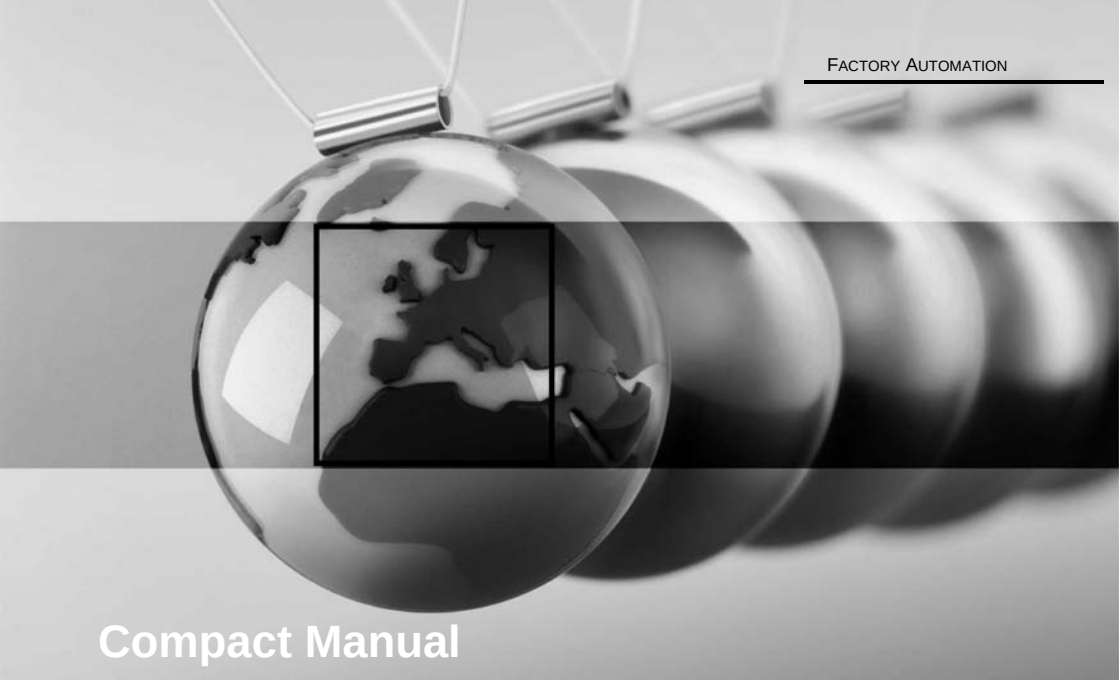

Compact Manual

PROFINET GATEWAYS

PEPPERL+FUCHS
SENSING YOUR NEEDS

With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship".

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PROFINET Gateways

1. Introduction

Congratulations

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

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

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

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

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

Symbols used

The following symbols are used in this manual:

Information!

This symbol indicates important information.

Attention!

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

Warning!

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

Contact

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

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Lilienthalstraße 200

68307 Mannheim

Telephone: +49 621 776-4411

Fax: +49 621 776-274411

E-Mail: fa-info@pepperl-fuchs.com

01.07.2016

2. Declaration of conformity

2.1 Declaration of conformity

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

Information!

A Declaration of Conformity can be requested from the manufacturer.

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

3. Safety

3.1 Symbols relevant to safety

Information!

This symbol indicates important information.

Attention!

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

Warning!

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

3.2 General notes on safety

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

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

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

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

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

Ensure that the ambient conditions comply with regulations.

3.3 Disposal

Information!

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

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

4. Setting up the AS-i Bus

1. Connect the unit to power.
2. Connect the AS-i cable to the unit.
3. One after the other connect the AS-i slaves to the AS-i cable and set the slave addresses.
   You may set the addresses directly on the slave using a portable addresser or by using the option [SLAVE ADR TOOL] in the display menu of your gateway.
4. In the display menu select [QUICK SETUP] to use the configuration of all AS-i circuits connected to the unit.
   Confirm with [STORE+RUN].
5. Set the PROFINET address and connect the gateway to the host fieldbus controller.
   You can set the addresses directly using the option [PROFINET] in the display menu of your gateway.

   The address can also be set by the host controller.

For more detailed information please refer to the installation guide for your gateway which is included with the unit.

5. Configuration and Start-up of the Safety Monitor

Configuration and start-up of the AS-i Safety Monitor is accomplished using a PC/ notebook running the ASIMON configuration software.

Note!

For more detailed information please refer to the separate manual for the ASIMON configuration software.

Configuration should be performed only by a safety specialist. All safety-related commands are password protected.

The correct safety functioning of the unit must absolutely be verified in the system!

Note!

Quick Start Guides for commissioning and service are provided on the website available for download.

6. PROFINET

6.1 Process data channel

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

6.1.1 Digital data

These data must be integrated into the control in order to access the slaves in the AS-i circuits.

Typical GSDML modules

C1:, C2: prefixed for double masters for AS-i circuit selection	
16 B.DI/O (0 … 31)	16 bytes for single-/A-slaves
16 B.DI/O (0B … 31B)	16 bytes for B-slaves
32 B.DI/O (0 … 31B)	32 bytes for single-/A- and B-slaves

Tab. 6-1.

In- and output data

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	F3	F2	F1	F0	D3	D2	D1	D0
	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 2929A			
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			

Tab. 6-2.

01.07.2016

In- and output data

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
26	slave 20B				slave 21B			
27	slave 22B				slave 23B			
28	slave 24B				slave 25B			
29	slave 26B				slave 27B			
30	slave 28B				slave 29B			
31	slave 30B				slave 31B			

Tab. 6-2.

Flags

	Input data	Output data
F0	ConfigError	Offline
F1	APF	LOS MasterBit
F2	PeripheryFault	→ ProtectedMode
F3	ConfigurationActive	→ ConfigurationMode

ConfigError:	0 = ConfigOK	1 = ConfigError
APF:	0 = AS-i Power OK	1 = AS-i Power Fail
PeripheryFault:	0 = PeripheryOK	1 = PeripheryFault
ConfigurationActive:	0 = ProtectedMode	1 = ConfigurationMode
Offline:	0 = Online	1 = Offline
LOS-Master-Bit:	0 = Offline by ConfigError deactivated	1 = Offline by ConfigError activated

6.1.2 Analog data

This section describes the analog process data. If you have analog slaves in your AS-i network, incorporate them as described in the following.

Typical GSDML modules

C1:, C2: prefixed for double masters for AS-i circuit selection		
n byte analog AI	8 bytes input data per analog slave, number of analog slaves. For ex.: 8 bytes analog in (4 sl.)	Parameter: first analog slave. It specifies the AS-i address of the first slave
n byte analog AO	8 bytes output data per analog slave, number of analog slaves	
n byte analog AI (ch.cfg)	2 bytes input data per slave, per channel	Parameter: first analog slave. It specifies the AS-i address of the first slave 2. Parameter: channel.configuration. It specifies the number of used channels per slave.
n byte analog AO (ch.cfg)	2 bytes output data per slave, per channel	

Tab. 6-3.

n byte AI/AO

Byte	Meaning
0	1. slave, channel 1, high byte
1	1. slave, channel 1, low byte
2	1. slave, channel 2, high byte
3	1. slave, channel 2, low byte
4	1. slave, channel 3, high byte
5	1. slave, channel 3, low byte
6	1. slave, channel 4, high byte
7	1. slave, channel 4, low byte
8	2. slave, channel 1, high byte
9	2. slave, channel 1, low byte
…	…
n	…

Tab. 6-4.

Note!

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

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

n byte AI/AO (Ch.cfg.)

Byte	4 channels	3 channels	2 channels	1 channel
0	1. slave, channel 1	1. slave, channel 1	1. slave, channel 1	1. slave, channel 1
1				
2	1. slave, channel 2	1. slave, channel 2	1. slave, channel 2	2. slave, channel 1
3				
4	1. slave, channel 3	1. slave, channel 3	2. slave, channel 1	3. slave, channel 1
5				
6	1. slave, channel 4	2. slave, channel 1	2. slave, channel 2	4. slave, channel 1
7				
…	…	…	…	…
n	…	…	…	…

Tab. 6-5.

6.1.3 Flags + Fault Detector

GSD module:

C1:, C2: prefixed for double masters for AS-i circuit selection	
Flags + fault detector	**2 byte input data (flags)**

Input data byte 0

Bit	meaning
0	peripheral fault
1	—
2	…
3	—
4	earth fault
5	over-voltage
6	noise
7	duplicate address

Tab. 6-6.

Input data byte 1

Bit	meaning
0	configuration error
1	slave with address ’0’ detected
2	auto_address_assignment *not* possible
3	auto_address_assignment available
4	configuration mode active
5	in normal operation
6	AS-i power fail
7	AS-i master off-line

Tab. 6-7.

6.1.4 Current Limit

Note!

Available only for gateways in version „1 gateway, 1 power supply for 2 AS-i circuits“.

GSDML module:

Power Control	**2 byte / 4 byte input data (flags)**	**Parameter: AS-i current limit 1st/2nd circuit**

The setting of the current limit takes place in 0,1 A steps via GSDML module parameter:

Input: 0 … 40 ≙ 0 A … 4,0 A

Note!

For gateways with 1 AS-i master the input data are two bytes long and for 2 AS-i masters 4 bytes.

Byte 0/1 refers to AS-i network 1 and byte 2/3 to AS-i network 2.

Input data byte 0/2

Bit	meaning
0	peripheral fault
1	over-current
2	…
3	failure redundant 24 V AUX (option single master)
4	earth fault
5	over-voltage
6	noise
7	duplicate address

Tab. 6-8.

Input data byte 1/3

Bit	meaning
0	configuration error
1	slave with address ’0’ detected
2	auto_address_assignment *not* possible
3	auto_address_assignment available
4	configuration mode active
5	*not* in normal operation
6	AS-i power fail
7	AS-i master off-line

Tab. 6-9.

6.1.5 List of Configuration Errors

Note!

Available only for gateways from Ident.-No. ≥ 16223 (see lateral label)!

The list of configuration errors contains the slave addresses with configuration errors.

GSDML module:

C1:, C2: prefixed for double masters for AS-i circuit selection	
Configuration error	**8 byte input data**

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	7A	6A	5A	4A	3A	2A	1A	–
1	15A	14A	13A	12A	11A	10A	9A	8A
…	…							
7	31B	30B	29B	28B	27B	26B	25B	24B

Tab. 6-10.

6.1.6 List of Peripheral Faults

Note!

Available only for gateways from Ident.-No. ≥ 16223 (see lateral label)!

The list of peripheral faults contains slave addresses which indicate peripheral faults. The cause for the peripheral fault report (e.g. broken wire) can be found in the documentation of the AS-i slave.

GSDML module:

C1:, C2: prefixed for double masters for AS-i circuit selection	
Peripheral fault	**8 byte input data**

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	7A	6A	5A	4A	3A	2A	1A	–
1	15A	14A	13A	12A	11A	10A	9A	8A
…	…							
7	31B	30B	29B	28B	27B	26B	25B	24B

Tab. 6-11.

6.1.7 Fieldbus bits

Note!

Available only with gateways with integrated safety monitor.

The fieldbus bits enable communication between the controller and the safety program. The fieldbus bits can be used to pass any acknowledgment signals or similar to the safety program and provide status information to the controller.

The states of the AS-i Safety in- and outputs are sent to the controller via the input data image (see par. <Safety diagnostics in the Input Data Image (IDI)>).

GSDML module: 2 Byte Fieldbus Bits

Output Data (function block Fieldbus Bit in ASIMON)

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	FB7	FB6	FB5	FB4	SI 4	SI 3	SI 2	SI 1
					FB3	FB2	FB1	FB0
1	FB15	FB14	FB13	FB12	FB11	FB10	FB9	FB8

Tab. 6-12.

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

Input Data (output assignment for Fieldbus Bit in ASIMON)

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	FB7	FB6	FB5	FB4	FB3	FB2	FB1	FB0
1	FB15	FB14	FB13	FB12	FB11	FB10	FB9	FB8

Tab. 6-13.

FB: Fieldbus Bit

SI 4, SI 3, SI 2, SI 1 Monitor Inputs

6.1.8 Safety Control/Status

Note!

Available only with gateways with integrated safety monitor.

GSDML module: SaW Monitor (n OSSD)

The module contains the diagnostics for the safety outputs in your safety monitor. Each release circuit corresponds to a safety output.

Output data

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	reserved				SI 4/ 2.Y2	SI 3/ 2.Y1	SI 2/ 1.Y2	SI 1/ 1.Y1
2	reserved							

Tab. 6-14.

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

Input Data

Byte	Meaning
0	Safety Status OSSD 1
1	Safety Status OSSD 2
...	…
n	Safety Status OSSD n

Tab. 6-15.

The table shows the color coding as represented in the ASIMON software.

Safety Status per OSSD (release circuit)

Bit value [0 ... 2]	**Status or color**	**Description**
0	continuous green	output on
1	flashing green	Wait time for **Stop cat. 1** running
2	continuous yellow	Start-up / Restart block active
3	flashing yellow	External test required / Acknowledgment / Turn-on delay active
4	continuous red	output off
5	flashing red	error
6	grey or off	output not projected
7	reserved	
Bit value [3 ... 5]	**status or color**	
	reserved	
Bit value [6]	**status or color**	
0	no device flashing yellow	
1	at least one device flashing yellow	
Bit value [7]	**status or color**	
0	no device flashing red	
1	at least one device flashing red	

Tab. 6-16. Coding of status bytes

6.1.9 Monitor and I/O data

Note!

Available only with gateways with integrated safety monitor.

GSDML module: 7 byte monitor and I/O data

The module contains 6 bytes of information about the current switching states of the local in- and outputs on the gateway as well as 1 byte of monitor information. These are encoded as follows:

Input data

Byte	Description
1	Monitor Info
2	Status SI1/SI2
3	Status SI3/SI4
4	Status SI5/SI6
5	Status SO1/SO2
6	Status SO3/SO4
7	Status SO5/SO6

Coding of the monitor info

Bit 0	Description
0	Monitor in configuration mode
1	Monitor in protection mode
Bit 1	Description
0	24V missing
1	24V o. k.
Bit [2 ... 5]	Reserved
Bit 6	Description
0	No component in the Test state (yellow flashing)
1	At least one component in the Test state (yellow flashing)
Bit 7	Description
0	No component in the Error state (red flashing)
1	At least one component in the Error state (red flashing)

Coding the status byte

Bit 0	Description
0	Depending on byte SI 1/3/5 or SO 1/3/5 Off
1	Depending on byte SI 1/3/5 or SO 1/3/5 On
Bit 1	Description
0	Depending on byte SI 2/4/6 or SO 2/4/6 Off
1	Depending on byte SI 2/4/6 or SO 2/4/6 On
Bit [2 ... 3]	Description (only if clamping terminals are used as a safety input)
0	Color of the associated safety-relevant component: red, green or gray
1	Color of the associated safety-relevant component: yellow ("wait")
2	Color of the associated safety-relevant component: yellow flashing ("test")
3	Color of the associated safety-relevant component: red flashing ("error")
Bit 4	Description
0	Clamping terminals configured as outputs or standard inputs
1	Clamping terminals configured for safety-relevant input
Bit [5 ... 7]	Reserved

6.1.10 Diagnostics Safe Link

Note!

Available only with gateways with integrated safety monitor.

The Safe Link process data diagnostics allows you to visualize the status of the safe link between the various gateways in the controller.

GSD module: 10 Bytes Safe Link Diag.

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	St. Addr 4		St. Addr 3		St. Addr 2		St. Addr 1	
2	St. Addr 8		St. Addr 7		St. Addr 6		St. Addr 5	
3	St. Addr 12		St. Addr 11		St. Addr 10		St. Addr 9	
4	St. Addr 16		St. Addr 15		St. Addr 14		St. Addr 13	
5	St. Addr 20		St. Addr 19		St. Addr 18		St. Addr 17	
6	St. Addr 24		St. Addr 23		St. Addr 22		St. Addr 21	
7	St. Addr 28		St. Addr 27		St. Addr 26		St. Addr 25	
8	reserved		St. Addr 31		St. Addr 30		St. Addr 29	
9	node status			node address				
10	domain no.			manager addr				

Tab. 6-17.

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

Bit-combination	Meaning
11	active
01	*not* active
10	*not* taught (only in the manager, message with the highest priority)
00	*not* used

node address:	node address within the Safe Link cluster
manager address:	node address of the Safe Link cluster manager
domain no.:	Safe Link cluster address *Only the 3 rear bits of the address are specified in the 'domain no.' !*

6.2 Diagnostics channel

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

6.2.1 Channel error codes

Slot	channel	error type	error text	help text
0	**AS-i Master** 0: circuit 1 1: circuit 2	16	configuration error	the actual configuration found on AS-i does not match the projected configuration, or the AS-i master performs startup operations.
		17	slave 0 detected	there is an AS-i slave with zero address
		18	no auto address assignment	automatic address assignment would not be possible
		19	auto address assignment available	as soon as an appropriate slave is connected, its address will be automatically assigned
		20	configuration mode	the AS-i master is in configuration mode
		21	no normal operation	the AS-i master is performing startup operations
		22	AS-i power fail	the AS-i power supply is insufficient
		23	off-line	the AS-i master doesn't send telegrams on AS-i
		24	peripheral fault	at least one AS-i slave reports a peripheral fault, or the AS-i master performs startup operations
		25	earth fault	the AS-i is short-circuited to ground
		26	overvoltage	the AS-i is short-circuited to an higher potential
		27	noise	the AS-i signals are noisy
		28	duplicate address	at least two AS-i slaves answers on the same address

Tab. 6-18.

6.2.2 Manufacturer specific diagnostic

AS-i flags

structure 0xA0: circuit 1

structure 0xA1: circuit 2

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

Tab. 6-19.

List of configuration errors

structure 0xA2: circuit 1

structure 0xA3: circuit 2

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

Tab. 6-20.

List of peripheral faults

structure 0xA4: circuit 1

structure 0xA5: circuit 2

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

Tab. 6-21.

Safety status (single- und A-slaves)

structure 0xA8: circuit 1

structure 0xA9: circuit 2

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

Tab. 6-22.

Safety status (B-slaves)

structure 0xAA: circuit 1

structure 0xAB: circuit 2

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

Tab. 6-23.

Each element of the manufacturer 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 ≡ 1
- APF ≡ 1
- PeripheralFault ≡ 1
- EarthFault ≡ 1
- DuplicateAddr ≡ 1

Evaluation of results can be individually activated/deactivated via PROFINET parameter or command interface.

The configuration file includes the following presettings:

- The diagnosis transmits EC-flags, DeltaList, LPF, EarthFault and DuplicateAddr.
- ExtDiag will be set if ConfigError ≡ 1 and APF ≡ 1.
  ExtDiag will *not* be set if PeripheralFault ≡ 1, EarthFault ≡ 1 and DuplicateAddr ≡ 1

7. PROFIsafe

7.1 Process data channel

GSDML Module: 8 Bytes PROFIsafe data

The assignment of the in- and output data bits depends on the configuration of the Safety Monitor. We recommend to use automatic configuration.

With automatic configuration the data are assigned as follows:

Input data

	Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
AS-i circuit 1	0	slave 7	slave 6	...	...	...	slave 2	slave 1	-
	1	slave 15	slave 14	...	...	...	...	slave 9	slave 8
	2	slave 23	slave 22	...	...	...	...	slave 17	slave 16
	3	slave 31	slave 30	slave 29	...	...	...	slave 25	slave 24
AS-i circuit 2	4	slave 7	slave 6	...	...	...	slave 2	slave 1	-
	5	slave 15	slave 14	...	...	...	...	slave 9	slave 8
	6	slave 23	slave 22	...	...	...	...	slave 17	slave 16
	7	SI 1,2	SI 3,4	SI 5,6	...	...	...	slave 25	slave 24
		slave 31	slave 30	slave 29					

Output data

	Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
AS-i circuit 1	0	slave 7	SO 6	SO 5	SO 4	SO 3	SO 2	SO 1	-
			slave 6	slave 5	slave 4	slave 3	slave 2	slave 1	
	1	slave 15	slave 14	...	...	...	...	slave 9	slave 8
	2	slave 23	slave 22	...	...	...	...	slave 17	slave 16
	3	slave 31	slave 30	...	...	...	...	slave 25	slave 24
AS-i circuit 2	4	slave 7	slave 6	...	...	...	slave 2	slave 1	-
	5	slave 15	slave 14	...	...	...	...	slave 9	slave 8
	6	slave 23	slave 22	...	...	...	...	slave 17	slave 16
	7	slave 31	slave 30	slave 29	...	...	...	slave 25	slave 24

7.2 PROFIsafe diagnostics

PROFIsafe communication can be "**activated**", set to passive ("**passivated**"), or turned off ("**inactive**") via the CPU.

7.2.1 PROFIsafe Status indicator

In protected operating mode when there is passivated PROFIsafe communication the message "PS" with the sub-line "Profisafe passivated" or a corresponding error message appears in the device display:

Status message	Meaning	Term[1]
PROFIsafe **activated**	PROFIsafe communication is active	activate_FV=0 and FV_activated=0
PROFIsafe **Gateway stopped**	Safety Monitor stopped	Monitor stopped
PROFIsafe passivated	PROFIsafe data passivated	activate_FV=1
PROFIsafe **inactive**	no PROFIsafe communication	other
PROFIsafe **address fault**	incorrect PROFIsafe address	diagnostic=0x40
PROFIsafe **watchdog-timeout**	PROFIsafe watchdog time expired	WDT-Timeout=1

Tab. 7-24. Meaning of the PROFIsafe messages

1. For terms see PROFIsafe specification.

If the gateway is in Projecting mode and there is activated Profisafe communication, "PS" is indicated by "**Profisafe activated**".

If no PROFIsafe module is selected in the I/O area of the gateway, no PROFIsafe message is generated.

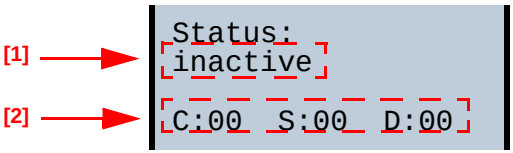
Status message	Protected operating mode	Projecting mode
PROFIsafe module selected, PROFIsafe active	no message	**PS** Profisafe activated
PROFIsafe module selected, PROFIsafe not active	**PS** Profisafe passivated	no message
PROFIsafe module not selected	no message	

Tab. 7-25.

If you are using a gateway with two AS-i masters and one of the two masters is in Projecting mode, PROFIsafe considers the entire device to be in Projecting mode.

The display menu can also be used to query the status of PROFIsafe communication:

Main menu || SAFETY || PROFISAFE || **STATUS**



The current status of PROFIsafe communication is displayed under **[1]**; below that **[2]** the contents of the PROFIsafe Status byte **[S]**, the Control byte **[C]** and the Diagnostic Word (Low-byte only) **[D]** are displayed.

7.2.2 PROFIsafe channel diagnostics

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

Tab. 7-26.

1. PS: Slot of the PROFIsafe module

8. Diagnostics

8.1 System diagnostics on the PC

8.1.1 Software for diagnostics, service and release measurements

The intuitively constructed software for diagnostics, service and release measurements enables PC-assisted measurement using the high-level measuring technology built into the masters.

This specially developed software assists both machine and systems builders in release measurements and preventive troubleshooting as well as end users in preventive maintenance and fast, self-performed error elimination. As an option the analysis data can also be sent to our technical support group and used as the basis for fast, reliable help with problem handling.

8.1.2 AS-i Control Tools

The Software AS-i Control Tools provide you with all the key testing and configuration possibilities of your AS-i circuit in organized fashion on your PC.

A graphic representation of your AS-i network provides you with a quick overview of the system status, showing for example any missing or unprojected slaves. In addition, peripheral errors and the status of the "AS-i Monitors" integrated into the Masters. The **diagnostic buffer** (not available with all devices!) stores with a time stamp in a ring buffer up to 1024 events. The AS-i Control Tools software also provides a simple and convenient way to configure new AS-i circuits or modify already existing configurations. This software is also a component of the ASIMON software.

8.1.3 ASIMON

The ASIMON software is used to configure the safety unit. Already configured systems can be diagnosed live using the software. The status of all in- and outputs is graphically represented as are the results of the preparatory processing.

When projecting the user has the ability to assign unique identifiers to the individual devices. These also appear in the device displays in connection with error messages. To prevent errors in the projecting stage the ASIMON software provides advance warning at the relevant points.

The AS-i Control Tools software is also part of the ASIMON.

8.1.4 Web server

Units having an Ethernet port provide all the diagnostics data through a web server. If necessary this also allws the system information to be viewed from any PC connected to the network without any additional software, simply using a standard internet browser and Java.

To be able to take advantage of the full scope of diagnostics functions and configuration possibilities of the AS-i Masters, you will however need the ASIMON software with integrated AS-i Control Tools and ideally also the software for diagnostics, service and release measurement.

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8.2 Diagnostics on the host controller

All the diagnostics information is also provided on the host controller.

8.2.1 On the fly diagnostics

PROFINET gateways transfer the most diagnostic information via the standard diagnostic.

8.2.2 Diagnostics through process data

Diagnostics through the process data provides a very simple means of incorporating diagnostics information into the controller program and displaying it on a control panel.

For useful diagnostics we recommend use of the following modules:

8.2.2.1 Diagnosing the AS-i circuits

- Gateways in „1 gateway, 1 power supply for 2 AS-i circuits“ version
  Power control (see chap. 6.1.4)
- For all other gateways
  Flags + Fault Detector (see chap. 6.1.3).
- List of Configuration Errors (see chap. 6.1.5)
- List of Peripheral Faults (see chap. 6.1.6)

When a configuration error is reported, e.g. because an AS-i slave has failed, the AS-i master continues to communicate with the remaining slaves. In many cases however a good and simple solution is to terminate running of the PLC program in case of a configuration error.

8.2.2.2 Diagnosing the Safety Monitor

- Safety diagnostics in the Input Data Image
  Diagnostics for the states of the safety AS-i in- and outputs. To obtain diagnostics information for a safety AS-i output the associated diagnostics slave address must be incorporated (see subsection <A>).
- Safety Control/Status
  Diagnosing the states of the release circuits (see chap. 6.1.8)
- Monitor and I/O Data
  Status of the safety monitor and of the local safety in- and outputs (see chap. 6.1.9)
- Fieldbus bits
  Manufacturer specific diagnostics (see chap. 6.1.7)
- Diagnostics Safe Link
  In case safe coupling of multiple safety monitors is used via Safe Link (see chap. 6.1.10).

Paragraph A: Safety diagnostics in the Input Data Image (IDI)

□ Safety diagnostics of safe AS-i inputs

Diagnostics in the IDI is a way of sending the key diagnostics functions to the controller without a command interface (Mailbox) or any additional effort. The diagnostics information is sent in the input data image, coded for the input bits of the address of the safety input slave.

The switching state of Channels 1 and 2 of the safety input is shown with negligible time lag in bits 0 and 1 and can be directly read:

Bit3	Bit2	Bit1	Bit0	Description
X	X	0	0	Both channels open
X	X	0	1	2nd channel open, 1st channel closed
X	X	1	0	2nd channel closed, 1st channel open
X	X	1	1	Both channel closed

Tab. 8-27.

Bits 2 and 3 are used to send the status of the safety input (the device color of the ASIMON):

Bit3	Bit2	Bit1	Bit0	Description
0	0	X	X	Device color: red, green or gray
0	1	X	X	Device color: yellow ("waiting")
1	0	X	X	Device color: yellow flashing ("testing")
1	1	X	X	Device color: red flashing ("Error")

Tab. 8-28. Stae of safety input

☐ Safety diagnostics of safe AS-i outputs

The diagnostic informations are transfered via the Input Data Image, coded to the input bits of the diagnostic address (diagnostic slave) of an AS-i safety slave. The diagnostics information for the safety output is encoded to the input data of the diagnostics slave of the respective safety output.

Bit value of the input bits of the diagnostic slaves

Bit	AS-i input
E0	diagnostics (see table device colors)
E1	
E2	
E3	reserved for EDM input

Tab. 8-29. Bit value of input bits of the diagnostic slaves

Device colors

The colors refer to the diagnostics in the ASIMON.

Value	Color	Description	state change	LED "OUT"[1]
0	green	output on	–	on
1	green flashing	–	–	–
2	yellow	restart inhibit	auxiliary signal 2	1 Hz
3	yellow flashing	–	–	–
4	red	output off	–	off
5	red flashing	waiting for reset of error condition	auxiliary signal 1	8 Hz
6	gray	connection or internal error	only via **Power On** on device	all LEDs flashing
7	green/yellow	output released, but not switched on	switched on by setting the output bit[1]	off

Tab. 8-30. Device colors

1. See documentation of the AS-i slave.

Important!

The following points must be noted for processing:

- The information for switching state and error status are not processed time-synchronous.
- When there is a configuration error all bits having value 0 are sent; this must be noted when processing the data.
- When the Monitor is stopped the device color is "gray".
- When regularly switching, the status "yellow flashing" can be recognized as a transition status. This depends on the component model set. This status cannot be understood as a testing request until it is stably reported (see Monitor Info and Safety Control/Status Byte). This is not the case until bit '6' is set in the Monitor Info and Safety Control/Status Byte ("At least one module in Test status"). This means the diagnostics information in the input data image does not serve as a trigger for the testing request, but rather only as detailed information after the Monitor Info and Safety Control/Status byte have indicated that at least one component has reported a testing request.

Changing the base setting

Setting and changing the diagnostics type is done using the device display (**[SAFETY]->[AS-I SAFETY]->[SAFE SUBST VAL]**)

8.2.3 Diagnosing the safety unit using the command interface

All the diagnostics data can also be queried individually and acyclic using the command interface commands. This method does however involve greater programming effort.

8.3 Error indication directly on the device

8.3.1 LEDs

The LEDs located on the device allow you to quickly see the status of the main function parameters, such as power, communication with the host controller, communication on the AS-i circuit and state of the safety in- and outputs.

8.3.2 LC-Display

In the display of the Gateways plain text messages are shown spontaneously for any detected errors (e.g. missing slaves, earth fault, duplicate address…).

8.3.3 AS-i Monitor

Comprehensive, standard measuring technology built into the AS-i Masters make it possible to simply localize even sporadically occurring configuration errors and interference sources affecting AS-i communication.

8.3.3.1 Duplicate address detection

The Master detects when two slaves having the same address are present in the AS-i circuit.

8.3.3.2 Earth fault monitor

The earth fault monitor checks the symmetry of the AS-i voltage. If the voltage is no longer sufficiently symmetrical, the noise immunity of data transmission is compromised.

8.3.3.3 Noise voltage detection

Noise voltages on the AS-i cable can cause telegram errors. The noise voltage detector monitors the AS-i circuit for AC voltages which have been generated by neither the AS-i Master nor the slaves.

8.3.3.4 Overvoltage detection

Normally UASi+ and UASi- are in symmetry with system ground. If this potential rises significantly, the overvoltage detector reports this anomaly.

9. Appendix

Quick Start Guides for commissioning and service are provided on the website available for download.

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