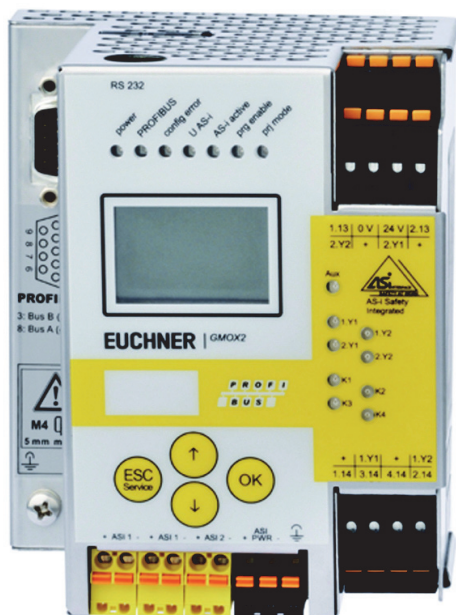


AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor

User manual



DP/V0 and DP/V1



AS-i 3.0 specification

Subject to modifications without notice.

Generally, this manual refers to products without mentioning existing patents, utility models, or trademarks.

The absence of any such references does not indicate that a product is patent-free.

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1. Symbol catalog



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.

1.1 Abbreviations

AS-i	AS-interface (actuator sensor interface)
AOPD	Active opto-electronic protective device
CRC	Cyclic redundancy check
I/O	Input/output
EDM	External device monitoring
EMC	Electromagnetic compliance
ESD	Electrostatic discharge
PELV	Protective extra-low voltage
PFD	Probability of failure on demand
PLC	Programmable logic control
SaW	Safety at Work, safety technic



Information!

Additional information can be found in section <Glossary>.

2. General

2.1 Product information

This system manual applies to the following 'EUCHNER GmbH + Co. KG' equipment:

AS-i 3.0 PROFIBUS Gateway single master with integrated safety monitor for 2 AS-i circuits (1 master, RS 232 diagnostic interface)	103373
AS-i 3.0 PROFIBUS Gateway single master with integrated safety monitor/decoupling coil for 2 AS-i circuits (1 master, RS 232 diagnostic interface)	103267
AS-i 3.0 PROFIBUS Gateway with integrated safety monitor for 2 AS-i circuits (double master, RS 232 diagnostic interface)	103374
AS-i 3.0 PROFIBUS Gateway with integrated safety monitor for 2 AS-i circuits (double master in version "1 power supply, 1 gateway for 2 AS-i circuits", RS 232 diagnostic interface)	103302

Tab. 2-1.

The AS-i/Gateway with integrated Safety Monitor combines an AS-i 3.0 PROFIBUS Gateway with a Safety Monitor for 2 AS-i circuits. The product offers the full functionality of an AS-i/PROFIBUS Gateway and an AS-i Safety Monitor for 2 AS-i circuits.

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

Functions of the device								
1 master	2 master	OSSDs	AS-i	Master, power supply	Diagnostic interface	Semiconductor outputs	SAW outputs	Safety relays
103373		16	2	1	RS 232	2	16	2
103267		16	2	1N	RS 232	2	16	2
	103374	16	2	2	RS 232	2	16	2
	103302	16	2	2N	RS 232	2	16	2

Tab. 2-2.

The AS-i PROFIBUS gateways are designed to connect AS-i systems to an upper-level PROFIBUS network. The gateways act as a master for AS-i and as a slave on PROFIBUS.

All AS-i functions can be used cyclically as well as acyclically via PROFIBUS DP/V1.

Caption	
1 master:	The device is a single master
2 master:	The device is a double master
OSSDs:	number of release circuits
	16: safety unit generates 16 independent switching signals
AS-i:	number of AS-i circuits
	2: safety unit functions with two equal AS-i circuits
Master, power supply:	1: The unit contains one AS-i Master. The device monitor is in a second AS-i circuit
	1N: The unit contains one AS-i Master. The unit also contains a power supply coupler for the second AS-i circuit. The device monitor is in a second AS-i circuit.
	2: The unit contains two AS-i Masters.
	2N: The unit contains two AS-i Masters and power supply couplers.
Diagnostic interface:	type of the diagnostic port
Semiconductor outputs:	number of semiconductor outputs
SaW outputs:	number of SaW outputs
Safety relays:	number of safety relays

Tab. 2-3.

For the cyclical data transfer up to 32 bytes of I/O data can be transferred as binary data for one AS-i network. Additionally, analog signals and all available commands of the new AS-i specification can be transferred via the command channel through PROFIBUS.

On the serial PROFIBUS Master AS-i Control Tools can be used to monitor the AS-i data online via PROFIBUS DP/V1.

2.2 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.

The AS-i/Gateway with safety monitor 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/Gateway with safety monitor switches off the system in protective operation mode with a maximum reaction time of 40 ms.

AS-i PROFIBUS
Gateway with integrated Safety Monitor

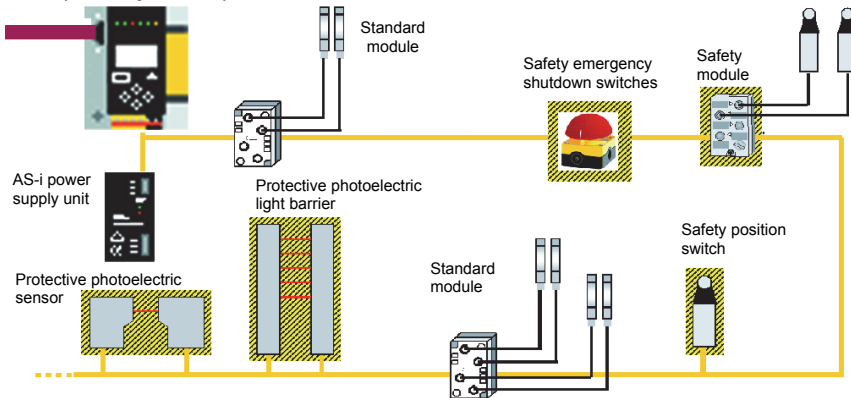


Abb. 2-1. Safe and standard components in an AS-i network

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.

2.3 Conformity statement

The AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor has been developed and manufactured in accordance with the applicable european standards and directives.

Information!

The corresponding conformity statement can be found at the very beginning of this system manual.

2.4 Certification according to DIN EN ISO 9001 : 2000

The manufacturer of the product possesses a certified quality assurance system in accordance with ISO 9001.

Information!

The current certificate can be viewed in internet: <http://www.euchner.de>

3. Safety

3.1 Safety standard

The AS-I Safety Monitor has been developed, manufactured, tested and submitted for type testing in accordance with the safety standards prevailing at the time of testing. The safety requirements per Category 4 in accordance with EN 954-1 and Performance Level "e" in accordance with EN ISO 13 849-1 are met by all devices.



Information!

A detailed listing of the values for probability of failure (PFD values) can be found in section <Safety-relevant characteristic data>.

Following a risk analysis you can use the AS-I Safety Monitor in accordance with its safety category as a shut-down protection device for protecting hazardous areas.

3.2 Intended use

3.2.1 Conditions of use

The AS-I Safety Monitor has been developed as a **shut-down protection device** for protecting hazardous areas on powered equipment.



Attention!

Protection of operating personnel and equipment is not provided if the device is not used in accordance with its intended use.



Attention!

Manipulation of and changes to the devices other than expressly described in this Manual are not permitted.

3.2.2 Residual risks (EN 292-1)

The circuits suggested in this Manual have been tested and verified with the greatest care. The prevailing standards and regulations are met when using the components and wiring shown. Residual risks remain in:

- There are any deviations from the suggested wiring concept which may result in the connected safety-relevant assemblies or protective devices not being incorporated or only insufficiently incorporated into the safety circuit.
- The operator does not follow the prevailing safety regulations for operation, setting and maintenance of the machine. Machine inspection and maintenance intervals must be strictly observed.

3.3 Areas of application

The AS-I Safety Monitor, when properly used, enables the operation of sensor-controlled personal protection equipment and additional safety components.

The device also assumes the mandatory E-STOP function (Stop Category 0 or 1) for all non-manually operated machines, dynamic monitoring of the restart function and the protection monitoring function.

Examples for use of the AS-I Safety Monitor:

The device is used economically in machines and equipment in which the standard AS-I bus is the local bus. Using the Safety Monitor as a bus component allows already existing AS-I bus configurations to be easily expanded, and safety components having the corresponding AS-i Safety at Work interface can be inserted without difficulty. If there is no AS-I Safety at Work interface on the safety component, so-called coupling modules can be used to establish the connection. Existing AS-I masters and AS-I power supplies can be used as well.

There are no industry-specific restrictions. Some of the key applications are listed below:

- Machine tools
- Expanded machining centers with multiple control elements and safety sensors for wood and metal processing
- Printing and paper processing machines, trimming machines
- Packaging machinery, both stand-alone and as systems
- Food and beverage machinery
- Workpiece and bulk material conveying systems
- Rubber and plastics industry processing machinery
- Automatic assembly and handling equipment.

3.4 Organizational requirements

3.4.1 Documentation

All the specifications in this System Manual, in particular the sections "Safety Instructions" and "Commissioning", must be strictly observed.

All the safety instructions in the manual "ASIMON 3 G2 Configuration Software" must be strictly observed.

Please note the safety rules when configuring the safety functions, see section <Configuration of the safety functions>. Checking of the release code and testing the system must be documented in writing and is part of the system documentation.

Keep this System Manual in a safe location where it can be readily accessed. It should always be available.

3.4.2 Traceability of the devices

The ordering party is responsible for ensuring traceability of the devices by serial number!

3.4.3 Safety regulations

Observe the locally prevailing legal regulations and requirements of the trade associations.

3.4.4 Qualified personnel

Installation, commissioning and maintenance of the devices are to be performed only by qualified specialists.

Electrical work is to be performed only by electrical technicians.

Setting and changing the device configuration via PC and **ASIMON 3 G2** configuration software are to be performed only by an authorized safety representative.

The **password** for changing a device configuration must be kept under lock and key by the safety representative.

3.4.5 Repair

Repairs, in particular opening of the housing, are to be performed only by the manufacturer or by an authorized representative of the manufacturer.

3.5 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. Specifications - AS-i/Gateway with safety monitor

4.1 Technical data

The technical data are placed in the data sheet. Please view the current version on the web page: www.euchner.de



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.

4.2 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. 4-4.



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.

4.2.1 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. 4-5.

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 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. 4-6.

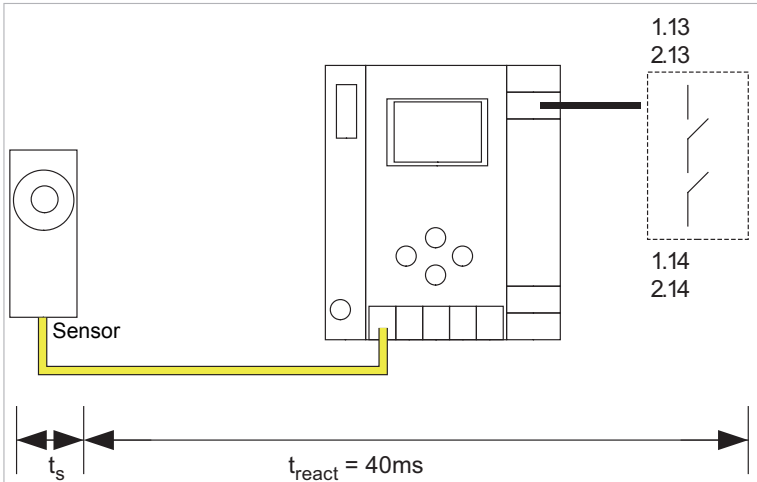


Attention!

If the option „augmented reliability“ is selected the response time will extend (see manual "ASIMON configuration software").

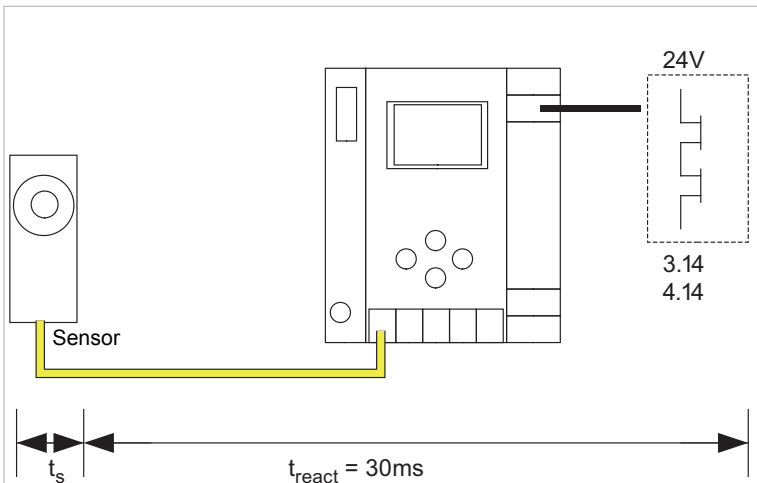
4.3 Reaction times

4.3.1 Sensor -> local relay output



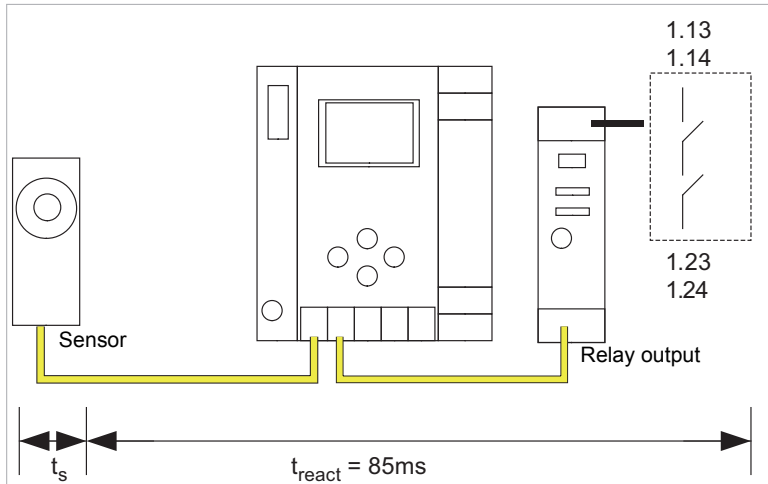
t_s = maximal reaction time of the sensor (see data sheet)
 t_{react} = maximal system reaction time

4.3.2 Sensor -> local electronic output



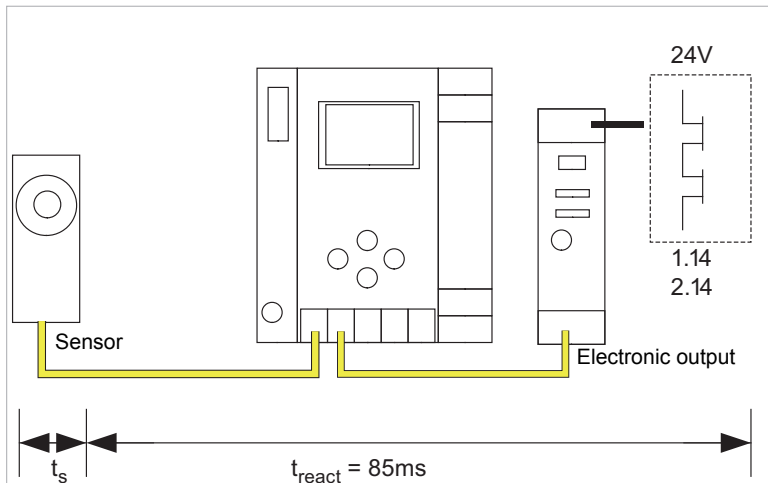
t_s = maximal reaction time of the sensor (see data sheet)
 t_{react} = maximal system reaction time

4.3.3 Sensor -> AS-i relay output



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

4.3.4 Sensor -> AS-i electronic output



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

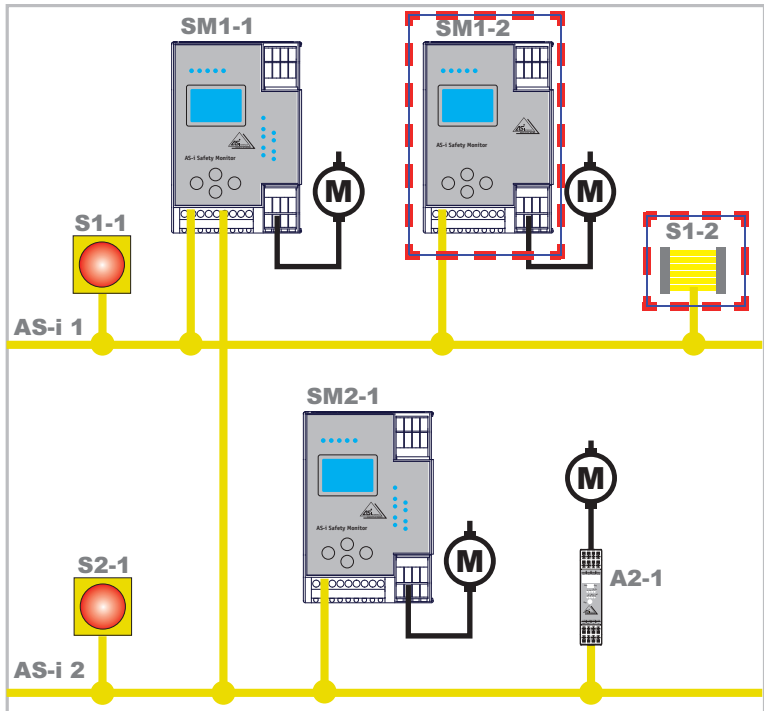
4.3.5 System reaction times – example calculations

System components:		
ASI1	AS-i network 1	
ASI2	AS-i network 2	
S1-1	Safe sensor slave	(EMERGENCY-OFF switch: $t_{R\ S1-1} = 100\ ms$)
S1-2	Safe sensor slave	(safety light barrier: $t_{R\ S1-2} = 18\ ms$)
S2-1	Safe sensor slave	(EMERGENCY-OFF switch: $t_{R\ S2-1} = 100ms$)
A2-1	Safe actuator slave	(motor starter: $t_{R\ A2-1} = 50ms$)
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. 4-7.

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

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



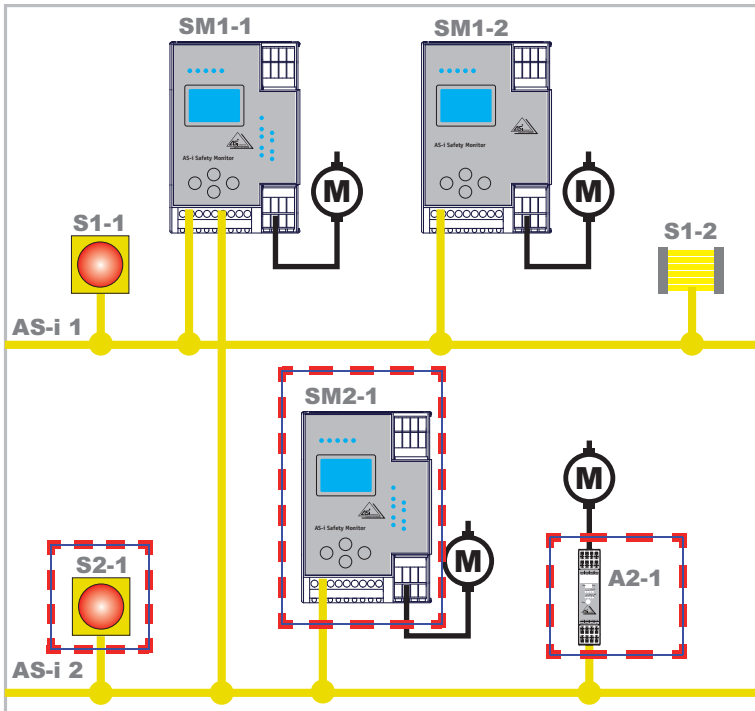
Upon activation of safety light barrier S1-2, the relay safety output of safety monitor SM1-2 is controlled.

Calculation of the AS-i relevant system reaction time:

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

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

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



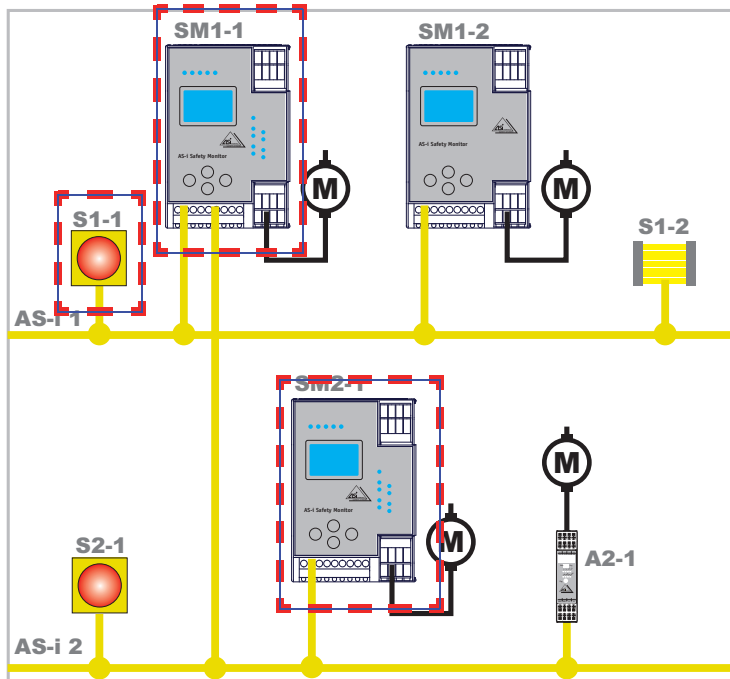
Upon locking of the EMERGENCY-OFF switch S2-1, the motor starter is controlled via the safe AS-interface output of safety monitor SM2-1.

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

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

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:

$$t_{\text{system total c)}} = t_{\text{R S1-1}} + t_{\text{R System ASi1}} + t_{\text{R System ASi2}} = 100\text{ms} + 40\text{ms} + 40\text{ms} = \underline{180\text{ms}}$$

4.4 Scope of delivery

The **basic unit** consists of:

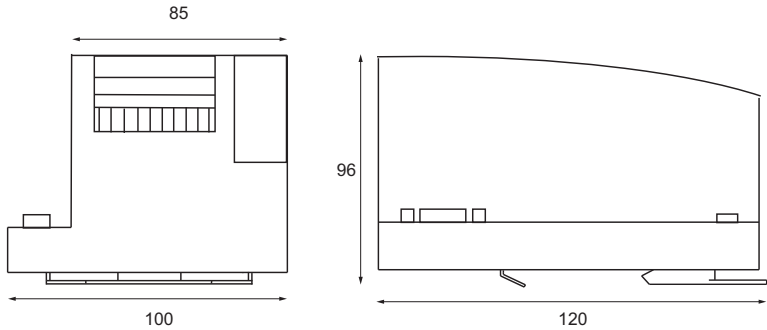
AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor.

The following **accessories** are available:

- Cage spring terminals ZMO-ZB-KK8-M
- Screw terminal ZMO-ZB-AK-8
- Cable for programming with PC ZMO-ZB-PGK
- 1 chip card ZMO-ZB-M11
- 10 chip cards ZMO-ZB-M10
- Configuration software ZMO-ZB-ANWPG ASIMON 3 G2

5. Installation

5.1 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.

5.2 Connections

 Ø 5 - 6 mm / PZ2	0,8 Nm 7 LB.IN
 10	2 x (0,5 ... 1,5) mm ²
 10	2 x (0,5 ... 1,5) mm ²
AWG	2 x 24 ...12



Caution

The AS-i power supply for the AS-i components must have isolation per IEC 60742 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 60742 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.

5.3 Installing in the control cabinet

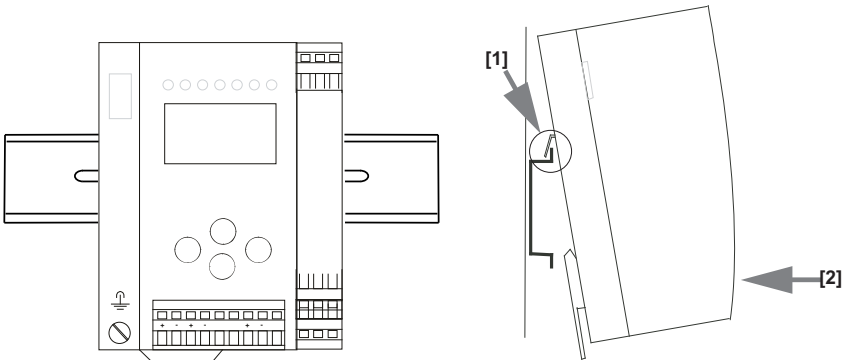
The AS-I/Gateway is installed in the control cabinet on 35mm DIN rails per DIN EN 50 022.



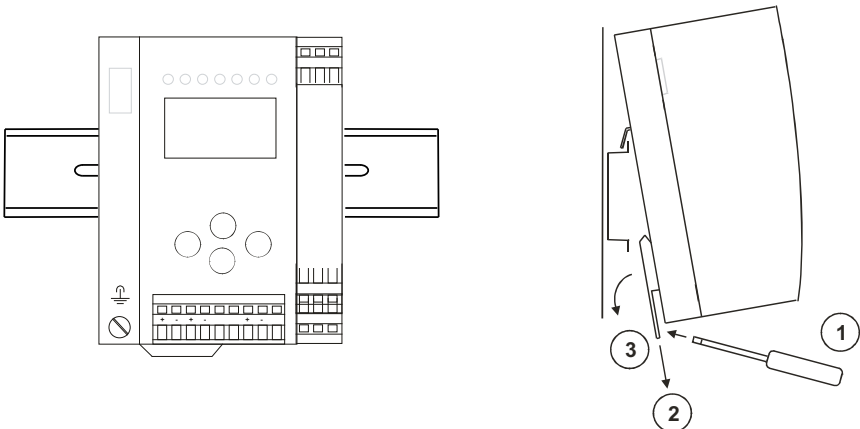
Information!

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.



5.4 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.

5.5 Electrical Connection

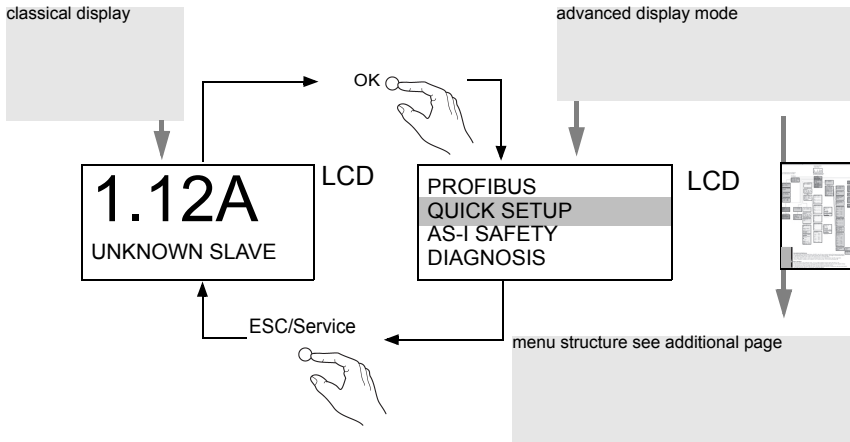


Information!

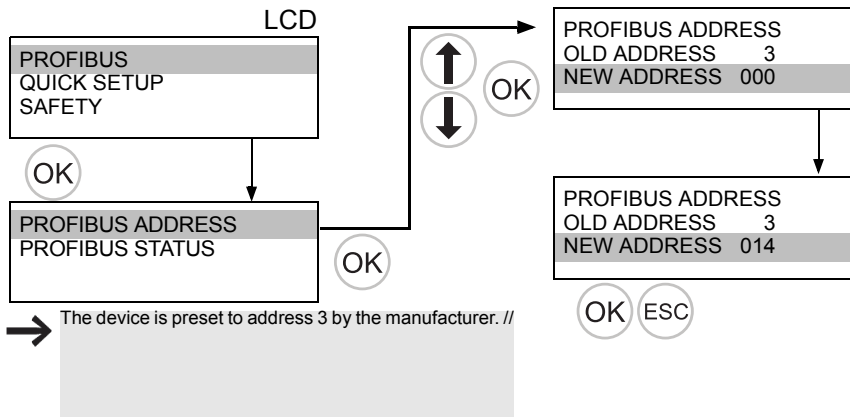
Electrical connections are described in section <Electrical connection>.

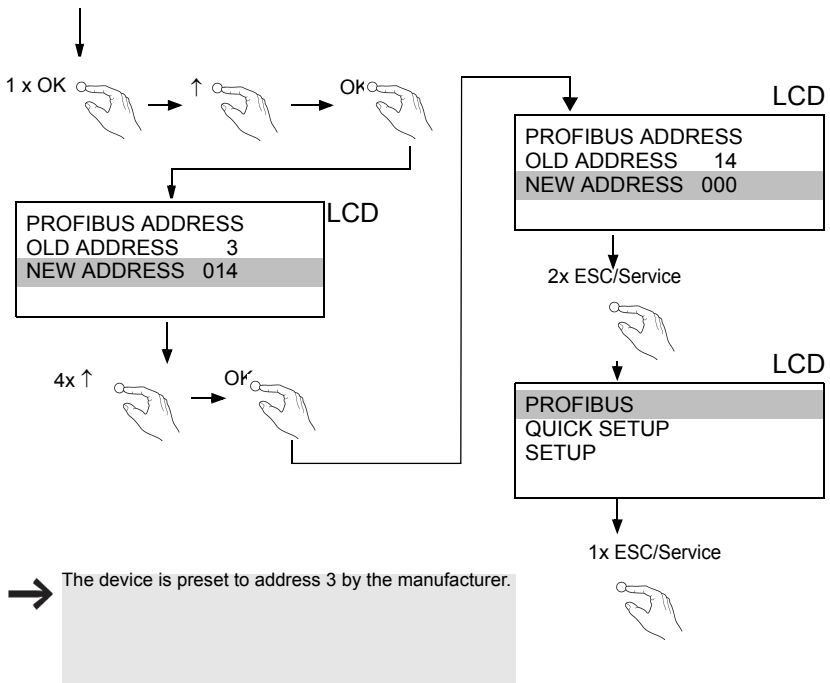
5.6 Commissioning

5.6.1 Switching to advanced display mode

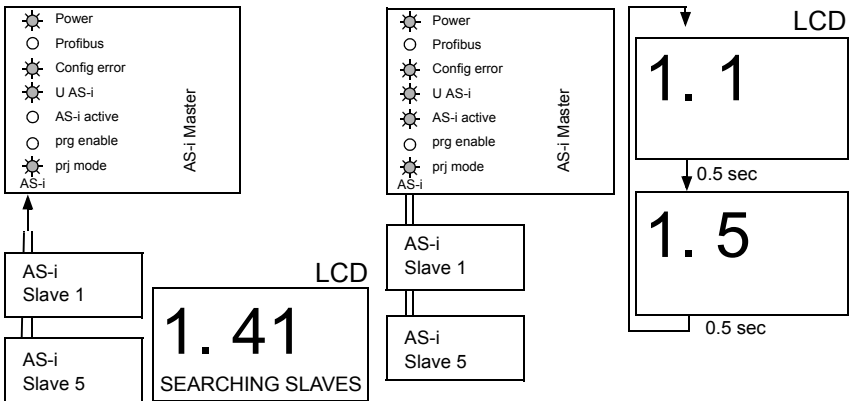


5.6.2 Setting the PROFIBUS-DP address

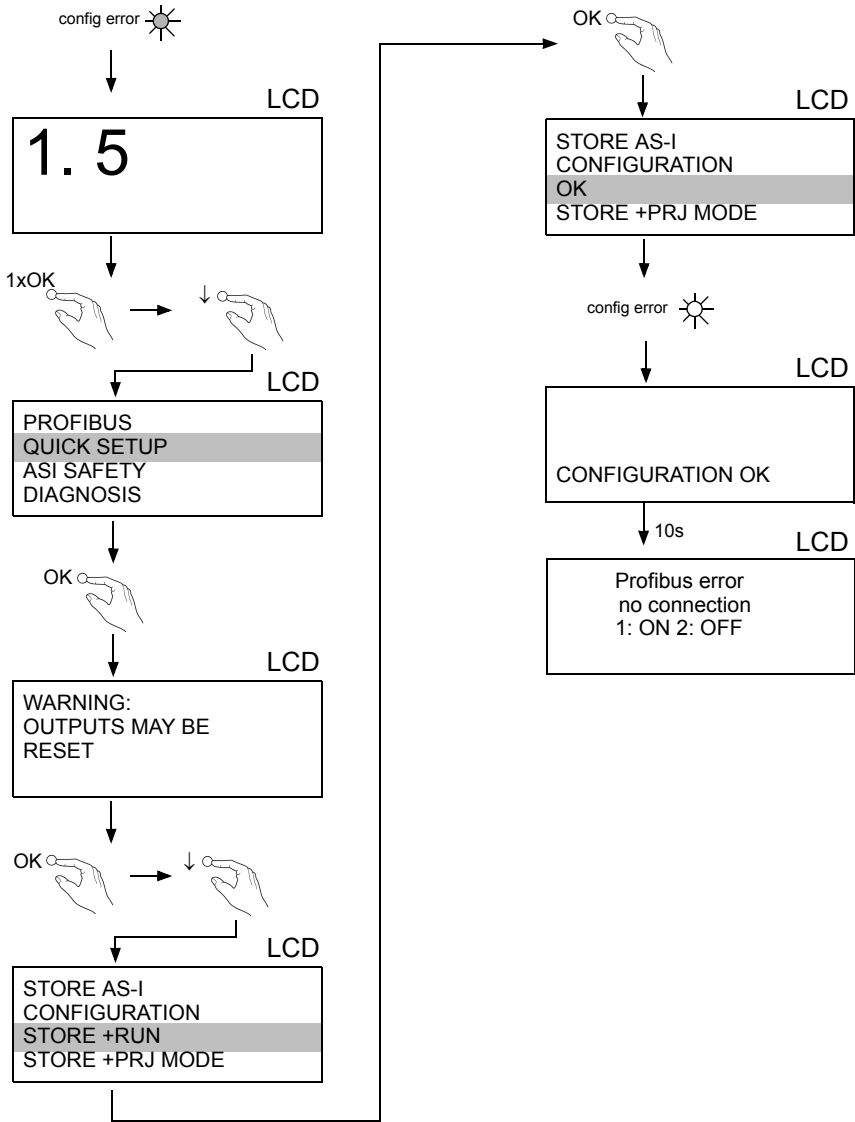




5.6.3 Connecting AS-i Slaves

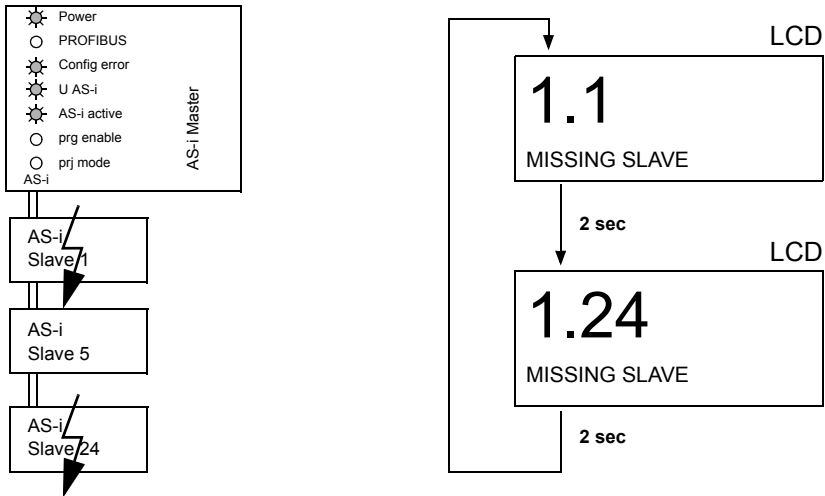


5.6.4 Quick setup

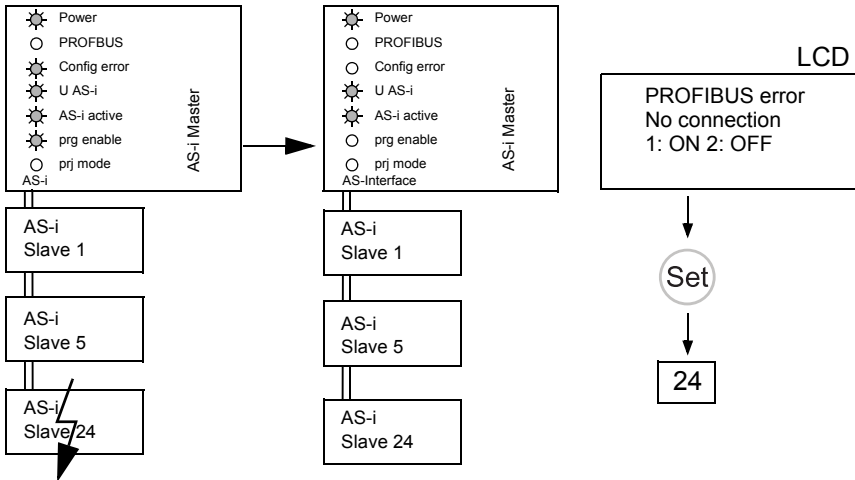


5.6.5 Error tracing

5.6.5.1 Faulty slaves

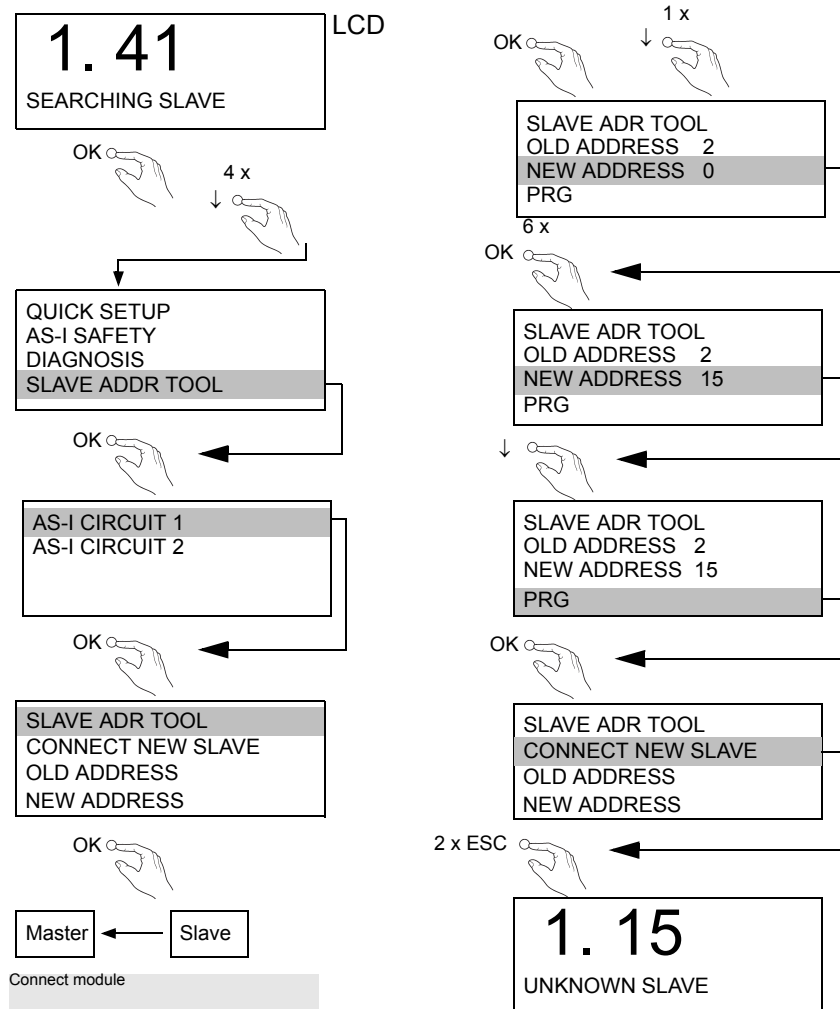


5.6.5.2 Error display (last error)



5.7 Addressing

5.7.1 Assigning address 15 to slave currently at address 2



Hinweis!

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

5.8

Local parameter setting of safe Gateways and Monitors

Nicht sichere Konfiguration // Non-safety configuration // Configuration non-sécurisée // Configurazione non sicura // Configuración no segura

- Karte nicht formatiert // Chip card not formatted // Carte à puce pas formatée // Scheda chip non formata // Tarjeta chip no formateada
- NEW CHIPCARD WILL BE FORMATTED DATA WILL BE SYNCHRONIZED**
- Karte wird formatiert // Chip card will be formatted // Carte à puce sera formatée // Scheda chip verrà formata // Tarjeta chip se formateará
 - Karte (ischen // Clear the card // Supprimer carte // Cancellare scheda chip // Borrar tarjeta chip
- CHIPCARD NOT COMPATIBLE**
- Konfiguration kompatibel (Werkskonfiguration) // Configuration compatible (factory settings) // Configurazione compatibile (configurazione d'usine) // Configuración compatible (configuración de fábrica)
- DATA FROM CHIPCARD TAKEN**
- Daten von Karte auf Gerät übertragen // Data transferred from chip card to device // Données transférées de la carte à puce au dispositif // Dati trasferiti dal chip card al dispositivo // Datos transferidos desde chip card de dispositivo
 - Keine Aktion erforderlich // No action required // Aucune action requise // Nessuna azione richiesta // Ninguna acción requerida
- DATA WILL BE SYNCHRONIZED**
- Daten werden vom Gerät auf Karte übertragen // Data transferred from device to chip card // Données transférées du dispositif à la carte à puce // Dati trasferiti dal dispositivo al chip card // Datos transferidos desde dispositivo de chip card
 - Keine Aktion erforderlich // No action required // Aucune action requise // Nessuna azione richiesta // Ninguna acción requerida
- CHIPCARD FOUND DATA WILL BE SYNCHRONIZED**
- Karte leer + formatiert // Chip card empty + formatted // Carte à puce vide + formatée // Scheda chip vuota + formata // Tarjeta chip vacía + formateada
 - Konfiguration auf Karte + Gerät ungleich (Werkskonfiguration geändert) // Configuration on chip card + device not identical // Configurazione sulla scheda chip + sul dispositivo non identici // Configuración en el tarjeta chip + dispositivo no idénticos
- Keine Meldung // No message // Nessun messaggio**
- Konfiguration auf Karte + Gerät gleich // Configuration on chip card + device identical // Configurazione sulla scheda chip + sul dispositivo identici // Configuración en el tarjeta chip + dispositivo idénticos
- CHIPCARD AND DATA DIFFERENT CARD->MASTER MASTER->CARD**
- Daten kopieren Karte -> Master oder Master -> Karte // Copy data Card -> Master or Master -> Card // Copier données Carte -> Maître ou Maître -> Carte // Copiare dati Chipcard -> Master o Master -> Chipcard // Copiar datos TarjetaChip -> Maestro o Maestro -> TarjetaChip

i

- CHIPCARD NO.
COMPATIBLE**

For further information see manual, section <Chip card>.

**SAFETY DATA WILL
BE SYNCHRONIZED**

- Karte löschen // Clear the card // Supprimer carte // Cancellare scheda chip // Borrare tarjeta chip

CHIPCARD FOUND
SAFETY DATA WILL
BE SYNCHRONIZED

- Sichere Konfiguration wird vom Gerät auf Karte übertragen // Safety configuration transferred from device to chip card //

COPY BANK TO MONITOR

- | | |
|---------------|----|
| RELEASE CODE: | |
| 1BDF | |
| ***** | |
| TYPE CODE | |
| 1BDF | OK |

Keine Meldung // No
message // Aucun
message // Nessun
messaggio // Ningún
mensaje

- Keine Aktion erforderlich //
No action required //

ERROR:
CHIPCARD AND
SAFETY DATA
DIFFERENT
DELET CHIPCARD
SAFETY DATA

- Datenquelle wählen // Select data source // Sélectionnez la source de données // Seleziona origine dati // Seleziona una fonte de datos

● **Sichere Konfiguration per Release-code freigeben //**
Validate safety configuration
 via release code // Validéz
 configuration sécurisée par
 code de déblocage //

● **Convalida di configurazione**
 sicurata tramite il codice di
 rilascio // Validación de la
 configuración segura a través
 de código de liberación

Convalida di configurazione
 sicurizza tramite il codice di
 rilascio // Validación de la
 configuración segura a través
 de código de liberación

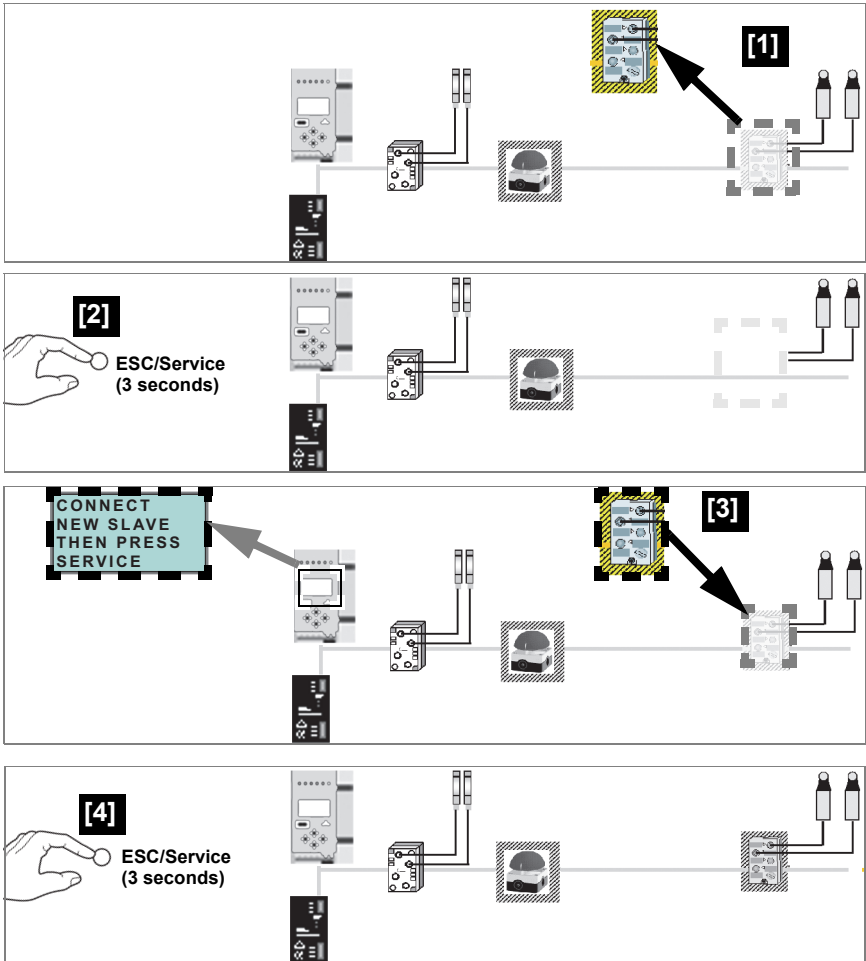
- Keine Aktion erforderlich // No action required // Aucune action requise // Nessuna azione richiesta // Ninguna acción requerida

• keine Aktion erforderlich //
no action required //
nessuna azione richiesta //
ninguna acción requerida

5.9 Replacing a defective safety-configured AS-i slave



The new slave must be able to send teaching codes and must have the same address as the old one. The addressing of the new slave is carried out automatically by default for all 'EUCHNER GmbH + Co. KG' AS-i Masters. Only one missing slave is allowed!

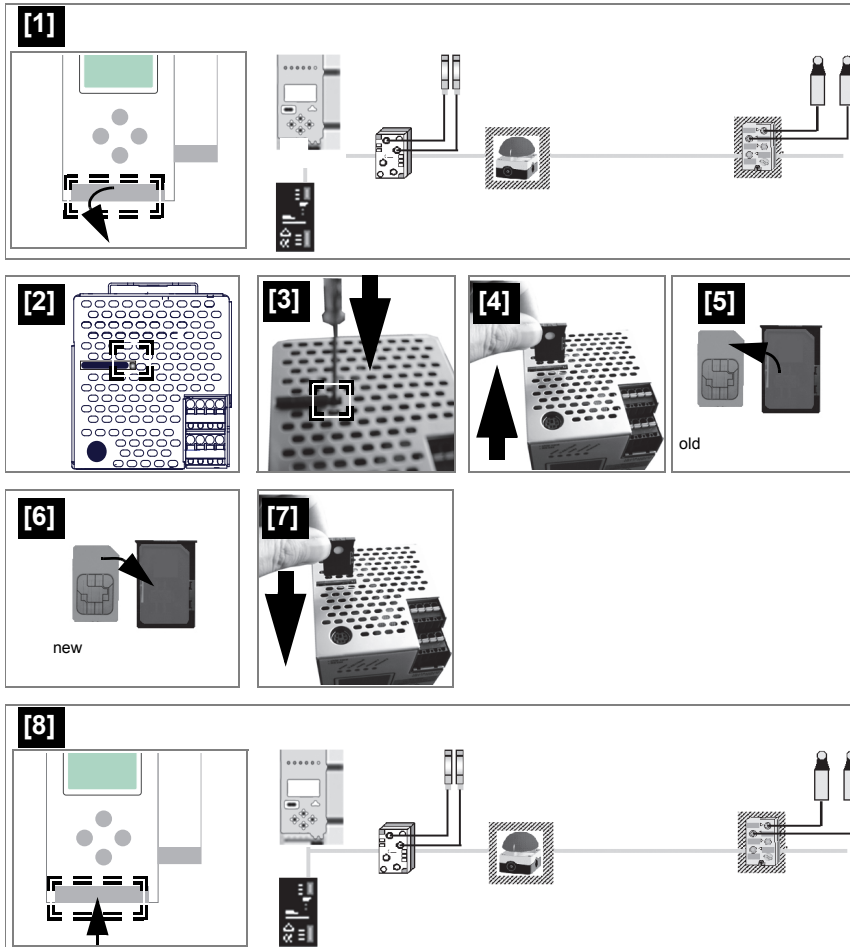


5.10 Replacing the chip card

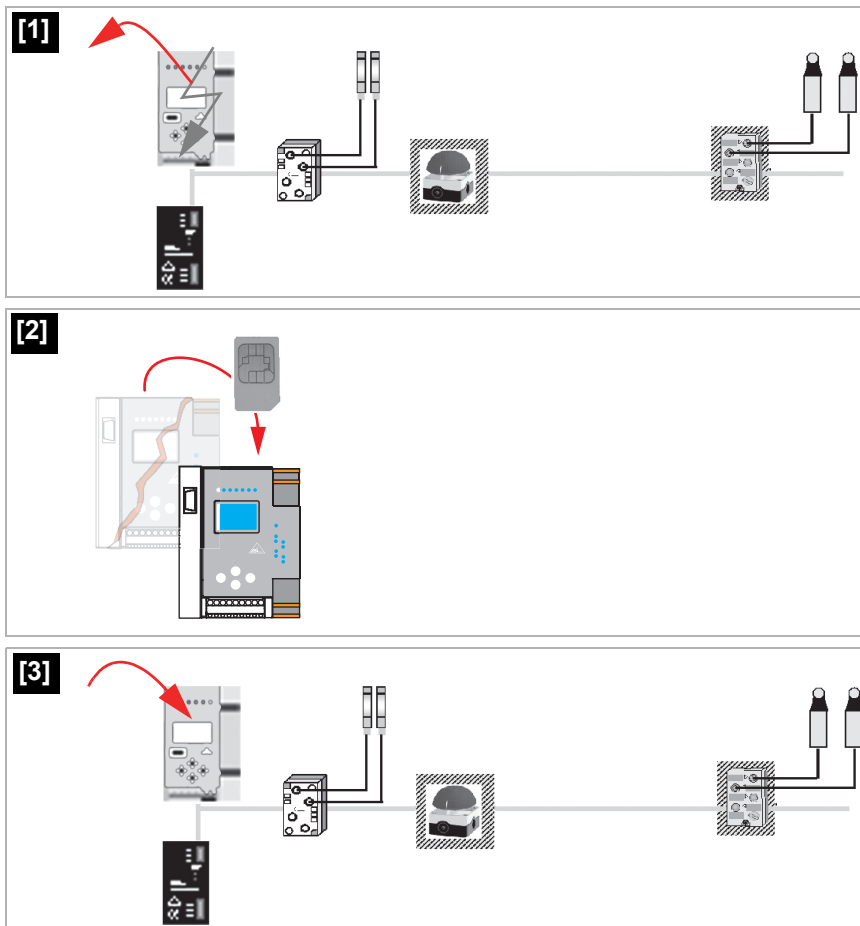


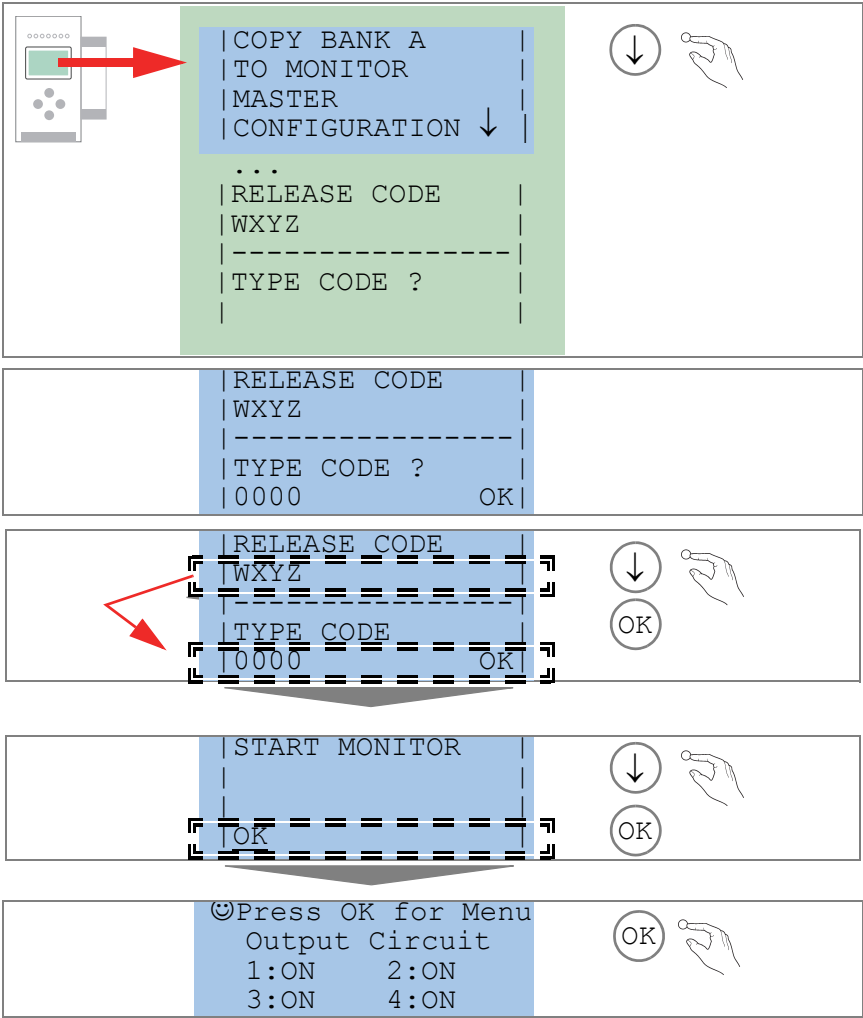
Caution!

Always turn off power before inserting or removing the card!

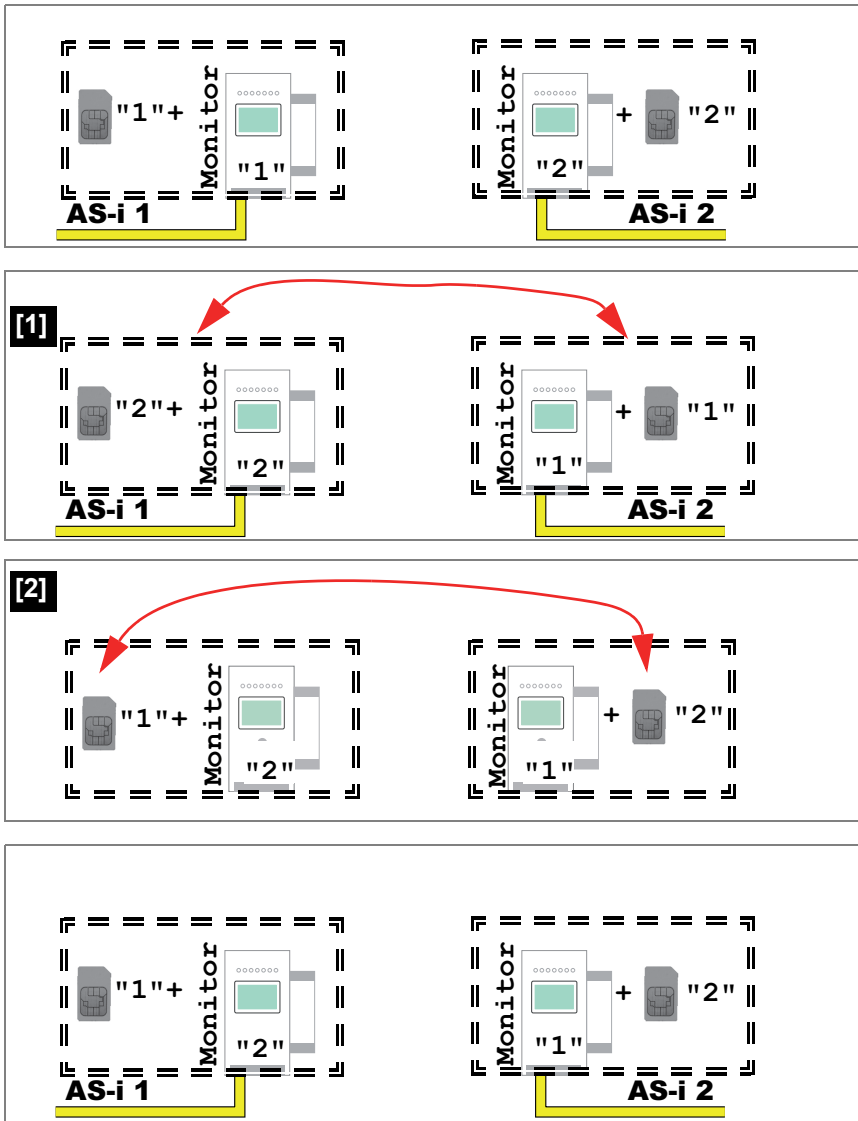


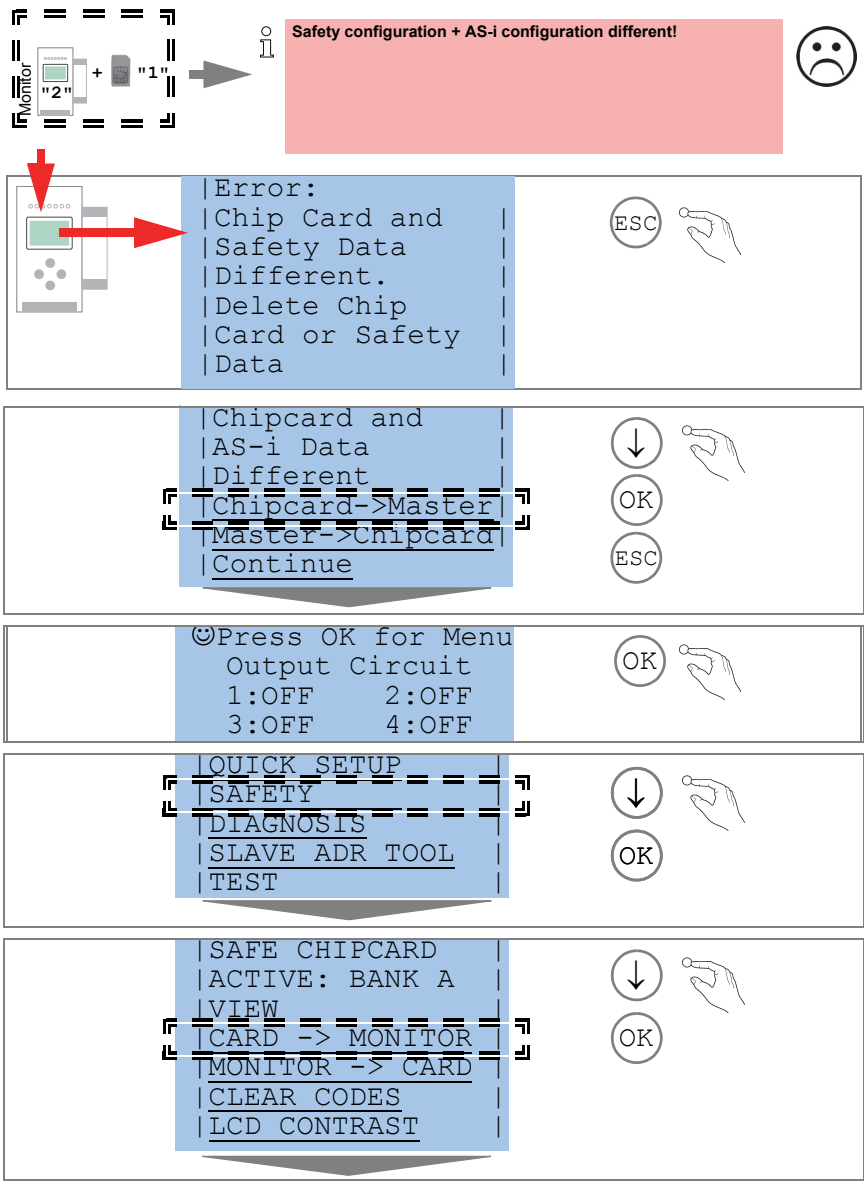
5.11 Replacing a defective device





















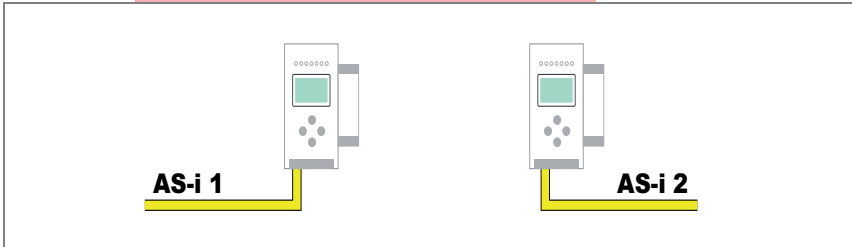
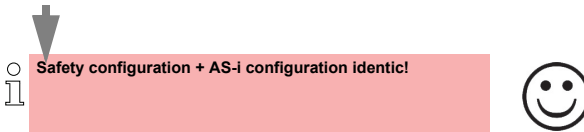


5.12 Replacing the monitor

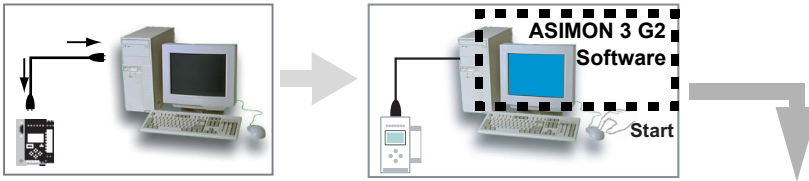




ENTER PIN <u>0000</u> <u>OK</u>	  
SELECT BANK <u>A</u> <u>OK</u>	  
STOP MONITOR <u>OK</u>	  
COPY BANK A to MONITOR RELEASE DATE: 2006/06/17 18:43 BY: ROLF BECKER CONFIG NAME: TEST SOFTWARE INSTALLATION INSTRUCTION V1.00 RELEASE CODE: 1BDF ----- TYPE CODE 1BDF	  
START MONITOR <u>OK</u>	   
☺Press OK for Menu Output Circuit 1:ON 2:ON 3:ON 4:ON	 



5.13 Safe configuration using ASIMON 3 G2



Caution!

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

ASIMON 3 G2 Software

Change the preset password "SIMON" 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**

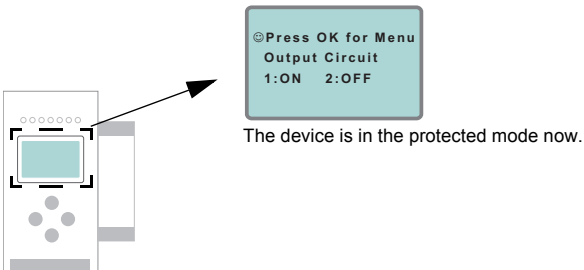
Check the configuration log (respect instructions in <chap. 5.8> of the ASIMON manual!).

**ASIMON 3 G2 Software**

Validate the configuration with MONITOR → VALIDATION.

**ASIMON 3 G2 Software**

Start the monitor with MONITOR → START.



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.



Execute Quick Setup once again in case of simulated slaves!



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

6. Maintenance

6.1 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>).

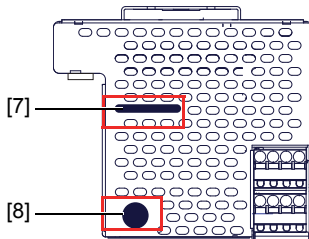
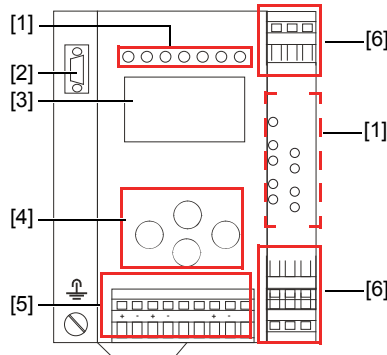
When the maximum turn-on duration is reached (three, six or twelve months), check the complete safety system and its proper function.

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

7. Electrical connection

7.1 Overview of terminals, indicators and operating elements

7.1.1 103374, 103302, 103373, 103267



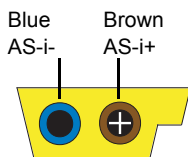
i		
	10	0,2 ... 2,5 mm ²
	10	0,2 ... 2,5 mm ²
AWG		24 ... 12

Legend:

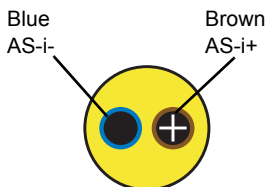
- [1] LEDs
- [2] D-SUB port (as PROFIBUS interface)
- [3] LC display
- [4] Buttons
- [5] Terminals: Supply voltage and AS-i circuit
- [6] Terminals: Safety unit
- [7] Chip card slot
- [8] RS 232 diagnostics port¹

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

7.2 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.

7.3 Information about the device types



Information!

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

7.4 AS-i and power supply terminal assignments



Information!

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

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



Information!

The function ground can be connected either to the grounding screw or to the terminal. The function ground should be made with as short a cable as possible to ensure good EMC characteristics.

Therefore function grounding using the grounding screw is preferred.



Caution

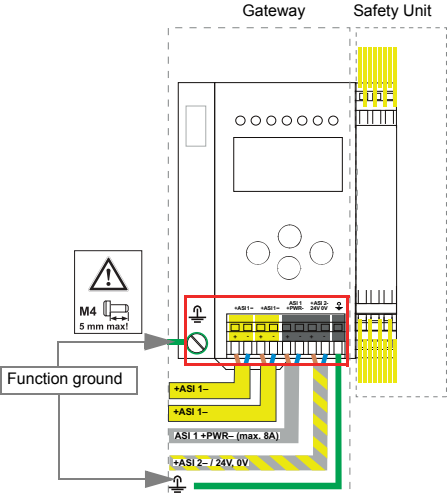
The AS-i power supply for the AS-i components must have isolation per IEC 60742 and be able to handle momentary power interruptions of up to 20 ms. The power supply for the 24 V supply must also have isolation per IEC 60742 and be able to handle momentary power interruptions of up to 20 ms. The maximum 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>.

7.4.1 Electrical connection 103373



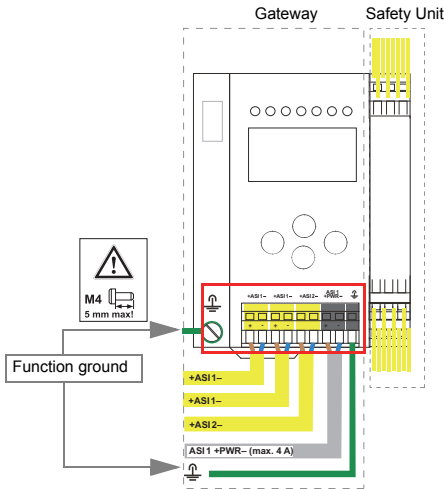
Terminal	Signal / Description
+ASI 1–	Connection to AS-i Circuit 1
ASI 1 +PWR–	Supply voltage for AS-i Circuit 1 (max. 8 A)
+ASI 2 – / 24 V, 0 V	Connection to AS-i Circuit 2; 24 V supply optional
FG	Function ground



Information!

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

7.4.2 Electrical connection 103267



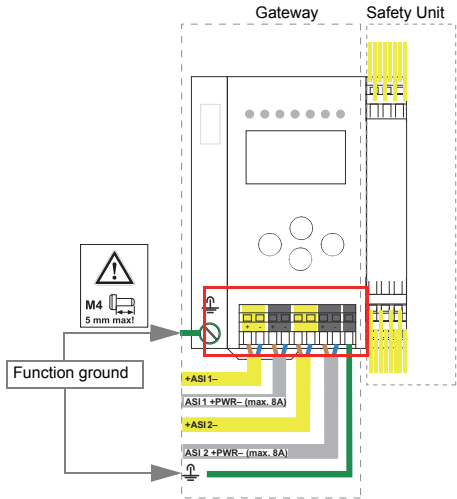
Terminal	Signal / Description
+ASI 1-	Connection to AS-i Circuit 1
+AS-i 2-	Connection to AS-i Circuit 2 (coupling slave)
ASI 1 +PWR-	Supply voltage for AS-i Circuit 1 (max. 4 A)
FG	Function ground



Information!

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

7.4.3 Electrical connection 103374



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

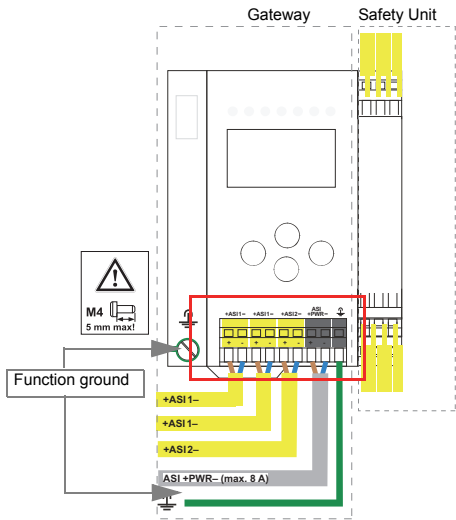


Information!
AS-i Circuits 1 and 2 are powered by separate power supplies.



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

7.4.4 Electrical connection 103302



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



Information!

AS-i Circuit 1 and 2 are both powered from a 'EUCHNER GmbH + Co. KG' power supply!

No other power supplies are approved!

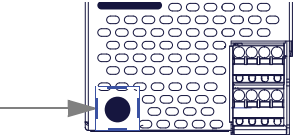


Information!

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

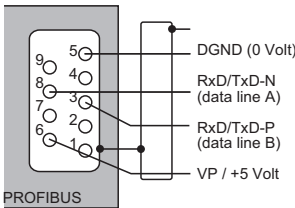
7.4.5 **Diagnostics interface**

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



7.5 **PROFIBUS interface**

The PROFIBUS interface is designed as a 9-pin D-SUB connector, in accordance with the PROFIBUS standard EN 50 170. It is located at the top left-hand side of the master.



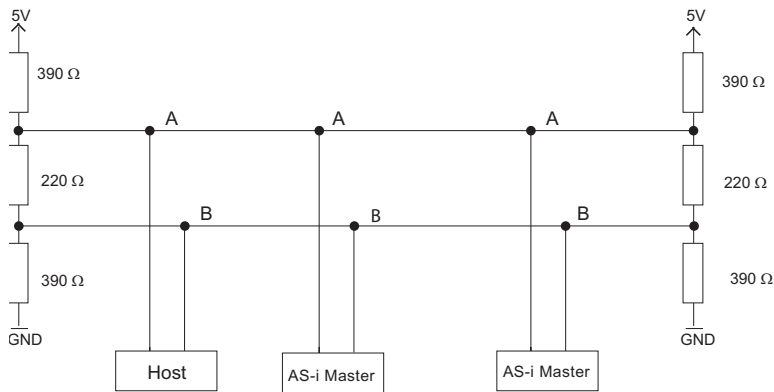
PIN	Designation of the D-SUB connector
Pin 3	Data line B („RxD/TxD-P“)
Pin 5	DGND (0 V)
Pin 6	VP / +5 V
Pin 8	Data line A („RxD/TxD-N“)

The AS-i/PROFIBUS gateway sends and receives signals on pins 3 and 8 of the D-SUB connector. The PROFIBUS signal “RxD/TxD-N (data line A)¹” is located on pin 8, the signal “RxD/TxD-P (data line B)¹” is located on pin 3.

Pin 5 (0 V) and pin 6 (5 V) supply 5 V DC for the bus termination resistor.

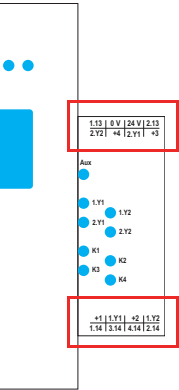
1. If you measure the DC voltage between RxD/TxD-P (data line B) and RxD/TxD-N (data line A), RxD/TxD-P (data line B) is the positive pole when the bus is silent.

7.5.1 Terminating resistors on the PROFIBUS network



7.6 Release circuits

7.6.1 Wiring overview of safety monitor



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

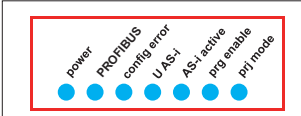
Semiconductor outputs are powered by separate 24 V DC.

+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}.

7.7 Indicators and operating elements

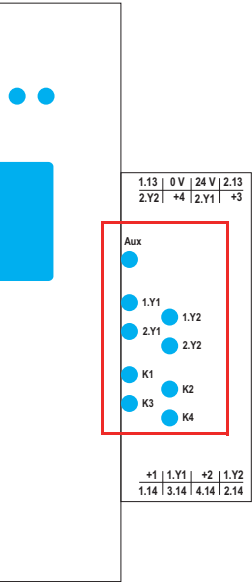
7.7.1 LED indicators – master



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

Power
The master is receiving sufficient power.
PROFIBUS
LED an: Gateway is allocated to a PROFIBUS Master. LED aus: Gateway is not allocated to a PROFIBUS Master.
config error
Configuration error. At least one configured slave is missing, or at least one detected slave is not configured, or for at least one configured and detected slave the actual configuration data does not match the nominal configuration data, or the master is in the startup process. This LED flashes if a peripheral fault has been detected for at least one AS-i slave on the AS-i network. If there are configuration errors as well as periphery faults, only the configuration error is displayed.
U AS-i
The AS-i network is sufficiently powered.
AS-i active
Normal operation is active
prg enable
Automatic single node replacement is enabled. Exactly one slave is missing in the protected operating mode. The slave can be replaced by another slave of the same type with address zero. The master automatically addresses the new slave to the faulty address and thus corrects the configuration error
prj mode
The AS-i master is in configuration mode.

7.7.2 LED indicators - monitor



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.

7.7.3 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>.

8. 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 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.

8.1 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.

8.2 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>.

3. 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>.

8.2.1 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.

8.2.2 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 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.

8.2.3 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 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.

8.3 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.

8.4 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
- PROFIBUS
- **ASIMON 3 G2** software over diagnostic port

- AS-i Control Tools over diagnostic port or PROFIBUS

The following diagnostics can be displayed (see section <DIAGNOSTICS>):

- Display of the switching state of the outputs
- State ("color") of the devices and sub-devices¹; distinction when turning off only half ("Category 2")
- Error history for finding the cause of sporadic errors

8.4.1 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.

8.5 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.

8.5.1 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.

1. For the sake of better diagnostics that procedure is being expanded using a Device/Device Color for adding diagnostics based on AS-i addresses (sub-devices) and their states.

- 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	•	• <i>(only from chip card)</i>
Stopping	•	•
Releasing	•	–
Starting	•	•
Teaching code sequences	•	•
Changing the password	•	• <i>(only from chip card)</i>
Changing the PIN	–	•

Legend:

"•" = possible;

"–" = not possible

Tab. 8-8.

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 display mode>).

8.5.2 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>.

8.6 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.

8.7 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.

8.7.1 Unsafe data

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

8.7.1.1 Card unformatted

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

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

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

8.7.1.2 Data not compatible

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

```
CHIPCARD NOT  
COMPATIBLE
```

8.7.1.3 Card empty

The following message is displayed for an empty card:

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

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

8.7.1.4 Data compatible

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

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

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

8.7.1.5 Data in the device and on the chip card identical

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

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

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

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

Description

CHIP CARD>MASTER: Chip card data are copied to the master

MASTER->CHIPCARD: Master data are copied to the chip card

NEXT: No change to the data

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

8.7.2 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.

8.7.2.1 Data incompatible

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

```
CHIPCARD NOT  
COMPATIBLE
```

8.7.2.2 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
```

8.7.2.3 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.

8.7.2.4 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.

8.7.2.5 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.

8.7.2.6 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.

8.7.3 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 PROFIBUS Gateway with integrated 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.

9. Operation in advanced display mode

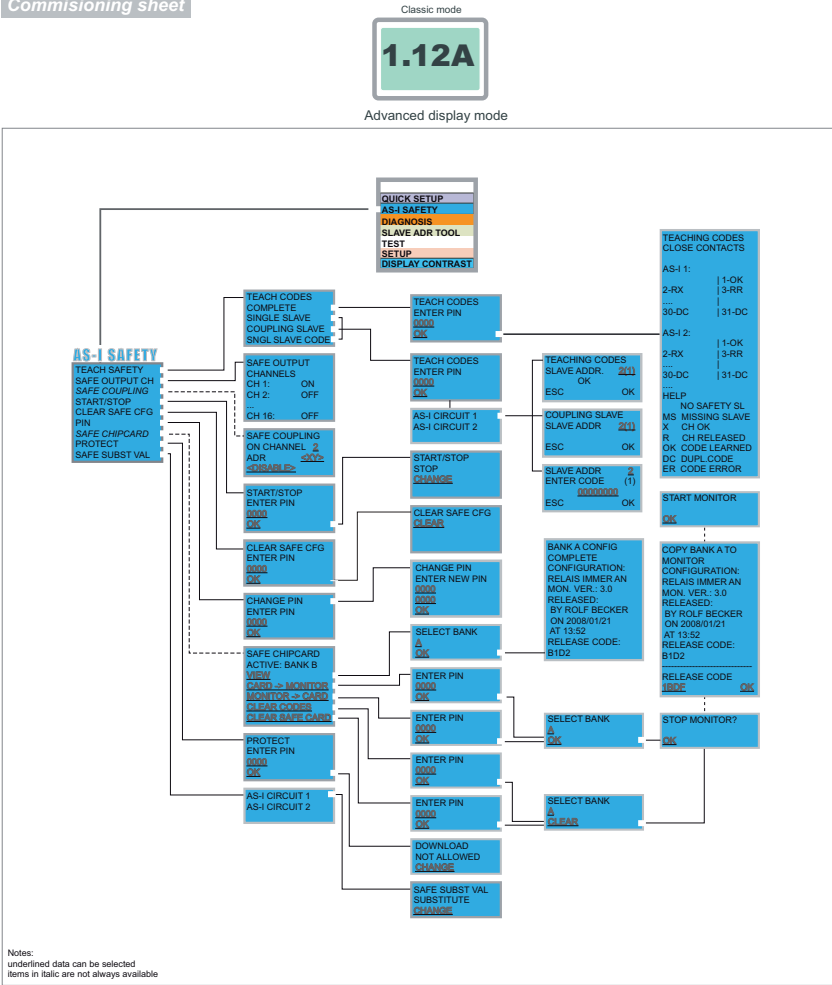


Information!

From SETUP/LANGUAGE you can set the desired menu language (German, English, French, Italian or Spanish), see <Language (menu language)>.

9.1 Overview

Commissioning sheet



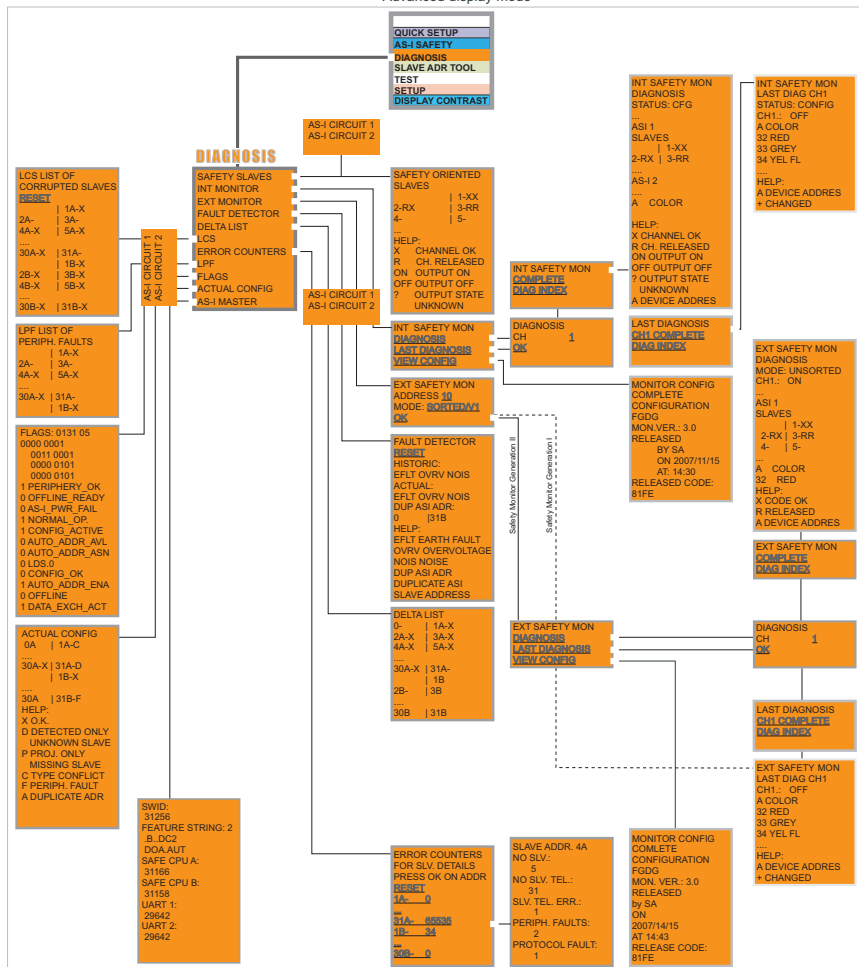
Basic Operation

The device starts in the traditional mode. You can switch between the two modes with ESC or OK. In the advanced mode the cursor is moved by both arrow buttons. Pushing OK puts you to the superior menu (in the drawing one step to the right side). ESC puts you back to the previous menu. To edit data you first mark them with the cursor and then select them with OK, change them with the arrow buttons and finally apply them with OK. Pushing ESC cancels the editing.

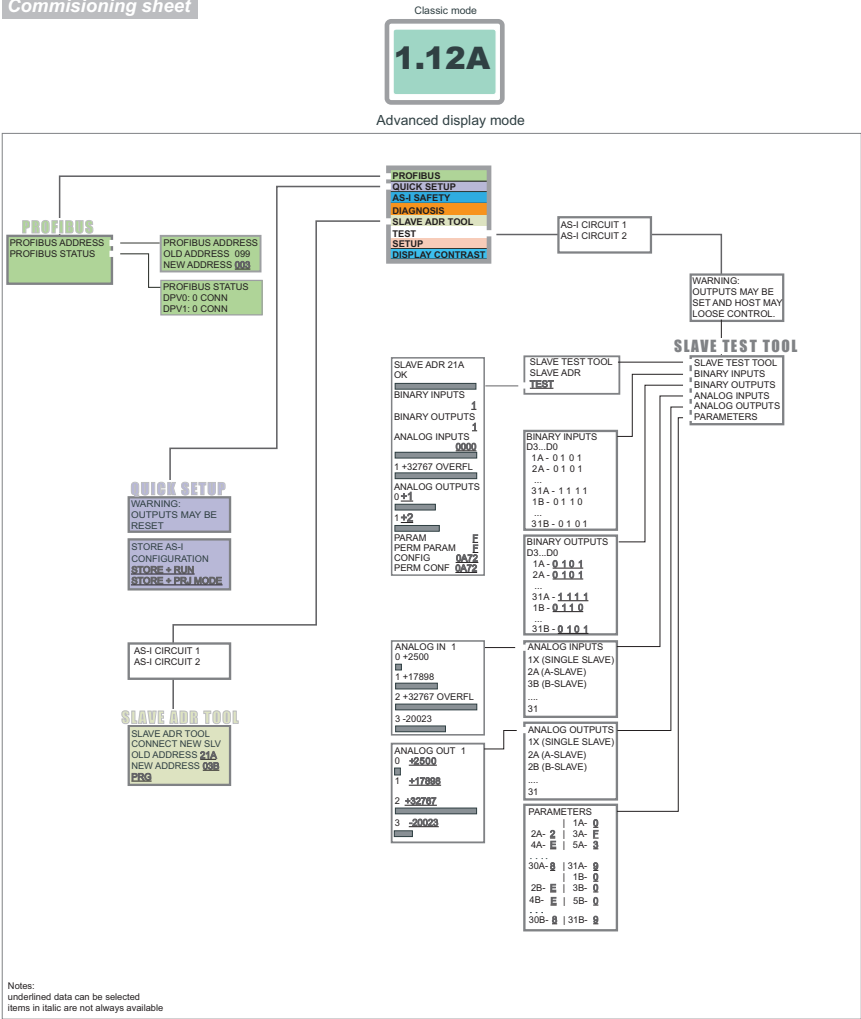
Classic mode

1.12A

Advanced display mode



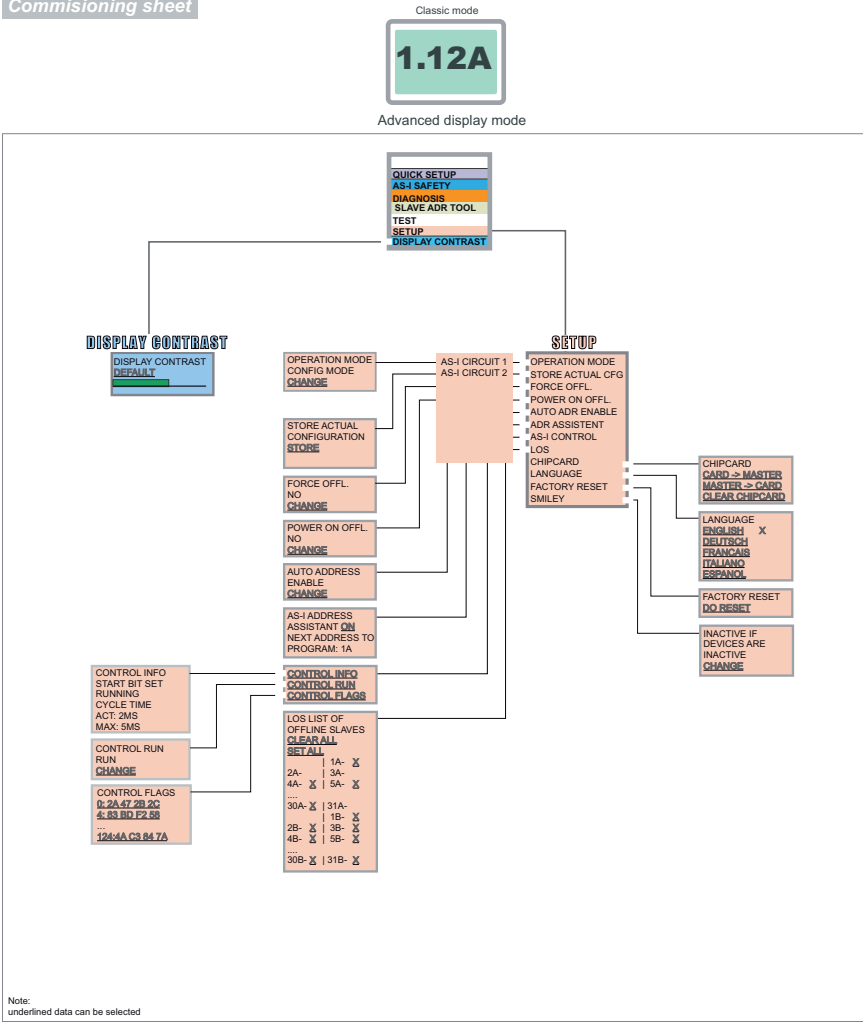
Commissioning sheet



Basic Operation

The device starts in the traditional mode. You can switch between the two modes with ESC or OK. In the advanced mode the cursor is moved by both arrow buttons. Pushing OK puts you to the superior menu (in the drawing one step to the right side). ESC puts you back to the previous menu. To edit data you first mark them with the cursor and then select them with OK, change them with the arrow buttons and finally apply them with OK. Pushing ESC cancels the editing.

Commissioning sheet



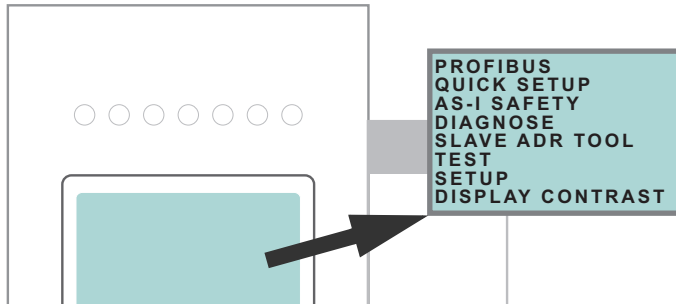


Warning!

Classical (Traditional) mode does not guarantee any protection of the settings of the device!

In the classical mode, it is possible to change settings while the device is in operation. This can lead to failures of the installation/process (for example changing the address of an AS-i slave).

9.2 Navigating through the advanced display mode



Information!

Some of the settings in the advanced mode are protected as long as the PROFIBUS Master Class 1 is running. That means that some status information can be displayed only.

To protect the installation/process, many options such as "change address", "write parameter", "set outputs", etc. cannot be performed with an active connection to the control system (active PROFIBUS masters Class 1Busconnection). In order to execute these commands via the display, the connection to the control system must be deactivated first (no PROFIBUS Master Class 1 connection).

The device starts up in the classical mode. Pressing the OK button switches to the advanced mode. To return to the classical mode, the ESC/service button must be pressed several times.

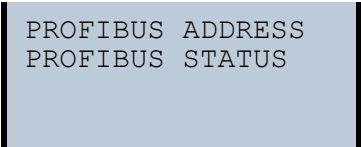
In the advanced mode, the selection menu can be moved up and down by using the two arrow buttons. Pressing OK switches to the selected function or to the displayed menu, respectively. Pressing ESC/service returns to the previous menu.

To edit a value it must be highlighted by using the selection bar and then pressing OK. The data can be changed by using the arrow-buttons. Changes are confirmed with OK. The ESC/service button cancels the editing process.

All possible slave addresses are displayed in sequence from 1 A to 31 A and from 1 B to 31 B. Data for single slaves are displayed along with the addresses 1 A to 31 A.

9.3 PROFIBUS (main menu)

Main menu || PROFIBUS ||

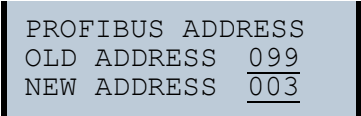


This menu enables PROFIBUS configuration and diagnostics.

PROFIBUS ADDRESS: setting of the PROFIBUS station address.
PROFIBUS STATUS: status of PROFIBUS connections.

9.3.1 PROFIBUS ADRESSE (PROFIBUS Station Address)

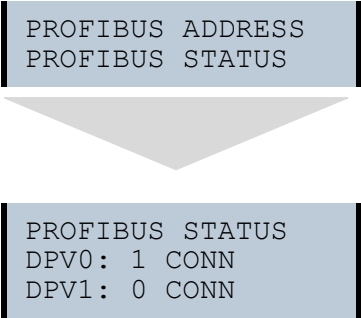
Main menu || PROFIBUS || PROFIBUS ADDRESS ||



This function is used to set and change the PROFIBUS station address.
The number following "Old Address" shows the current station address. By selecting "New Address", the address can be changed.

9.3.2 PROFIBUS STATUS

Main menu || PROFIBUS || PROFIBUS STATUS ||



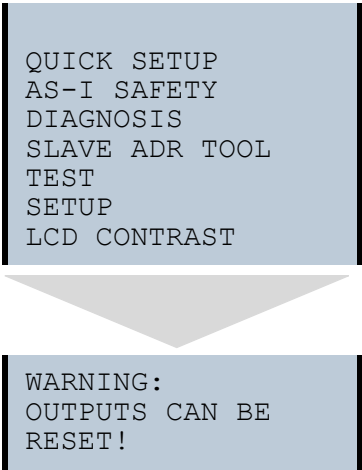
The function PROFIBUS Status indicates if and how many connections are active on each PROFIBUS channel.

DP/V0: number of active cyclic connections.
DP/V1: number of active acyclic connections.

9.4 QUICK SETUP

Main menu || **QUICK SETUP** ||

This menu enables a quick configuration of the AS-i network.



```
QUICK SETUP
AS-I SAFETY
DIAGNOSIS
SLAVE ADR TOOL
TEST
SETUP
LCD CONTRAST
```

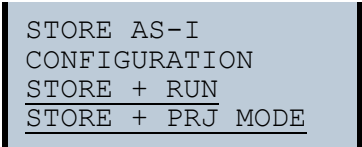
```
WARNING :
OUTPUTS CAN BE
RESET !
```



Warning!

Outputs can be reset!

Pressing "OK" switches the user to the sub menu "Store AS-i Configuration".



```
STORE AS-I
CONFIGURATION
STORE + RUN
STORE + PRJ MODE
```

Store+Run

Pressing "OK" stores the detected configuration and the detected slaves on the AS-i network as the active configuration. The gateway then switches to the protected operating mode.

Store + Prj Mode

Pressing "OK" stores the detected configuration and the detected slaves on the AS-i network as the active configuration. The gateway remains in configuration mode.

Pressing "ESC" leaves this menu and switches back to the main menu.

9.5 AS-I SAFETY

Main menu || AS-I SAFETY || CODEFOLGEN ||

```
QUICK SETUP
AS-I SAFETY
DIAGNOSIS
SLAVE ADR TOOL
TEST
SETUP
DISPLAY CONTRAST
```

```
TEACH CODES
SAFE OUTPUT CH.
SAFE COUPLING
START/STOP
CLEAR SAFE CFG
PIN
SAFE CHIPCARD
PROTECT
SAFE SUBST VAL
```

This menu enables the following functions:

TEACH CODES:	Teaching the code sequences using the display
SAFE OUTPUT CH:	Display function for the status of the individual channels
SAFE COUPLING:	Generating safe coupling slaves on the second AS-i circuit (Optional Menu) ¹
START/STOP	Changing mode Safe operating mode / configuration mode
CLEAR SAFE CFG:	Deleting the safe configuration
PIN:	Changing the PIN number
SAFE CHIPCARD:	Chip card configuration
PROTECT:	Protecting the configuration on the chip card
SAFE SUBST VAL:	Activation/deactivation of the code substitute function for safe slaves

1. This function is only displayed if no coupling slaves were entered in the configuration.

9.5.1 TEACH CODES

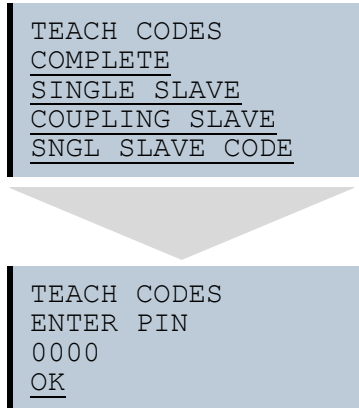
The TEACH CODES menu enables teaching of code sequences using the display.

9.5.1.1 TEACH CODES – COMPLETE

Main Menu || AS-I SAFETY || TEACH CODES || **TEACH CODES COMPLETE** ||

In the sub-menu TEACH CODES COMPLETE you teach the code tables for all included safety AS-i slaves.

First enter the PIN and confirm with OK.



If the PIN was correctly entered, the Monitor is stopped and the following information appears:

```
TEACHING CODES
CLOSE CONTACTS
```

```
AS-I 1:
      | 1-OK
2-RX | 3-RR
.... |
30-DC | 31-DC
```

```
AS-I 2:
      | 1-OK
2-RX | 3-RR
.... |
30-DC | 31-DC
```

```
....
HELP
      NO SAFETY SL
MS MISSING SLAVE
X CH OK
R CH RELEASED
OK CODE LEARNED
ER CODE ERROR
DC DUPL.CODE
```

**Information!**

If all safety AS-i slaves have been successfully taught, the first line in the display changes from TEACHING CODES to CODES LEARNED.

All safety contacts (also in sequence) must be closed for the safety unit to learn the code sequences. Incomplete code tables are not learned.

Press on ESC/Service to quit learning. It is then possible to restart the Monitor:

```
START MONITOR?
```

```
OK
```

**Information!**

See also <Procedure for configuring and teaching code sequences>.

9.5.1.2 SINGLE SLAVE

Main Menü || AS-I SAFETY || TEACH CODES || **SINGLE SLAVE** ||

This menu point allows you to teach the code table for a safe slave. Proceed as follows:

- Use the arrow keys to navigate to the third line (0000) on the display
- Enter the PIN there
- Use the arrow keys to navigate to the fourth line (OK) on the display
- Confirm your entries with OK

```
TEACH CODES
ENTER PIN
0000
OK
```

In the following menu:

- Use the arrow keys to select the AS-i circuit (1/2)
- Confirm with OK

```
AS-i CIRCUIT 1
AS-i CIRCUIT 2
```

After selecting the AS-i circuit the safe unit switches to configuration mode.

In the following menu:

- Use the arrow keys to navigate to the second line (--1) on the display

```
TEACH CODES
SLAVE ADDR.  --1
ESC          OK
...
HELP        ↓
```

- Confirm with OK (display flashes)
- Use the arrow keys to enter the desired address
- Confirm with OK (display stops flashing)
- Use one of the two arrow keys to exit the input screen
- Save with OK, or cancel the process by pressing ESC.



Information!

Be sure that all slave contacts on the corresponding slave are closed.

The teaching procedure was successful if an OK appears in the third line.

The graphical symbols indicate the state of the contacts:

Message	Description
RR	Both contacts open
RX	Left contact open, right contact closed.
XR	Right contact open, left contact closed.

Press the OK key to save the learned code table or press ESC to discard it.

9.5.1.3 COUPLING SLAVE

Main Menu || AS-I SAFETY || TEACH CODES || **COUPLING SLAVE** ||

This menu point allows you to teach the code table for a coupling slave. To continue, enter the PIN and confirm with OK.

```
TEACH CODES
ENTER PIN
0000
OK
```

In the following menu you select the AS-i circuit.

```
AS-i CIRCUIT 1
AS-i CIRCUIT 2
```

After selecting the AS-i circuit the safe unit switches to configuration mode.

Then enter the slave address.

```
COUPLING SLAVE
SLAVE ADDR.  --1

ESC
```

The teach procedure was successful if after approx. 2 s an OK appears in the display.

```
COUPLING SLAVE
SLAVE ADDR.  --1

ESC          [OK]
```

Save with OK, or cancel the process by pressing ESC.

9.5.1.4 INPUT CODE SEQ.

Main Menu || AS-I SAFETY || TEACH CODES || **INPUT CODE SEQ.** ||

This menu point allows you to directly enter the code sequence for a particular AS-i safety slave. If the slave address is already indicated, you can directly enter the sequence using the keys and then save or discard it.

To continue, enter the PIN and confirm with OK.

```
TEACH CODES
ENTER PIN
0000
OK
```

In the following menu you select the AS-i circuit.

```
AS-i CIRCUIT 1
AS-i CIRCUIT 2
```

After selecting the AS-i circuit the safe unit switches to configuration mode.

Then enter the code sequence.

```
SLAVE ADDR      --
ENTER CODE       1
      00000000
ESC              OK
```

If no error message is displayed, the teach procedure was successfully completed.

Use OK to save the entries and return to the previous menu. Use ESC to cancel the procedure.

9.5.2 SAFE OUTPUT CH (channels for the release circuits)

Main Menu || AS-I SAFETY || **SAFE OUTPUT CH** ||

```
SAFE OUTPUT
CHANNELS
CH 1:  ON
CH 2:  OFF
...
CH 16: OFF
```

In this menu you can read off the status of the 16 release circuits.

9.5.3 SAFE COUPLING (optional menu)

Main menu || AS-I SAFETY || **SAFE COUPLING** ||

```
SAFE COUPLING
ON CHANNEL      2
<ADR           00>
<ENABLE>
```



Information!

This menu is only displayed if there are no coupling slaves in the configuration.

On the 2nd AS-i circuit up to two safe AS-i slaves (coupling slaves) can be created which represent the states of the first two release circuits.

```
SAFE COUPLING
ON CHANNEL      2
<ADR           10>
<DISABLE>
```

After entering the address (using the arrow keys) and confirming (with OK), the display changes from ENABLE to DISABLE. Selecting DISABLE sets the address to "00".

For additional information refer to <Safe coupling slaves on the AS-i circuits>.

9.5.4 START/STOP (changing the Monitor mode)

Main Menu || AS-I SAFETY || **START/STOP** ||

```
START/STOP
ENTER PIN
0000
OK
```

```
START/STOP

STOP
```

In this menu you change the mode of the Monitor.

START: Sets the Monitor to protecting operating mode

STOP: Sets the Monitor to configuration mode

9.5.5 CLEAR SAFE CFG (delete safe configuration)

Main Menu || AS-I SAFETY || **CLEAR SAFE CFG** ||

```
CLEAR SAFE CFG
ENTER PIN
0000
OK
```

In the CLEAR SAFE CFG menu the stored safe information is deleted. This procedure is PIN protected.

9.5.6 PIN (changing the PIN)

Main Menu || AS-I SAFETY || PIN || **CHANGE PIN** ||

```
CHANGE PIN
ENTER PIN
0000
OK
```

```
CHANGE PIN
ENTER NEW PIN
0000
0000
OK
```

In this menu you change the PIN. This procedure is protected by entering the previous PIN.



Information!

The default setting for the PIN is "0000" and must not be changed.

9.5.7 SAFE CHIPCARD

Main Menu || AS-I SAFETY || **SAFE CHIPCARD** ||

```
SAFE CHIPCARD
ACTIVE: BANK B
VIEW
CARD -> MONITOR
MONITOR -> CARD
CLEAR CODES
CLEAR SAFE CARD
```

In this menu you can manage the safe area of the chip card.

ACTIVE: BANK X	Displays the active bank on the chip card.
VIEW:	Reads out the safety configuration of a chip card bank.
CARD->MONITOR:	Copies the configuration of a chip card bank to the Monitor.
MONITOR->CARD:	Copies the Monitor configuration to a chip card bank.
CLEAR CODES:	Deletes the safety configuration on the Monitor.
CLEAR SAFE CARD:	Deletes a safe memory bank on the chip card.

9.5.7.1 VIEW BANK X CONFIG (view active bank)

Main Menu || AS-I SAFETY || SAFE CHIPCARD || VIEW || SELECT BANK || **BANK X CONFIG** ||



After selecting the desired memory bank and confirming with OK, the configuration is displayed.

For additional information refer to <Chip card>.

9.5.7.2 CARD → MONITOR (copy card data to the Monitor)

Main Menu || AS-I SAFETY || SAFE CHIP CARD || CARD → MONITOR ||
ENTER PIN || SELECT BANK || **COPY BANK X → MONITOR** ||

SAFE CHIPCARD
ACTIVE: BANK B
VIEW
CARD → MONITOR
MONITOR → CARD
CLEAR CODES
CLEAR SAFE CARD

ENTER PIN
0000
OK

SELECT BANK
A
OK

STOP MONITOR
OK

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

```
START MONITOR

OK
```

In this menu you send the safe configuration stored on the memory card to the EEPROM on the Monitor. Use the keys to set the release code and confirm with OK.

After a bank on the chip card has been written to, this bank is the active bank. To activate the new configuration, the Safety Monitor must be started.

9.5.7.3 MONITOR → CARD (copy Monitor data to the chip card)

Main Menu || AS-I SAFETY || SAFE CHIPCARD || MONITOR → CARD ||
ENTER PIN || SELECT BANK || **COPY X → CARD** ||

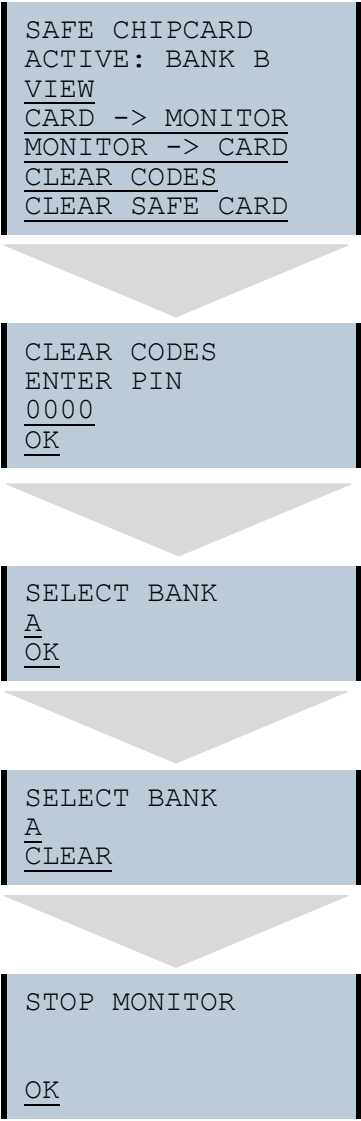
```
SAFE CHIPCARD
ACTIVE: BANK B
VIEW
CARD → MONITOR
MONITOR → CARD
CLEAR CODES
CLEAR SAFE CARD
```



In this menu you sent the safe configuration from the EEPROM on the Monitor to the memory card. This procedure is PIN protected.

9.5.7.4 CLEAR CODES (delete code sequences)

Main Menu || AS-I SAFETY || SAFE CHIPCARD || CLEAR CODES ||
ENTER PIN || SELECT BANK || **DELETE** ||



START MONITOR

OK

In this menu you delete the code sequences from the selected bank. This procedure is PIN protected.

9.5.7.5 CLEAR SAFE CARD

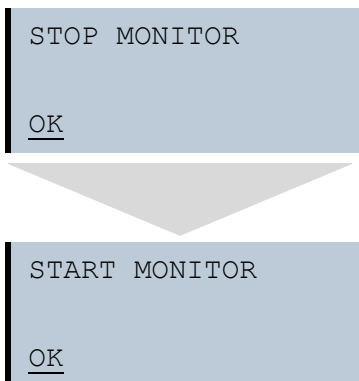
Main Menu || AS-I SAFETY || SAFE CHIPCARD || CLEAR SAFE CARD || ENTER PIN ||
SELECT BANK || **CLEAR** ||

SAFE CHIPCARD
ACTIVE: BANK B
VIEW
CARD -> MONITOR
MONITOR -> CARD
CLEAR CODES
CLEAR SAFE CARD

ENTER PIN
0000
OK

SELECT BANK
A
OK

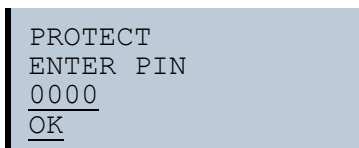
SELECT BANK
A
CLEAR



Using this menu you can delete the safe configuration from a chip card bank. This procedure is PIN protected.

9.5.8 PROTECT (protect safe configuration)

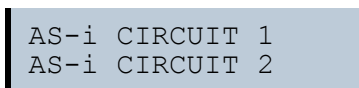
Main Menu || AS-I SAFETY || **PROTECT** ||



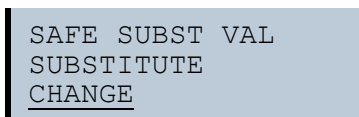
This function allows you to protect the safe configuration before downloading over the serial interface.

9.5.9 SAFETY SUBST VAL (Substitute values for input data from safe slaves)

Main menu || AS-I SAFETY || SAFETY SUBST VAL ||



When working with a double master (AS-i master and two AS-i circuits) the AS-i circuit must be selected first by using the arrow and the OK buttons.



This function enables activation/deactivation of the code substitute function for safe slaves.

SUBSTITUTE (values)

The safety code sequences are replaced by the following values:

Both channels are in the safe state: 0000_{bin}

Channel 1 is in the safe state: 0011_{bin}

Channel 2 is in the safe state: 1100_{bin}

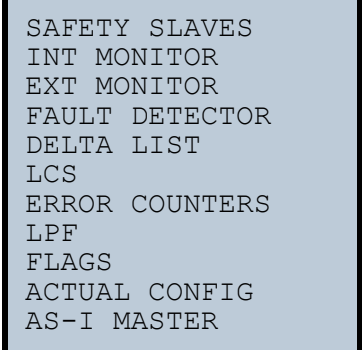
No channel is in the safe state: 1111_{bin}

NO SUBSTITUTE

The safety code sequences are transmitted via the input data.

9.6 DIAGNOSTICS

[Main menu](#) || **DIAGNOSIS** ||



```
SAFETY SLAVES
INT MONITOR
EXT MONITOR
FAULT DETECTOR
DELTA LIST
LCS
ERROR COUNTERS
LPF
FLAGS
ACTUAL CONFIG
AS-I MASTER
```

This menu contains the following sub-menus:

SAFETY SLAVES:	Safety input slaves
INT MONITOR:	Display the diagnosis data for the integrated Safety Monitor
EXT MONITOR:	Display the diagnosis data for the external Safety Monitors
FAULT DETECTOR:	Informations about the AS-i Fault Detector
DELTA LIST:	List of AS-i slaves with configuration error
LCS:	List of slaves having caused a configuration error
ERROR COUNTERS:	Fault counter for each single AS-i slave
LPF:	List of Peripheral Faults
FLAGS:	Display of the EC-Flags
ACTUAL CONFIG:	Display of the current configuration
AS-I MASTER:	Display of the software states

For additional information refer to chap. <Advanced Diagnostics for AS-i Masters>.

9.6.1 AS-i CIRCUIT (Selecting the AS-i circuit)

Main Menu || DIAGNOSIS || SAFETY SLAVES || **AS-i CIRCUIT** ||

```
AS-i CIRCUIT 1
AS-i CIRCUIT 2
```

Please select the required AS-i circuit using the arrow buttons and the OK button. Then you get the diagnostic menu.

9.6.2 SAFETY SLAVES (safety oriented slaves)

Main Menu || DIAGNOSIS || SAFETY SLAVES || **SAFETY ORIENTED SLAVES** ||

```
SAFETY ORIENTED
SLAVES

         | 1-XX
2-XR    | 3-RR
4-      | 5-
```

The list of “Safety Input Slaves” (“AS-i Safety at Work”) shows the slaves for which the safety function has been released.

The graphical symbols indicate the state of the contacts:

X: The channel is closed _____
R: The channel is open

The first place corresponds to Channel 2, the second place to Channel 1. Thus XR means that Channel 2 is OK and Channel 1 released.

The channels can not be evaluated individually, if the substitution of safety slaves input data was disabled in menu:

- command interface/ function profile

or

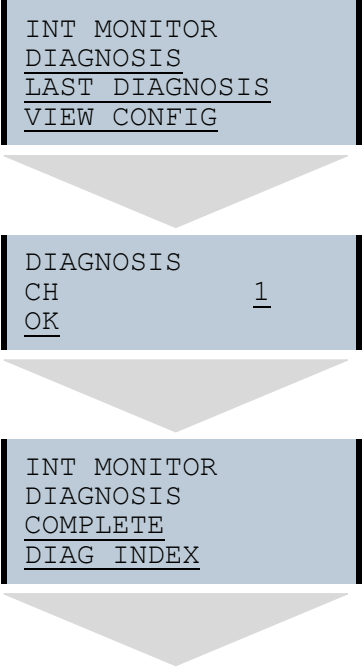
- slave value substitute (SAFETY SUBST VALUE).

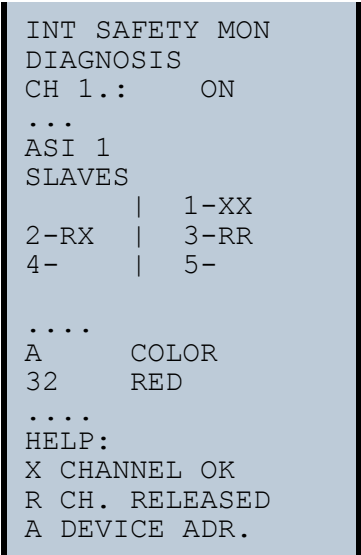
In this case both channels must have the same state, otherwise the indication will not be proper.

9.6.3 INT MON (internal monitor)

9.6.3.1 DIAGNOSTICS (Diagnostics for the internal monitor)

Main menu || DIAGNOSIS || INT MONITOR || **DIAGNOSIS** ||





This menu shows the status of the safety AS-i safe slaves and the diagnostics for the integrated Safety Monitor for each release circuit separately.

COMPLETE: The complete diagnostic is read out.

DIAG INDEX: The diagnostic is shown as it was configured under the "device_Index_Assignment" in ASIMON.

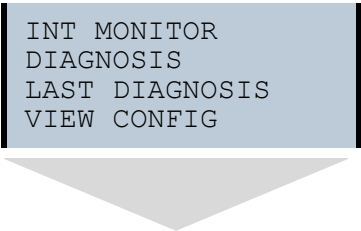


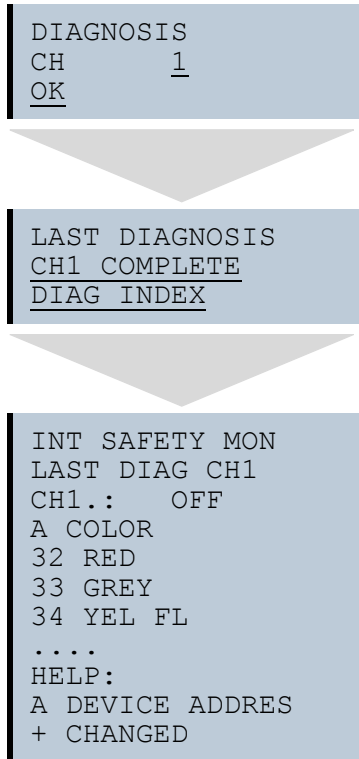
Information!

If the diagnosis is read using DIAG INDEX, the device count begins at 0, otherwise at 32!

9.6.3.2 LAST DIAGNOSIS (Last diagnostics for the int. monitor)

Main menu || DIAGNOSIS || INT MONITOR || **LAST DIAGNOSIS** ||





This menu displays the diagnosis at the time the Safety Monitor was deactivated.

Complete: The complete diagnostic is read out.

DIAG INDEX: The diagnostic is shown as it was configured under the "device_index_assignment" in ASIMON

For additional information, please refer to the <ASIMON> documentation.



Information!

If the diagnosis is read using DIAG INDEX, the device count begins at 0, otherwise at 32!

9.6.3.3 MONITOR CONFIG

Main Menu || DIAGNOSIS || MONITOR || VIEW CONFIG || **MONITOR CONFIG** ||

SAFETY MONITOR
DIAGNOSIS
LAST DIAGNOSIS
VIEW CONFIG

MONITOR CONFIG
COMPLETE
CONFIGURATION
FGDG
MON.VER.: 3.0
RELEASED
BY SA
ON 2007/11/15
AT: 14:30
RELEASED CODE:
81FE

This menu indicates which configuration is loaded in the integrated Safety Monitor.

9.6.4 EXT SAFETY MON (external monitor)

Main menu || DIAGNOSIS || EXT MONITOR || **EXT SAFETY MON** ||

EXT SAFETY MON
DIAGNOSIS
ADDRESS 10
MODE: SORTED/V1
OK

The AS-i Safety Monitor diagnostics reads the diagnostics data from the AS-i Safety Monitor and shows this diagnostics data in the display.

The menu item ADDRESS can be used to select the desired external monitor.

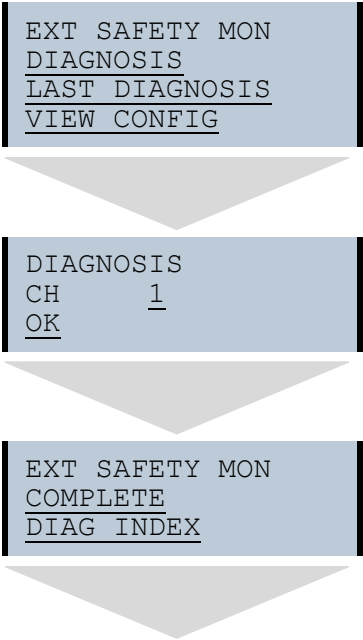
For additional information, please refer to the <ASIMON> documentation.

Generation 2 external monitors always have unsorted diagnostics.

9.6.4.1 DIAGNOSIS (Diagnostics for the external monitor)

Main menu || DIAGNOSIS || EXT MONITOR || EXT SAFETY MON || **DIAGNOSIS** ||

If the external Safety Monitor is a second generation version, this menu opens up.



```
EXT SAFETY MON
DIAGNOSIS
MODE: UNSORTED
CH1.:  ON

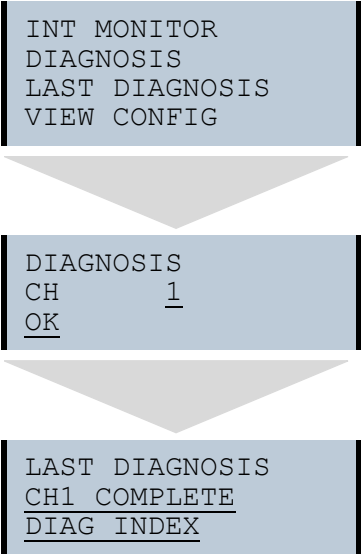
...
ASI 1
SLAVES
      | 1-XX
2-RX | 3-RR
4-   | 5-


...
A      COLOR
32     RED
HELP:
X CODE OK
R RELEASED
A DEVICE ADDRES
```

Just as with the internal Safety Monitor, here the current diagnostics and shut-down history can be read, see <INT MON (internal monitor)>.

9.6.4.2 LAST DIAGNOSIS (Last diagnostics for the int. monitor)

Main menu || DIAGNOSIS || INT MONITOR || **LAST DIAGNOSIS** ||





```
INT SAFETY MON
LAST DIAG CH1
CH1.:    OFF
A COLOR
32 RED
33 GREY
34 YEL FL
....
HELP:
A DEVICE ADDRES
+ CHANGED
```

This menu displays the diagnosis at the time the Safety Monitor was deactivated.

Complete: The complete diagnostic is read out.

DIAG INDEX: The diagnostic is shown as it was configured under the
"device_index_assignment" in ASIMON

For additional information, please refer to the <ASIMON> documentation.



Information!

If the diagnosis is read using DIAG INDEX, the device count begins at 0, otherwise at 32!

9.6.4.3 ACTUAL CONFIG (Configuration for the external monitor)

Main menu || DIAGNOSIS || EXT MONITOR || VIEW CONFIG || **MONITOR CONFIG** ||



```
EXT MONITOR
LAST DIAGNOSIS
VIEW CONFIG
```

```
MONITOR CONFIG
ASI ADDR: 10
SIM. SLAVES: 3
MON. VER.: 1.0
RELEASE DATE:
2006/06/17 18:43
BY:
ROLF BECKER
CONFIG NAME:
L3040 MIT LADEVO
RRICHTUNG LINK U
ND PALETTENWECHS
LER V1.23
RELEASE CODE:
1BDF
```

This menu indicates which configuration is loaded in the external Safety Monitor.

9.6.5 FAULT DETECTOR

Main menu || DIAGNOSIS || **FAULT DETECTOR** ||

```
FAULT DETECTOR
RESET
HISTORIC:
EFLT OVRV NOIS
ACTUAL:
EFLT OVRV NOIS
DUP ASI ADR:
    0          | 31B
HELP:
EFLT EARTH FAULT
OVRV OVERVOLTAGE
NOIS NOISE
DUP ASI ADDR
    DUPLICATE ASI
    SLAVE ADDRESS
```

The menu FAULT DETECTOR displays information about the AS-i fault detector and permits deleting the AS-i fault detector's history. Furthermore, a list of abbreviations in clear text is displayed in the HELP section.

By selecting RESET the history of the AS-i fault detector can be deleted.

The section HISTORIC lists the error messages generated by the AS-i fault detector since the last RESET.

The section ACTUAL lists the currently present error messages of the AS-i fault detector.

The following error messages are displayed:

- Duplicate address (displaying of 2 lowest slave addresses with duplicate addresses)
- Earth faults
- Noise
- Over-voltage

Optionally, the absence of the redundant 24 V for some single masters may be displayed.

9.6.6 DELTA LIST

[Main menu](#) || DIAGNOSIS || **DELTA LIST** ||

DELTA LIST		
0-		1A-X
2A-X		3A-X
4A-X		5A-X
...		
30A-X		31A-
		1B
2B-		3B
...		
30B		31B

The Delta List is a list of AS-i slaves with configuration error.

9.6.7 LCS (History of the slaves which have triggered a configuration error)

[Main menu](#) || DIAGNOSIS || **LCS** ||

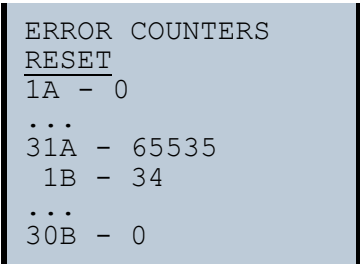
LCS LIST OF CORRUPTED SLAVES RESET		
		1A-X
2A-		3A-
4A-X		5A-X
...		
30A-X		31A-
		1B-X
2B-X		3B-X
4B-X		5B-X
...		
30B-X		31B-X

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.

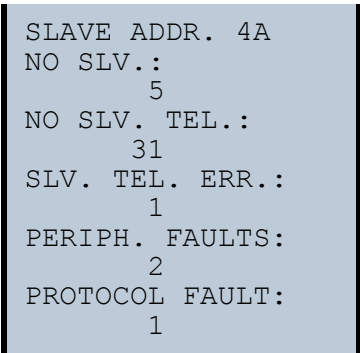
empty field: no error
X: AS-i Slave triggered a configuration error.

9.6.8 ERROR COUNTERS

Main Menu || DIAGNOSIS || ERROR COUNTERS ||



This list displays the fault counter for each single AS-i slave.
In addition, the number of voltage dropouts/undervoltage on AS-i (APF) is displayed.
Selecting RESET resets the fault counter to 0.
Selecting OK on a slave address displays a list with additional information:



Information	error discription
NO SLV	frequency of slave failure
NO SLV. TEL	number of missing slave telegrams
SLV. TEL. ERR	number of slave telegram errors
PERIPH. FAULTS	number of peripheral faults
PROTOCOL FAULT	number of superior protocol faults (i.e. CTT2)

9.6.9 LPF (List of Peripheral Faults)

Main menu || DIAGNOSIS || **LPF LIST OF PERIPH. FAULTS** ||

```

LPF LIST OF
PERIPH. FAULTS
          | 1A-X
2A-      | 3A-
4A-X     | 5A-X
...
30A-X    | 31A-
          | 1B-X
    
```

This list shows the list of slaves which have triggered peripheral faults (LPF).

Empty field: Peripheral O.K.

X: Peripheral fault

9.6.10 FLAGS

Main menu || DIAGNOSIS || **FLAGS** ||

```

FLAGS: 0131 05
        0000 0001
        0011 0001
        0000 0101
1  PERIPHERY_OK
0  OFFLINE_READY
0  AS-I_PWR_FAIL
1  NORMAL_OP.
1  CONFIG_ACTIVE
0  AUTO_ADDR_AVL
0  AUTO_ADDR_ASN
0  LDS.O
1  CONFIG_OK

1  AUTO_ADDR_ENA
0  OFFLINE
1  DATA_EXCH_ACT
    
```

This function displays the EC-flags in hexadecimal or binary format as well as single bits beginning with the least significant bit.

Arrangement of the bits within the byte:

Byte								
Byte value:	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
Bit:	7	6	5	4	3	2	1	0

Byte 1

Bit 0: Periphery_OK

This flag is set if none of the AS-i slave signals a peripheral fault.

Byte 2

Bit 0: Config_OK

The flag is set if the projected configuration is equal to the actual configuration.

Bit 1: LDS.0

The flag is set, if an AS-i slave with address 0 has been detected.

Bit 2: Auto_Addr_Asn

The flag is set if automatic addressing is possible (AUTO_ADDR_ENABLE = 1; no "incorrect" AS-i slave is connected to AS-i).

Bit 3: Auto_Addr_Avl

The flag is set if the automatic addressing is possible. This means that exactly one slave has failed.

Bit 4: Config_Active

The flag is set in configuration mode and is reset in protected mode.

Bit 5: Normal_Op.

The flag is set if the AS-i master is in normal operation.

Bit 6: AS-i Pwr Fail

The flag is set if the AS-i circuit is not sufficiently powered.

Bit 7: Offline_Ready

The flag is set if the AS-i master is offline.

Byte 3

Bit 0: Data_Exch_Act

If the flag "Data Exchange Active" is set, the data exchange with AS-i slaves is possible during the data exchange phase. If the bit is not set, the data exchange with AS-i slaves is inhibited. Instead of data telegrams READ_ID telegrams will be sent.

The bit is set by the AS-i master at the beginning of the offline phase.

Bit 1: Offline

This bit is set if the operating mode is supposed to be changing to offline or is already offline.

Bit 2: Auto_Addr_Ena

This flag indicates if automatic addressing has been disabled (bit = 0) or enabled (bit = 1) by the user.

9.6.11 ACTUAL CONFIG (actual slave configuration)

Main menu || DIAGNOSIS || **ACTUAL CONFIG** ||

ACTUAL CONFIG	
0A	1A-C
....	
30A-X	31A-D
	1B-X
....	
30A	31B-F
HELP:	
X O.K.	
D DETECTED ONLY	
UNKNOWN SLAVE	
P PROJ. ONLY	
MISSING SLAVE	
C TYPE CONFLICT	
F PERIPH. FAULT	
A DUPLICATE ADDR	

This function displays the status of the actual configuration of the individual AS-i slaves.

A help appears at the end of the list explaining the abbreviations:

- X (O.K.): The configuration data for the detected AS-i slave agree with the designed in configuration data.

- D (Detected Only): An AS-i slave is detected at this address, but it was not designed in.

- P (Projected Only): An AS-i slave was designed in at this address, but it was not detected.

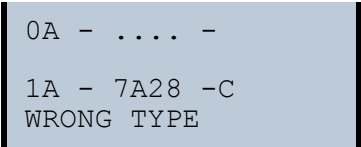
- C (Type Conflict): The configuration data for the detected AS-i slave do not agree with the designed in configuration data. The actual existing configuration of the connected AS-i slave is displayed.

- F (Periph. Fault): The AS-i slave has a peripheral error.

- A (Duplicate Adr.): Two AS-i slaves at the indicated address.

After selecting the desired AS-i slave address, the values for the current configuration data are displayed after the respective address in the following order:

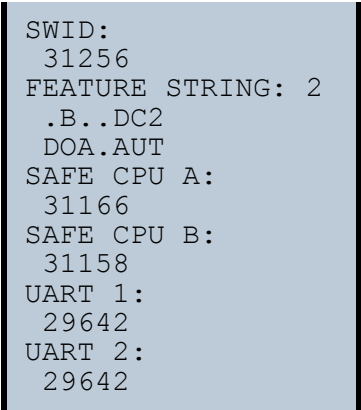
- IO (I/O-Configuration)
- ID (ID-Configuration)
- xID1 (extended ID1)
- xID2 (extended ID2).



In addition, the status of the configuration is shown in plain text.
If no AS-i slave is present at an address and none is designed in, four decimal points are displayed instead of the configuration data.

9.6.12 AS-I MASTER (Info)

[Main menu](#) || DIAGNOSIS || **AS-I MASTER** ||



This function shows information about the version and features of the AS-i master:

Information	Meaning
SWID	Software ID for the AS-i master
FEATURE String	Feature string for the AS-i master
SAFE CPU A	Software ID of the SAFE CPU A
SAFE CPU B	Software ID of the SAFE CPU B
UART 1	Software ID for the Safety UART 1
UART 2	Software ID for the Safety UART 2

9.7 SLAVE ADR TOOL

[Main menu](#) || **SLAVE ADR TOOL** ||

This function enables setting and changing the addresses of both new and already configured AS-i slaves. This function replaces the handheld AS-i address programming device.

Pressing the OK button continues with the actual test, ESC/SERVICE cancels the process.

```
SLAVE ADR TOOL
CONNECT NEW SLV
OLD ADDRESS
NEW ADDRESS
```

Now the new slave can be connected to the AS-i network. After connecting, the current address of the slave is displayed as OLD ADDRESS and the message CONNECT NEW SLV disappears.

To assign a new address to the slave the menu entry NEW ADDRESS must be selected. Afterwards the new address can be selected by using the arrow buttons. The selected address is assigned by selecting PRG on the menu and pressing the OK button.

```
SLAVE ADR TOOL
CONNECT
OLD ADDRESS  21A
NEW ADDRESS  03B
PRG
```

If an error occurs while addressing a slave, one of the following error messages is displayed for about 2 seconds:

Failed: SND: Slave with old address has not been detected.

Failed: SD0: Slave with address 0 already exists.

Failed: SD2: Chosen slave address already exists.

Failed: DE: AS-i slave address cannot be deleted.

Failed: SE: Error setting new address for AS-i slave.

Failed: AT: New address for AS-i slave could be stored temporarily only.

Failed: RE: Error reading extended ID1-code.



Information!

When working with a double master (AS-i master and two AS-i networks) the AS-i network must be selected first by using the arrow and the OK buttons.

```
AS-i CIRCUIT 1
AS-i CIRCUIT 2
```

9.8 TEST (Test tools for slaves)

Main menu || TEST ||

After selecting the menu TEST a warning message is displayed, pointing out, that it is possible during this test that outputs are set and that the host may loose control over the network.

```
WARNING :  
OUTPUTS MAY BE  
SET AND HOST MAY  
LOOSE CONTROL.
```

Pressing the OK button continues with the actual test, ESC/SERVICE cancels the process.

```
SLAVE TEST TOOL  
BINARY INPUTS  
BINARY OUTPUTS  
ANALOG INPUTS  
ANALOG OUTPUTS  
PARAMETERS
```

The menu TEST contains the following sub-menus:

- SLAVE TEST TOOL: Testing the selected slave
- BINARY INPUTS: State of the binary inputs
- BINARY OUTPUTS: State of the binary outputs
- ANALOG INPUTS: State of the analog inputs
- ANALOG OUTPUTS: State of the analog outputs
- PARAMETERS: Value of the current AS-i parameter

9.8.1 BINARY INPUTS

Main menu || TEST || BINARY INPUTS ||

```
BINARY INPUTS  
D3...D0  
1A - 0 1 0 1  
2A - 0 1 0 1  
3A - 0 0 0 1 ↓↓
```

This function displays the state of the binary inputs for all AS-i slaves.

- 0: Input cleared
- 1: Input set

9.8.2 BINARY OUTPUTS

Main menu || TEST || **BINARY OUTPUTS** ||

BINARY OUTPUTS				
D3...D0				
1A	-	0	1	0 1
2A	-	0	1	0 1
3A	-	0	0	0 1

This function displays the state of the binary outputs for all AS-i slaves.

0: Output cleared
1: Output set

The binary outputs can be modified after selecting an AS-i slave.

9.8.3 ANALOG INPUTS

Main menu || TEST || **ANALOG INPUTS** ||

ANALOG INPUTS	
1	X
2	A
3	B

The slave types are characterized as follows:

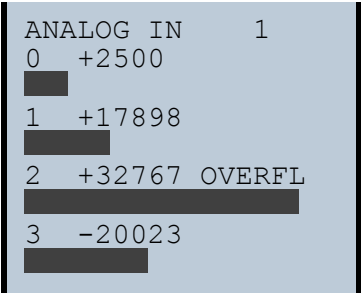
X: Single Slave
A: A-Slave
B: B-Slave
AB: A+B Slave
...

The data of the B slaves starts at channel 2!

The order in which information is displayed is as follows:

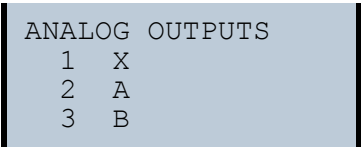
- AS-i slave address
- decimal 16-bit value
- bar graph

If the selected slave is a transparent slave, the value is always displayed without sign. If the selected slave is a transparent slave, the value is always displayed without sign. In this case, when the value is changed only positive values can be entered. Additionally, a value overflow is indicated by "Overfl".



9.8.4 ANALOG OUTPUTS

[Main menu](#) || TEST || ANALOG OUTPUTS ||

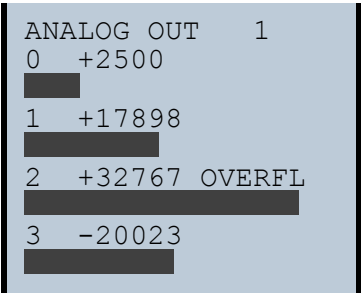


This function displays the values of the analog outputs for all AS-i slaves.

The order in which information is displayed is as follows:

- AS-i slave address
- decimal 16-bit value
- bar graph.

If the selected slave is a transparent slave, the value is always displayed without sign. If the selected slave is a transparent slave, the value is always displayed without sign. In this case, when the value is changed only positive values can be entered. Additionally, a value overflow is indicated by "Overfl".



The analog outputs can be changed after selecting an AS-i slave.

9.8.5 PARAMETER

Main menu || **TEST** || PARAMETER ||

```
PARAMETER
      | 1A - 0
2A - 2 | 3A - F
4A - E | 5A - 3 ↓
```

This function displays the hexadecimal value of the current AS-i parameters for all AS-i slaves.

The current AS-i parameters can be changed after selecting a slave address.

9.9 SETUP (configuration of the AS-i network)

Main menu || **SETUP** ||

```
OPERATION MODE
STORE ACTUAL CFG
FORCE OFFLINE
POWER ON OFFL.
AUTO ADR ENABLE
ADR. ASSISTENT
AS-I CONTROL
LOS
CHIPCARD
LANGUAGE
FACTORY RESET
SMILEY
```

In the "Setup menu", the following sub menus are available:

OPERATION MODE:	operation mode of the AS-i master
STORE ACTUAL CFG:	store current configuration
FORCE OFFL.:	switch AS-i Master to offline operation
POWER ON OFFL ¹ .:	switch AS-i circuit to offline operation
AUTO ADR ENABLE:	enable automatic address
ADR. ASSISTENT:	AS-i address assistant
AS-I CONTROL:	status of the control program
(optional)	
LOS:	list of offline slaves
CHIPCARD:	chipcard
LANGUAGE:	select menu language
FACTORY RESET:	reset to factory settings
SMILEY:	smiley display in the main menu

1. Available only with double masters

9.9.1 AS-I CIRCUIT

Main menu || **SETUP** ||

```
AS-i CIRCUIT 1
AS-i CIRCUIT 2
```

To start this setup menu, an AS-i circuit must first be selected using the arrow and the OK buttons.

The function is only available for AS-i masters with two AS-i circuits.

9.9.2 OPERATION MODE

Main menu || **SETUP** || **OPERATION MODE** ||

```
OPERATION MODE
CONFIG MODE
CHANGE
```

This function shows the current operation mode of the AS-i master:

PROTECTED MODE: protected operating mode

CONFIG MODE: configuration mode

The operation mode can be changed with "Change".

Parameters and configuration data can be modified in configuration mode, only.

9.9.3 STORE ACTUAL (store currently detected configuration)

Main menu || **SETUP** || **STORE ACTUAL** ||

```
STORE ACTUAL
CONFIGURATION
STORE
```

This function can only be executed in configuration mode.

This function enables currently detected slaves on the selected AS-i network to be stored in the configuration of the AS-i Master.

If "Store" was successful, the LED "Config error" is turned off. The configuration is stored and the configuration error has been eliminated.

However, if one of the connected slaves exhibits a peripheral fault, the LED "Config error" will flash.

If the AS-i master is in protected mode, the error message "Failed No Config Mode" will appear:

Address 0 is not a permitted operation address for a slave. If an AS-i slave with this address exists, storing the configuration will still be confirmed with "OK". However, the configuration error remains.

9.9.4 FORCE OFFLINE (Switch AS-i Master to offline operation)

Main menu || SETUP || **FORCE OFFLINE** ||

FORCE OFFLINE
NO
CHANGE

This function is used to change the address of a slave.

YES: AS-i Master is offline.

NO: AS-i Master is online.

With "Change", this status can be changed.

Switching the AS-i master to offline operation puts the AS-i network into the safe state. The AS-i master must be offline if an AS-i slave needs to be readdressed via the IR-interface.

9.9.5 AUTO ADDR ENABLE (enable automatic address)

Main menu || SETUP || **AUTO ADDRESS** ||

AUTO ADDRESS
ENABLE
CHANGE

This function is used to enable or disable automatic single node address assignment. This mode can be:

Enable: Automatic address assignment is released

Disable: Automatic address assignment is locked

With "Change" the operation can be changed.

9.9.6 AS-I ADDRESS (AS-i address assistant)

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

AS-I ADDRESS
ASSISTANT ON
NEXT ADDRESS
ADDR. : -

The AS-i address assistant assists the user to quickly set up an AS-i network. Once the AS-i configuration has been stored, a new AS-i slave with address 0 can be used to assign the correct address.

Selecting "Assistant on" or "Assistant off" switches the AS-i address assistant on or off. The current state of the AS-i address assistant is displayed:

ASSISTANT ON: AS-i address assistant is switched on.
ASSISTANT OFF: AS-i address assistant is switched off.

Procedure:

1. Store AS-i configuration in the device. This can easily be done by using the Windows software AS-i Control Tools (Master | Store configuration for the AS-i Master ...), or directly in the advanced display mode.
2. All AS-i slaves have to be addressed to 0 or to the desired address. The slaves must be disconnected from the AS-i network.
3. Start the AS-i address assistant.
4. Now the AS-i slaves are connected to the AS-i network one at the time in the order specified by the AS-i address assistant. The last line displayed for the AS-i address assistant shows which AS-i slave will be connected next.

9.9.7 AS-I CONTROL (Optional)

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

CONTROL	INFO
CONTROL	RUN
CONTROL	FLAGS

9.9.7.1 CONTROL INFO (Status of the control program)

Main menu || SETUP || AS-I CONTROL || CONTROL INFO ||

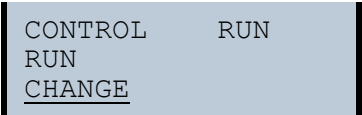
CONTROL	INFO
START BIT SET	
RUNNING	
CYCLE TIME	
ACT :	2MS
MAX :	5MS

This function displays the current status of the AS-i control (control program).

START BIT SET: The control program has been started.
START BIT RESET: The control program has been stopped.
RUNNING: The control program is running.
STOPPED: The control program has stopped. If, for instances, a configuration error occurs or if the master is in the configuration mode, the control program can be stopped even if the start bit is set.
CYCLE TIME ACT: Current cycle time of the control program.
CYCLE TIME MAX: Maximum cycle time of the control program since its last start.

9.9.7.2 CONTROL RUN (start or stop the control program)

Main menu || SETUP || AS-I CONTROL || CONTROL RUN ||



This function is used to start or stop the control program. It modifies the START BIT in the Control Info menu.

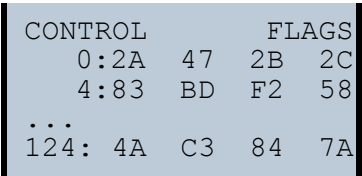
RUN: The control program has been started. The control program can be stopped even if the start bit is set, for example if a configuration error occurred or if the master is in configuration mode.

STOP: The control program has been stopped.

CHANGE: Change the state between RUN and and STOP.

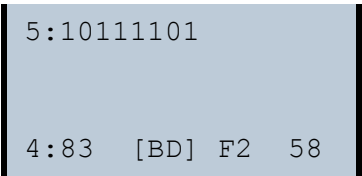
9.9.7.3 CONTROL FLAGS (control program flag memory)

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



This function is used to read and modify the control program's flag memory.

- First, a row needs to be selected using the soft keys.
- Pressing OK displays the selected row.

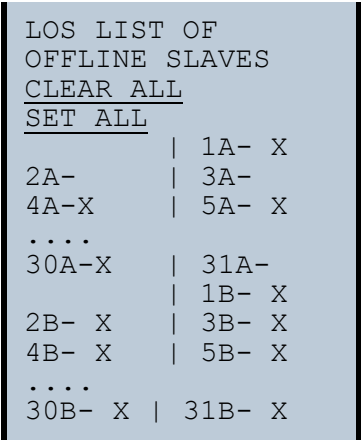


After pressing OK, the display mode changes and it is now possible to select individual flags using the soft keys. The selected flag is then displayed in binary format at the top row.

- Pressing OK again enables editing the selected binary value.

9.9.8 LOS (list of offline slaves)

Main menu || SETUP || LOS LIST OF OFFLINE SLAVES ||



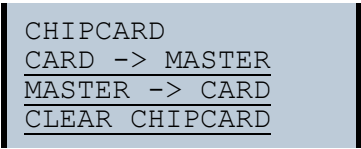
See also <Advanced Diagnostics for AS-i Masters>.

By using "Clear all" and "Set all" all bits in this list can be delete or set, respectively, at the same time. Below this is a list of all slaves that can be selected individually in order to set or delete the LOS bit.

Empty field: LOS bit deleted
X: LOS bit set

9.9.9 CHIPCARD

Main menu || SETUP || **CHIPCARD** ||



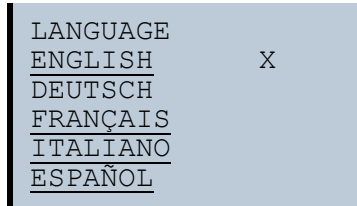
This function is used to send unsafe AS-i data between the master and chip card. In addition, the unsafe section of the chip card can be deleted.

CHIPCARD->MASTER: Chip card data are copied to the Monitor
MASTER->CHIPCARD: Monitor data are copied to the chip card
CLEAR CHIPCARD: Chip card data are cleared

For additional information refer to chap. <Chip card>.

9.9.10 Language (menu language)

Main Menu || SETUP || **LANGUAGE** ||



From this menu you can select the menu language. „X“ marks the currently selected language.

9.9.11 FACTORY RESET (factory default settings)

Main Menu || SETUP || **FACTORY RESET** ||



This function can be used to reset the master to the factory default settings. The "Reset" is done by selecting menu point DO RESET.



Warning!

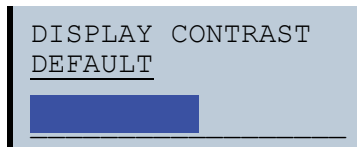
This function should be used only in emergencies, since all previously set attributes are set back to the factory setting and ,thus, secure communication and operation of the masters with the AS-i network is no longer guaranteed.

Master and AS-i network have to be reconfigured after a successful "Reset".

For double masters the "Reset" acts on both AS-i masters!

9.10 DISPLAY CONTRAST (set display contrast)

Main Menu || **DISPLAY CONTRAST** ||



This function allows you to set the display contrast.

- Use the arrow keys to select the line with the bar
- Confirm your selection with OK (bar flashes)
- Use the arrow keys to set the display contrast
- Use OK to apply the setting

The factory settings are invoked from the DEFAULT field.

If the contrast is set so that the display can no longer be read, it can be reset to the factory default setting as follows:

- Shut the unit off
- Press the MODE and SET keys and hold them down.
- Shut the unit on.

10. 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).

10.1 List of corrupted AS-i Slaves (LCS)

The **LCS** contains the information from the list of slaves with configuration error (**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").

10.2 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.

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

10.3 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.

10.4 Functions of the AS-i Fault Detector

10.4.1 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.

10.4.2 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 existing galvanic connection.

10.4.3 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.

10.4.4 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.

11. PROFIBUS DP

This chapter contains all necessary information to operate the AS-i/PROFIBUS gateways as part of a PROFIBUS DP network.

11.1 DP telegrams

11.1.1 Diagnostics

DP diagnostics

Byte	description
1	station state 1
2	station state 2
3	station state 3
4	Master address
5	ident high
6	ident low

Tab. 11-9.

The following blocks may be optionally appended to the DP diagnostics. Bytes 1 ... 4 are sent in each block according to the PROFIBUS standard.

Only when double masters are used is the entry „circuit 2“ available in the AS-i flags, delta list and LPF.

AS-i flags

Byte	description
1	0x06 header
2	0xA0 (circuit 1)/0xA1 (circuit 2) type
3	0x00 slot
4	0x00 spec
5	EC flags (high)
6	EC flags (low)

Tab. 11-10.

Delta list

Byte	description
1	0x0C header
2	0xA2 (circuit 1)/0xA3 (circuit 2) type

Tab. 11-11.

Delta list

Byte	description
3	0x00 slot
4	0x00 spec
5	delta (0 ... 7)
6	delta (8 ... 15)
...	...
12	delta (56 ... 63)

Tab. 11-11.

LPF

Byte	description
1	0x0C header
2	0xA4 (circuit 1)/0xA5 (circuit 2) type
3	0x00 slot
4	0x00 spec
5	LPF (0 ... 7)
6	LPF (8 ... 15)
...	...
12	LPF (56 ... 63)

Tab. 11-12.

Safety Single Slaves/Safety Slaves A

Byte	description
1	0x0C header
2	0xA8 (circuit 1)/0xA9 (circuit 2) type
3	0x00 slot
4	0x00 spec
5	yellow flashing (0 ... 7)
6	yellow flashing (8 ... 15)
7	yellow flashing (16 ... 23)
8	yellow flashing (24 ... 31)
9	red flashing (0 ... 7)

Tab. 11-13.

Safety Single Slaves/Safety Slaves A

Byte	description
10	red flashing (8 ... 15)
11	red flashing (16 ... 23)
12	red flashing (24 ... 31)

Tab. 11-13.

Safety Slaves B

Byte	description
1	0x0C header
2	0xAA (circuit 1)/0xAB (circuit 2) type
3	0x00 slot
4	0x00 spec
5	yellow flashing (0 ... 7)
6	yellow flashing (8 ... 15)
7	yellow flashing (16 ... 23)
8	yellow flashing (24 ... 31)
9	red flashing (0 ... 7)
10	red flashing (8 ... 15)
11	red flashing (16 ... 23)
12	red flashing (24 ... 31)

Tab. 11-14.

Description of the safety slave list:

- yellow flashing: safety slaves whose device is in state "yellow flashing".
- red flashing: safety slaves whose device is in state "red flashing".
- im byte 5 bit 0: 1=safety monitor has stopped, device color is not valid.
- im byte 9 bit 0: 1=no connection to safety monitor, device color is not valid.

EC-flags (high) and AS-i watchdog:

- bit 0: periphery fault
- bit 1: ...
- bit 2: failure redundant 24 V AUX (option safety monitor)
- bit 3: failure redundant 24 V AUX (option single master)
- bit 4: earth fault
- bit 5: over voltage
- bit 6: noise
- bit 7: duplicate address

EC-flags (low):

- bit 0: configuration error
- bit 1: slave with address '0' detected
- bit 2: auto_address_assignment *not* possible
- bit 3: auto_address_assignment available
- bit 4: configuration mode active
- bit 5: *not* in normal operation
- bit 6: AS-i power fail
- bit 7: AS-i master offline

Delta list: List of AS-i slaves with configuration error

- 1: ConfigError
- 0: no ConfigError

LPF: List of AS-i slaves with periphery fault

- 1: periphery fault
- 0: no periphery fault

Each element of the user diagnostics (ec-flags and slave lists) can be switched off by setting the appropriate bit in the parameter telegram.

ExtDiag will be set if at least one of the following conditions is fulfilled:

- ConfigError \equiv 1
- APF \equiv 1
- PeripheryFault \equiv 1

The conditions when to set the ExtDiag bit can be chosen using the user parameters or the commands of the command interface.

The GSD file includes the following presettings:

- The diagnosis transmits ec-flags, delta list and LPF.
- ExtDiag will be set if ConfigError = 1 and APF = 1. ExtDiag will not be set if there is a periphery fault.

11.1.1.1 Parameters

By selecting the appropriate parameters in the GSD file, the user can choose if and which slave list is transmitted as part of the diagnostics. Furthermore, it can be selected for which event ExtDiag is to be set in the diagnostics telegram.

11.1.2 Configuration DP/V0 (cyclic data)

The configuration of the AS-i/PROFIBUS gateways is set up by using the GSD file. Therefore it is necessary to import the provided GSD file into the PROFIBUS configuration tool.

11.1.2.1 Options

The input and output data field can be used with different "Special IDs".

The advantages of special input and output IDs are that they can include up to 64 elements (bytes or words), and that the length of input and output data is variable. Additionally, "manufacturer specific" data bytes can be set that define the ID type.

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 and they do not have to be requested through slower DP/V1 commands.

Up to 30 modules can be configured

Possible options:

Length ¹	description
4 byte I	digital input (slave 0 - 7)
8 byte I	digital input (slave 0 - 15)
12 byte I	digital input (slave 0 - 23)
16 byte I	digital input (slave 0 - 31)
20 byte I	digital input (slave 0 - 7b)
24 byte I	digital input (slave 0 - 15B)
28 byte I	digital input (slave 0 - 23B)
32 byte I	digital input (slave 0 - 31B)

Tab. 11-15.

1.Possible for 2 circuits

Length ¹	description
4 byte O	digital output (slave 0 - 7)
8 byte O	digital output (slave 0 - 15)

Tab. 11-16.

Length ¹	description
12 byte O	digital output (slave 0 - 23)
16 byte O	digital output (slave 0 - 31)
20 byte O	digital output (slave 0 - 7B)
24 byte O	digital output (slave 0 - 15B)
28 byte O	digital output (slave 0 - 23B)
32 byte O	digital output (slave 0 - 31B)

Tab. 11-16.

1.Possible for 2 circuits

Length ¹	description
16 byte I/O	digital in/out (slave 0 - 31)
16 byte I/O	digital in/out (slave 0b - 31b)
32 byte I/O	digital in/out (slave 0 - 31b)

Tab. 11-17.

1.Possible for 2 circuits



Information!

Up to eight command interfaces can be integrated.

Length ¹	description
2 byte I/O	command interface
4 byte I/O	command interface
8 byte I/O	command interface
11 byte I/O	command interface
12 byte I/O	command interface
34 byte I/O	command interface
36 byte I/O	command interface

Tab. 11-18.

1.Possible for 2 circuits

Length ¹	description
24 byte I	analog input (slave 29 - 31)
56 byte I	analog input (slave 25 - 31)

Tab. 11-19.

Length ¹	description
88 byte I	analog input (slave 21 - 31)
120 byte I	analog input (slave 17 - 31)
128 byte I	analog input (slave 16 - 31)
16 byte I	analog input (slave 14 - 15)

Tab. 11-19.

1.Possible for 2 circuits

Length ¹	description
24 byte O	analog output (slave 29 - 31)
56 byte O	analog output (slave 25 - 31)
88 byte O	analog output (slave 21 - 31)
120 byte O	analog output (slave 17 - 31)
128 byte O	analog output (slave 16 - 31)
16 byte O	analog output (slave 14 - 15)

Tab. 11-20.

1.Possible for 2 circuits

Length ¹	description
2 byte ... 128 byte I	analog input data, dynamic ²
2 byte ... 128 byte I	analog output data, dynamic

Tab. 11-21.

1.Possible for 2 circuits

2.Modul parameter erquired

Length ¹	description
2 byte I	flags and AS-i detector

Tab. 11-22.

1.Possible for 2 circuits

Length	description
2 byte I / 1 byte O	safety control / status

Tab. 11-23.

11.1.3 I/O Data

11.1.3.1 Process data

Process data is arranged the same as for the Siemens and AS-i/InterBus masters. Therefore, data for slaves with a higher address are transmitted in a least significant nibble. Additionally, the EC-flags or hi-flags, respectively, are placed at the data location of AS-i slave 0.

A rising edge of F2 and F3 switches the master to the desired mode.

A falling edge initiates deleting all bits in the LOS.

Input and Output Data Image

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

Tab. 11-24.

Input and Output Data Image

Byte	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
29	slave 26B				slave 27B			
30	slave 28B				slave 29B			
31	slave 30B				slave 31B			

Tab. 11-24.

Flags

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

Tab. 11-25.

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.

11.1.3.2 EC-Flags and AS-i detector

In addition to EC-flags, the AS-i detector flags are transferred with the AS-i diagnostic data.

Diagnostics data is designed as follows:

EC-flags (high) and AS-i watchdog:

- bit 0: periphery fault
- bit 1: ...
- bit 2: failure redundant 24 V AUX (option safety monitor)
- bit 3: failure redundant 24 V AUX (option single master)
- bit 4: earth fault
- bit 5: over voltage
- bit 6: noise
- bit 7: duplicate address

EC-flags (low):

- bit 0: configuration error
- bit 1: slave with address '0' detected
- bit 2: auto_address_assignment *not* possible
- bit 3: auto_address_assignment available

EC-flags (low):

- bit 4: configuration mode active
- bit 5: *not* in normal operation
- bit 6: AS-i power fail
- bit 7: AS-i master offline

11.1.3.3 AS-i 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 to or from the slaves, respectively, (profile 7.3., S-7.4, S-6.0, S- 7.5, S-7.A.8, S-7.A.9, S-7.A.A) can be transmitted cyclically with 16 bit values. Competing writing access attempts on analog output data are not interlocking each other. If analog data for a particular slave are transmitted both cyclically and acyclically via the command interface or DP/V1 connections, the acyclically transmitted values are overwritten by the cyclically transmitted values.

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

AS-i 16 bit data

Byte	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
1	Slave 31-n/8, channel 1, high byte							
2	Slave 31-n/8, channel 1, low byte							
3	Slave 31-n/8, channel 2, high byte							
4	Slave 31-n/8, channel 2, low byte							
...	...							
n-3	Slave 31, channel 3/Slave 31B, channel 1, high byte							
n-2	Slave 31, channel 3/Slave 31B, channel 1, low byte							
n-1	Slave 31, channel 4/Slave 31B, channel 2, high byte							
n	Slave 31, channel 4/Slave 31B, channel 2, low byte							

Tab. 11-26.

11.1.3.4 Command interface



Information!

The description of the ASIMON program can be found in the separate software manual „AS-i 3.0 Command interface“.

11.1.3.5 Safety Control/Status

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



Information!

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

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

Inputs

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

Tab. 11-27.

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	

Tab. 11-28.

Coding of status bytes

Bit [6]	status or color	
0	no device flashing yellow	
1	at least one device flashing yellow	
Bit [7]	status or color	
0	no device flashing red	
1	at least one device flashing red	

Tab. 11-28.

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. 11-29.

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)

Tab. 11-30.

Safety Control Status

Length	description
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. 11-30.

11.2 DP/V1

The AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor uses only one data segment (slot 1, index 16). This data segment contains a command interface similar to the one in the DP data telegram.

The DP/V1-command interfaces are processed every time they are sent. Therefore it is possible to execute the same command several times without changing "command" or "network" and setting a toggle bit.

11.3 PROFIBUS

The AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor uses a new GSD file with a new PNO-ID. All the setting options for the previous AS-i Masters are available. Cyclical data, Command interface and (optional) diagnostics are compatible with the previous Master.



Information!

GSD files for the previous AS-i Masters cannot be used, since the PROFIBUS parameters have a different structure.

12. System startup using AS-i Control Tools

The Windows based software "AS-i Control Tools" with a serial interface for stainless steel AS-i masters is designed to make the startup of the AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor as comfortable as possible.

Additionally, the software communicates with the AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor by using a PROFIBUS DP Master Simulator DP/V1 or the serial PROFIBUS master.

12.1 Windows software AS-i Control Tools



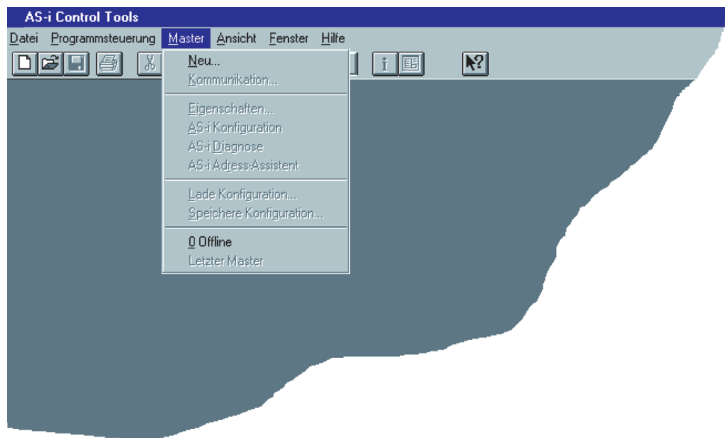
Information!

AS-i Control Tools must be installed first!

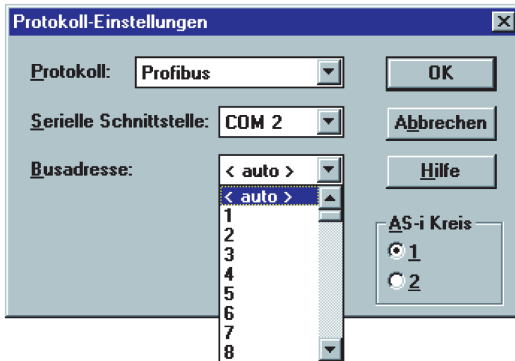
This way, the device driver is copied into the previous designed folder in AS-i Control Tools and should be recognized automatically.

The Windows software "AS-i Control Tools" enables the user to easily configure the AS-i network.

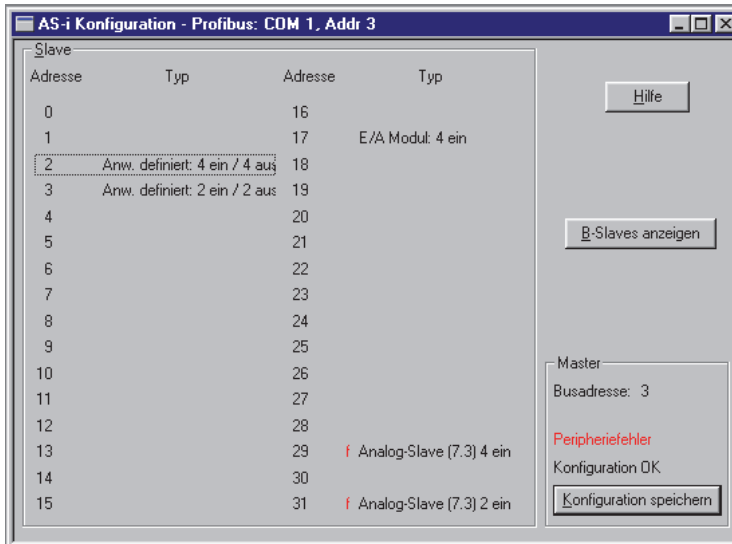
1. Plug the PROFIBUS Master Simulator or a serial PROFIBUS Master, respectively, into the D-SUB connector of the AS-i/PROFIBUS Gateway and connect the device to the PC via its serial interface.
2. Start AS-i Control Tools.
3. Select Master | New.



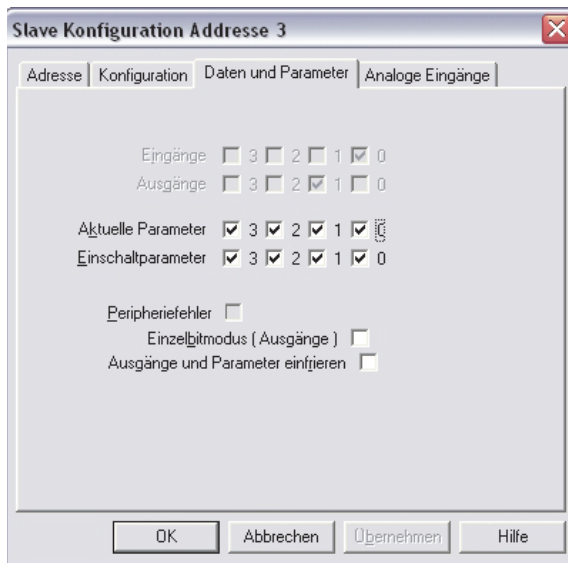
4. Choose PROFIBUS as the protocol.
5. Select the appropriate settings (for example serial interface COM 2, station address <auto>).



6. Select Master | AS-i configuration. The AS-i configuration editor will be started. All detected and configured AS-i slaves are displayed in this window.

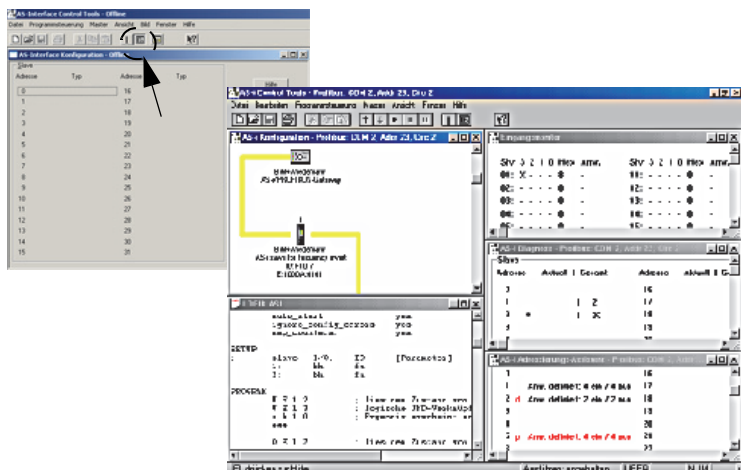


7. Click on a slave to open the dialog window 'slave configuration'.



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.

8. 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.

13. Configuration with Windows Software ASIMON 3 G2



Information!

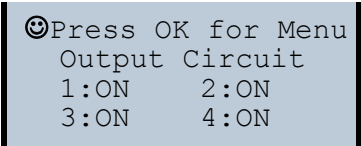
*Please note further information in the configuration software **ASIMON 3 G2** for Windows.*

14. Status indication, faults and fault elimination

14.1 Spontaneous display of faults from the safety unit

Spontaneous messages are displayed on 'EUCHNER GmbH + Co. KG' 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.



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 alternatingly.

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.

14.2 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.

14.3 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.

14.4 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.

15. 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.

Activation phase

In the activation phase the detected slaves are activated by sending the parameter. This is indicated by displaying code 42 on the Master's display. This phase takes no more than 10 ms, and is therefore too short to be displayed.

AS-i Power Fail

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

Initiation phase

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

The AS-i cycle is by one telegram longer as the number of active slaves (⇒ LAS).

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

Autoprog flags

Auto Address Enable; flag from the operating system to the AS-i Master.

With this flag, automatic addressing can be enabled or disabled. This flag is saved in non-volatile memory in the Master.

Auto Address Assign, Auto Address Possible; flag from the AS-i Master to the operating system.

Automatic programming is not disabled and no configuration error was found.

If a slave fails, it could be addressed automatically.

Auto Address Available, flag from the AS-i Master to the operating system. Exactly one AS-i slave is missing and the automatic single node replacement is not disabled.

If at this point a slave with the address 0 and the profile of the missing slave is connected, it automatically receives the address of the missing slave.

I/O code

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

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).

Detection phase

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

The detection phase is indicated by code "41".

Protected mode

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

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

ID code

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

Current configuration

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

\Rightarrow IO code, \Rightarrow ID code, \Rightarrow extended ID1code , \Rightarrow extended ID2 code.

Current parameter

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

Configuration Error/Config Error

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

Missing slave: A slave entered in the \Rightarrow LPS is not available

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

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

LAS - List of Activated Slaves

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

LDS - List of Detected Slaves

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

LPF - List of Peripheral Faults

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

LPS - List of Projected Slaves

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

Offline phase

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

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

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

No communication will take place during the offline phase.

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

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

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

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.

Permanent configuration

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

Permanent parameter

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

Configuration mode

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

See also \Rightarrow protected mode.

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.

16. Appendix: Example for startup on a Siemens S7

This example shows the start up of the AS-i/Gateway with safety monitor on a Siemens S7-300 programmable logic controller. The start up is the same with new range of devices.

Hardware used:	
SIMATIC S7 power supply	PS 307 5A
SIMATIC S7-CPU mit PROFIBUS DP	CPU 315-2DP Best. Nr.: 6ES7 315-2AF03-0AB0 Firmware Version 1.2
AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor	
AS-i-Power-Extender	
AS-i-4E-Modul	
AS-i-4E/4A-Modul	
power supply	Powers the AS-i components through the AS-i Power Extender
Software used:	
GSD-File für AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor	
SIMATIC Step7 Version 5.4 SP4 Service Pack 1	Ausgabestand: K5.4.4.0
Associated documentation:	
AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor" system manual	
SIEMENS S7-300 documentation	

16.1 Hardware configuration

16.1.1 Electrical connection for AS-i

To supply the AS-i circuit, connect the output on the AS-i Power Extender or an AS-i power supply to the AS-i/Gateway with safety monitor. Observe correct polarity of the terminals AS-i(+) and AS-i(-).

In the following the desired AS-i slaves are connected to the AS-i circuit. The AS-i slaves have their device address set to 0 by default. This must be changed to the desired AS-i slave address.

You can set the AS-i slave address using the function "AS-i SLAVE ADDR" function from the submenu "SETUP" on the AS-i/Gateway with safety monitor. For more detailed information, refer to chapter "Operating in advanced Display Mode".

Once the AS-i circuit has been configured and parameterized as desired, apply this configuration to the AS-i/Gateway with safety monitor using the function "QUICK SETUP".

The AS-i/Gateway with safety monitor is now ready to run.

16.1.2 Electrical connection for PROFIBUS DP

To connect the AS-i/Gateway with safety monitor to the CPU 315-2DP, a standard PROFIBUS cable with 9-pin SUB-D plug is used.

If the AS-i/Gateway with safety monitor is connected on the PROFIBUS as the last station, the termination resistor on the PROFIBUS plug must be enabled.

16.2 SIMATIC Step 7 Configuration

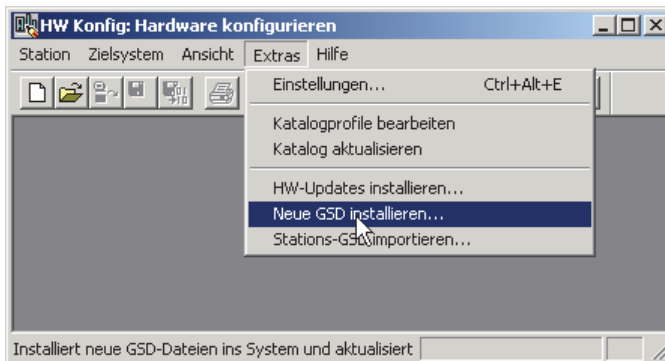
The remainder of this description presumes that a SIMATIC Step7 project has been created and added to an S7-300.

Now the hardware configuration must be opened for this SIMATIC-300 station.

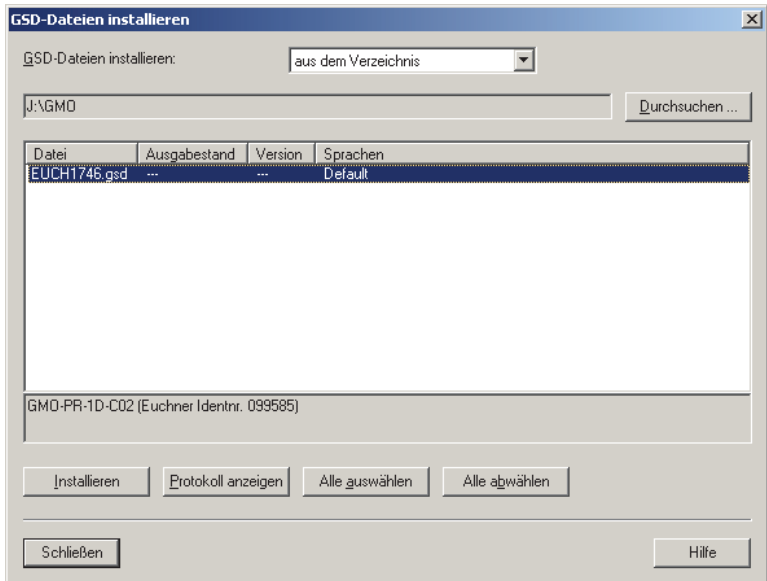
16.2.1 Configuration of the Hardware

Before configuring the hardware, the GSD file supplied with the AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor must be added to the hardware catalog.

Add the GSD file using the menu function "Install new GSD".



The PROFIBUS properties of the AS-i/Gateway with safety monitor are described in the GSD file.



Clicking on the "Open" field adds the GSD file to the hardware catalog.

After successful installation of the GSD file you may now open the hardware catalog. The modules contained under SIMATIC 300.

1. profile rail
2. power supply e.g. PS 307 5A
3. CPU e.g. CPU 315-2 DP

are added to the project. When selecting the CPU module, note the correct hardware version (identifiable by the imprint of the part number at lower left) and the firmware version (identifiable at left beneath the cover).

← → (0) UR							
Steckplatz	Baugruppe	Bestellnummer	Firmware	MPI-Adresse	E-Adresse	A-Adresse	
1	PS 307 5A	6ES7 307-1EA00-0AA0					
2	CPU 315-2 DP	6ES7 315-2AF03-0AB0	V1.2	2			
3	DP				1/23"		

When adding the CPU module you are prompted for the desired PROFIBUS connection. The standard proposed is for the CPU as PROFIBUS DP Master. This can be directly applied. The CPU mode must be set on the DP Master.

Eigenschaften - DP - (R0/S2.1)

Allgemein | Adressen | Betriebsart | Konfiguration

Kurzbezeichnung: DP

Bestell-Nr:

Name: DP

Schnittstelle

Typ: PROFIBUS

Adresse: 2

Vernetzt: Ja

Eigenschaften...

Kommentar:

OK Abbrechen Hilfe

The CPU PROFIBUS DP Properties can be used to display the properties for the PROFIBUS. Clicking on the "Settings" button displays the PROFIBUS settings.

Eigenschaften - PROFIBUS

Allgemein | Netzeinstellungen

Name: PROFIBUS(1)

S7-Subnetz-ID: 003C - 0005

Projektpfad: Bw_ASi3\PROFIBUS(1)

Speicherort des Projekts: C:\SIEMENS\s7proj\Bw_ASi3

Autor:

Erstellt am: 29.02.2004 11:20:58

Zuletzt geändert am: 29.02.2004 11:22:33

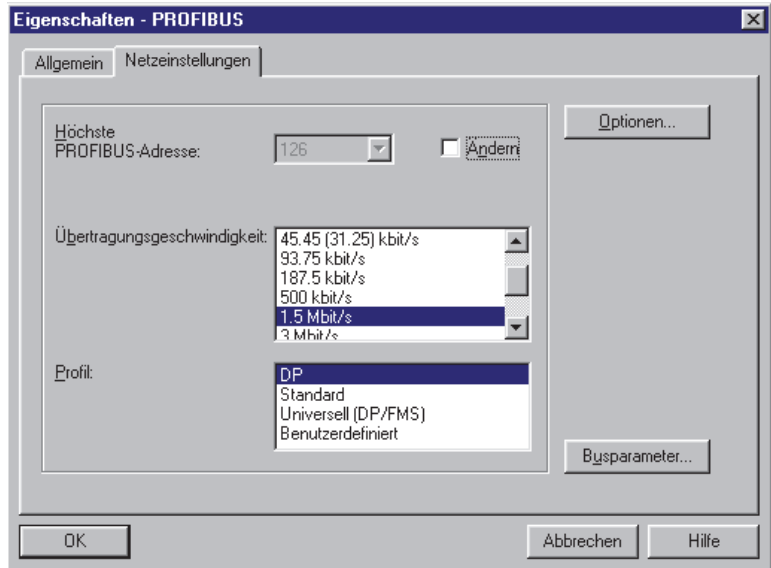
Kommentar:

OK Abbrechen Hilfe

Profile "DP" is generally used as the PROFIBUS profile.

The bit rate for the PROFIBUS can be set in the window "**Properties PROFIBUS**" → "**Network settings**" → "**Transmission rate**".

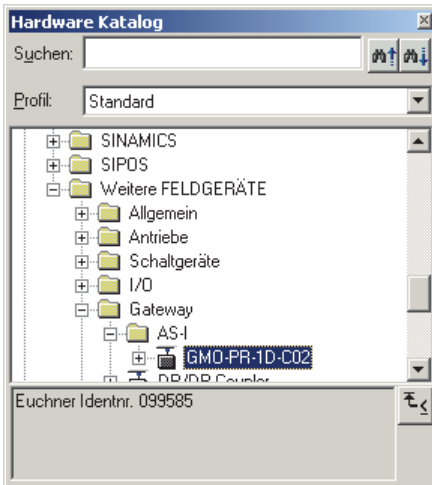
If special adjustments are needed, you can adjust the PROFIBUS parameters using the profile "**Properties PROFIBUS**" → "**Network settings**" → "**Profile**" → "**User defined**".



16.2.2 Insert AS-i/Gateway with safety monitor

Once the SIMATIC hardware has been added to the hardware configuration and the PROFIBUS configured, you can add the AS-i/Gateway with safety monitor to the project.

After successfully installing the GSD file you will find the AS-i/Gateway with safety monitor in the hardware catalog under **PROFIBUS/Other FIELD DEVICES/Gateway/AS-i**.



The AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor can now be added to the PROFIBUS branch using drag and drop.

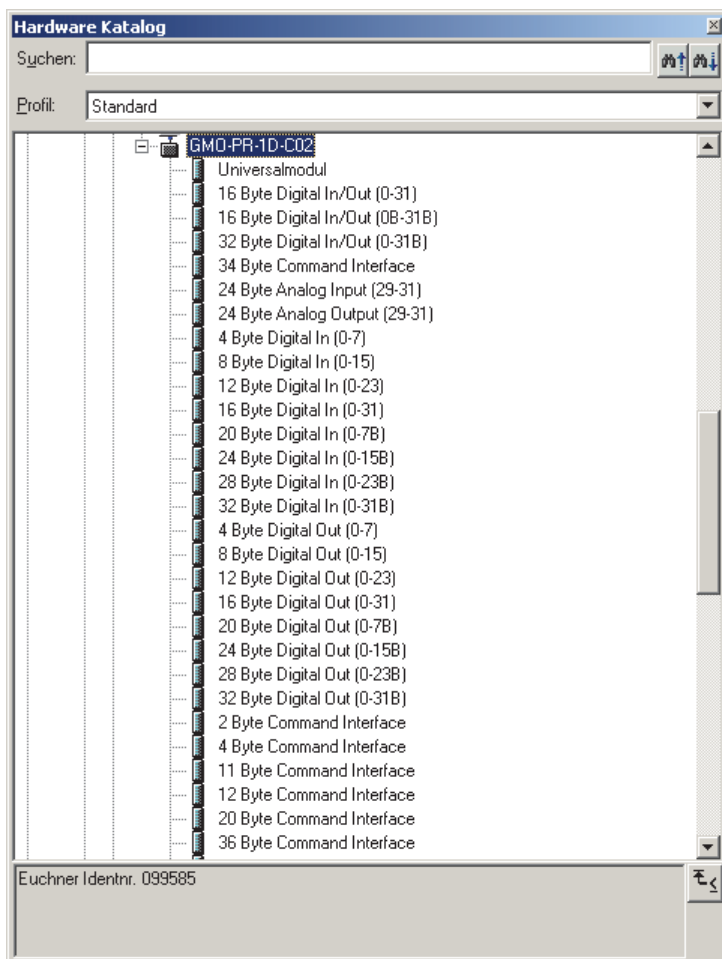
Opening the device by clicking on the plug sign in the hardware catalog causes a list to appear of the possible PROFIBUS communication modules.

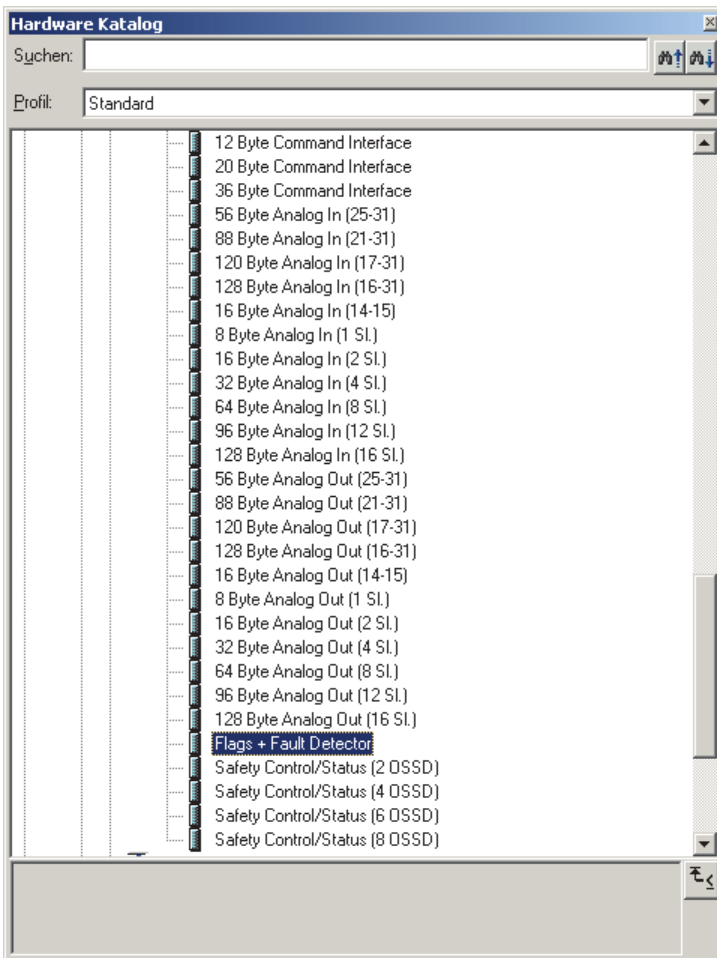
Which module you select for the desired PROFIBUS communication depends on which version of the AS-i circuit you have and on the desired communication possibilities.

For simple transmission of the data bits in an AS-i circuit with AS-i standard sensors in the I/O area of the SIMATIC CPU, use the module "16 Byte Digital In/Out (0-31)". With this module the input and output data for the possible 31 slaves in an AS-i circuit are send directly to the I/O section of the CPU.

When using A/B slaves, use the module "32 Byte Digital In/Out (0-31B)". The B-addressed slaves are mapped in the additional 15 bytes of data.

The other modules called "Digital" can be used instead of the above mentioned module to adapt to the actual AS-i circuit. This makes flexible adaptation to the structure of the AS-i circuit possible.



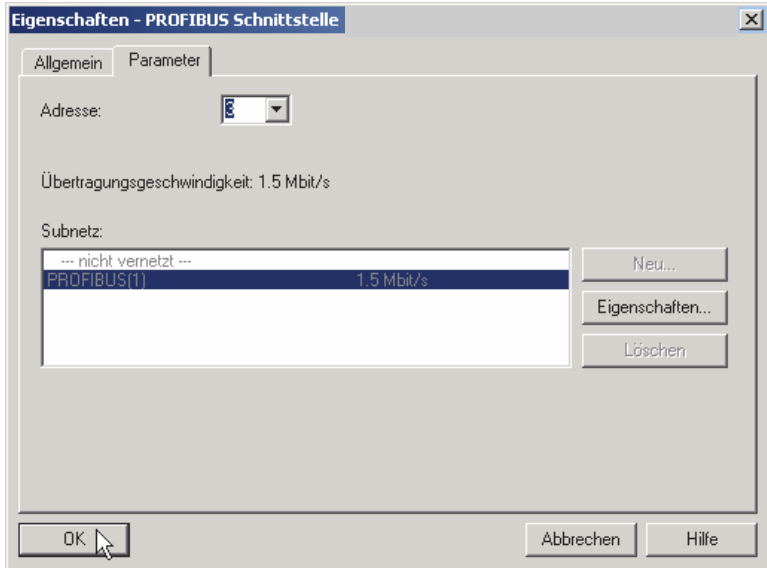


In addition to sending the AS-i slave digital data, a communication interface module can be added. The communication interface is used for sending specific commands to the AS-i/Gateway with safety monitor.

In order to send the analog values for AS-i slaves directly, the modules can be used with the keyword "Analog". The value in parentheses indicates which address range is to be used for the AS-i Analog slaves.

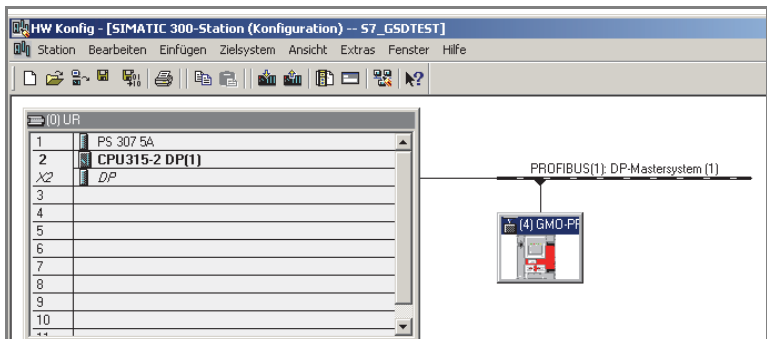
For modules "nn Byte Analog In (n Sl.)" and "nn Byte Analog Out (n Sl.)" the AS-i address of the analog slave can be freely selected.

When adding the AS-i/Gateway with safety monitor using drag and drop the dialog for assigning the PROFIBUS slave address is shown. The factory default setting for the AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor is Address 3.



16.2.3 AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor configure in-/outputs

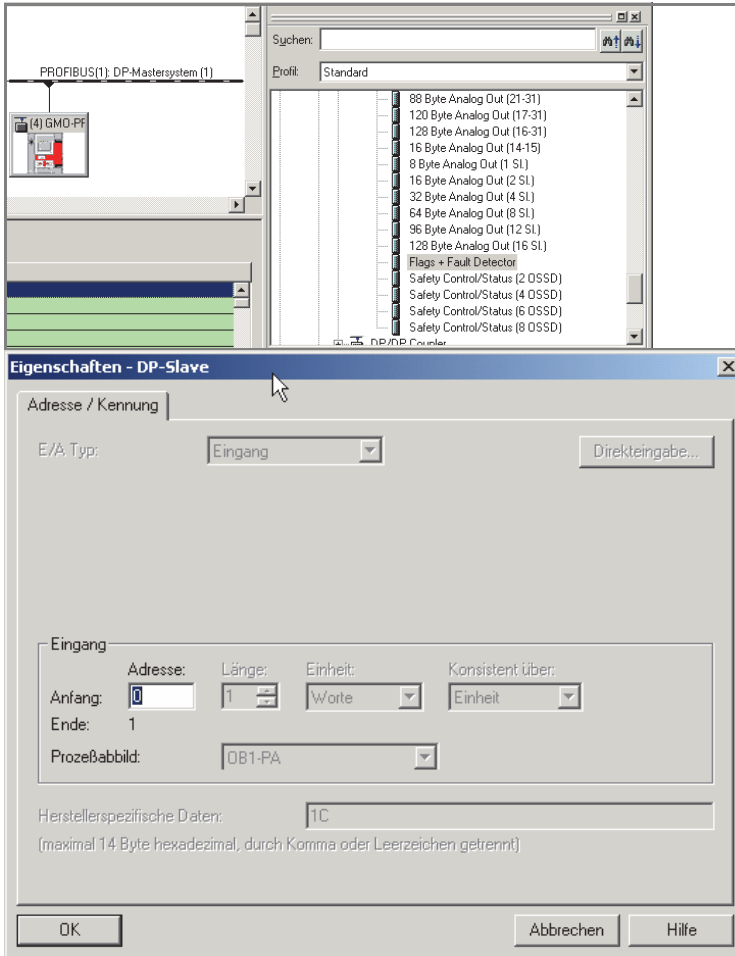
If the AS-i/Gateway with safety monitor is added to the PROFIBUS using drag and drop, the Step7 hardware configuration shows the following graphic.



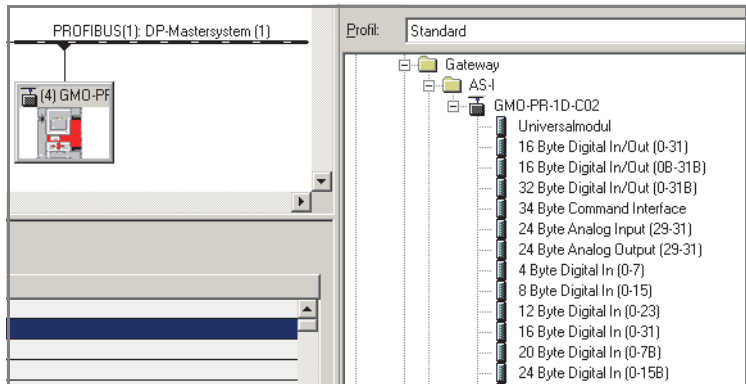
At this point the desired PROFIBUS communication module should be parameterised. This is done in the following steps:

1. Select the AS-i/Gateway with safety monitor by clicking on the Slave icon. In the lower edge of the screen a table is shown which contains lines beginning with Slot 0.

2. Select the desired communication module "Flags + Fault Detector" from the hardware catalog. These flags use the individual bits to signal the operating status of the AS-i/Gateway with safety monitor and should be processed in the application program.
3. Drag the selected communication module to the table line for Slot 0.



1. Select the desired communication module from the hardware catalog. Here "16 Byte Digital In/Out (0-31)"
2. Drag the selected communication module to the table line for slot 1.



3. If desired, you can now place additional modules for the command interface and analog value transmission in the following slots:

← → (4) GMD-PR-1D-C02

Steckplatz	DP-Kennung	Be...	E...	A...	Kommentar
1	65	Flags +0...	1		
2	193	16 Byte 2...	17	0...15	
3					
4					

4. Double-clicking on the desired slot line opens a dialog window in which you can assign the PROFIBUS communication module to the address range of the CPU.

Eigenschaften - DP-Slave

Adresse / Kennung

E/A Typ: Aus- Eingang Direkteingabe...

Ausgang

Adresse:	Länge:	Einheit:	Konsistent über:
Anfang: 2	16	Byte	Einheit
Ende: 17			

Prozeßabbild: OB1-PA

Eingang

Adresse:	Länge:	Einheit:	Konsistent über:
Anfang: 2	16	Byte	Einheit
Ende: 17			

Prozeßabbild: OB1-PA

Herstellerspezifische Daten: 01
(maximal 14 Byte hexadezimal, durch Komma oder Leerzeichen getrennt)

OK Abbrechen Hilfe

In this example the data transfer of the 16 byte in-/output data of the AS-i/Gateway with safety monitor takes place in (out) the CPU address range Input (output) data image byte 2 to 17.

16.2.4 AS-i/Gateway with safety monitor parameters

The AS-i/Gateway with safety monitor is symbolically represented as a rectangular window connected with the PROFIBUS branch. Double-clicking in the upper line of this window opens the dialog window for the properties of this PROFIBUS slave.

Eigenschaften - DP-Slave

Allgemein | Parametrieren

Baugruppe

Bestellnummer: Euchner Identnr. 099585 GSD-Datei (Typdatei): EUCH1746.GSD

Familie: Gateway

DP-Slave-Typ: GMD-PR-1D-C02

Bezeichnung: GMD-PR-1D-C02

Adressen

Diagnoseadresse: 1021

Teilnehmer/Mastersystem

PROFIBUS... 3

DP-Mastersystem (1)

SYNC/FREEZE-Fähigkeiten

☒ SYNC-fähig ☒ FREEZE-fähig

☒ Ansprechüberwachung

Kommentar:

The diagnostics address entered in this window is used for parameterizing the function module SFC13 (diagnostic request). At this address you can use the standard function SFC13 to read out the PROFIBUS diagnostic data of this DP slave while running.

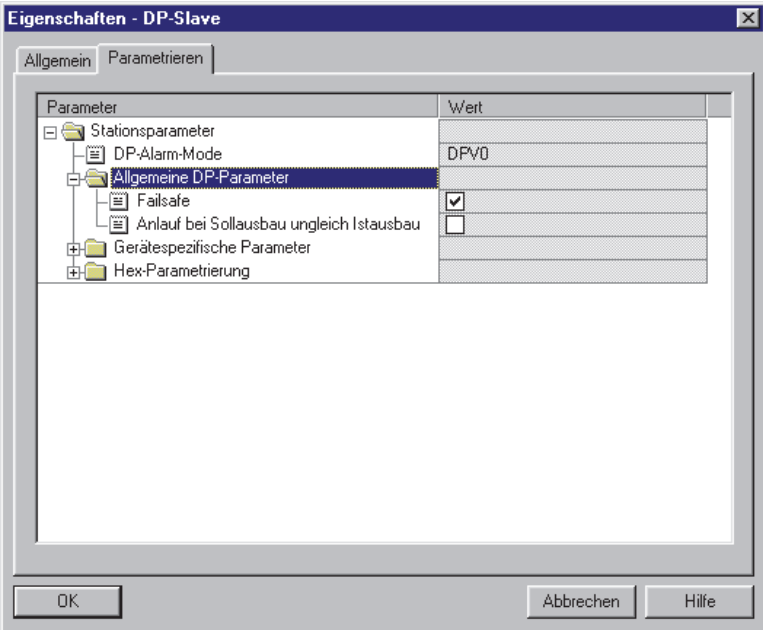
When invoking SFC13, note that the diagnostic address must be parameterized as a hexadecimal value.

For example: Diagnostic address 1022 → W#16#3FE

Clicking on the "Parameterize" tab displays the possible settings for the PROFIBUS start parameters.

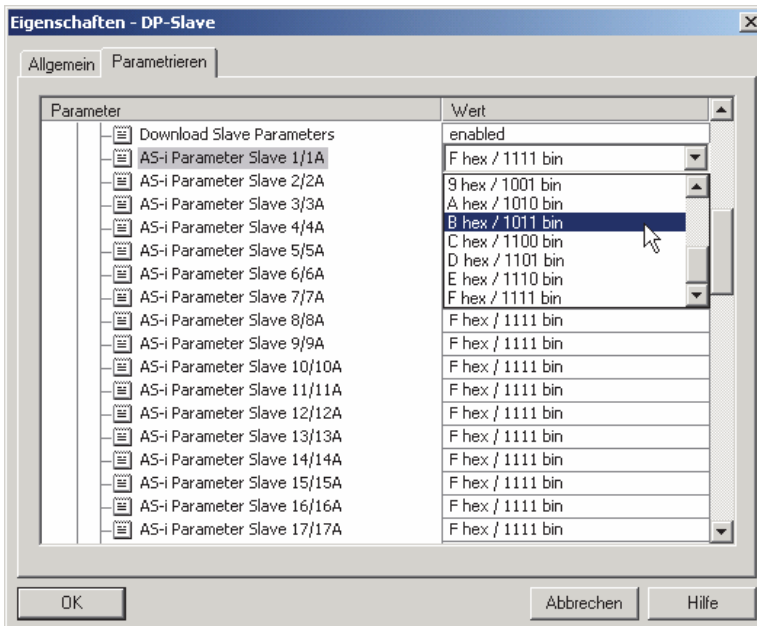
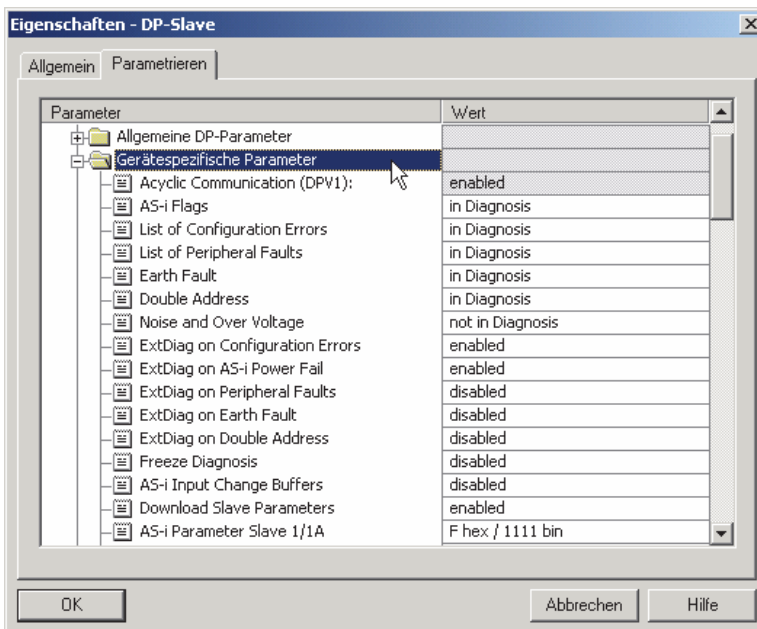
16.2.4.1 General DP parameters

Startup when nominal configuration is not the same as actual configuration:
Use this parameter to specify whether the AS-i circuit should be started up even if the AS-i circuit has a different configuration than the stored AS-i configuration.



16.2.4.2 AS-i-Parameter Slave 1/1A...

The parameter bits send to this AS-i slave can be selected in the drop down window. The settings which are made with the parameters bits can be found in the data sheet for the corresponding slave.



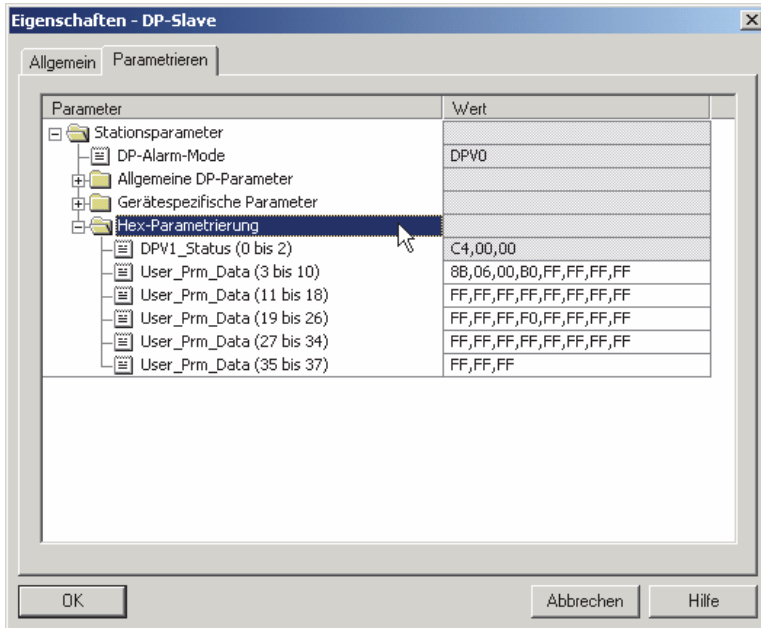
16.2.4.3 Hex parameterizing

DPV1_Status

Hexadecimal representation of the data resulting from the settings for parameter bytes 0 to 2.

User_Prm_Data

Hexadecimal representation of the data resulting from the settings for parameter bytes 3 to 37.



16.2.5 SIMATIC Step7 blocks

After the hardware has been configured, these can be sent to the CPU. Since data transmission of the AS-i data is done in this example directly to the process image, no additional Step7 program is needed for data refreshing. Therefore there is no program code in OB1.

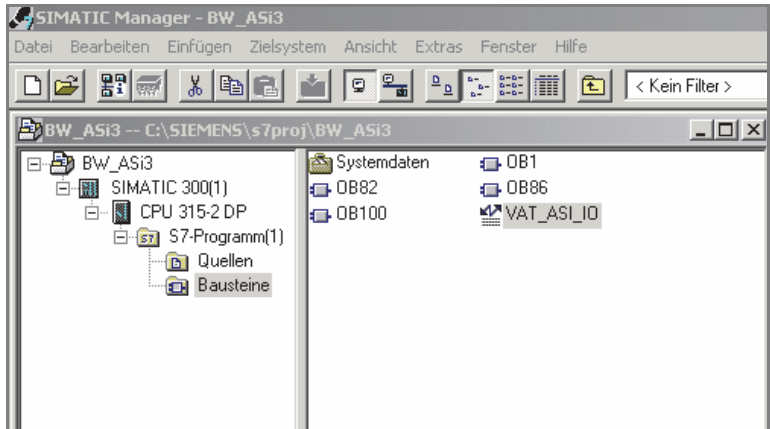
OB1 Cyclical program block. Access to the AS-i data is via the parameterized address space in the in-/outputs process image.

OB82: PROFIBUS diagnostic alarm. This OB is invoked as soon as a PROFIBUS slave has set the ExtDiag flag in the telegram reply. This ExtDiag flag allows a PROFIBUS slave to report an error condition to a PROFIBUS master. If OB82 is not present, the CPU is stopped when a PROFIBUS slave sets the ExtDiag flag.

OB86: PROFIBUS peripheral error. This OB is invoked when the PROFIBUS master detects a PROFIBUS slave failure.

OB100: Startup OB. This OB is run once when the CPU starts up.

VAT_ASI_IO: Variable table, AS-i startup example.



16.2.6 Variable table VAT_ASI_IO

In the hardware configuration the 16 bytes of I/O data for the AS-i/DP Gateway are coupled to the input/output byte Address 2 to 17 of the process image. The directly send AS-i diagnostic information for error processing are evident from the input bits of the EW0.

Flags + Fault Detector

Bit 0 = Configuration error

Bit 1 = Slave with address ZERO detected

Bit 2 = Automatic addressing not possible

Bit 3 = Automatic addressing available

Bit 4 = Projecting mode active

Bit 5 = Not in normal mode

Bit 6 = AS-i Power Fail

Bit 7 = AS-i Master is offline

Bit 8 = Peripheral error

Bit 9 = reserved

Bit 10 = reserved

Bit 11 = reserved

Bit 12 = Earth fault¹

Bit 13 = Overvoltage

Bit 14 = Noise

Bit 15 = Double address

This allows the AS-i circuit data to appear directly in the process image inputs/ outputs.

VAT ASI IO -- @BW ASI3\SIMATIC 300(1)\CPU 315-2 DP\S7-Programm(1) ONLINE					
	Operand	Symbol	Symbolkommentar	Anzei	Statuswert
1	EB 2	"IN_Flags_Slave1"	Bit7-4=Flags Bit3-0=Slave1	BIN	2#0000_1000
2	EB 3	"IN_Slave2_Slave3"	Bit7-4=Slave2 Bit3-0=Slave3	BIN	2#0100_0000
3	EB 4	"IN_Slave4_Slave5"	Bit7-4=Slave4 Bit3-0=Slave5	BIN	2#0000_0000
4	EB 5	"IN_Slave6_Slave7"	Bit7-4=Slave6 Bit3-0=Slave7	BIN	2#0000_0000
5	EB 6	"IN_Slave8_Slave9"	Bit7-4=Slave8 Bit3-0=Slave9	BIN	2#0000_0000
6	E 2.4	"IN_ASI_Config_Error"	0=ConfigOK 1=ConfigError	BOOL	false
7	E 2.5	"IN_ASI_Power_Fail"	0=AS-iPowerOK 1=AS-iPowerError	BOOL	false
8	E 2.6	"IN_Periphery_Fault"	0=PeripheryOK 1=PeripheryError	BOOL	false
9	E 2.7	"IN_Configuration_Active"	0=ConfigActive 1=ConfigInactiv	BOOL	false
10					
11	AB 2	"OUT_Flags_Slave1"	Bit7-4=Flags Bit3-0=Slave1	BIN	2#0000_0000
12	AB 3	"OUT_Slave2_Slave3"	Bit7-4=Slave2 Bit3-0=Slave3	BIN	2#0000_0100
13	AB 4	"OUT_Slave4_Slave5"	Bit7-4=Slave4 Bit3-0=Slave5	BIN	2#0000_0000
14	AB 5	"OUT_Slave6_Slave7"	Bit7-4=Slave6 Bit3-0=Slave7	BIN	2#0000_0000
15	AB 6	"OUT_Slave8_Slave9"	Bit7-4=Slave8 Bit3-0=Slave9	BIN	2#0000_0000
16	A 2.4	"OUT_ASI_Off_Line"	0=OnLine 1=OffLine	BOOL	false
17	A 2.5	"OUT_LOS_Masterbit"	0=OffLine when ConfigError 1=active when ConfigError	BOOL	false
18	A 2.6	"OUT_Configuration_Mode"	-> Set Configuration Mode	BOOL	false
19	A 2.7	"OUT_Protected_Mode"	-> Set Protected Mode	BOOL	false
20					
21	EW/ 0	"Flags + Fault Detector"	AS-i Diagnose Information	BIN	2#0000_0000_0000_0000
22					

In the structure of the 16 byte I/O data field each AS-i slave has a 4-bit data field. This is determined by the address of the AS-i slave within the AS-i circuit.

Assignment of the I/O address and AS-i slave address		
Address byte	Bits 7 - 4	Bits 3 - 0
I/O byte 2	flags	slave 1
I/O byte 3	slave 2	slave 3
I/O byte 4	slave 4	slave 5
I/O byte 5	slave 6	slave 7
I/O byte 6	slave 8	slave 9
I/O byte 7	slave 10	slave 11
I/O byte 8	slave 12	slave 13
I/O byte 9	slave 14	slave 15
I/O byte 10	slave 16	slave 17
I/O byte 11	slave 18	slave 19
I/O byte 12	slave 20	slave 21
I/O byte 13	slave 22	slave 23
I/O byte 14	slave 24	slave 25
I/O byte 15	slave 26	slave 27
I/O byte 16	slave 28	slave 29
I/O byte 17	slave 30	slave 31

1. This bit is set if a release circuit or device, which is assigned to a safety related slave has following colors: 'flashing green', 'yellow', 'yellow' or 'flashing red'.

The data for the slaves present and projected in the AS-i circuit are refreshed based on their position in the I/O data field.

The data fields for non-present slaves are filled with zero.

This means for example the AS-i data for the AS-i slave having Address 12 occupy bits 7 - 4 in I/O byte 8 of the controller.

16.2.6.1 AS-i flags byte 0, input bits 7 - 4

In order to check the current operating status of the AS-i circuit, the AS-i flags refreshed with each PROFIBUS cycle can be used. These for flags occupy bits 7 - 4 in input byte 0.

AS-i Config Error:

Bit 4: 0 = AS-i configuration OK, 1 = AS-i configuration faulty

If during running the gateway AS-i master detects a discrepancy between the nominal configuration and the actual configuration, this bit is set. This allows the control program to react to a faulty AS-i slave.

AS-i Power Fail

Bit 5: 0 = AS-i power OK, 1 = AS-i power fail

When there is a failure of the AS-i supply voltage, this is indicated by the AS-i power fail bit.

AS-i Peripheral Error

Bit 6: 0 = AS-i peripheral OK, 1 = AS-i peripheral error

This bit indicates that there is a peripheral error on an AS-i slave. This may result for example from incorrect parameterizing of the AS-i slave.

AS-i Configuration Active

Bit 7: 0 = AS-i configuration is active, 1 = AS-i configuration is inactive.

This bit indicates whether the AS-i gateway is in protected mode (Bit 7 = 0) or in projecting mode.



Information!

It is recommended that the AS-i flags be checked in the control program and to respond according to the reported states.

16.2.6.2 AS-i flags byte 0, output bits 7 - 4

Output bits 7 - 4 in byte 0 can be used to affect the status of the AS-i circuit by the controller.

AS-i Off Line

Bit 4: 0 = Online, 1 = Offline

Use this bit to enable/disable the data cycle of the AS-i circuit. If the AS-i Master is in offline mode, no AS-i communication with the AS-i slaves will take place.

AS-i LOS Master Bit

Bit 5: 0 = Offline when AS-i configuration error disabled, 1 = enabled

If this bit is set, the AS-i Master immediately switches to the offline phase and stops AS-i communication when an AS-i configuration error is detected. This results in the connected AS-i output modules immediately switching to safe mode (outputs turned off).

AS-i Configuration Mode

Bit 6: 0 = no action, 1 = turn on configuration mode of AS-i Master

Setting Bit 6 switches the AS-i Master to configuration mode. Then for example the command interface can be used to save an existing AS-i configuration using the controller.

The rising edge is used for switching. After Bit 7 = 1 in the input flags has indicated that the AS-i Master is in configuration mode, output bit 6 must be reset again by the controller.

AS-i Protected Mode

Bit 6: 0 = no action, 1 = turn on protected mode of AS-i Master

After successful configuration of the AS-i Master through the command interface, the AS-i Master can be switched back to protected mode.

The rising edge is used for switching. After Bit 7 = 0 in the input flags has indicated that the AS-i Master is in configuration mode, output bit 7 must be reset again by the controller.

The table shows an AS-i circuit which is in operation. Since there is no AS-i error, bits 4 - 7 in the input byte are ZERO.

In the case of AS-i Slave address 1, this is a 4 I/O module. In this module Output 3 is set and Input 1 allocated.

AS-i Slave address 2 is a 4 Input module. Input 2 is set.

VAT_ASI_IO -- @BW_ASi3\SIMATIC 300(1)\CPU 315-2 DP\S7-Programm(1) ONLINE					
	Operand	Symbol	Anzei	Statuswert	Steuerwert
1	EB 2	"IN_Flags_Slave1"	BIN	2#0000_1000	
2	EB 3	"IN_Slave2_Slave3"	BIN	2#0100_0000	
3	EB 4	"IN_Slave4_Slave5"	BIN	2#0000_0000	
4	EB 5	"IN_Slave6_Slave7"	BIN	2#0000_0000	
5	EB 6	"IN_Slave8_Slave9"	BIN	2#0000_0000	
6	E 2.4	"IN_ASi_Config_Error"	BOOL	false	
7	E 2.5	"IN_ASi_Power_Fail"	BOOL	false	
8	E 2.6	"IN_Periphery_Fault"	BOOL	false	
9	E 2.7	"IN_Configuration_Active"	BOOL	false	
10					
11	AB 2	"OUT_Flags_Slave1"	BIN	2#0000_0000	
12	AB 3	"OUT_Slave2_Slave3"	BIN	2#0000_0100	2#0000_0100
13	AB 4	"OUT_Slave4_Slave5"	BIN	2#0000_0000	
14	AB 5	"OUT_Slave6_Slave7"	BIN	2#0000_0000	
15	AB 6	"OUT_Slave8_Slave9"	BIN	2#0000_0000	
16	A 2.4	"OUT_ASi_Off_Line"	BOOL	false	
17	A 2.5	"OUT_LOS_Masterbit"	BOOL	false	
18	A 2.6	"OUT_Configuration_Mode"	BOOL	false	false
19	A 2.7	"OUT_Protected_Mode"	BOOL	false	false
20					
21	EW 0	"FLags + Fault Detector"	BIN	2#0000_0000_0000_0000	

16.2.7 System behavior on AS-i Config Error

If while running in protected mode a configured AS-i slave fails, an AS-i configuration error is generated.

1. The missing slave is shown on the display of the AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor.
2. The input flag AS-i Config Error bit 4 in byte 2 is set.
3. If the standard parameters for the PROFIBUS hardware configuration were applied unchanged for the AS-i/Gateway with safety monitor, the Gateway sets the ExtDiag flag in the PROFIBUS data reply. This results in the controller signaling a PROFIBUS slave error and invoking OB82. At the same time the event is written to the diagnostic buffer of the CPU.

If the message for the ExtDiagFlag is turned off in the PROFIBUS parameters, no PROFIBUS message is generated and OB82 is not activated. This is always recommended for applications which do not have to respond immediately to an error using OB82. In such cases the status can be processed using the message bit of the AS-i Flags or the Flags + Fault Detector bits for the normal PLC cycle. Error management can be structured on the basis of these messages.

YAT ASI IO -- @BW ASI3\SIMATIC 300(1)\CPU 315-2 DP\S7-Programm(1) ONLINE					
	Operand	Symbol	Anzei	Statuswert	Steuerwert
1	EB 2	"IN_Flags_Slave1"	BIN	2#0001_1000	
2	EB 3	"IN_Slave2_Slave3"	BIN	2#0100_0000	
3	EB 4	"IN_Slave4_Slave5"	BIN	2#0000_0000	
4	EB 5	"IN_Slave6_Slave7"	BIN	2#0000_0000	
5	EB 6	"IN_Slave8_Slave9"	BIN	2#0000_0000	
6	E 2.4	"IN_ASI_Config_Error"	BOOL	true	
7	E 2.5	"IN_ASI_Power_Fail"	BOOL	false	
8	E 2.6	"IN_Periphery_Fault"	BOOL	false	
9	E 2.7	"IN_Configuration_Active"	BOOL	false	
10					
11	AB 2	"OUT_Flags_Slave1"	BIN	2#0000_0000	
12	AB 3	"OUT_Slave2_Slave3"	BIN	2#0000_0100	2#0000_0100
13	AB 4	"OUT_Slave4_Slave5"	BIN	2#0000_0000	
14	AB 5	"OUT_Slave6_Slave7"	BIN	2#0000_0000	
15	AB 6	"OUT_Slave8_Slave9"	BIN	2#0000_0000	
16	A 2.4	"OUT_ASI_Off_Line"	BOOL	false	
17	A 2.5	"OUT_LOS_Masterbit"	BOOL	false	
18	A 2.6	"OUT_Configuration_Mode"	BOOL	false	false
19	A 2.7	"OUT_Protected_Mode"	BOOL	false	false
20					
21	EW 0	"FLags + Fault Detector"	BIN	2#0001_0000_0000_0001	

In the diagnostic buffer of the CPU the configuration error which occurred is entered with "Module error".

The affected AS-i/Gateway with safety monitor can be ascertained from the diagnostic address of the slave which reports the error. This diagnostic address is evident as a parameter of the OB82 when it is invoked. The event is declared as an incoming event.

The diagnostic address, here 1022, refers to the specification in the hardware specification of the S7 with respect to the AS-i/Gateway with safety monitor.

The screenshot shows the 'Baugruppenzustand - CPU 315-2 DP' window. The top bar indicates the path 'B:_ASI3\SIMATIC 300(1)\CPU 315-2 DP' and the CPU status 'RUN'. The status is 'Fehler' (Error). The window has tabs for 'Allgemein', 'Diagnosepuffer', 'Speicher', 'Zykluszeit', 'Zeitsystem', 'Leistungsdaten', 'Kommunikation', and 'Stacks'. The 'Diagnosepuffer' tab is active, showing a list of events. The 'Ereignisse' section has checkboxes for 'Filter-Einstellungen aktiv' and 'Uhrzeit incl. Zeitunterschied CPU/lokal'. The event list shows 8 events, all with the description 'Baugruppe gestört'. The details for event 1 are shown below the list, including the event ID '16# 3942' and a list of diagnostic information.

Nr.	Uhrzeit	Datum	Ereignis
1	13:49:02:944	29.02.04	Baugruppe gestört
2	13:49:02:941	29.02.04	Baugruppe gestört
3	13:49:02:938	29.02.04	Baugruppe gestört
4	13:49:02:934	29.02.04	Baugruppe gestört
5	13:49:02:924	29.02.04	Baugruppe gestört
6	13:49:02:875	29.02.04	Baugruppe gestört
7	13:49:01:752	29.02.04	Baugruppe gestört
8	13:49:01:747	29.02.04	Baugruppe gestört

Details zum Ereignis: 1 von 10 Ereignis-ID: 16# 3942

Baugruppe gestört
Baugruppentyp: DP-Normslave
Eingangsadresse: 1022
Anwenderinformation vorhanden
Diagnosealarm von Stellvertreter
Fehler baugruppenextern

Speichern unter... Einstellungen... Baustein öffnen Hilfe zum Ereignis

Schließen Aktualisieren Drucken... Hilfe

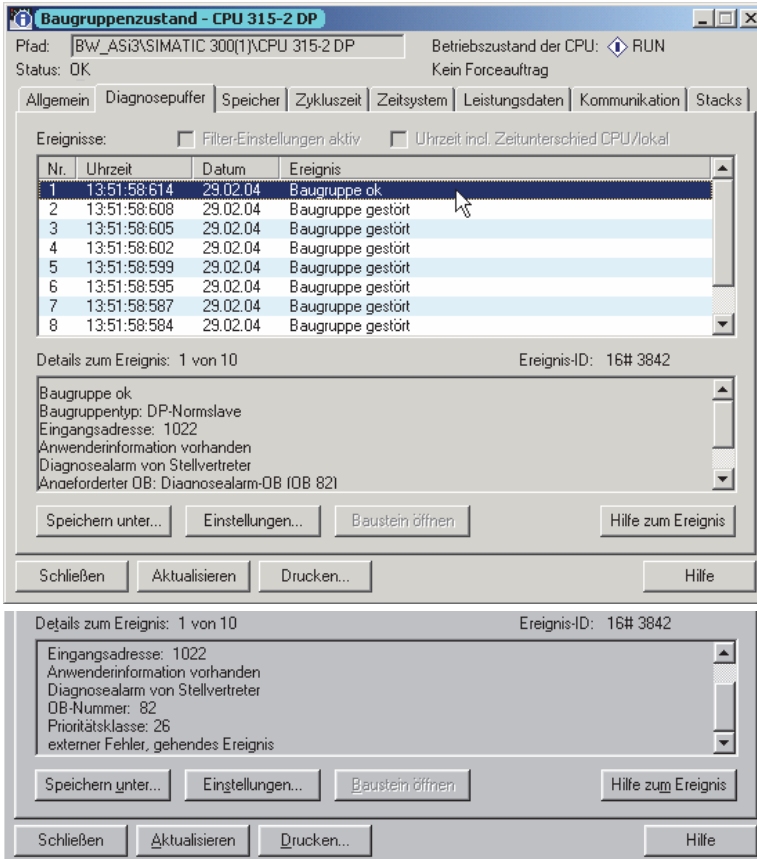
Details zum Ereignis: 1 von 10 Ereignis-ID: 16# 3942

Anwenderinformation vorhanden
Diagnosealarm von Stellvertreter
Fehler baugruppenextern
Angeforderter OB: Diagnosealarm-OB (OB 82)
Prioritätsklasse: 26
externer Fehler, kommendes Ereignis

Speichern unter... Einstellungen... Baustein öffnen Hilfe zum Ereignis

Schließen Aktualisieren Drucken... Hilfe

As soon as the AS-i configuration error is cleared, the OB82 is invoked again. In turn the diagnostic address of the AS-i/Gateway with safety monitor, here 1022, is entered as a parameter and the event is declared as an outgoing event.



Entry of the error messages in the diagnostic buffer of the CPU and invoking of the OB82 is a consequence of the set ExtDiag flag for an error in the AS-i 3.0 PROFIBUS Gateway with integrated Safety Monitor.

This can be prevented by turning off the ExtDiag flag in the PROFIBUS parameters of the AS-i/Gateway with safety monitor.

The errors can be responded to by the controller by querying the AS-i flag in the input data. This means a configuration error is reported twice in a standard case: Once via the AS-i flag Config Error and once via the ExtDiag flag in the PROFIBUS telegram.

If for timing reasons an AS-i error must be responded to in a non-interrupt controlled way, the message can be turned off using the ExtDiag flag. In this case it is sufficient to check the AS-i flag Config Error in the program sequence.

The same applies to the other messages.

If the message for various error states of the AS-i/Gateway with safety monitor is activated via the PROFIBUS and if the data for the PROFIBUS diagnostic data are enabled, the SIEMENS function module SFC13 can be used to retrieve the PROFIBUS diagnostic data of the AS-i Gateway and save them to a data module. Use of SFC13 is described in detail in the SIEMENS documentation for PROFIBUS.

16.2.8 Device-specific parameters

Acyclic Communication

Ein-/Ausschalten der azyklischen PROFIBUS-Kommunikation nach dem DPV1-Standard (nicht änderbar).

Default: Kommunikation nach DPV1 eingeschaltet.

AS-i Flags

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

Default: Transmission in the PROFIBUS 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.

Double Address

The AS-i/Gateway with safety monitor detects when there is double addressing. This list can be sent with the diagnostic data.

Default: Transmission in the PROFIBUS diagnostic data.

Earth Fault

The AS-i/Gateway with safety monitor can detect an earth (ground) fault. The information as to whether there is or is not an earth fault is sent in the diagnostic data.

Default: Transmission in the PROFIBUS diagnostic data.

ExtDiag on Configuration Errors

When an AS-i configuration error occurs, the AS-i/Gateway with safety monitor sets the ExtDiag flag in its PROFIBUS data reply. By setting this flag the Profibus DP slave tells the PROFIBUS master that there is an error condition and that the diagnostic data are being updated.

In the case of the S7 controller invoking of the OB82 is triggered when an ExtDiag flag is set. If the latter is not present, the controller is stopped.

Setting this ExtDiag flag can be suppressed using this parameter. Consequently no interrupt controlled OB82 invoking is triggered in the controller, and the controller must then respond to a possible AS-i configuration error by checking the AS-i flag in the input data.

Default: Setting of the ExtDiag flag for AS-i configuration error is enabled.

ExtDiag on AS-i Power Fail

Activates and deactivates setting of the ExtDiag flag on AS-i power fail.

Default: Setting of the ExtDiag flag on AS-i power fail is enabled.

ExtDiag on Peripheral Faults

Activates and deactivates setting of the ExtDiag flag on peripheral faults.

Default: Setting of the ExtDiag flag on peripheral faults disabled.

ExtDiag on Earth Fault

Activates and deactivates setting of the ExtDiag flag on earth (ground) fault.

Default: Setting of the ExtDiag flag on earth fault is disabled.

ExtDiag on Double Address

Activates and deactivates setting of the ExtDiag flag on double address.

Default: Setting of the ExtDiag flag on double address is disabled.

ExtDiag on Safety Status

Set the ExtDiagFlag when there is a safety slave with red or yellow flashing device.

Default: Set ExtDiagFlag for safety slaves with red or yellow flashing device.

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 PROFIBUS standard.

Input Data Filter

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

Default: No filtering of the input data.

Language

Selection of the displayed language.
Default: no change of the displayed language.

List of Configuration Errors

The AS-i/Gateway with safety monitor saves a list of all AS-i slaves which have triggered a present configuration error. This list can be sent with the PROFIBUS diagnostic data.
Default: Transmission in the PROFIBUS diagnostic data.

List of Peripheral Faults

The AS-i/Gateway with safety monitor saves a list of all AS-i slaves which have triggered a peripheral errors. This list can be sent with the PROFIBUS diagnostic data.
Default: Transmission in the PROFIBUS diagnostic data.

Noise and Over voltage

The AS-i/Gateway with safety monitor analyzes the quality of the AS-i voltage during running. This assessment can be sent with the diagnostic data.
Default: Not transmitted in the PROFIBUS 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

17. Reference List

17.1 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.

17.2 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>).

18. 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, error is displayed after pressing the "Set" button: it is a short-term voltage breakdown on AS-i 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> : checksum 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).

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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