

INSTRUCTION MANUAL

**WCS-Interface Module,  
DeviceNet**

**WCS-DG210**





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## Used symbols



*This symbol warns the user of potential danger. Nonobservance may lead to personal injury or death and/or damage to property.*

**Warning**



*This symbol warns the user of potential device failure. Nonobservance may lead to the complete failure of the device or other devices connected.*

**Attention**



*This symbol calls attention to important notes.*

**Note**

## Security advice



*This product must not be used in applications, where safety of persons depend on the correct device function. This product is not a safety device according to EC machinery directive.*

**Warning**

## Notes

These operating instructions refer to proper and intended use of this product. They must be read and observed by all persons making use of this product. This product is only able to fulfill the tasks for which it is designed if it is used in accordance with specifications of Pepperl+Fuchs.

The warranty offered by Pepperl+Fuchs for this product is null and void if the product is not used in accordance with the specifications of Pepperl+Fuchs.

Changes to the devices or components and the use of defective or incomplete devices or components are not permitted. Repairs to devices or components may only be performed by Pepperl+Fuchs or authorized work shops. These work shops are responsible for acquiring the latest technical information about Pepperl+Fuchs devices and components. Repair tasks made on the product that are not performed by Pepperl+Fuchs are not subject to influence on the part of Pepperl+Fuchs. Our liability is thus limited to repair tasks that are performed by Pepperl+Fuchs.

The preceding information does not change information regarding warranty and liability in the terms and conditions of sale and delivery of Pepperl+Fuchs.

This device contains sub-assemblies that are electrostatically sensitive. Only qualified specialists may open the device to perform maintenance and repair tasks. Touching the components without protection involves the risk of dangerous electrostatic discharge, and must be avoided. Destruction of basic components caused by an electrostatic discharge voids the warranty!

Subject to technical modifications.

Pepperl+Fuchs GmbH in D-68301 Mannheim maintains a quality assurance system certified according to ISO 9001.



### 1 Working principle

The WCS-DG210 acts as interface between the WCS reading head and the DeviceNet bus. The data are transferred via the RS 485 interface between the reading head(s) and the WCS-DG210 and via the DeviceNet protocol from the WCS-DG210 to the control. A maximum of four reading heads type WCS-LS221 (or WCS-LS121) can be connected. If several-reading heads are connected, they must have different addresses.

The DG210 complies with the conditions as per "DeviceNet Specification Release 2.0" and functions as a DeviceNet "Group 2 only slave" (Vendor-ID: 272, Device type: 12).

The interface module permits data transmission rates up to 500 kBaud in the DeviceNet. The WCS-DG210 is compatible with the previous model WCS-DG110.

### 2 Installation and commissioning

The installation of the interface module is done by clip-on attachment on a 35 mm top-hat rail (EN 50022-35).

The dimensions of the interface module are: 90 x 127 x 55 in mm (W x H x D).

The device has two cable lugs for connecting the protective earth. The protective earth must be connected to these cable lugs with a wire cross-section of at least 1.5 mm<sup>2</sup>.

#### 2.1 Electrical connection

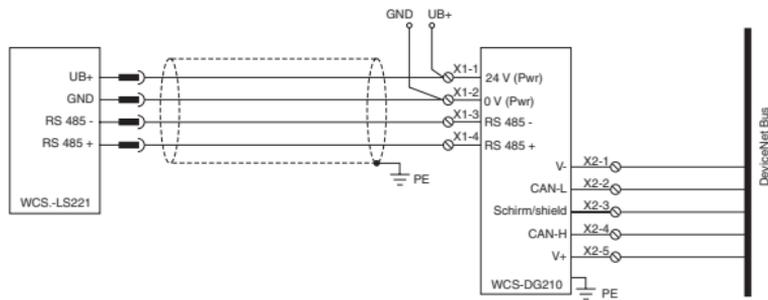


Fig. 2.1: Electrical connection

## 2.2 Operating voltage of the interface module

The operating voltage (24 V DC  $\pm$  20%) for the interface module is connected to terminals 1 and 2 of the 5-pole push-lock terminal. When the operating voltage is connected correctly, the green "Power" LED is illuminated.

Terminal X1		Designation
1	24V (Pwr)	Supply voltage interface module / Supply voltage reading heads
2	0V (Pwr)	Ground interface module / Ground reading heads
3	RS 485-	Data line RS 485- towards reading head
4	RS 485+	Data line RS 485+ towards reading head
5	not used	

Table 2.1: Terminal connection WCS-CG210 towards the reading head(s)

## 2.3 Connection of the reading head(s)

The voltage supply for the reading heads is connected to screw terminals X1-1 and X1-2 of the 5-pole push-lock terminal (same terminals as for connecting the operating voltage). The RS 485 data lines to the reading heads are connected to terminals X1-3 and X1-4.

Terminal reading head			Terminal interface module
WCS2A	WCS3A	WCS3B	
2	1	1	1
4	2	2	4
1	3	4	3
3	5	3	2

The sliding switch "Interface" must always be set to the position "485". If the module is at the beginning or end of the data line to the reading heads, the RS 485 terminating resistor must be activated. To do so, set the sliding switch "RS 485-Termination" to "On". If only one reading head is connected to the WCS-CG210, this switch must always be set to "On".

The number of reading heads connected is set with rotary switch S4. The position of the switch indicates the number of reading heads connected:

- 1: 1 reading head (address 0) connected
- 2: 2 reading heads (address 0 and 1) connected
- 3: 3 reading heads (address 0, 1 and 2) connected
- 4: 4 reading heads (address 0, 1, 2 and 3) connected

Rotary switch S5 has no function.

## 2.4 Connection to control

Connection to the DeviceNet is via the 5-pole plug connector with screw terminals X2. The MAC-ID of the DeviceNet address is set with the 6-pole DIP switch "Node ID". MAC-ID "0" is not permissible. The terminating resistor in the DeviceNet can be switched on ("On") or off ("Off") with the sliding switch "Termination".

Terminal X2		Designation
1	V- (Pwr)	0 V
2	CAN-L	dominant low
3	Shield	cable shield
4	CAN-H	dominant high
5	V+	24 VDC

Terminal connection WCS-CG210, towards the DeviceNet

## 2.5 Baud rate adjustment

The data transmission rate in the DeviceNet is set by two switches on the 8-fold DIP switch of the WCS-DG210. The position of the DIP switches is marked on the sticker on the device.

DIP-switch		Baud rate
S7	S6	
0	0	125 kBaud
0	1	250 kBaud
1	0	500 kBaud
1	1	125 kBaud

Table 2.2: Baud rate adjustment

## 2.6 EDS configuration file

An EDS file to support configuration can be down-loaded from our Internet homepage <http://www.pepperl-fuchs.com>.

## 3 Data exchange in the DeviceNet

The WCS-DG210 acts as "Group 2 Only Slave" in the DeviceNet. The access procedures "Polling," "Bit-Strobe" and "Change of state" are supported. If more than two reading heads are connected to the WCS-DG210, the data can only be interrogated via polling access. Transmitting a function byte also is only possible in polling mode.

### 3.1 Polling

In polling, a function byte is transmitted to the WCS-DG210 by the master. The WCS-DG210 then returns 16 data bytes. The 16 bytes contain the data of the 4 reading heads (4 x 4 bytes). If less than 4 reading heads are configured (via rotary switch S4), the four data bytes for the unconfigured reading heads contain the value 0x00.

	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	FO	0	FO	0	FO	0	FO

Table 3.1: Function byte for activating the reading head(s) in polling

Hints on FO function see page 14.

### 3.2 Bit-strobe

With bit-strobe access, the command "bit-strobe" is transmitted by the master without any further data. The master then always receives 8 data bytes as a response from the interface module. The 8 databytes contain the data of the reading heads with address 0 and 1 (2 x 4 bytes). If the reading head with address 1 is not connected (rotary switch S4 is in position 1), the 4 data bytes for this reading head are 0x00.

### 3.3 Change of state

In this procedure, the WCS-DG210 transmits 8 data bytes to the master without being requested as soon as the content of the data is changed. The data format corresponds to that for bit-strobe access. If the data of the reading heads change constantly, e. g. if the reading head is travelling fast, the data are transmitted every 5 ms. In this case the rest time is necessary to avoid overloading the Device-Net bus.

### 3.4 Data format of interface module for one reading head

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Wort n	0	0	0	0	0	P18	P17	P16	P15	P14	P13	P12	P11	P10	P09	P08
Wort n+1	P07	P06	P05	P04	P03	P02	P01	P00	0	0	0	DB	ERR	OUT	A1	A0

Table 3.2: Data format from the interface module for one reading head (4 bytes)

**Note:** In some plc controls the byte positions in a word are interchanged. The meaning of the data bits is explained on page 14.

## 4 Device LEDs

**Power:** The green LED must be illuminated. It indicates the correct voltage supply of the WCS-DG210.

**BusPower:** The LED is connected directly to the isolated supply voltage of the DeviceNet side.

**BusState:** Green continuous

WCS-DG210 connected to DeviceNet master

Green flashing

No connection to DeviceNet master

Red continuous

Serious error on DeviceNet bus (e. g. double MAC-ID)

Red flashing

Rectifiable error (e. g. timeout error)

Red/green flashing

Communication error

**State:** Green continuous

Data exchange with the reading heads. The number of the reading head being polled is shown via the four LEDs "Error No/Select ID". The table below shows the assignment of the LEDs "Select ID" to the reading head addresses.



ErrorNo Select ID				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

### Red continuous

The interface module has detected an error or a warning. The WCS-DG210 displays the binary coded error or warning number via the LEDs "Error No/Select ID".

Error (number 1...7):

Switch interface module on and off. If the error still occurs, the module must be replaced.

Warning (number 8...15):

The warning serves merely as information and is displayed by the WCS-DG210 for one minute and then automatically reset.

## 4.1 Description of error code

Error No / Select ID				Designation
8	4	2	1	
0	0	0	0	reserved
0	x	x	x	internal error interface module
1	x	x	0	internal warning interface module
1	0	0	1	timeout receiving data from reading head
1	0	1	1	error at data transfer from reading head
1	1	0	1	Fieldbus error (configuration error, vo connection, ...)
1	1	1	1	internal warning interface module

## 5 Technical data

General specifications	
Installation	DIN rail mounting
Electrical specifications	
Operating voltage	24 V $\pm$ 20 %
Power consumption P <sub>0</sub>	$\leq$ 3.6 W (without reading heads)
Interface 1	
Connection of	control (plc)
Interface type	DeviceNet
Transfer rate	max. 500 kBit/s
Data output format	binary code
Bus termination resistor	switchable
Interface 2	
Connection of	Read head
Connectable reading heads	WCS-LS221, WCS-LS121
Interface type	RS 485
Transmission method	half duplex
Transfer rate	62.5 kBit/s
RS 485 termination resistor	switchable
Refresh cycle of reading head	1 ms
Standard conformity	
Emitted interference	EN 55011
Interference rejection	DIN EN 50082-2
Ambient conditions	
Operating temperature	0 ... 45 °C (273 ... 318 K), no moisture condensation
Storage temperature	-40 ... 70 °C (233 ... 343 K)
Relative humidity	$\leq$ 80 %
Mechanical specifications	
Connection type	Interface 1: terminal connection $\leq$ 2.5 mm <sup>2</sup> , 5 pin Interface 2: terminal connection $\leq$ 2.5 mm <sup>2</sup> , 5 pin
Housing width	90 mm
Height of housing	127 mm
Housing depth	55 mm
Protection degree	IP24
Material	plastic
Installation position	any position
Mass	approx. 200 g

Table 5.1: Technical data

## 5.1 Electrical connection

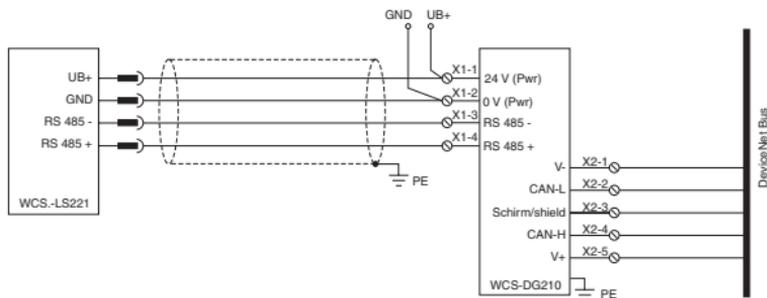


Fig. 5.1: Electrical connection

## 5.2 Dimensions

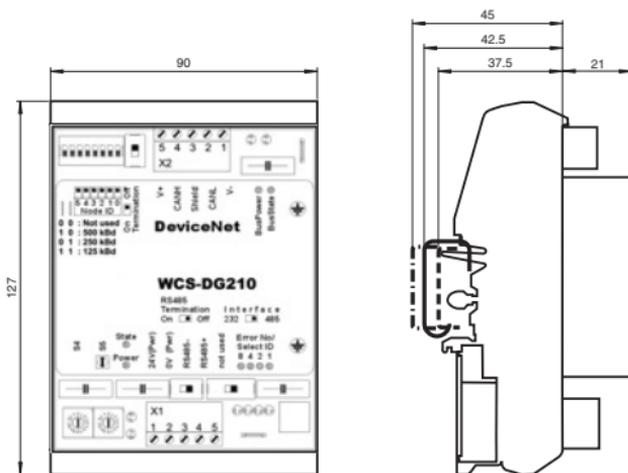


Fig. 5.2: Dimensions

## 6 Appendix

### 6.1 Activation of reading head

A0, A1	A1	A0	
	0	0	Reading head address 0
	0	1	Reading head address 1
	1	0	Reading head address 2
	1	1	Reading head address 3
F0	F0		Function number for reading head
	0		Transmitting positional value
	1		Transmitting diagnosis result

### 6.2 Diagnosis function F0=1

The reading head can be requested to perform a diagnosis of the optoelectronics by means of the request byte. The reading head must be outside the code rail. On the new generation reading head types (WCS2A, WCS2B, WCS3A and WCS3B), the degree of dirt accumulation on the optical unit is monitored automatically during operation and the diagnosis bit (DB) set if dirt accumulation is too high. Thus the specific request for diagnosis to the reading head via F0 in the request byte is no longer necessary. However for reasons of downwards compatibility this function is also supported by the new reading heads.

### 6.3 Data from reading head

Function number for reading head F0 = 0 (Transmitting positional value)				
ERR	DB	OUT	Description	Optical syst. reading head
0	0	0	Current positional value in P00...P18, binary coded	good
0	0	1	Reading head outside code rail, no positional value	good
			P0...P18 = 0 -> Reading head is partially out of the code rail	
			P0 = 1, P2...P18 = 0 -> Reading head is complete out of the code rail	
0	1	0	Current positional value in P00...P18, binary coded	bad
0	1	1	No positional value, reading head outside code rail	bad
1	x	x	No positional value, error signal from reading head, error number in P00...P04, binary coded	-

Diagnosis bit DB displays the result of the automatic self diagnosis of the reading head.

Function number for reading head F0=1 (Transmitting diagnosis result)				
ERR	DB	OUT	Description	Optical syst. reading head
0	1	0	Diagnosis invalid, reading head not outside code rail	-
0	1	1	Diagnosis result in P16...P18	
			P16...P18 = 0	good
			P16...P18 > 0	bad
1	x	x	Error signal from reading head, error no. in P00...P04, binary coded	-

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