

MANUAL

AS-INTERFACE

Handheld



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

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1 Declaration of Conformity

All products have been developed and manufactured taking into consideration applicable European standards and regulations.



Note!

A Declaration of Conformity can be requested from the manufacturer.

The manufacturer of this product has a certified quality assurance system in conformity with ISO 9001.



2 Safety

2.1 Used Symbols

Safety-relevant Symbols

**Danger!**

This symbol indicates a warning about a possible danger.

In the event the warning is ignored, the consequences may range from personal injury to death.

**Warning!**

This symbol indicates a warning about a possible fault or danger.

In the event the warning is ignored, the consequences may course personal injury or heaviest property damage.

**Caution!**

This symbol warns of a possible fault.

Failure to observe the instructions given in this warning may result in the devices and any connected facilities or systems develop a fault or fail completely.

Informative Symbols

**Note!**

This symbol brings important information to your attention.

**Action**

This symbol marks an acting paragraph.

2.2 General safety instructions

Installation and commissioning of all devices must be performed by a trained professional only.

Protection of operating personnel and the system is not ensured if the product is not used in accordance with its intended purpose.

Only use recommended original accessories.

Independent interventions and separate modifications are dangerous and will void the warranty and exclude the manufacturer from any liability. If serious faults occur, stop using the device. Secure the device against inadvertent operation. In the event of repairs, send the device to Pepperl+Fuchs.

When packing the device for storage or transport, use materials that will protect the device from bumps and impacts and protect against moisture. The original packaging provides the best protection. Also take into account the permitted ambient conditions.

3 Notes on disposal

Electronic waste is hazardous waste. When disposing of the equipment, observe the current statutory requirements in the respective country of use, as well as local regulations.

Do not dispose of storage batteries with the household refuse.



Consumers are obliged by law to dispose of used storage batteries in accordance with regulations. You can hand in your used batteries at public collection points in your area or sales points where batteries of that particular kind are sold. You can also send your used batteries directly to us for disposal. Please remember that this service is only available within the scope of normal use. If you wish to send back your used batteries, please affix sufficient postage stamps and send to our address. There are no extra charges for disposal.

4 Product description

4.1 What is AS-Interface?

The actuator-sensor interface (AS-Interface) replaces conventional wiring technology on the sensor-actuator level.

AS-Interface provides a secure data transfer, which is resistant to EMC influences, while minimizing the time and costs of installation and incorporating a diagnostic function. AS-Interface detects short-circuits, reduces incidental maintenance costs, and enables a simple decentralization of control processes. Your plant takes on greater transparency, making maintenance and tooling straightforward and more flexible.

AS-Interface is not a proprietary system, but an open standard accessible to manufacturers in a wide range of products.

AS-Interface is optimally suited for the safe transfer of small quantities of data under harsh industrial conditions. It has also established and proven itself as an economical standard for networking sensors and actuators in many applications.

Conventional wiring typically requires two wires for power supply and an additional wire for the signal or control line for each sensor and actuator. This results in high costs in terms of connection/distributor technology, requires time-intensive installation, and necessitates costly and complex documentation.

By comparison, AS-Interface offers the following advantages:

- Two-wire cable for the data and energy transmission of all slaves/modules.
- Connection using insulation piercing technology saves time, since stripping cables and fitting connector sleeves are avoided.

4.2 AS-Interface Specification 3.0

In 2004, the AS-Interface Association defined the AS-Interface Specification 3.0 as a backwards-compatible extension, while retaining the protocol and physical structure. AS-Interface Specification 3.0 gives the user important advantages:

- The number of possible network slaves is increased to 62. This is accomplished by enabling 31 **A** addresses and 31 **B** addresses of which each is able to support up to 4 output databits.

In the master message of Specification 3 the **I3** output bit has been replaced by the **SEL** select bit. This select bit enables, in addition to the address bits A0 to A4, differentiation in the address areas **A** and **B**. Through this differentiation, any address can be distributed in both A and B, e.g. the address 15A and 15B.

In Specification 2.1 3 output bits are available per AS-Interface slave. In Specification 3.0, through the definition of the multiplex bit in place of the I2 bit, 4 output bits are available per slave (communication of 4 output bits in succession via the data bits I1 and I0), i.e. a total of $4 \cdot 62 = 248$ output bits. The slave message remains unaffected by this change, i.e. there are still $4 \cdot 62 = 248$ input bits available. In practice, this means an increase of the cycle time to a max. 20 ms, since in the 1st cycle the data of the AS-Interface slaves in the address area A, and in the 2nd cycle, the data of the respective AS-Interface slaves in the address area B are written and read. Additionally, the output bits are transferred one after the other.

Due to the backwards compatibility of Specification 3.0 you can continue to use standard AS-Interface slaves. However, two of the 62 possible addresses are occupied by a standard AS-Interface slave.

Structure of the master message

SB	CB	A4	A3	A2	A1	A0	I4	SE L	MU X	I1	I0	PB	EB
----	----	----	----	----	----	----	----	---------	---------	----	----	----	----



Note!

You have the option of reducing the cycle time by reducing the number of AS-Interface slaves or by addressing the A/B-Slaves in the standard mode.

- Extended diagnostic function

In addition to communication faults (e.g. messages with errors), the AS-Interface master also detects hardware faults that are present on the AS-Interface slave. You have the option of utilizing these peripheral error messages to provide a defined system shutdown in the event of a fault, since sensor signals are no longer guaranteed to be available. In addition, a statistical evaluation of the data is conceivable in order to assess the safety of the system. Also, because of the extended diagnostics, it is possible to locate sporadically occurring faults with regard to configuration and communication and to evaluate them via the AS-I Control Tools.

- Extension of the ID-Codes of the AS-Interface slaves.

Specification 2.1 AS-Interface slaves (A/B slaves) have the hexadecimal value **A** as the ID-Code and have 2 more identification codes (ID1 and ID2) that describe the functionality of the slave. You have the option of describing the ID1-Code.

The ID-Code for standard AS-Interface slaves differs from the ID-Code of the A/B slaves. With standard AS-Interface slaves, no further identification codes are included.



Note!

If you have changed the ID1-Code and want to automatically program the address, check **before** the installation of the new AS-Interface slave that the ID1-Code has been correctly stored in the AS-Interface slave.

4.3 Use and application of the handheld

AS-Interface nodes are usually addressed with a handheld. As a rule, a number of steps are necessary to address the nodes and in the future you will be able to execute this procedure faster using the handheld:

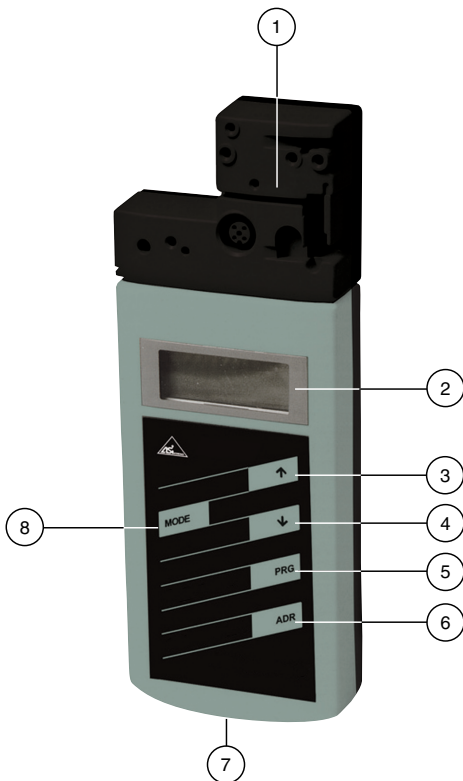
- Unique addressing of the AS-Interface nodes
- Power supply to the AS-Interface nodes via the handheld
- Function checks – even without programmable logic controller (PLC)

4.4 Delivery package

The delivery package contains:

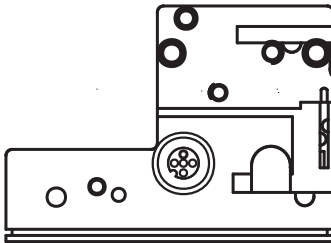
- Addressing device
- Charger
- Quick start guide

4.5 Displays and controls



- 1 AS-Interface connection adapter
- 2 LC Display
- 3 **up** arrow button
- 4 **down** arrow button
- 5 **PRG** button
- 6 **ADR** button
- 7 Charger connector
- 8 **Mode** button

4.5.1 AS-Interface connection adapter



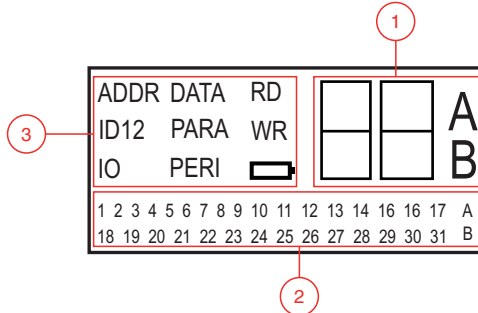
The AS-Interface connection adapter on the top of the addressing device is used to connect AS-Interface nodes (sensors, actuators, and interface modules) to the addressing device. The following devices and models can be connected directly to the addressing device by plugging into the AS-Interface connecting adapter:

- Devices with M12 plug
- AS-Interface modules

For models with an integrated addressing jack, please use the optional adapter cable.

The addressing device supplies the connected AS-Interface node with up to 28 V voltage ($25\text{ V} \leq 100\text{ mA}$). If this voltage is not sufficient, you have the option of using an external power supply for the AS-Interface node. In this case, the internal power supply is cut off by the addressing device.

4.5.2 LC display



- 1 Address and data display
- 2 Address field
- 3 Operating mode display

Address and data display

Depending on the operating mode, two digits and the letters A and B are used to display various information in this area of the display.

- The address of the currently selected AS-Interface node differs according to the AS-Interface specification supported and the address areas **Standard** (shown without letters), **A** and **B**.
- Target address which is to be communicated to the currently selected AS-Interface node
- Display of read data
- Display of data to be written

Address field

All the AS-Interface nodes of the AS-Interface network are shown in this area of the display:

- If the addressing device detects AS-Interface nodes from various address areas, the various address areas are identified in the right-hand section of the address field, as follows:
 - Without letters: For AS-Interface nodes that do not support the AS-Interface specification 2.1.
 - A: For AS-Interface nodes belonging to address area A.
 - B: For AS-Interface nodes belonging to address area B.

The display of the detected addresses in the respective address area changes every 2 seconds.






- The addresses of all AS-Interface nodes currently connected to the addressing device are shown in the **Addressing** operating mode by flashing digits. In all other operating modes, the addresses of the AS-Interface nodes shown flashing are those being actively accessed.
- During **Addressing**, the non-flashing digits represent addresses of AS-Interface nodes that have been assigned addresses by the addressing device.

Operating mode display









The current operating mode is shown in this area of the display.

4.5.3

Button assignment

Button	Description
	Set values (e.g. slave address, ID1 data, slave parameters, slave data), change of operating mode
	Set values (e.g. slave address, ID1 data, slave parameters, slave data)
	The function depends on the operating mode: <ul style="list-style-type: none"> • transfer of a new slave address to the slave (ADDR) • transfer of ID1 data (ID1) • transfer of slave parameters (PARA) • transfer of slave data (DATA)
	Switch on addressing device, search and read out slave addresses Double click: switch off addressing device
	Change between operating modes

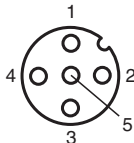
4.5.4 Key combinations

Key combinations	Description
 & 	Function dependent on the duration of pressing: <ul style="list-style-type: none"> • Short press: address 0 is assigned to the connected slave • Long press: the list of assigned slaves is deleted
 &  or 	Navigate through source addresses of several connected slaves connected to the addressing device
 &  or 	Navigate through the operating modes

4.5.5 Connections

The addressing device uses the following connections:

- Connection socket for the power supply to charge the internal battery on the underside of the addressing device.
- M12 socket on the AS-Interface connection adapter with the following pinning:
 - **Pin 1:** AS-Interface+
 - **Pin 2:** Digital input for optical addressing adapter
 - **Pin 3:** AS-Interface-
 - **Pin 4:** Digital output for optical addressing adapter
 - **Pin 5:** Power supply for optical addressing adapter



- 1 AS-Interface +
- 2 Digital input for optical addressing adapters
- 3 AS-Interface -
- 4 Digital output for optical addressing adapters
- 5 Voltage supply for optical addressing adapters

- Several individual AS-Interface+/- sockets on the AS-Interface connection adapter for connection of AS-Interface nodes.

4.6 Accessories

Various accessories are available.

4.6.1 External power supply

Product name
AS-Interface power supply
T-splitter for the connection of an external power supply (V1 plug) and an AS-Interface node (M12 socket)
Cable with V1 socket and open end for connection of the power supply

4.6.2 Programming cable

Product name
Extension cable for module/handheld programming unit

5 Commissioning

5.1 Preparation

The addressing device battery is delivered fully charged. Nevertheless, as a result of self-discharge, the charge may not be sufficient to operate the addressing device. Therefore, we recommend that you charge the battery for at least 24 hours prior to commissioning.



Note!

The battery cannot be overcharged.



Charging battery

1. Connect the plug of the plug-in power-supply unit cable to the device connecting jack.
2. Connect the plug-in power-supply unit to the mains power supply.

The battery is charged.



Connecting the AS-Interface nodes

Proceed as follows to connect an AS-Interface node:

1. Insert devices with an M12 plug and interface modules directly into the designated location on the connecting adapter and ensure that they are firmly seated.
2. For devices with an addressing jack, connect the optionally available adapter cable to the device and plug the other end of the cable into the addressing device.
3. If necessary, connect an external power supply.



Connecting an external power supply

1. Connect a T-splitter with parallel wiring (male to female / male) to the M12 socket of the AS-Interface connection adapter.
2. Connect the M12 socket of the power cable to the M12 plug of the T-splitter.
3. Connect the power supply with the power cable.
4. Connect the AS-Interface node to the T-splitter using the adapter cable.



Warning!


No reverse polarity protection

The device can be damaged or destroyed if the polarity is reversed.

- Connect the brown strand to AS-i + (pin 1), the blue to AS-i - (pin 3).
- Do not connect voltage to pin 2 or pin 4.
- Connection socket layout see chapter 4.5.5



Switching on the addressing device

1. Connect an AS-Interface node.
2. Briefly press the  button.

The addressing device switches on in the **Addressing** operating mode and shows the address of the current AS-Interface node.



Changing operating mode

You have several options to set the various operating modes.

1. Briefly press the **MODE** button to change operating modes.
2. Alternatively, press and hold the **MODE** button and scroll through the individual operating modes using the **↑** and **↓** buttons.
3. Press and hold the **MODE** button for approx. 2 s. On releasing the button, the addressing device switches to **Addressing** operating mode.

The current operating mode is shown in the operating mode display.



Navigating through the addresses.

1. Press the **ADR** button to jump to the next address of a connected AS-Interface node.
2. Alternatively, press and hold the **ADR** button and scroll to the next/previous address using the **↑** and **↓** buttons.

5.2

Storage and transport

For storage and transport purposes, package the unit using shockproof packaging material and protect it against moisture. The best method of protection is to package the unit using the original packaging. Furthermore, ensure that the ambient conditions are within allowable range.

6 Operation

6.1 Addressing operating mode

The addressing is divided into 3 individual procedures. The following table shows the individual processes:








Note!

When addressing AS-Interface slaves connected to the handheld, make sure that the address 0 is not occupied. Otherwise, an error message may occur.

Procedure	Addressing
Selecting the source address	<ul style="list-style-type: none"> one AS-Interface slave connected: The address of the connected AS-Interface slave is automatically detected as the source address. several AS-Interface slaves connected: The source address must be manually selected, see "Navigating through addresses / selecting source address when several slaves are connected" on page 17.
Selection of target address	see "Setting the target address" on page 18 When being addressed, if the target address is occupied by a further connected AS-Interface slave, the addressing device issues an error message.
Start addressing	see "Starting addressing" on page 18



Navigating through addresses / selecting source address when several slaves are connected

Press the  button to select the AS-Interface slave to which you want to assign a new address. If several AS-Interface slaves are connected to the addressing device, press the  button several times or press and hold the  button and scroll through the addresses using the  and  buttons.



Synonymous use of standard and A addresses





Note!

When addressing a slave, the address area of the target address is automatically adapted to the connected slave:

- To assign an address to a connected slave with or without extended addressing, it is sufficient to specify a target address in the standard address area or in address area A. For a slave without extended addressing, the addressing device assigns the set address automatically in the standard address area. For a slave with extended addressing, the addressing device assigns the set address automatically as an A address.
- To assign an address in address area B, you must specify target address area B. see "Setting the target address" on page 18. If a slave without extended addressing is connected, the addressing device shows a fault message.



Setting the target address

Set the target address using the  and  buttons.




Tip

Addresses marked as occupied

The already assigned addresses are stored in the addressing device in a list of assigned addresses and shown in the address field of the display as a non-flashing number. This list is available after restarting the addressing device. You can therefore avoid duplicate addressing.





Starting addressing

Briefly press the  button to start addressing.





Deleting the list of assigned addresses

To delete the list of assigned addresses, press and hold the  and  buttons simultaneously for approx. 2 s.



Assigning address 0 to slave


To assign address 0 to a connected slave, press and briefly hold the buttons  and  simultaneously.

6.2 Read ID operating mode

As soon as you switch to the **Read ID** operating mode, the ID code of the active AS-Interface slave is read in and shown in the address and data display. The value of the ID-Code is always **A** for A/B Slaves.



Repeat reading

To repeat the reading of the code, press the  button.

6.3 Read/write ID1 operating mode



Note!


AS-Interface Specification 2.1

This function applies only to AS-Interface slaves that support Specification 2.1.

As soon as you switch to the **Read/write ID1** operating mode, the ID1 code of the active AS-Interface slave is read in and is shown in the address and data display.



Repeat reading

To repeat the reading of the code, press the  button.






Write ID1 Code



Note!

The value of the ID1 Code ranges from 0 to 15 for standard AS-Interface slaves and from 0 to 7 for A/B slaves.

To write an ID1 Code to the active AS-Interface slave, proceed as follows:

1. Set the desired value for the ID1 Code with the  and  buttons.
The **RD** display goes out when scrolling up and down.
2. Press the  button to write the desired value permanently to the active AS-Interface slave,.

WR appears in the operating mode display.

6.4 Read ID2 operating mode



Note!


AS-Interface Specification 2.1

This function applies only to AS-Interface slaves that support Specification 2.1.

As soon as you switch to the **Read ID2** operating mode, the ID2 code of the active AS-Interface slave is read in and is shown in the address and data display. It is not possible to change this value.



Repeat reading


To repeat the reading of the code, press the  button.

6.5 Read IO operating mode

As soon as you switch to the **Read IO** operating mode, the IO code of the active AS-Interface slave is read in and is shown in the address and data display.



Repeat reading


To repeat the reading of the code, press the  button.

6.6 Read Peripheral Fault operating mode

As soon as you switch to the **Read Peripheral Fault** operating mode, the address and data display indicates if there is a peripheral fault on the AS-Interface slave. A peripheral fault is present if the value 1 is displayed. The cause of the fault depends on the AS-Interface slave being used.



Repeat reading

To repeat the reading of the code, press the  button.

6.7 Set Slave Parameter operating mode

In the operating mode **Read/write slave data**, the slave parameter value activates the data transmission from the addressing device to the AS-Interface slave. The standard value is 15 for standard AS-Interface slaves and 7 for A/B slaves.

The set data value is retained until:

- You change the active address in the **Addressing** operating mode,
- You replace the AS-Interface slaves which have the same address but different ID, ID2, or IO codes.
- The addressing device is automatically switched off or manually switched off after a long period without use.

You must adapt the corresponding slave parameters according to the AS-Interface slave used.



Set parameters

1. Set the desired slave parameter value with the and buttons.

By scrolling up and down, the **RD** display goes out.

2. Press the button.

WR appears in the operating mode display. The parameter value is temporarily accepted, but not transferred to the slave.

6.8 Read/write Slave Data operating mode

button is pressed briefly	Send previously set output data once to an AS-Interface slave/display set output data
button pressed and held	Cyclic sending of previously set output data
button is pressed briefly	Read out input data once from the AS-Interface slave and send previously set output data to the AS-Interface slave.
button pressed for 2 seconds.	Cyclic reading of the input data, cyclic sending of previously set output data.



Setting and sending output data

1. Set the desired output data value using the and buttons.



The **RD** display goes out when scrolling.





2. To temporarily save the desired output data value and transmit it once to the active AS-Interface slave, briefly press the button. If you want to execute a cyclic output data exchange, you must (for security reasons) press and hold the button. The output data value is cyclically transmitted to the AS-Interface slave until you release the button.





WR appears in the operating mode display.

The output data value is 0 as standard.

**Tip****Checking output data**

You can check the set output data by briefly pressing the  or  button. The set output data are displayed. No data is transferred to the slave.

The set output data value is temporarily stored in the handheld. The output data value is shown on the display as long as you do not press the ,  or  buttons. If the displayed output data value deviates from the stored output data after pressing the  button, then:



1. press the  button once. The set output data are shown and the **RD** goes out.
2. Set the desired output data value if necessary using the  and  buttons or
3. briefly press the  button to temporarily save the set output data value and transmit it once to the active AS-Interface slave.

The set data value is retained until:

- You change the active address in the **Addressing** operating mode,
- You replace the AS-Interface slaves which have the same address but different ID, ID2, or IO codes.
- The addressing device is automatically switched off or manually switched off after a long period without use.

**Reading data from the AS-Interface slave****Note!**

When input data are read from the AS-Interface slave, the output data and/or parameter values are also automatically transmitted from the addressing device to the AS-Interface slave. Check that these values do not endanger the trouble-free operation of your plant.

To read the input data from the AS-Interface slave, briefly press the  button. If you press the  button for at least 2 seconds, the input data from the AS-Interface slave is cyclically read and the output data from the addressing device is sent to the AS-Interface slave. This continues until you press any button on the addressing device. The addressing device does not switch itself off.

Complex communication protocols

The addressing device supports the following complex communication protocols:

- AS-Interface slaves with the **profile S-7.A.7** are detected as AS-Interface slaves with extended addressing and 4 inputs and 4 outputs and are correctly handled.
- AS-Interface slaves with the **Profile S-0.B** and **S-7.B** are detected as AS-Interface slaves and handled in accordance with AS-Interface at Work.

All other complex communication protocols are not supported and are handled by the addressing device as standard AS-Interface slaves.

Safety Code (AS-Interface Safety At Work)

As soon as both input channels of an AS-Interface safety slave are active, a cyclic sequence of 8×4 bits is transmitted to the addressing device. These data are designated as the Safety-Code. The Safety-Code is defined as follows:

Cycle	Structure of the data packet
1	00zz
2	yyxx
3	yyxx
4	yyxx
5	yyxx
6	yyxx
7	yyxx
8	yyxx

The Safety-Code always starts with the data packet 00zz. Thus this denotes the start of a new safety code. The two y-bits of the following data packets are never simultaneously 0. The two x-bits of the following data packets are 00.



Read Safety-Code (AS-Interface Safety at Work)

Reading Safety-Codes is supported by this addressing device. To be able to read Safety-Codes, proceed as follows:

1. Make sure that the two input channels of the AS-Interface safety slaves are active.
2. Press the button.

Each time the button is pressed, the hexadecimal value of the respective data packet of the Safety-Code, beginning with the first data packet 00zz, is shown in the address and data display.

7 Error messages

The following messages can appear in the addressing device display.

Error code	Meaning	Description	Remedy
F1	AS-Interface overload	Current consumption of the AS-Interface slaves connected to the addressing device is too high.	Connect an external power supply.
F2	Slave not found	No AS-Interface slave has been found at the active address	Check the address or connect an AS-Interface slave.
F3	Programming error	When programming the address or the IDI code, the value could not be permanently stored in the AS-Interface slave's EEPROM.	If necessary, repeat the programming.
F4	Target address occupied	The target address, to which the current AS-Interface slave is to be reprogrammed, is occupied.	Assign a different address to the active AS-Interface slave.
F5	Address 0 occupied	Address 0 is occupied by another AS-Interface slave	Make sure that address 0 is not occupied.
F6	Standard AS-Interface slave found instead of the A/B-Slave	The standard operation cannot be executed because the active AS-Interface slave does not satisfy the specification 2.1	You cannot use the Read IO, Set slave parameters, and Read/write slave data operating modes with the currently connected standard AS-Interface slave.
F7	A-/B slave found instead of the standard AS-Interface slave	The active standard AS-interface slave has been replaced by an A-/B slave	Assign an address to the A-/B-Slave in the corresponding address area A or B.
F8	Reception error	Due to a fault, the AS-Interface slave response could not be correctly received	Carry out the action again.

