

PSSu serial I/O-Communication



Product

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July 2011

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1. Useful documentation

Reading the documentation listed below is necessary for understanding this application note.
The availability of the indicated tools and safe handling are also presupposed with the user.

1.1. Documentation from Pilz GmbH & Co. KG

No.	Description	Item No.
1	Pilz international homepage, download section	www.pilz.com
2	Operating Manual PSSu E S RS232(-T)	1001378-EN-xx
3	Operating Manual PSSu E S RS485(-T)	1001379-EN-xx
4	Operating Manual PSSu K S RS232	1001689-EN-xx
5	Operating Manual PSSu H DP	21554-EN-xx
6	Operating Manual PSSu E F PS	21292-EN-xx

1.2. Documentation from other sources of information

No.	Description	Item No.
1		
2		

2. Hardware configuration

2.1. Pilz products

No.	Description	Order number	Number
1	PSSu H DP	312 045	1
2	PSSu E F PS	312 190	1
3	PSSu E S RS232	312 515	1
4	PSSu BP 1/8 C	312 601	1
5	PSSu BS 1/8 C	312 651	1

2.2. Device configuration

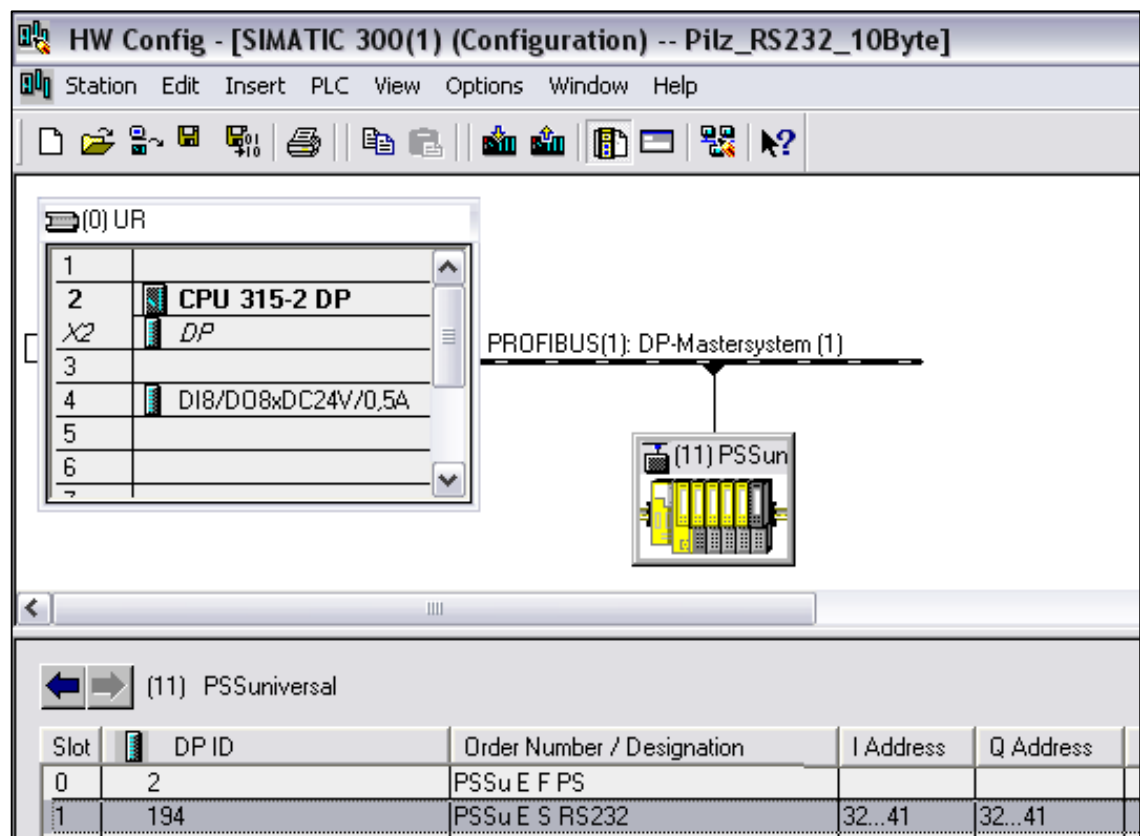


Fig. 1: Simatic HWConfig, configuration of PSSu system

- ▶ The following interface parameters can be configured for the electronic module:
 - Transmission rate
 - Block size (data bits and parity)
 - Number of stop bits
 - Continuous send
 - Xon/Xoff on send
 - Xon/Xoff on receive
 - RTS and CTS activated

- ▶ Please see section 3.6 "Invalid configuration settings when parameters set via fieldbus", on page 13!

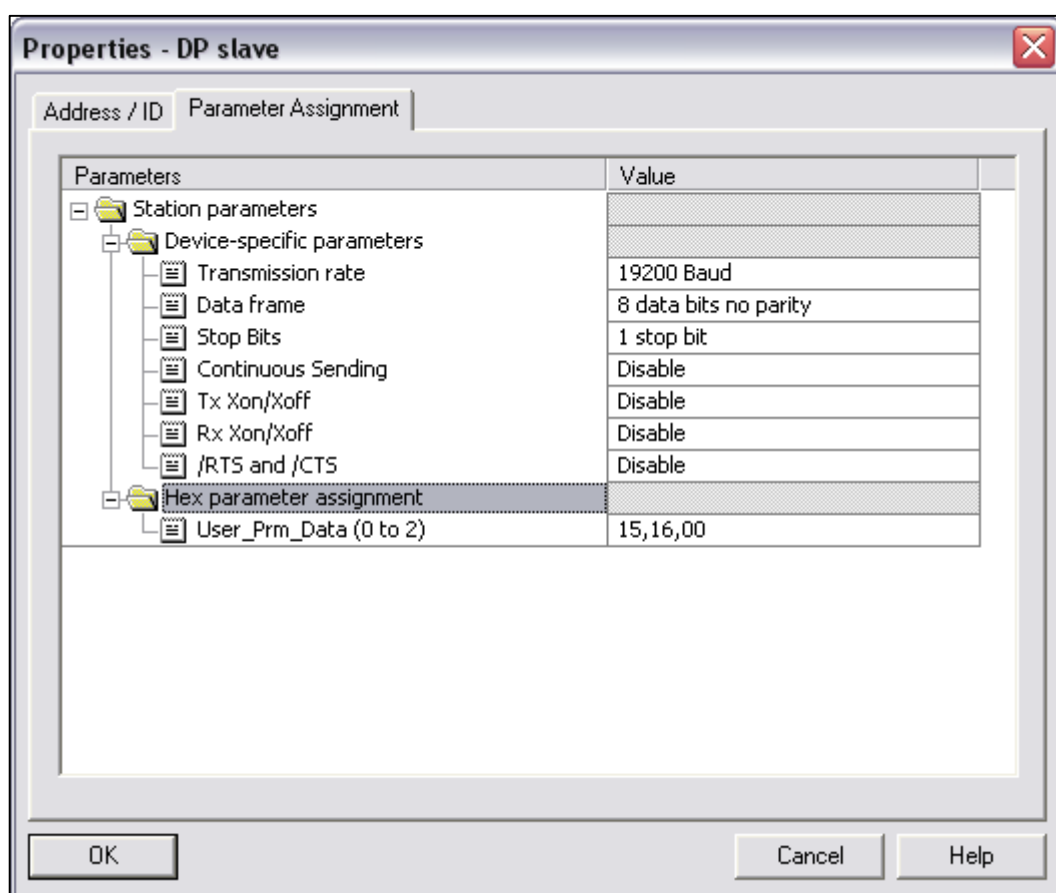


Fig. 2: Simatic HWConfig, parameter settings for the serial electronic module PSSu E S RS232

2.3. Electrical assignment of the electronic modules

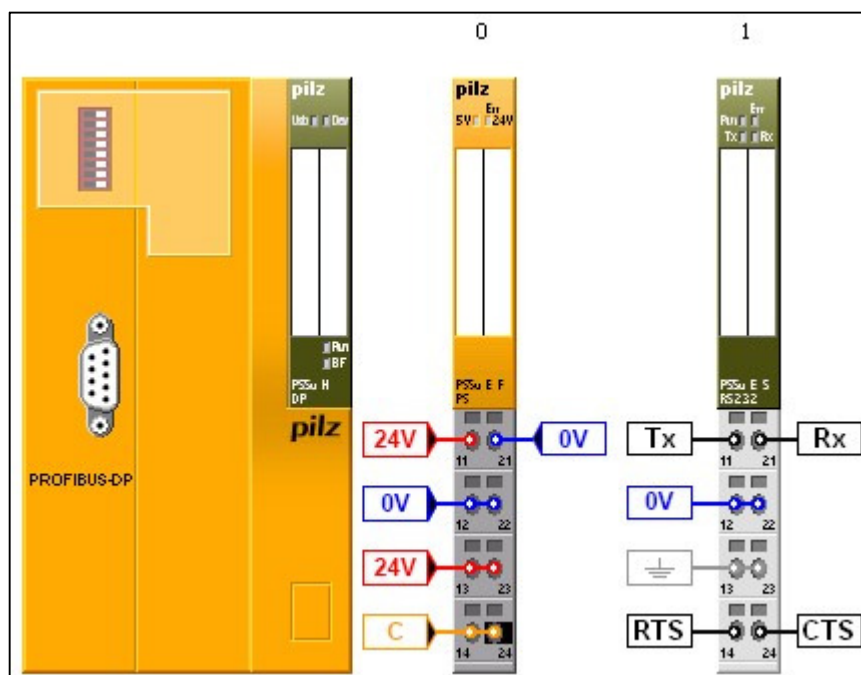


Fig. 3: Electrical assignment of the serial electronic modules (base module PSSu BP 1/8x)

3. Application Task

3.1. Introduction

For data exchange with the serial electronic modules:

- ▶ PSSu E S RS232,
- ▶ PSSu K S RS232,
- ▶ PSSu E S RS485

the PLC with the fieldbus master requires a function block for data exchange.

This application example illustrates how the FB "ST_SerialComm" is used to incorporate the serial PSSu modules from Pilz into a Siemens S7 control system.

3.2. General information

The function block provides the user with:

- ▶ a ring buffer as a receive buffer and a byte-oriented send buffer plus
- ▶ transparent data transfer.

▶ Notes:

- Due to the low I/O usable data bandwidth of 8 Bytes per PLC cycle, we recommend that this application is only used where time is not critical.
- Depending on the selected CPU type from the Siemens S7 series, it may be necessary to use the blocks SFC 14/15 in the user program, for consistent data transfer with the fieldbus master.

3.3. Technical information

The function block "ST_SerialComm" operates in handshake mode; the following control and status data from the electronic module is used:

Status byte 0	Bit0	= TransmitAccepted
	Bit1	= ReceiveRequest
	Bit2	= InitAccepted
	Bit3	= ContinuousSendingAccepted
	Bit4	= ReceiveBufferFull
	Bit5	= ParityError
	Bit6	= FramingError
	Bit7	= Overrun

Status byte 1 = ReceiveDataLength

Usable data bytes 2-9

Control byte 0	Bit0	= TransmitRequest
	Bit1	= ReceiveAccepted
	Bit2	= InitRequest
	Bit3	= ContinuousSendingRequest

Control byte 1 = SendDataLength

Usable data bytes 2-9

3.4. Description of function block "ST_SerialComm"

3.4.1. "Initialisation" function

The serial electronic module must be initialised to prepare it for data exchange.

► The procedure is as follows:

1. In the PLC program, set Bit 2 "InitRequest" =1 on control byte 0
2. The electronic module sets Bit 2 "InitAccepted" =1 in status byte 0.
3. In the PLC program, reset Bit 2 "InitRequest" =0 on control byte 0.
4. The electronic module resets Bit 2 "InitAccepted" =0 in status byte 0.
5. The electronic module is ready for data exchange.

► Note:

- Initialisation of the serial electronic modules is only activated when only Bit 2 "InitRequest" is set =1 in the first control byte 0 and all other bits in this byte are reset =0.
- The state of the second control byte 1 and status bytes 0/1 are irrelevant for activating initialisation.

► Request to complete initialisation:

Once the electronic module has set status bit 2 "InitAccepted" =1, the user must complete initialisation.

To do this, both control bytes 0/1 must be fully reset =0.

3.4.2. "Send data" function

A maximum of 8 data bytes can be sent per cycle.

► The procedure is as follows:

1. The data that is to be sent should be stored in PIO Bytes 2-9 of the electronic module.
2. In the PLC program, enter the send length in control byte 1 "SendDataLength"
3. Trigger data sending in control byte 0 by toggling bit 0 "TransmitRequest".
4. The electronic module confirms data sending in status byte 0 by toggling bit 0 "TransmitAccepted".

3.4.3. "Receive Data" function

- ▶ This is the procedure for receiving data:
 1. If receive data is present in the electronic module's receive buffer, the electronic module will signal this by toggling bit 1 ("ReceiveRequest") in status byte 0. The amount of received data is entered in status byte 1 at the same time.
 2. The received data will be stored in usable data bytes 2-9, depending on the number of bytes received in the electronic module's PII.
 3. Within the program, receipt/transfer of the data is confirmed by toggling Bit 1 ("ReceiveAccepted") in the control byte (Bit 1 in control byte 0 = Bit 1 in status byte 0).
 4. If there is additional data present in the receive buffer, the electronic module will signal this by retoggling Bit 1 in status byte 0.

3.4.4. "Continuous Send" function

With the "Continuous Send" function it is possible to send data continuously via the serial interface.

- ▶ The procedure is as follows:
 1. The "Continuous Send" function must be activated in the configuration of the electronic module.
 2. The sending data function from the electronic module's send buffer is active when Bit 3 is set =1 in control byte 0 ("ContinuousSendingRequest").
 3. Once the electronic module has sent all the data contained in the send buffer, it sets Bit 3 =1 ("ContinuousSendingAccepted") in status byte 0.
- ▶ Note:
 - Before the next piece of data is sent, Bit 3 must be reset to =0 in the program, in control byte 0 ("ContinuousSendingRequest").

3.5. Parameters for the function block "ST_SerialComm"

3.5.1. Input parameters for the function block "ST_SerialComm"

No.	Parameter	Data type	Note
1	BytesToSend	INT	Number of bytes to be sent
2	Send_DBNo	ARRAY[0..127] User can adapt to suit his application	Array in which the user stores the bytes that are to be sent
3	Receive_DBNo	ARRAY[0..1023] User can adapt to suit his application	Array in which the electronic module's receive data is stored in a ring buffer
4	Send_fromByteNo	INT	Address in "Send_DBxx" from which the first Byte is to be send.
5	Start_Receivebuffer	INT	Address in "Receive_DBxx" from which the first Byte is to be stored.
6	Receivebuffer_Size	INT	Size of the receive ring buffer
7	Input_HWAddress	ANYPointer	Address and data length of PII
8	Output_HWAddress	ANYPointer	Address and data length of PIO

3.5.2. Output parameters for the function block "ST_SerialComm"

No.	Parameter	Data type	Note
1	Receive_next_Byte	INT	Points to next position to be written in the receive buffer
2	ReceiveBufferFull	Bool	Receive buffer in electronic module completely full
3	ParityError	Bool	Serial data transfer error on the electronic module
4	FramingError	Bool	Serial data transfer error on the electronic module
5	OverrunError	Bool	Receive buffer overflow in the electronic module

3.5.3. Input and output parameters for the function block "ST_SerialComm"

No.	Parameter	Data type	Note
1	Reset	BOOL	Initialisation of electronic module; parameter is automatically reset once initialisation/reset has taken place
2	Start_Send	BOOL	Send process is triggered; FB resets this parameter once the data has been sent

3.6. Invalid configuration settings when parameters set via fieldbus

- ▶ Invalid configurations:
 - 2 stop bits in combination with all block sizes except "8 data bits, no parity".
 - Xon/Xoff in combination with RTS and CTS
(only affects electronic module PSSu E S RS232)

Invalid configurations cannot be prevented when the electronic module is configured via a fieldbus.

If the electronic module is configured with an invalid configuration via the fieldbus, the electronic module is taken out of service until it has a valid configuration.

If serial electronic modules are operated with a PROFIBUS DP head module, the whole PSSu system will be prevented from starting up if one electronic module has an invalid configuration.

3.7. Additional guidelines for operation

- ▶ Xon/Xoff threshold values on receive, when Xon/Xoff is activated on receive:
 - Xoff is sent as soon as 1000 characters are in the receive buffer.
 - Xon is sent as soon as fewer than 24 characters are in the receive buffer, when Xoff has previously been sent.
- ▶ Behaviour of the RTS signal when RTS and CTS are activated:
(only affects electronic module PSSu E S RS232)
 - RTS is deactivated as soon as 1000 characters are in the receive buffer.
 - RTS is activated as soon as fewer than 24 characters are in the receive buffer.

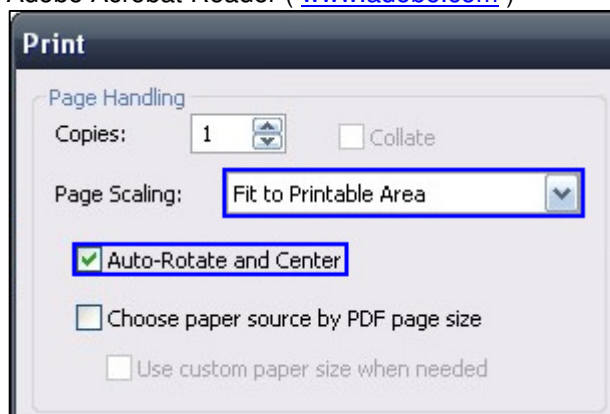
- ▶ Termination of the signals Tx+/Tx– and Rx+/Rx–:
(only affects electronic module PSSu E S RS485)
Dynamic terminations (consisting of 120 Ohm and 2.2nF) are present internally on the RS485 signals Tx+/Tx– and Rx+/Rx–. For this reason, on longer cables, the electronic module PSSu E S RS485 should only be used as the first and/or last module of the serial bus.

4. Table of figures

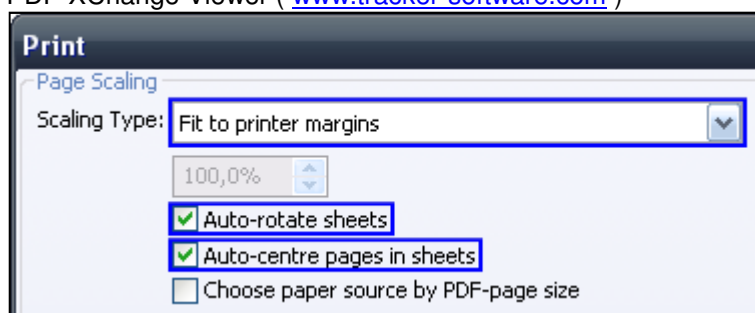
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