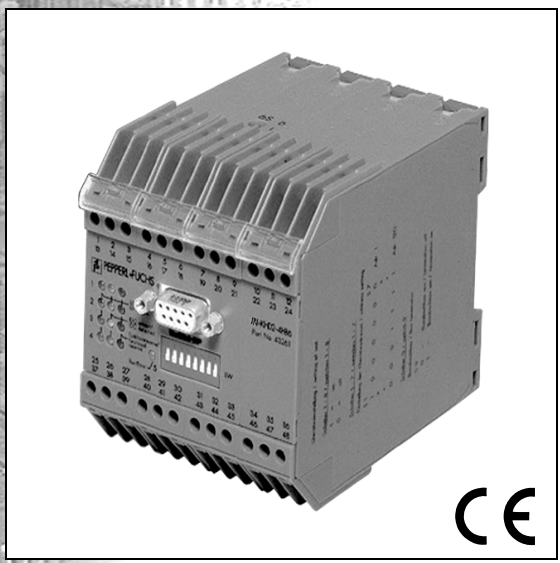
FACTORY AUTOMATION

Manual

IRI-KHD2-4HB6, IRI-KHA6-4HB6

CONTROL INTERFACE UNIT FOR
PROFIBUS-DP



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 25. 07 2001

Date of issue 25. 07 2001

1 Declaration of Conformity

The Inductive Identification Systems IRI-KHD2-4HB6/IRI-KHA6-4HB6 have been developed and produced in accordance with the applicable European standards and directives.

Note

The declaration of conformity can be requested from the manufacturer.

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

CE

ISO9001

Date of issue 02.08.2001

Date of issue 02.08.2001

2 General information

The symbols

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 02.08.2001

Date of issue 02.08.2001

3 Safety

3.1 Intended use

The control interface units IRI-KHD2-4HB6/IRI-KHA6-4HB6 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 T3, EN 50170).The control interface units are only to be used with the read heads and the code carriers from Pepperl+Fuchs.

Warning

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.

The devices IRI-KHD2-4HB6/IRI-KHA6-4HB6 may only be operated by appropriately qualified personnel in accordance with this operating manual.

3.2 General safety information

Warning

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

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 IRI-KHD2-4HB6/IRI-KHA6-4HB6 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 head can be detected and indicated by the master unit.

Note

More detailed information can be found in chapter 8 "Fault Diagnostics".

Date of issue 02.08.2001

Date of issue 02.08.2001

4 Product Description

4.1 Scope of delivery

The following is included with the delivery of the device:

- 1 device IRI-KHD2-4HB6/IRI-KHA6-4HB6
- 1 CD ROM including the manuals as PDF-file (german, english) and GSD file
- 1 terminal block

4.2 Range of application

Bus systems, especially the PROFIBUS, make the reduction of interconnection cabling possible and allow large data exchange over long distances. The control interface units IRI-KHD2-4HB6/IRI-KHA6-4HB6 with a PROFIBUS connection are unsurpassed when applied in large systems with many distant and distributed reading stations. Typical areas of application are:

- high-bay storage systems
- driverless transport systems
- interlinked production lines
- automatic container-identification

4.3 System description

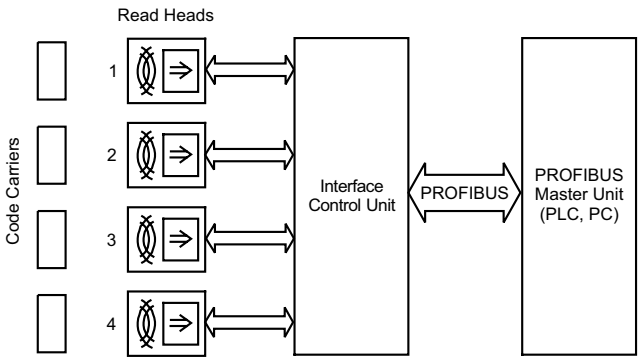


Figure 4.1 Function of the control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6 in the Inductive Identification System R.

Date of issue 27.08.2001

The control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6 takes over the control of the connected read heads that implement the data transmission with the code carriers, prepares the read information and controls the communication and data transmission with a PROFIBUS master unit.

It is possible to connect up to 4 read heads to a single IRI-KHD2-4HB6/IRI-KHA6-4HB6 unit.

With the PROFIBUS, the complete read functionality is available. The control interface unit operates as a passive subscriber of the system bus (slave).

Overview of commands

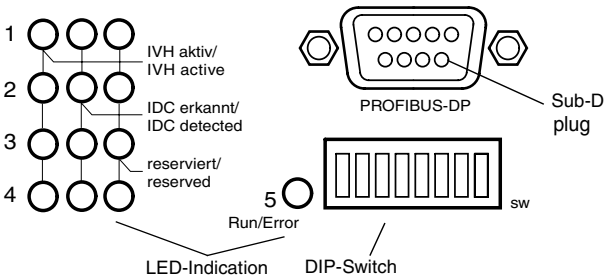
The following commands for the reading of data are available with the control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6:

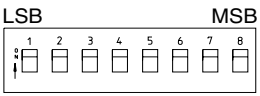
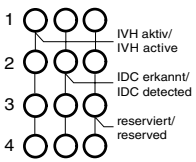
Reading fixcode carriers

Command	Function	Description
SF	Single Read Fixcode	All active parameterized read heads will be activated once. If multiple heads could successfully read the data then all read data are transmitted.
AF	Auto Read Fixcode	All active parameterized read heads are activated for such a time until one fixcode carrier is read.
BF	Buffered Auto Read Fixcode	All active parameterized read heads are activated continuously.
EF	Enhanced Buffered Auto Read Fixcode	All active parameterized read/write heads or read heads are activated continuously. If the code/data carrier leaves the reading area, status 5 is transmitted.

Date of issue 27.08.2001

4.4 Indicators and operators



DIP-switch (on the front side)	 Switches 1 ... 7: subscriber address Switch 8: no function
LED-indication (on the front side)	

Structure and functioning

Indicators	Description
Ident	3 LEDs per read head status
LED green	Read/write head active (4 LEDs, 1 per head)
LED yellow	Code carrier detected (4 LEDs, 1 per head)
LED red	Functional reserved (4 LEDs, 1 per head)
Bus	1 LED system status (two-coloured)
Run/Error LED green	device ready for operation/communication active
Run/Error LED red	device error
red-green blinking	device ready for operation/communication faulty

Bus termination (on the top side)	 Switch S9: 0 = OFF (Bus termination) 1 = ON

Date of issue 27.08.2001

4.5 Structure and functioning

The control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6 is the link between the read heads and the PROFIBUS master (PLC, PC, etc.). Two independently operating microprocessors, which are connected to each other via an interface, take over the data exchange of the read heads and the PROFIBUS master.

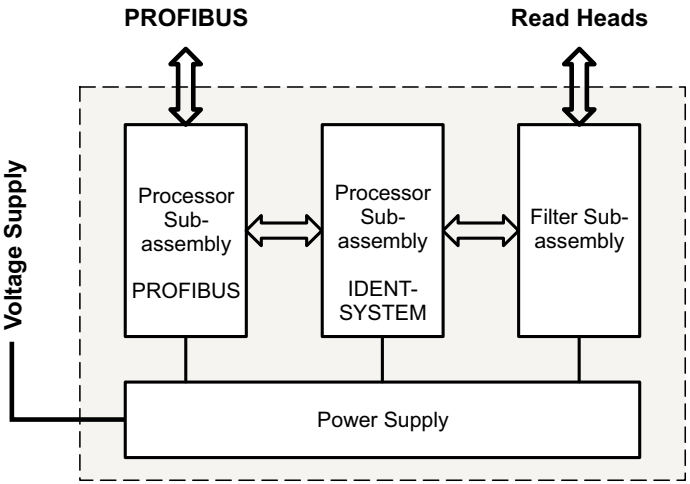


Figure 4.2 Block diagram of the control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6

Both the supply voltage and the RS 485 interface of the PROFIBUS are galvanically isolated within the system.

The telegram consists of 10 words and transfers the four fixcodes of the four read heads.

4.6 System variants

The control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6 comes in two versions which vary only in their supply voltage

Variant	Supply Voltage
IRI-KHD2-4HB6	18 V DC ... 32 V DC
IRI-KHA6-4HB6	85 V AC ... 253 V AC, 50 Hz ... 60 Hz

Date of issue 27.08.2001

4.7 Accessories/product family

The inductive identification system IDENT-I from Pepperl+Fuchs offers many different possibilities to combine single components.

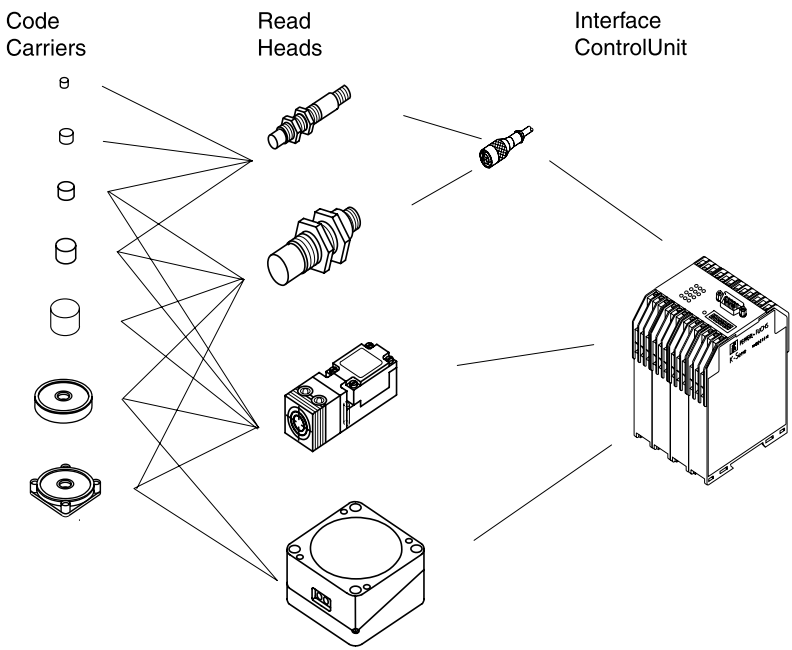


Figure 4.3 Overview of the inductive identification system structure

According to installation requirements, read distance, environmental conditions and memory requirements, one can select appropriate code carriers and read heads.

Note

Further information on the inductive identification system with read functioning (System R) can be found in the Sensor Systems 1 catalogue.

Date of issue 27.08.2001

Date of issue 27.08.2001

5 Installation

5.1 Storage and transport

The device must be packed for storage and transport so that it is shock-resistant and protected against humidity. The original packaging offers optimal protection. The necessary environmental conditions also must be satisfied (see Technical Data).

5.2 Unpacking

Check that the contents are not damaged. In case of damage, notify the postal service or the forwarding agent and inform the deliverer.

Check the contents of delivery with respect to your order and the delivery papers for:

- correct number of parts
- device type and version according to the name plate
- accessories
- manual(s)

Keep the original packaging in case the device must be repacked and stored or reshipped.

For any further questions please contact Pepperl+Fuchs GmbH.

Date of issue 27.08.2001

5.3 Mounting

5.3.1 Mounting to a top-hat rail

As with all systems in K-system housings from Pepperl+Fuchs, the control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6 can be snapped onto the 35 mm standard top-hat rail according to DIN EN 50022.

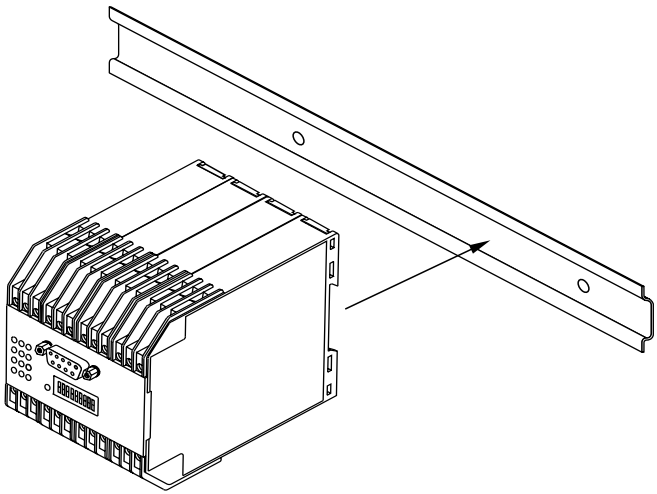


Figure 5.1 Mounting to the top-hat rail according to DIN EN 50022

Hang the unit over the top part of the top-hat rail and press the bottom part of the housing against the rail until it snaps onto the railing. Check that the unit sits firmly on the railing.

Date of issue 27.08.2001

5.3.2 Wall mounting

The control interface unit can also be mounted on the wall using four screws. Simply pull out the four outer brackets on the back side of the unit. The unit can be easily screwed onto the wall through the holes in the brackets. The screw pair spacing is 90 mm (max. screw diameter M5).

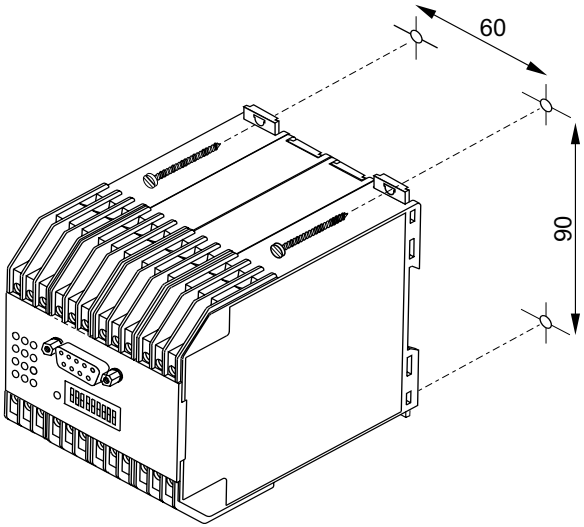


Figure 5.2 Wall mounting

5.4 Electrical connection

Warning

Only qualified personnel are permitted to carry out work under voltage and make electrical connection to the mains.

Ensure that the correct voltage is applied according to the name plate of the unit.

A mains isolating device must be installed close to the device and labelled as such for the IRI-KHD2-4HB6/IRI-KHA6-4HB6.

Date of issue 27.08.2001

5.4.1 Equipment connection

The electrical connection of the control interface unit is made with the self-opening screw terminals on the top and bottom of the unit, max. cross section 2 x 2.5 mm^2.

The PROFIBUS connection must be carried out according to the PROFIBUS specification via the 9-pole Sub-D socket on the front of the device. Additionally, the bus connections (RxD / TxD - P, RxD / TxD - N, Screen) are also available on the screw terminals.

Connect the read heads and the supply voltage according to the connection diagram and the labelled configuration of the terminals

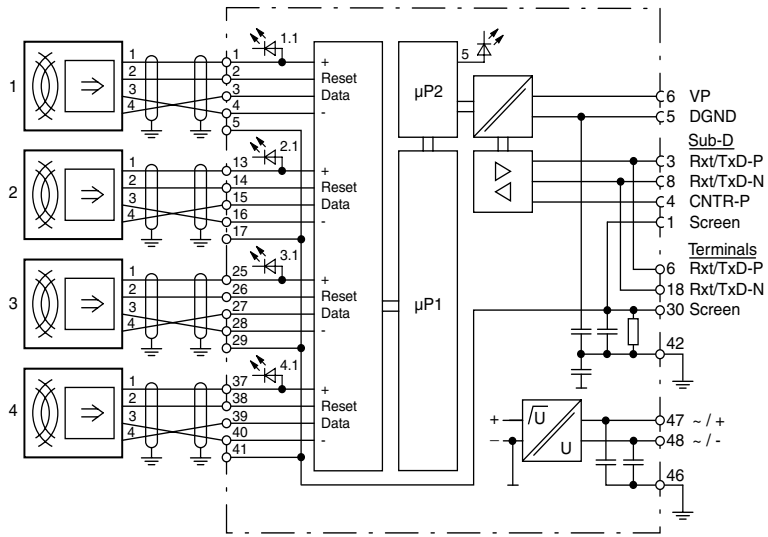


Figure 5.3 Connection diagram for the control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6

Location of the connection terminals

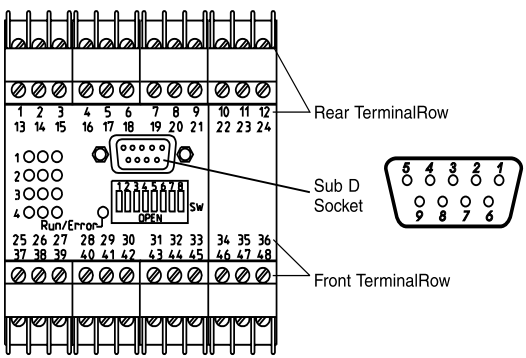


Figure 5.4 Assignment of connection terminals

Date of issue 27.08.2001

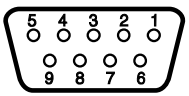
List of terminal assignments

Terminal	Function
1	supply voltage read head 1 positive
2	"direction" read head 1
3	"data" read head 1
4	supply voltage read head 1 negative
5	reserved
6	PROFIBUS RxD/TxD-P
7	reserved
8	reserved
9	reserved
10	reserved
11	reserved
12	reserved
13	supply voltage read head 2 positive
14	"direction" read head 2
15	"data" read head 2
16	supply voltage read head 2 negative
17	reserved
18	PROFIBUS RxD/TxD-N
19	reserved
20	reserved
21	reserved
22	reserved
23	reserved
24	reserved
25	supply voltage read head 3 positive
26	"direction" read head 3
27	"data" read head 3
28	supply voltage read head 3 negative
29	reserved
30	reserved
31	reserved
32	reserved
33	reserved
34	reserved
35	reserved
36	reserved
37	supply voltage read head 4 positive
38	"direction" read head 4

Date of issue 27.08.2001

Terminal	Function
39	"data" read head 4
40	supply voltage read head 4 negative
41	reserved
42	ground bus/identification system
43	reserved
44	reserved
45	reserved
46	ground power supply
47	L+ (IVI-KHD2-4HB6) or L (IVI-KHA6-4HB6)
48	L- (IVI-KHD2-4HB6) or N (IVI-KHA6-4HB6)

Assignment of the 9-pole Sub-D socket



PIN	Function
1	shield PROFIBUS cable (connect to metal casing of Sub-D connector)
2	reserved
3	PROFIBUS RxD/TxD-P
4	CNTR-P
5	DGND
6	VP
7	reserved
8	PROFIBUS RxD/TxD-N
9	reserved

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.

Note *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

5.4.2 Information for connecting the read head cable

The connecting cables to the read heads must be shielded. The cross section of the cables must be at least 0.14 mm^2.

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 5.5.). Please make sure that the screen is kept as small as possible.

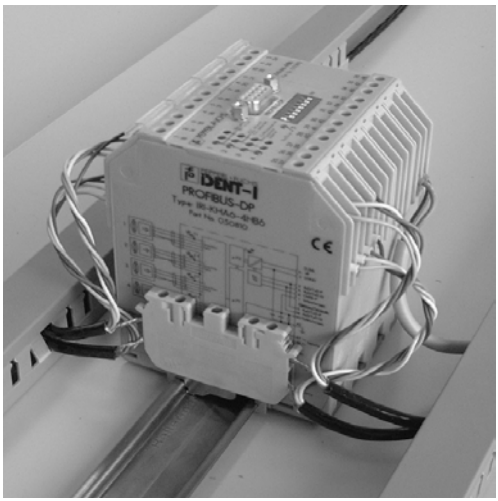


Figure 5.5 Terminal block with connecting cables

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 read heads.

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

Date of issue 27.08.2001

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.

Note

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.

5.4.3 Special connection information for the PROFIBUS cable

The connecting lead for the bus is specified in the EN 50170 as type A cable and can be used in accordance with the following table. Line parameters and lengths for a type B cable are also included in the following tables for the sake of completeness. Only cable of type A should be used in new designs because of the longer overall length of leads in systems.

Line parameters as follows:

Parameter	Line A	Line B*
cable design	two-wire twisted, shielded	two-wire twisted, shielded
capacitance per unit length		
(pF/m)	< 30	< 60
surge impedance		
(Ω)	135 ... 165	100 ... 130
loop resistance		
(Ω)	110	Ñ-
lead diameter		
(mm)	0.64	> 0.53
cross sectional area		
(mm^2)	> 0.34	> 0.22

Line B*) not to be used in future, if possible.

Attention

Use only twisted pair, shielded cable. In this case, the noise immunity will be optimised.

Transmission rates

The following transmission rates are supported:

9.6 kbit/s, 19.2 kbit/s, 44.44 kbit/s, 93.75 kbit/s, 187.5 kbit/s, 500 kbit/s and 1.5 Mbit/s.

The setting of the transmission rate required is self-synchronising.

Date of issue 27.08.2001

Length of leads

The reliable lengths of the transmission leads in a bus segment are determined from the following:

- type of bus cables used
- influence of external noise
- transmission rate
- number of bus subscribers

The maximum total lead length of a bus segment as a function of the transmission rate for maximum number of subscribers (32) is:

Transmission rate in kbit/s	9.6	19.2	44.44	93.75	187.5	500	1500
Line type A (in m)	1200	1200	1200	1200	1000	400	200
Line type B (in m)	1200	1200	1200	1200	600	200	•••

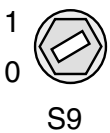
Note

By breaking into multiple bus segments and the application of repeaters, the transmission length can be increased. A maximum of three repeaters between two communicating bus subscribers can be used.

Bus termination

With the PROFIBUS, every bus segment must be terminated via terminating resistances at both ends of the bus leads.

Bus termination aktiv
Bus termination **not** aktiv



Rotation switch “S9“ for the Bus termination of the system on top side.

Adjust with an appropriate screwdriver.

Figure 5.6 Rotating switch S9 for the termination of the bus

The control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6 has built-in, switchable bus termination. The bus termination can be activated by turning the rotating switch S9 with an appropriate screwdriver.

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

5.5 Disassembly, packing and disposal

Repacking

The unit must be protected against humidity and shock when packing for later use. The original packaging offers optimal protection.

Disposal

Note

Electronic waste can be hazardous. Pay attention to local regulations when disposing of this unit.

The control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6 does not contain internal batteries which must be removed before disposal.

Date of issue 27.08.2001

6 Commissioning

Warning

Before proceeding with the commissioning, make sure that no danger to the system can arise from the device, e.g. due to uncontrolled control processes.

Attention

Check again all connections before proceeding with the commissioning.

Prepare for the commissioning by familiarising yourself with the communication between the PROFIBUS master and the control interface unit (Section 6 and 7 of this handbook). The commissioning requires a good knowledge of the PROFIBUS and the programming of the master unit.

6.1 Preparation

Due to the complexity of field bus programming with the PROFIBUS, it is unfortunately difficult to give a valid general description on how to perform the commissioning.

A very important aspect for the operation of an inductive identification system using the control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6 on the PROFIBUS is the response time of the total system. The question "How much time is required for data to be available in my computer once the data carrier is positioned in front of the read head?" cannot be correctly answered in general.

The important factors in respect to response time are:

- type of high order host system, e.g. PLC or PC
- type of PROFIBUS master, e.g. pre-defined transmission rate
- communication between the PROFIBUS master and the host system
- the number of PROFIBUS subscribers
- the number of control interface units on the PROFIBUS
- the number and type of read heads connected
- type of code or data carriers used
- type of access of the communications objects of the control interface unit
- type of commands on the identification system
- structure of the user program

For this reason, you should construct a test system for your particular application and check the transmission to the PROFIBUS master or host system if you have little experience with the design of a PROFIBUS system.

Date of issue 02.08.2001

Note

A complete series of design tools exist that allow a PROFIBUS user to plan and commission a network, even if he/she has no knowledge of the fundamental communication sequences.

There are PC programs and PROFIBUS PC connector cards which help determine the communication relationships and your parameters, and can clearly display bus telegrams on the screen.

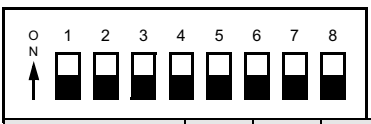
The system software of programmable logic controllers (PLC) with a PROFIBUS communication processor often offer network configuration and management possibilities.

6.2 Main procedure

Before the commissioning, the system address of the control interface unit and, if necessary, of the bus termination (see section 5.4.3 "Bus Termination“) must be set.

Setting of the unit address

Select a device address not already occupied by another bus subscriber (between 0 and 126) and set this address using the DIP-switch on the front of the device.



DIP-switch "SW" on the front side of the unit to adjust the PROFIBUS device address.

Device address	S1	S2	S3	S4	S5	S6	S7	S8
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
126	OFF	ON	ON	ON	ON	ON	ON	OFF

Figure 6.1 Setting the device address

Attention

The device address 127 is reserved for a special PROFIBUS service. If the address 127 is set on a slave unit, it will not function.

After connecting to voltage, the control interface unit automatically adjusts its transmission rate to that of the master. The supported rates are:

- 9.6 kbit/s
- 19.2 kbit/s
- 44.44 kbit/s
- 93.75 kbit/s
- 187.5 kbit/s
- 500 kbit/s
- 1.5 Mbit/s

Date of issue 02.08.2001

Configuration of the network master(s) for DP operation

The configuration data required for the control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6 can be found in the GSD file supplied and the network master is configured accordingly. If you have a configuration tool, then the network master is configured automatically by using the configuration tool to read the GSD file.
The device address must be entered to do this.

Self test

After switching on the supply voltage, the control interface unit checks the internal memory area with a self test. If a device error or transmission error occurs, or if an incorrect device address is set, communication will not be activated. The error is indicated with the LED "Run/Error" (Section 8 "Fault Diagnostics").

Interconnection structure

The interconnection structure is established automatically in DP mode.

Note

If the logic connection to the control interface unit is made, the LED "Run/Error" will be green and permanently illuminated.

It is now possible to communicate with the control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6 using the PROFIBUS master.

Date of issue 02.08.2001

Date of issue 02.08.2001

7 Operation with the PROFIBUS

7.1 General information on the PROFIBUS

The PROFIBUS is a standardised field bus that can exchange data between PLCs, PCs, operating and monitoring systems as well as sensors and actuators.

The framework of this operating manual can not be considered as an extensive introduction to the PROFIBUS. For substantial information, one is referred to the PROFIBUS standard DIN 19245 or EN 50170 and the relevant literature.

Note

Information brochures and a PROFIBUS product catalogue is available from the PROFIBUS User Organization e.V. (PNO), Karlsruhe

Performance features PROFIBUS-DP

The important PROFIBUS-DP performance features of the control interface unit IRI-KHD2-4HB6/IRI-KHA6-4HB6 are as follows:

- full DP slave functionality with the functions Data_Exchange, Slave_Diag, Set_Prm, Chk_Cfg, Get_Cfg, Global_Control
- modular DP slave device with one module each for read data
- transmission rates 9.6 kbit/s, 19.2 kbit/s, 44.44 kbits/s, 93.75 kbit/s, 187.5 kbit/s, 500 kbit/s and 1.5 Mbit/s self-synchronising
- switchable bus termination
- adjustable system address 0 ... 126

Date of issue 02.08.2001

7.2 PROFIBUS-DP

7.2.1 PROFIBUS-DP communication parameters

The communication parameters can be found in the master data file (GSD) for the device.The name of the GSD-file is: **p&f_00d2.gsd**.

7.2.2 PROFIBUS-DP functions

Function	Description	Maste
Set_Prm	Transfer parameterisation data to a DP slave	Class 1
Chk_Cfg	Transfer configuration data to a DP slave to check	Class 1
Get_Cfg	Read configuration data from a DP slave	Class 2
Data_Exchange	Send output data to a DP slave device and request input data from a DP slave	Class 1
Global_Control	Send special commands to one or more DP slaves	Class 1
Slave_Diag	Read diagnostic information from a DP slave	Class 1

7.2.3 Device identification/software version message for PROFIBUS-DP

Transmission of device identification and the software version is by the DP function "device-specific diagnosis".

Header byte <IDENTIFIER><><SW BUS><IND BUS><><SW ID><IND ID>

Header byte	length of diagnostic data in bytes incl. header byte, in this case "13"
<IDENTIFIER>	6 characters, "IRI-B6"
<>	blank (ASCII 20hex)
<SW BUS>	1 character, identification of the bus software, in this case "K"
<IND BUS>	1 character, index for the bus software, "A" ... "Z"
<>	blank (ASCII 20hex)
<SW ID>	1 character, identification of the identification system software, in this case "I"
<IND ID>	1 character, index for the identification system software, "A" ... "Z"

7.2.4 Definition of PROFIBUS-DP modules

Two modules are defined, one for entry data (read) and the other for output data (write), the identification byte for both is identical:

- data consistency over the entire length
- word structure
- input data (module: "10 Words input") or output data (module: "1 Word output")

The structure of the data words for the communication direction from DP master to control interface unit and from control interface unit to DP master is described in the following two chapters.

Date of issue 02.08.2001

7.3 Communication direction: PROFIBUS DP ⇒ Control interface unit

In the direction from the PROFIBUS DP master to the control interface unit, the words are structured as follows:

Word 0	Commands and parameters															
Bit No.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Description	B4	B3	B2	B1	DS	0	0	0	0	0	0	0	K3	K2	K1	T

Commands and command parameters are transmitted in word 0.

Toggle flag (T)

The toggle flag serves to unambiguously identify a new command which is valid. A new command is only then accepted by the control interface unit and executed provided this flag does not have the same status as the preceding command, i.e. when it is toggled.

In the acknowledgement from the control interface unit to the DP master, the toggle flag does not change and serves to indicate to the user that the command was received by the control interface unit and has been processed.

Note

Execution of the command is finished, when the execution counter became ≠ 0

Date of issue 02.08.2001

Command identification (B4 ... B1)

The desired command is defined by the command parameters B4 ... B1. A detailed description of these commands is given in Chapter 4.3

Command identification B4 ... B1				
15	14	13	12	Bit No.
B4	**B3**	**B2**	**B1**	**Designation**
0	0	0	0	No command
0	0	0	1	SF
0	0	1	0	AF
0	0	1	1	BF
0	1	0	0	not defined
0	1	0	1	not defined
0	1	1	0	not defined
0	1	1	1	not defined
1	0	0	0	not defined
1	0	0	1	not defined
1	0	1	0	not defined
1	0	1	1	not defined
1	1	0	0	not defined
1	1	0	1	EF
1	1	1	0	not defined
1	1	1	1	not defined

Doubleside mode (DS)

This function enables doubleside reading.
If this bit is set (DS = 1), code/data carriers of the types ICC-50 IDC-50, and IDC-CARD can be read from both sides. Otherwise code carriers are only read from the inscribed side.

Date of issue 02.08.2001

Head number (K3 ... K1)

The parameters K3 ... K1 define which read head(s) shall be activated..

Head number K3 ... K1			
3	2	1	Bit No.
K3	K2	K1	Head
0	0	0	1
0	0	1	2
0	1	0	3
0	1	1	4
1	0	0	all
1	0	1	all
1	1	0	all
1	1	1	all

7.3.1 Communication direction: control interface unit ⇒ PROFIBUS DP

10 data words in the direction control interface unit to the PROFIBUS master are structured as follows:

Word 0	**Command, Parameter and Toggle flag mirrored**															
Bit No.	15	**14**	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Designation	B4	**B3**	B2	B1	DS	0	0	0	0	0	0	0	K3	K2	K1	T
Word 1	**Status/Execution counter/Head number**															
Bit No.	15	**14**	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Designation	-	**K3**	K2	K1	A4	A3	A2	A1	H4	H3	H2	H1	S4	S3	S2	S1
Word 2 ... 9	**read data**															

Commands and command parameters already sent are repeated in word 0 as an acknowledgement.

Word 1 contains status information, the execution counter and the assigned head number. The bits H4 ... H1 are only used for the command EF in the "Enhanced Buffered Auto read Fixcode" mode. They contain information about head activity:

H_i=1 : the read head is activ
H_i=0 : the read head is not activ

The words 2 ... 9 contain the data read.

Date of issue 02.08.2001

Head number (K3 ... K1)

000_b = head 1	001_b = head 2	010_b = head 3	011_b = head 4

Should "all" heads respond, then the heads are successively read out in the sequence 1, 2, 3 and 4.

Execution counter (A4 ... A1)

The execution counter is reset for command start and incremented each time as soon as new status values or data are available.

Note

The fields, head number, status and the words 2 to 9 do not contain valid data as long as the counter remains at 0.

Status indicator (S4 ... S1)

General status and error messages are defined by the parameters S4 ... S1.

Status display S4 ... S1				
3	2	1	0	Bit No.
S4	**S3**	**S2**	**S1**	**Status**
0	0	0	0	error-free execution of command
0	1	0	0	incorrect command, invalid parameter or time-out
0	1	0	1	read error
0	1	1	0	hardware fault (read head defective)

Word 2 ... 9: Read numbers/Read data

For each of the four read heads a data field of 2 words is reserved.
Word 2 / 3: read head 1
Word 4 / 5: read head 2
Word 6 / 7: read head 3
Word 8 / 9: read head 4

Each of the data fields has the following structure:

Words 2 / 4 / 6 / 8

Bit	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
	ERR	L3	L2	L1	C28	C27	C26	C25	C24	C23	C22	C21	C20	C19	C18	C17

Words 3 / 5 / 7 / 9

Bit	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
	C16	C15	C14	C13	C12	C11	C10	C9	C8	C7	C6	C5	C4	C3	C2	C1

- ERR: Read error flag, head related.
  For command SF, AF, BF: Flag is always zero.
  For command AF: The read error flag will be set if no code/data carrier is in the reading area.

Date of issue 02.08.2001

- L3..1: 3 Bit read number, head related
- the read numbers of all active heads are set to 0 at the start of instruction and are incremented with the receipt of data or a status message of the respective head. In contrast to it the execution counter in word 1 is incremented with each data or status message of the identification system, independently of the head number.
- C28..1: 28 bit fixcode data, in hexadecimals packed
  The identification system transmits the fixcodes as ASCII strings with 7 characters length in data format '10'. Here the first three characters represent a hexadecimal number, the remaining four characters a decimal number.
  The first three characters are directly transferred into the bits C28 to C17 after ASCII/Hex transformation. The following four characters represent a hexadecimal number. Before comparing with the data format '10' they must converted to a four-digit decimal number (0..9999).

  e.g.: Code A764325 (ASCII) : C28..C1 = xA_h, 76_h, 10_h, E5 (x = ERR, L3..1)

Date of issue 02.08.2001

7.3.2 PROFIBUS-DP command sequence, example

The execution of the command commences as soon as a valid command has been written in the register with a toggled flag "T". After reception of the command, this flag, together with the remaining fields of the word 0, are passed back to the master as aknowledgement.

Initial status:

Head number (K3...1)	0
Execution counter (N4...1)	0
Status (S4...1)	0
4 x read error flags (ERR)	0 for SF, AF, BF; 1 for EF
4 x read numbers (L3...1)	0
4 x fixcode data (C28...1)	0

The execution counter is incremented on each command from the IDENT system. All the same time, the fields head number, status, read error flag, read numbers and fixcode data are set in accordance with the IDENT system message. The handling of the read error flag also depends on the command.

The read numbers are incremented when read data has been received from the IDENT system (Status 0). Only the read number of the data field is incremented, that is assigned to the head number sent by the IDENT system. The read number is not incremented if the IDENT system reports an error (Status 4, 5, 6).

The read error flag is not operated for the commands SF, AF und BF and always remains at 0.

The following applies to the command EF: The read error flag is reset (=0) as soon as read data has been received from the IDENT system (Status 0). The read error flag is set as soon as the IDENT system reports a read error (Status 5), and remains unchanged for other error messages (Status 4, 6).

A command sequence is shown in the following example.

Command: "Single Read Fixcode" with head 2, without doubleside mode

Command from the DP master

Command (B4 ... B1)	0001_b	SF (Single Read Fixcode)
Doubleside (DS)	0_b	doubleside mode OFF
Head number (K3 ... K1)	001_b	head number 2 responds
Toggle flag (T)	1_b	(or 0, depending on the previous status, for first command or when switched on = 1)

Word 0	**Commands and parameters**															
	B4	B3	B2	B1	DS	0	T2	T1	N4	N3	N2	N1	K3	K2	K1	T
	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1

$= 1003_{hex}$

Date of issue 02.08.2001

Response from the control interface unit to the DP master

Single commands are executed once and the result (success or error) is output.

	Word 0	Word 1	Word 2	Word 3	Word 4	Word 5	Word 6...9	
	1003 (hex)	1105 (hex)	XXXX	XXXX	XXXX	XXXX	XXXX	if no code carrier in front of head
or	1003 (hex)	1106 (hex)	XXXX	XXXX	XXXX	XXXX	XXXX	if head not connected or is defective
or	1003 (hex)	1100 (hex)	0000 (hex)	0000 (hex)	1B54 (hex)	0E3A (hex)	0000 ... 0E3A (hex)	if code carrier includes "B543642“ (ASCII) in front of head

Word 0: command and parameters mirror-imaged

Word 1: status/execution counter/head number (see below)

Words 2 ... 9: for successful reading, the corresponding data from the code carrier are given here.

Word 1	Status/Execution counter/Head number															
	-	K3	K2	K1	A4	A3	A2	A1	-	-	-	-	S4	S3	S2	S1
	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	1
or	0	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0
or	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0

Head number	(K3 ... K1)	001_b	read by head 2
Execution counter	(A4 ... A1)	0001_b	executed once
Status	(S4 ... S1)	0101_b	read error
	or	0110_b	hardware fault
	or	0000_b	error-free execution of command

Date of issue 02.08.2001

Date of issue 02.08.2001

8 Fault Diagnostics

LED error indicators

The "Run/Error" LED indicates the status of the control interface unit IRI-KHD2-4HB6/ IRI-KHA6-4HB6:

Status of the "Run/Error" LED	Description
permanent GREEN	ready for operation/communication active
5 s RED, 0.5 s GREEN blinking	ready for operation/communication faulty
permanent RED	device error

Date of issue 02.08.2001

Date of issue 02.08.2001

9 Technical Data

9.1 General specifications

The control interface unit is operated as a slave on the PROFIBUS-DP.

Up to 4 read heads can be connected to the control interface unit. All read heads connected to the device are detected and the codes which are read in transmitted in one cycle.

The address is set via DIP switches, and the terminating resistor for the bus is connected via a rotary switch.

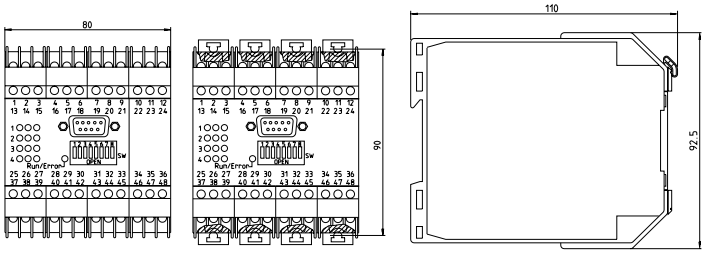
Number of read heads	max. 4
Interface	RS 485
Protocol	PROFIBUS-DP accord. to DIN EN 50170
Transmission rate	9.6, 19.2, 4.44, 93.75, 187.5, 500, 1500 kBit/s self-synchronising
Address adjustment	DIP switches

9.2 Electrical data

Order code	IRI-KHD2-4HB6	IVI-KRA6-4HB6
Power supply		
Supply voltage	18 V DC ... 32 V DC	85 V AC ... 253 V AC, 50 Hz ... 60 Hz
Ripple	≤ 10 %	
Current	250 mA	60 mA
Quiescent current	120 mA (type.)	35 mA (type.)
with activ heads	190 mA	45 mA
Power consumption	6 W	12 W

Date of issue 02.08.2001

9.3 Mechanical data



Ambient conditions	
Operating temperature	-25 °C ... +70 °C (248 Kelvin ... 343 Kelvin
Storage temperature	-25 °C ... +85 °C (248 Kelvin ... 358 Kelvin)
Humidity	max. 75 % rel. humidity
Mechanical specifications	
Protection degree	IP20 acc. EN 60529
Connection possibilities	self-opening apparatus terminals, max. cross sectional area 2 x 2.5 mm^2 9-pin Sub-D built-in connector
Housing material	Makrolon 6485
Construction type	K-System, 80 mm (4 TE)
Mounting	snaps onto 35 mm standard rail according to DIN EN 50022 or screw-mountable with 2 screws through pull-out brackets in 90 mm spacing

9.4 Indicating/operating means

LED green	Read head active (4 LEDs, 1 per head)
LED yellow	Code carrier detected (4 LEDs, 1 per head)
LED red	Functional reserved (4 LEDs, 1 per head)
LED red/green permanently green red-green blinking permanently red	device status device ready for operation/communication active device ready for operation/communication faulty device error
DIP-switches	setting the station address
Rotary switch (S9)	Bus termination 0 = not activ (OFF) 1 = aktiv (ON)

9.5 Software

Software	The GSD file is included in the scope of delivery.
Terminal block	is included in the scope of delivery

Date of issue 02.08.2001

10 Appendix

List of abbreviations

ACI	-	acyclic control interval
ALI	-	application layer interface
BRCT	-	PROFIBUS connection type: broadcast
CRC	-	cyclic redundancy check
DIP	-	dual in-line package, housing type
EEPROM	-	electronically erasable and programmable ROM
FMS	-	fieldbus message specification
HEX	-	hexadecimal
LED	-	light emitting diode
MIN_TSDR	-	minimal station delay time
MSAZ	-	PROFIBUS connection type: master-slave acyclic
MSZY	-	PROFIBUS connection type: master-slave cyclic
MULT	-	PROFIBUS connection type: multicast
PC	-	personal computer
PDU	-	protocol data unit
PLC	-	programmable logic controller
PNO	-	PROFIBUS User Organisation
RAC	-	read acknowledge request counter
RAM	-	random access memory
RCC	-	read confirmed request counter
ROM	-	read only memory
SAC	-	send acknowledge request counter
SAP	-	service access point
SCC	-	send confirmed request counter

Date of issue 02.08.2001

Date of issue 02.08.2001

11 Data exchange with an S5 IM308C

11.1 Short Description

The Pepperl+Fuchs control interface unit IRI-KH❑❑-4HB6 (bus address 3) is connected to the S5 via the IM308C Profibus master (bus address 1). 10 words of input data and 1 word of output data are exchanged with the control interface unit via the Profibus. The IM308C is parameterized using the COM Profibus program.

The 10 words of input data are written using the FB192 function block in data block 30.

Whereas the output data word can be accessed directly via the output address (in the example P010 = output word 10).

11.2 Used components

S5 135U	SIEMENS
CPU 928B	SIEMENS
IM308C	SIEMENS
IRI-KHD❑❑-HB6	Pepperl+Fuchs GmbH
PG 740	SIEMENS
FB192	SIEMENS
COM Profibus Program	SIEMENS

Setting PROFIBUS-DP address 3 on the IRI-KHxx-4HB6 via DIP switch 1 - 8

Switch 1	ON
Switch 2	ON
Switch 3	OFF
Switch 4	OFF
Switch 5	OFF
Switch 6	OFF
Switch 7	OFF
Switch 8	OFF

Note

In image block B1, data block DB30 and output word 10 in the "Control variables" can be viewed.

Date of issue 27.08.2001

11.3 Parameterizing the IM308C with COM Profibus

After starting the COM Profibus program, the supplied GSD file must be read in via the "File" menu, provided it has not yet been read in.

The control interface unit is then identified by the program under "other" devices.

The parameterization of the IM308C with a new project can now begin.

The individual steps are summarized below. The first step is the creation of a new project under the menu item "File -> New".

First, the Profibus master is defined. In the example, the card IM308C with bus address 1 is used as the master and an S5-135U with a CPU928B is used as the S5 station. The appropriate selection is confirmed with the OK button.

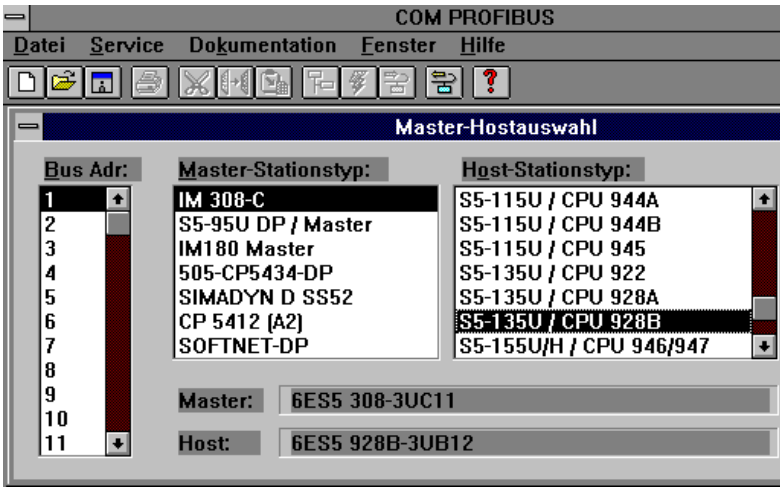


Figure 1

Date of issue 27.08.2001

Double click on the master system to open a window. Appearing on the right-hand side of this window is a selection table for the Profibus slaves. The control interface unit can now be added to the Profibus as "other" slave. The bus address set in the example is address 3.

The settings are taken over by the program by clicking the OK buttons.

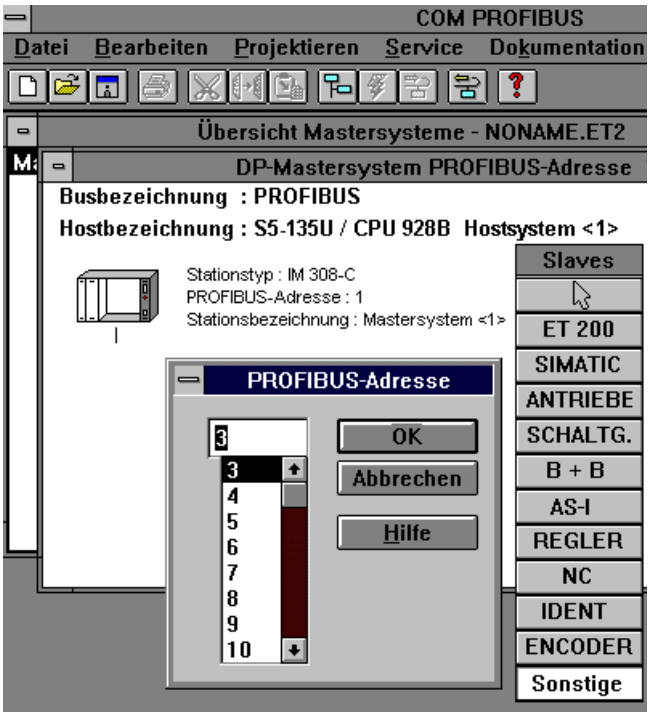


Figure 4

Date of issue 27.08.2001

In the window which now appears, select control interface unit IRI-KH❑❑4HB6 from the list of other slaves.

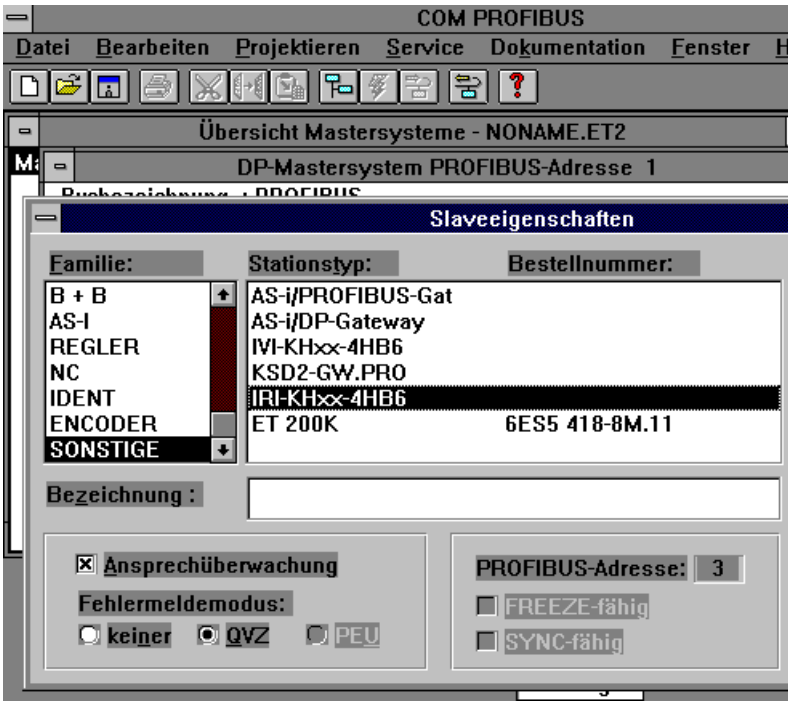


Figure 3

Upon successful selection, the window DP-Master SystemPROFIBUS-Adresse opens in which the Profibus branch is displayed.

If all settings have been made correctly up to now, the designation of the control interface unit appears on the square with bus address 3.

Double click on this square to configure the data transmission with the control interface unit.

Date of issue 27.08.2001

Select the Order Number button to open a window in which the set input/output data are displayed. The COM Profibus program uses the GSD file as the source of this information.

For the configuration, both entries are to be marked and taken over by the program by clicking on the appropriate buttons. The window can then be closed.

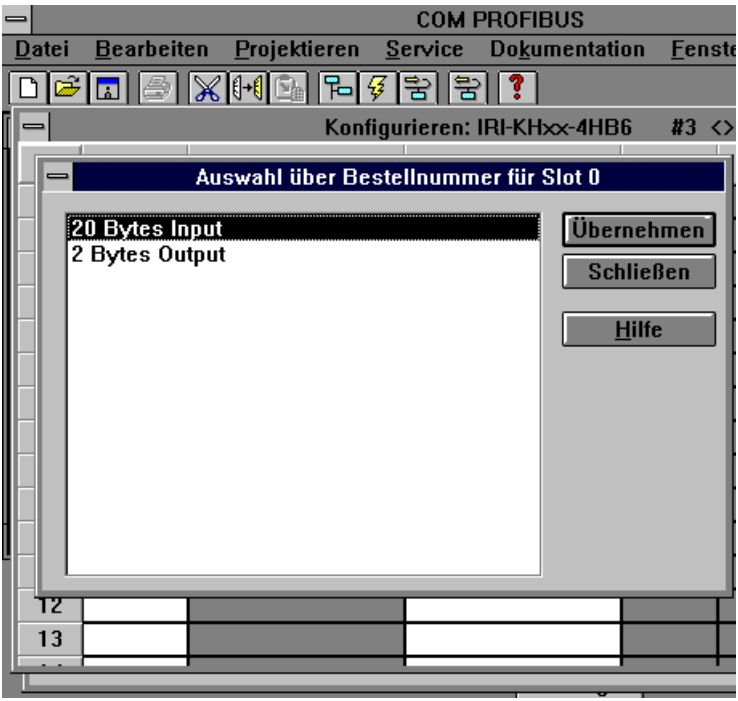


Figure 4

Date of issue 27.08.2001

Under the term "Identifier", the numbers 217 and 224 should now be entered. These two numbers represent the transmission parameters shown in figures 5 and 6 .

10 words of input data are transmitted by the control interface unit via the Profibus. This transmission must occur with component consistency. As a result, the data cannot be accessed directly from the input address area. For transmission, the function block FB192 must be used together with a data block for the reception of the data.

The FB192 is used for data communication between the S5CPU and the IM308C.

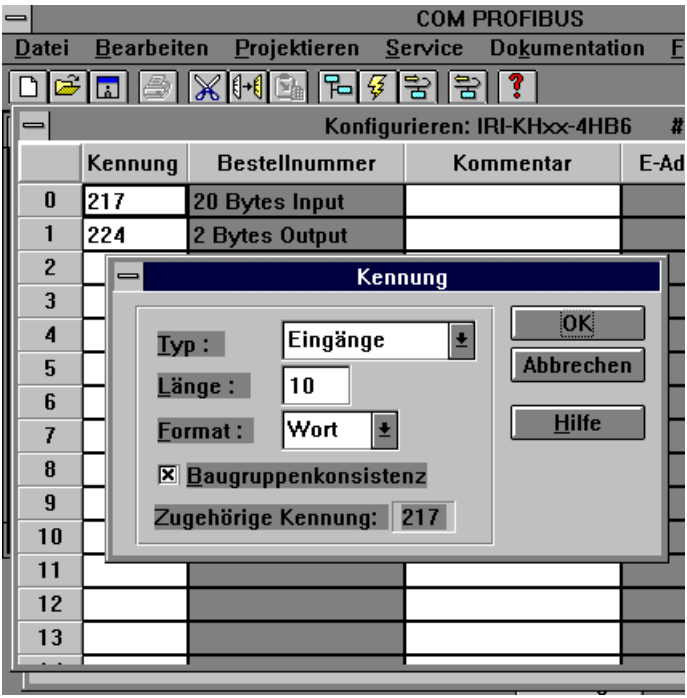


Figure 5

Date of issue 27.08.2001

The word of output data which is to be transmitted to the control interface unit can be accessed directly via an output address.

This is to be entered in field A-Adr. Address 10 is used in the example (Figure 7).

Figure 6

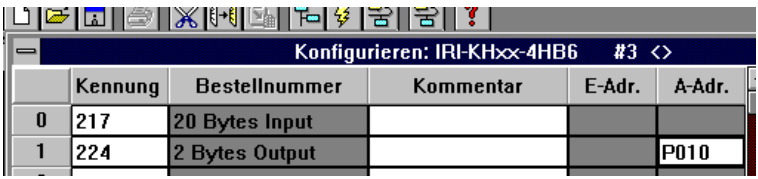


Figure 7

The configuration of the Profibus system with the control interface unit is now concluded and can be transmitted to the memory card of the IM308C.

After storing successfully on the memory card, the card can be inserted in the IM308C.

As soon as the control interface unit is correctly connected to the IM308C, the green LED illuminates.

Date of issue 27.08.2001

11.4 Program

OB1

```
                SPA FB3
 NAME:          IVI-DP
                BE
```

FB3

```
 NAME:          IVI-DP

                A DB 30

                SPA FB192
 NAME:          IM308C
                KH F800
                KY 0.3          Slave Address 3
                KC RI           RI Read command data
                KM 00000000 00000000
                KY 0.30         Data block number DB30
                KF +0           Offset for 1st data word, here 0
                KF -1
                MW 200          Marker for FB192 messages

                BE
```

The output data to be transmitted to the control interface unit are written to output address 10.

Date of issue 27.08.2001

AW 10

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	B4	B3	B2	B1	DS	SF	0	0	0	0	0	0	K3	K2	K1	T

- B4..1: Command identifier

B4	B3	B2	B1	Meaning
0	0	0	0	No command
0	0	0	1	SF
0	0	1	0	AF
0	0	1	1	BF
0	1	0	0	not def.
0	1	0	1	not def.
0	1	1	0	not def.
0	1	1	1	not def.
1	0	0	0	not def.
1	0	0	1	not def.
1	0	1	0	not def.
1	0	1	1	not def.
1	1	0	0	not def.
1	1	0	1	not def.
1	1	1	0	not def.
1	1	1	1	not def.

DS: Double-Side Mode ON/OFF (doubled-sided reading/writing for IDC/ICC-50 only)

SF: Security-Flag ON/OFF (data media can be read as code carriers)

K3..1: Head number

K3	K2	K1	Head
0	0	0	1
0	0	1	2
0	1	0	3
0	1	1	4
1	0	0	all
1	0	1	all
1	1	0	all
1	1	1	all

Date of issue 27.08.2001

- T: Toggle flag

Note

The toggle flag serves as an identifier for a new command and must always be toggled in order to transmit a command.

The input data transmitted by the control interface unit are located in data block DB30.

Word 0: command + parameter, mirrored

Word 1: status/execution counter/head number

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	K3	K2	K1	N4	N3	N2	N1	0	0	0	0	S4	S3	S2	S1

K3 ...1: read-head numbers (head 1...4, see above)

N4 ...1: 4-bit execution counter

S4 ...1: status/error message, see above

Words 2..9: read numbers/read data

A data field of 2 words is reserved for each of the four read heads:

Words 2/3: read head 1

Words 4/5: read head 2

Words 6/7: read head 3

Words 8/9: read head 4

Each of the data fields has the following structure:

Words 2/4/6/8

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	RES	L3	L2	L1	C28	C27	C26	C25	C24	C23	C22	C21	C20	C19	C18	C17

Words 3/5/7/9

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	C16	C15	C14	C13	C12	C11	C10	C9	C8	C7	C6	C5	C4	C3	C2	C1

RES: reserved

L3 ...1: 3-bit read number, head-related

C28 ...1: 28-bit fix-code data, packed hexadecimal

Date of issue 27.08.2001

Command execution begins as soon as a valid command is written to the identifier with toggled flag "T". Upon reception of the command, the flag is returned to the master together with the other fields of word 0 as acknowledgement.

DB 30

0:	KH 3005
1:	KH 2B00
2:	KH 0000
3:	KH 0000
4:	KH 0000
5:	KH 0000
6:	KH 3B06
7:	KH 0AAD
8:	KH 0000
9:	KH 0000

11.5 Example

Commands can be sent to the control interface unit by changing the output word AW 10.

When transmitting commands, note that bit 0 of output word AW 10 must always be toggled in order for the command to become valid.

T = 0, when previously 1

T = 1, when previously 0

For the first command, the toggle bit T must be equal to 1.

Date of issue 27.08.2001

Continuous reading of a code with read head No. 3 (Buffered-Auto-Read)

Output data:

AW 10 Command - Profibus master to control interface unit

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	T

Input data:

DB30

DW 0 Mirroring of the command from the control interface unit to the Profibus Master

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	T

DW 1 Status/execution counter/head number

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	-	K3	K2	K1	N4	N3	N2	N1	-	-	-	-	S4	S3	S2	S1

K3 ... 1: read-head numbers

N4 ... 1:1 bit execution counter

S4 ... 1: status/error message

DW 2 read head 1 data

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

DW 3 read head 1 data

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

DW 4 read head 2 data

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Date of issue 27.08.2001

DW 5 read head 2 data

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

DW 6 read head 3 data

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	RES	L3	L2	L1	C28	C27	C26	C25	C24	C23	C22	C21	C20	C19	C18	C17

DW 7 read head 3 data

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	C16	C15	C14	C13	C12	C11	C10	C9	C8	C7	C6	C5	C4	C3	C2	C1

DW 8 read head 4 data

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

DW 9 read head 4 data

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Date of issue 27.08.2001

Date of issue 27.08.2001

Date of issue 25.07.2001

Notes

Date of issue 25.07.2001

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Notes

Date of issue 25.07.2001

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Notes

Date of issue 25.07.2001

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

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