INSTRUCTION MANUAL

WCS-Interface Module, CANopen

WCS-CG210

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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

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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 warrantee 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 warrantee 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 warrantee!

Subject to technical modifications.

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

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1   Working principle

The WCS-CG210 acts as interface between the WCS reading head and the CAN-Bus. The data are transmitted between the reading head(s) and the WCS-CG210 via the RS 485 interface and from the WCS-CG210 to the control via the CANopen protocol. A maximum of four WCS2 and/or WCS3 reading heads of type LS221 (or LS121) can be connected. If several reading heads are connected, they must have different addresses. The interface module WCS-CG210 functions as CANopen slave in the "predefined connection set" and permits data transmission rates up to 1 MBaud.

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).

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

Table 2.1: Terminal connection of WCS-CG210

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^2.

2.1   Operating voltage of the interface module

The operating voltage (24 V DC ± 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.
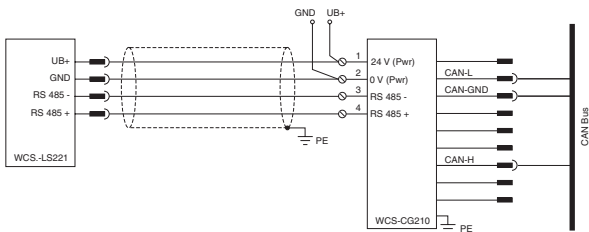
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Fig. 2.1: Electrical connection

2.2 Connection of the reading head(s)

The voltage supply for the reading heads is connected to screw terminals 1 and 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 3 and 4.

Terminal read. head			Terminal Interface module
WCS2A	WCS3A	WCS3B	
2	1	1	1
4	2	2	4
1	3	4	3
3	5	3	2

The number of reading heads connected is set with the rotary switch S4. The position of the switch simultaneously presets the baud rates:

1: 1 head   (addr. 0)   -BD-Set A
2: 2 heads   (addr. 0, 1)   -BD-Set A
3: 3 heads   (addr. 0, 1, 2)   -BD-Set A
4: 4 heads   (addr. 0, 1, 2, 3) -BD-Set A
5: 1 head   (addr. 0)   -BD-Set B
6: 2 heads   (addr. 0, 1)   -BD-Set B
7: 3 heads   (addr. 0, 1, 2)   -BD-Set B
8: 4 heads   (addr. 0, 1, 2, 3) -BD-Set B

DIP 7 6	BD - Set A	BD - Set B
0 0	1 MBaud	100 kBaud
0 1	500 kBaud	50 kBaud
1 0	250 kBaud	20 kBaud
1 1	125 kBaud	10 kBaud

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".

2.3 Device LEDs

Power: The green LED must be illuminated. It indicates the correct voltage supply of the WCS-CG210.

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

BusState: <u>Green continuous</u>

Guarding active

<u>Green flashing</u>

No guarding active

<u>Red continuous</u>

Guarding error

<u>Red flashing</u>

CAN-bus error

State: <u>Green continuous</u>

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.

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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-CG210 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-CG210 for one minute and then automatically reset.

2.4 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	x	1	internal warning interface module

2.5 Transmission type

As per CANopen specification, the transmission type can be configured in the WCS-CG210. After switching on the device the following transmission type is preconfigured:

S5 = 0...B, E and F: asynchronous

In this mode the WCS-CG210 transmits data automatically if the data of the reading head change, however minimum every 3 ... 250 ms (can be set with rotary switch S5, see table below). This prevents the CANopen Bus being overloaded in the case of continuous changes in the WCS data. With asynchronous transmission, if there is no change in the reading head data, i.e. vehicle is stopped, no further data are transmitted. By se-

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lecting S5=E / F the data will be transmitted max. every 3 ms / 5 ms, however minimum every 50 ms / 20 ms. Thus the control receives data even when the vehicle is at a standstill.

S5 = D: cyclic synchronous

The WCS-CG210 transmits data after receiving the SYNC command. If one or two reading heads are connected PDO1 is transmitted, if more then two reading heads PDO1 and PDO2. The typical response time after SYNC is 2 ms, the maximum response time is 5 ms.

S5	min. Delay time
0	3 ms
1	5 ms
2	10 ms
3	15 ms
4	20 ms
5	30 ms
6	40 ms
7	50 ms
8	100 ms
9	150 ms
A	200 ms
B	250 ms
C	res.
D	SYNC Mode
E	5 ms / 50 ms
F	3 ms / 20 ms

2.6 Connection to control

The connection to the CANopen bus is via a 9-pole plug connector. For this a 9-pole Sub-D socket is required which is plugged into the 9-pole Sub-D plug in the device. This socket is not part of the supply of the interface module. The module ID of the CANopen address is set via the 6-pole DIP switch "Node ID" (the most significant bit of the 7-digit module ID is "0"). Node-ID "0" is not permissible.

The terminating resistor in the CANopen bus can be switched on ("On") or off ("Off") with the sliding switch "Termination".

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PIN	Designation
1	
2	CAN-L
3	CAN-GND
4	-
5	
6	
7	CAN-H
8	
9	

2.7 Data exchange in the CANopen bus

The WCS-CG210 functions as CANopen slave in the "predefined connection set". 5 objects are defined for the data of the WCS reading heads:

Object 0x2000:   1 byte - function byte for activating the reading heads

Object 0x2001:   4 bytes data from reading head address 0

Object 0x2002:   4 bytes data from reading head address 1

Object 0x2003:   4 bytes data from reading head address 2

Object 0x2004:   4 bytes data from reading head address 3

The data format of the objects 0x2001... 0x2004 is identical.

Access to the objects is via the PDO (process data object). Here,

PDO1(tx):   Objects 0x2001 and 0x2002 being transmitted

PDO2(tx):   Object 0x2003 and 0x2004 being transmitted

PDO1(rx):   Object 0x2000 being received

PD02(rx):   not assigned

2.8 Object 0x2000 - function byte for activating the reading head(s)

	Read.head							
	Address 3		Address 2		Address 1		Address 0	
Bit	7	6	5	4	3	2	1	0
	0	F0	0	F0	0	F0	0	F0

See section 4.1 to 4.3 for information on F0 function.

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2.9 Object 0x2001...0x2004 - 4 bytes data from reading head

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

The meaning of the data bits is explained in section 4.3.

If a reading head is not configured (number of reading heads connected with rotary switch S4), all four data bytes of the relevant object have the value 0x00.
The object 1011h (Restore default parameters) is not supported by the WCS-CG210.

2.10 Connection to Lenze servo frequency changer Series 9300

The number of reading heads and the baud rate range is set by the rotary switch S4 (see also section 2.2). The setting A..D is also used to select the protocol for the Lenze servo frequency changer of series 9300.

switch S4:

9: 1 head	(addr. 0)	-BD-Set A
A: 2 heads	(addr. 0, 1)	-BD-Set A
B: 3 heads	(addr. 0, 1, 2)	-BD-Set A
C: 4 heads	(addr. 0, 1, 2, 3)	-BD-Set A

Objects 0x2001...0x2003 - 4 bytes data from reading head (Lenze-specification)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word n	0	0	0	DB	ERR	OUT	A1	A0	P7	P6	P5	P4	P3	P2	P1	P0
Word n+1	P15	P14	P13	P12	P11	P10	P9	P8	0	0	0	0	0	P18	P17	P16

The meaning of the data bits is explained in section 4.3.

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3 Technical data

General specifications	
Installation	DIN rail mounting
Electrical specifications	
Operating voltage	24 V ± 20 %
Power consumption P_0	≤ 3.6 W (without reading heads)
Interface 1	
Connection of	control system
Interface type	CANopen
Transfer rate	max. 1 MBit/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	≤ 80 %
Mechanical specifications	
Connection type	Interface 1: 9-pin Sub-D connector
	Interface 2: terminal connection ≤ 2.5 mm², 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 3.1: Technical data

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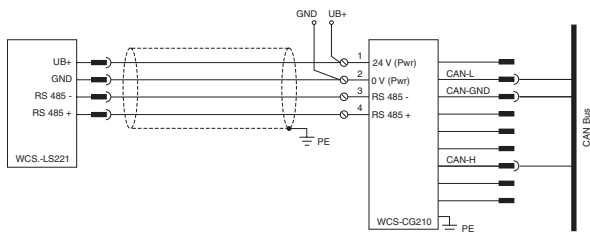*SENSING YOUR NEEDS*

3.1 Electrical connection

Fig. 3.1: Electrical connection

3.2 Dimensions

Fig. 3.2: Dimensions
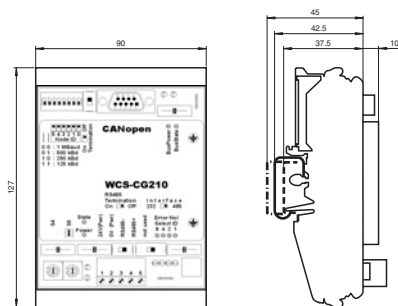
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4 Appendix

4.1 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

4.2 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.

4.3 Data from reading head

ERR	DB	OUT	Description	Optical syst. reading head
Function number for reading head F0 = 0 (Transmitting positional value)				
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	-

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

ERR	DB	OUT	Description	Optical syst. reading head
Function number for reading head F0=1 (Transmitting diagnosis result)				
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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5 Notes

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