



## MANUAL

### VAG-IBS-KF-FB

AS-INTERFACE/INTERBUS GATEWAY

IP20



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.

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### 1 Declaration of Conformity

The AS-i/InterBus gateway VAG-IBS-KF-FB has been developed and produced in accordance with the applicable European standards and directives.



*The corresponding of conformity can be requested from the manufacturer.*

#### Note

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





## **2 The Used 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.*





## 3 Safety

### 3.1 Intended Use



**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 device 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 operation manual is performed.*

*The connecting of the equipment and any maintenance work to be carried out with voltage applied to the equipment must only be performed by appropriately qualified electrotechnical personnel.*

*In the case that a failure cannot be repaired, the device must be taken out of operation and kept from inadvertently put back into operation.*

*Repair work is to be carried out by the manufacturer only. Additions or modifications to the equipment are not allowed and void the warranty.*



**Note**

*The operator is responsible for the observance of local safety standards.*



### 4 General Information

This operating instruction is for use with the following devices of the Pepperl+Fuchs GmbH:

- VAG-IBS-KF-FB

The AS-i/INTERBUS gateways serve to connect the Actuator-Sensor-Interface to the INTERBUS. The Gateways act as a complete master for the AS-Interface and as a slave for INTERBUS.

Both gateways can be used in the same way. Commissioning, debugging and setting up of the AS-i parameters can be accomplished with the use of two push-buttons, the display and the LEDs directly on the device as with all AS-i masters of Pepperl+Fuchs.

It is also possible to do the configuration of AS-interface with the CMD software. Advanced diagnostics to detect occasional occurring errors and judge the quality of the AS-interface communication can be executed as well with the CMD software.

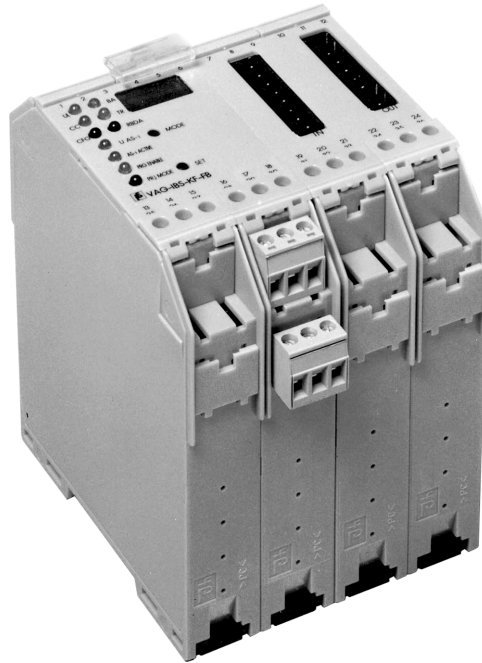
The gateway transmits the AS-i I/O data and AS-i flags cyclically within 9 INTERBUS words of the process data channel. All AS-interface functions can be called up via PCP objects.

INTERBUS module error can be configured to be caused by AS-i configuration error or AS-i power failure.



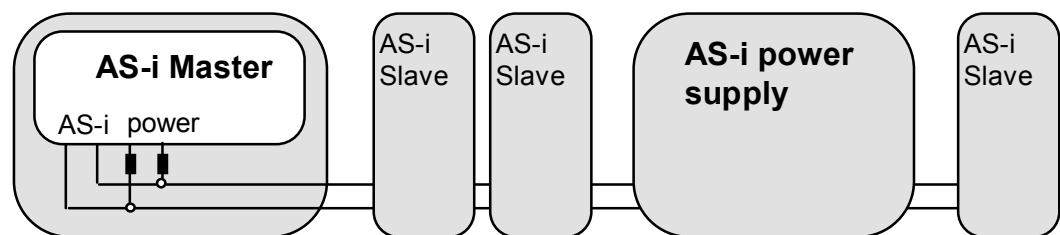
## 5 Installation, Displays and Operating Keys

### 5.1 AS-i/INTERBUS Remote Bus Gateway



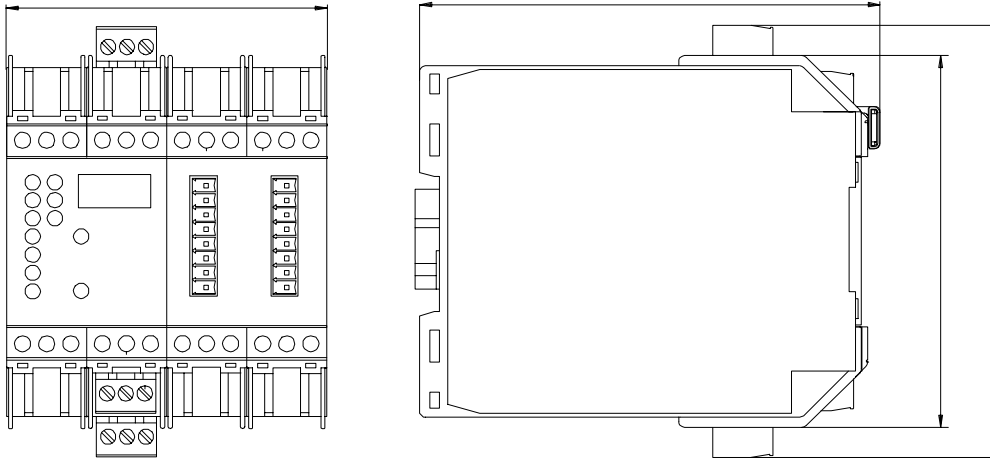
The devices in IP20 have the terminals for INTERBUS and the push buttons on the top of the housing. The AS-Interface is connected with plugable screw cramps at the side of the housing.

Every AS-i master and all the AS-i gateways in IP20 come with power supply A. An AS-i power supply has to be used which also supplies the AS-i master with power and can be connected to the AS-i cable like all the other AS-i components at any place. The AS-i master is connected to AS-i using the penetration technique of the electro-mechanical interface which is common with AS-i slaves as well.

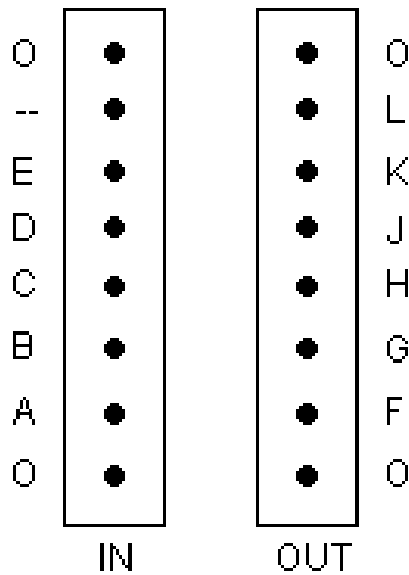


## 5.1.1 Connection of an INTERBUS Remote Bus Gateway

The AS-i/INTERBUS gateway in IP20 can be connected to INTERBUS with two Mini-CombiCon terminals on the top of the housing.



O	Shield
A	/D0
B	D0
C	/D1
D	D1
E	GND
-	-
O	Shield
<hr/>	
O	Shield
F	/D0
G	D0
H	/D1
J	D1
K	GND
L	RBST
O	Shield



## 5.2 Display and Operating Elements

On the front panel of the AS-i/INTERBUS gateway are several light-emitting diodes, a two-digit seven-segment display and two push buttons to configure the gateway.

## 5.2.1 LEDs

UL	LED (green). Lights up when the operating voltage is available on the INTERBUS side.
CC	LED (green). Lights up when connection has been made through the incoming ST cable.
config err	LED (red). Configuration error in the AS-i network. When this LED is alight, the seven-segment display indicates an AS-i address. This is the lowest AS-i address at which a configuration error has been detected, i.e. a higher AS-i address may appear when the error is rectified.
U ASI	LED (green). Lights up when the operating voltage in the AS-i network is correctly applied.
ASI active	LED (green). Lights up when the AS-i network is in protected mode, i.e. the AS-i cycle is running.
prg enable	LED (green). Configuration mode, i.e. the addresses of the AS-i slaves can be modified directly on the AS-i/INTERBUS gateway and the actual configuration of the AS-i can be displayed. All connected slaves participate in the data exchange, whilst in the protected mode only the configured slaves are addressed and polled.
prj mode	LED (yellow). Configuration mode, i.e. the addresses of the AS-i slaves can be modified directly on the AS-i/INTERBUS gateway and the actual configuration of the AS-i can be displayed. All connected slaves participate in the data exchange, whilst in the protected mode only the configured slaves are addressed and polled.
BA	LED (green). "Bus Active" Lights up when data are being exchanged through INTERBUS and is off when INTERBUS is in the stop condition.
TR	LED (green). Flashes when the AS-i/INTERBUS gateway is executing PCP communication, i.e. is being addressed and responding over the parameter channel.
RD	LED (green). Remote Bus disable.

## 5.2.2 Seven-Segment-Display

The seven-segment-display shows slave addresses, errors and operations modes. See also chapter 11.

### 5.2.3 Push-Buttons

The two push-buttons are:

**mode** switches between configuration mode and protected mode; stores the actual configuration as projected configuration.

**set** selection and setting of the address of an AS-i slave.

See chapter 6 for a detailed description.



## **6 Operating the AS-i/INTERBUS Gateway**

### **6.1 Master Start-Up**

After powering on, all segments of the figure display and all LEDs light up for approximately one second (self-test). Afterwards, the LEDs display the condition of their respective flags. The figure display shows the condition of the master:

**40 Off-line Phase**

The AS-i master initializes - there is no data communication on the AS-i.



**Attention**

***If the AS-i circuit is insufficiently powered ("U AS-i" does not light up)/INTERBUS, the master remains in the off-line phase.***

**41 Detection Phase**

Start of the start-up phase, where the system looks for slaves located on the AS-i. The master remains in the detection phase until it finds at least one slave.

**42 Activation Phase**

Condition at the end of the start-up operation where the parameters are transmitted to all connected and recognized slaves. This enables access to the AS-i slaves' data connections.

**43<sup>1</sup> Start of Normal Operation**

In normal operation the AS-i master can exchange data with all active slaves. It transmits management messages and looks for and activates newly connected slaves. During normal operation, the system keeps the maximum cycle time of 5 milliseconds.

### **6.2 Configuration Mode**

The configuration mode serves to configure the AS-i circuit.



**Attention**

***In the configuration mode, all recognized slaves are activated even when the desired and actual configurations do not match.***

Pressing the "mode" button for at least five seconds switches the master to configuration mode. While in configuration mode, the yellow "prj mode" LED lights up.

The system then displays one after the other all detected slaves at a speed of two per second. If the display is empty, no slaves were detected on the AS-i circuit.

In configuration mode, all recognized slaves are activated except of slave zero. The AS-i master is in normal operation. There is data exchange between the AS-i master

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1. Activation phase and the start of normal operation maybe so short that the numbers can not be seen in the display.

and all AS-i slaves detected by the master regardless of whether the detected AS-i slaves were projected before.



Attention

*When delivered the device is in configuration mode.*

### 6.3 Protected Operating Mode



Note

*In contrast with the configuration mode in the protected mode there is only data exchange between the AS-i master and the projected AS-i slaves.*

#### 6.3.1 Switching to Protected Operating Mode

The configuration mode can be left by pressing the “mode” button.

Pressing the button shortly:

Exits the configuration mode without projecting the current AS-i configuration.

Pressing the button for more than five seconds:

Exits the configuration mode and projects the actual AS-i configuration. Simultaneously the actual AS-i configuration is stored as nominal configuration in the EEPROM.



Note

*If the system detects an AS-i slave with address zero on the AS-i, it can not leave the configuration mode.*

In the protected operating mode, only AS-i slaves that are projected and whose actual configurations match the nominal configurations will be activated.

#### 6.3.2 Configuration Errors in Protected Operating Mode

As long as there is no configuration error, the numeric display is turned off while in protected operating mode. Otherwise, the address with a faulty assignment is displayed. A faulty assignment occurs when a slave has been recognized or projected but cannot be activated.

If there are more than one faulty assignments the one that was first detected is displayed. Pressing the “set” button shortly displays the next higher faulty address.

Shortly appearing configuration errors are stored in the device (advanced AS-i diagnosis). The last error that occurred can be displayed by pressing the set button. If a short AS-i power failure is responsible for the configuration error the display shows a “39”.

## **6.4 Assigning an AS-i Address in Configuration Mode**

### **6.4.1 Assigning a Slave Address**

(assigning an available address to a slave with address zero)

In configuration mode, the addresses of all detected slaves are displayed one after the other. To display the next higher available operating address, press the “set” button shortly. Each time you press the “set” button, the next available address is displayed.

Choose the displayed address as your target address by pressing the button for more than five seconds. The address display blinks. The master is ready for programming; pressing the “set” button again addresses the connected slave with address zero to the target (blinking address).

Any errors will be displayed by their error codes according to chapter 11. Otherwise, the detected slaves are displayed again as described in chapter 6.2..



*There must not be two AS-i slaves with the same address on the AS-i circuit.*

### **6.4.2 Erasing the Slave Address**

(assigning address zero to a detected slave)

In configuration mode, the addresses of all recognized slaves are displayed one after the other. By pressing and releasing the “set” button, the master displays the next available address. If you press the button for more than five seconds while the address of a detected slave is displayed, this slave will get the address zero and the display shows “00”.

When you release the button, the display continues to display the detected slaves.

## **6.5 Programming the Address in Case of Configuration Errors**

### **6.5.1 Automatic Address Assignment**



*One of AS-i's great advantages is the automatic address assignment. If a slave fails, it can be replaced by one of the same type with address zero. The master will detect the replacement and automatically addresses the new slave with the address of the faulty one.*

For automatic programming to work, some requirements must be met:

1. The AS-i master must be in the protected operating mode.
2. The “Auto\_Address\_Assign” release flag must be set.
3. Only one of the projected slaves may not be detected.

If these requirements are met, the AS-i master's "prg enable" LED lights up and a slave with address zero will be automatically assigned to the operating address of the missing slave.



**Attention**

*If the two slaves have different configuration data, i.e. are not of the same type as far as AS-i is concerned, the automatic address assignment will not be carried out.*

### 6.5.2 Manual Address Assignment



**Note**

*If several slaves fail, they cannot be replaced automatically by the AS-i master. Then these addresses have to be set manually. If this should not be done via the host interface or with a hand held addressing device, the slave addresses can also be changed with the help of the push buttons and the figure display of the device.*

In protected operating mode, wrong assignments are displayed as errors (see chapter 6.3). By pressing the "set" button, you can display all faulty assignments one after the other. By pressing the "set" button for more than five seconds, you can select the currently displayed address as a potential target address, and the display starts to blink.

If the faulty slave was previously replaced by a slave with address zero, the new slave can now be programmed for the blinking address by pressing the "set" key again. As a requirement, the new slave's configuration data must match the configuration data for the blinking address.

After the address has been successfully set, the next faulty assignment is displayed and the address assignment can begin from the start. Otherwise, the system displays an error code (chapter 11). When all faulty assignments are eliminated the display is empty.

### 6.6 Error Messages



**Attention**

*The system displays error codes for error messages that do not point to faulty assignments on the AS-i circuit. The code numbers are larger than 50 and are therefore outside the slave address range. These codes are described in the appendix, chapter 11.*

## 7 Advanced Diagnostics for AS-i Masters

The advanced AS-i diagnostics serve to locate occasionally occurring errors and to judge the quality of data transmission on AS-i without additional diagnostics tools.

The AS-i Parameterization of the INTERBUS CMD software supports the operation of the advanced diagnostics (LCS, error counters and LOS).

### 7.1 List of Corrupted AS-i Slaves (LCS)

To locate occasionally occurring short-time configuration errors the AS-i masters with advanced diagnostics manage beside the list of projected slaves (*LPS*), the list of detected slaves (*LDS*) and the list of activated slaves (*LAS*) a forth list, the **list of corrupted slaves (LCS)**. This list contains entries of all AS-i slaves which were responsible for at least one configuration error since powering up the AS-i master or reading the list. Short-time AS-i power failures are represented in the *LCS* at the position of AS-i slave with address 0.



**Note**

*With every read access the LCS will be deleted.*



**Note**

*The last short-time configuration error can also be displayed on the AS-i Master:*

*Pressing the “set” button of the AS-i master shows the AS-i slave which was responsible for the last short-time configuration error. If there was a short-time AS-i power failure the display shows “39” after pressing the “set” button.*

*This function is only available if device is in the normal operation mode of the protected mode (display empty) or in the off-line-phase.*

### 7.2 Error Counters: Counters of corrupted data telegrams

The AS-i master with advanced diagnostics has an error counter for each AS-i slave, which is increased every time there is a corrupted AS-i telegram. This makes it possible to judge the quality of the AS-i network, even if only a few corrupted telegrams occurred and the AS-i slave did not cause any configuration errors.



**Note**

*The counter values can be read via the host interface and will be deleted with every read access. The counter value is limited to 254. 255 means counter overflow.*

### 7.3 Off-line Phase on Configuration Errors (LOS)

The AS-i masters with advanced diagnostics offer the possibility to put themselves into the off-line Phase when a configuration error on the AS-Interface occurs. In this way the security of the application can be ensured. The reaction to a configuration er-

ror is very fast and the host can be relieved from this task. If there are any problems on the AS-i network, the AS-interface can be switched to a secure state.

There are two different ways to parameterize the AS-i master for this feature:

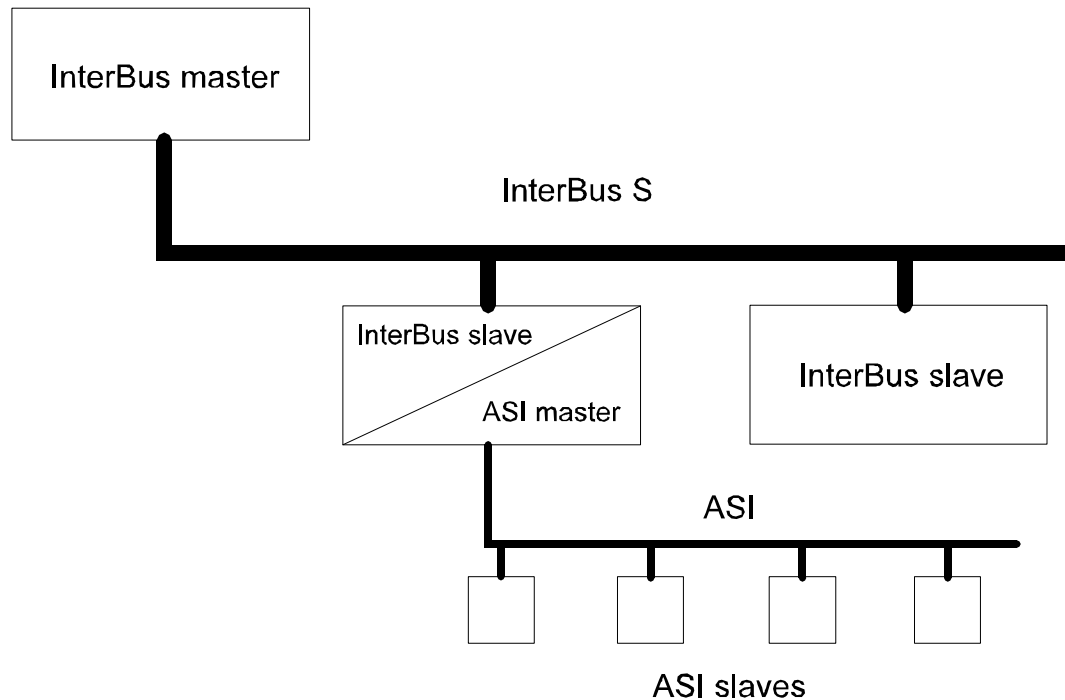
- Every configuration error during normal operation in protected mode releases the off-line phase.
- For each slave address can be chosen whether a configuration error on this address will release the off-line phase or not. This information is stored in the List of Off-line Slaves (LOS).

The user himself can decide how the system reacts to a configuration error on the AS-Interface. The AS-i master can release the off-line phase in critical situations, i.e. only with certain slave addresses, while in less critical situations (if one of the other AS-i slaves have a configuration error) only the error message configuration error is sent to the host, but AS-i is still running.

## 8 AS-i/INTERBUS Gateway

The primary task of the AS-i/INTERBUS gateway is to transfer bits from INTERBUS to the AS-i slaves (actuators) and to transfer bits from the AS-i to INTERBUS.

On the one hand, the AS-i/INTERBUS gateway is controlled by the INTERBUS master, i. e. it is an INTERBUS slave. On the other hand, it is the AS-i master, i. e. it monitors the AS-i network connected to it and controls all processes on it.



The processes on the two sides run independently of one another:

- the information from the process data channel on INTERBUS is temporarily stored in the AS-i/INTERBUS gateway until it can be transferred to the appropriate AS-i slave;
- the most recent available information from all the AS-i slaves is forwarded in an INTERBUS cycle via the process data channel to the INTERBUS master.

The maximum delay between INTERBUS master and AS-i slave is determined by the cycle time for the AS-i (maximum 5 ms) and the cycle time of INTERBUS (maximum 10 ms).

### 8.1 Information Exchange over INTERBUS

The AS-i/INTERBUS gateway uses 10 16-bit words on INTERBUS:

- One word is used for the PCP (Peripherals Communication Protocol) through which the AS-i/INTERBUS gateway is programmed and queried; the PCP word does not appear in the process image of the PLC. The INTERBUS master automatically masks out this word.
- One word is used as the control word. The INTERBUS master can use this to interrupt data transmission in the AS-i network.

- the control word is replaced by the status word in the read cycle. The status word supplies status information to the INTERBUS master.
- Eight words (128 bits) constitute the fast process data channel. Here, bits are exchanged directly with the AS-i, so that four bits are available for each of the possible total of 31 AS-i slaves (address 0 is reserved for special tasks).

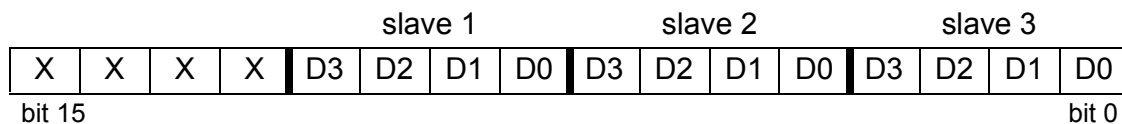
PCP (1 word)	Control word	Process Data (8 words)
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## 8.1.1 Process Data Channel

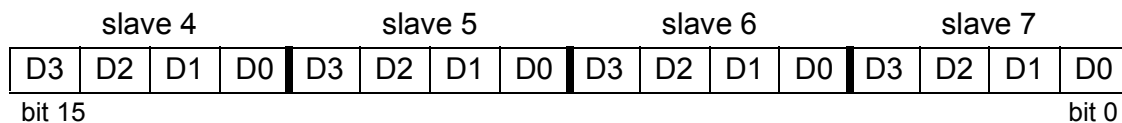
The process data channel transfers logical states directly between the programmable logic controller (PLC) and the digital actuators and sensors on the AS-i. INTERBUS and AS-i are thus invisible for machine programming, i. e. there is no difference with conventional parallel wiring for the INTERBUS master (controller).

The images of the sensors and actuators in the PLC are as follows:

1st word

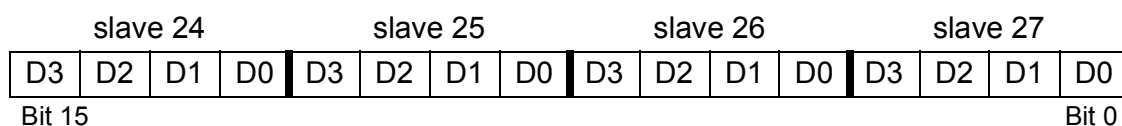


2nd word

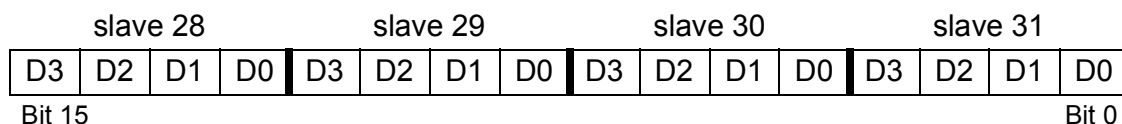


...  
...

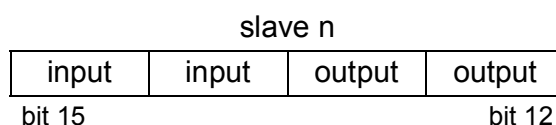
7th word



8th word



AS-i allows the use of a bit position for both input and output purposes. As a rule, AS-i slaves offer four inputs and outputs, each of which has its own bit position, e.g.:



An AS-i slave uses its bits of the process data word as input or output data.



The order of the slaves on INTERBUS can be programmed in the AS-i/INTERBUS gateway. It is not possible to access the data for slave 0, as this address is reserved for configuration mode.

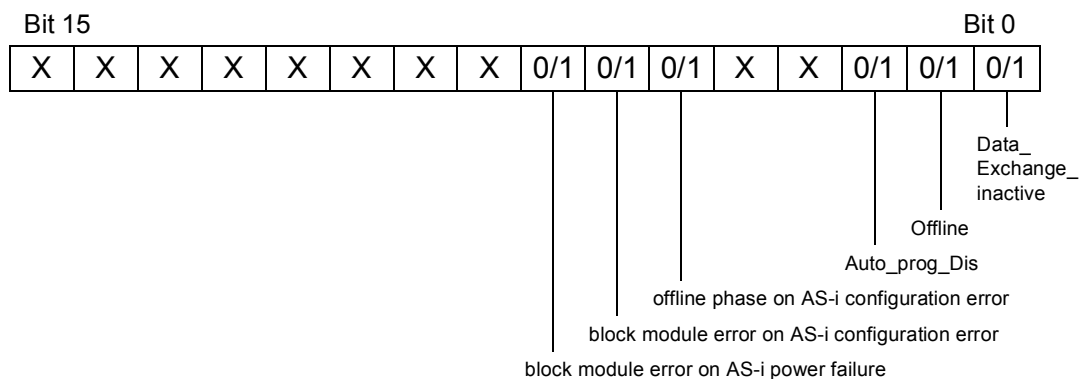
### 8.1.2 Control Word and Status Word

The INTERBUS master can use the control word to control the AS-i/INTERBUS gateway. The status word indicates the current state of the AS-i/INTERBUS gateway to the INTERBUS master.

Control word and status word are transmitted with each cycle of INTERBUS, just like the data on the process data channel.

#### Control word

Bit assignment in the control word for the AS-i/INTERBUS gateway (bit set: active, bit reset: off):



Controlling the AS-i master with the Bits 0, 1 and 2 is only possible if the PCP-object 5FEA (out-mode) = FALSE.

#### Data\_Exchange\_Inactive

Data exchange in the AS-i network is interrupted but continued again immediately after the bit was set to 0.

#### Offline

All AS-i slaves are reset. No communication is taking place in the AS-i network. The AS-i network is re-initialized when this bit is set to 0 again.

#### Auto\_Prog\_Disable

Disables the possibility of automatic addressing.

#### offline phase on configuration error

If this bit is set and the AS-i master is in normal operation mode of the protected mode every configuration error releases the offline phase.

If this bit is 0, the PCP-object 5FED (offline-slv) determines for each slave address individually whether a configuration error releases the offline phase. A configuration error is both the case of a projected slave with which data exchange is not possible and the case of a supernumerary slave.

Independent of the access to this function (PCP or process data) the acknowledgement is both possible by the process data (falling edge on bit 5 of the control word) and by PCP (every writing access to the object 5FED).

block module error on AS-i configuration error

If this bit is set the module error "AS-i configuration error" is blocked

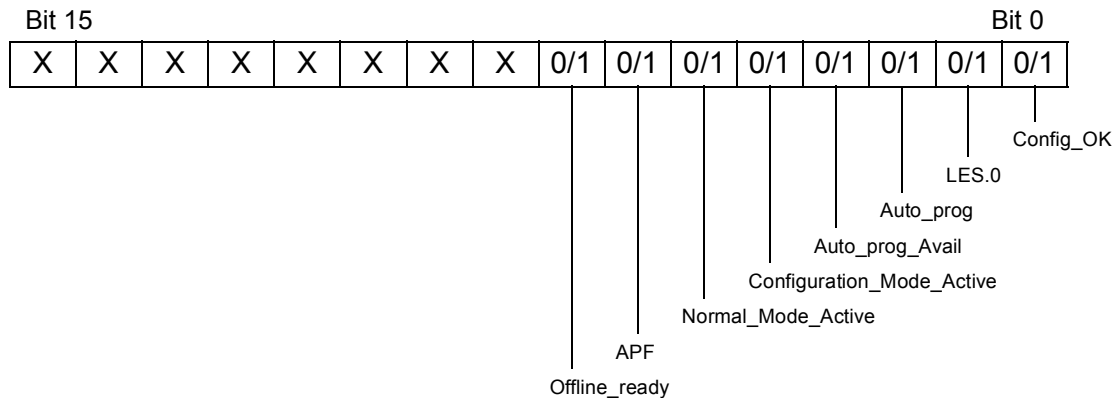
If this bit is 0 the blocking depends on the PCP-object 5FEC (stat-err).

block module error on AS-i power failure

If this bit is set the module error "AS-i power failure" is blocked

If this bit is 0 the blocking depends on the PCP-object 5FEC (stat-err).

## Status word



### Config\_OK

The desired configuration of the AS-i network coincides with the actual configuration, i. e. all parts of the AS-i are working and are correctly projected.

### LDS.0 (list of detected slaves)

A slave with address 0 is connected to the AS-i.

### Auto\_Prog

Automatic addressing of a slave is possible.

### Auto\_Prog\_Avail

The current error can be rectified by automatic programming. This state may occur, for instance, if precisely one slave is missing. This is a typical case for a field repair.

### Configuration\_Mode\_Active

The AS-i/INTERBUS gateway is in configuration mode.

### Normal\_Mode\_Active

The AS-i/INTERBUS gateway is in normal mode, the AS-i cycle is running.

### APF

Voltage drop in the AS-i. In this event, the AS-i/INTERBUS gateway re-initializes all AS-i slaves. This is necessary as the slaves are supplied with their operating voltage through the AS-i. See "Offline ready".

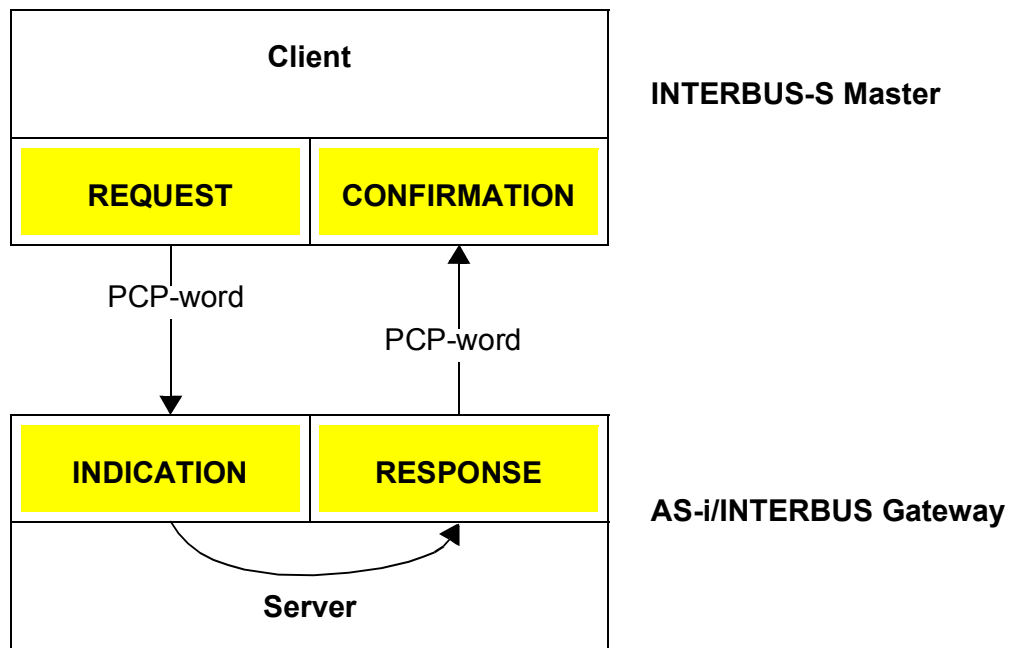
### Offline\_Ready

After switch-on, when the INTERBUS master has reset the AS-i/INTERBUS gateway through the control word and, following a voltage drop on the AS-i, the AS-i/INTERBUS gateway requires some time to initialize and check the AS-i. This signal is only active on completion of this phase.

### 8.1.3 Parameter Data Channel

The parameter data channel allows data transmission in a more flexible form than does the process data channel. Individual AS-i slaves can be separately controlled or polled through this channel. Its most important task, however, is command transmission. The AS-i/INTERBUS gateway operates in a pure server mode in this case, i. e. it understands certain commands the client can send. The client is always the INTERBUS master. Data transmission via the PCP channel can required a number of words per command. These words are sent in consecutive cycles of INTERBUS.

Handling the services through the PCP word:



### 8.2 INTERBUS Interface

The AS-i/INTERBUS gateway communicates with the INTERBUS master in three ways, as described in section 3.1. In total, the AS-i/INTERBUS gateway occupies 10 words on INTERBUS, the location of which in the interface board or the controller board of the INTERBUS master is a consequence of the INTERBUS cabling.

The process data channel occupies 9 words (process data channel plus control and status word) as described in see chapter 8.1.2 and 8.1.3. The PLC or similar can address the sensors and actuators through this channel as if they were connected conventionally with parallel wiring.

The INTERBUS master and AS-i/INTERBUS gateway communicate with each other on a simple, rapid basis using the control word and data word. See chapter 8.1.3 for details.

The most flexible communications option uses the parameter word. Although the method of transmission on this channel (Peripherals Communications Protocol, PCP) can transmit only one data word per INTERBUS cycle, the number of consecutively transmitted words for a command is variable. You should consult the INTERBUS literature for basic information regarding PCP.

PCP is used for a number of tasks in the gateway:

- setting the parameters for AS-i slaves and reading their configuration data;
- configuring AS-i slaves, i. e. storing the desired state of the AS-i network in the AS-i/INTERBUS gateway;
- reading the stored data;
- setting the operating mode (configuration mode, protected mode);
- modifying the operating address of an AS-i slave;
- reading the current configuration of the AS-i network;
- reading the advanced diagnosis data.

Naturally, the gateway has all the functions necessary for its tasks as INTERBUS slave and INTERBUS server.

## 8.2.1 Basic Data

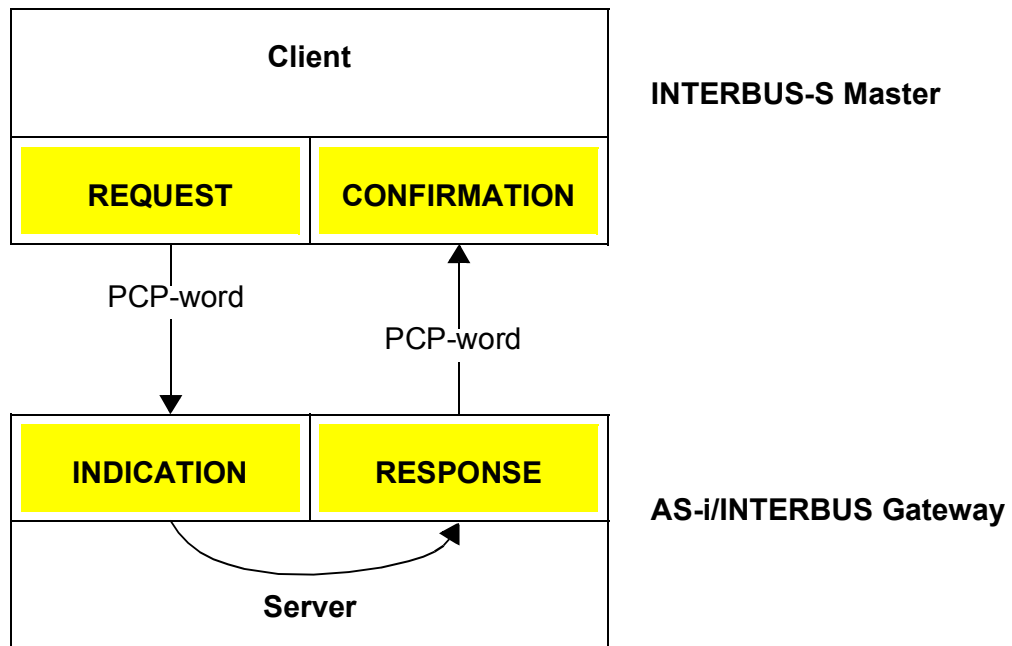
The basic INTERBUS data for the AS-i/INTERBUS gateway are shown in following tables, where xxd = decimal number and xxh means hexadecimal number.

The most important data of the AS-i/INTERBUS gateway for the programmer	
ID code	223d /DFh (INTERBUS ST) 243d / F3h (INTERBUS Remote Bus)
Length code	04h / 0Eh / 06h / 15h (dependent on the length of the process data)
Input address area	48 - 144 bits (adjustable in 32 bit steps)
Output address area	48 - 144 bits (adjustable in 32 bit steps)
PCP address area	1 word
Register length	4 / 6 / 8 / 10 words (depending on the length of the process data)
Register length	4 / 6 / 8 / 10 words (dependent on the length of the process data)
Module error message (E) when the following occurs:	AS-i configuration error / AS-i power fail

Identification of the AS-i/INTERBUS gateway as a virtual field device (VFD)			
VFD attribute	Assignment	Data type	Comment
Vendor name	Pepperl+Fuchs	Visible string	
Model name	ASI/IBS gateway	Visible string	
Revision	1.02	Visible string	
Profile	0	Octet string	The gateway does not correspond to a profile. However, it does use INTERBUS sensor/ actuator profile conventions

### 8.2.2 PCP Services

The AS-i/INTERBUS gateway operates exclusively as an INTERBUS server:



It provides the following PCP services:

<b>INTERBUS communications services of the AS-i/INTERBUS gateway</b>			
<b>Service</b>	<b>Functions group</b>	<b>Client/Server</b>	<b>confirmed/Unconfirmed</b>
Initiate	Administration	Server	confirmed
Abort	Administration	Client/Server	unconfirmed
Reject	Administration	Client/Server	unconfirmed
Status	Administration	Server	confirmed
Identify	Administration	Server	confirmed
Get-OV (long)	Administration	Server	confirmed
Write	Application	Server	confirmed
Read	Application	Server	confirmed

The INTERBUS client can use the READ service to read communication objects of the AS-i/INTERBUS gateway, with the WRITE service it can to the AS-i/INTERBUS gateway. As a server, the AS-i/INTERBUS gateway cannot initiate any read or write access.

The AS-i/INTERBUS gateway can only implement a communications relationship (PMS connection). If the INTERBUS master wishes to transmit data continuously over the process data channel, it must continuously request the data. This should, however, rarely be necessary as the AS-i data is transmitted over the process data channel.

Further information regarding the services may be found in the INTERBUS literature.

### 8.2.3 Provision of Access

The AS-i/INTERBUS gateway supports access rights to communications objects, see Appendix.

### 8.2.4 Static PMS Data Types

The AS-i/INTERBUS gateway uses only a small number of the standardized data types and no freely defined data types:

<b>Supported static data types</b>	
The remaining standard data types shall be assigned a zero object	
<b>Index</b>	<b>Standardized PMS data type</b>
01	boolean
10	octet string

<b>Description of the objects in the data type structure (DS) of the static object dictionary for the AS-i/INTERBUS gateway</b>				
<b>Index</b>	<b>Object code</b>	<b>Number of Elements</b>	<b>Data-Type-Index</b>	<b>Length</b>
40h Read_stored_data	DS	3	10 10 10	31 16 4
41h Configure_slave	DS	2	10 10	1 1
43h Read_Config_data	DS	2	10 10	32 4
44h Read_parameter	DS	2	10 10	16 4
45h Modify_operating_address	DS	2	10 10	1 1
46h input_data	DS	3	10 10 10	16 4 1
47h command call	DS	2	10 10	1 1
48h Advanced Diagnosis	DS	2	10 10	32 4
49h block module errors	DS	2	1 1	1 1

See chapter 9.3 for a description of the data structures.

The AS-i/INTERBUS gateway uses the following data objects which do not change during communications.

Communication type objects and data types:

Communication object	Index	Obj. type	Data type (length)	Content (length)
List of projected slaves (LPS)	5FA0	simple variable	octet string (4)	LPS (1*31)
Configuration mode	5FA1	simple variable	boolean	(true) - configuration mode (false) - protected mode
Parameterize_slave <sub>i</sub> (31 COs)	5FA2-5FC0	simple variable	octet string (1)	Parameters for slave <sub>i</sub> (1*4)
Store_actual_parameters	5FC1	simple variable	boolean	Store actual parameters (true) or not (false)
Store_actual_configuration	5FC2	simple variable	boolean	Store actual configuration (true) or not (false)
Output data	5FC3	simple variable	octet string (16)	Field of output data FOD (31*4)
Read_stored_data	5FC4	record	octet string (31) octet string (16) octet string (4)	Field of stored conf. data (31*8) Field of stored parameters (31*4) List of projected slaves (LPS) (1*31)
Configure_slave <sub>i</sub> (31 COs)	5FC5-5FE3	record	octet string (1) octet string (1)	Store configuration data of slave <sub>i</sub> (1*8) Store parameters of slave <sub>i</sub> (1*4)
Data transfer	5FE4	record	boolean boolean boolean	Set/reset offline flag Set/reset DA flag Set/reset Auto_Prog_Disable
Read_config_data	5FE5	record	octet string (32) octet string (4)	Field of the configuration data images (32*8) List of detected slaves (LDS) (1*32)
Read_parameters	5FE6	record	octet string (16) octet string (4)	Field of param. (31*4) List of active slaves (LAS) (1*31)
Modify operating address	5FE7	record	octet string (1) octet string (1)	old address new address
Input data	5FE8	record	octet string (16) octet string (4) octet string (1)	Input data (31*4) List of detected slaves (LDS) (1*31) execution control flags) (1*8)
Command call	5FE9	record	octet string (1) octet string (1)	slave address command

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Communication object	Index	Obj. type	Data type (length)	Content (length)
Enable process output data	5FEA	simple variable	boolean	Set/reset PD/PCP output data (false/true = PD/PCP transmission)
Read and delete advanced diagnosis data	5FEB	record	octet string (32) octet string (4)	Field of error counters (32*8) List of corrupted slaves (LCS) (1*32)
Block the module errors	5FEC	record	boolean  boolean	block error message AS-i power failure block error message AS-i configuration error
LOS	5FED	simple variable	octet string (4)	LOS (1*31)

See chapter 9.3 for a description of the data structures.

The Static Object Dictionary (SOD) specifies all the object types that are defined before the start of any communication and do not change during operation. It does not specify in which bit of the content of a communications object (CO) what information is stored.

The AS-i/INTERBUS gateway uses the following simple variable types of communications objects.

Communication objects of the simple variable type:

Index (CO)	5FA0	5FA1	5FA2-5FC0	5FC1	5FC2	5FC3
	List of projected slaves (LPS)	Configuration mode	Parameterize_slave <sub>i</sub>	Store_actual_parameters	Store_actual_configuration	Output data
Objekt code	simple variable					
Data type index	10	01	10	01	01	10
Length	4	1	1	1	1	16
Password	0	0	0	0		0
Access groups	0	0	0	0	0	0
Access-rights	Wa					
Local address	Implementation dependent					
Variable name	no entry					
Extension	no entry					

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See chapter 9.3 for a description of the data structures.

Communication object	Content	Access	Process data imaging
Read_stored_data (1 CO)	Stored configuration data field Stored parameters field List of projected slaves (LPS)	read read read	not possible not possible not possible
Configure_slave <sub>i</sub> (31 COs)	Stored configuration data for slave <sub>i</sub> Stored parameters for slave <sub>i</sub>	write write	not possible not possible
List of projected slaves (LPS, 1 CO)	LPS	write	not possible
Configuration mode (1 CO)	AS-i master operating mode	write	not possible
Read_stored_data (1 CO)	Configuration data images field List of detected slaves (LDS)	read read	not possible not possible
Read_parameters (1 CO)	Parameters field List of active slaves (LAS)	read read	not possible not possible
Parameterize_slave <sub>i</sub> (31 COs)	Parameters for slave <sub>i</sub>	write	not possible
Store_actual_parameters (1 CO)	Store_actual_parameters (true) or not (false)	write	not possible
Store_actual_configuration (1 CO)	Store_actual_configuration (true) or not (false)	write	not possible
Modify_operating_address (1 CO))	Old slave address/new slave address	write	not possible
Input data (1 CO)	Input data field (FID) List of detected slaves (LDS) execution control flags	read read read	possible not possible possible

See chapter 9.3 for a description of the data structures.

Object description of the AS-i/INTERBUS gateway communication objects:

Index (CO)	5FC4 Read_ stored_ data	5FC5- 5FE3 Configure_ slave <sub>i</sub>	5FE5 Read_con- figuration_ data	5FE6 Read_ parameters	5FE7 Modify_ operating_ address	5FE8 Input data
Objekt code	record					
Data type index	40h	41h	43h	44h	45h	46h
Password	0	0	0	0		0
Access groups	0	0	0	0	0	0
Access rights	Ra	Wa	Ra	Ra	Wa	Ra
Variable name	no entry					
Extension	no entry					
Local address (1)	implementation dependent					
Local address (2)	implementation dependent					
Local address (3)	implemen- tation dependent	no entry	no entry	no entry	no entry	implemen- tation dependent

See chapter 9.3 for a description of the data structures.

## 9 Parameter Data Channel (PCP)

### 9.1 Services Supported

The AS-i/INTERBUS gateway operates exclusively as an INTERBUS server, i. e. it provides services to the INTERBUS master.

INTERBUS communications services of the AS-i/INTERBUS gateway:

Service	Function group	Client/Server	Confirmed/unconfirmed
Initiate	Administration	Server	Confirmed
Abort	Administration	Client/Server	Unconfirmed
Reject	Administration	Client/Server	Unconfirmed
Status	Administration	Server	Confirmed
Identify	Administration	Server	Confirmed
Get-OD (long)	Administration	Server	Confirmed
Write	Application	Server	Confirmed
Read	Application	Server	Confirmed

This means that the AS-i/INTERBUS gateway provides READ and WRITE services in addition to the services provided on INTERBUS.

Data traffic with the AS-i slaves is preferably handled over the process data channel, as this route is faster (maximum cycle time 15 ms) and all the slaves are addressed and queried in parallel.

### 9.2 Communication Relationship List (CRL)

The communication relationship list on the AS-i/INTERBUS gateway contains just one entry. The AS-i/INTERBUS gateway has only one communication relationship to INTERBUS address 0. In other words: once the INTERBUS master has sent a request to the AS-i/INTERBUS gateway, it must wait until it has received the confirmation. Only then may it send the next request. The AS-i/INTERBUS gateway does not support symbolic names, only a virtual field device and no priorities.

Structure of the CRL header in the gateway:

Attribute	Value in the AS-i/INTERBUS gateway CRL
CR	0
Number of CRL entries	1
Symbol length	0
VFD pointer supported	false

CRL entries for the AS-i/INTERBUS gateway:

Attributes of the CRL entry	PMS connection
CR	2
Remote Address	0
Type	MMAZ
max SCC	1
max RCC	1
max SAC	1
max RAC	1
ACI	0
Connection attribute	D
Max-PDU-Sending-High	0
Max-PDU-Sending-Low	64
Max-PDU-Receiving-High	0
Max-PDU-Receiving-Low	64
Services supported	Get-OD (long) (ind/rsp) Write (ind/rsp); Read (ind/rsp) (bit 0..47) 00 00 00 80 30 00
Max-Number of Outstanding Client Services	1
Max-Number of Outstanding Server Services	1
Type-of-Connection	true
Symbol	No entry

## 9.3 Communication Objects for the AS-i/INTERBUS Gateway

The communication objects in the AS-i/INTERBUS gateway describe the services that the AS-i/INTERBUS gateway provides through the PCP services READ and WRITE.

### 9.3.1 List of Projected Slaves (index 5FA0)

(WRITE, Data-Type-Index 10h)

The list of projected slaves contains one bit for each slave installed on the AS-i. Set the bit for the address of each slave to be installed. Should one of these slaves fail, or should the AS-i/INTERBUS gateway find additional slaves, the AS-i/INTERBUS gateway will report a configuration error to the INTERBUS-S master through the status word.

- List of projected slaves (LPS):

Byte 0 slaves 1 - 7

S7*	S6	S5	S4	S3	S2	S1	0
-----	----	----	----	----	----	----	---

Byte 1 slaves 8 - 15

S15	S14	S13	S12	S11	S10	S9	S8
-----	-----	-----	-----	-----	-----	----	----

Byte 2 slaves 16 - 23

S23	S22	S21	S20	S19	S18	S17	S16
-----	-----	-----	-----	-----	-----	-----	-----

Byte 3 slaves 24 - 31

S31	S30	S29	S28	S27	S26	S25	S24
-----	-----	-----	-----	-----	-----	-----	-----

\*"0": slave is not projected, i. e. no slave with this address has to be installed,  
"1": slave is projected, i. e. a slave with this address has to be installed.

### 9.3.2 Configuration Mode (index 5FA1)

(WRITE, Data-Type-Index 01h)

This command is used to put the AS-i/INTERBUS gateway into configuration mode.

- Configuration mode

Byte 0

0xFF/0x00 (true/false)
------------------------

00h (false) = configuration mode off (protected mode)

ffh (true) = configuration mode on

### 9.3.3 Parameterize Slave<sub>i</sub> (index 5FA2-5FC0)

(WRITE, Data-Type-Index 10h, i = 1 ... 31)

With this service, you can send the 4 bits of parameter data to the selected AS-i slave. You use this command, for instance, to modify the properties of a slave during operation.

- Parameters to be sent to slave<sub>i</sub>:

Byte 0 slave<sub>i</sub>

X	X	X	X	P3	P2	P1	P0
---	---	---	---	----	----	----	----

P3, P2, P1, P0: Parameters for the slave

### 9.3.4 Store Actual Parameters (index 5FC1)

(WRITE, Data-Type-Index 01h)

You use this service to save the current parameter settings of all AS-i slaves as the new stored parameter settings, i. e. the current parameter settings will be restored the next time the AS-i is switched on. This command uses one byte of input data.

- Store current parameters of all slaves (1-31) as permanent parameters.

Byte 0

0xFF/0x00 (true/false)

00h (false) = no effect

ffh (true) = store current parameters

### 9.3.5 Store Actual Configuration (index 5FC2)

(WRITE, Data-Type-Index 01h)

You use this service to save the current configuration of all AS-i slaves as the new stored configuration, i. e. the current configuration will be taken as the desired configuration the next time the AS-i is switched on. This command uses one byte of input data.

- Store configuration of all slaves (1-31) as projected configuration.

Byte 0

0xFF/0x00 (true/false)

00h (false) = no effect

ffh (true) = store current configuration

### 9.3.6 Output Data (index 5FC3)

(READ, WRITE, Data-Type-Index 10h)

Use this command to write the output data to the AS-i sensors.

- output data field (FOD). This field contains 4 bits for each AS-i slave. You should, preferably, send these data through the process data channel.

Byte 0

slave 1

X	X	X	X	D3	D2	D1	D0
---	---	---	---	----	----	----	----

Byte 1

slave 2 -3

D3	D2	D1	D0	D3	D2	D1	D0
----	----	----	----	----	----	----	----

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·  
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Byte 15

slave 30 - 31

D3	D2	D1	D0	D3	D2	D1	D0
----	----	----	----	----	----	----	----

D3, D2, D1, D0: Data to the slave

### 9.3.7 Read Stored Data (index 5FC4)

(READ, Data-Type-Index 40h)

The stored data is a description of the desired state that should exist on the AS-i. This data must be previously written by the “configure slave<sub>i</sub>” service into the AS-i/INTER-BUS gateway, where it is stored in non-volatile memory.

- stored configuration data field. This field contains 8 bits for each slave, by means of which its properties can be set.

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Byte 0 slave 1

ID_3	ID_2	ID_1	ID_0	IO3	IO2	IO1	IO0
------	------	------	------	-----	-----	-----	-----

Byte 1 slave 2

ID_3	ID_2	ID_1	ID_0	IO3	IO2	IO1	IO0
------	------	------	------	-----	-----	-----	-----

·  
·  
·

Byte 30 slave 31

ID_3	ID_2	ID_1	ID_0	IO3	IO2	IO1	IO0
------	------	------	------	-----	-----	-----	-----

IO3, IO2, IO1, IO0: I/O-configuration (identifies number of inputs and outputs)

ID\_3, ID\_2, ID\_1, ID\_0: ID-configuration (identifies AS-i slave type)

- stored parameters field. This field contains four bits for each AS-i slave, these are transmitted to the slaves immediately after switch on.

Byte 31 slave 1

X	X	X	X	P3	P2	P1	P0
---	---	---	---	----	----	----	----

Byte 32 slave 2 - 3

P3	P2	P1	P0	P3	P2	P1	P0
----	----	----	----	----	----	----	----

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Byte 46 slave 30 - 31

P3	P2	P1	P0	P3	P2	P1	P0
----	----	----	----	----	----	----	----

P3, P2, P1, P0: Parameters for the slave

- list of projected slaves (LPS). This field contains one address for each possible slave address, indicating whether or not this address should be assigned.

Byte 47 slaves 1 - 7

S7*	S6	S5	S4	S3	S2	S1	0
-----	----	----	----	----	----	----	---

Byte 48 slaves 8 - 15

S15	S14	S13	S12	S11	S10	S9	S8
-----	-----	-----	-----	-----	-----	----	----

Byte 49 slaves 16 - 23

S23	S22	S21	S20	S19	S18	S17	S16
-----	-----	-----	-----	-----	-----	-----	-----

Byte 50 slaves 24 - 31

S31	S30	S29	S28	S27	S26	S25	S24
-----	-----	-----	-----	-----	-----	-----	-----

"0": slave is not projected, i. e. no slave with this address has to be installed,  
"1": slave is projected, i. e. a slave with this address has to be installed.

### 9.3.8 Configure Slave<sub>i</sub> (index 5FC5-5F94)

(WRITE, Data-Type-Index 41h, i = 1 ... 31)

With this service you can transmit the 8 bits of configuration data and 4 bits of parameter data for an AS-i slave to the AS-i/INTERBUS gateway. There this data is stored in non-volatile memory.

- configuration data of slave<sub>i</sub>

Byte 0 slave<sub>i</sub>

ID_3	ID_2	ID_1	ID_0	IO3	IO2	IO1	IO0
------	------	------	------	-----	-----	-----	-----

IO3, IO2, IO1, IO0: I/O-configuration (identifies number of inputs and outputs)

ID\_3, ID\_2, ID\_1, ID\_0: ID-configuration (identifies AS-i slave type)

- Parameters of slave<sub>i</sub> to be stored:

Byte 1 slaves<sub>i</sub>

X	X	X	X	P3	P2	P1	P0
---	---	---	---	----	----	----	----

P3, P2, P1, P0: Parameters for the slave

### 9.3.9 Data Transfer (Control Word) (index 5FE4)

(READ, WRITE, Data-Type-Index 01h)

Use this service to transmit the information for the control word also via the parameter data channel.

- transfer control word via parameter data channel

Byte 0; Data exchange inactive

0xFF/0x00 (true/false)
------------------------

00h (false) = The data exchange between the AS-i master and the AS-i slaves is enabled.

ffh (true) = The data exchange between the AS-i master and the AS-i slaves is disabled.



Byte 1; Offline

0xFF/0x00 (true/false)
------------------------

00h (false) = The AS-i network starts up again. Data is being exchanged.

ffh (true) = All AS-i slaves are reset. No communication takes place in the AS-i network.

Byte 2; Auto\_Prog\_Disable

0xFF/0x00 (true/false)
------------------------

00h (false) = The AS-i slaves can be automatically addressed.

ffh (true) = The AS-i slaves cannot be automatically addressed.

## 9.3.10 Read Configuration Data (index 5FE5)

(READ, Data-Type-Index 43h)

You can use this command to read the actual state of the AS-i. You will obtain the following information for each of the 32 possible addresses (including AS-i address 0, which can be occupied by a slave that is yet to be programmed).

- Configuration data images field. The AS-i/INTERBUS gateway reads this information from the slaves during the detection phase.

Byte 0 slave 0

ID_3	ID_2	ID_1	ID_0	IO3	IO2	IO1	IO0
------	------	------	------	-----	-----	-----	-----

Byte 1 slave 1

ID_3	ID_2	ID_1	ID_0	IO3	IO2	IO1	IO0
------	------	------	------	-----	-----	-----	-----

·  
·  
·

Byte 31 slave 31

ID_3	ID_2	ID_1	ID_0	IO3	IO2	IO1	IO0
------	------	------	------	-----	-----	-----	-----

IO3, IO2, IO1, IO0: I/O-configuration (identifies number of inputs and out-

ID_3	ID_2	ID_1	ID_0	IO3	IO2	IO1	IO0
------	------	------	------	-----	-----	-----	-----

ID_3	ID_2	ID_1	ID_0	IO3	IO2	IO1	IO0
------	------	------	------	-----	-----	-----	-----

puts)

ID\_3, ID\_2, ID\_1, ID\_0: ID-configuration (identifies AS-i slave type)

- List of detected slaves (LDS). This list contains one bit for each address and indicates whether a slave has been found.

Byte 32 slaves 0 - 7

S7*	S6	S5	S4	S3	S2	S1	S0
-----	----	----	----	----	----	----	----

Byte 33 slaves 8 - 15

S15	S14	S13	S12	S11	S10	S9	S8
-----	-----	-----	-----	-----	-----	----	----

Byte 34 slaves 16 - 23

S23	S22	S21	S20	S19	S18	S17	S16
-----	-----	-----	-----	-----	-----	-----	-----

Byte 35 slaves 24 - 31

S31	S30	S29	S28	S27	S26	S25	S24
-----	-----	-----	-----	-----	-----	-----	-----

\*"0": No slave with this address has been detected on the AS-i network.

"1": A slave with this address has been detected on the AS-i network.

You can frequently find the reason for a CONFIG ERR message from the AS-i/INTER-BUS gateway by comparing the list of projected slaves (LPS), list of detected slaves (LDS), and list of active slaves (LAS).

## 9.3.11 Read Parameters (index 5FE6)

(READ, Data-Type-Index 44h)

You can use this command to read the current parameter data for the AS-i slaves.

You will obtain the following data.

- four bits parameters for each slave

Byte 0 slave 1

X	X	X	X	P3	P2	P1	P0
---	---	---	---	----	----	----	----

Byte 1 slave 2 - 3

P3	P2	P1	P0	P3	P2	P1	P0
----	----	----	----	----	----	----	----

.

.

.

Byte 16 slave 30 - 31

P3	P2	P1	P0	P3	P2	P1	P0
----	----	----	----	----	----	----	----

.

P3, P2, P1, P0: current parameters of the slaves

- list of active slaves (LAS). One bit is set here for each slave that the AS-i/INTER-BUS gateway has currently access to.

Byte 17 slaves 0 - 7

S7*	S6	S5	S4	S3	S2	S1	S0
-----	----	----	----	----	----	----	----

Byte 18 slaves 8 - 15

S15	S14	S13	S12	S11	S10	S9	S8
-----	-----	-----	-----	-----	-----	----	----

Byte 19 slaves 16 - 23

S23	S22	S21	S20	S19	S18	S17	S16
-----	-----	-----	-----	-----	-----	-----	-----

Byte 20 slaves 24 - 31

S31	S30	S29	S28	S27	S26	S25	S24
-----	-----	-----	-----	-----	-----	-----	-----

"0": No slave with this address is active in the AS-i network,

"1": A slave with this address is active in the AS-i network.

### 9.3.12 Modify Operating Address (index 5FE7)

(WRITE, Data-Type-Index 45)

Use this command to modify the address of an AS-i slave and thus the position of its input and output data in the process data channel.

- old slave address (0 ... 31)

Byte 0

X	X	X	0x00-0x1F
---	---	---	-----------

- new slave address (0 ... 31)

Byte 1

X	X	X	0x00-0x1F
---	---	---	-----------

### 9.3.13 Input Data (index 5FE8)

(READ, Data-Type-Index 46h)

Use this command to read the input data from the AS-i sensors.

- input data field. This field contains 4 bits for each AS-i slave. You should, preferably, request these data through the process data channel.

Byte 0 slave 1

X	X	X	X	D3	D2	D1	D0
---	---	---	---	----	----	----	----

Byte 1 slave 2 - 3

D3	D2	D1	D0	D3	D2	D1	D0
----	----	----	----	----	----	----	----

·  
·  
·

**Byte 15 slave 30 - 31**

D3	D2	D1	D0	D3	D2	D1	D0
----	----	----	----	----	----	----	----

D3, D2, D1, D0: Data from slave

- list of active slaves (LAS). This list contains one bit for each slave indicating that this slave is active. Only the input data from the slaves entered in the list of active slaves are valid.

Byte 16 slaves 0 - 7

S7*	S6	S5	S4	S3	S2	S1	S0
-----	----	----	----	----	----	----	----

Byte 17 slaves 8 - 15

S15	S14	S13	S12	S11	S10	S9	S8
-----	-----	-----	-----	-----	-----	----	----

Byte 18 slaves 16 - 23

S23	S22	S21	S20	S19	S18	S17	S16
-----	-----	-----	-----	-----	-----	-----	-----

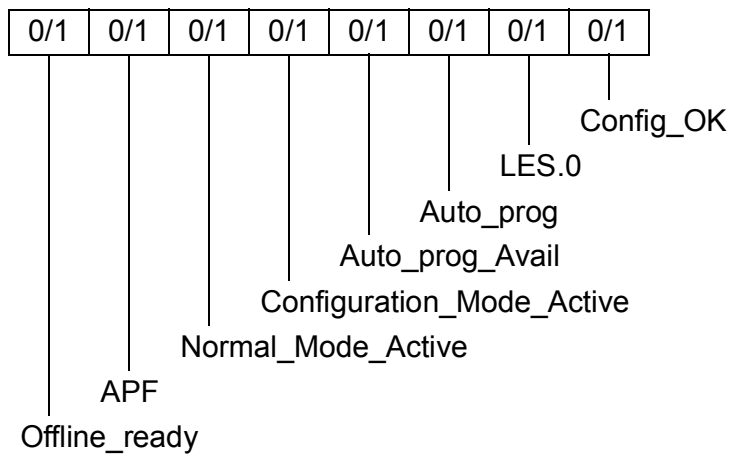
Byte 19 slaves 24 - 31

S31	S30	S29	S28	S27	S26	S25	S24
-----	-----	-----	-----	-----	-----	-----	-----

\*"0": slave is not active,  
"1": slave is active.

- Status word

Byte 20



### 9.3.14 Command Call (index 5FE9)

(WRITE, Data-Type-Index 47)

Use this command to send a command to an AS-i slave.

- slave address (0..31)

Byte 0

X	X	X	0x00-0x1F
---	---	---	-----------

- command (information part)

Byte 1

X	X	X	I4	I3	I2	I1	I0
---	---	---	----	----	----	----	----

I0 ... I4

Information bits to the AS-i slave

## 9.3.15 Enable Process Output Data (index 5FEA)

(READ, WRITE, Data-Type-Index 01h)

Use this service to determine through which channel the AS-i/INTERBUS gateway receive the process output data.

- Enable process output data via the parameter data channel:

Byte 0

0xFF/0x00 (true/false)
------------------------

0xFF = Output data through PCP

0x00 = Output data through process data channel

## 9.3.16 Read and Delete Advanced Diagnosis Data (index 5FEB)

(READ, Data-Type-Index 48h)

This service serves to read the data of the advanced diagnosis. Everytime the INTER-BUS master reads this object, error counters and LCS are deleted.

- error counters

Byte 0

AS-i power failure

APF
-----

Byte 1

slave 1

FZ1
-----

•  
•  
•

Byte 31

slave 31

FZ31
------

APF: number of short-time power failures

FZi: number of erroneous telegrams to slave i  
(255 = counter overflow)

- LCS

Byte 32

slaves 0 - 7

S7*	S6	S5	S4	S3	S2	S1	S0
-----	----	----	----	----	----	----	----

Byte 33 slaves 8 - 15

S15	S14	S13	S12	S11	S10	S9	S8
-----	-----	-----	-----	-----	-----	----	----

Byte 34 slaves 16 - 23

S23	S22	S21	S20	S19	S18	S17	S16
-----	-----	-----	-----	-----	-----	-----	-----

Byte 35 slaves 24 - 31

S31	S30	S29	S28	S27	S26	S25	S24
-----	-----	-----	-----	-----	-----	-----	-----

S0:

"0": AS-i power supply O.K.,

"1": short-time failure of the AS-i power supply occurred.

S1-S31:

\*"0": slaves with this address didn't have any configuration errors,

"1": slaves with this address caused a short-time configuration error.

## 9.3.17 Block the Module Errors (index 5FEC)

(READ, WRITE, Data-Type-Index 49h)

The module error messages "AS-i power failure" and "AS-i configuration error" can be blocked separately, both via the process data and PCP. Both blocks for each error source are logically combined as OR, i. e. the module errors are only reported if they are not blocked via PCP nor via the process data.

- block module errors

Byte 0; modul error on AS-i power failure

0xFF/0x00 (true/false)
------------------------

00h (false) = blocking depends on the control word

FFh (true) = modul error message blocked

Byte 1; Modulfehler bei AS-i-Konfigurationsfehlern

0xFF/0x00 (true/false)
------------------------

00h (false) = blocking depends on the control word

FFh (true) = modul error message blocked

## 9.3.18 LOS (index 5FED)

(READ, WRITE, Data-Type-Index 10h)

The object for the list of slaves, that shall release the offline phase when they have an error, is also an octet string with 32 bits as the other slavelists, too.

In any case writing this list acknowledges the release of the offline phase, whether this function was activated by this object or setting bit 5 of the control word.

- LOS

Byte 0 slaves 1 - 7

S7*	S6	S5	S4	S3	S2	S1	X
-----	----	----	----	----	----	----	---

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Byte1 slaves 8 - 15

S15	S14	S13	S12	S11	S10	S9	S8
-----	-----	-----	-----	-----	-----	----	----

Byte2 slaves 16 - 23

S23	S22	S21	S20	S19	S18	S17	S16
-----	-----	-----	-----	-----	-----	-----	-----

Byte3 slaves 24 - 31

S31	S30	S29	S28	S27	S26	S25	S24
-----	-----	-----	-----	-----	-----	-----	-----

S1-S31:

"0": no effect to the AS-i Master

"1": If the slave with this address is missing in the LAS, the AS-i master goes into the offline phase.

## 9.4 Acknowledgements

### 9.4.1 Responses to the PCP Services

The response of the AS-i/INTERBUS gateway to the specified services complies with the INTERBUS standard and is determined by the Application Layer Interface (ALI). The following error messages are provided for the READ and WRITE services:

Error codes for Read.rsp (-)	
Error class	6 Access
Error code	5 Object-Attribute-Inconsistent
Additional code	10h incorrect subindex

Error codes for Write.rsp (-)	
Error class	6 Access
Error code	5 Object-Attribute-Inconsistent
Additional code	10h incorrect subindex
	12h length of service parameter "data" too great
	13h length of service parameter "data" too small

The error codes can be queried on the INTERBUS master. They assist in troubleshooting in program development or indicate error situations in normal operation.

## 9.5 Example of a PCP Service

The PCP services are part of the commands which you can send to the INTERBUS master from your application program.

The following example shows the structure of a Write service that is used to configure a slave, see chapter 9.3.8. With this service you tell the AS-i master which slave type (including parameters and data direction) the AS-i master can expect at which slave address.

## Configure Slave 2 CO

Index: 5FC6 (AS-i slave 2)

AS-i slave type :3

Data direction: 8 ( = 3 input bits (IO0..IO2), 1 output bit (IO3))

Parameters: 5

## Structure of the associated Write service

0082		Write service (request)
0004		Quantity of subsequent command parameters
00	KR	Invoke ID ; communication reference CR
5FC6		Index for slave 2
00	02	Subindex ; number of following data bytes
38	05	Slave type, data direction; parameters



## 10 Accessories for putting AS-i into Operation and Test Tools

The AS-i circuit on the AS-i/INTERBUS Gateway can be put into operation with the CMD-software by Phoenix Contact.

### 10.1 CMD Software

The Windows software AS-i Control Tools enables you to configure the AS-i circuit in a very comfortable manner.

1. Start the "AS-i Parameterization" in the CMD software. The CMD software must be in the "Monitoring" state to be capable to establish a connection.
2. Call the command Master | AS-i configuration.  
The AS-i configuration editor will be started. All detected and projected AS-i slaves are displayed in this window.
3. Click on a slave entry to open the dialogbox slave configuration.

**Slave configuration**

Selected Slave: 2

Change address to: 2

Close

Help

Less...

Store

Inputs: ☒ 0 ☒ 1 ☒ 2

Outputs: ☐ 3

Current parameters: ☒ 0 ☐ 1 ☒ 2 ☒ 3

Power up parameters: ☒ 0 ☒ 1 ☐ 2 ☒ 3

Detected: 11 AS-i sensor

Projected: 10 2x2 input module

Username:

Device Type:

This dialog box is for changing a slave address, setting AS-i parameters or AS-i configuration data. Additionally you can test inputs and outputs.

A very easy approach to configure the AS-i circuit is connecting each AS-i slave to the line and setting the AS-i slave address one after the other. After that press the button "Store configuration" to adopt the detected AS-i circuit to the AS-i master as projected data.

Moreover you can use the **AS-i Address Assistant**. This tool changes automatically the address of an AS-i slave to the desired address after plugging the slave to the AS-i line. The desired AS-i configuration can be created off-line before and stored to a file.

## **AS-Interface** **Accessories for putting AS-i into Operation and Test Tools**

When you build up the plant you only have to plug the AS-i slaves to the AS-i line one after the other.

Further descriptions to all features of the software can be obtained from the integrated help.

## 11 Appendix: Displays of the Figure Display

In the basic state of the configuration mode, the display shows one after the other the addresses of all detected slaves at a rate of two per second. A blank display means that the *LDS* is empty, i.e. no slaves were detected.

In the basic state of the protected operating mode, the display is either blank or displays the address of a faulty assignment (see chapter 6.3.2).

During manual address programming, the slave address display has a different meaning (see chapter 6.4 and 6.5).

All displayed numbers that are bigger than 31 and therefore can not be interpreted as a slave address are status or error messages of the master. They have the following meanings:

39	Advanced AS-i diagnostics: If a 39 appears on the display after pressing the 'set'-button a short-time AS-i power failure occurred.
40	The AS-i master is in off-line phase.
41	The AS-i master is in detection phase.
42	The AS-i master is in activation phase.
43	The AS-i master starts the normal operating mode.
60	Software error: INTERBUS configuration error
66	Baudrate search
70	Hardware error: The AS-i master's EEPROM cannot be written to.
71	Software error: INTERBUS: wrong IB-length
72	Hardware error: The PIC processor does not respond.
73	Hardware error: The PIC processor does not respond.
74	Checksum error in the EEPROM.
75	Error in the external RAM.
76	Error in the external RAM.
80	Error while attempting to exit the configuration mode: A slave with address zero exists.
81	General error while changing a slave address.
82	The front panel operation is blocked. Until the next power-up of the AS-i master the accessing to the device only from the host via the interface.
83	Program reset of the AS-i Control programm: The AS-i Control programm is just read out of EEPROM and copied into the RAM.
88	Display test while starting up the AS-i master
90	Error while changing a slave address in protected operating mode: No slave with address 0 existing.
91	Error while changing slave address: Target address is already occupied.
92	Error while changing slave address: New address could not be set.
93	Error while changing slave address: New address could only be stored volatile in the slave.
94	Error while changing slave address in protected operating mode: Slave has wrong configuration data.

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95	Error while changing slave address in protected operating mode: The configuration error was caused by one slave too many (instead of one missing slave).
----	--

## 12 Appendix: The First Commissioning of AS-i



**Note**

*In this chapter an example is given of how to put an AS-i network into operation quickly and easily and without the need for external devices. The addressing of the components connected to the AS-i network can be performed directly on the AS-i master. It is of course more comfortable to do the addressing with a hand-held programming device or with the Windows software AS-i Control Tools. However, it is possible to configure even complex networks using only the AS-i master.*

What to do ?	How to go about it?
See to it that the AS-i master is properly supplied with power.	Connect the AS-i power supply unit to the terminals AS-i + and AS-i - of the master, connect the ground terminal. Turn on the power supply.
After the self-test: the LEDs "power", "config err", "U ASI" and "prj mode" are on. The figure display shows "40": the AS-i master is in the off-line phase. Shortly after that a "41" will be displayed: the AS-i master stays in the detection phase.	
Switch the device to the projecting mode, if the yellow LED does not light up.	Press the "modeMODE"-button for approx. five seconds.
The yellow LED "prj mode" lights up. The device is now in projecting mode.	
Add a slave with the address 0 to the AS-i line.	Connect the slave's terminals with the terminals AS-i +/- of the master.
The green LED "ASI active" lights up. The figure display shows "0". This means the AS-i master has detected the slave.	
Change the slave address to address 1.	Select address 1 by pressing the "set" button shortly, if necessary repeatedly. When a "1" appears on the display press the "set" button for approx. five seconds until the display blinks. Press again shortly the "set" button to assign the new address to the slave.
The AS-i master detects the slave with address 1 and displays "1".	
Connect another slave with address 0 to the AS-i line and allocate the address 2 to it.	Connect the slave to the AS-i line. The addressing is the same as for the previous slave.
The addresses of all slaves detected are now displayed sequentially.	
Change to the protected operating mode and store the AS-i configuration.	Leave the configuration mode by pressing the "mode" button for at least five seconds until the "prj mode" LED goes out.

## AS-Interface Appendix: The First Commissioning of AS-i

What to do ?	How to go about it?
The configuration of the AS-i master is now finished. Now the hierarchically higher fieldbus system can be put into operation.	

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## 13 Technical Data

### Product Description

The AS-i/INTERBUS gateway can be used to integrate an AS-i bus into an INTERBUS network.

### Features

- full functionality of an AS-i master
- INTERBUS protocol
- electrical isolation between INTERBUS and AS-i
- capability of connecting up to 31 slaves with up to 124 digital inputs and outputs
- status and diagnostic LEDs
- LCD (two-digit seven-segment display)
- two push-buttons for configuration
- configuration mode
- Replaceable electronic components (Local Bus ST only)
- Rail mountable
- Advanced AS-i diagnostics

### 13.1 AS-i INTERBUS Local Bus ST

Type	AS-i gateway to INTERBUS (Local Bus ST)
Product Number	52751
Identification code	233 decimal
Length code	04h / 0Eh / 06h / 15h (dependent on the length of the process data)
Register length	4 / 6 / 8 / 10 words (dependent on the length of the process data)
Degree of protection	IP 20
EMC directions	EN 50081, EN 50082
Permissible operating temperature	0°C ... 55°C
Permissible storage temperature	-15°C ... 85°C
Dimensions (w x d x h)	80x120x115 mm

### Applications

- the AS-i/INTERBUS gateway is a part on an INTERBUS compact station.

### Interfaces

INTERBUS interface

Local Bus ST

### Power Supply

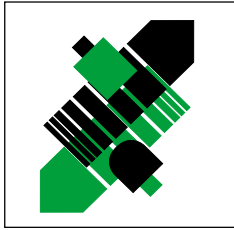
INTERBUS side	typically <200 mA (through the ST cable)
AS-i side	< 100 mA from the AS-i PSU (nominal 30 V direct current)
Electrical isolation	500 V alternating current between INTERBUS and AS-i



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this publication is, therefore, printed on paper bleached without the use of chlorine.

# One Company, Two Divisions.



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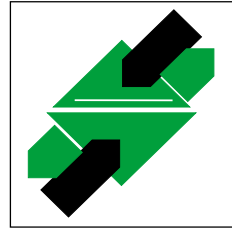
- Digital and analogue sensors
- in different technologies
  - Inductive and capacitive sensors
  - Magnetic sensors
  - Ultrasonic sensors
  - Photoelectric sensors
- Incremental and absolute rotary encoders
- Counters and control equipment
- Identification Systems
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