



Basic device manual
AS-i controller_e

ecomat300[®]

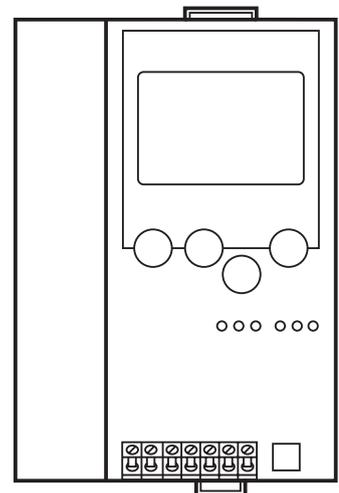
AC134x, AC135x

AC1307, AC1317

(x stands for any number)

Firmware version RTS 2.2 x
Target from 15
for CoDeSys[®] from version 2.3

7390563 / 00 10 / 2006



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1 About this manual

In this chapter we will give you an overview of the following points:

- What do the symbols and formats stand for?
- What devices are described in this manual?
- How is this manual structured?

1.1 What do the symbols and formats stand for?

The following symbols or pictograms shall illustrate our remarks in this manual:



Danger, in general

Sections marked with the pictogram "warning triangle" contain information for your safety. Thoroughly read and comply with these paragraphs.



Danger caused by electric current



Signal word: **DANGER**

Description of the consequences of this danger:
(death or serious irreversible injury is *to be expected*).



Signal word: **WARNING**

Description of the consequences of this danger:
(death or serious irreversible injury is *possible*).



Signal word: **CAUTION**

Description of the consequences of this danger:
(*minor reversible injury possible*)

Without warn-
ing symbol

Signal word: **CAUTION**

Description of the consequences of this danger:
(*property damage is to be expected or possible*).



Tip

The "i" in the square gives *important* information to help you handle the device or this manual correctly.

About this manual

What devices are described in this manual?

- Further symbols
- A state to be prevented to avoid a danger is marked by the preceding "circle" symbol.
 - ▶ A request requiring an action is marked by the preceding symbol "triangle".
 - > The response of the product to your action is marked by the preceding symbol "angle".
 - This arrow in the continuous text stands for "see" and refers to a text where you can find more details on the topic.

"Menu"

Menu items are in "inverted commas".

For several menu items to be selected successively we write:
"Main menu" > "Menu 2nd level" > "Menu 3rd level" etc.

[Elements]

Designations of keys or signal lamps such as [OK] or [PWR/COM] are written in bold and in brackets.

1.2

What devices are described in this manual?

This manual presents the AS-i controller family from **ifm electronic gmbh**

- with AS-i version 2.1 masters
- with a firmware from version RTS 2.2
- with the target from 15

In an additional manual "User Manual for PLC Programming with CoDeSys® 2.3" you will obtain more detailed information about the use of the programming system "CoDeSys for Automation Alliance". This manual is available as a free download on the **ifm** website:

→ http://www.ifm-electronic.com/ifmgb/web/asi_down.htm

Description of the corresponding fieldbus or Ethernet programming interface
→ separate instructions in addition to this device manual.

1.3

How is this manual structured?

This manual is a combination of different instruction types. It is for beginners and also serves as a reference for advanced users.

How to use this manual:

- To find a certain subject straight away, please use the table of contents at the beginning of this manual.
- Using the table of keywords at the end of the manual you can quickly find a term you are looking for.
- At the beginning of a chapter a brief overview of the contents of the chapter is given.

- Headers** You can find the title of the current chapter in bold in the header of each page. Below is the current title of the second order.
- Footers** You can find the chapter-related number of the page in the footer of each page.
- Selective reading** In the marginal column left you can find comments (marginalia) which make it easier for you to find certain paragraphs.
- Here you can also find pictograms and markings whose meaning is explained below.

Abbreviations and technical terms
→ Chapter 18 "Terms and abbreviations" at the end of the manual.

We reserve the right to make alterations which can result in a change of contents of the manual. The current version can be found at **ifm's** website:
http://www.ifm-electronic.com/ifmgb/web/asi_down.htm

Nobody is perfect. If you suggest improvements of the manual, you will receive a little gift from us to thank you.

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1.4 Overview: where is what?

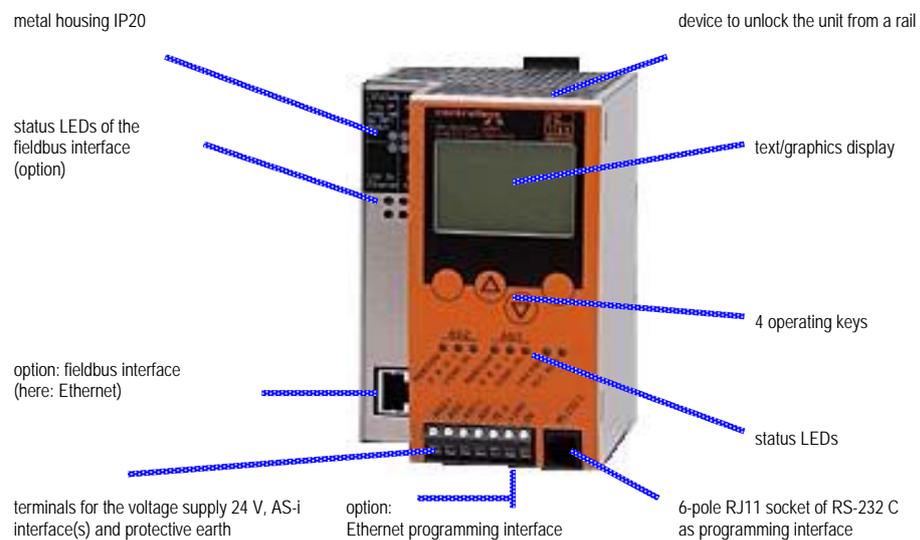


Figure: Controller_e overview

2 Safety instructions

In this chapter you can find general safety instructions, such as:

- General rules
- Safety instructions for mounting and installation
- When are you allowed to use this device and when not?

2.1 General

No characteristics are warranted with the information, notes and examples provided in this manual. With the drawings, representations and examples given no responsibility for the system is assumed and no application-specific particularities are taken into account.

The manufacturer of the machine/equipment is responsible for the safety of the machine/equipment.



Danger

Material damage or bodily injury when the notes in this manual are not adhered to!
ifm electronic assumes no liability for this.

- ▶ The acting person must have read and understood the safety instructions and the corresponding chapters of this manual before performing any work on or with this unit.
- ▶ The acting person must be authorised to work on the machine/equipment.

2.2 What previous knowledge is required?

This manual is intended for persons with knowledge of control technology and PLC programming with IEC 61131-3 as well as the CoDeSys® software.

The manual is intended for persons authorised to mount, connect and set up the controller_e according to the EMC and low voltage directives. The controllers must be installed and put into operation by a qualified electrician.

In case of malfunctions or uncertainties please contact the manufacturer:
→ back of the manual.

2.3 Warning notes on mounting

CAUTION

Moisture, dust, shocks, overheating

Damage or failure of the unit possible!

- Moisture may destroy the electronics.
- ▶ Use the unit in a condensation-free environment.
- Dust deposits obstruct the necessary circulation of air for heat dissipation.
- ▶ If possible, do not expose the unit to a dusty environment. If this cannot be avoided, you must clean the unit correspondingly often. → chapter 17 "Maintenance, repair and disposal".
- Shocks and vibrations may damage the unit.
- ▶ Adhere to the technical specifications.
- ▶ The air circulation through the vents must not be hampered. Therefore, allow about 30 mm of clear space above and below the unit when installing it.

According to the technical specifications (→"Technical data") you can operate the unit in a wide operating temperature range. Because of the additional internal heating the housing walls can have high perceptible temperatures when touched in hot environments. This is normal and no cause for a complaint.

2.4 Warning notes on installation

CAUTION

Short circuit, wrong connection

Malfunction of the machine/plant in which the unit is installed!

- ▶ Electrical installation tasks must be carried out by a qualified electrician.
- ▶ Disconnect power before connecting the controller to avoid short circuits during installation.
- ▶ Connect the terminals according to the terminal marking.
- ▶ The supply voltage (SELV) must not be connected to protective earth. Therefore, never connect the minus terminal to the FE terminal or to another terminal of the unit.

It must be ensured that the external voltage is generated and supplied according to the criteria for safety extra-low voltage (SELV), since this voltage is provided without further measures to supply the connected controller, the sensors and the actuators.

The wiring of all signals concerning the SELV circuit of the unit must also meet the SELV criteria (safety extra-low voltage, safe galvanic separation from other circuits).

If the supplied SELV voltage is externally grounded (SELV becomes PELV), the responsibility lies with the user and the respective national installation regulations must be complied with. All statements in this manual refer to the unit which is *not* grounded with respect to the SELV voltage.

The connection terminals may only be supplied with the signals indicated in the technical data and/or on the unit label and only the approved accessories of **ifm electronic** may be connected.

3 System requirements

3.1 Information concerning the device

This manual presents the AS-i controller family from **ifm electronic gmbh**

- with AS-i version 2.1 masters
- with a firmware from version RTS 2.2
- with the target from 15

3.2 Information concerning the software

The controller operates with CoDeSys[®] as from version 2.3.

In an additional manual "User Manual for PLC Programming with CoDeSys[®] 2.3" you will obtain more detailed information about the use of the programming system "CoDeSys for Automation Alliance". This manual is available as a free download on the **ifm** website:

→ http://www.ifm-electronic.com/ifmgb/web/asi_down.htm

3.3 Required accessories

To run the system you need the following accessories in addition to a controller (not included in the scope of supply):

- a power supply for 24 V supply (e.g. order no. DN2011) and
- one AS-i power supply per AS-i master (e.g. order no. AC1216)
- as well as AS-i slaves.

Description of the corresponding fieldbus or Ethernet programming interface
→ separate instructions in addition to this device manual.

If you want to use the PC for configuration and programming you also need:

- the software "CoDeSys for Automation Alliance" version 2.3 or higher
- a programming cable (e.g. article no. E70320)
- as well as a PC with serial interface.

4 Functions and features

CAUTION

Overload or wrong use of the unit

The unit and / or the associated machine/plant may be damaged or destroyed or may malfunction if the limits of the "Technical data" for this unit are exceeded or if the unit is used outside the specified "Functions and features".

- ▶ Use the unit only within the limits of the "Technical data"
→ page 15-1, chapter 15 "Technical data".
- ▶ Use the unit only in accordance with the "Functions and features"

4.1 Intended use

You may use the unit for the following purposes (= functions and features):

- as a fieldbus gateway between the actuator-sensor interface network and a higher-level controller (fieldbus master = host, e.g. PLC) via a fieldbus connection (option)
- as an independent controller for units via the actuator/sensor interface with/without data exchange to a PC for visualisation of the machinery states

4.2 Prohibited use

The controller must NOT be used for the following purposes:

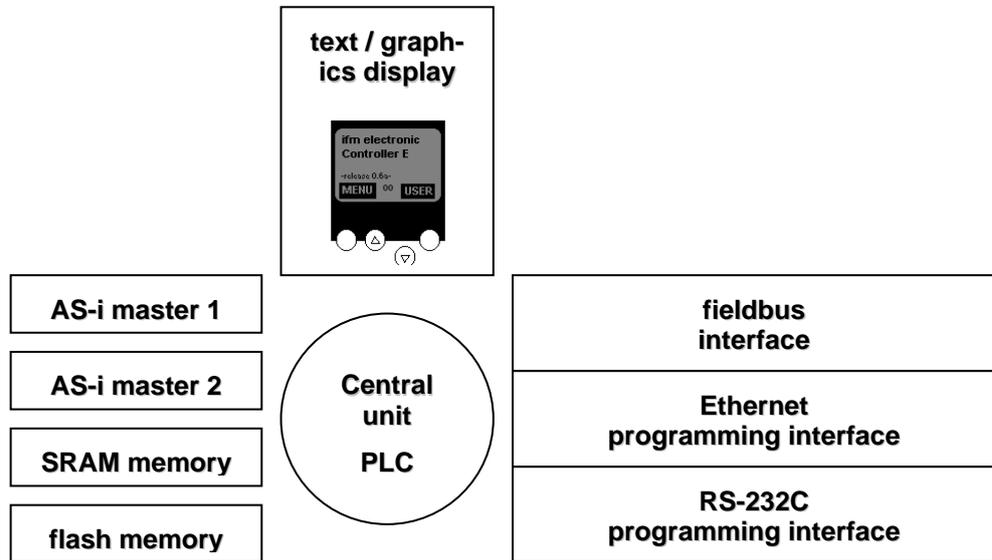
- outdoors
- in wet environments
- outside the limits of the technical data
→ page 15-1, chapter 15 "Technical data"

Tampering with the unit can seriously affect the safety of operators and machinery. This is not permitted and leads to an exclusion of liability and warranty.

5 Function

5.1 Data management

The controller consists of different units:



- The **central processing unit** (CPU) ensures the data transfer between the sub-systems. It manages the remanent flash memory and the volatile RAM memory.
- The **flash memory** is now 1 mbyte large and stores non-volatily...
 - the system configuration including the AS-i configurations,
 - the runtime system (RTS),
 - the PLC program (must explicitly be stored there!),
 - the remanent data.
- The operating system and the PLC programs run in the **SRAM memory**, now also 1 mbyte large, after power-on of the unit.
- The **AS-i masters** each feature a separate microcontroller and communicate according to the AS-i specification with the connected slave modules on the AS-i bus.
- By using a **text/graphics display** in the controller detailed system diagnosis is possible. The handling of the unit with the four keys is easy to learn.
 - page 8-1, chapter "Operating and display elements"
 - The bilingual design of the menus and messages simplifies worldwide use of this device family.
 - page 8-5, chapter "Text/graphics display: switch language"
 - An intelligent message management generates priority-based diagnostic and error messages and considerably supports the user during set-up and fault-finding.
 - chapter 16 "Error messages"
- The **PLC** is a real-time software core in the central unit. The core cyclically polls the user program. This user program is created and tested by means of the software CoDeSys®.

- The **serial programming interface**, (RS-232C with RJ11 socket) enables convenient projection and programming of the AS-i masters and the PLC via a personal computer with a transmission rate of up to 115 kBd.
- With the optional **Ethernet programming interface**, (10/100 MBd, twisted pair), the unit can, in addition to even faster programming and diagnosis, also be networked to other controller devices.
→ separate supplementary device manual
- The optional **fieldbus interface** operates independently and exchanges data with the central system via a "dual port RAM" interface or a DMA transfer.
→ separate supplementary device manual

5.2 AS-i data introduction

The AS-i master and the AS-i slaves make a large amount of data available to the user. The user can retrieve information, such as the status of the master and the configuration data of the slaves. These data are summarised in several data fields and can be accessed via standard IEC addresses (→ also page 12-6, chapter "Overview PLC addresses").

These addresses and their contents will be described in the following sections.

Field definitions for direct data access

Masters flags

The master flags for master 1 are at the word addresses %IW31.240/241.

The master flags for master 2 are at the word addresses %IW32.240/241.

The meaning of the different bits of these words is the same for master 1 and master 2 and is shown in the following table.

Word address master 1 master 2	Bit	Bit = TRUE means:
%IW31.240 %IW32.240	0	"No Slave Reset" When executing the function "Config all" (via the menu or command channel of the controller) the slaves are <u>not</u> reset, as described in the AS-i specification.
	1...15	reserved
%IW31.241 %IW32.241	0	"Config OK" There is no configuration error. The configuration of all AS-i slaves in the network complies with the projection data.
	1	"LDS.0" One slave with the AS-i address 0 was detected on the master.
	2	reserved
	3	reserved
	4	"Configuration_Active" The controller is in the projection mode.
	5	"Normal_Operation_Active" The AS-i master is in normal operation: it communicates with at least one slave.
	6	"AS-i_Power_Fail" The AS-i voltage is too low.
	7	reserved
	8	"Periphery_OK" None of the active AS-i slaves signals a peripheral fault.
	9	"Auto_Address_Enable" The mode "automatic addressing of the slaves" on this master is activated.
10...15	reserved	

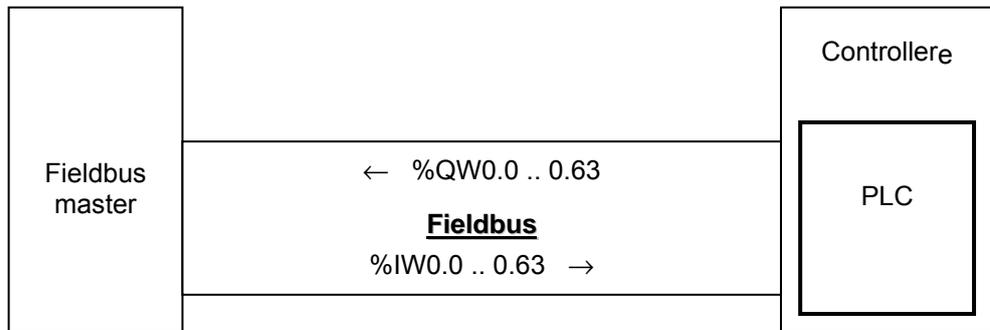
Example: to retrieve the bit LDS.0 "slave 0 detected" for master 1 the address %IX31.241.1 is used; for master 2 the address %IX32.241.1 is used.

Fieldbus
I/O data

Data exchange between fieldbus and PLC

As an option, we offer fieldbus interfaces for the controller, e.g. Profibus DP, DeviceNet, Ethernet, etc.

Data exchange via fieldbus is possible between the PLC in the controller and the fieldbus master (→ figure below).



The output words %QW0...63 are sent by the PLC to the fieldbus master.

The input words %IW0...63 are received by the PLC from the fieldbus master.

Description of the corresponding fieldbus: → separate supplementary device manual

Configuration data (CDI) of the slaves

The configuration data for standard, A and B slaves are each stored in one data word. The structure is shown below and is the same for all slaves.

The slave profile has the following structure:

S-[I/O code].[ID code].[ext. ID code2]

Bits 12...15	Bits 8...11	Bits 4...7	Bits 0...3
XID2	XID1	ID code	IO code
Extended ID code 2	Extended ID code 1	ID code	I/O configuration
3rd figure in the slave profile	(for AS-i slaves version 2.0 = Fh)	2nd figure in the slave profile	1st figure in the slave profile
(for AS-i slaves version 2.0 = Fh)	can be changed by the user		
Example: AC2255 4 digital inputs, 2 digital outputs AS-i profile = S-7.A.E this results in the following configuration data of the slave:			
1110 = 0Eh	0111 = 07h	1010 = 0Ah	0111 = 07h

Current and projected configuration data are distinguished. The addresses for these data are as follows.

Current configuration data (CDI)

Word address:

for master 1: xx = 31
for master 2: xx = 32

Word address	of slave	Word address	of slave
%IWxx.0	0	%IWxx.32	(*)
%IWxx.1	1(A)	%IWxx.33	1B
%IWxx.2	2(A)	%IWxx.34	2B
%IWxx.3	3(A)	%IWxx.35	3B
%IWxx.4	4(A)	%IWxx.36	4B
%IWxx.5	5(A)	%IWxx.37	5B
%IWxx.6	6(A)	%IWxx.38	6B
%IWxx.7	7(A)	%IWxx.39	7B
%IWxx.8	8(A)	%IWxx.40	8B
%IWxx.9	9(A)	%IWxx.41	9B
%IWxx.10	10(A)	%IWxx.42	10B
%IWxx.11	11(A)	%IWxx.43	11B
%IWxx.12	12(A)	%IWxx.44	12B
%IWxx.13	13(A)	%IWxx.45	13B
%IWxx.14	14(A)	%IWxx.46	14B
%IWxx.15	15(A)	%IWxx.47	15B
%IWxx.16	16(A)	%IWxx.48	16B
%IWxx.17	17(A)	%IWxx.49	17B
%IWxx.18	18(A)	%IWxx.50	18B
%IWxx.19	19(A)	%IWxx.51	19B
%IWxx.20	20(A)	%IWxx.52	20B
%IWxx.21	21(A)	%IWxx.53	21B
%IWxx.22	22(A)	%IWxx.54	22B
%IWxx.23	23(A)	%IWxx.55	23B
%IWxx.24	24(A)	%IWxx.56	24B
%IWxx.25	25(A)	%IWxx.57	25B
%IWxx.26	26(A)	%IWxx.58	26B
%IWxx.27	27(A)	%IWxx.59	27B
%IWxx.28	28(A)	%IWxx.60	28B
%IWxx.29	29(A)	%IWxx.61	29B
%IWxx.30	30(A)	%IWxx.62	30B
%IWxx.31	31(A)	%IWxx.63	31B

*) The address 0B is not possible, therefore these values are set to 0 by default.

Projected configuration data (CDI)

Word address:

for master 1: xx = 31
for master 2: xx = 32

Word address	of slave	Word address	of slave
%IWxx.96	0(A)	%IWxx.128	(*)
%IWxx.97	1(A)	%IWxx.129	1B
%IWxx.98	2(A)	%IWxx.130	2B
%IWxx.99	3(A)	%IWxx.131	3B
%IWxx.100	4(A)	%IWxx.132	4B
%IWxx.101	5(A)	%IWxx.133	5B
%IWxx.102	6(A)	%IWxx.134	6B
%IWxx.103	7(A)	%IWxx.135	7B
%IWxx.104	8(A)	%IWxx.136	8B
%IWxx.105	9(A)	%IWxx.137	9B
%IWxx.106	10(A)	%IWxx.138	10B
%IWxx.107	11(A)	%IWxx.139	11B
%IWxx.108	12(A)	%IWxx.140	12B
%IWxx.109	13(A)	%IWxx.141	13B
%IWxx.110	14(A)	%IWxx.142	14B
%IWxx.111	15(A)	%IWxx.143	15B
%IWxx.112	16(A)	%IWxx.144	16B
%IWxx.113	17(A)	%IWxx.145	17B
%IWxx.114	18(A)	%IWxx.146	18B
%IWxx.115	19(A)	%IWxx.147	19B
%IWxx.116	20(A)	%IWxx.148	20B
%IWxx.117	21(A)	%IWxx.149	21B
%IWxx.118	22(A)	%IWxx.150	22B
%IWxx.119	23(A)	%IWxx.151	23B
%IWxx.120	24(A)	%IWxx.152	24B
%IWxx.121	25(A)	%IWxx.153	25B
%IWxx.122	26(A)	%IWxx.154	26B
%IWxx.123	27(A)	%IWxx.155	27B
%IWxx.124	28(A)	%IWxx.156	28B
%IWxx.125	29(A)	%IWxx.157	29B
%IWxx.126	30(A)	%IWxx.158	30B
%IWxx.127	31(A)	%IWxx.159	31B

*) The address 0B is not possible, therefore these values are set to 0 by default.

Current parameter data

Word address: for master 1: xx = 31
for master 2: xx = 32

Word address	Bits 12...15	Bits 8...11	Bits 4...7	Bits 0...3
	Current parameter data of slave...			
%IWxx.64	4(A)	3(A)	2(A)	1(A)
%IWxx.65	8(A)	7(A)	6(A)	5(A)
%IWxx.66	12(A)	11(A)	10(A)	9(A)
%IWxx.67	16(A)	15(A)	14(A)	13(A)
%IWxx.68	20(A)	19(A)	18(A)	17(A)
%IWxx.69	24(A)	23(A)	22(A)	21(A)
%IWxx.70	28(A)	27(A)	26(A)	25(A)
%IWxx.71	1B	31(A)	30(A)	29(A)
%IWxx.72	5B	4B	3B	2B
%IWxx.73	9B	8B	7B	6B
%IWxx.74	13B	12B	11B	10B
%IWxx.75	17B	16B	15B	14B
%IWxx.76	21B	20B	19B	18B
%IWxx.77	25B	24B	23B	22B
%IWxx.78	29B	28B	27B	26B
%IWxx.79	reserved		31B	30B

Example: Current parameter for slave 6B on master 2:
 %IW32.73 (bits 0...3)

Reflected parameter data

The reflected parameter data of the controller_e are always a copy of the current parameter data.

Word address: for master 1: xx = 31
for master 2: xx = 32

Word address	Bits 12...15	Bits 8...11	Bits 4...7	Bits 0...3
	Reflected parameters of slave...			
%IWxx.160	4(A)	3(A)	2(A)	1(A)
%IWxx.161	8(A)	7(A)	6(A)	5(A)
%IWxx.162	12(A)	11(A)	10(A)	9(A)
%IWxx.163	16(A)	15(A)	14(A)	13(A)
%IWxx.164	20(A)	19(A)	18(A)	17(A)
%IWxx.165	24(A)	23(A)	22(A)	21(A)
%IWxx.166	28(A)	27(A)	26(A)	25(A)
%IWxx.167	1B	31(A)	30(A)	29(A)
%IWxx.168	5B	4B	3B	2B
%IWxx.169	9B	8B	7B	6B
%IWxx.170	13B	12B	11B	10B
%IWxx.171	17B	16B	15B	14B
%IWxx.172	21B	20B	19B	18B
%IWxx.173	25B	24B	23B	22B
%IWxx.174	29B	28B	27B	26B
%IWxx.175	reserved		31B	30B

Example: Reflected parameter data of slave 6B on master 2:
%IW32.169 (bits 0...3)

Slave lists

The different slave lists are stored in four words (word no. 0...3). The bit assignment of these words (assignment of slave information to the bits) is shown below.

Word no.	Bit no.															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	Slave															
0	15 (A)	14 (A)	13 (A)	12 (A)	11 (A)	10 (A)	9 (A)	8 (A)	7 (A)	6 (A)	5 (A)	4 (A)	3 (A)	2 (A)	1 (A)	0 *)
1	31 (A)	30 (A)	29 (A)	28 (A)	27 (A)	26 (A)	25 (A)	24 (A)	23 (A)	22 (A)	21 (A)	20 (A)	19 (A)	18 (A)	17 (A)	16 (A)
2	15 B	14 B	13 B	12 B	11 B	10 B	9 B	8 B	7 B	6 B	5 B	4 B	3 B	2 B	1 B	res
3	31 B	30 B	29 B	28 B	27 B	26 B	25 B	24 B	23 B	22 B	21 B	20 B	19 B	18 B	17 B	16 B

*) LAS and LPS have no slave 0, so these values are set to 0 by default!

Examples: Information about standard slave 16 is stored in word no. 1, bit no. 0.
Information about slave 28B is stored in word no. 3, bit no. 12.

In the following table you will find the addresses of the four words in which the corresponding slave lists are stored.

Word no.	LAS	LDS	LPF	LPS
0	%IWxx.80	%IWxx.84	%IWxx.88	%IWxx.92
1	%IWxx.81	%IWxx.85	%IWxx.89	%IWxx.93
2	%IWxx.82	%IWxx.86	%IWxx.90	%IWxx.94
3	%IWxx.83	%IWxx.87	%IWxx.91	%IWxx.95

LAS = list of activated slaves
LDS = list of detected slaves
LPF = list of slaves with peripheral faults
LPS = list of projected slaves

Word address:
for master 1: xx = 31
for master 2: xx = 32

Slave error counter

Word address:

for master 1: xx = 31
for master 2: xx = 32

Word address	Error counter	Word address	Error counter
%IWxx.176	1(A)	%IWxx.207	1B
%IWxx.177	2(A)	%IWxx.208	2B
%IWxx.178	3(A)	%IWxx.209	3B
%IWxx.179	4(A)	%IWxx.210	4B
%IWxx.180	5(A)	%IWxx.211	5B
%IWxx.181	6(A)	%IWxx.212	6B
%IWxx.182	7(A)	%IWxx.213	7B
%IWxx.183	8(A)	%IWxx.214	8B
%IWxx.184	9(A)	%IWxx.215	9B
%IWxx.185	10(A)	%IWxx.216	10B
%IWxx.186	11(A)	%IWxx.217	11B
%IWxx.187	12(A)	%IWxx.218	12B
%IWxx.188	13(A)	%IWxx.219	13B
%IWxx.189	14(A)	%IWxx.220	14B
%IWxx.190	15(A)	%IWxx.221	15B
%IWxx.191	16(A)	%IWxx.222	16B
%IWxx.192	17(A)	%IWxx.223	17B
%IWxx.193	18(A)	%IWxx.224	18B
%IWxx.194	19(A)	%IWxx.225	19B
%IWxx.195	20(A)	%IWxx.226	20B
%IWxx.196	21(A)	%IWxx.227	21B
%IWxx.197	22(A)	%IWxx.228	22B
%IWxx.198	23(A)	%IWxx.229	23B
%IWxx.199	24(A)	%IWxx.230	24B
%IWxx.200	25(A)	%IWxx.231	25B
%IWxx.201	26(A)	%IWxx.2xx	26B
%IWxx.202	27(A)	%IWxx.233	27B
%IWxx.203	28(A)	%IWxx.234	28B
%IWxx.204	29(A)	%IWxx.235	29B
%IWxx.205	30(A)	%IWxx.236	30B
%IWxx.206	31(A)	%IWxx.237	31B

Example: error counter slave 7 on master 1: %IW31.182

Configuration error counter

Word address	Configuration error counter
%IW31.238	Master 1
%IW32.238	Master 2

AS-i cycle counter

Word address	AS-i error counter
%IW31.239	Master 1
%IW32.239	Master 2

6 Mounting

For mounting the controller_e a 35 mm DIN rail to DIN EN 50022 is required. The unit mounted on the DIN rail can be easily removed from there without any tools.

The housing shape was selected to match the current 24 V and AS-i power supplies from **ifm electronic**. So, with a height of only 107 mm the controller_e can be installed in most control boxes with 120 mm height.

CAUTION

Overheating due to wrong mounting

The controller_e may overheat, which may result in damage.

- ▶ The controller_e must be mounted vertically in the control cabinet. This serves for an optimum heat dissipation from the unit.
- ▶ When mounting, leave a gap of at least 30 mm above and below the unit. The air circulation through the vents must not be hampered.

If the specified distances are adhered to, the unit can be operated in a temperature range of 0°C to +60°C.

CAUTION

Electromagnetic interference caused by a frequency converter

Frequency converters emit strong electromagnetic interference. This may interfere with the function of the AS-i controller_e.

- ▶ Install the controller_e outside the area of possible electromagnetic interference by neighbouring frequency converters.

7.1 Terminals of the controllere

Terminals	Function
+24V / 0V	Supply voltage 24 V DC (20...30 V PELV), e.g. from power supply DN2011 of ifm electronic This supply must not be grounded! Power consumption: up to 500 mA, depending on the data of the unit
FE	Functional earth of the unit
ASI1+	Bus cable AS-i master 1, positive pole (brown)
ASI1-	Bus cable AS-i master 1, negative pole (blue)
ASI2+	Bus cable AS-i master 2 (option), positive pole (brown)
ASI2-	Bus cable AS-i master 2 (option), negative pole (blue)
RS-232C	Serial programming interface

Further connections for fieldbus and/or Ethernet programming interfaces are available as an option and are described in separate instructions.

The unit is correctly connected to the functioning supply if the LED [**24 V PWR**] is lit after power on of the controllere.

7.2 The AS-i power supply

To operate an AS-i system a special AS-i power supply is required, e.g. AC1216 from **ifm electronic**. The AS-i power supply supplies the connected slaves with energy via the yellow AS-i cable and at the same time implements data decoupling from the voltage regulator of the power supply. Standard switched-mode power supplies do not feature data decoupling and are therefore not suited for use as AS-i current supply.

In the **ifm** AS-i power supplies the two terminals AS-i+ and AS-i- are designed redundantly, so that they can additionally be connected to the terminals ASI 1+ and ASI 1- of the controller without additional terminals. The same applies to ASI 2+ and ASI 2- for the second AS-i master circuit.

For the operation of the optional second AS-i master a second AS-i power supply is required, because the two master circuits must be electrically separated. In addition, the AS-i power supply supplies the analogue input part of the controller.

CAUTION

Overcurrent in case of short circuit

Risk of damage to units. In case of short circuits, the AS-i power supply provides the maximum current.

- ▶ Disconnect the power supply from power before connecting the controller.

CAUTION

Asymmetry of the AS-i signals

Interference or corruption of the AS-i signals.

When the AS-i network is grounded the signals AS-i+ and AS-i- are no longer symmetrical to the ground potential of the machine/plant.

- Do NOT ground the AS-i network.
- ▶ Connect the "Shield" terminal on the AS-i power supply to the machine ground so that it is well conductive (GND potential).

7.3 Wiring and set-up of the slaves

In general, the AS-i units are short-circuit protected and reverse-polarity protected, wiring of control cabinet modules should anyhow be carried out while disconnected.

Connecting the slaves

- ▶ Switch off the controller_e and its supply

CAUTION

Electrical voltage

Malfunction of the machine/plant in which the unit is installed!

Damage or destruction of the units by a short circuit when working while live.

- ▶ Electrical installation tasks must be carried out by a qualified electrician.
- ▶ Switch off the power supply before connecting the device in order to avoid short circuits during installation.
- ▶ Only install the controller_e and the slaves while disconnected!

AS-i field modules can also be installed while live.

SmartLine modules

- ▶ Connect (control cabinet) modules.
- ▶ Remove the Combicon connector with AS-i connection to enable automatic addressing of the slaves in rising order.

AS-i field modules

AS-i field modules usually consist of a lower part for the connection of the yellow (and black) flat cable and an upper part with the electronics.

- ▶ Insert the cable in the lower parts, but do not yet screw/clamp the upper parts on the lower parts, to enable automatic addressing of the slaves in rising order.

Power the controller_e on again

After power-on, the two power supplies supply the controller_e, the AS-i master and the AS-i bus with voltage. The green LED [PWR/COM] flashes because no valid slave has been detected yet.

In the next step the slaves must be addressed:

→ page 11-7, chapter 11.2 "Configuration"

8 Operating and display elements

In this chapter you will learn more about the elements on the controller:

- how to operate the unit
- how to obtain information about the unit and its configuration
- how to set parameters for the unit and the AS-i slaves.

8.1 Diagnostic LEDs

The three diagnostic LEDs on the controller inform about the status of the AS-i master and the connected systems:

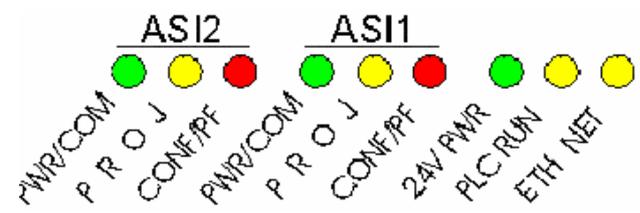


Figure: diagnostic LEDs

Comment on the figure "diagnostic LEDs":

- The LEDs [**AS12**] are an option for the second AS-i master, including the labelling
- The LED [**ETH NET**] is, including its labelling, an option for the Ethernet programming interface

Two designations for one LED, separated by a slash "/", signify:

- the first designation describes the status in case of a permanently lit LED (mostly normal operation) and
- the second designation describes the status in case of a flashing LED (mostly in case of a fault).

Diagnostic LEDs	LED colour	LED off	LED lit	LED flashes
ASI1 [PWR/COM] AS-i bus 1: Power Communication	green	No supply for AS-i bus 1	AS-i supply given; at least 1 slave detected on the bus	AS-i supply given; no slave correctly detected on the bus
ASI1 [PROJ] AS-i bus 1: Projection	yellow	Operating mode is active	Projection mode active; the configuration monitoring is deactivated	Projection mode active; change-over to protected mode not possible because a slave with the address 0 is connected
ASI1 [CONF/PF] AS-i bus 1: Configuration Peripheral fault	red	Configuration and periphery ok	Projected and current configuration do not match	Peripheral fault detected on at least one connected slave
ASI2 [PWR/COM] AS-i bus 2: Power Communication	green	No supply for AS-i bus 2	AS-i supply given; at least 1 slave detected on the bus	AS-i supply given; no slave correctly detected on the bus
ASI2 [PROJ] AS-i bus 2: Projection	yellow	Operating mode is active	Projection mode active; the configuration monitoring is deactivated	Projection mode active; change-over to protected mode not possible because a slave with the address 0 is connected
ASI2 [CONF/PF] AS-i bus 2: Configuration Peripheral Fault	red	Configuration and periphery ok	Projected and current configuration do not match	Peripheral fault detected on at least one connected slave
[24V PWR]	green	No 24 V operating voltage	24 V operating voltage available	---
[PLC RUN]	yellow	Controllere operating as gateway	PLC program in the controllere active	PLC program in the controllere stopped

8.2 Display

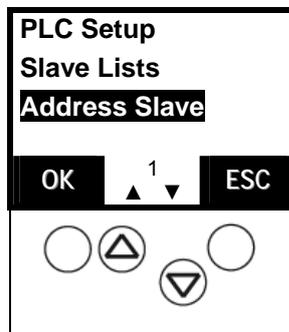
By using a text/graphics display in the controller, a detailed system diagnosis is possible. The handling of the unit with the four keys is easy to learn. The bilingual structure of the menus and messages simplifies worldwide use of this device family. An intelligent message management generates priority-based diagnostic and error messages and supports the user during set-up.

Above the keys, the display dynamically displays the corresponding functions.

After power-on of the controller, the unit either displays a start screen with the **ifm** logo or – if available – a list of the errors in the connected AS-i systems. In any case, the system menu can be accessed by pressing the left **[MENU]** button.

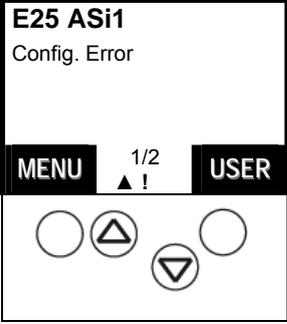
What is what in the text/graphics display?

Normal menu
screen



- > Usually the menu shows 3 to 5 lines, similar to the screen on the left
- > One menu line is inverted. This highlights the active or selected entry. When pressing **[OK]** the controller changes to the corresponding menu screen.
- > 1
Number of the menu screen
- > Triangles **[▲]** **[▼]**
Indication of which arrow keys can be actuated to scroll.
- ▶ Scroll the menu or the values with **[▲]** / **[▼]**
[▲] = scrolling upwards through the menu or values
[▼] = scrolling downwards through the menu or values
- ▶ Select the marked menu item by means of **[OK]**
- ▶ Cancel this menu by means of **[ESC]** and return to the previous menu level

Error screen In case of a configuration error or failure the start screen of the text/graphics display will provide information as shown in the following screen:

a)  **Display of a fault when the start screen was active**

- > E25 = error number
→ chapter 16 "Error messages"
- > ASi1 = concerned AS-i master channel number
- > Config. Error
There is a configuration error
- > 1/2
First of 2 pages with error messages
- > Flashing "!"
There is an error message
- > LED [**CONF/PF**] lights
- > Triangles [**▲**] / [**▼**]
Indication of which arrow keys can be actuated to scroll.

b)  **Indication of a fault when any menu screen is active**

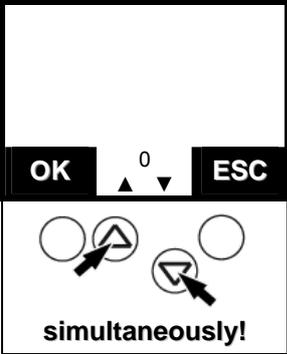
- > Flashing "!"
There is an error message
- > LED [**CONF/PF**] lights
- > Triangles [**▲**] / [**▼**]
Indication of which arrow keys can be actuated to scroll.

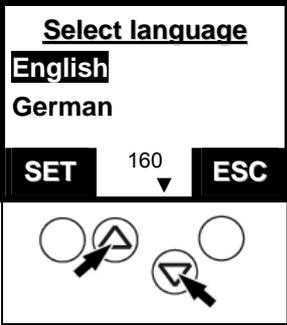
▶ Scroll back to the start screen by means of [**ESC**]

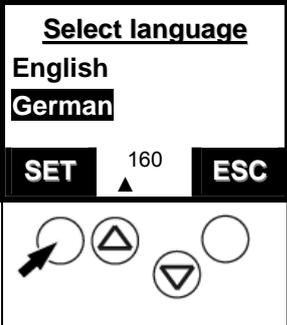
- > An error screen as described above appears

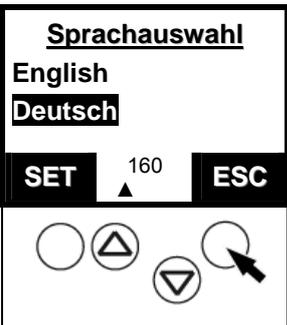
Text/graphics display: switch language

There are 2 languages stored for the text/graphics display in the controller.
You can switch between the languages at any time.

1. 

> Example: current language = English
▶ [▲] / [▼] pressed simultaneously for about 2 seconds
2. 

> Indication of the current language
▶ Scroll to the requested language by means of [▲] / [▼].
3. 

▶ Select the requested language by means of [SET]
4. 

> The display switches to the requested language
▶ Cancel the language selection by means of [ESC]
▶ That's it!

English is always available and is set as default language on delivery. The other language depends on the device version (→ AS-i catalogue). Therefore, the menus shown in this manual are only in English.

Text/graphics display: contrast setting

If the text/graphics display is difficult to read the contrast can be adjusted:

too bright

- > The display is too bright / too pale:



simultaneously!

- ▶ Press these buttons simultaneously.
- > The contrast becomes greater/darker.

too dark

- > The display is too dark:



simultaneously!

- ▶ Press these buttons simultaneously.
- > The contrast becomes lower/brighter.

The unit automatically stores the last setting.

8.3

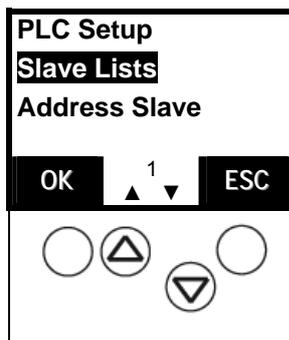
Key functions

The four buttons on the controller enable a quick and easy handling of the menu.

The keys [▲] and [▼] serve for menu selection and changing the displayed values. Menus with more than three options are adapted automatically. If it is possible to move upwards and downwards in the menu, this is indicated by means of small arrows in the middle of the lowest display row.

The two outer keys are function keys. Their function depends on the menu screen and is indicated in the lowest row of the display by means of inverted texts.

Example



- Here the left button serves for the function [OK], i.e. for confirmation of the selected menu item.
- The right button here serves for the function [ESC], i.e. returning to the previous menu level.

9



Menu

Note

In this manual the menu text is always in English.

→ page 8-5, chapter "Text/graphics display: switch language"

9.1

Menu overview

Via [**Menu**] you can access the following main menus:

Main menu	Function	Page
Quick Setup	Quick setting of AS-i and fieldbus parameters	9-2
PLC Setup	Setting of PLC operating modes	9-3
Slave Lists	Display of status information of the slaves in lists	9-4
Address Slave	Individual addressing of slaves	9-5
Diagnostics	Display of status information of the masters and reset of the error counter	9-6
Master Setup	Setting master operating modes	9-8
Fieldbus Setup	Setting fieldbus parameters	9-10
Slave Info	Displaying status information of individual active slaves	9-11
Slave Setup	Displaying or changing output data or parameters of individual slaves	9-12
System Setup	Setting parameters for programming interfaces, firmware updates, setting access passwords, etc.	9-14
System Info	Display of all system parameters	9-19

9.2 Main menu "Quick Setup"

Quick setting of AS-i and fieldbus parameters (password level 1 required)

Menu tree	Function
Quick Setup Config. all	<ul style="list-style-type: none">▶ Quick projection of everything → page 11-15> The controller changes to the projection mode, if it has not done so already.> The controller checks all connected slaves (on both masters) and enters them in its table as "projected".> The controller changes to the protected mode.
Quick Setup Fieldbus Setup	<ul style="list-style-type: none">▶ Quick fieldbus projection → supplementary instructions fieldbus (option)

9.3 Main menu "PLC Setup"

Setting of PLC operating modes (password level 1 required)

Menu tree	Function
PLC Setup	PLC settings
PLC Setup PLC Settings	> Display of the current operating mode (→ page 10-5)
PLC Setup PLC Settings Run	▶ If available: Start the PLC program in the controller > LED [PLC RUN] lights > The host on the fieldbus (option) only reaches the actuators on the AS-i bus via the PLC program in the controller
PLC Setup PLC Settings Stop	▶ Stopping the PLC program in the controller > LED [PLC RUN] flashes > The host on the fieldbus (option) only reaches the actuators on the AS-i bus via the PLC program in the controller
PLC Setup PLC Settings Gateway	▶ Switching the controller to operation as a gateway > LED [PLC RUN] goes out > The inputs/outputs on the AS-i bus are directly connected to the corresponding inputs and outputs on the fieldbus master (option)
PLC Setup PLC Info	> Display of information about the stored PLC program (if available): (→ page 13-1) • Program name • Program version • Storage data • Author of the program

9.4 Main menu "Slave Lists"

Display of status information of the slaves in lists

Menu tree	Function
Slave Lists AS-i Master 1	
Slave Lists AS-i Master 1 Detected Slaves AS-I 1	<p>Detected slaves on AS-i master 1: (→ page 13-3)</p> <ul style="list-style-type: none"> > Indication at which slave address the controller_e has <i>detected</i> one (or several) slaves type A, B or S (standard) on the bus, irrespective of whether the slave is active on the bus.
Slave Lists AS-i Master 1 Projected Slaves AS-I 1	<p>Projected slaves on AS-i master 1: (→ page 13-5)</p> <ul style="list-style-type: none"> > Indication at which slave address one (or several) slaves type A, B or S (standard) <i>are projected</i> on the bus.
Slave Lists AS-i Master 1 Activated Slaves AS-I 1	<p>Activated slaves on AS-i master 1: (→ page 13-8)</p> <ul style="list-style-type: none"> > Indication at which slave address the controller_e has detected an <i>activated</i> slave type A, B or S (standard) on the bus. <p>Only detected and projected slaves can be activated. The slave configuration is ok when all projected slaves on the bus have been detected and activated.</p>
Slave Lists AS-i Master 1 Periph. Flt. AS-i 1	<p>Peripheral fault on AS-i master 1: (→ page 13-11)</p> <ul style="list-style-type: none"> > Indication at which slave address the controller_e has detected one (or several) slaves type A, B or S (standard) with a wiring fault on the bus.
Slave Lists AS-i Master 2	as for AS-i master 1

9.5 Main menu "Address Slave"

Individual addressing of slaves (password level 1 required)

Menu tree	Function
Address Slave Change Address	Addressing of slaves (→ page 11-11)
Address Slave Change Address AS-i Master 1	<ul style="list-style-type: none"> > Display of the detected slave with the lowest address on the bus. ▶ Scroll through the addresses of the detected slaves with the buttons [▲] / [▼] ▶ After the [OK] button: change the current address using the buttons [▲] / [▼] ▶ Adopt the new address by pressing [OK]. <p>Alternatively:</p> <ul style="list-style-type: none"> ▶ Stop addressing and keep the old address with [ESC].
Address Slave Change Address AS-i Master 2	see slave addressing AS-i master 1
Address Slave Easy Startup	Easy startup (→ page 11-8)
Address Slave Easy Startup AS-i Master 1	<ul style="list-style-type: none"> > Message: "Master 1 waiting for slave 0". Display of the next free slave address. ▶ Integration of a new slave (with the address 0) by simply connecting the slave to the bus: > The controller automatically assigns the previously displayed slave address.
Address Slave Easy Startup AS-i Master 2	as for AS-i master 1

9.6 Main menu "Diagnostics"

Display of status information of the masters and reset of the error counter

Menu tree	Function
Diagnostics AS-i Master 1	
Diagnostics AS-i Master 1 Voltage Disturbance	Voltage failure: → page 13-16 > Display of the number of cases of undervoltage on the AS-i bus.
Diagnostics AS-i Master 1 Configuration Error	Configuration error: > Display of the number of detected configuration errors since the last reset
Diagnostics AS-i Master 1 Telegram Error	Message errors: → page 13-20 > Display of faulty AS-i messages in percent of the sent messages. ▶ After [MORE] : > Display of the number of active slaves > Display of the number of AS-i cycles per second



Tip

Please note when evaluating the information: the controller_e polls A/B slaves connected as pairs (i.e. with the same address) only in every second cycle.

Diagnostics AS-i Master 1 Noisy Slaves	Noisy Slaves: → page 13-23 > Display of the number of disturbed messages of each active slave. ▶ After [SORT] : > New sorting of the table according to the number of disturbed messages.
Diagnostics AS-i Master 1 Reset Error Counter	Resetting the error counter (password level 1 required): → page 13-25 ▶ After [OK] : > Setting all error counters to 0.
Diagnostics AS-i Master 1 Cycle time	Cycle time: → page 13-27 > Display of the longest cycle time of the system in [ms] since the last reset. ▶ After [ZERO] : > Resetting the previous test series and starting a new test series.
Diagnostics AS-i Master 2	as for AS-i master 1
Diagnostics Safety Master 1	Diagnosis safety monitor on master 1

Menu tree	Function
Diagnostics Safety Master 1 Read Monitor	Reading the states of the safety monitors → page 13-29 > Status information of the OSSD (Output Signal Switching Device)
Diagnostics Safety Master 1 Trigg. Slave	Reading the states of the safety slaves → page 13-33 > Status information of the input bits (code sequence)
Diagnostics Safety Master 1 Enable Monitor	Enabling an AS-i slave as safety monitor Now the controller can exchange the safety-related data with the safety monitor (special protocol). → page 13-36
Diagnostics Safety Master 1 Disable Monitor	Disable an AS-i slave as safety monitor. → page 13-39
Diagnostics Safety Master 1 Setup Monitor	Setting the diagnosis to enable circuits or all safety devices → page 13-42
Diagnostics Safety Master 1 Reset all	Resetting all set diagnostic states of the safety devices → page 13-45
Diagnostics Safety Master 2	as for Safety Master 1

9.7 Main menu "Master Setup"

Setting master operating modes

Menu tree	Function
Master Setup AS-i Master 1	Master Setup AS-i master 1
Master Setup AS-i Master 1 Config all	AS-i Master 1: Config all (password level 1 required) Prerequisites: - Operating mode = projecting - No slave with the address 0 on the bus > Safety query: "Are you sure?" ▶ After [OK]: > The controller checks all connected slaves (only on this master) and enters them as "projected" in its table. > The operating mode stays "projecting"
Master Setup AS-i Master 1 Operation Mode	AS-i Master 1: operating mode (password level 1 required) → page 10-2 > Display of the current setting
Master Setup AS-i Master 1 Operation Mode Protect. Mode	Operating mode "protected": > LED [PROJ] goes out. > Changes to the slaves are detected (LED [CONF/PF] lights). Slaves with a different projected profile are <u>not</u> activated.
Master Setup AS-i Master 1 Operation Mode Config. Mode	Operating mode "projecting": > LED [PROJ] lights. > Changes to the slaves are detected (LED [CONF/PF] lights). All connected slaves are active.
Master Setup AS-i Master 1 Autoaddr. Mode	AS-i Master 1: mode "automatic addressing" (password level 1 required) > Display of the current setting ▶ Scroll between ON and OFF with [▲] / [▼] ▶ Adopt with [OK]. • Automatic addressing ON: Permits the replaced slave to be assigned the address of the old slave in the protected mode (default) • Automatic addressing OFF: The replaced slave must be manually set to the right address.

Menu tree	Function
Master Setup AS-i Master 1 Slave Reset	AS-i Master 1: resetting the slave (password level 1 required) <ul style="list-style-type: none">> Display of the current setting▶ Scroll between ON and OFF with [▲] / [▼]▶ Adopt with [OK].• Slave reset ON: After switching the master to the protected mode the controller briefly sets all slave outputs to 0 (default).• Slave reset OFF: The status of the slave outputs remains unchanged when switching to another operating mode.
Master Setup AS-i Master 2	as for AS-i master 1

9.8 Main menu "Fieldbus Setup"

Setting fieldbus parameters (password level 1 required)

Menu tree	Function
Fieldbus Setup	Fieldbus Setup → supplementary instructions fieldbus (option)

9.9 Main menu "Slave Info"

Displaying status information of individual active slaves → page 13-48

Menu tree	Function
Slave Info AS-i Master 1	<ul style="list-style-type: none"> > Display of the detected slave with the lowest address on the bus. ▶ Scroll through the addresses of the detected slaves with [▲] / [▼] > After [OK]: current data of the selected slave (depending on the type of slave): <ul style="list-style-type: none"> • Data of the digital inputs and outputs (binary + hexadecimal) • Data of the analogue channels (decimal) • Entries in the lists of active / detected / projected slaves / slaves with peripheral fault • Slave profile configuration • Slave parameters • Number of message errors ▶ Scroll through the addresses of detected slaves with [▲] / [▼] to show the same data of other slaves ▶ Continue to the next data with [MORE]. ▶ Cancel with [ESC].
Slave Info AS-i Master 2	as for AS-i master 1

9.10 Main menu "Slave Setup"

Displaying or changing output data or parameters of individual slaves (password level 2 required)



WARNING

The output values remain unchanged

Risk of personal injury! Risk of material damage to the machine/plant! After changing the slave outputs the output values remain unchanged.

The output values only change in the following cases:

- Manual new setting of the outputs via Slave Setup
- Starting the PLC program – the program processes the outputs
- Switching the controller off and on again

- ▶ Secure the concerned area.
- ▶ Only trained personnel may manually set the outputs.
- ▶ Switch the outputs off again immediately after the end of the test.

Menu tree	Function
Slave Setup AS-i Master 1	<ul style="list-style-type: none"> > Display of the detected slave with the lowest address on the bus. ▶ Scroll through the addresses of the detected slaves with [▲ / ▼] ▶ Select slave address with [OK]
Slave Setup AS-i Master 1 Digital output	<ul style="list-style-type: none"> > Display of current data of the selected slave. → page 13-51 ▶ Change the value of the output signal with [▲] / [▼] and then press [SET]. > The row "Current" adopts the setup value and the change is passed on to the outputs as long as the active PLC program in the controller does not process these outputs. ▶ Cancel with [ESC].
Slave Setup AS-i Master 1 Parameter value	<ul style="list-style-type: none"> > Display of current parameter data of the selected slave. → page 11-19 ▶ Change the value of the parameter in the row "Setup" with [▲] / [▼] and transmit it to the slave with [SET]. > If the value or change is not permissible: "slave data invalid" ▶ Cancel with [ESC].
Slave Setup AS-i Master 1 Analogue value	<ul style="list-style-type: none"> > Display of current data of the selected slave (depending on the type of slave): analogue values. → page 13-51 ▶ After [OK]:

Menu tree	Function
Slave Setup AS-i Master 1 Analogue value Analogue channel 1 Analogue channel 2 Analogue channel 3 Analogue channel 4	<ul style="list-style-type: none"> ▶ Scroll through the numbers of the analogue channels with [▲] / [▼] ▶ After [OK]: > Display of current data of the selected slave. ▶ Change the value of the analogue channel with [▲] / [▼] and then press [SET]. > The row "Current" adopts the setup value and the change is passed on to the outputs as long as the active PLC program in the controller does not process these outputs. ▶ Cancel with [ESC].
Slave Setup AS-i Master 2	as for AS-i master 1

9.11 Main menu "System Setup"

Setting parameters for programming interfaces, firmware updates, setting access passwords, etc.

Menu tree	Function
System Setup Serial Port Baudrate	<ul style="list-style-type: none"> ▶ Scroll the possible baud rates of the serial interface with [▲] / [▼] → page 11-1 ▶ Confirm the selected value with [OK] Or: Cancel with [ESC]
System Setup Ethernet Setup	<ul style="list-style-type: none"> ▶ Only operational with an Ethernet programming interface (option)! → supplementary instructions "Ethernet programming interface" (option)
System Setup Ethernet Setup IP Address	<ul style="list-style-type: none"> > Display of the current IP address. The arrow ↑ indicates the set of numbers to be edited. To change it, the DHCP Setup must be OFF. ▶ Change to the next set of numbers with [→] ▶ Change the set of numbers with [▲] / [▼] ▶ Once again [→] after the last set of numbers > Display of new IP address ▶ Save new IP address with [OK] > Display of "WAIT" message during storage > Return to the menu "IP address"
System Setup Ethernet Setup SubNet Mask	<ul style="list-style-type: none"> > Display current subnet mask. The arrow ↑ indicates the set of numbers to be edited. To change it, the DHCP Setup must be OFF. ▶ Change to the next set of numbers with [→] ▶ Change the set of numbers with [▲] / [▼] ▶ Once again [→] after the last set of numbers > Display new subnet mask ▶ Save new subnet mask with [OK] > Display of "WAIT" message during storage. > Return to the menu "SubNet mask"

Menu tree	Function
System Setup Ethernet Setup Gateway Address	<ul style="list-style-type: none"> > Display of the current gateway address. The arrow ↑ indicates the set of numbers to be edited. To change it, the DHCP Setup must be OFF. ▶ Change to the next set of numbers with [→] ▶ Change the set of numbers with [▲] / [▼] ▶ Once again [→] after the last set of numbers > Display of new gateway address ▶ Save new gateway address with [OK] > Display of "WAIT" message during storage > Return to the menu "Gateway Address"
System Setup Ethernet Setup Baudrate	<ul style="list-style-type: none"> ▶ Scroll through the possible parameters with [▲] / [▼] ▶ Save new baud rate with [OK] > Display of "WAIT" message during storage > Return to the menu "Baud rate"
System Setup Ethernet Setup Auto Negotiation	<p>Automatic negotiation of the baud rate and the transmission (full-duplex/half-duplex) among the participants in the Ethernet:</p> <ul style="list-style-type: none"> ▶ Scrolling between ON and OFF with [▲] / [▼] ▶ Adopt with [OK] > Display of "WAIT" message during storage > Return to the menu "Auto Negotiation"
System Setup Ethernet Setup DHCP Setup	<p>Automatic retrieval of the IP address from an existing DHCP server:</p> <ul style="list-style-type: none"> ▶ Scroll between ON and OFF with [▲] / [▼] ▶ Adopt with [OK] > Display of "WAIT" message during storage > Return to the menu "DHCP Setup"
System Setup Ethernet Setup MAC ID	<ul style="list-style-type: none"> > Display of the manufacturer identification number of the Ethernet participant in the network.

Menu tree	Function
System Setup Modbus Setup	<p>Only operational with an Ethernet programming interface (option)!</p> <p>→ supplementary instructions "Ethernet programming interface" (option)</p> <ul style="list-style-type: none"> ▶ Scroll between enabling and blocking the Modbus support with [▲] / [▼] (password level 1 required)
System Setup Firmware Update	<p>Update of the firmware (RTS Runtime System Software) (password level 3 required):</p> <p>→ page 11-27</p> <p>Prerequisite: PC/laptop with special software connected to serial interface.</p>
System Setup Firmware Update Runtime System	<p>Update runtime system</p> <ul style="list-style-type: none"> > Display: "RTS Firmware: Connect to PC – Start now?" → The PC must be connected to update the RTS firmware. Start transmission now? ▶ [OK] ▶ Start transmission on the PC > Transmission active
System Setup Firmware Update AS-i Master 1	<p>Update AS-i Master 1</p> <ul style="list-style-type: none"> ▶ [OK] > Display: "AS-i 1 Firmware: Connect to System – Start now?" → The PC must be connected to update the firmware on the AS-i master 1. Start transmission now? ▶ [OK] ▶ Start transmission on the PC > Transmission active
System Setup Firmware Update AS-i Master 2	<p>as for update AS-i master 1</p>

Menu tree	Function
System Setup Password	<p>Prevents unauthorised changes to the controller by means of a 4-digit password. → page 11-22</p> <ul style="list-style-type: none"> > Display: "Password – 0000" An arrow (↑) below shows the digit to be edited ▶ Change to the next digit with [→] ▶ Change the digit with [▲] / [▼] ▶ Once again [→] after the last digit > Display password ▶ Adopt with [OK] Cancel with [ESC] > Return to the previous menu level. <p>If the password has been entered correctly the corresponding parameter changes are possible; if the password is wrong they are blocked.</p>
System Setup Factory default	<ul style="list-style-type: none"> ▶ Start factory default with [OK] (password level 3 required). → page 11-25 > Safety query "Are you sure?" ▶ [OK] > Resetting the controller to the factory settings. Some changes will not become effective before the next power-on. > PLC programs are <u>not</u> deleted. > The password is reset to level 1.
System Setup System Errors	<p>System Setup error messages → page 15-3</p> <ul style="list-style-type: none"> > History memory of the last system error message which must be acknowledged
System Setup System Specials	<p>System particularities (password level 2 required):</p>
System Setup System Specials Fall Back	<p>Switch between FALL BACK VNC ON and FALL BACK VNC OFF</p> <p>The menu entered by the user is automatically left after a defined time if the device is not operated.</p>
System Setup System Specials RTS Error	<p>Switch between RTS ERROR ON and RTS ERROR OFF</p> <p>The display of the Rxx system messages can be disabled by means of this setting.</p>

Menu tree	Function
System Setup System Specials Bitmap Manual	> Display of stored background images ▶ Scroll with the buttons [▲] / [▼] ▶ Cancel with the right button
System Setup System Specials Bitmap Cont.	> Alternating display of stored background images ▶ Cancel with the right button
System Setup System Specials Power-ON time	> Display of the current operating time (days, hours, minutes, seconds) since the last power-on. ▶ Cancel with [ESC]

9.12

Main menu "System Info"

Display of all system parameters

Menu tree	Function
System Info	<p>> Display of all system parameters: → page 13-59</p> <ul style="list-style-type: none">• Hardware version RTS runtime system firmware version AS-i master 1 firmware version AS-i master 2 firmware version Fieldbus system version• RTS checksum Consistency checksum Linux kernel version Linux RAM disc version• Serial number of the device <p>From here the display is only accessible in the administrator mode (protected by password level 3):</p> <ul style="list-style-type: none">• Designers Developers Programmers• Admin Info (permanently updated): RTS cycles 100 ms each max. RTS response time [ms] PLC cycle time [ms] max. PLC cycle time [ms] <p>▶ Delete cycle time values with [ZERO]</p> <p>▶ Scroll through the list of parameters with [MORE]</p> <p>▶ Return to the start menu with [MENU] or [ESC]</p>

Operating modes

Which operating modes are there for the AS-i master?

10 Operating modes

In this chapter you will learn (separately for AS-i master and PLC):

- Which operating modes are possible?
- What do the operating modes mean?
- Which operating mode should be used when?
- How are the operating modes changed?

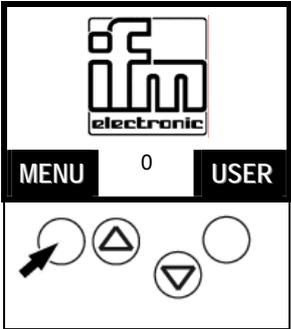
10.1 Which operating modes are there for the AS-i master?

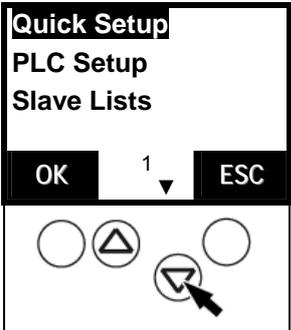
The master of the controller_e can be used in the following operating modes:

Operating mode	Meaning	Use
Operation Mode	Protected mode > LED [PROJ] off. > New slaves are only activated if they have been correctly projected before.	If the removal or adding of slaves is not supposed to affect the AS-i system. Changes to the projected constellation of slaves are indicated as an error message. "Slave X missing" or "Slave X not projected" If a faulty slave is replaced by a slave of the same type with the address 0, the system detects the replacement, adopts the new slave and assigns it the address of the faulty slave.
Config. Mode	Projecting > LED [PROJ] lights. > New slaves are <u>immediately</u> activated.	Only makes sense in case of planned changes to the AS-i system.

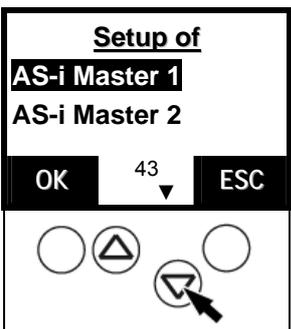
In principle, changes to the slaves which are connected to the master via AS-i are immediately detected. The LED [CONF/PF] lights as soon as there is a change to the projected status.

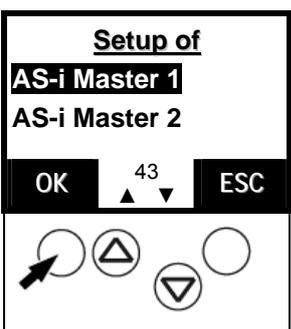
10.2 How are the operating modes for the AS-i master changed?

1. 

Press [MENU]
2. 

Press [▼] to scroll to "Master Setup"
3. 

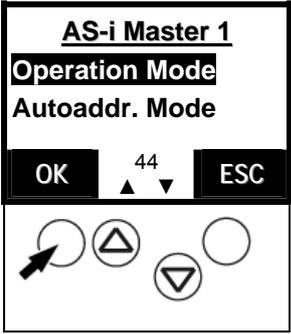
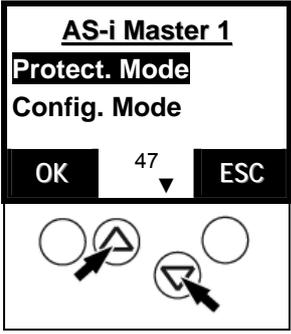
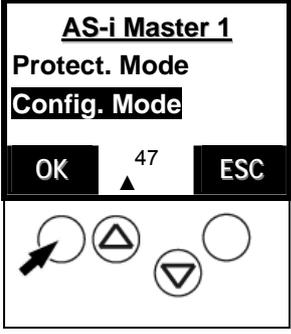
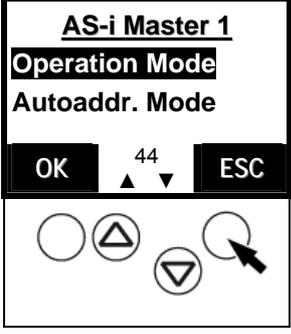
Select "Master Setup" with [OK]
4. 

If necessary, press [▼] to scroll to "Master 2"
5. 

Press [OK] to select the AS-i master.

Operating modes

How are the operating modes for the AS-i master changed?

6.  **AS-i Master 1**
Operation Mode
Autoaddr. Mode
OK 44 ESC
- ▶ Press [OK] to select "Operation Mode".
7.  **AS-i Master 1**
Protect. Mode
Config. Mode
OK 47 ESC
- > The marking shows the current operating mode.
▶ Press [▲] / [▼] to scroll to another operating mode
8.  **AS-i Master 1**
Protect. Mode
Config. Mode
OK 47 ESC
- ▶ Press [OK] to activate the selected operating mode.
10.  **AS-i Master 1**
Operation Mode
Autoaddr. Mode
OK 44 ESC
- > LED [PROJ] lights if the operating mode "Projecting" is active.
> LED [PROJ] is off if the operating mode "Protected mode" is active.
▶ Scroll back to the start screen several times with [ESC]
> That's it.

Operating modes

Which operating modes are there for the PLC in the controller?

10.3

Which operating modes are there for the PLC in the controller?

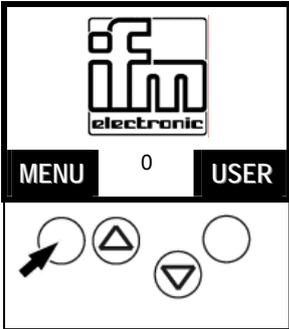
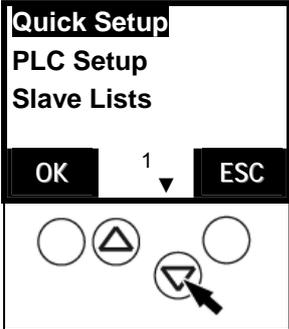
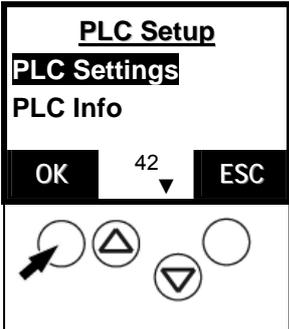
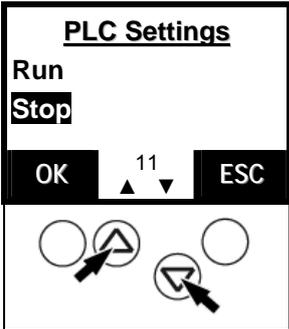
Operating mode	Meaning	Use
Run	PLC program start > The PLC program stored in the controller is processed. > LED [PLC RUN] lights	Control of the inputs and outputs on the controller by the PLC program
Stop	PLC program stop > The PLC program stored in the controller is stopped. > LED [PLC RUN] flashes	Changes to the PLC program or to the slaves
Gateway	Controller as gateway > LED [PLC RUN] goes out	The host on the fieldbus (option) reaches the actuators on the AS-i bus directly via the controller.



Tip

During changes to the PLC program or to the slaves the PLC program should be stopped to avoid malfunctions.

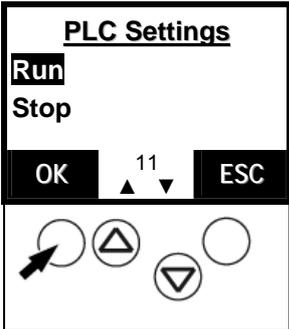
10.4 How are the operating modes for the PLC changed?

1.  Press [MENU]
2.  Press [▼] to scroll to "PLC Setup"
3.  Press [OK] to select "PLC Setup"
4.  Press [OK] to select "PLC Settings"
5.  > The marking shows the current operating mode.
> Press [▲] / [▼] to scroll to another operating mode

Operating modes

How are the operating modes for the PLC changed?

6. **PLC Settings**



Press **[OK]** to activate the selected operating mode

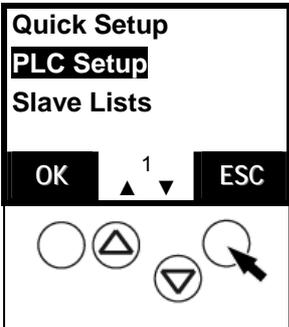


Tip

If there is no PLC program active in the controller, an error message appears if you try to change the PLC to "Run".

> The PLC changes to the operating mode "Stop".

7. **Quick Setup**



> LED **[PLC RUN]** lights if the PLC program is active.
> LED **[PLC RUN]** flashes if the PLC is stopped.
> LED **[PLC RUN]** is off if the controller operates as a gateway.

Press **[ESC]** to scroll back to the start screen
> That's it.

11 Set-up

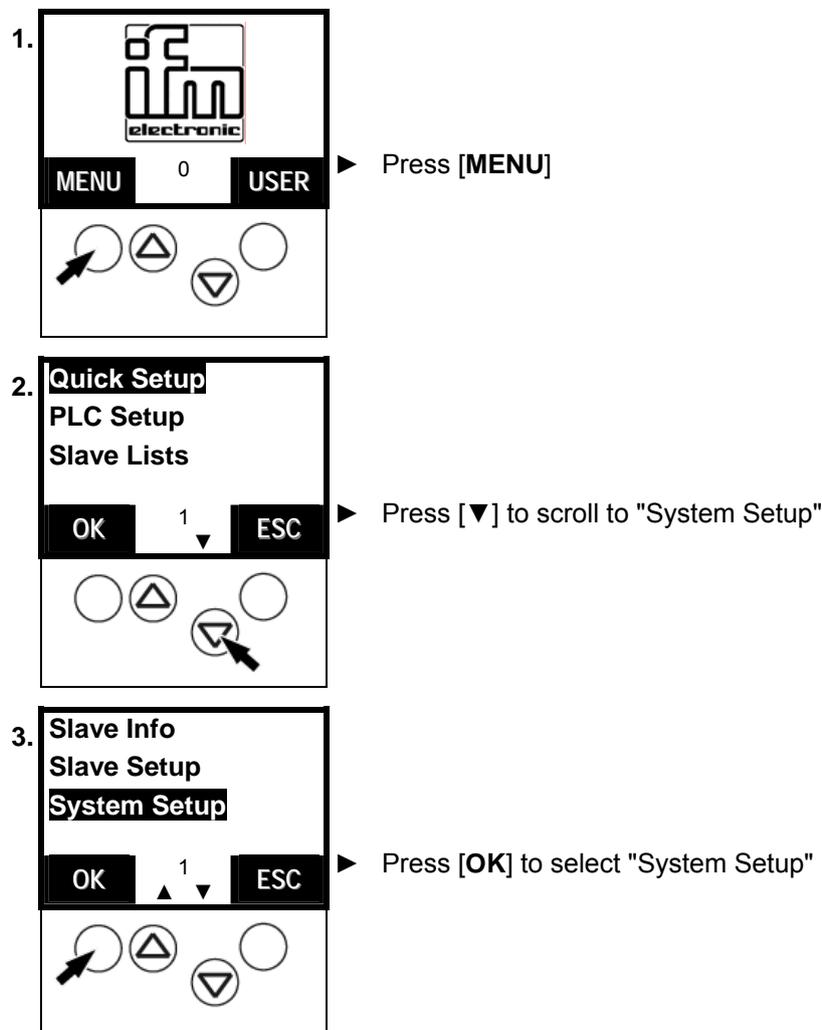
This chapter will show you how to set up the controller more quickly:

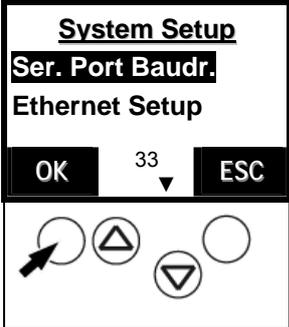
- Programming of the internal PLC
- Configuration of the connected slaves → page 11-7

The text/graphics display shows a start screen when powered on and, if applicable, error messages of the connected AS-i systems.

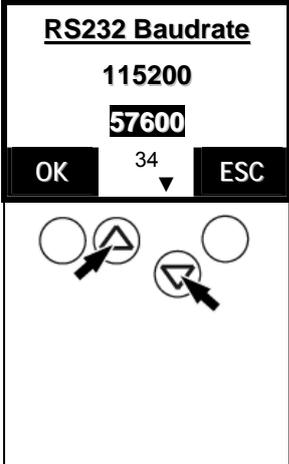
11.1 Setting the baud rate of the serial interface

To set the parameters for the controller via the PC or to program its PLC you must connect the two units to each other. The serial interface RS-232C is intended as standard. Here you can find out how to set the transmission speed of the serial interface:



4.  **System Setup**
Ser. Port Baudr.
Ethernet Setup
OK 33 ESC

▶ Press [OK] to select "RS232 Baudrate"

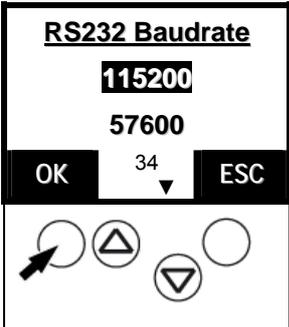
5.  **RS232 Baudrate**
115200
57600
OK 34 ESC

> Display of current value
▶ Press [▲] / [▼] to scroll to the requested baud rate
Selection:

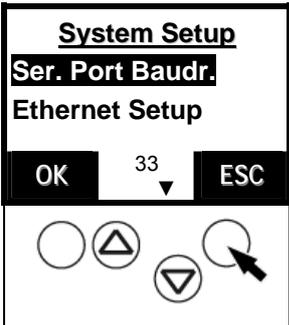
- 115 200 baud (factory setting),
- 57 600,
- 38 400,
- 19 200,
- 9 600,
- 4 800 or
- 2 400 baud*.



Tip
Select the quickest connection possible without any problems in combination with the used units (PC, connection cable, controller) and the electromagnetic interference on site.
*) The setting 2 400 baud is reserved for HMI and displays.

6.  **RS232 Baudrate**
115200
57600
OK 34 ESC

▶ Press [OK] to select the set baud rate

7.  **System Setup**
Ser. Port Baudr.
Ethernet Setup
OK 33 ESC

> Return to screen 33
▶ Press [ESC] twice to return to the start screen
> That's it.



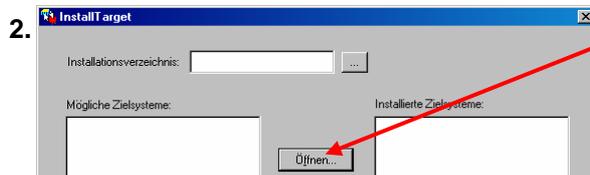
Tip
Set the same value on the PC!
→ page 11-4, chapter "RS-232C"

Install target for the controller

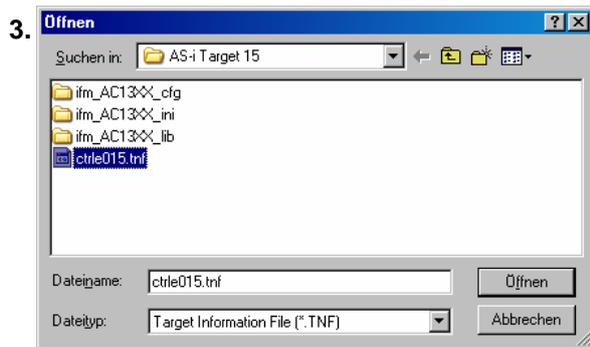
▶ Install the current target for the AS-i controller, if not done yet:

1. InstallTarget

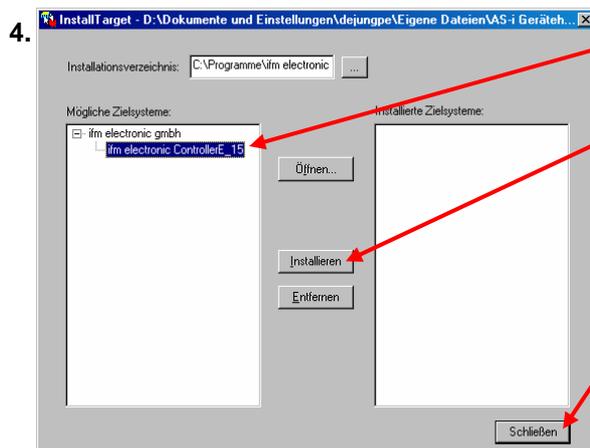
▶ Click on "Start" > "Programs" > "CoDeSys" > "InstallTarget" on the PC



▶ Click here to open the installation file "Target Information File .TNF"



▶ Select the source directory for the new target (from the installation CD) and confirm with [OK]



▶ Mark the target for the controller (→ screen)

▶ Press [Install] to start the installation

> Message "The installation directory does not exist. Create?"

▶ Press [Yes] to confirm

▶ Press [Close] to finish

> That's it. The new target is installed.

Connecting the programming unit

RS-232C

If the PC with the programming software is to be connected to the serial interface RS-232C of the controller, you need the programming cable with 1 Sub-D-9 connector (socket) and 1 RJ11 connector:

→ article no. E70320

- ▶ Use the cable indicated above to connect the PC to the controller
- ▶ Start the programming software CoDeSys® 2.3 on the PC
- ▶ Create a new project in CoDeSys®
- ▶ Set the target system:



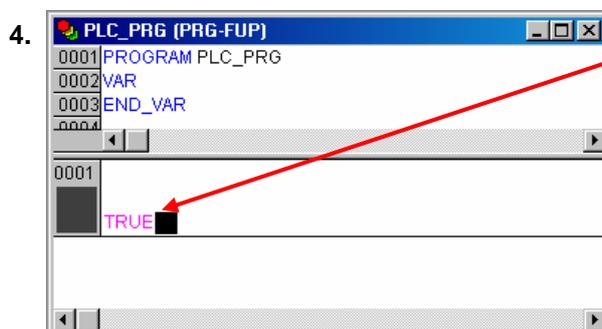
- ▶ Click on the symbol [▼]
- ▶ Select a valid target for the controller and confirm (e.g. "ifm electronic ControllerE_15" for target 15)



- ▶ Press [OK] to confirm

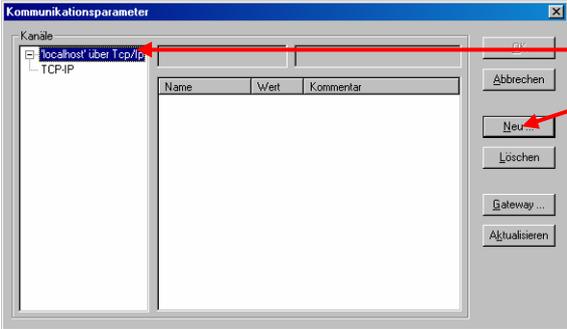
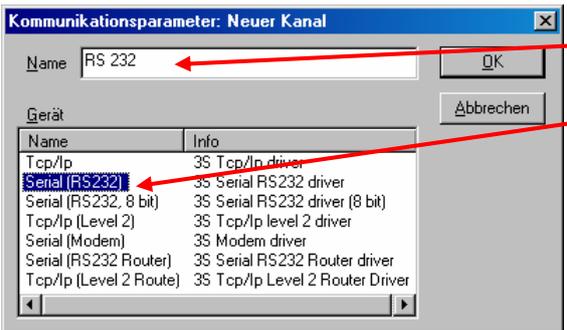
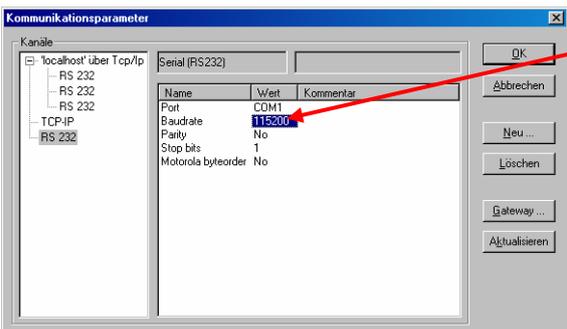
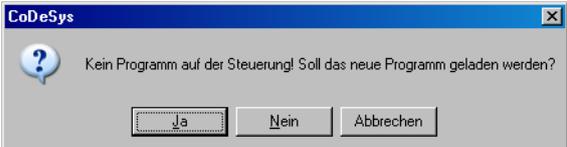


- ▶ Confirm the new block "PLC_PRG" by pressing [OK]



- ▶ Replace "???" by "TRUE" in the first network
- ▶ PC button [Enter]
- > The first "program" is provisionally ready.
- ▶ Menu sequence "Online" > "Communication Parameters"

Set-up
Setting the baud rate of the serial interface

5. 
 - ▶ Mark the topmost row in the column "Channels"
 - ▶ Click on **[New]**
6. 
 - ▶ Enter name as "RS 232"
 - ▶ Select "Serial (RS232)" as unit
 - ▶ Press **[OK]** to confirm
7. 
 - ▶ Gradually change the baud rate by double clicking until the value corresponds to the setting in the controller
→ page 11-1
 - ▶ Press **[OK]** to confirm
 - ▶ Test the connection by means of the menu sequence "Online" > "Login"
 - > If the reaction is "Communication Error":
 - ▶ Gradually change the baud rate and test the connection again
8. 
 - > If there is a connection between the PC and the controller the message on the left appears

In an additional manual "User Manual for PLC Programming with CoDeSys® 2.3" you will obtain more detailed information about the use of the programming system "CoDeSys for Automation Alliance". This manual is available as a free download on the ifm website:

→ http://www.ifm-electronic.com/ifmgb/web/asi_down.htm

**Ethernet
(option)**

If the PC with the programming software is to be directly connected to the optional Ethernet programming interface of the controller, you need a cross-over patch cable Cat5 with RJ45 connector on both sides.

→ article no. EC2080

Description of the Ethernet programming interface → separate supplementary instructions to this manual.

11.2

Configuration

In this chapter you will learn the methods to address slaves by means of the controller.

**Tip**

To allow the AS-i master to communicate with each individual slave, each address must only occur once in the system.

Slaves with the address 0 do not operate on the bus.

On delivery, the AS-i slaves always have the address 0.

The controller displays an error message and does not process slaves with wrong addresses or addresses which have been assigned twice.

Permissible slave addresses

Single slaves (0), 1...31

A/B slaves (0A), 1A...31A, 1B...31B *)

- If an address has been assigned for a single slave, this address must not be assigned as an A or B address at the same time. Addresses assigned for A/B slaves must not be also assigned for single slaves.
Example of non permissible address assignment: 17, 17A
- If an address has been assigned for an A slave, this address may also be assigned as B address. A/B slaves share one address number.
Example of permissible address assignment: 17A, 17B

Maximum number of slaves per master: 31 single slaves or 62 A/B slaves

*) The address 0B is not possible.

Automatic individual addressing of slaves

Now address the slaves. This is possible by means of the buttons and the text/graphics display on the controller. In the mode "Easy Startup" the controller can address the slaves automatically in rising order if the slaves are connected one after the other on the bus.



Tip

However, this automatic process only works without problems if the slave to be connected has the address 0! If the slave has already been used in another system, it will probably already have another address than 0.

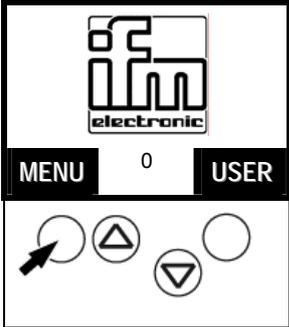
In such a case, the controller does not react to the connection of the new slave. This slave is not automatically addressed.

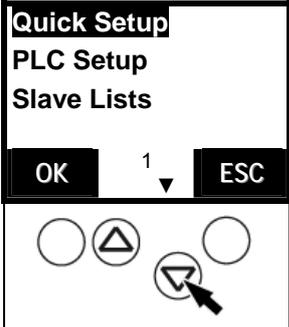
Then → page 11-11, chapter "Manual slave addressing".



Tip

Password level 1 required → page 11-23, chapter "Password setting"

- 

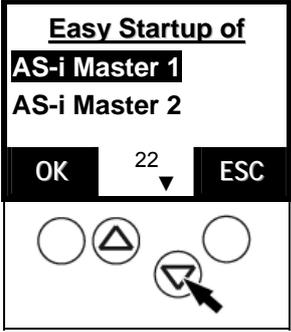
Press [MENU]
- 

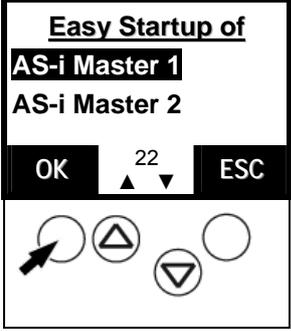
Press [▼] to scroll to "Address Slave"
- 

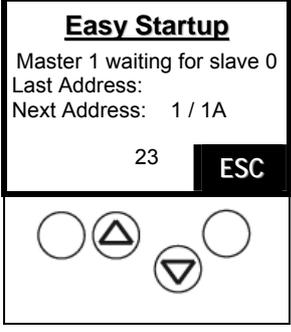
Press [OK] to select "Address Slave"

4. 

Press [▼] to scroll to "Easy Startup"
5. 

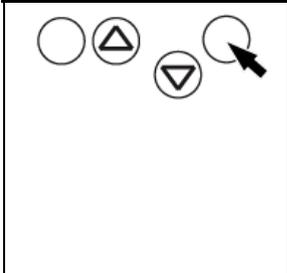
Press [OK] to select "Easy Startup"
6. 

If necessary press [▼] to scroll to AS-i master 2
7. 

Press [OK] to select the requested AS-i Master
8. 

The controller now waits for a slave still having the address 0 to be activated or connected on master 1.

Take one slave which still has the address 0 and connect it to the AS-i bus or activate it.

9. **Easy Startup**
- Master 1 waiting for slave 0
Last Address: 1
Next Address: 2 / 2A
- 23
!
- ESC
- 
- > The controller automatically assigns the lowest available address to this slave
 - > The controller displays the address assigned to the new slave and, below, the now next available slave address.
 - > LED [**PWR/COM**] no longer flashes but lights: at least one active slave is now correctly detected.
 - > LED [**CONF/PF**] lights: there is (at least) one new slave on the bus which the controller does not yet have in its projection list.
- When all slaves have been addressed:
- ▶ Press [**ESC**] to scroll back to the start screen



- Tip**
- ▶ Only connect one new slave at a time in the mode "Easy Startup"!
 - > When the controller has completed the integration of the new slave, the display "Waiting for Slave 0" reappears.
 - ▶ Note the address assigned under "Last address" for this slave.
 - ▶ Now you can connect the next slave with the address 0.

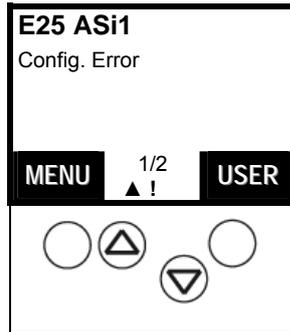
Manual slave addressing

The old slave address is not 0?

The automatic procedure described above (→ page 11-8) however only works without problems if the slaves to be connected have the address 0! If the slaves have already been used in another system the slaves will probably already have another address. In such a case, the controller does not react to the connection of the new slave.

- ▶ Remove these slaves from the system.

In the following section we will show you how the addresses of the units can be changed.



- ▶ End automatic addressing
Scroll back to the start screen (→ screen) by pressing [ESC] several times.

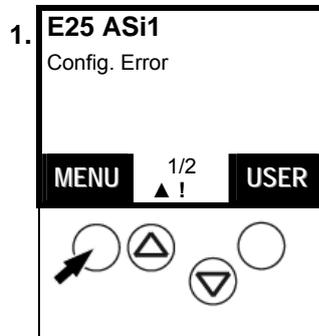
You would like to integrate a slave in the AS-i bus which has already been programmed an address but now needs a new address?

Prerequisites:

- Neither the "old" nor the new address of the slave must already be assigned on the bus.
- There must be no slave with the address 0 connected on the AS-i bus.
- ▶ If necessary, remove the already existing slave with the correct "old" address from the bus temporarily.
- ▶ Install or activate the new slave on the bus.



Tip
Password level 1 required → page 11-23, chapter "Password setting"



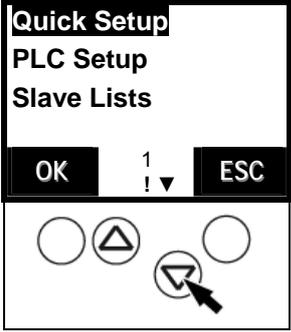
- > The display on the left appears instead of the **ifm** start screen: "Configuration error"

- > LED [**CONF/PF**] lights

Cause: there is (at least) one new slave on the bus which the controller does not yet have in its projection list.

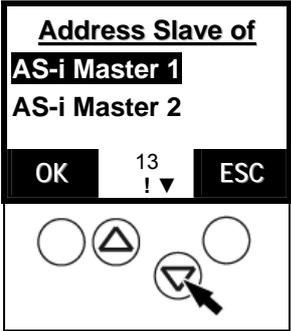
Note: description of the error message
→ chapter 16 "Error messages"

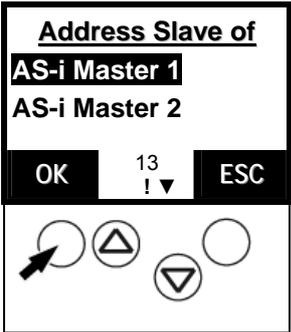
- ▶ Press [**MENU**]

2.  **Quick Setup**
PLC Setup
Slave Lists
OK 1 ! ▼ ESC
▶ Press [▼] to scroll to "Address Slave"

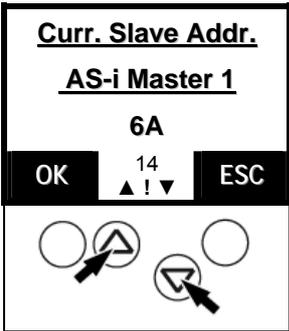
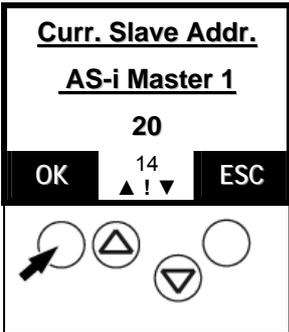
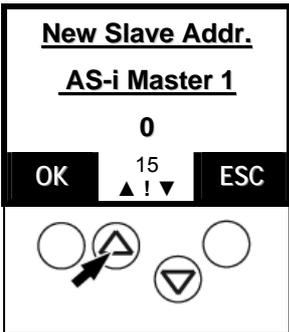
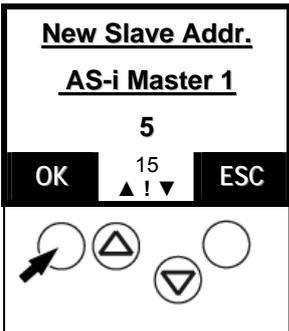
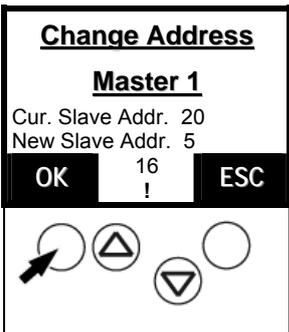
The screenshot shows a menu with three options: a circle, a circle with an upward-pointing triangle, and a circle with a downward-pointing triangle. The downward-pointing triangle option is highlighted with a cursor arrow.
3.  **PLC Setup**
Slave Lists
Address Slave
OK ▲ 1 ! ▼ ESC
▶ Press [OK] to select "Address Slave"

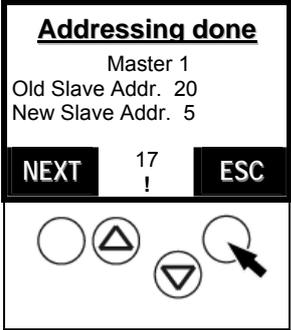
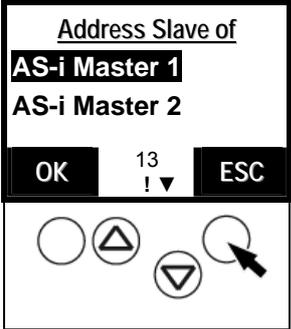
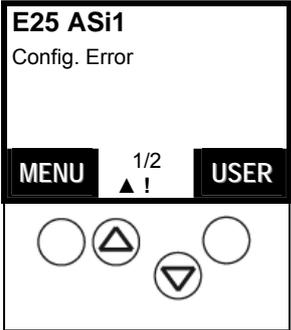
The screenshot shows the same menu as in step 2, but now the "Address Slave" option (the circle with the downward-pointing triangle) is highlighted with a cursor arrow.
4.  **Slave**
Change Address
Easy Startup
OK 12 ! ▼ ESC
▶ Press [OK] to select "Change Address"

The screenshot shows a menu with three options: a circle, a circle with an upward-pointing triangle, and a circle with a downward-pointing triangle. The circle option is highlighted with a cursor arrow.
5.  **Address Slave of**
AS-i Master 1
AS-i Master 2
OK 13 ! ▼ ESC
▶ If necessary press [▼] to scroll to AS-i master 2

The screenshot shows a menu with three options: a circle, a circle with an upward-pointing triangle, and a circle with a downward-pointing triangle. The downward-pointing triangle option is highlighted with a cursor arrow.
6.  **Address Slave of**
AS-i Master 1
AS-i Master 2
OK 13 ! ▼ ESC
▶ Press [OK] to select the requested AS-i Master

The screenshot shows the same menu as in step 5, but now the "AS-i Master 1" option (the circle) is highlighted with a cursor arrow.

7. **Curr. Slave Addr.**
AS-i Master 1
6A
14
OK ▲!▼ ESC
- > Display of the lowest found valid slave address
▶ Press [▲] / [▼] to scroll to the slave whose address is to be changed
- 
8. **Curr. Slave Addr.**
AS-i Master 1
20
14
OK ▲!▼ ESC
- ▶ Press [OK] to select the requested slave
- 
9. **New Slave Addr.**
AS-i Master 1
0
15
OK ▲!▼ ESC
- > Display neutral slave address 0
▶ Press [▲] to scroll to the requested slave address
- 
10. **New Slave Addr.**
AS-i Master 1
5
15
OK ▲!▼ ESC
- ▶ Press [OK] to select the new slave address
- 
11. **Change Address**
Master 1
Cur. Slave Addr. 20
New Slave Addr. 5
16
OK ! ESC
- > Display of old and new slave address
▶ Press [OK] to confirm the new slave address
- 

12. **Addressing done**
- 
- > Display of "WAIT" message during storage
 - > Display of the completed change (→ screen)
 - > LED [**CONF/PF**] lights: Configuration error
 - ▶ Press [**NEXT**] to repeat the steps 7 to 12 for another slave whose address is to be changed
 - ▶ Press [**ESC**] to end the addressing of slaves
13. **Address Slave of**
- 
- ▶ Press [**ESC**] to scroll back to the start screen
14. **E25 ASi1**
- 
- > The display on the left appears instead of the **ifm** start screen: "Configuration error"
- In the next section we will show you how to complete the configuration.

End configuration

Now all slaves are present on the bus with the correct address.

But the error message (the sign "!") keeps on flashing and the LED [CONF/PF] lights?

Cause: the controller_e has detected all slaves on the bus but the slaves are not yet – at least not all – in the "List of projected slaves" LPS.

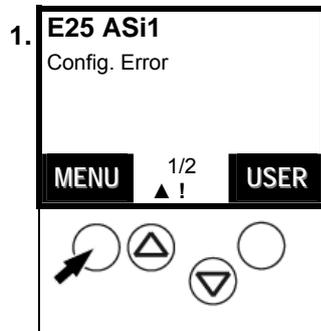
So: the error message "configuration error" is displayed as long as there is a difference between the detected and configured slaves.

Remedy: enter all detected slaves in the configuration list at the push of a button in the mode "Quick Setup".



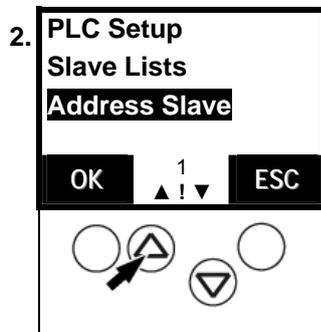
Tip

Password level 1 required → page 11-23, chapter "Password setting"



> The display on the left appears instead of the **ifm** start screen: "Configuration error"

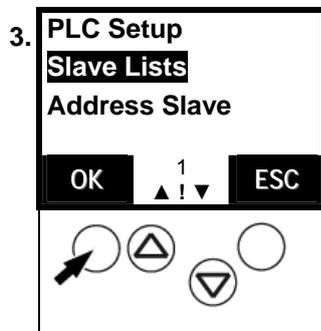
▶ Press the [MENU] button



> The controller_e shows the last used menu item

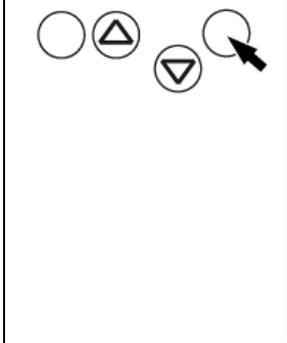
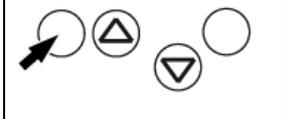
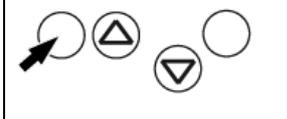
▶ Press [▲] to scroll to "Slave Lists"

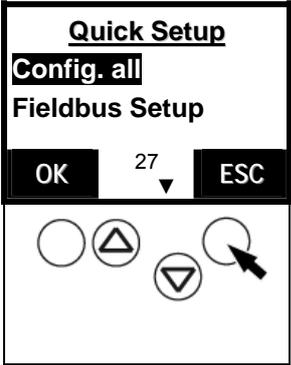
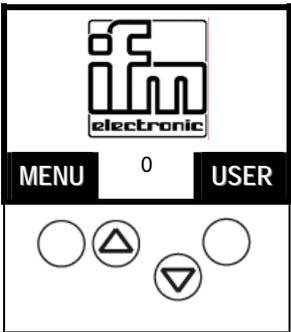
Reason: check the configuration made so far in the list of detected slaves LDS.



▶ Press [OK] to select "Slave Lists"

4. **Slave list of**
AS-i Master 1
AS-i Master 2
- OK 2 ! ▼ ESC
-
- ▶ If necessary, press [▼] to scroll to Master 2
5. **Slave list of**
AS-i Master 1
AS-i Master 2
- OK 2 ! ▼ ESC
-
- ▶ Press [OK] to select the requested master
6. **Detect. Sl. ASi1**
Project. Sl. ASi1
Active Sl. ASi1
- OK 91 ! ▼ ESC
-
- ▶ Press [OK] to select "Quick Setup"
7. **Detect. Sl. ASi1**
- | | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| A | . | . | . | . | . | . |
| B | . | . | . | . | . | . |
| S | . | . | . | . | . | . |
- OK 3 ▲ ! ▼ ESC
-
- > A table of detected slaves is displayed.
Here: no slaves have been detected on master 1 with the addresses 0 to 5.
- ▶ If necessary press [▲] to scroll to the next address block

8. **Detect. Sl. ASi1**
- | | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|----|----|
| A | • | - | - | - | - | - |
| B | - | - | - | - | - | - |
| S | - | • | • | - | - | - |
- OK 3 ESC
▲!▼
- 
- > A table of detected slaves is displayed. Here an example:
 - an A/B slave has been detected as A slave at the address 6
 - single slaves have been detected at the addresses 7 and 9.
 - ▶ Check found slave addresses and compare them to the plan
 - ▶ If necessary press [▲] to scroll to the next address block
 - ▶ Press [ESC] 3 times to scroll back to the menu "Slave Lists"
 - ▶ In case of wrong slave addresses reassign them: → page 11-11, chapter "Manual slave addressing"
9. **Quick Setup**
PLC Setup
Slave Lists
- OK 1 ESC
▲!▼
- 
- > The controller shows the last used menu item
 - ▶ Press [▲] to scroll to "Quick Setup"
Reason: enter all detected slaves in the configuration list at the push of a button.
10. **Quick Setup**
PLC Setup
Slave Lists
- OK 1 ESC
▲!▼
- 
- ▶ Press [OK] to select "Quick Setup"
11. **Quick Setup**
Config. all
Fieldbus Setup
- OK 27 ESC
!▼
- 
- ▶ Press [OK] to select "Config all"

12.  > The safety query appears:
Are you sure you want to project all slaves on AS-i master 1 and 2?
▶ Press [OK] to confirm
13.  > Display of "WAIT" message during storage
> Error message "!" goes out
> The display on the left appears
> Red LED [CONF/PF] goes out
> Yellow LED [PROJ] goes out because the unit now automatically activates the "protected mode"
▶ Press [ESC] twice to return to the start screen
14.  > That's it. All detected slaves are projected.

11.3 Changing slave parameter data

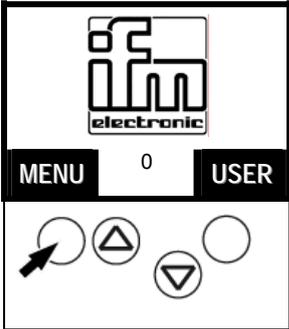
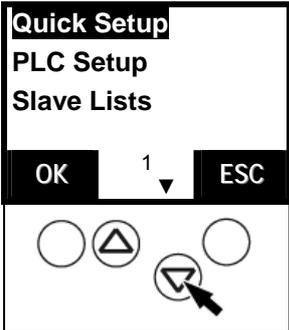
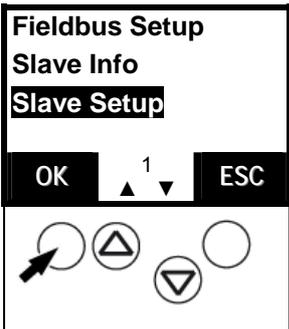
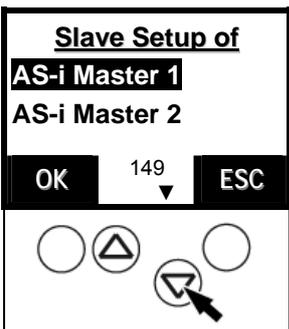
The parameter value "0Fh" is preset for the slaves.

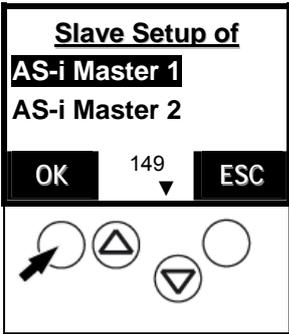
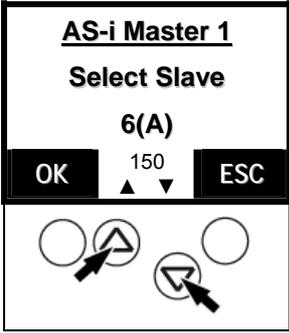
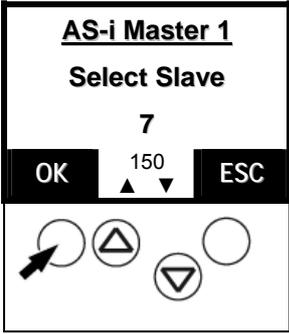
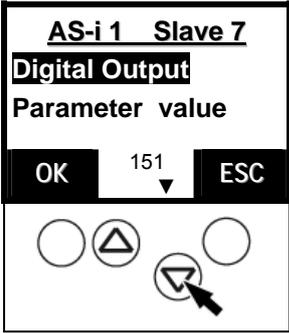
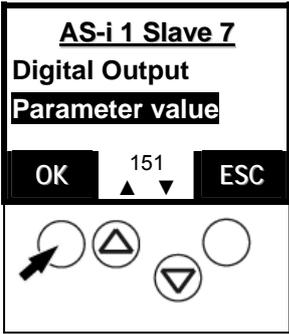
Example for reasonable parameter changes: not connected analogue input channels generate a peripheral fault of the module. By changing parameters you can block unused channels so that the module does not trigger a peripheral fault.

Please note the corresponding remarks in the instructions of the modules.



Tip
Password level 2 required → page 11-23, chapter "Password setting"
Changes to the values are not adopted in case of a wrong password level

1.  Press [MENU]
2.  Press [▼] to scroll to "Slave Setup"
3.  Press [OK] to select "Slave Setup"
4.  If necessary, press [▼] to scroll to master 2

5. **Slave Setup of**
AS-i Master 1
AS-i Master 2
OK 149 ESC
- 
- ▶ Press [OK] to select the requested master
6. **AS-i Master 1**
Select Slave
6(A)
OK 150 ESC
- 
- > Display of the lowest found valid slave address
▶ If necessary press [▲] / [▼] to scroll to another slave
7. **AS-i Master 1**
Select Slave
7
OK 150 ESC
- 
- ▶ Press [OK] to select the requested slave
8. **AS-i 1 Slave 7**
Digital Output
Parameter value
OK 151 ESC
- 
- ▶ Press [▼] to scroll to "Parameter value"
9. **AS-i 1 Slave 7**
Digital Output
Parameter value
OK 151 ESC
- 
- ▶ Press [OK] to select "Parameter value"

10. **Parameter value**
AS-i 1 Slave 7
Current: 1111 [0Fh]
Setup: 1111 [0Fh]

154

SET ESC

> Display current parameter value and target value, as binary value and hexa value

▶ Press [▲] / [▼] to set target value parameter data

11. **Parameter value**
AS-i 1 Slave 7
Current: 1111 [0Fh]
Setup: 1001 [09h]

154

SET ESC

▶ Press [SET] to save new parameter data on the slave. Keep the button pressed until the change has been adopted!

12. **Parameter value**
AS-i 1 Slave 7
Current: 1001 [09h]
Setup: 1001 [09h]

154

SET ESC

> The target value parameter data are copied to the current parameter data

If the target value of the parameter data for this slave is not permitted:

> Display error message: "Slave data invalid"

▶ Repeat steps 10...12 with corrected values

▶ Press [ESC] 5 times to return to the start screen

▶ That's it.

11.4 Password protection

General

In the menu "System Setup" the operation can be restricted or enabled in the item "password". On delivery, the unit is in the user mode (= password level 1). By entering an arbitrary invalid password (e.g. 1000) all menu items that allow settings to be changed will be blocked. This blocking is the password level 0 (end user mode).



CAUTION

Access to controller menus by unauthorised users

Risk for persons and plant/machine by access of unauthorised users to special menus of the controller.

- ▶ Change the password to the level 0 again as soon as the work in a higher password level has been completed. → page 11-23 "Password setting"

Password levels

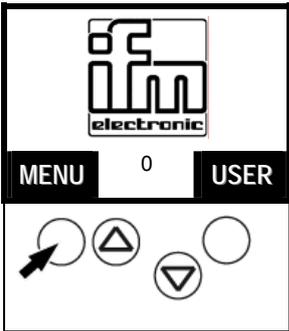
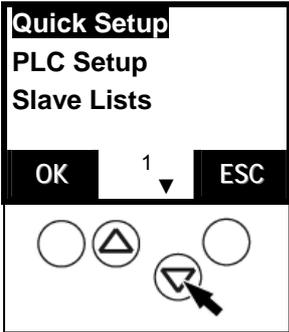
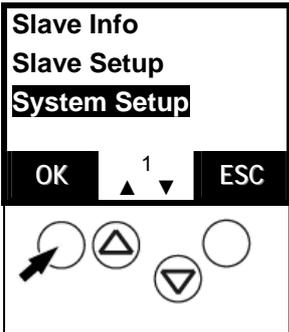
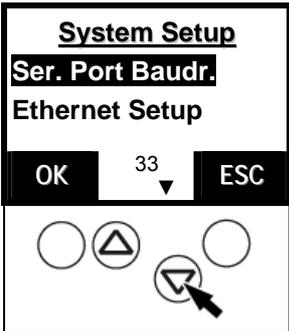
Password level	Operating mode	Password	Note
0	end user mode	any	
1	user mode	CE01	factory setting
2	service mode	E02C	

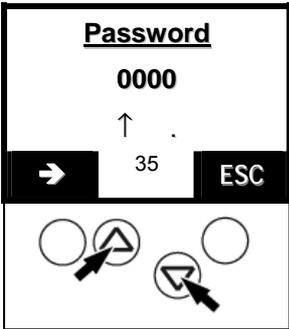
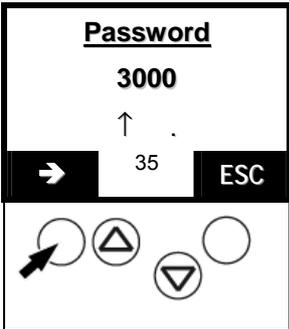
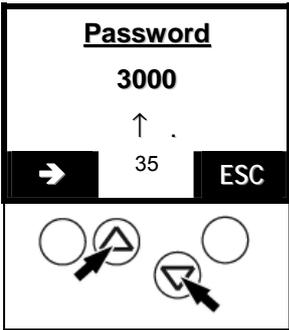
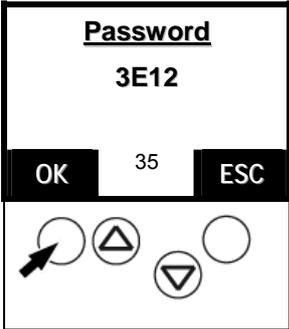
Main menu	2nd menu level	Required password level
Quick Setup	all	1
PLC Setup	all	1
Address Slave	all	1
Diagnostics	Reset Error Counter	1
Master Setup	Config all	1
Master Setup	Operating mode	1
Master Setup	Autoaddr. mode	1
Master Setup	Slave Reset	1
Fieldbus Setup	all	1
System Setup	Modbus Setup	1
System Setup	Firmware update	3 *)
System Setup	Factory default	3 *)
System Setup	System Specials	2
System Info	Admin Info	3 *)
Slave Setup	all	2
All other menus	all	0

*) Please contact your AS-i sales specialist if you want to work with the password level 3.

The set password is immediately valid when entered and remains effective until the setting is changed.

Password setting

1.  Press [MENU]
2.  Press [▼] to scroll to "System Setup"
3.  Press [OK] to select "System Setup"
4.  Press [▼] to scroll to "Password"
5.  Press [OK] to select "Password"

6.  > Display password "0000"
The arrow ↑ points to the figure which can be changed
▶ Press [▲] / [▼] to change the figure in the range of 0...F
7.  > Display password changed so far
▶ Press → to select the next figure
8.  > Display password changed so far
The arrow ↑ points to the figure which can be changed
▶ Repeat the steps 6...7 for all figures
9.  ▶ Press [OK] to set a new password



Tip

The set password is immediately valid when entered and remains effective until the setting is changed.

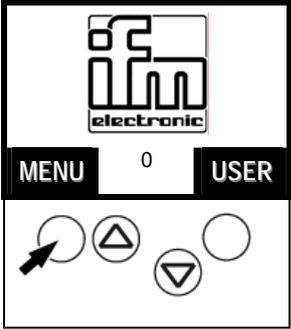
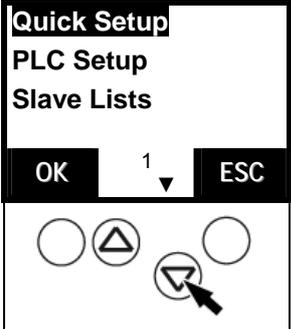
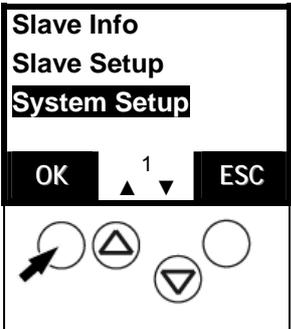
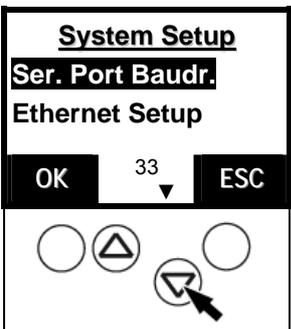
11.5 Factory default

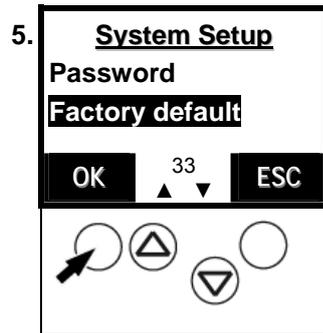
You work with a used controller (e.g. from a test project). Now you would like to restore the factory settings of the controller to prepare it for the new project?



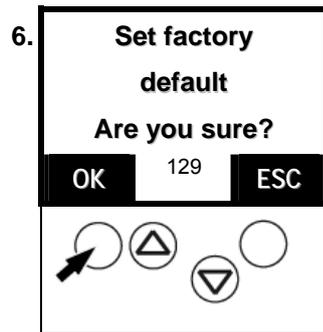
Tip

Password level 3 required → page 11-23, chapter "Password setting"
For the administrator mode please contact your AS-i sales specialist.

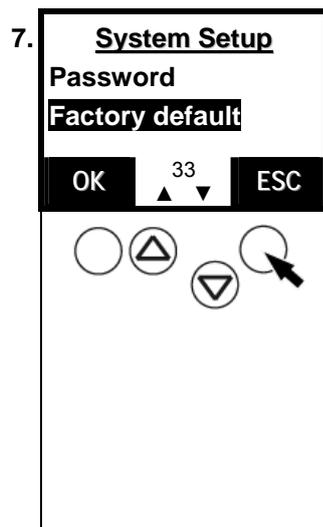
1.  Press [MENU]
2.  Press [▼] to scroll to "System Setup"
3.  Press [OK] to select the "System Setup"
4.  Press [▼] to scroll to "Factory default"



▶ Press [OK] to select "Factory default"



> Display of safety query:
Are you sure you want to reset to the factory settings?
▶ Press [OK] to confirm



> Reset of the controller to the settings on delivery.
Some changes will not become effective before the next power-on.
> PLC programs are not deleted.
> The password is reset to level 1
> Return to screen 33
▶ Press [ESC] twice to return to the start screen
▶ Switch the unit off and on again
> The language of the controller is reset to English
> The baud rate of the serial interface is reset to 115 200 baud.
> That's it.

11.6 Firmware update



Tip

To update the operating system of the controller_e you need a special software which is not generally available for security reasons.

If required please contact our AS-i sales specialist.

11.7 Sets of characters

The controller_e has 3 different sets of characters used in the menu:

- 16 pixels high proportional font
- 8 pixels high proportional font
- 8 pixels high, 6 pixels wide font for tables

Table of characters:

0		32	space	64	Ⓐ	96	`	128	Ç	160	á	192	Ⓘ	224	
1		33	?	65	À	97	a	129	ü	161	í	193	Ⓛ	225	β
2		34	"	66	B	98	b	130	é	162	ó	194	Ⓣ	226	
3		35	#	67	C	99	c	131	â	163	ú	195	Ⓝ	227	
4		36	§	68	D	100	d	132	ä	164	ñ	196	—	228	
5		37	‰	69	E	101	e	133	à	165	Ñ	197	†	229	
6		38	&	70	F	102	f	134	â	166	œ	198		230	μ
7		39	'	71	G	103	g	135	ç	167	ø	199		231	
8		40	<	72	H	104	h	136	ê	168	¿	200	Ⓛ	232	
9		41	>	73	I	105	i	137	ë	169	Γ	201	Ⓛ	233	
10		42	*	74	J	106	j	138	è	170	¬	202	Ⓛ	234	
11		43	+	75	K	107	k	139	ï	171	½	203	Ⓛ	235	
12		44	,	76	L	108	l	140	î	172	¾	204	Ⓛ	236	
13		45	-	77	M	109	m	141	ï	173	¡	205	=	237	
14		46	.	78	N	110	n	142	â	174	«	206	Ⓛ	238	
15		47	/	79	O	111	o	143	â	175	»	207		239	
16	▶	48	Ø	80	P	112	p	144	É	176	▨	208		240	
17	◀	49	1	81	Q	113	q	145	æ	177	▨	209		241	±
18	‡	50	2	82	R	114	r	146	œ	178	▨	210		242	
19	!!	51	3	83	S	115	s	147	ô	179	|	211		243	
20	¶	52	4	84	T	116	t	148	ö	180	†	212		244	
21	§	53	5	85	U	117	u	149	ð	181		213		245	
22	■	54	6	86	U	118	v	150	û	182		214		246	
23	‡	55	7	87	W	119	w	151	ù	183		215		247	
24	↑	56	8	88	X	120	x	152	ÿ	184		216		248	
25	↓	57	9	89	Y	121	y	153	ö	185	||	217	Ⓛ	249	
26	→	58	:	90	Z	122	z	154	Û	186	||	218	Ⓛ	250	
27	←	59	;	91	[	123	<	155	ø	187	Ⓛ	219	■	251	
28	└	60	<	92	\	124	!	156	£	188	Ⓛ	220	■	252	
29	↔	61	=	93	]	125	>	157	¥	189		221		253	z
30	▲	62	>	94	^	126	~	158	Pt	190		222		254	■
31	▼	63	?	95	—	127	△	159	f	191	Ⓛ	223	■	255	

12 Programming

In an additional manual "User Manual for PLC Programming with CoDeSys® 2.3" you will obtain more detailed information about the use of the programming system "CoDeSys for Automation Alliance". This manual is available as a free download on the ifm website:

→ http://www.ifm-electronic.com/ifmgb/web/asi_down.htm

12.1 Deviations from the indications in the programming manual

As opposed to the indications in the programming manual, the following particularities apply to the controller:

- The functions "Write file to PLC" and "Read file from PLC" in the CoDeSys menu "Online" are not supported.
- Retain variables are not automatically stored. To do so, the function block "Store_Retain" must be retrieved.
- Task management is not implemented.
- Persistent variables are not implemented.
- Target visualisation is not possible.

12.2 Online changes in the PLC

To reduce the amount of data to be transmitted to the controller CoDeSys® only transmits the changed program blocks to the PLC. This accelerates programming in case of program changes during set-up. The term "online change" describes a function of the unit allowing a change to the PLC program without interrupting the program. So, the processing of the changed PLC program is possible without re-setting the outputs.



CAUTION

Dangerous, uncontrolled machine states!

The changeover to the changed PLC project can take up to 100 ms in case of an "online change". During this time the outputs remain in their current state. The PLC data are not initialised after the "Online Change".

- ▶ Stop the machine/system or bring it into a safe state before changing the PLC program in the controller.
→ page 10-4, chapter 10.4 "How are the operating modes for the PLC changed?"

12.3 Boot project / source code

The project loaded in the controller_e is at first only stored in the volatile SRAM, just like the AS-i configuration. This means it will be lost if the controller_e is no longer supplied with 24 V.

Boot process

When the supply voltage of the controller_e is switched on, the operating system copies the programs and data stored as boot project into the SRAM where they are executed (boot process). After this, the AS-i masters receive their configuration data. The AS-i masters initialise the AS-i slaves and start the data transfer to the slaves.

Creating a boot project

When the configuration of an AS-i system has been completed and the PLC project tested, this information must be non-volatilely stored in the flash memory. This is done in CoDeSys[®] via "Online" > "Create boot project".



CAUTION

Dangerous, uncontrolled machine states!

The flash process can take 5 to 20 seconds when creating a boot project! During this time the outputs remain in their current state.

- ▶ Stop the machine/system or bring it into a safe state before creating a boot project or saving the AS-i configuration.
→ page 10-4, chapter 10.4 "How are the operating modes for the PLC changed?"

Transmit source code from the PC to the controller_e

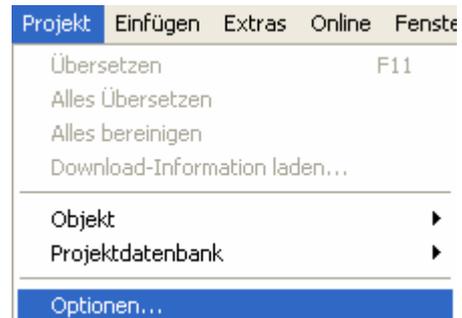
The controller_e gives you the option of automatically transmitting the source code of the boot project to the controller_e. What for?

Source code

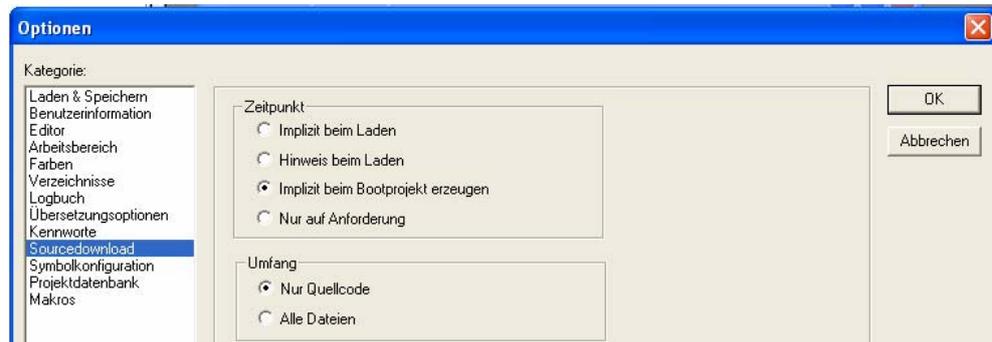
The source code contains all the data of your project, i.e. also the comments of your programs. If these data are stored in the controller_e, a service technician may continue to process the program at the machine, even if he does not have the original project on his PC.

The setting shown here automatically sends the source data together with the boot project to the controller_e.

- ▶ To do so, the following option must be activated in the CoDeSys® program:
- ▶ "Project" > "Options..." > select "Source download"



Menu "Options"
| "Source
download"

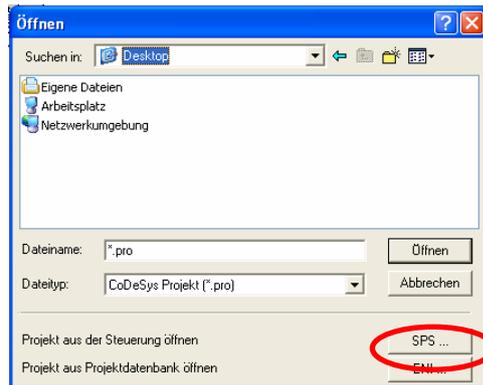


- ▶ Time = "Implicit on create boot project"
- Extent = "Source code only"
- ▶ Press [OK] to confirm
- > The source code is also transmitted to the controller_e when creating the boot project

Transmit source code from the controller to the PC

Your project was transmitted as source code from the PC to the controller and is available there. It is now possible to transmit the source code from the controller to the PC. To demonstrate this, save and close your current project.

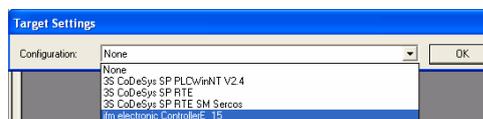
- ▶ Menu "File" > "Open..." in CoDeSys®



- ▶ Click on [PLC...]:
"Open project from PLC"

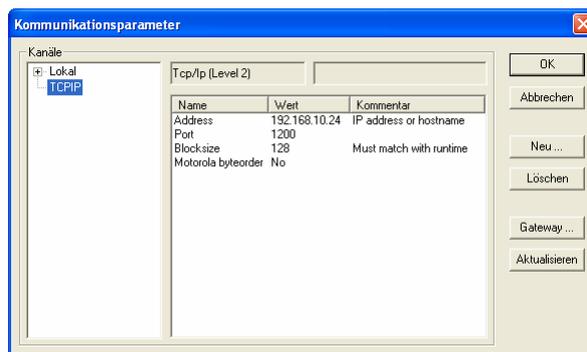


- ▶ Click on the symbol [▼]



- ▶ Select "ifm electronic ControllerE" with the corresponding target number (here: 15)

- ▶ In the "Online" menu select "Communication parameters"



- ▶ Select the setting which matches the setting in the controller (→ CoDeSys® manual).
- ▶ Convince yourself that the project which you have transmitted from the controller corresponds to your original project.

12.4 Remanent PLC data (flag)

Three types of data can be stored in the PLC:

- remanent variable (in CoDeSys® declared as retain variable)
- volatile variable (if not declared as "retain variable")
- remanent flags MW 0...79
- volatile flags MW 80...127

The remanent variables are stored, just like all the other data, in the volatile SRAM memory and are not automatically stored in the flash memory! The library "ifm_AsiUtils_010000.lib" contains a function to store 1 Kwords of remanent variables if required.

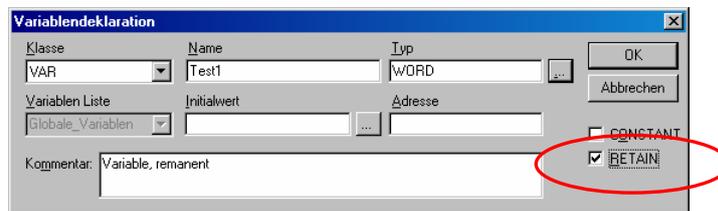
CAUTION

Due to the design the maximum number of possible write cycles for the flash memory is limited.

- Do not poll the PLC cyclically! Possible loss of data due to destruction of the memory!
- ▶ Store remanent variables separately only if required.

For this reason, only static information such as formulations or target times should be stored in the remanent storage section. When the voltage is restored, the section of the remanent variables with the last stored values is restored.

Remanent variables are declared as "retain variables" in CoDeSys®:



In addition, there are the remanent flag words MW 0...MW 79 to store dynamic values such as counter values. In case of power failure these 80 words are automatically stored by the operating system and restored when the voltage is restored. The flags in MW 80...MW 127 are not remanent!

12.5 System variables

System variables in the controller can be indirectly accessed via a special table of pointers at the basic address 0xFFB00.

The easiest way to use these system calls is to integrate the supplied library "ifm_AsiUtils_010000.lib" in your project.

The library applies to controller units with the firmware RTS 2.x and replaces the previous libraries "ecoasi20.lib" and "ecoasi21.lib".

12.6 Overview PLC addresses

The PLC addresses consist of several elements in the following order:

Start character	%	The definition of an address starts with "%"
Data type	I	Inputs are defined by an "I" for input
	Q	Outputs are defined by a "Q" for output
	M	Flags are defined by an "M"
Data length	X	Bit information is defined by an "X"
	B	Bytes (= 8 bits) are defined by a "B"
	W	Words (= 2 bytes = 16 bits) are defined by a "W"

Address structure

Binary slaves		Analogue slaves
individual bit	all bits in one byte ¹	whole channel (whole word)
%aXm.ss.b	%aBm.ss	%aWm.ss.k

Legend
value ranges

a =	I	inputs			
	Q	outputs			
	M	flag	bit	0...15	
			byte	remanent	0...159
not remanent				160...255	
word	remanent	0...79			
	not remanent	80...127			
X =	address =	bit address ²			
B =		byte address			
W =		word address			
m =	binary single or A slaves	master 1	m = 1		
		master 2	m = 2		
	binary B slaves	master 1	m = 11		
		master 2	m = 12		
	analogue slaves	master 1	m = 21		
		master 2	m = 22		
ss =	slave address (1...31)				
k =	channel number (0...3)				
b =	bit address	binary slave	0...3		
		flag	0...15		

¹ Byte = for inputs/outputs only 4 bits (0...3) are used

² Bit address only possible for inputs/outputs, master flags and flags

Examples for addressing

Slave	Selection	Parameters	Sample addresses
binary single or A slave	all 4 bits in one byte	output byte of slave 22 on master 1	%QB1.22
		input byte of slave 6A on master 2	%IB2.6
	single bit	bit 3 (input) of slave 24 on master 2	%IX2.24.3
		bit 0 (output) of slave 8 on master 1	%QX1.8.0
binary B slaves	all 4 bits in one byte	output byte of slave 22B on master 1	%QB11.22
		input byte of slave 6B on master 2	%IB12.6
	single bit	bit 3 (input) of slave 24B on master 2	%IX12.24.3
		bit 0 (output) of slave 8B on master 1	%QX11.8.0
analogue slaves	all 16 bits in one channel (word)	analogue input in channel 3 of slave 31 on master 1	%IW21.31.2
		analogue output from channel 4 of slave 17 on master 2	%QW22.17.3
	validity and overflow bit *)	signal "overflow" from channel 1 to slave 31 on master 1 Bit information → table at the bottom	%IX21.31.4
	status (channel 5)	status of slave 31 on master 2	%IW21.31.4
flags	whole flag word	flag word 21 (remanent)	%MW21
	single byte	flag byte 162 (not remanent)	%MB162
	single bit	bit 8 from flag word 21 (remanent)	%MX21.8

*) validity and overflow bits of analogue slaves are defined in **channel 4**:

15...9	8	7	6	5	4	3	2	1	0
reserved	analogue transfer valid	OV	TV	OV	TV	OV	TV	OV	TV
		channel 3		channel 2		channel 1		channel 0	

Legend:

OV = overflow

TV = transfer valid

Further examples:

Data	Master	Slave	Sample addresses
current parameter data (bits 0...3) → page 5-7	2	6B	%IW32.73
reflected parameter data (bits 0...3) → page 5-8	2	6B	%IW32.169
slave error counter → page 5-10	1	7	%IW31.182
	2	6B	%IW32.212
configuration error counter → page 5-11	1	--	%IW31.238
AS-i cycle counter → page 5-11	2	--	%IW32.239



Example

Tip
All addresses in these further examples can only be retrieved as WORD addresses. A breakdown into single bits is only possible by copying the word to a symbolic address and retrieving this bit by bit.

```

0001 PROGRAM PLC_PRG
0002 VAR
0003   LASMaster1 AT %IW31.81:WORD;
0004   LPSMaster2 AT %IW32.83:WORD;
0005   LASSlave16M1: BOOL;
0006   LPSSlave22BM2: BOOL;
0007 END_VAR
0008

```

Copying %IW31.81 to LASMaster1

Copying %IW32.83 to LPSMaster2

0001

LASMaster1.0 — LASSlave16M1

Query:
master 1, slave 16 / 16A
in the list of active slaves
output to LASSlave16M1

0002

LPSMaster2.6 — LPSSlave22BM2

Query:
master 2, slave 22B
in the list of projected slaves
output to LPSSlave22BM2



Tip
A flag word consists of two flag bytes.
Flag word %MW(n) corresponds to the flag bytes %MB(2n) and %MB(2n+1).
Example:
Flag word %MW21 corresponds to the flag bytes %MB42 and %MB43.

12.7 Access digital slave inputs/outputs via PLC

Digital slave I/Os can be accessed in 3 ways.

Access via addresses

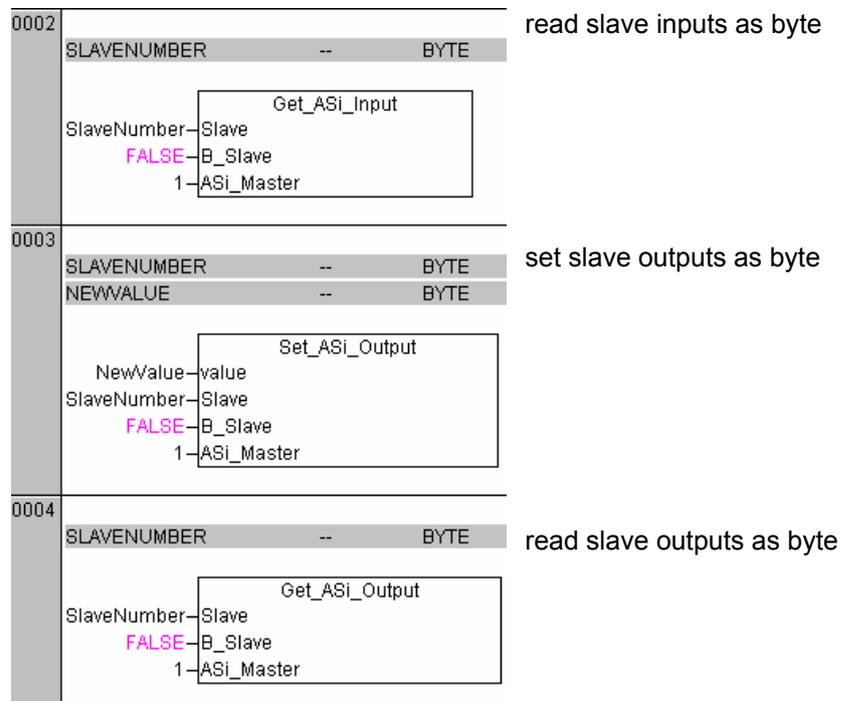
Description → page 12-6, chapter "Overview PLC addresses"

Access via function calls

Description of the circuits of the function blocks

→ library ifm_AsiUtils_010000.lib

Examples:



Indexed data access via table of pointers

Using pointers to the real memory addresses you can have direct access to the stored information.

Example:

```
0001 FUNCTION Get_ASi_Input : BYTE
0002 VAR_INPUT
0003     Slave:BYTE;
0004     B_Slave:BOOL;
0005     ASi_Master:BYTE;
0006 END_VAR
0007
0008 VAR
0009     pSlaveInCyc: POINTER TO POINTER TO ARRAY [1..64] OF BYTE;
0010     sl: BYTE;
0011 END_VAR
0012
0013 sl := slave;
0014
0015 IF (sl = 0) OR (sl > 64) THEN
0016     Get_ASi_Input := 0;
0017     RETURN;
0018 END_IF
0019
0020 IF B_slave AND (sl < 32) THEN
0021     sl := sl + 32;
0022 END_IF
0023
0024 IF ASi_Master = 2 THEN
0025     pSlaveInCyc := PointerList + 16#C4;
0026 ELSE
0027     pSlaveInCyc := PointerList + 16#24;
0028 END_IF
0029
0030 Get_ASi_Input := pSlaveInCyc^[sl]AND 16#0F;
```

For detailed information see the
→ supplementary documentation "User Manual for PLC Programming with CoDe-Sys® 2.3"

12.8

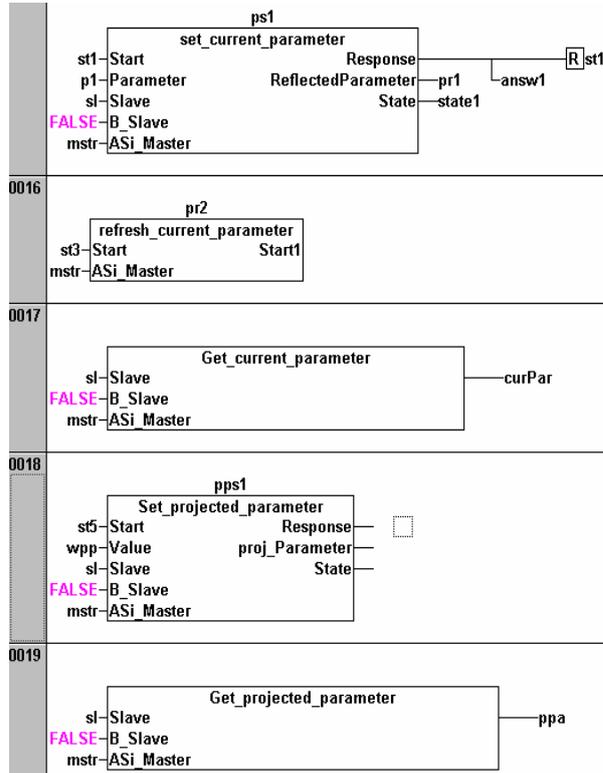
Read and write slave parameters via PLC



Tip

Access to slave parameters is not trivial. Therefore please always use the function calls in the library ifm_AsiUtils_010000.lib.

Examples:



Changes the parameter in the slave "sl" on master "mstr"

After changing a parameter the parameter list for the master "mstr" in the controller must be updated

Reads the current parameter value of slave "sl" and displays the value as "curPar"

Writes the value "wpp" as projected parameter for the slave "sl" in the parameter list of the controller

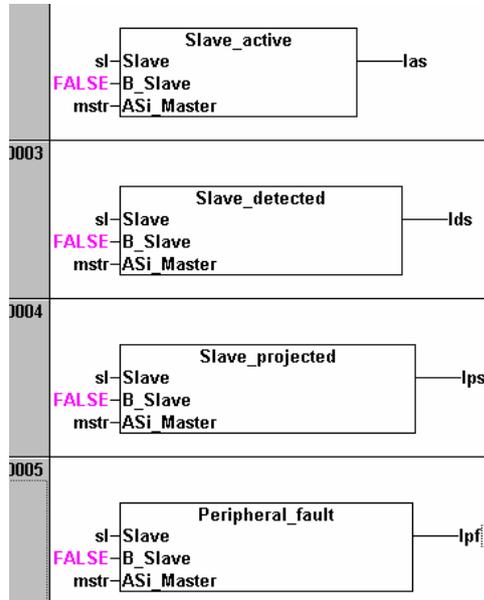
Reads the projected parameters for the slave "sl" from the parameter list in the controller and displays the value as "ppa"

12.9 Read in AS-i slave lists via PLC

Using the function calls from the library ifm_AsiUtils_010000.lib the slave lists can be read, as shown below.

Examples:

Access via function blocks



Query whether a slave with the address "sl" is active on the bus of master "mstr". If yes:

> las = TRUE

Query whether a slave with the address "sl" is detected on the bus of master "mstr". If yes:

> lds = TRUE

Query whether a slave with the address "sl" is projected on the bus of master "mstr". If yes:

> lps = TRUE

Query whether there is a peripheral fault on the slave with the address "sl". If yes:

> lpf = TRUE

Access with pointers

```

0008 pLAS: POINTER TO POINTER TO ARRAY [0..3] OF WORD;
0009 LASx: ARRAY [0..3] OF WORD;
0010
0011
0012 IF ASi_Master = 2 THEN
0013   pLAS := PointerList + 16#E0;
0014 ELSE
0015   pLAS := PointerList + 16#40;
0016 END_IF
0017 LASx := pLAS^^;

```

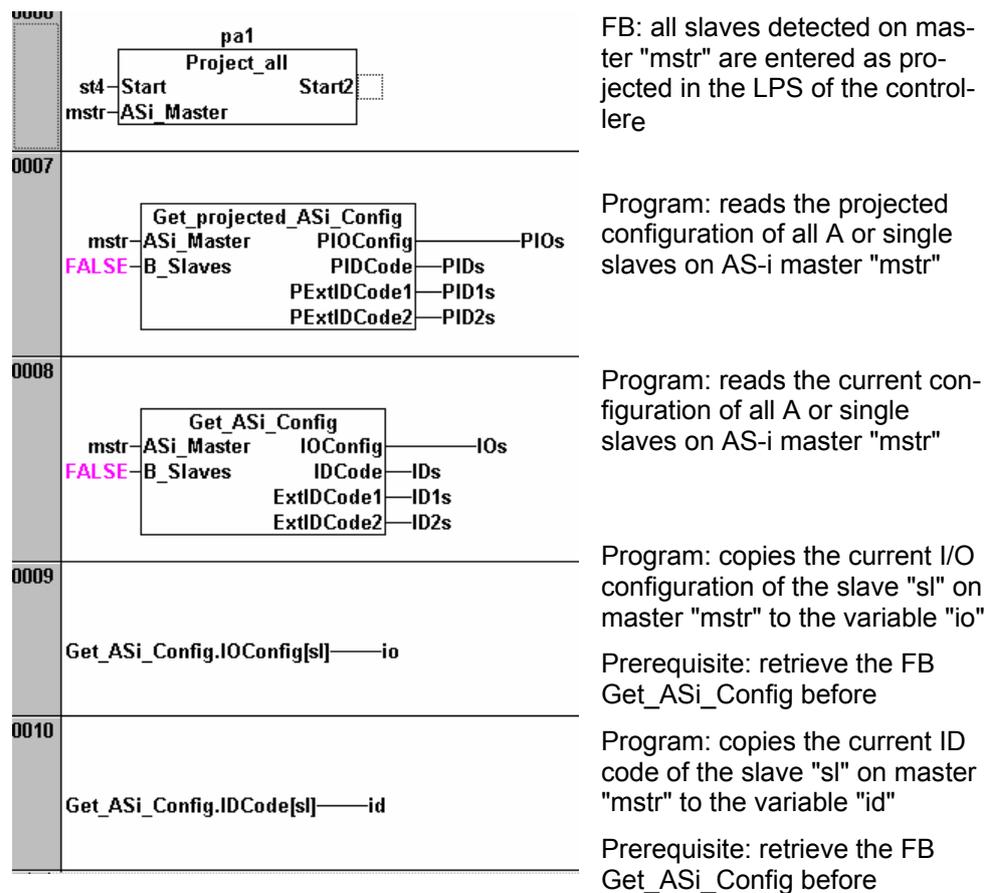
For detailed information see the → supplementary documentation "User Manual for PLC Programming with CoDeSys® 2.3"

12.10 Configure AS-i slaves via PLC

The library ifm_AsiUtils_010000.lib additionally contains function calls to reconfigure the AS-i system...

- to revise the projection table
- to re-address slaves
- to review the configuration
- etc.

Examples:



Note on network 0007 / 0008:

If the parameter "B_Slaves" is "TRUE" the corresponding statement applies to the "Configuration of all B slaves".

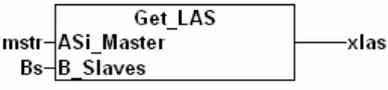
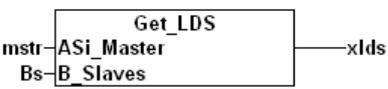
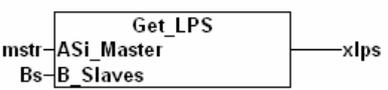
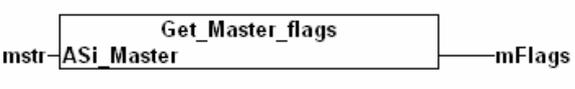
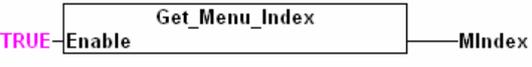
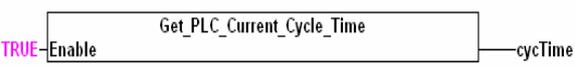
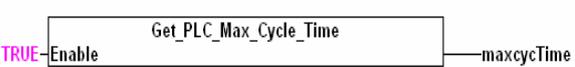
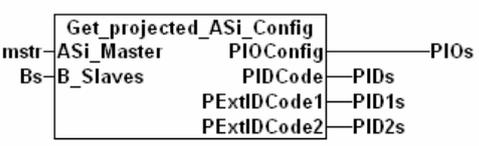
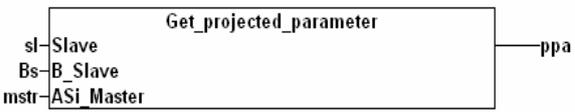
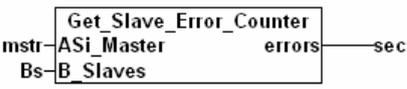
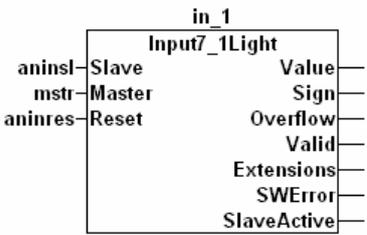
12.11 Overview system blocks

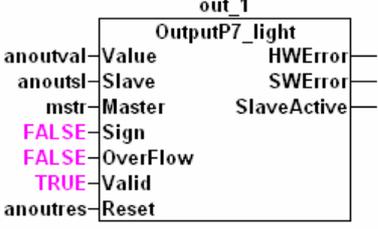
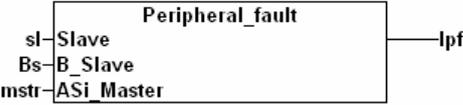
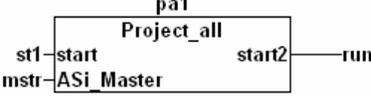
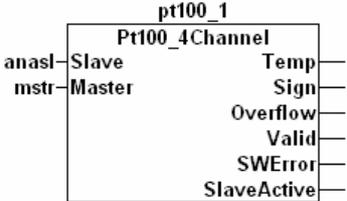
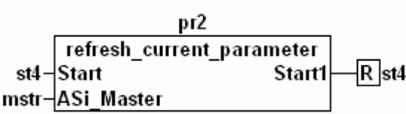
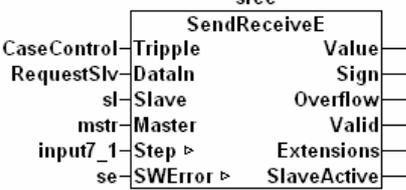
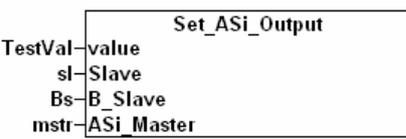
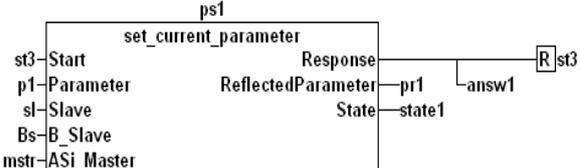
In addition to the CoDeSys® standard libraries another system library for the controller is contained on the CD:

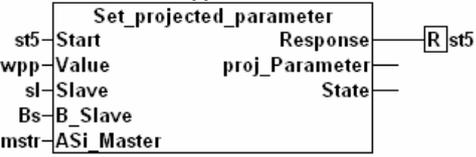
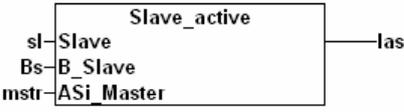
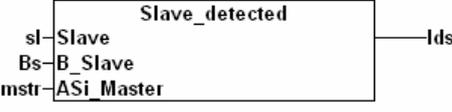
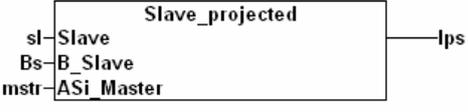
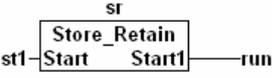
"ifm_AsiUtils_010000.lib" contains the blocks necessary for working with AS-i slaves version 2.x. In new projects the components of this library should be used for access to AS-i system information.

ifm_AsiUtils_010000.lib blocks

<p>Changing the slave address from "oldAddress" to "newAddress" as soon as "Start" changes to TRUE</p>	
<p>Executing an AS-i command (possible commands → description "command channel" in separate fieldbus manual)</p>	
<p>Reading the current configuration information of a connected AS-i slave</p>	
<p>Reading the current input values of an AS-i slave</p>	
<p>Reading the current output values of an AS-i slave</p>	
<p>Reading which button of the controller is actuated</p>	
<p>Reading the configuration error counter</p>	
<p>Reading the current parameters of an AS-i slave</p>	
<p>Updating the global slave lists</p>	

<p>Reading the list of active slaves LAS</p>	
<p>Reading the list of detected slaves LDS</p>	
<p>Reading the list of slaves which detect an external peripheral fault LPF</p>	
<p>Reading the list of projected slaves LPS</p>	
<p>Reading the current status of AS-i master flags</p>	
<p>Reading the menu index in the controllere</p>	
<p>Reading the current PLC cycle time in [ms]</p>	
<p>Reading the maximum PLC cycle time in [ms]</p>	
<p>Reading the projected configuration information of an AS-i slave</p>	
<p>Reading the projected parameter values of an AS-i slave.</p>	
<p>Reading the current number of faulty AS-i messages of an AS-i slave</p>	
<p>Only for 7.1 slaves Reading analogue input of a slave type 7.1</p>	

<p>Multiplex reading and writing of 8 bits of a slave</p> <p>Transmitting 2 data bits and 2 address bits per cycle in 4 cycles</p>	
<p>Only for 7.1 slaves</p> <p>Writing analogue output of a slave type 7.1</p>	
<p>If a slave detects an external peripheral fault the output is TRUE</p>	
<p>Updating AS-i configuration on an AS-i master as soon as "Start" changes to TRUE</p>	
<p>Requires library I71Light.lib</p> <p>Reading analogue inputs of a PT100 slave type 7.1</p>	
<p>After changing one or several parameters of AS-i slaves, the set of parameters must be updated by a positive edge on "Start"</p>	
<p>Retrieved by FB "Input7_1Light"</p> <p>Organises the communication with the analogue inputs of slaves type 7.1</p>	
<p>Setting the outputs of a slave to the contents of "value"</p>	
<p>Setting the current parameters of a slave as soon as "Start" changes to TRUE</p>	

<p>Selection of the operating mode of an AS-i master</p> <p>1 = projection mode</p> <p>0 = protected mode</p>	<p style="text-align: center;">sm1</p> 
<p>Setting the projected parameters of an AS-i slave</p>	<p style="text-align: center;">pps1</p> 
<p>The output is TRUE if the slave is activated</p>	<p style="text-align: center;">Slave_active</p> 
<p>The output is TRUE if the slave is detected</p>	<p style="text-align: center;">Slave_detected</p> 
<p>The output is TRUE if the slave is projected</p>	<p style="text-align: center;">Slave_projected</p> 
<p>Stores the variables defined as VAR_RETAIN in the flash memory</p> <p>IMPORTANT: due to the limited number of possible write access to the flash memory this command must not be carried out cyclically!</p>	<p style="text-align: center;">sr</p> 

13 Operation

In this chapter you will find out what you can do with the controller during operation.

13.1 Change PLC operating mode

→ page 10-4, chapter 10.3

"Which operating modes are there for the PLC in the controller?"

→ page 10-5, chapter 10.4

"How are the operating modes for the PLC changed?"

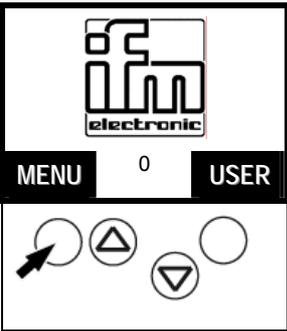
13.2 Information about the stored PLC program

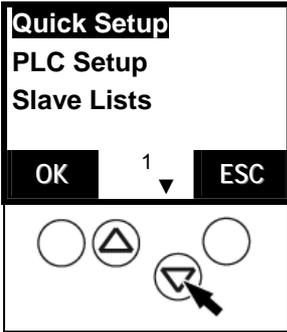
The controller gives you the data of the currently stored PLC program:



Tip

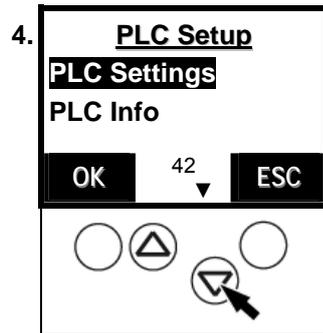
Password level 1 required → page 11-23, chapter "Password setting"

- 

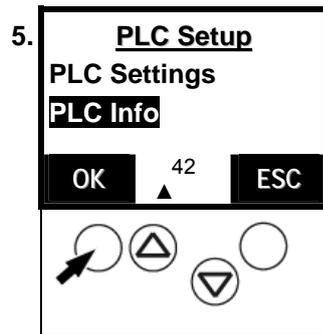
Press the [MENU] button
- 

Press [▼] to scroll to "PLC Setup"
- 

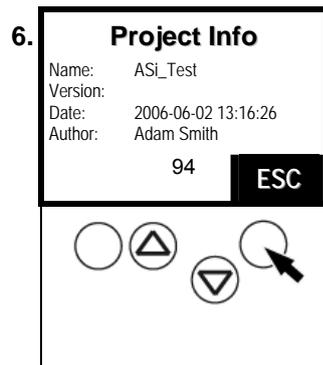
Press [OK] to select "PLC Setup"



▶ Press [▼] to scroll to "PLC Info"



▶ Press [OK] to select "PLC Info"

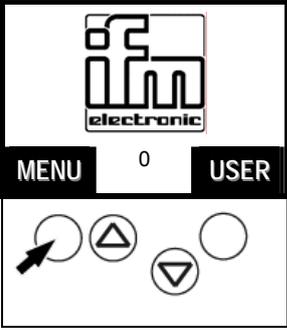
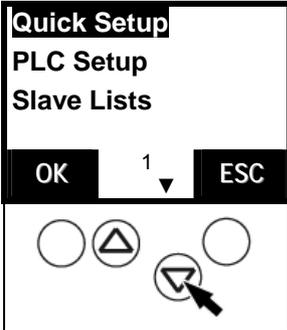
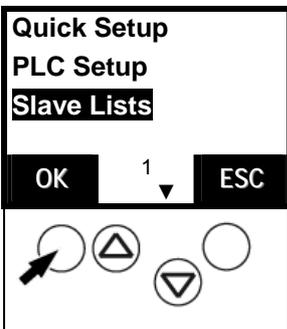
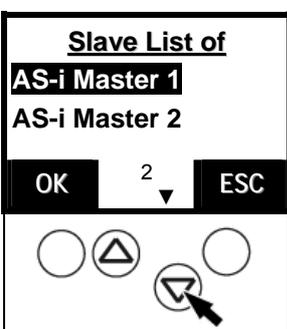


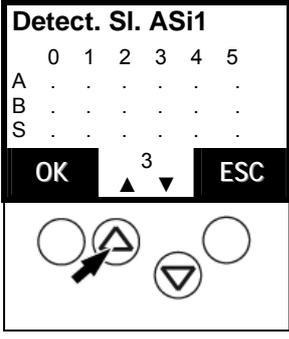
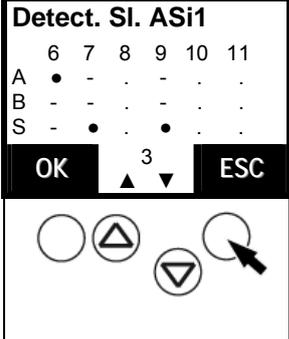
- > Name = file name of the PLC program
- > Version = PLC program version, if stored in the project
- > Date = date + time when the project was stored on the PC
- > Author = name stored as author in the project
- ▶ Press [ESC] 3 times to return to the start screen
- > That's it.

13.3 Display of detected slaves (list)

Display at which slave address the controller_e has *detected* one (or several) slaves type A, B or S (standard) on the bus, irrespective of whether or not the slave is active on the bus.

Definition: a slave is deemed as detected by an AS-i master if the slave is activated and has sent the master its identifier.

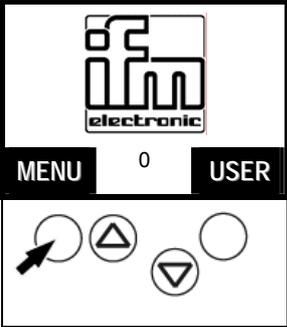
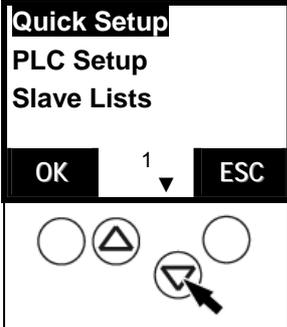
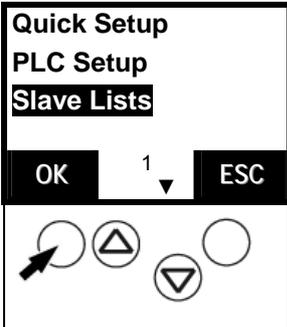
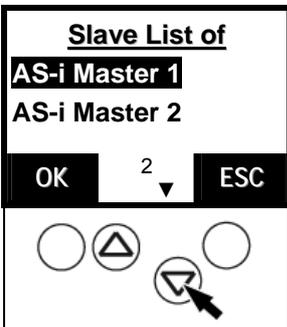
1.  Press the [MENU] button
2.  Press [▼] to scroll to "Slave Lists"
3.  Press [OK] to select "Slave Lists"
4.  If necessary press [▼] to scroll to AS-i master 2

5. **Slave List of**
AS-i Master 1
AS-i Master 2
- OK ▲ 2 ▼ ESC ▶ Press [OK] to select the requested AS-i Master
- 
6. **Detect. SI. ASi1**
Project. SI. ASi1
Active. SI. ASi1
- OK ▲ 91 ▼ ESC ▶ Press [OK] to select "Detect. SI."
- 
7. **Detect. SI. ASi1**
- | | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| A | . | . | . | . | . | . |
| B | . | . | . | . | . | . |
| S | . | . | . | . | . | . |
- OK ▲ 3 ▼ ESC ▶ A table of detected slaves is displayed. Here: no slaves have been detected on master 1 with the addresses 0 to 5.
 ▶ If necessary press [▲] to scroll to the next address block
- 
8. **Detect. SI. ASi1**
- | | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|----|----|
| A | • | - | - | - | - | - |
| B | - | - | - | - | - | - |
| S | - | • | - | • | - | - |
- OK ▲ 3 ▼ ESC ▶ A table of detected slaves is displayed. Here an example:
- an A/B slave was detected as A slave at the address 6,
 - a single slave was detected at the addresses 7 and 9.
- ▶ Note found slave addresses
 ▶ If necessary press [▲] to scroll to the next address block
 ▶ Press [ESC] 4 times to return to the start screen
 > That's it.
- 

13.4 Display of projected slaves (list)

Indication at which slave address one (or several) slaves type A, B or S (standard) are *projected* on the bus.

Definition: a slave is deemed as projected on the AS-i master if the slave is entered in the controller in the "List of projected slaves" (LPS). To be entered in the LPS, the slave must be activated at this time and have a valid, unique address.

1.  Press the [MENU] button
2.  Press [▼] to scroll to "Slave Lists"
3.  Press [OK] to select "Slave Lists"
4.  If necessary press [▼] to scroll to AS-i master 2

5. **Slave Setup of**
AS-i Master 1
 AS-i Master 2

OK 2 ESC

▶ Press [OK] to select the requested AS-i Master

6. **Detect. Sl. ASi1**
Project. Sl. ASi1
 Active. Sl. ASi1

OK 91 ESC

▶ Press [▼] to scroll to "Projected slaves"

7. **Detect. Sl. ASi1**
Project. Sl. ASi1
 Active. Sl. ASi1

OK 91 ESC

▶ Press [OK] to select "Projected slaves"

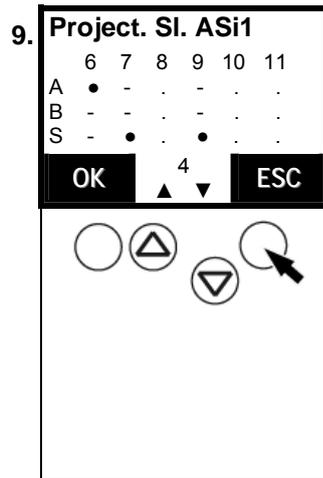
8. **Project. Sl. ASi1**

	0	1	2	3	4	5
A
B
S

OK 4 ESC

> A table of projected slaves is displayed.
 Here: no slave has been projected on master 1 with the addresses 0 to 5.

▶ If necessary press [▲] to scroll to the next address block.

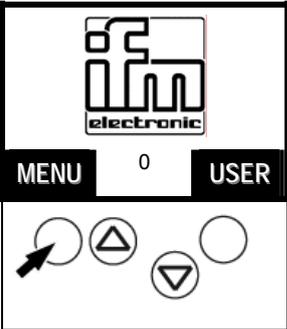
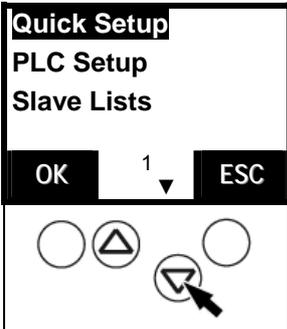
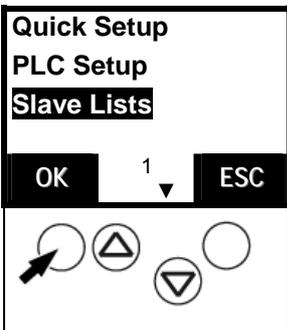
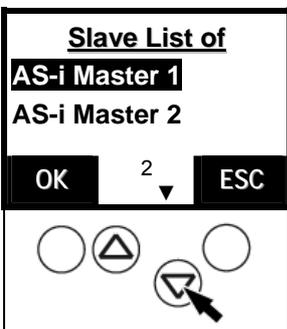


- > A table of projected slaves is displayed. Here an example:
- an A/B slave was projected as A slave at the address 6,
- a single slave was projected at the addresses 7 and 9.
- ▶ Note found slave addresses
- ▶ If necessary press [▲] to scroll to the next address block
- ▶ Press [ESC] 4 times to return to the start screen
- > That's it.

13.5 Display of active slaves (list)

Indication at which slave address the controller_e has detected an *activated* slave type A, B or S (standard) on the bus.

Definition: a slave is deemed as active on the AS-i master if the AS-i master cyclically exchanges data with the slave.

1.  Press the [MENU] button
2.  Press [▼] to scroll to "Slave Lists"
3.  Press [OK] to select "Slave Lists"
4.  If necessary press [▼] to scroll to AS-i master 2

5. **Slave Setup of**
AS-i Master 1
 AS-i Master 2

OK 2 ESC

▶ Press [OK] to select the requested AS-i Master

6. **Detect. Sl. ASi1**
 Project. Sl. ASi1
 Active. Sl. ASi1

OK 91 ESC

▶ Press [▼] to scroll to "Active Sl. "

7. **Detect. Sl. ASi1**
 Project. Sl. ASi1
Active. Sl. ASi1

OK 91 ESC

▶ Press [OK] to select "Active Sl."

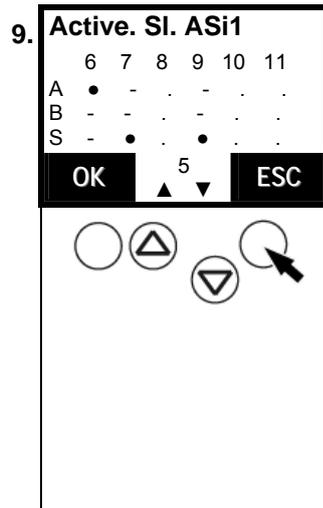
8. **Active. Sl. ASi1**

	0	1	2	3	4	5
A
B
S

OK 5 ESC

> A table of activated slaves is displayed.
 Here: no slaves have been detected on master 1 with the addresses 0 to 5.

▶ If necessary press [▲] to scroll to the next address block



- > A table of activated slaves is displayed.
Here an example:
- an A/B slave was detected as activated A slave at the address 6,
- an activated single slave was detected at the addresses 7 and 9.
- ▶ Note found slave addresses
- ▶ If necessary press [▲] to scroll to the next address block
- ▶ Press [ESC] 4 times to return to the start screen
- > That's it.

13.6 Display of slaves with peripheral fault (list)

Indication at which slave address the controller_e has detected one (or several) slaves type A, B or S (standard) with a wiring fault on the bus.

The LED [**CONF/PF**] flashes as soon as there is a peripheral fault.

What is a peripheral fault?

Peripheral faults depend on the used slaves and can have different reasons.

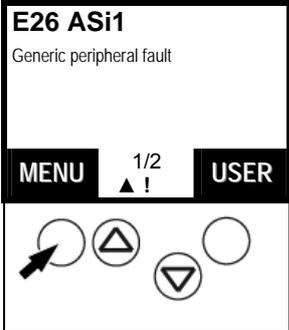
Examples:

- A slave with analogue inputs is projected but does not receive a signal in the defined range at one of its enabled inputs (faulty electrical connection to the transducer).
- External 24V voltage supply missing at one slave which requires it.

1. **E26 ASi1**
Generic peripheral fault

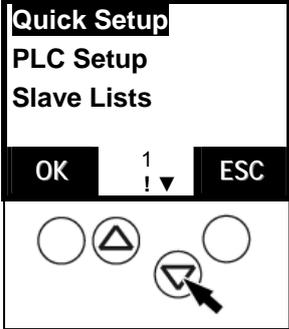
> LED [**CONF/PF**] flashes
> The display on the left appears instead of the **ifm** start screen:
peripheral fault

▶ Press the [**MENU**] button



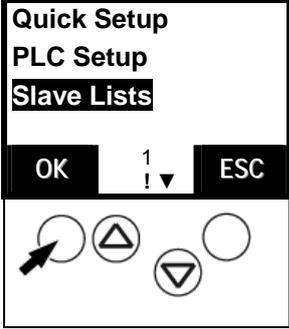
2. **Quick Setup**
PLC Setup
Slave Lists

▶ Press [**▼**] to scroll to "Slave Lists"

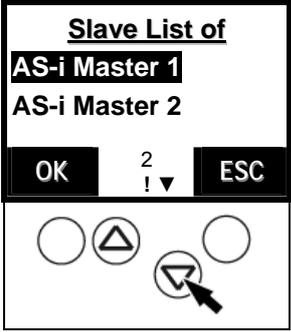


3. **Quick Setup**
PLC Setup
Slave Lists

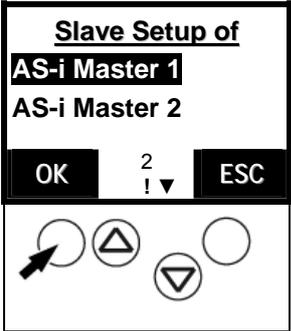
▶ Press [**OK**] to select "Slave Lists"



4. **Slave List of**
AS-i Master 1
AS-i Master 2



▶ If necessary press [▼] to scroll to AS-i master 2
5. **Slave Setup of**
AS-i Master 1
AS-i Master 2



▶ Press [OK] to select the requested AS-i Master
6. **Detect. Sl. ASi1**
Project. Sl. ASi1
Active. Sl. ASi1



▶ Press [▼] to scroll to "Periph. Flt."
7. **Project. Sl. ASi1**
Active. Sl. ASi1
Periph. Flt. ASi1



▶ Press [OK] to select "Periph. Flt."
8. **Periph. Flt. ASi1**

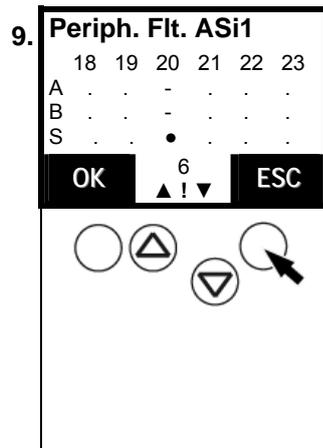
	0	1	2	3	4	5
A
B
S



▶ A table of the slaves with peripheral faults is displayed.

 - Here: no slaves with peripheral faults have been detected on master 1 with the addresses 0 to 5.

▶ If necessary press [▲] to scroll to the next address block

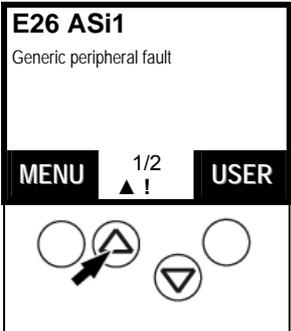


- > A table of the slaves with peripheral faults is displayed.
- Here: a single slave with peripheral fault was detected at the address 20
- ▶ Note found slave addresses
- ▶ If necessary press [▲] to scroll to the next address block
- ▶ Press [ESC] 4 times to return to the start screen
- > That's it.

13.7 Display slave with peripheral fault

Indication at which slave address the controller_e has found a slave type A, B or S (standard) with a wiring fault (periphery) on the bus.

→ also page 13-11, chapter "Display of slaves with peripheral fault (list)"

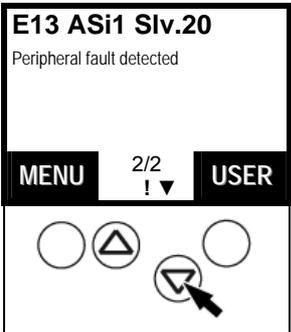
▶  **E26 ASi1**
Generic peripheral fault

MENU 1/2 USER ▲ !

▶ LED [CONF/PF] flashes

▶ The display on the left appears in addition to the ifm start screen:
peripheral fault on AS-i master 1

▶ Press [▲] to scroll to "Slave Lists"

2.  **E13 ASi1 Slv.20**
Peripheral fault detected

MENU 2/2 USER ! ▼

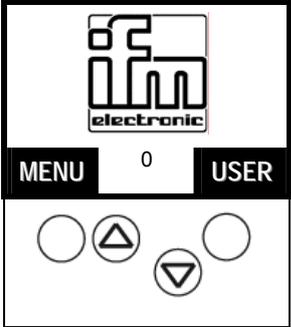
▶ LED [CONF/PF] flashes

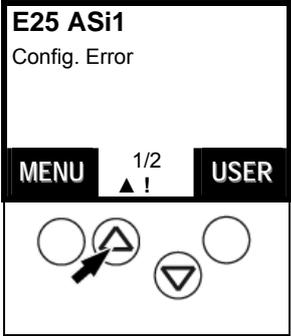
▶ Slave 20 on AS-i master 1 signals peripheral fault

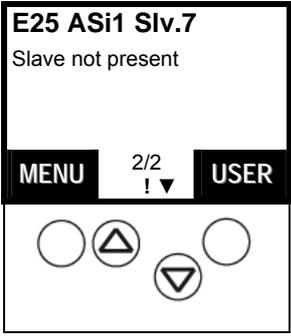
▶ Press [▼] to scroll back to the start screen

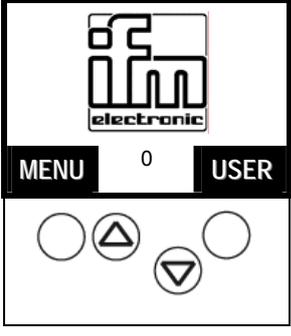
13.8 Find out an unknown slave address

If the address of a connected slave is not known you can find it out very easily:

1. 

 - > [PROJ] is off.
 - ▶ When the LED [PROJ] lights switch the master to the operating mode "protected mode".
→ page 10-2, chapter 10.2 "How are the operating modes for the AS-i master changed?"
 - ▶ Remove the unknown slave from the bus.
2. 

 - > The display on the left appears in addition to the ifm start screen: "Configuration error"
 - > LED [CONF/PF] lights
 - Cause: slaves which the controller has in its projection list cannot be found on the bus.
 - Note: description of the error message
→ chapter 16 "Error messages"
 - ▶ Press [▲] to scroll to the error page
3. 

 - > Display error message: "AS-i Master 1: slave 7 missing"
So: in our example the unknown slave has the address 7.
 - ▶ Connect removed slave again
4. 

 - > That's it: the ifm start screen is displayed again

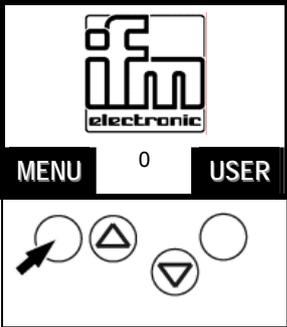
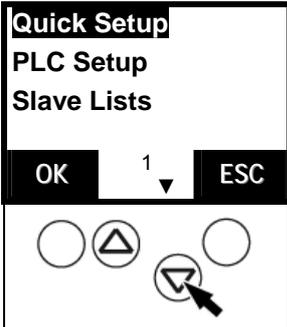
13.9 Number of AS-i voltage failures on the AS-i master

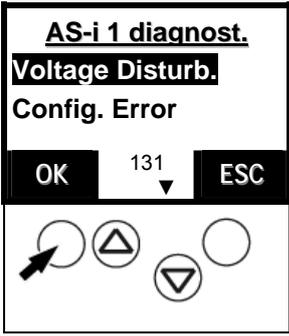
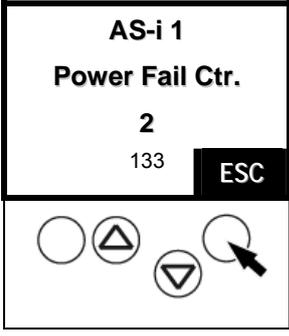
How often was an inadmissible decrease or interruption of the voltage supply of the AS-i bus responsible for system failures? The controller shows it:

Here you can not see in detail when the individual faults occurred.
→ chapter 16 "Error messages"

The error counter is reset...

- when the unit is switched off and on again
- with the function "Reset error counter", → page 13-25

1.  Press the **[MENU]** button
2.  Press **[▼]** to scroll to "Diagnostics"
3.  Press **[OK]** to select "Diagnostics"
4.  If necessary press **[▼]** to scroll to another master

5.  **Diagnostics of AS-i Master 1**
Safety Master 1
OK 130 ESC
▶ Press [OK] to select the requested master
6.  **AS-i 1 diagnost.**
Voltage Disturb.
Config. Error
OK 131 ESC
▶ Press [OK] to select "Voltage Disturb."
7.  **AS-i 1**
Power Fail Ctr.
2
133 ESC
> Display of the number of failures of the AS-i supply on the master
Reset error counter:
→ page 13-25, chapter 13.13
▶ Press [ESC] 4 times to return to the start screen

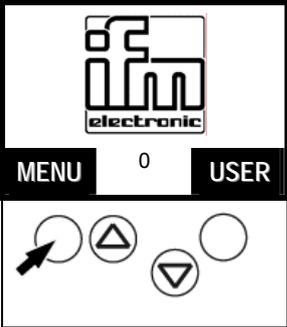
13.10 Number of configuration errors on the master

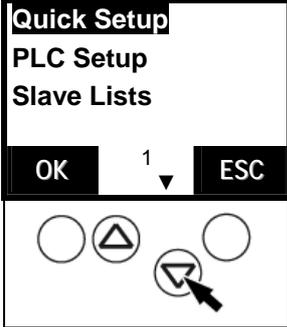
Display of the number of configuration errors on the master

Here you can not see in detail when the individual faults occurred.
→ chapter 16 "Error messages"

The error counter is reset...

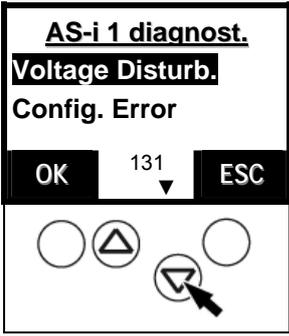
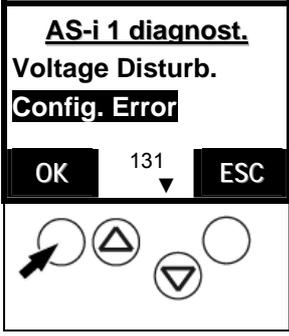
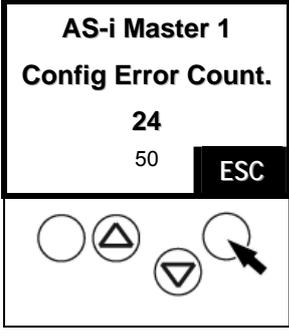
- when the unit is switched off and on again
- with the function "Reset error counter", → page 13-25

1.  Press the [MENU] button

2.  Press [▼] to scroll to "Diagnostics"

3.  Press [OK] to select "Diagnostics"

4.  If necessary press [▼] to scroll to another master

5.  Press **[OK]** to select the requested master
6.  Press **[▼]** to scroll to "Configuration error"
7.  Press **[OK]** to select "Configuration error"
8.  > Display of the number of configuration errors on master
Reset error counter:
→ page 13-25, chapter 13.13
Press **[ESC]** 4 times to return to the start screen

13.11 Faulty AS-i messages on the master

A message error means that the expected response message from a slave is not received within a defined time or that the signal sequences in the response message of the AS-i master cannot be interpreted.

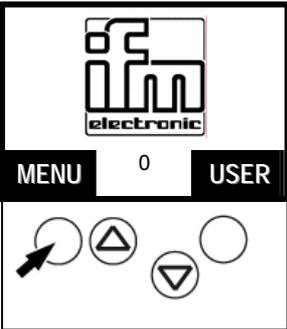
Examples:

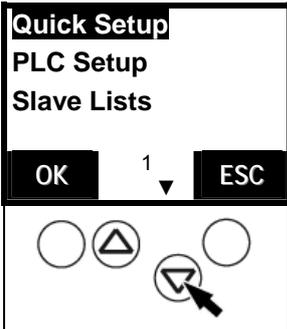
- The AS-i line is asymmetrically operated due to an electric fault (earth fault on one side). The AS-i signal is no longer clearly recognisable.
- The electrical AS-i connection to an AS-i slave is not ok.
- Interference by the electric environment of the AS-i network (EMC) affects the AS-i message traffic.

Here you can not see in detail when every individual fault occurred.
→ chapter 16 "Error messages"

The error counter is reset...

- when the unit is switched off and on again
- with the function "Reset error counter", → page 13-25

1.  Press the [MENU] button

2.  Press [▼] to scroll to "Diagnostics"

3.  Press [OK] to select "Diagnostics"

4. **Diagnostics of AS-i Master 1**
Safety Master 1

OK 130 ESC

▶ If necessary press [▼] to scroll to another master

5. **Diagnostics of AS-i Master 1**
Safety Master 1

OK 130 ESC

▶ Press [OK] to select the requested master

6. **AS-i 1 diagnost.**
Voltage Disturb.
Config. Error

OK 131 ESC

▶ Press [▼] to scroll to "Telegr. Error"

7. **AS-i 1 diagnost.**
Config. Error
Telegr. Error

OK 131 ESC

▶ Press [OK] to select "Telegr. Error"

8. **AS-i Master 1**
Telegr. Error Count.
0.4 %

MORE 51 48 / s ESC

> Dynamic display of faulty AS-i messages in percent of the sent messages
> Dynamic display of faulty AS-i messages per second
▶ Press [MORE] to scroll to the next screen

9. **AS-i Master 1**
Performance

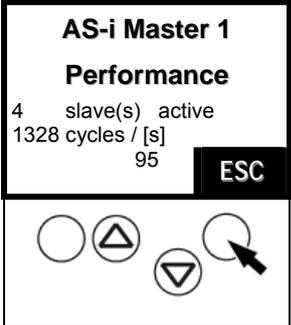
4 slave(s) active
1328 cycles / [s]
95

ESC

> Dynamic display of the performance of this master:

- Number of active slaves
- Number of AS-i cycles per second

▶ Press [ESC] 4 times to return to the start screen



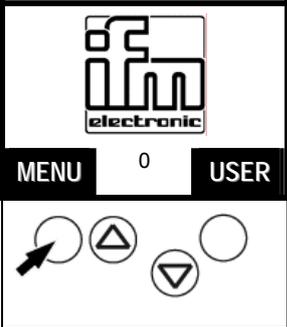
13.12 Number of disturbed messages on the master (of "Noisy Slaves")

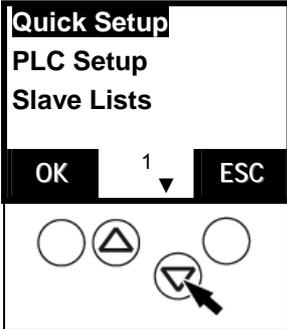
You would like to know how many distorted messages the different slaves have sent (since the last reset of the error counter)? The controller shows it, sorted by the number of distorted messages.

Here you can not see in detail when every individual fault occurred.
→ chapter 16 "Error messages"

The error counter is reset...

- when the unit is switched off and on again
- with the function "Reset error counter", → page 13-25

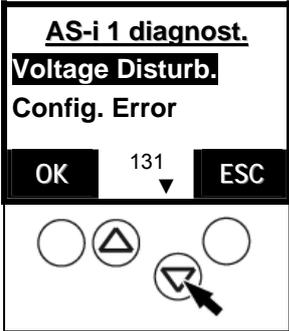
1.  Press the [MENU] button

2.  Press [▼] to scroll to "Diagnostics"

3.  Press [OK] to select "Diagnostics"

4.  If necessary press [▼] to scroll to another master

5. **Diagnostics of AS-i Master 1 Safety Master 1**

▶ Press [OK] to select the requested master
6. **AS-i 1 diagnost. Voltage Disturb. Config. Error**

▶ Press [▼] to scroll to "Noisy Slaves"
7. **AS-i 1 diagnost. Telegr. Error Noisy Slaves**

▶ Press [OK] to select "Noisy Slaves"
8. **AS-i 1 Noisy Slv.**

IX	Slv.	Error
1	7	122
2	6A	83


▶ Dynamic display of the number of distorted messages of the different slaves, sorted by frequency of occurrence:
 - Column "IX": Number in rank order (frequency)
 - Column "Slv. ": Address of the slave
 - Column "Tele.": Number of distorted messages
▶ Press [SORT] to sort again according to the current rank order
▶ Press [▲] / [▼] to scroll to the slaves with a higher/lower rank order
- Alternatively:
- ▶ Press [ESC] 4 times to return to the start screen

13.13 Reset error counter

Here you can find out how to reset the error counter in the diagnostic memory of the controller.



Tip

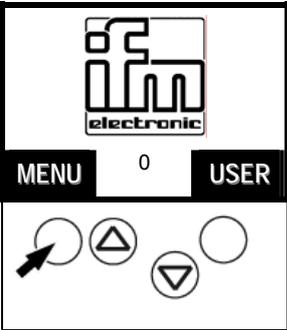
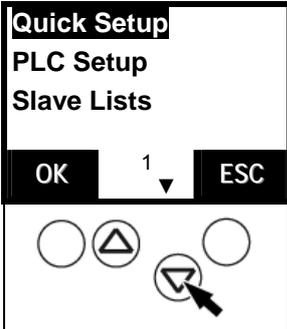
You should not reset the diagnostic memory of the controller before the analysis of the values stored so far.

The reset process cannot be reversed.



Tip

Password level 1 required → page 11-23, chapter "Password setting"

1.  Press the **[MENU]** button
2.  Press **[▼]** to scroll to "Diagnostics"
3.  Press **[OK]** to select "Diagnostics"

4. **Diagnostics of AS-i Master 1 Safety Master 1**

OK 130 ESC

▶ If necessary press [▼] to scroll to another master

5. **Diagnostics of AS-i Master 1 Safety Master 1**

OK 130 ESC

▶ Press [OK] to select the requested master

6. **AS-i 1 diagnost. Voltage Disturb. Config. Error**

OK 131 ESC

▶ Press [▼] to scroll to "Reset error counter"

7. **AS-i 1 diagnost. Noisy Slaves Reset Error Count.**

OK 131 ESC

▶ Press [OK] to select "Reset Error Count."

8. **AS-i Master 1 Reset Error Count.?**

OK 52 ESC

> Safety query: "Set all error counters to 0?"

▶ Press [OK] to reset all error counters to 0

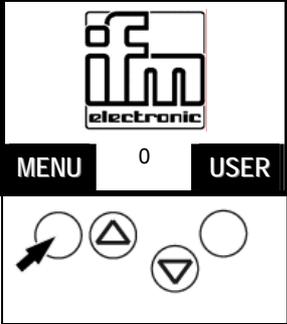
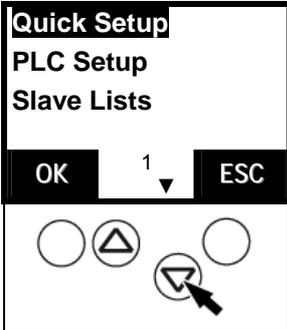
> Return to screen 131

Alternatively:

▶ Press [ESC] to scroll to screen 131 without changing the error counters

13.14 Display of the longest cycle time

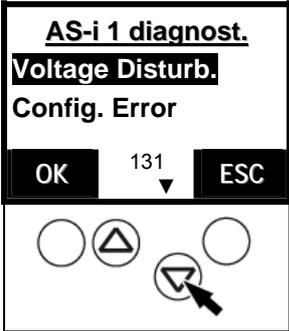
Display of the longest cycle time of the system in [ms] since the last reset or after the last power-on of the unit:

1.  Press the **[MENU]** button
2.  Press **[▼]** to scroll to "Diagnostics"
3.  Press **[OK]** to select "Diagnostics"
4.  If necessary press **[▼]** to scroll to another master

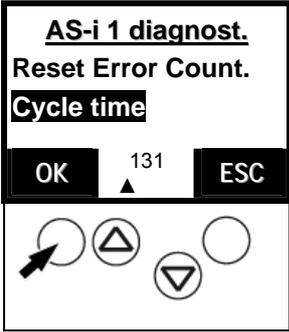
5. **Diagnostics of AS-i Master 1 Safety Master 1**



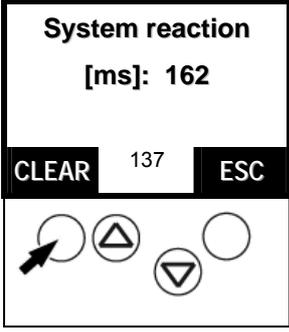
▶ Press [OK] to select the requested master
6. **AS-i 1 diagnost. Voltage Disturb. Config. Error**



▶ Press [▼] to scroll to "Cycle time"
7. **AS-i 1 diagnost. Reset Error Count. Cycle time**



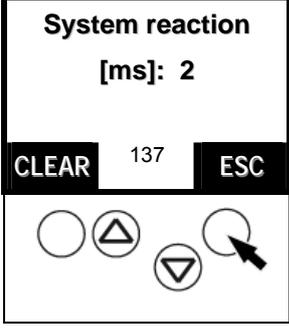
▶ Press [OK] to select "Cycle time"
8. **System reaction [ms]: 162**



> Display of the longest cycle time of the AS-i system in [ms] since the last reset

▶ To update the display retrieve the image again: Buttons [ESC] > [OK] > [OK]

▶ Press [ZERO] to set the cycle time test series to 0
9. **System reaction [ms]: 2**



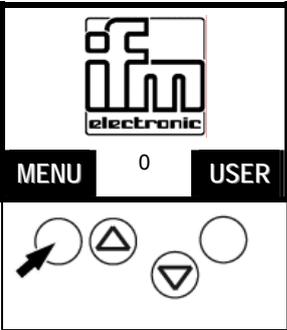
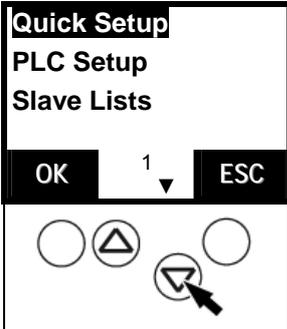
> Reset of the current test series

> Start of a new test series

▶ Press [ESC] 3 times to return to the start screen

13.15 Read states of the safety monitor

By means of the following method the controller shows you the current data of the AS-i safety monitor.

1.   Press the **[MENU]** button
2.   Press **[▼]** to scroll to "Diagnostics"
3.   Press **[OK]** to select "Diagnostics"
4.   Press **[▼]** to scroll to the requested safety master

5. **Diagnostics of AS-i Master 1 Safety Master 1**



▶ Press **[OK]** to select the requested master

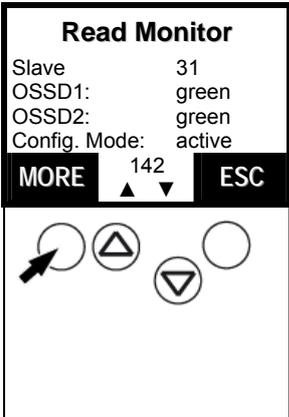
6. **Safety Monitor Read Monitor Trigg.Slave**



▶ Press **[OK]** to select "Read Monitor"

a) no safety device triggered

7. **Read Monitor**



> Display of the current data of the safety monitor:

- Slave = configured AS-i slave address
- OSSD1 = LED colour* for enable circuit 1
- OSSD2 = LED colour* for enable circuit 2
- Configuration mode active / not active = operating mode of the safety monitor

▶ Press **[MORE]** to scroll to further data

OR:

▶ Press **[ESC]** to return to screen 141

- * red = relay contact interrupted: safety device triggered
 yellow = relay contact interrupted + restart disable = ready to start
 green = relay contact closed: safety devices ok



Tip

Depending on the type of connected safety devices (one / two channels) the displays of OSSD1 and OSSD2 may be different.

b) safety device triggered

7. **Read Monitor** > Display of the current data of the safety monitor

Slave	31
OSSD1:	red
OSSD2:	red
Config. Mode:	active

MORE 142 **ESC**
▲!▼

- slave = configured AS-i slave address
- OSSD1 = LED colour* for enable circuit 1
Here: enable circuit interrupted
- OSSD2 = LED colour* for enable circuit 2
Here: enable circuit interrupted
- Configuration mode active / not active
= operating mode of the safety monitor
(not active = Run mode)

▶ Press **[MORE]** to scroll to further data
(only possible in case of a fault)

or:

▶ Press **[ESC]** to return to screen 141

8. **OSSD1 Slave 31** > Display of the data of enable circuit 1:

Device Index	32 [1/3]
Colour:	red

OSSD2 143 **ESC**
▲!▼

- Slave = configured AS-i slave address
- Device index (corresponding to the configuration of the safety monitor with the software "ASIMON")
- [1/3] = display of the first of 3 sub-indexes
sub-index 1 = sensor
sub-index 2 = start condition
sub-index 3 = relay contact
- LED colour* for enable circuit 1

▶ Press **[▲]** / **[▼]** to scroll between the status messages of the other concerned index devices

▶ Press **[OSSD2]** to scroll to enable circuit 2

or:

▶ Press **[ESC]** to return to screen 141

9. **OSSD2 Slave 31** Like screen 143, but for OSSD2

Device Index	32 [1/3]
Colour:	red

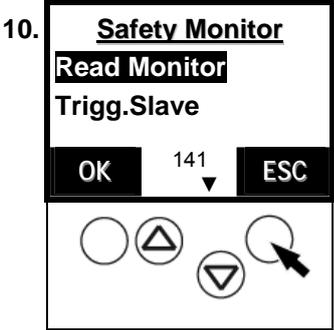
OSSD1 144 **ESC**
▲!▼

▶ Press **[OSSD1]** to scroll to enable circuit 1

or:

▶ Press **[ESC]** to return to screen 141

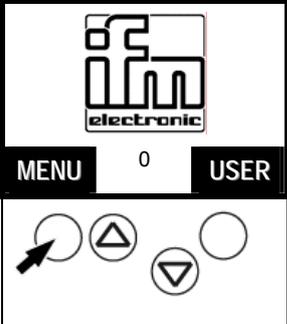
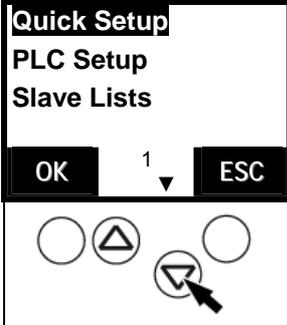
- * red = relay contact interrupted: a safety device has triggered
- yellow = relay contact interrupted + restart disable = ready to start
- green = relay contact closed: safety devices ok



▶ Press [ESC] 3 times to return to the start screen
> That's it!

13.16 Read states of safety slaves

By means of the following method the controller_e shows you the current data of the AS-i safety slaves.

1.   Press the [MENU] button
2.   Press [▼] to scroll to "Diagnostics"
3.   Press [OK] to select "Diagnostics"
4.   Press [▼] to scroll to the requested safety master

5. **Diagnostics of AS-i Master 1 Safety Master 1**



Press [OK] to select the requested master

6. **Safety Monitor Read Monitor Trigg.Slave**



Press [▼] to scroll to "Trigg.Slave"

7. **Safety Monitor Read Monitor Trigg.Slave**



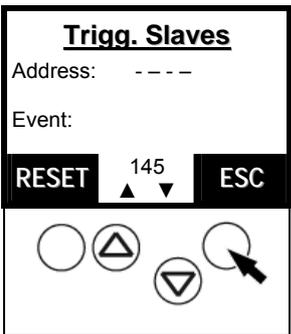
Press [OK] to select "Trigg.Slave"

a) Safety sensor not actuated / not triggered

8. **Trigg. Slaves**

Address: ----

Event:



> Display of the current data of the first detected and triggered safety slave

- Here: no sensor triggered
no further displays / functions

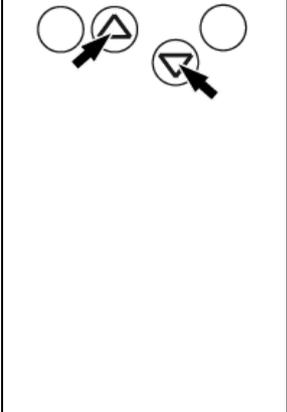
Press [ESC] to return to screen 141

b) safety sensor actuated / not triggered

8. **Trigg. Slaves**

Address: 3 active
 Safety slave trigg. (1/2)
 Event: 1/1
 POT ...d...h...m...s

RESET 145 ESC
 ▲!▼



> Display of the current data of the first detected and triggered safety slave

- Address = current address of the safety slave on the safety monitor
 active = sensor triggered
 inactive = sensor not / no longer triggered
- (1/2) = display/number of triggered sensors
- Event 1/1 = no./number* of triggered sensors
- POT (Power On Time) shows the time elapsed since power-on until the occurrence of the trigger event

▶ Press [▲] / [▼] to scroll between several triggered sensors

▶ [RESET] deletes the display of the now no longer triggered sensors
 Still triggered sensors remain displayed

▶ Press [ESC] to return to screen 141

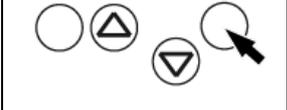
* Automatic upwards counting of the events (1/1 → 1/2) as soon as another sensor is triggered.

Downwards counting not before [RESET].

9. **Safety Monitor**

Read Monitor
Trigg.Slave

OK 141 ESC
 ▲▼



▶ Press [ESC] 3 times to return to the start screen

> That's it!

13.17 Set AS-i address(es) of the safety monitor(s)

By means of the following method you can set the same AS-i address for the safety monitor in the controller that you have already stored with the "ASIMON" safety parameter-setting software in the safety monitor.

After this, the controller can exchange data with the safety monitor via a special protocol.

More information on the protocol → device manual of the safety monitor.

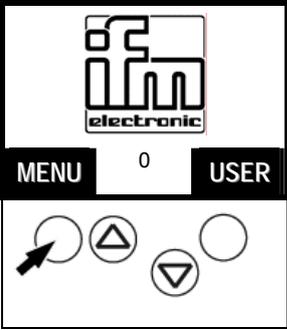


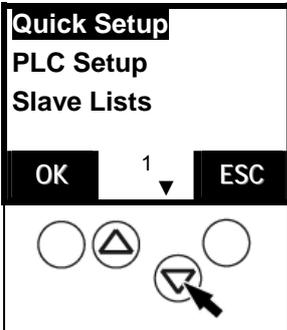
DANGER

The protocol changes output states of the set slaves.

Danger for people and machine by uncontrolled machine states.

▶ Only set AS-i safety monitors in this menu.

- 

▶ Press the [MENU] button
- 

▶ Press [▼] to scroll to "Diagnostics"
- 

▶ Press [OK] to select "Diagnostics"

4. **Diagnostics of AS-i Master 1 Safety Master 1**

OK 130 ESC

▶ Press [▼] to scroll to the requested safety master

5. **Diagnostics of AS-i Master 1 Safety Master 1**

OK 130 ESC

▶ Press [OK] to select the requested master

6. **Safety Monitor Read Monitor Trigg.Slave**

OK 141 ESC

▶ Press [▼] to scroll to "Enable Monitor"

7. **Safety Monitor Trigg.Slave Enable Monitor**

OK 141 ESC

▶ Press [OK] to select "Enable Monitor"

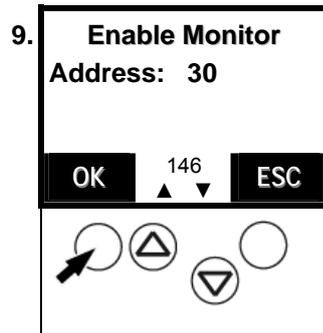
8. **Enable Monitor Address: 31**

OK 146 ESC

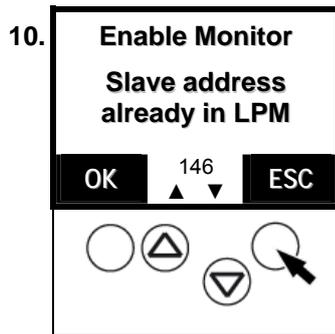
> Display of the address of the first found safety monitor

▶ Press [▲] / [▼] to scroll to the requested address of the safety monitor

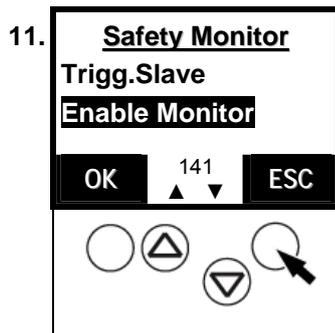
IMPORTANT: select the same setting as with "ASIMON" in the safety monitor



▶ Press **[OK]** to confirm the requested address of the safety monitor



> Message that the selected address has been found in the list of projected monitors (LPM)
> Controller_e enters the AS-i address of the safety monitor in the list of participants
> After this, the controller_e can exchange data with the safety monitor via a special protocol.
▶ Press **[ESC]** to return to screen 141

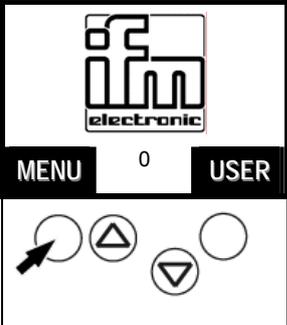
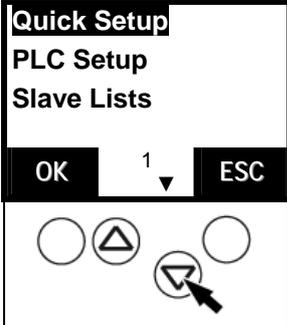


▶ Press **[ESC]** 3 times to return to the start screen
> That's it!

13.18 Reset the AS-i address(es) of the safety monitor(s)

By means of the following method you can delete the AS-i address of the safety monitor in the controller.

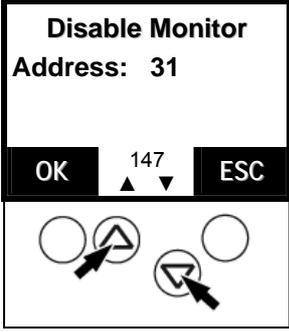
After this the controller processes the safety monitor just like an ordinary slave (4I/4O) – without taking into consideration safety-related data.

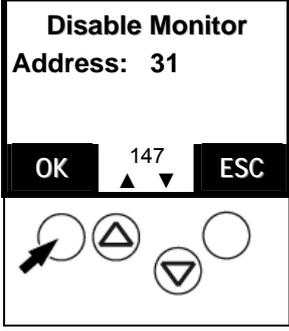
1.  ▶ Press the [MENU] button
2.  ▶ Press [▼] to scroll to "Diagnostics"
3.  ▶ Press [OK] to select "Diagnostics"
4.  ▶ Press [▼] to scroll to the requested safety master

5. 

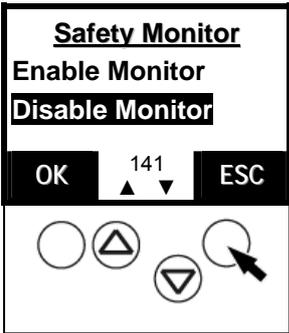
▶ Press [OK] to select the requested master
6. 

▶ Press [▼] to scroll to "Disable Monitor"
7. 

▶ Press [OK] to select "Disable Monitor"
8. 

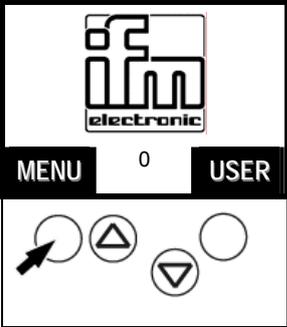
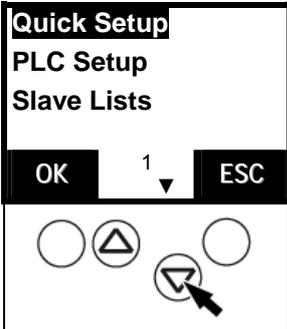
> Display of the address of the first found safety monitor
▶ Press [▲] / [▼] to scroll to the requested address of the safety monitor
9. 

▶ Press [OK] to confirm the requested address of the safety monitor
▶ Confirm the safety query with [OK]

10.  > The controller deletes the AS-i address from the list of participants
- > After this the controller processes the safety monitor just like an ordinary slave – without taking into consideration safety-related data.
- ▶ Press [**ESC**] 3 times to return to the start screen
- > That's it!

13.19 Set diagnostic behaviour of the safety monitor

By means of the following method you can set the parameters set via "ASIMON" for the safety monitor in the controller.

1.  ▶ Press the [MENU] button
2.  ▶ Press [▼] to scroll to "Diagnostics"
3.  ▶ Press [OK] to select "Diagnostics"
4.  ▶ Press [▼] to scroll to the requested safety master

5. **Diagnostics of AS-i Master 1**
Safety Master 1



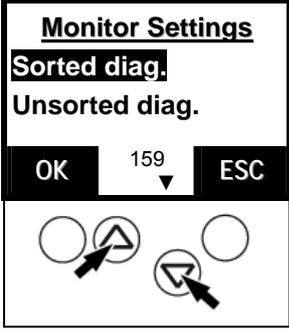
▶ Press [OK] to select the requested master
6. **Safety Monitor**
Read Monitor
Trigg.Slave



▶ Press [▼] to scroll to "Setup Monitor"
7. **Safety Monitor**
Disable Monitor
Setup Monitor



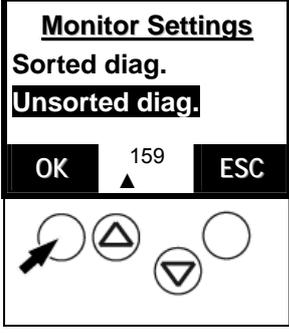
▶ Press [OK] to select "Setup Monitor"
8. **Monitor Settings**
Sorted diag.
Unsorted diag.



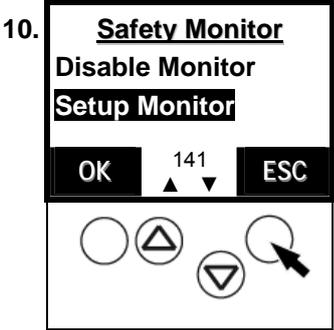
▶ Display of the current setting of the safety monitor (marked line = active):

 - sorted = sorting by enable circuits
 - unsorted = sorting by numbers of the safety devices

▶ Press [▲] / [▼] to scroll to the requested setting
IMPORTANT: select the same setting as with "ASIMON" in the safety monitor
9. **Monitor Settings**
Sorted diag.
Unsorted diag.



▶ Press [OK] to confirm the settings



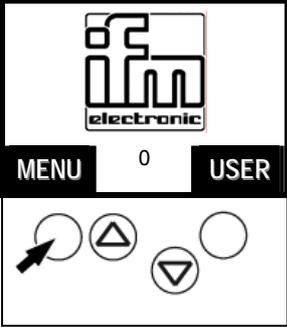
▶ Press [ESC] 3 times to return to the start screen
> That's it!

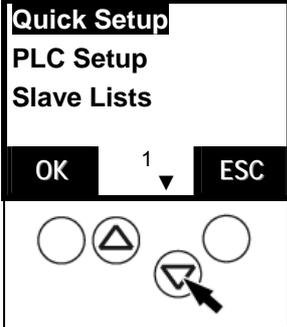
13.20 Reset diagnostic states of safety devices

By means of the following method you can delete the stored diagnostic states of the safety devices.



Tip
 Password level 1 required → page 11-23, chapter "Password setting"

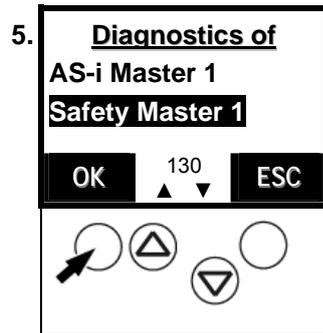
1. 

▶ Press the [MENU] button
2. 

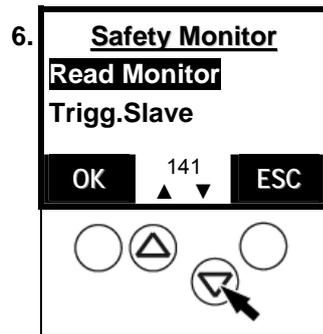
▶ Press [▼] to scroll to "Diagnostics"
3. 

▶ Press [OK] to select "Diagnostics"
4. 

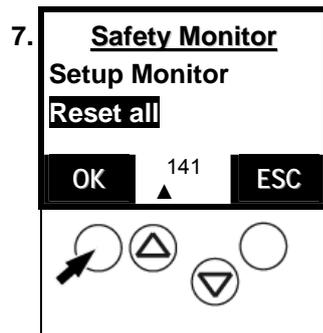
▶ Press [▼] to scroll to the requested safety master



▶ Press [OK] to select the requested master

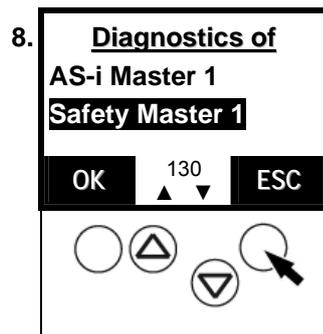


▶ Press [▼] to scroll to "Reset all"



▶ Press [OK] to select "Reset all"

▶ Confirm the safety query with [OK]



> The controller deletes the entries in the event list

▶ Press [ESC] twice to return to the start screen

> That's it!

13.21 Change operating mode of the AS-i master

Please refer to the following chapter in the manual:

→ page 10-1, chapter 10.1

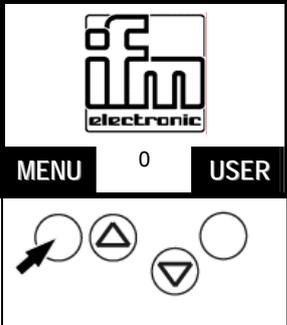
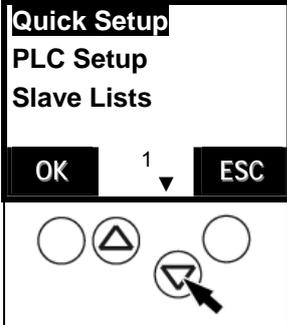
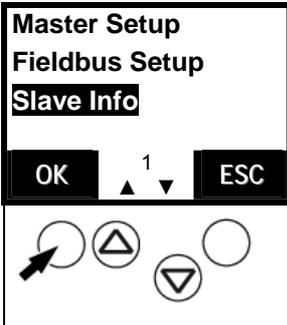
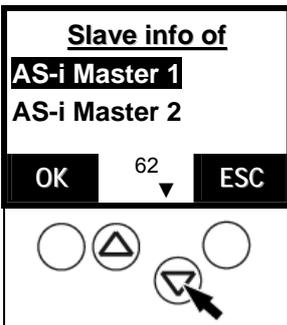
"Which operating modes are there for the AS-i master?"

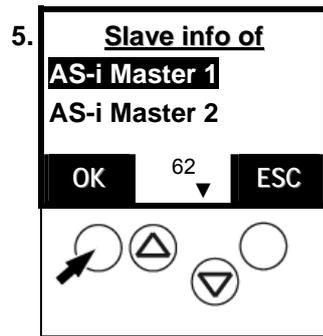
→ page 10-2, chapter 10.2

"How are the operating modes for the AS-i master changed?"

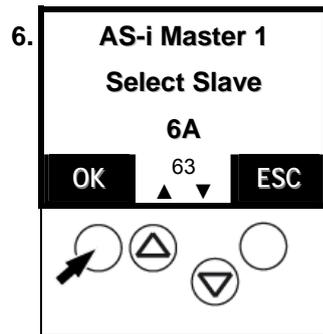
13.22 Display of slave data

You would like to know the configuration of the different slaves?
This is how to see it:

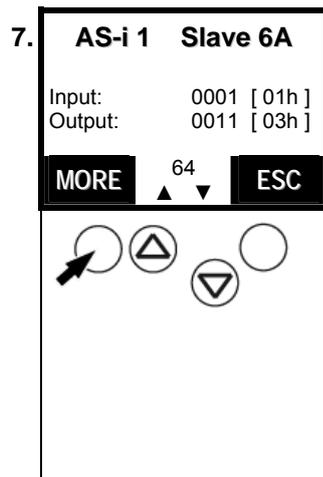
1.  ▶ Press the **[MENU]** button
2.  ▶ Press **[▼]** to scroll to "Slave Info"
3.  ▶ Press **[OK]** to select "Slave Info"
4.  ▶ If necessary press **[▼]** to scroll to master 2



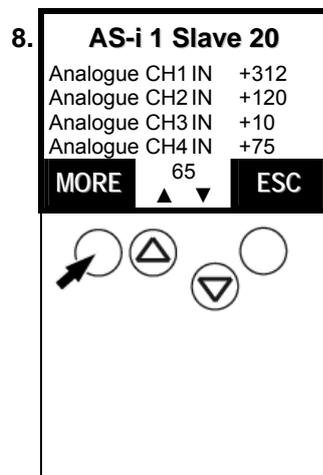
▶ Press [OK] to select the requested master



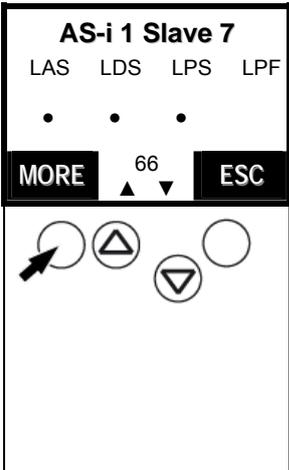
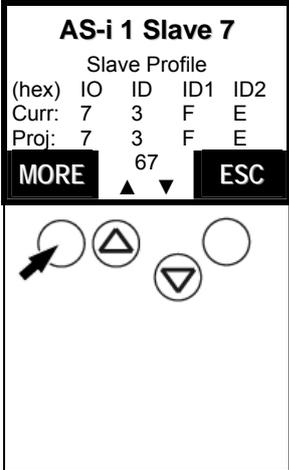
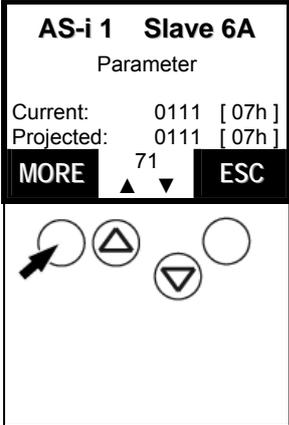
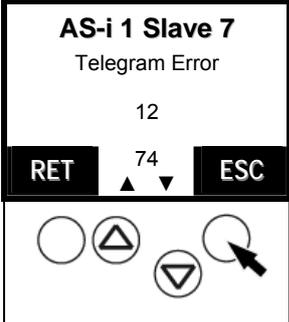
> Display of the lowest found valid slave address
 ▶ If necessary press [▲] / [▼] to scroll to another slave address active on the master



> Dynamic display of the digital inputs and outputs, as binary value and hexa value:
 • Input: digital inputs
 • Output: digital outputs
 ▶ Press [▲] / [▼] to scroll to any other slave address
 > Display of the values of the other slave address. If the address is not occupied by an active slave: display values as "0000 [00h]"
 ▶ Press [MORE] to scroll to the next page
 Alternatively:
 ▶ Press [ESC] to scroll back to screen 62



> Dynamic display of analogue channels as decimal values:
 • If the slave has no analogue channel: Display of the value as "."
 • If it has analogue inputs: "IN" in front of the value
 • If it has analogue outputs: "OUT" in front of the value
 ▶ Press [▲] / [▼] to scroll to any other slave address
 ▶ Press [MORE] to scroll to the next page
 Alternatively:
 ▶ Press [ESC] to scroll back to screen 62

9.  > Display in which slave lists the slave is entered:
- LAS: list of activated slaves
 - LDS: list of detected slaves
 - LPS: list of projected slaves
 - LPF: list of slaves with peripheral faults
- ▶ Press [▲] / [▼] to scroll to any other slave address
- ▶ Press [MORE] to scroll to the next page
- Alternatively:
- ▶ Press [ESC] to scroll back to screen 62
10.  > Display of configuration data of the slave:
- Current: current value of the slave
Here: slave type = S-7.3.E
or, if the slave is not activated on the master:
display "F F F F"
 - Projected: value which is entered in the projection table
- ▶ Press [▲] / [▼] to scroll to any other slave address
- ▶ Press [MORE] to scroll to the next page
- Alternatively:
- ▶ Press [ESC] to scroll back to screen 62
14.  > Display of slave parameters as binary value and hexa value: (default value: "1111 [0Fh]")
- Current: current value of the slave
 - Projected: value which is entered in the projection table
- ▶ Press [▲] / [▼] to scroll to any other slave address
- ▶ Press [MORE] to scroll to the next page
- Alternatively:
- ▶ Press [ESC] to scroll back to screen 62
15.  > Display of faulty messages
- ▶ Press [▲] / [▼] to scroll to any other slave address
- ▶ Press [RET] to return to screen 63
- ▶ Press [ESC] 3 times to return to the start screen

13.23

Set output values

For testing it might be useful to set the value of an output without being affected by the PLC program. The controller_e helps you.



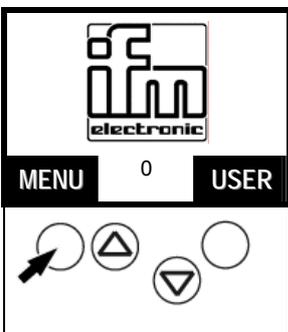
<p>WARNING</p> <p>The output values remain unchanged</p> <p>Risk of personal injury! Risk of material damage to the machine/plant! After changing the slave outputs the output values remain unchanged.</p>
<p>The output values only change in the following cases:</p> <ul style="list-style-type: none"> • Manual new setting of the outputs via Slave Setup • Starting the PLC program – the program processes the outputs • Switch the controller_e off and on again
<ul style="list-style-type: none"> ▶ Secure the concerned area. ▶ Only trained personnel must manually set the outputs. ▶ Switch the outputs off again immediately after the end of the test.



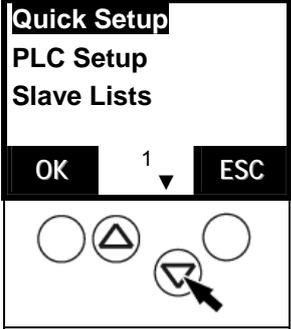
<p>Tip</p> <p>Changes to the outputs are <u>not</u> effective in the following cases:</p> <ul style="list-style-type: none"> • The PLC is in the RUN mode (LED [PLC RUN] lights). • AND: The corresponding outputs are processed by the PLC. • Changes of digital outputs on analogue modules. • Changes of analogue outputs on digital modules. <p>▶ Switch PLC to the operating mode STOP → page 10-4, chapter "How are the operating modes for the PLC changed?"</p> <p>LED [PLC RUN] flashes</p>



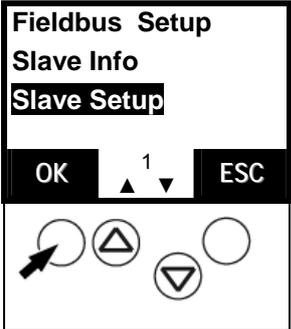
<p>Tip</p> <p>Password level 2 required → page 11-23, chapter "Password setting"</p>

1.  ▶ Press the [MENU] button

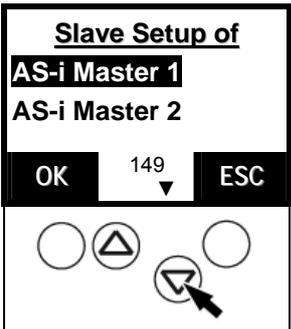
2. **Quick Setup**
PLC Setup
Slave Lists



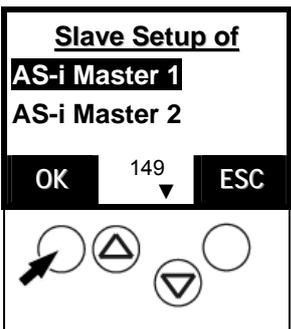
Press [▼] to scroll to "Slave Setup"
3. **Fieldbus Setup**
Slave Info
Slave Setup



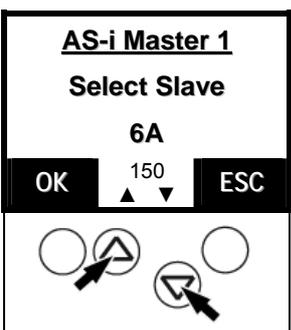
Press [OK] to select "Slave Setup"
4. **Slave Setup of**
AS-i Master 1
AS-i Master 2



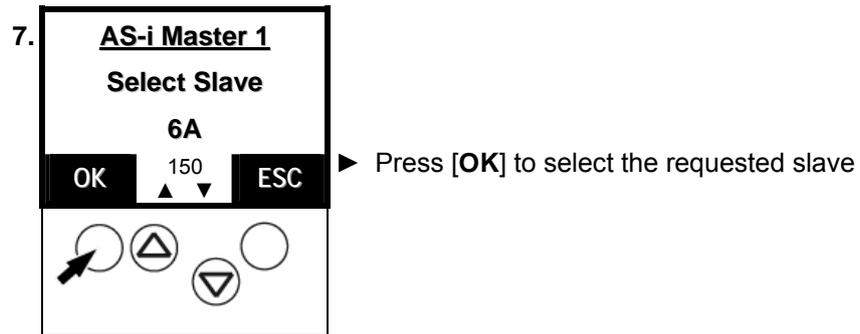
If necessary press [▼] to scroll to AS-i master 2
5. **Slave Setup of**
AS-i Master 1
AS-i Master 2



Press [OK] to select the requested AS-i master
6. **AS-i Master 1**
Select Slave
6A



> Display of the lowest found valid slave address
 > If necessary press [▲] / [▼] to scroll to another slave address



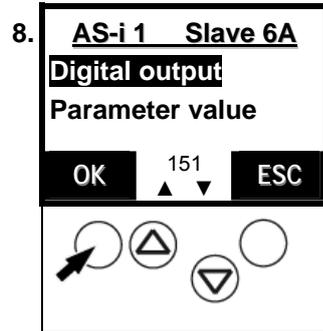
Continue with: "Set digital output"

→ page 13-54

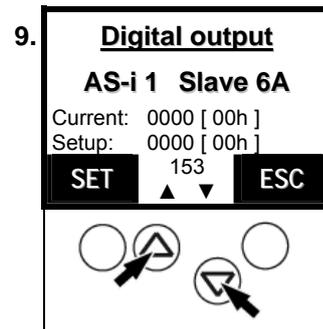
Continue with: "Set analogue output"

→ page 13-56

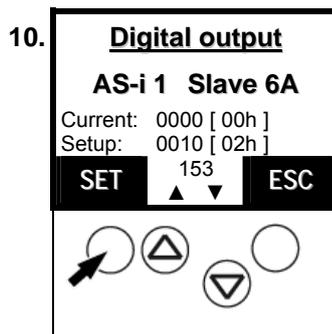
Set digital output



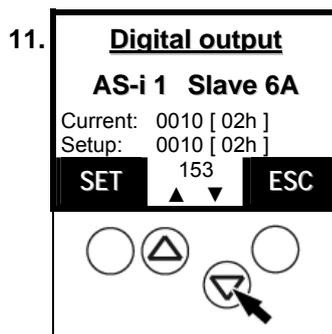
▶ Press [OK] to select "Digital output"



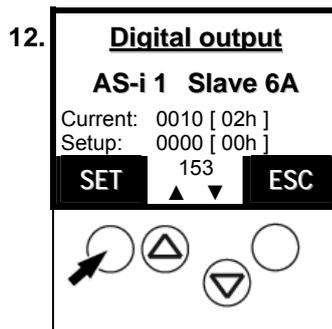
> Current = digital outputs current value binary / hexadecimal
 > Setup = digital outputs target value binary / hexadecimal
 ▶ Press [▲] / [▼] to set the requested target value



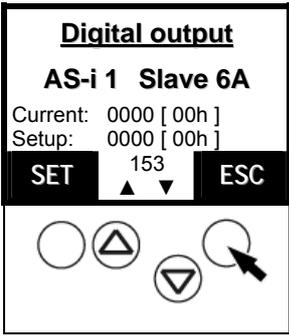
> Setup = set target value
 ▶ Press [SET] to send the set target value to the outputs of the slave



> Value in "Current" adopts value from "Setup"
 > Outputs on the slave are switched accordingly. Set outputs remain on as long as another setup or the start of the PLC changes the outputs again.
 ▶ Press [▼] to set the target value "0000"



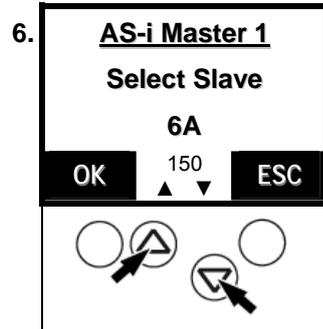
▶ Press [SET] to send the set target value to the outputs of the slave

13. 

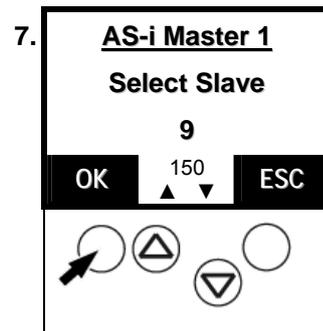
- > Value in "Current" adopts value from "Setup"
- > Outputs on the slave are switched accordingly. Set outputs remain on as long as another setup or the start of the PLC changes the outputs again.

▶ Press **[ESC]** twice to return to screen 150

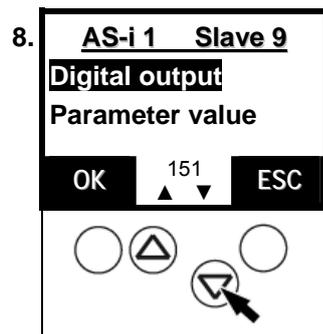
Set analogue output



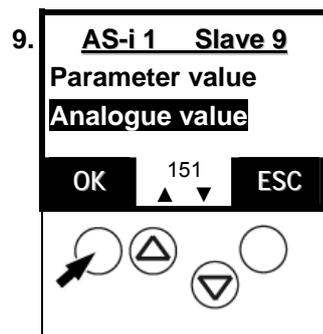
> Display of the lowest found valid slave address
 ▶ If necessary press [▲] / [▼] to scroll to another slave address



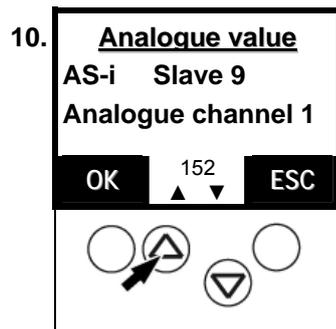
▶ Press [OK] to select the requested slave



▶ Press [▼] to scroll to "Analogue value"



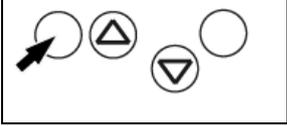
▶ Press [OK] to select "Analogue value"



▶ Press [▲] to scroll to the requested analogue channel

11. **Analogue value**
AS-i Slave 9
Analogue channel 1

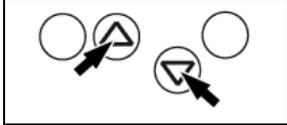
OK 152 ESC



▶ Press [OK] to select the requested analogue channel

12. **Analogue output**
AS-i 1 Slave 9
Channel: 2
Current: +0
Setup: +0

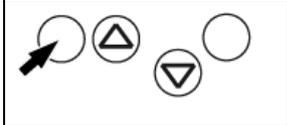
SET 155 ESC



> Current = current value analogue output channel
> Setup = target value analogue output channel
▶ Press [▲] / [▼] to set the requested target value
Brief inching: step increment 1
Long inching: step increment 100

13. **Analogue output**
AS-i 1 Slave 9
Channel: 2
Current: +0
Setup: +604

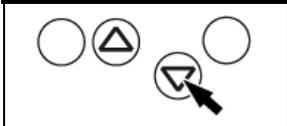
SET 155 ESC



> Setup = set target value
▶ Press [SET] to send the set target value to the outputs of the slave

14. **Analogue output**
AS-i 1 Slave 9
Channel: 2
Current: +604
Setup: +604

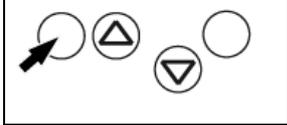
SET 155 ESC



> Display in "Current" adopts value from "Setup"
> Outputs on the slave are switched accordingly. Set outputs remain on as long as another setup or the start of the PLC changes the outputs again.
▶ Press [▼] to set the target value "0"

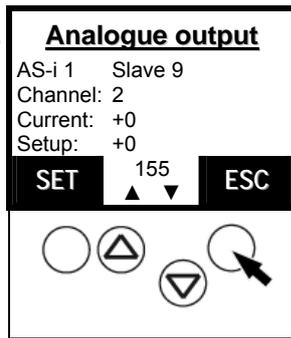
15. **Analogue output**
AS-i 1 Slave 9
Channel: 2
Current: +604
Setup: +0

SET 155 ESC



▶ Press [SET] to send the set target value to the outputs of the slave

16.

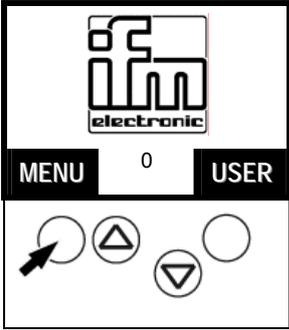
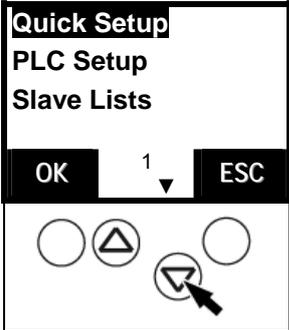
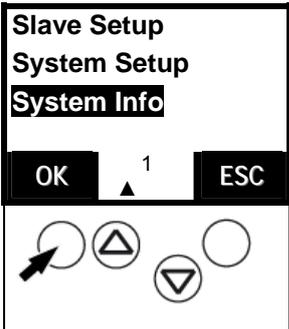
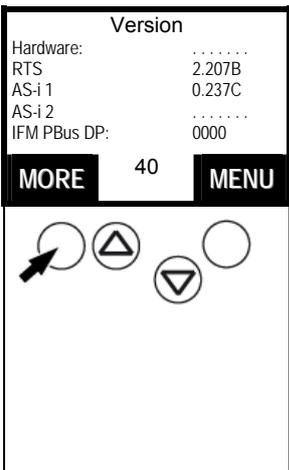


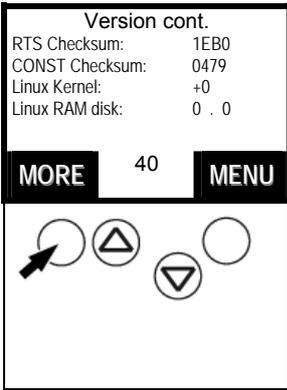
- > Display in "Current" adopts value from "Setup"
- > Outputs on the slave are switched accordingly. Set outputs remain on as long as another setup or the start of the PLC changes the outputs again.

▶ Press **[ESC]** twice to return to screen 150

13.24 Display system parameters

Here the controller gives you all the information it has about itself.

1.  Press left **[MENU]** button
2.  Press **[▼]** to scroll to "System Info"
3.  Press **[OK]** to select "System Info"
4. 
 - > Display of system versions:
 - Indication of the hardware version
 - Operating system of the controller
 - Operating system version for master 1
 - Operating system version for master 2
 - The integrated fieldbus is Profibus DP with the indication of the **ifm** version
 - ▶ Press **[MORE]** to scroll to the next page
 - Alternatively:
 - ▶ Press **[MENU]** to scroll to screen 1 (main menu)

5.  > Display of the system versions, 2nd page:

- Checksum of the operating system
- Checksum of the system constants
- Version of the Linux operating system kernel
- Version of the Linux memory driver

▶ Press **[MORE]** to scroll to the next page

Alternatively:

▶ Press **[MENU]** to scroll to screen 1 (main menu)

6.  > Display of the serial number of the controller

▶ Press **[OK]** to scroll to the next page

Alternatively:

▶ Press **[MENU]** to scroll to screen 1 (main menu)



Tip
 For more displays:
 Password level 3 required → page 11-23, chapter "Password setting"

10.  > Press **[ESC]** to return to the start screen

> That's it!

14 Scale drawing

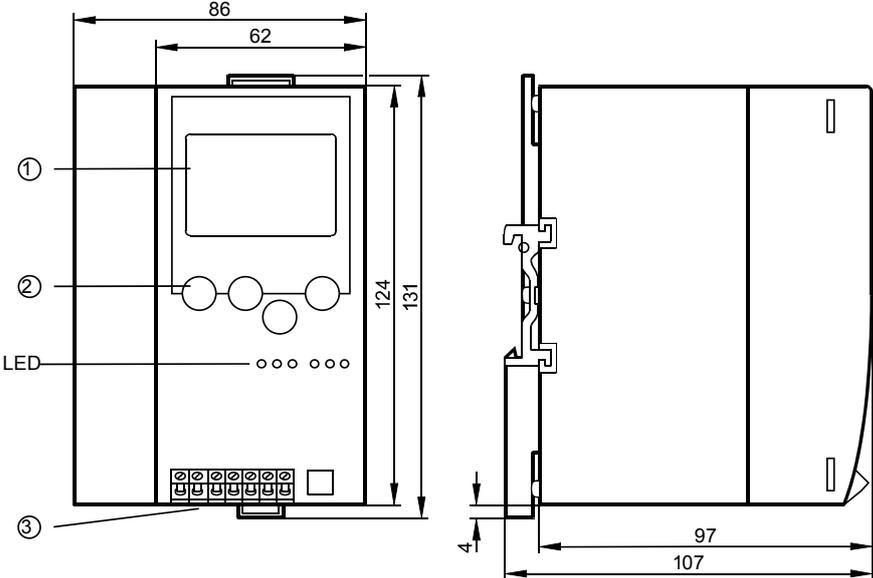


Figure: dimensions of the controller_e

15 Technical data

15.1 General data

Operating voltage	20...30 V DC (PELV)
Current consumption	< 0.5 A (depending on the implemented options)
Operating temperature	0...+60 °C
Storage temperature	-20...+70 °C
Protection to DIN 40050	IP 20
Housing material	aluminium, galvanised steel
Fixing	on Din rail 35 mm
Housing dimensions	106.3 x 85.5 x 123.6 mm

15.2 Data AS-i master

Number of AS-i masters	1 (standard) or 2 (option)
AS-interface profile	M3 to version 2.1
AS-interface voltage	26.5...31.6 V (special AS-i power supply)
Current consumption from AS-i	0.01 A / master
Microcontroller	Infineon C1610 microcontroller
Supported V2.1 features	<ul style="list-style-type: none">• A/B slaves• Peripheral fault detection• Analogue Plug+Play (profile 7.3 / 7.4)• Extended ID codes
Other features	<ul style="list-style-type: none">• AS-i cycle counter• Communication error counter per slave• Configuration error counter• Change to the protected mode without resetting the AS-i system

15.3 Data serial interface RS-232C

Baud rates	9 600, 19 200, 38 400, 57 600, 115 200 Bit/sec
Communication parameters	8 data bits, no start bit, 1 stop bit, no parity
Connection	RJ11 western socket, 6-pole
Protocol	Automation Alliance standard protocol

15.4 Data PLC

Microcontroller	Infineon C165 microcontroller	
SRAM	1 Mbyte	
Flash memory	1 Mbyte	
PLC program memory	228 kbytes	
Program size	up to 19000 commands in IL (simple binary commands)	
Data memory	196 kbytes	
Remanent flags	160 bytes	%MW0...%MW79
Retain area	2 kbytes (stored by PLC command)	
Programming languages	<ul style="list-style-type: none"> • Instruction list • Function block diagram • Ladder diagram • Sequential function chart • Extended function block diagram (Continuous Function Chart) • Structured text • All languages according to IEC 61131-3 	
Program blocks	<ul style="list-style-type: none"> • Programs • Functions • Function blocks 	
Operations	<ul style="list-style-type: none"> • Binary combinations • Arithmetics • Moving and rotating • Comparisons • Math. functions • Text processing • Jumps and return 	
Data types	<ul style="list-style-type: none"> • Binary • Fixed point (byte, word, double word) 	

	<ul style="list-style-type: none">• Floating point• String• Array• Structure• Pointer• Date and time
Processing times	< 1 μ s for simple bit or integer operations
Flag	4096 bits (= 256 bytes), thereof 1280 bits remanent (= 160 bytes)
Times	> 300
Counter	> 300
Binary inputs (AS-i)	max. 496
Binary outputs (AS-i)	max. 372
Analogue inputs/outputs (AS-i)	max. 248

16 Error messages

There are 2 different types of error messages in the controller:

Handling errors and internal system errors:

- Menu operation interrupted.
- Error message superposes menu screen
- Error message only disappears after the following:
error has been removed AND
error message has been acknowledged by means of the right function key.

Process error (error codes E10...E30):

- Error message appears instead of the start screen.
- No interruption of the menu operation.
- Exclamation mark flashes in the text/graphics display in the middle of the line at the bottom (only if projection mode is deactivated)
- The error message disappears again as soon as the error has been corrected.

The following tables are sorted in groups by error code.

Error messages

System errors: error codes B00...B11 (boot error)

16.1 System errors: error codes B00...B11 (boot error)

- Menu operation interrupted.
- Error message superposes menu screen
- Error message only disappears after:
error has been removed AND
error message has been acknowledged by means of the right function key.

Error message	Cause(s)	Solution
B00	Controller boot error After power-on of the device, an error was found during initialisation of the individual device components. For further details please refer to the following error messages.	▶ Check further error messages
B01	Initialisation master 1 failed Unsuccessful initialisation of the master. Possible causes: <ul style="list-style-type: none"> • Impermissible interference on the 24V power supply. • Impermissible interference on the AS-i power supply. • Impermissibly high electrostatic charges and electromagnetic fields in close proximity of the device. 	▶ Grounding of the device via the DIN rail ▶ Connection of the FE terminal to the machine ground ▶ Use a separate switched-mode power supply to supply the device.
B02	The same for master 2	▶ ditto
B03	General FAT error An error was found in the data field of the "File Allocation Table" FAT.	▶ Check further error messages
B04	Only one master detected in the system The operating system can only detect 1 master in the controller although 2 masters should be present. Possible causes: defective hardware	▶ Replace controller and project again
B05	Two masters detected in the system The operating system can detect 2 masters in the controller although only 1 master should be accessible. Possible cause: defective hardware	▶ Replace controller and project again
B06	Fieldbus type not detected During automatic detection of the integrated fieldbus no enabled fieldbus module could be detected. Possible cause: defective hardware	▶ Replace controller and project again

Error messages

System errors: error codes B00...B11 (boot error)

Error message	Cause(s)	Solution
B07	Number of detected masters not correct During the inquiry about the version releases of the masters some invalid information was received. Possible cause: defective hardware	▶ Replace controller and project again
B08	Execution of the PLC program blocked by the user When the device was started the automatic start of the PLC program was stopped by the user. The left function key of the unit was activated during the switch-on operation.	▶ Release function key during switch-on operation or: ▶ No actions because this is requested by the user

16.2 Process error: error codes E10...E30 (AS-i system)

- Error message appears instead of the start screen.
- No interruption of the menu operation.
- Exclamation mark flashes in the text/graphics display in the middle of the line at the bottom (only if projection mode is deactivated)
- The error message disappears again as soon as the error has been corrected.

Error message	Cause(s)	Solution
E10	Slave not activated The slave was detected in the system but not activated by the master. Detected slave profile does not correspond to the projected slave profile and the master is in the "protected mode".	<ul style="list-style-type: none"> ▶ Check slave profile: "Menu" > "Slave Info" → page 13-48, chapter 13.22 "Display of slave data" ▶ Connect slave with the right profile ▶ Project slaves again: "Menu" > "Quick Setup" → page 11-15, chapter "End configuration"
E11	Slave not present Slave present in the "List of projected slaves" LPS but not detected by the AS-i master	<ul style="list-style-type: none"> ▶ Check connections of the slave ▶ Connect slave again
E12	Slave not projected The slave was detected on the AS-i bus but is missing in the "List of projected slaves" LPS	<ul style="list-style-type: none"> ▶ Project slaves again: "Menu" > "Quick Setup" → page 11-15, chapter "End configuration"
E13	Peripheral fault detected on at least one connected slave	<ul style="list-style-type: none"> → page 13-11, chapter 13.6 "Display of slaves with peripheral fault (list)" → page 13-14, chapter 13.7 "Display slave with peripheral fault"
E14	Safety slave signals alarm	Error message not active at present
E15	7.3 Analogue protocol error	Error message not active at present
E20	AS-i voltage error The master is in the "Protected mode" and detects that the AS-i voltage supply is not greater than 28 V. The message is only generated if at least one slave is projected.	<ul style="list-style-type: none"> ▶ Check AS-i voltage supply on the master and – if necessary – replace
E21	No slave detected The master is in the "Protected mode" and detects that no slave is connected to the AS-i bus. The message is only generated if at least one slave is projected.	<ul style="list-style-type: none"> ▶ Check slave connections ▶ Check AS-i line

Error messages

Process error: error codes E10...E30 (AS-i system)

Error message	Cause(s)	Solution
E22	<p>Slave 0 detected</p> <p>The master is in the "Protected mode" and detects a slave with the address 0 on the AS-i bus.</p> <p>This message is only generated if the profile of the missing slave on the AS-i bus is identical to the profile of the slave with the address 0.</p>	<p>► Switch master to the operating mode "Projection mode".</p> <p>→ page 10-2, chapter 10.2 "How are the operating modes for the AS-i master changed?"</p>
E23	<p>Slave 0 has wrong profile</p> <p>The master is in the "Protected mode" and detects a slave with the address 0 on the AS-i bus.</p> <p>This message is only generated if the profile of the missing slave on the AS-i bus is not identical to the profile of the slave with the address 0.</p>	<p>► Check and replace slave</p> <p>► Project slaves again: "Menu" > "Quick Setup"</p> <p>→ page 11-15, chapter "End configuration"</p>
E24	<p>Automatic addressing not activated</p> <p>The master is in the "Protected mode" and detects a slave with the address 0 on the AS-i bus.</p> <p>This message is only generated if the profile of the missing slave on the AS-i bus is identical to the profile of the slave with the address 0, and the "Automatic Addressing" in the master, however, was not activated.</p>	<p>► Activate "Automatic addressing" in the master:</p> <p>→ page 11-8, chapter "Automatic individual addressing of slaves"</p>
E25	<p>Projection error of the master</p> <p>The master is in the "Normal operating mode" and detects a projection error.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> • The profiles of the detected slaves are not identical to the projected slaves. • One or more slaves are additionally detected on the AS-i bus. • One or several slaves are missing on the AS-i bus. 	<p>► Check the detected and projected slave profile in the menu "Slave Info".</p> <p>→ page 13-48, chapter 13.22 "Display of slave data"</p> <p>► Check the entries of the slaves in the lists LAS, LDS, LPS, LPF in the menu "Slave Lists".</p> <p>→ page 13-3, chapter 13.3 "Display of detected slaves (list)"</p> <p>→ page 13-5, chapter 13.4 "Display of projected slaves (list)"</p> <p>→ page 13-8, chapter 13.5 "Display of active slaves (list)"</p> <p>→ page 13-11, chapter 13.6 "Display of slaves with peripheral fault (list)"</p>
E26	<p>Peripheral fault detected on the AS-i bus</p> <p>The master is in the "Normal operating mode" and detects that at least one slave on the AS-i bus signals a peripheral fault.</p>	<p>→ page 13-11, chapter 13.6 "Display of slaves with peripheral fault (list)"</p> <p>→ page 13-14, chapter 13.7 "Display slave with peripheral fault"</p>

Error messages

Process error: error codes E10...E30 (AS-i system)

Error message	Cause(s)	Solution
E27	<p>Normal operation of the master not active</p> <p>The master reports that it is not in the "Normal operating mode".</p> <p>Possible causes:</p> <ol style="list-style-type: none">1. The master detects an AS-i voltage smaller than 22V and therefore changes into the "Offline Mode".2. The master has received a request from the operating system to pass into the "Offline Mode".3. The master has found a transfer error in the communication with the operating system. <p>Other causes which can lead to the error message directly after the device has been switched on:</p> <ol style="list-style-type: none">4. Initialisation of the master after switching on the device was not successful.5. The master has not yet received the projection nor the projected parameters from the operating system.6. The master has not yet been started by the operating system.	<p>On 1:</p> <ul style="list-style-type: none">▶ Check the AS-i voltage supply on the master and replace it – if necessary <p>On 2:</p> <ul style="list-style-type: none">▶ Check AS-i voltage supply on the master and replace it – if necessary <p>On 3:</p> <ul style="list-style-type: none">▶ Switch the PLC off and on again▶ Replace the controller and project again <p>On 4:</p> <ul style="list-style-type: none">▶ Switch the PLC off and on again▶ Replace the controller and project again <p>On 5:</p> <ul style="list-style-type: none">▶ Wait.▶ If too long: → 4. <p>On 6:</p> <ul style="list-style-type: none">▶ Wait.▶ If too long: → 5.
E28	Safety slave triggered on channel 1.	▶ Error message not active at present
E29	Safety slave triggered on channel 2.	▶ Error message not active at present
E30	<p>Safety slave triggered.</p> <p>The master has detected a "safety slave" on the AS-i bus and detects that the inputs of the slave are constantly switched to LOW for a period of > 64 ms.</p>	<ul style="list-style-type: none">▶ Check slave▶ Remove the cause of the error

Error messages

System errors: error codes F00...F10 (flash errors)

16.3 System errors: error codes F00...F10 (flash errors)

- Menu operation interrupted.
- Error message superposes menu screen
- Error message only disappears after:
error has been removed AND
error message has been acknowledged by means of the right function key.

Error message	Cause(s)	Solution
F00	<p>General flash failure</p> <p>This error message contains all the unsuccessful operations which have to do with the integrated flash device.</p> <p>For further details please refer to the following error messages.</p>	<ul style="list-style-type: none"> ▶ Check further error messages
F01	<p>Invalid flash command</p> <p>The operating system has received an invalid command for the flash function block.</p> <p>Possible cause: error in the command from the PLC.</p>	<ul style="list-style-type: none"> ▶ Check and correct command ▶ Repeat the command
F02	<p>Erasure of the flash sector failed</p> <p>The flash device has not executed the command to erase a flash sector.</p> <p>Possible cause: access to the flash module which currently processes commands.</p>	<ul style="list-style-type: none"> ▶ Repeat the command
F03	<p>Flash verification failed</p> <p>The data which were to be stored by the flash device could not be verified.</p> <p>Possible cause: access to the flash module which currently processes commands.</p>	<ul style="list-style-type: none"> ▶ Repeat the command
F04	<p>Timeout</p> <p>The flash device reports a timeout during a command execution.</p> <p>Possible cause: access to the flash module which currently processes commands.</p>	<ul style="list-style-type: none"> ▶ Repeat the command
F05	<p>Invalid command</p> <p>The flash device has received an invalid command.</p> <p>Possible cause: software error in the operating system.</p>	<ul style="list-style-type: none"> ▶ Check and correct command ▶ Repeat the command

Error messages

System errors: error codes F00...F10 (flash errors)

Error message	Cause(s)	Solution
F06	<p>Timeout of the response of the flash</p> <p>The operating system has found a time-out during the execution of a flash command.</p> <p>Possible cause: Access to the flash module which currently processes commands.</p>	<p>► Repeat the command</p>
F07	<p>Erasure of the PLC sectors in the flash failed</p> <p>The attempt to delete the sectors in which the PLC program is stored was unsuccessful.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. The sectors were blocked against overwriting (AC1325 and AC1326). 2. Access to the flash module which currently processes commands. 3. Flash device defective. 	<p>On 1:</p> <p>► Command not possible</p> <p>On 2:</p> <p>► Repeat the command</p> <p>On 3:</p> <p>► Replace the unit and project again</p>
F08	<p>Storage of the PLC program in the flash failed</p> <p>Storage of the PLC program in the flash device was unsuccessful.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. The sectors were blocked against overwriting (AC1325 and AC1326). 2. Access to the flash module which currently processes commands. 3. Flash device defective. 	<p>On 1:</p> <p>► Command not possible</p> <p>On 2:</p> <p>► Repeat the command</p> <p>On 3:</p> <p>► Replace the unit and project again</p>
F09	<p>Storage of the remanent data in the flash failed</p> <p>Storage of the remanent data in the flash module failed (%MB... [Var_Retain]).</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. Access to the flash module which currently processes commands. 2. Flash device defective. 	<p>On 1:</p> <p>► Repeat the command</p> <p>On 2:</p> <p>► Replace the unit and project again</p>
F10	<p>PLC program write-protected.</p> <p>The attempt to store the PLC program in the flash device was unsuccessful.</p> <p>Possible cause: the PLC program was write-protected.</p>	<p>► Disable write protection via program "freeflash.pro".</p>

16.4 System errors: error codes F21...F30 (FAT errors)

FAT = File Allocation Table (part of the memory management)

- Menu operation interrupted.
- Error message superposes menu screen
- Error message only disappears after:
error has been removed AND
error message has been acknowledged by means of the right function key.

Error message	Cause(s)	Solution
F21	Invalid FAT checksum detected The checksum of the FAT contains an invalid value. Possible cause: impermissible interference on the 24V power supply during the storage operation of the data in the flash device.	<ul style="list-style-type: none"> ▶ Grounding of the device via the DIN rail ▶ Connection of the FE terminal to the machine ground ▶ Use a switched-mode power supply to supply the device. ▶ Repeat the command
F22	Invalid FAT header detected The code in the header of the FAT contains an invalid entry. Possible cause: impermissible interference on the 24V power supply during the storage operation of the data in the flash device.	▶ ditto
F23	Invalid FAT identifier The field ID of an FAT area contains an invalid value. Possible cause: impermissible interference on the 24V power supply during the storage operation of the data in the flash device.	▶ ditto
F24	Blank FAT found The FAT does not contain any entry. Possible cause: the user has completely deleted the flash module	▶ Replace the unit and project again
F25	Checksum of the remanent data invalid The checksum of the remanent data within the FAT contains an invalid value. Possible cause: impermissible interference on the 24V power supply during the storage operation of the data in the flash device.	<ul style="list-style-type: none"> ▶ Grounding of the device via the DIN rail ▶ Connection of the FE terminal to the machine ground ▶ Use a switched-mode power supply to supply the device. ▶ Repeat the command

Error messages

System errors: error codes F21...F30 (FAT errors)

Error message	Cause(s)	Solution
F26	<p>Invalid identifier of the remanent data detected</p> <p>The field ID of the remanent data contains an invalid value.</p> <p>Possible cause: impermissible interference on the 24V power supply during the storage operation of the data in the flash device.</p>	► ditto
F27	<p>Pointer to remanent data in the wrong area</p> <p>The start address of the remanent data is outside the permitted area.</p> <p>Possible cause: impermissible interference on the 24V power supply during the storage operation of the data in the flash device.</p>	► ditto
F28	<p>Storage of the FAT failed</p> <p>An error has occurred during the storage of the FAT.</p> <p>Possible cause: impermissible interference on the 24V power supply during the storage operation of the data in the flash device.</p>	► ditto
F29	<p>Storage of the remanent data failed</p> <p>An error has occurred during the storage of the remanent data.</p> <p>Possible cause: impermissible interference on the 24V power supply during the storage operation of the data in the flash device.</p>	► Repeat the command
F30	<p>Change to the mirror range of the remanent data failed</p> <p>An error has occurred during the change to the mirror range of the remanent data.</p> <p>Possible causes: impermissible interference on the 24V power supply during the storage operation of the data in the flash device.</p>	► Repeat the command

Error messages

System errors: error codes M01...M20 (AS-i master command errors)

16.5 System errors: error codes M01...M20 (AS-i master command errors)

- Menu operation interrupted.
- Error message superposes menu screen
- Error message only disappears after:
error has been removed AND
error message has been acknowledged by means of the right function key.

Error message	Cause(s)	Solution
M01	<p>Error on command execution</p> <p>An error has occurred during the execution of an AS-i command which has stopped the execution of the command.</p> <p>For further details please refer to the following error messages.</p>	<ul style="list-style-type: none"> ▶ Check further error messages
M02	<p>Slave not found</p> <p>It was tried to access a slave by means of an AS-i command which is not on the AS-i bus. The slave is not in the LDS.</p>	<ul style="list-style-type: none"> ▶ Check connections of the slave ▶ Connect slave again
M03	<p>Slave 0 found</p> <p>The master detects a slave with the address 0 on the AS-i bus and can therefore not execute the command.</p> <p>Example: the address of a slave is to be changed while a slave with the address 0 is present on the AS-i bus.</p>	<ul style="list-style-type: none"> ▶ Remove the slave with the address 0 or address it correctly
M04	<p>Slave with the same address found</p> <p>During the execution of a command the master detects that there already is a slave at the requested address on the AS-i bus.</p> <p>Example: the address of a slave is to be changed to an address which is already occupied by another slave on the AS-i bus.</p>	<ul style="list-style-type: none"> ▶ Remove one of the slaves with double address ▶ Readdress the remaining slave ▶ Reactivate the removed slave
M05	<p>Delete the old slave address</p> <p>The attempt to reprogram a slave to the address 0 fails.</p> <p>Example: the AS-i slave has a limited number of possibilities to change the address, these are now exhausted.</p>	<ul style="list-style-type: none"> ▶ Replace the slave
M06	<p>Reading the "Extended ID Code 1"</p> <p>The master does not receive any or an invalid answer during the retrieval of the "Extended ID code 1".</p> <p>Example: attempt to readdress an A/B slave to another address.</p>	<ul style="list-style-type: none"> ▶ Repeat the command

Error messages

System errors: error codes M01...M20 (AS-i master command errors)

Error message	Cause(s)	Solution
M07	Writing to slave failed 1. The attempt of the master to readdress a slave to the new target address fails. 2. Writing the "Extended ID Code 1" to slave 1 fails. Example: attempt to readdress an A/B slave to another address.	▶ Repeat the command
M08	New address only stored temporarily During the readdressing of a slave the new address could no longer be written on the slave because the slave is no longer detected on the AS-i bus. Possible causes: 1. Double addressing 2. Major bus interference	On 1: ▶ Remove one of the slaves with double address ▶ Readdress the remaining slave ▶ Reactivate the removed slave On 2: ▶ Remove the cause of the error
M09	Extended ID1 temporarily stored While writing the "ID Code 1" to the slave the code could not be written to the slave because the slave is no longer detected on the AS-i bus. Possible causes: 1 Double addressing 2 Major bus interference	On 1: ▶ Remove one of the slaves with double address ▶ Readdress the remaining slave ▶ Reactivate the removed slave On 2: ▶ Remove the cause of the error
M10	Slave not in the LAS The master detects that a slave has not been activated. Possible causes: the slave profile in the projection data is not identical with the profile of the detected slave and the master is in the "Protected Mode".	▶ Switch the master to the operating mode "Projection mode". → page 10-2, chapter 10.2 "How are the operating modes for the AS-i master changed?" ▶ Check and replace the slave ▶ Project slaves again: "Menu" > "Quick Setup" → page 11-15, chapter "End configuration"

Error messages

System errors: error codes M01...M20 (AS-i master command errors)

Error message	Cause(s)	Solution
M11	<p>Slave data invalid</p> <p>This error message has a multiple meaning and thus depends on the requested command:</p> <ol style="list-style-type: none">1. Readdressing of the slave Address 32 = 0B was indicated as target address.2. Write parameters The attempt has been made to write a value greater than 0x7 to an A/B slave, ID=0xA.	<p>On 1:</p> <ul style="list-style-type: none">▶ Address 0B is not permitted▶ Write valid address <p>On 2:</p> <ul style="list-style-type: none">▶ Write valid value
M12	<p>7.4 Sequence error</p> <p>During the transfer according to the "7.4 slave protocol" the master detected an error in the triple sequence of the slave.</p> <p>Possible causes:</p> <ol style="list-style-type: none">1. Interference on the bus2. Software error in the AS-i slave	<p>On 1:</p> <ul style="list-style-type: none">▶ Remove the cause of the error <p>On 2:</p> <ul style="list-style-type: none">▶ Contact AS-i specialist or manufacturer
M13	<p>Timeout in 7.4 transfer</p> <p>During the transfer to the "7.4 slave protocol" the master detected a timeout in the communication with the operating system.</p> <p>Possible cause:</p> <p>Long PLC cycle which slows down the transfer of the individual 7.4 segments of the operating system or PLC to the master to an unacceptable degree: $t > 1 \text{ sec.}$</p> <p>In this case, the master will end the most recent 7.4 transfer and will again enter into normal data exchange with the respective slave.</p>	<ul style="list-style-type: none">▶ Shorten the PLC cycle by optimising the program, avoid program loops and complex arithmetic operations
M14	<p>Invalid slave address</p> <p>This error message has a multiple meaning and thus depends on the requested command:</p> <ol style="list-style-type: none">1. The attempt was made to write a parameter to slave 0.2. For readdressing, the address 0 or 0B was indicated as start and target address.3. During the attempt to write the extended ID code 1 the address 0 was used.	<p>On 1:</p> <ul style="list-style-type: none">▶ Correct the slave address <p>On 2:</p> <ul style="list-style-type: none">▶ Indicate a valid address <p>On 3:</p> <ul style="list-style-type: none">▶ Indicate a valid address

Error messages

System errors: error codes M01...M20 (AS-i master command errors)

Error message	Cause(s)	Solution
M15	Slave interrupted 7.4 transfer The addressed 7.4 slave has stopped the transfer. Possible cause: error in the 7.4 data of the PLC. Possible causes: <ol style="list-style-type: none">1. Interference on the bus2. Software error in the AS-i slave	On 1: <ul style="list-style-type: none">▶ Remove the cause of the error On 2: <ul style="list-style-type: none">▶ Contact slave manufacturer
M16	Slave deleted during active 7.4 transfer During an active 7.4 protocol transfer the slave was deleted from the list of active slaves by the master. Possible cause: interference on the bus	<ul style="list-style-type: none">▶ Remove the cause of the error
M17	7.4 transfer still active The attempt was made to start a new 7.4 transfer during an active 7.4 protocol transfer.	<ul style="list-style-type: none">▶ Repeat the command
M18	7.4 sequence error of fieldbus master (host) The sequence bit was set to 1 by the host or the PLC although a value smaller than 30 was indicated in the "Dlen" data field.	<ul style="list-style-type: none">▶ Correct the value "Dlen" or: <ul style="list-style-type: none">▶ Change the sequence bit
M19	Invalid 7.4 data length (no MOD tripartition) The indicated data length "Dlen" is not a multiple of the factor 3.	<ul style="list-style-type: none">▶ Correct the value "Dlen"▶ A 7.4 protocol transfer always consists of several data triples.
M20	Invalid command The fieldbus master (host) or the PLC in the controller tried to send a command to the master that it does not know.	<ul style="list-style-type: none">▶ Check the reason for the wrong command and correct it.

16.6 System errors: error codes R01...R30 (RTS errors)

RTS = Real Time System (runtime system = operating system of the controller_e)

- Menu operation interrupted.
- Error message superposes menu screen
- Error message only disappears after:
error has been removed AND
error message has been acknowledged by means of the right function key.

Error message	Cause(s)	Solution
R01	<p>Unknown operating mode of the runtime system</p> <p>The set operating mode of the device ("RUN"/"STOP"/"GATEWAY") is unknown to the operating system.</p> <p>Possible cause: modification of the device from a gateway variant into a device with PLC support.</p>	<p>► Switch the device off and keep the left function key pressed during the switch-on operation.</p>
R02	<p>Error MUX field master 1</p> <p>During the transfer of the MUX fields by the operating system the master detected an invalid field number.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. Parts of the operating system have been overwritten by the PLC. 2. Impermissible interference on the 24V power supply. 	<p>On 1:</p> <ul style="list-style-type: none"> ► Check the reason for the wrong command and correct it. ► Reinstall operating system <p>On 2:</p> <ul style="list-style-type: none"> ► Grounding of the device via the DIN rail ► Connection of the FE terminal to the machine ground ► Use a switched-mode power supply to supply the device. ► Repeat the command
R03	Error MUX field master 2	► ditto
R04	<p>Protocol error (EDET) master 1</p> <p>The master has detected a protocol error during the transfer of the data fields.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. Parts of the operating system have been overwritten by the PLC. 2. Impermissible interference on the 24V power supply. 	► ditto
R05	Protocol error (EDET) master 2	► ditto

Error messages

System errors: error codes R01...R30 (RTS errors)

Error message	Cause(s)	Solution
R06	<p>General RTS program failure</p> <p>The operating system has detected an invalid status in the process while executing the program internally.</p> <p>Possible cause: operating system software error.</p>	<p>► Reinstall the operating system</p>
R07	<p>Master not in the "Projection mode"</p> <p>The attempt was made to execute an AS-i command which is only permitted in the "Projection Mode".</p>	<p>► Switch the master to the operating mode "Projection mode".</p> <p>→ page 10-2, chapter 10.2 "How are the operating modes for the AS-i master changed?"</p>
R08	<p>No PLC program loaded</p> <p>The attempt was made to start a PLC program although no program has been loaded in the controller.</p>	<p>► Load PLC program into the controller:</p> <p>→ page 11-4, chapter "Connecting the programming unit"</p>
R09	<p>RS-232C transmission error (baud rate) detected</p> <p>The hardware of the integrated serial interface chip has found a transfer error in the RS-232C data flow.</p> <p>Possible causes:</p> <ol style="list-style-type: none">3. Baud rate setting in the controller different from the setting in the PC.4. Other programs (e.g. messenger) send via the RS-232 interface of the PC	<p>On 1:</p> <p>► Adjust baud rate:</p> <p>→ page 11-1, chapter 11.1 "Setting the baud rate of the serial interface"</p> <p>On 2:</p> <p>► Stop other programs on the PC</p>
R10	<p>RS-232C buffer overflow detected</p> <p>A buffer overflow was detected in the serial receive buffer of the RS-232C interface.</p> <p>Possible causes:</p> <ol style="list-style-type: none">1. RS-232 message too long or baud rate too high.2. Faulty connection cable between PC and RS-232C connection on the controller	<p>On 1:</p> <p>► Check the driver or reduce the baud rate</p> <p>On 2:</p> <p>► Replace connection cable</p>
R11	<p>RS-232C parity check failed</p> <p>The parity check of the serial data flow of the RS-232C interface was unsuccessful.</p> <p>Possible cause: electromagnetic interference</p>	<p>► Reduce interference on the RS-232 cable by means of the following measures:</p> <ul style="list-style-type: none">- screen the cable- reduce the cable length- remove the interfering source

Error messages

System errors: error codes R01...R30 (RTS errors)

Error message	Cause(s)	Solution
R12	<p>The serial protocol was changed</p> <p>The decoding of the serial data flow was changed.</p> <p>Possible cause: command during the serial data flow to change the device to the Test Mode / Normal Operating Mode.</p>	<p>► Remove error in the protocol driver</p>
R13	<p>24 V supply voltage unstable</p> <p>During normal operation voltage drops below 18 V were found on the 24 V power supply cable.</p>	<p>► Stabilise the 24 V supply voltage so that it is permanently above 20 V</p> <p>Better:</p> <p>► Use switched-mode power supply</p>
R14	<p>Restart of the unit after failure of the 24 V supply voltage</p> <p>The voltage failure of the 24V power supply caused the device to start again.</p>	<p>► Acknowledge the message</p> <p>> Controllere resumes normal operating mode</p> <p>In future:</p> <p>► Stabilise the 24 V supply voltage so that it is permanently above 20 V</p> <p>Better:</p> <p>► Use switched-mode power supply</p>
R15	<p>Timeout of the main processor detected</p> <p>The main processor has detected a timeout.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> • Impermissible interference on the AS-i power supply. • Unacceptably high electrostatic charges and electromagnetic fields in close proximity of the device. • Hardware / operating system software error. 	<p>► Ground of the device via the DIN rail</p> <p>► Connect the FE terminal to the machine ground</p> <p>► Use a switched-mode power supply to supply the device.</p> <p>If hardware error:</p> <p>► Replace the controllere and project again</p> <p>If software error of the operating system:</p> <p>► Reinstall the operating system</p>
R16	<p>Software forced a restart</p> <p>The main processor has detected a restart of the device which was not caused by a voltage failure.</p>	<p>► Find the reason, maybe also check further error messages</p>
R17	<p>Unit waiting for stable 24 V power supply</p> <p>After the device was switched on an unacceptably low 24V power supply was detected: < 18 V.</p>	<p>► Acknowledge the message</p> <p>> Controllere resumes normal operating mode</p> <p>In future:</p> <p>► Stabilise the 24 V supply voltage so that it is permanently above 20 V</p> <p>Better:</p> <p>► Use switched-mode power supply</p>

Error messages

System errors: error codes R01...R30 (RTS errors)

Error message	Cause(s)	Solution
R18	<p>The AS-i master signals a timeout during the communication with the fieldbus master (host).</p> <p>During the continuous communication of the master with the operating system the master has detected a timeout.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 5. Voltage drops on the 24 V power supply cable 6. Operating system software error. 	<p>On 1:</p> <ul style="list-style-type: none"> ▶ Use a switched-mode power supply to supply the device. <p>On 2:</p> <ul style="list-style-type: none"> ▶ Reinstall operating system
R19	Error message not active at present	▶ Error message not active at present
R20	<p>Profibus DP configuration invalid</p> <p>The configuration of the Profibus master for the device is not valid.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> • Module lengths incorrect • Number of modules incorrect • Sum of the data lengths across all modules too large 	▶ Check the received data lengths in the menu "Fieldbus Setup"
R21	<p>No Profibus DP card present in the system</p> <p>A Profibus DP card is expected in the device, however, it has not been detected.</p> <p>Possible cause: wrong operating system in the unit: e.g. AC1325 operating system software in an AC1311.</p>	▶ Install valid operating system
R22	<p>Profibus DP parameters invalid</p> <p>The parameter setting of the Profibus master for the device is not valid.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> • Structure of the parameter field incorrect • Length of the parameter field incorrect • Coding of the different parameters does not correspond to the specification 	▶ Adopt the parameter field from the GSD file and modify it according to the specification.

Error messages

System errors: error codes R01...R30 (RTS errors)

Error message	Cause(s)	Solution
R23	<p>Download of the Profibus DP parameters failed</p> <p>The attempt to download the current / projected parameters of the AS-i slaves via the Profibus was unsuccessful.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> • The slave to which the parameter was to be written was deleted from the list of detected slaves. • A timeout was detected during the execution of the AS-i command "Write Parameter". 	<ul style="list-style-type: none"> ▶ End the connection to the Profibus master. ▶ Resume the connection to the Profibus master. ▶ Download the current / projected parameters of the AS-i slaves via the Profibus
R24	<p>Missing edge during communication with the master</p> <p>During communication with the master a change in the state of the control signal was not detected.</p> <p>Possible cause: operating system software error.</p>	<ul style="list-style-type: none"> ▶ Reinstall operating system
R25	<p>Master signals: invalid operating environment found</p> <p>The master reports that it is not in the "Normal operating mode".</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. The master detects an AS-i voltage smaller than 22 V and therefore changes into the "Offline Mode". 2. The master has received a command from the operating system to change into the "Offline Mode". 3. The master has detected a transfer error in the communication with the operating system. 4. With the AS-i power supply connected the master detects that no slave is connected to the AS-i bus. <p>Other causes which can lead to the error message directly after the device has been switched on:</p> <ol style="list-style-type: none"> 5. The initialisation of the master while the device is switched on was not successful. 6. The master has not yet received the projection nor the projected parameters from the operating system. 7. The master has not yet been started by the operating system. 	<p>On 1:</p> <ul style="list-style-type: none"> ▶ Use a switched-mode power supply to supply the device. <p>On 2:</p> <ul style="list-style-type: none"> ▶ Check the reason for the wrong command and correct it. <p>On 3:</p> <ul style="list-style-type: none"> ▶ → error message R15 <p>On 4:</p> <ul style="list-style-type: none"> ▶ Check and correct the wiring on the AS-i bus <p>On 5:</p> <ul style="list-style-type: none"> ▶ → page 16-2, error message B01 <p>On 6:</p> <ul style="list-style-type: none"> ▶ → page 16-2, error message B01 <p>On 7:</p> <ul style="list-style-type: none"> ▶ → page 16-2, error message B01
R26	Error message not active at present	Error message not active at present

Error messages

System errors: error codes R01...R30 (RTS errors)

Error message	Cause(s)	Solution
R27	<p>PLC accesses address space which is reserved for Profibus DP</p> <p>The PLC has tried to access the protected address range of the Profibus DP ASIC.</p> <p>Possible cause: a PLC project was loaded into an AC1305/06/25/26 with the support of the Anybus fieldbus card.</p>	<p>► Remove functions from the PLC project which make use of an Anybus card.</p>
R28	<p>Execution of the action protected by a password</p> <p>A functionality of the device was requested which is not allowed with the currently active password.</p>	<p>► Set higher password level: → page 11-23, chapter "Password setting"</p>
R29	<p>Invalid command of the connected fieldbus master (host)</p> <p>An unknown command was received in the "Test Mode" operating mode of the device.</p>	<p>► Check the reason for the wrong command and correct it.</p>
R30	<p>Checksum of the command of fieldbus master (host) invalid</p> <p>An invalid checksum in the data flow was detected in the "Test Mode" operating mode of the device.</p> <p>Rectification: Configuration of the data flow according to the specification.</p>	<p>► Configure the data flow according to the specification</p>

Error messages

System errors: error codes T00...T11 (timeout errors)

16.7 System errors: error codes T00...T11 (timeout errors)

- Menu operation interrupted.
- Error message superposes menu screen
- Error message only disappears after:
error has been removed AND
error message has been acknowledged by means of the right function key.

Error message	Cause(s)	Solution
T00	Timeout master communication The operating system has detected a timeout during communication with the master. Possible causes: <ul style="list-style-type: none"> • Impermissible interference on the 24V power supply. • Impermissible interference on the AS-i power supply. • Impermissibly high electrostatic charges and electromagnetic fields in close proximity of the device. 	<ul style="list-style-type: none"> ▶ Grounding of the device via the DIN rail, connection of the FE terminal to the plant ground. ▶ Use a switched-mode power supply to supply the device.
T01	System cycle timeout The operating system has found a timeout during the execution of a system cycle. Possible cause: parts of the operating system in SRAM have been overwritten by the PLC.	<ul style="list-style-type: none"> ▶ Check the reason for the wrong command and correct it.
T02	AS-i command timeout on channel 1 of master 1 The operating system has detected a timeout during the execution of a command for the master on channel 1. Possible cause: The status information of the command channel has been overwritten by the PLC.	<ul style="list-style-type: none"> ▶ Check the reason for the wrong command and correct it.
T03	Same for channel 2 master 1	▶ ditto
T04	Same for channel 1 master 2	▶ ditto
T05	Same for channel 2 master 2	▶ ditto
T06	PLC cycle timeout The operating system has detected a timeout during the execution of a PLC cycle. Possible cause: closed loop within the PLC.	<ul style="list-style-type: none"> ▶ Check the reason for the wrong command and correct it.

Error messages

System errors: error codes T00...T11 (timeout errors)

Error message	Cause(s)	Solution
T07	<p>PLC command timeout</p> <p>During the execution of a command started by the PLC a timeout was detected.</p> <p>Possible causes: overwriting the status information of the command channel by the PLC or an installed fieldbus</p>	<p>► Check the reason for the wrong command and correct it.</p>
T08	<p>Timeout in a request of a PLC command</p> <p>During the attempt to start a command on the command channel a timeout was detected.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 7. The status information of the command channel has been overwritten by the PLC. 8. Permanent use of the command channel by the installed fieldbus 	<p>On 1:</p> <p>► Check the reason for the wrong command and correct it.</p> <p>On 2:</p> <p>► Check the reason for the wrong command and correct it.</p>
T09	<p>Timeout during communication with the fieldbus</p> <p>A timeout was detected during the communication of the device with the connected fieldbus. This monitoring is active after a first communication of the device via the connected fieldbus.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. Fieldbus master has stopped the communication. 2. Connection cable interrupted. 	<p>On 1:</p> <p>► Check the reason for the wrong command and correct it.</p> <p>On 2:</p> <p>► Check and correct connection cable</p>
T10	<p>Timeout during change of the operating mode of the AS-i master</p> <p>Switching the master to another operating mode failed</p> <p>Possible cause: during the change into the "Protected Mode" the master has detected a slave with the address 0 and can thus not change into this operating mode.</p>	<p>► Correct the slave address</p> <p>► Repeat the command</p>
T11	<p>Timeout during update of the MUX fields</p> <p>During the update of the MUX fields, e.g.: analogue values of the slaves 1...31, a timeout was detected.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 9. Parts of the operating system have been overwritten by the PLC. 10. Interference on the 24V power supply cable. 	<p>On 1:</p> <p>► Check the reason for the wrong command and correct it.</p> <p>On 2:</p> <p>► Use a switched-mode power supply to supply the device.</p>

16.8 List of errors

Errors	Cause(s)	Solution
<p>Controllere does not display the start screen after power-on:</p> <ul style="list-style-type: none"> > Text/graphics display blank or not readable > LEDs light / flash mazily 	<p>Faulty content of the PLC memory, e.g.: program error in the boot project</p>	<ul style="list-style-type: none"> ▶ Switch off the unit ▶ Press the left function key and keep it pressed ▶ Switch the unit on again > Display can be read again ▶ Release the function key > PLC memory and boot project are deleted irretrievably ▶ Check the PLC program in the PC and correct it ▶ Store the PLC program in the controllere and create as boot project
	<p>Electromagnetic incompatibility</p>	<ul style="list-style-type: none"> ○ Voltage supply does not correspond to the AS-i rule? ▶ Correct it ○ Grounding not according to specifications? ▶ Correct it ○ Strong interference by neighbouring machines? ▶ If possible: change the location ▶ Correct or screen interfering machines
<p>The controllere does not react to the button being pressed or only with a long delay.</p> <ul style="list-style-type: none"> > Error messages R02 to R05 	<p>The cycle time of the PLC is > 300 ms. Other processes in the controllere have priority.</p>	<ul style="list-style-type: none"> ▶ Check and correct the PLC program
<p>The text/graphics display is shaded.</p> <ul style="list-style-type: none"> > Error message R16 appears. 	<p>AS-i supply voltage is < 18.2 V</p>	<ul style="list-style-type: none"> ○ Overload of the AS-i power supply: too many slaves on one AS-i bus ▶ Distribute slaves to several AS-i masters ▶ Each AS-i master needs its own power supply
<p>When changing the address of A/B slaves the controllere sometimes freezes in the "Wait" display.</p>	<p>System error</p>	<ul style="list-style-type: none"> ▶ Press [ESC] to leave the menu item

Error messages

How does the controller react in case of a fault?

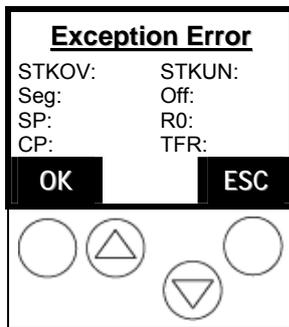
Errors	Cause(s)	Solution
The LDS slave list does not show any slave with the address 0 although such a slave has just been connected.	There is at least one other slave with the address 0 connected to the master.	<ul style="list-style-type: none"> ▶ Remove the last slave with the address 0 from the bus ▶ Program the old slave with the address 0 to the intended address (→ page 11-8 or page 11-11) ▶ Reactivate the removed slave ▶ Reconfigure the controller → page 11-15
The controller cannot detect 2 identical slaves with the same address as a fault.	As long as the slave replies are identical, no logical distinction is possible.	<ul style="list-style-type: none"> ▶ Remove one of the two slaves and assign a new address to the other ▶ Reactivate the removed slave ▶ Reconfigure the controller → page 11-15
		▶

16.9

How does the controller react in case of a fault?

Faults displayed during operation	Reaction
The slave is disconnected from the AS-i bus	Slave without watchdog: output signals remain unchanged Slave with watchdog: output signals switched off AS-i master as PLC: IMPORTANT: absorb the slave failure in the PLC program. If necessary: stop the machine/plant
The AS-i master is removed from the fieldbus	AS-i master as gateway: output signals switched off AS-i master as PLC: input signals from the fieldbus master are ignored The PLC continues to trigger the AS-i outputs without any changes IMPORTANT: absorb the fieldbus failure in the PLC program. If necessary: stop the machine/plant
Controller fails as fieldbus slave	Effect → Description of the fieldbus master (host)

16.10 Hardware errors, exception errors



- > The main processor has detected an exception error.
- > All current activities are interrupted.
- ▶ Power the controller off and on again
- ▶ If without success: note down the display information and contact a sales specialist



Tip

If this error message is shown immediately after power on, execution of the PLC program can be prevented:

- ▶ During power on press the left function key of the device and keep it pressed.
- > The PLC program is declared as "non valid", no longer initialised and no longer executed.

The following indications in the TFR register give more information about the failure cause:

TFR register															
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
NMI	STKOF	STKUF	|	|	|	|	|	UNDOPC	|	|	|	PRTFLT	ILLOPA	ILLINA	ILLBUS

Bit	Name	Possible error source
NMI	interrupt cannot be masked	hardware
STKOF	stack overflow	PLC program / hardware
STKUF	stack underflow	PLC program / hardware
UNDOPC	unknown machine command	PLC program / hardware
PRTFLT	32-bit code error	PLC program / hardware
ILLOPA	invalid access to 16-bit operand	PLC program / hardware
ILLINA	invalid jump address	PLC program / hardware
ILLBUS	invalid access to external bus	hardware

- Examples:
- TFR 0004 invalid access to 16-bit operand, e.g. by the PLC
 - TFR 0002 invalid jump address, e.g. by the PLC

17 Maintenance, repair and disposal

In case of correct use no maintenance and repair measures are necessary. Only the manufacturer is allowed to repair the unit. If necessary, the unit can be cleaned by qualified personnel using a dry cloth after disconnecting all connected circuits.

After use dispose of the unit in an environmentally friendly way in accordance with the applicable national regulations.

18 Terms and abbreviations

A/B slave	→Slave with an A or B being appended to its address number and which may therefore be present in the → master twice.
Address	This is the "name" of the bus participant. All participants need a clearly defined address so that the signals can be exchanged without problem.
AS-i	AS-i = actuator sensor interface Bus system for the first binary field level.
ASIMON	Software for configuration of the AS-i safety monitor Download of the demo version: http://www.ifm-electronic.com/ifmgb/web/asi_down.htm
Baud	Baud, abbreviation: Bd = unit for the data transmission speed. Do not confuse baud with "bits per second" (bps, bits/s). Baud indicates the number of changes of state (steps, cycles) per second over a transmission length. But it is not defined how many bits per step are transmitted. The name baud can be traced back to the French inventor J. M. Baudot whose code was used for telex machines. 1 MBd = 1024 x 1024 Bd = 1 048 576 Bd
Operating system	Basic program in the device, establishes the connection between the hardware of the device and the user software.
Bus	Serial data transmission of several participants at the same cable.
CAN	CAN = C ontroller A rea N etwork CAN is a priority controlled fieldbus system for larger data volumes. It is available in different variants, e.g. CANopen, CAN in Automation (CiA) or →DeviceNet. CAN can be used over larger distances, e.g. provide AS-i with information. Corresponding →gateways are available.
CoDeSys	CoDeSys for Automation Alliance combines companies of the automation industry whose hardware devices can be programmed using the widely used IEC 61131-3 development tool CoDeSys®. CoDeSys® is a registered trademark of 3S – Smart Software Solutions GmbH, Germany.
Controllere	Master in the AS-i bus system of the generation E
DeviceNet	Fieldbus system for larger data volumes based on the →CAN technology, requires special cables, complex connection technology. Can be used over longer distances as fieldbus for AS-i. Corresponding →gateways are available.

DHCP	<p>DHCP = Dynamic Host Configuration Protocol = protocol for dynamic configuration by the →host</p> <p>DHCP is a protocol which offers the dynamic configuration of IP addresses and thus coherent information. The protocol supports the further use of IP addresses which are only available in a limited number by a centralised management of the address assignment.</p> <p>At first power on of a participant in a network the participant registers with a server using this service. The server assigns a local free IP address to the participant.</p>
EMC	<p>EMC = Electro-Magnetic Compatibilty</p> <p>According to the EC directive (89/336 EEC) concerning electromagnetic compatibility (in short EMC directive) requirements are made for electrical and electronic apparatus, equipment, systems or components to operate satisfactorily in the existing electromagnetic environment. The devices must not interfere with their environment and must not be adversely influenced by external electromagnetic interference.</p>
Ethernet	<p>Ethernet is a widely used, manufacturer-independent technology which enables data transmission in the network at a speed of 10 or 100 million bits per second (Mbps). Ethernet belongs to the family of so-called "optimum data transmission" on a non exclusive transmission medium. The concept developed in 1972 was specified as IEEE 802.3 in 1985.</p>
FE	<p>FE = Functional Earth</p> <p>Functional earth is a reference potential which is not connected to protective earth or only connected when special measures are taken. The functional earth serves as equalisation of potential for an ungrounded installation (e.g. SELV).</p>
Fieldbus	<p>A →bus for industrial applications: extremely robust with respect to mechanics and data technology</p>
Firmware	<p>Basic program in the device, virtually the operating system</p> <p>The firmware establishes the connection between the hardware of the device and the user software.</p>
Gateway	<p>Coupler</p> <p>Gateways enable connection of completely different systems. Gateways are used when two incompatible network types are to be connected by converting the protocol of one system to the protocol of the other system.</p> <p>Here: connection between AS-i and higher-level fieldbus systems such as →Profibus DP, →DeviceNet, Interbus-S or other interfaces, e.g. RS-485. The device includes an AS-i master which is directly coupled to the →host interface (e.g. →Profibus DP slave).</p>
Host	<p>The controller in the hierarchy above the AS-i master, e.g. a PLC or a processor, also called "fieldbus master".</p>
ID	<p>ID = Identifier</p> <p>Name to differentiate the devices / participants connected to a system.</p>

IP address	<p>IP = Internet Protocol</p> <p>The IP address is a number necessary to clearly identify an internet participant. For the sake of clarity the number is written in 4 decimal values, e.g. 127.215.205.156.</p>
LAS	<p>List of Active Slaves</p> <p>In this slave list the controller_e enters the slaves detected as active for this AS-i master.</p>
LDS	<p>List of Detected Slaves</p> <p>In this slave list the controller_e enters the slaves detected as present for this AS-i master.</p>
LED	<p>LED = Light Emitting Diode</p> <p>Light emitting diode, also called luminescent diode, an electronic element of high coloured luminosity at small volume with negligible power loss.</p>
LFS	<p>List of Failed Slaves</p> <p>In this slave list the controller_e enters the slaves with a projection error on this AS-i master.</p>
LPS	<p>List of Projected Slaves</p> <p>In this slave list the controller_e enters the slaves projected for this AS-i master.</p>
MAC ID	<p>MAC = Manufacturer's Address Code = manufacturer's serial number</p> <p>→ID = Identifier</p> <p>Every network card has a MAC address, a clearly defined worldwide unique numerical code, more or less a kind of serial number. Such a MAC address is a sequence of 6 hexadecimal numbers, e.g. "00-0C-6E-D0-02-3F".</p>
Marginalia	<p>Marginal column beside a text used for notes and comments. Because of its outstanding position well suited for quickly finding certain sections in the text.</p>
Master	<p>Handles the complete organisation on the bus. The master decides on the bus access time and polls the →slaves cyclically.</p>
Master-slave communication	<p>AS-i strictly operates to the master-slave principle. The master polls all slaves one after the other in always the same order. Only one master per network line is allowed (→cyclical polling).</p>
MBd	<p>→Baud</p>

Modbus	<p>The Modbus protocol is a communication protocol based on a →master/slave architecture and was generated by Modicon* in 1979 for communication with its PLCs. In industry Modbus is the de-facto standard.</p> <p>Modbus/TCP comes after →Ethernet-TCP/IP. Modbus/TCP is a portion of the protocol on TCP defined for the serial interface. The →IP address clearly defines every device in a network. Therefore the slave address was used to identify several logical units (unit IDs) in one physical device. To do so, the extended IP addressing is used.</p> <p>Example: 192.168.83.28.1 means unit ID 1 on IP address 192.168.83.28.</p> <p>*) Modicon passed from AEG to the group Schneider in 1994.</p>
OSSD	<p>OSSD = Output Signal Switching Device = output signal of a switchgear, here: output signal of an AS-i safety monitor</p>
Password	<p>In the menu "System Setup", menu item "Password" the handling can be restricted or enabled. When delivered, the device is in the user mode. By entering an invalid password (e.g. 1000) all menu items that allow settings to be changed will be blocked.</p> <p>→ page 11-22, chapter 11.4 "Password protection"</p>
PELV	<p>PELV = Protective Extra Low Voltage</p> <p>Functional extra low voltage with safe separation, grounded variant of SELV.</p> <p>Extra low voltage with safe separation (grounded variant of SELV). The specification as PELV system to IEC364-4-41 (initially DIN VDE 0100-410:1997-01) covers a measure to protect against direct and indirect contact with dangerous voltages by a "safe separation" between primary and secondary side in the device (e.g. power supply to PELV specification).</p> <p>For this reason no separate PE conductor is required in a PELV system. It is <u>allowed</u> to ground circuits and / or bodies in a PELV system.</p>
Pictograms	<p>Image symbols which convey information by a simplified graphic representation.</p> <p>→ page 1-1, chapter "What do the symbols and formats stand for?"</p>

Polling	<p>The controller master fetches the data from every participant in the system successively:</p> <ol style="list-style-type: none"> 1. Master calls participant 1 2. Participant 1 replies with its current data (current values) 3. Master transfers more data (preset values) to participant 1 if necessary 4. Participant 1 acknowledges receipt of the data <p>etc., the same procedure for all other participants.</p> <p>Cyclical polling: AS-i master cyclically polls the data of all →slaves on the bus (see above). The data is updated in the →master after max. 5 ms. If A/B slaves are used, the →cycle time can be 10 ms.</p>
Profibus	<p>Fieldbus system for larger data volumes, requires special cables, complex connection technology. Is available in different variants as →Profibus FMS, DP or PA. Profibus DP can be used over longer distances, e.g. as fieldbus for AS-i. Corresponding →gateways are available.</p>
Profibus FMS	<p>Profibus FMS (Fieldbus Message Specification) to network controllers – no longer standardised from 2007</p>
Profibus DP	<p>Profibus DP (Decentralised Periphery) to trigger sensors and actuators by a central controller in production technology. In particular the numerous standard diagnostic options are important. More applications are the connection of "distributed intelligence", i.e. networking of several controllers among each other (similar to →Profibus FMS). Data rates up to 12 Mbits/s on twisted two-wire cables and/or fibre optics are possible.</p>
Profibus PA	<p>Profibus PA (Process Automation) is used to control field devices by means of a process control system in process technology. This PROFIBUS variant is suitable for hazardous areas (zones 0 and 1). Only a small current flows on the bus cables in an intrinsically safe circuit so that even in case of a problem no sparks are produced. The disadvantage of this variant is the slower data transmission rate.</p>
Remanent	<p>Remanent data are protected against data loss in case of power failure.</p> <p>The operating system for example automatically copies the remanent data to a flash memory as soon as the voltage supply falls below a critical value. If the voltage supply is available again the operating system loads the remanent data back to the RAM memory.</p> <p>The data in the RAM memory of a controller, however, is volatile and normally lost in case of power failure.</p>

RTS	<p>RTS = Run Time System</p> <p>Run time systems are basic versions of applications. These minimum versions are supplied with certain products to meet the prerequisites for the execution of the actual product or to be able to look at or use results generated by this product on other processors: making available all routines required to execute a program in a programming language, e.g. interactions with the operating system, memory requirements, error routines, inputs and outputs.</p>
SELV	<p>SELV = Safety Extra Low Voltage</p> <p>Active parts integrated in SELV circuits must not be connected to ground or protective conductors of other circuits. They must be safely separated from active parts of higher voltage.</p> <p>SELV circuit = secondary circuit (output voltage) which is rated and protected so that its voltages do not exceed a safe value in case of correct operation (of the power supply) or in case of a single fault (of the power supply).</p> <p>SELV circuits are separated from the input voltage (mains voltage) by double or enhanced insulation. The voltage value must not exceed 60 V DC (or 42.4 V AC).</p>
Single slave	→Slave whose address number may only occur once on the →master.
Slave	<p>Passive participant on the bus, only replies on request of the →master. Slaves have a clearly defined and unique →address on the bus. A distinction is made:</p> <ul style="list-style-type: none"> • single slaves whose address numbers may only occur once on the master and • A/B slaves with an A or B being appended to their address number which may therefore be present in the master twice.
Target	The target indicates the target system where the PLC program is to run. The target contains the files (drivers) required for programming and parameter setting.
Unit ID	→Modbus
Watchdog	In general the term watchdog is used for a component of a system which watches the function of other components. If a possible malfunction is recognised, it is either signalled or suitable program branchings are activated. The signal or branchings serve as a trigger for other co-operating system components to solve the problem.
Cycle time	<p>This is the time for a cycle. The following process takes place:</p> <ol style="list-style-type: none"> 5. PLC cycle: the PLC program performs one complete run. 6. AS-i cycle: all AS-i slaves are updated (5...10 ms).

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nn-n	The indication of the page where you can find some information about the keyword is written in normal characters.
<i>ii-i</i>	The indication of the page where the keyword is <i>detailed</i> is written in <i>italics</i> .

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