

MANUAL

WCS-PNG110
WCS PROFINET
INTERFACE MODULE



CE

With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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1 Introduction

Congratulations

You have chosen a device manufactured by Pepperl+Fuchs. Pepperl+Fuchs develops, produces and distributes electronic sensors and interface modules for the market of automation technology on a worldwide scale.

Symbols used

The following symbols are used in this manual:



Note!

This symbol draws your attention to important information.



Handling instructions

You will find handling instructions beside this symbol

Contact

If you have any questions about the device, its functions, or accessories, please contact us at:

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2 Declaration of conformity

2.1 CE conformity

This product was developed and manufactured under observance of the applicable European standards and guidelines.



Note!

A declaration of conformity can be requested from the manufacturer.

3 Safety

3.1 Symbols relevant to safety



Danger!

This symbol indicates a warning about a possible danger.

In the event the warning is ignored, the consequences may range from personal injury to death.



Warning!

This symbol indicates a warning about a possible fault or danger.

In the event the warning is ignored, the consequences may course personal injury or heaviest property damage.



Caution!

This symbol warns of a possible fault.

Failure to observe the instructions given in this warning may result in the devices and any connected facilities or systems develop a fault or fail completely.

3.2 Intended use

The WCS-PNG110 interface module serves as an interface between the WCS reading heads and the PLC.

Read through these instructions thoroughly. Familiarize yourself with the device before installing, mounting, or operating.

Always operate the device as described in these instructions to ensure that the device and connected systems function correctly. The protection of operating personnel and plant is only guaranteed if the device is operated in accordance with its intended use.

3.3 General safety instructions

The operator of the system is responsible in terms of planning, mounting, commissioning, operating and maintenance.

Installation and commissioning of all devices must be performed by a trained professional only.

Independent interventions and separate modifications are dangerous and will void the warranty and exclude the manufacturer from any liability. If serious faults occur, stop using the device. Secure the device against inadvertent operation. In the event of repairs, send the device to Pepperl+Fuchs.



Note!

Disposal

Electronic waste is hazardous waste. When disposing of the equipment, observe the current statutory requirements in the respective country of use, as well as local regulations.

4 Product description

4.1 Use and application

The WCS-PNG110 interface module acts as an interface between the WCS reading head and the PROFINET IO. Data is transferred between the reading head and the interface module via an RS 485 interface. The data from the interface module to the PLC is transferred using the PROFIBUS protocol. You can connect a maximum of four WCS reading heads Type LS221 (and/or LS121) to one WCS-PNG110 interface module. If you connect several reading heads, they must have different addresses. The number of connected reading heads is configured in the hardware project settings.

5 Installation

5.1 Mounting

The dimensions of the WCS-PNG110 interface module are:
23 x 111 x 115 mm (W x H x D).

The WCS-PNG110 interface module is attached to a 35 mm wide DIN mounting rail (EN 50022-35) with a snap attachment.

The device is grounded via the mounting rail.



Note!

Grounding of the mounting rail

The mounting rail must be grounded to the switch cabinet. The connection wire must have a cross section of at least 10 mm².

5.2 Electrical connection

Connector X1 is located on the top side of the interface module, connector X2 on the underside.

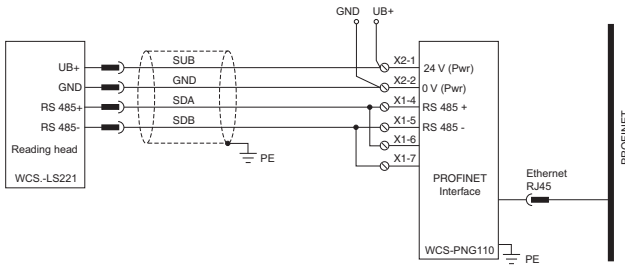


Figure 5.1: Electrical connection



Note!

To use with an RS 485 interface, terminal "Rx 422+" on connector X1 must be connected to terminal "Tx 422+", and terminal "Rx 422-" must be connected to terminal "Tx 422-".

Terminal		Designation
4	Rx 422+	Data line RS 485+ to reading head
5	Rx 422-	Data line RS 485- to reading head
6	Tx 422+	
7	Tx 422-	

Table 5.1: Terminal X1



Preparing to use the RS 485 interface

1. Connect terminal 4 "Rx 422+" to terminal 6 "Tx 422+".
2. Connect terminal 5 "Rx 422-" to terminal 7 "Tx 422-".

Terminal		Designation
1	UB (Pwr)	Operating voltage interface module/ operating voltage reading head
2	0 V (Pwr)	Ground interface module/ground reading head

Table 5.2: Terminal X2



Caution!

Damage to the device

Connecting an alternating current can damage the device or result in it malfunctioning.

Connect interface module to direct current (DC).



Connecting the interface module to the voltage

Connect the operating voltage (10...30 V DC) to terminals 1 and 2 of the 4-pin connector X2 on the interface module.

The "Power" LED lights up green.

6 Commissioning

6.1 Cable routing in the RS 485 bus

The data cable must always form an in-line connection between the first and the last node. This in-line connection must end with a terminator.

The RS 485 terminators are integrated in the WCS reading heads and can be switched on and off with the interface module.

If only **one reading head** is connected, one device is connected at the beginning and one device is connected at the end of the data line.

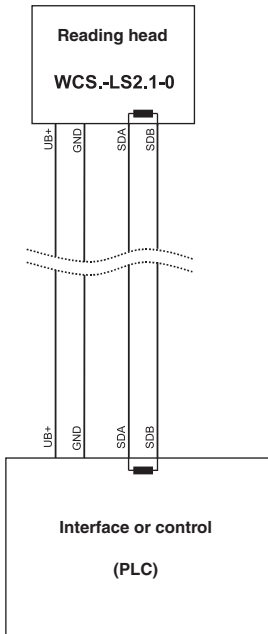


Figure 6.1: Connection of **one** reading head

If **two reading heads** are attached to one interface module, there are two wiring versions:

- **Version A:**

One reading head is located at the beginning and one reading head at the end of the data line. With two reading heads, the RS 485 terminator is activated. The interface module is located between these two heads and does not have an RS 485 terminator. Each reading head is connected to the interface module by a separate data cable.

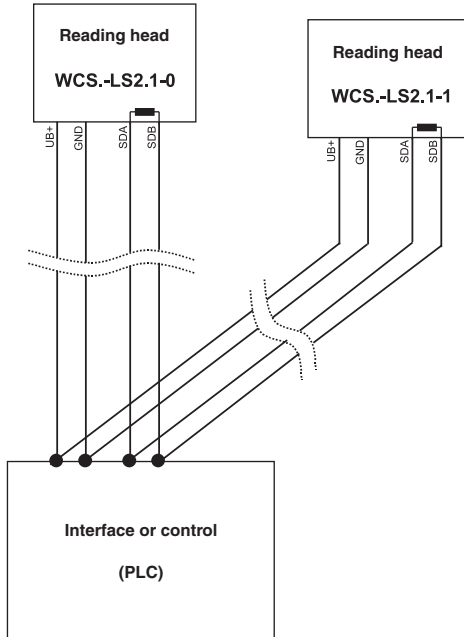


Figure 6.2: Connection of **two** reading heads, Version A

- **Version B:**

The interface module is located at the beginning of the data line; one reading head is located at the end of the data line. Both need the RS 485 terminator. The second reading head is connected to the line connection between the interface module and the first reading head through a short spur (length < 1 m). Use bus terminal BT 111 to connect the spur.

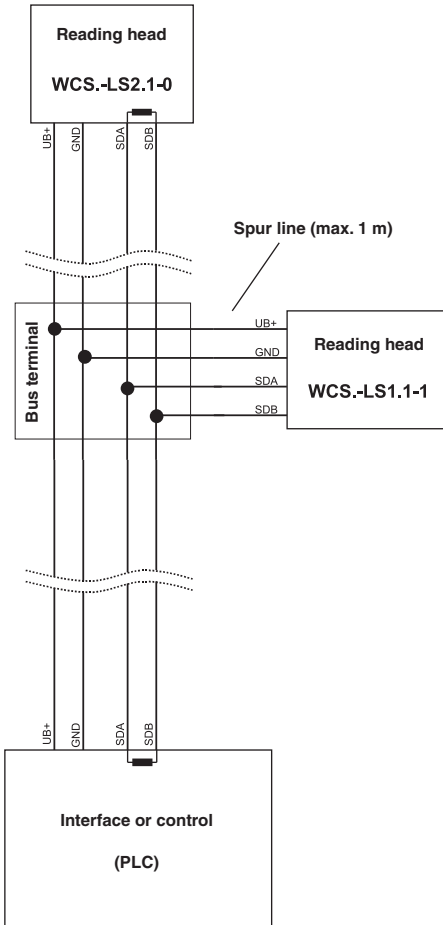


Figure 6.3: Connection of **two** reading heads, Version B

The wiring version used depends on which is best suited for the application. If **three or four reading heads** are used on the same interface module, connect these using spurs as shown in version B.

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6.2 Meaning of LEDs

Power:

The "Power" LED lights up **green**: The WCS-PNG110 interface module is correctly connected with the power supply.

1, 2, 4, 8 and State:

The "State" LED lights up or flashes **green**: Data exchange takes place with the reading heads.

The number of the reading head that the interface module is exchanging data with is displayed by the four LEDs "1, 2, 4, 8":

LED				reading head address
8	4	2	1	
0	0	0	1	0
0	0	1	0	1
0	1	0	0	2
1	0	0	0	3

The "State" LED lights up **red**: The interface module has recognized an error or a warning.

The interface module displays the binary coded error and/or warning number via the "1, 2, 4, 8" LEDs. For a description of the error codes see chapter 7.3.

Error (No. 1...5): Switch the interface module off and back on. If the error occurs again, the module must be replaced.

Warning (No. 6...15): The warning provides information. The interface module displays the warning for one minute and then resets automatically.

PROFINET State:

The "PROFINET State" LED lights up **green**: Data exchange in progress.

The "PROFINET State" LED flashes **green**: PROFINET initialized.

The "PROFINET State" LED flashes **red**: Error during PROFINET initialization.

The "PROFINET State" LED lights up **red**: PROFINET hardware error.

PROFINET Power:

The "PROFINET Power" LED lights up **green**: The LED is directly connected with the power supply on the PROFINET side.

PROFINET Link/Activity:

The "Link/Activity" LED is controlled directly by the PROFINET processor and lights up **green** if the Ethernet data exchange is found. When there is data traffic on the network, the LED flashes **green** at the same speed as the sent/received data.

6.3 Connecting the reading heads

If you install several WCS reading heads together on one interface module, the reading heads must have different addresses. This will allow the PLC to allocate the data to the correct reading heads. If you connect only one WCS reading head to the interface module, this reading head is always given the address 0. You can connect up to four WCS reading heads to the interface module via an RS 485 line. The default address of the reading head as delivered is 0.

If you install several WCS reading heads together on one interface module, the reading heads must have different addresses. This will allow the PLC to allocate the data to the correct reading heads. If you connect only one WCS reading head to the interface module, this reading head is always given the address 0. You can connect up to four WCS reading heads to the interface module via an RS 485 line. The default address of each reading head as delivered is 0. Refer to the configuration instructions for the reading head if you need to change the address of the reading head.

The number of connected reading heads and their mode of operation is configured by the hardware project setting using the GSD file. For hardware planning, please use the GSD file which can be downloaded from our website: <http://www.pepperl-fuchs.com> (see chapter 6.5).

Terminal pin reading head		Terminal interface module
WCS2B	WCS3B	
2	1	X2-1
4	2	X1-4
1	4	X1-5
3	3	X2-2

Table 6.1: Connection of WCS reading heads



Connecting the reading head

1. Connect the power supply for the reading head to terminals 1 and 2 of the 4-pin connector X2 on the interface module.
2. Connect the RS 485 data line to the reading head on terminals 4 and 5 of connector X1.

If you operate the WCS-PNG110 interface module at the beginning or end of the RS 485 bus, you must activate the RS 485 terminator.



Activating the RS 485 terminator

1. To use with an RS 485 interface, slide the "Rx 422" switch to OFF.
2. To activate the RS 485 terminator, slide the "Tx 422" switch to ON.
3. To deactivate the RS 485 terminator, slide the "Tx422" switch to OFF.
4. If only one reading head is connected, you must always activate the RS 485 terminator. Slide the "Tx 422" switch to ON.

6.4 Connecting the WCS-PNG110 to the network

The connection to the PROFINET IO is made via the "RJ 45 PROFINET IO" connector on the underside of the interface module.

Terminal		Designation
1	TD+	Transmission line +
2	TD-	Transmission line -
3	RD+	Receive line +
4		
5		
6	RD-	Receive line -
7		
8		

Table 6.2: Terminal of the 8-pin "RJ 45 PROFINET IO" connector



Note!

The cable to the surrounding modules on the Ethernet line must be at least 0.6 m long.



Connecting the device to the controller

Plug the PROFINET connector into the RJ 45 connector. Use a Cat. 5 data cable.



Setting data exchange mode

Set the "S4" and "S5" rotary switches to position 0.

6.5 Adding WCS-PNG110 to the network



Caution!

Device not configured or configured incorrectly

System failure caused by incorrectly configured device

Configure the device prior to commissioning.



Note!

Various tools are available that allow you to configure the interface module. This manual describes how to configure a Siemens SIMATIC controller. If you are using a PLC from a different manufacturer, the process is similar to the one described here.

The device properties are held in a GSD file. PROFINET IO uses the XML-based GSDML language for this purpose. The GSD file can be downloaded from our website: <http://www.pepperl-fuchs.com>.



Downloading a GSD file from the Internet

On our home page (<http://www.pepperl-fuchs.com>), select the product selector and look for the product designation (WCS-PNG110). Click on **Technical Documents**.

This will take you to the GSD file, which has been compressed ready to download.

Every node within a PROFINET network must have a unique name. Every node is identified by its device name and IP address.

The factory default configuration of the WCS-PNG110 interface module is as follows:

IP address: 10.10.10.10

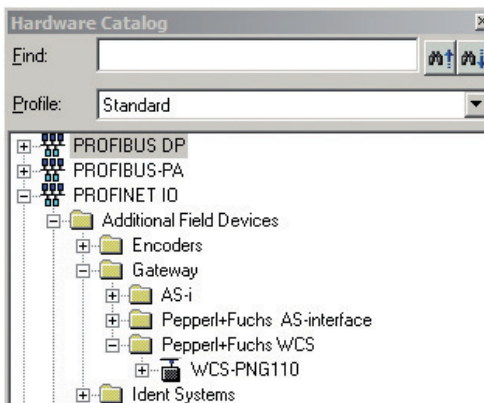
Device name: UNIGATE-PN

You can change the IP address and device name during the configuration process. If you are using more than one interface module on the network, you must assign each interface module a name that will enable the PLC to uniquely identify the device, e.g. WCS-PNG110A, WCS-PNG110B, etc. Each name may only appear once in the network.

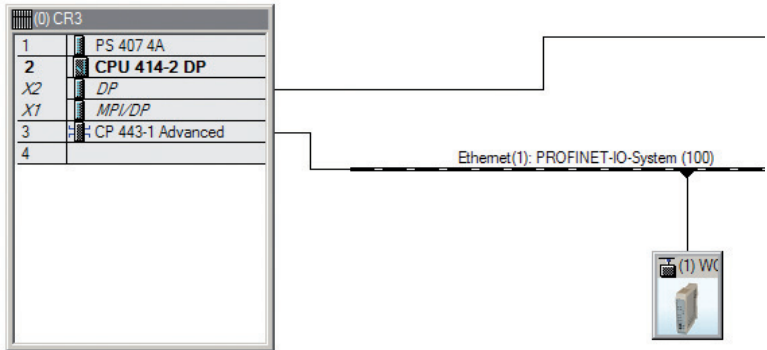


Adding the device to the network

1. Open SIMATIC Manager and select the PROFINET IO system.
2. Install the GSD file by clicking on **Options** and then **Install GSD File**.
The device data is added to the hardware catalog.
3. Open the hardware catalog and browse through the tree structure until you see a WCS-PNG110 symbol (PROFINET IO > Additional Field Devices > Gateway > Pepperl+Fuchs WCS).



4. Drag the WCS-PNG110 from the tree structure and drop it into your PROFINET IO system.
The symbol for the WCS-PNG110 is shown in the PROFINET IO system.



- Double-click on the device symbol.
The **Properties** window opens.
- Enter the required network configuration.



Searching for a device on the network

To see which devices are on the network, click on **Browse** in the **Edit Ethernet Node** window.

The PLC interrogates the network to see which PROFINET nodes are present (Broadcast query). A list of the connected devices is displayed in the window.



Changing the device name



Note!

The PLC must not communicate with the device via PROFINET while you are changing the device name. An error message will be output if you try to change the device name while the system is running.

- Stop PROFINET communication if it is active.
- Select **Pepperl+Fuchs WCS** from the list of nodes (default device name: UNIGATE-PN) and click on **OK**.

3. In the field **Assign device name**, enter the device name for the interface module. Click on **Assign Name**.

The interface module is given the name you enter and can then be uniquely identified by the PLC.

4. In the **Properties** window, enter the new device name and save the configuration.

The PLC will recognize the name of the device and will be able to communicate with it.



Note!

An LED on the device can be made to flash using the configuration tools. If you have a number of WCS-PNG110 interface modules on the network, this function will enable you to uniquely identify each device. Select the device from the list of Ethernet modules and click on **Flash**. The "State" LED on the relevant WCS-PNG110 interface module will start to flash.

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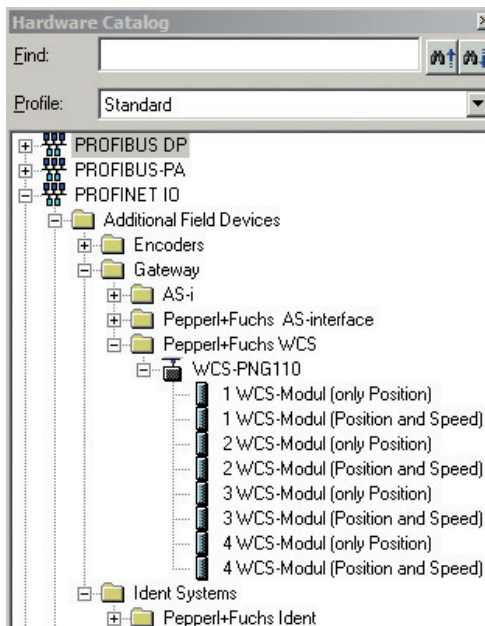
Depending on your application, select one, two, three or four connected reading heads and the operating mode. When in "only Position" mode, the reading heads output their position. In "Position and Speed" mode, the reading heads output their position and the speed at which they are currently moving.

Regardless of the number of reading heads, 1 byte is reserved for querying the diagnosis of the reading heads in the master. For the response data, 4 bytes are reserved per reading head in "only Position" mode (configuration data for 4 reading heads: 0x20, 0xD1, 0xD1, 0xD1, 0xD1). In "Position and Speed" mode, 6 bytes are reserved per reading head (configuration data for 4 reading heads: 0x20, 0xD2, 0xD2, 0xD2, 0xD2).



Setting the number of reading heads, operating mode and addresses

1. Open the hardware catalog and browse through the tree structure until you see the WCS-PNG110 symbol (PROFINET IO > Additional Field Devices > Gateway > Pepperl+Fuchs WCS).
2. Click on + next to the WCS-PNG110 symbol to expand the tree structure.



3. Select the module with the appropriate number of reading heads and operating mode and drag it into the window where the modules are listed.

The selected module is added to the list.

4. To change the input and output address of the module, double-click on the module and enter the addresses in the **Properties** window.
5. Click on **Transfer** to transfer all the settings to the PLC.

6.6 Request byte for reading heads

	reading head address 3		reading head address 2		reading head address 1		reading head address 0	
Bit	7	6	5	4	3	2	1	0
	0	F0	0	F0	0	F0	0	F0

F0=0: The reading head sends the position data to the interface module. This standard function is automatically active after commissioning.

F0=1: The reading head sends the result of the diagnostic function.

For more information on the function of F0 see chapter 7.

6.7 Data format of WCS-PNG110 interface module for the reading heads

In "only Position" mode, 4 bytes are reserved for each reading head.

Bit	7	6	5	4	3	2	1	0
Input address + 4x reading head address + 0	0	0	0	0	0	P18	P17	P16
Input address + 4x reading head address + 1	P15	P14	P13	P12	P11	P10	P09	P08
Input address + 4x reading head address+ 2	P07	P06	P05	P04	P03	P02	P01	P00
Input address +4x reading head address + 3	0	0	0	DB	ERR	OUT	A1	A0

Table 6.3: Data format for each connected reading head in "only Position" mode, reading head address = 0 ... 3

In "Position and Speed" mode, 6 bytes are reserved for each reading head.

Bit	7	6	5	4	3	2	1	0
Input address + 6x reading head address + 0	0	0	0	0	0	P18	P17	P16
Input address + 6x reading head address + 1	P15	P14	P13	P12	P11	P10	P09	P08
Input address + 6x reading head address + 2	P07	P06	P05	P04	P03	P02	P01	P00
Input address + 6x reading head address + 3	0	0	0	DB	ERR	OUT	A1	A0
Input address + 6x reading head address + 4	0	0	0	0	0	0	0	0
Input address + 6x reading head address + 5	0	S06	S05	S04	S03	S02	S01	S00

Table 6.4: Data format for each connected reading head in "Position and Speed" mode, reading head address = 0 ... 3

To see what the data bit means see chapter 7.

7 Appendix

7.1 Meaning of F0

F0	Function number for reading head
0	Send position value
1	Send diagnosis result

Diagnostic function F0=1

The reading head can be requested to perform a diagnosis of the photoelectrics by means of the request byte. For this purpose, the reading head must be located outside of the code rail.

On the WCS2B and WCS3B reading heads, the degree of dirt accumulation on the photoelectrics is monitored automatically during operation and the diagnostic bit (DB) set if dirt accumulation is too high. Thus the request for diagnosis to the reading head via F0 in the request byte is no longer necessary. For reasons of downward compatibility, this function is also supported by the new reading heads.

Diagnostic bit (DB)

Diagnostic bit DB displays the result of the self-diagnosis of the reading head.

7.2 Data from reading head

Meaning of A1 and A0

A1	A0	reading head address
0	0	reading head address 0
0	1	reading head address 1
1	0	reading head address 2
1	1	reading head address 3

Function number for reading head F0=0 (send position value)

DB	ERR	OUT	Description	State of the reading head
0	0	0	Current position value binary coded in P00...P18	good
0	0	1	reading head outside of the code rail, not a position value	good
			P0...P18=0: reading head partially outside of the code rail	
			P0=1, P2...P18=0: reading head completely outside of the code rail	
1	0	0	Current position value binary coded in P00...P18	poor
1	0	1	not a position value, reading head outside of the code rail	poor
x	1	x	not a position value, error message from reading head, error number binary coded in P00...P18	-

Function number for reading head F0=1 (send diagnosis result)

DB	ERR	OUT	Description	State of the reading head
1	0	0	Diagnosis invalid, reading head not outside of the code rail	-
1	0	1	Diagnosis result in P16...P18	
			P16...P18=0	good
			P16...P18>0	poor
x	1	x	Error message from reading head, error message binary coded in P00...P04	-

7.3

Error codes

ErrorNo/Select ID LED				Error number	Designation
8	4	2	1		
0	1	1	1	7	Communication reading head, send buffer overflow
1	0	0	0	8	Communication reading head, receive buffer overflow
1	0	0	1	9	Communication reading head, timeout
1	0	1	0	10	General fieldbus error
1	0	1	1	11	Parity or frame check error
1	1	0	1	13	Fieldbus error (configuration error, no connection ...)
1	1	1	1	14	Fieldbus data buffer overflow

Table 7.1: error code meaning

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