FACTORY AUTOMATION

INSTRUCTION MANUAL

WCS-Interface Module, Ethernet

WCS-EG210

CE

PEPPERL+FUCHS
SENSING YOUR NEEDS

Part. No. 194441 / DOCT-0979 / 18.10.2006

Date of edition: 18.10.2006 Part No. 194441 Document No. DOCT-0979

Used symbols

Warning

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

Attention

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

Note

This symbol calls attention to important notes.

Security advice

Warning

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.

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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 assu rance system certified according to ISO 9001.

CE

ISO**9001**

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1 Operation

The WCS-EG210 communicates via the TCP (TCP/IP) or UPD (UDP/IP) protocol using port 2000d.

The baud rate is automatically configured to either 10 Mbit/s or 100 Mbit/s.

The rotary switch "S4" selects the data protocol.

TCP protocol

After establishing communication between the interface module and the client, the WCS-EG210 will automatically transfer WCS read head data as long as the WCS's configu-ration settings remain unchanged.

UDP protocol

It is necessary to send a single, initial request byte from a client to the WCS-EG210. After receiving this byte, the WCS-EG210 will then continuously supply updated reader data to the client.

2 Ethernet

The present developments in the field of Industrial Ethernet are based on the vision of an integrated access of all data of a company through a uniform communication system. In higher levels of enterprise communication Ethernet is the main medium of data transfers. Combined with other IT technologies it is internationally standardized. In the long run automation engineers will benefit from the rapid technological progress in the mass markets of IT and web technologies.

Ethernet technically provides a system with higher data transfer rates than common field bus systems. TCP/IP and UDP/IP do have a statistical access method to access the medium thereby prohibiting determined response times. Many developments are intensely done on additional real time mechanisms, e.g. Ethernet Powerlink, Ethernet/IP, Profinet or EtherCat. However, you can already get access times that are sufficient for many applications when using TCP/IP or UDP/IP. If you directly connect the absolute encoder to a computer via a 100 Mbit network card, you will get a cycle time of less than 2 ms. In huge networks the cycle times will depend on the utilization of the network.

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2.1 TCP/IP

Even though Ethernet and TCP/IP are often used together and sometimes used interchanged, these are three different kinds of terms and you should carefully separate them. The coherences are based on the ISO/OSI reference model after ISO/IEC 7498 that is needed to basically understand these terms.

Ethernet only describes layer 1 and 2 in this model, nevertheless the term is often used in error in engineering as description of all layers between 1 and 7.

The IP protocol of layer 3 was developed in the 70's by the US military (MIL-STD 1777). It allows a universal addressing independent of the hardware involved in heterogeneous networks. It also manages the transfer of large packets by splitting them up into smaller packets. The well-known TCP protocol (MIL-STD 1778) ensures a reliable data transfer.
Http (RFC 2068) and SMTP (MIL-STD 1781) belong to layer 7 of the OSI model and allow to transfer data and documents via web browser or to send e-mails.

2.2 UDP/IP

User Datagram Protocol is utilized to send data that does not need to be transferred in a reliable way. The UDP packet is encapsulated in an IP packet which in turn is encapsulated in a PPP packet. Both UDP and IP have checksum octets and the PPP packet has its FCS octets however this can only guarantee that the data and the destination are correct. If a packet is lost, it will not be resent using UDP, this issue is only addressed by the TCP protocol.

3 Hardware setup and Ethernet Connection

3.1 Network Topology

Using Ethernet there are different kinds of topologies possible. The connection of the encoder can be made both directly to the computer with a network card or indirectly with a switch, hub or company network, see figure below. If you use a direct connection to a computer without network components in between, you need to use a standard, "straight" network cable (not a crossover cable). You need at least a cable of category 5 to get a data

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transfer rate up to 100 Mbit. If there is a network component in the network, which does not provide Fast Ethernet, the sensor will automatically switch down to 10 Mbit.

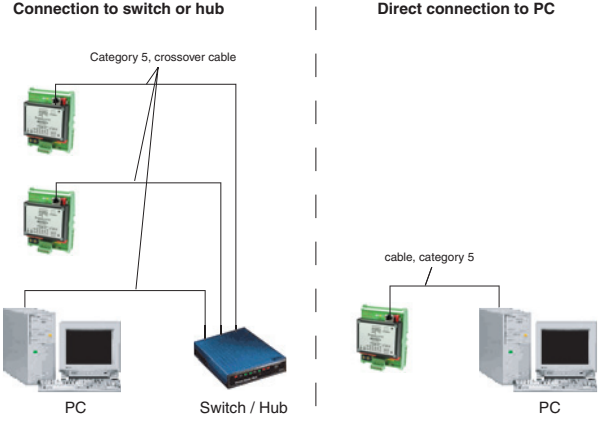

figure 3.1: Network topology

Note

For connection with PC or notebook with other network components in between, a crossover cable must be used.

Note

To achieve a data transfer rate of 100 Mbit/s, a category 5 cable must be used.
If one of the network components does not support Fast Ethernet, the encoders data transfer rate switches to 10 Mbit/s automatically.

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4 Dimensions and Mounting

Housing: 90 x 127 x 55mm (W x H x D)

Mounting method: Snap-lock to 35mm DIN track (EN 50022-35)

Environmental protection class: IP 24

Terminal		Designation	PC connection in case of configuration of the interface module
1	24 VDC (Pwr)	Operating voltage of the interface module / readin heads	
2	0 VDC (Pwr)	Ground interface module / reading heads	
3	(RX) RS 485-	Data line RS 485+ to reading head	RXD line (PC: TXD line)
4	(TX) RS 485+	Data line RS 485- to reading head	TXD line (PC: RXD line)
5	Not used		PC: Ground

Table 4.1: Terminal connection WCS-EG210

4.1 Operating voltage of interface module

The interface module supply voltage is connected to terminals #1 and #2 of the 5-pole push-lock terminal. If the supply is properly connected, the green "Power" LED will illuminate

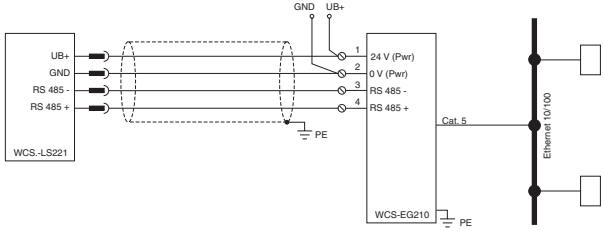

figure 4.1: electrical connection

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4.2 Reading head connection

The WCS read head's supply voltage is connected via terminals #1 and #2 of the plug con-nector (identical to the interface module supply voltage).

The read head's RS485 data lines are connected to terminals #3 and #4. The "Interface" sliding switch should always be set to position "485." If the module is at the beginning or end of the data line (with respect to the reading heads), the RS485 terminating resistor must be activated. To do so, set the sliding switch designated "RS485 Termination" to "On." If only one reading head is connected to the WCS-EG210, this switch should always be set to "On."

connection pin at reading head		terminal at interface module
WCS2A	WCS3A	
2	1	1
4	2	4
1	3	3
3	5	2

Rotary switch S4 defines the number of connected reading heads and the required Ethernet bus data protocol. S4 settings are described below:

S4	Reading Head Configuration and Protocol
0	1 reading head connected, TCP protocol
1	2 reading heads connected, TCP protocol
2	3 reading heads connected, TCP protocol
3	4 reading heads connected, TCP protocol
4	1 reading head connected, UDP protocol
5	2 reading heads connected, UDP protocol
6	3 reading heads connected, UDP protocol
7	4 reading heads connected, UDP protocol
8	See S4.0, 1 reading head connected, TCP protocol
9	See S4.0, 1 reading head connected, TCP protocol
A	See S4.0, 1 reading head connected, TCP protocol
B	See S4.0, 1 reading head connected, TCP protocol
C	See S4.0, 1 reading head connected, TCP protocol
D	See S4.0, 1 reading head connected, TCP protocol
E	See S4.0, 1 reading head connected, TCP protocol
F	See S4.0, 1 reading head connected, TCP protocol

Table 4.2: rotary switch S4

Rotary switch S5 presently unused - Set S5 to "0."

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4.3 LED indicators

Power: Green LED: Indicates proper voltage supply.

State Green continuous

Indicates active data exchange with the reading head(s). Note: The number of the reading head currently polled (1-4) is indicated via the four "Error No/Select ID" LEDs.

Red continuous

Indicates the interface module has detected an error or warning. The EG210 displays the binary coded error/warning number via the four "Error No/Select ID" LEDs.

Error No/ Select ID Error Code Description

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 data transfer from reading head
1	1	0	1	Field bus error (e.g. config. or connect error)
1	1	1	1	Internal warning interface module

Link The Ethernet controller circuit dictates this LED's status. Once illuminated, it confirms the interface module is inside an Ethernet network and is correctly receiving link pulses.

LAN 10 This LED indicates an Ethernet bus data transmission rate of 10 Mbit/sec.

LAN 100 This LED indicates an Ethernet bus data transmission rate of 100 Mbit/sec.

Collision This LED indicates a data collision in the Ethernet bus.

Duplex This LED illuminates if the Ethernet bus data transfer is full duplex.

Bus State Green continuous

A TCP/IP connection was established, and is active.

Green flashing

The interface module is waiting for a connection.

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Red/green flashing

The interface module is waiting for the initial data exchange

Red continuous

General network error

4.4 Request byte for the 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 Function

F0 = 0: Reading head sends positional data to the WCS-EG210. Default function, active after power on.

F0 = 1: Reading head sends diagnostic scan results to the WCS-EG210.

Further F0 function descriptions can be found on page 60 of the 2006 WCS manual (Pepperl+Fuchs internet product selector pages).

4.5 Interface module data format - Single reading head

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

see section 6.3 for databit description.

For each configured reading head, 4 data bytes are transmitted.

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4.6 Configuration of the WCS-EG210

For a simple configuration of the interface module, we provide the software "WCS Configuration Tool" free of charge for your download.

Download:

- Visit the Pepperl+Fuchs Homepage http://www.pepperl-fuchs.com.
- Choose your prefered language.
- Type WCS-EG210 into the search box.
- Follow the provided link to reach the product page.
- Klick the provided link to download the configuration tool (.zip file).
- Install the configuration tool on your PC/Notebook.

Configuration:

1. Switch off the interface modules power supply.
2. Adjust rotary switch S4 and S5 to position „F“ and the interface switch to position „232“.
3. Power up the interface module by a 24 V DC voltage source.
4. Connect the RS232 interface of the PC/Laptop to the interface module via the 3 clamps 3 (RX), 4 (TX) und 5 (0V).
5. Start the configuration tool.
6. Select in menue "File" *Upload*.
7. Adjust the IP-address and Subnet-Mask.
8. Select in menue "File" *Download*. After successful download the status notification "download finished" appears.

The configuration is now finished.

- Switch off the interface modules power supply.
- Adjust the interface switch to position „485“.
- Adjust the rotary switch S5 in pos. „0“ and switch S4 according to the wished function/protocol (see table 4.2 at page 8).

After next power up, the interface module operates in the wished operation mode.

Hinweis

The switch settings are only evaluated when switching on the interface module. Changes of the switch settings don’t affect until the next switching on.

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5 Technical Data

General specifications	
Installation	DIN rail mounting
Electrical specifications	
Operating voltage	24 V ± 10 %
Power consumption P_0	≤ 3.6 W (without reading heads)
Interface 1	
Connection of	control system
Interface type	Ethernet
Protocol	TCP/IP and UDP/IP
Transfer rate	10 MBit/s or 100 MBit/s
Data output format	binary code
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
RS485 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: RJ 45 socket, 8-pin Interface 2: terminal connection ≤ 2.5 mm^2 , 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

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5.1 Electrical connection

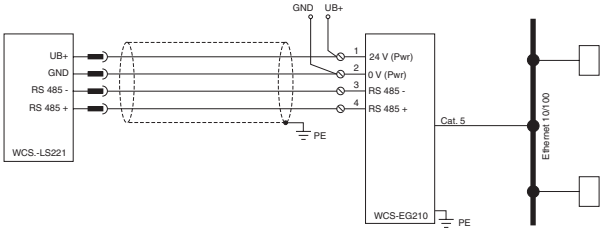

figure 5.1: electrical connection

5.2 Dimensions

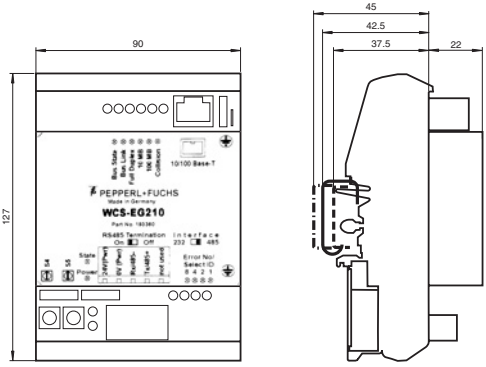

figure 5.2: Dimensions

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6 Appendix

6.1 Activation of reading head

A0, A1	A1	A0	Reading head address
	0	0	Reading head address 0
	0	1	Reading head address1
	1	0	Reading head address 2
	1	1	Reading head address 3
F0	F0		Function number for reading head
	0		transmitting position value
	1		transmitting diagnosis result

6.2 Diagnosis function F0=1

The reading head can be requested to perform a diagnosis of the opto-electronics by means of the request byte. The reading head must be outside the code rail. On the new generation reading head types (WCS2A, WCS3A), 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 position value)				
ERR	DB	OUT	Description	Reading head optics condition
0	0	0	current position value in P00...P18, binary coded	good
0	0	1	Reading hood is out of the code rail, no position value	good
			P0...P18 = 0 -> reading head is partially out of the code rail	
			P0 = 1, P2...P18 = 0 -> reading head is completely out of the code rail	
0	1	0	current position value in P00...P18, binary coded	bad
0	1	1	Reading hood is out of the code rail, no position value	bad
1	x	x	no position 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.

Function number for reading head F0 = 1 (transmitting diagnosis result)				
ERR	DB	OUT	Description	reading head optics condition
0	1	0	invalid diagnosis, reading head not out of the 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 number in P00...P04 binary coded	-

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7 Notes

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