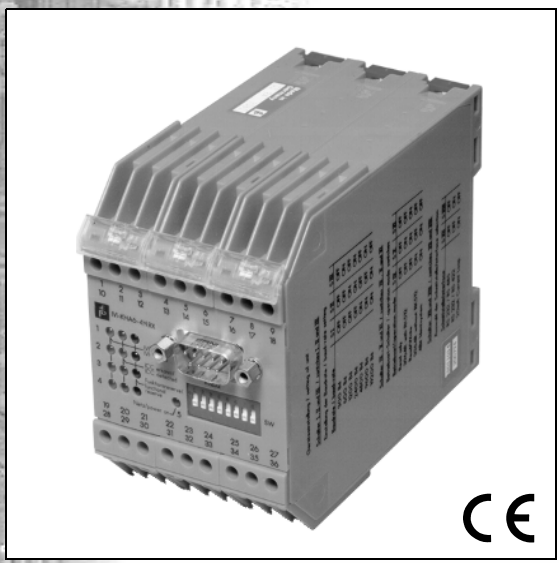
FACTORY AUTOMATION

MANUAL

IVI-KHA6-4HRX, IVI-KHD2-4HRX

CONTROL INTERFACE UNIT FOR

4 READ/WRITE HEADS



PEPPERL+FUCHS

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, as published by
the Central Association of the 'Elektrotechnik und Elektroindustrie (ZVEI) e.V.',
including the supplementary clause "Extended reservation of title"

We at Pepperl+Fuchs recognise a duty to make a contribution to the future.
For this reason, this printed matter is produced on paper bleached without the use of chlorine.

Table of contents

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

1 Declaration of conformity

The Control interfaces IVI-KHA6-4HRX and IVI-KHD2-4HRX have been developed and produced in accordance with the applicable European standards and directives.

Note

A corresponding declaration of conformity can be requested from the manufacturer.

The manufacturer of the product, Pepperl+Fuchs GmbH in D-68301 Mannheim, possesses a certified quality assurance system in accordance with ISO 9001.

CE

ISO**9001**

Date of issue 27.08.2001

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

2 General information

Warning

This symbol warns the user of possible danger. Failure to heed this warning can lead to personal injury or death and/or damage to equipment.

Attention

This symbol warns the user of a possible failure. Failure to heed this warning can lead to total failure of the equipment or any other connected equipment.

Note

This symbol gives the user important hints.

Date of issue 27.08.2001

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

3 Safety

3.1 Intended Use

The control interface units IVI-KHA6-4HRX/IVI-KHD2-4HRX serve as part of the inductive identification system IDENT-I from Pepperl+Fuchs to connect to a high order computer (PLC, PC) with the PROFIBUS-DP interface (DIN 19245 T1 + T2, EN 50170).The control interface units are only to be used with the read/write heads and the code/data carriers from Pepperl+Fuchs.

The protection of operating personnel and the system against possible danger is not guaranteed if the control interface unit is not operated in accordance with its intended use.

Warning *The devices IVI-KHA6-4HRX/IVI-KHD2-4HRX may only be operated by appropriately qualified personnel in accordance with this operating manual.*

3.2 General safety information

Safety and correct functioning of the device cannot be guaranteed if any operation other than that described in this operating manual is performed.

Warning *The connection of the equipment and any maintenance work to be carried out with voltage applied to the equipment must only be performed by appropriately qualified electro-technical personnel.*

In the case that a failure cannot be repaired, the device must be taken out of operation and protected against inadvertently being put back into operation.

Repair work may only be carried out by the manufacturer. Additions or modifications to the equipment are not allowed and void the warranty. The responsibility for the observance to local safety standards lies with the operator.

3.3 Functional safety/monitoring

The control interface units IVI-KHA6-4HRX/IVI-KHD2-4HRX operate on a microprocessor basis. Functional disturbances and equipment errors/faults are signalled with the LED "Run/Error" on the front of the device.

In addition function control via the PROFIBUS is possible by interrogating the diagnosis/status information. Device failure or breakdown of a read/write head can be detected and indicated by the master unit.

Date of issue 27.08.2001

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

4 Basic operating modes

This control interface unit can be configured to operate either as a fixed code control interface unit or as a read/write control interface unit. The operating mode is selected by means of DIP switches S4, S5 and S6, located on the top of the unit.

Basic operation mode	S4	S5	S6
Fixed Code	open	open	open
Read/write	open	close	close
3964R with RK512 Interpreter	open	close	open
3964R without RK512 Interpreter	close	open	open

When configured in fixed-code mode, this interface unit is software compatible with the IRI-KHA6-4HRX and IRI-KHD2-4HRX control interface unit units.

By some kind of switches, the description of the switch-setting "open" corresponds with "OFF" or "0". The switch-setting "close" corresponds with "ON" or "1".

Switch settings which have not been defined should not be used.

Date of issue 27.08.2001

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

5 Serial interface/DIP switches

The RS 232 serial interface is connected via the built-in 9-pin sub-D-connector. Alternatively, RS 422, RS 485 or 20 mA interfaces can be connected via the terminals.

The interface standard is selected by setting DIP switches S7 and S8.

Standard	S7	S8
RS 232 / RS 485	open	open
RS 232 / RS 422	open	close
20 mA-current loop	close	open

Since the control interface unit incorporates only one serial interface, which operates with different drivers and receivers for the various standards, only one standard interface may be connected at any one time.

The transmission speed (baud rate) is set with DIP switches S1, S2 and S3 as follows:

Baud-rate	S1	S2	S3
300 Bd	open	open	open
600 Bd	open	open	close
1 200 Bd	open	close	open
2 400 Bd	open	close	close
4 800 Bd	close	open	open
9 600 Bd	close	open	close
19 200 Bd	close	close	open
not defined	close	close	close

Data is transmitted using one start bit, 8 data bits, one stop bit and no parity bit. The control interface unit also responds to one-and-a-half and two stop bits.

In the basic fixed-code operating mode, the following data formats are possible:

8 data bits, no parity

7 data bits, even parity

7 data bits, odd parity

To set these transmission formats, the command RST (in upper or lower case, but not in combination) must be sent to the control interface unit immediately after power on. The control interface unit adjusts automatically to the required format.

In binary mode, the number of data bits to be transmitted is always 8. If 7 data bits are set, the control interface unit will return the error message “M5” in response to the command “SB”.

Date of issue 27.08.2001

Copyright Pepperl+Fuchs, Printed in Germany

5.1 RS 232 Interface

The RS 232 interface connections are routed to the 9-pin sub-D-connector as follows:

Data signal input	RxD	Pin 2
Data signal output	TxD	Pin 3
Clear to send input	CTS	Pin 8
Request to send output	RTS	Pin 7
Ground	GND	Pin 5

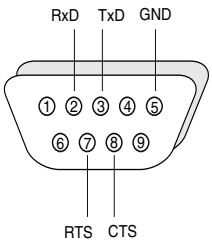


Bild 5.1: 9-pin Sub-D-connector with pin connection

The cable for connection to a PC should be as follows:

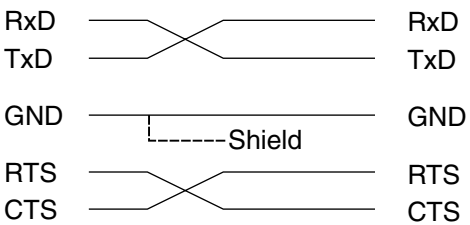


Bild 5.2: Connection cables PC

The RTS and CTS connections could be unused.

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

5.2 RS 422 and RS 485 interfaces

With these two standards, the data signal is defined as the voltage differential between two conductors. Since possible interferences have the same effect on both conductors, provided a tightly twisted pair is used, a more secure data transmission is obtained than with the RS 232 interface, particularly at high transmission rates.

The RS 422 standard provides a symmetrical four-wire connection that is insensitive to interference. The transmit and receive lines are separate, so that full duplex operation is possible.

With the RS 485 standard, the transmit and receive lines are coupled, permitting half-duplex operation only. The transmitter is disabled to allow the receipt of data. The ability of multi-point connections is not implemented in the control interface unit.

Connection details are shown in the diagram on page 3. Terminals 15 to 18 should be used for the RS 422. For the RS 485, Terminals 17 and 18 should be connected.

5.3 20 mA current loop or TTY interface

The TTY interface was originally designed for teletype control. Two pairs of conductors are used, one to send, and one to receive data.The data can be transferred in full duplex mode, which is not supported by the control interface unit. Current loop transmission is very resistant to interference and therefore offers secure data transmission, even where long lengths of cable are used.

The current loop connections of the control interface unit are galvanically isolated by opto-couplers. The control interface unit represents the passive side of the transmission, i.e. the current and voltage required for transmission must be provided at the other end.

5.4 Connection cables

The maximum cable length between the control interface unit and the host computer will vary according to the data transmission speed, the interface standard and the level of interference. For this reason it is only possible to give approximate values:

Standard	Max. cable length
RS 232	15 m
RS 422	1000 m
RS 485	1000 m
20 mA current loop	1000 m

A screened twisted twin-core cable with a minimum wire cross-section of 0.14 mm^2 should be used for the connection.

The screen of the read head lead is connected on both sides to earth (PE) with low resistence and low induction. For that the attached terminal block can be used (see figure 5.3). Please make sure that the screen is kept as small as possible.

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

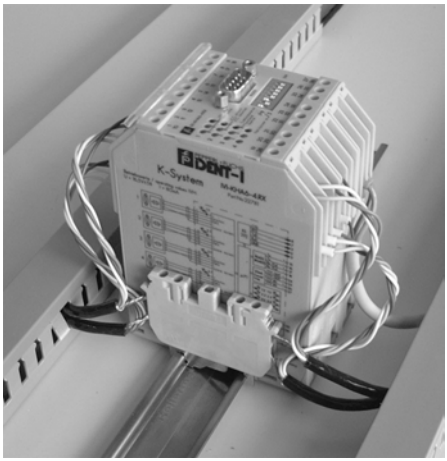


Bild 5.3: Terminal block with connecting cables

Read head cable lengths up to 50 m or 100 m are possible if the following conditions are satisfied:

up to 50 m read head cable:	cross sectional area of at least 4 x 0.25 mm^2 maximum resistance 78 Ohm/km maximum capacitance 90 pF/m (e.g. LIYC11C, Mukkenhaut & Nusselt MUNFLEX C11Y)
up to 100 m read head cable:	cross sectional area of at least 4 x 0.5 mm^2 maximum resistance 37 Ohm/km maximum capacitance 90 pF/m

Attention

With a cable length of 100 m, a series resistor of 82 Ohm must be fitted in the cable connected to the 'Reset' terminal of the control interface unit.

Since more EM interference can result with longer cable lengths, the maximum cable lengths given above might not be possible for some applications.

Note

If leads with double shielding are used, e.g. metallic wire mesh and metallic foil, they must be connected to each other using a low impedance connection at one end of the cable.

Many noise impulses come from the supply cables, e.g. switch-on current of a motor. For this reason, running the supply cables in parallel with the data/signal cables, especially in the same cable duct, should be avoided.

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

6 Commands

Commands are used for serial communication with the control interface unit.

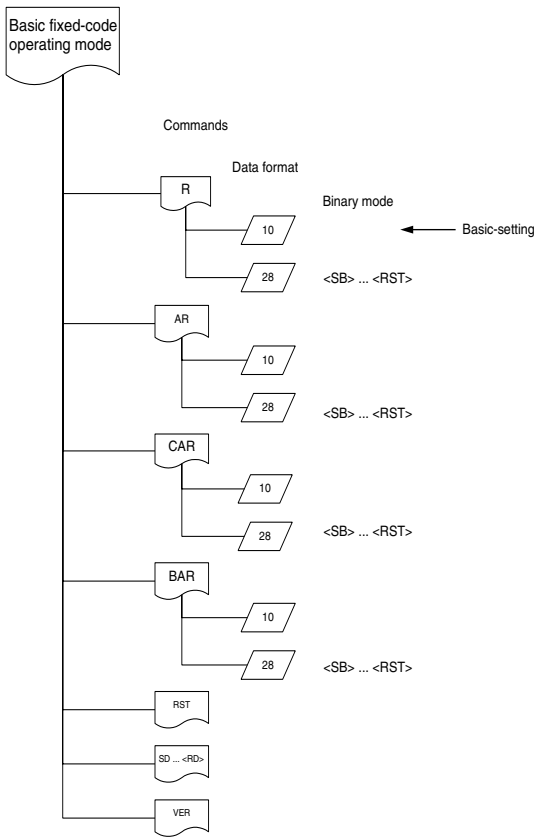
The valid commands are determined by the selected basic operating mode.

6.1 Commands in the basic fixed code operating mode

All IRI-KHD2-4HRX commands are implemented in this mode.

The commands consist of a number of ASCII characters, comprising the mode, read-head number and data format. The read-head number and the data format can be omitted, in which case, either the previously set values or, after power-on, the basic settings are valid. A comma must be inserted between the read-head number and the data format. All commands are terminated with a carriage return (<CR>) and line feed (<LF>), one of which may be omitted. The commands may be entered in either upper or lower case.

6.1.1 Command overview



Date of issue 27.08.2001

6.1.2 Command structure

Cmd<HdNo><,DF>

Cmd: Command mode

HdNo: Read-head number (optional)

DF: Data format (optional)

The inputs <HdNo> and <DF> are optional. If these parameters are not entered, the last valid setting will be used.

6.1.3 Command description

Command	Description
R	**Read mode** The read head reads the code once. The control interface unit transmits the code or transmits an error message if it is unable to read a code carrier.
AR	**Autoread mode** The read head reads continuously until a code carrier is available. The code is then output. This mode can be cancelled by entering a new command.
CAR	**Continuous Autoread mode** This mode corresponds to the AR mode. The code carrier is read and the code is output. The command then remains active, i.e. the code carrier is read again and the code transmitted etc.
BAR	**Buffered Autoread mode** In Continuous Autoread mode, a code carrier in front of a read head is continuously read and its code is transmitted. Since all these codes have to be processed by the higher-level control system, this can lead to an overload. A solution is provided by use of the command BAR, which causes a code to be transmitted once only. Only when a new code is identified or when the system repeatedly fails to read a code, will a further code be transmitted.

Note

Note that in a high-interference environment, a code may be transmitted a number of times, since it may be temporarily unrecognizable due to interference and then transmitted again as a new code.

The command mode is followed by the number of the read head (1, 2, 3, or 4). If an X is transmitted instead of the read head number, all connected read heads are interrogated in succession. The code is read and transmitted followed by the number of the read head (R mode). In AR mode, reading continues until a code carrier can be read. In CAR mode, all the connected read heads read continuously until a new command is entered.

After power-on, read head 1 is selected. If no read head number is specified, the previously selected head remains valid. Selecting read head 0 disables all read heads. This is useful when energy consumption needs to be kept to the minimum.

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

There are also system commands, used to input control statements to the system, such as restart, switch to binary mode, or output the software version number. The system commands are executed in both normal and binary modes. In the case of the system commands, no additional parameters are required.

Command	Description
RST	**Restart** This command cancels all previously programmed commands and resets the control interface unit to the basic settings, i.e. with no active read command and using data format 10. The control interface unit recognizes the parity setting on the received characters R, S, and T and adapts accordingly. Since this command enables the control interface unit to identify the parameters for serial transmission, the command must be entered either all in upper case or all in lower case.
SB	**Set binary mode** All the data read is transmitted one byte at a time, one byte consisting of 8 data bits. This format is possible only if the serial interface is set to transmit 8 data bits per byte, and should be used when transmission speed is a priority. The command “SB” is valid only if data format 28 has previously been set via a read command. The RST command is used to exit the binary mode.
SD	**Set double sided mode** In this mode, code carriers ICC-50 and ICC-50F are read from the back, i.e. the side away from that carrying the code. With these code carriers, the same read distance may be achieved on either side. Note that in the worst case, the read time may be doubled. The double sided mode can be cancelled by transmitting the command RST.
VER	**Version number** This command is used to request output of the software version number.

6.1.4 Data formats for the basic fixed code operating mode

For each command, it is possible to specify the data format in which the codes, when read, are to be transmitted via the serial interface. If the data format is not specified, the previously selected format will be used. If it is specified, it must be preceded by a comma to distinguish it from the read head number. When the system is switched on, data format 10 is set, and the data output is in ASCII character format. Binary representation can be selected with the command SB.

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

Data format	Description
10	This format is active when the control interface unit is switched on and after transmission of a reset command (RST). The 64 bits of a code carrier are read, but only 28 bits of data are output. The read head number is not output. The first 12 bits are transmitted in hexadecimal notation and the next 16 bits in decimal. All information is transmitted in ASCII format: binary mode is not permissible. If binary mode is selected, an error message is output.
28	The 64 bits of a code carrier are read, but only 28 bits of data are output as a decimal number. There is no decimal conversion in binary mode. The code is preceded by the number of the read head, followed by a space.

In the basic setting, all data is output in the form of ASCII characters. Depending on the data format, this is either a decimal number or in hexadecimal form. In binary mode, all data is transferred without conversion into ASCII characters. The distinction between decimal and hexadecimal numbers does not apply. Binary mode is not permissible in data format 10, the basic setting. The code is always sent in the form of ASCII characters.

In **Data Format 10** the first 12 bits (A01h = 1010 0000 0001b) are transmitted as a hexadecimal number. The next 16 bits (1C3Eh = 0001 1100 0011 1110b) are converted into a decimal number (1C3Eh =7230d). The code is NOT preceded by a read head number. Therefore, the use of "X" as the read head number is only of use when only one read head is connected. Thus, in this example, the following character string is transmitted:

ASCII	A	0	1	7	2	3	0	<CR>	<LF>
Hex	41	30	31	37	32	33	30	0D	0A
Dez	65	48	49	55	50	51	48	13	10

There is no provision for the **binary mode** in data format 10.

In **Data Format 28**, the first 12 bits (A01h = 1010 0000 0001b) and the next 16 bits (1C3Eh = 0001 1100 0011 1110b) are converted separately into decimal numbers (A01h = 2561d and 1C3Eh =7230d). The code is preceded by the read head number, followed by a space. The character string transmitted is as follows:

ASCII	3		2	5	6	1	7	2	3	0	<CR>	<LF>
Hex	33	20	32	35	36	31	37	32	33	30	0D	0A
Dez	51	32	50	53	54	49	55	50	51	48	13	10

Read head number

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

In **binary mode** there is no decimal conversion. The read-head number is transferred in bits 4 and 5 of the first byte. The two most significant bits, 6 and 7 are set to 0.

Bit	7	6	5	4	3	2	1	0	
	0	0	0	0	x	x	x	x	Read head 1
	0	0	0	1	x	x	x	x	Read head 2
	0	0	1	0	x	x	x	x	Read head 3
	0	0	1	1	x	x	x	x	Read head 4

x x x x contains the first 4 bits of the code.

The following byte sequence is output:

Hex	2A	01	1C	3E
Dez	42	1	28	62

Read head number

To save time, no <CR> <LF> is sent.

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

6.1.5 Error messages in basic fixed code operating mode

Error messages are transmitted via the serial interface in response to certain events. These messages take the form of a letter and error number representing the type of error. The messages are identical in normal and binary modes. Each error message is terminated with <CR><LF>.

Error messages in data format 10:

Error message	Description
E0	The read head to be interrogated is not connected or not ready
E1	Hardware error in control interface unit
E2	No code carrier or data carrier in position, or data transfer is not possible
E3	Unable to read code carrier or data carrier
M5	Binary mode cannot be used in the selected data format
M9	Unable to communicate with read head
E9	Unable to understand the command received, or parity error or check sum error in the serial communication

Error messages in data format 28:

Error message	Description
M0	Hardware error in control interface unit, Watchdog Reset
M1	Memory error in control interface unit after RAM test
M2	Memory error in control interface unit after ROM test
M3	Received command has not been understood
M4	Parity error in the serial communication or check sum error
M5	Binary mode is not permissible in the selected data format
M6	The interrogated read head is not connected or not ready
M7	No code carrier or data carrier is available, or the transfer of data is not possible
M8	Parity error during data transmission with code carrier or data carrier
M9	Read head cannot be interrogated

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

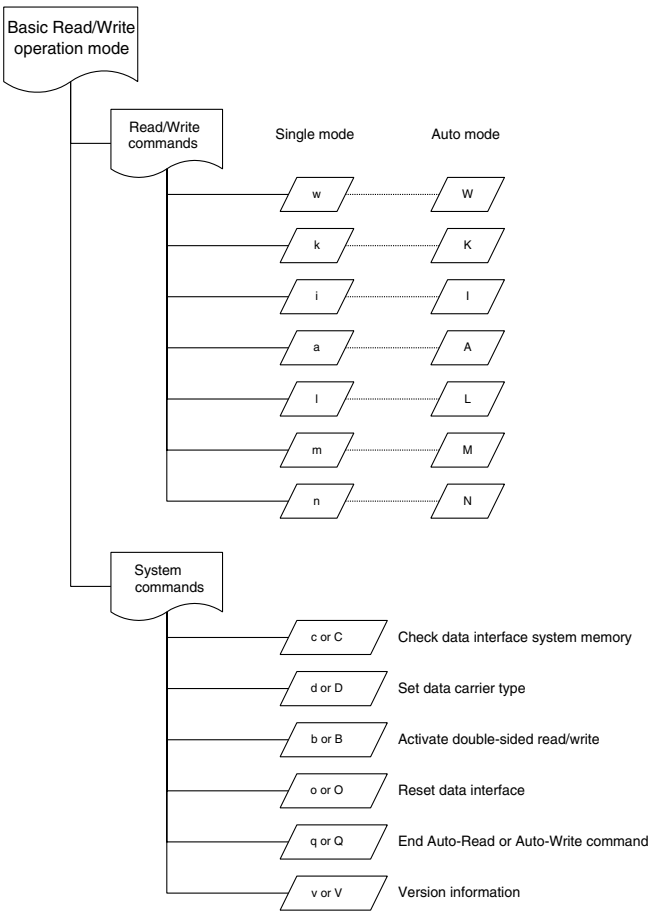
6.2 Commands in basic read/write operating mode

The commands can be divided into read/write commands and system commands. The read/write commands allow access to the data storage area to which the user has access. The syntax for these commands depends on the type of data carrier selected. All steps can only be implemented with read/write heads.

All control instructions to the system are defined as system commands.

These commands are introduced by one character, the command header, which may be followed by various parameters. All ASCII values for these characters are added in a check sum. The check sum comprises one byte only. Any carry-over is truncated. After the check sum, an ETX character (End of Text) is transmitted, indicating the end of the command.

6.2.1 Command overview



Date of issue 27.08.2001

6.2.2 Command structure

Read/write commands have a "Single" mode corresponding to the "Read" mode in the fixed code system, and an "Auto" mode, corresponding to the "Auto-Read" mode in the fixed code system. The distinction between these modes is made not by another command, but by the use of upper or lower case text in the command header.

When "x" or "X" is transmitted as the read head number in a command, the command will apply to all the connected read heads. In the case of 'Read' commands, all connected heads are interrogated, and the data from all detected data carriers will be transmitted. To enable the data received to be linked with the relevant head, the head number is inserted in each reply string after the status message. If more than one data carrier is detected in a read cycle, a separate reply string, terminated with the ETX character, will be transmitted for each code that is read.

Example:

Command:	a <HdNo><CHCK><ETX>
Response, read head No. (HdNo) 1 ... 4:	a <Status><DB><CHCK><ETX>
Response, read head No. (HdNo) x:	a<Status><HdNoA><DB><CHCK><ETX>

In the case of 'Write' commands, the data is written to the first data carrier detected. The head number of the corresponding head is transmitted between the status message and the check sum.

Example:

Command:	<HdNo><StAdrH><BytesH><DB><CHCK><ETX>
Response, read head No. (HdNo) 1 ... 4:	K <Status><CHCK><ETX>
Response, read head No. (HdNo) x:	K <Status><HdNoA><CHCK><ETX>

Key to abbreviations:

HdNo Head number (0 ... 4, x or X), 1 ASCII character. Entering 0 disables all heads. Entering "x" as the number will cause all heads to be interrogated in rotation.

HdNoA Head number (1 ... 4) in the reply to an "X" command, 1 ASCII character.

DT Data carrier type (1, 3, or 4), 1 ASCII character. See chapt.6.2.4

PNo Page number, 3 ASCII characters; page numbering for:

IDC - ... -1K:	(000 ... 003)	4 pages of 256 bits each
IMC-40-64K:	(000 ... 0FF)	256 pages of 256 bits each
IMC-40-256K:	(000 ... 3FF)	1024 pages of 256 bits each

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

StAdrH Start address. Address of the first relevant byte in read/write mode. The syntax and length of this command differs according to the type of data carrier. Addressing is carried out byte by byte.

IDC- ...	(00 ... 1F)	2 ASCII characters
IDC- ... -1K:	(00 ... 7F)	2 ASCII characters
IMC-40-64K:	(0000 ... 1FFF)	4 ASCII characters
IMC-40-256K:	(0000 ... 7FFF)	4 ASCII characters

BytesH Number of corresponding bytes in read/write mode in hexadecimal notation, 2 ASCII characters
(01 ... 20-StAdrHr) for IDC- ... (Max. 32 bytes)
(01 ... 80-StAdrH) for IDC- ... -1K and IMC-40- ... (Max. 128 bytes).

DB Binary representation of data. The number of characters transmitted depends on the command.

32DB 32 data bytes in binary format.

CHCK Check sum for the data transmission (binary, 1 byte). The sum of all transmitted characters ignoring any carry-over.

Status Status or error message in read/write mode, 2 ASCII characters space (ASCII characters 32d).

ETX End of Text (ASCII character 03h)

6.2.3 Command description: read/write commands

Read 32 bytes from address 0, Single mode

Command:	a <HdNo><CHCK><ETX>
Response:	a <Status><DB><CHCK><ETX>
Example:	Read all data in slave mode with read head 2: Command: a 2 93h 03h

Read 32 bytes from address 0, Auto mode

Command:	A <HdNo><CHCK><ETX>
Response:	A <Status><DB><CHCK><ETX>
Example:	Read all data in auto mode with read head 1: Command: A 1 72h 03h

Read bytes, Single mode

Command:	w <HdNo><StAdrH><BytesH><CHCK><ETX>
Response:	w <Status><DB><CHCK><ETX>

Date of issue 27.08.2001

Read bytes, Auto mode

Command:	W <HdNo><StAdrH><BytesH><CHCK><ETX>
Response:	W <Status><DB><CHCK><ETX>
Example:	Read bytes 7 to 11 in auto mode with read head 1: Command: W 1 07 05 54h 03h

Write bytes, Single mode

Command:	k <HdNo><StAdrH><BytesH><DB><CHCK><ETX>
Response:	k <Status><CHCK><ETX>

Write bytes, Auto mode

Command:	K <HdNo><StAdrH><BytesH><DB><CHCK><ETX>
Response:	K <Status><CHCK><ETX>
Example:	Write "P+F" to data carrier, at start-address 10, in auto mode with read head 2: Command: K 2 0A 03 50h 2Bh 46h 12h 03h

Read code carrier, Single mode

Command:	i <HdNo><CHCK><ETX>
Response:	i <Status><DB><CHCK><ETX>

Read code carrier, Auto mode

Command:	I <HdNo><CHCK><ETX>
Response:	I <Status><DB><CHCK><ETX>
Example:	Read all data in auto mode with read head 1: Command: I 1 7Ah 03h

Reset IDC, Single mode

This command applies to IDC- ... and IDC- ... -1K data carriers

Actions:

both IDCs:	Deletes all word-attribute bits.
IDC- ... only:	Writes "AAAB" for data words 0-E, and "AAAA" for data word F.
Command:	h <HdNo><CHCK><ETX>
Response:	h <Satus><CHCK><ETX>

Reset IDC, Auto mode

Command:	H <HdNo><CHCK><ETX>
Response:	H <Status><CHCK><ETX>
Example:	With read head 1 near the data carrier, use "Reset IDC" in auto mode: Command: H 1 79h 03h

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

The following commands apply to the IMC-40- ... and IDC- ... -1K data carriers:

Read page, Single mode

Command:	l <HdNo><PNr><CHCK><ETX>
Response:	l <Status><32DB><CHCK><ETX>

Read page, Auto mode

Command:	L <HdNo><PNr><CHCK><ETX>
Response:	L <Status><32DB><CHCK><ETX>
Example:	Page 7 is to be read in auto mode with read head 2: Command: L 2 007 15h 03h

The following commands apply only to the IMC-40- ... data carriers:

Write page, Single mode

Command:	m <HdNo><PNr><32DB><CHCK><ETX>
Response:	m <Status><CHCK><ETX>

Since a complete page is written, the <DB> field must comprise 32 bytes.

Write page, Auto mode

Command:	M <HdNo><PNr><32DB><CHCK><ETX>
Response:	M <Status><CHCK><ETX>
Example:	Zeros are to be written on page 7, in auto mode, using read head 2. Command: M 2 007 00h ... (32 times) ... 00h 15h 03h

6.2.4 Description of System Commands:

The command header (the first character of the command) may be either upper or lower case.

Set data carrier type

This command is used to indicate the type of data carrier with which the control interface unit is to communicate. The default setting is the IDC- ... -1K data carrier.

Command:	d <DT><CHCK><ETX>
Response:	d <CHCK><ETX>

<DT>	Data carriers
1	IDC- ...
2	reserved
3	IMC-40- ...
4	IDC- ... -1K

Example: Set data carrier type IMC-40 - ... : Command: d 3 97h 03h

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

Test control interface unit memory

Entering this command initiates a check of the external RAM and EPROM.

Command:	c <CHCK><ETX>
Response:	c <Status><CHCK><ETX>
Example:	Command: c 63h 03h

Quit

This command can be used to cancel a command in Auto mode.

Command:	q <CHCK><ETX>
Response:	q <CHCK><ETX>
Example:	Cancel command for both read-heads: Command: Q 51h 03h

Enable double-sided Read mode

This is for applications where a data carrier is to be read not only from the front but also from the back. This applies only to data carriers which are not designed for flush-mounting in steel. The command results in an attempt to read from or write to the front of the data carrier. If this fails, the read/write operation is repeated from the other side.

This function is disabled by the Restart command (o).

Command:	b <CHCK><ETX>
Response:	b <CHCK><ETX>
Example:	Command: B 42h 03h

Restart

This command re-initializes the control interface unit, taking account of the DIP switch settings. The command disables the double-sided read mode and cancels all auto mode commands. The default data carrier type is the IDC- ... -1K data carrier.

Command:	o <CHCK><ETX>
Response:	o <CHCK><ETX>

Check sum calculation

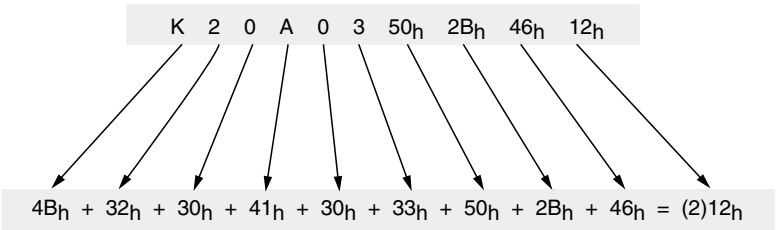
Calculate the check sum as follows:

1. Add together all values within the command which precede the check sum position.
2. If the sum is greater than FF (hex.), then the check sum will comprise only the last two (hex.) digits.

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

Example: Write "P+F" to the data carrier at start address 10, in auto mode and using read head No. 2:



Complete command: K 2 0A 03 50h 2Bh 46h 12h 03h

If the hex sum is, e.g.: 72h,
then the check sum is: 72h.

If, as above, the hex sum is: 212h,
this gives a check sum of: 12h.

Date of issue 27.08.2001

Copyright Pepperl+Fuchs, Printed in Germany

6.2.5 Software example in Basic (GW-Basic, Q-Basic)

Sample program for the commands "Read bytes" and "Write bytes":

```
10        REM Example of programm for Ident-I System V
20        OPEN "com1: 9600, n,8,1,DS,CD,LF" FOR RANDOM AS #1
30        ETX$ = CHR$(3) 'ASCII-Zeichen "End of Text"
40        PRINT "Read 32 bytes in Single mode"
50        CMND$ = "w10020"
60        GOSUB 1000
70        CMND$ = CMND$+CHECKSUM$+ETX$
80        PRINT "Command:";CMND$
90        PRINT #1,CMND$;
100       RESPONSE$=INPUT$(37, #1)
110       PRINT "Response:";RESPONSE$
120       PRINT
130       PRINT "Write bytes in Single mode"
140       INPUT "Enter the text (Press Enter to cancel):", PROGSTRG$
150       IF LEN(PROGSTRG$) = 0 THEN END
160       IF LEN(PROGSTRG$) > 32 THEN PROGSTRG$ = LEFT$(PROGSTRG$, 32)
170       NOOFBYTES$ = RIGHT$ ("0" + HEX$(LEN(PROGSTRG$)), 2)
180       CMND$ = "k100" + NOOFBYTES$ + PROGSTRG$
190       GOSUB 1000
200       CMND$ = CMND$ + CHECKSUM$ + ETX$
210       PRINT "Command:"; CMND$
220       PRINT #1; CMND$;
230       RESPONSE$=INPUT$(5, #1)
240       PRINT "Response: "; RESPONSE$
250       PRINT
260       GOTO 40
1000      REM Checksum calculation
1010      DUMMY = 0
1020      FOR I = 1 TO LEN(CMND$)
1030      DUMMY = DUMMY + ASC(MID$(CMND$, I, 1))
1040      NEXT I
1050      CHECKSUM$ = CHR$(DUMMY MOD 256)
1060      RETURN
```

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

6.2.6 Error messages in basic read/write operating mode

The status word consists of 2 bytes which follow the command header in the response. If there is no error, 00 will be transmitted. A status word other than 00 indicates that one of the error conditions described below has occurred.

Error messages / Status:

Hex-Value	Description
00	No error
01	Command not defined
02	Read head not connected or not ready
03	No code carrier or data carrier connected, or unable to transmit data.
04	Write error
05	EPROM error
06	Check sum error (serial interface)
07	RAM error
08	Check sum error (data carrier)
09	Address or data volume outside admissible range
0A	Unable to communicate with read/write head
0B	Watchdog reset
0C	Echo error in inductive transmission
0D	This function not available with the selected data carrier type
0E	The connected read/write head is not suitable for this control interface unit
0F	Synchronisation error in control interface unit
10	Battery low (applies to battery-operated data carriers only) but command was executed correctly.
11	Acknowledgment error in transmission to data carrier

Date of issue 27.08.2001

Copyright Pepperl+Fuchs, Printed in Germany

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

7 Technical data

7.1 General specifications

The interface unit carries out the processing of information to and from the read/write heads (programming, reading, error detection). It also receives commands via the serial interface of the host computer or control system, processes the commands and returns responses by the same route. The interface unit is accommodated in a 60 mm wide terminal housing, to which up to four read/write heads may be connected. The terminal layout is as shown in the connection diagram above.

This control interface unit may only be used with read/write heads whose type codes begin with IVH.

The front panel incorporates one green LED for the power supply (power on) and three further LEDs for each of the read/write heads. Of these, the green LEDs indicate whether the associated read/write head is switched on (IVH active). On successful completion of a write or read operation, a yellow LED lights up briefly (IDC detected). The red LEDs are reserved for future functions and are not relevant at present.

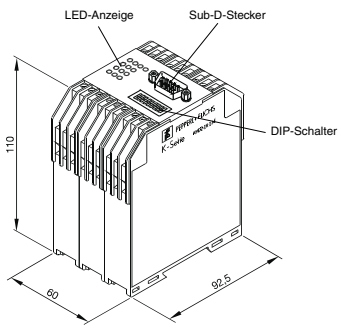


Bild 7.1: External view of the interface unit IVI-KHD2-4HRX/IVI-KHA6-4HRX

Date of issue 27.08.2001

Copyright Pepperl+Fuchs, Printed in Germany

7.2 Connection diagram and terminal assignments

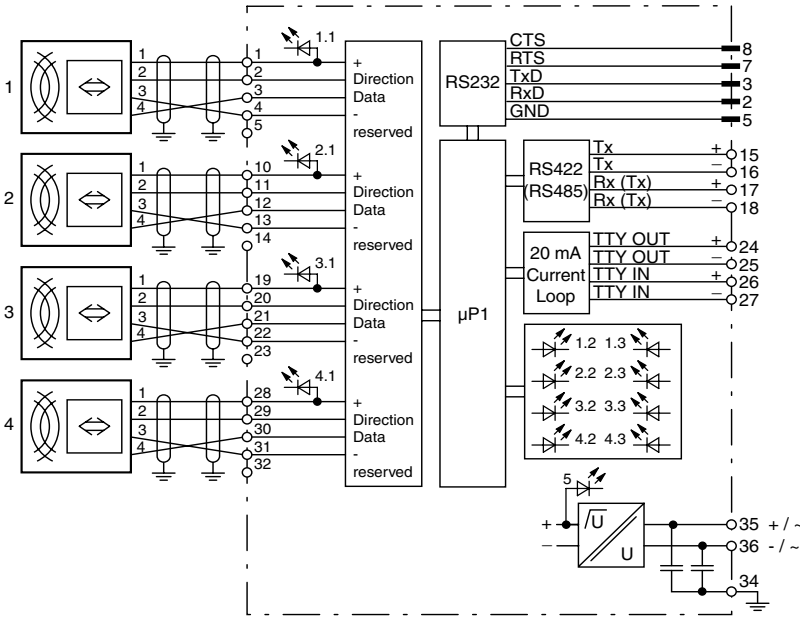


Bild 7.2: Connection diagram for the control interface unit IVI-KHD2-4HRX/IVI-KHA6-4HRX

List of terminal assignments

Terminal	Function
1	supply voltage read/write head 1 (plus)
2	„direction“ read/write head 1
3	„data“ read/write head 1
4	supply voltage read/write head 1 (minus)
5	reserved
6	PROFIBUS RxD/TxD-P
7	reserved
8	reserved
9	reserved
10	reserved
11	reserved
12	reserved
13	supply voltage read/write head 2 (plus)
14	„direction“ read/write head 2
15	„data“ read/write head 2
16	supply voltage read/write head 2 (minus)

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

Terminal	Function
17	reserved
18	PROFIBUS RxD/TxD-N
19	reserved
20	reserved
21	reserved
22	reserved
23	reserved
24	reserved
25	supply voltage read/write head 3 (plus)
26	„direction“ read/write head 3
27	„data“ read/write head 3
28	supply voltage read/write head 3 (minus)
29	reserved
30	reserved
31	reserved
32	reserved
33	reserved
34	reserved
35	reserved
36	reserved
37	supply voltage read/write head 4 (plus)
38	„direction“ read/write head 4
39	„data“ read/write head 4
40	supply voltage read/write head 4 (minus)
41	reserved
42	ground bus/identification system
43	reserved
44	reserved
45	reserved
46	ground power sypplyl
47	L+ or L
48	L- or N)

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

7.3 Technical data

Order number	IVI-KHD2-4HRX	IVI-KHA6-4HRX
Power supply		
Operation voltage	18 V DC ... 32 V DC Residual ripple ≤ 10 $\%_{SS}$	90 V AC ... 253 V AC 50 ... 60 Hz
Power consumption	max. 5 W	max. 5 VA

Interface	
Interface options (selected via S7 and S8)	RS 232 or RS 422 or RS 485 TTY 20 mA (current loop) passive
Transmission rate	300 ... 19 200 Bit/s

Number of read/write heads	max. 4
Read/write head power supply	120 mA/17,5 V DC ± 5 %

Ambient conditions	
Operating temperature	-25 °C to +70 °C (248 to 343 Kelvin)
Storage temperature	-25 °C to +85 °C (248 to 358 Kelvin)
Humidity	max. 75 % relative of air humanidity
Schutzart nach EN 60529	IP 20
Interface immunity as in:	EN 50081-2 (ermitted interference) EN 50082-2 (noise immunity)

Mechanical data	
Construction type	60 mm terminal housing
Mounting	Snap-mounted on standard rail to DIN 46277 or screwed fixing to DIN 43602
Vibration resistance when installed as specified	To DIN IEC 721 Part 3-5 Class 5M2
Housing method	Makrolon 6485
Plammability class	UL94
Connections	self opening terminals, max. core cross-section 2x2,5 mm^2 Built-in 9-pin Sub-D-connector

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

8 Operating control interface units using the 3964R protocol

8.1 Notes on the 3964R protocol

The 3964R procedure was defined to allow the transfer of data via a serial point-to-point connection in which the majority of data errors and time-outs are detected and corrected by the protocol. The 3964R protocol is an asynchronous bit-serial transmission procedure. A character frame consists of one start bit, 8 data bits, one even parity bit and one stop bit.

Start bit	0 LSB	1	2	3	4	5	6	7 MSB	Even parity	Stop bit

Bild 8.1: 11-bit character frame

The transmission rate is set via DIP switches S1, S2, and S3.

Communication always starts with a **command message** either to transmit data (SEND messages) or to fetch data (FETCH messages).

The control interface unit replies with a "Response" message, with or without data.

A SEND message comprises a message header and data. A FETCH message comprises a message header only.

The **message header** consists of 10 bytes of information about the data target in the case of a SEND message, or information on the data source, in the case of a FETCH message.

If the RK 512 Interpreter is used, the message header is structured as follows:

Byte	Code	Description	Check
1	00h	Message	yes
2	00h	Identifier	yes
3	'E'	Message "input"	yes
4	x	Type of data	no
5	xx	Target address of data (high)	no
6	xx	Target address of data (low)	no
7	yy	Volume of data (high)	no
8	yy	Volume of data (low)	no
9	FFh	Coordination marker	no
10	FFh	Coordination marker	no

Bild 8.2: Message header

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

8.1.1 Byte description:

1	Message identification, 00h, or FFh for any follow-up message
2	Message identification, always 00h
3	SEND ('A') or FETCH ('E') command. Byte 3 is an ASCII character
4	Command type, .i.e. type of data to be transmitted 'D' = Data block Byte 4 is an ASCII character
5 and 6	Target address for SEND, or source address for FETCH Byte 5 = DB number, Byte 6 = DW number
7 and 8	Volume of user data to be transmitted, in bytes or words, depending on data type
9	Byte number of the coordination marker, or FFh when no coordination marker is defined. In the case of control interface units, this byte is always FFh.
10	Bits 0 to 3: Bit number of coordination marker. If no coordination marker is defined, this byte is always Fh. Bits 4 to 7: CPU number, expressed as a digit from 1 to 4. If no CPU number is specified, but there is a coordination marker, it is taken as 0h. Where there is neither a CPU number nor a coordination marker, it is Fh. In the case of control interface unit, this is always FFh.

The control interface unit do not use bytes 4 to 8. Their content is copied in the response message.

8.1.2 Handshake procedure

To establish communication, the control system sends the ASCII control character STX (Start of Text). The control interface unit responds with the ASCII character DLE (Data Link Escape), after which the user information is transmitted. Whenever it appears in the user data, the character DLE is sent twice. When the data has been transmitted, the control system inserts the characters DLE ETX BCC, indicating the end of transmission, and waits for a DLE acknowledge character from the control interface unit. The data is verified with the block check character, BCC. BCC is the longitudinal even parity (EXOR logic operation on all data bytes) of the block transmitted or received. The calculation begins with the first byte of user data after communication is established and ends after the characters DLE ETX when communication is terminated.

The control system sends the control character STX to establish communication. If the control interface unit responds with DLE before the time-out for acknowledgment, the protocol switches to send mode. If the control interface unit responds with NAK or any character other than DLE, or if the acknowledgment time delay elapses without a response, communication fails. With Siemens control systems, the procedure is abandoned after 6 unsuccessful attempts, and the error is registered in the coordination byte KBS.

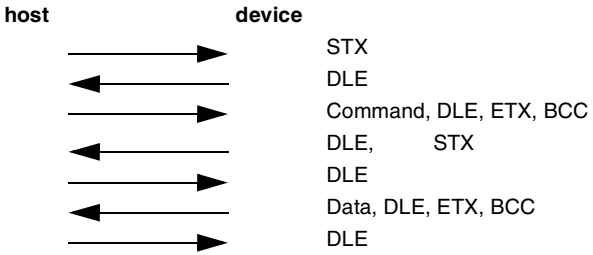
Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

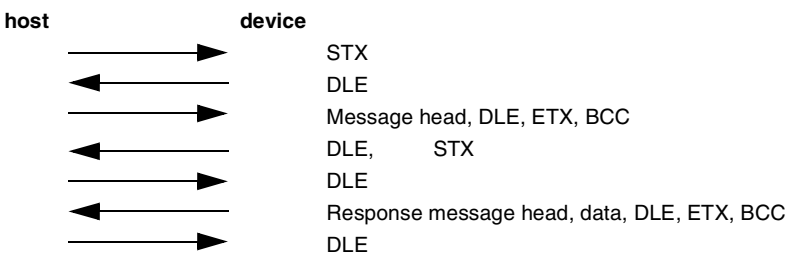
The control system terminates the reception when it receives the character sequence DLE ETX BCC. It compares the block check character (BCC) received with the built-in longitudinal parity. If the block check character is correct, and no other receive errors have occurred, the control system transmits DLE. If the BCC is incorrect, NAK is transmitted to the control interface unit, and a repetition of the process is awaited. The control system terminates the reception if the data block cannot be received without error after a (programmable) number of attempts, or if the repeat transmission is not initiated within the (programmable) block delay time.

8.1.3 Basic structure of all messages

1.) Without Interpreter RK512

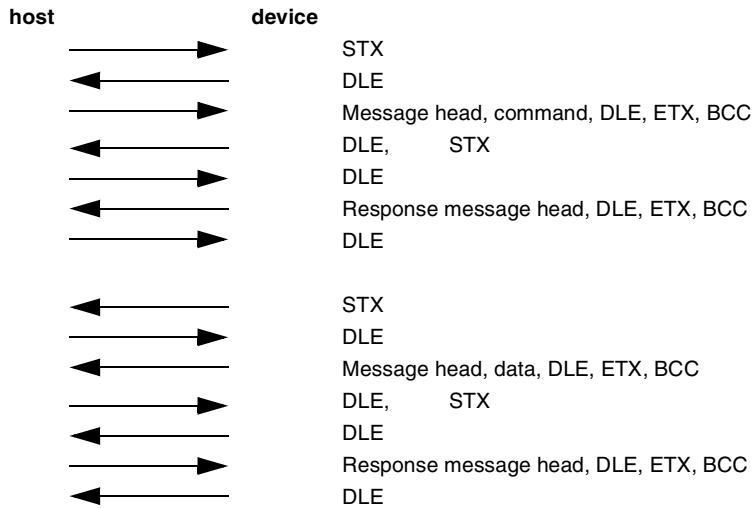


2.) With Interpreter RK512, communication involving FETCH messages



Date of issue 27.08.2001

3.) With interpreter RK512, communication involving send-messages



8.1.4 Data exchange via FETCH messages involving 3964R with RK512

This type of data exchange is possible only in the basic fixed code operating mode.

The first time a FETCH message is received, the control interface unit switches into a "Read" mode in which all read heads connected to the control interface unit are interrogated continuously.

For each correctly received FETCH message, the control interface unit returns a response message, in which the status of all 4 read heads (always 20 bytes) is transmitted.There are 5 bytes for each read head. The data length for a read head is the same whether or not a code has been read.

Each head has a "Read Sequence number" (8 bits) which is incremented whenever

- two codes are read in succession, and the first differs from the second
- two identical codes are read in succession, and the first of these has been transmitted to the control system

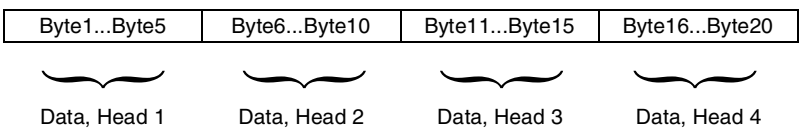


Bild 8.3: Structure of message data

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

Bild 8.4: Data record of a read head after reading a code

Example: 1A650DC455,i.e.:Read head 1,Code A650DC4,Read sequence-no.55

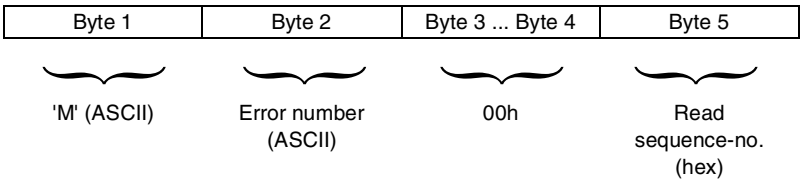


Bild 8.5: Data record of a read head after failure to read a code (Read head, specific error and status)

Example: 'M''6'000034

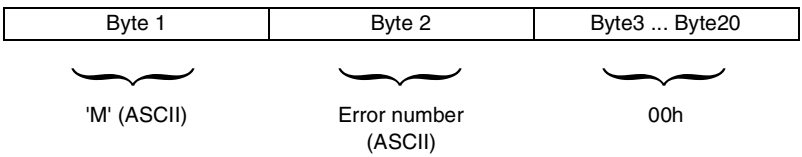


Bild 8.6: Data record of the message in the event of a faulty device r

Example: 'M' '1' 00000000000000000000000000000000000000

Date of issue 27.08.2001

8.1.5 Data exchange via 3964R with RK512 involving SEND messages

The commands are transmitted in the form of data contained in a SEND message. Responses to the command received are transmitted to the control system via a SEND-message. The possible responses to a command are as follows:

- Fixed code command: Codes, error messages
- Read/write commands: Data, error messages, negative acknowledgment of a write command
- Operating mode commands: Positive or negative command acknowledgment

The message parameters in the response message are obtained from the initializing SEND message. This gives the user the opportunity to place the required data in the appropriate address space. The following parameters are required from the initializing SEND message:

Parameter	Permissiblerange
Number of target data block	3 ... FFh
Start address in target data block	0 ... FFh
CPU number	any
Coordination marker	FFFFh

The only restriction is in relation to the data type. The data can be transmitted in a single data block only. Accordingly, send and receive data are organized in words. If the selected data format has a data length consisting of an odd number of bytes, a byte, value 00h, is added. The same applies to the transmission of a command from the control system to the control interface unit.

Example: "Double-sided" read command

Data transmitted to the control interface unit: 02 00

Communication errors or errors relating to the message structure are transmitted in the 4th character of the response message.

Value	Significance
0Ch	The data type specified is not valid
10h	Bytes 1 and 2 of the message were not 00h
14h	The data block specified is not permissible
34h	The quantity of data sent was incorrect
36h	Incorrect message sequence

Bild 8.7: Error numbers for message errors

8.1.6 Data exchange without the RK512 Interpreter

The command and data structure are the same as when using the protocol with the RK512. The RK512-specific message header and message exchange sequence are not used.

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

8.2 Command interpreter, systems for fixed code and read/write commands

8.2.1 Command structure

The mode commands described below behave in the same way as the corresponding standard commands. For each mode command received, with the exception of the RST command, the control interface unit responds with a message transmitting the status of the control interface unit. The commands are transmitted to the control interface unit in the form of data in a SEND message. The commands are encoded byte by byte. The control interface unit acknowledges the commands with a further SEND message, in which the status corresponding to the command is transmitted.

8.2.2 Mode commands

Description	Hex identifier	Parameter
Reset	01h	00h
Double-sided read	02h	00h
Set data carrier type (only read/write commands)	44h	01h ... 04h

Bild 8.8: Mode commands

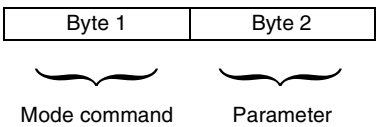


Bild 8.9: Structure of a mode command

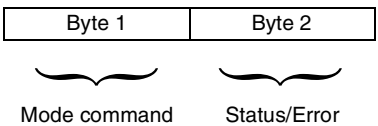


Bild 8.10: Structure of the response message in reply to the transmitted mode command

Example: Correct transmission of the "Double-sided read" command

Transmitted to the control interface unit: '02 00'
Transmitted to the control system: '02 00'

Note

No message is transmitted in response to an RST command!

Date of issue 27.08.2001

8.2.3 Fixed code read commands

Command	Hex identifier
Read Fixed code	20h
Buffered Read Fixed code	21h

Bild 8.11: Fixed code read commands

Read commands for the basic fixed code operating mode with read head number

When a read head is specified in a command, it is interrogated once only. The result (code or error message) will then be transmitted in a SEND message. After successful transmission, the control interface unit waits for another command.

Byte 1	High Byte 2	Low Byte 2	High Byte 3	Low Byte 3	Byte 4 ... Byte 6
20h	0	Head Status	Head-no.	Code	Code

Bild 8.12: Structure of response message after a code has been read

Example: A code was read at read head 4

Read-command without read head number

All connected heads are interrogated once. The codes which are read are transmitted in packed form in a message. The data structure is as for commands R1 … R4.

Example: A code was read at read head 2 and 4.

Response: 20 0A 1A 66 0C 8F 4A 65 11 78

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

Buffered auto read with read head number

Command initialization takes place once only, through the transmission of a SEND message containing the command. A read head specified in the command will be interrogated continuously. If a faulty read head is detected, the control interface unit cancels the command, transmits the error status and waits for a further command. Errors relating to communication between the read head and the code carrier (no code carrier available) are suppressed.

Codes are transmitted only when:

- a new code is read
- at least 5 unsuccessful read attempts have occurred between two successful readings of identical codes

Together with the code data, an 8-bit wide read sequence number is transmitted, which is incremented whenever two non-identical codes are read in succession, or when at least 5 unsuccessful attempts to read occur between the reading of two identical codes.

Byte 1	High Byte 2	Low Byte 2	High Byte 3	Low Byte 3	Byte 4 ... Byte	Byte 7
21h	0	Head Status	Head-no.	Code	Code	Read sequence-no.

Bild 8.13: Message data for a read head after successful reading of a code

Example: A code was read at head 4, read sequence-no. 34h

Response: 21 08 4A 65 13 0C 34

Buffered auto read without read head number

The command description is the same as for the BAR command, except that all connected read heads are interrogated continuously. After successful reading of a code carrier, all connected read heads will be interrogated again, and all codes read will be transmitted in a message.

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

8.2.4 Read commands

Command	Hex identifier
Auto Read Bytes	57h
Single Read Bytes	77h

Bild 8.14: Read commands

Read commands for data carriers

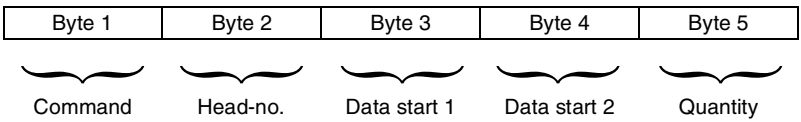


Bild 8.15: Structure of a read command

Example: A single read attempt at head-no. 3. Read 5 bytes starting at address 0Ah (=10) : 77 03 00 0A 05

Structure of the response message after the data has been read

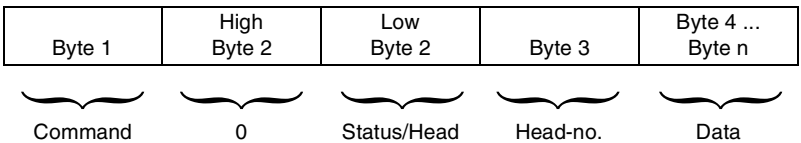


Bild 8.16: Structure of the response message after the data has been read

Example: Response to the above read command: 77 04 03 11 22 33 44 55

Structure of the response message in the event of an error

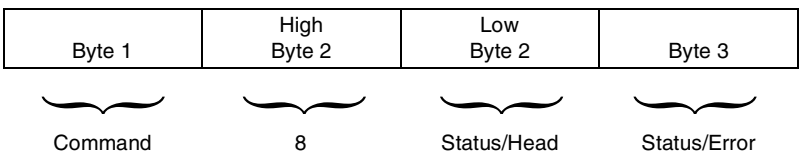


Bild 8.17: Structure of the response message in the event of an error

Example: Response to the above read command if no code was read: 77 80 07

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

8.2.5 Write commands

Command	Hex identifier
Auto Write Bytes	4Bh
Single Write Bytes	6Bh

Bild 8.18: Write commands

Write commands for data carriers

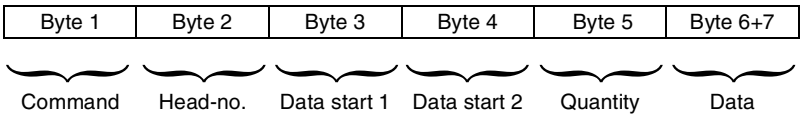


Bild 8.19: Structure of a write command

Example: A single write attempt at head 1. Write 2 bytes (AAh, BBh), write, starting at address 14h: 6B 01 00 14 02 AA BB

Structure of the response message after the data has been written

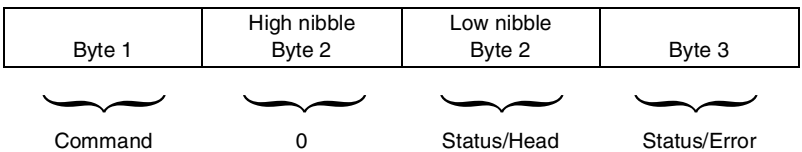


Bild 8.20: Structure of the response message after the data has been written

Example: Response to the above write command: 6B 01 00

Structure of the response message in the event of an error

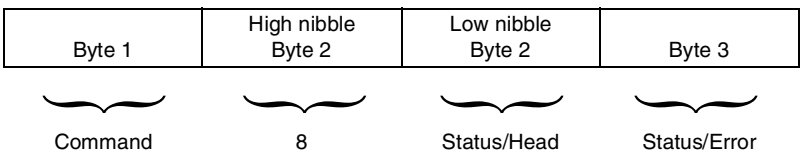


Bild 8.21: Structure of the response message in the event of an error

Example: Response to the above write command if head 1 is not connected: 6B 80 06

Date of issue 27.08.2001

8.2.6 Additional read/write commands for IDC- ... -1K and IMC-40- ... data carriers

Read/write commands

Command	Hex identifier
Auto Read Page	4Ch
Single Read Page	6Ch

Bild 8.22: Read/write commands

Structure of a read page command

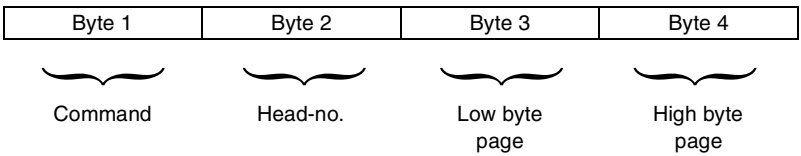


Bild 8.23: Structure of a read page command

Example: A single read attempt at head 4. Read page 2: 6C 04 00 02

Structure of the response message after data has been read

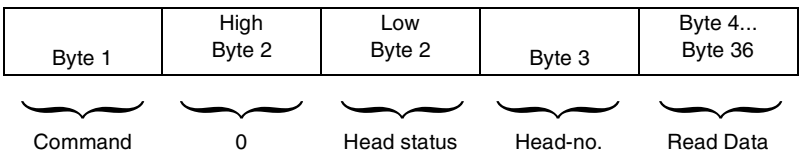


Bild 8.24: Structure of the response message after data has been read

Example: The above read page command was erroneous due to a defective read head: 6C 80 06

Structure of the response message after data has been written

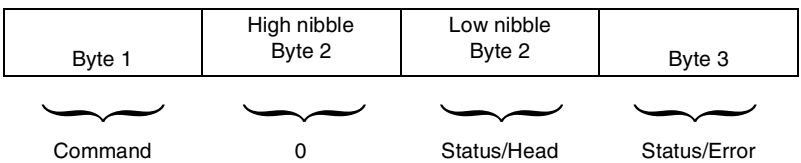


Bild 8.25: Structure of the response message after data has been written

Example: Response to the above command after a write operation at head 4: 4D 0F 00

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

8.2.7 Additional read/write commands for IMC-40 - ... data carriers

Write/read commands

Command	Hex identifier
Auto Write Page	4Dh
Single Write Page	6Dh

Structure of a write page command

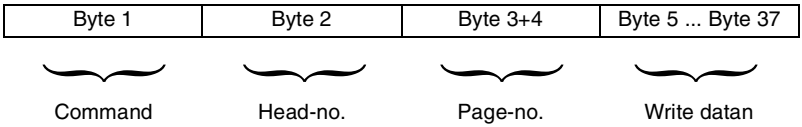


Bild 8.26: Structure of a write page command

Example: Auto write page 3 at all connected read heads: 4D 05 00 03 ... (32 bytes of data) ...

Structure of the response message after data has been written

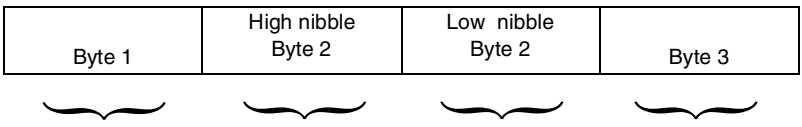


Bild 8.27: Structure of the response message after data has been written

Example: Response to the above command after a write operation at Head 4: 4D 0F 00

Date of issue 27.08.2001

8.2.8 Admissible Parameters

Head number	Hex identifier	
	Nibble	Byte
1	1	1
2	2	2
3	3	3
4	4	4
X	5	5

Bild 8.28: Structure of the "Read head-no." nibble and the "Head-no" byte

BIT	Read-head
0	1
1	2
2	3
3	4

Bild 8.29: Structure of the head status nibble when no errors detected

Data carrier type	Page number
IDC- ...	----------
IDC - ... -1K	000 ... 003h
IMC-40-64K	000 ... 0FFh
IMC-40-256K	000 ... 3FFh

Bild 8.30: Structure of the head status nibble when no errors detected

Data carrier type	Address
IDC- ...	0000 ... 001Fh
IDC - ... -1K	0000 ... 007Fh
IMC-40-64K	0000 ... 1FFFh
IMC-40-256K	0000 ... 7FFFh

Bild 8.31: Valid start addresses (Data Start 1 and Data Start 2) for read/write commands for the various data carrier types.

Data carrier type	Quantity
IDC- ...	01 ... 20h
IDC- ... -1K	01 ... 80h
IMC-40-64K	01 ... 80h
IMC-40-256K	01 ... 80h

Bild 8.32: Valid number of data bytes for read/write commands for the various data carrier types

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

Note

The number of bytes to be read out is limited by the maximum number of bytes (256) in response and follow-up messages. If read head-no. "X" is selected, 125 bytes can be read in each of two successful read operations, 83 bytes in each of 3 and 62 bytes in each of four read operations.

Whenever "DLE" is sent, this further increases the volume of data. If the data output exceeds 256 bytes, an error message is transmitted.

8.3 Error and status messages when using the 3964R protocol

Hex Value	Signification
00	No error
01	Memory error in control interface unit after RAM test
02	Memory error in control interface unit after ROM test
03	Unable to understand command
04	Parity error in serial communication
05	Write error
06	Read head not connected or not ready
07	No code or data carrier is available, or an error has occurred during data transfer between code or data carrier and control interface unit
08	Parity or CRC error during transmission with code or data carrier
09	Address or quantity of data outside valid range
0A	Programmable Array Logic (PAL) frozen in read head
0B	Watchdog reset
0C	Echo error in inductive transmission
0D	Function not available with the selected data carrier
0E	A read head of older technology is connected
0F	Synchronization error at nibble interface
10	Battery low (applies only to 8 and 32 Kbyte data carriers), but the command was executed successfully
11	Acknowledgment error in transmission to data carrier
12	Too much data for 2 messages

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Pepperl+Fuchs Group • Tel.: Germany (06 21) 7 76-0 • USA (330) 4 25 35 55 • Singapore 7 79 90 91 • Internet http://www.pepperl-fuchs.com

9 ASCII Table

hex	dez.	ASCII	hex	dez.	ASCII	hex	dez.	ASCII	hex	dez.	ASCII
00	0	NUL	20	32	Space	40	64	@	60	96	‘
01	1	SOH	21	33	!	41	65	A	61	97	a
02	2	STX	22	34	“	42	66	B	62	98	b
03	3	ETX	23	35	#	43	67	C	63	99	c
04	4	EOT	24	36	$	44	68	D	64	100	d
05	5	ENQ	25	37	%	45	69	E	65	101	e
06	6	ACK	26	38	&	46	70	F	66	102	f
07	7	BEL	27	39	‘	47	71	G	67	103	g
08	8	BS	28	40	(	48	72	H	68	104	h
09	9	HT	29	41	)	49	73	I	69	105	i
0A	10	LF	2A	42	*	4A	74	J	6A	106	j
0B	11	VT	2B	43	+	4B	75	K	6B	107	k
0C	12	FF	2C	44	,	4C	76	L	6C	108	l
0D	13	CR	2D	45	-	4D	77	M	6D	109	m
0E	14	SO	2E	46	.	4E	78	N	6E	110	n
0F	15	SI	2F	47	/	4F	79	O	6F	111	o
10	16	DLE	30	48	0	50	80	P	70	112	p
11	17	DC1	31	49	1	51	81	Q	71	113	q
12	18	DC2	32	50	2	52	82	R	72	114	r
13	19	DC3	33	51	3	53	83	S	73	115	s
14	20	DC4	34	52	4	54	84	T	74	116	t
15	21	NAK	35	53	5	55	85	U	75	117	u
16	22	SYN	36	54	6	56	86	V	76	118	v
17	23	ETB	37	55	7	57	87	W	77	119	w
18	24	CAN	38	56	8	58	88	X	78	120	x
19	25	EM	39	57	9	59	89	Y	79	121	y
1A	26	SUB	3A	58	:	5A	90	Z	7A	122	z
1B	27	ESC	3B	59	;	5B	91	[	7B	123	{
1C	28	FS	3C	60	<	5C	92	\	7C	124	|
1D	29	GS	3D	61	=	5D	93	]	7D	125	}
1E	30	RS	3E	62	>	5E	94	^	7E	126	~
1F	31	US	3F	63	?	5F	95	_	7F	127	DEL

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

Date of issue 27.08.2001

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

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, as published by the Central Association of the 'Elektrotechnik und Elektroindustrie (ZVEI) e.V.',
including the supplementary clause "Extended reservation of title"

We at Pepperl+Fuchs recognise a duty to make a contribution to the future.
For this reason, this printed matter is produced on paper bleached without the use of chlorine.

One Company, Two Divisions.

Factory Automation Division

Product Range

- Digital and analogue sensors
- in different technologies
  - Inductive and capacitive sensors
  - Magnetic sensors
  - Ultrasonic sensors
  - Photoelectric sensors
- Incremental and absolute rotary encoders
- Counters and control equipment
- Identification Systems
- AS-Interface

Areas of Application

- Machine engineering
- Conveyor or transport
- Packaging and bottling
- Automotive industry

Process Automation Division

Product Range

- Signal conditioners
- Intrinsically safe interface modules
- Remote Process Interface (RPI)
- Intrinsically safe field bus solutions
- Level control sensors
- Process measuring and control systems engineering at the interface level
- Intrinsic safety training

Areas of Application

- Chemical industry
- Industrial and community sewage
- Oil, gas and petrochemical industry
- PLC and process control systems
- Engineering companies for process systems

Service Area

Worldwide sales, customer service and consultation via competent and reliable Pepperl+Fuchs associates ensure that you can contact us wherever or whenever you need us. We have subsidiaries worldwide for your convenience.

The Pepperl+Fuchs Group

USA Headquarters
Pepperl+Fuchs Inc. • 1600 Enterprise Parkway
Twinsburg, Ohio 44087 • Cleveland-USA
Tel. (330) 4 25 35 55 • Fax (330) 4 25 93 85
e-mail: sales@us.pepperl-fuchs.com

Asia Pacific Headquarters
Pepperl+Fuchs Pte Ltd. • P+F Building
18 Ayer Rajah Crescent • Singapore 139942
Tel. (65) 7 79 90 91 • Fax (65) 8 73 16 37
e-mail: sales@sg.pepperl-fuchs.com

Worldwide Headquarters
Pepperl+Fuchs GmbH • Königsberger Allee 87
68307 Mannheim • Germany
Tel. +49 621 7 76-0 • Fax +49 621 7 76-10 00
http://www.pepperl-fuchs.com
e-mail: fa-info@de.pepperl-fuchs.com

PEPPERL+FUCHS

Subject to reasonable modifications due to technical advances • Copyright PEPPERL+FUCHS • Printed in Germany • Part. No. 41 994 07/01 02