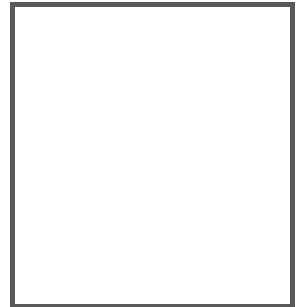


MANUAL

**AS-I 3.0 PROFINET
GATEWAY WITH INTEGR.
SAFETY MONITOR**



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"

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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 contains 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

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 equipment:

4.1.1 AS-i 3.0 PROFINET Gateway with integr. Safety Monitor

Article No.	Type	Inputs safety, expandable to	Outputs Safety, SIL 3, cat. 4	Safety outputs, independent according to SIL 3,	Safety communication	Number of AS-i networks, number of AS-i Master	1 power supply, 1 gateway for 2 AS-i networks ¹	Diagnostic and configuration interface ²	Programming in C
VBG-PN-K30-DMD-S16	Safety, PROFINET	max. 62 x 2 channels	4 release circuits; 2 x relay, 2 x fast electronic safe outputs	max. 16	-	2 AS-i networks, 2 AS-i Masters	no, max. 8A/AS-i network, redundant supply	Ethernet fieldbus + RS 232	no
VBG-PN-K30-D-S16	Safety, PROFINET	max. 62 x 2 channels	4 release circuits; 2 x relay, 2 x fast electronic safe outputs	max. 16	-	2 AS-i networks, 1 AS-i Master	no, max. 8A/AS-i network, redundant supply	Ethernet fieldbus + RS 232	no
VBG-PN-K30-DMD-S16-EV	Safety, PROFINET	max. 62 x 2 channels, max. 1922 in max. configuration	4 release circuits; 2 x relay, 2 x fast electronic safe outputs	max. 32, max. 992 in max. configuration	Safe Link	2 AS-i networks, 2 AS-i Masters	no, max. 4A/AS-i Kreis Power24V ³	Ethernet fieldbus + RS 232	optional

Tab. 4-1. Funcion range "AS-i 3.0 PROFINET Gateway with integr. Safety Monitor"

- power supply, 1 gateway for 2 AS-i networks, inexpensive power supplies:
 - "yes, max. 4A/AS-i network":
Cost-effective power for 2 AS-i networks with 1 power supply (optionally supply of multiple Single Gateways by 1 power supply).
 - "no, max. 8A/AS-i network, redundant supply":
1 power supply per AS-i network. Gateway is powered in normal operation from one of the two AS-i power supplies. Should one AS-i power supply fail, switching to the other AS-i power supply allows all the diagnostics functions to be maintained and the unaffected AS-i network continues to operate.
 - "no, max. 8A/AS-i network":
1 power supply per AS-i network
- Ethernet fieldbus + RS 232:
Access to AS-i master and safety monitor via Pepperl+Fuchs proprietary software over Ethernet fieldbus interface or RS 232 interface and adapter cable.
- AS-i Power24V capable:
 - VBG-PN-K30-DMD-S16-EV device can be operated directly on a 24V (PELV) power supply
 - with integrated data coupling coils and adjustable self-resetting fuses for safe use also of powerful 24V power supplies.

The AS-i 3.0 PROFINET Gateway with integr. Safety Monitor combines two devices in one housing: an AS-i/PROFINET Gateway and a Safety Monitor for 2 AS-i circuits.

The safety unit provides 4 inputs which can be defined as either EDM or as START inputs.

AS-i/PROFINET-Gateways serve to connect AS-i systems to the superordinate PROFINET controller. It acts as a master for AS-i and as a slave on field bus level.

Commissioning, debugging and setting up of the AS-i parameters can be accomplished with the use of the display, but it can also be handled via the diagnostic interface and the field bus.

4.1.2 AS-i 3.0 Gateway PROFINET via PROFIsafe

Article No.	Type	Inputs safety, expandable to	Outputs Safety, SIL 3, cat. 4	Safety outputs, independent according to SIL 3,	Safety communication	Number of AS-i networks, number of AS-i Master	1 power supply, 1 gateway for 2 AS-i networks	Diagnostic and configuration interface	Programming in C
VBG-PNS-K30-DMD	PROFIsafe, PROFINET	max. 62 x 2 channels	4 release circuits; 2 x relay, 2 x fast electronic safe outputs	max. 16	PROFIsafe (F-CPU)	2 AS-i networks, 2 AS-i Masters	no, max. 8A/AS-i network, redundant supply	RS 232 + Ethernet	no

Tab. 4-2. Function range "AS-i 3.0 Gateway PROFINET via PROFIsafe"

The AS-i 3.0 Gateway PROFINET via PROFIsafe is a combination of an AS-i/PROFINET Gateway with a PROFIsafe F-device. It is used for transmitting of safety related data to/from SaW slaves via the standard field bus PROFINET.

The gateway supports 64 release circuits. The integrated safety unit provides 4 non-safety inputs. PROFIsafe transfers input status data to F-Host.



Information!

PROFIsafe is a certified acc. to IEC 61508 profile for PROFIBUS and PROFINET. With SIL 3 (Safety Integrity Level) or category 4 acc. to EN 954-1 fulfills PROFIsafe the highest safety requirements for the process- and manufacturing industry. Both safety related and standard communication are possible via one and the same cable.

AS-i/PROFINET-Gateways serve to connect AS-i systems to the superordinate PROFINET controller. It acts as a master for AS-i and as a slave on field bus level.

Commissioning, debugging and setting up of the AS-i parameters can be accomplished with the use of the display, but it can also be handled via the diagnostic interface and the field bus.

4.2 New Generation of AS-i Gateways with ethernet diagnostics interface

The plus points of the new Gateway generation at a glance:

- Gateways now programmable in C
- Ethernet diagnostics interface for remote diagnostics
- Integrated web server: diagnostics for the Gateways and the AS-i circuits over Ethernet possible with no additional software
- GSD configuration files already stored in the web server
- Earth fault monitor distinguishes between AS-i cable and sensor cable
- Current from both AS-i circuits in the "1 Gateway, 1 power supply for 2 AS-i circuits" version can now be read directly on the unit
- Self-resetting fuses in the "1 Gateway, 1 power supply for 2 AS-i circuits" version
- Device temperature display
- AS-i Power24V capable
- Interfaces for virtually every bus system and Ethernet solution



Information!

See also section <Functions of the new generation of AS-i Gateways> for further information.

4.3 Brief description

The actuator-sensor interface (AS-i) has established itself as a system for networking primarily binary sensors and actuators at the lowest level of the automation hierarchy. The high number of installed systems, the ease of use and the reliable operating behaviour also make the AS-i interesting in the area of machine safety.

The **safety** AS-i system is intended for safety applications up to Category 4/SIL 3. Mixed operation of standard components and safe components is possible.

AS-i 3.0 Gateway PROFINET via PROFIsafe

The safety unit monitors within an AS-i system the safe slaves which have been assigned according to the configuration specified by the user with the configuration software. This safety information is transmitted to PROFIsafe.

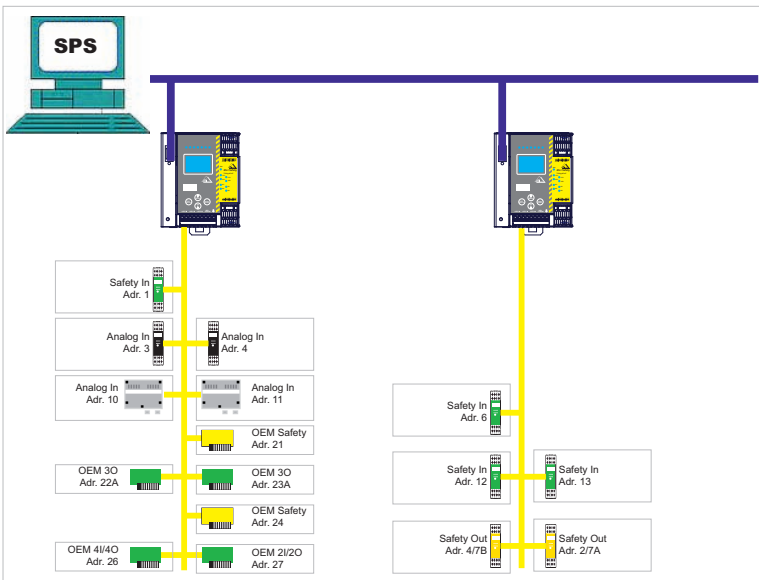


Abb. 4-1. Safe and standard components in an AS-i network

AS-i 3.0 PROFINET Gateway with integr. Safety Monitor

The AS-i/PROFINET Gateway monitors within an AS-i system the safe slaves which have been assigned according to the configuration specified by the user with the configuration software. In the event of a stop request or a defect, the AS-i/PROFINET Gateway switches off the system in protective operation mode with a maximum reaction time of 40 ms.

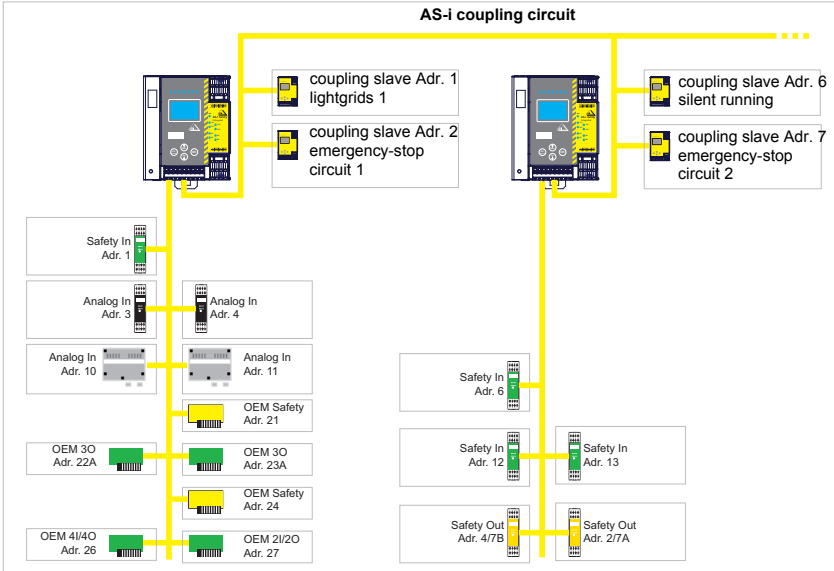


Abb. 4-2. Safe and standard components in an AS-i network

Multiple AS-i Safety Monitors can be used within an AS-i system. In this way, a safe slave can be monitored by multiple AS-i Safety Monitors.

5. Specifications - AS-i/PROFINET Gateways

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>.



Attention!

The AS-I power supply for the AS-I components must have isolation per IEC 60 742 and be able to handle momentary power interruptions of up to 20 ms. The power supply for the 24 V supply must also have isolation per IEC 60 742 and be able to handle momentary power interruptions of up to 20 ms. The maximum output voltage of the power supply must also be less than 42 V in case of a fault.

5.2 Safety-relevant characteristic data

Characteristic data	Value	Standard
Safety category	4	EN 954-1
Safety category	4	EN ISO 13849-1: 2008
Performance Level (PL)	e	
Safety Integrity Level (SIL)	3	EN 61508: 2001
Lifespan (TM) in years	20	EN ISO 13849-1: 2008
Maximum switch-on time in months	12	EN 61508: 2001
Max. system reaction time in milliseconds	40	EN 61508: 2001

Tab. 5-3.



Attention!

In addition to the system reaction time of max. 40 ms, the reaction times of the safe AS-interface sensor slave, of the sensor being used for monitoring, of the safe AS-interface actuator slave and of the actuator used for this purpose must still be added. Please note that additional reaction times may likewise arise through the configuration of the safety monitor.



Notice!

Refer to the technical data for the slaves as well as to that for the sensors and actuators for the reaction times to be added.



Attention!

The system reaction times of the daisy-chained AS-interface components are added up.

5.2.1 Overview of parameter for determining the failure rates

nop/y	switching intervals t_{cycle} [s]	B10d value	electromechanics		Standard
			MTTF _d [years]	PFH [1/h]	
105.120	300	2.500.000	237,82	$9,908 \times 10^{-9}$	EN ISO 13849-1
52.560	600		475,65	$4,853 \times 10^{-9}$	
8.760	3600		2853,88	$9,054 \times 10^{-10}$	

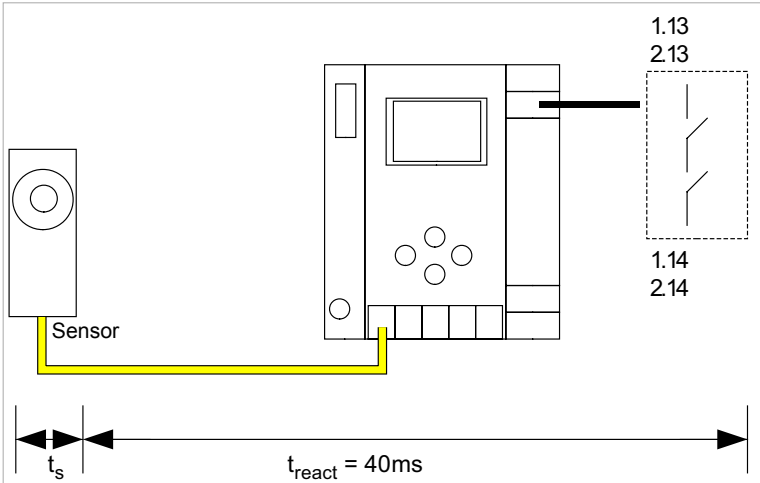
Tab. 5-4.

nop/y	switching intervals t_{cycle}	B10d value	electronics PFH	electromechanics		PFH total	Standard
				MTTF _d	PFH		
105.120	300	2.500.000	$4,76 \text{ E}^{-09}$	237,82	$1,12 \times 10^{-8}$	$1,6 \times 10^{-8}$	EN 62061 EN 61508
52.560	600			475,65	$5,09 \times 10^{-9}$	$9,85 \times 10^{-9}$	
8.760	3600			2853,88	$7,82 \times 10^{-10}$	$5,54 \times 10^{-9}$	

Tab. 5-5.

5.3 Reaction times

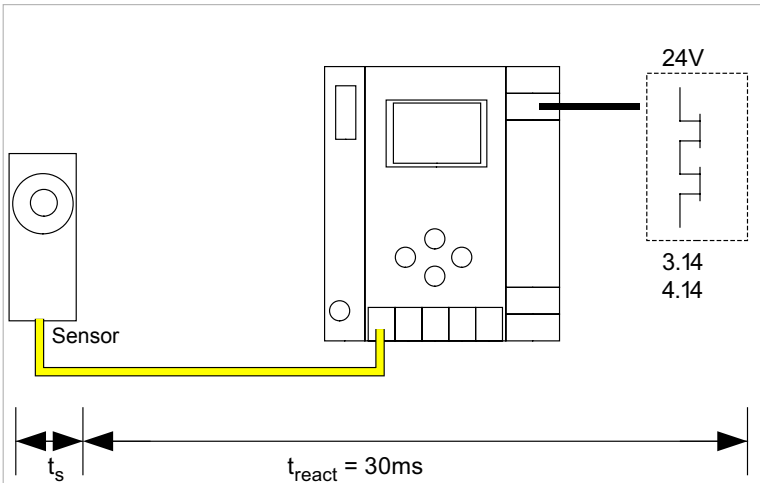
5.3.1 Sensor -> local relay output



t_s = maximal reaction time of the sensor (see data sheet)

t_{react} = maximal system reaction time

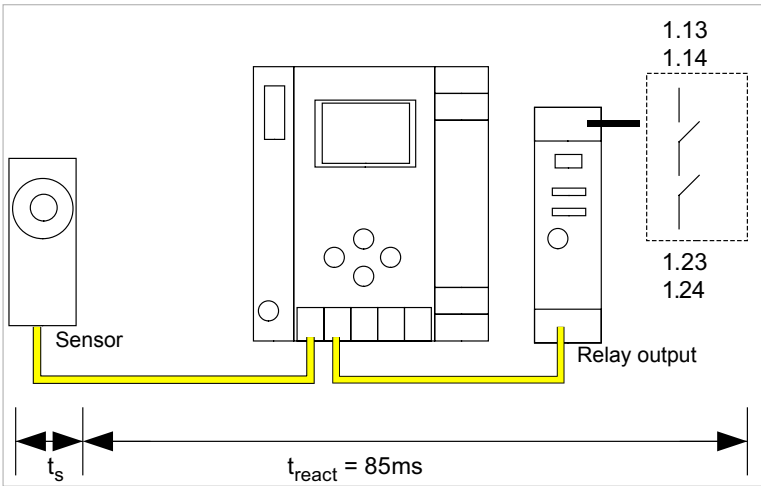
5.3.2 Sensor -> local electronic output



t_s = maximal reaction time of the sensor (see data sheet)

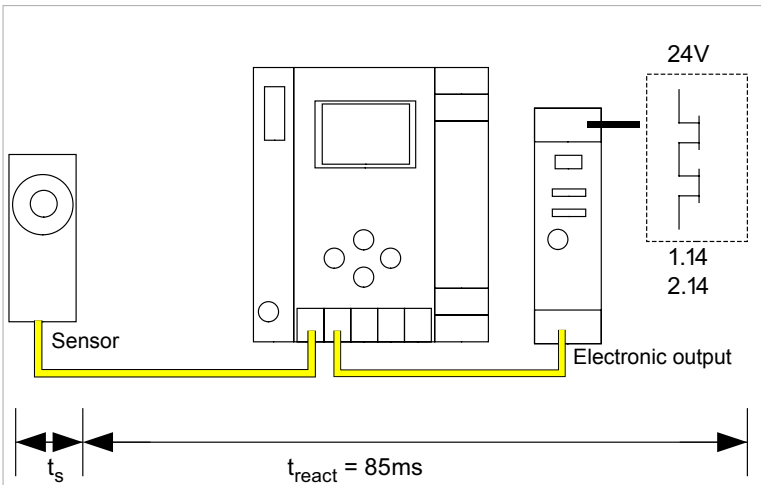
t_{react} = maximal system reaction time

5.3.3 Sensor -> AS-i relay output



t_s = maximal reaction time of the sensor (see data sheet)
 t_{react} = maximal system reaction time

5.3.4 Sensor -> AS-i electronic output



t_s = maximal reaction time of the sensor (see data sheet)
 t_{react} = maximal system reaction time

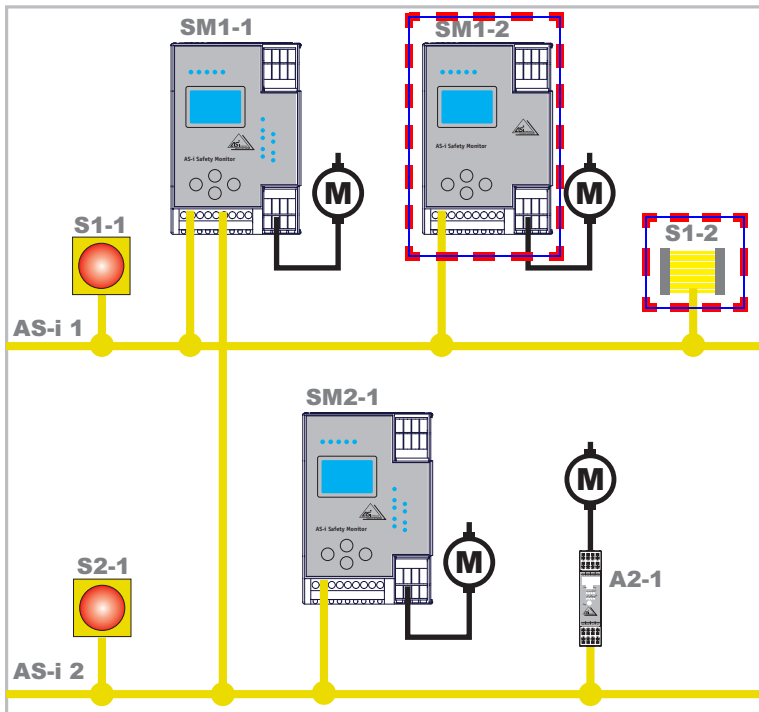
5.3.5 System reaction times – example calculations

System components:		
ASI1	AS-i network 1	
ASI2	AS-i network 2	
S1-1	Safe sensor slave	(EMERGENCY-OFF switch: $t_{R\ S1-1} = 100\text{ ms}$)
S1-2	Safe sensor slave	(safety light barrier: $t_{R\ S1-2} = 18\text{ ms}$)
S2-1	Safe sensor slave	(EMERGENCY-OFF switch: $t_{R\ S2-1} = 100\text{ms}$)
A2-1	Safe actuator slave	(motor starter: $t_{R\ A2-1} = 50\text{ms}$)
SM1-1	Safety monitor with 16 relais circuits and one safe AS-i output in AS-i network 1	
SM1-2	Safety monitor with 2 relais circuits and one safe AS-i output in AS-i network 1	
SM2-1	Safety monitor with 16 relais circuits and one safe AS-i output in AS-i network 2	

Tab. 5-6.

System configuration - example 1: Calculation of the system reaction time

System configuration - example 1: Calculation of the system reaction time



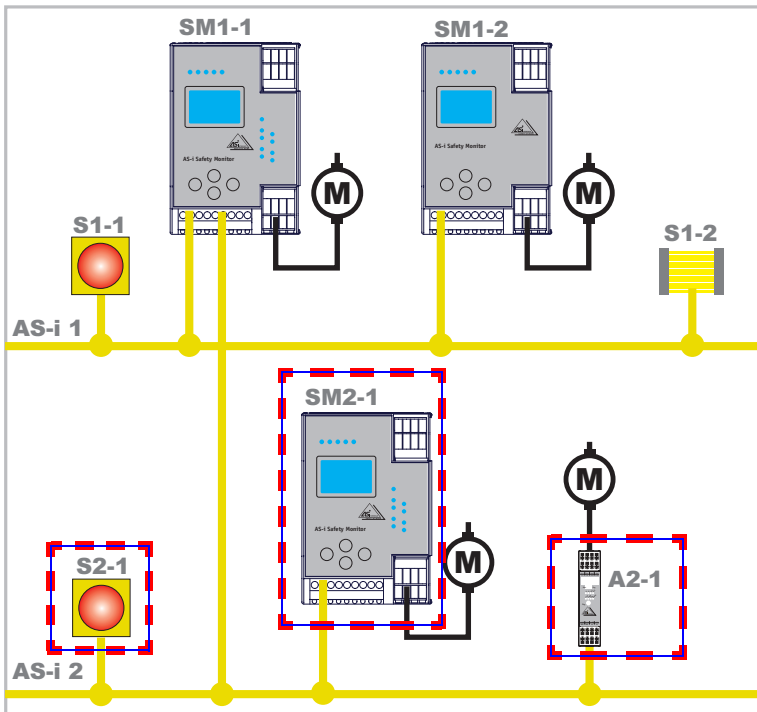
Upon activation of safety light barrier S1-2, the relay safety output of safety monitor SM1-2 is controlled.

Calculation of the AS-i relevant system reaction time:

$$t_{\text{System total a)}} = t_{R \text{ S1-2}} + t_{R \text{ System}} = 18\text{ms} + 40\text{ms} = \underline{58\text{ms}}$$

System configuration - example 2: Calculation of the system reaction time

System configuration - example 2: Calculation of the system reaction time



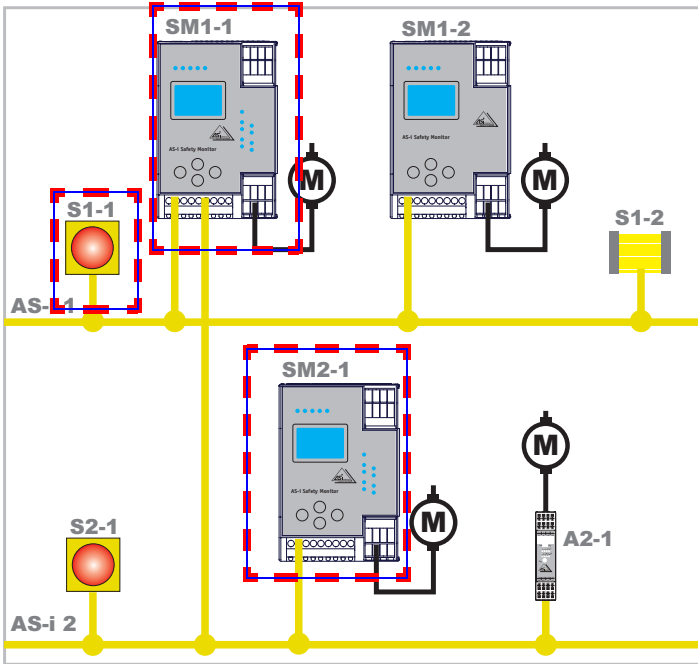
Upon locking of the EMERGENCY-OFF switch S2-1, the motor starter is controlled via the safe AS-interface output of safety monitor SM2-1.

Calculation of the AS-interface-relevant system reaction time:

$$t_{\text{System total b)}} = t_{R \text{ S2-1}} + t_{R \text{ System}} + t_{R \text{ A2-1}} = 100\text{ms} + 40\text{ms} + 50\text{ms} = \underline{190\text{ms}}$$

System configuration - example 3: Calculation of the system reaction time

System configuration - example 3: Calculation of the system reaction time



Upon locking of the EMERGENCY-OFF switch S1-1, the relay output of safety monitor SM2-1 is controlled via the coupling of the safe AS-interface output of safety monitor SM1-1.

Calculation of the AS-i relevant system reaction time:

$$t_{\text{System total c)}} = t_{R \text{ S1-1}} + t_{R \text{ System ASI1}} + t_{R \text{ System ASI2}} = 100\text{ms} + 40\text{ms} + 40\text{ms} = \underline{180\text{ms}}$$

5.4 Scope of delivery

The **basic unit** consists of:

AS-i 3.0 PROFINET Gateway with integr. Safety Monitor.

The following **accessories** are available:

Software CD with

- **ASIMON 3 G2** communication software for Microsoft® Windows XP/Vista/Windows 7/Windows 8®
- System manual in PDF format (Adobe® Reader® Version 7.x or newer is required for viewing the files)

6. Specifications - AS-i/PROFIsafe Gateway

6.1 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>.



Attention!

The AS-I power supply for the AS-I components must have isolation per IEC 60 742 and be able to handle momentary power interruptions of up to 20 ms. The power supply for the 24 V supply must also have isolation per IEC 60 742 and be able to handle momentary power interruptions of up to 20 ms. The maximum output voltage of the power supply must also be less than 42 V in case of a fault.

6.2 Safety-relevant characteristic data

Characteristic data	Value	Standard
Safety category	4	EN 954-1
		EN ISO 13849-1: 2008
Performance Level (PL)	e	EN ISO 13849-1: 2008
Safety Integrity Level (SIL)	3	IEC 61508: 2001
Lifespan (TM) in years	20	EN ISO 13849-1: 2008
Maximum switch-on time in months	12	IEC 61508: 2001
PFD	$< 9,25 \times 10^{-6}$	IEC 61508: 2001, EN 62061: 2005
PFH _D (probability of a dangerous failure per hour)	$< 5,36 \times 10^{-9}$	IEC 61508: 2001, EN 62061: 2005
Max. system reaction time in milliseconds		IEC 61508: 2001
PROFIsafe → local relay output	15	
PROFIsafe → local electronic output	5	
PROFIsafe → AS-i relay output	60	
PROFIsafe → AS-i electronic output	50	
AS-i → PROFIsafe	30	
PROFINET → local output	40	
PROFINET → AS-i		
AS-i → local output		
AS-i → AS-i		
AS-i → PROFINET	50	

Tab. 6-7.

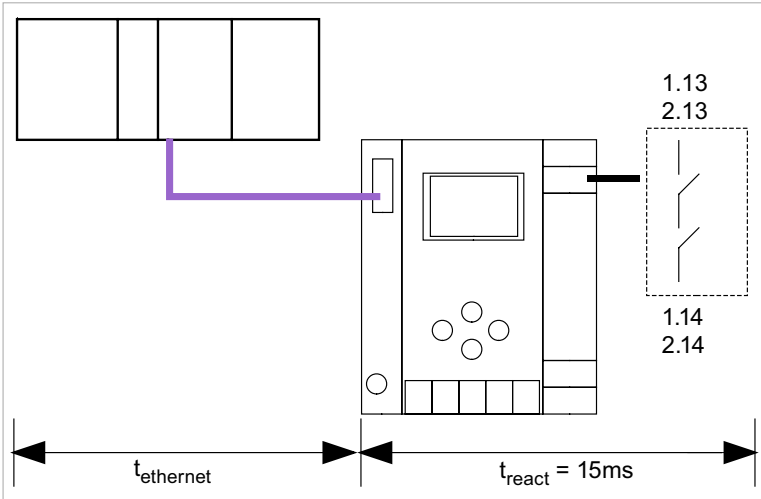


Attention!

In addition to the system reaction time in the gateway, eventually reaction times of other daisy-chained safe AS-i and PROFIsafe components have to be added too. Please note that additional reaction times may likewise arise through the configuration of the safety unit.

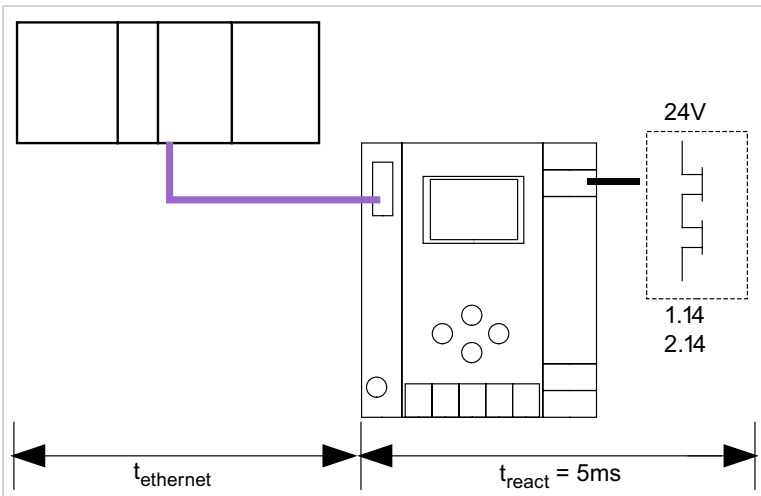
6.3 Reaction times

6.3.1 Ethernet (PROFIsafe) -> local relay output



t_{ethernet} = reaction time PROFIsafe type 150ms
 t_{react} = maximal system reaction time

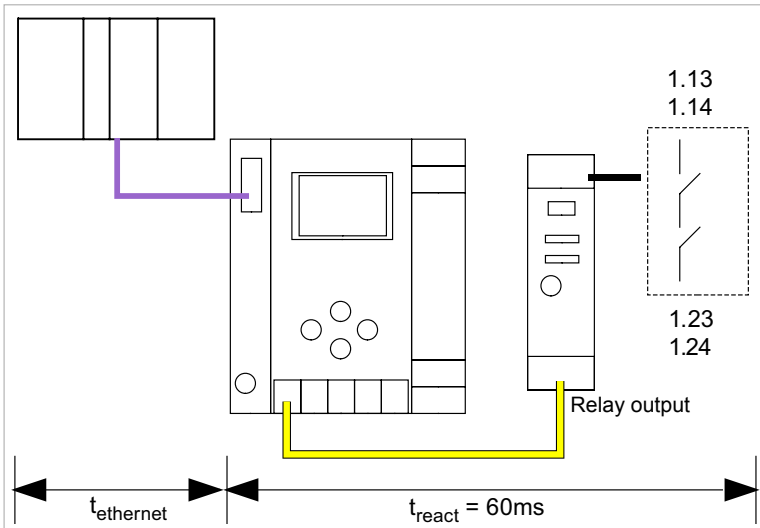
6.3.2 Ethernet (PROFIsafe) -> local electronic output



t_{ethernet} = reaction time PROFIsafe type 150ms
 t_{react} = maximal system reaction time

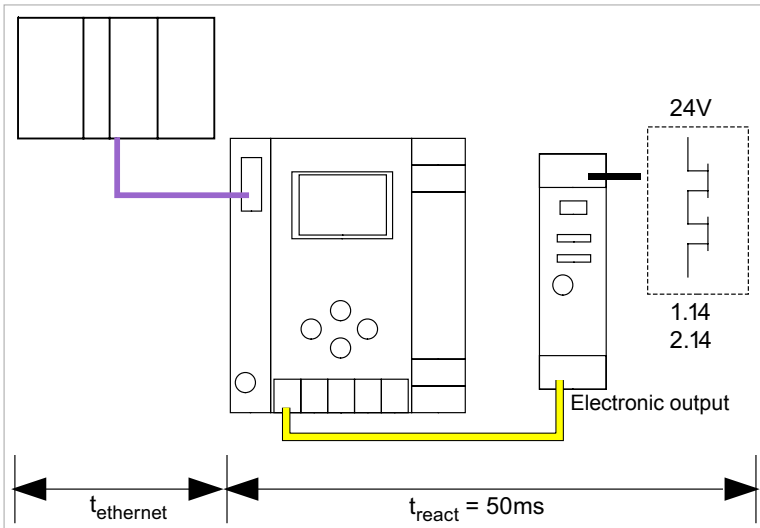
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6.3.3 Ethernet (PROFIsafe) -> AS-i relay output



t_{ethernet} = reaction time PROFIsafe type 150ms
 t_{react} = maximal system reaction time

6.3.4 Ethernet (PROFIsafe) -> AS-i electronic output

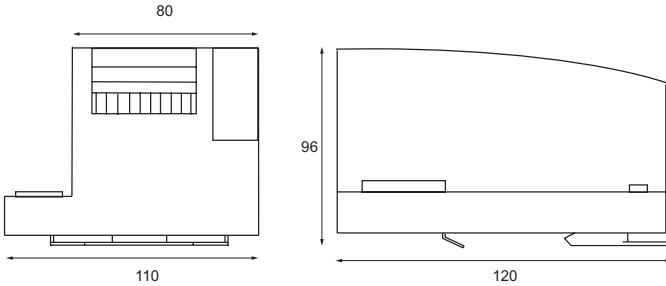


t_{ethernet} = reaction time PROFIsafe type 150ms
 t_{react} = maximal system reaction time

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7. Installation

7.1 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.

7.2 Connections

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



Attention!

The power supply for the AS-I components must have isolation per IEC 60 742 and be able to handle momentary power interruptions of up to 20 ms. The power supply for the 24 V supply must also have isolation per IEC 60 742 and be able to handle momentary power interruptions of up to 20 ms. The maximum output voltage of the power supply must also be less than 42 V in case of a fault.

7.3 Installing in the control cabinet

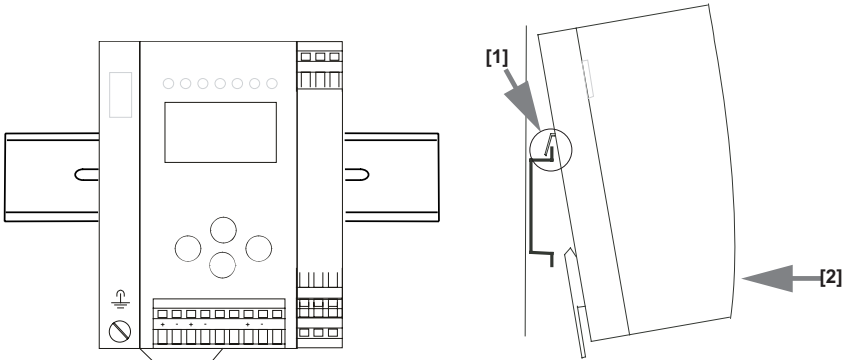
The AS-I/Gateway is installed in the control cabinet on 35mm DIN rails per DIN EN 50 022.



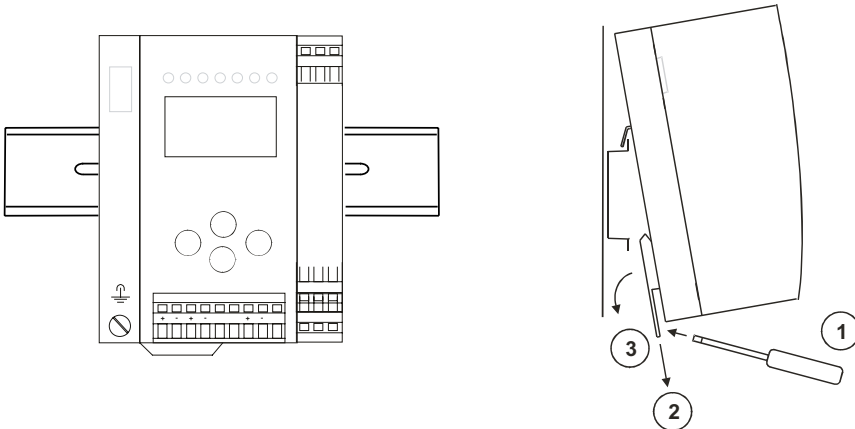
Information!

The enclosure of the AS-I/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.



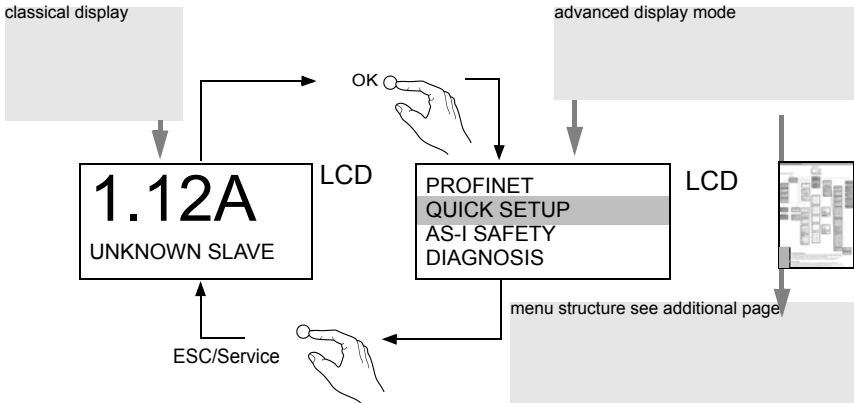
7.4 Removing



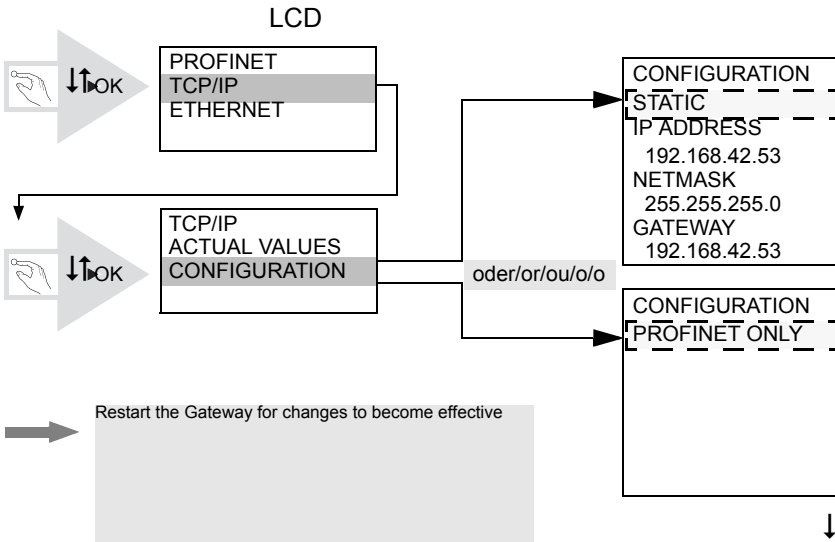
To remove, press the holding clamps [2] down using a screwdriver [1], press the unit firmly against the upper rail guide and lift out.

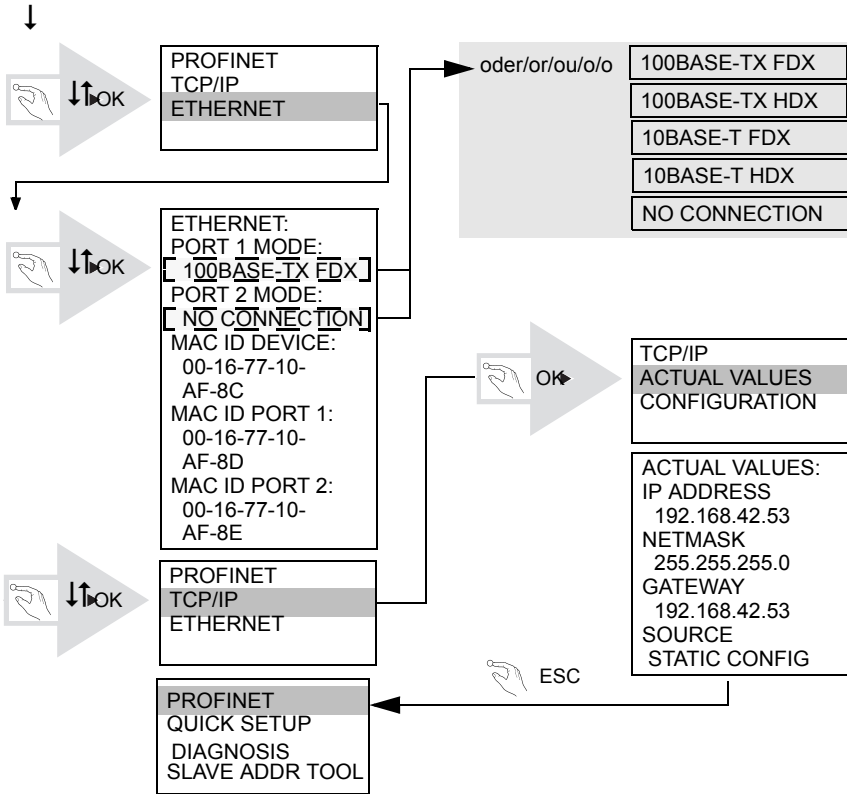
7.5 Commissioning

7.5.1 Switching to advanced display mode



7.5.2 Setting the PROFINET properties



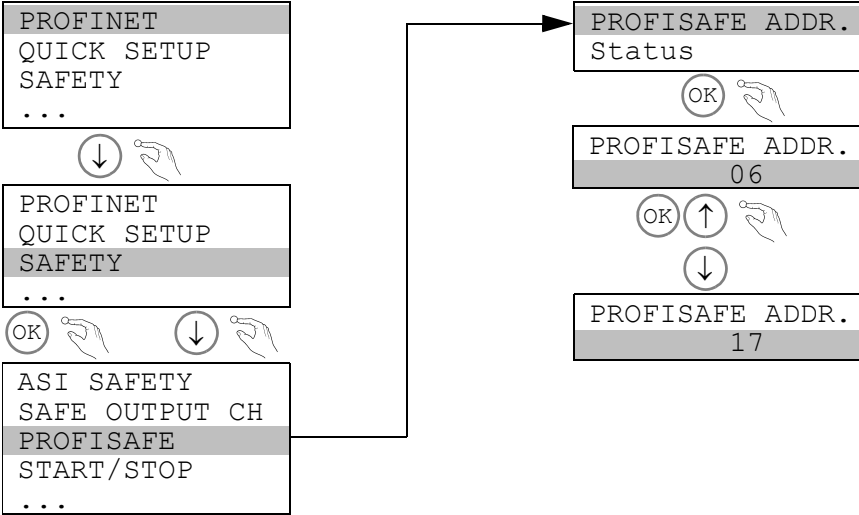


7.5.3 Setting the PROFIsafe address

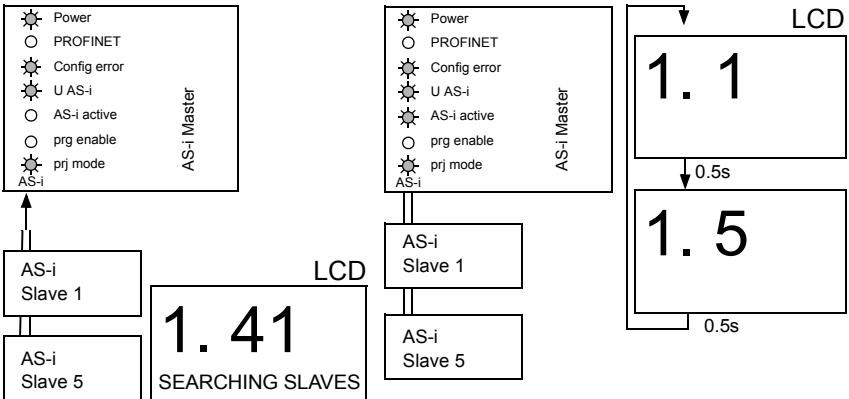


Information!

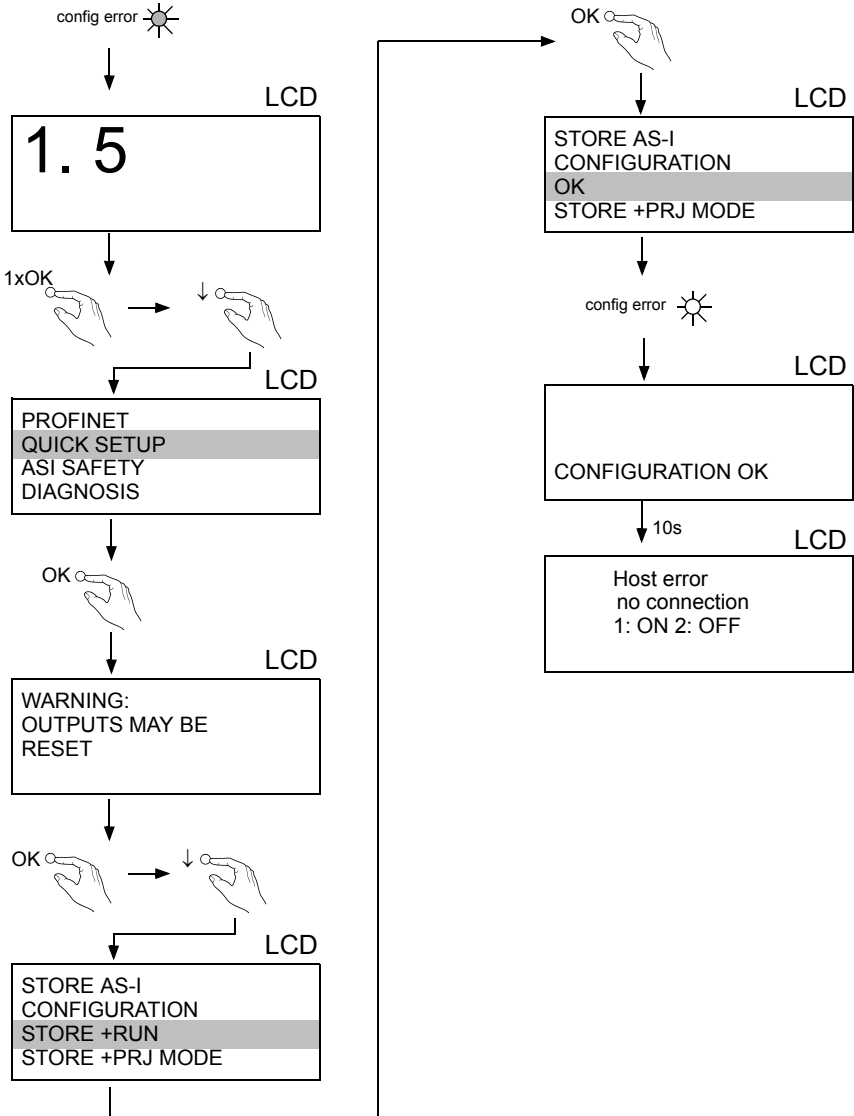
Available only with AS-i PROFIsafe Gateways.



7.5.4 Connecting AS-i Slaves



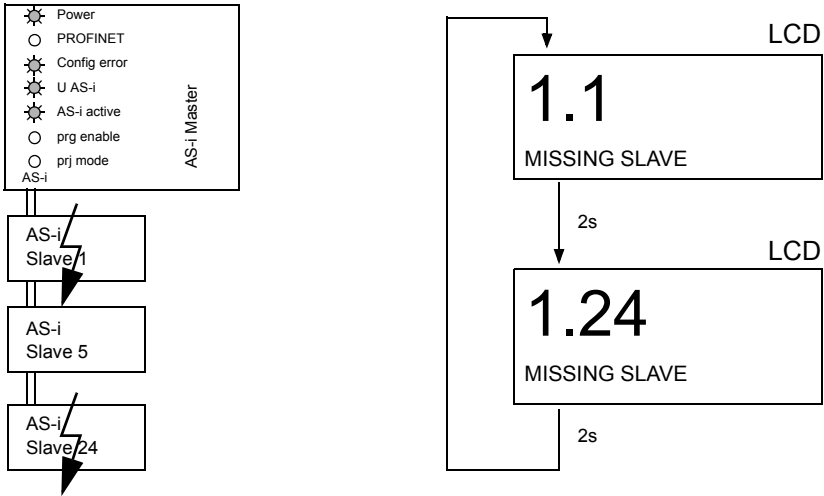
7.5.5 Quick setup



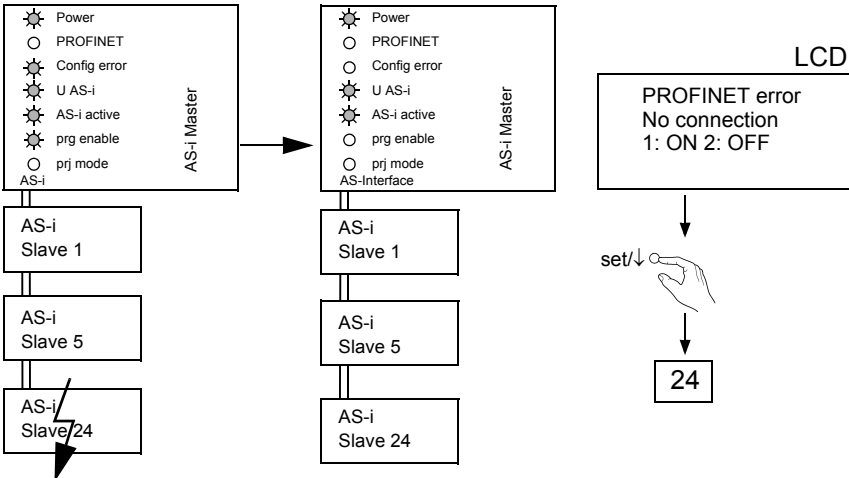
27.9.2013

7.5.6 Error tracing

7.5.6.1 Faulty slaves

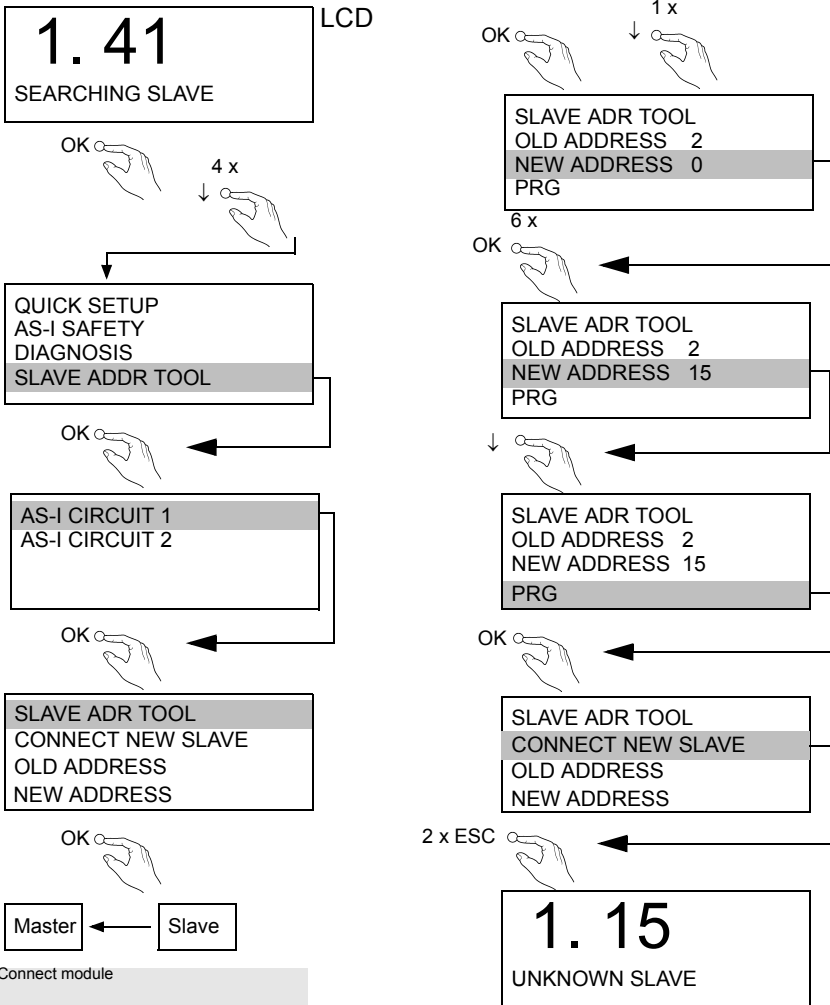


7.5.6.2 Error display (last error)



7.6 Addressing

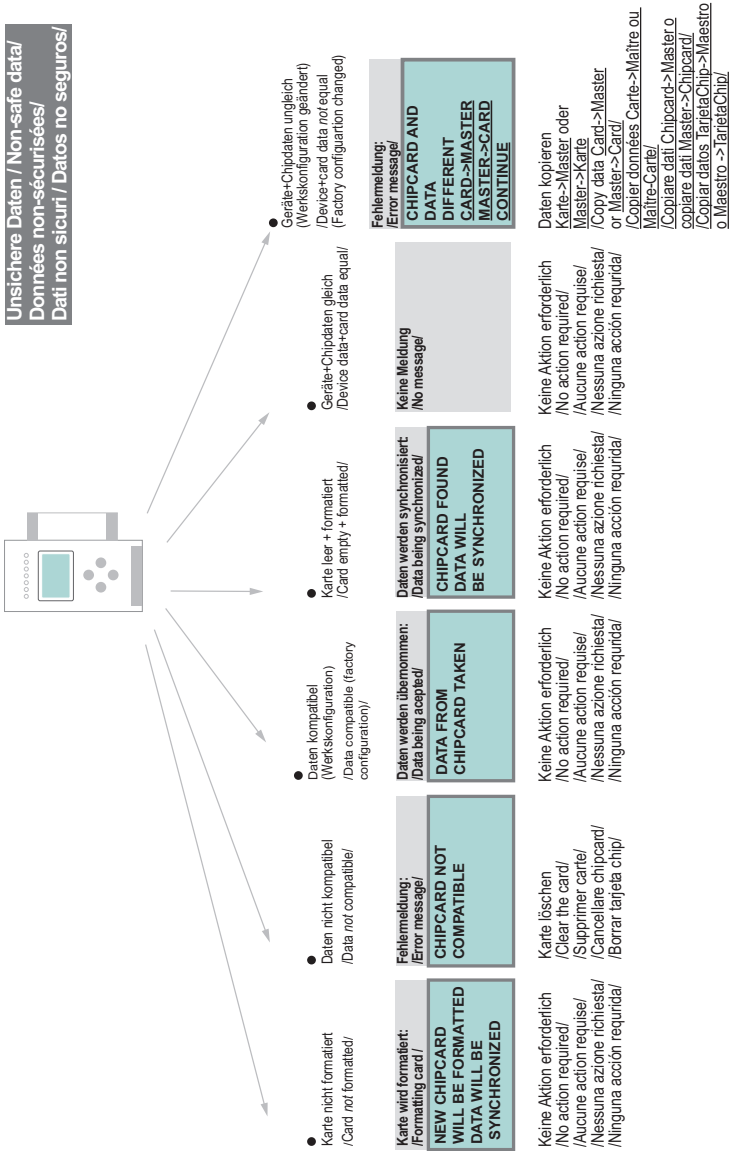
7.6.1 Assigning address 15 to slave currently at address 2



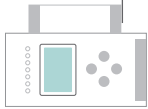
Hinweis!

Weitere Informationen finden Sie im Kap. <Bedienung im erweiterten Anzeigemodus>.

7.7 Local parameter setting of safe AS-i Gateways and Monitors



Sichere Daten / Safe data/
Données sécurisées/
Dati sicuri / Datos seguros



- Stamm-/Vollständige Konfiguration auf der Chipkarte enthalten /Master configuration or complete configuration on the card
- Gerät enthält validierte Konfiguration, Daten ungleich /There is a validated configuration on the card, data not equal
- Beide Konfigurationen ungleich/Both configurations not equal

- Stamm-/Vollständige Konfiguration auf der Chipkarte /Master configuration or complete configuration on the card
- Gerät enthält validierte Konfiguration /There is a validated configuration on the card
- Beide Konfigurationen gleich/Both configurations identical

- Gerät enthält keine validierte Konfiguration in the device/No validated configuration in the device/
- Stamm-/Vollständige Konfiguration auf der Chipkarte /Master configuration or complete configuration on the card

- Validierte Konfiguration im Gerät, Chipkarte leer /Validated configuration in the device, chip card empty

- Keine validierte Konfiguration im Gerät + Chipkarte /No validated configuration in the device + chip card/

- Sichere Daten auf der Chipkarte nicht kompatibel zum Gerät /Safe data on the chip card not compatible to the device/

Fehlermeldung:
/Error message/
**ERROR.
CHIPCARD AND
SAFETY DATA
DIFFERENT.
DELETE CHIPCARD
OR SAFETY DATA**

Daten löschen
/Clear data/
/Supplier données /
/Borrar datos

Keine Meldung
/No message/

Keine Aktion erforderlich
/No action required/
/Aucune action requise/
/Nessuna azione richiesta/
/Ninguna acción requirida/

Datenfreigabe per
Release-Code notwendig:
/Data release via release code
required/

**COPY BANK A TO
MONITOR
RELEASE CODE:
1BDF
TYPE CODE
1BDF OK**

Konfiguration per
Release-Code freigeben
/Validate the configuration
via release code/
/Respecter les indications
de sécurité exposées
dans le manuel ASIMON
/Osservare le istruzioni di
sicurezza riportate nel
manuale ASIMON
/Habilitar la configuración
via código de liberación/

Daten werden synchronisiert:
/Data being synchronized/
**CHIPCARD FOUND
SAFETY DATA WILL
BE SYNCHRONIZED**

Keine Aktion erforderlich
/No action required/
/Aucune action requise/
/Nessuna azione richiesta/
/Ninguna acción requirida/

Daten werden synchronisiert:
/Data being synchronized/
**CHIPCARD FOUND
SAFETY DATA WILL
BE SYNCHRONIZED**

Keine Aktion erforderlich
/No action required/
/Aucune action requise/
/Nessuna azione richiesta/
/Ninguna acción requirida/

Fehlermeldung:
/Error message/
**CHIPCARD NOT
COMPATIBLE**

Karte löschen
/Clear the card/
/Supplier carte/
/Cancellare chipcard/
/Borrar chip/

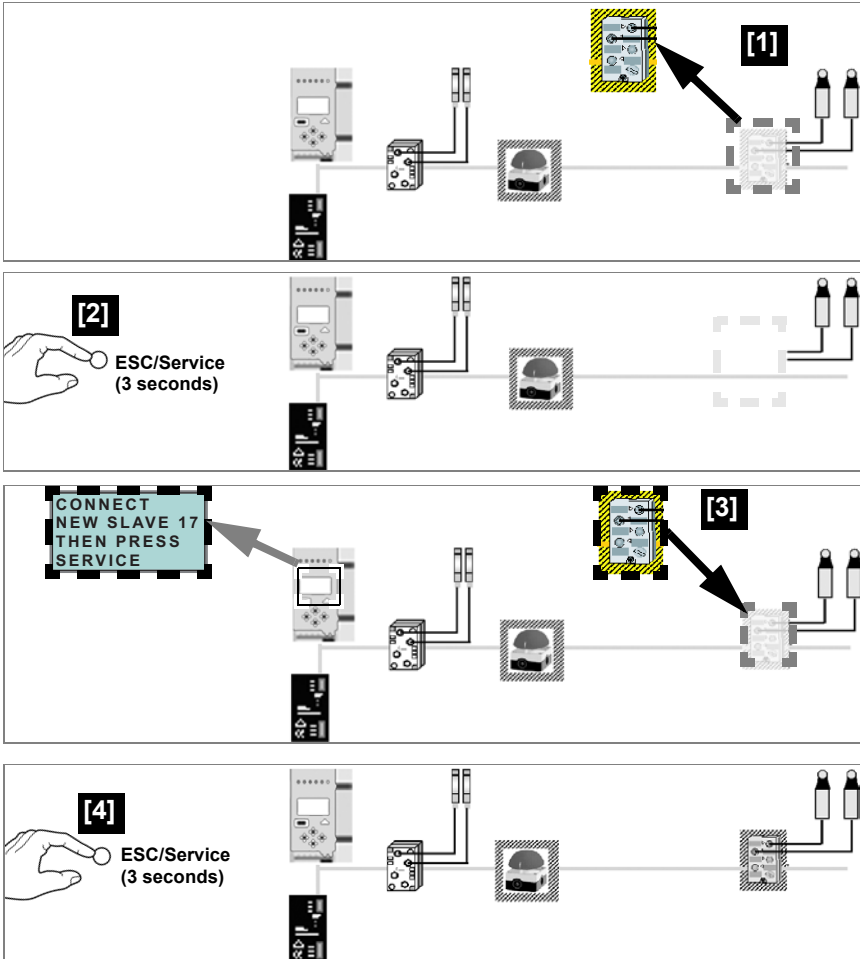


For further information see manual, section <Chip card>

7.8 Replacing a defective safety-related AS-i slave



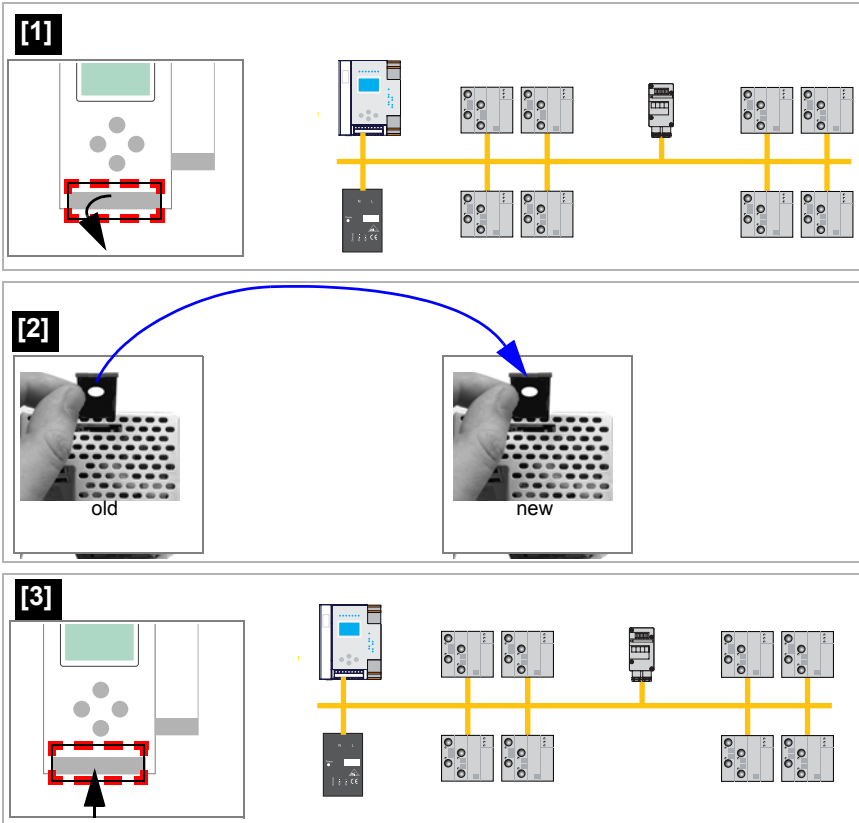
The new slave must be able to send code sequences and must have the same address as the old one. The addressing of the new slave is carried out automatically by default for all Pepperl+Fuchs AS-i Masters. Only one missing slave is allowed!



7.9 Replacing the chip card



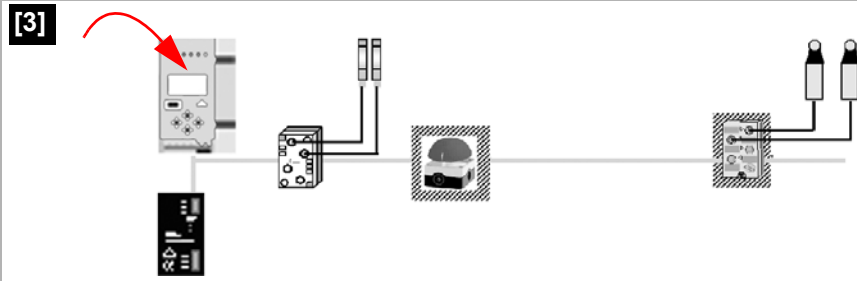
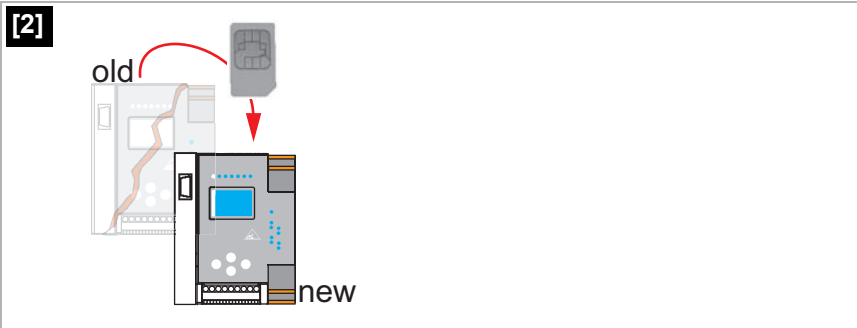
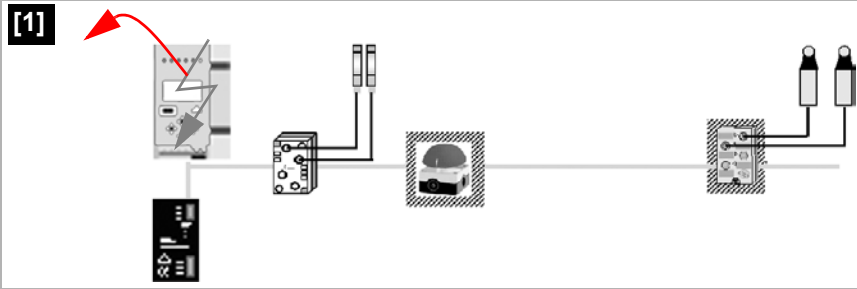
Always turn off power before inserting or removing the card!

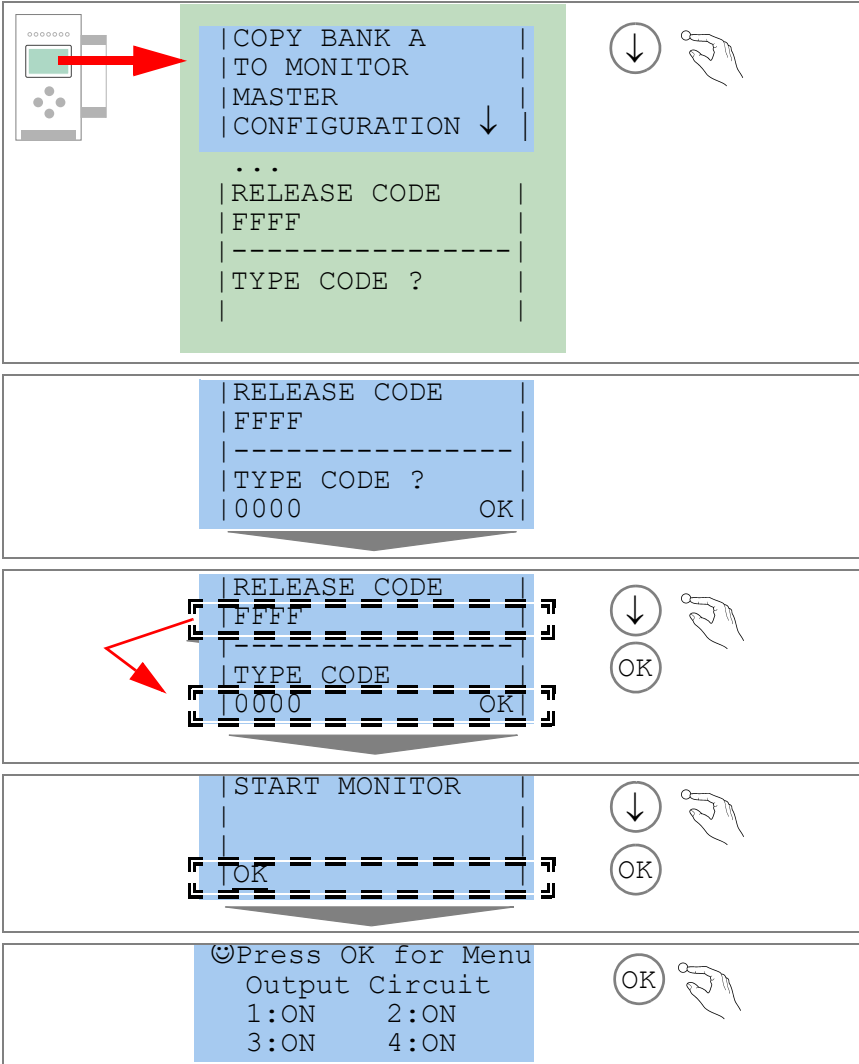


7.10 Replacing a defective device

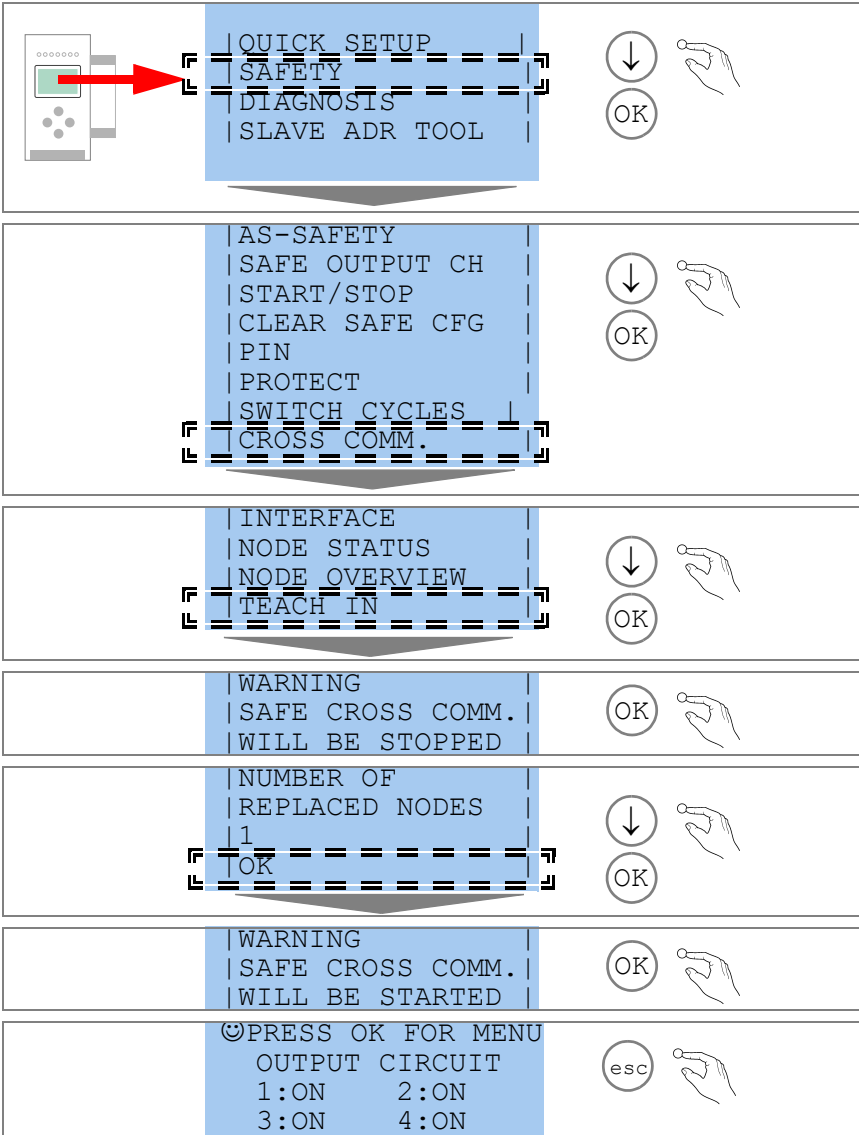


If Safe Link is used, it is necessary to teach the group manager after replacing a defective device (see next section)!

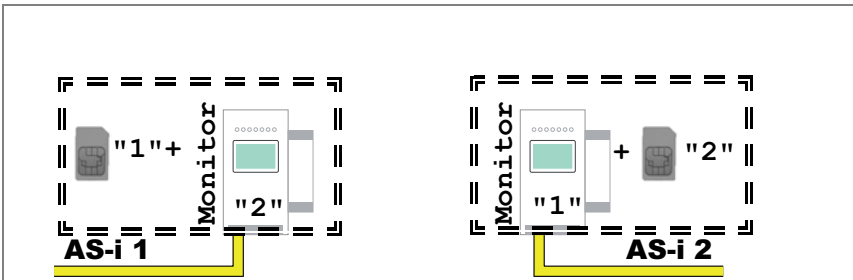
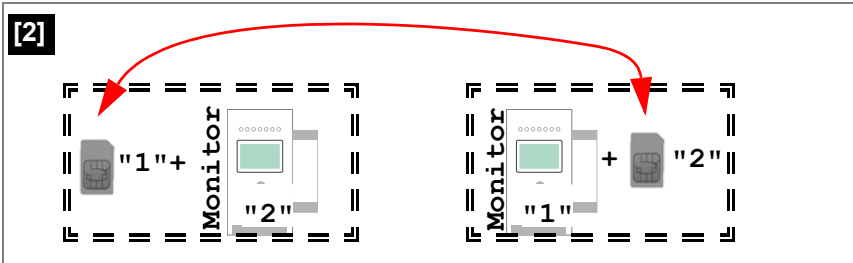
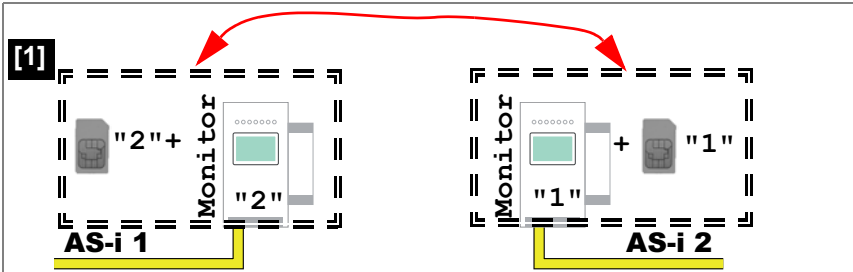
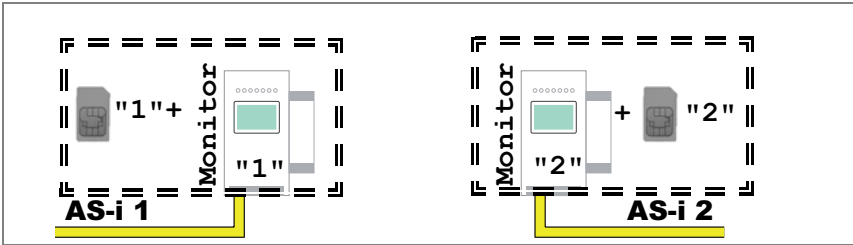


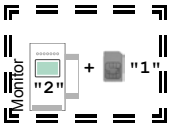


7.10.1 Teaching the group manager after replacing a device



7.11 Replacing the monitor

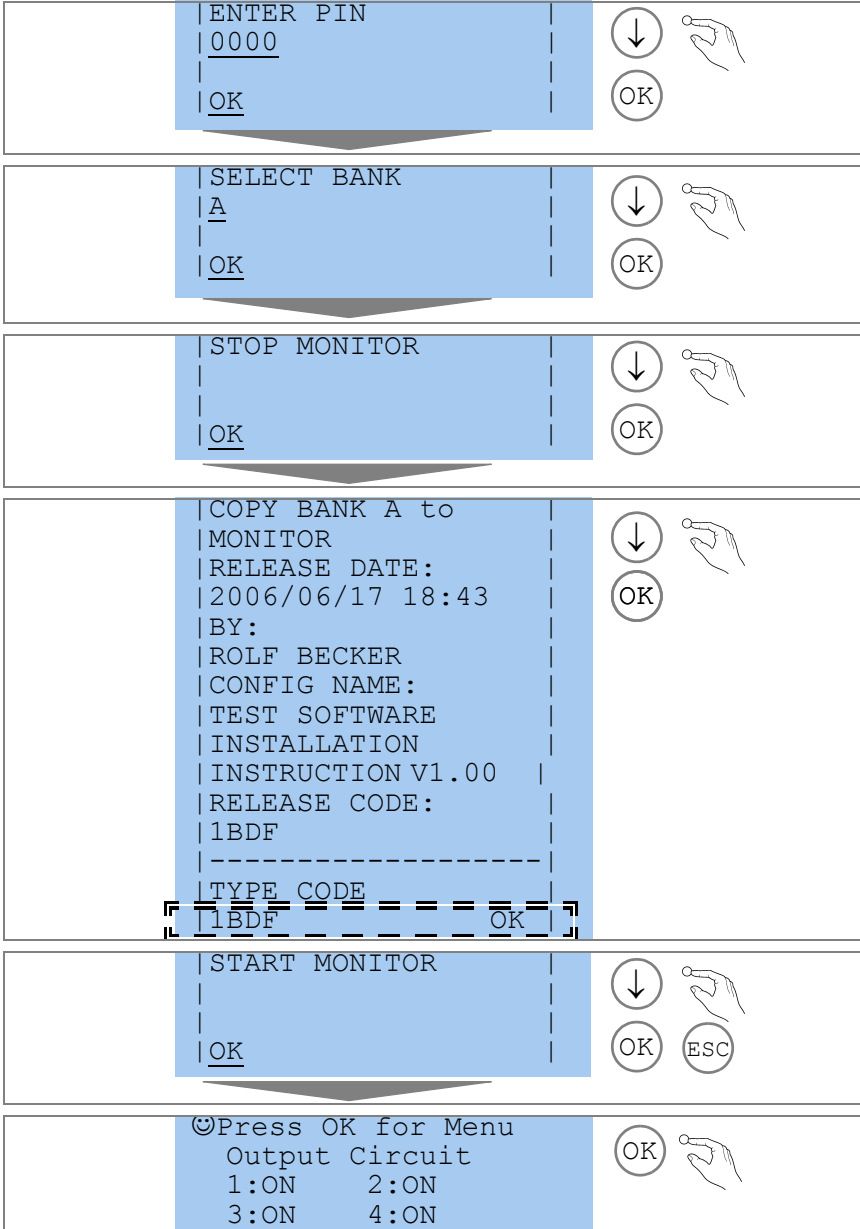






Safety configuration + AS-i configuration different!

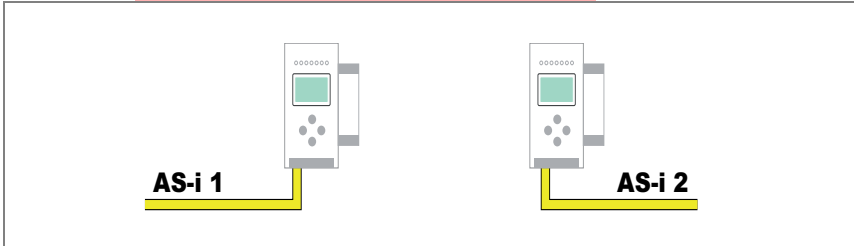


	<pre> Error: Chip Card and Safety Data Different. Delete Chip Card or Safety Data</pre>	<p>ESC </p>
	<pre> Chipcard and AS-i Data Different Chipcard->Master Master->Chipcard Continue</pre>	<p>↓ </p> <p>OK</p> <p>ESC</p>
	<pre>☺Press OK for Menu Output Circuit 1:OFF 2:OFF 3:OFF 4:OFF</pre>	<p>OK </p>
	<pre> QUICK SETUP SAFETY DIAGNOSIS SLAVE ADR TOOL TEST</pre>	<p>↓ </p> <p>OK</p>
	<pre> SAFE CHIPCARD ACTIVE: BANK A VIEW CARD -> MONITOR MONITOR -> CARD CLEAR CODES LCD CONTRAST</pre>	<p>↓ </p> <p>OK</p>

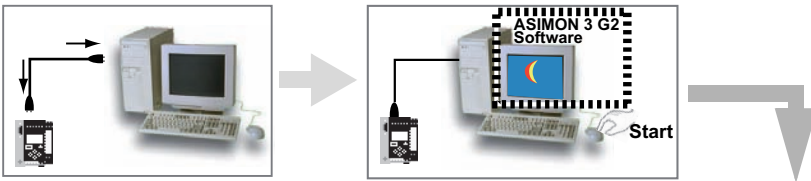


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 Safety configuration + AS-i configuration identric! 



7.12 Safe configuration using ASIMON 3 G2



Before commissioning the safety unit, put the gateway into operation!

ASIMON 3 G2 Software

Change the preset password during the first use of the device (Monitor/change password!)

ASIMON 3 G2 Software

Create the desired configuration.

ASIMON 3 G2 Software

Download the configuration with MONITOR / PC-> MONITOR into the device. Enter the password for this purpose.

ASIMON 3 G2 Software

You can acknowledge the request TEACH CODE SEQUENCES? selecting "Yes", or you can do it later via display selecting "No".



ASIMON 3 G2 Software

Check the configuration log (respect instructions in <chap. 5.8> of the ASIMON manual!).



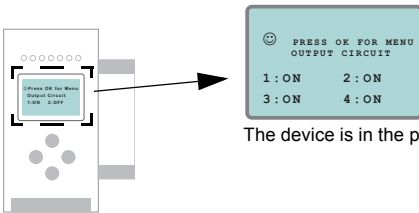
ASIMON 3 G2 Software

Validate the configuration with MONITOR → VALIDATION.



ASIMON 3 G2 Software

Start the monitor with MONITOR → START.



The device is in the protected mode now.



If you have assigned the safety monitor its own address in the software ASIMON 3 G2, adjust the configuration in the AS-i master (Quick Setup)! This is also valid when using simulated slaves. /



Please consider notes on safety in the software manual ASIMON 3 G2!

8. Maintenance

8.1 Checking for safe turn-off

The safety representative is responsible for checking flawless function of the AS-i Safety Monitor within the safety system.

Safe turn-off when an associated safe sensor or switch is triggered must be checked at least once a year.



Attention!

To do this, actuate each safe AS-i slave and observe the switching behavior of the output circuits of the AS-i Safety Monitor.



Attention!

Note the maximum turn-on duration and the overall turn-on operating duration. These values depend on the PFD value selected (see section <Safety-relevant characteristic data>).

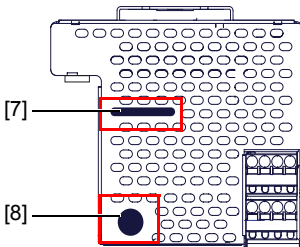
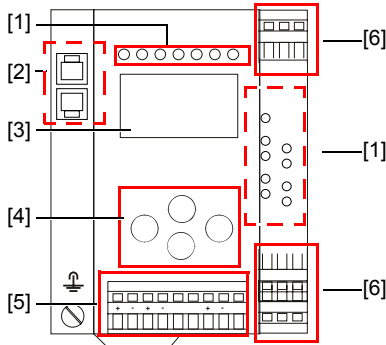
When the maximum turn-on duration is reached (three, six or twelve months), check the complete safety system and its proper function.



When the total operating time (20 years) has been reached, the device must be returned to the manufacturer to check for proper function.

9. Electrical connection

9.1 Overview of terminals, indicators and operating elements

9.1.1 VBG-PN-K30-D-S16, VBG-PN-K30-DMD-S16, VBG-PNS-K30-DMD, VBG-PN-K30-DMD-S16-EV



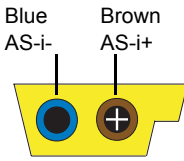
i	
	0,2 ... 2,5 mm ²
	0,2 ... 2,5 mm ²
AWG	24 ... 12

Legend:

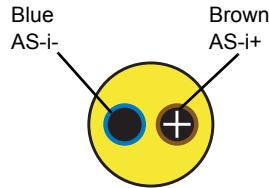
- [1] LEDs
- [2] PROFINET interface
- [3] LC display
- [4] Buttons
- [5] Terminals: Supply voltage and AS-i circuit
- [6] Terminals: Safety unit
- [7] Chip card slot
- [8] RS 232 diagnostics port¹

1. Only together with ASIMON 3 G2 Software or AS-i Control Tools

9.2 AS-i bus connection



Yellow AS-i 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.

9.3 Information about the device types



Information!

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

9.4 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.



Attention!

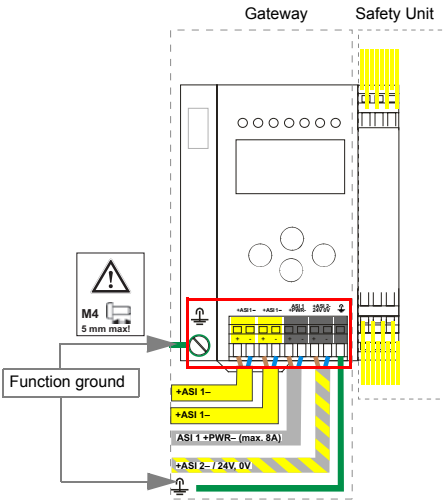
The AS-i power supply for the AS-i components must have isolation per IEC 60 742 and be able to handle momentary power interruptions of up to 20 ms. The power supply for the 24 V supply must also have isolation per IEC 60 742 and be able to handle momentary power interruptions of up to 20 ms. The maximum output voltage of the power supply must also be less than 42 V in case of a fault.



+AS-i 2- (Connection to 2nd AS-i Circuit)

More information about the additional slave circuit can be found in section <Safe coupling slaves on the AS-i circuits>.

9.4.1 Electrical connection VBG-PN-K30-D-S16



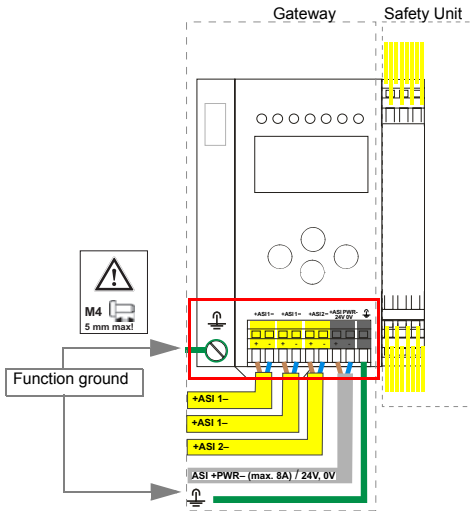
Terminal	Signal / Description
+ASI 1-	Connection to AS-i Circuit 1
ASI 1 +PWR-	Supply voltage for AS-i Circuit 1 (max. 8 A)
+ASI 2 - / 24 V, 0 V	Connection to AS-i Circuit 2; 24 V supply optional
FG	Function ground



Information!

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

9.4.2 Electrical connection VBG-PN-K30-DMD-S16-EV



Terminal	Signal / Description
+ASI 1-	Connection to AS-i Circuit 1
+AS-i 2-	Connection to AS-i Circuit 2
ASI +PWR- / 24 V, 0 V	Supply voltage for AS-i Circuits (max. 8 A) / Power 24¹ supply optional
FG	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!

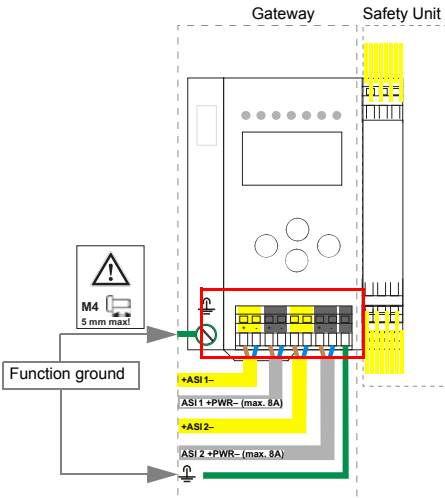
Earth fault detector sensor without function when using AS-i Power24!



Information!

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

9.4.3 Electrical connection VBG-PN-K30-DMD-S16, VBG-PNS-K30-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)
FG	Function ground



Information!

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

Information!

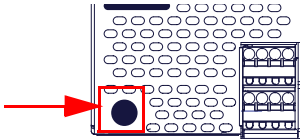
For additional information, please refer to the section <AS-i and power supply terminal assignments>.

9.5 Diagnostics interface

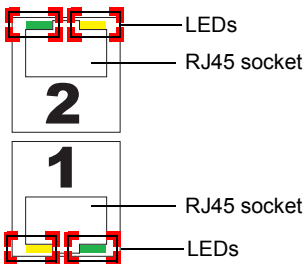
The service and diagnostics interface (in conjunction with **AS-i Control Tools** or **ASIMON 3 G2** software) is used for communication between the PC and the unit.

9.5.1 Diagnostics port RS 232

The service and diagnostics interface is configured as a mini DIN-6 female and it is placed on the front plate, on the left hand side.



9.6 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 (\pm PWR) is present.

LEDs in the sockets (2 per socket):

Port (green)

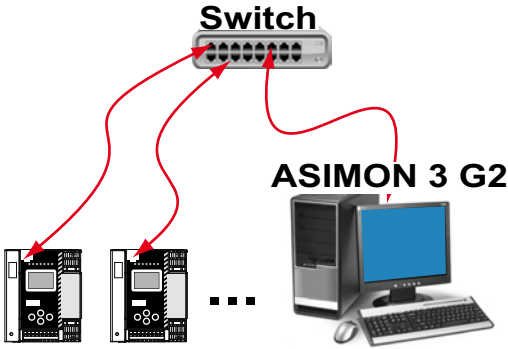
LED flashes green: ethernet connection active (i.e. cable plugged in).

Activity (yellow)

LED flashes yellow: transmitting/receiving active.

9.7 Safe coupling via Ethernet (VBG-PN-K30-DMD-S16-EV)

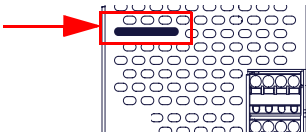
The device supports Safe Link via Ethernet. In order to establish a safe coupling between several devices, they should be connected via the ethernet diagnostics interface to a switch.



Information!

Please refer here to the information in the section <Safe Link>.

9.8 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.

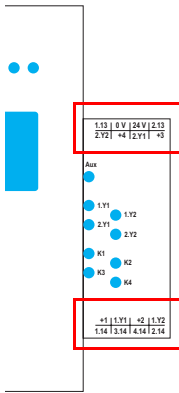


Warning!

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

9.9 Release circuits

9.9.1 Wiring overview - safety unit



1.Y1 (EDM 1/Start 1), 2.Y1 (EDM 2/Start 2), 1.Y2 (EDM 3/Start 3), 2.Y2 (EDM 4/Start 4)

The safety unit provides 4 inputs. The EDM & START inputs can be defined freely. The inputs may not be connected to other potentials, but rather only directly or through potential-free switches to + (for EDM/START). Switching current static 4 mA at 24 V, dynamic 30 mA at 24 V (T=100 µs).

3.14, 4.14

Semiconductor outputs. Max. contact load: 0.5 A DC-13 at 30 V.

1.13, 1.14; 2.13, 2.14

Potential-free relay contacts. Safety relay with one contact set for read-back. Max. contact load: 3 A AC-15 at 30 V, 3 A DC-13 at 30 V.

0 V, 24 V

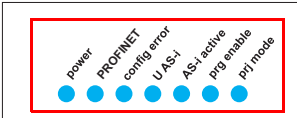
Semiconductor outputs are powered by separate 24 V DC.

+1, +2, +3, +4 (for EDM/Start)

Output supply, powered by AS-i. May not be connected to other potentials, but rather only directly or through potential-free switches to one of the EDM or START inputs. Voltage 30 ... 15 V_{DC}.

9.10 Indicators and operating elements

9.10.1 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

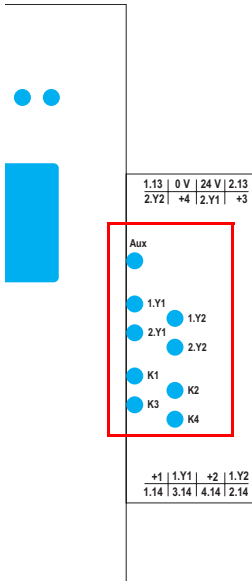
Automatic single node replacement is enabled.

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.

9.10.2 LED indicators - safety unit



The LED's on the safety unit indicate:

Aux

24 V supply for the semiconductor outputs is present.

1Y.1, 1Y2, 2Y.1, 2Y.2

Input 1.Y1 (EDM 1/Start 1), 2.Y1 (EDM 2/Start 2), 1.Y2 (EDM 3/Start 3), 2.Y2 (EDM 4/Start 4) is turned on.

K1, K2

Contact sets 1.13, 1.14 (K1) resp. 2.13, 2.14 (K2) closed.

K3, K4

semiconductor output 3.14 (K3) resp.4.14 (K4) is turned on.



Information!

If there is no auxiliary voltage connection available, LEDs are turned off, even if the corresponding release circuit is turned on.

9.10.3 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

Change to extended mode.

ESC/Service

For teaching the code table for a new safe slave, when exactly one safe slave is being replaced, and for unlocking the Safety Monitor. This button is also used to exit extended mode.

For additional information see:

- <Section <Function of the ESC/Service key>
- <Section <Replacing a defective safety-configured AS-i slave>
- <Section <Operation in advanced display mode>.

10. Function and startup of the Safety Monitor

Configuration and startup of the AS-i Safety Monitor is accomplished using a PC/ Notebook and the **ASIMON 3 G2** configuration software.

The operating language of the device can be set for the respective country (see section <Operation in advanced display mode>).



Information!

*The description of the **ASIMON 3 G2** software and startup of the AS-i Safety Monitor can be found in the manual "**ASIMON 3 G2 AS-i Safety Monitor Configuration Software for Microsoft®-Windows®**".*

*The software manual is an important component of the operating manual for the AS-i Safety Monitor. It is not possible to configure and start up the AS-i Safety Monitor without the **ASIMON 3 G2** software.*

Configuration may be performed only by a safety authorized person. All safety-related commands are password protected.

10.1 Powering up the device

As soon as supply voltage is present on the device an internal system test is started. This operating state is indicated by lighting of the upper LED row.

10.2 Configuration of the safety functions

The device can be configured in several ways:

1. Using **ASIMON 3 G2** software
The **ASIMON 3 G2** software represents the most universal method of configuring the Safety Monitor. Here the behavior of the Safety Monitor can be determined by linking various monitoring modules. After being sent to the Safety Monitor, this configuration is verified and can then be validated.
For additional information, refer to the separate manual for the **ASIMON 3 G2** configuration software.
2. Using a chip card with the master configuration
Configurations stored on the chip card, which are validated but which do not contain any code sequences, can be sent to the device. The code sequences must then be taught to the corresponding safety AS-i slaves.
This procedure is useful when you want to use a safety program in several safety monitors without any changes.



Information!

For additional information refer to section <Description of configuration using chip card with master configuration>.

- Using a chip card with complete configuration
In contrast to the master configuration, the complete configuration also contains the code sequences for all included slaves. Sending the complete configuration from the chip card to the Safety Monitor can make replacement of the device enormously simpler and faster.



Information!

For additional information refer to <Configuration using a chip card with complete configuration>.

10.2.1 Description of configuration using ASIMON 3 G2 software

The following description represents a short guide to configuring the AS-i Safety Monitor. For a detailed description of the **ASIMON 3 G2** software, refer to the corresponding manual for the **ASIMON 3 G2** configuration software.

The **ASIMON 3 G2** software is responsible for the following:

- Configuring the AS-i Safety Monitor
- Documenting the device configuration
- Starting up the AS-i Safety Monitor
- Diagnosing the AS-i Safety Monitor



Information!

*The description of the **ASIMON 3 G2** program can be found in the separate software manual.*

Proceed as follows:

- Install the program on your PC.
- Apply power to the AS-i Safety Monitor



Information!

To prevent ESD damage, we recommend grounding at an appropriate location before plugging in the interface cable to the Safety Monitor.

- Connection of monitors with a RS 232 diagnostics interface
 - To connect, plug the diagnostic cable end with the PS2 connector into the socket of the diagnostic interface (RS 232) of the monitor and the other end with the 9-pin Sub-D socket connector to a free COM port (serial RS232 interface) on your PC (see section "Connection between the AS-i Safety Monitor and the PC" in the software manual).
- Configure the AS-i Safety Monitor and start it up as described in the software manual.



Attention!

Before starting up the device you must adapt the device configuration to your application. This means configuring the AS-i Safety Monitor according to the software manual so that the location to be protected is in fact protected by the device.

10.2.2 Description of configuration using chip card with master configuration

Generating a master configuration:

- Generate a configuration using the **ASIMON 3 G2** software
- Load the configuration into the device
- Release (validate) the configuration, but do not teach the code sequences
- The code sequences will be taught on the physical AS-i circuit



Attention!

Safety advisory:

Ensure that the chip card contains the configuration intended for and released for the application!

This can be done by comparing the release codes on the display (section <Operation in advanced display mode>):

- The safety representative who generated and validated the release code stores the release code for the master configuration and approves use of the configuration for specific equipment.
- The person performing the startup reads out the release code on the display before teaching the code and compares it with the release code stored and approved for the equipment.

After the chip card has been used to load the configuration into the device, the safety functions of the device must be checked in the equipment.

Checking of the release code and testing the system must be documented in writing and is part of the system documentation.

10.2.3 Configuration using a chip card with complete configuration

The chip card contains the **complete configuration** if:

- An empty chip card is plugged into an AS-i Safety Monitor which already contains a **complete configuration**, or
- The chip card is already inserted while the configuration is being written into the device using **ASIMON 3 G2** software and before validating the code sequences.

If the AS-i Safety Monitor needs to be replaced, the stored configuration can be transferred by simply plugging the chip card from the old device into the new one.



Attention!

Safety advisory:

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

Ensure that the chip card contains the configuration intended for and released for the application!

This can be done by comparing the release codes on the display (section <Operation in advanced display mode>):

- The safety representative who generated and validated the release code stores the release code for the master configuration and approves use of the configuration for specific equipment.
- The person performing the startup reads out the release code on the display before starting the equipment and compares it with the release code stored and approved for the equipment.

After the chip card has been used to load the configuration into the device, the safety functions of the device must be checked in the equipment.

Checking of the release code and testing the system must be documented in writing and is part of the system documentation.

10.3 Safety-relevant documentation of the application



Information!

The detailed description of the safety-relevant documentation of the configuration for your application can be found in the separate software manual.

Proceed as follows:

- Create the configuration of the AS-i Safety Monitor for your application.
- Validate the configuration (done by the safety supervisor).
- Print out the final configuration protocol and optionally the configuration overview (see Section "Configuration documentation" in the software manual).
- Sign the final configuration protocol (done by the safety supervisor).
- Take the protocol for the safety-relevant documentation for your application (machine documentation) and keep it in a safe place.

10.4 Diagnostic data



Information!

A detailed description of the setting for diagnostics mode is described in the section "Setting diagnostics type" in the separate manual "AS-i 3.0 Command Interface".

Diagnostics data can be obtained in any of 4 ways:

- Display
- Diagnostic interface¹

1. Only together with ASIMON 3 G2 Software or AS-i Control Tools

- Fieldbus interface¹

10.4.1 Diagnostics of release circuits 1-4 via the binary data

If monitor slaves with base address +1 and +2 exist, the state of several OSSDs is transmitted there.

Monitor base address+1 assignment	
Data bit	Content
D0	State of output circuit 1
D1	State of message output 1
D2	State of output circuit 2
D3	State of message output 2

Monitor base address+2 assignment	
Data bit	Content
D0	State of output circuit 3
D1	State of message output 3
D2	State of output circuit 4
D3	State of message output 4

10.5 Switch-off history

The switch-off history, accessible from the menu DIAGNOSTICS->INT MONITOR->LAST DIAGNOSTIC, is intended to make reconstruction of the reason for switch-off easier for the user. The states of all safety-relevant AS-i slaves and all devices at the time the state change on the output device (change from green to another color) are stored.



Information!

Available only with AS-i/PROFINET Gateways.

10.5.1 Diagnostic values in the IDI



IDI diagnostics can be optionally enabled for the following devices:

- VBG-PN-K30-D-S16 ident. no. \geq 15050
- VBG-PN-K30-DMD-S16 ident. no. \geq 15051
- VBG-PNS-K30-DMD ident. no. \geq 15054
- VBG-PN-K30-DMD-S16-EV ident. no. \geq 15216

The input values for safety-relevant input slaves can be substituted in various ways. This makes the diagnostics information available directly in the cyclical I/O data. The default setting is the "substitution values" for the two input channels. Setting diagnostics values also sends 2 bits of color information for the associated safety-relevant component in addition to the input channels. The substitution possibilities are defined in the following tables:

Bit 3	Bit 2	Bit 1	Bit 0	Description
0	0	0	0	Both channels off
0	0	1	1	2nd channel off, 1st channel on
1	1	0	0	2nd channel on, 1st channel off
1	1	1	1	Both channels on

Tab. 10-8. Default status substitution values

Bit 3	Bit 2	Bit 1	Bit 0	Description
		0	0	Both channels off
		0	1	2nd channel off, 1st channel on
		1	0	2nd channel on, 1st channel off
		1	1	Both channels on
0	0			Device color: red, green or blue
0	1			Device color yellow: ("wait")
1	0			Device color: yellow flashing ("test")
1	1			Device color: red flashing ("error")

Tab. 10-9. Diagnostic values



Information!

The switching state of channel 1 and channel 2 (channel 1, channel 2 'on' or 'off', bit 0, bit 1) is sent at optimal speed. The device colors (bit 2, bit 3) have device-internal lower priority and can be sent slower.

The diagnostic values bit 0/1 and 2/3 are not synchronized. The states of the input channels and the resulting color can be sent at different times.



Information!

The color and thereby the status of the component do not always have to agree with the switching state of the input channels. In case of lost telegrams, untaught slaves or non-synchronous switching of the two channels, error and test states may result (red flashing and yellow flashing).

10.6 Password protection

All safety-related commands are password protected. These include:

- Loading configurations into the Monitor
- Stopping
- Learning code sequences
- Releasing
- Changing the password



Information!

No new release is necessary if when using safety-configured AS-i slaves code sequences have been newly learned using the ESC/Service key.

10.6.1 Procedure for configuring and teaching code sequences

The configuration is created using **ASIMON 3 G2** software, loaded into the safety unit and released. The name of the person releasing and the date are stored at this moment. If code sequences controlled through the display are newly taught, this is secured by a PIN to prevent unintended/unauthorized changing of the code sequences.



Information!

For additional information see section <Replacing a defective safety-configured AS-i slave>.

- A PIN is a 4-digit number and can only be changed from the display, not via the **ASIMON 3 G2** software.
- After entering the PIN, the display can be used to start a teaching procedure for the code sequences. The monitor stops immediately after entering the PIN. After teaching, the monitor starts after a prompt and acknowledgement on the display.

Action	ASIMON Software	On AS-i Safety Monitor
Configure and load into Safety Monitor	•	• (only from chip card)
Stopping	•	•
Releasing	•	–
Starting	•	•
Teaching code sequences	•	•
Changing the password	•	• (only from chip card)
Changing the PIN	–	•

Legend:

"•" = possible;

"–" = not possible

Tab. 10-10.

Code sequences for releasing a configuration do not necessarily have to have been successfully learned. It is also possible to release without code sequences, which must then be learned at a later time.

Teaching the code sequences is simple to perform:

- Using the ESC/Service key (See section <Replacing a defective safety-configured AS-i slave>)

or

- Using the display (See section <Operation in advanced display mode>).

10.6.2 Function of the ESC/Service key

In traditional (classical) display mode, the ESC/Service key takes on two kinds of functions:

- Briefly pressing the ESC/Service key unlocks the Safety Monitor when red is flashing
- A longer press (3s) starts the teach procedure for a slave.



Information!

For additional information see section <Replacing a defective safety-configured AS-i slave>.

10.7 Safe coupling slaves on the AS-i circuits

The two AS-i circuits are capable of emulating a total of up to sixteen safe coupling slaves.

The assignment of the coupling slaves addresses to the release circuits is made using the ASIMON software.

10.8 Chip card

The chip card is divided into two areas. One area is reserved for unsafe data and administration, the other for safe data.



Warning!

Always turn off power before inserting or removing the card.

10.8.1 Unsafe data

This section describes the system behavior of the unsafe system section when using the chip card.

10.8.1.1 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.

10.8.1.2 Data not compatible

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

```
CHIPCARD NOT  
COMPATIBLE
```

10.8.1.3 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.

10.8.1.4 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.

10.8.1.5 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.

10.8.1.6 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.

10.8.2 Safe data

This section describes the system behavior of the safe unit when using the chip card.

In general the safe part of the chip card has 4 memory banks (A...D). A bank is referred to as an active bank. Unless otherwise stated, the operations described in the following are always performed on the active bank.

10.8.2.1 Data incompatible

If a card with incompatible data is found, the following error message is output:

```
CHIPCARD NOT  
COMPATIBLE
```

10.8.2.2 Data compatible

If a card with an empty active memory bank is found, the safety configuration including code sequences is written to the card and in future all changes are made in the card and in the device at the same time. The following message is displayed on the device:

```
CHIPCARD FOUND.  
SAFETY DATA WILL  
BE SYNCHRONIZED
```

10.8.2.3 Complete configuration

If when starting with an empty device a card with a released safety configuration including code sequences is found (Complete safety configuration) in the active memory bank, this configuration is written to the device, then the menu for releasing using Release Code is opened:

```
COPY BANK A
TO MONITOR
RELEASE DATE:
2006/06/17 18:43
BY: ROLF BECKER
CONFIG NAME:
L3040 MIT LADEVO
RRICHTUNG LINKU
ND PALETTENWECHS
LER V1.23
RELEASE CODE: 1BDF
- - - - -
- - - - -
TYPE CODE
0000
OK
```

If the active bank contains a Complete Configuration and if the data in the active bank on the memory card and the data in the device are identical (e.g. both empty), in future all changes are made in the card and in the device at the same time.

10.8.2.4 Data on the chip card and in the device are identical

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

10.8.2.5 Data not identical

If the active bank on the memory card and in the device are not empty at start and the data are not identical, the following message is displayed:

```
ERROR.
CHIPCARD AND
SAFETY DATA
DIFFERENT.
DELETE CHIPCARD
OR SAFETY DATA
```


The safety unit will not operate in this case. You must either clear the device or the active bank via menu.

10.8.2.6 Operating the chip card from the menu

The data on the chip card can, as described in section <SAFE CHIPCARD>, be exchanged between the Monitor and the chip card. Note however the following:

In order to store a configuration on the chip card as a master configuration (i.e. without code sequences), proceed as follows:

- Write the released configuration into the Monitor without code sequences.
- Copy the configuration into a memory bank using the menu.

For additional information, see section <CARD →MONITOR (copy card data to the Monitor)>.

To convert a master configuration on the memory card to a Complete Configuration, this configuration must be overwritten by a Complete Configuration.

This is done as follows:

- Copy the card data to the Monitor.
- Teach the code sequences
- Write the data from the Monitor to the card.

10.8.3 Working with multiple memory banks

The chip card has four memory banks, each of which may contain a configuration (Complete or Master configuration). One of the banks is the active bank.

The AS-i 3.0 PROFINET Gateway with integr. Safety Monitor always independently utilizes the active bank. Menu commands can however be used to copy the other memory banks to the AS-i Safety Monitor.

The corresponding memory bank thereby becomes the active bank.

If configurations from another memory bank are copied, a few safety rules need to be followed:



Attention!

Safety advisory:

Ensure that the configuration intended for and released for the application is used!

This can be done by comparing the release codes on the display (See section <MONITOR CONFIG>):

- The safety representative who generated and validated the configuration stores the release code for the configuration (Complete or Master) stores the release code for the configuration and approves use of the configuration for specific equipment.
- The person performing the startup reads out the release code on the display before starting the equipment or before teaching the code sequences in the case of master configurations and compares it with the release code released for the equipment.

After the chip card has been used to load the configuration into the device, the safety functions of the device must be checked in the equipment.

Checking of the release code and testing the system must be documented in writing and is part of the system documentation.

11. Operation in advanced display mode



Information!

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

12. Advanced Diagnostics for AS-i Masters

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).

12.1 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").

12.2 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.

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

12.3 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.

12.4 Functions of the AS-i Fault Detector

12.4.1 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.

12.4.2 Earth/Ground Fault Detector

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

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

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.

12.4.3 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.

12.4.4 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.

12.5 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>.

12.5.1 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.

```
Control Info
Control Run
Control Flags

Control Flags
0:00 00 00 00
4:00 00 00 00
8:00 00 00 00 ↓
```

12.5.2 Interchangeable memory card

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

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

```
Chipcard
AS-i Chipcard
Format Chipcard
```

12.5.3 Earth fault monitor

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

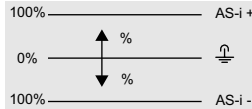
The new earth fault monitor allows the service technician to detect whether an earth fault has occurred directly on AS-i

```
1.
Earth fault
```

or on a sensor line.

```
1.
Earth fault sen.
```

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



```
EFLT Ratio:           ↑
AS-i+ 2%
AS-i DC Voltage: 1
                   31,3V
                   ↓
```

```
EFLT Ratio:           ↑
AS-i+ 100%
AS-i DC Voltage: 2
                   31,5V
                   ↓
```

12.5.4 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.

```
AS-i power
Reset
Maximal:             2
                   1,3A
                   ↓
```



```
Maximal:      ↑  
  1,3A  
current:     2  
  0,3A      ↓
```

```
Current:      ↑  
  0,3A  
Current limiting 2  
  3,2A      ↓
```

12.5.5 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.

```
Current limiting  
  3,2A  
2
```

12.5.6 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 length and with an AS-i power supply min. 100 m line length can be realised.

```
AS-i Power  
24V geerdet  
change
```

```
AS-i Power  
AS-i PWR Supply  
change
```

12.5.7 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. Moreover the configuration file are stored on the web server and so they are always within reach.

12.5.8 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".

```
Mode Change
```

```
Offline Phase  
yes  
change
```

13. 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.

13.1 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!

13.2 Logical slots

13.2.1 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. 13-11.



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. 13-12.

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

Tab. 13-13.

Length	description
2 byte I	flags and AS-i detector

Tab. 13-14.

Spezific PROFIsafe "special-IDs"

PROFIsafe V2

Allocation PROFIsafe in input and output area of control

Byte n+0	0-7	0-6	0-5	0-4	0-3	0-2	0-1	0-0 (reserviert)
Byte n+1	1-7	1-6	1-5	1-4	1-3	1-2	1-1	1-0
Byte n+2	2-7	2-6	2-5	2-4	2-3	2-2	2-1	2-0
Byte n+3	3-7	3-6	3-5	3-4	3-3	3-2	3-1	3-0
Byte n+4	4-7	4-6	4-5	4-4	4-3	4-2	4-1	4-0
Byte n+5	5-7	5-6	5-5	5-4	5-3	5-2	5-1	5-0
Byte n+6	6-7	6-6	6-5	6-4	6-3	6-2	6-1	6-0
Byte n+7	7-7	7-6	7-5	7-4	7-3	7-2	7-1	7-0
Byte n+8	PROFIsafe internal (status byte / control byte)							
Byte n+9	PROFIsafe internal (CRC2)							
Byte n+10	PROFIsafe internal (CRC2)							
Byte n+11	PROFIsafe internal (CRC2)							

Tab. 13-15.



Information!

Allocation of input and output signals depends on the configuration in the ASIMON software.



Information!

Handling of diagnostic alarms and restarting of Profisafe communication requires use of certain organization modules in the PLC. Please refer in this regard to the user's manual for your PLC or the "Quick Start – Simatic Manager Standard Diagnosis" from Pepperl+Fuchs GmbH.



Information!

Available only with AS-i PROFIsafe Gateways.

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. 13-16.

- 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

13.2.2 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. 13-17.

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			

Tab. 13-18.

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Input and Output Data Image

Byte	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
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. 13-18.

Flags

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

Tab. 13-19.

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.

13.2.3 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. 13-20.



Information!

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

13.2.4 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. 13-21.



Information!

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

13.2.5 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. 13-22.

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															

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 be 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 attempts 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.

13.2.6 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. 13-23.

13.2.7 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. 13-24.



Information!

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

13.2.8 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. 13-25.



Information!

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

13.2.9 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. 13-26.



Information!

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

13.3 Executing of command interface commands

The command interface can 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.

13.4 PROFINET diagnostics

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

13.4.1 Channel error codes

Slot	chan- nel	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 a 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. 13-27.

AS-i Master

- 0: circuit 1
- 1: circuit 2

Slot	channel	code	message
PS ¹	0	64	incorrect target address
		65	invalid target address
		66	invalid source address
		67	invalid watchdog time
		68	submitted SIL-class is too high
		69	invalid CRC2-length
		70	invalid PROFIsafe-version
		71	CRC1 error
		72	parameter setting inconsistent
		75	iParCRC

Tab. 13-28.

1. PS: Slot of the PROFIsafe module



Information!

Available only with AS-i/PROFIsafe Gateways.

13.4.2 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 <i>not</i> 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	—

Tab. 13-29.

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Byte	bit	message
1	4	earth fault
1	5	overvoltage
1	6	noise
1	7	double addressing

Tab. 13-29.

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	—
4	1	slave 1B: config error
...
7	7	slave 31B: config error

Tab. 13-30.

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. 13-31.

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
...
7	7	slave 31/31A: red flashing

Tab. 13-32.

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. 13-33.

13.4.3 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. 13-34.

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	
Bit [7]	status or color	

Tab. 13-35.

Coding of status bytes

0	no device flashing red
1	at least one device flashing red

Tab. 13-35.

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. 13-36.

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

Tab. 13-37.

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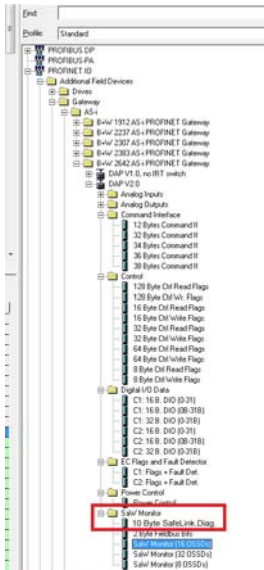
Safety Control-Status (only with PROFIsafe)

Length	description
32 byte I 8 byte O	Safety Ctrl/Status (32 OSSD)
64 byte I 16 byte O	Safety Ctrl/Status (64 OSSD)

Tab. 13-38.

13.4.3.1 Diagnostics in the cyclic channel (10 Byte SafeLink.Diag.)

With this very simple diagnostics, the basic status of SafeLink can be captured. In a configuration file also bytes shorter than 10 can be selected.



Bit	7	6	5	4	3	2	1	0
1	st. adr 4		st. adr 3		st. adr 2		st. adr 1	
2	st. adr 8		st. adr 7		st. adr 6		st. adr 5	
3	st. adr 12		st. adr 11		st. adr 10		st. adr 9	
4	st. adr 16		st. adr 15		st. adr 14		st. adr 13	
5	st. adr 20		st. adr 19		st. adr 18		st. adr 17	
6	st. adr 24		st. adr 23		st. adr 22		st. adr 21	

Tab. 13-39.

7	st. adr 28	st. adr 27	st. adr 26	st. adr 25
8	reserved	st. adr 31	st. adr 30	st. adr 29
9	node status		node address	
10	domain no.		manager adr	

Tab. 13-39.

St. adr: status of an address from the list 'node overview':

bit-combination	meaning
11	active
01	not active
10	nicht taught (only the manager, with the highest priority message)
00	not used

13.5 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.

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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

13.6 Media Redundancy Protocol MRP

The AS-i/PROFINET Gateway supports Media Redundancy Protocol (MRP), a protocol for highly available networks that can be used to compensate for single failures in a ring topology.

To be a station in an MRP ring,

- the Gateway must be configured using "DAP V2.25", and
- 'Client' must be selected as the media redundancy role in the Properties for the PROFINET interface.



Information!

Please see section <Status indication, faults and fault elimination> for further codes indicated by the display.

14. 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.

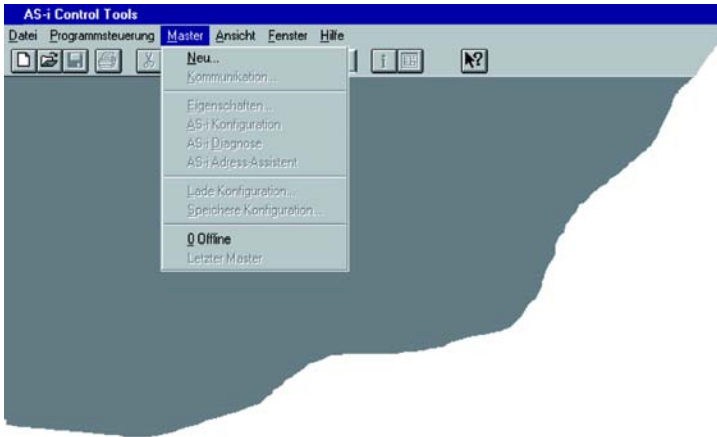


Information!

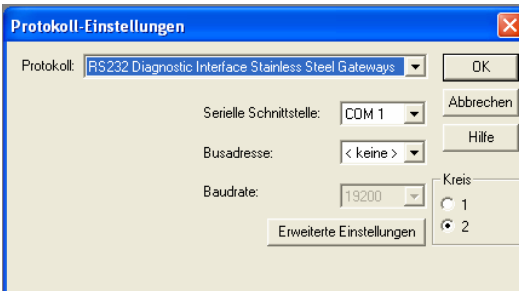
AS-i Control Tools must be installed first!

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.



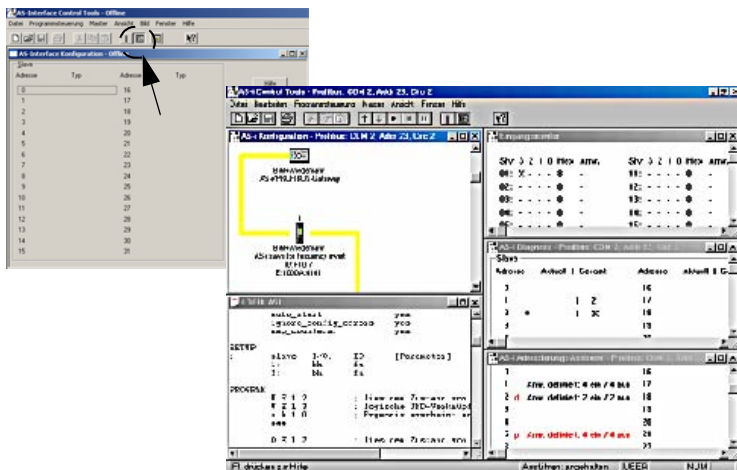
5. Select the appropriate settings (for example serial interface COM 2, station address <auto>).
6. Select Master | AS-i configuration.
7. The AS-i configuration editor will be started. All detected and configured AS-i slaves are displayed in this window.

- 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.

- 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.

15. Configuration with Windows Software ASIMON 3 G2



Information!

*Please note further information in the configuration software **ASIMON 3 G2** for Windows.*

16. Status indication, faults and fault elimination

16.1 Spontaneous display of faults from the safety unit

Spontaneous messages are displayed on Pepperl+Fuchs GmbH AS-i monitors as follows:

- When both networks are operating without error, a smiley is displayed.
- When field bus communication fails, this is indicated by a text message.
- When there is a fault on an AS-i slave, this is displayed until the fault is no longer present.
- When there are no faults present, the states of the safety unit are displayed in text beneath the smiley.
- When four local release circuits are present, a line is displayed with their status.

```

    ☺Press OK for Menu
      Output Circuit
      1:ON      2:ON
      3:ON      4:ON
    
```

Coding:

Display in protecting mode:

1, 2, 3 and 4 for the release circuits

display	status of the safety unit	meaning
ON	green	relais circuit turned on
OFF	red	relais circuit turned off
WAIT	flashing green	wait time Stop 1 running
START	yellow	waiting for Start signal

Display in error status:

SAFETY FAULT: flashing red

TEST: flashing yellow

Red and *flashing yellow* are fault messages and are treated separately.

If the safety unit is in configuration mode, this is indicated by the CONFIG-OPERATION display.

Yellow flashing and *red flashing* means the AS-i slave address of the faulted device is displayed. If there are other faults present at the same time, all faults are displayed alternately.

If the safety unit is in the *red flashing* state and no menu is open, the safety unit can be unlocked by pressing the ESC/Service key (Section <Function of the ESC/Service key>).

- If the message "Fatal Error" is reported from the safety unit, only this error message will be displayed in normal mode (not the menu). The non-safe unit continues to operate normally in this case and the menus can also be opened.

```
FATAL ERROR
000 255 222 111
```

- All other messages are not shown spontaneously.

If the safety unit is in the *yellow flashing* state, depending on the status of the configuration an external test may be required, an acknowledgement of the status may need to be made, or the turn-on delay active.

16.2 Replacing a defective safety-configured AS-i slave

If a safety-configured AS-i slave is defective, it can be replaced even without a PC or reconfiguration of the AS-i Safety Monitor by pressing the ESC/Service key on the AS-i Safety Monitor.



Information!

Pressing the ESC/Service key changes the safety monitor from protecting mode to configuration mode. The output circuits are therefore not turned off.

Code tables for replaced AS-i slaves can be taught without the PIN.

Proceed as follows:

1. Disconnect the AS-i slave from the AS-i cable.
2. Press the ESC/Service key on the AS-i Safety Monitor and on all other safety monitors for approx. 3 seconds.

```
CONNECT NEW
SLAVE 17
THEN PRESS
SERVICE
```

3. Connect the new safety-configured AS-i slave, which has already been programmed to the corresponding address, to the AS-i cable.
4. Press the ESC/Service key again on the AS-i Safety Monitor and on all other Safety Monitors which use the replacement safe AS-i slave for approx. 3 seconds. The code table for the new slave is taught and checked for correctness.
If this is OK, the AS-i Safety Monitor changes to protecting mode. Otherwise you are prompted again to teach.



Information!

Inputs on the new slave must be turned on.



Attention!

After replacing a defective safe AS-i slave, always check the correct function of the new slave.

16.3 Replacing a defective AS-i Safety Monitor

If an AS-i Safety Monitor is defective and needs to be replaced, the replacement unit does not necessarily have to be newly configured using the **ASIMON 3 G2** software, rather it is possible to copy the configuration of the defective device using a chip card.

Requirement:

The replacement unit has an empty configuration in its configuration memory.



Information!

After replacing a defective safe AS-i Safety Monitor, always check the correct function of the new AS-i Safety Monitor.

16.4 Forget the password? What do I do now?



Attention!

Only the responsible safety representative is permitted to retrieve a lost password as follows!

If the password is lost for your configuration, proceed as follows:

1. Find the valid configuration protocol for the AS-i Safety Monitor whose password you have lost (printout or file). In the configuration protocol in line 10 (Monitor Section, Validated) you will find a 4-digit code.
- If you do not have the configuration protocol and do not want to place the AS-i safety monitor in configuration mode, connect the AS-i safety monitor whose password you have lost to the PC and start the **ASIMON 3 G2** software.
- Select a neutral configuration and start the diagnostics function in **ASIMON 3 G2** using MONITOR -> DIAGNOSTICS. Wait until the current configuration appears on the screen. This may take up to 1 minute.
- Open the window MONITOR/BUS INFORMATION (EDIT MENU -> MONITOR/BUS INFORMATION...). On the Title tab you will also find the 4-digit code in the Download time window area.
2. Contact technical support at your supplier and enter the 4-digit code.
3. From this code a master password can be generated which can be used to access the stored configuration.
4. Use this master password to stop the AS-i Safety Monitor and enter a new user password. In the Monitor menu of the **ASIMON 3 G2** configuration software select the menu item Password changing.



Attention!

*Please note that accessing the configuration stored in the AS-i Safety Monitor can affect the safe function of the system. Changes to released configurations are to be made only by authorized personnel. Any change must be made according to the instructions in the User's Manual for the **ASIMON 3 G2** configuration software.*



Information!

The default password (factory setting) of the AS-i safety monitor is "SIMON". If you would like to reconfigure the AS-i safety monitor, you must first change this default password to a new one known only to you as safety officer.

17. Safe Link

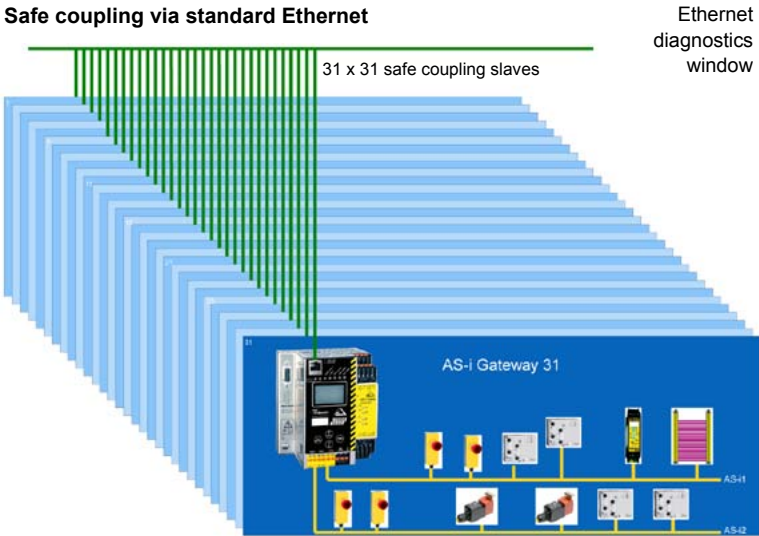
17.1 General introduction

Safe Link represents the most efficient and cost-effective way to link safe signals from multiple AS-i networks.

As for an AS-i linking network, safe linking using potential-free contacts or safe electronic in- and outputs eliminates expensive and cumbersome wiring. Safe Link also offers the same system range as a PROFINET controller based on the PROFIsafe standard without being restricted to a particular system controller.

Safe Link allows up to 1922 safe inputs to be processed in a full configuration of 31 gateways with 62 safe slaves. 31 safe bits per Gateway are provided for coupling, resulting in a total of 961 signals that can be safely coupled.

Safe coupling via standard Ethernet



For Safe Link the Gateways are connected over the Ethernet diagnostics interface (10 Mbit/s, half-duplex) and a switch. In the case of PROFINET and EtherNET/IP+Modbus TCP, instead the fieldbus interface can be used for Safe Link.

If the Ethernet interface is used for coupling, devices having different controller systems (such as PROFIBUS, PROFINET, EtherNet/IP, Modbus, sercos, etc.) can exchange signals with each other without any additional effort using the switch.

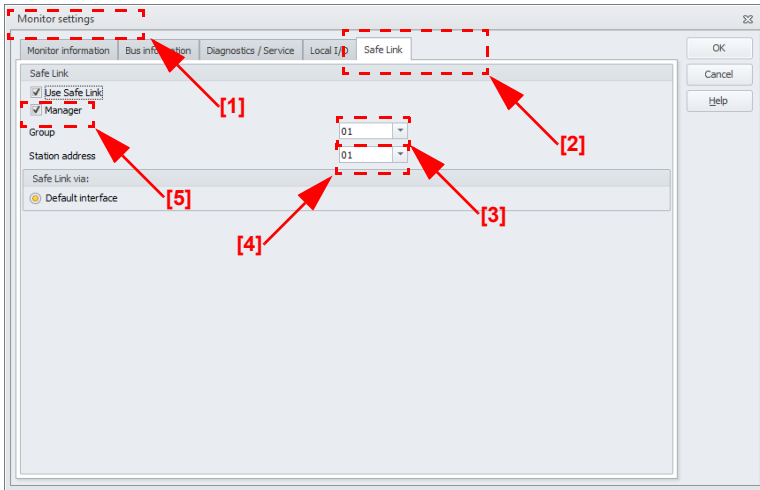
Since data transmission is based on the sending of multicasts, it must be ensured that the switch used can process and pass along the corresponding broadcasts.

17.2 Configuration

Safe Link	
Ethernet diagnostics interface	10Mbits, half-duplex
Ports	Depends on the Multicast group Port 1024 to 1038
Protocol	UDP
Data packets	72 bytes per packet Average 286 packets per second
Group organization	
Number	max. 15 groups (Group addresses 1 to 15)
No. of devices	max. 31 devices per group
System size	
max. system size	31 Gateways x 62 safe input slaves = 1922 safe inputs in full configuration
Kopplung	
max. no. of coupled signals	31 GW x 31 signal bits = 961 safe coupled signals in full configuration
Switch	
Requirements	<ul style="list-style-type: none"> • Multicast-capable • If not all connected devices receive all signals, an IGMP-capable lean managed switch is required

17.2.1 Configuration using ASIMON

Complete configuration of Safe Link is done using the ASIMON software, in the "Monitor/Bus information" section [1] on the "Safe Link" tab [2].



Here the group and device addresses are assigned and the safe programs for the individual Gateways managed. Information about the IP addresses of the participating devices are also stored in the project structure.

In organizational terms all Gateways that need to communicate with each other are combined in one group (Group addresses 1 to 15) [3].

Each device in a group is given a unique device address (Device addresses 1 to 31) [4].

One of the devices is assigned as the manager of the group [5], which means it monitors whether all the participating devices are present in the network.

31 bits are available in each Gateway which can be used by the other group members as safe signals.

In a full configuration with 31 Gateways this means a total of 961 safe coupled signals are available.



Information!

Before setting up Safe Link, be sure you have read the information on configuring Safe Link in the ASIMON documentation in the section <Safe Link Tab>

17.3 Diagnostics

Directly on the device

If a group member does not receive the expected messages from another member, it displays the device address of the missing Gateway together with the message "not active".

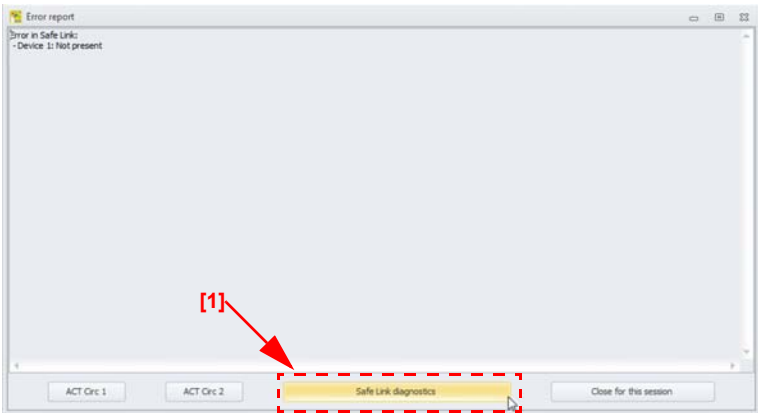
e.g. missing data telegrams from Devicer 4:

```
X.4 not active
```

About ASIMON

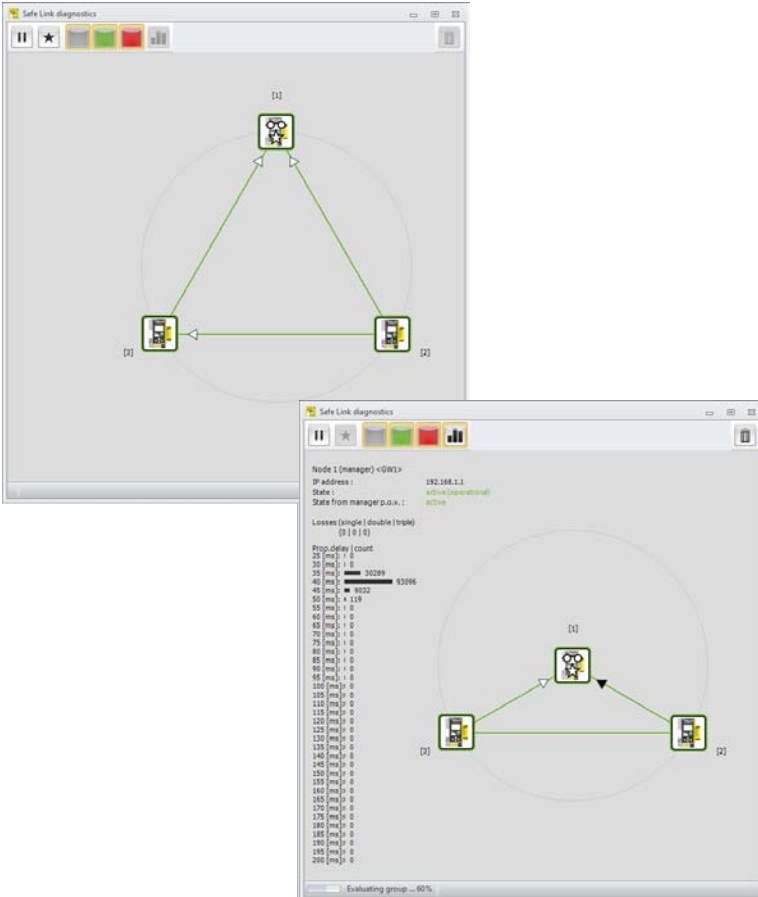
The ASIMON software can be used at any time to perform diagnostics for the Safe Link by invoking "Safe Link diagnostics" from the "Start diagnostics" menu in the "Applications" section. This opens a window with a graphical detailed view of the state of communication for all group members.

If an error occurs in Safe Link, the corresponding signals are shown in gray in the ASIMON configuration, and at the same time a popup window opens automatically with a reference to missing devices.



Clicking on the "Safe Link diagnostics" button [1] on the bottom edge of the popup window also opens the diagnostics window for Safe Link.

Here you are shown the status and direction of communication between the individual group members in graphical format. Based on the arrow colors you can see which sections of communication may be associated with telegram errors.



Information!

Please refer here to the information in the ASIMON documentation in the <Safe Link diagnostics> section.

18. 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-i Power Fail

Voltage below the threshold on the AS-i cable.

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".

EDM (External Device Monitoring, feedback circuit)

Used for monitoring the switching function of the contactors connected to the Safety Monitor, whereby the normally closed contacts (forced-opening when possible) are fed back to the start circuit of the Safety Monitor. A restart is then only possible if the normally closed contacts are closed (in the quiescent state).

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 \Rightarrow 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.

Inclusion phase

The AS-i master sends a command to an available slave address to detect new slaves. If no reply is received, it immediately begins with the next data exchange phase.

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 \Rightarrow peripheral fault.

Offline phase

In offline phase there is no communication on AS-i.

OSSD = Output Signal Switching Device, release circuit

The safe AS-i components and functional devices assigned to an output circuit of the AS-i safety monitor. They are responsible for releasing the machine element which generates the hazardous movement.

Password

Security code for a (security) configuration, is required for releasing a configuration or activating a changed configuration. The password is a string of 4 ... 8 alphanumeric characters. It is stored in the configuration.

Peripheral fault

Depending on the slave, an overflow, an overload on the sensor supply, or some other fault affecting the slave peripheral can be displayed.

PIN

A security code is required for teaching code sequences. The PIN is a 4-digit decimal number.

The PIN does not authorize for activating a safety configuration.

The PIN is stored in the EEPROM of the unprotected device section as well as in the unprotected area of the chip card, and is therefore sent to a new device when the chip card is replaced. When resetting to factory defaults, the PIN is set to 0000.

Release Code

Security code for a safety configuration on the chip card. A 4-character hexadecimal number generated by the **ASIMON 3 G 2** software. The release code is displayed before copying a configuration from the memory card to the Monitor and must be repeated by the operator.

This provides a technical safeguard against errors in the unprotected display and keyboard software.

Single Slave

A single slave can in contrast to a \Rightarrow *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:

\Rightarrow *I/O configuration* and \Rightarrow *ID-Code*, as well as \Rightarrow *extended ID1-Code* and \Rightarrow *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.

Master configuration

Released configuration, without code sequences. The safety unit cannot turn on the outputs, but as soon as the code sequences are learned, the device is usable.

Such a master configuration can for example be used in serial production machine building for loading the safety program, whereby the configuration is created in the design and the code sequences taught on the physical machine.

Complete configuration

Counterpart to \Rightarrow *master configuration*. Release configuration including code sequences. The device is always usable.

19. Appendix, Examples

19.1 Startup on a Siemens NC control

The following example describes the settings needed for starting up a PROFIsafe Gateway on a Siemens NC control (here an 840dSL).

To place the PROFIsafe Gateway in operation on a Siemens control, a few settings are needed for the Gateway to function.

The individual items here are excerpted as examples from the corresponding Siemens manuals.

19.1.1 Setting in the S7 configuration

- Install the corresponding GSD file in the S7 hardware configuration.
- Insert the Gateway into the PROFIBUS circuit (this can be found under Profibus-DP, Additional field devices, Gateways, AS-i).
- Set the corresponding PROFIsafe protocol (the NC control only supports V1 at the present time).



Note!

The Profisafe data field must be inserted in "Slot 1" (see illustration).

Slotplatz	DP-Kennung	Bestellnummer / Bezeichnung	E-Adresse	A-Adresse	Kommentar	
1	190	PROFIsafe V1	0	0		
2	193	32 Byte Digital In/Out (D 31E)	8	8		
3	193	34 Byte Command Interface	512	512	545	
4	193	Safety Control/Status (S4 D55D)	48	103	40	55
5	85	Page-Fault Detector	545	547		
6						
7						
8						
9						
10						
11						
12						
13						

The "F_Dest_Add" is set in the PROFIsafe data field, and must then also be set in the NC control under "PROFISAFE_IN_ADDRESS" and "PROFISAFE_OUT_ADDRESS".

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19.1.2 Setting in the NC control

The "PROFISAFE_MASTER_ADDRESS" is taken from the hardware configuration (F_Source_Address) and entered in number 10385.

Example:

10385 7D2 (corresponds to 2002 decimal)

19.1.3 Setting "PROFISAFE_IN_ADDRESS"

The "PROFISAFE_IN_ADDRESS" must be set in two 32-bit fields so that the 64-bit Gateway input data can be addressed.

Example:

10386[0] 050000CA (corresponds to 202 decimal, from the hardware configuration, F-destination address, the 5 at the beginning stands for Profibus, addresses the first 32 bits of the input data).

10386[1] 050100CA (corresponds to 202 decimal, from the hardware configuration, F-destination address, the 5 at the beginning stands for Profibus, addresses bits 33-64 of the input data).

19.1.4 Setting "PROFISAFE_OUT_ADDRESS"

The "PROFISAFE_OUT_ADDRESS" must be set analogous to the "PROFISAFE_IN_ADDRESS" so that all 64 bits can also be addressed here.

Example:

10387[0] 050000CA (corresponds to 202 decimal, from the hardware configuration, F-destination address, the 5 at the beginning stands for Profibus, addresses the first 32 bits of the output data)

10387[1] 050100CA (corresponds to 202 decimal, from the hardware configuration, F-destination address, the 5 at the beginning stands for Profibus, addresses bits 33-64 of the output data).

19.1.5 Setting "PROFISAFE_IN_ASSIGN"

Here you enter in which data range the safe input bits are entered in the INSE.

Example:

10388[0] 001032 (The first 32 bits are mapped from 1 to 32).

10388[1] 033064 (The next 32 bits are mapped from 33 to 64).

19.1.6 Setting "PROFISAFE_OUT_ASSIGN"

Here you enter from which data range the safe output bits are taken from the OUTSE.

Example:

10389[0] 001032 (The first 32 bits are mapped from 1 to 32).

10389[1] 033064 (The next 32 bits are mapped from 33 to 64).

19.1.7 Setting "PROFISAFE_IN_FILTER"

Here the filter is defined which is used to write the data from the "PROFISAFE_IN_ADDRESS" to the "PROFISAFE_IN_ASSIGN". In this example there is no filter, rather all data are passed directly.

Example:

13300[0] FFFFFFFF

13300[1] FFFFFFFF



Information!

*The first byte **INSE 1** is reserved in the upper example! Slave 1 is mapped to the **INSE 2**. If it is not intended, we recommend you the following setting:*

13300[0] FFFFFFFE

13300[1] FFFFFFFF

Slave 1 is mapped to the **INSE 1** in this example.

19.1.8 Setting "PROFISAFE_OUT_FILTER"

Here the filter is defined for writing the data from the "PROFISAFE_OUT_ASSIGN" to the "PROFISAFE_OUT_ADDRESS". In this example there is no filter, rather all data are passed directly.

Example:

13300[0] FFFFFFFF

13300[1] FFFFFFFF

19.2 Safety diagnostics in the input data image (IDI)



Information!

This functionality is available only in certain models. For additional information see section <Diagnostic values in the IDI>.

19.2.1 Representation of the diagnostic information

Diagnostics in the IDI is a way to get the most important diagnostics information into the controller without using a command interface (mailbox) and without additional effort. The diagnostics information is sent in the input data image, encoded to the input bits of the safety input slave address.

Bits 0 and 1 represent the switching state of Channels 1 and 2 of the safety input, thereby making the state directly accessible very quickly.

Bit 3	Bit 2	Bit 1	Bit 0	Description
X	X	0	0	Both channels open
X	X	0	1	2 nd channel open, 1 st channel closed
X	X	1	0	2 nd channel closed, 1 st channel open
X	X	1	1	Both channels closed

Tab. 19-40.

Bits 2 and 3 contain the state of the safety input (the device color of the ASIMON):

Bit 3	Bit 2	Bit 1	Bit 0	Description
0	0	X	X	Device color: red, green or gray
0	1	X	X	Device color: yellow ("wait")
1	0	X	X	Device color: yellow flashing ("test")
1	1	X	X	Device color: red flashing ("error")

Tab. 19-41.



Attention!

Note the following points when performing an evaluation:

- The information for switching state and error status are not processed synchronously
- When there is a configuration error all bits having a value of 0 are sent; this must be noted when evaluating the data.
- When the monitor is stopped the device color is "gray".
- The state "yellow flashing" can be recognized as a transition state with regular switching. This depends on the set module type. This state should be understood as a test request only if it is stably reported.

19.2.2 Other representation variants

In addition to the above, there are also the following variants for representing the diagnostics:

- Safety code sequence:
 Sending of the code sequence, with no evaluation of the data; the current state is sent for each bit. Sending of a code sequence for safety input slaves results in a continuous changing between states "1" and "0".
- Substitution values:
 Substitution of the code sequences by the state of the input (Safe Subst Val), where the following values are sent:

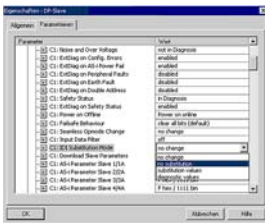
Bit 3	Bit 2	Bit 1	Bit 0	Description
0	0	0	0	Both channels off
0	0	1	1	2 nd channel off, 1 st channel on
1	1	0	0	2 nd channel on, 1 st channel off
1	1	1	1	Both channels on

Tab. 19-42.

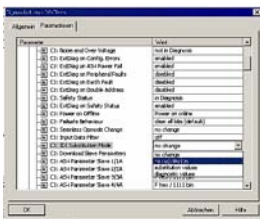
19.2.3 Changing the default setting

The diagnostics type is set or changed using the device display (Safety -> AS-i Safety -> Safe subst Val)

Another method for setting the diagnostics type is by using the GSD/GSDML parameters:



Old GSD files do not affect the setting; new GSDs do not change the mode by default (default setting: "no change"):



19. Reference List

19.1 Manual: "ASIMON 3 G2 Configuration Software"

This Manual contains a detailed description of the configuration software for the AS-i Safety Monitor. The manual is an important component of the documentation for the AS-i Safety Monitor. It is not possible to configure and start up the AS-i Safety Monitor without the **ASIMON 3 G2** software.

19.2 Sources

1. Kriesel, Werner R.; Madelung, Otto W. (editors): AS-interface. Das Aktuator-Sensor-Interface für die Automation. Auflage, Carl Hanser Verlag; München, Wien, 1999, ISBN 3-446-21064-4
2. Spezifikation des AS-interface, ComSpec V3.0 AS-international Association (available from AS-international Association, <http://www.as-interface.net>).
3. Vorschlag eines Grundsatzes für die Prüfung und Zertifizierung von „Bussystemen für die Übertragung sicherheitsrelevanter Nachrichten“, Stand 29.2.2000.
4. AS-interface - Die Lösung in der Automation, Ein Kompendium über Technik, Funktion, Applikation (erhältlich, auch in englischer Sprache, bei AS-international Association, <http://www.as-interface.net>).

20. 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. <u>"control checksum"</u> : checksumm in Control III C program (bin.file) not correct. The file is possibly damaged. <u>"control exec err"</u> : error in Control III C program. <u>"control watchdog"</u> : watchdog predetermined in Control III C program has expired . <u>"control incomp"</u> : Control III C program from another gateway type loaded (e.g. Ethernet IP in Profibus gateway).

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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.)

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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. +1 330 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

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