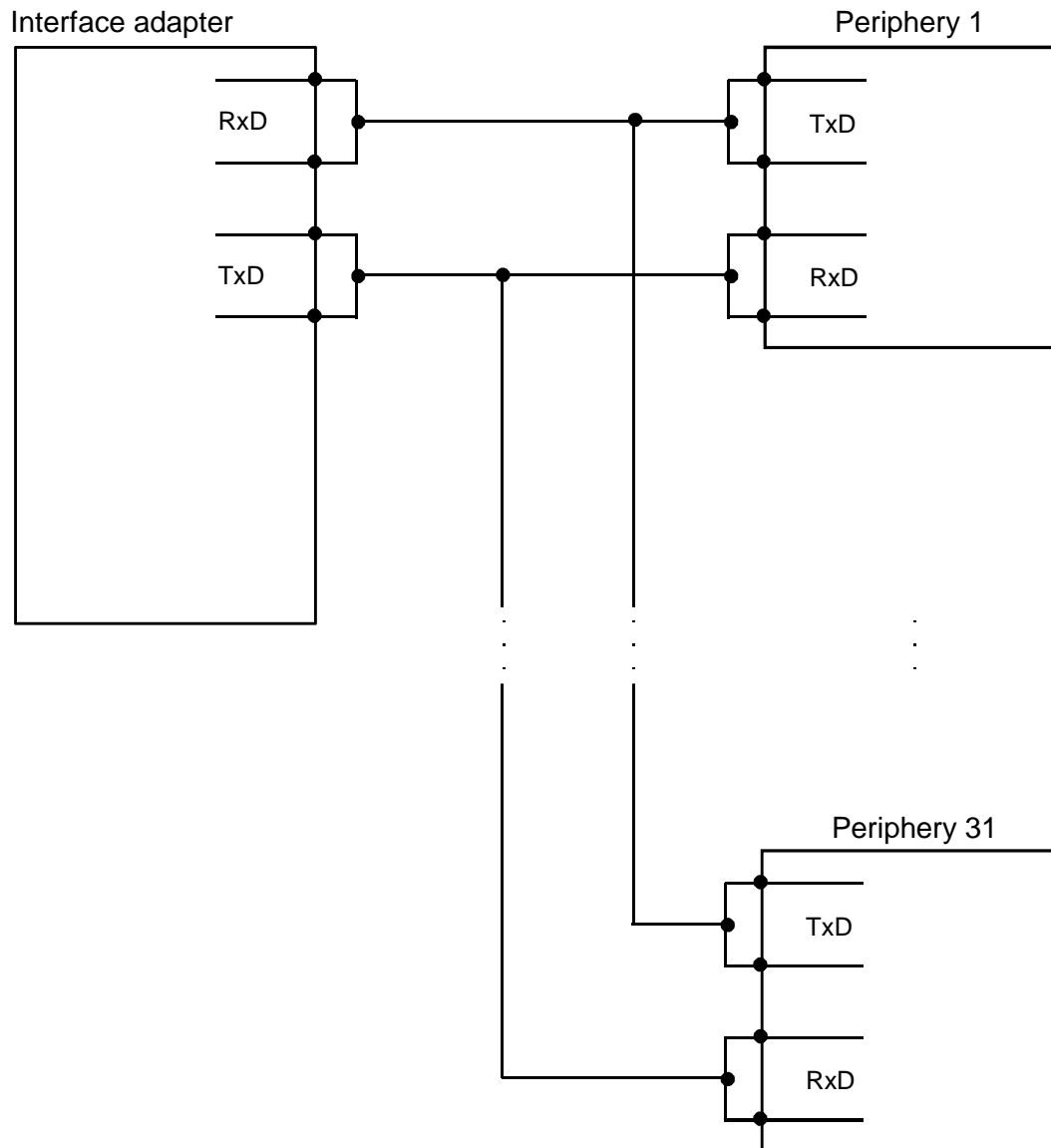
Part 4   SOFTWARE

Outline   This chapter describes the software-related integration of the BG4xD and related adapters. In addition to an overview of the required FB's you will also find details on various error and status messages. The chapter then continues with a description of high-speed DMA communications followed by some information about protocols that are currently available. Another part of this chapter describes the configuration options. The chapter is then concluded with an example of a common configuration.

The following are described below:

- Communications by means of handler modules
- Status- and error messages
- High speed DMS access
- Protocols and procedures (ASCII, STX/ETX, 3964(R) RK512)
- Configuration
- Examples

Contents

Communications by means of standard handler modules

The standard handler modules SEND-D/A, RECV-D/A are employed to control the data communication functions.

Based on certain parameters the SSM-D decides on a method for the data transfer. Jobs are initiated in standard mode by direct-modules and data communications is controlled by means of the ALL-modules.

The following modules are required:

Module/PLC	*PLC-115*	*PLC-135*	*PLC-155*
Synchronous	FB249	FB125	FB125
Send-Direct	FB244	FB120	FB120
Send-ALL	FB244	FB120/FB126	FB120/FB126
Recv-Direct	FB245	FB121	FB121
Recv-ALL	FB245	FB121/FB127	FB121/FB127
Control	FB247	FB123	FB123
Reset	FB248	FB124	FB124

block-size

Large quantities of data are divided into a number of data blocks before they are transferred. The size of these data blocks is referred to as the block-size. You must define the block-size in SYNCHRONous (16...512 bytes).

Every interface of the BG4xD that was previously configured must be synchronised by the handler module SYNCHRON when the PLC is started. This statement applies to every type of startup for the PLC:

- OB20 for new start
- OB21 for a manual re-start
- OB22 for a re-start issued after a power failure

block-size	BG4XD block-size in bytes
0	default block-size for a CPU. This may differ depending on the type of CPU.
1	16
2	32
3	64
4	128
5	256
6	512
255	512

Status and Error Messages

Handler modules issue status and error messages

- via of the indicator word ANZW (information for the processing of jobs)
- via the parameter error byte PAFE (indicates that bad job parameters have been issued)

Status and error flags in the indicator word

The "indicator word" returns the status for a specific job being executed on the BG4XD.

In a user program every job should be associated with a separate "indicator word" that is created for the job.

Contents and structure of the indicator word ANZW

In principle, the indicator word has the following structure:

31	16	15	0	Bit

length word   indicator word
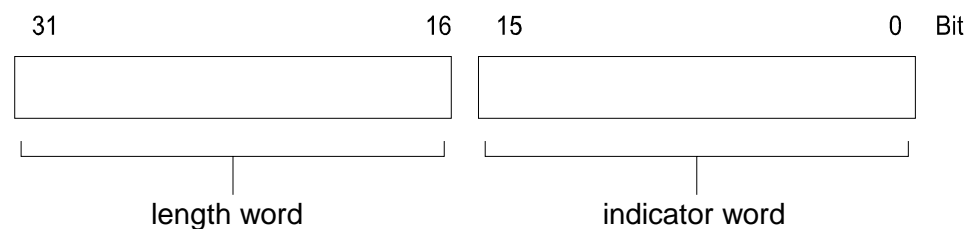
The handler modules (SEND, RECEIVE) store the data that was already transferred for the respective job in the length word; received data is stored in receive jobs; data that has already been transmitted is stored in transmit jobs.

The "length word" indicator is always in bytes and absolute.

ANZW

15	8	7	0	Bit

Handshake makes sense (data available)
0   RECEIVE disabled
1   RECEIVE enabled

Job running
0   SEND/FETCH enabled
1   SEND/FETCH disabled

Job completed without error

Job completed with error(s)

Data transfer active

Data transmission completed

Data reception completed

Enable/Disable data block
0 enabled
1 disabled

Error
0 no error
1...5 PLC-error
6...15 BG4xD-error

reserved

The 4 "tetrades" of the indicator word

- **Tetrade 1**   Bit 0 to 3,   Status indicators of the job:

  this indicates whether a job has been started, whether an error has occurred or whether the job has been disabled (e.g. if the virtual connection does not exist).

- **Tetrade 2**   Bit 4 to 7,   Data control for the job
                                                    (data transfer CPU - BG4xD):

  this indicates whether the data transfer for the job is still active or that the transmission or the reception of data has been completed.

  The data transfer for the job can be disabled by means of the bit "Enable/Disable" (Disable =1; Enable =0).

- **Tetrade 3**   Bit 8 to 11,   Error flags for the job:

  this is where the error flags for the job appear. These error flags are only valid if the bit "job completed with errors" in the tetrade for the status is also set.

- **Tetrade 4**   Bit 12 to 15,   not used at present.

Error flags in tetrade 3

0 no error

If the bit "job completed with errors" is also set this indicates that the BG4xD has re-initiated the job after a NEW-START or a RESET.

3 Area in PLC too small or does not exist

6 to F: error messages from the BG4xDs.

Error messages 6 to F are generated by the BG4xD modules and must therefore be interpreted as BG4xD-specific messages.

Solution: locate and remove the source for the error by means of the respective BG4xD description.

Using the
indicator word

Bit 0 Handshake makes sense

Set/cleared   by the handler module in accordance with the indicator in the job status.

The bit for handshake makes sense (=1) is used by the RECEIVE-module (message available or RECEIVE can be initiated).

Utilisation   by the RECEIVE module; only when this bit is set does the RECEIVE module initiate the handshake with the BG4xD. By the user (check whether a message is available)

Bit 1 Job started

Set   by the handler module, when the job has been issued to the BG4xD.

Cleared   by the handler modules, when a job has been completed by the BG4XD (e.g. acknowledgement received).

Utilisation   by the handler modules

a new job is issued when the "old" job has been completed.

By the user to check whether it makes sense to trigger a new job.

Bit 2 Job completed without errors

Set   by the handler modules if the respective job was completed without errors.

Cleared   by the handler modules if the job is initiated again.

Utilisation   by the user to check whether the job has been completed without errors.

Bit 3 Job completed with errors

Set   by the handler modules when the respective job has been completed with errors. The cause for the error is encoded in the high-byte of the indicator word.

Cleared   by the handler module when the job is initiated.

Utilisation   by the user to check whether the job was completed with errors.

If the flag for "job completed with errors" is set, the high-byte of the indicator word contains the cause for the error.

Bit 4 Data reception / data transmission active

Set	by handler modules SEND & RECEIVE when the transmission / reception for a job has been started, e.g. when data is transferred by means of the ALL-function (dummy DMA) but the job was initiated by means of SEND-Direct.
Cleared	by handler modules SEND, RECEIVE, when the data transfer for a job has been completed (last sub-block transferred).
Utilisation	by the user. The user must not change the data for a job while the data transfer BG4XD-PLC is active. In the case of small data packets this is not critical as the respective data transfer can be completed in a single call to the module. Larger quantities of data can, however, only be transferred in multiple blocks where the creation of the different blocks is spread over multiple PLC-cycles. To ensure data consistency the user must first check whether the transfer of the data block has been completed before changing the data of the job.

Bit 5 Data transmission completed

Set	by handler module SEND when data transmission for a job has been completed.
Cleared	by handler module SEND when a new data transmission was started for a new job (new trigger). By the user when the status has been verified (creation of flanks).
Utilisation	by the user. The user can use this bit to determine whether the data record for a job has already been transferred to the BG4XD and when a new data record can be made available for the active job (e.g. cyclic transfer).

Bit 6 Data reception completed

Set	by handler module RECEIVE when the reception of the data for a job has been completed.
Cleared	by handler module RECEIVE when a data transfer to the PLC was started for a new job (new trigger). By the user when the status has been verified (creation of flanks).
Utilisation	by the user. The user can use this bit to determine whether the data record of a job has already been transferred to the PLC and at what point a new data record was transferred into the PLC for the active job.

Bit 7 Disable / enable data block

Set	by the user, to prevent the RECEIVE module from writing into an area or to prevent the SEND module from reading from an area (only for the first data block)
Cleared	by the user, to enable the respective data area.
Utilisation	by the handler modules SEND, RECEIVE. If bit 7 is set, the modules will not initiate a data transfer, but instead they will return an "error" to the BG4xD module.

Bit 8 to 11   Error byte

When the BG4xD returns an error flag for a job (into the job status), the handler modules enter this flag into the high-byte of the indicator word.

This error flag is only valid if the bit "job completed with errors" in the status bit is set simultaneously.

Error messages in the indicator word

0 no error

When the bit "job completed with errors" is set then the BG4xD had to re-establish the connection after a new start or a RESET.

1 bad Q/ZTYP for HTB

The job was configured with an incorrect TYP-identifier

2 area does not exist in the PLC

An incorrect DB (DBNR) was configured when the job was initiated.

3 area in PLC too small

The sum of Q/ZANF and Q/ZLAE exceeds area boundaries. The area boundary of the data module is determined by the size of the module. The area boundary for flags, timers, counters, etc. depends on the PLC.

4 QVZ-error in the PLC

The source or destination parameter contain a reference to an area in the PLC where memory is defective or not installed. The QVZ-error can only occur for Q/ZTYP AS, PB, QB or when in case of memory errors.

5 error in indicator word

The specified indicator word can not be processed. This error occurs when a data word or a double word was specified with ANZW that is not or no longer contained in the specified data module. That is DB too small or non-existent.

6 no valid ORG-format

The destination or source for the data was neither specified in the handler module (Q/TYP="NN") nor in the connection module.

7 Reserved

8 no unused transport connections

The transport connection capacity was exceeded. You should clear any unused connections.

9 remote error

An error occurred on a communication partner during a READ/WRITE job.

A Connection error

The connection required by a job was not or not yet established. This error will disappear when a connection can be established. If all the connections of the BG4xD have been interrupted this points to a defective module or bus cable. This error can also be caused by incorrect configuration parameters, e.g. bad addressing.

B Handshake error

This could point to a system error or that the size of the data block has been set too large.

C Initiation error

The job was initiated by means of an incorrect handler module or the size of the data block transferred was too large.

D Termination after RESET

This is a procedural message. The connection was interrupted and the serial channel was reset. The connection can be re-established.

E Job with bootstrap function

This is a procedural message. The respective job is of type READ/WRITE-PASSIV and it can not be started from the PLC.

F Job does not exist

The respective job was not configured on the BG4xD. This error can occur when the SSNR/A-NR combination entered into the handler module was bad or if the required connection module was omitted.

Bits 4 to 7 of byte 2 are reserved for expansion purposes.

Status and error flag in PAFE

This byte (output, flag) is set when the module recognises a parameter error.

The structure of the PAFE is as follows:

```
7                          0    Bit-no.
┌──┬──┬──┬──┬──┬──┬──┬──┐
│  │  │  │  │  │  │  │  │
└──┴──┴──┴──┴──┴──┴──┴──┘
```

Error
0 no error
1 error

error number
0 no error
1 bad ORG-format
2 area does not exist (DB not available)
3 area size too small
4 QVZ-error
5 bad indicator word
6 no source/destination parameters for
   SEND/RECEIVE All
7 interface does not exist
8 interface failure
9 interface overload
A reserved
B illegal A-NR
C interface (BG4XD) does not acknowledge or
   negative acknowledgement
D illegal parameter / BLGR (first byte)
E reserved
F reserved

The length word   The indicator word is followed immediately (at the next memory address)
                       the length word. Here the quantity of data transferred between PLC and
                       BG4XD for the respective job is saved.

      Write access   by SEND, RECEIVE when the data transfer is active.

      Cleared   by overwriting, or by each and every
                                     SEND, RECEIVE, FETCH.

      Utilisation   by the user

- The length word contains the up to date source or destination quantity
  when the bit "job completed without errors" or data transmission / data
  reception completed is set.
- When the bit "job completed with errors" is set the length word contains
  the quantity of data that was transferred until the error occurred.

Calculation of the   The length word is calculated as follows:
length word   **current transfer count + count of data already been transferred.**

**Important status
and error flags**

Below a summary of important status and error messages that can appear in the "indicator word". These are represented as "HEX"-patterns that are similar to those that can be observed by means of the PG in the PLC using the status / control-var-test function. The X character indicates "undefined" or "irrelevant"; no. is the error number.

Possible indicator words

Indicator word: X F X A

Error flag "F" signifies that the respective job was not defined on the BG4xD. Status indicator A inhibits the job (for SEND / FETCH and RECEIVE).

Indicator word: X A X A

Error flag "A" signifies that the connection required by the communication job was not or not yet established. Status indicator "A" inhibits SEND, RECEIVE and FETCH.

Indicator word: X 0 X 8

The connection was re-established (e.g. after the BG4XD was restarted), SEND is enabled (SEND communication job).

Indicator word: X 0 X 9

The connection was re-established, RECEIVE is enabled. (RECEIVE communication job).

Indicator word: X 0 2 4

SEND was completed without errors, i.e. the data was transferred.

Indicator word: X 0 4 5

RECEIVE was completed without errors, i.e. the data was received by the PLC.

Indicator word: X 0 X 2

The SEND, RECEIVE, READ or WRITE job is active. In case of SEND the partner has not yet changed to RECEIVE. In case of RECEIVE the partner has not yet started the SEND.

Communication by means of Direct Access Mode (DAM)

DAM communications can be used for high-speed communications.

The direct read and write access to the communication area reduces the overhead required for the integrated circuits and the internal runtimes for the SSM-D.

In direct access mode the channels have a 1:1 relationship to the page frames:

- Page frame 0 can be used for communications via handler modules.
- Page frame 1 is allocated to channel 1
- Page frame 2 is allocated to channel 2

  and

- Page frame 3 is allocated to channel 3

Here follows a detailed description of the operation:

Page frame selection

Page frames are selected by means of the Adress-Byte (F)FEFF. Only the PLC has permission to write into this cell and it can only be read by certain specific PLC's. A CPU can therefore address up to 256 page frames. Depending on the base page frame setting it is possible to select four page frames on the SSM in accordance with the following calculation:

"Page frame select" = "base page frame" + "page frame of the SSM";

Page frame partitioning

An SSM page frame consists of a 1 KB memory area that to which both the CPU as well as the SSM can write and from which they can read. The page frame is located within the PLC-window (F)F400-(F)F7FF and it is divided into the following partitions:

- 512 byte data area
- 256 byte OS area
- 224 byte status area
- 32 byte handshake area

Accesses   The handshake area of the page frame is misused by a simple event-
                      mechanism. The data area is the communication area and it is divided into
                      a Send and a Receive area.

  • Data buffer for send in the area   (F)**F400** to (F)**F4FF**
  • Data buffer for receive in the area   (F)**F500** to (F)**F5FF**
  • Length word send   (F)**F7E0** and (F)**F7E1**
  • Length word receive   (F)**F7E2** and (F)**F7E3**
  • Status byte   (F)**F7E4**
  • Error byte receive   (F)**F7E5**

                      Send is enabled when bit 4 of the status byte is set. At this moment the
                      data and the length word must be consistent. When the data has been
                      received bit 4 is reset by the firmware of the SSM.

                      Receive bit 5 is set when data was received from the serial interface. The
                      user must acknowledge the reception of the data by resetting bit 5. Any
                      new data received when this bit is active is discarded.

Restrictions   This mode is subject to the following restrictions:

  • A maximum of 256 bytes of data can be exchanged for either send or
    receive.
  • The co-ordination of send and receive data is the task of the PLC.
  • It is not possible to use the page frame for simultaneous handler module
    based communications.

Protocols and Procedures

Two communication partners exchange data by means of protocols.

ASCII   ASCII data communications is a simple form of data transfer that may be compared to a multicast/broadcast-function. To ensure that messages can be divided into logical parts the 'character delay time' (ZVZ) of the receiver must be matched by the transmitter.

On the SSM-D the ZVZ is specified in milliseconds (ms) and it must be larger than or equal to 2ms.

On the transmitter the equivalent of the receiver's character delay time is the 'time from reception of job ' (ZNA). These two times can be used to establish a simple PLC<->PLC communication path. Any transmit job is only acknowledged with 'job completed without errors' (AFOF) when the data was transmitted and the ZNA has expired.

It is not necessary to specify any times on the PLC. The module is responsible for the handling.

STX/ETX   STX/ETX is a simple protocol using a header and a trailer. For reasons of downward compatibility to existing SSM's it is possible to define any two start characters as well as two stop characters.

For the transmitter it is also possible to define a ZNA similar to the one defined for the ASCII data transfer.

3964(R)   The 3964(R) procedure controls the data transfer on a point-to-point link between the SSM and a communication partner. During the data transfer the procedure adds control characters to the user data. These control characters can be used by the communication partner to check whether the data was received completely and without errors.

The procedure uses the following control characters:

- STX   Start of Text
- DLE   Data Link Escape
- ETX   End of Text
- BCC   Block Check Character (only for 3964R)
- NAK   Negative Acknowledge

Note: When a DLE is transferred as part of the user data it is sent twice to distinguish it from DLE control characters used when the link is established and when it is terminated (DLE-duplication). The receiver reverses the duplication of DLEs.

In case of the 3964(R) procedure the priority assigned to one communication partner must be less than that of the other. If both communication partners should simultaneously issue a sent request the partner with the lower priority will delay its send request.

Procedure   Here follows a description of the structure of the procedure and the respective messages:
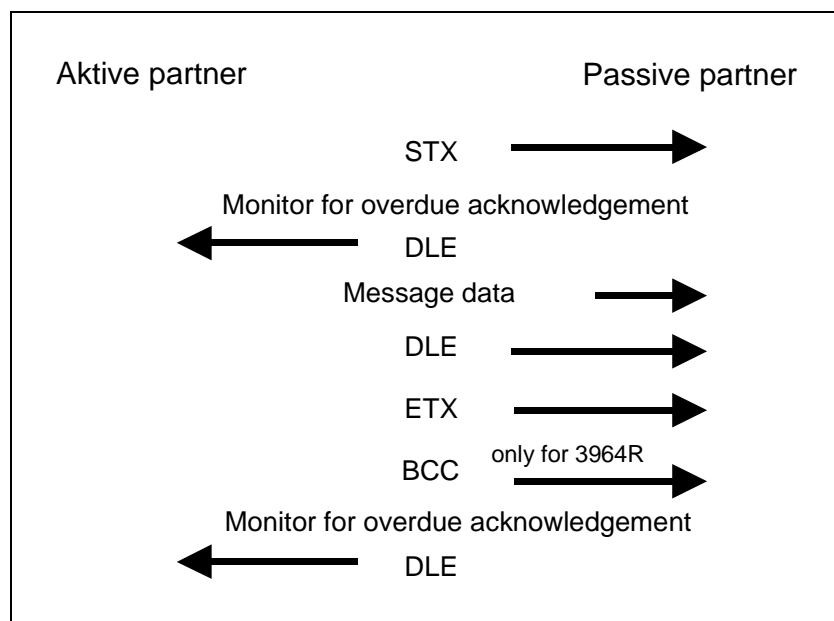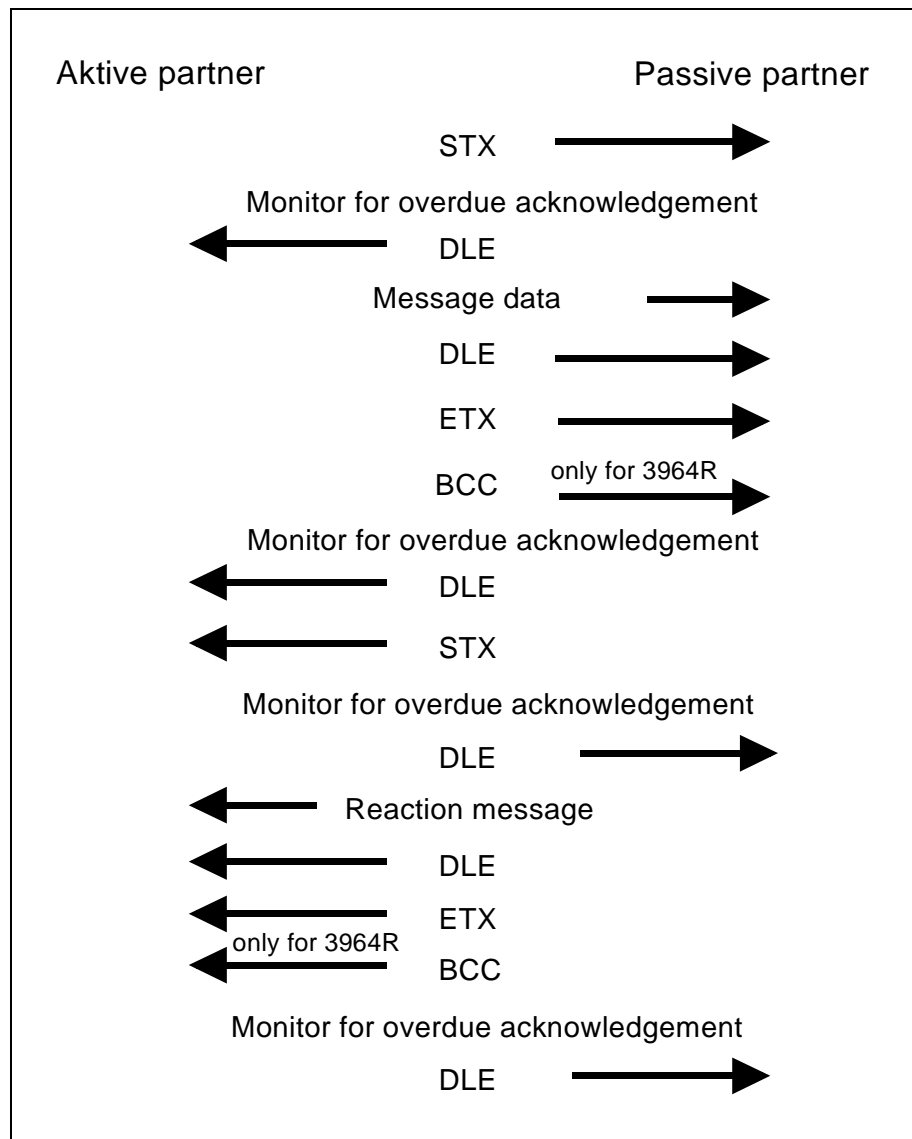

You can transfer a maximum of 250 bytes per message.

3964(R) with RK512

The RK512 is an expanded 3964(R). A preamble is transmitted before any user data is transferred. This preamble contains details about the size, type and the length of the user data.

Procedure

The following paragraph describes the structure of the procedure and messages:

```
┌─────────────────────────────────────────────────────────┐
│                                                         │
│   Aktive partner                    Passive partner     │
│                                                         │
│                         STX  ──────────────▶           │
│             Monitor for overdue acknowledgement         │
│          ◀──────────────  DLE                           │
│                   Message data  ──────────▶             │
│                         DLE  ──────────────▶           │
│                         ETX  ──────────────▶           │
│                         BCC  only for 3964R ──────▶    │
│             Monitor for overdue acknowledgement         │
│          ◀──────────────  DLE                           │
│          ◀──────────────  STX                           │
│             Monitor for overdue acknowledgement         │
│                         DLE  ──────────────▶           │
│          ◀──────────  Reaction message                  │
│          ◀──────────────  DLE                           │
│          ◀──────────────  ETX                           │
│     only for 3964R ◀──────  BCC                         │
│             Monitor for overdue acknowledgement         │
│                         DLE  ──────────────▶           │
│                                                         │
└─────────────────────────────────────────────────────────┘
```

Time-out timers	The following time-outs apply :

Ack-overdue-time:	(QVZ)	=	2000 ms
Character-overdue-time:	(ZVZ)	=	220 ms

The QVZ is monitored between the STX and the DLE and from the BCC to the DLE. The ZVZ is monitored throughout the reception of the entire message.

When the QVZ expires after an STX was transmitted the STX is repeated. When this process has been repeated 5 times the connection is terminated by the transmission of a NAK. The same sequence occurs when a NAK or any other character is received after the STX was transmitted.

If the QVZ should time out after the message was transmitted (after the BCC-byte) or when a character other than a DLE is received, the connection is re-established and the message is retransmitted. This process is also repeated 5 times if it is unsuccessful, thereafter it a NAK is transmitted and the connection is terminated.

Passive mode

When the procedure driver is expecting a the request for a connection and it receives a character other than an STX it will respond with a NAK. The procedure driver does not respond to NAK characters.

If the ZVZ is exceeded during reception a NAK is transmitted and the driver will wait for the re-establishment of the connection.

Should the procedure driver not be ready when the STX is received it will transmit a NAK.

Block-Check-Character (BCC-byte)

The 3964R procedure provides additional data protection by appending a block-check character to the end of messages. The BCC-byte is calculated by means of an XOR function that includes all the data of the message, complete with DLE/ETX.

The procedure responds with a NAK instead of the DLE when a BCC-byte is received that does not match the calculated one.
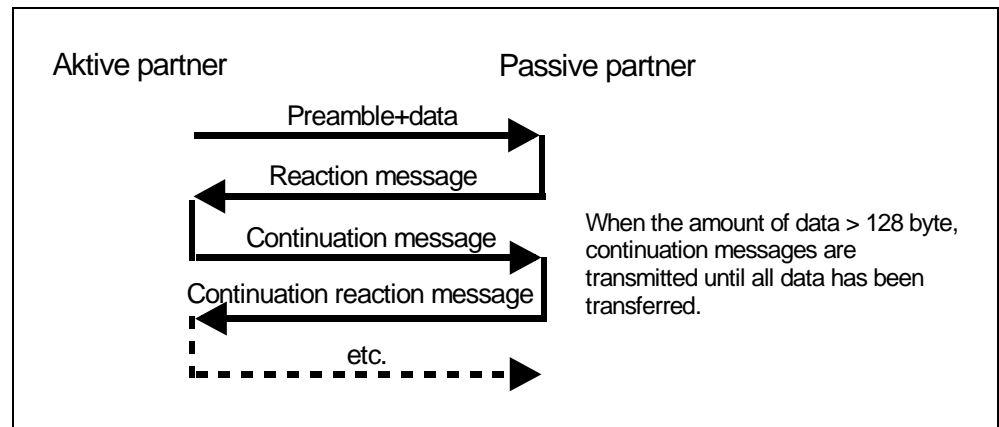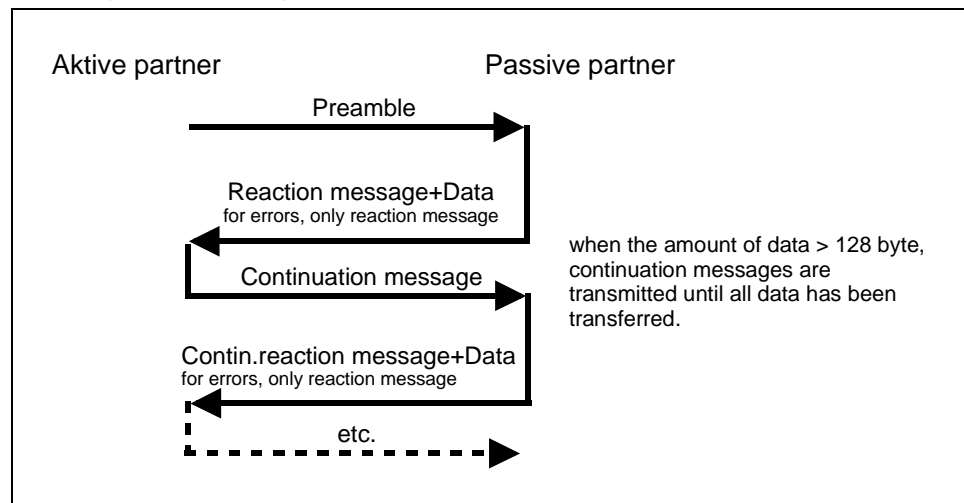
Initialisation conflict

If both communication partners should attempt to simultaneously establish a connection during the QVZ the partner having the lower priority transmits a DLE and changes to receive mode.

DLE

The procedure driver duplicates DLE-characters in a message, i.e. the sequence DLE/DLE is transmitted. On the receive side the duplicated DLE is stored as a single DLE. The end of any message is always the sequence DLE/ETX/BCC (only for 3964R).

Control codes :	02h = STX
	03h = ETX
	10h = DLE
	15h = NAK

Logical message   *SEND (data transmission)*
sequence

```
┌──────────────────────────────────────────────────────────────────────────┐
│                                                                            │
│   Aktive partner                          Passive partner                  │
│                                                                            │
│                       Preamble+data                                        │
│              ─────────────────────────────▶                               │
│                       Reaction message                                     │
│              ◀─────────────────────────────                               │
│                      Continuation message                                  │
│              ─────────────────────────────▶    When the amount of data     │
│                 Continuation reaction message   > 128 byte,                 │
│              ◀─────────────────────────────    continuation messages are   │
│                            etc.                 transmitted until all data  │
│              ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─▶   has been transferred.        │
│                                                                            │
└──────────────────────────────────────────────────────────────────────────┘
```

FETCH (data retrieval)

```
┌──────────────────────────────────────────────────────────────────────────┐
│                                                                            │
│   Aktive partner                          Passive partner                  │
│                                                                            │
│                        Preamble                                            │
│              ─────────────────────────────▶                               │
│                  Reaction message+Data                                     │
│                for errors, only reaction message                           │
│              ◀─────────────────────────────                               │
│                   Continuation message                                     │
│              ─────────────────────────────▶    when the amount of data     │
│                Contin.reaction message+Data     > 128 byte,                 │
│                for errors, only reaction message continuation messages are  │
│              ◀─────────────────────────────    transmitted until all data  │
│                            etc.                 has been transferred.       │
│              ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─▶                               │
│                                                                            │
└──────────────────────────────────────────────────────────────────────────┘
```

In both cases the procedure waits a maximum of 5s for a reaction, thereafter it will terminate the reception.

Message contents   Every message has a preamble. The contents of the preamble depends on
the events that have preceded this message exchange and comprises all
the necessary information.

Structure of the output message

Normal message			Reaction message		
Byte			Byte		
1	00	Message	1	00	Reaction
2	00	flag	2	00	message
			3	00	flag
3	A	Output command			
4	X	Type of data	4	xx	Error code
5	xx	Parameter 1			
6	xx	Destination			
7	yy	Parameter 2			
8	yy	Quantity			
9	zz	Parameter 3			
10	zz	Co-ordination flag			
11	aa				
-	bb	Data			
N	xy				

When the amount of data >128 bytes, additional messages are
transmitted.

Structure of additional messages

Continuation message			Continuation-reaction message		
Byte			Byte		
1	FF	Continuation	1	FF	Continuation-
2	00	message flag	2	00	reaction
			3	00	message
3	A	Output command			
4	X	Type of data	4	xx	Error code
5	aa				
-	bb	Data			
N	xy				

**Sample
output message**

Active partner		Passive partner	

STX →

← DLE

Preamble:

```
00 ┐
00 │
A  │
D  │        Output
05 │        Data
01 │ →      in DB 5
00 │        from DW 1
08 │        8 words
FF │        no co-ordinati-
FF ┘        on flag
```

```
1st WORD   01 ┐
           02 │
2nd WORD   A0 │
           B0 │
           A1 │ →    8 words
           B2 │      data
           .  │
           .  │
8th WORD   FF │
           FF ┘
```

DLE →   End of message
ETX →   + Block Check Char
BCC →

← DLE

← STX
DLE →
← 00
← 00   Reaction message
← 00   no error
← 00

← DLE
← ETX
← BCC

DLE →
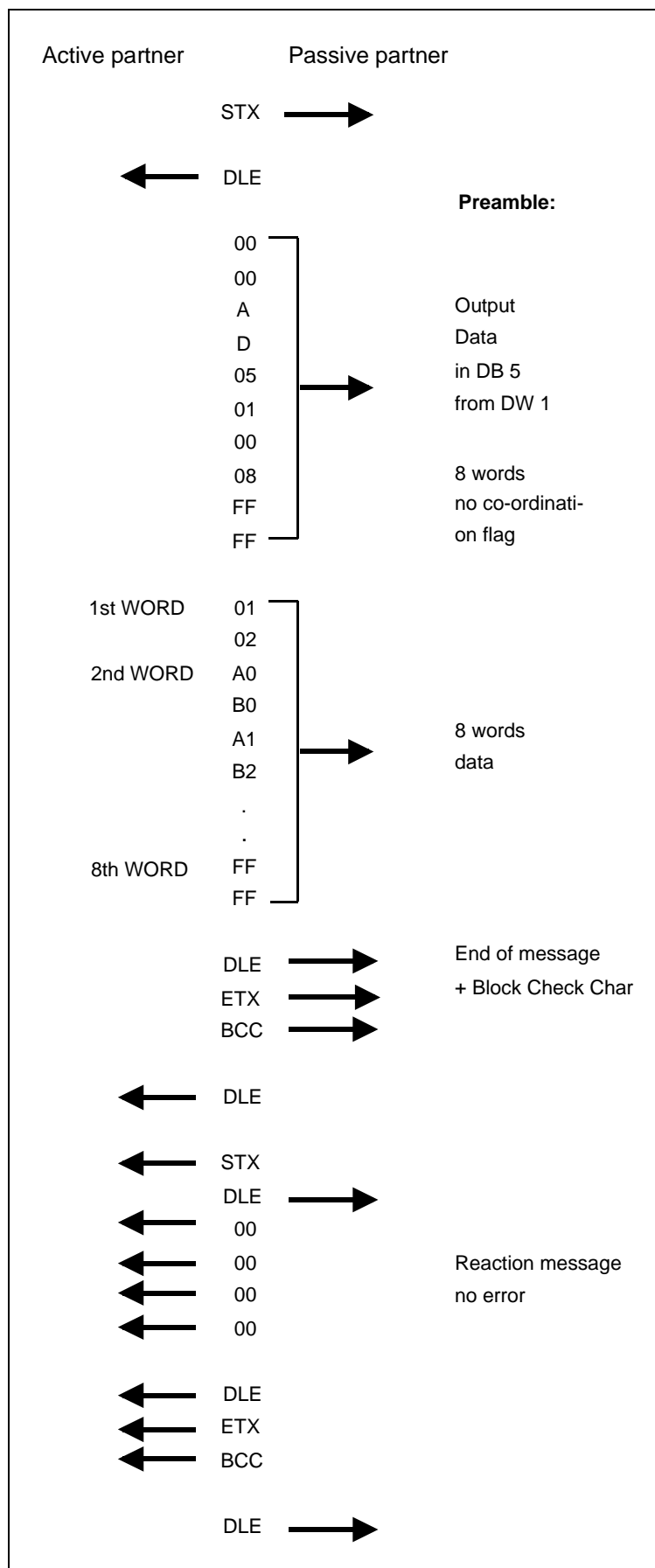
Structure of the input message

```
┌─────────────────────────────────────────────────────────────────┐
│                                                                   │
│   Normal message                     Reaction message             │
│                                                                   │
│  Byte                               Byte                          │
│   1  ┌──┐ Message                    1  ┌──┐ Reaction-            │
│   2  │00│ flag                       2  │00│ message              │
│      │00│                            3  │00│ flag                 │
│   3  ├──┤ Input command                 │00│                      │
│   4  │ E│ Type of data              4  ├──┤ Error code           │
│      │ X│                               │xx│                      │
│   5  ├──┤ Parameter 1               5  ├──┤                      │
│   6  │xx│ Destination                -  │aa│ Data                 │
│      │xx│                            N  │bb│                      │
│   7  ├──┤ Parameter 2                   │xy│                      │
│   8  │yy│ Quantity                   └──┘                        │
│      │yy│                                                         │
│   9  ├──┤ Parameter 3                                             │
│  10  │zz│ Co-ordination flag                                      │
│      │zz│                                                         │
│      └──┘                                                         │
│                                                                   │
└─────────────────────────────────────────────────────────────────┘
```

When the amount of data >128 bytes, additional messages are transmitted.

Structure of additional messages

```
┌─────────────────────────────────────────────────────────────────┐
│                                                                   │
│  Continuation message          Continuation-reaction message      │
│                                                                   │
│  Byte                          Byte                               │
│   1  ┌──┐ Continuation          1  ┌──┐ Continuation-            │
│   2  │FF│ message flag          2  │FF│ reaction                 │
│      │00│                       3  │00│ message                  │
│   3  ├──┤ Input command            │00│                          │
│   4  │ E│ Type of data         4  ├──┤ Error code               │
│      │ X│                          │xx│                          │
│      └──┘                       5  ├──┤                          │
│                                  -  │aa│ Data                     │
│                                  N  │bb│                          │
│                                     │xy│                          │
│                                     └──┘                          │
│                                                                   │
└─────────────────────────────────────────────────────────────────┘
```

**Sample input
message**

Aktive partner	Passive partner

STX ──▶

◀── DLE

Preamble:

00

00

E   Input

M   flag

00

10   from flag byte 16

00

20   32 flag bytes

06   Co-ordination

04   flag MB 6.4

DLE ──▶

ETX ──▶   End of message

BCC ──▶   + Block Check Char

◀── DLE

◀── STX

DLE ──▶

◀── 00

◀── 00   Reaction message

◀── 00   + Data

◀── 00

AB   MB16

CD   MB17

EF   .

00   .

01   .

02   .

.   .

.   .

FF   MB47

◀── DLE   End of message

◀── ETX

◀── BCC   + Block Check Char

DLE ──▶

Coordination flag   When a message is received in active mode the co-ordination flag is set in the partner PLC. This is done for input and for output commands. If the co-ordination flag is set when a message containing this flag is received, then the data is not retrieved (or transferred), but an error message (error code 32h) is transmitted instead. In this case the user must reset the co-ordination flag in the partner-PLC.

When a message is received that does not contain the co-ordination flag FFFFh must be transmitted.

Configuration

Two possibilities exist for the configuration of the SSM-D:

- configuration by means of the CPU
- configuration by means of WinNCS (under development)

Configuration via the CPU

Procedure

Start-up-OB:

- Issue a call to Synchron and initialise the page frame
  (page frame base address, block size, PAFE)

Cycle-OB:

- Interface configuration
  (SEND with job-no. 201 and parameter-DB)
- Generate SEND and RECEIVE jobs
- Generate SEND ALL and RECEIVE ALL jobs
  (SEND and RECEIVE with a job-no. 0)

Parameter-DB structure

A subset of parameters must be defined in MODI_1:

General parameters for every channel in use:

Data word						
L	R	Type	Designator	Ranges		
					Values	Default
0		BYTE	Channel	CHANNEL_1 CHANNEL_2 CHANNEL_3	1 2 3	
	0	BYTE	Mode activate subsequent parameter set	MODI_NONE MODI_1	0 0x01, 0x81	0
1		BYTE	Baudrate	BAUDRATE_DEF BAUDRATE_150 BAUDRATE_300 BAUDRATE_600 BAUDRATE_1K2 BAUDRATE_1K8 BAUDRATE_2K4 BAUDRATE_4K8 BAUDRATE_7K2 BAUDRATE_9K6 BAUDRATE_14K4 BAUDRATE_19K2 BAUDRATE_38K4 BAUDRATE_57K6	0 1 2 3 4 5 6 7 8 9 10 11 12 13	9

	1	BYTE	DataBits	DATABIT_5	0	3
				DATABIT_6	1	
				DATABIT_7	2	
				DATABIT_8	3	
2		BYTE	Parity	PARITY_NONE	0	0
				PARITY_ODD	1	
				PARITY_EVEN	3	
	2	BYTE	StopBits	STOPBIT_1	1	1
				STOPBIT_1_5	2	
				STOPBIT_2	3	
3		BYTE	FlowControl	FLOW_NONE	0	0
				FLOW_HARDWARE	1	
				FLOW_XON_XOFF	2	
	3	BYTE	Protocol	PROTOCOL_ASCII_HTB	0x01	0x01
				PROTOCOL_ASCII_DAM	0x81	
				PROTOCOL_STXETX_HTB	0x02	
				PROTOCOL_STXETX_DAM	0x82	
				PROTOCOL_3964	0x03	
				PROTOCOL_3964R	0x04	
				PROTOCOL_RK512	0x05	
				PROTOCOL_RK512R	0x06	

Depending on the selected protocol the following parameters must also be specified in the DB:

for PROTOCOL_ASCII:

Data word						
L	R	Type	Designator		Ranges	
Transmit channel					Values	Default
4		WORD	BufAnz (PLC-format)*		1..n	1
5		WORD	BufSize (PLC-format)*		16..1024	256
6		WORD	ZNA, time delay after job (PLC-format)*		0..n	500
Receive channel						
7		WORD	BufAnz (PLC-format)*		1..n	1
8		WORD	BufSize (PLC-format)*		16..1024	256
9		WORD	ZVZ, character delay time (PLC-format)*		2..n	200

* The PLC-format is identical to the S5-format from Siemens

for PROTOCOL_STXETX:

Data word		Type	Designator	Ranges	
L	R			Values	Defaults
Transmit channel				Values	Defaults
4		WORD	BufAnz (PLC-format)*	1..n	1
5		WORD	BufSize (PLC-format)*	16..1024	256
6		WORD	ZNA, time delay after job (PLC-format)*	0..n	0
Start code					
7		WORD	Quantity (PLC-format)*	1, 2	1
8	[8]	BYTE	Code[2]	0..255	STX
End code					
9		WORD	Quantity (PLC-format)*	1, 2	1
10	[10]	BYTE	Code[2]	0..255	ETX
Receive channel					
11		WORD	BufAnz (PLC-format)*	1..n	1
12		WORD	BufSize (PLC-format)*	16..1024	256
13		WORD	TMO, timeout (PLC-format)*	2..n	200
Start code					
14		WORD	Quantity (PLC-format)*	1, 2	1
15	[15]	BYTE	Code[2]	0..255	STX
End code					
16		WORD	Quantity (PLC-format)*	1, 2	1
17	[17]	BYTE	Code[2]	0..255	ETX

* The PLC-format is identical to the S5-format from Siemens

for PROTOCOL_3964R:

Data word		Type	Designator	Ranges	
L	R			Values	Defaults
Transmit-/ receive channel				Values	Defaults
4		WORD	BufAnz (PLC-format)*	1..n	1
5		WORD	BufSize (PLC-format)*	16..1024	128
6		WORD	ZNA, time delay after job (PLC-format)*	0..n	0
7		WORD	ZVZ char. overdue time (PLC-format)*	1..n	200
8		WORD	QVZ ack. overdue time (PLC-format)*	1..n	500
9		WORD	BWZ block delay time (PLC-format)*	1..n	10000
10		WORD	STX number of retries connection set-up (PLC-format)*	1..n	3
11		WORD	DBL number of retries data blocks (PLC-format)*	1..n	6
12		WORD	Priority 0==Low, >0==High	0, 1	1

* The PLC-format is identical to the S5-format from Siemens

for PROTOCOL_RK512R:

Data word					
L	R	Type	Designator	Ranges	
Transmit-/ receive channel				Values	Defaults
4		WORD	BufAnz (PLC-format)*	1..n	1
5		WORD	BufSize (PLC-format)*	16..1024	128
6		WORD	ZNA, time delay after job (PLC-format)*	0..n	0
7		WORD	ZVZ char. overdue time (PLC-format)*	1..n	200
8		WORD	QVZ ack. overdue time (PLC-format)*	1..n	500
9		WORD	BWZ block delay time (PLC-format)*	1..n	10000
10		WORD	STX number of retries connection set-up (PLC-format)*	1..n	3
11		WORD	DBL number of retries data blocks (PLC-format)*	1..n	6
12		WORD	Priority 0==Low, >0==High	0, 1	1
13		WORD	QVZ for user acknowledgement		5000

* The PLC-format is identical to the S5-format from Siemens

The following parameters are constants

Parameter	Setting
Page frame base address	DIP-switch
No. of page frames	1
Job-no.	Channel 1 SEND: 1
	Channel 1 RECV: 2
	Channel 2 SEND: 3
	Channel 2 RECV: 4
	Channel 3 SEND: 5
	Channel 3 RECV: 6
Job type	SEND 0x81, RECV 0x82
Job priority	2
Organisation	None
Indicator word	None

Note!

For more detailed information please refer to the example at the end of chapter 4.

Configuration by means of WinNCS

Here the SSM-D uses the configuration to decide on the method used for data transmission. The configuration is similar to that of the CP143 TCP/IP and is under development.

Example of a Configuration via the CPU

This example shows the basic configuration procedure. In the example we are using an interface module carrying two interface adapters. For each interface we have configured a transmit and a receive job with the following parameters

- Page frame base address: 0
- Block size: 512 byte
- Parameter saved in DB9
- ASCII-communications
- Transmit data from DB10 via channel 1 with a length of 30 words
- Receive data from channel 1 and save in DB11 with a length of 10 words
- Transmit data from DB12 via channel 2 with a length of 30 words
- Receive data from channel 2 and save in DB13 with a length of 10 words

OB 20, 21, 22

```
BAUSTEIN#OB21 (restart)
      BIB     #14098
00004     :SPA FB 249
      NAME #SYNCHRON
      SSNR =KY 0,0           PAGE FRAME BASE ADDRESS 0
      BLGR =KY 0,6           BLOCK SIZE 512
      PAFE =MB 199           ERROR BYTE
0000E     :
00010     :BE
```

OB20 and OB22 are identical to OB21

OB1

First, the interface parameters must be configured in OB1. The parameter configuration mode is activated by means of a SEND and the job-no. 201. You then enter the following parameters into this mode:

Page frame base address, indicator word, parameter-DB, 1. Data word in DB, number of data words and error byte

```
BAUSTEIN#OB1
      BIB     #14098
0000A     :U   M 1.1
0000C     :R   M 1.1         TRANSMIT ENABLE PARAMETER SS1
0000E     :SPA FB 244
      NAME #SEND
      SSNR =KY 0,0           PAGE FRAMW BASE ADDRESS
      A-NR =KY 0,201         JOB NO. 201 PARAMETER TRANSF.
      ANZW =MW 2             INDICATOR WORD
      QTYP =KC DB            PARAMETER IN DB
      DBNR =KY 0,9           PARAMETER-DB DB9
      QANF =KF +0            FIRST WORD WITH PARAMETERS DW0
      QLAE =KF +10           NUMBER OF PARAMETER WORDS
      PAFE =MB 190           ERROR BYTE
00024     :U   M 1.2         TRANSMIT ENABLE PARAMETER SS2
00026     :R   M 1.2
00028     :SPA FB 244
NAME #SEND
      SSNR =KY 0,0           PAGE FRAM NUMBER
      A-NR =KY 0,201         JOB NO. 201 PARAMETER TRANSF.
      ANZW =MW 2             INDICATOR WORD
      QTYP =KC DB            PARAMETER IN DB
      DBNR =KY 0,9           PARAMETER-DB DB9
      QANF =KF +10           FIRST WORD WITH PARAMETERS DW10
      QLAE =KF +10           NUMBER OF PARAMETER WORDS
      PAFE =MB 190           ERROR BYTE
      ....
```

At this time the SEND and RECEIVE jobs are generated in OB1:

```
00042      :
00044      :U   M 1.0         INITIATE TRANSMISSION
00046      :R   M 1.0
00048      :SPA FB 244
    NAME #SEND
    SSNR =KY 0,0
    A-NR =KY 0,1             JOB NO.1: CHANNEL 1 SEND
    ANZW =MW 6
    QTYP =KC DB
    DBNR =KY 0,10            FROM DB10 AT DW 0 LENGTH 30 WORDS
    QANF =KF +0
    QLAE =KF +30
    PAFE =MB 198
00060      :
00062      :U   M 11.0
00064      :SPA FB 245
    NAME #RECEIVE
    SSNR =KY 0,0
    A-NR =KY 0,2             JOB NO.2: CHANNEL 1 RECV
    ANZW =MW 10
    ZTYP =KC DB
    DBNR =KY 0,11            INTO DB11 AT DW 0 LENGTH 10 WORDS
    ZANF =KF +0
    ZLAE =KF +10
    PAFE =MB 197
0007E      :
00080      :U   M 1.3
00082      :R   M 1.3
00084      :SPA FB 244
    NAME #SEND
    SSNR =KY 0,0
    A-NR =KY 0,3             JOB NO.3: CHANNEL 2 SEND
    ANZW =MW 14
    QTYP =KC DB
    DBNR =KY 0,12           FROM DB12 AT DW0 LENGTH 30 WORDS
    QANF =KF +0
    QLAE =KF +30
    PAFE =MB 198
0009C      :
0009E      :U   M 19.0
000A0      :SPA FB 245
    NAME #RECEIVE
    SSNR =KY 0,0
    A-NR =KY 0,4             JOB NO.4: CHANNEL 2 RECV
    ANZW =MW 18
    ZTYP =KC DB
    DBNR =KY 0,13
    ZANF =KF +0             IN DB 13 AT DW0 LENGTH 10 WORDS
    ZLAE =KF +10
    PAFE =MB 197
000BA      :
000BC      :                JOB NO. 5,6 ARE FOR CHANNEL 3
```

Block mode with SEND-ALL or RECEIVE-ALL

When the 512 byte block size defined in the start-up OB is exceeded the data transfer is handled by means of SEND-ALL or RECEIVE-ALL commands for block-wise data communications.

The function call in OB1 must use job no. 0 to specify a SEND ALL or a RECEIVE ALL:

```
000CE       :SPA FB 244
       NAME #SEND
       SSNR =KY 0,0
       A-NR =KY 0,0
       ANZW =MW 22
       QTYP =KC
       DBNR =KY 0,0
       QANF =KF +0
       QLAE =KF +0
       PAFE =MB 195
000E2       :
000E4       :SPA FB 245
       NAME #RECEIVE
       SSNR =KY 0,0
       A-NR =KY 0,0
       ANZW =MW 30
       ZTYP =KC
       DBNR =KY 0,0
       ZANF =KF +0
       ZLAE =KF +0
       PAFE =MB 194
000FA       :
000FC       :U   M 1.7
000FE       :BEB
00100       :
00102       :L   MW 40
00104       :L   KB 1
00106       :+F
00108       :T   MW 40
0010A       :L   KF +20        ISSUE THE TRANSMIT TRIGGER ONLY
0010E       :<F
00110       :BEB
00112       :S   M 1.0         WITH EVERY 20TH CYCLE
00114       :S   M 1.3         CHANNEL 1
00116       :L   KB 0          CHANNEL 2
00118       :T   MW 40
0011A       :
0011C       :A   DB 10
0011E       :L   DW 0          CHANGE DATA FOR MONITORING PURP.
00120       :L   KB 1
00122       :+F
00124       :T   DW 0
00126       :A   DB 12
00128       :L   DW 0
0012A       :L   KB 1
0012C       :+F
0012E       :T   DW 0
0013C       :BE
```

Parameter module DB9

You can activate the parameter configuration mode by means of a SEND and job no. 201. In this parameter configuration mode you must also provide a reference to a DB (here DB9) that contains the parameter data. The DB9 used in this example has a length of 10 words and it contains the parameters for channels 1 and 2. Channel 3 is not used.

```
BAUSTEIN#DB9
      BIB    #9108
00000:  KY = 1,129          Channel/PARAMETER SET ACTIVE
00001:  KY = 12,3           BAUDRATE 38400/DATABITS 8
00002:  KY = 3,3            PARITY Even/STOPBITS 2
00003:  KY = 1,1            FLOW CONTROL Hardw./PROTOCOL
                            ASCII HTB
00004:  KF = +2             TRANSMIT BUFANZ
00005:  KF = +100           TRANSMIT BUFSIZE
00006:  KF = +20            TIME DELAY AFTER JOB
00007:  KF = +2             RECEIVE BUFANZ
00008:  KF = +100           RECEIVE BUFSIZE
00009:  KF = +10            CHARACTER OVERDUE TIME
00010:  KY = 2,129          SS-NO./PARAMETER SET
00011:  KY = 12,3           BAUDRATE/DATABITS
00012:  KY = 3,3            PARITY/STOPBITS
00013:  KY = 1,1            FLOW CONTROL/PROTOCOL E.G.ASCII
00014:  KF = +2             TRANSMIT BUFANZ
00015:  KF = +100           TRANSMIT BUFSIZE
00016:  KF = +20            TIME DELAY AFTER JOB
00017:  KF = +2             RECEOVE BUFANZ
00018:  KF = +100           RECEIVE BUFSIZE
00019:  KF = +10            CHARACTER OVERDUE TIME
```

Part 5   Installation

Outline   This chapter describes the procedure that should be followed for the installation and for troubleshooting. It also contains a description of the diagnostic interface that you can use for the analysis of problems, etc.

The installation guidelines are another important part of this chapter. The installation guide lines provide the basic procedure for the installation of an automation system. This paragraph contains information on the installation of cables, proper grounding and screening techniques.

Please observe the installation guidelines in this chapter when you are installing your system.

The chapter concludes with the technical data of the BG4xD-module and the different interface adapters.

Here follows a description of:

- The installation check-list
- Default settings
- Start-up properties and troubleshooting
- Installation guide lines
- Technical data

Contents

Installation Procedure

- Install the required interface adapters on the module.
- If the system requires 24V for the adapters, change the respective jumpers as required.
- Define the page frame base address on the module by means of DIP-switch S1.
- Turn off the power to the PLC and insert the module into the PLC in accordance with the respective specifications.
- Connect the 25-pin D-type socket of the module to the respective periphery.
- Turn on the power to the PLC.
- Check that the LEDs located on the module and the adapter react properly.

Plug-in slots in the PLC-115U through 185U

Plug-in slots in the PLC-115U

Plug-in slot ZG	PS	CPU	0	1	2	3	4	5	6	IM
PLC-115U										
CR700-1			①							
CR700-2			■	■	■	■	■	■		
CR700-3			■	■	■	■	■	■		
CR700-0LA										
CR700-0LB			■	■	■					
ER701-0										
ER701-1										
ER701-2										
ER701-3			■	■	■	■	■	■	■	

① Here only one power supply connection exists via X1
   (upper connector)

Attention!

The installation of a BG4xD in module rack PLC-115U requires the installation of an enclosed adapter with 2 or 4 plug-in slots.

**Plug-in slots in
PLC-135 through
185U**

Plug-in slot ZG	3	11	19	27	35	43	51	59	67	75	83	91	99	107	115	123	131	139	147	155	163
PLC-135U																					
ZG -3KA13			■	■	■	■	■	■	■												
ZG -3KA21			■	■	■	■	■	■	■												
ZG -3KA31			■	■	■	■	■	■	■												
ZG -3KA41			■	■	■	■	■	■	■												
ZG -3UA11			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
ZG -3UA21			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
ZG -3UA31			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
ZG -3UA41			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
ZG -3UA51			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
PLC-135U/155U																					
ZG -3UA11			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
ZG -3UA21			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
ZG -3UA31			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
ZG -3UA51			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
PLC-155U																					
ZG -3UA11			■		■	■	■	■		■	■	■	■	■	■	■	■				
ZG -3UA21			■		■	■	■	■		■	■	■	■	■	■	■	■				
PLC-185U																					
EG -3UA11			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			
EG -3UA21			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			
EG -3UA31			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			
EG -3UA41			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			

Page Frame Base Address Setting with DIP-Switch S1

DIP-switch S1 is used to define the page frame base address. The addressing of the interface module is **not** defined by the plug-in slot!

The address for access to the module only depends on the DIP-switch setting.

The DIP-switch setting is the binary page frame base address. This code is entered in groups of 4. This implies that the first two switches (1 and 2) are always in location zero. The board carries a silk-screened example for page frame base address 8.

DIP-switch S1
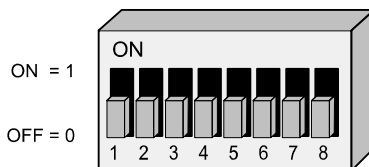
Use this to define the page frame base address in groups of 4 (0, 4, 8, ..., 252).

Switches S1-1 and S1-2 must always be at 0

Example

DIP-switch S1
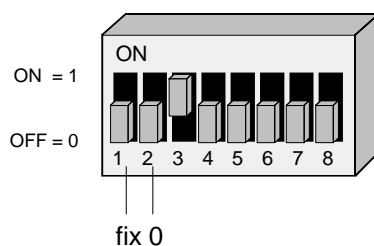
This example shows the settings for page frame base address 4

Switches S1-1 and S1-2 must always be at 0

Power Supply Selection for Adapters

Internal power supply via the back plane bus

If the PLC is able to supply 24V on the bus then the power supply can obtain the input power from the bus. You can use jumpers X3 on the main board to select whether 24V is derived from the upper connector or from the lower one. The jumpers should be positioned as follows to obtain 24V from the upper connector (X1) - (applies to PLC–115U):

Power supply via X1 for PLC-115U

```
X1  X2  X1  X2

┌──────────────────┐
│ ▌●   ●   ▌●   ●  │
│ ▌●   ●   ▌●   ●  │  X3
└──────────────────┘
  P24       M24
```
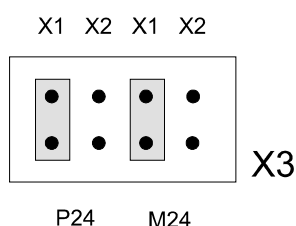
Power supply via X2 for PLC-135U, PLC-150U, PLC-155U

Where the 24V supply is only available from the lower connector (X2) the jumpers should be placed as follows (applies to PLC-135U, PLC-150U, PLC-155U):

```
X1  X2  X1  X2

┌──────────────────┐
│ ●  ▌●   ●   ▌●   │
│ ●  ▌●   ●   ▌●   │  X3
└──────────────────┘
  P24       M24
```
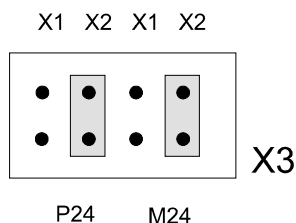
Connectors J1 and J2 on the 20mA-adapter (or on the combination adapter) must be placed in position "INT" for internal power supply.

External power supply via 25-pin D-type socket

Both the 20mA-adapter and the combination adapter have jumpers X3 and X5 that select either an external or an internal power supply. Jumper M24 (X3) connects the ground line and jumper P24 (X5) the 24V supply line. When the module should be connected to an external power supply both jumpers must be located in the position "EXT" (external power supply).

⚠️

Attention!

When the BG4xD is connected to external 24V power, jumpers X3 must be positioned in the parking position!

Parking position of jumper X3

X1   X2   X1   X2

●   ●   ●   ●

● ●   ● ●   X3

P24   M24
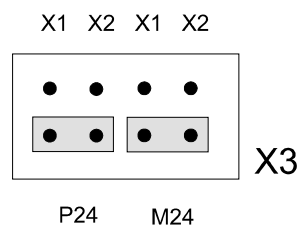
Jumpers X3 provide the link to the 24V supply from the back plane bus. If the module is connected to an external supply it is imperative that these jumpers are located in the position shown above. The external supply voltage must be connected to pins 11 (+24 V) and 22 (common) of the 25-pin D-type plug.

Start-up Behaviour

Power ON
- when the module was installed for the first time
  - the default configuration is used:

    Default function (without procedure/protocol)

    Baudrate 9600 Baud

    even parity

    1 Start bit

    8 Data bits

    2 Stop bits
  - All buffers are cleared

- when the module has been running before
  - current parameters are retained. The configuration is maintained by the internal battery of the PLC.
  - All buffers are cleared

STOP-START
- Stop-start operation
  - the previously selected function (protocol/procedure) and any changed default parameters are retained
  - all buffers are cleared

Troubleshooting

**Serial
communication
errors**

Reason:

The 25-pin D-type plug was wired incorrectly

Remedy:

Check that the interface parameters are correct.

For the RS232C adapter, check that pins 4 and 5 are linked.

For the combination module using the RS232C interface, check that pins 7 and 20 are linked.

Execute a Loopback-test by connecting the output directly to the input.

Check that RECEIVE is initiated.

**BG4xD uses
default parameter**

Reason:

Parameters are not accepted as they contain invalid settings. The validity of every set of parameters is verified and parameters are accepted if this check is positive. When an error is detected the module will start using default parameters.

Remedy:

Check that the specified parameters are correct.

Reason:

Flat or missing battery in the PLC. For this reason the parameters are not retained by the page frame.

Remedy:

Check the backup battery in your PLC and replace, if necessary.

Reason:

When the backup battery on the module has been connected (soldered link Y1 installed) the parameters are saved in RAM under battery power when the module is removed from the frame. If the battery should be flat the parameters can not be saved. The module will then start using default parameters.

Remedy:

Run the module for at least 24h in the rack while the rack is powered on so that the battery can be charged.

Using the diagnostic interface

Since monitoring of the data being transferred between the PLC and its periphery is becoming more important, VIPA-modules are fitted with a separate interface consisting of an RJ45-socket.

This interface provides access to the RxD and TxD signals of the different channels. These signals are at the standard RS232 levels. The different channels can be selected by means of a binary code connected to pins 7 and 8 (see table).

You can display and analyse these signals by means of an appropriately wired RJ45 to D-type (9-pin) adapter and a terminal program.

Pin assignment for the RJ 45 socket
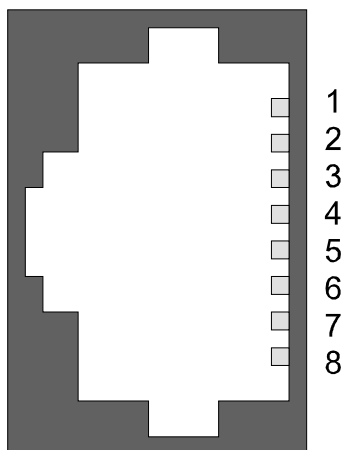
Pin no.	Function		Chan. 1	Chan. 2	Chan. 3
1	used internally				
2	RXD				
3	TXD				
4	used internally				
5	GND				
6	VCC (5V)				
			Chan. 1	Chan. 2	Chan. 3
7	Selection of individual channels	0 (GND)	1 (5V)	0 (GND)	1 (5V)
8	Selection of individual channels	0 (GND)	0 (GND)	1 (5V)	1 (5V)

Attention!

When the RS485 or RS485/422P adapters are employed the functionality of the diagnostic interface is limited.

Since these modules are not capable of full-duplex operations the receive channel (RXD) is not active when the transmit channel (TXD) is being used.

Installation Guidelines

The installation guidelines contain information on installation techniques guaranteeing interference-free operation of PLC's. This chapter describes how interference can enter into automation equipment, how the electromagnetic compatibility (EMC) can be guaranteed and screening techniques.

What does EMC mean?
The term electromagnetic compatibility (EMC) refers to the ability of an electrical device to operate properly within a specific electromagnetic without illegal interference from or to this environment.

All VIPA-products were developed for applications in hostile industrial environments and satisfy stringent EMC requirements. In spite of this you should always complete an EMC plan including any possible source for electrical interference before you commence with the installation of the controller.

Summary of the possible sources of interference
Electromagnetic interference can enter the automation equipment along diverse paths:

- Fields
- I/O signalling lines
- Bus system
- Power supply
- Neutral conductors

Depending on the medium of propagation (via conductors or not) and the distance to the source of interference this may enter the automation equipment via different coupling mechanisms.

We differentiate between:

- galvanic coupling
- capacitive coupling
- inductive coupling
- radiation coupling

The most important rules for ensuring EMC

In many cases EMC can be guaranteed by the adherence to some very elementary rules. For this reason you must observe the following basic rules when you are installing a controller.

- When you install the automation devices you must ensure proper, large surface grounding of all inactive metal parts.
  - Install a centrally located connection between ground and earthing/neutral conductor system.
  - Provide large surface, low-impedance grounding for all inactive metal parts.
  - Avoid using aluminium components. Aluminium oxidises quickly and for this reason it is not the best choice of material for grounding purposes.

- Ensure that any wiring or cabling is routed properly.
  - Divide the cabling into groups of cables. (High power, power supply, signal and data lines).
  - High power lines and signal or data cables must always be placed into separate channels or racks.
  - Signal and data lines must be located as close as possible to ground planes (e.g. frame members, metal rails, cubicle covers).

- Ensure that screen conductors are attached properly.
  - Data lines must be screened.
  - Analogue lines must be screened. Where low-amplitude signals are transferred it may be of advantage to ground the screen on one side of the cable only.
  - Use cable clamps to provide a large surface ground connection between the screens and the neutral rail directly at the point where the cable enters the cubicle.
  - Ensure that the screen/neutral rail is connected to the cubicle by a low-impedance connection.
  - Use only metallic or metallized covers for plugs attached to screened data lines.

- For special applications you may require special EMC techniques.
  - Connect snubber networks that are not controlled by PLC-modules to all inductive components.
  - Use incandescent lamps for the internal illumination of cubicles, avoid fluorescent lamps.

- Provide a uniform neutral reference potential and earth all electrical equipment wherever possible.
  - Ensure that proper earthing techniques are employed at all times. Earthing of the controller is intended to protect the operation thereof.
  - Connect all parts of the installation and the cubicles to central units as well as expansion units by means of a star-type earthing/neutral conductor system. In this way you can prevent earth loops.
  - If you encounter potential differences between the plant and the cubicles, install equipotential bonding conductors of sufficient dimensions.

Screening of lines   The effect of electrical, magnetic or electromagnetic stray fields is reduced by screening; this is referred to as attenuation.

The screening rail that is electrically connected to the enclosure conducts stray currents from the screen of the cables to ground. In this case it is important to ensure that the link to the neutral conductor is formed by a low-impedance conductor as the stray currents could otherwise become a source of electrical disturbance in themselves.

The following must be noted when lines are screened:

- Use lines provided with a braided screen wherever possible.

- The coverage provided by the screen should be more than 80%.

  You should always ground the screen of these cables at both ends.
  You can only achieve proper suppression of higher frequency interference by grounding the screen at both ends.

  Under exceptional circumstances the screen can be grounded at one end only. In this case, however, you are only attenuating low frequency components.
  The one-sided ground connection can be of advantage when:

  - an equipotential bonding conductor can not be installed

  - Analogue signals (a few mV or µA) are transferred

  - Foil-type screens (static screens) are used.

- Always use metallic or metallized covers for serial data cabling. Connect the screen of the cable to the cover. Do **not** connect the screen to PIN 1 of the plug!

- For stationary operations it is recommended to strip the insulation from the screened cable without interruption of the screen and to connect the screen at this point to the screen/neutral rail.

⚠ **Attention!**

Where potential differences exist between earth terminals the screen connected between these can carry a compensating current.

Remedy: equipotential bonding conductor.

- The braids of screens should be connected by means of metallic cable clamps. These clamps must provide a good electrical large surface contact to the screen.

- Connect the screen to the screening rail directly after it enters the cubicle. Let the remainder of the screen continue up to the module but do **not** connect it to ground at this point!

Technical Data

Interface modules BG4xD	Supply voltage	+5 V ± 5 %
	Current consumption	600 mA
	Internal processor clock frequency	24 MHz
	Communication rate asynchronous	75 ... 57.600 Baud
	RS232C Handshake	RTS/CTS
	Dimensions	
	- Height	233,4 mm
	- Depth	160,0 mm
	Weight	ca. 400 g
	Environmental conditions	
	- Operating temperature	0 °C ... 55 °C
	- Storage- and transport temperature	-20 °C ... 70 °C
	- Relative humidity (no condensation)	95 % to 25 °C
	- no forced ventilation	
	Space required	1 Plug-in slot
	Usable on the IM-plug-in slot	no

Adapters

20mA Current Loop adapter MD25D	Supply voltage	+5 V (internally via module)
	Current consumption	12 mA
	Communication rate asynchronous Handshake	75 ... 38.400 Baud -
	Isolation	yes
	20 mA current sources	2
	Load voltage - acceptable range - internally via back plane bus - externally via 25pin socket	24 VDC 10 V ... 36 V DC
	Constant current for 24 V	app. 22 mA
	Dimensions - Height - Depth	 50 mm 70 mm with LED

20mA-/RS232C combination adapter MD26D	Supply voltage	+5 V (internally via module)
	Current consumption	40 mA
	Communication rate asynchronous	75 ... 38.400 Baud
	Handshake	RTS/CTS
	Isolation:	
	- 20 mA Current Loop	yes
	- RS232C	no
	20 mA current sources	2
	Load voltage typically.	24 VDC
	- acceptable range	10 ... 36 V DC
	- internally via back plane bus	
	- externally via 25pin socket	
	Constant current for 24 V	app. 22 mA
	Dimensions	
	- Height	50 mm
	- Depth	70 mm with LED

RS232C adapter MD22D	Supply voltage	+5 V (internally via module)
	Current consumption	40 mA
	Communication rate asynchronous	75 ... 38.400 Baud
	Handshake	RTS/CTS
	Isolation	no
	Dimensions	
	- Height	50 mm
	- Depth	70 mm with LED

RS422/RS485 adapter MD21D

Supply voltage	+5 V (internally via module)
Current consumption	85 mA
Isolation	no
Communication rate asynchronous	75 ... 38.400 Baud
Load resistors	100 Ω (jumper)
Dimensions	
- Height	50 mm
- Depth	70 mm with LED

RS422P adapter MD33D

Supply voltage	+5 V (internally via module)
Current consumption	100 mA
Isolation	yes
Communication rate asynchronous	75 ... 38.400 Baud
Load resistors (transmit and receive line)	100 Ω (switch)
Dimensions	
- Height	50 mm
- Depth	90 mm with LED

RS485Padapter MD34D	Supply voltage	+5 V (internally via module)
	Current consumption	100 mA
	Isolation	yes
	Communication rate asynchronous	75 ... 38.400 Baud
	Load resistors (transmit and receive line)	100 Ω (switch)
	Dimensions	
	- Height	50 mm
	- Depth	90 mm with LED

RS422HP adapter MD35D	Supply voltage	+5 V (internally via module)
	Current consumption	100 mA
	Isolation	yes
	Handshake	RTS/CTS signal lines
	Communication rate asynchronous	75 ... 38.400 Baud
	Load resistors (transmit and receive line)	100 Ω (switch)
	Dimensions	
	- Height	50 mm
	- Depth	90 mm with LED

A   Appendix

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M.Stich