

# **SERIAL-PROFIBUS-INTERFACE SPI 3**

---

for Fieldbus devices with a serial interface

ASCII | 3964R | RK512

[Contents SPI 3 – SIMATIC S5/S7 \(up to SPI Release 11\)](#)

[Contents Online Documentation](#)

## Dear customer

---

This online documentation is designed to help you with engineering, connecting up, configuration and parameter setting of the SPI 3. Please feel free to contact our Technical Support department if you need further help:

Trebing & Himstedt Prozessautomation GmbH & Co. KG  
Technical Support Dept.  
Wilhelm-Hennemann-Str. 13  
D-19061 Schwerin, Germany

Telephone: +49-385-3 95 72-500

Telefax: +49-385-3 95 72-22

e-mail: [support@t-h.de](mailto:support@t-h.de)

homepage: <http://www.t-h.de>

The information in this online documentation is the property of Trebing & Himstedt Prozessautomation GmbH & Co. KG. This online documentation or extracts thereof may only be duplicated or passed on to third parties following explicit written approval from Trebing & Himstedt Prozessautomation GmbH & Co. KG. The right is reserved to make changes to this online documentation and to the SPI 3 device at any time without prior notification.

All product names used in this manual are trademarks or otherwise protected by law, even if this is not specifically mentioned.

SIMATIC® is a registered trademark of Siemens AG.

|  |    |
|--|----|
| Introduction .....   | 2  |
| Scope of delivery .....  | 3  |
| Documentation & Media kit (optional) .....                     | 3  |
| About this Online Documentation .....                          | 3  |
| Safety notes .....   | 4  |
| Safety notes for the planning stage .....                      | 4  |
| Safety notes for installation and operation of the SPI 3 ..... | 5  |
| Overview of the SPI 3 .....                                    | 6  |
| Connections and interfaces .....                               | 6  |
| Mounting the device .....                                      | 6  |
| Operating elements .....                                       | 6  |
| Indicating elements .....                                      | 7  |
| Release .....  | 7  |
| Mounting and connecting up the SPI 3 .....                     | 8  |
| Attaching the SPI 3 to the top-hat rail .....                  | 8  |
| Connecting up the power feed .....                             | 8  |
| Connecting up to a fieldbus device with serial interface ..... | 8  |
| Connecting up to the PROFIBUS .....                            | 9  |
| Setting the PROFIBUS address .....                             | 9  |
| Setting up the SPI 3 .....                                     | 10 |
| Configuring the SPI 3 .....                                    | 11 |
| Setting parameters for the SPI 3 .....                         | 12 |
| Installing the function blocks .....                           | 13 |
| Checking the SPI 3 for correct operation .....                 | 14 |
| Checking the SPI 3 power feed .....                            | 14 |
| Checking the PROFIBUS communication .....                      | 14 |
| Checking the serial interface communication .....              | 14 |
| Exchanging data using the SIMATIC FB's .....                   | 15 |
| Parameters for data transfer for SIMATIC S5 .....              | 16 |
| Parameters for data transfer for SIMATIC S7 .....              | 18 |
| Data consistency (only for S7) .....                           | 20 |
| Configuring the size of the data blocks (S5 and S7) .....      | 21 |
| Sending data (S5 and S7) .....                                 | 21 |
| Receiving data (S5 and S7) .....                               | 22 |
| Processing RK512 telegrams (S5 and S7) .....                   | 23 |
| Error diagnosis and remedies .....                             | 24 |
| Technical specifications .....                                 | 26 |
| Appendix .....   | 27 |
| Creating a configuration telegram .....                        | 27 |
| Creating a parameter telegram .....                            | 27 |
| Standard bus-related parameters .....                          | 27 |
| SPI 3-specific parameters .....                                | 28 |
| Glossary .....   | 30 |
| General conditions .....                                       | 37 |

# Introduction

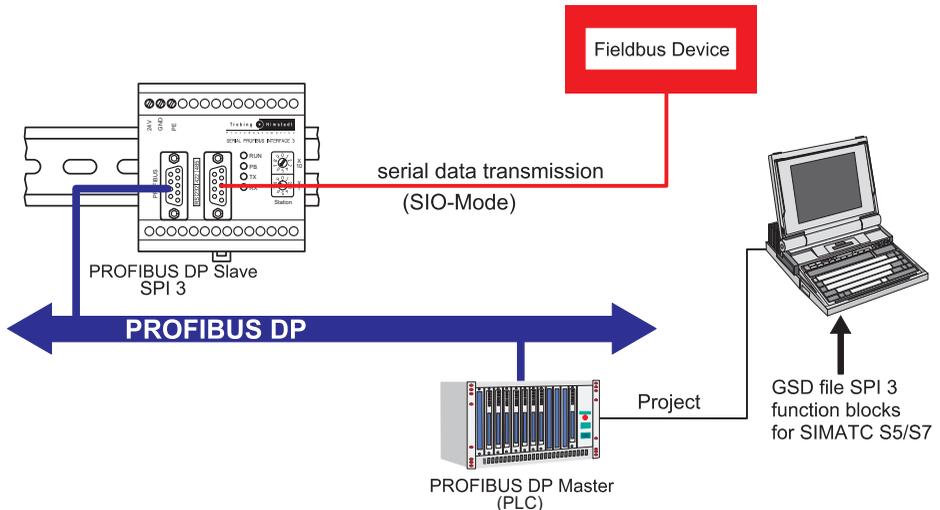
The SPI 3 (SERIAL-PROFIBUS-INTERFACE 3) allows a PROFIBUS-DP master to communicate with a fieldbus device with a serial interface. This allows the fieldbus device to function as a real PROFIBUS station, whereby the SPI 3 converts the data to be exchanged between the PROFIBUS-DP master and the fieldbus device into a format which is compatible with the other device.

Data is exchanged between the DP master and the SPI 3 in the form of telegrams or telegram fragments through a data channel, the size of which can be configured to adapt it to the telegram length and the size of the PLC I/O area. The data channel consists of a send channel and a receive channel.

The SPI 3 is easy to install and configure and a separate program for configuration or parameter setting is not necessary. Configuration is done using the respective PROFIBUS-DP master.

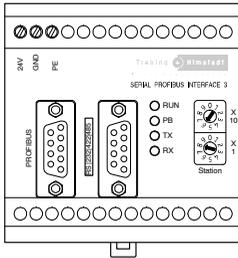
## Features of the SPI 3:

- DP slave at up to 12 Mbit/s
- Serial baud rates up to 57.6 kbit/s
- Versions available for RS232, RS422 or RS485 serial interface
- Function blocks for SIMATIC S5/S7 (Included in Documentation & Media-Kit)
- Does not require special configuration software
- Simple and fast Integration in PROFIBUS-DP networks
- I/O range configurable from 2 to 64 data words

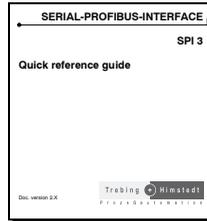


*Example for SPI 3 interface module overview*

## Scope of delivery



SPI 3



Quick start guide

## Documentation & Media kit (optional)

The documentation & media kit contains this online documentation, function blocks for SIMATIC S5 and S7, GSD file and example files. You can download the documentation & media kit ([www.t-h.de](http://www.t-h.de)). You need GSD file for the PLC project.

## About this Online Documentation

Please read this online documentation before starting the installation work. It contains important information on planning your system, connecting up and configuring the SPI 3 and on parameter setting.

The online documentation uses the following keywords and symbols:



### Danger!

Risk of injury to personnel due to electric shock.



### Warning!

Risk of damage to equipment.



### Note!

Indicates useful tips.

# Safety notes

## Safety notes for the planning stage

Observe the general rules for PROFIBUS components when planning the SPI 3 installation.

Please observe the following to avoid risk to personnel and damage to equipment and to ensure that the SPI 3 functions correctly:

|                       |  |
|-----------------------|--|
| Safety regulations    | <ul style="list-style-type: none"><li>– Observe the guidelines in the VDE 0100 regulations for handling electrical components,</li><li>– Observe the applicable safety and accident prevention regulations.</li></ul>  |
| Assembly personnel    | The SPI 3 must only be installed or de-installed by qualified technical personnel with appropriate electrotechnical qualifications.  |
| PROFIBUS standard     | Observe the guidelines in the PROFIBUS standard EN 50 170.   |
| Bus cable             | Bus wiring should only take place using special screened, twisted pair PROFIBUS cable. The high data transfer rates can only be guaranteed with the correct cable type.  |
| Cable lengths         | Refer to the manual for the DP master for information on maximum cable lengths for PROFIBUS.   |
| Terminating resistors | Terminating resistors must be used if the SPI 3 is installed at the beginning or end of the PROFIBUS cable segment. In this case, you should use PROFIBUS connectors which contain an integrated terminating resistor. We recommend you to use connectors from ERNI and Siemens. If the bus is incorrectly terminated, this can lead to errors in data transfer or to damage to other stations on the bus.   |
| Bus connectors        | You should only use commercially available PROFIBUS connectors for connecting the bus. We recommend you to use connectors from ERNI and Siemens.   |
| Cable screen          | Screened cables are less sensitive to interference due to electromagnetic fields. With screened cables, the interference currents are led to ground through the screening rail, which is electrically connected to the case. To ensure that the interference currents which flow through the screening do not themselves interfere with other devices, it is important to provide a low impedance connection to the protective ground. Observe the following rules for the screens of the PROFIBUS cable and the serial interface cable: <ul style="list-style-type: none"><li>– The braiding of the screening should have a degree of coverage of more than 80 %.</li></ul> |

- The screening should include a braided screen and should not consist solely of foil screening, since the latter can be easily damaged by cable tension and pressure.
- To ensure good immunity to interference at high frequencies as well, the screening of the cable should be attached to the screening rail at both ends of the cable.

### Safety notes for installation and operation of the SPI 3

Please observe the following before connecting up the SPI 3 to avoid risk to personnel and damage to equipment and to ensure that the SPI 3 functions correctly:

- The SPI 3 is designed as an interface between fieldbus devices with serial interfaces and the PROFIBUS. Do not use the SPI 3 for any other purpose.
- The SPI 3 may only be installed or de-installed by qualified technical personnel with appropriate electrotechnical qualifications. When connecting up the SPI 3, you must observe the guidelines in the VDE 0100 regulations for handling electrical equipment.
- Always mount the SPI 3 on a suitable top-hat rail.
- The cables used to connect up the SPI 3 should not apply any mechanical forces to the device.



#### **Danger!**

Never open the case of the SPI 3 and do not make any modifications to the device.



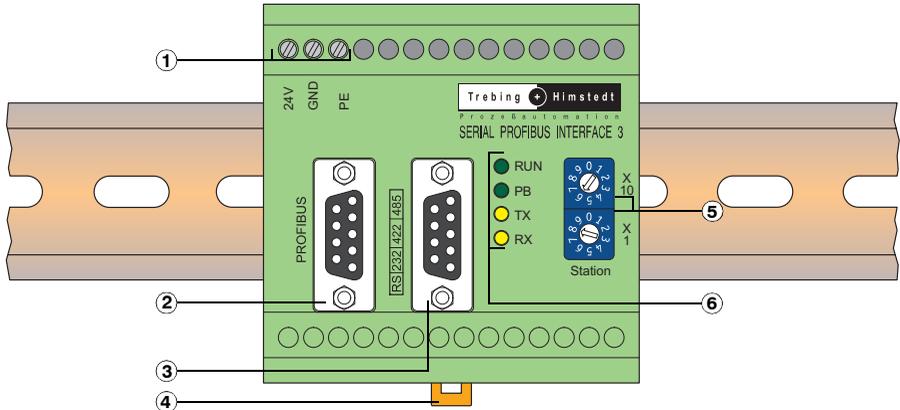
#### **Warning!**

Small objects or liquids must not be allowed to enter the case of the SPI 3 (e.g. through the ventilation slots) since this could damage the device.

Never cover up the ventilation slots in the case.

Large temperature differences between the storage location and installation site can cause condensation to form within the case of the SPI 3, which can damage the device. If large temperature differences are present, you should wait at least 3-4 hours after installing the SPI 3 and before switching on the power.

## Overview of the SPI 3



### Connections and interfaces

- Power feed ①
  - 24 V Screw terminal for external 24 V power supply
  - GND Signal ground terminal
  - PE Protective ground terminal
- PROFIBUS interface ②
- Serial interface ③ (RS232, RS422 or RS485 see label on SPI 3)

### Mounting the device

- Spring-loaded orange clip ④ for releasing the SPI 3 from the top-hat rail

### Operating elements

- Two rotary switches ⑤ for setting the PROFIBUS address
  - Switch for setting the tens value
  - Switch for setting the units value

## Indicating elements

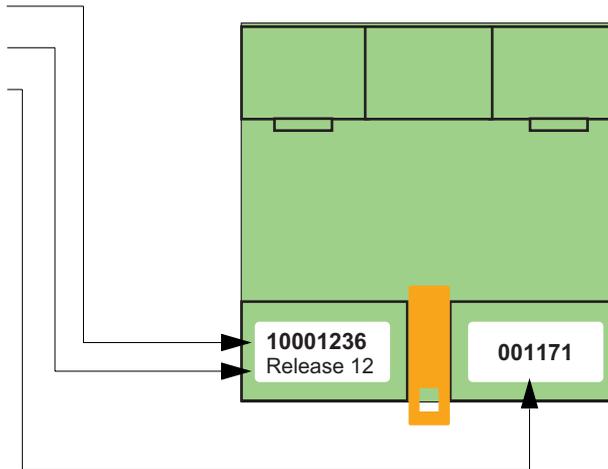
LEDs ⑥ to indicate operating states (see »Error diagnosis and remedies« on page 24):

- RUN: lights continuously if supply voltage is present, flashes in case of errors
- PB: lights up if the SPI 3 has been configured by the master and is operational, flashes in case of errors
- TX: flashes if data is being sent to the serial interface
- RX: flashes if data is being received from the serial interface

## Release

The following information is indicated on the SPI 3 back-panel:

- Article No.
- Release No.
- Serial No.



## Mounting and connecting up the SPI 3

### Attaching the SPI 3 to the top-hat rail

- Hook the SPI 3 onto the top-hat rail and snap it into place.

In order to remove the SPI 3 from the top-hat rail, pull out the orange locking clip ④ with a suitable tool.

### Connecting up the power feed

**Danger!**

Incorrect grounding of the SPI 3 can injure personnel and damage equipment. Make sure that the SPI 3 is correctly grounded.



**Warning!** Although the SPI 3 is protected against polarity reversal, connecting up the power feed with incorrect polarity for extended periods can damage the device. Make sure that the power feed is connected with correct polarity.

- Connect the cables for 24 V power feed, ground and protective ground to the corresponding screw terminals 24 V, GND and PE (①).

### Connecting up to a fieldbus device with serial interface

**Note!**

To ensure that the SPI 3 functions without errors, you should use a screened cable for connecting to the serial fieldbus device.

- Ensure that the Sub-D connector for the serial interface uses the pin assignments shown in »Technical specifications« on page 26 (connect the cable screen to the case of the sub-D connector).
- Attach the sub-D connector for the serial interface to the serial interface socket ③ on the SPI 3.

## Connecting up to the PROFIBUS



### Note!

You should only use commercially available PROFIBUS connectors for connecting to the bus. We recommend you to use connectors from ERNI and Siemens.

If the SPI 3 is installed at the beginning or end of the PROFIBUS cable segment, you should use PROFIBUS connectors which contain an integrated terminating resistor. We recommend you to use connectors from ERNI and Siemens.

To ensure that the SPI 3 functions without errors, you must ground the screen of the PROFIBUS cable.

- Ensure that the PROFIBUS connector uses the pin assignments shown in »Technical specifications« on page 26.
- Attach the PROFIBUS connector to the PROFIBUS interface socket ② on the SPI 3 and secure the connector with the retaining screws.

## Setting the PROFIBUS address



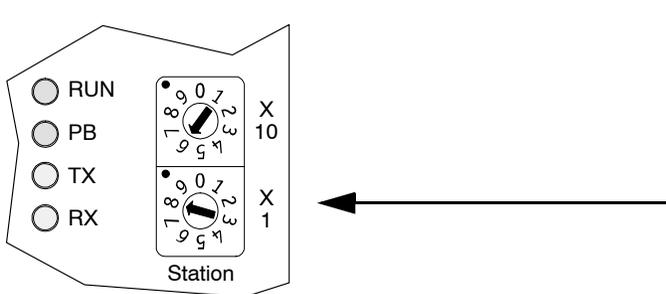
### Note!

The SPI 3 only updates its PROFIBUS address during a restart. Set the PROFIBUS address on the SPI 3 before switching on the power, or turn off the power briefly after changing the PROFIBUS address.

PROFIBUS addresses 00 to 02 are reserved. You should only use addresses between 03 and 99.

- The PROFIBUS address is set with the two rotary switches ⑤.

**Example:** In order to set the PROFIBUS address 68, turn the rotary switch for the 10's to 6, and the rotary switch for the units to 8.



## Setting up the SPI 3

In order to set up the SPI 3, you need to configure it, set the parameters and install the function blocks in your PLC programming software.

When configuring the SPI 3 from the DP master using a commercially-available PROFIBUS configurator program, refer to the on-line help for information on specifying the parameters. Since there are a large number of different PROFIBUS configurators on the market, it is only possible to give a general overview of the process of configuration and parameter setting:

- Start the PROFIBUS configurator on the DP master.
- Insert the diskette with the device database files (GSD) into the diskette drive of the programming device (usually a PC).
- Load the SPI 3 GSD file THDP0091.GSD in the configurator.
- Configure the SPI 3 and set the parameters as described in the configurator's online help or user manual.

**Note!**

If you do not want to use a PROFIBUS configurator program, you need to create your own configuration and/or parameter telegram. See »Creating a configuration telegram« on page 27 for more information.

## Configuring the SPI 3

When configuring the SPI 3 with the PROFIBUS configurator, you will be prompted to choose a firmware module from the menu. Choose a module from the following list according to the required I/O area and data transfer protocol:

| Module name  | I/O area | Data transfer protocol                  |
|--|----------|---|
| ASCII, 3964R, RK512 modules with simple parameters (for application in connection with FBs 100, 101, 103, 200, 201, 203 – control data stamp/mirror in byte 0 and byte 1)                            |          |   |
| MODUL_C1C1C101   | 2 words  | unstructured ASCII driver, 3964R, RK512 |
| MODUL_C1C3C301   | 4 words  | unstructured ASCII driver, 3964R, RK512 |
| MODUL_C1CFCF01   | 16 words | unstructured ASCII driver, 3964R, RK512 |
| MODUL_C1DFDF01   | 32 words | unstructured ASCII driver, 3964R, RK512 |
| MODUL_C1FFFF01   | 64 words | unstructured ASCII driver, 3964R, RK512 |
| ASCII, 3964R, RK512 modules with extended parameters (for application of release 12 and higher in connection with FBs 100, 101, 103, 200, 201, 203 – control data stamp/mirror in byte 0 and byte 1) |          |   |
| ASCII_Prm+___2W_i/o  | 2 words  | unstructured ASCII driver, 3964R, RK512 |
| ASCII_Prm+___4W_i/o  | 4 words  | unstructured ASCII driver, 3964R, RK512 |
| ASCII_Prm+___16W_i/o   | 16 words | unstructured ASCII driver, 3964R, RK512 |
| ASCII_Prm+___32W_i/o   | 32 words | unstructured ASCII driver, 3964R, RK512 |
| ASCII_Prm+___64W_i/o   | 64 words | unstructured ASCII driver, 3964R, RK512 |
| Application-specific modules (only for application in connection with manufacturer-specific devices and FBs – control data stamp/mirror in byte 0 and byte 1)  |          |   |
| MODUL_C1414101   |          |   |
| MODUL_C1434301   |          |   |
| MODUL_C1858703   |          |   |
| MODUL_C1858C03   |          |   |
| MODUL_C1C2C303   |          |   |
| MODUL_82000004   |          |   |
| MODUL_C1CFCF07   |          |   |
| MODUL_C1DFDF07   |          |   |
| MODUL_C1FFFF07   |          |   |



### Note!

You should only configure one module for the SPI 3 device.

After configuring the SPI 3, you need to set the parameters. This is described in »Setting parameters for the SPI 3« on page 12.

## Setting parameters for the SPI 3

When you configure the SPI 3 with the PROFIBUS configurator, you will be prompted to choose the required parameters from a menu.

You can set the following parameters:

**Unstructured ASCII driver, 3964R, RK512** see »SPI 3-specific parameters« on page 28

Data transfer rate

Flags (only available in modules with extended parameters)

Handshake mode

ASCII code for the Xon character

(only required for Xon/Xoff handshake)

ASCII code for the Xoff character

(only required for Xon/Xoff handshake)

Parity

Character frame

Character timeout, response timeout

(see »Glossary« on page 30)

Data transfer mode

Priority

Start sign (only available in modules with extended parameters)

Stop sign (only available in modules with extended parameters)

Telegram length (only available in modules with extended parameters)

Choose the parameter values according to the serial fieldbus device you are using. If necessary, refer to the descriptions of the required parameters in this manual.

## Installing the function blocks



### Note!

The function blocks (FB's) are only suitable for SIMATIC S5 and S7 controllers. If you want to use another type of controller, you will need to create new function blocks yourself. See online documentation for more information.

You can either check the function blocks with the example project, or start with installing the respective function blocks in your existing project. You only need to open the respective example project with the corresponding SPS programming software (Step 5 or Step 7):

1. Test example project (no connection of serial client required):
  - Start SPS programming software.
  - Open the respective PLC project.
  - Adapt the applied SPS hardware (the exact name of the applied hardware in the example project is to be found in the »readme\_e.txt« file).
  - Execute SPS Erase Program.
  - Load the project into the SPS.  
After successful loading and subsequent SPS RUN, the LEDs RUN and PB will light on the SPI 3 (see also: »Checking the PROFIBUS communication« on page 14). The TX LED flashes.
2. Load function blocks in an existing project:
  - Start SPS programming software.
  - Open the respective PLC project.
  - Copy the FB into your SPS program. Enter FB command parameters (see »Parameters for data transfer for SIMATIC S5 or ... SIMATIC S7«).
  - Execute further steps for your SPS program (integrate SPI 3 in hardware catalogue, select module, adjust SPI 3-specific parameters, create DB, command FB etc.).
  - Proceed further as described in the handbook or online support of the SPS programming software.

The SPI 3 is ready for use after installing the function blocks.

## Checking the SPI 3 for correct operation

Several checks should be made before using the SPI 3 to transfer data.

### Checking the SPI 3 power feed

- At this stage, do not attach either the PROFIBUS interface or the serial interface,
- switch on the power feed for the SPI 3.

The RUN LED should light continuously. If this is not the case, there is a fault in the 24 V power feed. Refer to »Error diagnosis and remedies« on page 24 for details of how to locate the fault.

### Checking the PROFIBUS communication

- Connect up the PROFIBUS interface cable,
- switch on the power feed for the SPI 3,
- start the DP master, which has been configured previously (see »example project Test« on page 13).

The PB LED should light continuously. If this is not the case, there is an error in the PROFIBUS communication. Refer to »Error diagnosis and remedies« on page 24 for details of how to locate the fault.

### Checking the serial interface communication

- Connect up the PROFIBUS interface cable and the serial interface cable,
- switch on the power feed for the SPI 3,
- start the DP master, which has been configured previously,
- start the communication with the serial device.

The RUN LED should light continuously. If it does not light, or it only flashes, there is an error in the communication with the serial device. Refer to »Error diagnosis and remedies« on page 24 for details of how to locate the fault.

If no errors were detected, the SPI 3 is ready for use and you can use it for transferring data.

The TX LED should flash when data is being transmitted over the serial interface and the RX LED should flash when data is being received over the serial interface (see »Indicating elements« on page 7).

## Exchanging data using the SIMATIC FB's

Asynchronous data exchange between the PLC and the SPI 3 is controlled by function blocks (FB's). The following FBs contains (you can download from the internet: [www.t-h.de](http://www.t-h.de)):

For SIMATIC S5:

- FB200 is used to send data from the PLC to the SPI 3,
- FB201 is used to receive data from the SPI 3 in the PLC,
- FB203 is used to process RK512 telegrams (passive station), which are sent or received by the SPI 3.

For SIMATIC S7:

- FB100 is used to send data from the PLC to the SPI 3,
- FB101 is used to receive data from the SPI 3 in the PLC,
- FB103 is used to process RK512 telegrams (passive station), which are sent or received by the SPI 3.

Parameters must be set for each of the FB's (you can also use the supplied example project). The example project is intended as a guide. Don't forget to set the length of the I/O area in your program to match the module you have chosen (in example OB1: EA-L is set for an I/O area of 4 data words in length).



### Note!

The function blocks (FB's) are only suitable for SIMATIC S5 and S7 controllers (see online documentation).

In the case of SIMATIC S5 controllers, you may need to adapt the FB to the CPU you are using (see the Step5 manuals). The FB's are suitable for the CPU's 922, 941 and 945. The example program is for the S5-115U/CPU941B, IM308-C.

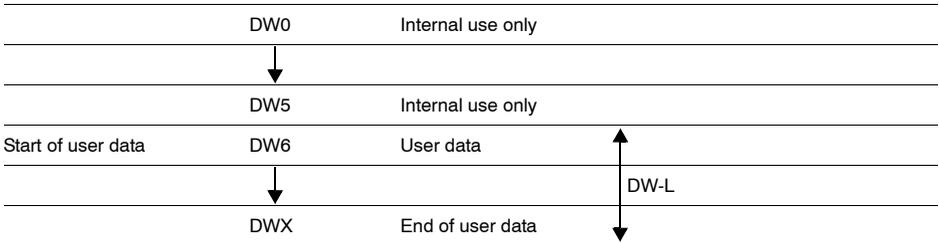
The SIMATIC S7 example projects use an S7 315 2DP hardware; article No. 6ES7 315-2AF01-0AB0.

In the case of the data transfer protocol "unstructured ASCII driver" in combination with the RS485 serial interface, the SPI 3 sends the telegram which is received from the DP master for the serial partner back to the DP master again. The telegram can then be evaluated by the DP master and discarded.

Refer to »readme\_e.txt« for further information

## Parameters for data transfer for SIMATIC S5

The control data or user data to be exchanged is copied to a special PLC memory area – the data block (DB) – from where the PLC writes the data to the SPI 3 through the DP master. The data block consists of several data words, whereby data words 0 to 5 (DW0 to DW5) are reserved for internal use. User data always starts at DW6.



The following parameters must be specified when calling the FB's. The tables indicate which of the parameters are required for each of the FB's:

### Parameters for address information:

specify the location and length of the address array in the PLC address space.

| Name | Type | Description / Function                     | present in: |       |       |
|------|------|--|-------------|-------|-------|
|      |      |  | FB200       | FB201 | FB203 |
| A-A  | KF   | Starting address of send data area         | X           | X     | X     |
| E-A  | KF   | Starting address of receive data area      | X           | X     | X     |
| EA-L | KF   | Length of I/O area of the SPI 3 (in bytes) | X           | X     | X     |

### Parameters for user data:

specify the location of the send/receive data blocks used for exchanging telegrams.

| Name | Type | Description / Function                     | present in: |       |       |
|------|------|--|-------------|-------|-------|
|      |      |  | FB200       | FB201 | FB203 |
| DB   | B    | Data block for sending/receiving telegrams | X           | X     |       |
| DW-L | W    | Length of data to send/receive (in bytes)  | X           | X     |       |

### Parameters for processing RK512 telegrams:

specify the send and receive data blocks used for RK512 telegrams.

| Name | Type | Description / Function                    | present in: |       |       |
|------|------|---|-------------|-------|-------|
|      |      |   | FB200       | FB201 | FB203 |
| DB-Q | B    | Data block for received RK512 telegrams   |             |       | X     |
| DB-Z | B    | Data block for RK512 telegrams to be sent |             |       | X     |

**Parameter for return codes:**

contain information on the status or processing results of the FB; also used to transfer commands (e.g. reset) to the FB.

| Name | Type | Description / Function               | present in: |       |       |
|------|------|--------------------------------------|-------------|-------|-------|
|      |      |                                      | FB200       | FB201 | FB203 |
| ANZW | W    | Status word for data transfer status | X           | X     | X     |

ANZW is used to convey information on the status of the currently executing data transfer operation.

ANZW consists of 16 bits, of which bits 0, 1 and 4 are used for the coordination of a send or receive operation as follows:

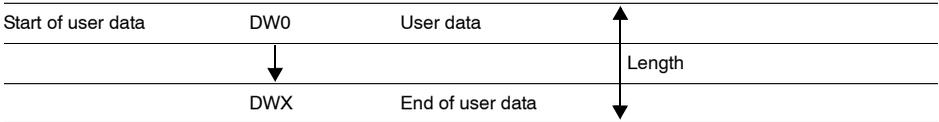
|                  |   |  |
|------------------|---|--|
| Bit 0 = 1        | For FB200 and FB201:<br>For FB203:  | Operation is executing<br>Telegram is being received                         |
| Bit 1 = 1        | For FB200:<br>For FB201:<br>For FB203:  | Operation completed,<br>Telegram has been received<br>Telegram is being sent |
| Bit 4 = 1        | Reset the operation<br>Set bit 4 to 1 to cancel the operation. Bit 4 is set to 0 again by the FB when the operation has been reset. |  |
| Bit 2, 3, 5...15 | internal use by the FB, do not change   |  |

**Note!**

**FB203 for SIMATIC S5 uses the marker areas MW200 and MW202 for internal calculations. Do not use these market areas on your PLC program.**

## Parameters for data transfer for SIMATIC S7

The control data or user data to be exchanged is copied to a special PLC memory area – the data block (DB) – from where the PLC writes the data to the SPI 3 through the DP master. User data always starts at DW0.



The following parameters must be specified when calling the FB's. The tables indicate which of the parameters are required for each of the FB's:

### Parameters for address information:

specify the location and length of the address array in the PLC address space .

| Name      | Type    | Description / function  | FB100 | present in: |       |  |
|-----------|---------|---|-------|-------------|-------|--|
|           |         |   |       | FB101       | FB103 |  |
| A_Anfang  | POINTER | Starting address of send data area<br>(z. B.: M2.0, A5.0, DB10.DBX8.0)    | X     | X           | X     |  |
| E_Anfang  | POINTER | Starting address of receive data area<br>(z. B.: M2.0, E5.0, DB10.DBX8.0) | X     | X           | X     |  |
| EA_Laenge | INTEGER | Length of I/O area of the SPI 3 (in bytes)                                | X     | X           | X     |  |

### Parameters for user data:

specify the location of the send/receive data blocks used for exchanging telegrams .

| Name    | Type     | Description / function  | FB100 | present in: |       |  |
|---------|----------|---|-------|-------------|-------|--|
|         |          |   |       | FB101       | FB103 |  |
| DB_Data | Block_DB | Data block for sending/receiving telegrams<br>(e.g.: DB37, DB38)                                      | X     | X           |       |  |
| Laenge  | WORD     | Length of data to send/receive (in bytes)<br>(e.g.: Send: MB40, B#16#0A / Receive:<br>MB40, DB3.DBB5) | X     | X           |       |  |

**Parameters for processing RK512 telegrams:**

specify the send and receive data blocks used for RK512 telegrams; specify compatibility with SIMATIC S5 .

| Name         | Type     | Description / function                                 | present in: |       |       |
|--------------|----------|--|-------------|-------|-------|
|              |          |  | FB100       | FB101 | FB103 |
| DB_Empfangen | Block_DB | Data block for received RK512 telegrams (e.g.: DB37)   |             | X     |       |
| DB_Senden    | Block_DB | Data block for RK512 telegrams to be sent (e.g.: DB38) |             | X     |       |
| S5_KOMP      | BOOL     | S5 compatibility                                       |             | X     |       |

The »S5\_KOMP« parameter is used to provide compatibility between S5 and S7 controllers. This is necessary due to the different addressing scheme:

| Data word in S5 | Data word in S7    |
|-----------------|--------------------|
| DW0             | DBW0 = DBB0 + DBB1 |
| DW1             | DBW1 = DBB1 + DBB2 |
| DW2             | DBW2 = DBB2 + DBB3 |
| ...             | ...                |

S5\_KOMP = 0: processed data word (DW2) = requested data word (DW2)

S5\_KOMP = 1: processed data word (DW4) = requested data word × 2 (DW2 × 2)

**Note!**

Use OB121 for error checking as described below, since the S7-300 does not allow an existing DB to be checked.

Don't forget to take account of the different addressing of data words used by the S5 and the S7.

In OB121, write 0xFF to DBB0 with »DB\_Senden«. This creates an error telegram for a job with a non-existing DB.

| Job (send/fetch)   | Target/destination S5     | Target/destination S7                       |
|--------------------|---------------------------|---|
| DB5 DW1 length = 1 | DB5 DW1                   | DB5.DBW1 (DBB1 + DBB2)                      |
| DB5 DW1 length = 4 | DB5 DW1 + DW2 + DW3 + DW4 | DB5.DBW1 + DBW3 + DBW5 + DBW7 (S5_KOMP = 0) |
| DB5 DW1 length = 4 | DB5 DW1 + DW2 + DW3 + DW4 | DB5.DBW2 + DBW4 + DBW6 + DBW8 (S5_KOMP = 1) |

**Parameter for return codes:**

contain information on the status or processing results of the FB; also used to transfer commands (e.g. reset) to the FB.

| Name | Type | Description / function               | present in: |       |       |
|------|------|--------------------------------------|-------------|-------|-------|
|      |      |                                      | FB100       | FB101 | FB103 |
| ANZW | W    | Status word for data transfer status | X           | X     | X     |

ANZW is used to convey information on the status of the currently executing data transfer operation.

ANZW consists of 16 bits, of which bits 0, 1 and 4 are used for the coordination of a send or receive operation as follows:

|                  |   |  |
|------------------|---|--|
| Bit 0 = 1        | For FB100 and FB101:<br>For FB103:  | Operation is executing<br>Telegram is being received                         |
| Bit 1 = 1        | For FB100:<br>For FB101:<br>For FB103:  | Operation completed,<br>Telegram has been received<br>Telegram is being sent |
| Bit 4 = 1        | Reset the operation<br>Set bit 4 to 1 to cancel the operation. Bit 4 is set to 0 again by the FB when the operation has been reset. |  |
| Bit 2, 3, 5...15 | internal use by the FB, do not change   |  |

**Data consistency (only for S7)**

You must use the system functions SFC14 and SFC15 if you are using a firmware module with an I/O area of more than 2 words. This copies the n words of inputs to a data area (marker area or DB) and the n words from a data area to n words of outputs. Specify these data areas in the FB with the parameters »E\_Anfang« and »A\_Anfang« ein.

SFC14 and SFC15 are standard FB's for the S7. Refer to the online help or your Step7 user manual for further information.

## Configuring the size of the data blocks (S5 and S7)

The data blocks used for sending and receiving RK512 telegrams (DB-Q and DB-Z for S5; DB\_Empfangen and DB\_Senden for S7) must be at least 78 words in length to allow enough space for the telegrams.



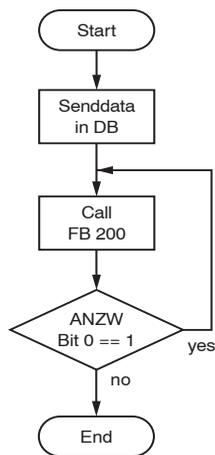
### Note!

Ensure that the data blocks used to send and receive RK512 telegrams exist and are long enough, otherwise the FB will output an error telegram (FB203 for S5; FB103 for S7).

## Sending data (S5 and S7)

Proceed as follows to send data:

- Copy the data to be sent to the user data area (DW6 to DWX for S5; DW0 to DWX for S7) of the source data block (DB).
- Call the Send data FB (FB200 for S5; FB100 for S7) repeatedly while bit 0 (Operation is executing) is 1.
- The data has been completely sent when bit 1 (Operation completed) changes to 1.

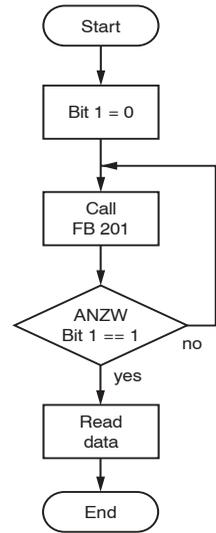


== comparison

## Receiving data (S5 and S7)

Proceed as follows to receive data:

- Set bit 1 (Telegram has been received) to 0, and call the Receive data FB (FB201 for S5; FB101 for S7).
- While bit 0 (Operation is executing) is 1, the FB receives the data and stores it in the destination data block.
- When the FB has received all the data, it sets bit 1 (Telegram has been received) to 1. The received data is now available in the destination data block.
- Reset the FB by setting bit 1 (Telegram has been received) to 0. The FB is then ready to receive again.



== comparison

## Processing RK512 telegrams (S5 and S7)

Proceed as follows to process RK512 telegrams (FB203 for S5; FB103 for S7):

- Configure the data blocks (DB-Q and DB-Z for S5; DB\_Empfangen and DB\_Senden for S7) with the appropriate size. See »Configuring the size of the data blocks (S5 and S7)« on page 21 for more information.

**Note!**

Data blocks DB-Q, DB-Z, DB\_Empfangen and DB\_Senden are only used for internal processing by the FB.

- Following a boot or restart, carry out a reset by setting bit 4 of ANZW to 1.
- Call the appropriate FB cyclically.

The FB will now process the received RK512 telegrams automatically.

**Note!**

The FB works only as a passive RK512 partner. Processing of following command telegrams is not possible.

## Error diagnosis and remedies

If errors are detected, the pattern of flashing of the PB and RUN LED's on the SPI 3 can be used for error diagnosis. The LED's can flash with the following patterns (this is called the "LED code"):

| LED off   | LED short   | LED medium  | LED long  | LED on  |
|---|---|---|---|---|
|  |  |  |  |  |
| LED always off  | LED is ¾ off ¼ on   | LED is ½ off ½ on   | LED is ¼ off ¾ on   | LED always on   |



### Note!

If the PB LED ("PROFIBUS") is off, the RUN LED is on continuously and no longer indicates a valid LED code. Accordingly, the RUN LED can only be used for diagnosis when the PB LED is lit. The PROFIBUS diagnostics and error statuses are reset when the error is no longer present or when the slave gets new parameter and configuration values

| PB LED code   | Status   | Significance  | Remedy  |
|---------------|--|---|---|
| PB LED off    | Correct data transfer rate could not be determined | – No PROFIBUS master in the network   | – Connect up the DP master<br>– Check the wiring                                |
| PB LED short  | No DP master available                             | – A master is available but it is not a DP master<br>– A master is available but communication is not taking place with PROFIBUS-DP | – Check DP configuration of the master<br>– Check address setting on the SPI 3  |
| PB LED medium | Incorrect parameter                                | – Parameter telegram faulty   | – Check the DP parameter telegram, use the correct GSD file                     |
| PB LED long   | Incorrect configuration                            | – Configuration telegram faulty   | – Check the number of modules (only one module is allowed in the configuration) |
| PB LED on     | Data exchange OK                                   | – Data exchange is currently taking place   | – SPI 3 working correctly   |

| <b>RUN LED code</b> | <b>Status</b>    | <b>Significance</b>                                     | <b>Remedy</b>   |
|---------------------|------------------|---|---|
| RUN LED off         | SPI 3 not ready  | – 24 V supply not present                               | – Check external power supply<br>– Check the wiring   |
| RUN LED short       | Interface error  | – Interface parameters invalid                          | – Check the parity (e.g. you have chosen 7 data bits without parity although 7 data bits requires parity)                         |
| RUN LED medium      | Send error       | – Error when sending                                    | – Check the wiring<br>– Check whether the partner station is ready (this error should only occur with 3964 and derived protocols) |
| RUN LED long        | Receive error    | – Error when receiving                                  | – Check character format and data transfer rate of partner station  |
| RUN LED on          | Communication OK | – Serial partner communicating correctly with the SPI 3 | – SPI 3 working correctly   |

If errors occur during communication, you can also carry out PROFIBUS diagnostics with the DP master. The device-specific diagnostics data contains the following information:

- 1 byte header for device-related diagnostics      0x02
- 1 byte bit-mapped to indicate the error      Bit 0 = 1  
    Parameter error  
    Bit 1 = 1  
    Send error (3964R · RK512)  
    Bit 2 = 1  
    Receive error

# Technical specifications

## Electrical data

|  |      |                  |
|--|------|------------------|
| Nominal supply voltage                 | V DC | 24 (20.4...28.8) |
| Current consumption                    | mA   | 200              |
| Galvanic isolation, PROFIBUS interface | V DC | 500              |

## Ambient conditions

|                       |    |        |
|-----------------------|----|--------|
| Operating temperature | °C | 0...60 |
|-----------------------|----|--------|

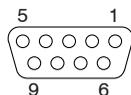
## Case

|                      |    |              |
|----------------------|----|--------------|
| Protection class     | IP | 20           |
| Dimensions W × H × D | mm | 75 × 75 × 53 |

## PROFIBUS interface

|                    |       |  |
|--------------------|-------|--|
| Interface type     |       | RS 485   |
| Data transfer rate | Bit/s | 9.600; 19.200; 93.750; 187.500; 0,5M; 1,5M; 3M; 6M; 12M, automatic detection of the data transfer rate |

Pin assignment Sub-D connector

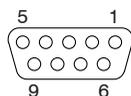


|       |                                 |
|-------|---------------------------------|
| Pin 1 | Screen                          |
| Pin 2 | Unused                          |
| Pin 3 | B-line                          |
| Pin 4 | Request to Send (RTS)           |
| Pin 5 | Ground for 5 V (M5)             |
| Pin 6 | +5 V (galvanically isolated P5) |
| Pin 7 | Unused                          |
| Pin 8 | A-line                          |
| Pin 9 | Unused                          |

## Serial interface

|                      |       |   |
|----------------------|-------|---|
| Interface type       |       | RS 232* / RS 422* / RS 485*   |
| Data transfer rate** | Bit/s | 110; 300; 600; 1.200; 2.400; 4.800; 9.600; 19.200; 28.800; 38.400; 57.600 |
| Data frame**         | Bit   | 7 / 8   |
| Parity**             |       | Even, odd, none, mark, space  |

Pin assignment Sub-D connector



|       | RS 232    | RS 422  | RS 485 |
|-------|-----------|---------|--------|
| Pin 1 | Screen    | Screen  | Screen |
| Pin 2 | TXD (out) | Unused  | Unused |
| Pin 3 | RXD (in)  | REC-P   | BUS-P  |
| Pin 4 | Unused    | TRANS-P | Unused |
| Pin 5 | GND       | GND     | GND    |
| Pin 6 | +5 V      | +5 V    | +5 V   |
| Pin 7 | CTS (in)  | Unused  | Unused |
| Pin 8 | RTS (out) | REC-N   | BUS-N  |
| Pin 9 | Unused    | TRANS-N | Unused |

## Other

|                                   |       |                                 |
|-----------------------------------|-------|---------------------------------|
| I/O area (PROFIBUS-DP)**          | words | 2, 4, 16, 32, 64                |
| Certification                     |       | CE                              |
| Max. number of fieldbus devices** |       | 32 (RS 485); 1 (RS 232, RS 422) |

\* See label on the SPI 3 for information on the serial interface which is fitted

\*\* Depends on the protocol

# Appendix

## Creating a configuration telegram

Depending on the number and size of the inputs and outputs, the configuration telegram contains one or more module codes. The module codes are used to select the operating mode of the SPI 3 (see »Configuring the SPI 3« on page 11).

The module codes in the configuration telegram should be specified as follows:

|   | extended parameters (Release 12 and higher) | simple parameters |
|---|---|-------------------|
| – 2 words I/O area: ASCII_Prm+___2W_i/o   |   | C1C1C101          |
| – 4 words I/O area: ASCII_Prm+___4W_i/o   |   | C1C3C301          |
| – 16 words I/O area: ASCII_Prm+___16W_i/o |   | C1CFCF01          |
| – 32 words I/O area: ASCII_Prm+___32W_i/o |   | C1DFDF01          |
| – 64 words I/O area: ASCII_Prm+___64W_i/o |   | C1FFFF01          |

## Creating a parameter telegram

If you cannot or do not want to use a configurator for setting the SPI3 parameters, you will need to create a parameter telegram. The parameter telegram contains both standardized bus-related parameters and device-specific parameters for the SPI 3.

### Standard bus-related parameters

The first 7 bytes (bytes 0...6) of the parameter telegram contain bus-related parameters which are standardized in EN 50 170. Bytes 4 and 5 contain the vendor ID (Trebing & Himstedt = hex 0x0091). The settings of the other 5 bytes depend on your network configuration (see EN 50 170).

## SPI 3-specific parameters

The following 18 bytes of the parameter telegram (bytes 7 to 24) contain SPI 3-specific parameters (see table). The specific parameters are valid for SPI 3 release 12 and higher.



### Note!

The hex value for character timeout/response timeout must be specified in Motorola format (high byte first).

If you use an RS 485 interface, you must set handshake to NONE.

Bytes 12, 22, 23, and 24 are only available in case of modules with extended parameters (Release 12 and higher).

| Byte  | Parameter          | Value   | Hex code   | Default                          |
|-------|--------------------|---|--|----------------------------------|
| 7...9 | Constant           | Cannot be changed   | 0x00   | 0x00                             |
| 10    | Constant           | Cannot be changed   | Module-dependent<br>0x01 (simple param.)<br>0x08 (extended param.)                   | Module-dependent<br>0x01<br>0x08 |
| 11    | Data transfer rate | 110 Bit/s<br>300 Bit/s<br>600 Bit/s<br>1200 Bit/s<br>2400 Bit/s<br>4800 Bit/s<br>9600 Bit/s<br>19200 Bit/s<br>28800 Bit/s<br>38400 Bit/s<br>57600 Bit/s | 0x00<br>0x01<br>0x02<br>0x03<br>0x04<br>0x05<br>0x06<br>0x07<br>0x08<br>0x09<br>0x0A | 9600 (0x06)                      |
| 12    | Flags              | Lock diagnosis alarms<br>Release diagnosis alarms   | 0x00<br>0x01   | Release diagnosis alarms (0x01)  |
| 13    | Handshake method   | Xon/Xoff<br>RTS/CTS<br>none   | 0x00<br>0x01<br>0x02   | none (0x02)                      |
| 14    | Xon                | ASCII code of the Xon character<br>0...255  | 0x11   | 17 (0x11)                        |
| 15    | Xoff               | ASCII code of the Xoff character<br>0...255   | 0x13   | 19 (0x13)                        |
| 16    | Parity             | none<br>even<br>odd<br>mark<br>space  | 0x00<br>0x01<br>0x02<br>0x03<br>0x04   | even (0x01)                      |
| 17    | Data frame         | 7 data bits<br>8 data bits  | 0x07<br>0x08   | 8 Bit (0x08)                     |

| Byte  | Parameter  | Value   | Hex code   | Default                 |
|-------|--|---|--|-------------------------|
| 18+19 | Character timeout (unstructured ASCII data)<br>Response timeout (for 3964 and RK512) | Both parameters in units of 10 ms: (0...65535) × 10 ms  | 0x0000<br>to<br>0xFFFF                                       | 200 (0x00, 0xC8)        |
| 20    | SIO mode   | unstructured ASCII driver CT <sup>1)</sup><br>3964R (checksum)<br>RK512 (checksum)<br>3964R (no checksum)<br>RK512 (no checksum)<br>ASCII driver fixed length <sup>2)</sup><br>ASCII driver Stop sign <sup>3)</sup><br>ASCII driver Start/Stop sign <sup>4)</sup> | 0x00<br>0x01<br>0x02<br>0x03<br>0x04<br>0x05<br>0x06<br>0x07 | ASCII driver ZVZ (0x00) |
| 21    | Priority for 3964R   | low<br>high   | 0x00<br>0x01   | low (0x00)              |
| 22    | Start sign <sup>5)</sup>   | ASCII code of the Start sign<br>0...255   | 0x01 to 0xFF   | STX (0x02)              |
| 23    | Stop sign <sup>6)</sup>  | ASCII code of the Stop sign<br>0...255  | 0x01 to 0xFF   | ETX (0x03)              |
| 24    | Telegram length <sup>7)</sup>  | 1...255 (in byte)   | 0x01 to 0xFF   | 1 (0x01)                |

- 1) The adjusted »character timeout« is used for final telegram identification.
- 2) The adjusted »telegram length« is used for final telegram identification.
- 3) The adjusted »Stop sign« is used for final telegram identification.
- 4) The adjusted »Start sign« or »Stop sign« is used for final telegram identification.
- 5) Does only apply if »ASCII driver Start/Stop sign« transfer mode has been selected.
- 6) Does only apply if »ASCII driver Stop sign« or »ASCII driver Start/Stop sign« transfer mode has been selected.
- 7) Does only apply if »ASCII driver fixed length« transfer mode has been selected.



#### Note!

If you have selected one of the transfer modes »ASCII driver fixed length«, »ASCII driver Stop sign« or »ASCII driver Start/Stop sign«, and an additional character timeout » ≠ 0 « has been entered, final telegram identification is additionally executed with the selected character timeout. If final telegram identification is to be executed exclusively by a sign or telegram length, character timeout needs to be set at » = 0 «.

Maximum telegram length cannot exceed 255 bytes. Telegrams are automatically fragmented in case of telegram lengths surpassing this value.

In case of manufacturer-specific application of sartorius scales, you need to select an »even« parity and a smaller character timeout.

## Glossary

|                     |  |
|---------------------|--|
| Address             | → Station address  |
| ANZW                | 16 bit in-out variable for sending commands to an FB and receiving return values.  |
| Bit                 | Abbreviation for <b>binary digit</b> , the smallest unit in the binary system; it can have the value 0 or 1.   |
| Bus                 | Cable with two defined ends which is used for exchanging data between the connected bus stations.  |
| Bus connector       | Plug used to connect the bus stations to the bus cable.  |
| Bus segment         | → Segment  |
| Bus station         | Device attached to the bus which can send data over the bus (e.g. DP master), receive data over the bus (e.g. DP slave), or amplify signals (e.g. repeater).   |
| Byte                | A byte consists of eight bits and is the smallest addressable amount of memory.  |
| Character timeout   | Used to detect the end of a telegram in the case of an unstructured flow of ASCII data. The telegram currently being received is considered to be completed when the time between two received characters is larger than the specified character timeout.  |
| Command byte        | → Stamp  |
| Configuration       | During configuration, the modules and the addresses of the DP slave are assigned. The actual configuration describes the modules which are actually present in the slave. The required configuration describes the modules which should be present in the slave. This approach allows an incorrect configuration to be detected when the system is booted. |
| Configurator        | Software for configuring PROFIBUS devices and for setting parameters.  |
| Control information | Used to synchronize and fragment the exchange of telegrams via PROFIBUS DP. Control information is always contained in the first byte (byte 0) of the DP data channel.   |

|                    |   |
|--------------------|---|
| CPU                | <b>Central Processing Unit</b>  |
| Data block         | Special memory area in a PLC which is optimized for storing data; it consists of a specified number of words (or bytes) of memory.  |
| Data channel       | A logical channel for exchanging data with the SPI 3. The size of the data channel (i.e. I/O area) is dependent on the SPI 3 configuration. If a telegram is larger than the data channel, it needs to be fragmented.   |
| Data transfer rate | Measurement for the speed of data transfer, specified in bits per second.   |
| Data word          | 16 bit area of memory in a data block.  |
| Diagnostics        | Detection, localization, classification and display of errors, faults and messages.   |
| DP                 | → PROFIBUS  |
| DP address         | ID number used to uniquely identify each bus device (station) in PROFIBUS DP.   |
| DP standard        | Bus protocol for PROFIBUS DP which is standardized in EN 50 170.  |
| Floating           | Indicates that a component or circuit is not electrically connected to ground   |
| Fragment           | Part of a telegram which is transferred through a data channel.   |
| FREEZE             | Control command that a DP slave receives from the DP master. It causes the slave to store (freeze) the current states of its inputs and to transfer the frozen values cyclically to the master. The slave only starts to transfer the cyclically updated values to the master again after it receives the UNFREEZE command. |
| Function block     | Used to control the asynchronous exchange of data between PROFIBUS and a Fieldbus device with serial interface via the SPI 3.   |

|                       |   |
|-----------------------|---|
| Function code         | Used to uniquely specify a function that can be executed in the controller.   |
| Galvanically isolated | With galvanically isolated I/O devices, the reference potentials of control circuits and power circuits are not electrically interconnected.  |
| Ground                | Conductive material (e.g. ground wire) whose electrical potential is considered to be zero; all interconnected inactive components of a device which cannot assume dangerous voltages even in case of faults.   |
| GSD                   | Device Data Base file (DDB), i.e. electronic device data sheet which describes the features of the PROFIBUS device uniquely and completely in a clearly specified syntax. A GSD file for the SPI 3 you can download from the internet and is required to set up the device.   |
| Handshake             | Method used to synchronize data exchange. For example, data can only be exchanged between a master and slave after the master and the slave have “agreed” that the exchange should take place.  |
| ID byte               | Configures the number and size of the bytes to be transferred in a module.  |
| Input byte            | PLC address area which contains the data that the DP slave sends to the DP master.  |
| IP 20                 | Protection class specification to DIN 40 050. Components of the device which carry voltages are protected against touching with the fingers and against the penetration of solid objects with a diameter of more than 12 mm.  |
| Master                | Active bus station that can send data to other bus stations and request data from other bus stations.   |
| Mirror                | The input byte 0 of a data channel is called the mirror. The SPI 3 mirrors (returns a copy of) the stamp (q.v.) to confirm the operation or when user data is being processed. Mirror = 0 indicates that the DP slave is ready for data exchange. If mirror = 0, input byte 2 contains information on the length of the following user data. Mirror $\neq$ 0 indicates that user data will now follow or that the operation is completed. |

|                        |   |
|------------------------|---|
| MODBUS                 | MODBUS RTU is implemented according to the Reference Guide "Modicon PI-MBUS-300, Rev. D".   |
| Module                 | Selecting a module during device configuration determines the configuration telegram and thus the size of the PLC I/O area.   |
| MSB                    | <b>Most Significant Bit</b>   |
| Non-floating           | With non-floating I/O devices, the reference potentials of control circuits and power circuits are electrically interconnected and are not galvanically isolated.   |
| Non-isolated           | With non-isolated I/O devices, the reference potentials of control circuits and power circuits are electrically interconnected.   |
| Output byte            | PLC address area which contains data which the DP master sends to the DP slave.   |
| Parameter              | Variable used to specify the behavior of a device   |
| Parameter master       | When the system is booted, the parameter master passes parameter information to the DP slave. The parameter master can write to and read from the slave and change the configuration of the slave.  |
| Parameter setting      | To set the behavior of a DP slave and its modules.  |
| Parameter telegram     | Contains all parameters which can be set for a DP slave   |
| Parity                 | Even parity: The sum of all 1's in a byte must be an even number. Odd parity: the sum of all 1's in a byte must be an odd number. The parity bit which can be 1 or 0 is used to create an even or odd parity to allow detection of errors due to lost bits. |
| PII (Ger: PAE)         | Process input image (PII)   |
| PLC                    | Programmable logic controller, electronic controller whose control function is controlled by the program in its memory.   |
| POI (Ger: PAA)         | Process output image (POI)  |
| Potential equalization | Electrical connection between conducting bodies to bring them to an identical or practically identical potential and thus prevent interfering or dangerous voltages between the bodies.   |

|                     |   |
|---------------------|---|
| PROFIBUS            | <b>Process Field Bus</b> is an open Fieldbus system used to network PROFIBUS compatible devices. PROFIBUS works with three different protocols: PROFIBUS-DP (Decentral Peripheral), PROFIBUS-FMS (Fieldbus Message Specification), and PROFIBUS-PA (Process Automation). PROFIBUS is standardized in EN 50 170. |
| Protocol            | A set of rules and regulations which control the flow of information in a communication system. The term protocol can refer to either hardware or software.   |
| Receive             | The Fieldbus device receives a telegram from the DP master through the SPI 3.   |
| Receive channel     | Data channel for data which the SPI 3 receives.   |
| Remote peripheral   | I/O device which is not directly integrated in the PLC CPU, but is accessed remotely via the bus.   |
| Response monitoring | If a slave is not accessed within the response monitoring timeout, it switches automatically to a safe status by setting all outputs to 0. The response monitoring timeout is specified during parameter setting.   |
| Response timeout    | The duration of time within which the partner device must respond. The response timeout must be configured the same for both partner devices.   |
| Segment             | Section of the bus cable between two terminating resistors. A bus segment can support up to 32 bus stations, and several bus segments can be connected together with RS 485 repeaters.  |
| Send                | The DP master sends a telegram to a Fieldbus device through the SPI 3.  |
| Send channel        | Data channel for data which is sent to the SPI 3.   |
| Slave               | Bus station which is only allowed to exchange data with a master, and only on request of the master.  |

|                      |  |
|----------------------|--|
| Stamp                | <p>The output byte 0 of a data channel is called the stamp.</p> <p>Stamp = 0 indicates that the master is ready for data exchange. If stamp = 0, output byte 2 contains information on the length of the following user data.</p> <p>Stamp <math>\neq</math> 0 indicates that user data now follows or that the operation is completed.</p>        |
| Station address      | Address with which the DP master accesses the PROFIBUS DP slave.   |
| Status byte          | → Mirror   |
| Step 5               | Programming language used for user programs for SIMATIC S5 controllers.  |
| Step 7               | Programming language used for user programs for SIMATIC S7 controllers.  |
| Step 7 tool          | Tool for Step 7 which automates particular programming tasks.  |
| SYNC                 | Control command that a DP slave receives from the DP master. It causes the slave to store (freeze) the current states of its outputs. When following telegrams are received, it stores the output data, but the states of the outputs remain unchanged. The outputs are only cyclically updated again after the slave receives the UNSYNC command. |
| Telegram             | A data flow which is sent or received through the serial interface (SIO), e.g. when you send a text to a text display or receive a bar code from a bar code scanner.   |
| Telegram fragment    | Part of a send or receive telegram. A telegram must be fragmented when it is so large that it cannot be transferred within a single PLC cycle  |
| Terminating resistor | Used to stop electrical reflections and thus signal distortion at the end of the bus cable. Terminating resistors are required at each end of the bus cable.   |
| Tool                 | Software tool used to specify and change the parameters of a parameter block.  |

|              |  |
|--------------|--|
| Version code | Indicates the version of a product and is always incremented when the hardware or software in the product is updated or modified. The version code can be seen on the first and second page of this online documentation at the bottom left. |
| Word         | → Data word  |
| Xon          | With software flow control, the Xon control character indicates readiness to receive; complement of Xoff.  |
| Xoff         | With software flow control, the Xoff control character indicates unreadiness to receive; complement of Xon.  |

## Änderungsrecht / Right to make changes

Trebing & Himstedt Prozeßautomation GmbH & Co. KG behält sich das Recht vor, das vorliegende Handbuch sowie die Eigenschaften der Hard- und Software jederzeit weiterzuentwickeln, auch ohne dieses vorher anzukündigen oder über Änderungen zu berichten.

Trebing & Himstedt Prozeßautomation GmbH & Co. KG reserves the right to make changes to this manual and to the specifications of the hardware and software at any time and without warning or prior notice.

## Haftungsausschluss / Liability and Guarantee

Trebing & Himstedt Prozeßautomation GmbH & Co. KG übernimmt keine Garantie dafür, dass die Hard- und Software unter allen Einsatzfällen ordnungsgemäß arbeitet. Mit heutigen technischen Mitteln ist es nicht möglich, Software so zu entwickeln, dass sie für alle Anwendungsanforderungen fehlerfrei ist. Trebing & Himstedt Prozeßautomation GmbH & Co. KG lehnt darum jede Haftung für direkte und indirekte Schäden, die sich aus dem Betrieb der Hard- und Software und der im Handbuch beschriebenen Verwendbarkeit ergeben, ab.

*Trebing & Himstedt Prozeßautomation GmbH & Co. KG makes no warranty, representation or guarantee that the hardware and software will perform correctly in all conceivable situations. It is not possible with currently available technical aids and methods to develop software which is completely free of errors in all conceivable applications. Accordingly, Trebing & Himstedt Prozeßautomation GmbH & Co. KG does not accept any liability for damage, both direct and indirect, arising from the use of the hardware and software and/or the information contained in this manual.*

## Elektrostatische Gefährdung von Baugruppen (EGB) / ESD Guidelines

Die Hardware enthält elektronische Bauelemente, die gegen elektrostatische Entladung empfindlich sind. Sie sollten darum die elektronischen Bauelemente niemals direkt berühren. Bei Einstellarbeiten an der Platine ist darauf zu achten, den eigenen Körperwiderstand ausreichend zu erden. Dieses kann durch ein Erdungsarmband oder Erdungsschutzstreifen an ESD gerechten Schuhen in Verbindung mit ESD Boden erfolgen. Im einfachsten Fall muss ein elektrisch leitfähiger, geerdeter Gegenstand berührt werden (Heizung, Wasserleitung, blankes Metallteil eines geerdeten Schaltschranks). Beschädigungen durch elektrostatische Entladung müssen sich nicht sofort fehlerhaft auswirken. Beim späteren Betrieb können folgende Fehler auftreten:

- vorzeitiger Ausfall von Bauelementen und Baugruppen,
- Schwankung typischer Leistungsparameter,
- zeitweilig auftretende Fehler,
- temperaturabhängige Fehler.

Eine elektrostatische Entladung wird vom Menschen erst bei verhältnismäßig hohen Spannungen wahrgenommen. Entladungen unterhalb der Wahrnehmungsgrenze können aber bereits zu Schäden oder Zerstörung der Bauelemente führen.

*The hardware contains electronic components which are sensitive to electrostatic discharge. Before touching the printed circuit board, you should first discharge electrostatic voltages from your body by using a grounded anti-static wristband or anti-static shoes or a grounded anti-static carpet. A simple precaution is to touch a grounded, electrically conducting surface such as a heating radiator, water pipe or unpainted surface of a grounded control cabinet. Damage due to electrostatic discharge may not be apparent immediately, and can lead to the following types of fault at a later stage.*

- premature failure of components and modules,
- fluctuation of typical performance characteristics,
- intermittent faults,
- temperature-dependent faults.

An electrostatic discharge can only be perceived by humans if the voltage is high enough. However, lower electrostatic voltages which are below the limits of perception can still damage or destroy electronic components.

## Urheberrecht / Copyright

Das vorliegende Handbuch enthält Informationen, die geistiges Eigentum der Trebing & Himstedt Prozeßautomation GmbH & Co. KG sind. Der Benutzer verpflichtet sich, die im Handbuch enthaltenen Informationen ausschließlich für den Betrieb der Hard- und Software zu nutzen. Die Weitergabe von Informationen an Dritte, soweit sie nicht als allgemein bekannt anzusehen sind, ist nicht gestattet. Weitergabe, Vervielfältigung, Verwertung und Auszüge des Inhalts sind nur nach ausdrücklicher Genehmigung durch Trebing & Himstedt Prozeßautomation GmbH & Co. KG gestattet.

*The information contained in this manual is the copyright of Trebing & Himstedt Prozeßautomation GmbH & Co. KG. Users of the manual agree to use the information which is contained solely for the operation of the hardware and software. The information contained must not be given to third parties except that it is clearly part of the public domain. The transmission, reproduction or use of this documentation or parts thereof is not permitted without express written authority from Trebing & Himstedt Prozeßautomation GmbH & Co. KG.*

## Produktbeobachtungspflicht / Product observation liability

Im Rahmen unserer Produktbeobachtungspflicht versuchen wir, vor von uns zu erkennenden Gefahren durch das Zusammenwirken von Hard- und Software sowie beim Einsatz von Produkten Dritter zu warnen. Eine Beobachtung ist nur nach ausreichender Information des Endkunden über den geplanten Einsatzzweck und die vorhandenen Hardware-/Softwarekomponenten möglich. Bei Veränderungen der Einsatzbedingungen oder/und durch Austausch von Hardware/Software ist es uns auf Grund der komplexen Beziehungen nicht mehr möglich, alle Gefahren konkret zu beschreiben und auf ihre Wirkung im Gesamtsystem, insbesondere auf unsere Hard- und Software zu überprüfen. Dieses Handbuch beschreibt nicht sämtliche technischen Eigenschaften der Hard- und Software und seiner Varianten. Für weitere Informationen wenden Sie sich bitte an Trebing & Himstedt Prozeßautomation GmbH & Co. KG.

*Within the framework of our product observation liability, we do our best to warn third parties of dangers we have identified which can result from the interaction of hardware and software and the usage of our products. This is only possible if we receive sufficient information from our customers on the planned application(s) and the existing hardware and software components. As a result of the complex interactions, it is no longer possible for us to accurately identify all dangers and to check the effect on the overall system and in particular on our hardware and software if the conditions of application have changed and/or hardware or software has been exchanged. This manual does not describe all technical characteristics of the hardware and software and the available versions. Please contact Trebing & Himstedt Prozeßautomation GmbH & Co. KG for further information.*

## Gewährleistung / Warranty

Wir gewähren für unsere Produkte eine Garantie gemäß unseren Allgemeinen Geschäfts- und Lieferbedingungen.  
Our products are subject to warranty in accordance with our general business and supply conditions.

