ifm electronic

CE

Basic device manual

AS-i controller$_e$

ecomat300 ®

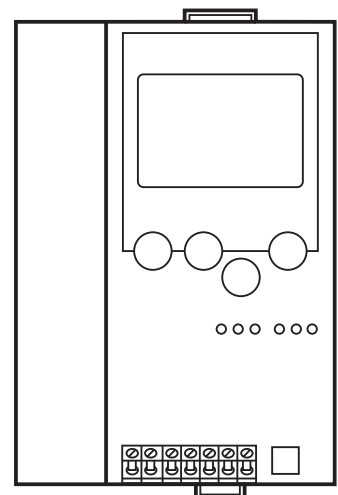**AC1307 / AC1317**
AC1345 / AC1346
AC1353 / AC1354

Firmware version RTS 2.x

Target from V.15

for CoDeSys® from version 2.3

Contents

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 warning 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.

Further symbols	**o**	A state to be <u>prevented</u> to avoid a danger is marked by the preceding "circle" symbol.
	►	A request requiring an <u>action</u> is marked by the preceding symbol "triangle".
	>	The <u>response</u> of the product to your action is marked by the preceding symbol "angle".
	→	This arrow in the continuous text stands for "<u>see</u>" 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$_e$ family from **ifm electronic gmbh**

- with AS-i version 2.1 masters

- with a firmware version RTS 2.x

- with the target from 15

In the "User manual CoDeSys® V2.3" 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:
→ www.ifm.info > choose country/language > Service > Download > bus system AS-Interface

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.

1.4   Overview: where is what?

metal housing IP20

device to unlock the unit from a rail

status LEDs of the fieldbus interface (option)

text/graphics display

option: fieldbus interface (here: Ethernet)

4 operating keys

status LEDs

terminals for the voltage supply 24 V, AS-i interface(s) and protective earth

option: Ethernet programming interface

6-pole RJ11 socket of RS-232 C as programming interface

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 pro-vided 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. $\rightarrow$ 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 ($\rightarrow$"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$_e$ 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_e 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_e 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_e (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$_e$ 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 controllere consists of different units:
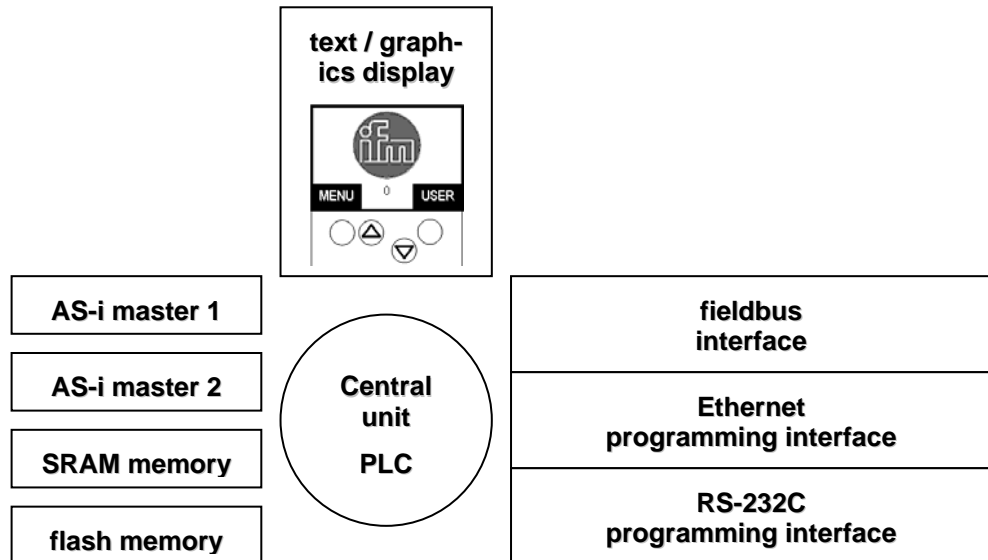
- The **central processing unit** (CPU) ensures the data transfer between the sub-systems. It manages the remanent flash memory and the volatile RAM memory.

- The **flash memory** is now 1 mbyte large and stores non-volatilely...

    - 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 controllere 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 controllere devices.
  $\rightarrow$ 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.
  $\rightarrow$ 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 ($\rightarrow$ 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 controllerₑ) 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 controllerₑ 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.

Data exchange between fieldbus and PLC

Fieldbus
I/O data

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

Data exchange via fieldbus is possible between the PLC in the controller$_e$ and the fieldbus master ($\rightarrow$ figure below).

Fieldbus master	$\leftarrow \leftarrow \leftarrow \leftarrow$ **Feldbus** $\rightarrow \rightarrow \rightarrow \rightarrow$	Controller$_e$ PLC
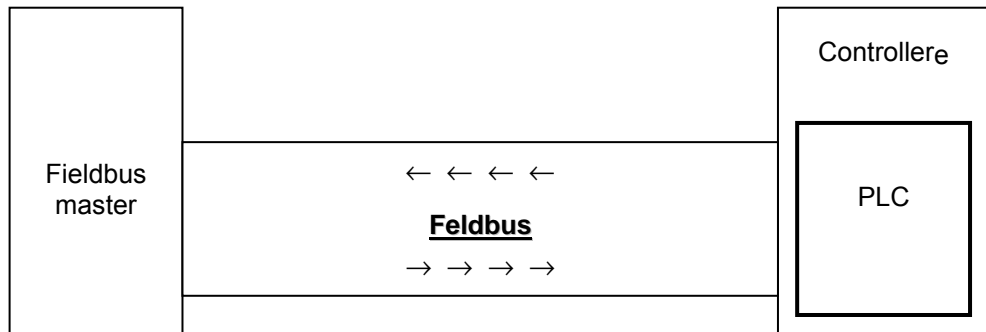
Description of the corresponding fieldbus: $\rightarrow$ separate supplementary device manual

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 controller₆ 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)	%Wxx.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 Electrical connection

This chapter contains information about the connection of the controller$_e$ to the supply and to the AS-i bus.
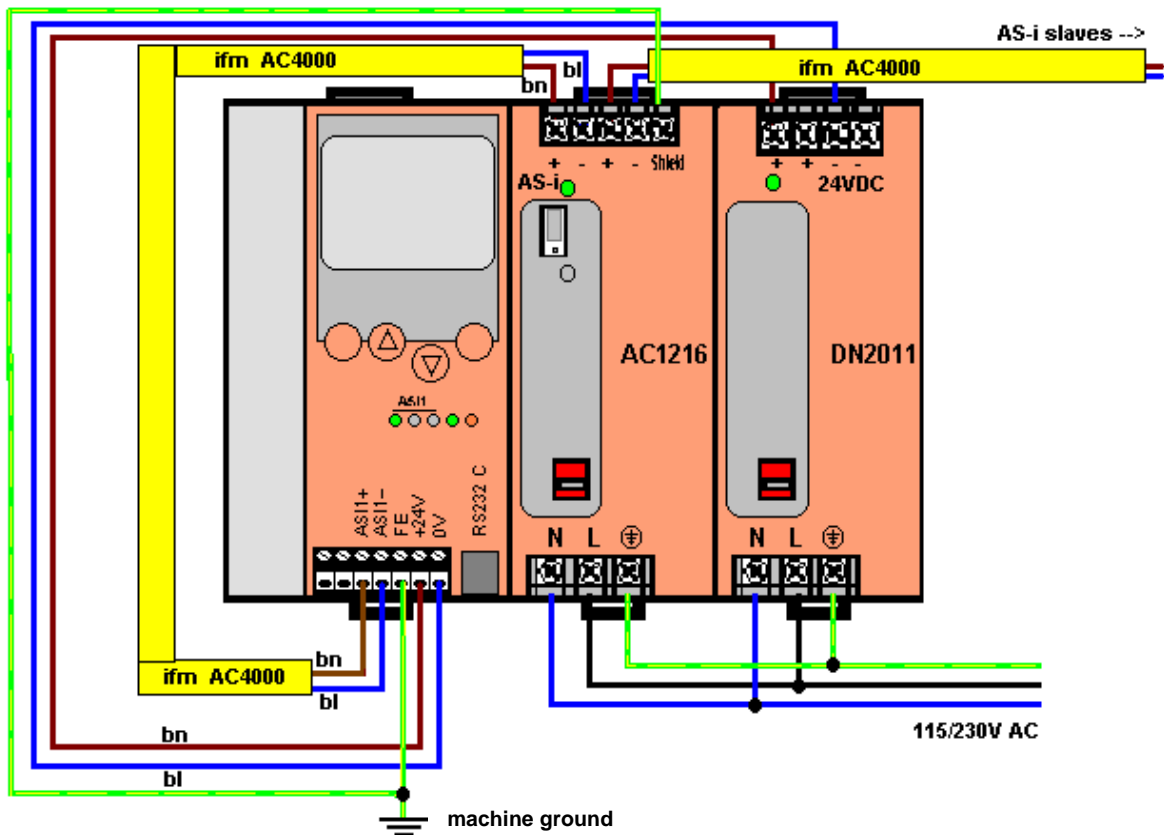
Figure: non binding suggestion for wiring of the controller$_e$

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.

► Disconnect power before connecting the controller$_e$ to avoid short circuits during installation.

► Adhere to the applicable standards and directives during installation (e.g. additional installation of a fuse).

► Connect the terminals according to the terminal marking.

► The supply voltage (SELV) must not be connected to protective earth.
Never link the minus terminal to the FE terminal or to another terminal of the unit.

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$_e$ 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$_e$.

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$_e$.

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.

o   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 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:

8   Operating and display elements

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

- 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 controllerₑ inform about the status of the AS-i master and the connected systems:
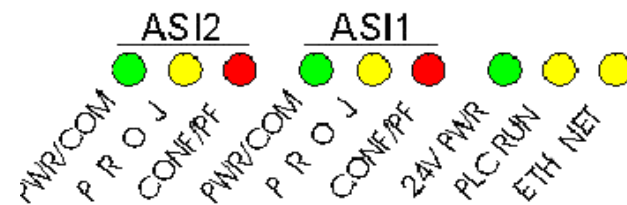
Figure: diagnostic LEDs

Comment on the figure "diagnostic LEDs":

- The LEDs [**ASI2**] 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: **P**ower **Com**munication	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: **Proj**ection	yellow	Operating mode is active	Projection mode active; the configuration monitoring is deactivated	Projection mode active; changeover to protected mode not possible because a slave with the address 0 is connected
ASI1 [**CONF/PF**] AS-i bus 1: **Conf**iguration **P**eripheral **f**ault	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: **P**ower **Com**munication	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: **Proj**ection	yellow	Operating mode is active	Projection mode active; the configuration monitoring is deactivated	Projection mode active; changeover to protected mode not possible because a slave with the address 0 is connected
ASI2 [**CONF/PF**] AS-i bus 2: **Conf**iguration **P**eripheral **F**ault	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$_e$ 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$_e$ 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.
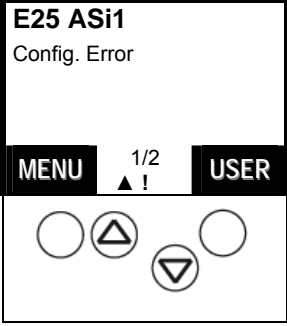
What is what in the text/graphics display?

Normal menu screen

PLC Setup
Slave Lists
Address Slave

OK   1   ESC
▲ ▼
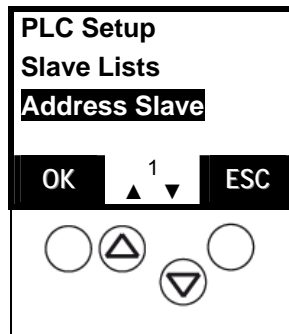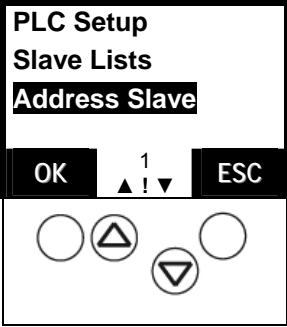
> Usually the menu shows 3 to 5 lines, similar to the screen on the left

> One menu line is inverted.
This highlights the active or selected entry. When pressing [**OK**] the controller$_e$ 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)
```
E25 ASi1
Config. Error

MENU  1/2   USER
      ▲ !
```

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)
```
PLC Setup
Slave Lists
Address Slave

OK    1    ESC
   ▲ ! ▼
```

Indication of a fault when any menu screen is active
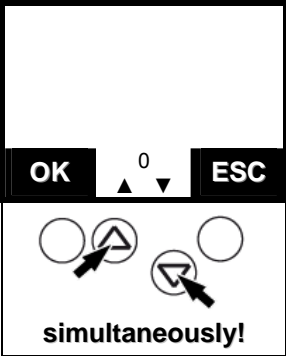
> Flashing "**!**"
  There is an error message

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

> Triangles [▲] / [▼]
  Indication of which arrow keys can be actuated to scroll.
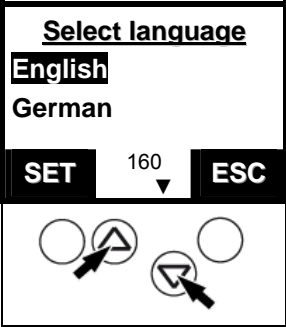
► Scroll back to the start screen by means of [**ESC**]
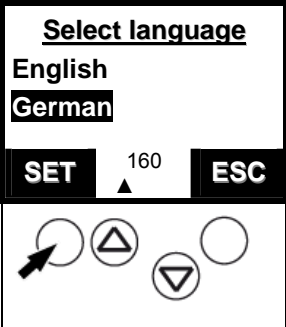
> An error screen as described above appears
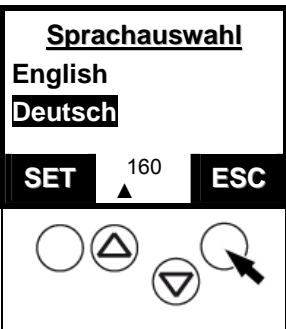
Text/graphics display: switch language

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

1.

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

2.

Select language
English
German

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

3.

Select language
English
German

► Select the requested language by means of [**SET**]

4.

Sprachauswahl
English
Deutsch

> 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

```
PLC Setup
Slave Lists
Address Slave

OK      1     ESC
      ▲   ▼
```

• 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
	► Quick projection of everything
	   → page11-15

	> The controller_e changes to the projection mode, if it has not done so already.
	> The controller_e checks all connected slaves (on both masters) and enters them in its table as "projected".
	> The controller_e changes to the protected mode.
Quick Setup Fieldbus Setup	► 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 ($\rightarrow$ page 10-5)

PLC Setup
    PLC Settings
        Run
	► If available: Start the PLC program in the controller$_e$
	
	> 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$_e$

PLC Setup
    PLC Settings
        Stop
	► Stopping the PLC program in the controller$_e$
	
	> 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$_e$

PLC Setup
    PLC Settings
        Gateway
	► Switching the controller$_e$ 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): ($\rightarrow$ 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
	Detected slaves on AS-i master 1:
	($\rightarrow$ page 13-3)
	
	> Indication 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 the slave is active on the bus.

Slave Lists
    AS-i Master 1
        Projected Slaves AS-I 1
	Projected slaves on AS-i master 1:
	($\rightarrow$ page 13-5)
	
	> Indication at which slave address one (or several) slaves type A, B or S (standard) *are projected* on the bus.

Slave Lists
    AS-i Master 1
        Activated Slaves AS-I 1
	Activated slaves on AS-i master 1:
	($\rightarrow$ page 13-8)
	
	> Indication at which slave address the controller$_e$ has detected an *activated* slave type A, B or S (standard) on the bus.
	
	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.

Slave Lists
    AS-i Master 1
        Periph. Flt. AS-i 1
	Peripheral fault on AS-i master 1:
	($\rightarrow$ page 13-11)
	
	> 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
	> 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**].
	
	Alternatively:
	
	► 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
	> 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 controllerℓ 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 un-dervoltage on the AS-i bus.

Diagnostics
    AS-i Master 1
        Configuration Error
	Configuration error:
	
	> Display of the number of detected con-figuration 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 controllere polls A/B slaves connected as pairs (i.e. with the same address) only in every second cycle.

Menu tree	Function

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$_e$ 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 controllerε 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)
	
	> 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→ page13-48

Menu tree	Function
Slave Info AS-i Master 1	> 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):
	• Data of the digital inputs and outputs (binary + hexadecimal)
	• Data of the analogue channels (deci-mal)
	• Entries in the lists of active / detected / projected slaves / slaves with periph-eral fault
	• Slave profile configuration
	• Slave parameters
	• Number of message errors
	► Scroll through the addresses of de-tected 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$_e$ 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	> 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
	> 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$_e$ does not process these outputs.
	
	► Cancel with [**ESC**].

Slave Setup
    AS-i Master 1
        Parameter value
	> 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
	> 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
	► 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$_e$ 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	► 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	► Only operational with an Ethernet programming interface (option)! → supplementary instructions "Ethernet programming interface" (option)

System Setup
   Ethernet Setup
      IP Address
	> 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
	> 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
	> 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
	► 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
	Automatic negotiation of the baud rate and the transmission (full-duplex/half-duplex) among the participants in the Ethernet:
	
	► 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
	Automatic retrieval of the IP address from an existing DHCP server:
	
	► 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
	> Display of the manufacturer identification number of the Ethernet participant in the network.

Menu tree	Function
System Setup Modbus Setup	Only operational with an Ethernet pro-gramming interface (option)! → supplementary instructions "Ethernet programming interface" (option) ► Scroll between enabling and blocking the Modbus support with [▲] / [▼] (password level 1 required)
System Setup Firmware Update	Update of the firmware (RTS Runtime System Software) (password level 3 required): → page 11-27 Prerequisite: PC/laptop with special soft-ware connected to serial interface.

System Setup
    Firmware Update
        Runtime System
	Update runtime system
	
	> Display: "RTS Firmware:
	Connect to PC – Start now?"
	→ The PC must be connected to up-date the RTS firmware. Start transmis-sion now?
	
	► [**OK**]
	
	► Start transmission on the PC
	
	> Transmission active

System Setup
    Firmware Update
        AS-i Master 1
	Update AS-i Master 1
	
	► [**OK**]
	
	> Display: "AS-i 1 Firmware:
	Connect to System – Start now?"
	→ The PC must be connected to up-date 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
	as for update AS-i master 1

Menu tree	Function

System Setup
    Password
	Prevents unauthorised changes to the con-
	troller$_e$ by means of a 4-digit password. →
	page 11-22
	
	> 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.
	
	If the password has been entered correctly
	the corresponding parameter changes are
	possible; if the password is wrong they are
	blocked.

System Setup
    Factory default
	► Start factory default with [**OK**] (pass-
	    word level 3 required).
	    → page 11-25
	
	> Safety query "Are you sure?"
	
	► [**OK**]
	
	> Resetting the controller$_e$ to the factory
	    settings. Some changes will not be-
	    come effective before the next power-
	    on.
	
	> PLC programs are <u>not</u> deleted.
	
	> The password is reset to level 1.

System Setup
    System Errors
	System Setup error messages
	→ page 15-3
	
	> History memory of the last system error
	    message which must be acknowledged

System Setup System Specials	System particularities (password level 2 required):

System Setup
    System Specials
        Fall Back
	Switch between
	FALL BACK VNC ON and
	FALL BACK VNC OFF
	
	The menu entered by the user is automati-
	cally left after a defined time if the device is
	not operated.

System Setup
    System Specials
        RTS Error
	Switch between
	RTS ERROR ON and
	RTS ERROR OFF
	
	The display of the Rxx system messages
	can be disabled by means of this setting.

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 back-ground 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	> Display of all system parameters: → page 13-59
	• 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
	From here the display is only accessible in the administrator mode (protected by password level 3):
	• 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]
	► Delete cycle time values with [**ZERO**]
	► Scroll through the list of parameters with [**MORE**]
	► Return to the start menu with [**MENU**] or [**ESC**]

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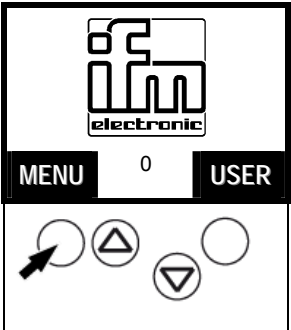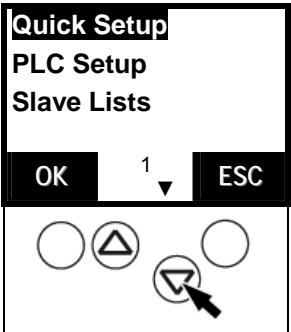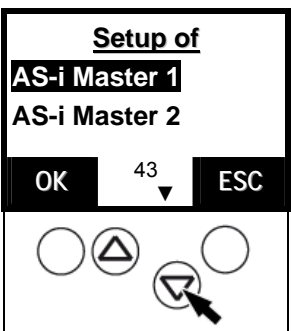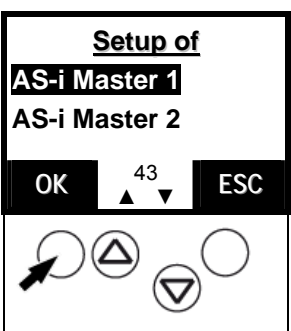
10.1 Which operating modes are there for the AS-i master?

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 immediately activated.	Only makes sense in case of planned changes to the AS-i system.
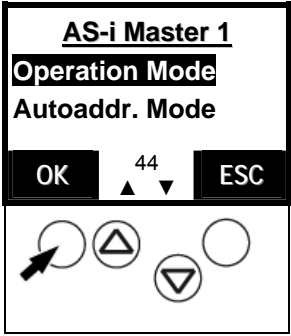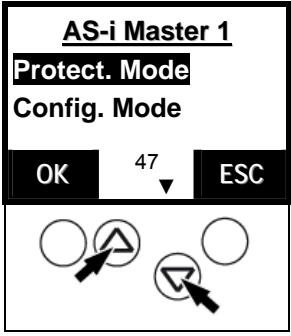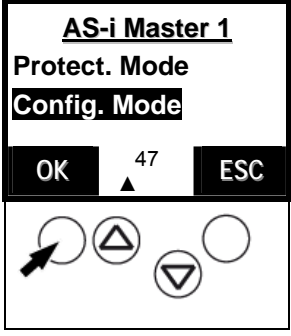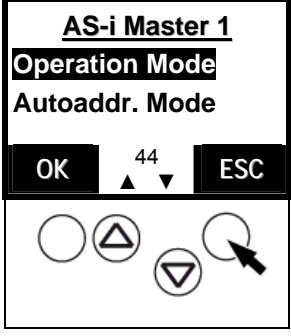
In principle, changes to the slaves which are connected to the master via AS-i are immediately detected. The LED [**CONF/PF**] lights as soon as there is a change to the projected status.

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

1.

MENU   0   USER

► Press [**MENU**]

2.

Quick Setup
PLC Setup
Slave Lists

OK   1 ▼   ESC

► Press [▼] to scroll to "Master Setup"

3.

Address Slave
Diagnostics
Master Setup

OK   ▲ 1 ▼   ESC

► Select "Master Setup" with [**OK**]

4.

Setup of
AS-i Master 1
AS-i Master 2

OK   43 ▼   ESC

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

5.

Setup of
AS-i Master 1
AS-i Master 2

OK   43 ▲ ▼   ESC

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

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.

10.3 Which operating modes are there for the PLC in the controllere?

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

Tip

During changes to the PLC program or to the slaves the PLC program should be stopped to avoid malfunctions.
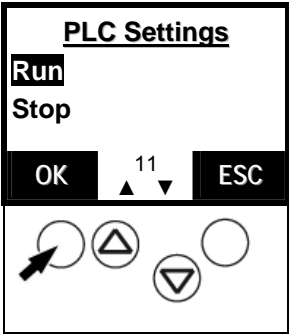
10.4 How are the operating modes for the PLC changed?
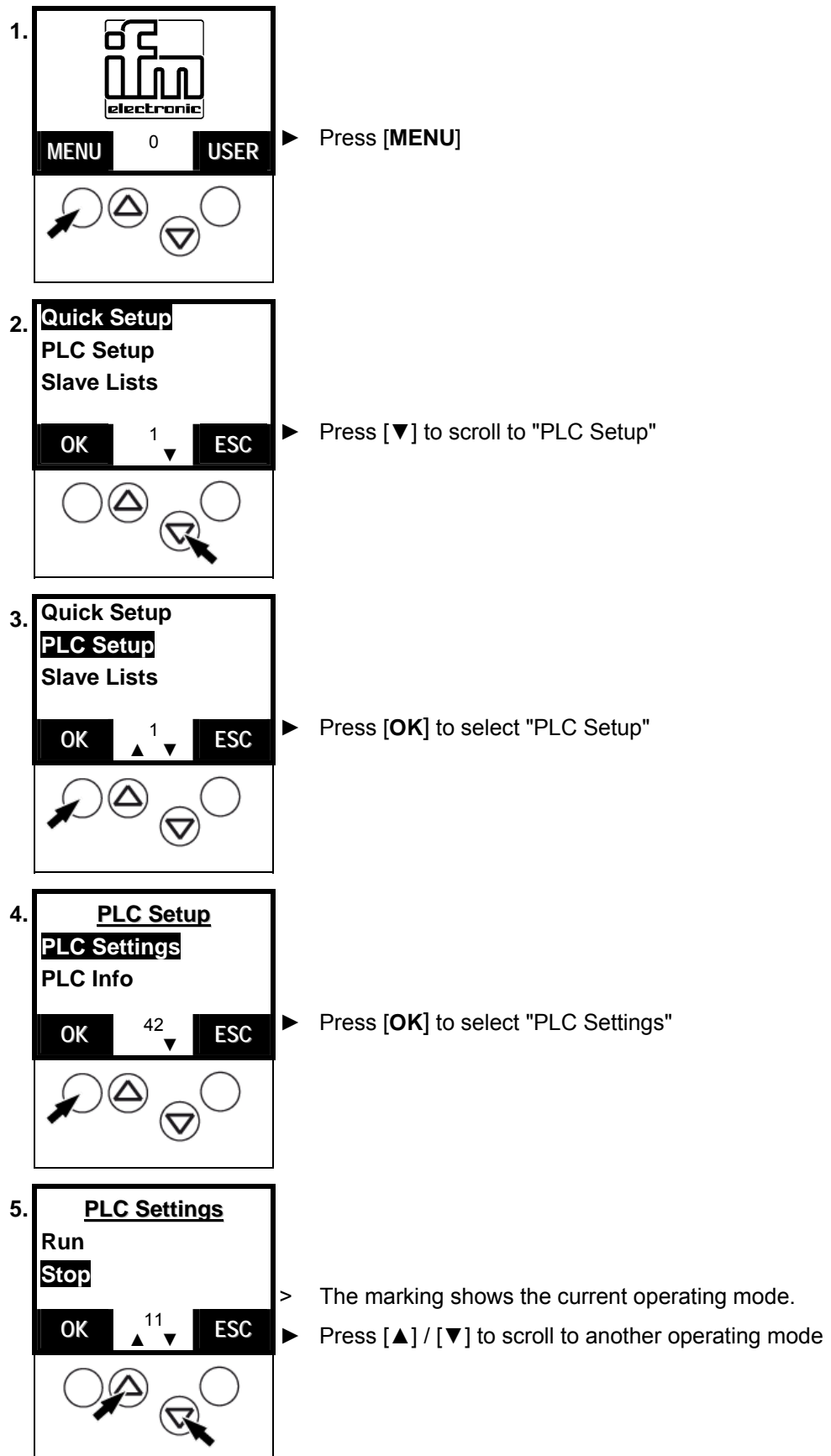
1. ► Press [**MENU**]

2. ► Press [▼] to scroll to "PLC Setup"

Quick Setup
PLC Setup
Slave Lists

3. ► Press [**OK**] to select "PLC Setup"

Quick Setup
PLC Setup
Slave Lists

4. ► Press [**OK**] to select "PLC Settings"

PLC Setup
PLC Settings
PLC Info

5.

PLC Settings
Run
Stop

> The marking shows the current operating mode.

► Press [▲] / [▼] to scroll to another operating mode

6.

PLC Settings
Run
Stop

OK   11   ESC
▲ ▼

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

ℹ️
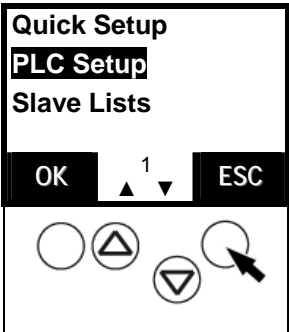
Tip

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

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

7.

Quick Setup
PLC Setup
Slave Lists

OK   1   ESC
▲ ▼

> 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 controller‌ₑ 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 controllerₑ 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 controllerₑ 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:

1. ► Press [**MENU**]

2. ► Press [▼] to scroll to "System Setup"

3. ► Press [**OK**] to select "System Setup"

4.

System Setup
Ser. Port Baudr.
Ethernet Setup

OK   33 ▼   ESC
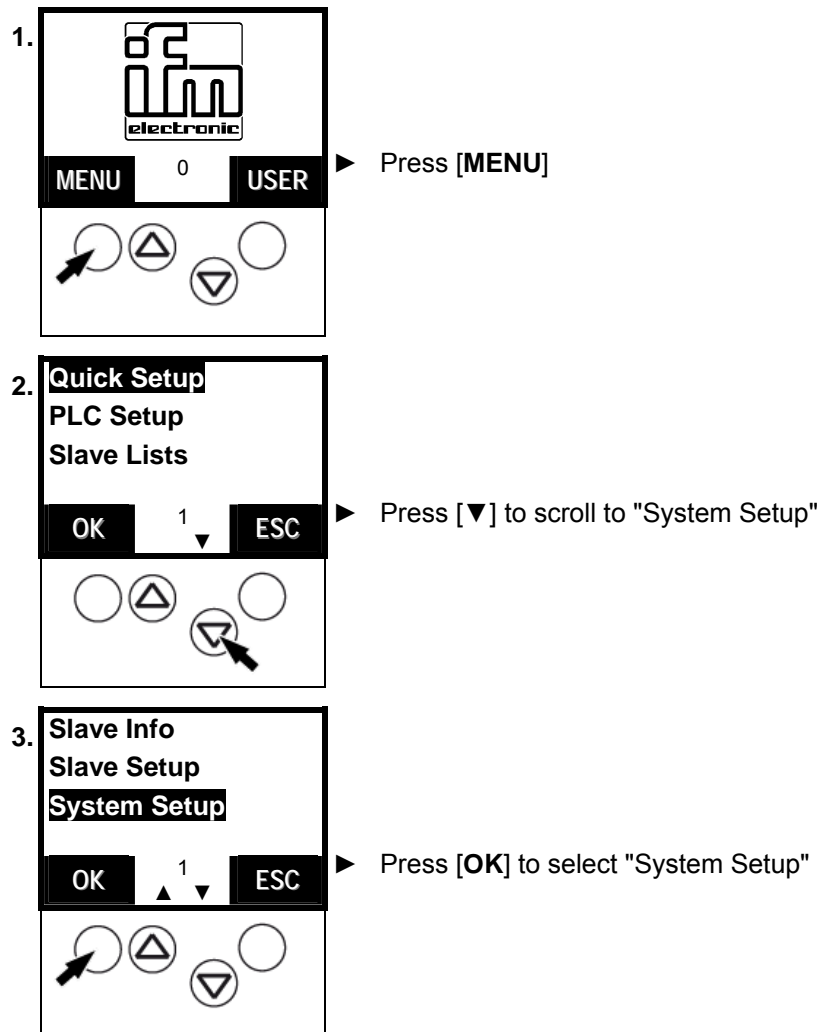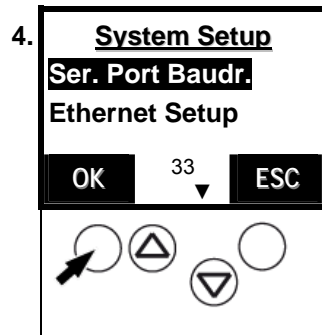
► Press [**OK**] to select "RS232 Baudrate"

5.

RS232 Baudrate

115200

57600

OK   34 ▼   ESC
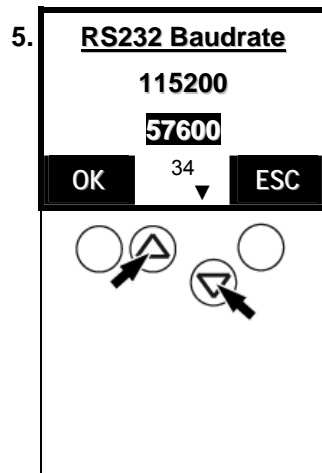
> Display of current value

► 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, controllere) 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
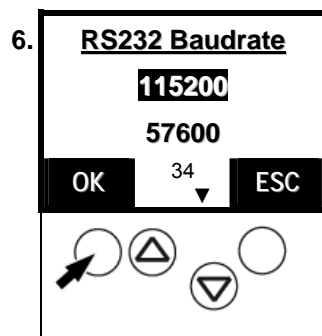
► Press [**OK**] to select the set baud rate

7.

System Setup
Ser. Port Baudr.
Ethernet Setup

OK   33 ▼   ESC
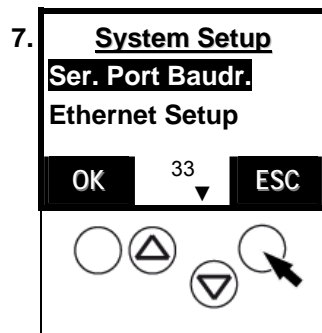
> Return to screen 33

► 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 controllerₑ

► Install the current target for the AS-i controllerₑ, if not done yet:

1. InstallTarget

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

2.
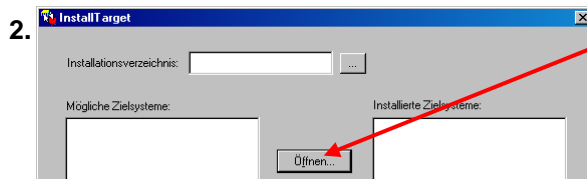
► Click here to open the installation file "Target Information File .TNF"

3.
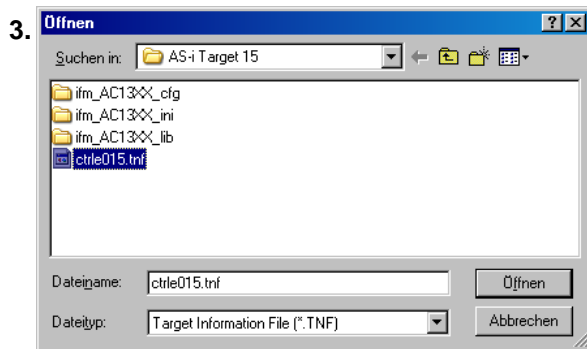
► Select the source directory for the new target (from the installation CD) and confirm with [**OK**]

4.
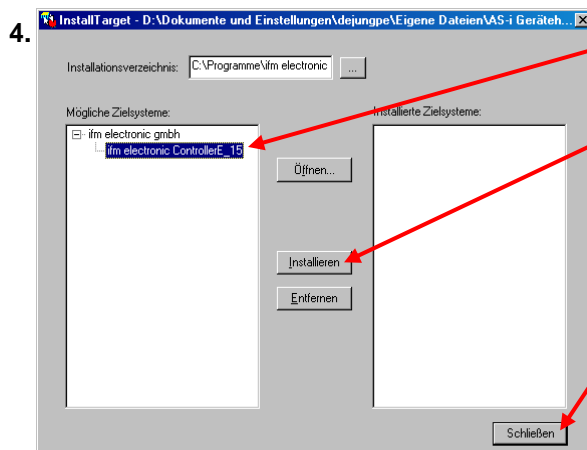
► Mark the target for the controllerₑ (→ screen)

► 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 controllerₑ, 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 controllerₑ

► Start the programming software CoDeSys® 2.3 on the PC

► Create a new project in CoDeSys®

► Set the target system:

1.

► Click on the symbol [▼]

► Select a valid target for the controllerₑ and confirm (e.g. "ifm electronic ControllerE_15" for target 15)

2.

► Press [**OK**] to confirm

3.
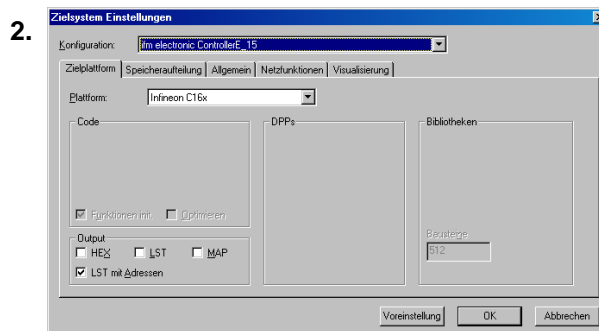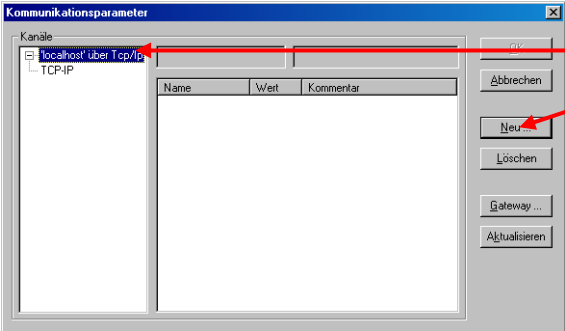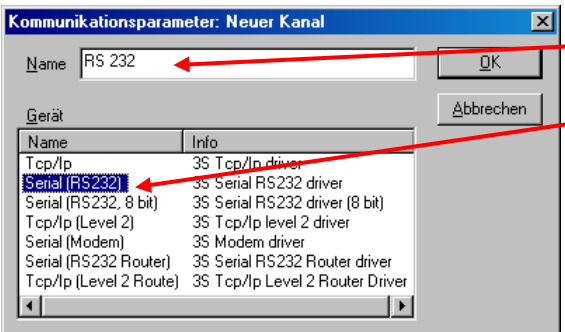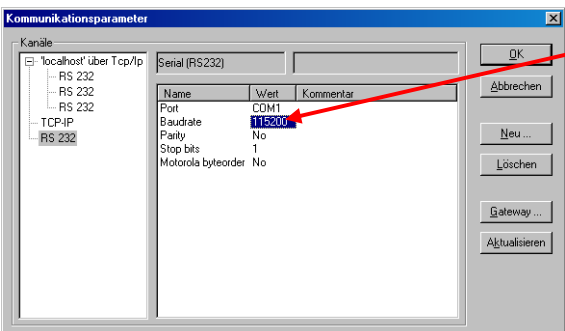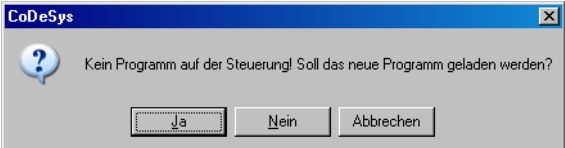
► Confirm the new block "PLC_PRG" by pressing [**OK**]

4.
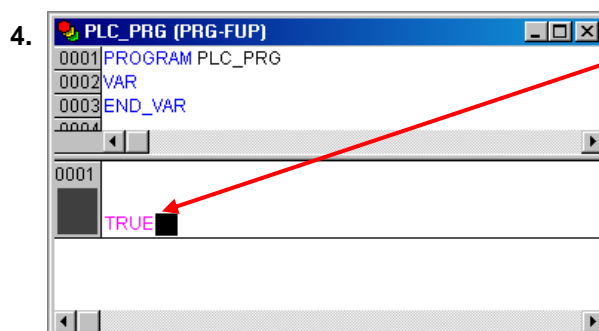
► Replace "???" by "TRUE" in the first network

► PC button [**Enter**]

> The first "program" is provisorily ready.

► Menu sequence "Online" > "Communication Parameters"

11-4

5. Kommunikationsparameter

Kanäle
'localhost' über Tcp/Ip
TCP-IP

OK
Abbrechen
Neu...
Löschen
Gateway ...
Aktualisieren

Name | Wert | Kommentar

► Mark the topmost row in the column "Channels"

► Click on [**New**]

6. Kommunikationsparameter: Neuer Kanal

Name | RS 232 | OK
Abbrechen

Gerät

Name	Info
Tcp/Ip	3S Tcp/Ip driver
Serial (RS232)	3S Serial RS232 driver
Serial (RS232, 8 bit)	3S Serial RS232 driver (8 bit)
Tcp/Ip (Level 2)	3S Tcp/Ip level 2 driver
Serial (Modem)	3S Modem driver
Serial (RS232 Router)	3S Serial RS232 Router driver
Tcp/Ip (Level 2 Route)	3S Tcp/Ip Level 2 Router Driver

► Enter name as "RS 232"

► Select "Serial (RS232)" as unit

► Press [**OK**] to confirm

7. Kommunikationsparameter

Kanäle
'localhost' über Tcp/Ip
RS 232
RS 232
RS 232
TCP-IP
RS 232

Serial (RS232)

OK
Abbrechen
Neu ...
Löschen
Gateway ...
Aktualisieren

Name	Wert	Kommentar
Port	COM1	
Baudrate	115200	
Parity	No	
Stop bits	1	
Motorola byteorder	No	

► Gradually change the baud rate by double clicking until the value corresponds to the setting in the controller$_e$ → 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. CoDeSys

Kein Programm auf der Steuerung! Soll das neue Programm geladen werden?

Ja | Nein | Abbrechen

> If there is a connection between the PC and the controller$_e$ 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_e.

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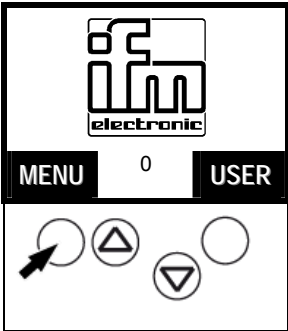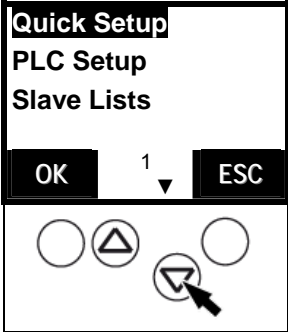
Now address the slaves. This is possible by means of the buttons and the text/graphics display on the controller$_e$. In the mode "Easy Startup" the controller$_e$ can address the slaves automatically in rising order if the slaves are connected one after the other on the bus.
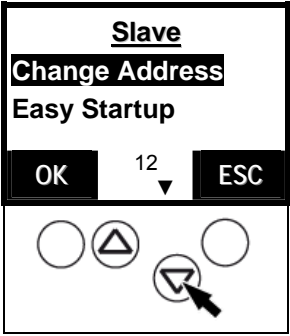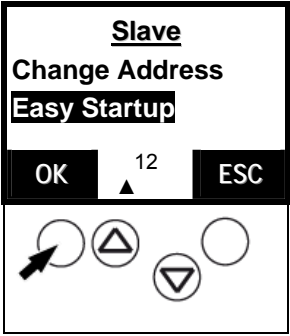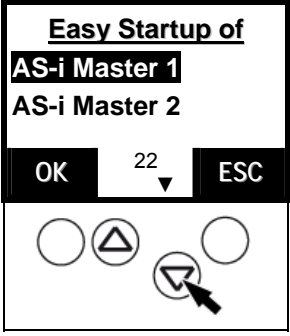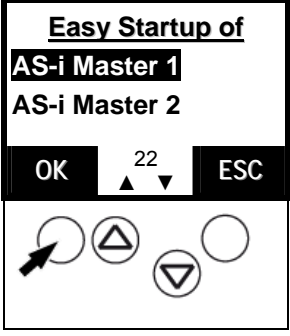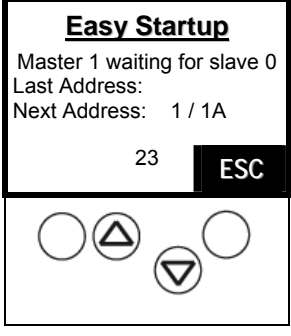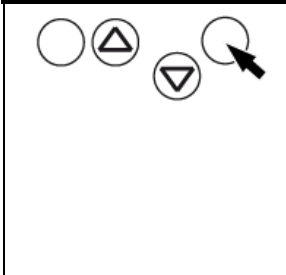
Tip

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$_e$ does not react to the connection of the new slave. This slave is not automatically addressed.
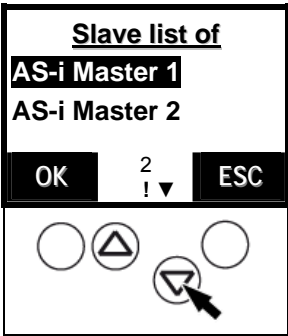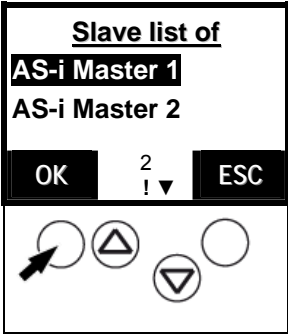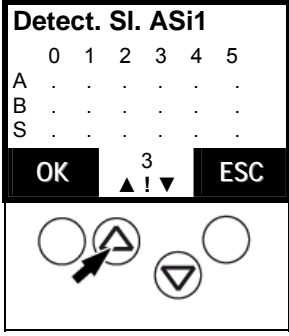
Then → page 11-11, chapter "Manual slave addressing".

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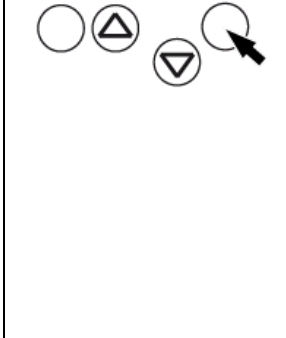
Password level 1 required → page 11-23, chapter "Password setting"

1. ► Press [**MENU**]

2. ► Press [▼] to scroll to "Address Slave"

3. ► Press [**OK**] to select "Address Slave"

4.

	Slave	
	Change Address	
	Easy Startup	
OK	12 ▼	ESC

► Press [▼] to scroll to "Easy Startup"

5.

	Slave	
	Change Address	
	Easy Startup	
OK	12 ▲	ESC

► Press [**OK**] to select "Easy Startup"

6.

	Easy Startup of	
	AS-i Master 1	
	AS-i Master 2	
OK	22 ▼	ESC

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

7.

	Easy Startup of	
	AS-i Master 1	
	AS-i Master 2	
OK	22 ▲ ▼	ESC

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

8.

	Easy Startup	
Master 1 waiting for slave 0		
Last Address:		
Next Address:	1 / 1A	
	23	ESC

> The controllerℯ 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 <u>one</u> 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 controllerₑ 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.

E25 ASi1
Config. Error

MENU   1/2   USER
         ▲ !
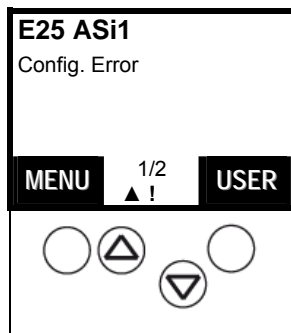
► End automatic addressing
Scroll back to the start screen (→ screen) by pressing [**ESC**] several times.

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"
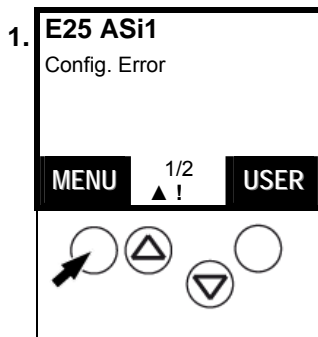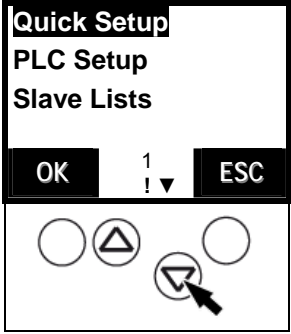
1.

E25 ASi1
Config. Error

MENU   1/2   USER
         ▲ !

> 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 controllerₑ does not yet have in its projection list.
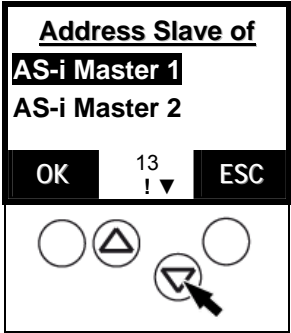
Note: description of the error message
→ chapter 16 "Error messages"
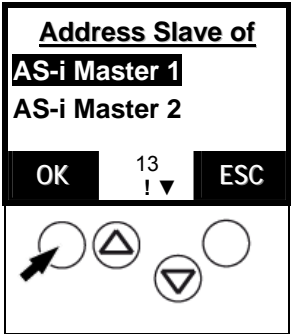
► Press [**MENU**]

2. Quick Setup
PLC Setup
Slave Lists
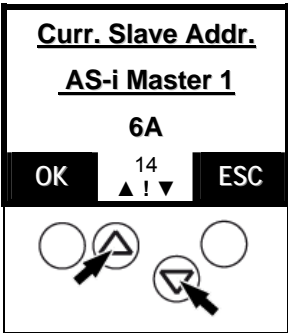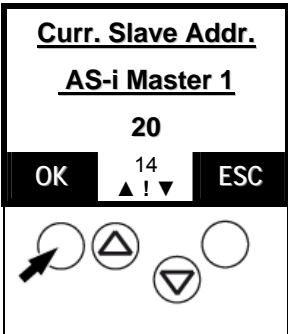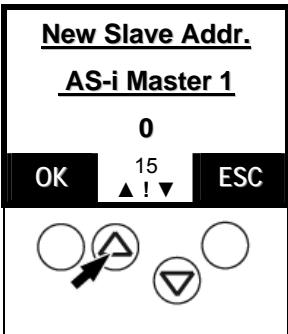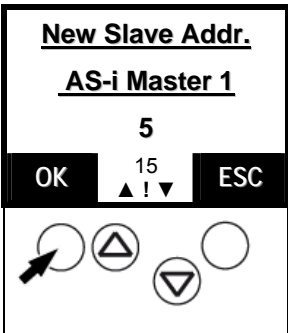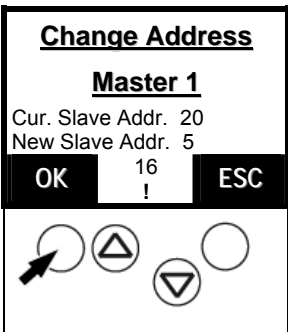
OK   1 ! ▼   ESC

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

3. PLC Setup
Slave Lists
Address Slave

OK   ▲ 1 ! ▼   ESC
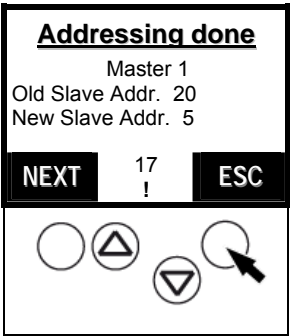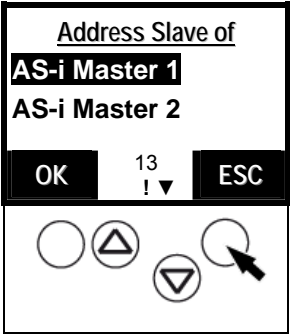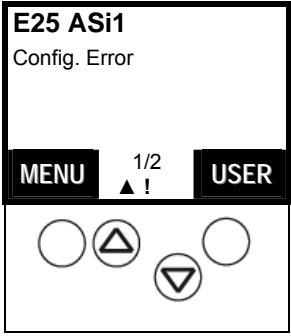
► Press [**OK**] to select "Address Slave"

4. Slave
Change Address
Easy Startup

OK   12 ! ▼   ESC

► Press [**OK**] to select "Change Address"

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

6. Address Slave of
AS-i Master 1
AS-i Master 2

OK   13 ! ▼   ESC

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

7.	**Curr. Slave Addr.**		
	AS-i Master 1		
	6A	>	Display of the lowest found valid slave address
	OK 14 ▲ ! ▼ ESC	►	Press [▲] / [▼] to scroll to the slave whose address is to be changed

8.	**Curr. Slave Addr.**		
	AS-i Master 1		
	20		
	OK 14 ▲ ! ▼ ESC	►	Press [**OK**] to select the requested slave

9.	**New Slave Addr.**		
	AS-i Master 1		
	0	>	Display neutral slave address 0
	OK 15 ▲ ! ▼ ESC	►	Press [▲] to scroll to the requested slave address

10.	**New Slave Addr.**		
	AS-i Master 1		
	5		
	OK 15 ▲ ! ▼ ESC	►	Press [**OK**] to select the new slave address

11.	**Change Address**		
	Master 1		
	Cur. Slave Addr. 20 New Slave Addr. 5	>	Display of old and new slave address
	OK 16 ! ESC	►	Press [**OK**] to confirm the new slave address

12.

Addressing done
Master 1
Old Slave Addr. 20
New Slave Addr. 5

NEXT   17   ESC
         !

> Display of "WAIT" message during storage
> Display of the completed change ($\rightarrow$ 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
AS-i Master 1
AS-i Master 2

OK   13   ESC
      ! ▼

► Press [**ESC**] to scroll back to the start screen

14.

E25 ASi1
Config. Error

MENU   1/2   USER
        ▲ !

> 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?
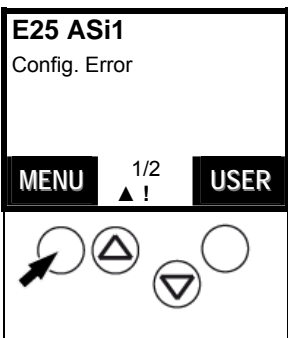
Cause: the controller₆ has detected all slaves on the bus but the slaves are not yet – at least not all – in the "List of projected slaves" LPS.
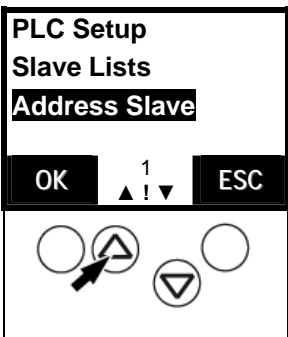
So: the error message "configuration error" is displayed as long as there is a difference between the detected and configured slaves.

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"

1.

E25 ASi1
Config. Error

MENU   1/2   USER
           ▲ !
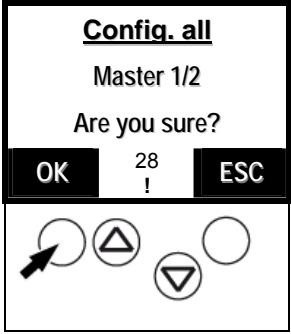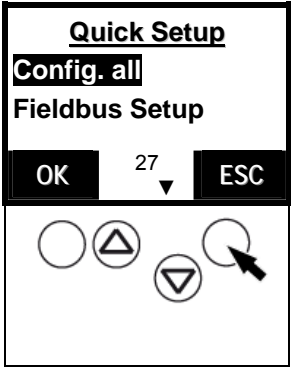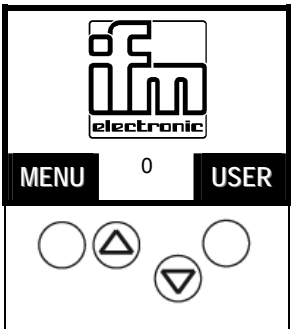
> The display on the left appears instead of the **ifm** start screen: "Configuration error"

► Press the [**MENU**] button

2.

PLC Setup
Slave Lists
Address Slave

OK   1   ESC
     ▲ ! ▼

> The controller₆ 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.

3.

PLC Setup
Slave Lists
Address Slave

OK   1   ESC
     ▲ ! ▼

► 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 controllere 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.

> **Config. all**
>
> Master 1/2
>
> Are you sure?
>
> OK   28   ESC
>   !

>   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.

> **Quick Setup**
>
> **Config. all**
>
> **Fieldbus Setup**
>
> OK   27   ESC
>   ▼

>   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.

> ifm electronic
>
> MENU   0   USER

>   That's it. All detected slaves are projected.

11.3   Changing slave parameter data
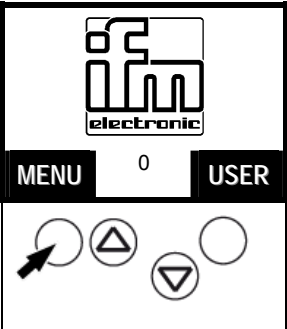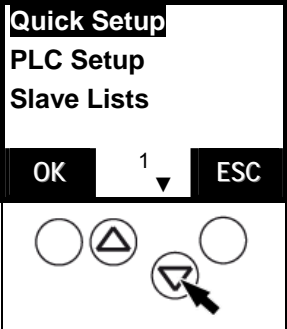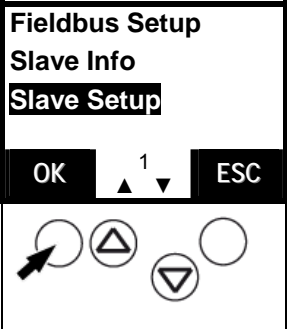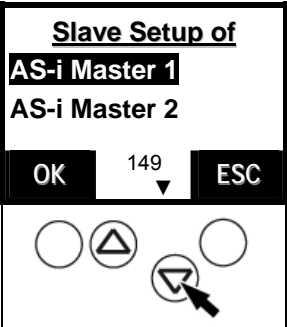
The parameter value "0Fh" is preset for the slaves.
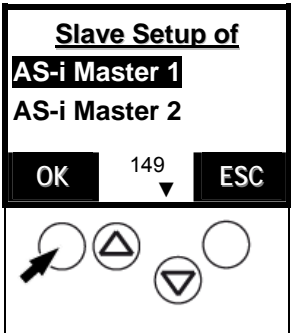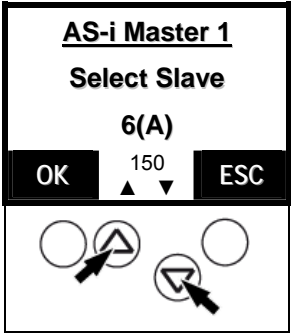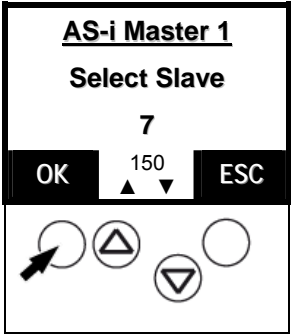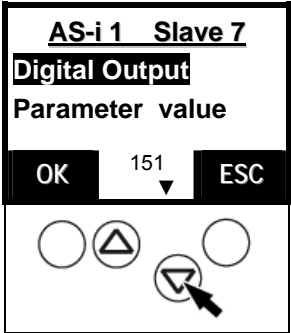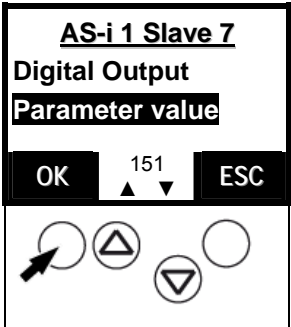
Example for reasonable parameter changes: not connected analogue input channels generate a peripheral fault of the module. By changing parameters you can block unused channels so that the module does not trigger a peripheral fault.

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
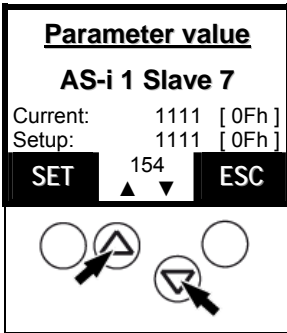
1. ► Press [**MENU**]

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] |

SET   154   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] |

SET   154   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] |

SET   154   ESC
▲   ▼

> The target value parameter data are copied to the current parameter data
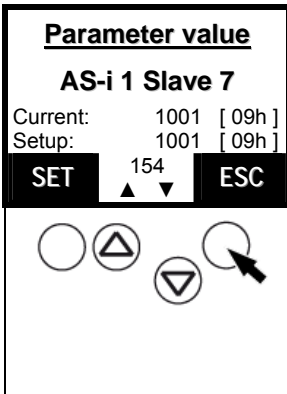
If the target value of the parameter data for this slave is not permitted:

> 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 controllere menus by unauthorised users
Risk for persons and plant/machine by access of unauthorised users to special menus of the controllere.
► 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
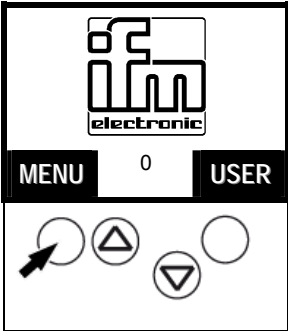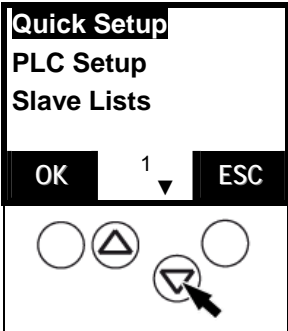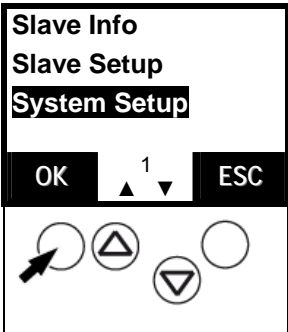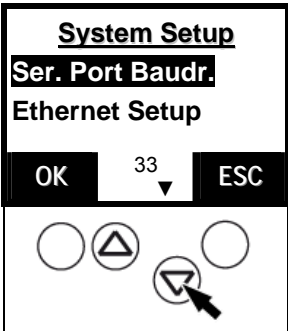
Password level	Operating mode	Password	Note
0	end user mode	any	
1	user mode	CE01	factory setting
2	service mode	E02C	
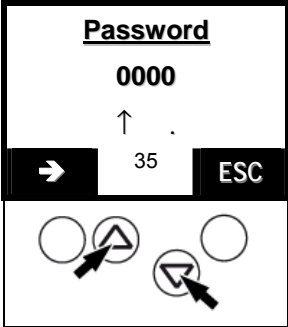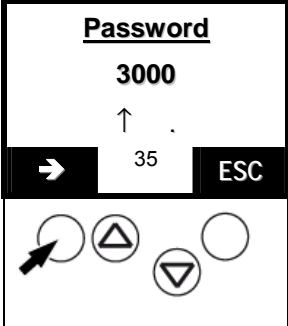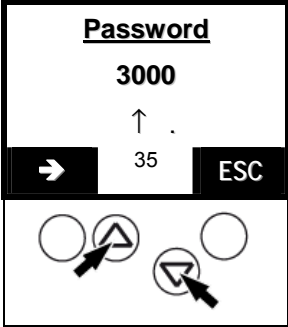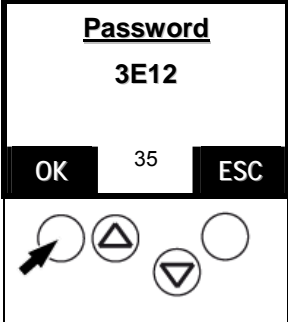
Main menu	2nd menu level	Required password level
Quick Setup	all	1
PLC Setup	all	1
Address Slave	all	1
Diagnostics	Reset Error Counter	1
Master Setup	Config all	1
Master Setup	Operating mode	1
Master Setup	Autoaddr. mode	1
Master Setup	Slave Reset	1
Fieldbus Setup	all	1
System Setup	Modbus Setup	1
System 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.

Password
0000
↑ .
➔   35   ESC

> 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.

Password
3000
↑ .
➔   35   ESC

> Display password changed so far

► Press ➔ to select the next figure

8.

Password
3000
↑ .
➔   35   ESC

> Display password changed so far
> The arrow ↑ points to the figure which can be changed

► Repeat the steps 6...7 for all figures

9.

Password
3E12
OK   35   ESC

► Press [**OK**] to set a new password

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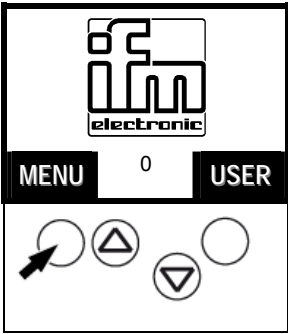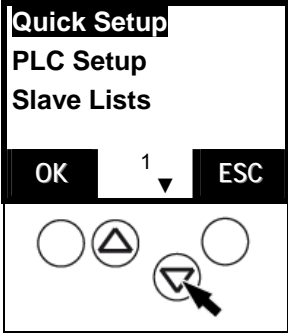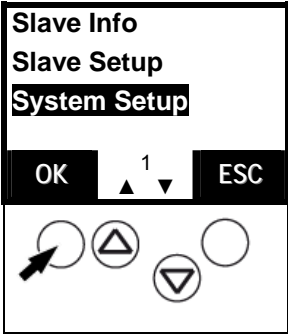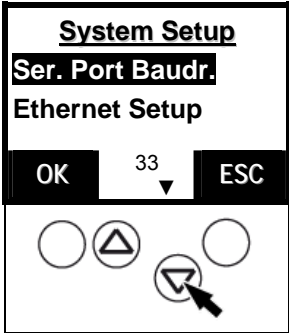
11.5 Factory default

You work with a used controller$_e$ (e.g. from a test project). Now you would like to restore the factory settings of the controller$_e$ 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.
Quick Setup
PLC Setup
Slave Lists

OK   1   ESC
► Press [▼] to scroll to "System Setup"

3.
Slave Info
Slave Setup
System Setup

OK   1   ESC
► Press [**OK**] to select the "System Setup"

4.
System Setup
Ser. Port Baudr.
Ethernet Setup

OK   33   ESC
► Press [▼] to scroll to "Factory default"

5.

<u>**System Setup**</u>
Password
Factory default

OK   33   ESC
▲ ▼
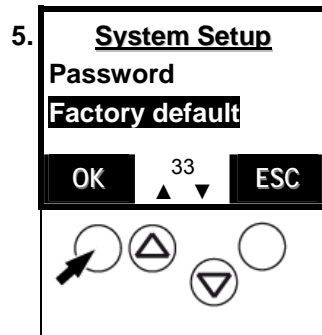
► Press [**OK**] to select "Factory default"

6.

Set factory
default
Are you sure?

OK   129   ESC
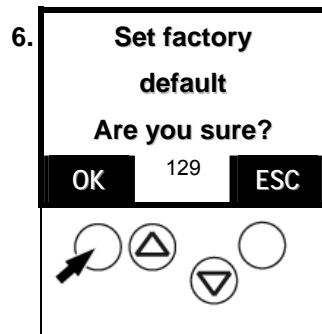
> Display of safety query:
Are you sure you want to reset to the factory settings?

► Press [**OK**] to confirm

7.

<u>**System Setup**</u>
Password
Factory default

OK   33   ESC
▲ ▼
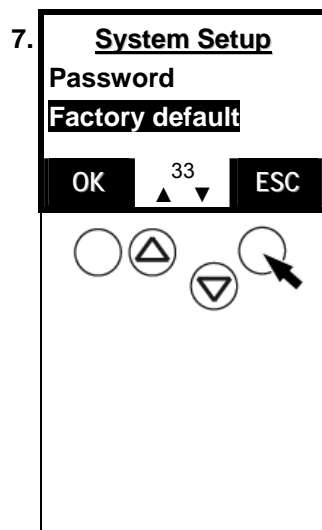
> Reset of the controllere to the settings on delivery. Some changes will not become effective before the next power-on.

> PLC programs are <u>not</u> deleted.

> The password is reset to level 1

> Return to screen 33

► Press [**ESC**] twice to return to the start screen

► Switch the unit off and on again

> The language of the controllere 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 controllerₑ 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 controllerₑ 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	A	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	å	166	ª	198		230	µ
7		39	'	71	G	103	g	135	ç	167	º	199		231	
8		40	(	72	H	104	h	136	ê	168	¿	200	╚	232	
9		41	)	73	I	105	i	137	ë	169	⌐	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	¼	204	╠	236	
13		45	−	77	M	109	m	141	ì	173	¡	205	=	237	
14		46	.	78	N	110	n	142	Ä	174	«	206	╬	238	
15		47	/	79	O	111	o	143	Å	175	»	207		239	
16	►	48	0	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	Æ	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	ò	181		213		245	
22	▬	54	6	86	V	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	Ü	186	║	218	┌	250	
27	←	59	;	91	[	123	{	155	¢	187	╗	219	█	251	
28	∟	60	<	92	\	124	¦	156	£	188	╝	220	▄	252	
29	↔	61	=	93	]	125	}	157	¥	189		221		253	²
30	▲	62	>	94	^	126	~	158	Pt	190		222		254	■
31	▼	63	?	95	_	127	⌂	159	ƒ	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 controllerₑ:

- 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 controllerₑ 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 resetting 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 controllerₑ. → 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 <u>5 to 20 seconds</u> 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 controllerℯ

The controllerℯ gives you the option of automatically transmitting the source code of the boot project to the controllerℯ. 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 controllerℯ, 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 controllerℯ.

► To do so, the following option must be activated in the CoDeSys® program:

► "Project" > "Options..." > select "Source download"
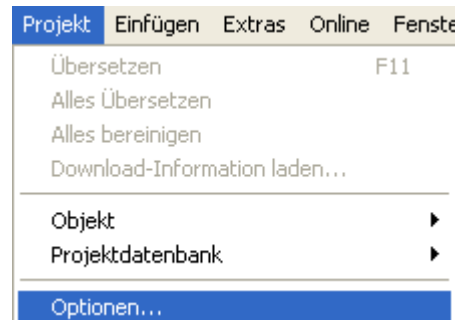
Menu "Options" | "Source download"
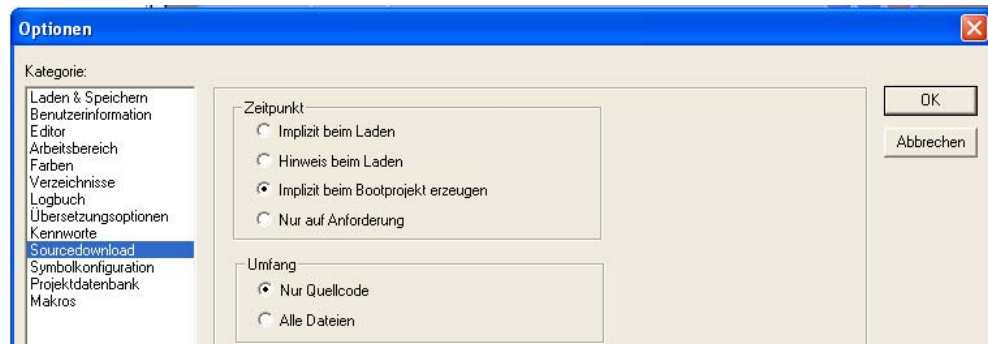
► Time = "Implicit on create boot project"
Extent = "Source code only"

► Press [**OK**] to confirm

> The source code is also transmitted to the controllerℯ when creating the boot project

Transmit source code from the controller_e to the PC

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

► Menu "File" > "Open…" in CoDe-Sys®
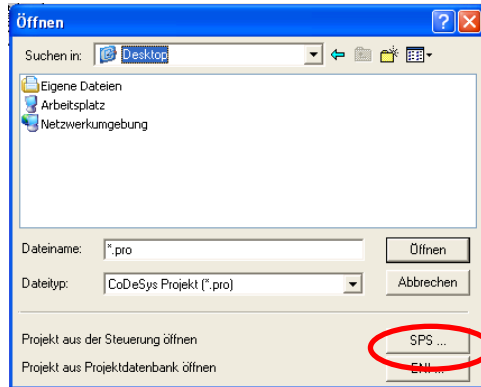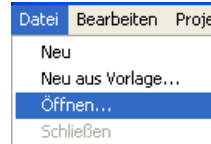
► Click on [**PLC…**]: "Open project from PLC"

► Click on the symbol [▼]
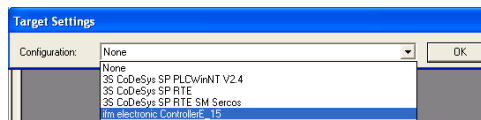
► Select "ifm electronic ControllerE" with the corresponding target number (here: 15)

► In the "Online" menu select "Communication parameters"
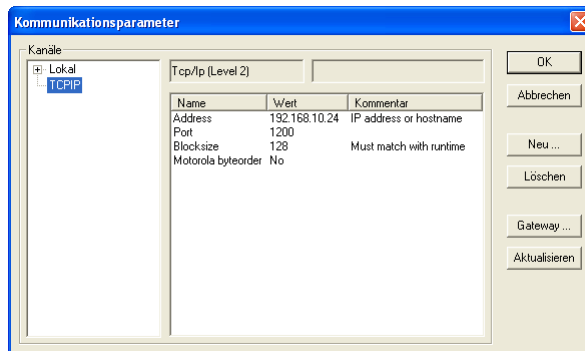
► Select the setting which matches the setting in the controller_e (→ CoDeSys® manual).

► Convince yourself that the project which you have transmitted from the controller_e 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 statical 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®:
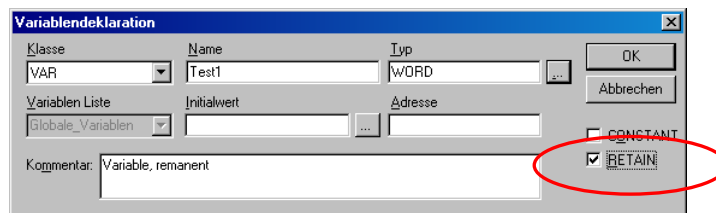
In addition, there are the remanent flag words MW 0...MW 79 to store dynamic values such as counter values. In case of power failure these 80 words are automatically stored by the operating system and restored when the voltage is restored. The flags in MW 80...MW 127 are not remanent!

12.5   System variables

System variables in the controllerₑ 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 controllerₑ 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

i

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.

Example

```
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

i

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:

```
0002
SLAVENUMBER              --       BYTE

                    Get_ASi_Input
       SlaveNumber─Slave
             FALSE─B_Slave
                 1─ASi_Master
```

read slave inputs as byte

```
0003
SLAVENUMBER              --       BYTE
NEWVALUE                 --       BYTE

                    Set_ASi_Output
         NewValue─value
      SlaveNumber─Slave
            FALSE─B_Slave
                1─ASi_Master
```

set slave outputs as byte

```
0004
SLAVENUMBER              --       BYTE

                    Get_ASi_Output
      SlaveNumber─Slave
            FALSE─B_Slave
                1─ASi_Master
```

read slave outputs as byte
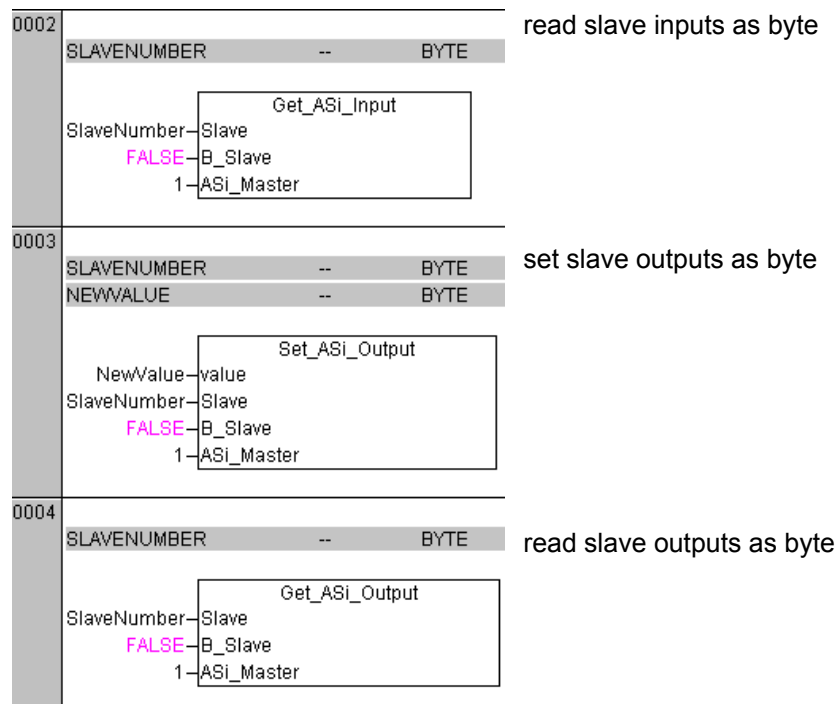
Indexed data access via table of pointers

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
```

```
0001 sl := slave;
0002
0003 IF (sl = 0) OR (sl > 64) THEN
0004     Get_ASi_Input := 0;
0005     RETURN;
0006 END_IF
0007
0008 IF B_slave AND (sl < 32) THEN
0009     sl := sl + 32;
0010 END_IF
0011
0012 IF ASI_Master = 2 THEN
0013     pSlaveInCyc := PointerList + 16#C4;
0014 ELSE
0015     pSlaveInCyc := PointerList + 16#24;
0016 END_IF
0017
0018 Get_ASi_Input := pSlaveInCyc^^[sl]AND 16#0F;
0019
```

For detailed information see the

→ supplementary documentation "User Manual for PLC Programming with CoDeSys® 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:
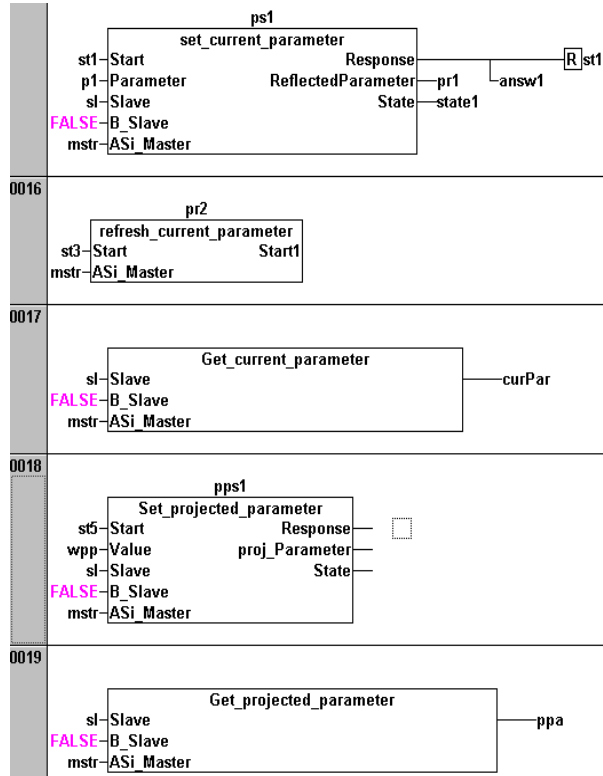
Changes the parameter in the slave "sl" on master "mstr"

After changing a parameter the parameter list for the master "mstr" in the controller_e 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_e

Reads the projected parameters for the slave "sl" from the parameter list in the controller_e 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
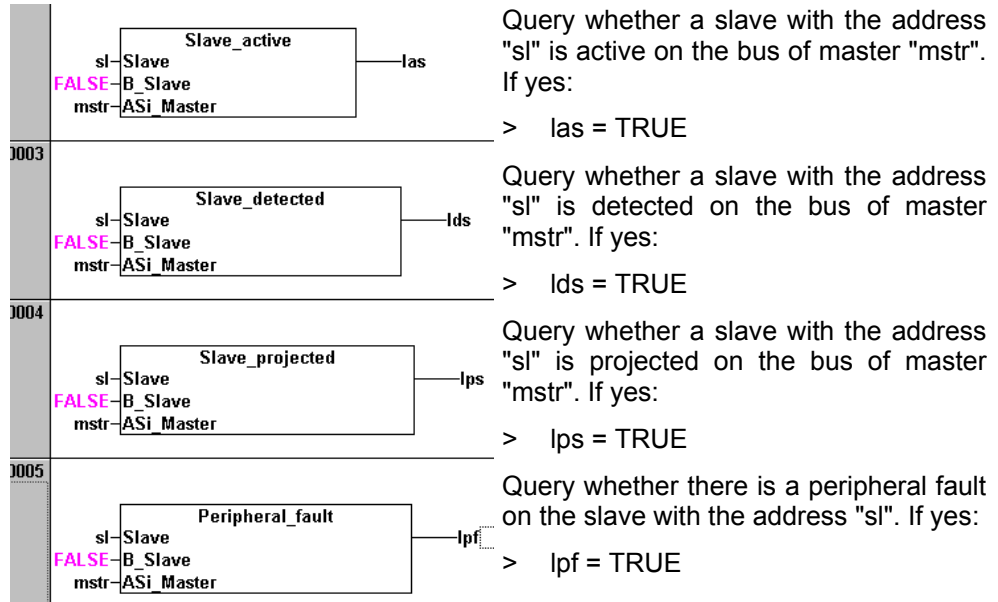
Access with pointers

```
0008  pLAS: POINTER TO POINTER TO ARRAY [0..3] OF WORD;
0009  LASx: ARRAY [0..3] OF WORD;

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:

FB: all slaves detected on master "mstr" are entered as projected in the LPS of the controllere

Program: reads the projected configuration of all A or single slaves on AS-i master "mstr"

Program: reads the current configuration of all A or single slaves on AS-i master "mstr"

Program: copies the current I/O configuration of the slave "sl" on master "mstr" to the variable "io"

Prerequisite: retrieve the FB Get_ASi_Config before

Program: copies the current ID code of the slave "sl" on master "mstr" to the variable "id"

Prerequisite: retrieve the FB Get_ASi_Config before

Note on network 0007 / 0008:
If the parameter "B_Slaves" is "TRUE" the corresponding statement applies to the "Configuration of all B slaves".
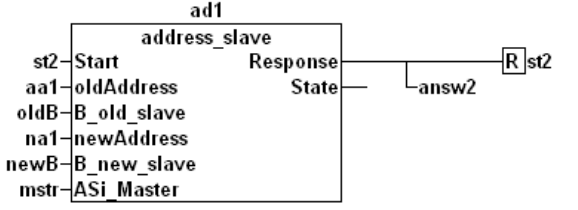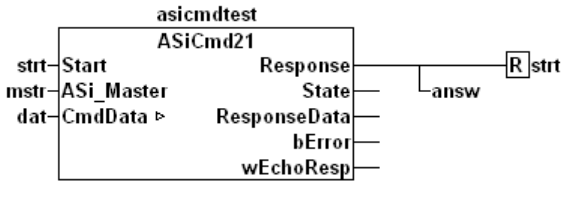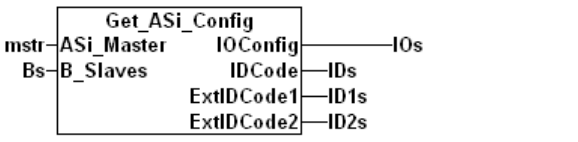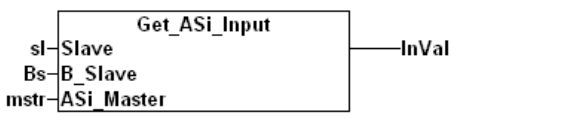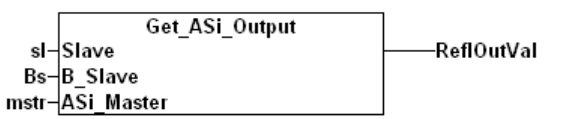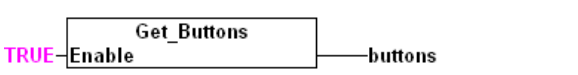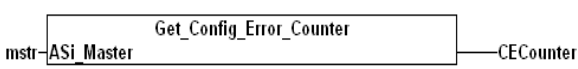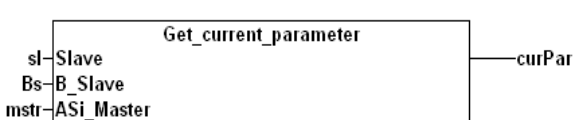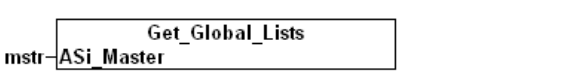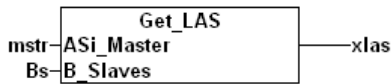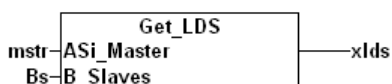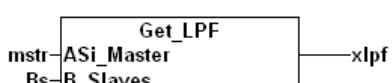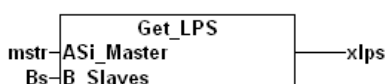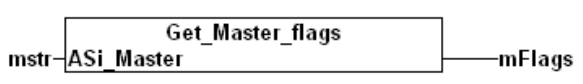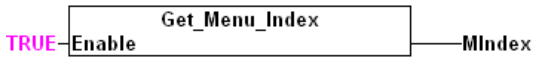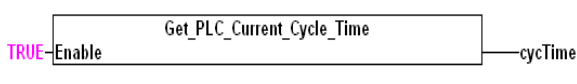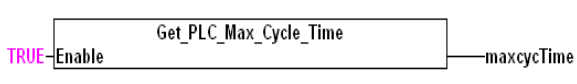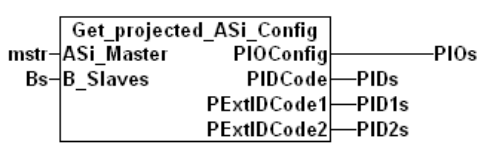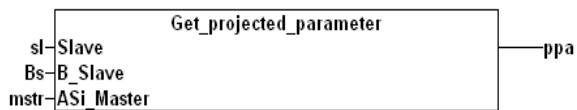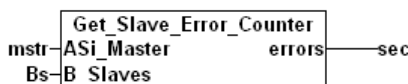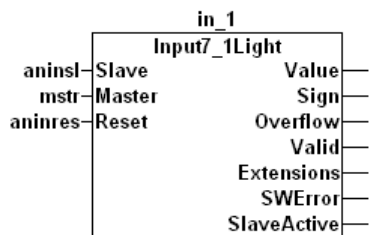
12.11   Overview system blocks
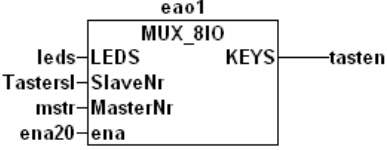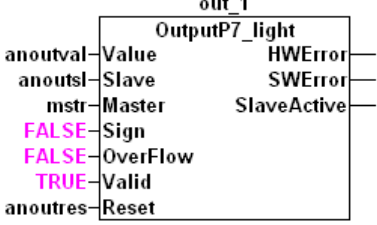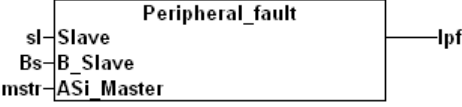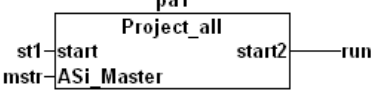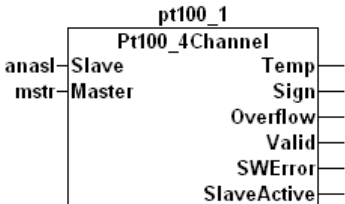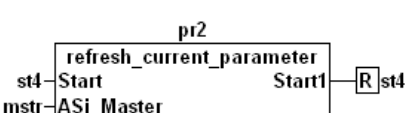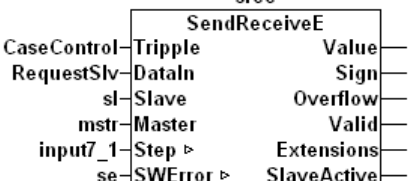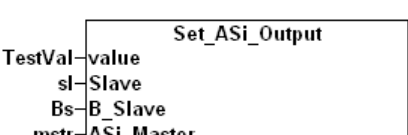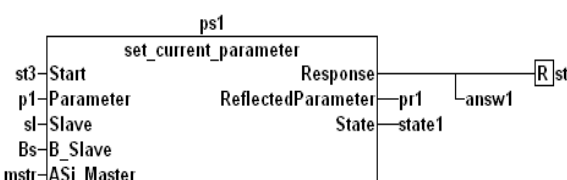
In addition to the CoDeSys® standard libraries another system library for the controller$_e$ is contained on the CD:
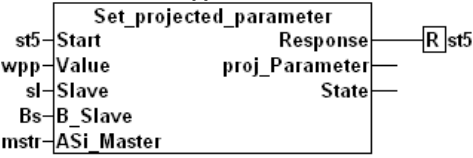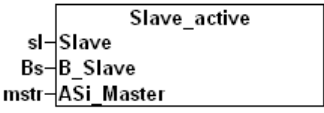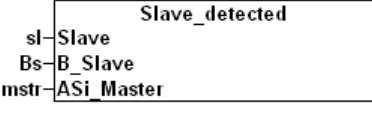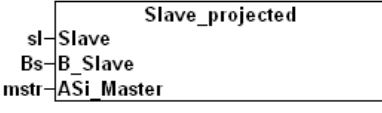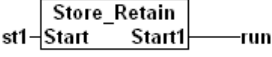
"ifm_AsiUtils_010000.lib" contains the blocks necessary for working with AS-i slaves version 2.x. In new projects the components of this library should be used for access to AS-i system information.

ifm_AsiUtils_010000.lib blocks

Changing the slave address from "oldAddress" to "newAddress" as soon as "Start" changes to TRUE	**ad1** **address_slave** st2–Start Response—⎤R st2 aa1–oldAddress State—�’answ2 oldB–B_old_slave na1–newAddress newB–B_new_slave mstr–ASi_Master
Executing an AS-i command (possible commands → description "command channel" in separate fieldbus manual)	**asicmdtest** **ASiCmd21** strt–Start Response—⎤R strt mstr–ASi_Master State—�’answ dat–CmdData ▷ ResponseData— bError— wEchoResp—
Reading the current configuration information of a connected AS-i slave	**Get_ASi_Config** mstr–ASi_Master IOConfig—IOs Bs–B_Slaves IDCode—IDs ExtIDCode1—ID1s ExtIDCode2—ID2s
Reading the current input values of an AS-i slave	**Get_ASi_Input** sl–Slave Bs–B_Slave —InVal mstr–ASi_Master
Reading the current output values of an AS-i slave	**Get_ASi_Output** sl–Slave Bs–B_Slave —ReflOutVal mstr–ASi_Master
Reading which button of the controller$_e$ is actuated	**Get_Buttons** TRUE–Enable —buttons
Reading the configuration error counter	**Get_Config_Error_Counter** mstr–ASi_Master —CECounter
Reading the current parameters of an AS-i slave	**Get_current_parameter** sl–Slave Bs–B_Slave —curPar mstr–ASi_Master
Updating the global slave lists	**Get_Global_Lists** mstr–ASi_Master

Reading the list of active slaves LAS	**Get_LAS** mstr—ASi_Master Bs—B_Slaves — xlas
Reading the list of detected slaves LDS	**Get_LDS** mstr—ASi_Master Bs—B_Slaves — xlds
Reading the list of slaves which detect an external peripheral fault LPF	**Get_LPF** mstr—ASi_Master Bs—B_Slaves — xlpf
Reading the list of projected slaves LPS	**Get_LPS** mstr—ASi_Master Bs—B_Slaves — xlps
Reading the current status of AS-i master flags	**Get_Master_flags** mstr—ASi_Master — mFlags
Reading the menu index in the controllere	**Get_Menu_Index** TRUE—Enable — MIndex
Reading the current PLC cycle time in [ms]	**Get_PLC_Current_Cycle_Time** TRUE—Enable — cycTime
Reading the maximum PLC cycle time in [ms]	**Get_PLC_Max_Cycle_Time** TRUE—Enable — maxcycTime
Reading the projected configuration information of an AS-i slave	**Get_projected_ASi_Config** mstr—ASi_Master PIOConfig — PIOs Bs—B_Slaves PIDCode—PIDs PExtIDCode1—PID1s PExtIDCode2—PID2s
Reading the projected parameter values of an AS-i slave.	**Get_projected_parameter** sl—Slave — ppa Bs—B_Slave mstr—ASi_Master
Reading the current number of faulty AS-i messages of an AS-i slave	**Get_Slave_Error_Counter** mstr—ASi_Master errors—sec Bs—B_Slaves
Only for 7.1 slaves Reading analogue input of a slave type 7.1	**in_1** **Input7_1Light** aninsl—Slave Value— mstr—Master Sign— aninres—Reset Overflow— Valid— Extensions— SWError— SlaveActive—

Description	Block
Multiplex reading and writing of 8 bits of a slave Transmitting 2 data bits and 2 address bits per cycle in 4 cycles	eao1 MUX_8IO leds—LEDS KEYS—tasten TastersI—SlaveNr mstr—MasterNr ena20—ena
Only for 7.1 slaves Writing analogue output of a slave type 7.1	out_1 OutputP7_light anoutval—Value HWError— anoutsl—Slave SWError— mstr—Master SlaveActive— FALSE—Sign FALSE—OverFlow TRUE—Valid anoutres—Reset
If a slave detects an external peripheral fault the output is TRUE	Peripheral_fault sl—Slave —lpf Bs—B_Slave mstr—ASi_Master
Updating AS-i configuration on an AS-i master as soon as "Start" changes to TRUE	pa1 Project_all st1—start start2—run mstr—ASi_Master
Requires library I71Light.lib Reading analogue inputs of a PT100 slave type 7.1	pt100_1 Pt100_4Channel anasl—Slave Temp— mstr—Master Sign— Overflow— Valid— SWError— SlaveActive—
After changing one or several parameters of AS-i slaves, the set of parameters must be updated by a positive edge on "Start"	pr2 refresh_current_parameter st4—Start Start1—R st4 mstr—ASi_Master
Retrieved by FB "Input7_1Light" Organises the communication with the analogue inputs of slaves type 7.1	sree SendReceiveE CaseControl—Tripple Value— RequestSlv—DataIn Sign— sl—Slave Overflow— mstr—Master Valid— input7_1—Step ▷ Extensions— se—SWError ▷ SlaveActive—
Setting the outputs of a slave to the contents of "value"	Set_ASi_Output TestVal—value sl—Slave Bs—B_Slave mstr—ASi_Master
Setting the current parameters of a slave as soon as "Start" changes to TRUE	ps1 set_current_parameter st3—Start Response—R st3 p1—Parameter ReflectedParameter—pr1 └answ1 sl—Slave State—state1 Bs—B_Slave mstr—ASi_Master

Selection of the operating mode of an AS-i master 1 = projection mode 0 = protected mode	sm1 Set_Mode mode−mode mstr−ASi_Master
Setting the projected parameters of an AS-i slave	pps1 Set_projected_parameter st5−Start Response−R st5 wpp−Value proj_Parameter− sl−Slave State− Bs−B_Slave mstr−ASi_Master
The output is TRUE if the slave is activated	Slave_active sl−Slave las Bs−B_Slave mstr−ASi_Master
The output is TRUE if the slave is detected	Slave_detected sl−Slave lds Bs−B_Slave mstr−ASi_Master
The output is TRUE if the slave is projected	Slave_projected sl−Slave lps Bs−B_Slave mstr−ASi_Master
Stores the variables defined as VAR_RETAIN in the flash memory **IMPORTANT:** due to the limited number of possible write access to the flash memory this command must not be carried out cyclically!	sr Store_Retain st1−Start Start1 run

Further information → software description

13 Operation

In this chapter you will find out what you can do with the controller_e 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_e?"

→ page 10-5, chapter 10.4
"How are the operating modes for the PLC changed?"
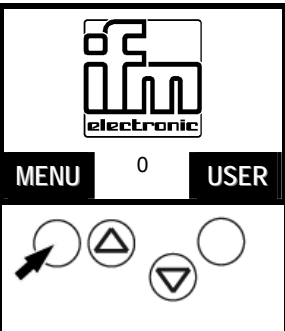
13.2 Information about the stored PLC program
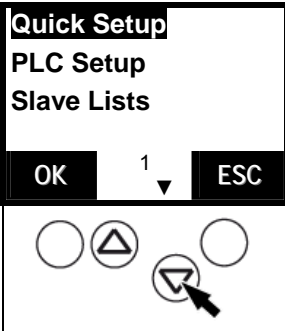
The controller_e gives you the data of the currently stored PLC program:

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

1.

► Press the [**MENU**] button

2.

► Press [▼] to scroll to "PLC Setup"

3.

► Press [**OK**] to select "PLC Setup"

4.

PLC Setup

PLC Settings

PLC Info

OK   42 ▼   ESC

► Press [▼] to scroll to "PLC Info"

5.

PLC Setup

PLC Settings

PLC Info

OK   42 ▲   ESC

► Press [**OK**] to select "PLC Info"

6.

Project Info

Name: ASi_Test
Version:
Date: 2006-06-02 13:16:26
Author: Adam Smith

94   ESC
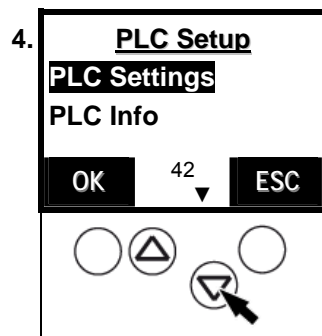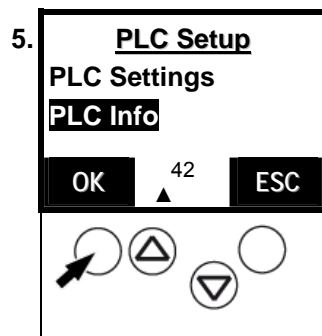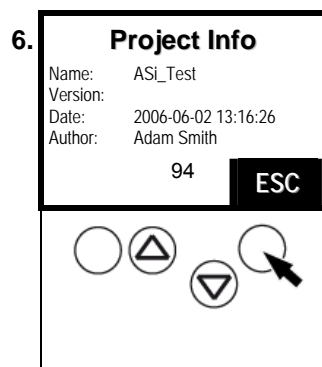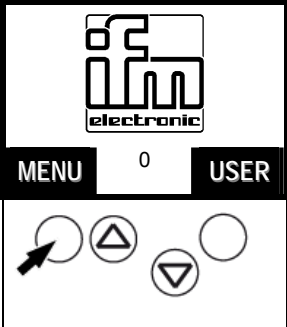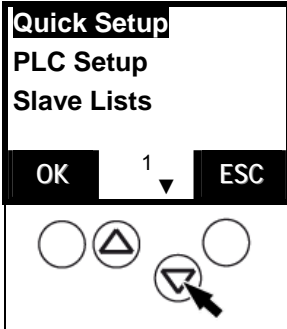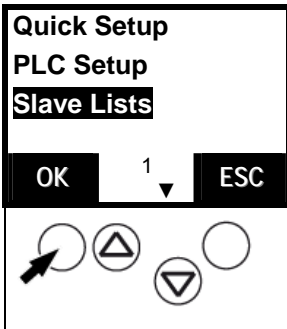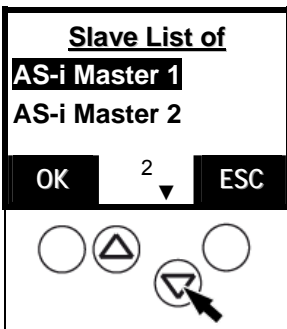
> Name = file name of the PLC program

> 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. Sl. ASi1
Project. Sl. ASi1
Active. Sl. ASi1

OK   ▲ 91 ▼   ESC

► Press [**OK**] to select "Detect. Sl."

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:
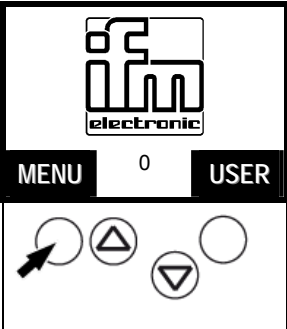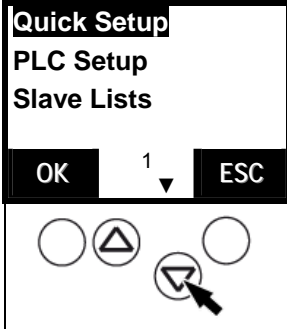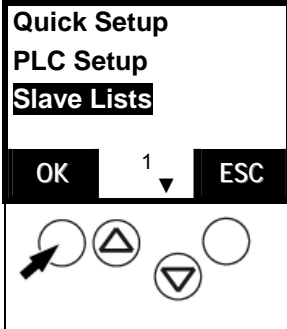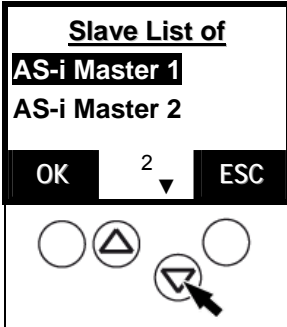
• an A/B slave was detected as A slave at the address 6,

• 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.
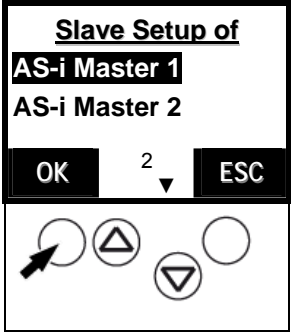
13.4 Display of projected slaves (list)

Indication at which slave address one (or several) slaves type A, B or S (standard) are *projected* on the bus.
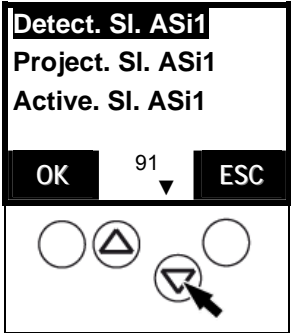
Definition: a slave is deemed as projected on the AS-i master if the slave is entered in the controllere in the "List of projected slaves" (LPS). To be entered in the LPS, the slave must be activated at this time and have a valid, unique address.

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
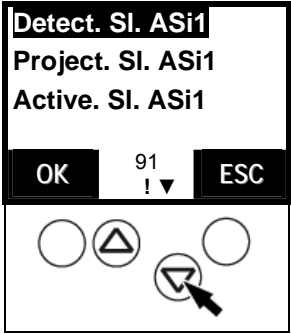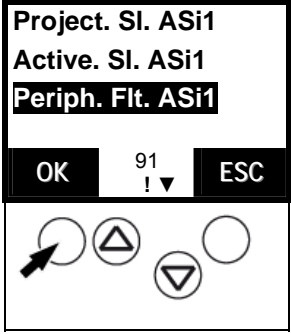
OK   2 ▼   ESC

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

6.

Detect. Sl. ASi1
Project. Sl. ASi1
Active. Sl. ASi1

OK   91 ▼   ESC
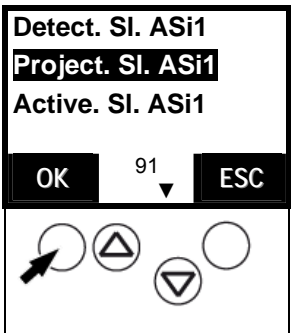
► Press [▼] to scroll to "Projected slaves"

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.

9.

Project. Sl. ASi1

	6	7	8	9	10	11
A	•	-	.	-	.	.
B	-	-	.	-	.	.
S	-	•	.	•	.	.

OK   4 ▲ ▼   ESC
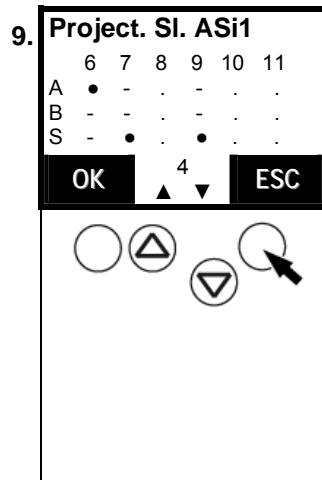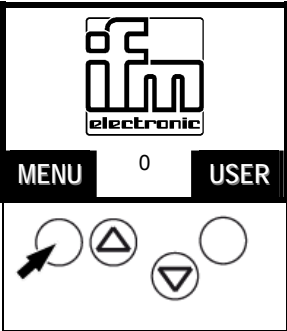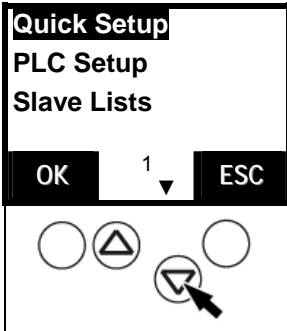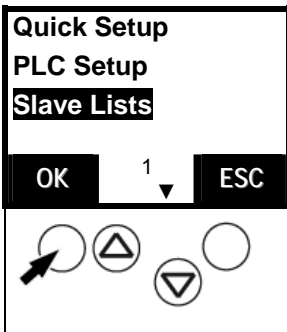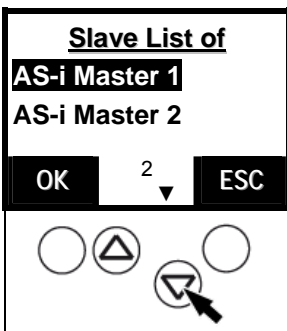
> A table of projected slaves is displayed.
> Here an example:

• 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.
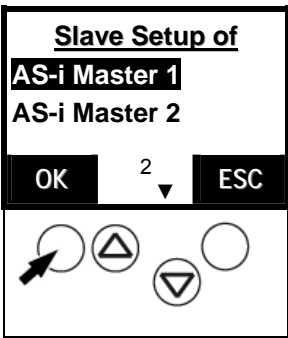
13.5 Display of active slaves (list)

Indication at which slave address the controller$_e$ has detected an *activated* slave type A, B or S (standard) on the bus.
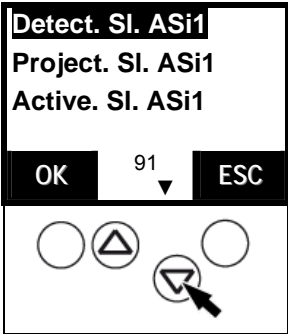
Definition: a slave is deemed as active on the AS-i master if the AS-i master cyclically exchanges data with the slave.

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.
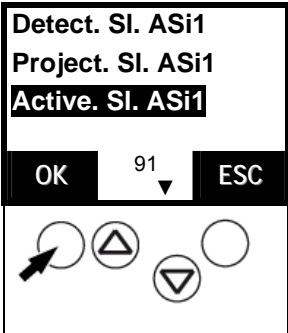
> **Detect. Sl. ASi1**
> **Project. Sl. ASi1**
> **Active. Sl. ASi1**
>
> OK   91 ▼   ESC

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

7.

> **Detect. Sl. ASi1**
> **Project. Sl. ASi1**
> **Active. Sl. ASi1**
>
> OK   91 ▼   ESC
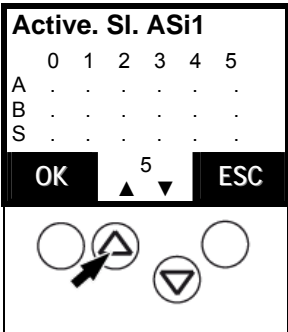
► Press [**OK**] to select "Active Sl."

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

9.

Active. Sl. ASi1	
6 7 8 9 10 11	
A • - . - . .	
B - - . - . .	
S - • . • . .	
OK 5 ESC	
▲ ▼	
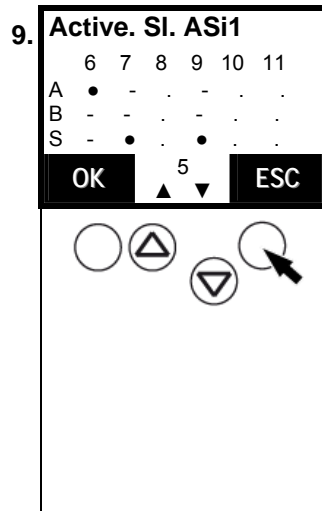
> A table of activated slaves is displayed. Here an example:

• 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

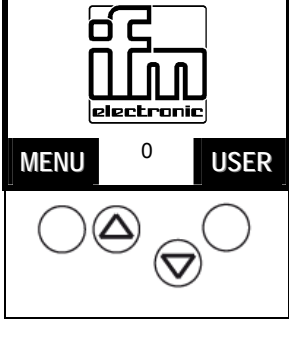> That's it.

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 pe-
ripheral fault?

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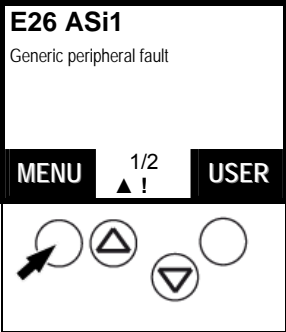
Examples:

- 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


MENU    1/2    USER
        ▲ !
```
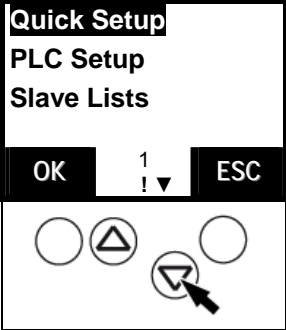
> LED [**CONF/PF**] flashes

> 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


OK    1    ESC
      ! ▼
```
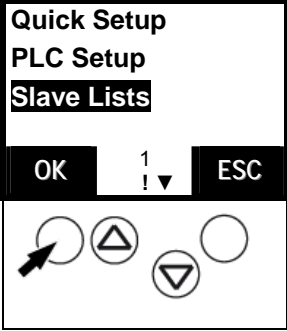
► Press [▼] to scroll to "Slave Lists"
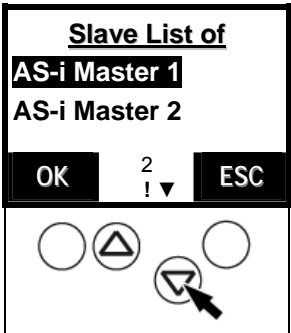
3.

```
Quick Setup
PLC Setup
Slave Lists


OK    1    ESC
      ! ▼
```
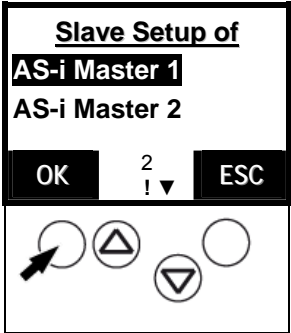
► Press [**OK**] to select "Slave Lists"

4.

Slave List of
AS-i Master 1
AS-i Master 2

OK   2   ESC
! ▼

► If necessary press [▼] to scroll to 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 "Periph. Flt."

7.

Project. Sl. ASi1
Active. Sl. ASi1
Periph. Flt. ASi1

OK   91   ESC
! ▼

► Press [**OK**] to select "Periph. Flt."

8.

Periph. Flt. ASi1

```
   0  1  2  3  4  5
A  .  .  .  .  .  .
B  .  .  .  .  .  .
S  .  .  .  .  .  .
```

OK   6   ESC
! ▼

> 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

9.

Periph. Flt. ASi1

	18	19	20	21	22	23
A	.	.	-	.	.	.
B	.	.	-	.	.	.
S	.	.	•	.	.	.

OK	6 ▲ ! ▼	ESC
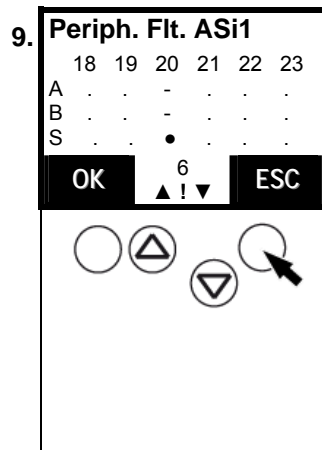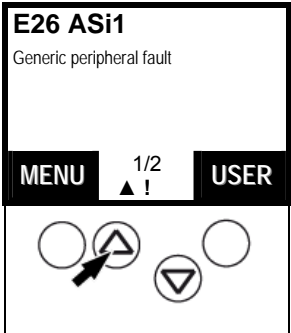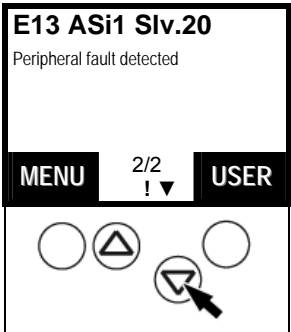
> A table of the slaves with peripheral faults is displayed.

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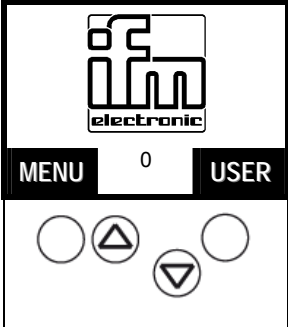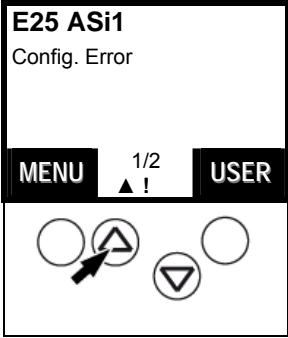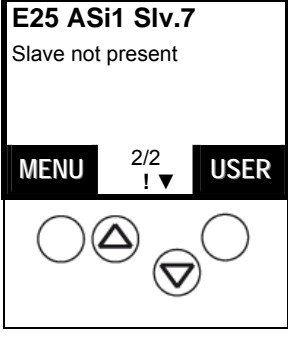
Indication at which slave address the controller﹢ has found a slave type A, B or S (standard) with a wiring fault (periphery) on the bus.

→ 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.

E25 ASi1
Config. Error

MENU 1/2 USER
▲ !

> The display on the left appears in addition to the **ifm** start screen: "Configuration error"

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

Cause: slaves which the controller_e 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.

E25 ASi1 Slv.7
Slave not present

MENU 2/2 USER
! ▼

> Display error message:
"AS-i Master 1: slave 7 missing"
S*o:* 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
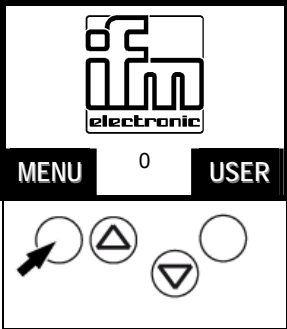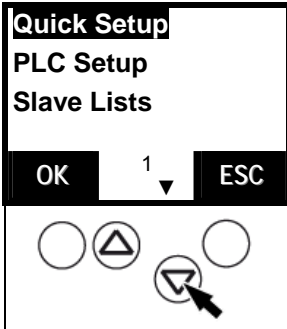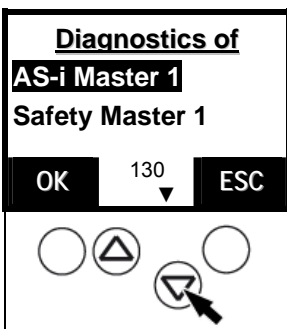
13.9 Number of AS-i voltage failures on the AS-i master
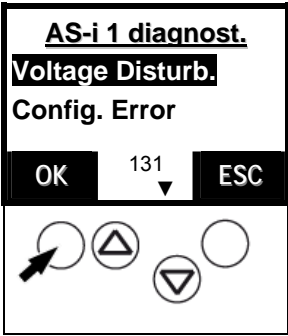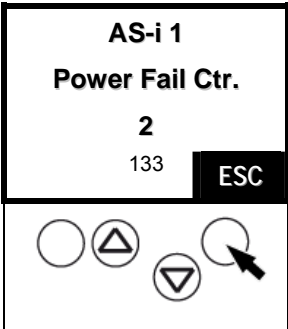
How often was an inadmissible decrease or interruption of the voltage supply of the AS-i bus responsible for system failures? The controller_e shows it:

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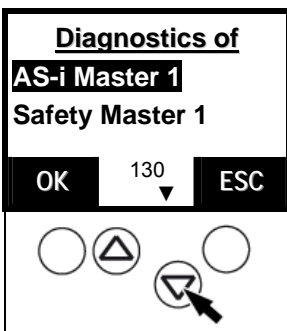→ chapter 16 "Error messages"

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
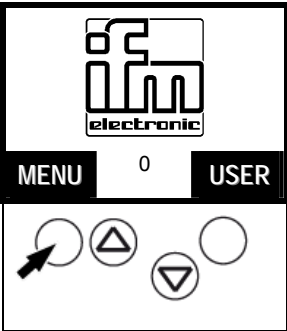
13.10   Number of configuration errors on the master
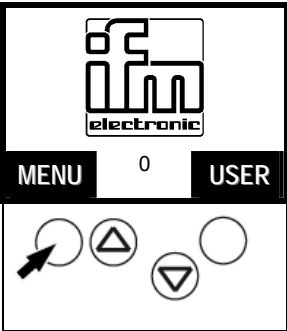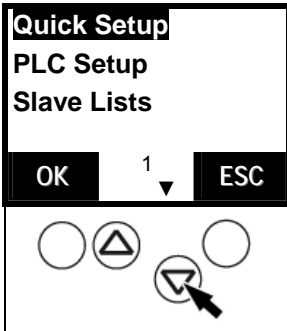
Display of the number of configuration errors on the master

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. Quick Setup
PLC Setup
Slave Lists

OK   1   ESC   ► Press [▼] to scroll to "Diagnostics"

3. Slave Lists
Address Slave
Diagnostics

OK   1   ESC   ► 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
             ▼
```
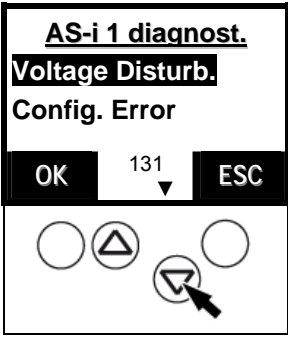
► Press [▼] to scroll to "Configuration error"

7.

```
    AS-i 1 diagnost.
  Voltage Disturb.
  Config. Error

    OK      131     ESC
             ▼
```

► Press [**OK**] to select "Configuration error"

8.

```
    AS-i Master 1

  Config Error Count.
          24
        50      ESC
```

> 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"
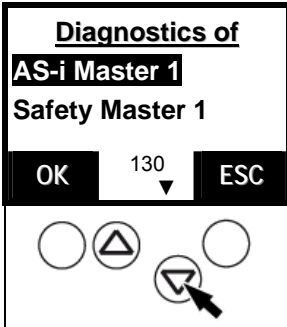
The error counter is reset...

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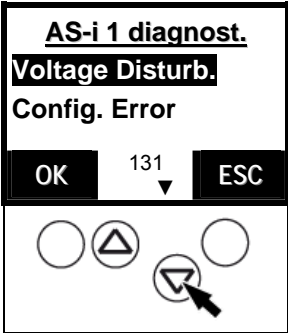
- with the function "Reset error counter", → page 13-25

1.   ► Press the [**MENU**] button
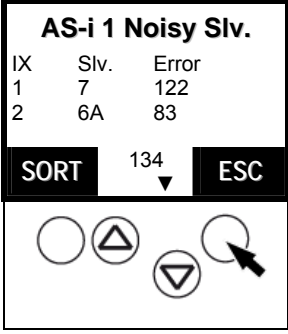
2.   ► Press [▼] to scroll to "Diagnostics"

3.   ► Press [**OK**] to select "Diagnostics"
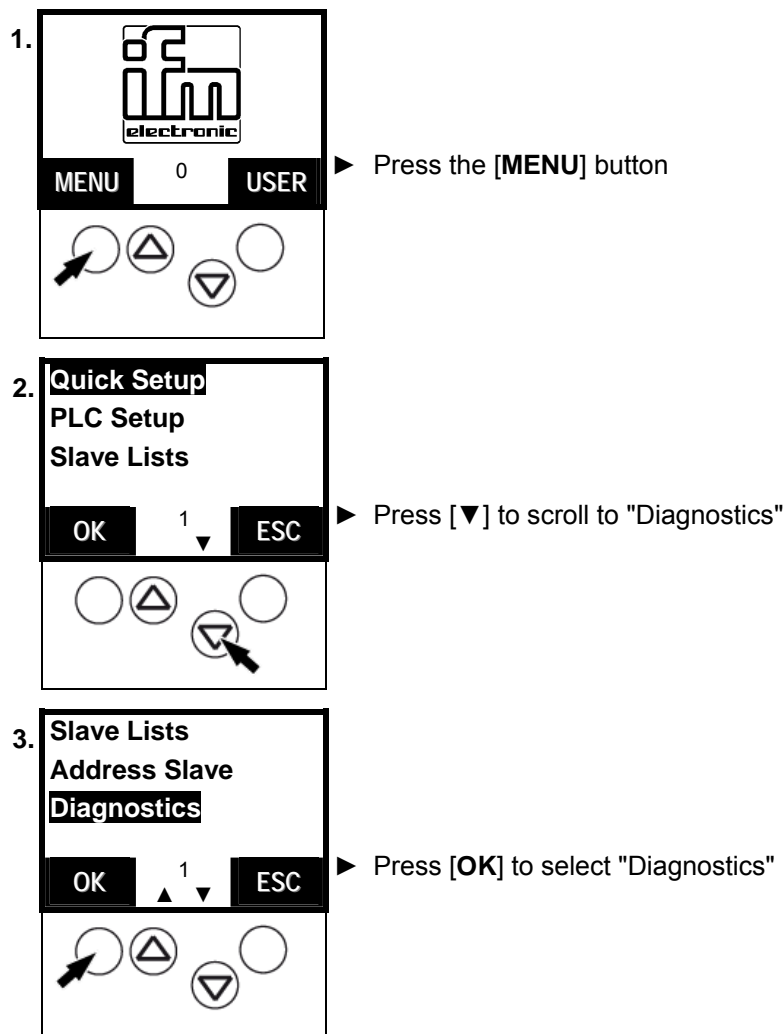
4.	**Diagnostics of** **AS-i Master 1** **Safety Master 1** OK 130 ▼ ESC	► If necessary press [▼] to scroll to another master
5.	**Diagnostics of** **AS-i Master 1** **Safety Master 1** OK 130 ▼ ESC	► Press [**OK**] to select the requested master
6.	**AS-i 1 diagnost.** **Voltage Disturb.** **Config. 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 %** 48 / s MORE 51 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
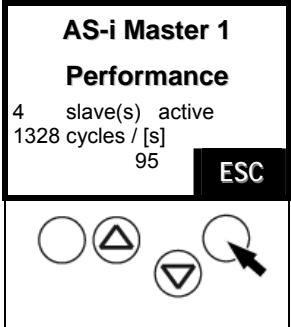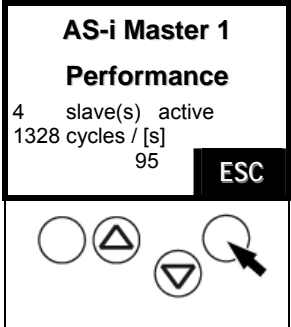
9.

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
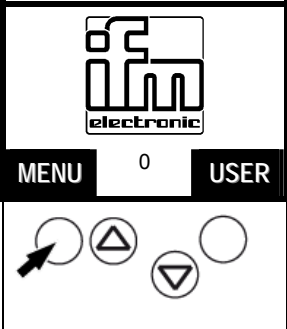
13.12 Number of disturbed messages on the master (of "Noisy Slaves")
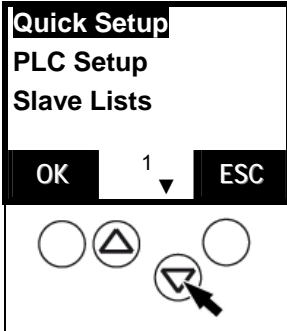
You would like to know how many distorted messages the different slaves have sent (since the last reset of the error counter)? The controller$_e$ shows it, sorted by the number of distorted messages.

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**
>
> 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 "Noisy Slaves"

7.

> **AS-i 1 diagnost.**
> **Telegr. Error**
> **Noisy Slaves**
>
> OK   131 ▲ ▼   ESC

► Press [**OK**] to select "Noisy Slaves"

8.

> **AS-i 1 Noisy Slv.**
>
> | IX | Slv. | Error |
> |----|------|-------|
> | 1 | 7 | 122 |
> | 2 | 6A | 83 |
>
> SORT   134 ▼   ESC

> 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_e.
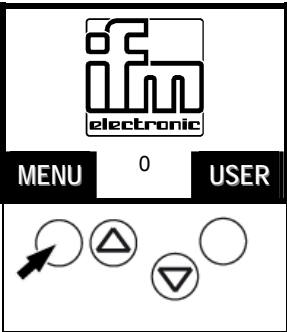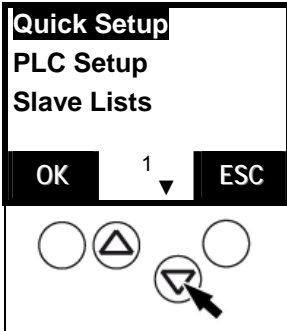
ℹ️	**Tip**
	You should not reset the diagnostic memory of the controllere before the analysis of the values stored so far.
	The reset process cannot be reversed.
ℹ️	**Tip**
	Password level 1 required → page 11-23, chapter "Password setting"

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
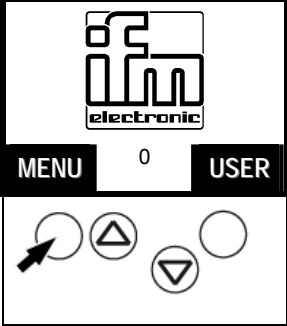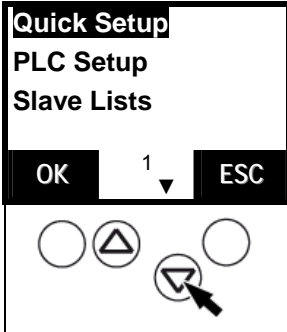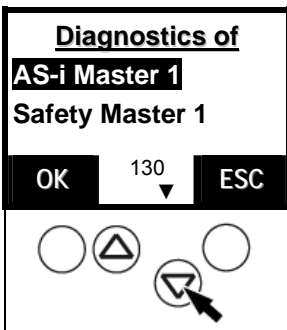
► Press [**OK**] to select "Reset Error Count."

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

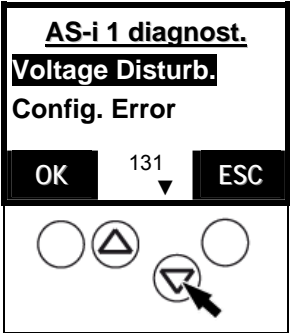## 13.14 Display of the longest cycle time

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.
Quick Setup
PLC Setup
Slave Lists

OK   1 ▼   ESC

► Press [▼] to scroll to "Diagnostics"

3.
Slave Lists
Address Slave
Diagnostics

OK   ▲ 1 ▼   ESC

► 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
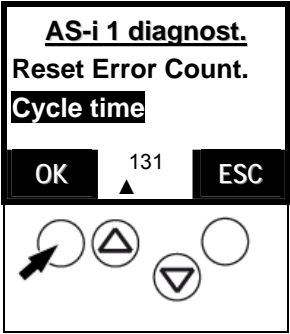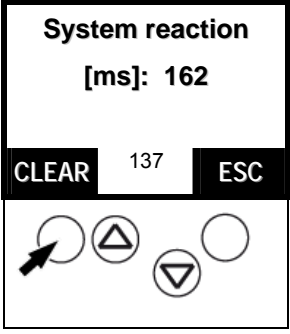
► Press [▼] to scroll to "Cycle time"

7.

AS-i 1 diagnost.
Reset Error Count.
Cycle time

OK   131 ▲   ESC
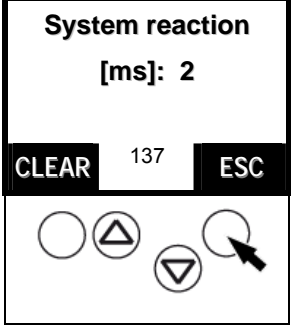
► Press [**OK**] to select "Cycle time"

8.

System reaction

[ms]: 162

CLEAR   137   ESC

> 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
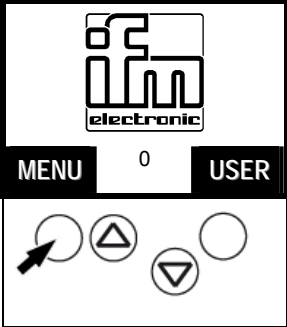
9.

System reaction
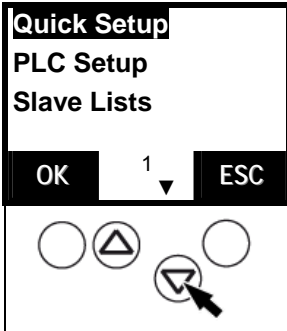
[ms]: 2

CLEAR   137   ESC

> 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 controller₆ 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**
>
> OK   130 ▲ ▼   ESC

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

6.
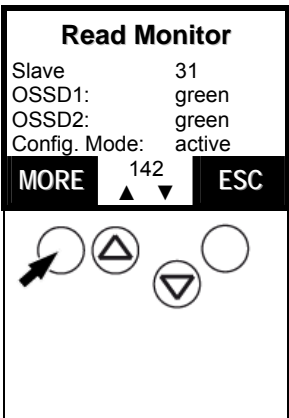
> **Safety Monitor**
> **Read Monitor**
> **Trigg.Slave**
>
> OK   141 ▼   ESC

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

a) no safety device triggered

7.

> **Read Monitor**
> Slave   31
> OSSD1:   green
> OSSD2:   green
> Config. Mode: active
> MORE   142 ▲ ▼   ESC

> 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**

Device Index 32 [1/3]
Colour: red
OSSD1 144 ▲ ! ▼ ESC

Like screen 143, but for OSSD2

► Press [**OSSD1**] to scroll to enable circuit 1
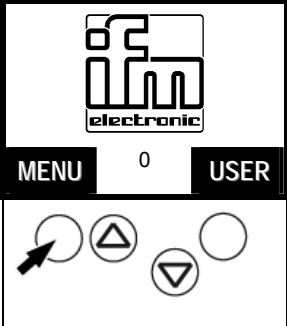
or:

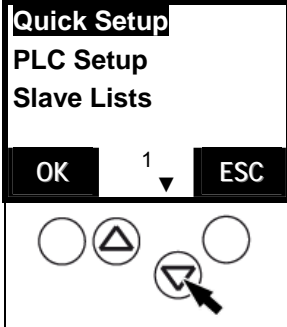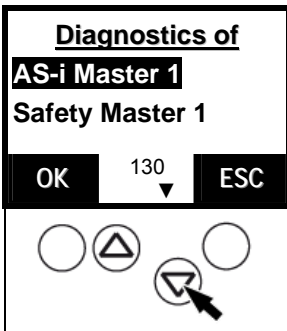► Press [**ESC**] to return to screen 141

* 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

10.

Safety Monitor
Read Monitor
Trigg.Slave

OK   141   ESC
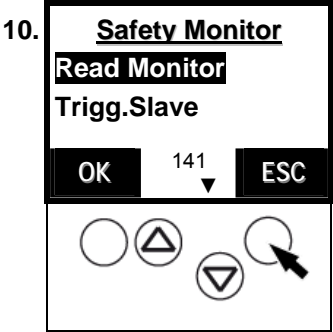
► Press [**ESC**] 3 times to return to the start screen

> That's it!

13.16   Read states of safety slaves

By means of the following method the controller℮ 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**
>
> OK   130 ▲ ▼   ESC

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

6.

> **Safety Monitor**
> **Read Monitor**
> **Trigg.Slave**
>
> OK   141 ▲ ▼   ESC

► Press [▼] to scroll to "Trigg.Slave"

7.

> **Safety Monitor**
> **Read Monitor**
> **Trigg.Slave**
>
> OK   141 ▲ ▼   ESC

► Press [**OK**] to select "Trigg.Slave"

a) Safety sensor not actuated / not triggered

8.

> **Trigg. Slaves**
> Address: - - - -
> Event:
>
> RESET   145 ▲ ▼   ESC

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

• Here: no sensor triggered
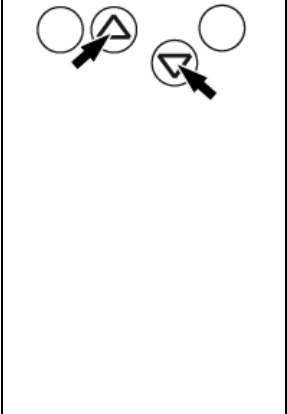 no further displays / functions

► 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_e that you have already stored with the "ASIMON" safety parameter-setting software in the safety monitor.

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

More information on the protocol → device manual of the safety monitor.
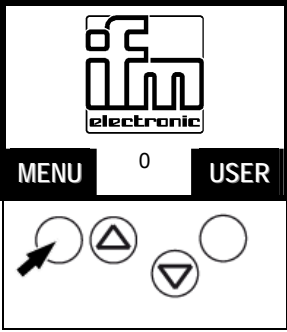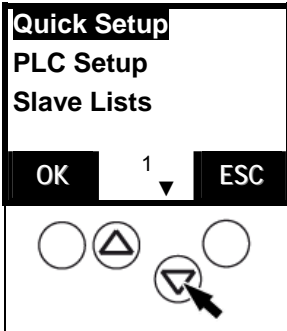
> **DANGER**
>
> The protocol changes output states of the set slaves.
>
> Danger for people and machine by uncontrolled machine states.
>
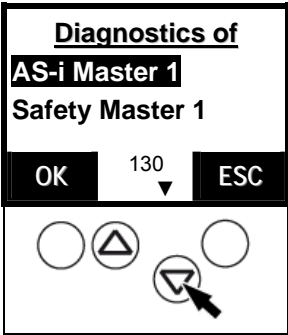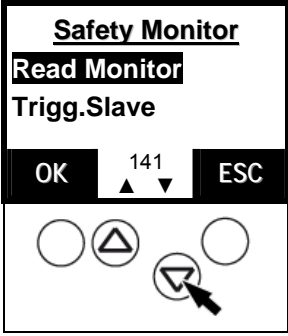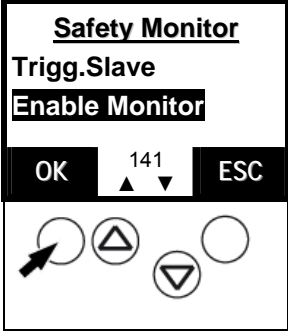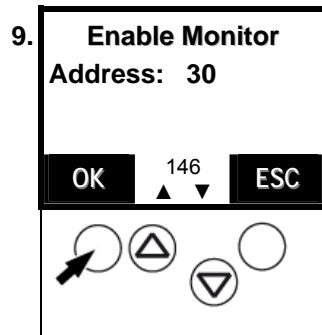> ►   Only set AS-i safety monitors in this menu.
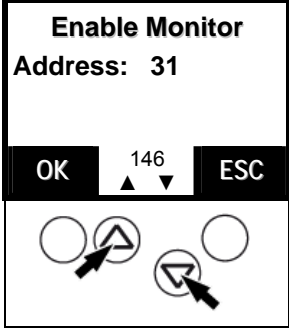
1.

►   Press the [**MENU**] button

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

   ►   Press [▼] to scroll to "Diagnostics"

3. **Slave Lists**
   Address Slave
   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

9.

Enable Monitor

Address: 30

OK   146   ESC

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

10.

Enable Monitor

**Slave address
already in LPM**

OK   146   ESC
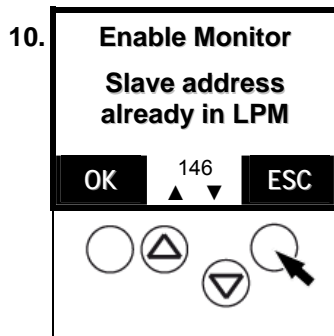
> Message that the selected address has been found in the list of projected monitors (LPM)

> Controllerₑ enters the AS-i address of the safety monitor in the list of participants

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

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

11.

Safety Monitor

Trigg.Slave

Enable Monitor

OK   141   ESC
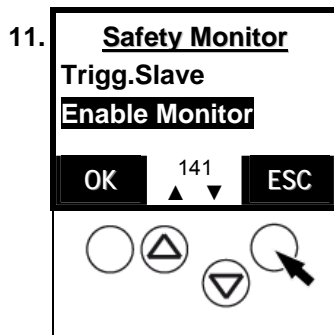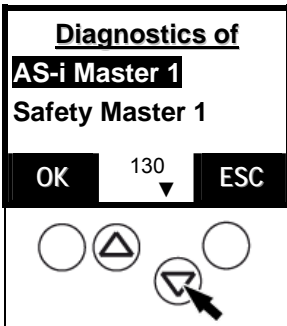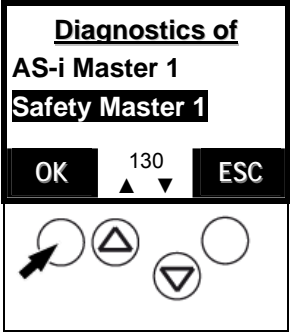
► Press [**ESC**] 3 times to return to the start screen

> That's it!

13.18 Reset the AS-i address(es) of the safety monitor(s)
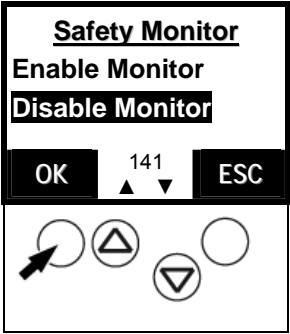
By means of the following method you can delete the AS-i address of the safety monitor in the controller$_e$.

After this the controller$_e$ 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"
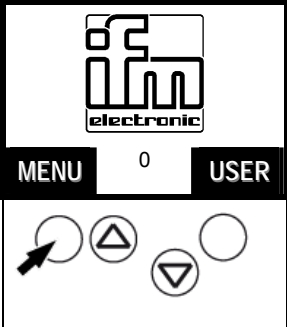
3.
► Press [**OK**] to select "Diagnostics"

4.
► Press [▼] to scroll to the requested safety master

5.

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 "Disable Monitor"

7.

Safety Monitor
Enable Monitor
Disable Monitor

OK 141 ▲ ▼ ESC

► Press [**OK**] to select "Disable Monitor"

8.
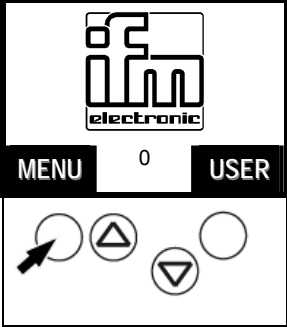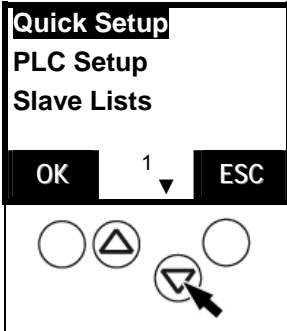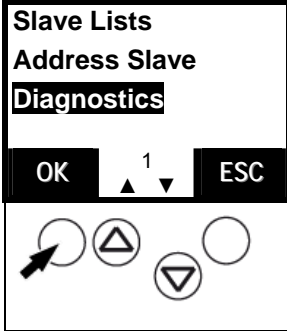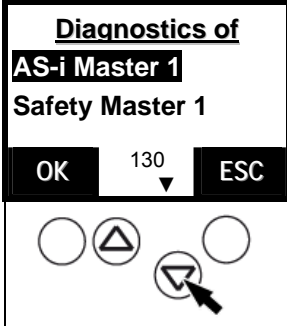
Disable Monitor
Address: 31

OK 147 ▲ ▼ ESC

>   Display of the address of the first found safety monitor

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

9.

Disable Monitor
Address: 31

OK 147 ▲ ▼ ESC

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

► Confirm the safety query with [**OK**]

10.

Safety Monitor
Enable Monitor
Disable Monitor
OK   141   ESC
▲ ▼

> The controllere deletes the AS-i address from the list of participants

> After this the controllere processes the safety monitor just like an ordinary slave – without taking into consideration safety-related data.
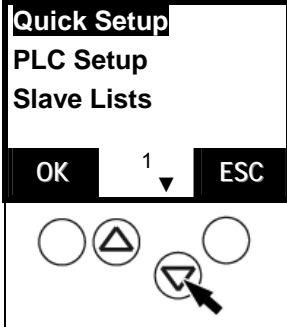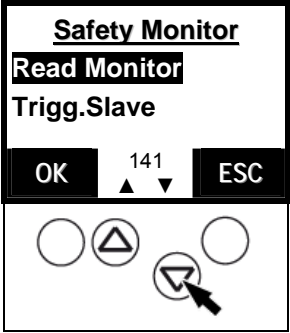
► Press [**ESC**] 3 times to return to the start screen

> That's it!

13.19 Set diagnostic behaviour of the safety monitor

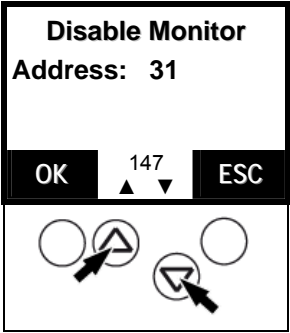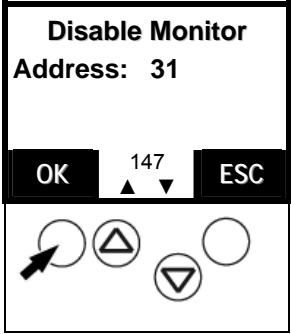By means of the following method you can set the parameters set via "ASIMON" for the safety monitor in the controllere.

1.

► Press the [**MENU**] button

2.

► Press [▼] to scroll to "Diagnostics"

3.

► Press [**OK**] to select "Diagnostics"

4.

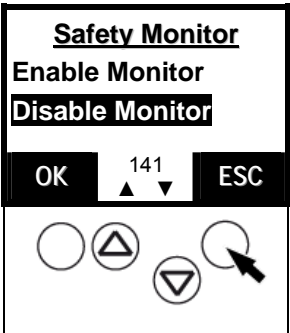► Press [▼] to scroll to the requested safety master

5.

Diagnostics of
AS-i Master 1
Safety Master 1

OK   130 ▲ ▼   ESC

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

6.

Safety Monitor
Read Monitor
Trigg.Slave

OK   141 ▲ ▼   ESC
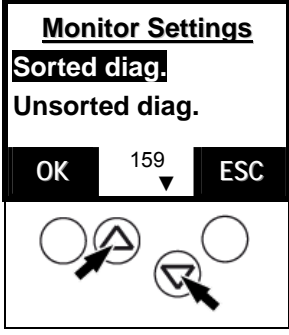
► Press [**▼**] to scroll to "Setup Monitor"

7.

Safety Monitor
Disable Monitor
Setup Monitor

OK   141 ▲ ▼   ESC
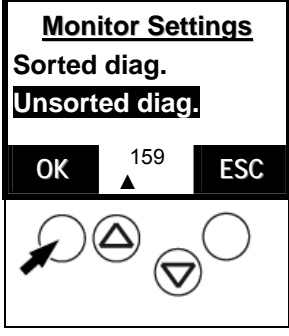
► Press [**OK**] to select "Setup Monitor"

8.

Monitor Settings
Sorted diag.
Unsorted diag.

OK   159 ▼   ESC

> 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.

OK   159 ▲   ESC

► Press [**OK**] to confirm the settings

10.

Safety Monitor
Disable Monitor
Setup Monitor

OK   141   ESC
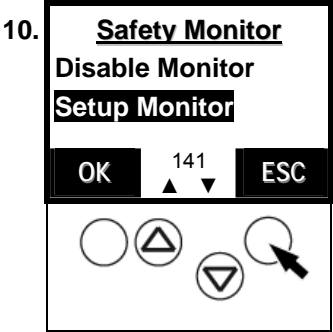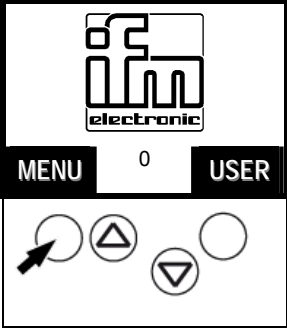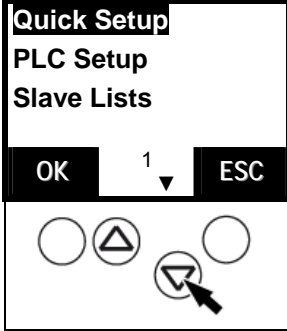
► Press [**ESC**] 3 times to return to the start screen

> 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

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 "Reset all"

7.

Safety Monitor
Setup Monitor
Reset all
OK   141 ▲   ESC
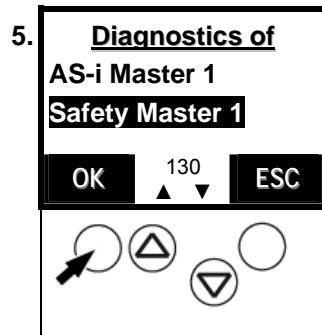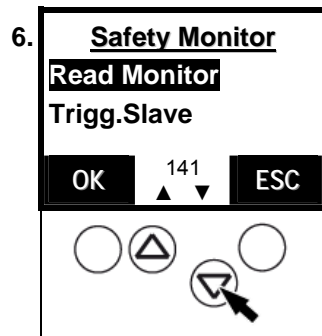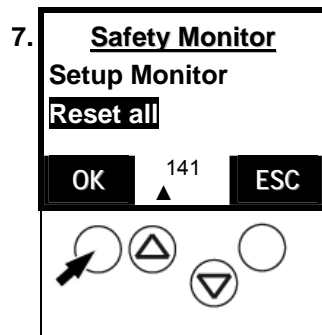
► Press [**OK**] to select "Reset all"

► Confirm the safety query with [**OK**]

8.

Diagnostics of
AS-i Master 1
Safety Master 1
OK   130 ▲ ▼   ESC
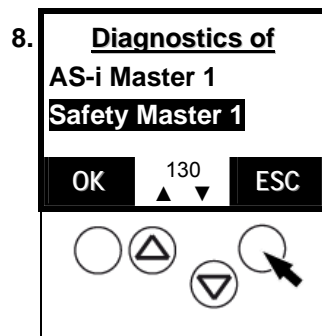
> The controllere deletes the entries in the event list

► Press [**ESC**] twice to return to the start screen

> That's it!

13.21 Change operating mode of the AS-i master

13-47

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?"
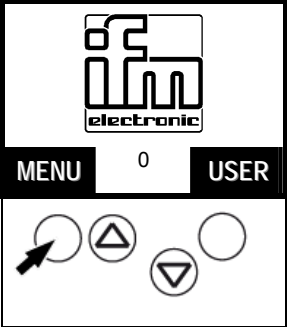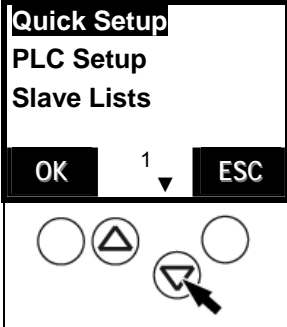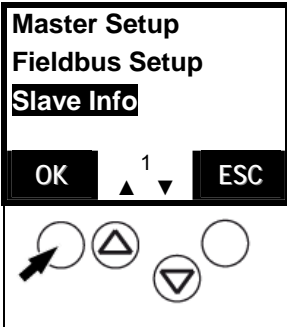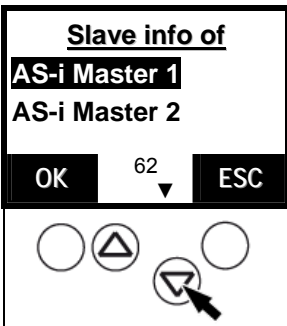
→ page 10-2, chapter 10.2
"How are the operating modes for the AS-i master changed?"

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
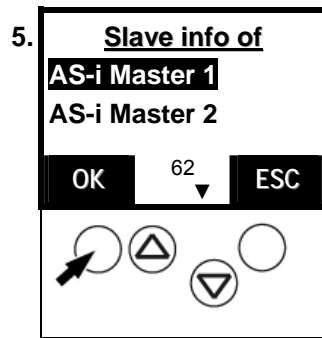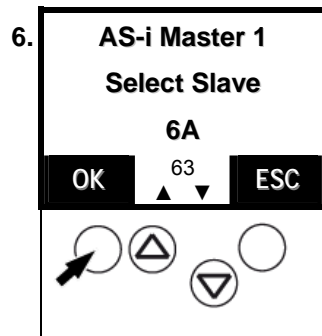
5.

Slave info of
AS-i Master 1
AS-i Master 2
OK   62 ▼   ESC

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

6.

AS-i Master 1
Select Slave
6A
OK   63 ▲▼   ESC

> Display of the lowest found valid slave address

► If necessary press [▲] / [▼] to scroll to another slave address active on the master

7.

AS-i 1   Slave 6A
Input: 0001 [01h]
Output: 0011 [03h]
MORE   64 ▲▼   ESC
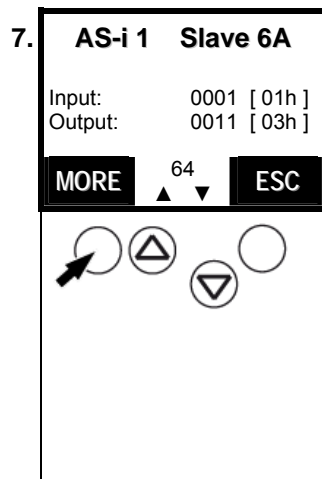
> Dynamic display of the digital inputs and outputs, as binary value and hexa value:

• 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

8.

AS-i 1 Slave 20
Analogue CH1 IN   +312
Analogue CH2 IN   +120
Analogue CH3 IN   +10
Analogue CH4 IN   +75
MORE   65 ▲▼   ESC
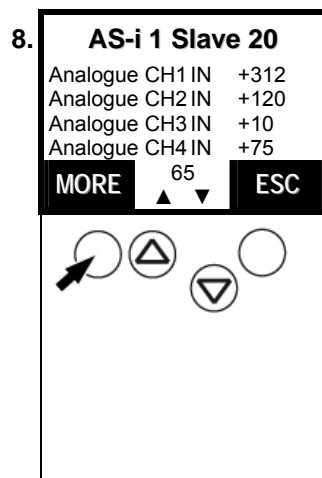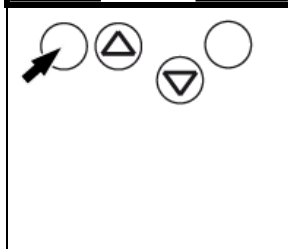
> Dynamic display of analogue channels as decimal values:

• 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.

```
      AS-i 1 Slave 7

   LAS   LDS   LPS   LPF

     •     •     •

  MORE      66      ESC
          ▲   ▼
```

> 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:
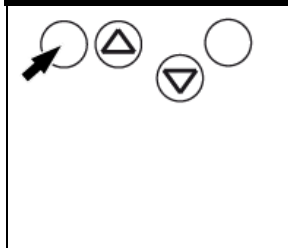
► Press [**ESC**] to scroll back to screen 62

10.

```
      AS-i 1 Slave 7

       Slave Profile
  (hex)  IO   ID   ID1  ID2
  Curr:  7    3    F    E
  Proj:  7    3    F    E
  MORE      67      ESC
          ▲   ▼
```

> 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:
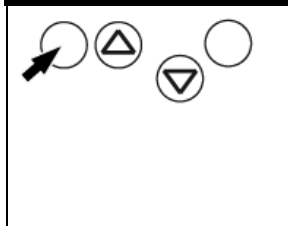
► Press [**ESC**] to scroll back to screen 62

14.

```
   AS-i 1    Slave 6A

        Parameter

  Current:      0111  [ 07h ]
  Projected:    0111  [ 07h ]
  MORE      71      ESC
          ▲   ▼
```

> 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.

```
      AS-i 1 Slave 7

      Telegram Error

          12

  RET       74      ESC
          ▲   ▼
```

> 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.
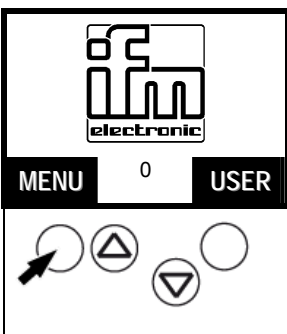
WARNING
The output values remain unchanged
Risk of personal injury! Risk of material damage to the machine/plant! After changing the slave outputs the output values remain unchanged.
The output values only change in the following cases:
• Manual new setting of the outputs via Slave Setup
• Starting the PLC program – the program processes the outputs
• Switch the controller$_e$ off and on again
► Secure the concerned area.
► Only trained personnel must manually set the outputs.
► Switch the outputs off again immediately after the end of the test.
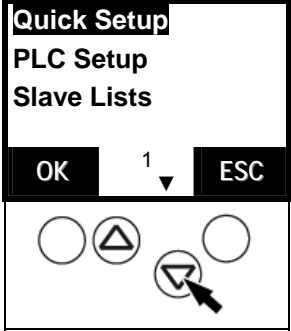
Tip
Changes to the outputs are <u>not</u> effective in the following cases:
• The PLC is in the RUN mode (LED [PLC RUN] lights).
• AND: The corresponding outputs are processed by the PLC.
• Changes of digital outputs on analogue modules.
• Changes of analogue outputs on digital modules.
► Switch PLC to the operating mode STOP → page 10-4, chapter "How are the operating modes for the PLC changed?"
LED [**PLC RUN**] flashes

Tip
Password level 2 required → page 11-23, chapter "Password setting"

1.

► Press the [**MENU**] button

2.

| Quick Setup |
| PLC Setup |
| Slave Lists |
| OK   1 ▼   ESC |
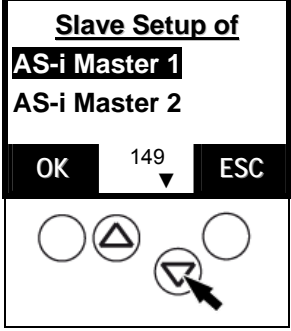
► Press [▼] to scroll to "Slave Setup"

3.

| Fieldbus Setup |
| Slave Info |
| Slave Setup |
| OK   ▲ 1 ▼   ESC |
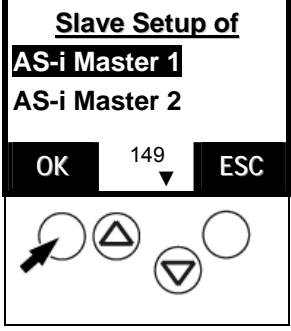
► Press [**OK**] to select "Slave Setup"

4.
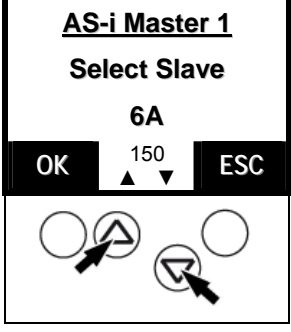
| Slave Setup of |
| AS-i Master 1 |
| AS-i Master 2 |
| OK   149 ▼   ESC |

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

5.

| Slave Setup of |
| AS-i Master 1 |
| AS-i Master 2 |
| OK   149 ▼   ESC |

► Press [**OK**] to select the requested AS-i master

6.

| AS-i Master 1 |
| Select Slave |
| 6A |
| OK   ▲ 150 ▼   ESC |

>   Display of the lowest found valid slave address

► If necessary press [▲] / [▼] to scroll to another slave address

7.

| AS-i Master 1 |
| Select Slave |
| 6A |

OK   150   ESC
      ▲ ▼

► Press [**OK**] to select the requested slave
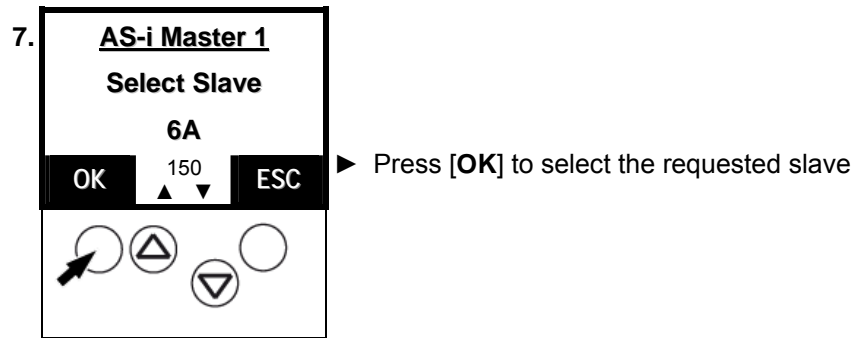
Continue with: "Set digital output"   → page 13-54
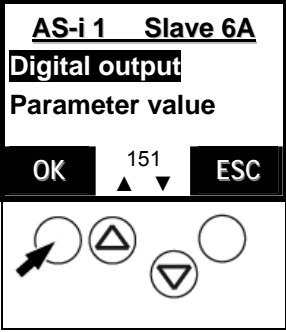
Continue with: "Set analogue output"   → page 13-56
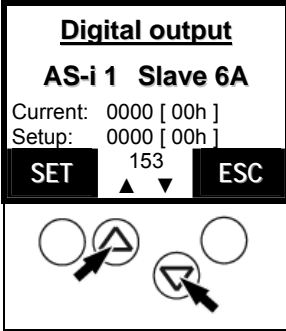
Set digital output
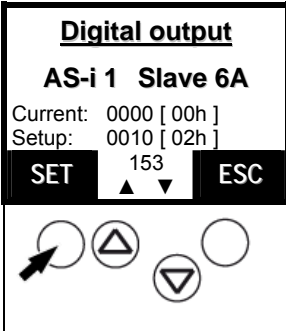
8.

```
AS-i 1    Slave 6A
Digital output
Parameter value

OK      151      ESC
         ▲   ▼
```
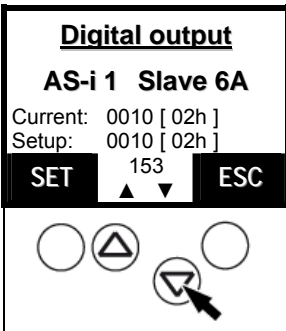
► Press [**OK**] to select "Digital output"

9.

```
   Digital output

AS-i 1   Slave 6A
Current:  0000 [ 00h ]
Setup:    0000 [ 00h ]
SET      153      ESC
          ▲   ▼
```
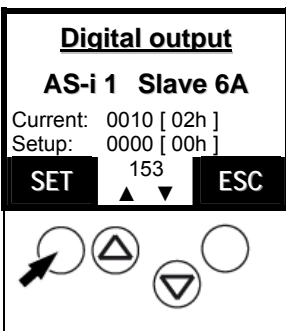
> Current = digital outputs current value binary / hexa-decimal

> Setup = digital outputs target value binary / hexadecimal

► Press [▲] / [▼] to set the requested target value

10.

```
   Digital output

AS-i 1   Slave 6A
Current:  0000 [ 00h ]
Setup:    0010 [ 02h ]
SET      153      ESC
          ▲   ▼
```

> Setup = set target value

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

11.

```
   Digital output

AS-i 1   Slave 6A
Current:  0010 [ 02h ]
Setup:    0010 [ 02h ]
SET      153      ESC
          ▲   ▼
```

> 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"

12.

```
   Digital output

AS-i 1   Slave 6A
Current:  0010 [ 02h ]
Setup:    0000 [ 00h ]
SET      153      ESC
          ▲   ▼
```

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

13.
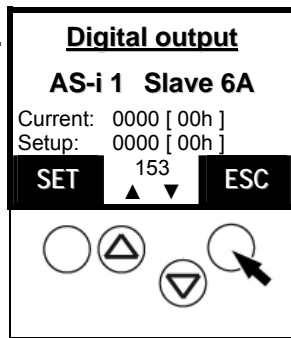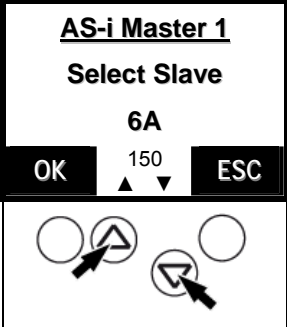
Digital output
AS-i 1   Slave 6A
Current: 0000 [00h] Setup: 0000 [00h]
SET   153   ESC   ▲ ▼

> 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.
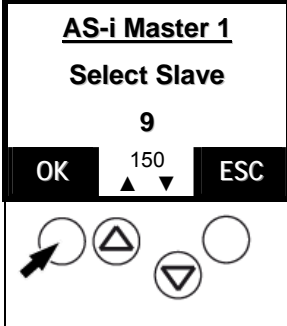
► Press **[ESC]** twice to return to screen 150

Set analogue output
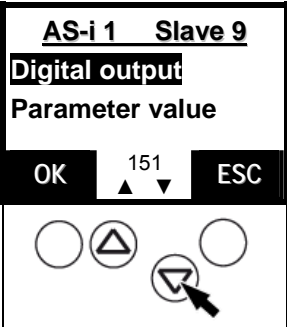
6.

AS-i Master 1

Select Slave
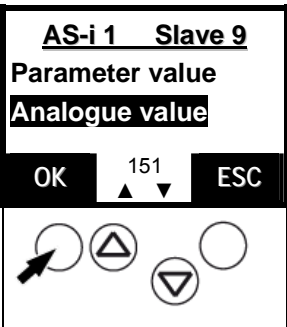
6A

OK   150 ▲ ▼   ESC

> Display of the lowest found valid slave address

► If necessary press [▲] / [▼] to scroll to another slave address

7.

AS-i Master 1

Select Slave

9

OK   150 ▲ ▼   ESC
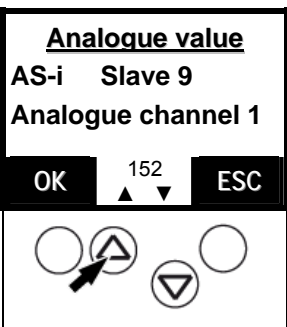
► Press [**OK**] to select the requested slave

8.

AS-i 1   Slave 9

Digital output

Parameter value

OK   151 ▲ ▼   ESC

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

9.

AS-i 1   Slave 9

Parameter value

Analogue value

OK   151 ▲ ▼   ESC

► Press [**OK**] to select "Analogue value"

10.

Analogue value

AS-i   Slave 9

Analogue channel 1

OK   152 ▲ ▼   ESC

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

11.
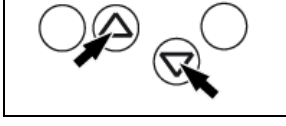
> **Analogue value**
> **AS-i   Slave 9**
> **Analogue channel 1**
>
> OK   152 ▲ ▼   ESC

► 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
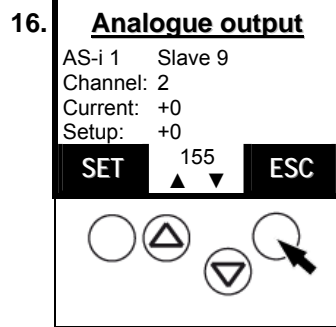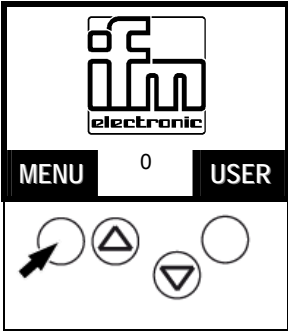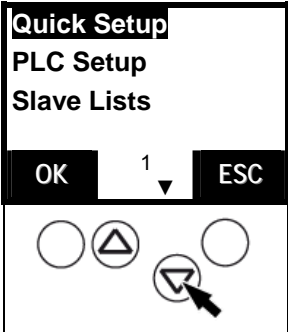
16.

Analogue output

AS-i 1   Slave 9
Channel: 2
Current: +0
Setup: +0

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.
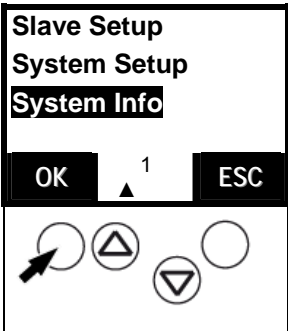
► Press **[ESC]** twice to return to screen 150
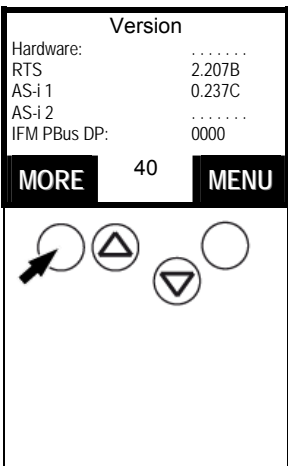
13.24 Display system parameters

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

1.

► Press left [**MENU**] button

2.

Quick Setup
PLC Setup
Slave Lists

OK   1 ▼   ESC

► Press [▼] to scroll to "System Info"

3.

Slave Setup
System Setup
System Info

OK   1 ▲   ESC

► Press [**OK**] to select "System Info"

4.

Version
Hardware: . . . .
RTS   2.207B
AS-i 1   0.237C
AS-i 2   . . . .
IFM PBus DP: 0000

MORE   40   MENU
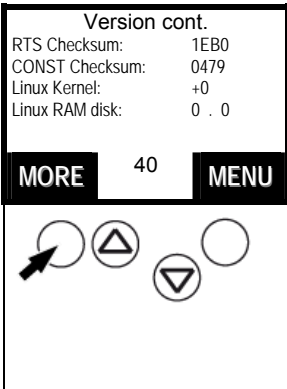
> Display of system versions:

• Indication of the hardware version

• Operating system of the controller_e

• 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.

Version cont.	
RTS Checksum:	1EB0
CONST Checksum:	0479
Linux Kernel:	+0
Linux RAM disk:	0 . 0

MORE   40   MENU

> 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.

Serial No

65A35DA11001

OK   41   MENU

> Display of the serial number of the controllere
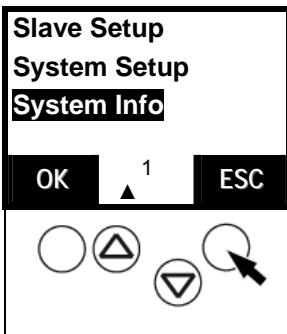
► Press [**OK**] to scroll to the next page

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.

Slave Setup

System Setup

System Info

OK   1   ESC

► Press [**ESC**] to return to the start screen

> That's it!

14   Scale drawing

14-1
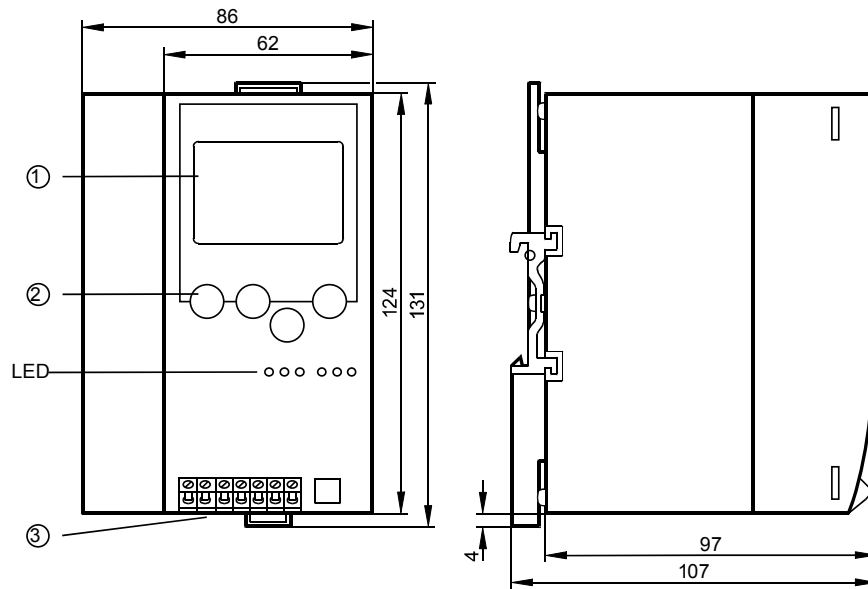
Figure: dimensions of the controllere

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	• A/B slaves • Peripheral fault detection • Analogue Plug+Play (profile 7.3 / 7.4) • Extended ID codes
Other features	• 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	• 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	• Programs • Functions • Function blocks	
Operations	• Binary combinations • Arithmetics • Moving and rotating • Comparisons • Math. functions • Text processing • Jumps and return	
Data types	• Binary • Fixed point (byte, word, double word)	

	• Floating point • String • Array • Structure • Pointer • Date and time
Processing times	< 1µs 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

16-1

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

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.

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: • 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 controllerₑ although 2 masters should be present. Possible causes: defective hardware	► Replace controllerₑ and project again
B05	Two masters detected in the system The operating system can detect 2 masters in the controllerₑ although only 1 master should be accessible. Possible cause: defective hardware	► Replace controllerₑ 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 controllerₑ and project again

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$_e$ 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".	► 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	► 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	► Project slaves again: "Menu" > "Quick Setup" → page11-15, chapter "End configuration"
E13	Peripheral fault detected on at least one connected slave	→ 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.	► 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.	► Check slave connections ► Check AS-i line

Error message	Cause(s)	Solution
E22	Slave 0 detected The master is in the "Protected mode" and detects a slave with the address 0 on the AS-i bus. 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.	► Switch master to the operating mode "Projection mode". → page 10-2, chapter 10.2 "How are the operating modes for the AS-i master changed?"
E23	Slave 0 has wrong profile The master is in the "Protected mode" and detects a slave with the address 0 on the AS-i bus. 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.	► Check and replace slave ► Project slaves again: "Menu" > "Quick Setup" → page 11-15, chapter "End configuration"
E24	Automatic addressing not activated The master is in the "Protected mode" and detects a slave with the address 0 on the AS-i bus. 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.	► Activate "Automatic addressing" in the master: → page 11-8, chapter "Automatic individual addressing of slaves"
E25	Projection error of the master The master is in the "Normal operating mode" and detects a projection error. Possible causes: • 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.	► Check the detected and projected slave profile in the menu "Slave Info". → page 13-48, chapter 13.22 "Display of slave data" ► Check the entries of the slaves in the lists LAS, LDS, LPS, LPF in the menu "Slave Lists". → page 13-3, chapter 13.3 "Display of detected slaves (list) " → page 13-5, chapter 13.4 "Display of projected slaves (list)" → page 13-8, chapter 13.5 "Display of active slaves (list)" → page 13-11, chapter 13.6 "Display of slaves with peripheral fault (list)"
E26	Peripheral fault detected on the AS-i bus The master is in the "Normal operating mode" and detects that at least one slave on the AS-i bus signals a periphery fault.	→ page 13-11, chapter 13.6 "Display of slaves with peripheral fault (list)" → page 13-14, chapter 13.7 "Display slave with peripheral fault"

Error message	Cause(s)	Solution
E27	Normal operation of the master not active The master reports that it is not in the "Normal operating mode". Possible causes: 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. Other causes which can lead to the error message directly after the device has been switched on: 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.	On 1: ► Check the AS-i voltage supply on the master and replace it – if necessary On 2: ► Check AS-i voltage supply on the master and replace it – if necessary On 3: ► Switch the PLC off and on again ► Replace the controller$_e$ and project again On 4: ► Switch the PLC off and on again ► Replace the controller$_e$ and project again On 5: ► Wait. ► If too long: → 4. On 6: ► 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	Safety slave triggered. 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.	► Check slave ► Remove the cause of the error

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	General flash failure This error message contains all the unsuccessful operations which have to do with the integrated flash device. For further details please refer to the following error messages.	► Check further error messages
F01	Invalid flash command The operating system has received an invalid command for the flash function block. Possible cause: error in the command from the PLC.	► Check and correct command ► Repeat the command
F02	Erasure of the flash sector failed The flash device has not executed the command to erase a flash sector. Possible cause: access to the flash module which currently processes commands.	► Repeat the command
F03	Flash verification failed The data which were to be stored by the flash device could not be verified. Possible cause: access to the flash module which currently processes commands.	► Repeat the command
F04	Timeout The flash device reports a timeout during a command execution. Possible cause: access to the flash module which currently processes commands.	► Repeat the command
F05	Invalid command The flash device has received an invalid command. Possible cause: software error in the operating system.	► Check and correct command ► Repeat the command

Error message	Cause(s)	Solution
F06	Timeout of the response of the flash The operating system has found a time-out during the execution of a flash command. Possible cause: Access to the flash module which currently processes commands.	► Repeat the command
F07	Erasure of the PLC sectors in the flash failed The attempt to delete the sectors in which the PLC program is stored was unsuccessful. Possible causes: 1. The sectors were blocked against overwriting (AC1325 and AC1326). 2. Access to the flash module which currently processes commands. 3. Flash device defective.	On 1: ► Command not possible On 2: ► Repeat the command On 3: ► Replace the unit and project again
F08	Storage of the PLC program in the flash failed Storage of the PLC program in the flash device was unsuccessful. Possible causes: 1. The sectors were blocked against overwriting (AC1325 and AC1326). 2. Access to the flash module which currently processes commands. 3. Flash device defective.	On 1: ► Command not possible On 2: ► Repeat the command On 3: ► Replace the unit and project again
F09	Storage of the remanent data in the flash failed Storage of the remanent data in the flash module failed (%MB... [Var_Retain]). Possible causes: 1. Access to the flash module which currently processes commands. 2. Flash device defective.	On 1: ► Repeat the command On 2: ► Replace the unit and project again
F10	PLC program write-protected. The attempt to store the PLC program in the flash device was unsuccessful. Possible cause: the PLC program was write-protected.	► Disable write protection via program "freeflash.pro".

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

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	Error on command execution An error has occurred during the execution of an AS-i command which has stopped the execution of the command. For further details please refer to the following error messages.	► Check further error messages
M02	Slave not found 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.	► Check connections of the slave ► Connect slave again
M03	Slave 0 found The master detects a slave with the address 0 on the AS-i bus and can therefore not execute the command. Example: the address of a slave is to be changed while a slave with the address 0 is present on the AS-i bus.	► Remove the slave with the address 0 or address it correctly
M04	Slave with the same address found During the execution of a command the master detects that there already is a slave at the requested address on the AS-i bus. 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.	► Remove one of the slaves with double address ► Readdress the remaining slave ► Reactivate the removed slave
M05	Delete the old slave address The attempt to reprogram a slave to the address 0 fails. Example: the AS-i slave has a limited number of possibilities to change the address, these are now exhausted.	► Replace the slave
M06	Reading the "Extended ID Code 1" The master does not receive any or an invalid answer during the retrieval of the "Extended ID code 1". Example: attempt to readdress an A/B slave to another address.	► Repeat the command

Error message	Cause(s)	Solution
M07	Writing to slave failed 1. The attempt of the master to read-dress 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, chapter10.2 "How are the operating modes for the AS-i master changed?" ► Check and replace the slave ► Project slaves again: "Menu" > "Quick Setup" → page11-15, chapter "End configuration"

Error message	Cause(s)	Solution
M11	Slave data invalid This error message has a multiple meaning and thus depends on the requested command: 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.	On 1: ► Address 0B is not permitted ► Write valid address On 2: ► Write valid value
M12	7.4 Sequence error During the transfer according to the "7.4 slave protocol" the master detected an error in the triple sequence of the slave. Possible causes: 1. Interference on the bus 2. Software error in the AS-i slave	On 1: ► Remove the cause of the error On 2: ► Contact AS-i specialist or manufacturer
M13	Timeout in 7.4 transfer During the transfer to the "7.4 slave protocol" the master detected a timeout in the communication with the operating system. Possible cause: 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 sec. 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.	► Shorten the PLC cycle by optimising the program, avoid program loops and complex arithmetic operations
M14	Invalid slave address This error message has a multiple meaning and thus depends on the requested command: 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.	On 1: ► Correct the slave address On 2: ► Indicate a valid address On 3: ► Indicate a valid address

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: 1. Interference on the bus 2. Software error in the AS-i slave	On 1: ► Remove the cause of the error On 2: ► 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	► 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.	► 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.	► Correct the value "Dlen" or: ► 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.	► 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$_e$ tried to send a command to the master that it does not know.	► 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 controllere)

- 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	Unknown operating mode of the runtime system The set operating mode of the device ("RUN"/"STOP"/"GATEWAY") is unknown to the operating system. Possible cause: modification of the device from a gateway variant into a device with PLC support.	► Switch the device off and keep the left function key pressed during the switch-on operation.
R02	Error MUX field master 1 During the transfer of the MUX fields by the operating system the master detected an invalid field number. Possible causes: 1. Parts of the operating system have been overwritten by the PLC. 2. Impermissible interference on the 24V power supply.	On 1: ► Check the reason for the wrong command and correct it. ► Reinstall operating system On 2: ► 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	Protocol error (EDET) master 1 The master has detected a protocol error during the transfer of the data fields. Possible causes: 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 message	Cause(s)	Solution
R06	General RTS program failure The operating system has detected an invalid status in the process while executing the program internally. Possible cause: operating system software error.	► Reinstall the operating system
R07	Master not in the "Projection mode" The attempt was made to execute an AS-i command which is only permitted in the "Projection 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?"
R08	No PLC program loaded The attempt was made to start a PLC program although no program has been loaded in the controllerₑ.	► Load PLC program into the controllerₑ: → page 11-4, chapter "Connecting the programming unit"
R09	RS-232C transmission error (baud rate) detected The hardware of the integrated serial interface chip has found a transfer error in the RS-232C data flow. Possible causes: 3. Baud rate setting in the controllerₑ different from the setting in the PC. 4. Other programs (e.g. messenger) send via the RS-232 interface of the PC	On 1: ► Adjust baud rate: → page 11-1, chapter 11.1 "Setting the baud rate of the serial interface" On 2: ► Stop other programs on the PC
R10	RS-232C buffer overflow detected A buffer overflow was detected in the serial receive buffer of the RS-232C interface. Possible causes: 1. RS-232 message too long or baud rate too high. 2. Faulty connection cable between PC and RS-232C connection on the controllerₑ	On 1: ► Check the driver or reduce the baud rate On 2: ► Replace connection cable
R11	RS-232C parity check failed The parity check of the serial data flow of the RS-232C interface was unsuccessful. Possible cause: electromagnetic interference	► Reduce interference on the RS-232 cable by means of the following measures: - screen the cable - reduce the cable length - remove the interfering source

Error message	Cause(s)	Solution
R12	The serial protocol was changed The decoding of the serial data flow was changed. Possible cause: command during the serial data flow to change the device to the Test Mode / Normal Operating Mode.	► Remove error in the protocol driver
R13	24 V supply voltage unstable During normal operation voltage drops below 18 V were found on the 24 V power supply cable.	► Stabilise the 24 V supply voltage so that it is permanently above 20 V Better: ► Use switched-mode power supply
R14	Restart of the unit after failure of the 24 V supply voltage The voltage failure of the 24V power supply caused the device to start again.	► Acknowledge the message > Controllerℇ resumes normal operating mode In future: ► Stabilise the 24 V supply voltage so that it is permanently above 20 V Better: ► Use switched-mode power supply
R15	Timeout of the main processor detected The main processor has detected a timeout. Possible causes: • 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.	► Ground of the device via the DIN rail ► Connect the FE terminal to the machine ground ► Use a switched-mode power supply to supply the device. If hardware error: ► Replace the controllerℇ and project again If software error of the operating system: ► Reinstall the operating system
R16	Software forced a restart The main processor has detected a restart of the device which was not caused by a voltage failure.	► Find the reason, maybe also check further error messages
R17	Unit waiting for stable 24 V power supply After the device was switched on an unacceptably low 24V power supply was detected: < 18 V.	► Acknowledge the message > Controllerℇ resumes normal operating mode In future: ► Stabilise the 24 V supply voltage so that it is permanently above 20 V Better: ► Use switched-mode power supply

Error message	Cause(s)	Solution
R18	The AS-i master signals a timeout during the communication with the fieldbus master (host). During the continuous communication of the master with the operating system the master has detected a timeout. Possible causes: 5. Voltage drops on the 24 V power supply cable 6. Operating system software error.	On 1: ► Use a switched-mode power supply to supply the device. On 2: ► Reinstall operating system
R19	Error message not active at present	► Error message not active at present
R20	Profibus DP configuration invalid The configuration of the Profibus master for the device is not valid. Possible causes: • 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	No Profibus DP card present in the system A Profibus DP card is expected in the device, however, it has not been detected. Possible cause: wrong operating system in the unit: e.g. AC1325 operating system software in an AC1311.	► Install valid operating system
R22	Profibus DP parameters invalid The parameter setting of the Profibus master for the device is not valid. Possible causes: • 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 message	Cause(s)	Solution
R23	Download of the Profibus DP parameters failed The attempt to download the current / projected parameters of the AS-i slaves via the Profibus was unsuccessful. Possible causes: • 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".	► 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	Missing edge during communication with the master During communication with the master a change in the state of the control signal was not detected. Possible cause: operating system software error.	► Reinstall operating system
R25	Master signals: invalid operating environment found The master reports that it is not in the "Normal operating mode". Possible causes: 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. Other causes which can lead to the error message directly after the device has been switched on: 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.	On 1: ► Use a switched-mode power supply to supply the device. On 2: ► Check the reason for the wrong command and correct it. On 3: ► → error message R15 On 4: ► Check and correct the wiring on the AS-i bus On 5: ► → page 16-2, error message B01 On 6: ► → page 16-2, error message B01 On 7: ► → page 16-2, error message B01
R26	Error message not active at present	Error message not active at present

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

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: • 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 plant ground. ► Use a switched-mode power supply to supply the device.
T01	**System cycle timeout** The operating system has found a time-out during the execution of a system cycle. Possible cause: parts of the operating system in SRAM have been overwritten by the PLC.	► 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.	► 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.	► Check the reason for the wrong command and correct it.

Error message	Cause(s)	Solution
T07	PLC command timeout During the execution of a command started by the PLC a timeout was detected. Possible causes: overwriting the status information of the command channel by the PLC or an installed fieldbus	► Check the reason for the wrong command and correct it.
T08	Timeout in a request of a PLC command During the attempt to start a command on the command channel a timeout was detected. Possible causes: 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	On 1: ► Check the reason for the wrong command and correct it. On 2: ► Check the reason for the wrong command and correct it.
T09	Timeout during communication with the fieldbus 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. Possible causes: 1. Fieldbus master has stopped the communication. 2. Connection cable interrupted.	On 1: ► Check the reason for the wrong command and correct it. On 2: ► Check and correct connection cable
T10	Timeout during change of the operating mode of the AS-i master Switching the master to another operating mode failed 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.	► Correct the slave address ► Repeat the command
T11	Timeout during update of the MUX fields During the update of the MUX fields, e.g.: analogue values of the slaves 1...31, a timeout was detected. Possible causes: 9. Parts of the operating system have been overwritten by the PLC. 10. Interference on the 24V power supply cable.	On 1: ► Check the reason for the wrong command and correct it. On 2: ► Use a switched-mode power supply to supply the device.

16.8 List of errors

Errors	Cause(s)	Solution
Controllerₑ does not display the start screen after power-on: > Text/graphics display blank or not readable > LEDs light / flash mazily	Faulty content of the PLC memory, e.g.: program error in the boot project	► 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
	Electromagnetic incompatibility	o Voltage supply does not correspond to the AS-i rule? ► Correct it o Grounding not according to specifications? ► Correct it o Strong interference by neighbouring machines? ► If possible: change the location ► Correct or screen interfering machines
The controllerₑ does not react to the button being pressed or only with a long delay. > Error messages R02 to R05	The cycle time of the PLC is > 300 ms. Other processes in the controllerₑ have priority.	► Check and correct the PLC program
The text/graphics display is shaded. > Error message R16 appears.	AS-i supply voltage is < 18.2 V	o 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
When changing the address of A/B slaves the controllerₑ sometimes freezes in the "Wait" display.	System error	► Press [**ESC**] to leave the menu item

| 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.	► 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 controllere → page 11-15
The controllere 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.	► Remove one of the two slaves and assign a new address to the other ► Reactivate the removed slave ► Reconfigure the controllere → page 11-15
		►

16.9 How does the controllere 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
Controllere fails as fieldbus slave	Effect → Description of the fieldbus master (host)

16.10 Hardware errors, exception errors

Exception Error

STKOV:	STKUN:
Seg:	Off:
SP:	R0:
CP:	TFR:

OK   ESC
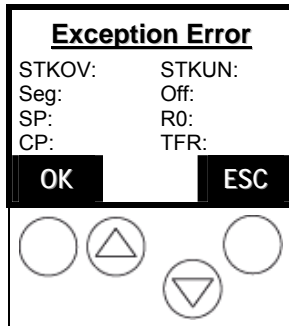
> The main processor has detected an exception error.

> 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	l	l	l	l	l	UNDOPC	l	l	l	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 = **a**ctuator **s**ensor **i**nterface 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.
Controller$_e$	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	DHCP = **D**ynamic **H**ost **C**onfiguration **P**rotocol = protocol for dynamic configuration by the →host
	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.
	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.
EMC	EMC = **E**lectro-**M**agnetic **C**ompatibility
	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.
Ethernet	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.
FE	FE = **F**unctional **E**arth
	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).
Fieldbus	A →bus for industrial applications: extremely robust with respect to mechanics and data technology
Firmware	Basic program in the device, virtually the operating system
	The firmware establishes the connection between the hardware of the device and the user software.
Gateway	Coupler
	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.
	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).
Host	The controller in the hierarchy above the AS-i master, e.g. a PLC or a processor, also called "fieldbus master".
ID	ID = **Id**entifier
	Name to differentiate the devices / participants connected to a system.

IP address	IP = **I**nternet **P**rotocol
	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.
LAS	**L**ist of **A**ctive **S**laves
	In this slave list the controller enters the slaves detected as active for this AS-i master.
LDS	**L**ist of **D**etected **S**laves
	In this slave list the controller enters the slaves detected as present for this AS-i master.
LED	LED = **L**ight **E**mitting **D**iode
	Light emitting diode, also called luminescent diode, an electronic element of high coloured luminosity at small volume with negligible power loss.
LFS	**L**ist of **F**ailed **S**laves
	In this slave list the controller enters the slaves with a projection error on this AS-i master.
LPS	**L**ist of **P**rojected **S**laves
	In this slave list the controller enters the slaves projected for this AS-i master.
MAC ID	MAC = **M**anufacturer's **A**ddress **C**ode = manufacturer's serial number →ID = **Id**entifier 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".
Marginalia	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.
Master	Handles the complete organisation on the bus. The master decides on the bus access time and polls the →slaves cyclically.
Master-slave communication	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).
MBd	→Baud

Modbus	The Modbus protocol is a communication protocol based on a →master/slave architecture and was generated by Modi-con* in 1979 for communication with its PLCs. In industry Modbus is the de-facto standard.
	Modbus/TCP comes after →Ethernet-TCP/IP. Modbus/TCP is a portion of the protocol on TCP defined for the serial inter-face. The →IP address clearly defines every device in a net-work. Therefore the slave address was used to identify sev-eral logical units (unit IDs) in one physical device. To do so, the extended IP addressing is used.
	Example: 192.168.83.28.1 means unit ID 1 on IP address 192.168.83.28.
	*) Modicon passed from AEG to the group Schneider in 1994.
OSSD	OSSD = **O**utput **S**ignal **S**witching **D**evice = output signal of a switchgear, here: output signal of an AS-i safety monitor
Password	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.
	→ page 11-22, chapter 11.4 "Password protection"
PELV	PELV = **P**rotective **E**xtra **L**ow **V**oltage
	Functional extra low voltage with safe separation, grounded variant of SELV.
	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 secon-dary side in the device (e.g. power supply to PELV specifica-tion).
	For this reason no separate PE conductor is required in a PELV system. It is allowed to ground circuits and / or bodies in a PELV system.
Pictograms	Image symbols which convey information by a simplified graphic representation.
	→ page 1-1, chapter "What do the symbols and formats stand for?"

Polling	The controller master fetches the data from every participant in the system successively: 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 etc., the same procedure for all other participants. 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.
Profibus	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.
Profibus FMS	Profibus FMS (**F**ieldbus **M**essage **S**pecification) to network controllers – no longer standardised from 2007
Profibus DP	Profibus DP (**D**ecentralised **P**eriphery) 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.
Profibus PA	Profibus PA (**P**rocess **A**utomation) 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.
Remanent	Remanent data are protected against data loss in case of power failure. 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. The data in the RAM memory of a controller, however, is volatile and normally lost in case of power failure.

RTS	RTS = **R**un **T**ime **S**ystem
	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.
SELV	SELV = **S**afety **E**xtra **L**ow **V**oltage
	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.
	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).
	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).
Single slave	→Slave whose address number may only occur once on the →master.
Slave	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:
	• 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	This is the time for a cycle. The following process takes place:
	5. PLC cycle: the PLC program performs one complete run.
	6. AS-i cycle: all AS-i slaves are updated (5...10 ms).

Table of keywords

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

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FIN	ifm electronic oy • 00440 Helsinki • Phone 09 / 751 777 00
GB, IRL	ifm electronic Ltd. • Hampton, Middlesex TW12 2HD • Phone 0208 / 213-0000
GR	Sigma Hellas Ltd. • Piraeus 18510 • Phone 0210 / 4522745
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I	ifm electronic s.a. • 20041 Agrate-Brianza (MI) • Phone 039 / 68.99.982
IL	Astragal Ltd. • Tel Aviv 61008 • Phone 03 -559 1660
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RA, ROU 55	Aparatos Eléctricos Automáticos SACIF • 1419 Buenos Aires • Phone 114 574 15
ROC	Everharmony Enterprise, Inc. • Taipei • Phone 02 27 07 00 69
ROK	KC Enterprises Co., Ltd. • Seoul • Phone 02 / 335-3029
RP	Gram Industrial, Inc. • 1701 Philipines • Phone 02 / 873 15 56
S	ifm electronic a b • 512 60 Överlida • Phone 0325 / 661 500
SGP	ifm electronic Pte. Ltd. • Singapore 609 916 • Phone 6562 8661/2/3
SK	ifm electronic s.r.o. • 835 54 Bratislava • Phone 02 / 44 87 23 29
THA	Sang Chai Meter Co., Ltd. • Bangkok 10 400 • Phone 02 / 616 80 31
TR	ifm electronic Ltd. Sti. • 34384 Okmeydani/Istanbul • Phone 0212 / 210 50 80
USA, CND	ifm efector inc. • Exton, PA 19341 • Phone 0610 / 5 24-2000
MEX	ifm efector S. de R. L. de C.V. • Monterrey, N. L. Mexico 64630 • Phone 81 8040-3535
ZA	Shorrock Automation (Pty) Ltd. • 0108 Pretoria • Phone 012 34 5 4449