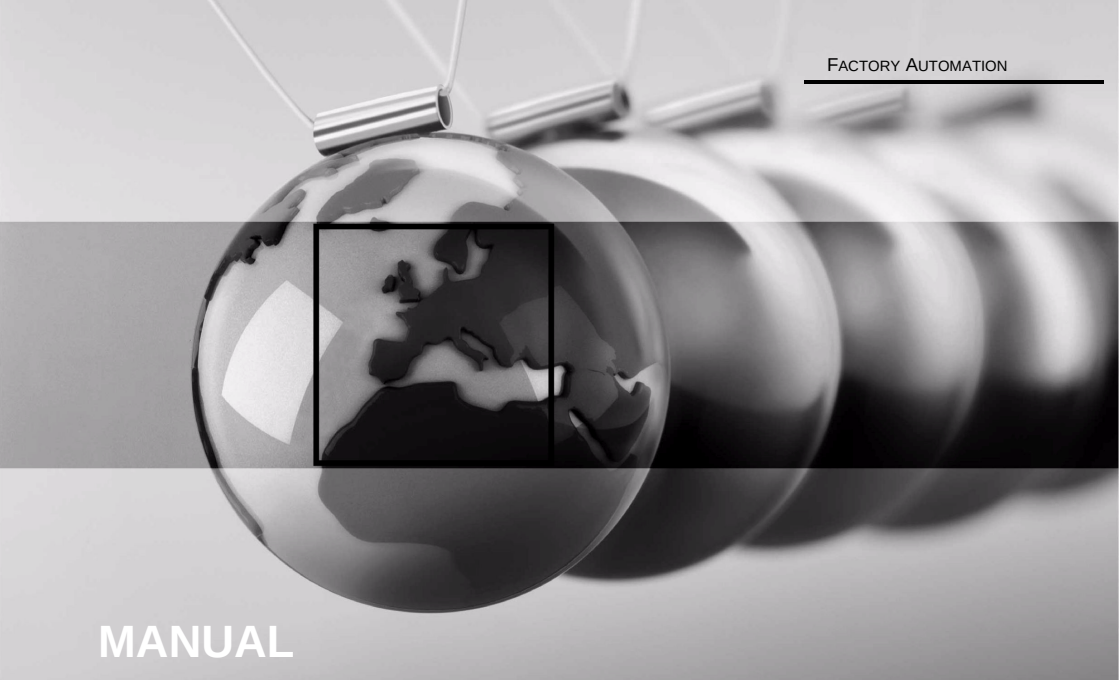


MANUAL

AS-I 3.0 PROFINET GATEWAY IN STAINLESS STEEL

PEPPERL+FUCHS
SENSING YOUR NEEDS

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, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship".

Table of contents

AS-i 3.0 PROFINET Gateway in Stainless Steel

31.1.2014

31.1.2014

1. Introduction

Congratulations

You have chosen a device manufactured by Pepperl+Fuchs. Pepperl+Fuchs develops, produces and distributes electronic sensors and interface modules for the market of automation technology on a worldwide scale.

Before installing this equipment and put into operation, read this manual carefully. This manual containes instructions and notes to help you through the installation and commissioning step by step. This makes sure bring such a trouble-free use of this product. This is for your benefit, since this:

- ensures the safe operation of the device
- helps you to exploit the full functionality of the device
- avoids errors and related malfunctions
- avoids costs by disruptions and any repairs
- increases the effectiveness and efficiency of your plant

Keep this manual at hand for subsequent operations on the device.

After opening the packaging please check the integrity of the device and the number of pieces of supplied.

Symbols used

The following symbols are used in this manual:

Information!

This symbol indicates important information.

Attention!

This symbol warns of a potential failure. Non-compliance may lead to interruptions of the device, the connected peripheral systems, or plant, potentially leading to total malfunctioning.

Warning!

This symbol warns of an imminent danger. Non-compliance may lead to personal injuries that could be fatal or result in material damages and destruction.

Contact

If you have any questions about the device, its functions, or accessories, please contact us at:

Pepperl+Fuchs GmbH
Lilienthalstraße 200
68307 Mannheim
Telephone: +49 621 776-4411
Fax: +49 621 776-274411
E-Mail: fa-info@pepperl-fuchs.com

31.1.2014

2. Declaration of conformity

2.1 Declaration of conformity

This product was developed and manufactured under observance of the applicable European standards and guidelines.

Information!

A Declaration of Conformity can be requested from the manufacturer.

The product manufacturer, Pepperl+Fuchs GmbH, D-68307 Mannheim, has a certified quality assurance system that conforms to ISO 9001.

3. Safety

3.1 Symbols relevant to safety

Information!

This symbol indicates important information.

Attention!

This symbol warns of a potential failure. Non-compliance may lead to interruptions of the device, the connected peripheral systems, or plant, potentially leading to total malfunctioning.

Warning!

This symbol warns of an imminent danger. Non-compliance may lead to personal injuries that could be fatal or result in material damages and destruction.

3.2 General notes on safety

Only instructed specialist staff may operate the device in accordance with the operating manual.

User modification and or repair are dangerous and will void the warranty and exclude the manufacturer from any liability. If serious faults occur, stop using the device. Secure the device against inadvertent operation. In the event of repairs, return the device to your local Pepperl+Fuchs representative or sales office.

The connection of the device and maintenance work when live may only be carried out by a qualified electrical specialist.

The operating company bears responsibility for observing locally applicable safety regulations.

Store the not used device in the original packaging. This offers the device optimal protection against impact and moisture.

Ensure that the ambient conditions comply with regulations.

3.3 Disposal

Information!

Electronic waste is hazardous waste. Please comply with all local ordinances when disposing this product!

The device does not contain batteries that need to be removed before disposing it.

4. General

4.1 Product information

This system manual applies to the following Pepperl+Fuchs GmbH equipment:

4.1.1 AS-i 3.0 PROFINET Gateway in Stainless Steel

Article No.	Type	Model	Fieldbus interface	Number of AS-i networks, number of AS-i Master	1 power supply, 1 gateway for 2 AS-i networks,	Diagnostic and configuration interface	Recognition of duplicate AS-i addresses	AS-i fault detector	AS-i Power24V[1]	Programming in C
VBG-PN-K20-DMD-EV	PROFINET AS-i	Gateway	PROFINET	2 AS-i networks, 2 AS-i Masters	yes, max. 4A/ AS-i network	RS 232 + Ethernet	yes	yes	yes	optional
VBG-PN-K20-DMD	PROFINET AS-i	Gateway	PROFINET	2 AS-i networks, 2 AS-i Masters	no, max. 8A/ AS-i network, redundant supply	RS 232 + Ethernet	yes	yes	yes	optional
VBG-PN-K20-D	PROFINET AS-i	Gateway	PROFINET	1 AS-i network, 1 AS-i Master	no, max. 8A/ AS-i network	RS 232 + Ethernet	yes	yes	yes	optional
VBG-PN-K20-D-BV	PROFINET AS-i	Gateway	PROFINET	1 AS-i network, 1 AS-i Master	no, max. 8A/ AS-i network	—	—	yes	yes	—

Tab. 4-1. Function range "AS-i 3.0 PROFINET Gateway in Stainless Steel"

1. **AS-i Power24V** capable.
The devices can be operated directly on a 24V (PELV) power supply. The gateway VBG-PN-K20-DMD-EV is optimized with integrated data coupling coils and adjustable self-resetting fuses for safe use also of powerful 24V power supplies. The gateways VBG-PN-K20-D, VBG-PN-K20-DMD and VBG-PN-K20-D-BV need to add in Power24V-operation a power supply decoupling unit.

The AS-i PROFINET Gateways serve to connect AS-i systems to the superordinate PROFINET. The gateways act as a master for AS-i and as a slave on PROFINET.

All AS-i functions can be used via ethernet.

4.2 AS-i specification 3.0

The AS-i 3.0 gateways already fulfil the AS-i specification 3.0.

The previous specifications (2.1 and 2.0) are supported as well.

Advanced Diagnostics

Diagnostics, which go far beyond the standard diagnostics facilitate the simple detection of the occasionally occurring configuration errors and further irritations towards the AS-i communication. So in case of an error the down time of machines can be minimized or you can initiate preventive maintenance.

Commissioning and monitoring

The AS-i Gateway can be commissioned via the RS 232 diagnostics interface and the software "AS-i Control Tools".

Commissioning, debugging and setting up of the AS-i parameters can also be accomplished with the use of push-buttons on the frontside of the gateway, the display and the LEDs.

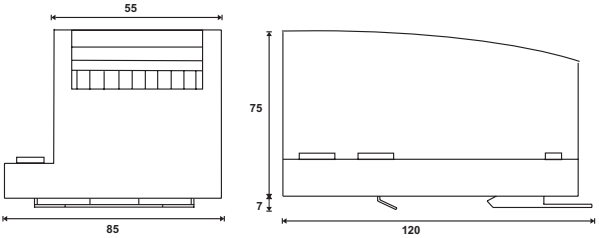
5. Specifications

5.1 Technical data

The technical data are placed in the data sheet. Please view the current version on the web page: http://www.pepperl-fuchs.com.

6. Installation

6.1 Dimensions



Warning!

Cover the top of the gateway when doing any drilling work above the unit. No particles, especially metal chips, should be allowed to enter the housing, since this could cause a short circuit.

Information!

Please refer to installation instruction for this device for detailed mounting information.

6.2 Connections

	0,2 ... 2,5 mm^2
	0,2 ... 2,5 mm^2
AWG	24 ... 12

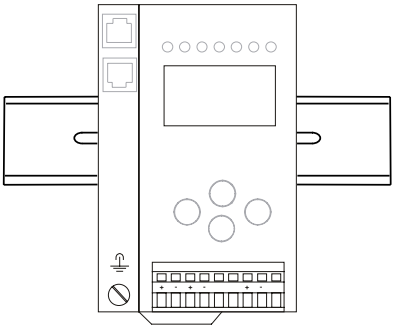
6.3 Installing in the control cabinet

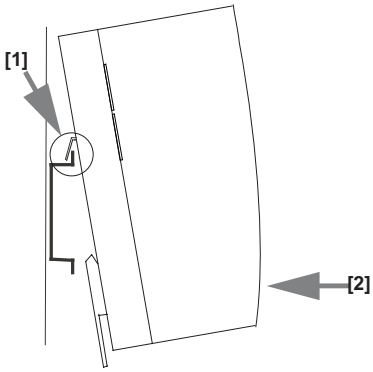
The AS-i PROFINET Gateway is installed in the control cabinet on 35mm DIN rails per DIN EN 50 022.

Information!

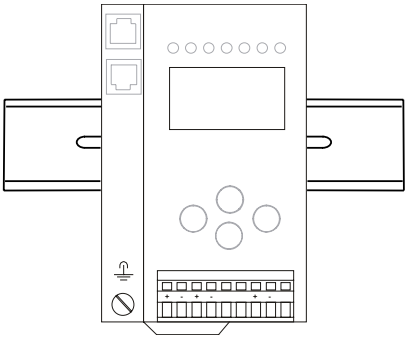
The enclosure of the AS-i PROFINET Gateway is made of stainless steel. The unit is also suitable for exposed wall mounting.

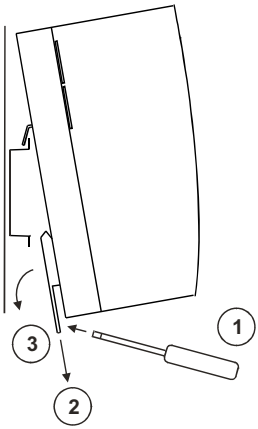
To install, place the unit on the upper edge of the DIN rail and then snap in the lower edge.





6.4 Removing

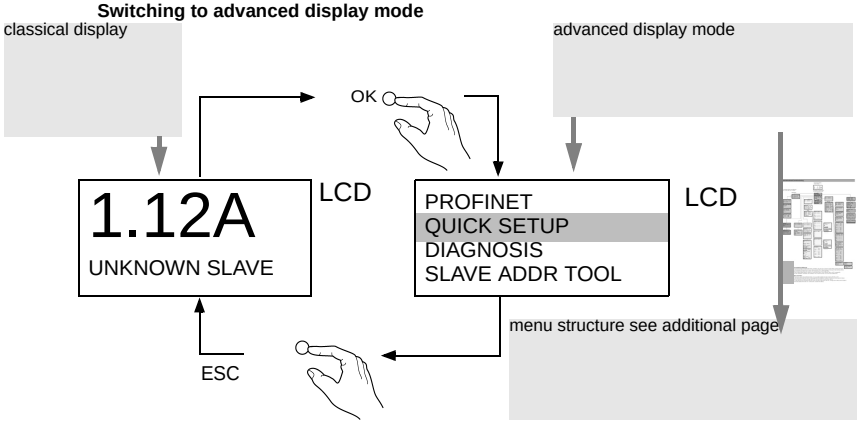




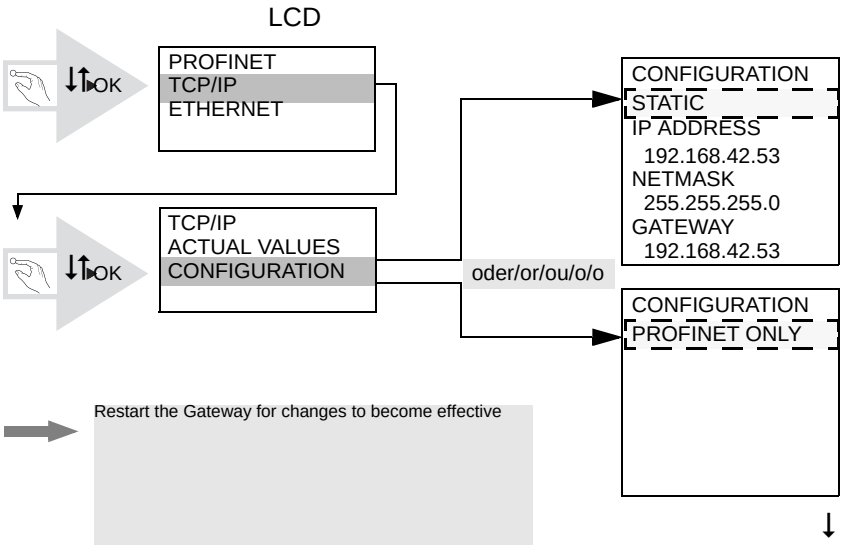
To remove, press the holding clamps [2] down using a screwdriver [1], press the unit firmly against the upper rail guide and lift out.

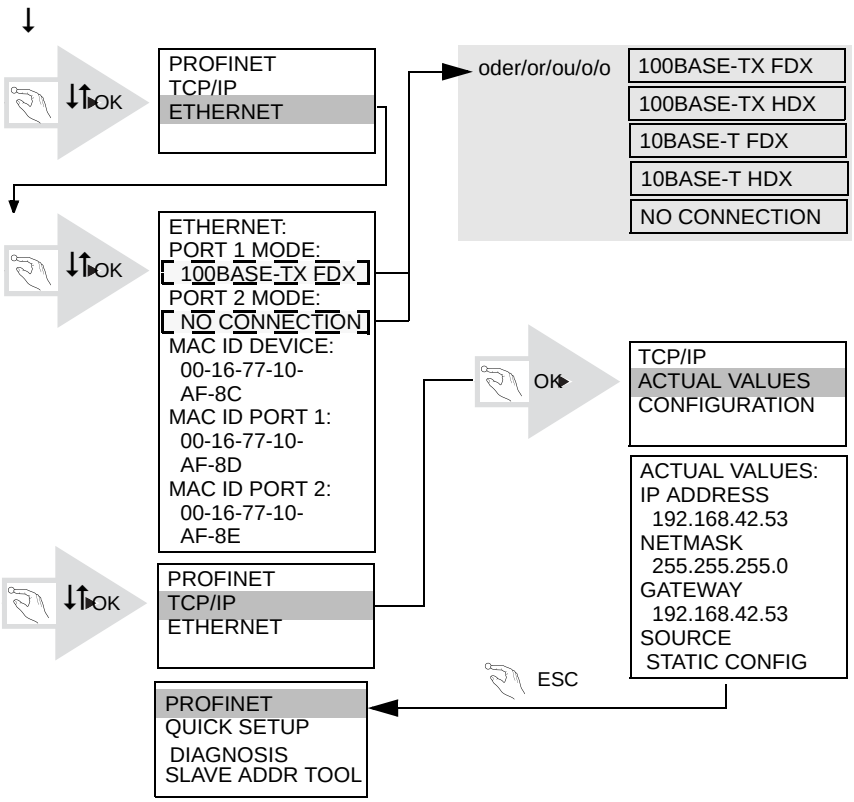
6.5 Commissioning

Switching to advanced display mode

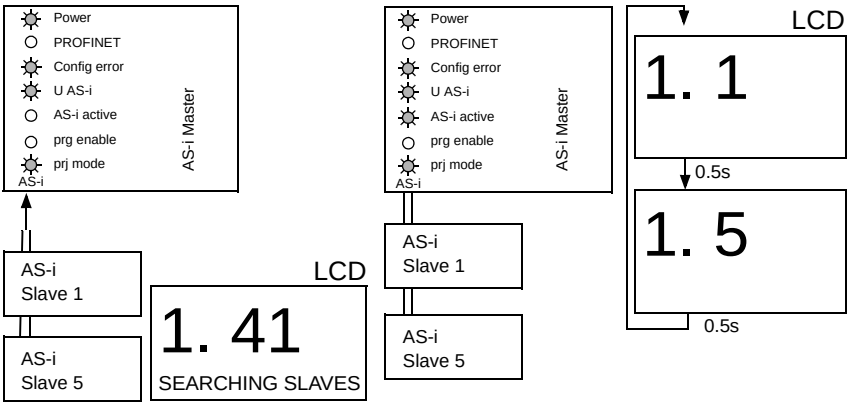


6.5.1 *Setting the PROFINET properties*

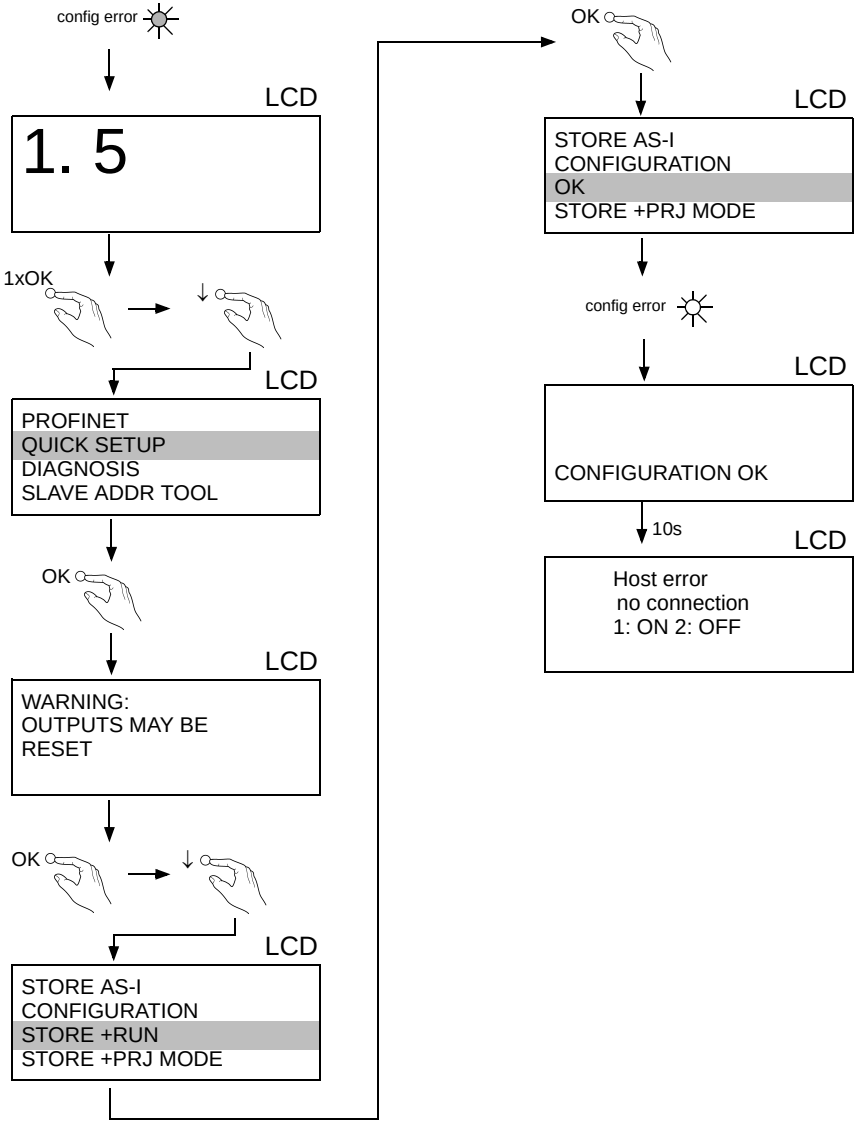



PROFINET
TCP/IP
ETHERNET
OK
oder/or/ou/o/o
100BASE-TX FDX
100BASE-TX HDX
10BASE-T FDX
10BASE-T HDX
NO CONNECTION
ETHERNET:
PORT 1 MODE:
100BASE-TX FDX
PORT 2 MODE:
NO CONNECTION
MAC ID DEVICE:
00-16-77-10-
AF-8C
MAC ID PORT 1:
00-16-77-10-
AF-8D
MAC ID PORT 2:
00-16-77-10-
AF-8E
TCP/IP
ACTUAL VALUES
CONFIGURATION
ACTUAL VALUES:
IP ADDRESS
192.168.42.53
NETMASK
255.255.255.0
GATEWAY
192.168.42.53
SOURCE
STATIC CONFIG
ESC
PROFINET
QUICK SETUP
DIAGNOSIS
SLAVE ADDR TOOL

6.5.2 Connecting AS-i Slaves

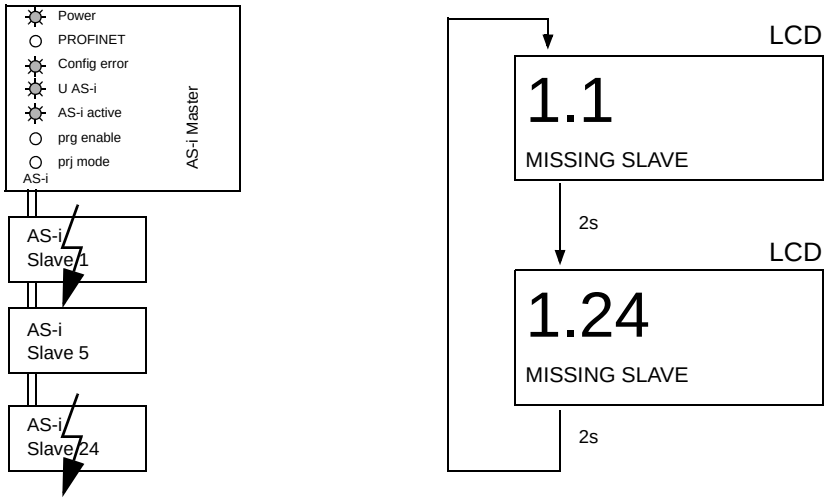


6.5.3 Quick setup

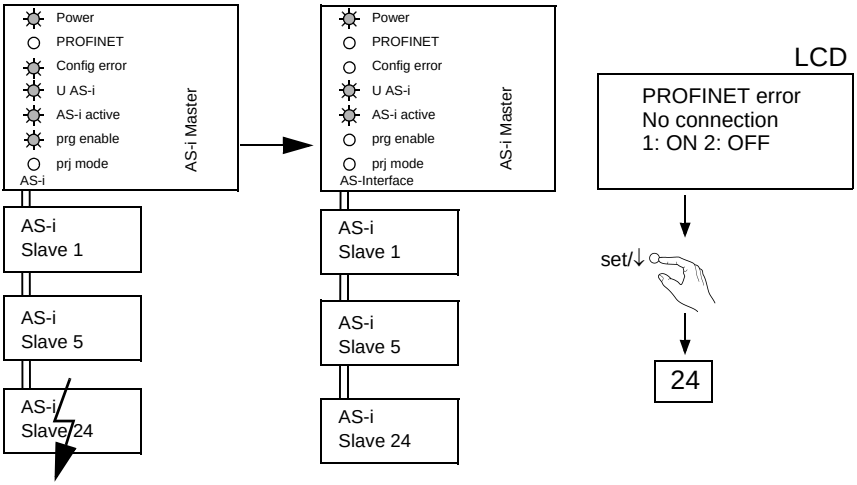


6.5.4 Error tracing

6.5.4.1 Faulty slaves



6.5.4.2 Error display (last error)

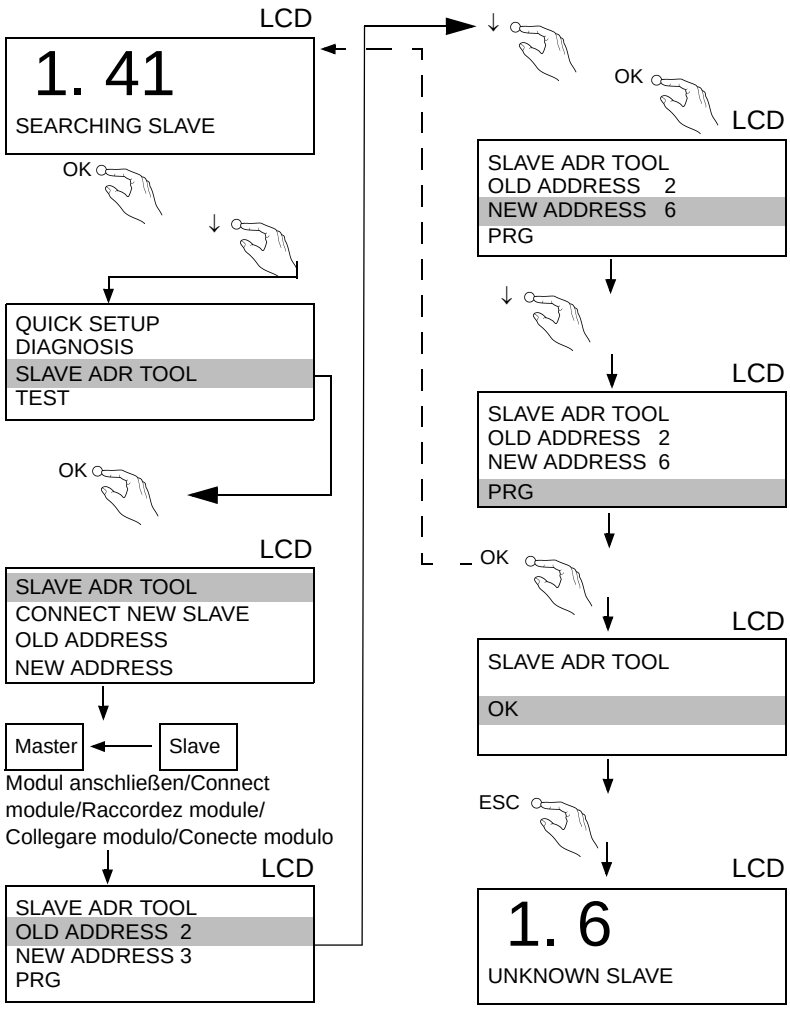


31.1.2014

PEPPERL+FUCHS

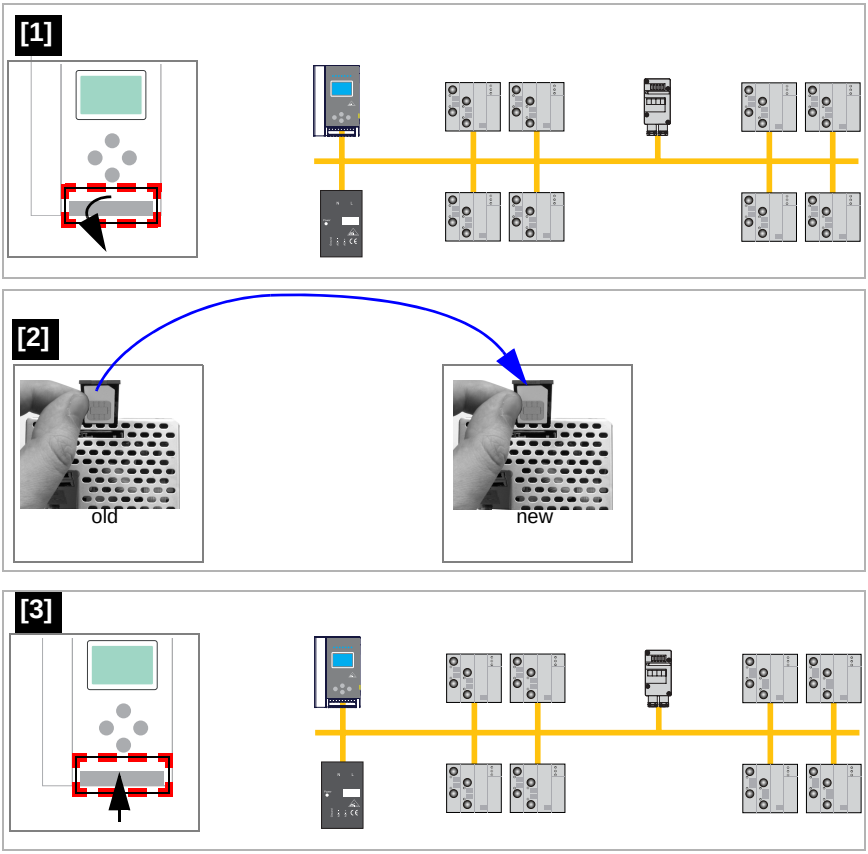
6.5.5 Addressing

6.5.5.1 Assigning address 6 to slave currently at address 2

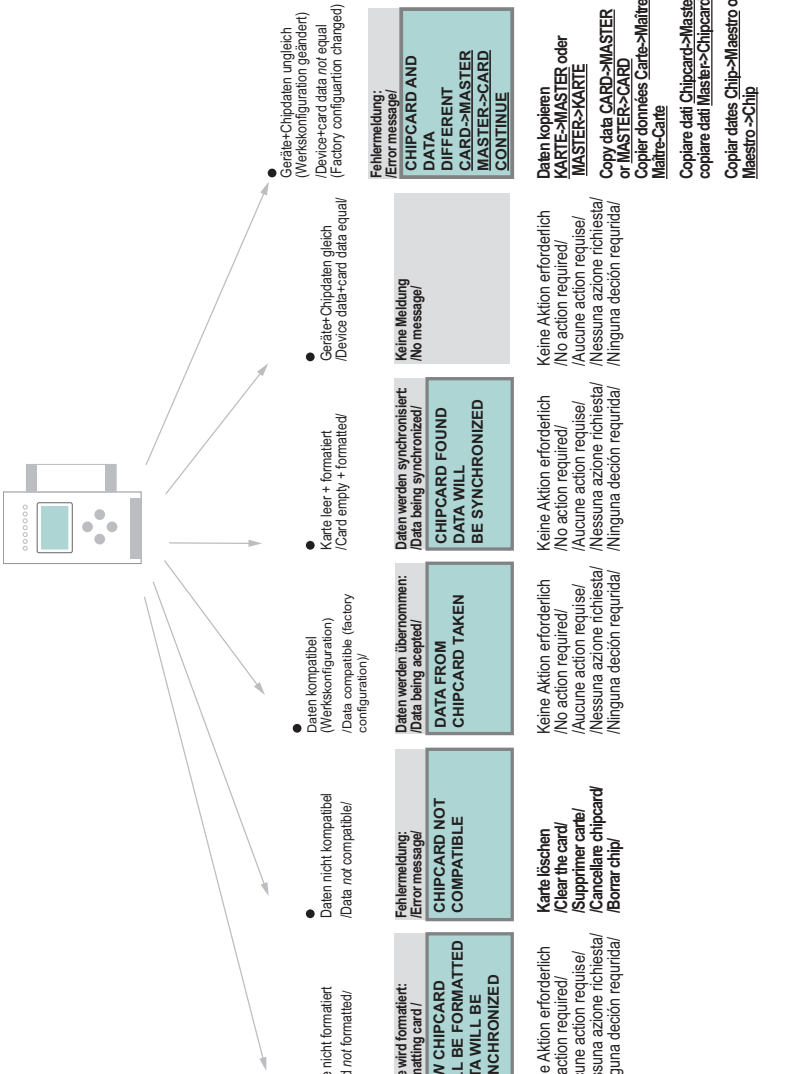


6.5.6 Replacing the chip card

Always turn off power before inserting or removing the card!



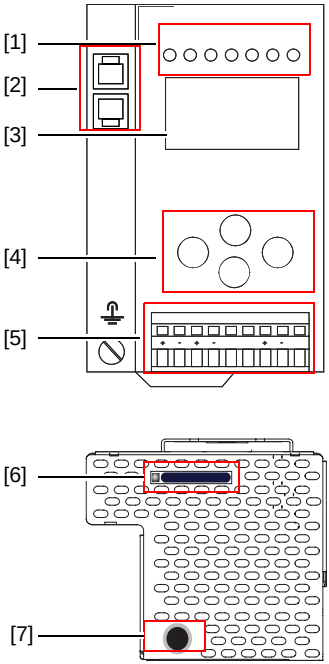
6.5.7 Local parameter setting of AS-i/Gateways

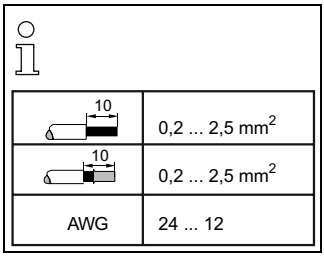


7. Electrical connection

7.1 Overview of terminals, indicators and operating elements

7.1.1 VBG-PN-K20-D, VBG-PN-K20-DMD-EV, VBG-PN-K20-DMD



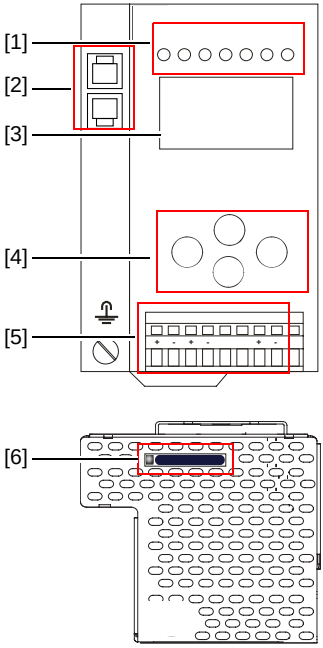


Legend:

[1] LEDs
[2] PROFINET interface
[3] LC display
[4] Buttons
[5] Terminals: Supply voltage and AS-i circuit
[6] Chip card
[7] RS232 diagnostics port[1]

1. Only together with AS-i Control Tools

7.1.2 VBG-PN-K20-D-BV

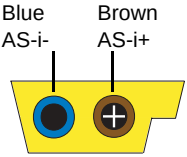


10	0,2 ... 2,5 mm^2
10	0,2 ... 2,5 mm^2
AWG	24 ... 12

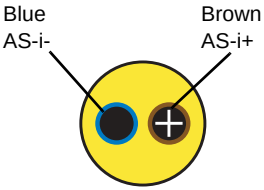
Legend:

[1] LEDs
[2] PROFINET interface
[3] LC display
[4] Buttons
[5] Terminals: Supply voltage and AS-i circuit
[6] Chip card

7.2 AS-i bus connection



Yellow ASi ribbon cable



2-conductor AS-i round cable
(Recommended: flexible power cable
H05VV-F2x1,5 per DIN VDE 0281)

Information!

Electrical work is to be performed only by electrical technicians.

7.3 Information about the device types

Information!

A listing of the individual devices and their features can be found in section <Product information>.

7.4 AS-i and power supply terminal assignments

Information!

The cable indicated by grey must not have slaves or repeaters connected to it.

The yellow cable must not have AS-i power suppliers or additional masters connected to it.

Information!

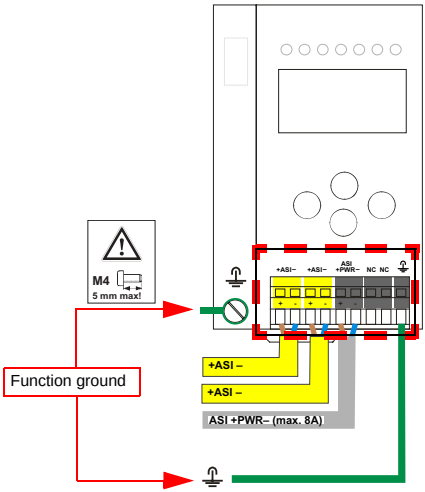
The function ground can be connected either to the grounding screw or to the terminal.

The function ground should be made with as short a cable as possible to ensure good EMC characteristics.

Therefore function grounding using the grounding screw is preferred.

31.1.2014

7.4.1 Electrical connection VBG-PN-K20-D, VBG-PN-K20-D-BV

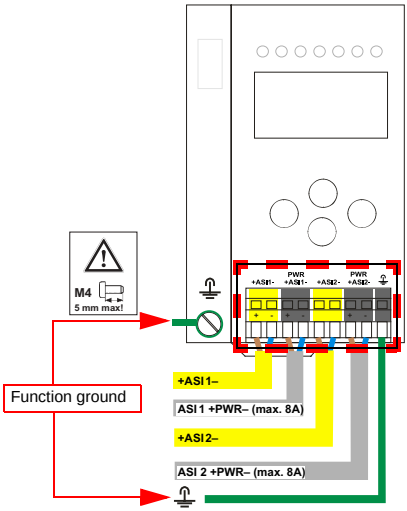


Terminal	Signal / Description
+AS-i–	Connection to AS-i Circuit
ASI +PWR–	Supply voltage for AS-i Circuit (max. 8 A)
FE	Function ground

Information!

For additional information, please refer to the section <AS-i and power supply terminal assignments>.

7.4.2 Electrical connection VBG-PN-K20-DMD



Terminal	Signal / Description
+ASI 1–	Connection to AS-i circuit 1
+ASI 2–	Connection to AS-i circuit 2
ASI 1 +PWR–	Supply voltage for AS-i circuit 1 (max. 8 A)
ASI 2 +PWR–	Supply voltage for AS-i circuit 2 (max. 8 A)
FE	Function ground

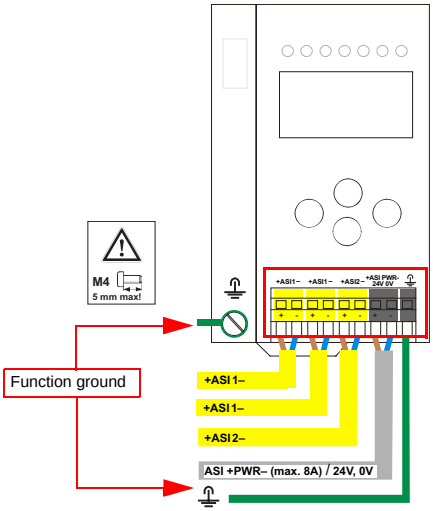
Information!

AS-i circuits 1 and 2 are powered by separate power supplies.

Information!

For additional information, please refer to the section <AS-i and power supply terminal assignments>.

7.4.3 Electrical connection VBG-PN-K20-DMD-EV



Terminal	Signal / Description
+ASI 1–	Connection to AS-i circuit 1
+ASI 2–	Connection to AS-i circuit 2
ASI +PWR– / 24 V, 0 V	Supply voltage for AS-i circuits (max. 8 A) / **AS-i Power24**[1] supply optional
FE	Function ground

1. The gateway is AS-i Power24V capable and can be operated directly on a 24V (PELV) power supply.

Information!

AS-i Circuit 1 and 2 are both powered from a Pepperl+Fuchs GmbH power supply! No other power supplies are approved!

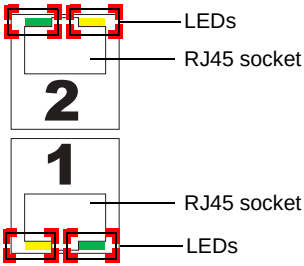
Attention!

*Earth fault detector sensor without function when using **AS-i Power24**!*

Information!

For additional information, please refer to the sections: <AS-i and power supply terminal assignments> and <AS-i Power24V capable>.

7.5 PROFINET interface



Connection to an Ethernet network is carried out using the one of the two RJ45 sockets on the left housing side (see section <Overview of terminals, indicators and operating elements>).

The two sockets lead to an integrated real-time switch. They are based on MDI/ MDI-X (auto-crossover) and support 100Base-TX und 10Base-T networks in each case with full- and half duplex (auto negotiation).

Information!

The switch will operate only if supply voltage (± PWR) is present.

LEDs in the sockets (2 per socket):

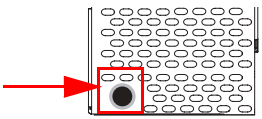
Port (green)
LED flashes green: ethernet connection active (i.e. cable plugged in).
Activity (yellow)
LED flashes yellow: transmitting/receiving active.

7.6 Diagnostics interface (only with: VBG-PN-K20-D, VBG-PN-K20-DMD-EV, VBG-PN-K20-DMD)

The service and diagnostics interface (in conjunction with **AS-i Control Tools** software) is used for communication between the PC and the unit.

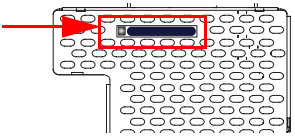
7.6.1 Diagnostics port RS 232

The service and diagnostics interface is configured as a mini DIN-6 female and it is placed at the top of the housing (see section <Overview of terminals, indicators and operating elements>).



31.1.2014

7.7 Chip card



The configuration is stored in a fixed installed EEPROM and can be overwritten by the chip card. The chip card does not have to be inserted in operation.

Warning!

Power must always be turned off when removing or inserting the chip card!

7.7.1 Using the chip card

The chip card integrated in the AS-i master is used to read-out and to store configuration data.

7.7.1.1 Card unformatted

If an unformatted card is found when the device is started, the following is displayed:

```
NEW CHIPCARD
WILL BE FORMATED
AS-I DATA WILL
BE SYNCHRONIZED
```

The chip card is formatted and then the data copied to the chip card.

7.7.1.2 Data not compatible

If a card is found whose data are incompatible with the device, the following error message is displayed:

```
CHIPCARD NOT
COMPATIBLE
```

7.7.1.3 Card empty

The following message is displayed for an empty card:

```
CHIPCARD FOUND
AS-I DATA WILL
BE SYNCHRONIZED
```

From this time on all changes are made both in the device and on the chip card.

7.7.1.4 Data compatible

When starting with an empty device (e.g. after a factory reset) a non-empty card is found whose data are compatible with the device, the following message is displayed:

```
AS-I DATA FROM
CHIPCARD TAKEN
```

The card configuration is written to the device. From this time on all changes are made both in the device and on the chip card.

7.7.1.5 Data in the device and on the chip card identical

If the card and device are not empty at start and the data are identical, no message is displayed.

7.7.1.6 Data in the device and on the chip card not identical

If the card and device are not empty at start and the data are not identical, an error message is displayed and the card is not synchronized with the device. The following menu is then automatically opened:

```
CHIPCARD AND
AS-I DATA
DIFFERENT
CARD->MASTER
MASTER->CARD
CONTINUE
```

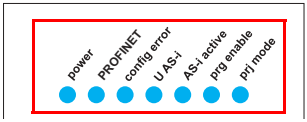
Description

CHIP CARD>MASTER:	Chip card data are copied to the master
MASTER->CHIPCARD:	Master data are copied to the chip card
NEXT:	No change to the data

The menu can be exited by pressing the ESC/Service key without changing the data.

7.8 Indicators and operating elements

7.8.1 LED indicators – master



The LED's on the front panel of the device indicate:

Power
The master is receiving sufficient power.

PROFINET
Green: PROFINET controller connected (otherwise LED flashes red)

config error
Configuration error.
At least one configured slave is missing, or at least one detected slave is not configured, or for at least one configured and detected slave the actual configuration data does not match the nominal configuration data, or the master is in the startup process.
This LED flashes if a peripheral fault has been detected for at least one AS-i slave on the AS-i network. If there are configuration errors as well as periphery faults, only the configuration error is displayed.

U AS-i
The AS-i network is sufficiently powered.

AS-i active
Normal operation is active

prg enable
Automatic single node replacement is enabled.
Exactly one slave is missing in the protected operating mode. The slave can be replaced by another slave of the same type with address zero. The master automatically addresses the new slave to the faulty address and thus corrects the configuration error

prj mode
The AS-i master is in configuration mode.

7.8.2 Buttons

The buttons are used for the following:

Mode/⇑ Switching between configuration mode and protected operating mode, and saving the current AS-i configuration as the nominal configuration.
Set/⇓ Selecting the address of and assigning an address to a slave.
OK, ESC Changing to the advanced display mode.

For additional information see section <Operation in advanced display mode>.

8. Operation in advanced display mode

Information!

*You will find a description of the display menu in the separate document "**Display_Menue**".*

9. Advanced Diagnostics for AS-i Masters

Information!

A listing of the individual devices and their range of functions can be found in section <Product information>.

The advanced AS-i diagnostics is intended to localize occasionally occurring configuration errors and to determine the quality of data transmission on AS-i without using additional diagnostics tools.

AS-i Control Tools, a MS-Windows software designed to simplify AS-i installation and used to program AS-i Control, enables operation of the advanced diagnostics functions (LCS, error counters, and LOS).

9.1 List of corrupted AS-i Slaves (LCS)

The LCS contains the information from the Delta list. In addition to the list of configured slaves (LPS), the list of detected slaves (LDS), and the list of activated slaves (LAS), the AS-i master creates a fourth list, the list of corrupted slaves (LCS) containing advanced diagnostics data used to diagnose the causes for intermittently occurring configuration errors on AS-i. This list contains entries for all AS-i slaves that were responsible for at least one intermittent configuration error since the list was last read or since the AS-i master was turned on. Furthermore, intermittent AS-i power failures are listed in the LCS at the position of AS-i slave with address 0.

Information!

Whenever the LCS is read it is deleted from memory.

Information!

The last intermittent configuration error can also be displayed on the AS-i master:

Pressing the "Set" button on the AS-i master initiates the display of the AS-i slave responsible for the last intermittent configuration error. If a intermittent AS-i power failure occurred, the display shows 39 after pressing the "Set" button.

This function is only available if the device is in normal operating mode of the protected mode (display empty) or in the off-line phase (Display: "40").

9.2 Protocol analysis: Counters for corrupted data telegrams

The AS-i master with advanced diagnostics provides a counter for telegram repetitions for each AS-i slave. The counter counts up every time a corrupted data telegram has been found, making it possible to determine the quality of the transmission if only a few telegrams are corrupt and the AS-i slave never caused a configuration error.

Information!

The counter values are read via the host interface and will be deleted after they were read.

The highest possible counter value is 254. 255 indicates a counter overflow.

31.1.2014

Displaying the protocol analysis is possible through the AS-i Control Tools software by using the command "Master | AS-i Diagnostics".

9.3 Offline Phase for Configuration Errors

The AS-i masters with advanced diagnostics offer the possibility to set themselves into the offline phase when a configuration error occurs and thus are able to transition the AS-i network into a safe operational state. This ensures a quick reaction to a configuration error and the host can be relieved from this task. If any problems occur on the AS-i network, the AS-i masters can independently switch the AS-interface into a safe state.

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

- Any configuration error occurring on AS-i switches the master from regular operation in protected mode into the offline phase.
- o . A list with the addresses of slaves that can potential initiate the off-line phase is defined (list of offline slaves LOS).

The user can decide how the system should react to a configuration error on AS-i. Thus, the AS-i master can be set to the offline phase for critical AS-i slaves, whereas for less critical slaves only the error message is sent to the host, but AS-i is still running.

Like the advanced diagnostics, the parameterization "offline phase on configuration error" is also supported by "AS-i-Control-Tools"
(Command | Characteristics | Offline because of configuration error).

There are two options to reset the error message "OFFLINE BY LOS:

1. Deleting the complete LOS list on the affected AS-i network ("CLEAR ALL").
2. Power reset on the affected AS-i network.

Attention!

If a power reset occurs on the AS-i network 1 the complete double gateway will be shut down.

9.4 Functions of the AS-i Fault Detector

9.4.1 Duplicate address detection

If two slaves on an AS-i network have the same address, a duplicate address exists. Since the master cannot communicate individually with these slaves any longer, this is considered an error. Because the two slave replies interfere, it is impossible for the master to recognize the slave responses. This results in extremely unstable network behavior.

The duplicate address detection function is used to safely recognize a duplicate address and to display it on the screen and in AS-i Control Tools.

A duplicate address causes a configuration error and is displayed on the screen.

Information!

Duplicate addresses can be recognized only on an AS-i segment directly connected to the master.

9.4.2 Earth/Ground Fault Detector

An Earth/Ground Fault exists when the voltage $\mathbf{U_{GND}}$ (Nominal value of U_{GND}=0,5 U_{AS-i}.) is outside of the following range:

$$\mathbf{10\%\ U_{AS-i} \leq U_{GND} \leq 90\%\ U_{AS-i}}$$

This error substantially limits the noise immunity of the AS-i communication.

Ground faults are indicated on the master´s display as well as in AS-i Control Tools.

Information!

To recognize ground faults the master must be grounded with its machine ground connection.

Information!

A ground fault in one of the two networks of a double master in a version 1 power supply for two AS-i networks causes a ground fault in the other network as well because of the the existing galvanic connection.

9.4.3 Noise Detector

The noise detector detects AC voltages on AS-i, that are not initiated by an AS-i master or AS-i slaves. These interference voltages can cause telegram disturbances.

A frequent cause are insufficiently shielded frequency inverters or improperly routed cables.

Noises is indicated on the master´s display as well as in AS-i Control Tools.

9.4.4 Over-voltage Detector

Over-voltages are present if the conductors of an AS-i network that normally are routed electrically symmetrical with respect to machine ground, are strongly electrically raised. A cause can for example be startup procedures of large consumers.

However, over-voltages do generally not interfere with the AS-i communication, but can under certain circumstances cause incorrect sensor signals.

Over-voltages are indicated on the master´s display as well as in the AS-i Control Tools.

9.5 Functions of the new generation of AS-i Gateways

The new generation scores with further optimized diagnostics, several additional functions and even greater operating convenience.

Information!

A listing of the individual devices and their features can be found in section <New Generation of AS-i Gateways with ethernet diagnostics interface>.

9.5.1 C-programmable Gateways

Main menu || SETUP || AS-I CONTROL || **CONTROL FLAGS** ||

The devices programmed in C are able themselves to take over a great number of control tasks. In smaller systems the user will even be able to do without a PLC altogether: if desired the C program can function as a full mini-PLC. In more complex applications the C-programmable Gateways make the work of the PLC easier - for example by pre-processing special functions.

9.5.2 Interchangeable memory card

Main menu || SETUP || CHIPCARD || **AS-I CHIPCARD** ||

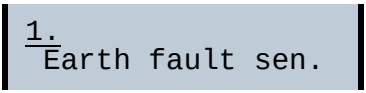
Interchangeable memory card: redundant memory for C program and device configuration.

9.5.3 Earth fault monitor

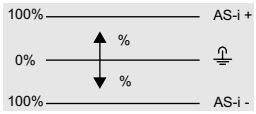
Main menu || DIAGNOSE || **ASI WATCHDOG** ||

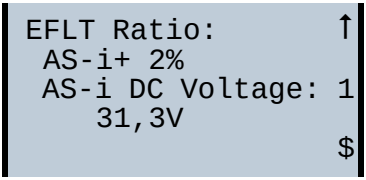
The new earth fault monitor allows the service technician to detect whether an earth fault has occurred directly on AS-i

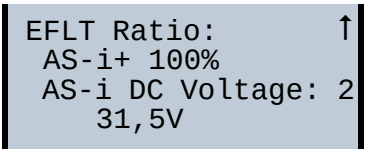
or on a sensor line.



The menu **EFLT Ratio** shows the asymmetry of the AS-i network, referenced to ground (see sketch).

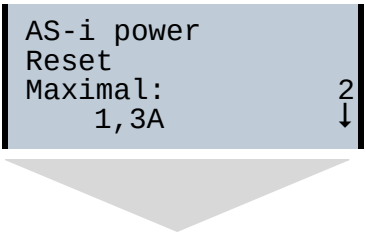




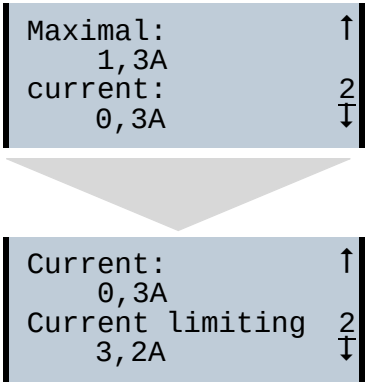


9.5.4 Current can be read directly on the unit

Now the devices display both the maximum current and the current actually present in the respective AS-i circuit. Heavy consumers or a strong overload in an AS-i circuit are then easy to detect. Plus you can set the maximum current in the AS-i circuit on these devices. This ensures line protection even when using large 24V power supplies.



31.1.2014

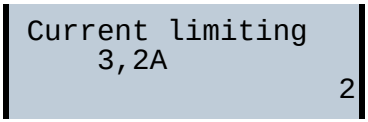


9.5.5 Self-resetting fuses

Main menu || SETUP || **CURRENT LIMIT** ||

Thanks to self-resetting fuses in the "1 Gateway, 1 power supply for 2 AS-i circuits" Gateway version, when there is a short circuit in one of the two AS-i circuits the other circuit and the Gateway remain operational - the host controller keeps receiving diagnostic information from AS-i, which also provides meaningful assistance towards rapid troubleshooting.

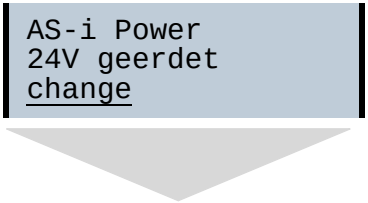
The fuse resets itself periodically to check if the error is solved. The measured current value is available as diagnostic information at the field on the display and at the control level.

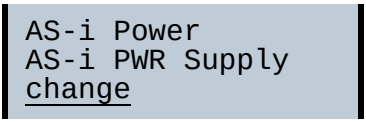


9.5.6 AS-i Power24V capable

Main menu || SETUP || **ASI POWER** ||

Gateways for AS-i Power24V have been developed especially for use in small systems. They don‘t need any special AS-i power supply. With a standard 24V power supply a 50 m line lenght and with an AS-i power supply min. 100 m line lenght can be realised.





9.5.7 Ethernet diagnostics interface with web server

These devices allow diagnostics for both the Gateway and the AS-i networks (including Safety technology) over Ethernet without additional software. AS-i network can be thus a part of a remote maintenance concept. Morover the configuration file are stored on the web server and so they are always within reach.

9.5.8 Transitionless operating mode changes

Main menu || SETUP || **MODE CHANGE** ||

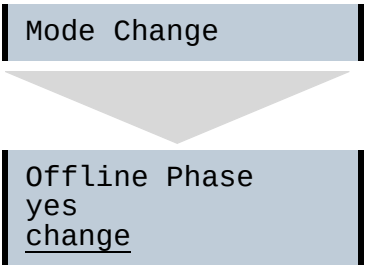
These devices are able to change the operating mode from projecting mode to the protected operating mode without having to first go to the "offline phase".

This means the Slave outputs are not cleared and the safe Slaves not turned off.

Activation and deactivation is set using the PROFINET start parameterization.

This function must be explicitly activated; the default setting is “Deactivated.”

The setting for activated and deactivated is saved, which means that it remains set after a "power cycle".



10. Configuration of AS-i/PROFINET Gateways

This section includes information for the configuration of the AS-i 3.0 PROFINET Gateway in a PROFINET network.

10.1 Projecting PROFINET network

The configuration tool needs information about the bus participants for the projecting of a PROFINET network. These information is provided from the manufacturers of bus participants as "equipment master data" in GSDML files.

During the configuration, the GSDML file must be imported into the PROFINET configuration tool.

The AS-i/PROFINET Gateway appears then in the hardware catalog as:

"PROFINET IO/Other field devices/Gateway/Pepperl+Fuchs AS-interface".

Information!

*The device name of the AS-i 3.0 PROFINET-Gateway is: **""**. Any PROFINET participant will be identified over this name. That means that every PROFINET participant has to become a precise name with the help of AS-i Control Tools.*

The name of the gateways is "" per default.
This must be changed to the requested name during the projecting!

10.2 Logical slots

10.2.1 Options

The GSD file offers several combinations (several lengths) for transmitting I/O data, the command interface , as well as AS-i 16 bit data. This allows them to be transmitted directly as part of the process data channel.

Up to 30 modules can be configured

Possible options:

Length	description
16 byte I	digital input (slave 0 - 31)
20 byte I	digital input (slave 0 - 7b)
32 byte I	digital input (slave 0 - 31B)

Tab. 10-2.

Information!

Up to four command interfaces can be integrated.

Length	description
12 byte I/O	command interface
32 byte I/O	
34 byte I/O	
36 byte I/O	

Tab. 10-3.

Length	description
2 byte … 128 byte I	analog input data, dynamic
2 byte … 128 byte O	analog output data, dynamic

Tab. 10-4.

Length	description
2 byte I	flags and AS-i detector

Tab. 10-5.

EC-flags (16-bit)

EC-flags (16-bit)								
	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
byte 0	DA	NSE	OV	EF	–	–	–	Pok
byte 1	OR	APF	NA	CA	AAv	AAs	S0	Cok

Tab. 10-6.

DA:	Double address
NSE	Noise
OV:	Overvoltage
EF:	Earth falut
Pok:	Periphery_Ok
OR:	Offline_Ready
APF:	APF
NA:	Normal_Operation_Active
CA:	Configuration_Active
AAv:	Auto_Address_Available
AAs:	Auto_Address_Assign
S0:	LDS.0
Cok:	Config_Ok

byte 0

DA	0 = OK
	1 = Double address
NSE	0 = OK

	1 = Noise
OV	0 = OK
	1 = Overvoltage
EF	0 = OK
	1 = Earth falut
Pok	0 = OK
	1 = Periphery fault

byte 1

Cok	0 = OK
	1 = 'Config Error'
S0	1 = Address '0' present
	0 = Adresse '0' *not* present
AAs	1 = 'Auto_Address_Assign' *not* active
	0 = 'Auto_Address_Assign' active
AAv	1 = 'Auto_Address_Available' active
	0 = 'Auto_Address_Available' *not* active
CA	0 = 'Configuration_Active' *not* active
	1 = 'Configuration_Active' active
NA	0 = 'Normal_Operation_Active' OK
	1 = 'Normal_Operation_Active' *not* OK
APF	0 = *no* APF
	1 = APF
OR	0 = online
	1 = offline

10.2.2 32 bytes digital AS-i I/O data (A and B slaves)

Modul: 32 byte digitale I/O (A+B)			
Module ident number	0x80000001		
Name	32 byte digitale I/O (A+B)		
Details	32 bytes digital AS-i I/O data (A and B slaves)		
Category	digital I/O data		
Submodule:			
Submodule ident number	0x00000001		
Cycl. Input data			
Name	data type	display as bits	length (bytes)
Sensor data	OctetString	yes	32
Cycl. output data			
Name	data type	display as bits	length (bytes)
Actuator data	OctetString	yes	32

Tab. 10-7.

Input and Output Data Image

Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
	F3	F2	F1	F0				
0	flags				slave 1/1A			
1	slave 2/2A				slave 3/3A			
2	slave 4/4A				slave 5/5A			
3	slave 6/6A				slave 7/7A			
4	slave 8/8A				slave 9/9A			
5	slave 10/10A				slave 11/11A			
6	slave 12/12A				slave 13/13A			
7	slave 14/14A				slave 15/15A			
8	slave 16/16A				slave 17/17A			
9	slave 18/18A				slave 19/19A			
10	slave 20/20A				slave 21/21A			
11	slave 22/22A				slave 23/23A			
12	slave 24/24A				slave 25/25A			
13	slave 26/26A				slave 27/27A			
14	slave 28/28A				slave 29/29A			
15	slave 30/30A				slave 31/31A			
16	reserved				slave 1B			
17	slave 2B				slave 3B			
18	slave 4B				slave 5B			
19	slave 6B				slave 7B			
20	slave 8B				slave 9B			
21	slave 10B				slave 11B			
22	slave 12B				slave 13B			
23	slave 14B				slave 15B			
24	slave 16B				slave 17B			
25	slave 18B				slave 19B			
26	slave 20B				slave 21B			
27	slave 22B				slave 23B			
28	slave 24B				slave 25B			
29	slave 26B				slave 27B			
30	slave 28B				slave 29B			
31	slave 30B				slave 31B			

Tab. 10-8.

Flags

	Input data	Output data
F0	ConfigError	Off-line
F1	APF	LOS-master-bit
F2	PeripheryFault	→ ConfigurationMode
F3	ConfigurationActive	→ ProtectedMode

Tab. 10-9.

ConfigError:	0=ConfigOK	1=ConfigError
APF:	0=AS-i-Power OK	1=AS-i-Power Fail
PeripheryFault:	0=PeripheryOK	1=PeripheryFault
ConfigurationActive:	0=ProtectedOperationMode	1=ProjectingMode
Off-Line:	0=On-Line	1=Off-Line
LOS-master-bit	0=Off-Line by ConfigError deactivated	1=Off-Line by ConfigError activated.

10.2.3 16 bytes digital AS-i I/O data (A slaves only)

Modul: 16 byte digitale I/O (A)			
Module ident number	0x80000001		
Name	16 byte digitale I/O (A)		
Details	16 bytes digital AS-i I/O data (A slaves only)		
Category	digital I/O data		
Submodule:			
Submodule ident number	0x00000001		
Cycl. Input data			
Name	data type	display as bits	length (bytes)
Sensor data	OctetString	yes	16
Cycl. output data			
Name	data type	display as bits	length (bytes)
Actuator data	OctetString	yes	16

Tab. 10-10.

Information!

For information about I/O data image, refer to the table <Input and Output Data Image>.

10.2.4 16 bytes digital AS-i I/O data (B slaves only)

Modul: 16 byte digital I/O (B)			
Module ident number	0x80000001		
Name	16 byte digital I/O (B)		
Details	16 bytes digital AS-i I/O data (B slaves only)		
Category	digital I/O data		
Submodule:			
Submodule ident number	0x00000001		
Cycl. Input data			
Name	data type	display as bits	length (bytes)
Sensor data	OctetString	yes	16
Cycl. output data			
Name	data type	display as bits	length (bytes)
Actuator data	OctetString	yes	16

Tab. 10-11.

Information!

For information about I/O data image, refer to the table <Input and Output Data Image>.

10.2.5 4 words analog AS-i input data

Modul: 4 words analog E						
Module Ident Number	0x80000005					
Name	4 words analog in					
Details	4 words analog AS-i input data					
Category	analog inputs					
Submodule:						
Submodule ident number	0x00000001					
Cycl. input data						
Name	data type	display as bits	length (bytes)			
Analog inputs	unsigned16					
Analog inputs	unsigned16					
Analog inputs	unsigned16					
Analog inputs	unsigned16					
general parameter (Index: 1 -- length: 1 byte)						
Name of parameter	data type	byte offset	bit offset	bit length	default value	value range
First analog slave	unsigned8	0		–	1	1 ... 30

Tab. 10-12.

16-bit value

	16-bit value															
	2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}
	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
word 1	channel 1															
word 2	channel 2															
word 3	channel 3															
word 4	channel 4															

Tab. 10-13.

16-bit data

Information!

A-slaves map the data on channels 1 and 2.

B-slaves map the data on channels 3 and 4.

In addition to the access via the command interfaces, the 16-bit data for or by the slaves with 16-bit value can by exchanged cyclically (profile 7.3., S-7.4, S-6.0, S-7.5, S-7.A.8, S-7.A.9, S-7.A.A). Competing writing access attemps on 16-bit output data will not be blocked by every other. If 16-bit output data for a particular slave are being transmitted both cyclically and acyclically with the command interface, the acyclically transmitted values will be overwritten by the cyclically transmitted values.

AS-i 16-bit data can be transmitted in a reserved data area. Therefore accessing 16-bit data is as easy as accessing digital data.

10.2.6 4 Words analog AS-i output data

Modul: 4 words analog Out						
Module ident number	0x80000006					
Name	4 words analog out					
Details	4 words analog AS-i output data					
Category	analog outputs					
Submodule:						
Submodule ident number	0x00000001					
Cycl. output data						
Name	datentyp	display as bits	length (bytes)			
Analog outputs	unsigned16					
Analog outputs	unsigned16					
Analog outputs	unsigned16					
Analog outputs	unsigned16					
general parameter (Index: 1 -- length: 1 byte)						
Name of parameter	data type	byte offset	bit offset	bit length	default value	value range
First analog slave	unsigned8	0		–	1	1 ... 30

Tab. 10-14.

10.2.7 36 bytes command interface

Modul: 36 bytes Cmd If			
Module ident number	0x80000002		
Name	36 bytes Cmd If		
Details	36 bytes command interface		
Category	command interface		
Submodule:			
Submodule ident number	0x00000001		
Cycl. input data			
Name	data type	display as bits	length (bytes)
Command echo	unsigned8		
Execution status	unsigned8		
Response data	OctetString		34
Cycl. output data			
Name	data type	display as bits	length (bytes)
Command echo	unsigned8		
AS-i circuit	unsigned8		
Request data	OctetString		34

Tab. 10-15.

Information!

For information about the structure and the description of the command interface, refer to the manual "AS-i 3.0 Command Interface".

10.2.8 34 bytes command interface

Modul: 34 bytes Cmd If			
Module ident number	0x80000002		
Name	34 bytes Cmd If		
Details	34 bytes command interface		
Category	command interface		
Submodule:			
Submodule ident number	0x00000001		
Cycl. Input data			
Name	data type	display as bits	length (bytes)
Command echo	unsigned8		
Execution status	unsigned8		
Response data	OctetString		32
Cycl. output data			
Name	data type	display as bits	length (bytes)
Command	unsigned8		
AS-i circuit	unsigned8		
Request data	OctetString		32

Tab. 10-16.

Information!

For information about the structure and the description of the command interface, refer to the manual "AS-i 3.0 Command Interface".

10.2.9 12 byte command interface

Modul: 12 bytes Cmd If			
Module ident number	0x80000002		
Name	12 bytes Cmd If		
Details	12 bytes command interface		
Category	command interface		
Submodule:			
Submodule ident number	0x00000001		
Cycl input data			
Name	data type	display as bits	length (bytes)
Command echo	unsigned8		
Execution status	unsigned8		
Response data	OctetString		10
Cycl. output data			
Name	data type	display as bits	length (bytes)
Command	unsigned8		
AS-i circuit	unsigned8		
Request data	OctetString		10

Tab. 10-17.

Information!

For information about the structure and the description of the command interface, refer to the manual "AS-i 3.0 Command Interface".

10.3 Executing of command interface commands

The command interface cann be accessed via the slot 0, subslot 1, data set 7FFF with "date set read/write". The command interface command is executed when the data set is written. The result can be read in the same data set. This command interface has the same structure as those in the process data.

10.4 PROFINET diagnostics

Description of the diagnostic data which are sent via the PROFINET diagnostics channel.

10.4.1 Channel error codes

Slot	channel	error type	error text	help text
0	AS-i Master	16	configuration error	the actual configuration found on AS-i does not match the projected configuration, or the AS-i master performs startup operations.
		17	slave 0 detected	there is an AS-i slave with zero address
		18	no auto address assignment	automatic address assignment would not be possible
		19	auto address assignment available	as soon as an appropriate slave is connected, its address will be automatically assigned
		20	configuration mode	the AS-i master is in configuration mode
		21	no normal operation	the AS-i master is performing startup operations
		22	AS-i power fail	the AS-i power supply is insufficient
		23	off-line	the AS-i master doesn't send telegrams on AS-i
		24	peripheral fault	at least one AS-i slave reports a peripheral fault, or the AS-i master performs startup operations
		25	earth fault	the AS-i is short-circuited to ground
		26	overvoltage	the AS-i is short-circuited to an higher potential
		27	noise	the AS-i signals are noisy
		28	duplicate address	at least two AS-i slaves answers on the same address

Tab. 10-18.

AS-i Master

0: circuit 1
1: circuit 2

10.4.2 Manufacturer specific diagnostic

AS-i flags

structure 0xA0: circuit 1
structure 0xA1: circuit 2

Byte	bit	message
0	0	config error
0	1	slave 0 detected
0	2	automatic addressing *not* possible
0	3	automatic addressing possible
0	4	configuration mode
0	5	no normal operation
0	6	AS-i power fail
0	7	off-line
1	0	peripheral fault
1	1	—
1	2	—
1	3	—
1	4	earth fault
1	5	overvoltage
1	6	noise
1	7	double addressing

Tab. 10-19.

List of configuration errors

structure 0xA2: circuit 1
structure 0xA3: circuit 2

Byte	bit	message
0	0	slave 0: config error
0	1	slave 1/1A: config error
0	2	slave 2/2A: config error
…	…	…
3	7	slave 31/31A: config error
4	0	—

Tab. 10-20.

31.1.2014

Byte	bit	message
4	1	slave 1B: config error
…	…	…
7	7	slave 31B: config error

Tab. 10-20.

List of peripheral faults

structure 0xA4: circuit 1
structure 0xA5: circuit 2

Byte	bit	message
0	0	—
0	1	slave 1/1A: peripheral fault
0	2	slave 2/2A: peripheral fault
…	…	…
3	7	slave 31/31A: peripheral fault
4	0	—
4	1	slave 1B: peripheral fault
…	…	…
7	7	slave 31B: peripheral fault

Tab. 10-21.

Safety status (single- und A-slaves)

structure 0xA8: circuit 1
structure 0xA9: circuit 2

Byte	bit	message
0	0	SaW configuration operation
0	1	slave 1/1A: yellow flashing
0	2	slave 2/2A: yellow flashing
…	…	…
3	7	slave 31/31A: yellow flashing
4	0	SaW monitor error
4	1	slave 1/1A: red flashing
4	2	slave 2/2A: red flashing

Tab. 10-22.

Byte	bit	message
…	…	…
7	7	slave 31/31A: red flashing

Tab. 10-22.

Safety status (B-slaves)

structure 0xAA: circuit 1
structure 0xAB: circuit 2

Byte	bit	message
0	0	—
0	1	slave 1B: yellow flashing
0	2	slave 2B: yellow flashing
…	…	…
3	7	slave 31B: yellow flashing
4	0	—
4	1	slave 1B: red flashing
4	2	slave 2B: red flashing
…	…	…
7	7	slave 31B: red flashing

Tab. 10-23.

10.5 Safety Control/Status

In the fieldbus configuration the designator **Safety Control/Status** can be added as cyclical data. This is possible both for the integrated Safety Monitor and for 2nd generation Monitors.

Information!

Generation III external Monitors allow a maximum of eight OSSDs to be sent.

The state of the outputs and the message outputs is then inserted as a cyclical input datum.

Inputs

byte	description
1	Status OSSD 1, color-coded as defined in the table <Coding of status bytes>).
2	Status OSSD 2, color-coded as defined in the table <Coding of status bytes>).
…	…
n	Status OSSD n, color-coded as defined in the table <Coding of status bytes>).

Tab. 10-24.

Coding of status bytes

Bit [0 ... 3]	state or. color	description
00_{16}	green permanent lighting	output on
01_{16}	green flashing	delay time is running at stop category 1
02_{16}	yellow permanent lighting	start-up/restart-disable active
03_{16}	yellow flashing	external test necessary / acknowledgement / start delay active
04_{16}	red permanent lighting	output off
05_{16}	red flashing	error
06_{16}	grey or off	output not projected
07_{16}	reserved	
Bit [6]	status or color	
0	no device flashing yellow	
1	at least one device flashing yellow	

Tab. 10-25.

Coding of status bytes

Bit [7]	status or color
0	no device flashing red
1	at least one device flashing red

Tab. 10-25.

The cyclical output identifier contains the 4 Safety Monitor bits 1.Y1, 1.Y2, 2.Y1 and 2.Y2. The monitoring element “Monitor input” and the start elements “Monitor Start-Monitor Input” and “Activation using Monitor Input” access these data. In contrast, the “Feedback circuit” element always accesses the EDM input.

Outputs

byte	description
1	byte from the fieldbus
	bit 0: 1.Y1
	bit 1: 1.Y2
	bit 2: 2.Y1
	bit 3: 2.Y2
	bit 4 ... 7: reserved
2	reserved

Tab. 10-26.

The bits of the output bytes are ORed with the real and the homonymous hardware inputs of the device.

Safety Control Status

Length	**description**
2 byte I 1 byte O	Safety Ctrl/Status (2 OSSD)
4 byte I 1 byte O	Safety Ctrl/Status (4 OSSD)
6 byte I 2 byte O	Safety Ctrl/Status (6 OSSD)
8 byte I 2 byte O	Safety Ctrl/Status (8 OSSD)
10 byte I 3 byte O	Safety Ctrl/Status (10 OSSD)
12 byte I 3 byte O	Safety Ctrl/Status (12 OSSD)

Tab. 10-27.

Safety Control Status

Length	description
14 byte I 4 byte O	Safety Ctrl/Status (14 OSSD)
16 byte I 4 byte O	Safety Ctrl/Status (16 OSSD)

Tab. 10-27.

10.6 Device-specific parameters

AS-i Flags

Specifies whether the AS-i flags are sent in the PROFINET diagnostic.

Default: Transmission in the PROFINET diagnostic data.

Download Slave Parameters

Based on this entry the parameter bits can be downloaded for each AS-i slave. These are then sent to the connected AS-i slave when the AS-i cycle is started. Sending of the set parameters bits can be disabled with this value.

Default: Sending of the AS-i parameter bits enabled.

Failsafe Behaviour

Setting the master response when an AS-i slave fails.

Clear all bits: Input data are set to 0_{hex} (standard)

Set all bits: Input data are set to F_{hex}.

Retain old value: Input data are left at the last valid value.

Default: Input data are set to 0_{hex}

Freeze Diagnosis

The diagnostic data are continuously updated during runtime. If this is not desired, this parameter can be used to disable continuous updating. Updating then takes place only when this is required by the PROFINET standard.

Input Data Filter

Filtering of the input data by the specified number of AS-i cycles.

Default: No filtering of the input data.

Language

Selection of the displayed language.

Default: no change of the displayed language.

List of Configuration Errors

The AS-i PROFINET Gateway saves a list of all AS-i slaves which have triggered a present configuration error. This list can be sent with the PROFINET diagnostic data.

Default: Transmission in the PROFINET diagnostic data.

List of Peripheral Faults

The AS-i PROFINET Gateway saves a list of all AS-i slaves which have triggered a peripheral errors. This list can be sent with the PROFINET diagnostic data.

Default: Transmission in the PROFINET diagnostic data.

Safety Status

Safety slaves whose device is in the red or yellow flashing state can be shown in the diagnostics.

Default: Display of device status enabled in diagnostics.

Substitution values

Setting the substitution of input data for safety-relevant AS-i slaves:

Keep old value:	No change
No substitution values:	No substitution (code sequence)
Substitution values:	Substitution based on switching state
Diagnostic values:	Substitution based on switching state and associated safety-relevant component

Information!

For further codes indicated by the display, see section <Codes indicated by the display>.

11. System startup using AS-i Control Tools

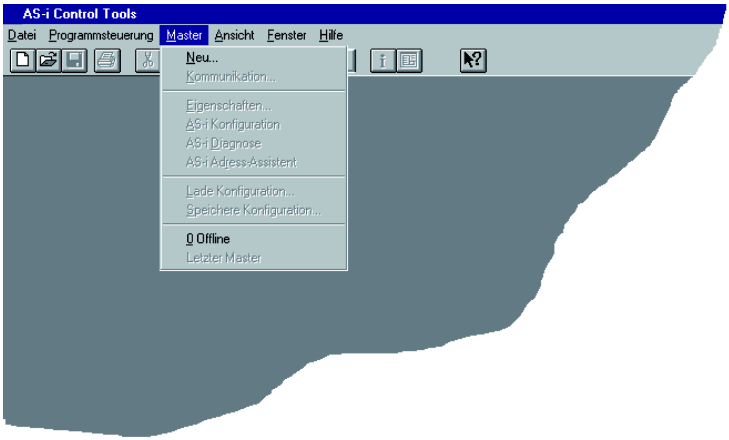
The Windows based software AS-i Control Tools enables an easy and clear configuration of the AS-i network.

Information!

AS-i Control Tools must be installed first!

This way, the device driver is copied into the previous designed folder in AS-i Control Tools and should be recognized automatically.

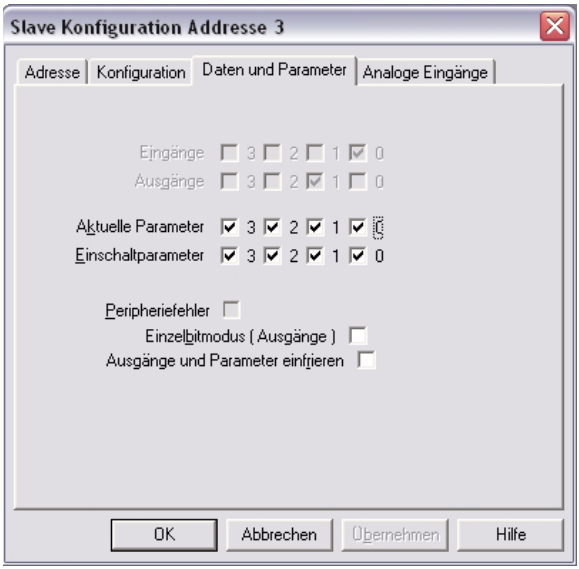
1. Connect the device to the PC via its serial interface and the diagnostic interface.
2. Start AS-i Control Tools.
3. Select Master | New.



4. Choose RS232 diagnostic interface as the protocol.

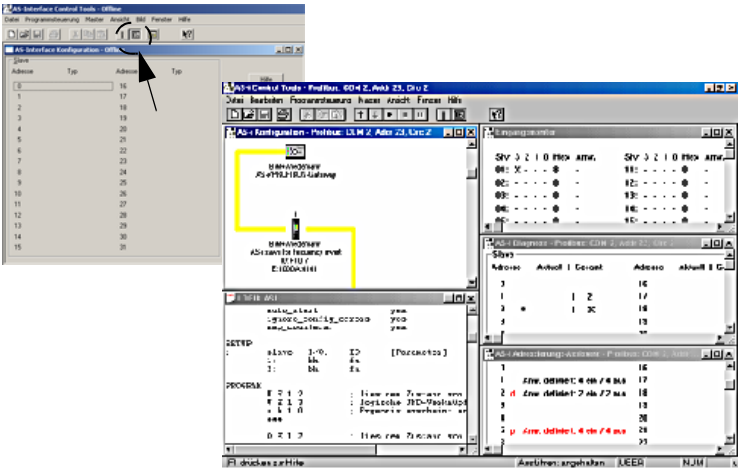
5. Select the appropriate settings (for example serial interface COM 2, station address <auto>).
6. Select Master | AS-i configuration.
7. The AS-i configuration editor will be started. All detected and configured AS-i slaves are displayed in this window.

8. Click on a slave to open the dialog window 'slave configuration'.



This window enables the user to edit a slave address and to set AS-i parameters or AS-i configuration data. Additionally, inputs and outputs can be tested.

9. Click the second button on the right side of the tool bar to get a graphical display of "AS-i Control Tools".



Configuring the AS-i network is easily accomplished by first connecting each AS-i slave separately to the AS-i line and setting its address, followed by pressing the button “Store configuration” to store the existing AS-i network in the AS-i master as configuration data.

Furthermore, an **AS-i Address Assistant** is available, allowing to perform an address change of a new AS-i slave to the desired address as soon as it is connected to the AS-i network. The desired AS-i configuration can be created offline ahead of time and can be stored to a file. When setting up the system the AS-i slaves are then simply connected, one at a time, to the AS-i network. Further descriptions to all additional features of this software can be obtained from the integrated help file.

12. Codes indicated by the display

In the basic state of the configuration mode, the addresses of all detected slaves are displayed in two-second intervals. A blank display indicates that the LDS (List of Detected Slaves) is empty, 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.

During manual address programming, the slave address display has a different meaning (see also chapter "Operating in advanced display mode").

All displayed numbers bigger than 31 which 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: After pressing the 'set'-button a short-time AS-i power failure occurred.
40	The AS-i master is in offline 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.
68	Hardware error: disturbed internal communication.
69	Hardware error: disturbed internal communication.
70	Hardware error: The AS-i master's EEPROM cannot be written.
71	Wrong PIC-type.
72	Hardware error: wrong PIC-processor.
73	Hardware error: wrong PIC-processor.
74	Checksum error in the EEPROM.
75	Error in the internal RAM.
76	Error in the external RAM.
77	AS-i control software error: Stack overflow (AS-i control II)
78	AS-i control software error: checksum error in the control program. "control checksum": checksumm in Control III C program (bin.file) not correct. The file is possibly damaged. "control exec err": error in Control III C program. "control watchdog": watchdog predetermined in Control III C program has expired . "control incomp": Control III C program from another gateway type loaded (e.g. Ethernet IP in Profibus gateway).

79	Checksum error in the data menu. "breakpoint": Control III C program in break point.
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 repowering-up the device can only be accessed from the host via the interface.
83	Program reset of the AS-i Control program: The AS-i Control program is being read from the 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 used.
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 the slave address in protected operating mode: Slave has wrong configuration data.
95	The error 95 is caused by a superfluous slave and not by a missing slave. That is why the slave address is occupied by this superfluous slave. (In the protected mode the slave addresses which caused any configuration error can be displayed by pressing the SET button. AS-i master without graphical display are not able to differentiate between a missing slave, an incorrect slave or a redundant slave. All incorrect addresses are displayed. By pressing the SET button 5 sec. the displayed address starts to flash. Pressing the SET button again the master attempts to program the slave at the address 0 to the incorrect address.)

13. Glossary

A/B slave

An AS-i slave with extended addressing. The address range of an A/B slave extends from 1A to 31A and 1B to 31B. As the master needs the fourth output data bit for switching between A and B address, A/B slaves only have three output data bits maximum.

Activation phase

In the activation phase the detected slaves are activated by sending the parameter. This is indicated by a "42" on the Master's Display. This phase takes only 10 ms, tops, to short to be displayed.

AS-i Power Fail

Voltage drop on the AS-i line; If the voltage drops below a specific value, the master changes to the ⇒ Offline phase.

Initiation phase

After the initial data exchange with all AS-i slaves the master is looking for new slaves. For this purpose an inquiring call is sent to one AS-i address. If a reply is received, the master tries to read the ⇒ current configuration of the slave. Depending on the mode (⇒ protected mode or ⇒ configuration mode) and on the current configuration, the detected slave will be activated.

After each data exchange with all AS-i slaves exactly one inquiring call is sent to one slave address. Hence, the AS-i cycle always includes one more telegram than the number of activated slaves (⇒ LAS).

Autoprog flags

Auto Address Enable; flag from the operating system to the AS-i Master.
With this flag, automatic addressing can be enabled or disabled. This flag is saved in non-volatile memory in the Master.

Auto Address Assign, Auto Address Possible; flag from the AS-i Master to the operating system.
Automatic programming is not disabled and no configuration error was found.
If a slave fails, it could be addressed automatically.

Auto Address Available, flag from the AS-i Master to the operating system. Exactly one AS-i slave is missing and the automatic single node replacement is not disabled.
If at this point a slave with the address 0 and the profile of the missing slave is connected, it automatically receives the address of the missing slave.

I/O code

The first digit of the slave profile, which indicates how many in- and outputs the slave has. A 4I/4O slave has for example a “7”, and a slave with 4 digital inputs a "0".

Detection phase

In the detection phase, after the startup the master is scanning for AS-i slaves. The master remains in this phase until at least one slave was detected. If the master remains in the detection phase no slave was found. Most of the time, the reason for this is a wrong power supply or a wiring error.

The detection phase is indicated by code "41".

Protected mode

In protected operating mode only those slaves that are registered in the ⇒ LPS and whose current configuration matches the target configuration are activated.

Also see ⇒ configuration mode. This mode is intended for normal operation, since all AS-i protective measures are activated.

ID code

The ID code is set by the slave manufacturer and cannot be changed. The AS-i Association determines the ID codes which are assigned for a particular class of slaves. For example, all ⇒ *A/B slaves* have ID code “A“.

ID1 Code, extended ID1 code

The ID1 code is set by the slave manufacturer. In contrast to the other codes, which determine the profile, it can be changed from the master or using an addressing device. The user should however only use this feature in exceptional circumstances, since otherwise *configuration errors* may occur.

In the case of A/B slaves, the MSB of the ID1 code is used for distinguishing between the A and the B address. Therefore, only the lowest 3 bits are relevant for these slaves.

Since this code was not introduced until AS-i Specification 2.1, it is also referred to as extended ID1 code.

ID2 Code, extended ID2 code

The ID2 code is set by the slave manufacturer and cannot be changed. The AS-i Association determines the ID2 codes, which are assigned for a particular class of slaves. For example, all 2-channel 16 bit input slaves having an S-7-3 bit code use ID2 code “D”. Since this code was not introduced until AS-i Specification 2.1, it is also referred to as extended ID2 code.

Current configuration

The configuration data of all slaves detected by the master. The configuration data of a slave, the ⇒ slave profile, consists of:

⇒ IO code, ⇒ ID code, ⇒ extended ID1code , ⇒ extended ID2 code.

Current parameter

The AS-i parameter that have most recently been sent to the AS-i slave, as opposed to ⇒ permanent parameters.

Configuration Error/Config Error

An configuration error is displayed if the target and the current configuration of the connected slaves do not match. A configuration error could be due to the following:

Missing slave:A slave entered in the ⇒ LPS is not available

Wrong type of slave:The ⇒ slave profile of the connected slave does not comply with the configuration.

Unknown slave: A connected slave is not entered in the ⇒ LPS.

LAS - List of Activated Slaves

The master exchanges I/O data with the slaves entered in the LAS. In protected mode only the detected slaves (⇒ LDS) that are expected by the master and are entered in the ⇒ LPS are activated. In configuration mode all slaves entered in the ⇒ LDS are activated.

LDS - List of Detected Slaves

If the master was able to read the ⇒ slave profile, the slave is entered in the LDS.

LPF - List of Peripheral Faults

The list of peripheral faults was introduced with specification 2.1. This list includes an entry for each slave that signals a ⇒ peripheral fault.

LPS - List of Projected Slaves

The list of projected slaves includes all slaves expected by the master. When saving the current configuration all entries in the ⇒ LDS are stored in the LPS (except for a slave with address 0).

Offline phase

In the offline phase all input and output data is reset. This phase is entered after the startup of the master, after a ⇒ AS-i power fail, and during the transition from the ⇒ configuration mode to the ⇒ protected mode.

Furthermore, the master can actively be transfered into the offline phase by setting the offline flag.

During the offline phase, masters with a LED display show code "40".

Peripheral fault

A peripheral fault is indicated by a red flashing LED on the master and on the slave.

Depending on the slave type this indicates an overflow, an overload of the sensor's power supply, or another fault regarding the periphery of the slave.

Permanent configuration

The configuration data of all expected slaves stored in the master (⇒ slave profile). If the ⇒ permanent configuration differs from the ⇒ actual configuration, a configuration error exists.

Permanent parameter

The parameters saved in the master and sent to the slave after startup of the master during the ⇒ activation phase.

Configuration mode

During the configuration mode the master exchanges data with all connected slaves, no matter which of the slaves were configured. Thus, in this mode it is possible to operate a system without the necessity to configure it before.

See also ⇒ protected mode.

Single Slave

A single slave can in contrast to a ⇒ *A/B slave* only be addressed from range 1 to 31; the fourth output data bit can be used. All slaves as defined by the older AS-i Specification 2.0 are single slaves.

There are however also single slaves as defined by Specification 2.1, for example the new 16 bit slaves.

Slave profile

Configuration data for a slave, consisting of:

⇒ *I/O configuration* and ⇒ *ID-Code*, as well as ⇒ *extended ID1-Code* and ⇒ *extended ID2-Code*.

The slave profile is used to distinguish between various slave classes. It is specified by the AS-i Association and set by the slave manufacturer.

AS-i 2.0 slaves do not have extended ID1 and ID2 codes. A 2.1 or 3.0 AS-interface master enters in this case an “F” for each of the extended ID1 and ID2 codes.

14. Reference List

14.1 Manual: “AS-i 3.0 Command Interface“

This Manual contains a detailed description of the AS-i 3.0 Command Interface.

FACTORY AUTOMATION – SENSING YOUR NEEDS

Worldwide Headquarters
Pepperl+Fuchs GmbH
68307 Mannheim · Germany
Tel. +49 621 776-0
E-mail: info@de.pepperl-fuchs.com

USA Headquarters
Pepperl+Fuchs Inc.
Twinsburg, Ohio 44087 · USA
Tel. +1330 4253555
E-mail: sales@us.pepperl-fuchs.com

Asia Pacific Headquarters
Pepperl+Fuchs Pte Ltd.
Company Registration No. 199003130E
Singapore 139942
Tel. +65 67799091
E-mail: sales@sg.pepperl-fuchs.com

www.pepperl-fuchs.com

PEPPERL+FUCHS
SENSING YOUR NEEDS