Original Device Manual
SmartPLC SafeLine AC4S
with PROFINET device interface

AC402S

for ISO 13849 up to PL e
for IEC 61508 up to SIL 3 and 62061 up to SIL CL 3

Master Profile: M4
Firmware: 4.2.5

English

7391187/00 12/2017

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1 Preliminary note

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1.1 Legal and copyright information

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1.2 Purpose of the document

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This document applies to devices of the type "SmartPLC AC4S with PROFINET" interface" (art. no.: AC402S) with the firmware version 4.2.5.

These instructions describe the following topics:

- Mounting and electrical connection of AC402S
- Installation of additional devices (sensors, actuators) to the local I/O interface
- Operation and configuration of the device via the menu (GUI and web interface)
- Command channels, cyclic and acyclic data records
- Error diagnostics and troubleshooting

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1.3 Symbols and styles used

13839

► ... Instructions

> ... Reaction, result

→ ... Cross-reference or internet link

123 Decimal number
0x123 Hexadecimal number
0b010 Binary number

[...] Designation of pushbuttons, buttons or indications

1.4 Overview: User documentation for AC4S

18655

ifm electronic provides the following user documentation for the models of the device class "Fail-safe SmartPLC AC4S":

Document	Content / Description
Data sheet	Technical data of AC402S as a table
Operating instructions *	▪ Notes on mounting and electrical installation of the AC402S ▪ Set-up, description of the operating and display elements, maintenance information, scale drawing
Device manual	▪ Notes on operation of AC402S via GUI and web interface ▪ Description of the cyclic and acyclic data records, fieldbus parameters and command interface ▪ Error description
Supplement device manual	▪ Description of the acyclic data sets and the command interface
Programming manual	▪ Creation of a project with the device using CODESYS ▪ Configuration of the device using CODESYS ▪ Programming of the standard PLC of the device ▪ Programming of the fail-safe PLC of the device ▪ Description of the device-specific CODESYS function libraries

Legend:
*... The operating instructions are supplied with the device.

All documents can be downloaded from ifm's website.

1.5 Modification history

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Version	Topic	Date
00	New creation of document	12/2017

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2 Safety instructions

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Warnings used 9

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2.1 General safety instructions

8516

Read this document before setting up the product and keep it during the entire service life.

Only use the product for its intended purpose.

If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.

Improper or non-intended use may lead to malfunctions of the device, to unwanted effects in the application or to a loss of the warranty claims.

The manufacturer assumes no liability for any consequences caused by tampering with the device or incorrect use by the operator.

► Observe these operating instructions.

► Adhere to the warning notes on the product.

2.2 Required background knowledge

6919

This document is intended for specialists. Specialists are people who, based on their relevant training and experience, are capable of identifying risks and avoiding potential hazards that may be caused during operation or maintenance of the product.

For programming these people should also have knowledge of control technology experience in PLC programming to IEC 61131-3.

The document contains information about the correct handling of the product.

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2.3 Tampering with the unit

11242

⚠ WARNING

Tampering with the units can affect the safety of operators and machinery!

Tampering with the units is not allowed.
In case of non-compliance our liability and warranty expire.

- ► Do not open the devices!
- ► Do not insert any objects into the devices!
- ► Prevent metal foreign bodies from penetrating!

2.4 Warnings used

13685

⚠ WARNING

Death or serious irreversible injuries may result.

⚠ CAUTION

Slight reversible injuries may result.

NOTICE

Property damage is to be expected or may result.

Important note
Non-compliance may result in malfunction or interference.

Information
Supplementary note.

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3 System description

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Software 26

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This chapter describes the structure and the components of the system.

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3.1 Intended use

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3.1.1 Permitted use

19458

The fail-safe SmartPLC SafeLine AC402S integrates two AS-i masters, a fail-safe PLC, a standard PLC, a web server and an PROFINET interface with 2-port switch.

- The fail-safe SmartPLC SafeLine
- controls the exchange of data to the sensor/actuator level.
- can be used as a safe and a non-safe controller (PLC).
- communicates with the higher-level control level via PROFINET.
- visualises sensor/actuator data on the integrated web server.
- allows device configuration via the web server.

3.1.2 Prohibited use

22053

The device may not be used beyond the limits of the technical data (→ **Technical data** (→ p. 154))!

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3.2 Information concerning the device

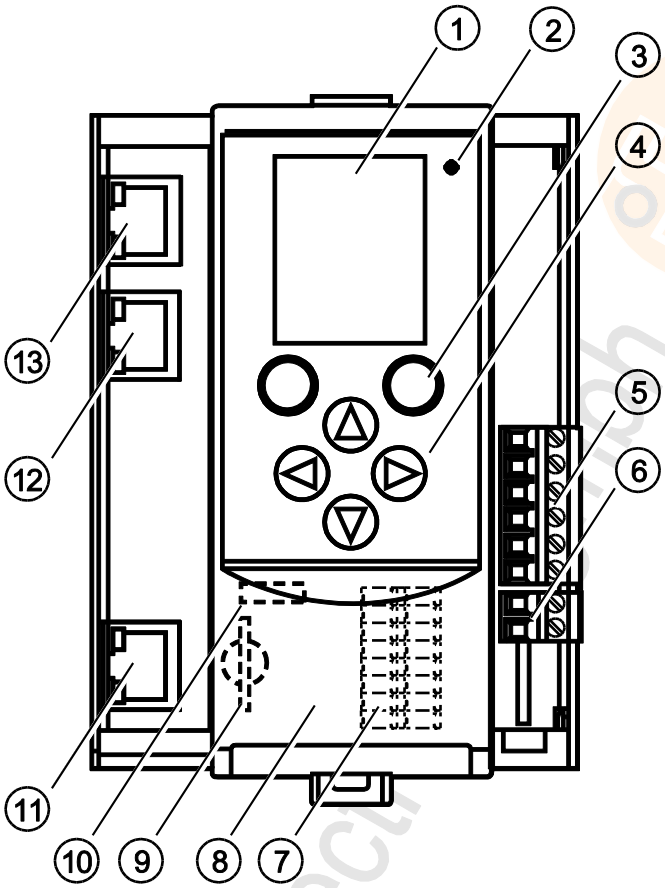
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3.2.1 Overview

7112



Legend:

1. Display
2. Status LED (H1)
3. 2 function keys
4. 4 arrow keys
5. Connector (X1) for AS-i 1, AS-i 2, functional earth
6. Connector (X2) for AUX
7. Local inputs and outputs (X4) (behind the front flap)
8. Front flap
9. Slot for SD card (X5) (behind the front flap)
10. Ethernet configuration interface 1 (X3) (behind the front flap)
11. Ethernet configuration interface 2 (X8) with status LED (H6, H7)
12. PROFINET interface 1 (X7) with status LED (H4 H5)
13. PROFINET interface 2 (X6) with status LED (H2, H3)

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3.2.2 Operating elements

15840

The device provides the following operating elements.

Arrow and function keys

15867

Below the display is the key panel with two function keys and four arrow keys. The operator controls the Graphical User Interface (GUI) of the device with the keys.
Operating notes: → **Operation** (→ p. 45)

3.2.3 Display elements

7062

The device provides the following display elements:

Display

7083

The display is used to display the Graphical User Interface (GUI) of the device.
Operating notes: → **Operation** (→ p. 45)
Technical data: → **Technical data** (→ p. 154)

Status LEDs

18985

The device features the following status LEDs which display the current status of system components.
Meaning of the LED colours and flashing frequencies: → **Status LED** (→ p. 144)

3.2.4 Interfaces

15839

The device provides the following interfaces:

Ethernet configuration interfaces

7107

The configuration interface 1 (X3) is behind the front flap of the device.
The configuration interface 2 (X8) is underneath the PROFINET interface (X6/X7).
The user can access the following functions via both interfaces:

- web interface for device configuration and diagnostics
- Programming of the device-internal standard PLC and the fail-safe PLC with CODESYS
- Operation as additional fieldbus interface

Possible network topologies: → **Configuration interfaces: Connection concepts** (→ p. 159)
Technical data: → **Technical data** (→ p. 154)

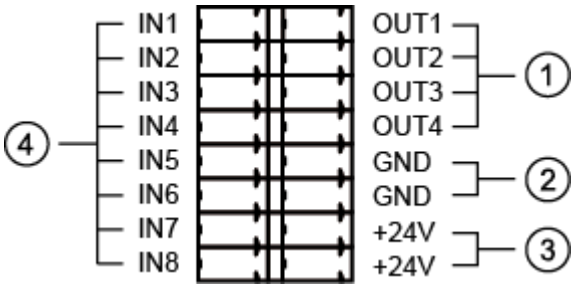
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Local input/output interface

7152

The local input/output interface (X4) is behind the front flap of the device. Safe and non-safe peripherals without AS-i interface can be connected to the local inputs and outputs.

Connections of the local I/O interface:



1. 4x output channels (OUT1 .... OUT4) → **Local outputs** (→ p. 14)
2. 2x voltage ground GND → **Voltage source / voltage ground** (→ p. 14)
3. 2x voltage source +24V → **Voltage source / voltage ground** (→ p. 14)
4. 8x input channels (IN1 ... IN8) → **Local inputs** (→ p. 14)

Voltage source / voltage ground

19824

+24V and GND are used as voltage supply for the safety IO PCB of the safety module of AC402S.

- Notes on the electrical connection: → **Electrical connection** (→ p. 29)

Local inputs

19825

The local I/O interface provides 8 input channels for the connection of devices (e.g. sensors, switches, light curtains). Each input channel can be used as safe or standard input. Configuration is effected via the programming system CODESYS.

- Connection of peripherals: → **Connect devices to local I/O interface** (→ p. 32)
- Technical data: → **Technical data** (→ p. 154)

Local outputs

19826

The local I/O interface provides 4 output channels for the connection of devices (e.g. actuators, relays). Each output channel can be used as safe or standard output. Configuration is effected via the programming system CODESYS.

- Notes on the connection of peripherals: → **Connect devices to local I/O interface** (→ p. 32)
- Technical data: → **Technical data** (→ p. 154)

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Possible combinations of input and output channels

12095

The inputs IN1...IN8 can be configured both as safe and non-safe inputs.
The outputs OUT1...OUT4 can be configured both as safe and non-safe outputs.
This permits the following minimum or maximum input and output combinations:

Min. configuration	Max. configuration
▪ 8 non-safe inputs ▪ 4 non-safe outputs	▪ 4 safe inputs, 2 channels (SIL3) ▪ 4 safe outputs, 1 channel (SIL3)

SD card slot

9135

The SD card slot (X5) is located behind the front flap of the device. The following actions can be performed with an SD card:

- update the firmware of the device
- save/restore the device configuration

Technical data: → **Technical data** (→ p. 154)

PROFINET fieldbus interface

12113

The device communicates with the higher-level control instance of the PROFINET network via the PROFINET interface (X6/X7).

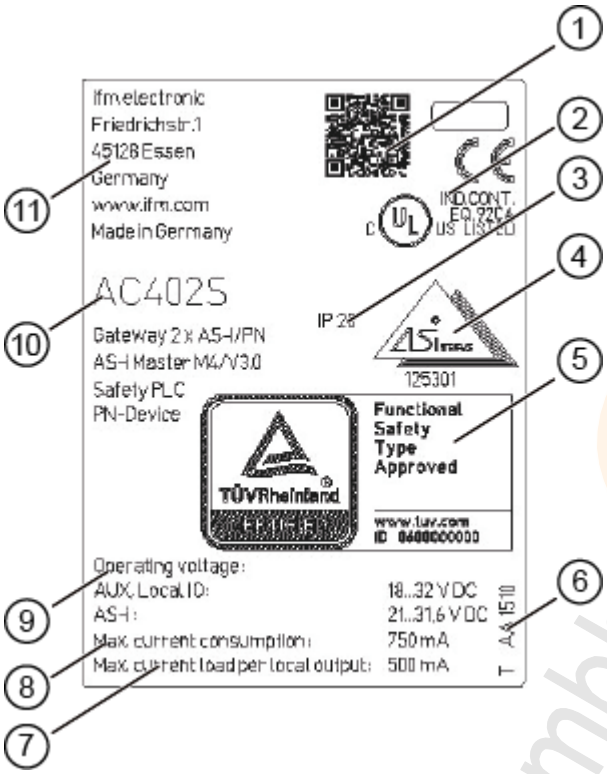
- Notes regarding connetion concepts: → **Configuration interfaces: Connection concepts** (→ p. 159)
- Technical data: → **Technical data** (→ p. 154)

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3.2.5 Type label

19822

The type label is on the right housing side of the device. It provides the following information:



1. QR code for product website
2. CE/cULus marking
3. Protection class
4. AS-i certification
5. TÜV certification
6. Hardware version
7. Operating voltage for
   – Aux / local IO PCB
   – AS-i
8. max. current consumption of the device
9. max. load per output channel of the local I/O interface
10. Type designation incl. device functionality
    – number of AS-i fieldbus gateways
    – classification of the AS-i masters
    – fail-safe PLC
    – fieldbus
11. Manufacturer identification

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3.3 Hardware

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3.3.1 Safety architecture

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System architecture

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The hardware structure of the safety module of AC402S corresponds to the implementation to DIN EN ISO 13849-1:2008, IEC 62061:2010 and IEC61508:2010 with a two-channel architecture with hardware fault tolerance (HFT = 1).

The device achieves the following characteristic safety values:

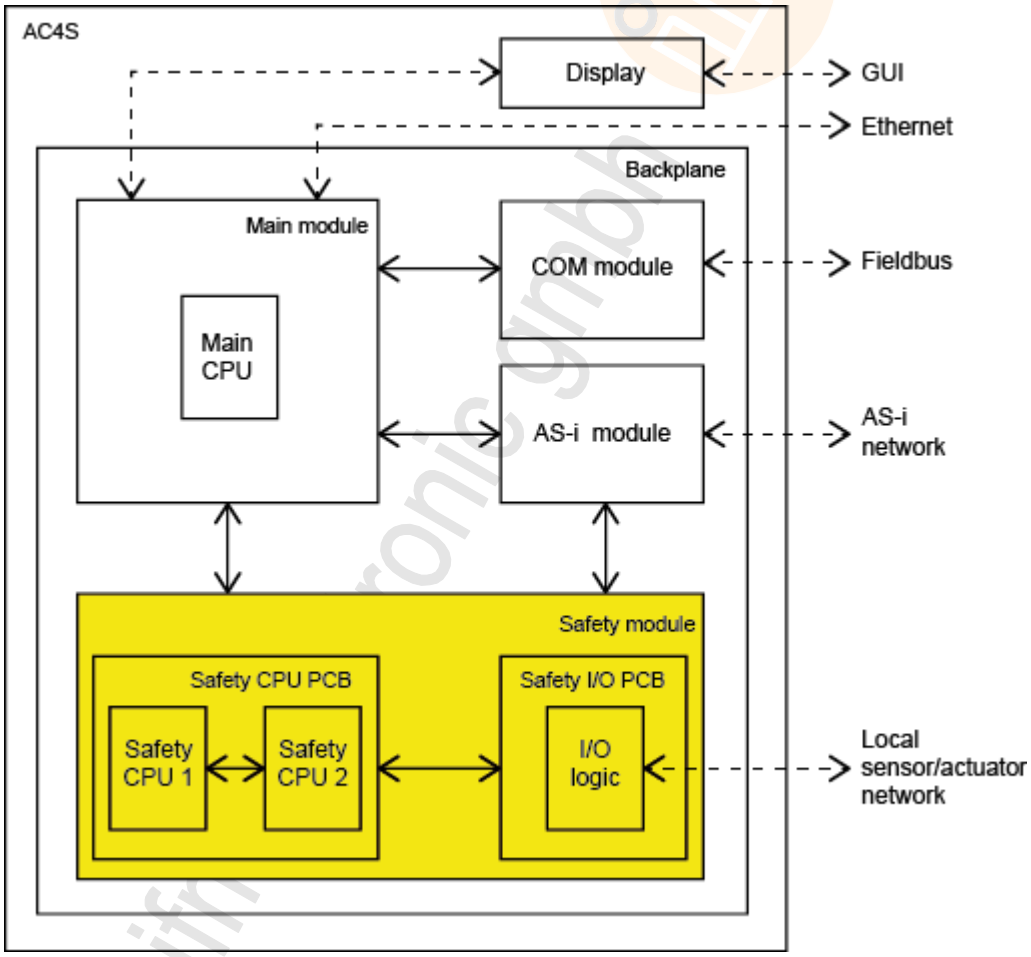
- SIL 3 / SIL CL 3 referred to IEC 61508:2010 and IEC 62061:2010
- Performance Level e EN ISO 13849-1:2008)
- Category 4 (EN ISO 13849-1:2008)

The reachable characteristic safety values of the automation system implemented with AC402S depend on the following components:

Safety classification of the peripherals installed at the local I/O interface (→ **Supported device types** (→ p. 33))

Safety classification of the installed safe AS-i slaves

AC402S has the following system architecture:



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Main module

19837

The main module is the central component of AC402S. It contains the recovery system and the firmware of the device and controls the communication between the individual system components via the backplane. The main module has interfaces to the following components:

- Display (→ **Display** (→ p. 20))
- COM module (→ **COM module** (→ p. 20))
- Ethernet configuration interface
- AS-i module (→ **AS-i module** (→ p. 20))
- Safety module (→ **Safety module** (→ p. 21))

Display

19855

The display is the graphic user interface of AC402S via which the user can configure and diagnose the device. The display exchanges the resulting data with the main module.

COM module

19856

The COM module provides the PROFINET functionality of AC402S. This comprises the PROFINET connection and the necessary firmware. The COM module receives the fieldbus data from the main module via an interface and transfers it to the fieldbus. Simultaneously it receives data from the fieldbus and transfers it to the main module for further processing.

AS-i module

19843

The AS-i module provides the AS-i functionality of AC402S such as receiving, evaluating and transmitting AS-i telegrams without any logical preprocessing. It contains 2 AS-i masters controlling 2 separate AS-i circuits.

The following number of AS-i slaves can be connected to each AS-i master:

- up to 62 non safe AS-i slaves or
- up to 31 safe AS-i input slaves or
- up to 15 AS-i control slaves to control safe AS-i output slaves

The AS-i module exchanges the data of the safe AS-i slaves with the safety module via the backplane. All AS-i data is provided to the main module for representation on the display.

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Safety module

19840

The safety module contains the safety-related hardware of AC402S. The architecture of the safety module provides the following structural features:

- 1oo2 hardware architecture (1 out of 2 architecture)
- 2-channel structure with separate diagnostics in both channels
- 2-channel safe inputs selectable
- 1-channel and 2-channel safe outputs selectable
- Built-in tests on both safe processing units (safety CPU 1/2)
- Hardware failure tolerance (HFT) = 1

The safety module consists of the following components:

- Safety CPU PCB with 2 processors for the control technology signal processing (safety CPU1/2)
- Safety I/O PCB with a separate voltage supply for the local I/O interface

Both PCBs are separated from each other galvanically. They are supplied from separate voltage sources.

Both safety CPUs have separate watchdogs and reset circuits. They are interconnected via cross communication.

Both PCBs are interconnected via a serial interface for bidirectional data exchange.

The safety module has interfaces to the main module and the AS-i module.

Process safety time

19839

The process safety time depends on the source and the objective of the request, the signal processing and the transmission length.

- ► When setting up the safety function, also take into account the process safety time of the application!
- ► Take into account other potential delays caused by upstream and downstream components (sensors, actuators) for time-related considerations. These times extend the response time for safety-related faults.
- ► Process safety time of the other components of the safety function: the manufacturers' data sheets

If the safety time is shorter than the process safety time required by the safety function of the plant, a single fault can in the worst case lead to a faulty output signal for a short time but not to a loss of the safety function.

A loss of the safety function can only occur if the faulty signal cannot be corrected within the process safety time.

In the following cases a single fault cannot lead to a hazardous situation:

- if the safe state is assumed
- if the fault detection and the reaction to the fault happen within the process safety time

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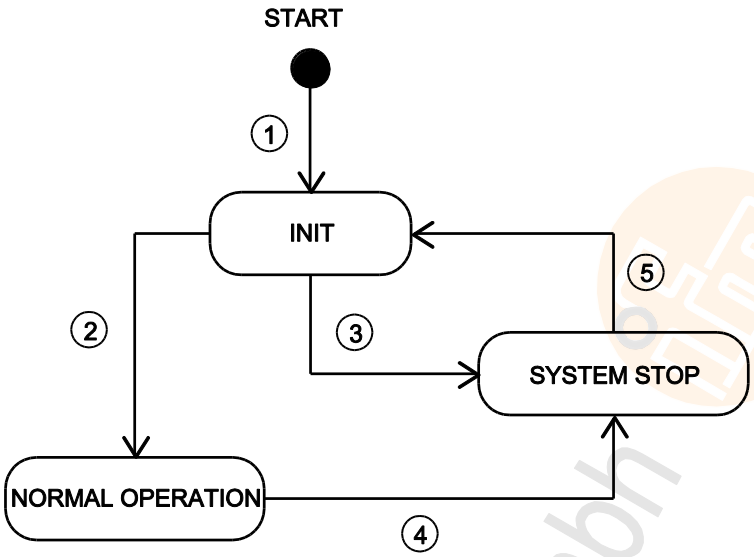
3.3.2 Operating states of AC402S

19835

AC402S has the following operating states:

- INIT
- NORMAL OPERATION
- SYSTEM STOP

Below the state chart:



- **INIT**
  After the start the device automatically goes into the INIT state (1). In the INIT state the device undergoes the different hardware and integration tests (PBIT = Power-up Built-In Test). If the PBIT test is successfully passed, the device takes the state NORMAL OPERATION (2). If the PBIT test is not passed, the device passes into the SYSTEM STOP (3).
- **NORMAL OPERATION**
  In NORMAL OPERATION the device of standard PLC and the fail-safe PLC provides a working environment. The states and the operation modes of the PLC applications are valid (see programming manual). Simultaneously and irrespective of the processing of the PLC applications the device continuously undergoes different hardware tests (CBIT = continuous built-in test). If this CBIT test is not passed, the device goes into the SYSTEM STOP state (4).
- **SYSTEM STOP**
  In SYSTEM STOP the device is in the safe state. To leave the SYSTEM STOP state the operator has to carry out a power-on reset. The device changes to the INIT state (5).

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3.3.3 Monitoring and securing mechanisms

19836

System start / power on reset

19842

When the voltage supply has been applied, the safety module of AC402S automatically undergoes a power-on built-in test (PBIT). The PBIT consists of the following routines:

- Test and installation of the safety-relevant hardware modules
- Test of the program, configuration and user data in SDRAM (CRC test)

If at least one of these partial tests is failed, the system reacts as follows:

- The safety module goes into the safe state
- The transition from the fail-safe PLC to the safe operation is prevented
- An error message is provided in the online support centre (OSC) of the device

Normal operation

19844

During normal operation the safety module of AC402S continuously undergoes a continuous built-in test (CBIT). The CBIT detects accidental hardware errors. It monitors all safety-relevant hardware modules. The CBIT consists of the following routines:

- Monitor the safety-relevant hardware modules with the required DC
- Monitor all diagnostic data that is relevant for the safe functions
- Monitor the program process

Depending on the error class the device triggers certain measures (→ **Error classes** (→ p. 23)).

3.3.4 Error detection and processing

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Error classes

19849

AC402S recognises the following error classes:

Fatal error

19847

The following errors are classified as fatal errors:

- error in the device (temperature exceeded, soiling)
- error in the channels

Response to fatal errors:

- The safety module goes into the safe state (→ **Safe state** (→ p. 25))

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Serious error

19848

Following errors are classified as serious errors:

- Errors occurring in the periphery which do not affect the processing logic of the device

Response to serious errors:

- The safety module goes into the safe state (→ **Safe state** (→ p. 25))

Exception errors

19845

An exception error occurs when the device software is in a non foreseen state.

Response to exception errors:

- The safety module goes into the safe state (→ **Safe state** (→ p. 25))

Scheduling errors

19846

The following errors are classified as scheduling errors:

- Errors in the correct processing of the different tasks in the course of which the operating system cannot make a task change any more so that the watchdog is triggered.

Response to scheduling errors:

- All output channels of the local I/O interface go into the default state (= switched off)
- All safe output slaves stop sending code sequences
- Restart disable of the fail-safe PLC

Error message

19850

AC402S signals occurring errors via the following mechanisms:

- status LED (→ **Status LED** (→ p. 144))
- online support Centre (→ **Online Support Centre (OSC)** (→ p. 149))

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Safe state

19851

The safety module of AC402S is always in the safe state. Exceptions are the following operating states of the fail-safe PLC:

- debug operation
- download operation
- safe operation

If a fatal, serious or exception error occurs during these operating states, the safety module of AC402S goes into the safe state.

The safe state is characterised by the following features:

- All safe output channels of the local I/O interface are already power-free
- All safe AS-i control slaves have stopped sending code sequences
- the fail-safe PLC is in the STOP mode
- the cyclic data transfer between safety module and basic device is interrupted
- the data packages of the safe cross communication between the two safety CPUs are filled with zero sequences and marked as "invalid"
- the basic device detects that the safety module is in the safe state and provides this information in the OSC and on the PROFINET and configuration interface



All non safety-relevant functions of the basic device continue to be available in the safe state.

Reset error

19852

All error states (→ **Error classes** (→ p. 23)) can only be exited using one of the following measures.

► Reboot the device (power-on reset)

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3.4 Software

Contents

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Certified software components for safe applications 27

7077

3.4.1 Software modules of the device

19830

AC402S has the following software modules:

Software modules	Description
Recovery system	Environment for the firmware installation
Firmware	Firmware of AC402S
CODESYS standard runtime system (standard PLC)	Runtime environment for the execution of CODESYS applications to IEC 61131
CODESYS safety runtime system (fail-safe PLC)	Certified runtime environment for the execution of safe CODESYS applications
Standard application	CODESYS application for standard PLC
Safe application	CODESYS application for fail-safe PLC (= safety function)

The user is responsible for setting the safe function of the application (= safe application). If necessary, he must also obtain an approval from the supervisory and test organisations according to the national regulations.

3.4.2 Safety functions

19854

AC402S provides the following safety functions:

- Freely programmable fail-safe PLC
- Safe reading of local digital inputs and linking via the fail-safe PLC
- Safe control of local digital outputs via the fail-safe PLC
- Safe reading of safe AS-i input slaves and linking via the fail-safe PLC
- Control of safe AS-i output slaves via the fail-safe PLC
- Safe data transfer between min. 2 AC402S
- Safe data transfer from and to EtherCAT slaves (FSoE)

AC402S provides the programmer with a safe environment which is suited for the execution of a safe application to SIL3. The user is responsible for programming the safe application.

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3.4.3 Certified software components for safe applications

19821

To program safe applications for AC402S ifm electronic provides certified software components for the programming environment CODESYS safety 3.5. In addition, the user can use the function libraries supplied with CODESYS safety.

Information about device-specific software components and about how to program standard PLC and the fail-safe PLC: → Programming manual fail-safe SmartPLC AC4S"

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4 Mounting

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22016

4.1 Install device

14343

The device must only be installed, connected and put into operation by a qualified electrician as the safe function of the device and machinery is only guaranteed when installation is correctly carried out.

The installation and connection must comply with the applicable national and international standards. Responsibility lies with the person installing the device.

- ► Fix the device onto a 35 mm raised rail.
- ► Vertical installation (upright).
- ► Adhere to a minimum distance of 30 mm between the ventilation holes (perforated sheet) and other parts.
- ► Maximum operating distance: 2000 m above sea level
- ► The protection rating of the device is IP 20. The installation must take place in a control cabinet with at least IP 54 protection.
- ► Lay the cables in a cable duct.
- ► Keep the installation space of the device free from electrically-conductive particles.

Ensure a condensation-free environment. Avoid excessive dust, vibration and shock. The air circulation through the vents must not be impeded. Installation in environments with ionising radiation is not permitted.

Avoid installation in direct vicinity of frequency inverters or other interfering sources.

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5 Electrical connection

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Connect devices to local I/O interface....32

14350

The device must be connected by a qualified electrician.

- ► Disconnect power before connecting the device.
- ► Observe the national and international regulations for the installation of electrical equipment.
- ► Connect the device as indicated on the terminals.
- ► Ensure an electrical connection between the AC402S (X1, terminal FE) and the ground of the installation.

5.1 Wiring

10257

Terminal X1	Pin	Description
AS-i 2 +	1	AS-i + for AS-i line 2
AS-i 2 -	2	AS-i - for AS-i line 2
AS-i 1 +	3	AS-i + for AS-i line 1
AS-i 1 -	4	AS-i - for AS-i line 1
FE	5	Functional earth
	6	Not connected

Terminal X2	Pin	Description
24 V	1	+24 V device supply
GND	2	GND

Terminal X4	Pin	Description
	1...8	IN1...IN8
	9...12	OUT1...OUT4
	13,14	GND
	15,16	+24 V power supply Safe-IO module

A fixed terminal assignment is mandatory for the fail-safe inputs (IN 1...8) → **Connect sensors / actuators** (→ p. 44)

Terminal X3, X8	Configuration interfaces
Socket X6	EtherCAT interface 2 (OUT)
Socket X7	EtherCAT interface 1 (IN)

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5.2 Connect the supply voltage

19831

Supply the device with one of the following versions.

5.2.1 Standard configuration: 24 V power supply and AS-i power supply/supplies

19823

► Connect the supply voltage inputs of the device to the power supply intended for this purpose.

- AS-i bus 1
  Connect the AS-i 1+ and AS-i 1- pins of terminal X1 to the AS-i power supply (e.g. AC1254) of the first AS-i bus.
- AS-i bus 2
  Connect the AS-i 2+ and AS-i 2- pins of terminal X1 to the AS-i power supply (e.g. AC1254) of the second AS-i bus.

Power must be applied simultaneously to the Safe_IO module (terminal X4) and to the device supply (terminal X2).

- 24 V device supply
  Connect the pins 24 V and 0 V of terminal X2 to a 24 V DC power supply (18...32 V SELV/PELV).
- 24 V Safe-IO power supply
  Connect the pins 24 V and GND of terminal X4 to a 24 V DC power supply (18...32 V SELV/PELV).

► Ensure a low-resistance connection of the symmetry point of the device (terminal X1, pin 5 FE) to the ground of the installation.

► For the 24 V power supply (device, Safe-IO), select a power supply which supplies an output current of at least 3 A.

► The cable length of the DC supply between power supply and AC402S is to be limited to max. 3 m.

The power supplies used must meet the standard DIN EN 60950-1 for SELV/PELV.

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5.2.2 Device supply via a joint power supply

7141

- ► If necessary, remove inserted connectors from terminals X1 and X2.
- ► Plug the data decoupling module AC1250 (not supplied) in the terminals X1 and X2.
- ► Connect the first AS-i bus to the pins AS-i 1+ and AS-i 1- of the data decoupling module.
- ► Connect the second AS-i bus to the pins AS-i 2 + and AS-i 2 - of the data decoupling module.

Power must be applied simultaneously to the Safe-IO module (terminal X4) and to the device supply pin 1 (24 V) and pin 2 (0 V) of the data decoupling module AC1250.

- ► Connect the DC power supply (21.5...31.6 V SELV/PELV) to the pins 24 V and 0 V of the data decoupling module.
- ► Connect the pins 24 V and GND of terminal X4 of the AC402S to the above-mentioned power supply, or, if required, to another 24 V DC power supply (18...32 V SELV/PELV).

Recommendation: Directly link the voltage supply of terminal X4 through to pin 1 (24 V) and pin 2 (0 V) of the data coupling module AC1250.

- ► Ensure a low-resistance connection of the symmetry point of the device (terminal X1, pin 5 FE) to the ground of the installation.
- ► Select a power supply which supplies an output current of at least 3 A.
- ► The cable length of the DC supply between power supply and AC402S is to be limited to max. 3 m.

The power supplies used must meet the standard DIN EN 60950-1 for SELV/PELV.

The Safe-IO module (terminal X4) must not be supplied via an AS-i power supply.

Supply the device and both AS-i lines with the passive data decoupling module AC1250 and a DC power supply (SELV/PELV 21.5 V...31.6 V).

The output voltage which is adjusted on the power supply then also corresponds to the voltage level of both generated AS-i bus voltages.

The possible cable length of the two AS-i lines can be reduced (50 m per AS-i line at 24 V).

The output voltage of the power supply used is therefore to be selected in accordance with the requirements of the application within the permitted limits from 21.5...31.6 V.

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5.3 Connect devices to local I/O interface

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17640

- ► Only connect devices that are supported by the AC402S (→ **Supported device types** (→ p. 33))!
- ► To obtain a certain safety integrity level to EN ISO 13849 or performance level to EN 62061, observe the max. obtainable SIL / cat. /PL values when devices are installed on the local I/O interface.

5.3.1 Supported connection types

11234

The local I/O interface of AC402S supports the connection of safe and non-safe devices. The following connection methods are possible:

Connection method	Description
Input, 1 channel, non-safe	▪ corresponds to a standard input ▪ The input value is read in the safe application by means of an FB.
Input, 2 channels, safe	▪ is composed of 2 standard inputs ▪ The 2 logical input signals are monitored by means of a logical device and linked with a safe process signal. ▪ The safe process signal can be used in the safe application.
Input, 2 channels with test pulse, safe	▪ is composed of 2 standard inputs ▪ The 2 logical input signals are monitored by means of a logical device and linked with a safe process signal. ▪ To detect cross-bridging the input signals are also checked for the presence of a test pulse. ▪ The safe process signal can be used in the safe application.
Output, 1 channel, non-safe	▪ corresponds to a standard output ▪ The output value is generated in the safe application by means of an FB.
Output, 1 channel, safe	▪ A safe process signal is provided on 1 output without additional monitoring.
Output, 2 channels, safe	▪ A safe process signal is provided on 2 outputs without additional monitoring

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5.3.2 Supported device types

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11210

The local I/O interface (X4) supports the connection of the following safe device types.

The signals of the clock outputs of safe sensors are not evaluated by AC402S.

► Note possible effects of the obtainable SIL/PL of the entire system.

The proper function of a connected local device can only be obtained by selecting a logical device interface in CODESYS suitable for the operating conditions.

► Observe the notes of how to integrate safe devices in a CODESYS project (→ original programming manual, **Configure safe devices at local I/O interface**)!

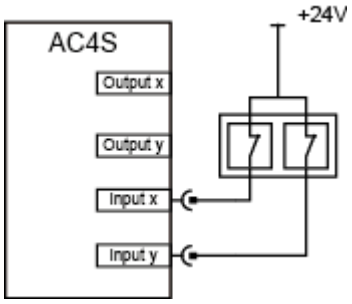
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Mechanical switches

18456

Device type MS-1

11235

Circuit diagram/wiring diagram	Description	Safety classification		
		max. SIL	max. PL	max. cat.
	▪ Mechanical switch ▪ Two-channel connection ▪ not tested	3	e	4

The indicated safety classifications can only be obtained with protected wiring between switch and AC402S.

► Observe current standards of the country in which the AC402S automation system is to be operated.

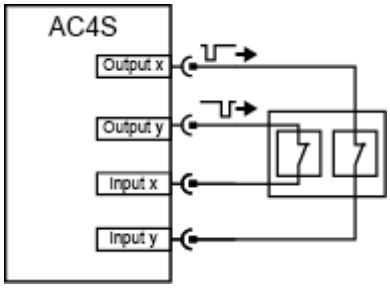
Switch must meet the conditions of the standard IEC 60947-5-1 (Appendix K).

► Select the input circuits according to the max. safety classification (SIL / cat. / PL).

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Device type MS-2

14105

Circuit diagram/wiring diagram	Description	Safety classification		
		max. SIL	max. PL	max. cat.
	▪ Mechanical switch ▪ Two-channel connection ▪ Test with 2 time-shifted switch-off pulses on the input channels ▪ Test signals are generated by AC402S.	3	e	4

Switch must meet the conditions of the standard IEC 60947-5-1 (Appendix K).

- ► Select the input and output circuits according to the max. safety classification (SIL / cat. / PL).
- ► If several MS-2 are connected, the test signals must be different.
- ► Observe current standards of the country in which the AC402S automation system is to be operated.
- ► Test the safety function within the two-error occurrence time.
  The second-error occurrence time takes 24 hours. Within this time the safety function of the device should be requested once.

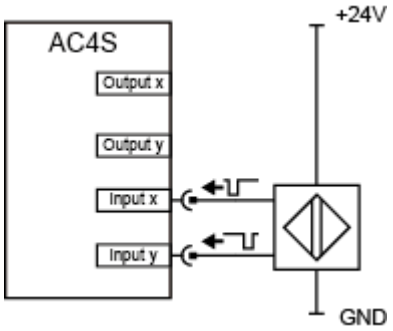
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Electronic sensors

18457

Device type S-1

14198

Circuit diagram/wiring diagram	Description	Safety classification		
		max. SIL	max. PL	max. cat.
	▪ Electronic sensor ▪ Two-channel connection (4-wire operation) ▪ Self-testing with 2 OSSD outputs (test signals are generated by the sensor and filtered or ignored by AC402S ▪ Examples (ifm art. no.): – GI701S – GM701S – GM705S	3	e	4

► Note the supply voltage limits of the sensor.

► Select the input circuits according to the max. safety classification (SIL / cat. / PL).

When the indicated ifm articles are used, the maximum safety classification according to the SIL/Cat./PL values listed in the table can be achieved. Note the current standards.

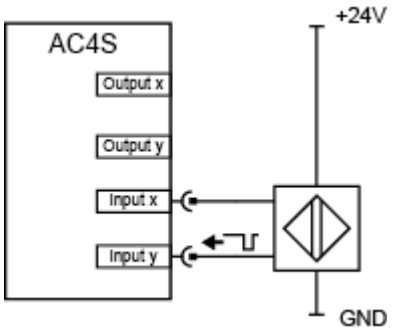
► If other than the indicated products are used, note the current standards.

► Test the safety function within the two-error occurrence time.
The second-error occurrence time takes 24 hours. Within this time the safety function of the device should be requested once.

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Device type S-2

16192

Circuit diagram/wiring diagram	Description	Safety classification		
		max. SIL	max. PL	max. cat.
	▪ Electronic sensor ▪ Two-channel connection (4-wire operation) ▪ Self-testing with 2 OSSD outputs (test signals are generated by the sensor and filtered or ignored by AC402S ▪ Examples (ifm art. no.): – GF711S – GG711S – GI711S – GG712S – GI712S – GG851S	2	d	4

► Note the supply voltage limits of the sensor.

► Select the input circuits according to the max. safety classification (SIL / cat. / PL).

When the indicated ifm articles are used, the maximum safety classification according to the SIL/Cat./PL values listed in the table can be achieved. Note the current standards.

► If other than the indicated products are used, note the current standards.

► Test the safety function within the two-error occurrence time.
The second-error occurrence time takes 24 hours. Within this time the safety function of the device should be requested once.

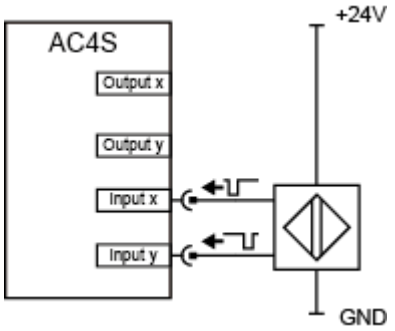
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Safety light curtains

18458

Device type SLV-1

18449

Circuit diagram/wiring diagram	Description	Safety classification		
		max. SIL	max. PL	max. cat.
	▪ Safety light curtains type 2 ▪ Self-testing with 2 OSSD outputs (test signals are generated by the sensor and filtered or ignored by AC402S ▪ Examples (ifm art. no.): – OY431S to OY440S – OY031S to OY040S – OY051S to OY060S – OY072S to OY080S – OY094S to OY100S	1	c	--

► Note the supply voltage limits of the safety light curtain.
► Select the input circuits according to the max. safety classification (SIL / cat. / PL).

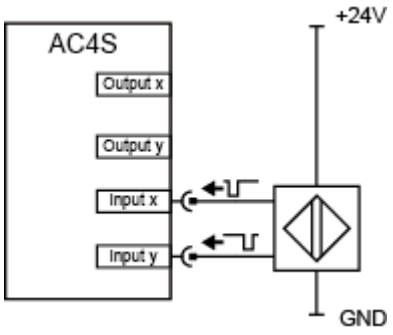
When the indicated ifm articles are used, the maximum safety classification according to the SIL/Cat./PL values listed in the table can be achieved. Note the current standards.

► If other than the indicated products are used, note the current standards.
► Test the safety function within the two-error occurrence time.
The second-error occurrence time takes 24 hours. Within this time the safety function of the device should be requested once.

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Device type SLV-2

18450

Circuit diagram/wiring diagram	Description	Safety classification		
		max. SIL	max. PL	max. cat.
	▪ Safety light curtains type 4 ▪ Self-testing with 2 OSSD outputs (test signals are generated by the sensor and filtered or ignored by AC402S ▪ Examples (ifm art. no.): – OY403S – OY405S – OY407S – OY001S to OY011S – OY041S to OY050S – OY061S to OY070S – OY082S to OY090S – OY104S to OY110S – OY441S to OY450S – OY221S to OY230S – OY204S to OY210S – OY241S to OY250S – OY261S to OY270S – OY282S to OY290S	3	e	--

► Note the supply voltage limits of the safety light curtain.
► Select the input circuits according to the max. safety classification (SIL / cat. / PL).

When the indicated ifm articles are used, the maximum safety classification according to the SIL/Cat./PL values listed in the table can be achieved. Note the current standards.

► If other than the indicated products are used, note the current standards.
► Test the safety function within the two-error occurrence time.
The second-error occurrence time takes 24 hours. Within this time the safety function of the device should be requested once.

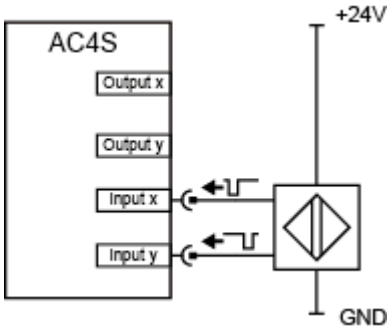
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Safety light grids

18459

Device type SLG-1

18451

Circuit diagram/wiring diagram	Description	Safety classification		
		max. SIL	max. PL	max. cat.
	▪ Safety light grids type 2 ▪ Self-testing with 2 OSSD outputs (test signals are generated by the sensor and filtered or ignored by AC402S ▪ Examples (ifm art. no.): – OY411S to OY413S – OY111S to OY113S	1	c	--

► Note the supply voltage limits of the safety light grid.
► Select the input circuits according to the max. safety classification (SIL / cat. / PL).

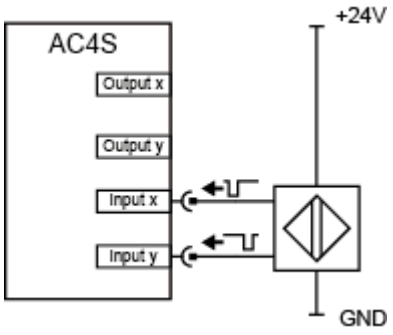
When the indicated ifm articles are used, the maximum safety classification according to the SIL/Cat./PL values listed in the table can be achieved. Note the current standards.

► If other than the indicated products are used, note the current standards.
► Test the safety function within the two-error occurrence time.
The second-error occurrence time takes 24 hours. Within this time the safety function of the device should be requested once.

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Device type SLG-2

18452

Circuit diagram/wiring diagram	Description	Safety classification		
		max. SIL	max. PL	max. cat.
	▪ Safety light grids type 4 ▪ Self-testing with 2 OSSD outputs (test signals are generated by the sensor and filtered or ignored by AC402S ▪ Examples (ifm art. no.): – OY114S to OY116S – OY901S to OY903S – OY421S to OY423S – OY120S to OY122S – OY951S to OY953S	3	e	--

► Note the supply voltage limits of the safety light grid.

► Select the input circuits according to the max. safety classification (SIL / cat. / PL).

When the indicated ifm articles are used, the maximum safety classification according to the SIL/Cat./PL values listed in the table can be achieved. Note the current standards.

► If other than the indicated products are used, note the current standards.

► Test the safety function within the two-error occurrence time.
The second-error occurrence time takes 24 hours. Within this time the safety function of the device should be requested once.

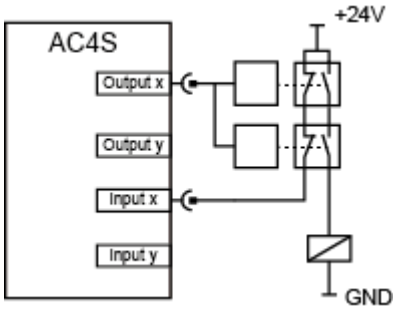
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Output relay

18460

Device type AR-1

18453

Circuit diagram/wiring diagram	Description	Security classifications		
		max. SIL	max. PL	max. cat.
	▪ 2 positively-guided relays with signal contact ▪ 2 output relays in series connection; common triggering of the relays via one output ▪ Check-in of the signal contact via local input channel of AC402S	2	d	3

► Note the supply voltage limits of the relays.
► Select the input and output circuits according to the max. safety classification (SIL / cat. / PL).
► Test relay for correct operation once a year.

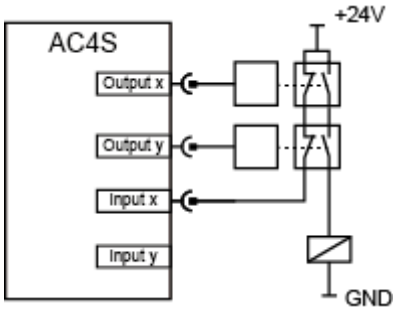
The indicated safety classifications can only be obtained with protected wiring between switch and AC402S.

► Observe current standards of the country in which the AC402S automation system is to be operated.
► Carry out suitable start-up tests.

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Device type AR-2

18454

Circuit diagram/wiring diagram	Description	Security classifications		
		max. SIL	max. PL	max. cat.
	▪ 2 positively-guided relays with signal contact ▪ 2 output relays in series connection; Separate triggering of the relays via 2 outputs ▪ Check-in of the signal contact via local input channel of AC402S	3	e	4

- ► Lay output signal cables protected against damage or test output signals.
- ► Note the supply voltage limits of the relays.
- ► Test relays for correct operation once a month.
- ► Select the input and output circuits according to the max. safety classification (SIL / cat. / PL).
- ► Observe current standards of the country in which the AC402S automation system is to be operated.
- ► Carry out suitable start-up tests.

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5.3.3 Connect sensors / actuators

17700

The sensors or actuators are connected to all local (safe) inputs and outputs via terminal X4.

⚠ WARNING

Risk of personal injuries and/or damage to property.

Safety-relevant functions to SIL 3 / cat. 4 / PL e can only be implemented if one of the following input combinations is used for the connection of 2-channel sensors:

- IN1 and IN8
- IN2 and IN7
- IN3 and IN6
- IN4 and IN5

ifm electronic does not assume any guarantee for obtaining the required SIL / cat. / PL if other than the above-mentioned input combinations is used.

► Use one of the above-mentioned input combinations for the connection of 2-channel sensors.

► Connect the sensor switching signals to the pins IN1...IN8 of terminal X4.
► Connect actuators to the pins OUT1...OUT4 of terminal X4.
► When external sensors / actuators are connected, their supply voltage and/or reference potential of terminal X4 (Safe-IO module supply) must be tapped.
► When external sensors are connected, observe the max. permitted supply voltage of the sensor and select the Safe-IO module supply accordingly.
► The signal cable length for external devices (sensors, actuators) is to be limited to max. 10 m.
► Do not exceed the maximum output current of 0.5 A per output.
► Do not exceed a switching frequency of 25 Hz when connecting the inductive loads (DC-13).

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6 Operation

Contents

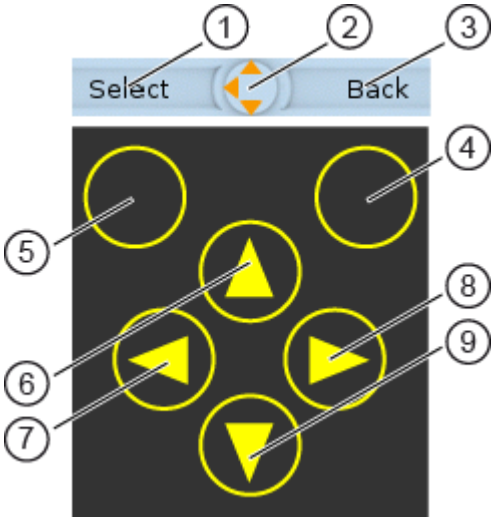
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14805

6.1 Control of the graphical user interface

6930

Below the display is the key panel with six membrane keys. The operator controls the graphical user interface of the device with these keys. The key panel is closely linked to the navigation status bar.



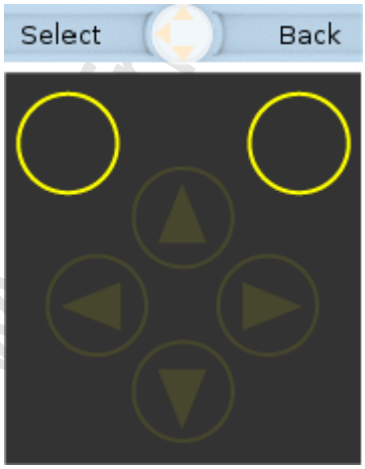
Legend:

1. Label left function key
2. Navigation compass
3. Label right function key
4. Right function key
5. Left function key
6. [▲] arrow key
7. [◀] arrow key
8. [▶] arrow key
9. [▼] arrow key

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6.1.1 Function keys

7090



The two **function keys** allow the operator to trigger specified actions (e.g. tick a checkbox). The function of the function keys changes depending on the context.

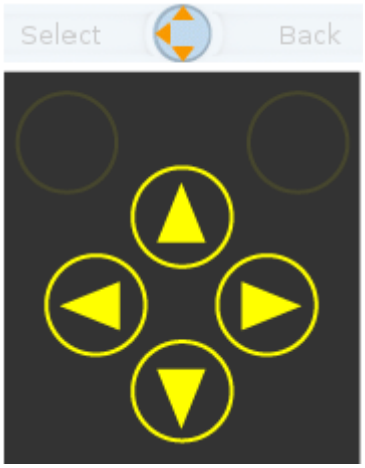
The two **text fields in the navigation status bar** are associated with the function keys located directly below the display. They indicate the action that will be triggered if the function key is pressed in the current work step. If the function key is not labelled, it means that it has no function in the present situation.

Example (→ figure):

- ► The left function key triggers the action [Select].
- ► The right function key triggers the action [Back].

6.1.2 Arrow keys

7091



The four**arrow keys** [▲], [▶], [▼] and [◀] can be used for navigation and selection.

The **navigation compass** shows which of the four arrow keys can be used in the respective work step.

Examples:



All arrow keys are active and will trigger a device response when pressed.



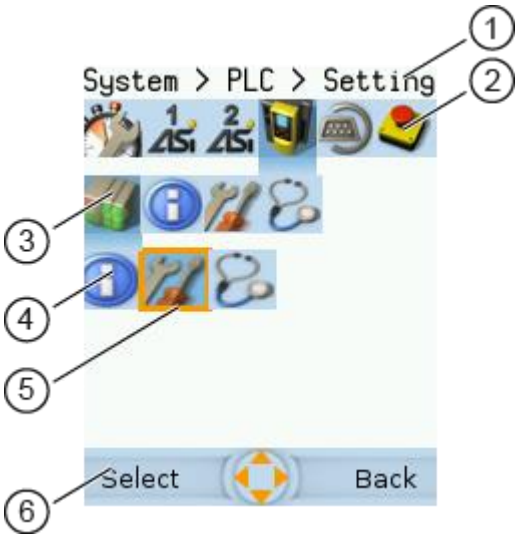
Only the arrow keys [▶] and [▼] are active and will trigger a device response when pressed.

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6.2 Menu view

6996

The menu view allows the user to select the menu page with the required control or display function.



Legend:

1. Info bar
2. Main navigation bar
3. Subnavigation bar 1
4. Subnavigation bar 2
5. Selected menu item (focus)
6. Navigation status bar with
   - labelling of the function keys
   - navigation compass

Long texts are displayed as scrolling text in the info bar.

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6.2.1 Menu navigation

10967

The central operating elements in the menu view are the three **navigation bars**. They reflect the menu structure of the device software. Each navigation bar represents a menu level. The symbols in a navigation bar represent the submenus and menu items.

Rules for menu navigation:

► Use [◀] / [▶] to navigate within a menu level.

> The selected symbol has the **focus** (= orange frame).

> If the selected symbol has a submenu, the corresponding **subnavigation bar** will automatically appear.

► Use [▼] to go one menu level down.

► Use [▲] to go one menu level up.

At the lowest menu level:

► Press [Select] function key to go to the page of the selected menu item (→ **Page view** (→ p. 50)).

In the main navigation bar:

► Press [Back] function key to return to the start screen (→ **Start screen** (→ p. 67)).

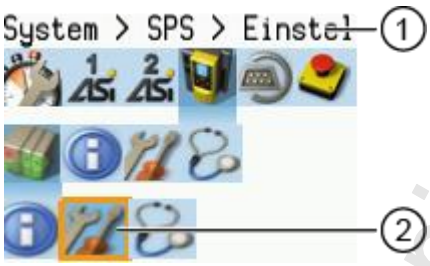
6.2.2 Navigation aids

15830

The following screen elements help you navigate through the menu:

> The **info bar** shows the navigation path of the selected menu symbol.

> The **navigation compass** shows which navigation steps are possible from the current position.

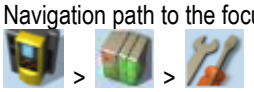


Legend:

(1) Info bar

Navigation path to the focused menu element:
[System] > [PLC] > [Setup]

(2) Menu element with focus

Navigation path to the focused menu element:


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Example

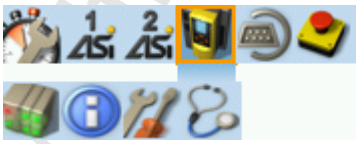
11770

To access the menu page containing the setting options for the device-internal PLC:

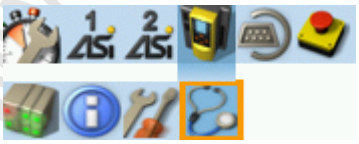
1. > Initial position when accessing the menu screen



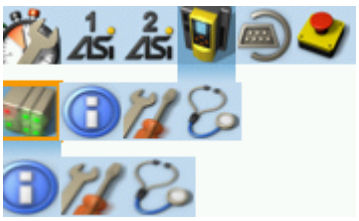
2. ► Use [▶] to select the [System] menu symbol.
   > The focus is on the [System] menu symbol.
   > The first subnavigation bar appears.



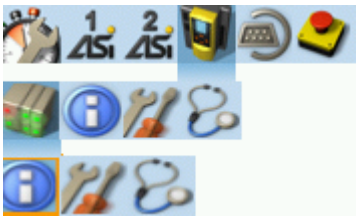
3. ► Use [▼] to change to the first subnavigation barh.
   > The focus is on the [Diagnosis] menu symbol.



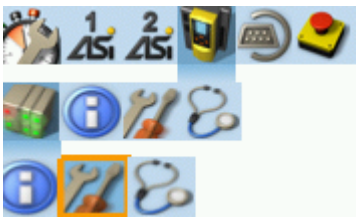
4. ► Use [◀] to select the [PLC] menu symbol.
   > The focus is on the [PLC] menu symbol.
   > The second subnavigation bar appears.



5. ► Use [▼] to change to the second subnavigation bar.
   > The focus is on the [Information] menu symbol.



6. ► Use [▶] to select the [Settings] menu symbol.
   > The focus is on the [Settings] menu symbol.
   ► Press the [Select] function key to go to the page view of the [Settings] menu item.
   > The page shows the setting options for the device-internal PLC.

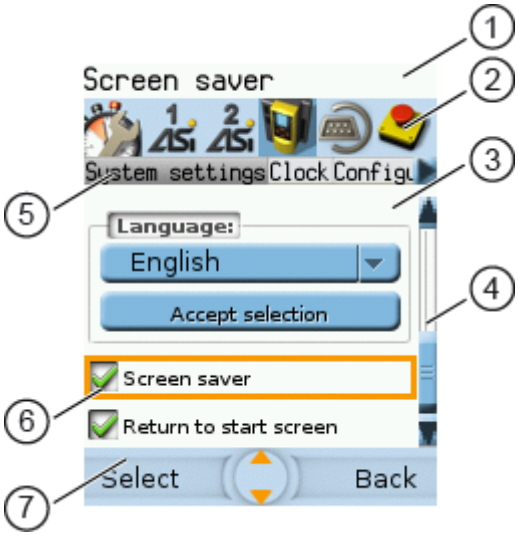


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6.3 Page view

7959

The page view allows the user to select and execute a requested function.



Legend:

1. Info bar
2. Main navigation bar
3. Page
4. Scroll bar
5. Tab menu
6. Page element with focus
7. Navigation status bar with
   - labelling of function keys
   - navigation compass

6.3.1 Navigate on a page

15831

The page contains elements, that allow the operator to control the device or access information.
For page navigation, the following basic rules apply:

► Use the arrow keys [▼] / [▲] to change between the different page elements.
> The selected element is marked (= orange frame).
► Use the [Back] function key to return to the tab menu / menu view.

Rules for using the different control elements: → **Description of the control elements** (→ p. 51)

6.3.2 Use navigation aids

14838

The following aids offer navigation users additional orientation:

> The **info bar** shows detailed information about the selected element (focus).

Long texts are displayed as scrolling text in the info bar.

> The active menu symbol in the **main navigation bar** has a dark background.
> A **scroll bar** appears on the right side of the screen if the elements do not fit on the page.
> The **navigation compass** shows the navigation options in the active work step.
> The **text fields in the navigation status bar** show the current assignment of the function keys.

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6.3.3 Description of the control elements

Contents

Tab menu/Tab 52
Button 53
Checkbox....53
List 54
Slave selector 55
Confirmation message....60
Numerical field....61
Binary field....62

7013

A page consists of different control elements.

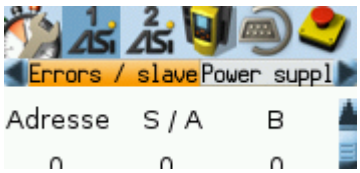
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Tab menu/Tab

8737

A tab menu groups together the different functions of a menu page. A tab menu consists of at least two tabs. A tab combines related functions.

Example:



> The focused tab has an orange background
> The info bar displays the name of the active tab (in this example: `Errors / slave`).
> The symbols ◀ and ▶ indicate that there are more tabs on the left and right sides of the visible tab.
> The page shows the control elements that belong to the currently selected tab.

Tabs can have the following background colours:

`Version` = Tab has the focus

`Version` = Tab is active

`Version` = Tab is inactive

Use:

1 Select the menu item

► Go to the menu item with the tab menu.
> The tab menu appears.
> The focus is on the left-hand tab.

2 Select a tab

► Use [◀] / [▶] arrow key to select the desired tab.
> The focus (orange background) moves to the selected tab:
`Version`
> The page shows the functions of the selected tab.

3 Activate the menu page

► Press [Select] arrow key to go to the page that belongs to the active tab.
> When going to the page, the tab menu remains visible.
> The background colour of the active tab turns grey.
`Version`

4 Carry out the desired functions

► Use [▼] to select and execute the desired function.

5 Change to tab menu

► Press [Back] function key to change to the tab menu.
> The focus (orange background) moves to the active tab.

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Button

14196

A button allows the operator to carry out a specified action once. The caption on the button describes the action.

Example:

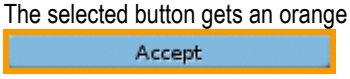


Use:

1 Select a button

► Use the arrow keys [▲] / [▼] to select a button.

> The selected button gets an orange frame:



2 Activate the button

► Use [Select] function key to activate the selected button.

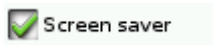
> The function is executed.

Checkbox

7038

A checkbox permits the user to activate/deactivate a parameter. A checkbox control element consists of a checkbox and a caption.

Example:

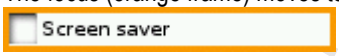


Use:

1 Select a checkbox

► Use [▲] / [▼] arrow key to select the checkbox

> The focus (orange frame) moves to the selected checkbox



OR:



2 Check/uncheck a checkbox

► Use [Select] function key to check/uncheck the selected checkbox.

> The status change is indicated:

 = checkbox is checked

OR:

 = checkbox is unchecked

The setting or clearing of a checkbox is not always immediately effective. Often the change must be confirmed by clicking a button (e.g. [Accept selection])!

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List

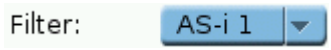
7042

A list provides a set of defined values. The operator can select precisely one value from this set (= 1 of n selection).

Examples:



= list without caption



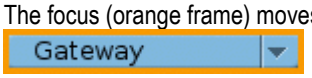
= list with caption

Use:

1 Select a list

► Use [▲] / [▼] arrow key to select the list.

> The focus (orange frame) moves to the selected list.



> The list shows the active value: (in this example`Gateway`).

2 Activate the list

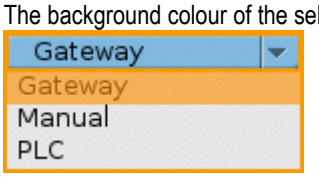
► Use [Select] function key to open the list.

> The opened list shows the selectable values.

3 Select a value

► Use [▲] / [▼] arrow key to select the desired value from the list.

> The background colour of the selected value turns orange.



4 Apply the selected value

► Use [Select] function key to apply the selected value.
OR:
Use [Back] function key to quit and close the list.

> The list shows the selected value.

The set value will not always become effective immediately. Often the change must be confirmed by clicking a button (e.g. [Accept selection])!

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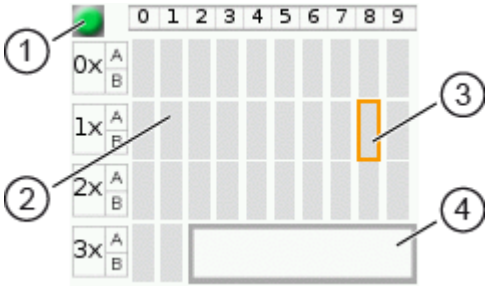
Slave selector

Contents

Overview of slave states....56
Overview of free slave addresses....58

7018

The slave selector is used to select an AS-i slave or an AS-i address.



Legend:

1. Indicator of AS-i master operating mode
2. AS-i address symbol
3. Highlighted AS-i address (focus)
4. Status message of highlighted AS-i address

> The **status LED** indicates the active operating mode of the AS-i master:
  = AS-i master in protected mode
  = AS-i master in projection mode

> Every field represents an **AS-i address**. An AS-i address can be occupied by:
  – a single slave symbol
  – an A/B slave pair symbol

> The row and column headers help to locate the AS-i address.

  Example: address of the field selected in the picture
  – row header: 1x (= tens digit of the AS-i address)
  – column header: 8 (= units digit of the AS-i address)
  – type of slave: single slave (= symbol fully occupies the address field)
  – resulting AS-i address: 18

> The symbol of the A/B slave pair appears when an A or B slave is used on this address.

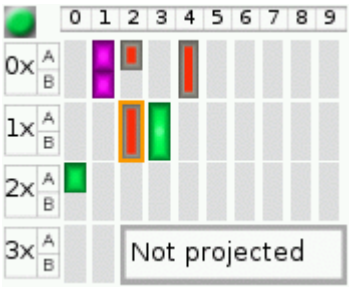
The slave selector is used in the following overviews:

- Overview of slave states (→ **Overview of slave states** (→ p. 56))
- Overview of free slave addresses (→ **Overview of free slave addresses** (→ p. 58))

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Overview of slave states

6992



> The slave selector shows an overview of the slaves in the selected AS-i network.

> The symbol colour signals the slave status. Meaning of symbols and colours:
→ **Slave status: colour code + symbols** (→ p. 57)

> The text field displays the status of the selected AS-i slave. Possible status messages:

- `Slave active`
- `Not projected` (= configuration error)
- `Double address` (= double address error)
- `Periphery` (= periphery fault)

Use:

1 Select an AS-i slave

► Use the arrow keys [▲], [▶], [▼] and [◀] to select the desired AS-i slave.

> The focus (= orange frame) is on the selected AS-i slave.

> The info bar shows the address of the selected AS-i slave.

> The text field shows a status message about the selected AS-i slave.

2 Activate the selected AS-i slave

► Use [Select] function key to activate the selected AS-i slave and go to the next menu page.
OR:
Use [Back] function key to cancel and leave the slave selector.

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Slave status: colour code + symbols

11236

Single slave	A/B slave	Colour	Meaning
		grey	No slave found: slave address is neither in the LPS nor in the LDS
		green	Slave is activated (in LAS)
		red	Configuration error type 1: slave is projected (in LPS) but was not found (in LDS)
		yellow	Slave signals a peripheral fault
		pink	Several slaves have the same address (double address error)
		grey red	Configuration error type 2: ▪ the found slave (in LDS) is not projected (in LPS) ▪ the found slave has another profile than projected

Meaning of the colour combinations (example: configuration error type 2)

11237

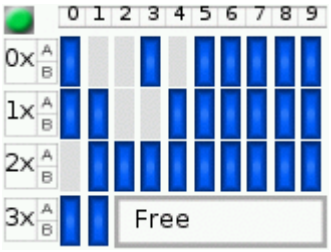
Symbol	Colour	Meaning
	grey red grey	Configuration error type 2: ▪ Single slave is projected (in LPS) but was not found (in LDS). ▪ Instead, a new A slave with the same address was installed.
	grey grey red	Configuration error type 2: ▪ Single slave is projected (in LPS) but was not found (in LDS). ▪ Instead, a new B slave with the same address was installed.
	grey red	Configuration error type 2: ▪ A or B slave is projected (in LPS) but was not found (in LDS). ▪ Instead, a new single slave with the same address was installed.

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Overview of free slave addresses

6993

In this overview, the slave selector shows the free and occupied AS-i addresses.



> The symbol colour indicates the state of the AS-i address.
Meaning of symbols and colours:
→ **Free slave addresses: colour code + symbols** (→ p. 59)

> The text field displays the status of the selected AS-i slave.
Possible status messages:

- `Free`
- `Missing slave`

Use:

1 Select the AS-i address

► Use the arrow keys [▲], [▶], [▼] and [◀] to select the desired AS-i address.

> The focus (= orange frame) is on the selected AS-i address.

> The info bar displays the selected AS-i address.

> The text field shows a status message for the selected AS-i address.

2 Activate the selected AS-i address

► Press [Select] function key to activate the selected AS-i address and go to the next menu page.
OR:
Press [Back] function key to cancel and leave the slave selector.

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Free slave addresses: colour code + symbols

11239

Single slave	A/B slave	Colour	Meaning	Prio.
		grey	Slave address is already used.	--
		turquoise	Address is free according to LDS (= no slave found), however: address already belongs to a stored projection (= application profile).	1
		blue	Address is free according to LDS (= no slave found). Address is not used in a stored projection (= application profile).	2

Meaning of the colour combinations

11240

Symbol	Colour	Meaning
	blue blue	Slave to be addressed is an A/B slave: A and B addresses are free.
	blue grey	Slave to be addressed is an A/B slave: – A address is free. – B address is used.
	grey blue	Slave to be addressed is an A/B slave: – A address is used. – B address is free.
	turquoise turquoise	Slave to be addressed is an A/B slave: A and B addresses are free, but already used in a stored projection.
	turquoise grey	Slave to be addressed is an A/B slave: – A address is free, but already used in a stored projection. – B address is used.
	grey turquoise	Slave to be addressed is an A/B slave: – A address is used. – B address is free, but already used in a stored projection.
	turquoise blue	Slave to be addressed is an A/B slave: – A address is free, but already used in a stored projection. – B address is free.
	blue turquoise	Slave to be addressed is an A/B slave: – A address is free – B address is free, but already used in a stored projection.

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Confirmation message

7033

The confirmation message is a security prompt. It appears when important changes are made to the system settings. The confirmation message shows the changes made. For the changes to become effective, they first need to be acknowledged by the operator.

Example:



> Action: Change AS-i slave address from 1a to 1b
> Confirmation message shows:
  - Action (= `Change AS-i address`)
  - Slave address prior to change
  - Slave address after change
> The operator has the following input options:
  - [Select] function key
  - [Back] function key

Use:

1 Change the settings

► Change the system settings.

> The confirmation message appears.

2 Confirm the message

► Press [Select] function key to confirm the changes and apply the new value.
OR:
Press [Back] function key to reject the changes and continue to use the old value.

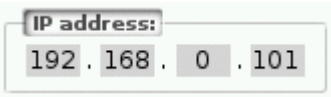
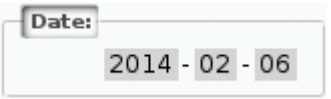
> The page displays the valid settings.

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Numerical field

7046

The numerical field allows the operator to enter integer values. The value range is context-specific. Numerical fields are part of the following GUI elements:

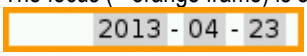
Control element	Example	Meaning
IP address		Entry of an IP address (IPv4) in [w.x.y.z] format ▪ w | x | y | z = network segments (value range: 0... 255)
Date		Date entry in [yyyy-mm-ss] format ▪ yyyy = year (value range: 0000 ... 9999) ▪ mm = month (value range: 01 ... 12) ▪ dd = day (value range: 01 ... 31)
Time		Time entry in [hh:mm:ss] format ▪ hh = hours (value range: 00 ... 12) ▪ mm = minutes (value range: 00 .... 59) ▪ ss = seconds (value range: 00 ... 59) The numerical field for seconds (ss) cannot be edited!
Analogue value		Entry of an analogue output value Value range (per numerical field): 0 ... 9

Use (using the example of the numerical date field):

1 Select a numerical field

► Use [▲] / [▼] arrow key to select the date control element.

> The focus (= orange frame) is on the selected date control element.



> The date control element displays the current date

2 Activate the editing mode

► Press [Select] function key to enter the editing mode.

> The focus (orange frame) is on the right element



3 Set the desired value

► Use [▲] / [▼] arrow key to increment the desired value.

> The segment displays the new value.

Press and hold the arrow key [▲] / [▼] to rapidly move through larger value ranges.

4 Select the next segment

► Use the arrow key [◀] / [▶] to mark the segment to be edited.

> The focus (orange frame) moves to the marked segment



► Optional: Repeat steps 3 and 4 until all segments have the desired values.

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5 Adopt the set values

► Use [Select] function key to confirm the set values and to leave the edit mode.
OR:
Use [Back] function key to reset the set values and to leave the edit mode.

> The date control element displays the valid date

The set value will not always become effective immediately. Often the change must be confirmed by clicking a button (e.g. [Accept selection])!

Binary field

7047

The binary field allows the operator to change a digital value bit-wise.
Example:



> Display of the 4-bit digital value:
- Binary representation
  = bit is on (= 1).
  = bit is off (= 0).
- Hexadecimal representation:
  0xf = 1111

Use:

1 Select the binary field

► Use [▲] / [▼] arrow key to select the binary field.

> The focus (orange frame) is on the selected binary field.



> The control element shows the current value (digital and hexadecimal).

2 Activate the editing mode

► Press [Select] function key to enter the editing mode.

> The focus (orange frame) is on the right element.



3 Set the desired value

► Use [▲] / [▼] arrow key to set the desired value.

> The control element shows the new value in digital and hexadecimal format.

4 Select the next segment

► Use [◀] / [▶] arrow key to mark the segment to be edited.

> The focus (orange frame) is on the selected segment.



► Optional: Repeat steps 3 and 4 until all segments have the desired values.

5 Apply the set values

► Use [Select] function key to confirm the set values and to leave the edit mode.
OR:
Use [Back] function key to reset the set values and to leave the edit mode.

> The binary field displays the current value (binary and hexadecimal).

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6.4 Remote access

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7068

The device has an integrated web server. It generates a web interface which allows remote access to all device functions via an web browser. The web-interface allows the operator to easily configure, parameterise and monitor the device in permanent operation via an ethernet-based network.

6.4.1 General

7069

The operating concept of the web interface follows the same philosophy as the operating concept of the local display. The web interface uses the same menu items, the same menu structure and the same symbols as the graphic user interface of the local display.

Observe notes regarding the additional functionality of the web interface: → **Additional functions** (→ p. 68)

6.4.2 Recommended browsers

7070

Use one of the following Internet browsers to correctly display the HTML pages of the web interface:

- Microsoft Internet Explorer (from version 8.0)
- Mozilla Firefox (from version 3.5)

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6.4.3 Operating instructions

Web interface: Access

10283

► PC / Laptop / mobile device: Start Internet browser.

► Internet browser: Enter IP address of the device in the address line (e.g. `192.168.82.2`)

> Internet browser displays the start page of the web interface.

Web interface: Navigation

14193

In the web interface, the pointing device (e.g. mouse, touchpad) is used instead of the following key functions:

- Navigation functions of the arrow keys [▼], [▲], [▶], [◀]
- Selecting functiions of the function keys [Select] and [Back]

Example:

To select  > :

► Place the cursor on symbol [AS-i 1] in the main navigation bar.

> symbol [AS-i 1] has the focus.

> Subnavigation bar appears.

> Navigation trail shows actual position in the menu tree: `AS-i 1`



► Place the cursor on symbol [Diagnosis] in the subnavigation bar.

> symbol [Diagnosis] has the focus.

> Navigation trail shows actual position in the menu tree: `AS-i 1 > Diagnosis`



► Click on symbol [Diagnosis]

> Web browser shows menu page [Diagnosis]

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Web interface: Password protection

14187

The web server has a basic password protection to prevent unwanted or unauthorised changes to the device settings via the web interface.

When the web interface is accessed, a status bar at the top shows if the user is logged in or logged out:

Status: logged in	User is logged in: ▪ Full access to device settings ▪ Full access to diagnostics and information data
Status: logged out	User is logged out: ▪ No access to device settings ▪ Access to diagnostics and information data

The password is: CAFE
The password protection cannot be deactivated! The password cannot be changed!

Web interface login

14221

► Go to the web interface (→ **Operating instructions** (→ p. 64)).
> At the top of the web interface, the status bar displays the following status message:
Status: logged out
► Enter the fixed password in the [Password:] field.
► Click [Login] to log in to the web interface.
> The status bar displays the changed status:
Status: logged in
> The operator has unlimited access to all menus and functions of the web interface.

The operator remains logged in if one of the following actions is carried out:
- the web browser is closed and reopened
- the PC/laptop is restarted
- AC402S is restarted

To prevent unauthorised access to the device settings:
► Manually log off before you leave the web interface! (→ **Disconnect from web interface** (→ p. 66))
► Remember to turn off the "Save password" function of your web browser before accessing the web interface!
► If the "Save password" function of your web browser is not turned off: delete the stored passwords in your browser settings!

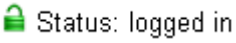
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Disconnect from web interface

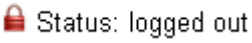
14276

To log out of the web interface:

► Start web interface

> Status line with status message is displayed at the top of the web interface:


► Log out of the web interface by clicking [Logout]

> Status bar shows changed status


> User can only access menus in the web interface containing diagnostic and information data.

> An error message is displayed when a user in the web interface accesses a menu with device settings.

The user stays logged into the web interface even when the web browser is closed and then restarted.

To prevent unauthorised access to the device settings:

► After finishing the access via the web browser manually log out of the device web interface!

► When passwort memory function of the web browser is not deactivated: Delete all saved passwords in the browser settings!

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7 Menu

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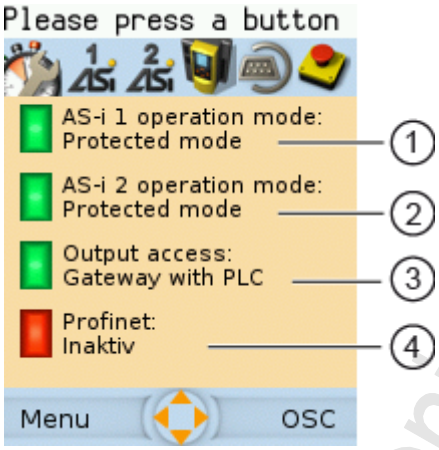
18788

This chapter describes the menu functions of the device's graphical user interface.

7.1 Start screen

18922

When starting the device, the start screen of the graphical user interface appears (special case: system start after initial commissioning or firmware update: → **Start screen 'Basic settings'** (→ p. 139)). The start screen displays the status information of important system components. The start screen is also the starting point for access to the menu functions of the AC402S.



1. AS-i master 1 operation mode
   → **Operating mode of the AS-i master** (→ p. 146)
2. Operating mode of the AS-i master 2
   → **Operating mode of the AS-i master** (→ p. 146)
3. Control instance of the AS-i slave outputs
   → **Control instance of the AS-i outputs** (→ p. 146)
4. Status of the PROFINET connection
   → **Fieldbus status** (→ p. 147)

► Change to the menu with [Menu] function key (→ **Menu functions** (→ p. 68)).

OR:

► Display the online support centre with [OSC] function key (→ **Online Support Centre (OSC)** (→ p. 149)).

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7.2 Menu functions

23463

The main navigation bar of the AC402S provides access to the following menus:

Icon	Description
	Access to the most important device functions → **System** (→ p. 89)
	Configuration and diagnostics of the AS-i 1 network (AS-i master, AS-i slaves) → **AS-i 1/ AS-i 2**
	Configuration and diagnostics of the AS-i 2 network (AS-i master, AS-i slaves) → **AS-i 1/ AS-i 2**
	Configuration and diagnostics of the device, control of the device-internal standard PLC → **System** (→ p. 89)
	Configuration and diagnostics of the interfaces (PROFINET, configuration interface) → **Interfaces** (→ p. 109)
	Status and diagnostics of the device-internal fail-safe PLC → **Safety** (→ p. 119)
	Online Support Centre* → **Online Support Centre (OSC)** (→ p. 149)
	Control and administration of the ifm system solutions (ifm apps)* → **ifm system solutions** (→ p. 131)

* ... only available via the web interface of the device

7.2.1 Additional functions

7236

Compared to the user interface of the display, the web interface offers the following additional functions:

- Download device description file
  (→ **Download GSDML file** (→ p. 116))
- Adopt date and time of a PC/laptop
  (→ **Adopt the system time of the PC** (→ p. 103))
- Store diagnostic protocol
  (→ **Store diagnostic protocol** (→ p. 107))
- Use ifm system solutions
  (→ **ifm system solutions** (→ p. 131))
- Diagnostics display
  (→ **Start screen: Status LEDs** (→ p. 146))

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7.3 Quick setup

9010

The [Quick setup] menu provides fast access to the most important device functions.

Navigation path	Functions
	→ **Quick setup: Project AS-i networks** (→ p. 70) → **Quick setup: Configure the operating mode of the AS-i masters** (→ p. 71) → **Quick setup: Configure the output access** (→ p. 72) → **Quick setup: Access the device via QR code** (→ p. 73) → **Quick setup: Configure the PROFINET interface** (→ p. 73) → **Quick setup: Set the Configuration interface 1** (→ p. 74) → **Quick setup: Set the configuration interface 2** (→ p. 75) → **Quick setup: Address the AS-i slaves connected to AS-i master 1** (→ p. 76) → **Quick setup: Address the AS-i slaves connected to AS-i master 2** (→ p. 77)

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7.3.1 Quick setup: Project AS-i networks

8973

During projection adaptation, the AS-i master carries out the following actions:

- The configuration data of all detected AS-i slaves (LDS) is saved
- The detected AS-i slaves are added to the list of projected slaves (LPS)

During a project a projection adaptation all output parameters of the unconnected AS-i slaves are reset to their default value in the AS-i master (single /A slaves = 0xF, B slaves = 0x7).

To carry out the projection adaptation on AS-i master 1 and/or AS-i master 2:

1 Select menu page

► 

► Select tab [Project all].

2 Select the AS-i master for projection adaptation

► Set the following parameters as required:

Parameter	Description	Possible values	
[AS-i Master 1]	Select AS-i master 1 for projection adaptation	☐	Exclude AS-i master 1 from projection adaptation
		☑	Include AS-i master 1 in projection adaptation
[AS-i Master 2]	Select AS-i master 2 for projection adaptation (only available for devices with 2 AS-i masters)	☐	Exclude AS-i master 2 from projection adaptation
		☑	Include AS-i master 2 in projection adaptation

3 Start the projection adaptation

► Activate the button [Start projection process].

> The selected AS-i masters go into the "projection mode".

> A projection adaptation is carried out on the selected AS-i masters.

> After projection adaptation, the selected AS-i masters go into the "protected mode".

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7.3.2 Quick setup: Configure the operating mode of the AS-i masters

8974

Information regarding the operating modes of an AS-i master:→ **Operating modes of the AS-i master** (→ p. 162)

To configure the operating modes of the AS-i masters:

1 Select the menu page

► 

► Select [Operation modes] tab.

2 Configure the operating mode of AS-i master 1 and the behaviour of the connected AS-i slaves

> In group [AS-i master 1], set the following parameters as required:

Parameter	Meaning	Possible values	
[Projection mode]	Active operating mode of the AS-i master	☐	Projection mode inactive: AS-i network runs in protected mode (normal mode)
		☑	Projection mode active: AS-i network can be projected. (→ **Quick setup: Address the AS-i slaves connected to AS-i master 1** (→ p. 76) or → **Quick setup: Address the AS-i slaves connected to AS-i master 2** (→ p. 77))
[No slave reset]	Behaviour of the AS-i slaves when changing the operating mode	☐	Slave is reset when changing the operating mode: When changing the operating mode, the AS-i slaves will be reset for a short moment (reset or offline phase).
		☑	Slave is not reset when changing the operating mode: When changing the operating mode, the AS-i slaves continue to operate without interruption.

> Selected values are applied.

3 Optional: set the operating mode of AS-i master 2 and the behaviour of the AS-i slaves

► Repeat step 2 for the group [AS-i master 2].

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7.3.3 Quick setup: Configure the output access

17867

Only one control instance at a time can have write access to the outputs of the connected AS-i slaves. The operator configures the control instance with the parameter [Output access].

To configure the control instance of the AS-i slave outputs:

1 Select the menu page

► 

► Select [Operation modes] tab.

2 Set the control instance for the outputs of the AS-i slaves

► From the list [Output access], select the desired value:

Parameter	Meaning	Possible values	
[Output access]	Control instance of the AS-i slave outputs	[Gateway]	A higher-level PLC controls the outputs of the AS-i slaves.
		[Manual]	The operator controls the outputs of the AS-i slaves via the graphical user interface.
		[PLC]	The device-internal PLC controls the outputs of the AS-i slaves.

3 Save the changes

► Press [Accept selection] to save the changes.

> The selected instance controls the outputs of the AS-i slaves.

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7.3.4 Quick setup: Access the device via QR code

11764

The QR code (**Q**uick **R**esponse Code) allows the operator to access the web interface of the device from a smartphone or tablet PC.

Requirements:

- The AS-i device must be connected to a wireless LAN router with switch functionality.
  (→ **Connection via Ethernet network** (→ p. 160))
- The smartphone/tablet PC is connected to the wireless LAN router.
- The smartphone/tablet PC provides a camera function.
- The smartphone/tablet PC has a QR-code reader installed.

1 Select menu page

► 

► Select the [QR-Code] tab.

> The display shows the QR code.

2 Read the QR code

► Start the QR code reading app and scan the QR code.

> The smartphone displays the web interface of the device (→ **Remote access** (→ p. 63)).

7.3.5 Quick setup: Configure the PROFINET interface

8976

To configure the PROFINET-interface:

1 Select menu page

► 

► Select [Profinet] tab.

2 Set IP parameters of the PROFINET-interface

> Set following parameters as requested:

Parameter	Description	Possible values
[IP address]	IP address of the PROFINET-interface	e.g. `192.168.10.3`
[Subnet mask]	Netmask of the PROFINET-network segment	e.g. `255.255.255.0`
[Gateway address]	IP address of the PROFINET-gateway	e.g. `192.169.10.1`

3 Save changes

► Use [Accept] to save the changes.

► Selected values are applied.

> PROFINET-Interface is accessible via the set address.

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7.3.6 Quick setup: Set the Configuration interface 1

8991

The device provides the following options for configuration of the Ethernet Configuration interface 1:

- Manual = The operator sets the interface parameters (IP address, network mask, gateway address) manually.
- Automatic = The interface parameters are set automatically. The operator can choose between these protocols:
  – Dynamic Host Configuration Protocol (DHCP)
  – Zero Configuration Networking (Zeroconf)

The device must be connected to a DHCP server to automatically receive the interface parameters via DHCP.

► Connect the configuration interface (X3) to a DHCP server.

To configure the IP parameters of the configuration interface:

1 Select the menu page

► 

► Select [Config. interface X3] tab.

2 Show the active settings

> The parameters below show the active settings:

Parameter	Meaning	Possible values	
[Optain IP address autom.]	Active method for the configuration of the interface parameters	☐	Manual assignment of the interface parameters through the operator
		☑	Automatic assignment of the interface parameters
[IP status]	Configuration protocol used	[Static]	The operator sets the IP parameters manually.
		[DHCP]	The IP parameters are set by a DHCP server.
		[Zeroconfig]	The IP parameters are set automatically with the Zeroconf protocol.
[IP address]	IP address of the interface	e.g. `192.168.0.100`	
[Subnet mask]	Network mask of the network segment	e.g. `255.255.255.0`	
[Gateway address]	IP address of the network gateway	e.g. `192.168.0.1`	

► Take one of the following actions:
  – Configure the IP parameters manually: continue with → step 3
  – Configure the IP parameters automatically: continue with → step 4

3 Configure the IP parameters manually

► Uncheck [Optain IP address autom].

► Set the following parameters as required:
  – [IP address]
  – [Subnet mask]
  – [Gateway address]

► Press [Accept] to save the changes.

► Continue with → step 5

4 Configure the IP parameters automatically

► Check [Optain IP address autom].

► Press [Accept] to save the changes.

> The device tries to obtain IP parameters from a DHCP server.

> If the IP parameter configuration via DHCP server fails, the device will generate the IP parameters by means of the Zeroconf protocol.

The automatic configuration of the interface takes approx. 10 seconds.

5 Show the current settings

> The parameters (→ step 2) show the active IP settings of the Configuration interface 1.

7.3.7 Quick setup: Set the configuration interface 2

7105

Configuration interface 2 (X8) has the same configuration options as configuration interface 1 (X3).

→ **Quick setup: Set the Configuration interface 1** (→ p. 74)

To configure configuration interface 2 (X8):

1 Select menu page

► 

► Select tab [Config interface X8].

2 Configure interface

► Set the interface as required.

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7.3.8 Quick setup: Address the AS-i slaves connected to AS-i master 1

8992

To change the address of an AS-i slave connected to AS-i master 1:

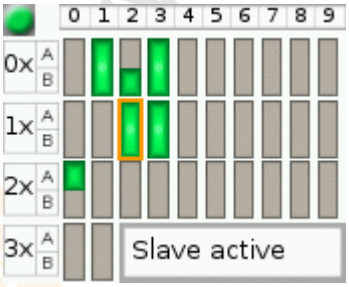
1 Select the menu page

► 

► Select [Addressing AS-i 1] tab.

2 Select the AS-i slave

> The page provides an overview of the current addressing and status of the AS-i slaves on the selected AS-i master (→ figure)
Notes on colour codes: → **Overview of slave states** (→ p. 56)

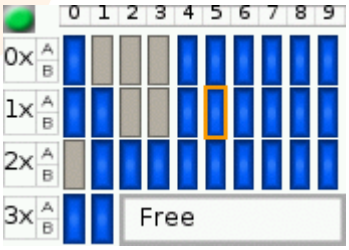


► Select the AS-i slave of which want to change the address.

► Use [Select] to activate the selected AS-i slave.

3 Select a new AS-i address

> The page provides an overview of the free AS-i addresses (→ figure)
Notes on colour codes: → **Overview of free slave addresses** (→ p. 58)



► Select the address to be assigned to the AS-i slave.

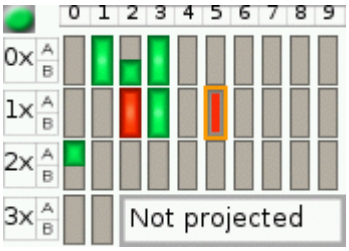
► Assign the selected address with [Select].

> The confirmation prompt appears.

► Confirm the message with [OK].

> The AS-i slave has new address.

> The page provides an overview of the current addressing and configuration errors (→ figure)



4 Address additional AS-i slaves (optional)

► Repeat steps 2 and 3 to address additional AS-i slaves.

After the address change, the present configuration no longer corresponds to the stored configuration.

> The slave status indicates a configuration error.

To eliminate the configuration error:

► Start a projection adaptation (→ **Quick setup: Project AS-i networks** (→ p. 70)).

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7.3.9 Quick setup: Address the AS-i slaves connected to AS-i master 2

11671

The procedure for addressing the AS-i slaves connected to AS-i master 2 is the same as for addressing the AS-i slaves connected to AS-i master 1 (→ **Quick setup: Address the AS-i slaves connected to AS-i master 1** (→ p. 76)).

To change the address of an AS-i slave connected to AS-i master 2

1 Select the menu page

► 

► Select [Addressing AS-i 2] tab.

2 Change the AS-i slave address

► Address AS-i slaves.

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7.4 AS-i 1 / AS-i 2

15912

The [AS-i 1] and [AS-i 2] menus provide access to configuration and diagnosis functions of the AS-i network components.

Navigation path	Content
1 AS-i >  2 AS-i > 	AS-i master settings → **Set the operating mode of the AS-i master** (→ p. 79) → **Carry out a projection adaptation** (→ p. 80) → **Set the monitoring functions of the AS-i master** (→ p. 80)
1 AS-i >  2 AS-i > 	AS-i network diagnosis → **Display and reset the error counters** (→ p. 81) → **Display the error statistics of the AS-i slaves** (→ p. 81) → **Display the voltage supply analysis** (→ p. 82) → **Display and reset performance data** (→ p. 82)
1 AS-i >  2 AS-i > 	AS-i slave settings → **Display the input/output data of the AS-i slave** (→ p. 83) → **Change the digital output values manually** (→ p. 85) → **Change the analogue output values manually** (→ p. 85) → **Show AS-i slave information** (→ p. 86) → **Change an AS-i slave address** (→ p. 87) → **Change an AS-i slave parameter output** (→ p. 87) → **Change the Extended ID1 of the AS-i slave** (→ p. 88)

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7.4.1 AS-i 1 / AS-i 2: Master setup

8996

The menu item [Master setup] provides access to the configuration options of the selected AS-i master.

Set the operating mode of the AS-i master

15877

More information on the operating modes of the AS-i master: → **Operating modes of the AS-i master** (→ p. 162)

To set the operating mode of the AS-i master:

1 Select the menu page

▶  >  or  > 

2 Set the operating mode of AS-i master 1 and the behaviour of the connected AS-i slaves

> Set the following parameters as required:

Parameter	Description	Possible values	
[Projection mode]	Active operating mode of the AS-i master	☐	Projection mode inactive: AS-i network operates in protected mode (normal mode)
		☑	Projection mode active: AS-i network can be projected.
[No slave reset]	Behaviour of the AS-i slaves when changing the operating mode	☐	Slave is reset when changing the operating mode: When changing the operating mode, the AS-i slaves will be reset for a short moment (reset or offline phase).
		☑	Slave is not reset when changing the operating mode: When changing the operating mode, the AS-i slaves continue to operate without interruption.

> Selected values are applied.

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Carry out a projection adaptation

8938

During projection adaptation, the AS-i master stores the configuration of all AS-i slaves currently found on the AS-i network in its memory and assigns a valid AS-i address to each of them.

The projection adaptation can only be carried out in projection mode:
- ► [Projection mode] must be checked (→ **Set the operating mode of the AS-i master** (→ p. 79)).
- ► During a Projection process all output parameter of not connected AS- slaves in the AS-i master will be reset to their default values (single / A slaves = 0xF, B slaves = 0x7).

To launch the projection adaptation:

1 Select the menu page

►  >  or  > 

2 Carry out a projection adaptation

► Press [Start projection process] button.

> The projection adaptation is carried out.

If successful:

> All slaves on the AS-i master are projected.

If not successful:

> The Online Support Center displays an error message.

► Remove the error and repeat the process.

Set the monitoring functions of the AS-i master

11728

To set the monitoring functions of the selected AS-i master:

1 Select the menu page

►  >  or  > 

2 Set the monitoring functions of the AS-i master

► Set the following parameters as required:

Parameter	Description	Possible values	
[Automatic addressing]	Behaviour if AS-i slave is replaced (→ **Protected mode** (→ p. 162))	☐	Automatic addressing disabled
		☑	Automatic addressing enabled
[Earth fault detection]	Detection of earth faults	☐	Do not detect earth faults in the AS-i system
		☑	Detect earth faults in the AS-i system
[Double address detection]	Double address detection	☐	Do not detect AS-i slaves with the same address
		☑	Detect AS-i slaves with the same address

> Selected values are applied.

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7.4.2 AS-i 1 / AS-i 2: Diagnosis

9039

The [Diagnosis] menu provides access to the diagnostic data of the selected AS-i network.

Display and reset the error counters

9042

To display and reset the AS-i error counters:

1 Select the menu page

►  >  or  > 

► Select [Error counters] tab.

2 Display the error counters

> Page shows the following information:

Name	Description
[Telegrams]	Number of message errors that occurred
[Configuration]	Number of configuration errors that occurred
[Voltage < 22.5V]	Number of voltage errors < 22.5 V
[Voltage < 19.0V]	Number of voltage errors < 19.0 V
[Earth fault]	Number of detected earth faults

3 Optional: reset the error counters

► Press [Reset] button.

> All error counters are reset to 0.

Display the error statistics of the AS-i slaves

9087

To display the error messages of the AS-i slaves on the selected AS-i master:

1 Select the menu page

►  >  or  > 

► Select [Errors / slave] tab.

2 Display the error statistics of the AS-i slaves

> Page shows the following information:

Column header	Description
[Address]	Address of the AS-i slave
[S/A]	Number of errors of the single or A slave at this address
[B]	Number of errors of the B slave at this address

► Use [▲] / [▼] to scroll through the table.

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Display the voltage supply analysis

9088

To display the voltage supply analysis:

1 Select the menu page

►  >  or  > 

► Select [Power supply] tab.

2 Display the voltage supply analysis

> Page shows the following information:

Name	Description	Possible values	
[Power supply]	Method of voltage supply	[Aux]	Voltage is supplied separately by the AS-i network and AUX 24 V.
		[AS-i]	Voltage is only supplied by the AS-i network.
		[Power24]	Voltage is supplied by data decoupling module.
[AS-i voltage]	AS-i voltage measured (in [V])	e.g. 30.3 V	
[DC earth fault]	Evaluation of the network symmetry		AS-i network is symmetrical
			AS-i network is asymmetrical
			AS-i network has earth fault
		Graphical representation of the network symmetry: 	

Display and reset performance data

9089

To display the performance statistics of the selected AS-i master:

1 Select the menu page

►  >  or  > 

► Select [Performance] tab.

2 Display performance data

> Page shows the following information:

Designation	Description
[Activated slaves]	Number of active AS-i slaves on the AS-i network
[AS-i cycle time [ms]]	AS-i cycle time (value in [ms])
▪ [minimum]	shortest cycle time
▪ [maximum]	longest cycle time
▪ [current]	current cycle time

3 Optional: reset the performance data

► Press [Reset] button.

> The saved statistic data for minimum and maximum cycle times are deleted.

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7.4.3 AS-i 1 / AS-i 2: AS-i slaves

9037

The [AS-i Slaves] menu provides access to information and configuration options of the AS-i slaves.

The scope of configuration options shown ([Data] and [Setup] tab) varies according to the status of the selected AS-i slaves.

Display the input/output data of the AS-i slave

10934

To display the input/output data or the parameter output of the selected AS-i slaves:

1 Select the menu page

►  >  or  > 

► Select an AS-i slave (→ **Slave selector** (→ p. 55)).

► Select [Data] tab.

2 Display input/output data

> Depending on the profile of the selected AS-i slave, the page displays the following data:

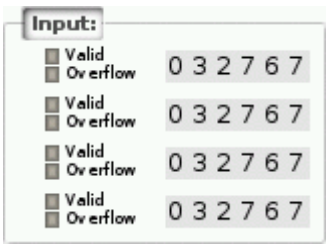
Digital input

15972

Name	Description	Example / Possible values	
[Inputs]	Current values of the digital inputs (binary and hexadecimal representation)		
		=	Data bit is switched off (0 / OFF)
		=	Data bit is switched on (1 / ON)

Analogue input

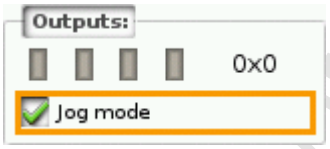
15973

Name	Description	Example / Possible values	
[Inputs]	Current values of the analogue input channels and information about their status		
▪ [Valid]	The Valid bit indicates whether the displayed value is valid.		Invalid value
			Valid value
▪ [Overflow]	The Overflow bit indicates whether the displayed value is within the value range.		Value within valid value range
			Valid value range exceeded

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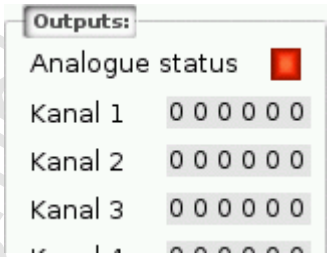
Digital output

15974

Designation	Description	Example / Possible values
[Outputs]	Current values of the digital outputs (binary and hexadecimal representation)	
		Data bit is switched off (0 / OFF)
		Data bit is switched on (1 / ON)
▪ [Jog mode]	The parameter controls the behaviour of the outputs in the event of a changed output value.	Jog mode disabled ("switch mode") > The changes do not affect the output until you quit the editing mode.
		Jog mode enabled ("momentary switch mode") > The changes immediately affect the output.

Analogue output

15975

Name	Description	Example / Possible values
[Outputs]	Current values of the analogue output channels and information about their status	
▪ [Analogue status]	Current status of the analogue outputs	Not O.K.
		O.K.
▪ [Channel x]	Current value of the analogue output channel x (x = 1...n; n = number of channels per AS-i slave)	per digit: `0 ... 9`

Parameter input

15843

Name	Description	Example / Possible values
[Parameter input]	Current value of the parameter input (binary and hexadecimal representation)	
		Data bit is switched off (0 / OFF)
		Data bit is switched on (1 / ON)

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Change the digital output values manually

10939

⚠ WARNING

Risk of personal injury! Risk of material damage to the machine/plant!

The operator is responsible for any consequences caused by the manual change of the digital ouput values!

- ► Secure the concerned area.
- ► Only trained personnel is allowed to set outputs manually.

If the jog mode is deactivated:
After changing the slave outputs the output values remain on the changed values.

- ► Change the inverted outputs again immediately to the original values after the end of the test!

To change the digital output values of an AS-i slave manually:

1 Enable manual access to the outputs

- ► Set [Output access] parameter = Manual (→ **Set output access** (→ p. 97)).

2 Select the menu page

- ►  >  or  > 
- ► Select an AS-i slave (→ **Slave selector** (→ p. 55)).
- ► Select [Data] tab.

3 Set the digital output values manually

- > The group [Outputs] displays the current value of the digital output (binary and hexadecimal representation).
- ► Set [Jog mode] as required. (→ **Digital output** (→ p. 84))
- ► Change the desired output value bit by bit.
- > Selected value is applied.

Change the analogue output values manually

10940

To change the analogue output values of an AS-i slave manually:

1 Enable manual access to the outputs

- ► Set [Output access] parameter = Manual (→ **Set output access** (→ p. 97)).

2 Select the menu page

- ►  >  or  > 
- ► Select an AS-i slave (→ **Slave selector** (→ p. 55)).
- ► Select [Data] tab.

3 Set the analogue output values manually

- > [Outputs] group shows the current value of the analogue output.
- ► Change the value of the requested channel one digit at a time (→ **Numerical field** (→ p. 61)).
- > Selected value is applied.
- ► Optional: repeat step 3 to change further channels.

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Show AS-i slave information

10935

To display information about an AS-i slave:

1 Select the menu page

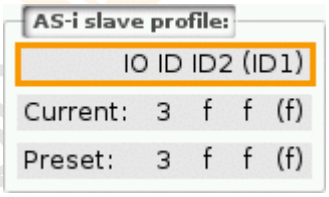
►  >  or  > 

► Select an AS-i slave (→ **Slave selector** (→ p. 55)).

► Select [Information] tab.

2 Display information about the AS-i slave

> Page shows the following information:

Name	Description	Possible values	
[AS-i slave addess]	Current address of the AS-i slave	e.g. 13B	
[Slave status]	Current status of the AS-i slave		AS-i slave is active
			AS-i slave is missing
			Not projected
			Double address error
			Periphery fault
[AS-i slave profile]	Current (= Current) and expected (= Preset) slave profile (IO, ID, ID2, ID1) in hexadecimal format		

► Use [▲] / [▼] for page navigation.

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Change an AS-i slave address

10944

To change the address of an AS-i slave:

1 **Select the menu page**

►  >  or  > 

► Select an AS-i slave (→ **Slave selector** (→ p. 55)).

► Select [Setup] tab.

2 **Change the address of the AS-i slave**

► Press the [Change slave address] button.

> The page displays an overview of the free AS-i addresses (→ **Overview of free slave addresses** (→ p. 58)).

► Select the address to be assigned to the AS-i slave and confirm with [Select] function key.

> Security prompt appears.

► Press [OK] to confirm the security prompt.

> The AS-i slave has a new address.

> The page displays an overview of the AS-i slave states (→ **Overview of slave states** (→ p. 56)).

3 **Optional: change further AS-i addresses.**

► Repeat step 2 to change further AS-i slave addresses.

After the address change, the present configuration (LDS) no longer corresponds to the stored configuration (LPS).

> The OSC displays a configuration error.

To remove the configuration error:

► start a projection adaptation (→ **Carry out a projection adaptation** (→ p. 80)).

Change an AS-i slave parameter output

10945

To change the parameter output of an AS-i slave:

1 **Enable manual access to the outputs**

► Set [Output access] parameter = Manual (→ **Set output access** (→ p. 97))

2 **Select the menu page**

►  >  or  > 

► Select an AS-i slave (→ **Slave selector** (→ p. 55)).

► Select [Setup] tab.

3 **Change the parameter output of the AS-i slave**

> The [Parameter output] group displays the current assignment of the parameter output (binary and hexadecimal representation).

► Adjust the desired output value one position at a time.

> Selected value is applied.

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Change the Extended ID1 of the AS-i slave

10952

To set the Extended ID1 of an AS-i slave:

1 Select the menu page

►  >  or  > 

► Select an AS-i slave (→ **Slave selector** (→ p. 55)).

► Select [Setup] tab.

2 Set the Extended ID1

> The [ID1] list displays the current Extended ID1 value (hexadecimal format).

► Select the desired value for Extended ID1 from the [ID1] list.

> Selected value is applied.

After changing the Extended ID1, the existing configuration no longer corresponds to the stored configuration:

> An error message appears (configuration error).

► Start a projection adaptation (→ **Carry out a projection adaptation** (→ p. 80)).

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7.5 System

10979

The [System] menu provides access to functions that allow configuration of the system and the device-internal standard PLC.

Navigation path	Functions
 > 	Device-internal standard PLC → **System: Programmable Logic Controller (PLC)** (→ p. 90)
 > 	System information → **Show version information** (→ p. 96)
 > 	System settings → **Set output access** (→ p. 97) → **Switch the menu language** (→ p. 98) → **Set the behaviour of the display** (→ p. 99) → **Set the system time manually** (→ p. 101) → **Synchronise the system time with an NTP server** (→ p. 102) → **Adopt the system time of the PC** (→ p. 103) → **Export device configuration** (→ p. 105) → **Import device configuration** (→ p. 106) → **Store diagnostic protocol** (→ p. 107)
 > 	System diagnostics → **Display diagnostic data** (→ p. 108)

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7.5.1 System: Programmable Logic Controller (PLC)

8955

The [PLC] menu provides access to the device-internal standard PLC.

Navigation path	Functions
	standard PLC information: → **Display the status of the CODESYS standard PLC** (→ p. 91) → **Display information about standard PLC projects** (→ p. 91)
	standard PLC settings → **Control a single standard PLC application** (→ p. 92) → **Control standard PLC applications** (→ p. 93) → **Show target visualisation** (→ p. 94)
	standard PLC diagnosis → **Show memory used** (→ p. 95)

For information about the programming of the device-internal standard PLC with CODESYS, please refer to the programming manual:
→ www.ifm.com > product page > [Downloads]

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PLC: Information

11778

The [Information] menu item provides access to the standard PLC status and project information.

Display the status of the CODESYS standard PLC

14841

To display information about the current status of the device-internal standard PLC:

1 Select the menu page

►  >  > 

► Select [Status] tab.

2 Display the status of the CODESYS standard PLC

> Page shows the following information:

Name	Description	Possible values	
Status LED	Status of the device-internal standard PLC		The CODESYS standard PLC is disabled.
			The CODESYS standard PLC is enabled.
[Version]	CODESYS version	e.g. `3.5.3.60`	
[Node name]	Name of device in CODESYS project	e.g. `ifm_SmartPLC_SafeLine`	

Display information about standard PLC projects

14842

To obtain information about the CODESYS project stored on the device-internal standard PLC:

1 Select the menu page

►  >  > 

► Select [Project] tab.

2 Display information about standard PLC projects

> Page shows the following information:

Name	Description
[Project]	Name of the CODESYS project file
[Title]	Name of the CODESYS project
[Version]	Version number of the CODESYS project
[Author]	Author of the CODESYS project

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PLC: Settings

16217

The [Settings] menu item provides access to the standard PLC applications (apps) on the device.

Control a single standard PLC application

14846



1 [App x/y]
– x ... number of the app displayed
– y ... total number of apps stored

2 Status and name of the application
= application has been stopped
= application has been started

3 Information concerning the application
– date and time of creation
– author
– version of application
– size

To control a single standard PLC application stored on the device:

1 Select the menu page

►  >  > 

► Select [Applications] tab.

2 Select an application

► Use [▼] to select the message field.

> The focus (orange frame) is on the message field.

► Use [▼] / [▲] to select the requested application.

► Perform one of the following actions:
– Launch a single standard PLC application: continue with → step 3
– Stop a single standard PLC application: continue with → step 4

3 Launch a single PLC application

► Press [Start] to launch the selected standard PLC application.

> The confirmation prompt appears.

► Press [OK] to confirm the prompt.

> The standard PLC application is started.

► Continue with → step 5

4 Stop a single standard PLC application

► Press [Stop] to stop the selected application.

> The confirmation prompt appears.

► Press [OK] to confirm the prompt.

> The application is stopped.

5 Display information about the standard PLC application

> The status display of the standard PLC application is updated

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Control standard PLC applications

14847

To control all standard PLC applications stored on the device:

1 Select the menu page

►  >  > 

► Select [All applications] tab.

2 Display status information about the standard PLC applications

> Page shows the following information:

Designation	Meaning
[Total]	Number of applications stored on the device
[Started]	Number of applications running

► Perform one of the following actions:
– Launch all standard PLC applications: continue with → step 3
– Stop all standard PLC applications: continue with → step 4
– Reset all standard PLC applications: continue with → step 5

3 Launch all standard PLC applications

► Press [Starten] button.

> The confirmation prompt appears.

► Press [OK] to confirm the prompt.

> All standard PLC applications are started.

► Continue with → step 6

4 Stop all standard PLC applications

► Press [Stop] button.

> The confirmation prompt appears

► Press [OK] to confirm the prompt.

> All standard PLC applications are stopped.

► Continue with → step 6

5 Reset all standard PLC applications

► Press [Reset] button.

> The confirmation prompt appears.

► Press [OK] to confirm the prompt.

> All standard PLC applications are reset and stopped.

6 Display the status of the standard PLC applications

> The page shows updated information about the stored standard PLC applications.

> The status of the [Start], [Stop] and [Reset] buttons is updated.

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Show target visualisation

9055

Using the CODESYS programming system, the user can optionally program a target visualisation to create an application-specific user interface for the display of AC402S. The target visualisation is loaded onto the device together with the CODESYS project, but it must be activated manually.

If no valid target visualisation is stored on the device, a green screen appears after activating the [Activate Target-Visu] button

To exit the target visualisation and return to the menu page:

► Press [◀] and [▶] simultaneously.

If the device does not react when entering [◀] + [▶], the key combination is deactivated.

► Activate the key combination using the system command "Show target visualisation" (→ Device Manual Supplement, **Command 0x0110 – Display target visualisation**)!

To activate the target visualisation:

1 Select menu page

►  >  > 

► Select the [Activate TargetVisu] tab.

2 Start the target visualisation

► Press [Activate Target-Visu] button.

> The confirmation message appears.

► Press [OK] button to confirm the message.

> The display shows the target visualisation.

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PLC: Diagnosis

10936

The [Diagnosis] menu item provides access to diagnostic data of the device-internal standard PLC.

Show memory used

14845

To display information about the memory capacity currently used:

1 Select the menu page

►  >  > 

► Select [Memory] tab.

2 Show memory used

> Page shows the following information:

Name	Description
[CODESYS]	Memory capacity occupied by CODESYS data (in Kbytes)
[free]	Free memory (in Kbytes)

The current usage of memory space is read out once when calling up the menu page. These values are not refreshed while the menu page is displayed. Any changes regarding the memory capacity (e.g. through download of a new CODESYS project) will therefore not be reflected in the displayed values.

To update the displayed values:

► Quit the [Diagnosis] menu page.

► Access the [Diagnosis] menu page again.

> The menu page displays the current memory usage of device.

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7.5.2 System: Information

7281

The [Information] menu item provides access to the version information about the system components.

Show version information

11774

To display information about the hardware and software components of the device:

1 Select the menu page

►  > 

► Select [Version] tab.

2 Show version information

> Page shows the following information:

Name	Description	Possible values
[Modell]	Article number of the device	e.g. AC402S
[SN]	Serial number of the device	e.g. 000000113034
[Build]	Version number of the installed firmware	e.g. 4.2.5
[HW version]	Version number of the device main board	e.g. AA

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7.5.3 System: Setup

7274

The [Setup] menu item provides access to the configuration options of the system.

Set output access

18627

To set the control instance for the outputs of the AS-i slaves:

1 Select the menu page

►  > 

► Select [System settings] tab.

2 Set the control instance for the outputs of the AS-i slaves

► Select the required value from the [Output access] list:

Parameter	Description	Possible values	
[Output access]	Control instance for the outputs of the AS-i slaves	[Gateway]	A higher-level PLC controls the outputs of the AS-i slaves.
		[Manual]	The operator controls the outputs of the AS-i slaves via the graphical user interface.
		[PLC]	The device-internal standard PLC controls the outputs of the AS-i slaves.

3 Save the changes

► Press [Accept selection] button to save the changes.

> The selected instance controls the outputs of the AS-i slaves.

The outputs of the safe AS-i slaves are always controlled by the failsafe PLC of the AC402S!

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Switch the menu language

7088

To select the language of the GUI texts:

1 Select the menu page

►  > 

► Select [System settings] tab.

2 Select the menu language

> The [Language] list shows the active language in which the GUI texts are displayed.

► Set the following parameters as required:

Parameter	Description	Possible values	
[Language]	Language in which the GUI texts are displayed	[Deutsch]	German
		[English]	English
		[Français]	French
		[Español]	Spanish
		[Italiano]	Italian
		[Português]	Portuguese

3 Save the changes

► Press [Accept selection] button.

> GUI elements are displayed in the requested language.

Optional: switch the language with a key combination

15834

The languages available on the device are saved in an ordered list:

- German
- English
- French
- Spanish
- Italian
- Portuguese

To switch the language with a key combination (from the active language):

► Press [▶] + [▲] to select the previous language in the list.

OR:

► Press [▶] + [▼] to select the next language in the list.

> GUI elements are displayed in the requested language.

The key combination allows you to change the language from any menu page.

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Set the behaviour of the display

9107

To set the display behaviour (screen saver, behaviour in case of inactivity):

1 Select the menu page

►  > 

► Select [System settings] tab.

2 Set the behaviour of the display

► Set the following parameters as required:

Parameter	Description	Possible values	
[Screen saver]	Status of the screen saver	☐	Screen saver is inactive: Display remains permanently switched on.
		☑	Screen saver is active: Display is switched off after 10 minutes of inactivity.
[Return to start screen]	Display behaviour in case of extended period of user inactivity	☐	The currently selected menu page stays on the screen.
		☑	When the set time has elapsed, the display automatically changes to the start screen.

> Selected values are applied.

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Set the system time

10954

The system time consists of date and time. The device provides the following options for setting the system time:

- Manual: The operator sets the date and time manually.
- Via NTP server: The device has an NTP client. The system time can be synchronised with an NTP server.
- Apply the system time of a PC/laptop: The device adopts the system time of a PC/laptop (only available via the web interface of the device)

To set the system time:

1 Select the menu page

►  > 

► Select [Clock] tab.

2 Display the current system time settings

> The following parameters display the current system time settings:

Parameter	Description	Possible values	
[Activate NTP]	Activate the NTP client of the device		NTP client is deactivated: Device adopts the manually set values for [Time] and [Date].
			NTP client is not active: From an NTP server, the device adopts the values for [Time] and [Date].
Status LED	Status of NTP client and synchronisation with NTP server	[NTP not active ]	NTP client is deactivated: Applicable are the manually set values for [Time] and [Date].
		[NTP waiting ]	NTP client is active: Device waits for messages from NTP server.
		[NTP successful ]	NTP client is active: Time synchronisation with NTP server was successful.
[Time]	System time (format [hh:mm:ss])	e.g. 12:23:56	
[Date]	System date (format [yyyy-mm-dd])	e.g. 2014-04-23	

3 Select the configuration method

► Select one of the following:

– **Set the system time manually** (→ p. 101)
– **Synchronise the system time with an NTP server** (→ p. 102)
– **Adopt the system time of the PC** (→ p. 103)

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Set the system time manually

10963

To set the system time manually:

1 **Select the menu page**

►  > 

► Select [Clock] tab.

2 **Deactivate the NTP client of the device**

► Uncheck [Activate NTP] (→ **Set the system time** (→ p. 100)).

► Press [Accept selection] button.

> The changes become effective.

> NTP status: [`NTP not active`]

3 **Set the system time manually**

► Set [Time] and [Date] (Operating notes: → **Numerical field** (→ p. 61))

> Selected values are applied.

Seconds cannot be changed manually. When leaving the edit mode, the seconds will be automatically set to `0`.

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Synchronise the system time with an NTP server

10969

To synchronise the system time with an NTP server:

To synchronise the system time and date via Network Time Protocol (NTP), connect the configuration interface of the device to an NTP server directly or over a network.

1 Select the menu page

►  > 

► Select [Clock] tab.

2 Deactivate the NTP client

► Uncheck [Activate NTP] (→ **Set the system time** (→ p. 100)).

> The IP address field and the [NTP-Offset] list can be edited.

3 Set the IP address of the NTP server and NTP offset

► Set the following parameters as required:

Parameter	Description	Possible values	
IP address field	IP address of the NTP server	e.g. `192.168.0.100`	
[NTP-Offset] (optional)	Time zone of the NTP server in UTC (Universal Coordinated Time).	[no offset]	System time is taken from NTP server without offset
		[UTC -12:00 ... UTC +12:00]	Adopt time zones according to UTC division (displayed number of hours will be added/subtracted)

► Press [Accept selection] button.

► The device tries to synchronise the system time with the NTP server.

> NTP status: [`NTP waiting` ]

In case of a successful synchronisation:

> NTP status: [`NTP successful` ]

> [Time] and [Date] show the synchronised values.

In case of a failed synchronisation:

► Check the settings of the IP parameters of the configuration interface.

► Check the IP address of the NTP server.

► Repeat the process.

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Adopt the system time of the PC

15756

To adopt the date and time of a PC/laptop:

This function is only available via the web-interface of the device (→ **Remote access** (→ p. 63)).

Requirements:

- Connect the device with PC/laptop (→ **Configuration interfaces: Connection concepts** (→ p. 159)).
- Start the web browser and open the web interface of the device (→ **Recommended browsers** (→ p. 63)).

This function can only be executed via the web interface of the device.

1 Select the menu page

-  > 
- Select the [Clock] tab.

2 Adopt the system time of the PC/laptop

- Uncheck [Activate NTP] (→ **Set the system time** (→ p. 100)).
- In group [Apply Time and Date from the PC]: Press [OK] button.

> The device applies the date and time of the PC/laptop.

> [Date] and [Time] display the system time.

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Clone device configuration

7276

This function is only available via the local user interface of the device.

The device makes it possible to create an image of the current device configuration, to transfer it to another device and activate it there (clone). The export/import of the configuration file is made via an SD card.

A device configuration consists of the following settings:

- System settings
- AS-i 1/AS-i 2 settings
- PROFINET settings
- standard PLC applications (incl. PLC task configuration, variables and data)
- Fail-safe PLC application (incl. safety PLC task configuration, variables and data)

Cloning a device configuration is only possible if the following conditions are met.

- The firmware versions of the source device and the target device are compatible (compatible = versions are identical in the major release and minor release, e.g. V**3.2.** is compatible with V**3.2.**2, but: V**3.2.**1 is incompatible with V**3.3.**1).
- Source and target device have the same article number.

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Export device configuration

16199

NOTICE

Risk of undesired system behaviour

During the export the control functions of the device are not available.

► Do not export the device configuration during operation of the plant!

NOTICE

Risk of data loss

An interruption of the export can lead to a faulty export file.

► Do not disconnect the device during the export.

► Only start the export after the boot application has been successfully generated.

► Do not remove the SD card from the device before the export is completed.

The SD card has to be formatted with the FAT32 file system. SD cards with other file systems are not recognised by the AC402S.

To allow identification of the saved configuration the export file is saved using the following name convention:

`ifm_DevID_xxxxxxxxxxxx_YYYYMMDDhhmmss.iconf`

- DevID — Article number of the device
- xxxxxxxxxxxx — Serial number of the device
- YYYYMMDDhhmmss — Timestamp of the saved file (YYYY = year, MM = month, DD = day, hh = hours, mm = minutes, ss = seconds)

To save the current device configuration on an SD card:

1 Select menu page

►  > 

> Select [Configuration] tab.

2 Save the device configuration

► Insert an empty, formatted SD card in the SD card slot of the device.

► Activate the [Export configuration] button.

> The device saves the current configuration on the SD card. The device stores the current configuration on the SD card.

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Import device configuration

14442

NOTICE

Risk of undesired system behaviour

The import of a wrong or faulty boot project can lead to a non-safe state of the plant.

► Check all safety functions of the installation after the import of the device configuration.

16200

NOTICE

Risk of undesired system behaviour

During the import the control functions of the device are not available. During the import the device reboots.

► Do not import the device configuration during operation of the plant!

NOTICE

Risk of data loss

An interruption of the import can lead to a faulty device configuration.

► Do not disconnect the device during the import.

► Do not remove the SD card from the device before the import is completed.

To avoid that a wrong device configuration is restored:

► Check before the import if the required device configuration is saved on the SD card (identification of the saved device configuration: → **Export device configuration** (→ p. 105)).

► Save only the device configuration to be imported in the root directory of the SD card.

To transfer a stored device configuration to the device:

1 Select menu page

►  > 

► Select [Configuration] tab.

2 Restore the device configuration

► Insert an SD card with the stored device configuration in the SD card slot.

► Activate the [Import configuration] button.

> A warning appears.

► Confirm prompt with [OK].

> The device configuration is loaded and saved onto the device.

> The device reboots.

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Store diagnostic protocol

7040

Using the diagnostic protocol, the user can archive the current device configuration or provide all relevant information to the service staff via the device settings.

The diagnostic protocol contains the following information in the selected user language:

- AS-i configuration
- PROFINET configuration
- System settings
- CODESYS information
- OSC history

This function is only available via the web-interface of the device (→ **Remote access** (→ p. 63)).

Requirements:

► Connect the device with PC/laptop (→ **Configuration interfaces: Connection concepts** (→ p. 159)).

► Start the web browser and open the web interface of the device (→ **Recommended browsers** (→ p. 63)).

1 Select menu page

►  > 

► Select the [Diagnostic protocol] tab.

2 Store diagnostic protocol

► Press the [Generate diagnostic protocol] button.

> AC402S generates diagnostic protocol.

> The progress bar indicates the status of the process.

> A dialogue window appears.

► Select file name and memory location and press [OK] to confirm.

> The diagnostic protocol is stored as an HTML file at the selected location.

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7.5.4 System: Diagnosis

9053:

The [Diagnosis] menu item provides access to the diagnostic data of the device.

Display diagnostic data

15827

To display the diagnostic data of the device:

1 Select menu page

▶  > 

2 Display diagnostic data

> Page shows the following information:

Name	Description	Possible values	
[Betriebszeit [JJ-TTT SS:MM]]	Operating time of system and components	All times indicated in [JJ-TTT-SS-MM] format: YY = years DD = days hh = hours mm = minutes	
▪ [gesamt]	Operating time of device		
▪ [aktuell]	Operating time of device since last system start		
▪ [LCD]	Operating time of LCD		
▪ [SPS]	Operating time of controller		
[Temperatur]	Current device temperature	Indications in [°C] (→ Note)	
[Versorgt durch]	Voltage supply of device	[Aux]	Voltage is supplied separately by AS-i network and AUX 24 V.
		[AS-i]	Voltage is only supplied by the AS-i network.
		[Power Modul]	Voltage is supplied by data decoupling module.

The temperature monitoring continuously checks the system temperature of the device. The following temperature ranges apply:

- Normal range: < 79.9 °C
- Limit range: 80 °C ... 84.9 °C
- Critical range: >= 85 °C

If the system temperature reaches the critical zone, a warning is displayed in the → **Online Support Centre (OSC)** (→ p. 149). The warning only disappears when the device temperature is again in the normal range.

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7.6 Interfaces

7106

The [Schnittstellen] menu provides access to the configuration options of the device's interfaces.

Navigation path	Functions
 > 	Configuration interface 1 → **Configure the IP parameters manually** (→ p. 111) → **Configure the IP parameters automatically** (→ p. 111) → **Show Ethernet information** (→ p. 112)
 > 	Configuration interface 2 → **Interfaces: Configuration interface 2** (→ p. 112)
 > 	PROFINET interface → **Interfaces: PROFINET interface** (→ p. 113)

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7.6.1 Interfaces: Configuration interface 1

7279

The [Configuration interface 1] menu provides access to the settings of the Ethernet Configuration interface 1 (port X3).

Notes on IP settings

14856

The device provides the following options for configuration of the Ethernet Configuration interface 1:

- Manual = The operator sets the interface parameters (IP address, network mask, gateway address) manually.
- Automatic = The interface parameters are set automatically. The operator can choose between these protocols:
  – Dynamic Host Configuration Protocol (DHCP)
  – Zero Configuration Networking (Zeroconf)

To display the current configuration method and the active IP parameters of the configuration interface:

1 Select the menu page

►  > 

► Select [IP setup] tab.

2 Show the active settings

> The parameters below show the active settings:

Parameter	Meaning	Possible values	
[Optain IP address autom.]	Active method for the configuration of the interface parameters	☐	Manual assignment of interface parameters through operator
		☑	Automatic assignment of interface parameters
[IP status]	Configuration protocol used	[Static]	The operator sets the IP parameters manually.
		[DHCP]	The IP parameters are set by a DHCP server.
		[Zeroconf]	The IP parameters are set automatically with the Zeroconf protocol.
[IP address]	IP address of the interface	e.g. `192.168.0.100`	
[Subnet mask]	Network mask of the network segment	e.g. `255.255.255.0`	
[Gateway address]	IP address of the network gateway	e.g. `192.168.0.1`	

► Select one of the following options:
– **Configure the IP parameters manually** (→ p. 111)
– **Configure the IP parameters automatically** (→ p. 111)

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Configure the IP parameters manually

14860

To configure the IP parameters of the configuration interface manually:

1 Select the menu page

►  > 

► Select [IP setup] tab.

2 Deactivate the NTP client

► Uncheck [Obtain IP address autom.] (→ **Notes on IP settings** (→ p. 110)).

> The IP address fields [IP address], [Subnet mask] and [Gateway address] can be edited.

3 Configure the IP parameters

► Configure the following parameters as required (→ **Notes on IP settings** (→ p. 110)):
– [IP address]
– [Subnet mask]
– [Gateway address]

4 Save the changes

► Press [Accept] button.

> Selected values are applied.

> [IP status] displays the active configuration method: [Static]

Configure the IP parameters automatically

14859

The device must be connected to a DHCP server to automatically receive the interface parameters via DHCP.

► Connect the configuration interface (X3) to a DHCP server.

To configure the IP parameters of the configuration interface automatically:

1 Select the menu page

►  > 

► Select [IP setup] tab.

2 Enable the NTP client

► Activate the [Obtain IP address autom.] (→ **Notes on IP settings** (→ p. 110))

3 Save the changes

► Press [Accept] button.

> The device tries to obtain the IP parameters from a DHCP server.

> If the configuration of IP parameters via DHCP server fails, the device will generate the IP parameters with the Zeroconf protocol.

> [IP address], [Subnet mask] and [Gateway address] display the set IP parameters.

> Selected values are applied.

> [IP status] displays the active configuration method: DHCP or Zeroconf.

The automatic configuration of the IP parameters takes approx. 10 seconds.

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Show Ethernet information

14857

To show Ethernet information regarding the configuration interface:

1 Select the menu page

►  > 

► Select [Ethernet information] tab.

2 Show Ethernet information

> Page shows the following information:

Name	Description
[MAC ID]	MAC identification number of the interface

7.6.2 Interfaces: Configuration interface 2

7234

The [Konfigurationsschnittstelle 2] menu provides access to the settings of the Ethernet configuration interface 2 (port X2).

The Ethernet configuration interfaces 1 (X3) and 2 (X8) must not be participants of the same EtherNet subnet. Non-compliance may lead to connection problems under CODESYS.

► Configure IP settings so that interfaces X3 and X8 are part of different Ethernet subnets.

The menu functions correspond to the functions of the menu [Configuration interface 1].
For information regarding the menu functions: → **Interfaces: Configuration interface 1** (→ p. 110)

► For the selection of the menu page replace the symbol  by !

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7.6.3 Interfaces: PROFINET interface

7097

The [PROFINET] menu provides access to information, settings and diagnostic data regarding the PROFINET interface.

Navigation path	Functions
	PROFINET information → **Display I&M information** (→ p. 114) → **Display PROFINET data** (→ p. 115) → **Display module configuration** (→ p. 116) → **Download GSDML file** (→ p. 116)
	PROFINET settings → **PROFINET interface** (→ p. 117)
	PROFINET diagnosis → **Display diagnostic data** (→ p. 118)

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PROFINET: Information

11781

The menu item [Information] provides access to information regarding the PROFINET interface.

Display I&M information

9116

To display the I&M information (I&M = Identification & Maintenance):

1 Select menu page

►  >  > 

► Select [I&M information] tab.

2 Display I&M information

> Page shows the following information:

Designation	Description
[Manufacturer ID]	Manufacturer ID
[Order number]	Article no. of the device
[SN]	Serial number of the device
[HW version]	Hardware version of the unit
[SW version]	Firmware version of the unit
[Revision no.]	Revision number of the unit
[Profile ID]	ID of the device profile
[Profile type]	Type of the device profile
[I&M version]	Version of the I&M data

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Display PROFINET data

9119

In order to display the PROFINET parameters and the device-specific parameters:

1 Select menu page

►  >  > 

► Select [Profinet data] tab.

2 Display PROFINET data

> Page shows the following information:

Designation	Description	Possible values	
[]Device information	Parameters of the PROFINET-device		
▪ [MAC ID]	MAC-ID of the device	e.g. `00:02:01:01:98:D4`	
▪ [Device name]	Name of the device		
▪ [IP address]	IP address of the PROFINET-Interface	e.g.	
▪ [Device type]	type of the device	e.g. `asi-pn`	
[Host information]	Parameters of the PROFINET-Controller (host)		
▪ [IP address]	IP address of the PROFINET-Controller	e.g. `192.168.10.1`	
▪ [Host name]	Designation of the PROFINET-Controller		
[Analog. channels/I-slave]	Number of analogue channels per projected input slave	[Unknown]	Device is not connected to the fieldbus master
		[1 channel]	1 channel per single slave OR: 1 channel per A slave
		[2 channels]	2 channels per single slave OR: 2 channels per A slave
		[4 channels]	4 channels per single slave OR: 2 channels per A/B slave
[Analog. channels/O-slave]	Number of analogue channe3ls per projected output slave	→ [Analog. channels/I-slave]	
[Failsafe state]	Behaviour of the AS-i outputs in case of a PROFINET-connection interruption	[Reset outputs]	Outputs are reset to the preset values
		[Hold outputs]	Outputs hold the values which were available immediately before interruption of the connection.
[Parameter download]	Transmission of the AS-i slave parameters when establishing a PROFINET-connection	☐	Parameters are not downloaded, i.e. AS-i slaves are activated with the parameters set on the device
		☑	Parameters are downloaded, i.e. when the connection is established, the AS-i slave parameters set in the projecting software are PROFINET-downloaded by the controller to the device.
[Profinet alarms]	Transmission of the PROFINET-alarms	☐	No transmission of PROFINET-alarms when errors occur in the gateway
		☑	Transmission of PROFINET-alarms when errors occur in the gateway

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Designation	Description	Possible values	
[Swap IO]	Swap of assignment of the slave nibbles in the byte	☐	Assignment of the slave nibble remains constant
		☑	Assignment of the slave nibble is swapped

Detailed information on the device-specific parameters: →**Parameter data** (→ p. 176)

Display module configuration

14192

To display the active configuration of the PROFINET-modules:

1 Select menu page

►  >  > 

► Select [Module configuration] tab.

2 Display module configuration

> Page shows active module configuration of the PROFINET-Slots (→ appendix).

The fieldbus slots can only be configured in the PROFINET-projection software.

Download GSDML file

14188

This function is only available via the web-interface of the device (→ **Remote access** (→ p. 63)).

Requirements:

► Connect the device with PC/laptop (→ **Configuration interfaces: Connection concepts** (→ p. 159)).

► Start the web browser and open the web interface of the device (→ **Recommended browsers** (→ p. 63)).

1 Select menu page

►  >  > 

► Select [GSDML file] tab.

> Menu page [GSDML file] is displayed.

2 Download GSDML file

► Mouse-click on [Download GSDML file] to download the device description.

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PROFINET: Setup

16196

The [Setup] menu item provides access to the configuration options of the PROFINET interface.

PROFINET interface

15855

We recommend installing the fieldbus on the PROFINET-controller and to adopt the configuration on the device.

In order to PROFINET-configure the interface:

1 Select menu page

►  >  > 

2 Set IP parameters of the PROFINET-interface

► Set the following parameters as required:

Parameters	Description	Possible values
[IP address]	IP address of the PROFINET-interface	e.g. `192.168.10.3`
[Subnet mask]	Netmask of the PROFINET-network segment	e.g. `255.255.255.0`
[Gateway address]	IP address of the PROFINET-Gateways	e.g. `192.169.10.1`

3 Save changes

► Press [Accept] button .

> Selected values are applied.

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PROFINET: Diagnosis

9126

The menu item [Diagnosis] provides access to the diagnostic data of the PROFINET interface:

Display diagnostic data

15876

In order to PROFINET-display the diagnostic data:

1 Select menu page

▶  >  > 

2 Display diagnostic data

> Page shows the following information:

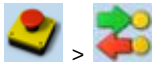
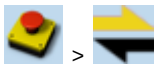
Name	Description	Possible values	
[PROFINET connection status]	Display of the connection status of the PROFINET-interfaces		
▪ [Status port X6]	Connection status port X6		No connection to the PROFINET-controller
			Connection to the PROFINET-controller established
▪ [Status port X7]	Connection status port X7		No connection to the PROFINET-controller
			Connection to the PROFINET-controller established

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7.7 Safety

18912

The menu [Safety] provides access to the status and diagnostic information of the safety-relevant PLC of the device.

Navigation path	Functions
	Status of the safe AS-i slaves to AS-i master 1: → **Display the status of the safe AS-i slaves** (→ p. 120) → **Display switching states of the safe AS-i input slaves** (→ p. 122)
	Status of the safe AS-i slaves to AS-i master 2: → **Safety: Status of the fail-safe slaves at AS-i master 2** (→ p. 124)
	Local inputs/outputs: → **Display the switching states of the local inputs** (→ p. 125) → **Display the switching states of the local outputs** (→ p. 127)
	Status of the fail-safe cross communication (FSoE) → **Display the status of the connection to FSoE slaves** (→ p. 129) → **Display the status of the fail-safe cross networking** (→ p. 129)
	System: → **Display status information of the fail-safe PLC** (→ p. 130)

The elements of the menu [Safety] are exclusively used for diagnostic purposes. Programming and controlling of the safety-relevant functions of AC402S must only be made via the CODESYS development system (→ programming manual)

Observe the notes on the meaning of deviating menu symbols of the [Safety] menu.
→ **Availability of the fail-safe PLC** (→ p. 152)

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7.7.1 Safety: Status of the fail-safe slaves at AS-i master 1

9019

The [Status of the fail-safe AS-i slaves] menu page provides access to diagnostic data and switching states of the safe AS-i input slaves on AS-i master 1.

Display the status of the safe AS-i slaves

14850

The menu page shows status information about the safe AS-i input slaves on the selected AS-i master.

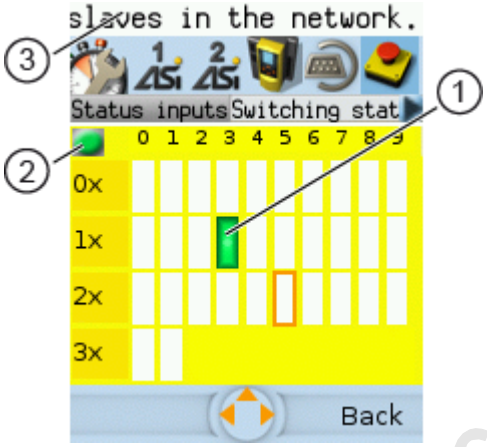
1 Select menu page

►  > 

► Select [Status inputs] tab.

2 Display the status of the safe AS-i slaves

> Menu page shows the slave selector of the safe AS-i input slaves.



Legend:

1. Address and status of the safe AS-i input slaves on the selected AS-i master → **Diagnostic data: Colour codes + symbols** (→ p. 121)
2. Current configuration status of the fail-safe PLC → **Configuration status: Colour codes + symbols** (→ p. 121)
3. Information about the marked slave

Virtual control slaves are not represented in this view.

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Configuration status: Colour codes + symbols

18273

Symbol	Colour	Description
	yellow	No safe configuration available
	green	safe configuration available

Diagnostic data: Colour codes + symbols

10926

Symbol	Colour	Description
	white	No safe AS-i input slave present
	grey	Safe AS-i input slaves present but not part of the safe configuration
	green	Safe AS-i input slave operates correctly; no test necessary
	yellow	Test requested
	red	Error - no safe AS-i input slave connected - AS-i slave missing - AS-i slave present but master in the protected mode and slave not projected - logical device of the AS-i slave in the error state - logical device of the AS-i slave in the hardware error state - invalid or double code sequence

Logical devices are elements of the CODESYS programming system. They are used for the logical preprocessing of input signals.
For detailed information: → Programming manual fail-safe SmartPLC AC4S

For detailed information regarding the error causes: → **Online Support Centre (OSC)** (→ p. 149)

Optional: change settings of the safe AS-i input slaves

11186

To change the settings of the selected safe AS-i input slaves:

► Use the arrow keys to mark the safe AS-i input slave.
► Use [Select] to activate the marked AS-i slave.
> Setting options of the selected safe AS-i input slave are displayed.
► Change the settings as requested.

For information about the settings of the safe AS-i slaves: → **AS-i 1 / AS-i 2: AS-i slaves** (→ p. 83)

► Use [Back] to return to the display of the diagnostic data.

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Display switching states of the safe AS-i input slaves

14851

The menu page shows switching states of the safe AS-i slaves on the selected AS-i master.

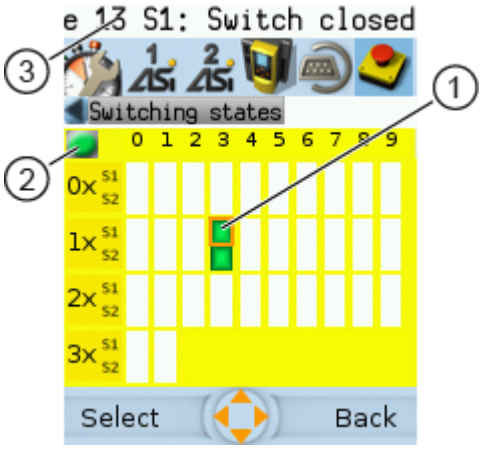
1 Select menu page

►  > 

► Select [Switching states] tab.

2 Select safe AS-i slave.

> Page shows slave selector with the switching states of the safe AS-i input slaves:



Legend:

(1) Switching states S1/S2 of the safe AS-i input slaves (evaluation of the code half-sequences)
→ **Switching states: Colour codes + symbols** (→ p. 123)
→ **Meaning of the colour combinations** (→ p. 123)

(2) Current configuration status of the fail-safe PLC
→ **Configuration status: Colour codes + symbols** (→ p. 121)

(3) Information about the marked switching states

Configuration status: Colour codes + symbols

18273

Symbol	Colour	Description
	yellow	No safe configuration available
	green	safe configuration available

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Switching states: Colour codes + symbols

9020

Symbol	Colour	Description
	white	No safe AS-i input slave of the safe configuration
	grey	– Switch open – code sequence already taught
	red	– Switch open – code sequence not yet taught
	green	– Switch closed – code sequence taught – transferred code sequence is identical with taught code sequence

Meaning of the colour combinations

15872

Symbol	Colour	Description
	grey grey	– switches S1 and S2 are open – the two code half-sequences have been taught
	grey green	– switch S1 is open, code half-sequence has been taught – switch S2 is closed, code half-sequence has been taught
	green grey	– switch S1 is closed, code half-sequence has been taught – switch S2 is open, code half-sequence has been taught
	green green	– switches S1 and S2 are closed – the two code half-sequences are identical with the taught CODE half-sequences
	red green	– switch S1 is open, code half-sequence has not been taught yet – switch S2 is closed, code half-sequence has been taught
	green red	– switch S1 is closed, the code half-sequence has been taught – switch S2 is open, the code half-sequence has not been taught yet
	red red	– switches S1 and S2 are open – the two code half-sequences have not been taught yet

Optional: change settings of the safe AS-i input slaves

11186

To change the settings of the selected safe AS-i input slaves:

► Use the arrow keys to mark the safe AS-i input slave.

► Use [Select] to activate the marked AS-i slave.

> Setting options of the selected safe AS-i input slave are displayed.

► Change the settings as requested.



For information about the settings of the safe AS-i slaves: → **AS-i 1 / AS-i 2: AS-i slaves** (→ p. 83)

► Use [Back] to return to the display of the diagnostic data.

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7.7.2 Safety: Status of the fail-safe slaves at AS-i master 2

9014

The [Status of the fail-safe AS-i slaves] menu page provides access to diagnostic data and switching states of the safe AS-i input slaves on AS-i master 2.

The menu functions correspond to the functions of the [AS-i 1 master settings] menu.
For information regarding the menu functions: → **Safety: Status of the fail-safe slaves at AS-i master 1** (→ p. 120)

► For the selection of the menu page replace the symbol  by .

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7.7.3 Safety: Local IOs

16661

The [local IOs]menu page provides access to information about the switching states of the local inputs and outputs.

Display the switching states of the local inputs

15874

To display the switching states of the local inputs:

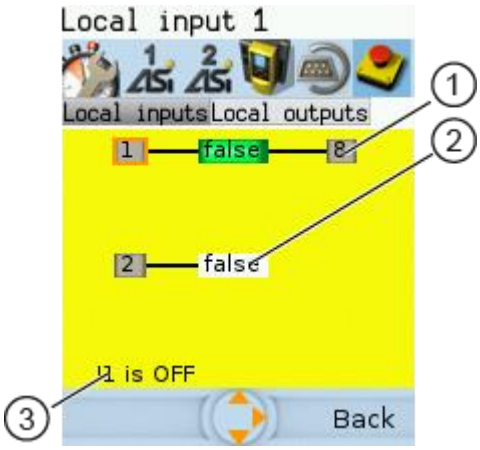
1 Select menu page

►  > 

► Select [Local inputs] tab.

2 Display switching states of the local inputs

> Menu page shows the following information:



Legend:

1. Switching states of the local inputs (→ **Switching states of the inputs: Colour codes + symbols** (→ p. 126))
2. Switching states of the logical devices of the local inputs (→ **Switching states of the logical devices: Colour codes + symbols** (→ p. 126))
3. Text field with status information of the marked input

The switching states of the local inputs are only displayed if the safe application is in the RUN mode.

The switching states may be displayed although no safe configuration is stored on the device (→ **Display status information of the fail-safe PLC** (→ p. 130)).
The displayed data is invalid in this case.

► Select the required symbol with [▼] / [▲].

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Switching states of the inputs: Colour codes + symbols

11776

Symbol	Colour	Description
	grey	Local input is switched off
	green	Local input is switched on

Switching states of the logical devices: Colour codes + symbols

9017

Symbol	Colour	Description
	white	Local input is configured as a non-safe input.
	yellow	Testing of the logical devices requested
	green	Logical device for safe inputs does not operate correctly.
	red	Logical device for safe inputs is in the error state.

Designation	Description
[false]	Logical device provides the safe value FALSE.
[true]	Logical device provides the safe value TRUE.

Logical devices are elements of the CODESYS programming system. They are used for the logical preprocessing of input signals.
For detailed information: → Programming manual fail-safe SmartPLC AC4S

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Display the switching states of the local outputs

9022

To display the switching states of the local outputs:

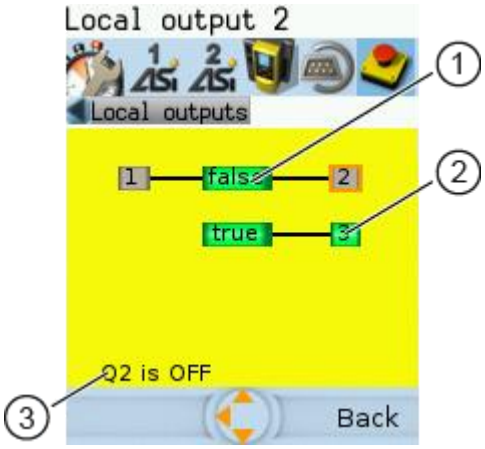
1 Select menu page

►  > 

► Select [Local outputs] tab.

2 Display the switching states of the local outputs

> Menu page shows the following information:



Legend:

1. Switching states of the logical devices of the local outputs (→ **Switching states of the logical devices: Colour codes + symbols** (→ p. 128))
2. Switching states of the local outputs (→ **Switching states of the local outputs: Colour codes + symbols** (→ p. 128))
3. Text field with status information of the marked output

The switching states of the local outputs are only displayed if the safe application is in the RUN mode.

The switching states may be displayed although no safe configuration is stored on the device (→ **Display status information of the fail-safe PLC** (→ p. 130)).
The displayed data is invalid in this case.

► Select the required symbol with [▼] / [▲].

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Switching states of the local outputs: Colour codes + symbols

18799

Symbol	Colour	Description
	grey	Local output is switched off
	green	Local output is switched on

Switching states of the logical devices: Colour codes + symbols

14837

Symbol	Colour	Description
	white	Local output is configured as non-safe output
	green	Logical device for safe input operates correctly
	red	Logical device for safe output is in the error state

Designation	Description
[false]	Logical device provides the safe value FALSE
[true]	Logical device provides the safe value TRUE
[pulse]	A test pulse is generated on the output.

Logical devices are elements of the CODESYS programming system. They are used for the logical preprocessing of input signals.
For detailed information: → Programming manual fail-safe SmartPLC AC4S

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7.7.4 Safety: FSoE

23814

The menu page [FSoE] provides access to the information about the status of the fail-safe communication via EtherCAT (FSoE).

Display the status of the connection to FSoE slaves

21773

To display the status of the connection to an FSoE slave:

1 Select menu page

►  > 

► Select tab [FSoE-Slaves].

2 Display the status of the connection to an FSoE slave

> Menu page shows list with the following information (per FSoE connection):

Name	Description	Possible values	
Status LED	Status display of the connection		Connection interrupted
			Connection established
[Connection-ID]	ID of the FSoE connection	1...65535	
Event	Description of the event		

The menu page shows information about 32 FSoE connections.

Display the status of the fail-safe cross networking

23617

To display the status of the fail-safe cross networking to the other AC402S:

1 Select menu page

►  > 

► Select tab [FSoE-Slaves].

2 Display the status of the connection to an FSoE slave

> Menu page shows list with the following information (per Safety NetVar connection):

Name	Description	Possible values	
Status LED	Status display of the connection		Connection interrupted
			Connection established
[Connection-ID]	ID of the FSoE connection	1...65535	
Event	Description of the event		

The menu page shows information about 32 FSoE connections.

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7.7.5 Safety: System

15913

The [System] menu page provides access to status information of the fail-safe PLC of AC402S.

Display status information of the fail-safe PLC

14852

To display status information of the fail-safe PLC:

1 Select menu page

►  > 

2 Display status information of the fail-safe PLC

> Menu page shows the following information:

Name	Description	Possible values	
[F PLC firmware]	Firmware version of the fail-safe PLC	e.g. Rel:(1)01.00.243	
[Safety PLC status]	Status of the fail-safe PLC	Invalid	Invalid state
		Safe started	Safety module correctly started
		No application	No safe configuration available
		IEC task enabled	Safe IEC task enabled
		IEC task started	Safe IEC task started
		IEC error	Error in the safe IEC task
		RUN (debug)	Safe application in the RUN mode (debug operation)
		STOP (debug)	Safe application in the STOP mode (debug operation)
		RUN (safe)	Safe application in the RUN mode (safe operation)
		CODESYS error	Fail-safe PLC in the safe error state
		Hardware error	Error in the hardware of AC402S

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7.8 ifm system solutions

7065

This menu is only available via the web interface of AC402S.
→ **Remote access** (→ p. 63)

The [ifm system solutions] menu provides access to information and installation options for ifm system solutions.

Navigation path	Functions
	ifm system solutions: → **Show information about installed ifm apps** (→ p. 133) → **Install single/basic app** (→ p. 134) → **Install multi app** (→ p. 135) → **Update ifm apps** (→ p. 136) → **Uninstall ifm apps** (→ p. 136)

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7.8.1 Notes on ifm system solutions

7053

With the AC402S, ifm electronic offers different system solutions for the simple implementation of typical applications. System solutions consist of applications which are processed by the device-internal CODESYS standard PLC.

ifm system solutions and user-created standard applications must not be stored and run simultaneously on the AC402S!

► Delete all CODESYS system solutions stored on the device before installing new ifm system solutions or user applications!

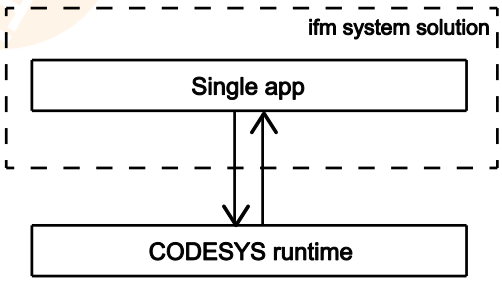
Users can download the available ifm system solutions from ifm's website.
→ www.ifm.com > Service > Download > Industrial communication

Types of ifm system solutions

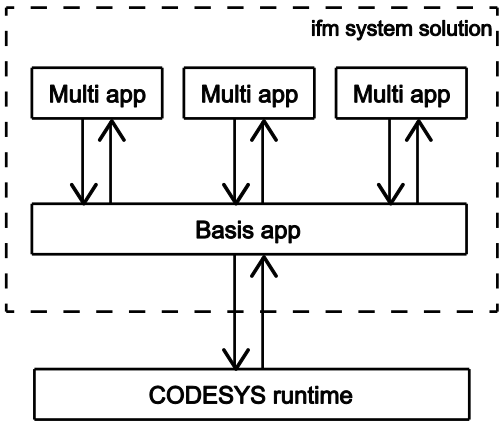
8682

There are 2 types of ifm system solutions:

- **Single apps**
  Single apps provide the user with a CODESYS-based solution. Single apps directly access the I/O mechanisms of the CODESYS standard PLC. Only one single app must be stored and executed on the device.



- **Basic app + multi apps**
  Multi apps provide the user with the possibility to execute different CODESYS-based solutions in parallel. The multi apps use the services of the basic app in order to be able to access the inputs and outputs of AC402S at the same time. They operate as a pure communication layer between the I/O mechanisms of the CODESYS standard PLC and the connected multi apps.
  Maximum 5 multi apps at a time can be stored and executed in parallel on the device.



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7.8.2 Show information about installed ifm apps

9041

In order to display information about the ifm system solutions installed on the device:

1 Select menu page

► 

► Select the [Information] tab.

2 Show information about installed ifm apps

> The browser window displays an overview of the installed ifm apps. The following information is displayed for each ifm app:

Information	Meaning
[Name]	Designation of the ifm system solution app
[Version]	Version number of the ifm system solution app
[Type]	Type of ifm app (single, basic, multi)
[Description]	Description of the functionality of the ifm system solution app
[Licence information]	Licence information about the ifm system solution in the selected user language
[Link to the ifm system solution app]	Hyperlink for web visualisation of the ifm system solution app

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7.8.3 Install single/basic app

7092

Only one single app, basic app or CODESYS standard PLC application must be stored on the device.
When installing a single/basic app, all ifm system solutions and CODESYS standard PLC applications stored on the device are deleted.

To install a single or basic app on the device:

1 Select menu page

► 

► Select the [Installation] tab.

2 Select single/basic app

► Activate the [Search] button.

> A dialogue window appears.

► Select the requested single/basic app (*.ifmapp) and click [Open] to load it.

> The file name of the selected single/basic app is displayed.

3 Transfer the single/basic app to the device

► Click on [Transfer file] button to transfer the selected single/basic app to the device.

> The progress bar indicates the status of the process.

> After successful transfer: The window shows information about the copied single/basic app.

► Optional: Click on [Cancel] to stop the download process.

4 Install the single/basic app

► Activate the [Start installation] button.

> CODESYS standard PLC is stopped.

> All ifm system solutions and CODESYS standard PLC applications on the device are deleted.

> The selected single/basic app is installed.

> The progress bar indicates the status of the installation process.

> CODESYS standard PLC is started.

> The installed single/basic app is automatically started (RUN state).

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7.8.4 Install multi app

6954

Maximum 5 multi apps must be stored on the device simultaneously.

To install a multi app on the device:

Requirements:

> The basic app is installed and started (RUN state) (→ **Install single/basic app** (→ p. 134))

1 Select menu page

► 

► Select the [Installation] tab.

2 Select multi app

► Activate the [Search] button.

> A dialogue window appears.

► Select the requested multi app (*.ifmapp) and click the [Open] button to load it.

> The file name of the selected multi app is displayed.

3 Transfer the multi app onto the device

► Click on [Transfer file] to transfer the selected multi app onto the device.

> The progress bar indicates the status of the process.

> After successful transfer: The window shows information about the copied multi app.

► Optional: Click on [Cancel] to stop the download process.

4 Install multi app

► Activate the [Start installation] button.

> CODESYS standard PLC is stopped.

> The selected multi app is installed.

> The progress bar indicates the status of the installation process.

> CODESYS standard PLC is started.

> The installed multi app is automatically started (RUN state).

► Optional: Repeat steps 2 to 4 to install further multi apps.

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7.8.5 Update ifm apps

6925

The user can update an ifm system solution installed on the device by overwriting it with the new version of the ifm system solution.

Naming convention for ifm apps:

`AppName_x.y.z.ifmapp`

AppName =	name of the ifm app
x.y.z =	version number of the ifm app
ifmapp =	file extension of an ifm app

To update an ifm system solution:

Requirements:

> The name of the new ifm app and the installed ifm app must be identical.

> The version number of the ifm app must be greater than that of the installed ifm app.

To determine the version of the installed ifm app: → **Show information about installed ifm apps** (→ p. 133)

1 Download new ifm app

► Download new version of the ifm system solution (→ **Notes on ifm system solutions** (→ p. 132)).

2 Update the installed ifm app

► Install the new ifm system solution
– Single/basic app: → **Install single/basic app** (→ p. 134)
– multi app: → **Install multi app** (→ p. 135)

7.8.6 Uninstall ifm apps

7014

When a basic app is uninstalled, all dependent multi apps are uninstalled, too.
Before uninstalling an ifm app, the CODESYS standard PLC of AC402S is stopped. After successful uninstallation, the CODESYS standard PLC is started again.

To uninstall an ifm system solution installed on the device:

1 Display installed ifm apps

► **Show information about installed ifm apps** (→ p. 133)

2 Uninstall ifm app

► In the section of the respective ifm app:
Activate the [Uninstall app] button.

> CODESYS standard PLC is stopped.

> The selected ifm app is uninstalled.

> CODESYS standard PLC is started.

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8 Setup

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15844

This section provides information for setting up the device following mounting, electrical installation and connection to AS-i network components.

Observe the notes on mounting and electrical connection of the device!
→ Operating instructions (supplied with the device)

8.1 Install device

15953

► Install AC402S correctly (→ **Install device** (→ p. 28)).

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8.2 Connect the device to the periphery

9000

8.2.1 PROFINET interface

24741

If the device is to be operated as PROFINET device:

► Connect the device to PROFINET network via the PROFINET interface (X6/X7).

8.2.2 Ethernet configuration interfaces

3859

To access the web interface or the programming interface of the device-internal PLC of the device:

► Connect the device to the Ethernet network or the PC/laptop via the configuration interface 1 (X3) or 2 (X8) (→ **Configuration interfaces: Connection concepts** (→ p. 159)).

If AC402S is to be operated as EtherCAT master:

► Connect the device to the EtherCAT network via the configuration interface 1 (X3) or 2 (X8).

8.2.3 Install devices on the local I/O interface

10860

If non-safe and safe peripherals without AS-i interface are part of the system configuration, they have to be linked via the local I/O interface (X4) of AC402S.

- Installation instructions for the local I/O interface: → **Connect devices to local I/O interface** (→ p. 32)

The installation of the safe peripherals on the local I/O interface influences the obtainable characteristic safety figures (PL/SIL/cat.) of the entire system.

► Observe the obtainable characteristic safety figures of the connection types for the installation of the safer peripherals on the local I/O interface.

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8.3 Connect the device

6957

► Ensure correct electrical connection of AC402S (→ **Electrical connection** (→ p. 29)).

8.4 Start screen 'Basic settings'

11226

The 'Basic settings' start screen appears after the following actions/events:

- initial setup
- firmware update
- data loss due to battery failure

The basic settings provide access to the GUI texts, system time, etc.

The same operating notes as for the page view apply for the 'Basic settings' start screen (→ **Page view** (→ p. 50)).

8.4.1 Change the basic settings of the device

18511

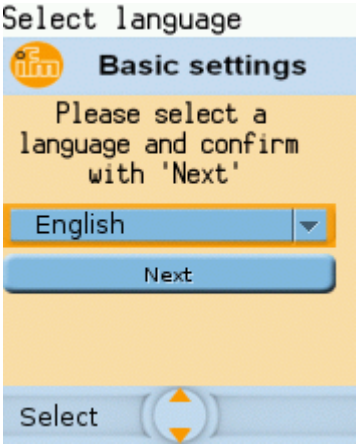
To change the basic settings of the device:

1 Start the device

► Connect the device to a circuit.
> The device starts.
> The display shows the start screen "Basic settings" (screenshot).

2 Set the language of the GUI texts

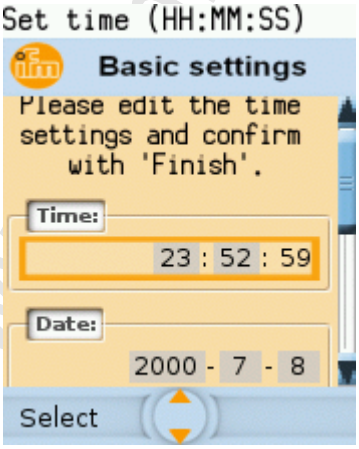
► List shows the active language.
► Use [▼] / [▲] to mark the list.
> The focus (= orange frame) is on the marked list.
► Open the list with the left function key [Select].
► Use [▼] / [▲] to mark the desired language and press [Select] to activate it.
> The GUI texts appear in the selected language.
► Go to the next page with [Next].



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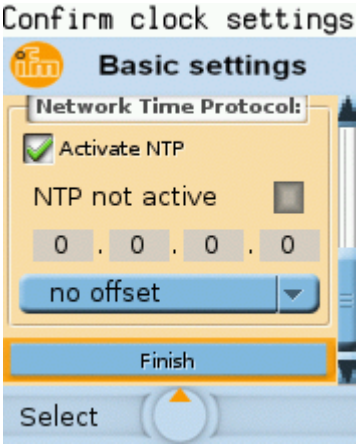
3 Set the system time

Option 1: Set the system time manually



► [Uhrzeit] and [Datum] indicate the current system time.
► Deactivate the checkbox [NT aktivieren].
> Status LED = ■
► In the group [Uhrzeit], set the desired clock time one position at a time.
► In the group [Datum], set the desired date one position at a time.
► Save the changes with [Fertigstellen] and go to the standard start screen.

Option 2. Synchronise the system time with an NTP server



► Activate the checkbox [NTP aktivieren].
> Status LED = ■
► Enter the IP address of the NTP server in the IP address field.
► Pick the time zone of the NTP server from the list (UTC format).
> The NTP client of the device synchronises the system time with the selected NTP server.
► Wait until status LED = ■
> [Datum] and [Uhrzeit] show the synchronised values.
► Save the changes with [Fertigstellen] and go to the standard start screen.

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8.5 Notes on the firmware update

13545

An update of the firmware of AC402S must only be made by an authorised employee of ifm electronic gmbh.

► Contact your AS-i specialist for more information.

After a firmware update, the user must re-evaluate the existing, safety-relevant application and ensure that the defined safety function continues to be met correctly.

► Re-evaluate the safety-relevant application.

► Compile safety-relevant application again, load it to device and create boot application.

8.6 Connect and address AS-i slaves

9004

To integrate AS-i slaves into an AS-i network that is controlled by one of the AS-i masters of the device:

1 Connect and address the AS-i slave

► Connect ONE AS-i slave to be addressed to the requested AS-i network (AS-i 1 or AS-i 2) as described in the corresponding installation instructions.

► Assign the desired address to the AS-i slave
(→ **Quick setup: Address the AS-i slaves connected to AS-i master 1** (→ p. 76) or → **Quick setup: Address the AS-i slaves connected to AS-i master 2** (→ p. 77)).

► Optional: Repeat step 1 to connect and address further AS-i slaves.

2 Project the AS-i network

► Carry out a projection adaptation on the AS-i master with the newly addressed AS-i slaves
(→ **Quick setup: Project AS-i networks** (→ p. 70)).

> The AS-i master adds the detected slaves (LDS) to the list of the projected slaves (LPS).

> The AS-i slaves have a valid address and are integrated in the AS-i network.

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8.7 Set up Profinet

9007

Detailed information on the configuration of the PROFINET-network: → Operating instructions of the PROFINET-master

To integrate the device into a PROFINET-network:

1 Set interface parameters

►  >  > 

► Set interface parameters (→ **PROFINET interface** (→ p. 117)).

2 Integrate the device with a GSDML file into a PROFINET-project

► Copy GSDML file of the device on PC/laptop with the PROFINET-configuration software (→ **Download GSDML file** (→ p. 116)).

► Load the device with the GSDML file into the device library of the PROFINET-configuration software (→ operating instructions of the PROFINET-configuration software).

► Integrate the device into the PROFINET-project.

3 Set device parameters, fieldbus modules and system behaviour

► Set the following parameters in the PROFINET-configuration software:
– Device-specific parameters (→ **Parameter data** (→ p. 176))
– PROFINET-Modules (→ **PROFINET modules** (→ p. 179))

► Set the system behaviour in the PROFINET-configuration software (e.g. watchdog)

4 Configuration activate

► Store configuration and load to the PROFINETController (download).

► PROFINET-Start controller.

> The device is integrated into the PROFINET-network (→ status LED of the PROFINET-interface)

5 Select

►  >  > 

► Select the [Profinet data] tab.

> Page shows the stored configuration.

8.8 Set Ethernet configuration interfaces

13346

To configure the Ethernet configuration interfaces 1 (X3) and 2 (X8):

- Ethernet configuration interface 1 (X3):

  ►  > 

  ► Select [IP setup].

  ► Set interface parameters (→ **Notes on IP settings** (→ p. 110)).

- Ethernet configuration interface 2 (X8):

  ►  > 

  ► Select [IP setup].

  ► Set interface parameters (→ **Notes on IP settings** (→ p. 110)).

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8.9 Replace standard AS-i slave

18531

AC402S makes it possible to replace a standard AS-i slave by a new AS-i slave in the operating mode "protected mode".

Requirements:

> New and old AS-i slave have the same device profile (→ **Profiles of AS-i slaves** (→ p. 166)).
> The new AS-i slave has the address 0.
> Parameter [Automatic addressing] is activated (→ **Set the monitoring functions of the AS-i master** (→ p. 80)).

1 Remove old AS-i slave

► Disconnect the AS-i slave to be replaced from the AS-i network
> AC402S detects a configuration error and generates a corresponding OSC message.

2 Install new AS-i slave

► Connect the new AS-i slave to the AS-i network.
> AC402S detects the new AS-i slave and automatically assigns the address of the old AS-i slave.
> The OSC error message disappears.
> The new AS-i slave is ready for operation.

8.10 Replace safe AS-i slave

18612

AC402S makes it possible to replace an AS-i slave with a new safe AS-i slave in the operating mode "protected mode".

Requirements:

> New and old AS-i slave have the same AS-i profile (→ **Profiles of AS-i slaves** (→ p. 166)).
> New and old slave are of the same function type.
> The new AS-i slave has the address 0.
> The new safe AS-i input slave is unlocked.
> Parameter [Automatic addressing] is activated (→ **Set the monitoring functions of the AS-i master** (→ p. 80)).

1 Remove old AS-i slave

► Disconnect the safe AS-i slave to be replaced from the AS-i network
> AC402S detects a configuration error and generates a corresponding OSC message.

2 Install new AS-i slave

► Connect the new AS-i slave to the AS-i network.
> AC402S detects the new AS-i slave and automatically assigns the address of the old AS-i slave.
> AC402S detects incorrect code sequence and requests testing of the new AS-i slave via OSC message.
► Carry out test (e.g. E-stop switch: lock ⇨ unlock).
> AC402S fills code table with code sequence of the new safe AS-i input slave.
> New safe AS-i input slave is ready for operation.

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9 Troubleshooting

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Online Support Centre (OSC) 149
Availability of the fail-safe PLC 152
Display diagnostic protocol 152

7288

This chapter offers information regarding fault detection and troubleshooting.

9.1 Status LED

7094

The status LEDs of the device provide information about the current state of system components.

Position of the status LED on device: → **Overview** (→ p. 12)

9.1.1 Status LED: Basic device

6950

Status LED			Description
H1	green	on	Device has started, warnings or error messages.
	yellow	flashes 0.5 Hz	There is a warning but not an error message.
	red	flashes 2 Hz	There is an error message.

9.1.2 Status LED: Fieldbus PROFINET

12115

Status LED			Description
H2	yellow	off	no data transmission
		flashes	Reception of data
H3	green	off	no physical connection
		on	Physical connection OK
H4	yellow	off	no data transmission
		flashes	Reception of data
H5	green	off	no physical connection
		on	Physical connection OK

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9.1.3 Status LED: Configuration interface 2 (X8)

12794

Status LED			**Description**
H6	yellow	off	no data transmission
		flashes	Reception of data
H7	green	off	no physical connection
		on	Physical connection OK

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9.2 Start screen: Status LEDs

7777

The start screen of the graphic user interface proves the following status information (→ **Start screen** (→ p. 67)):

9.2.1 Status of the web interface

20766

Status LED			Description
Web interface status	red	on	offline
	green	on	online

This function is only available via the web interface of the device (→ **Remote access** (→ p. 63)).

9.2.2 Operating mode of the AS-i master

7780

Status LED			Description
AS-i 1|2 operating mode	yellow	on	projection mode
	green	on	protected mode

9.2.3 Control instance of the AS-i outputs

7783

Status LED			Description
Output control	yellow	on	manually | manually via PLC
	green	on	gateway | gateway with PLC
	blue	on	PLC

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9.2.4 Fieldbus status

11816

Status LED			Meaning
PROFINET	red	on	PROFINET inactive
	green	on	PROFINET active

Status of the Safety PLC

20765

Status LED			Meaning
Safety PLC status	gray	ein	No safety configuration available
	green	ein	Safety configuration available

This function is only available via the web interface of the device (→ **Remote access** (→ p. 63)).

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9.3 Online diagnosis function

7055

The device offers an online diagnosis function. It helps the user to find and eliminate the source of occuring failures and errors.

9.3.1 Message types

18986

The online diagnostic function of AC402S distinguishes 3 types of messages:

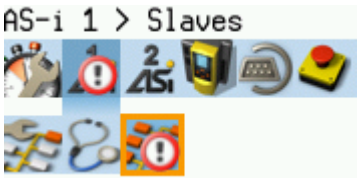
Symbol	Message type	Meaning
	Error	▪ An error occurred; proper operation of the device is disturbed. ▪ User action absolutely required
	Warning	▪ An irregularity has occurred ▪ User action required
	Event	▪ An uncritical event has occurred ▪ No user action required

9.3.2 Locate error sources

7063

The online diagnosis function helps the operator to locate the source of ooccuring warning and error messages. The menu symbols of the navigation path leading to the menu page, which generates a message, are overlain by a warning / error symbol. Thus, the operator can easily locate the error source.

Example:



> The following menu symbols are overlain by an error symbol:
  - Main navigation bar: [AS-i 1]
  - Sub navigation bar: [Slaves]

> Error source on menu page [AS-i 1] > [Slaves]

If a function unit of the device causes a warning and an error message at the same time, then the error symbol is displayed.

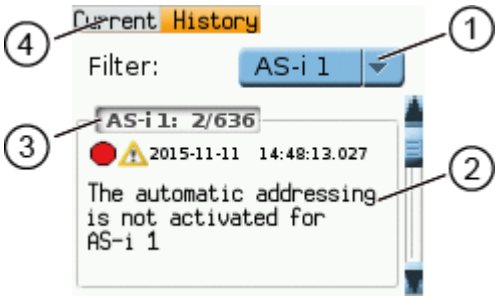
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9.4 Online Support Centre (OSC)

11385

The online support centre (OSC) shows detailed information about occurring events, interference and errors.

The OSC appears as follows:



1. List to select the filter and the name of the selected filter
2. Message
   A message consists of error symbol, time stamp and error details
3. Cons. number of the error messages displayed and total number of messages
4. List to select the view
   [Current]: → **OSC: Display current messages** (→ p. 150)
   [History]: → **OSC: Show message history** (→ p. 151)

The following rules for the display of messages apply:

- system components of AC402S (hardware, firmware):
  - All message types are displayed.
- Logical devices (safe AS-i slaves and safe local devices):
  - Error state messages are always displayed.
  - The programmer can deactivate the state messages of the safe function
- FBs of the SafetyPLCopen library:
  - Programmer can activate the transmission of the messages to the OSC

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9.4.1 OSC: Display current messages

14279

The [Current] tab lists all current messages. The messages are in chronological order. Alle messages regarding warnings and errors are displayed.

Under [Current] only messages will be displayed, that are created in the non-safe part of the AC402S. Messages created in the safe part of the AC402S are only displayed in the message history (→ **OSC: Show message history** (→ p. 151)).

Information about the different types of messages: → **Message types** (→ p. 148)
Overview of possible OSC messages of the device: → **OSC messages** (→ p. 214)

To view the error messages that are currently active:

1 Select the menu page

► On the start screen: Select [OSC] function key.

► Select [Current] tab.

2 Show current messages

> The page shows the error messages that are currently active.

► Press [▼] to select the message field.

> The focus (orange frame) is on the message field.

► Use [▲]/[▼] to go through the error messages.

3 Optional: filter messages

► Set the following parameters as required:

Parameter	Description	Possible values	
[Filter]	System component the message was created in	[All]	Display all messages in chronological order of their occurrence (= preset).
		[AS-i 1]	Display messages that were created in AS-i master 1.
		[AS-i 2]	Display messages that were created in AS-i master 2 (only selectable for devices with 2 AS-i masters).
		[System]	Display messages that were created in the system.

> Page shows filtered messages.

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9.4.2 OSC: Show message history

11775

The [History] tab lists all messages which occurred during the operating time of the device. The messages are shown in chronological order. The device displays messages regarding events, warnings and errors.

The messages are stored in a ring buffer. The ring buffer can store 2000 messages. If full, the device overwrites the oldest message(s) (time stamp).

There is a message pair for each failure (warning, error). It indicates the time of occurrence of the failure and the time at which the cause of the failure was rectified. The symbols of the messages are correspondingly marked.

Example: Error message

= Time at which the error occurred

= Time at which the cause of the fault was rectified.

To display the history of messages created so far again:

1 Select menu page

► On the start screen: Select [OSC].

► Select [History] tab.

2 Display all messages

> The page shows all previously generated error messages.

► Press [▼] to select the message field.

> The focus (orange frame) is on the message field.

► Use [▲]/[▼] to go through the error messages.

3 Optional: Filter messages

► Set the following parameters as required:

Parameter	Description	Possible values	
[Filter]	System component the message was created in	[All]	Display all messages in chronological order of their occurrence (= preset).
		[AS-i 1]	Display messages that were created in AS-i master 1.
		[AS-i 2]	Display messages that were created in AS-i master 2 (only selectable for devices with 2 AS-i masters).
		[System]	Display messages that were created in the system.

> Page shows filtered messages.

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9.5 Availability of the fail-safe PLC

20705

The [Safety] menu symbol indicates the availability of the fail-safe PLC.

Symbol	Description
	▪ Fail-safe PLC of AC402S operating reliably. ▪ The operator has access to all sub-menus and functions of the [Safety] menu.
	▪ Fail-safe PLC of AC402S running internal hardware test (PBIT). ▪ The operator can access the sub-menus and functions of the [Safety] menu. ▪ The operator can access all other menus and their sub-menus and functions.
	▪ The fail-safe PLC of AC402S is not available due to a fatal error. ▪ The operator can access the sub-menus and functions of the [Safety] menu. ► To determine the error cause: → **Online Support Centre (OSC)** (→ p. 149)

If the menu symbol [Safety] remains greyed out for longer than 5 minutes and simultaneously the status LED lights yellow, the device has to be rebooted.

► To remove the error: Reboot the device (power reset)

9.6 Display diagnostic protocol

18990

To get an overview of the configuration and the current OSC messages, the operator can store the diagnostic protocol in the system

→ **Store diagnostic protocol** (→ p. 107)

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10 Appendix

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7156

10.1 Approval tests / certifications

7157

Software-relevant certifications:

- AS-i master profile M4 according to AS-i specification 3.0
- Fieldbus certification: Profinet class B

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10.2 Technical data

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9011

10.2.1 Environmental conditions

15940

Environmental conditions	
Ambient temperature [°C]	0...50° for UL application: max. 45
Storage temperature [°C]	-20...70
Max. perm. relative air humidity [%]	95, non condensing
Height above sea level [m]	< 2000
Protection rating control cabinet	IP54

10.2.2 Safety classification

15942

Safety classification	
Standards	▪ SIL 3 (IEC 61508 : 2010) ▪ SIL cl 3 (IEC 62061: 2010) ▪ PL e / category 4 (EN ISO 13849-1 : 2008)
Mission time TM [h]	175200 (20 years)
PFH	1.21 x 10E-8
PFD_{avg}	1.04 x 10E-4

10.2.3 Power supply connections

9047

Power supply connections	
AS-i 1, AS-i 2, FE	plug-in, 6 poles, Combicon
24 V Power supply	plug-in, 2 poles, Combicon

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10.2.4 Electrical data

18981

Electrical data	
Operating voltage [V]	18...32 DC (AUX)
Current consumption from 24 V DC and AS-i [mA]	< 750 (24 V) / < 10 from AS-i 1 / < 10 V from AS-i 2
Electrical separation	yes

10.2.5 Display elements

9045

Display	
Technology	LCD, colour
Size	35 x 28 mm (1.8“)
Resolution	220 x 176 pixels
Colour depth	18 bits (= 262 144 possible colours)

LED	
Possible colours	red, green, yellow

10.2.6 Housing

9044

Housing	
Degrees of protection	IP20
Material	Aluminium, steel sheet, Makrolon
Dimensions (W x H x D) [mm]	93 x 128,2 x 106,2

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10.2.7 Interfaces

18272

Inputs (local I/O interface)	
Number	▪ 4 (two channels, safe) ▪ 8 (one channel, non safe)
Circuits	DC PNP (type 2 to IEC 61131-2)
Sensor supply	to SELV/PELV
Voltage range [V]	24 DC (18...32 DC)
Input current [mA]	7

Outputs (local I/O interface)	
Number	▪ 2 (two channels, safe) ▪ 4 (one channel, safe) ▪ 4 (one channel, non safe)
Circuits	Transistor PNP
Voltage range [V]	24 DC (18...32 DC)
External supply	to SELV/PELV
Max. current load per output [mA]	500
Max. inductance [mH]	400
Max. switching frequency [Hz]	25
Utilisation category	DC-13
Electrically isolated	yes
Short-circuit proof	yes

11070

EtherNet configuration interface	
Connection	2x RJ45
Transmission	10/100 Mbits/s
Protocol	HTTP, FTP, Telnet

11071

Ethernet fieldbus interface	
Connection	2x RJ45
Protocol	Profinet RT (device), class B
Transmission	10/100 Mbits/s
Switch	integrated 2-port switch (iRT compatible)

11072

SD card slot	
Media	SD memory cards (max. 32 Gbytes)
Format	SDHC format is supported
Supported file formats	FAT32

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10.2.8 AS-interface

18616

AS-interface	
Number of AS-i master	2
AS-i version	3.0
AS-i profile	M4

10.2.9 Programmable Logic Controller (PLC)

15946

standard PLC	
Type	CODESYS Control Runtime System (incl. CODESYS WebVisu and TargetVisu)
Programming system	CODESYS Development System V3.5 SP9 Patch 7 Hotfix 3
Programming language	FBD, SFC, IL, CFC, LD, ST
Memory available for standard PLC applications / RETAIN variables	appr. 10 MB / 4072 Byte

Fail-safe PLC	
Type	CODESYS Control Safety Runtime System (certified)
Programming system	CODESYS Development System V3.5 SP9 Patch 7 Hotfix 3 with installed ifm AS-i package 1.5.2.10
Programming languages	FBD
Available memory for safe application / data	384 KBytes / 128 KBytes

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10.3 Address assignment in Ethernet networks

14436

In the Ethernet network every IP address MUST be unique.

The following IP addresses are reserved for network-internal purposes and are therefore not allowed as an address for participants: nnn.nnn.nnn.0 | nnn.nnn.nnn.255.

Only network participants whose subnet mask is identical and whose IP addresses are identical with respect to the subnet mask can communicate with each other.

Rule:
If part of the subnet mask = 255, the corresponding IP address parts must be identical.
If part of the subnet mask = 0, the corresponding IP address parts must be different.

If the subnet mask = 255.255.255.0, 254 participants communicating with each other are possible in the network.
If the subnet mask = 255.255.0.0, 256x254 = 65 024 participants communicating with each other are possible in the network.

In the same physical network different subnet masks of the participants are allowed. They form different groups of participants which cannot communicate with groups of participants having other subnet masks.

In case of doubt or problems please contact your system administrator.

Examples:

Participant A IP address	Participant A Subnet mask	Participant B IP address	Participant B Subnet mask	Communication of participants possible?
192.168.82.247	255.255.255.0	192.168.82.10	255.255.255.0	Yes, 254 participants possible
192.168.82.**247**	255.255.255.0	192.168.82.**247**	255.255.255.0	No (same IP address)
192.168.82.247	255.255.**255**.0	192.168.82.10	255.255.**0**.0	No (different subnet mask)
192.168.**82**.247	255.255.255.0	192.168.**116**.10	255.255.255.0	No (different IP address range: 82 vs. 116)
192.168.222.213	255.255.0.0	192.168.222.123	255.255.0.0	Yes, 65 024 participants possible
192.168.111.213	255.255.0.0	192.168.222.123	255.255.0.0	Yes, 65 024 participants possible
192.168.82.247	255.255.255.0	192.168.82.**0**	255.255.255.0	No; the whole network is disturbed because the IP address xxx.xxx.xxx.0 is not allowed

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10.4 Configuration interfaces: Connection concepts

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1970

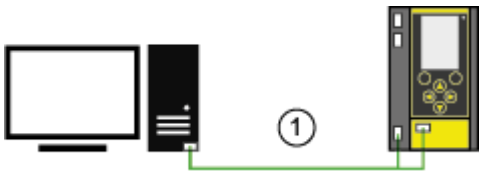
The device has 2 configuration interfaces X3 and X8 (→ **Ethernet configuration interfaces** (→ p. 13)).

To use the interface functions configuration interface X3 or X8 has to be connected to the necessary IT infrastructure. The device supports the following connection types:

- **Direct connection** (→ p. 159)
- **Connection via Ethernet network** (→ p. 160)

10.4.1 Direct connection

2305



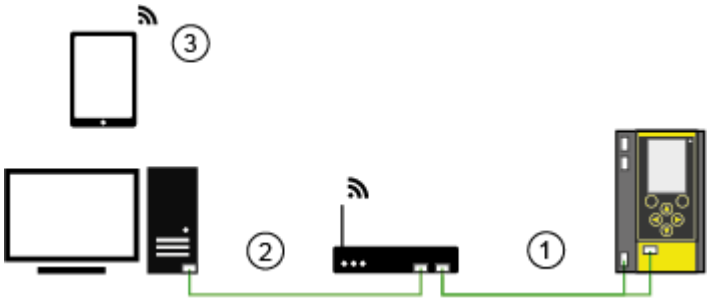
① ► Connect either configuration interface 1 (X3) or 2 (X8) to the PC/laptop via Ethernet cable.
► Set the IP parameters of the configuration interface according to the requirements. (→ **Address assignment in Ethernet networks** (→ p. 158))
> User can access the web interface and/or programming interface of the device.

The selected configuration interface must not be used as EtherCAT master!

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10.4.2 Connection via Ethernet network

1978



① ► Connect either configuration interface 1 (X3) or 2 (X8) to switch / WiFi router via Ethernet cable.
► Set IP parameters of the configuration interface and the switch / WiFi router so that the data exchange between both devices is ensured. (→ **Address assignment in Ethernet networks** (→ p. 158))

② ► Connect the PC/laptop to the switch using an Ethernet cable.
> User can access the web interface and/or programming interface of the device.

OR:

③ ► Establish wireless connection of PC/laptop/mobile device to the WiFi router.
> User can access the web interface and/or programming interface of the device.

The selected configuration interface must not be used as EtherCAT master!

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10.5 AS-i master

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8900

Master = Handles the complete organisation on the bus. The master decides on the bus access time and polls the →slaves cyclically.

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10.5.1 Operating modes of the AS-i master

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8934

The AS-i master can be operated in one of the following operating modes:

Protected mode

14833

In the operating mode "Protected mode" (= normal mode), the AS-i master only communicates with AS-i slaves that are entered in the list of projected slaves (LPS) and where current and target configuration match.

The AS-i master automatically detects the following actions and signals a configuration error:

- an AS-i slave is added to the AS-i network (error message: Slave not projected)
- an AS-i slave is removed from the AS-i network (error message: Slave not present)

Optionally, the operator can activate/deactivate the following monitoring functions (→ **Set the monitoring functions of the AS-i master** (→ p. 80)):

• Automatic addressing:	When a defective slave is replaced, the AS-i master controls the addressing. The new AS-i slave obtains the same address as the old AS-i slave if the following conditions are met: ▪ The new AS-i slave has the address `0`. ▪ Both AS-i slaves have the same device profile.
• Double address recognition:	The AS-i master recognises whether one or several AS-i slaves have the same address (error message: Double address error).
• Earth-fault detection:	The AS-i master detects any earth faults.

In the operating mode "Protected mode", the operator can control the PLC applications stored on the device (start, stop, reset).

Projection mode

14848

In the operating mode "Projection mode", the AS-i master communicates with all AS-i slaves that are connected to the AS-i line and do not have the address 0. Missing AS-i slaves are not detected by the AS-i master.

In projection mode a projection adaptation can be carried out. The AS-i master reads the configuration data of all detected AS-i slaves and saves it permanently.

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Switch operating modes

5487

The operator / programmer can switch the operating modes of the AS-i master as follows:

- per GUI / web interface (→ **Set the operating mode of the AS-i master** (→ p. 79))
- per function block `Set_Mode` (→ programming manual: **Set_Mode**)

If an AS-i slave with the address 0 is connected, then the AS-i master cannot switch from "projection mode" into "protected mode" !

► Address the AS-i slave correctly.

► Switch the operating mode.

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10.5.2 Master flags

16936

The master flags contain information about the status of the AS-i master and the fieldbus host.

The master flags are transmitted along with the input data of the digital AS-i slaves in the acyclic data set DS2 (→ Device Manual Supplement - Acyclic datasets and command interface).

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10.6 AS-i slaves

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Slave = Passive participant on the bus, only replies on request of the →master. Slaves have a clearly defined and unique →address in the bus.

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10.6.1 Profiles of AS-i slaves

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Configuration data (CDI) of the slaves (slave profiles)

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5346

The configuration data CDI (= **C**onfiguration **D**ata **I**mage) for single, A and B slaves is stored in a data word. The structure is shown below and is the same for all slaves.

Structure of the slave profile

5347

The slave profile has the following structure: S-[IO code].[ID code].[ext. ID code2]

Bits 15...12	Bits 11...8	Bits 7...4	Bits 3...0
XID2 extended ID code 2 3rd figure in the slave profile (AS-i slave v2.0 = 0xF *)	XID1 extended ID code 1 is no part of the slave profile can be changed by the user (AS-i slave v2.0 = 0xF *)	ID code ID code 2nd figure in the slave profile	IO code I/O configuration 1st figure in the slave profile
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:		
0b1110 = 0xE	(e.g.) 0b0111 = 0x7	0b1010 = 0xA	0b0111 = 0x7
The corresponding CDI data word is: 11100111 10100111 = 0xE7A7			

*) AS-i slaves according to the AS-i specification 2.0 and older do not support the extended ID codes 1 and 2. In the master 0xF is stored for this configuration data.

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Description of the IO code for digital slaves

5349

Structure slave profile = S-[IO-Code].x.x

IO code [hex]	**IO code** (bits 3…0)	**Function of the periphery bit**			
		D3	**D2**	**D1**	**D0**
0	0000	input	input	input	input
1	0001	output	input	input	input
2	0010	input / output	input	input	input
3	0011	output	output	input	input
4	0100	input / output	input / output	input	input
5	0101	output	output	output	input
6	0110	input / output	input / output	input / output	input
7	0111	input / output	input / output	input / output	input / output
8	1000	output	output	output	output
9	1001	input	output	output	output
A	1010	input / output	output	output	output
B	1011	input	input	output	output
C	1100	input / output	input / output	output	output
D	1101	input	input	input	output
E	1110	input / output	input / output	input / output	output
F	1111	not allowed			

Description of the ID code (selection)

5351

Structure slave profile = S-x.[ID-Code].x

ID code [hex]	**ID code** (Bits 3…0)	**Description**
0	0000	4 I/O connections for binary sensors and/or actuators with 1 signal each
1	0001	2 dual-signal I/O connections for binary sensors and/or actuators with 2 signals each
A	1010	slave operates in the extended addressing mode (B slave or A/B slave)
B	1011	slave corresponds to Safety-at-Work
F	1111	manufacturer-specific device (cannot be replaced with products from other manufacturers)

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Description of the extended ID code 1

5353

Can be changed by the user, however not a part of the slave profile.

Default value:
0xF for single slaves
0x7 for A/B slaves

The value is evaluated and checked by the master. The user can make an additional distinction between slaves which do not differ in the AS-i system, e.g. slaves with different ranges for current, voltage or frequency. This prevents damage when replacing slaves with a wrong performance range.

Description of the extended ID code 2

5355

Extended ID code 2 for analogue slaves with profile 7.3.x

5357

The extended ID code 2 is used to specify complex slaves.

Structure slave profile = S-7.3.[ext.ID code2]

Bit 3	Bit 2	Bit 1	Bit 0	Description
		0	0	1-channel slave
		0	1	2-channel slave
		1	0	4-channel slave
		1	1	4-channel slave (if slave has no extended ID code)
	0			transparent data exchange = binary bits
	1			analogue value transmission
0				output slave
1				input slave

The ID code 2 results from a combination of the options stated above.

Extended ID code 2 for analogue slaves with profile 7.4.x

5358

The extended ID code 2 is used to specify complex slaves.

Structure slave profile = S-7.3.[ext. ID code2]

Bit 3	Bit 2	Bit 1	Bit 0	Description
		0	0	1-channel slave
		0	1	2-channel slave
		1	0	4-channel slave
		1	1	4-channel slave (if slave has no extended ID code)
0	0	0	0	4 binary inputs + 4 binary outputs
0				output slave
1				input slave

The ID code 2 results from a combination of the options stated above.

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Valid combinations IO code / ID code / extended ID code 2

5359

Structure slave profile = S-[IO code].[ID code].[ext. ID code2]

IO code [hex]	ID code [hex]	Ext. ID code 2 [hex]	Meaning
0…E not: 9, B, D	0	x	binary I/O connections for sensors and actuators
0, 3, 8	1	x	1 or 2 binary sensors or actuators with 2 signals each (dual-signal devices)
0	1	x	4 binary inputs for 2 dual-signal sensors
0…E not: 2A	A	x	slave operates in the "extended addressing mode" (B slave or A/B slave)
0	A	E	slave with extended address function: 4 binary inputs for 2 dual-signal sensors (e.g. I/O module AC2250)
0	B	x	slave corresponds to Safety-at-Work
0…E	F	x	manufacturer-specific device (cannot be replaced by other products)
1	1	x	single sensor with remote setting: 3 binary inputs + 1 binary output (e.g. sensor OC5226)
3	1	x	2 binary inputs for 1 dual-signal sensor AND 2 binary outputs for 1 dual-signal actuator
3	A	x	slave with extended address function
3	A	1	slave with extended address function: 2 binary inputs + 1 binary output
3	A	2	slave with extended address function: 4 binary inputs
6	0	x	quick combined transaction type 5 of 8, 12 or 16 data bits by using 2, 3 or 4 slave addresses in a slave
7	0	F	motor starter 2I + 2O (e.g. ZB0032)
7	0	E	4 binary inputs + 4 binary outputs (e.g. I/O module AC2251)
7	1	x	interface for the transmission of 6...18-bit signals; analogue profile for combined transaction type 1; was replaced by S-7.3
7	2	x	extended slave profile for the transmission of 6...18-bit signals; extended analogue profile for combined transaction type 1; was replaced by S-7.4
7	3	x	slave profile for 16-bit transmission with integrated support in the master; integrated analogue profile for combined transaction type 1 (→ **Extended ID code 2 for analogue slaves with profile 7.3.x** (→ p. 169))
7	3	5	2 analogue outputs of 16 bits each (e.g. I/O module AC2618)
7	3	6	4 analogue outputs of 16 bits each (e.g. I/O module AC2518)
7	3	C	1 analogue input of 16 bits (e.g. sensor PPA020)
7	3	D	2 analogue inputs of 16 bits each (e.g. I/O module AC2616)
7	3	E	4 analogue inputs of 16 bits each (e.g. I/O module AC2516)
7	4	x	extended slave profile for 16-bit transmission with integrated support in the master; integrated extended analogue profile for combined transaction type 1 (→ **Extended ID code 2 for analogue slaves with profile 7.4.x** (→ p. 169))
7	4	C	RFID identification system for writing and reading RFID tags 15-bit data + 1-bit messages (e.g. DTA100)

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IO code [hex]	**ID code** [hex]	**Ext. ID code 2** [hex]	**Meaning**
7	A	x	slave operates in the "extended addressing mode" (B slave or A/B slave)
7	A	5	slave operates in the "extended addressing mode" (B slave or A/B slave) combined slave; supports combined transaction type 2
7	A	7	slave operates in the "extended addressing mode" (B slave or A/B slave) 4 binary inputs + 4 binary outputs
7	A	8	slave operates in the "extended addressing mode" (B slave or A/B slave) 1 channel for combined transaction type 4
7	A	9	slave operates in the "extended addressing mode" (B slave or A/B slave) dual channel for combined transaction type 4
7	A	A	slave operates in the "extended addressing mode" (B slave or A/B slave) 8 binary inputs + 8 binary outputs
7	A	E	slave operates in the "extended addressing mode" (B slave or A/B slave); dual sensor with actuator interface (e.g. sensor AC2317); 2 binary inputs + 2 binary outputs
7	B	x	safety slave with non-safe outputs
7	B	0	safety slave with non-safe outputs; 2 safe binary inputs (e.g. I/O module AC005S)
7	B	E	safety sensor with non-safe outputs; 2 safe binary inputs AND 2 safe binary outputs AND 2 non-safe (relay) outputs (e.g. I/O module AC009S)
7	D	x	device for motor control (electromechanical)
7	D	0	electromechanical motor control with open sub-profile
7	D	1	electromechanical direct starter
7	D	2	electromechanical reverser
7	D	3	electromechanical direct starter with brake
7	D	4	electromechanical reverser with brake
7	D	5	electromechanical direct starter with accessories
7	D	6	electromechanical reverser with accessories
7	E	x	device for motor control (electronic)
7	E	0	electronic motor control with open sub-profile
7	E	1	electronic direct starter
7	E	2	electronic reverser
7	E	3	electronic direct starter with brake
7	E	4	electronic reverser with brake
7	E	5	electronic direct starter with accessories
7	E	6	electronic reverser with accessories
8	1	x	4 binary outputs for 2 dual-signal actuators
B	1	x	dual-signal actuator with feedback: 2 binary outputs + 2 binary inputs
B	A	5	slave operates in the "extended addressing mode" (B slave or A/B slave); supports combined transaction type 2
B	A	E	slave operates in the "extended addressing mode" (B slave or A/B slave); 2 binary outputs + 2 binary inputs (e.g. AC2086 module)

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IO code [hex]	**ID code** [hex]	**Ext. ID code 2** [hex]	**Meaning**
D	1	x	single actuator with monitoring: 1 binary output + 3 binary inputs

x = any value (0...F)

Devices with M4 master profile enable connection of slaves with more than 4 digital inputs/outputs. The transmission is combined: Part of the data transmission is carried out via the digital bits D0...D3, another part via the "analogue" channels.

The more data is transmitted, the longer it takes until all data of a slave has been transmitted.
Cycle time single slave = 5 ms
Cycle time A/B slave (if address is only assigned to A or B slave) = 5 ms
Cycle time A/B slave (if address is assigned to A and B slave) = 10 ms
The cycle time for CTT transmission is a multiple of these values for individual data.

CTT = Combined Transaction Type

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Slave profiles for slaves with combined transaction

5362

Structure slave profile = S-[IO-Code].[ID-Code].[ext.ID-Code2]

Slave profile	Master profile	Assignment analogue channels in the device		Bits D0…D3	Additional acyclic string data transaction	Combined transaction CTT
		Number of channels	Use analogue / digital			
S-6.0	M4	1 I **and** 1 O	2/3/4 x 4 binary inputs **and** 2/3/4 x 4 binary outputs	—	no	type 5
S-7.3	M3	1/2/4 I **or** 1/2/4 O	1/2/4 analogue inputs **or** 1/2/4 binary outputs	—	no	type 1
S-7.4	M3	1/2/4 I **or** 1/2/4 O	1/2/4 analogue inputs **or** 1/2/4 binary outputs	4 inputs **or** 4 outputs	yes	type 1
S-7.5.5	M4	0…4 I **and** 0…4 O	0…4 analogue inputs or < 65 binary inputs **and** 0…4 analogue outputs or < 65 binary outputs	2 inputs **and** 2 outputs	yes	type 2
S-7.A.5	M4	0…2 I **and** 0…2 O	0…2 analogue inputs or < 33 binary inputs **and** 0…2 analogue outputs or < 33 binary outputs	2 inputs **and** 1 output	yes	type 2
S-7.A.7	M4	—	—	4 inputs **and** 4 outputs	no	type 3
S-7.A.8	M4	1 I	1 analogue input **or** < 17 binary inputs	1 output	no	type 4
S-7.A.9	M4	2 I	2 analogue inputs **or** < 33 binary inputs	—	no	type 4
S-7.A.A	M4	1 I **and** 1 O	8 binary inputs **and** 8 binary outputs	—	no	type 3
S-B.A.5	M4	0…2 I **and** 0…2 O	0…2 analogue inputs or < 33 binary inputs **and** 0…2 analogue outputs or < 33 binary outputs	—	yes	type 2

Legend colour pattern:

binary inputs | binary outputs | analogue inputs | analogue outputs

Combined transaction – Use of analogue channels in the gateway depending on the slave profile

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Transaction	Slave profile	Slave type	Number channels	Analogue input channels					Analogue output channels				
				CH3	CH2	CH1	CH0	Trans.	CH3	CH2	CH1	CH0	Trans.
CTT5	6.0.x	S	1	–	–	–	b	–	–	–	–	b	–
CTT1	7.3.C	S	1	–	–	–	a	–	–	–	–	–	–
	7.3.D	S	2	–	–	a	a	–	–	–	–	–	–
	7.3.E	S	4	a	a	a	a	–	–	–	–	–	–
	7.3.4	S	1	–	–	–	–	–	–	–	–	a	–
	7.3.5	S	2	–	–	–	–	–	–	–	a	a	–
	7.3.6	S	4	–	–	–	–	–	a	a	a	a	–
	7.3.C	S	1	–	–	–	a	–	–	–	–	–	–
	7.3.D	S	2	–	–	a	a	–	–	–	–	–	–
	7.3.E	S	4	a	a	a	a	–	–	–	–	–	–
	7.3.4	S	1	–	–	–	–	–	–	–	–	a	–
	7.3.5	S	2	–	–	–	–	–	–	–	a	a	–
	7.3.6	S	4	–	–	–	–	–	a	a	a	a	–
CTT1	7.4.4	S	1	–	–	–	–	–	–	–	–	a	X
	7.4.5	S	2	–	–	–	–	–	–	–	a	a	X
	7.4.6	S	4	–	–	–	–	–	a	a	a	a	X
	7.4.C	S	1	–	–	–	a	X	–	–	–	–	–
	7.4.D	S	2	–	–	a	a	X	–	–	–	–	–
	7.4.E	S	4	a	a	a	a	X	–	–	–	–	–
CTT2	7.5.5	S	0…4	a b	a b	a b	a b	X	a b	a b	a b	a b	X
CTT2	7.A.5	A	0…2	–	–	a b	a b	X	–	–	a b	a b	X
	7.A.5	B	0…2	a b	a b	–	–	X	a b	a b	–	–	X
CTT3	7.A.7	A	–	only binary				–	only binary				–
		B	–					–					–
CTT4	7.A.8	A	1	–	–	–	a b	–	–	–	–	–	–
		B	1	–	a b	–	–	–	–	–	–	–	–
CTT4	7.A.9	A	2	–	–	a b	a b	–	–	–	–	–	–
		B	2	a b	a b	–	–	–	–	–	–	–	–
CTT3	7.A.A	A	1	–	–	–	b	–	–	–	–	b	–
		B	1	–	b	–	–	–	–	b	–	–	–
CTT2	B.A.5	A	0…2	–	–	a b	a b	X	–	–	a b	a b	X
	B.A.5	B	0…2	a b	a b	–	–	X	a b	a b	–	–	X

CHn = channel
Trans. = transparent mode

S = single slave
A = A slave
B = B slave

a = analogue inputs/outputs (word)
b = binary inputs/outputs (bits)
– = not used

X = additional acyclic transaction of strings for device, parameters, diagnosis

Legend colour pattern:

binary inputs | binary outputs | analogue inputs | analogue outputs

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10.7 Fieldbus Profinet

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PROFINET (**Pro**cess **Fi**eld **Net**work) is the open Industrial Ethernet Standard of Profibus & Profinet International (PI) for automation. Profinet uses TCP/IP and IT standards, is real-time Ethernet compatible and enables the integration of fieldbus systems.

The Profinet concept has a modular design, so that the user can choose the functionality himself. This is basically different as regards the type of data exchange, to meet the requirements regarding the speed.

For Profinet, there are the two perspectives Profinet-CBA and Profinet-IO:

- Profinet-CBA (Component Based Automation) is intended for the component-based communication via TCP/IP and the real-time communication for real-time requirements in modular plant construction. Both ways of communication can be used in parallel.
- Profinet-IO has been created for real-time (RT) and synchronous communication IRT (IRT = isochronous real-time) with the decentralised periphery. The designations RT and IRT only describe the real-time characteristics in the communication within Profinet-IO.

→ www.profibus.com (umbrella organisation)

10.7.1 Fieldbus parameters

17999

The fieldbus parameters provide information for the integration of the device into the PROFINET network. The fieldbus parameters are set directly on the device.

Parameter	Meaning	Value range
IP address	IP address (IPv4) of the device's PROFINET interface	e.g.: 192.168.0.200
Subnet mask	Subnet mask of the PROFINET network segment	e.g.: 255.255.255.0
Gateway address	IP address (IPv4) of the PROFINET gateway	e.g.: 192.168.0.100

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10.7.2 Parameter data

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The parameter data enable an individual setting of the system. The parameter data is set via slot 0 of the system.

In the Siemens Step7 configuration tool "HW-Config." the parameter data is accessed by double-click on slot 0 of the device. All necessary settings can be made in the tab [Parameters].

Parameters: Compact Mode

10865

Parameter	Description	Value range	
Analogue channels per input slave	Number the analogue channels per input slave	4 channels* =	4 channels (Variable slave assignment)
		2 channels =	2 channels (Fixed slave assignment)
		1 channel =	1 channel (Fixed slave assignment)
Analogue channels per output slave	Number of analogue channels per output slave	4 channels* =	4 channels (Variable slave assignment)
		2 channels =	2 channels Fixed slave assignment)
		1 channel =	1 channel (Fixed slave assignment)
1. analogue input slave … 31. analog input slave	Assignment of the AS-i slave address to a position in the analogue input data image. Condition: Parameter [Analog channels per input slave] = 4 channels For each AS-i analogue slave 4 words at data are reserved.	Slave 1 AS-i master 1* … Slave 15 AS-i master 1* Slave 17 AS-i master 1 … Slave 31 AS-i master 1 Slave 1 AS-i master 2 … Slave 31 AS-i master 2	
1. analog output slave … 31. analog output slave	Assignment of the AS-i slave address to a position in the analogue output data image. Condition: Parameter [Analog channels per output slave] = 4 channels For each AS-i analogue slave 4 words of data are reserved.	Slave 1 AS-i master 1 … Slave 16 AS-i master 1 Slave 17 AS-i master 1* … Slave 31 AS-i master 1* Slave 1 AS-i master 2 … Slave 31 AS-i master 2	
Failsafe state	Behaviour of the slave outputs if an interrupted fieldbus connection is detected	Clear outputs* =	All AS-i outputs are switched off in case of an interrupted PROFINET connection (value = 0).
		Hold outputs =	The outputs are held in the last valid state that existed before the interrupted connection was detected.
PROFINET alarms	Transmission of the PROFINET alarms	Disable =	The PROFINETalarm data is NOT written to the AS-i system.
		Enable* =	The PROFINET alarm data is written to the AS-i system.
Swap IO mapping slot 1...4	Slave assignment in the bytes of the digital data	yes* =	Slave n+1 / slave n
		no =	Slave n / slave n+1

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Parameter	Description	Value range	
AS-i param. download	Transmission of the slave parameters when downloading a configuration from the PROFINET projection software.	Disable* =	The following slave parameter data are NOT downloaded to the device. The parameters set in the device apply.
		Enable =	Each time the PROFINET connection is established, the following slave parameter data are downloaded to the device, activated in the AS-i slaves, and stored non-volatilely.
Param. slave 1(A) AS-i master 1 … Param. slave 31(A) AS-i master 1 Param. slave 1B AS-i master 1 … Param. slave 31B AS-i master 1 Param. slave 1(A) AS-i master 2 … Param. slave 31(A) AS-i master 2 Param. slave 1B AS-i master 2 … Param. slave 31B AS-i master 2	Parameter data of the AS-i slaves. The set values are only activated when the parameter "AS-i param. download" is set to the value "Enable".	P3..P0 = P3..P0 = … P3..P0** = … P3..P0* =	2#0000 / 16#0 2#0001 / 16#1 ... 2#0111 / 16#7 ... 2#1111 / 16#F

* ... Default setting for single slaves
** ... Default setting for A/B slaves

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Parameters: Flexible mode

10891

Parameter	Description	Values	
Failsafe state	Behaviour of the slave outputs if an interrupted fieldbus connection is detected	Clear outputs* =	All AS-i outputs are switched off in case of an interrupted PROFINET connection (value = 0).
		Hold outputs =	The outputs are held in the last valid state that existed before the interrupted connection was detected.
PROFINET alarms	Transmission of the PROFINET alarms	Disable =	The PROFINETalarm data is NOT written to the AS-i system.
		Enable* =	The PROFINET alarm data is written to the AS-i system.
Swap IO mapping slot 1...4	Slave assignment in the bytes of the digital data	yes* =	Slave n+1 / slave n
		no =	Slave n / slave n+1
AS-i param. download	Transmission of the slave parameters when downloading a configuration from the PROFINET projection software.	Disable* =	The following slave parameter data are NOT downloaded to the device. The parameters set in the device apply.
		Enable =	Each time the PROFINET connection is established, the following slave parameter data are downloaded to the device, activated in the AS-i slaves, and stored non-volatilely.
Param. slave 1(A) AS-i master 1 … Param. slave 31(A) AS-i master 1 Param. slave 1B AS-i master 1 … Param. slave 31B AS-i master 1 Param. slave 1(A) AS-i master 2 … Param. slave 31(A) AS-i master 2 Param. slave 1B AS-i master 2 … Param. slave 31B AS-i master 2	Parameter data of the AS-i slaves. The set values are only activated when the parameter "AS-i param. download" is set to the value "Enable".	P3..P0 = P3..P0 = … P3..P0** = … P3..P0* =	2#0000 / 16#0 2#0001 / 16#1 ... 2#0111 / 16#7 ... 2#1111 / 16#F

* ... Default setting
** ... Default setting for A/B slaves

GSDML file

7244

To represent the Profinet gateway in a fieldbus projection software (e.g. Siemens Step7) a GSDML file is provided.

The GSDML file for the ifm AS-i PROFINET gateway AC402S is stored in the device and can be loaded to the configuration PC via the web interface (→ **Download GSDML file** (→ p. 116)). All parameter and process data which is valid for the device is defined in the GSDML file.

On the Siemens Step7 object manager:
The object manager is part of the hardware configuration in Step7. It provides the device catalogue containing all devices which are available for projection. The catalogue consists of two parts. All non Siemens devices are listed in "Profinet – Further fieldbus devices". These devices are described using GSDML files which are imported into Step7.

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10.7.3 Cyclic data

9005

The cyclic process data is, as the name suggests, cyclically updated via the fieldbus mechanisms.

For this, it must be defined in the fieldbus configuration which data with which lengths in which address areas of the host controller are to be used.

So-called slots contain each the process data of several AS-i slaves.

PROFINET modules

8739

The following tables show the available PROFINET modules in the flexible mode and in the compact mode.

PROFINET modules: Flexible mode

9210

Slot	Description	Detailed information
1	Digital input/output data AS-i master 1 for single and A slaves	→ **Slot 1 – Digital inputs/outputs of single/A slaves, AS-i master 1** (→ p. 181)
2	Digital input/output data AS-i master 2 for single and A slaves	→ **Slot 2 – Digital inputs/outputs of single/A slaves, AS-i master 2** (→ p. 181)
3	Digital input/output data AS-i master 1 for B slaves	→ **Slot 3 – Digital inputs/outputs of B slaves, AS-i master 1** (→ p. 182)
4	Digital input/output data AS-i master 2 for B slaves	→ **Slot 4 – Digital inputs/outputs of B slaves, AS-i master 2** (→ p. 182)
7	Data from the device-internal standard PLC to the higher-level fieldbus PLC	→ **Slot 7 - Inputs from AC402S standard PLC** (→ p. 193)
8	Data of the higher-level fieldbus PLC to the device-internal standard PLC	→ **Slot 8 - Outputs to AC402S standard PLC** (→ p. 194)
101... 131*	Analogue data at AS-i master 1 can be configured via projection software at the PROFINET-host)	→ **Slot 1ss/2ss – flex modules for analogue slaves** (→ p. 192)
201... 231*	Analogue data at AS-i master 2 can be configured via projection software at the PROFINET-host (only available for devices with 2 AS-i masters)	

* ... 1ss = AS-i master 1 ss = slave address
2ss = AS-i master 2

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PROFINET modules: Compact Mode

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Slot	Description	Detailed information
1	Digital input/output data AS-i master 1 for single and A slaves	→ **Slot 1 – Digital inputs/outputs of single/A slaves, AS-i master 1** (→ p. 181)
2	Digital input/output data AS-i master 2 for single and A slaves	→ **Slot 2 – Digital inputs/outputs of single/A slaves, AS-i master 2** (→ p. 181)
3	Digital input/output data AS-i master 1 for B slaves	→ **Slot 3 – Digital inputs/outputs of B slaves, AS-i master 1** (→ p. 182)
4	Digital input/output data AS-i master 2 for B slaves	→ **Slot 4 – Digital inputs/outputs of B slaves, AS-i master 2** (→ p. 182)
5	Analogue input data can be configured via device parameters (→ **Parameter data** (→ p. 176))	→ **Slot 5 – Analogue input data** (→ p. 185)
6	Analogue output data can be configured via device parameters (→ **Parameter data** (→ p. 176))	→ **Slot 6 – Analogue output data** (→ p. 186)
7	Data from the device-internal standard PLC to the higher-level fieldbus controller	→ **Slot 7 - Inputs from AC402S standard PLC** (→ p. 193)
8	Data of the higher-level fieldbus controller to the device-internal standard PLC	→ **Slot 8 - Outputs to AC402S standard PLC** (→ p. 194)

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Slot 1 – Digital inputs/outputs of single/A slaves, AS-i master 1

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Slot	Description	Value range	Length [bytes]
1	Digital inputs/outputs of single or A slaves, connected to AS-i master 1	S/A slaves 01…07 AS-i 1 = S/A slaves 1 to 7 of AS-i master 1	4
		S/A slaves 01…15 AS-i 1 = S/A slaves 1 to 15 of AS-i master 1	8
		S/A slaves 01…23 AS-i 1 = S/A slaves 1 to 23 of AS-i master 1	12
		all S/A slaves AS-i 1 = all S/A slaves of AS-i master 1	16

In each 4-byte data block, the data of 8 AS-i slaves is transmitted (→ **Mapping of the digital input/output data** (→ p. 183)).

Slot 2 – Digital inputs/outputs of single/A slaves, AS-i master 2

8745

Slot	Description	Value range	Length [bytes]
2	Digital inputs/outputs of single or A slaves, connected to AS-i master 2 (only available for devices with 2 AS-i masters)	S/A slaves 01…07 AS-i 2 = S/A slaves 1 to 7 of AS-i master 2	4
		S/A slaves 01…15 AS-i 2 = S/A slaves 1 to 15 of AS-i master 2	8
		S/A slaves 01…23 AS-i 2 = S/A slaves 1 to 23 of AS-i master 2	12
		all S/A slaves AS-i 2 = all S/A slaves of AS-i master 2	16

In each 4-byte data block, the data of 8 AS-i slaves is transmitted (→ **Mapping of the digital input/output data** (→ p. 183)).

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Slot 3 – Digital inputs/outputs of B slaves, AS-i master 1

8748

Slot	Description	Value range	Length [bytes]
3	Digital inputs/outputs of B slaves, connected to AS-i master 1	B-slaves 01…07 AS-i 1 = B slaves 1 to 7 of AS-i master 1	4
		B-slaves 01…15 AS-i 1 = B slaves 1 to 15 of AS-i master 1	8
		B-slaves 01…23 AS-i 1 = B slaves 1 to 23 of AS-i master 1	12
		all B slaves AS-i 1 = all B slaves of AS-i master 1	16

In each 4-byte data block, the data of 8 AS-i slaves is transmitted (→ **Mapping of the digital input/output data** (→ p. 183)).

Slot 4 – Digital inputs/outputs of B slaves, AS-i master 2

8749

Slot	Description	Value range	Length [bytes]
4	Digital inputs/outputs of B slaves, connected to AS-i master 2 (only available for devices with 2 AS-i masters)	B-slaves 01…07 AS-i 2 = B slaves 1 to 7 of AS-i master 2	4
		B-slaves 01…15 AS-i 2 = B slaves 1 to 15 of AS-i master 2	8
		B-slaves 01…23 AS-i 2 = B slaves 1 to 23 of AS-i master 2	12
		all B slaves AS-i 2 = all B slaves of AS-i master 2	16

In each 4-byte data block, the data of 8 AS-i slaves is transmitted (→ **Mapping of the digital input/output data** (→ p. 183)).

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Mapping of the digital input/output data

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The following table shows in which area of a byte the input/output data of each slave are transmitted.

Byte no.	Bits 4...7	Bits 0...3	Content			
			S/A slaves 01...07 **B slaves 01...07**	**S/A slaves 01...15** **B slaves 01...15**	**S/A slaves 01...23** **B slaves 01...23**	**all S/A slaves** **all B slaves**
1	Master flags[1] Master flags	Slave 1(A) Slave 1B	X	X	X	X
2	Slave 2(A) Slave 2B	Slave 3(A) Slave 3B	X	X	X	X
3	Slave 4(A) Slave 4B	Slave 5(A) Slave 5B	X	X	X	X
4	Slave 6(A) Slave 6B	Slave 7(A) Slave 7B	X	X	X	X
5	Slave 8(A) Slave 8B	Slave 9(A) Slave 9B		X	X	X
6	Slave 10(A) Slave 10B	Slave 11(A) Slave 11B		X	X	X
7	Slave 12(A) Slave 12B	Slave 13(A) Slave 13B		X	X	X
8	Slave 14(A) Slave 14B	Slave 15(A) Slave 15B		X	X	X
9	Slave 16(A) Slave 16B	Slave 17(A) Slave 17B			X	X
10	Slave 18(A) Slave 18B	Slave 19(A) Slave 19B			X	X
11	Slave 20(A) Slave 20B	Slave 21(A) Slave 21B			X	X
12	Slave 22(A) Slave 22B	Slave 23(A) Slave 23B			X	X
13	Slave 24(A) Slave 24B	Slave 25(A) Slave 25B				X
14	Slave 26(A) Slave 26B	Slave 27(A) Slave 27B				X
15	Slave 28(A) Slave 28 B	Slave 29(A) Slave 29B				X
16	Slave 30(A) Slave 30B	Slave 31(A) Slave 31B				X

Legend:

[1] ... The master flags (M flags) are only transmitted in the digital input data (→ **Table: Master flags** (→ p. 184)).

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Table: Master flags

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Bits 4...7 of the first byte of the digital input data contain the master flags. They provide information on the operating state of the AS-i master.

Bit 7	Bit 6	Bit 5	Bit 4
AS-i power fail (19 V)	Configuration error in the AS-i system	AS-i master is offline	Periphery fault

In the digital output data, bits 4...7 have no relevance and are not evaluated!

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Slot 5 – Analogue input data

8750

Slot	Description	Value range	Length [Words]
5	Analogue inputs of up to 31 single or A slaves, connected to AS-i master 1 or 2 (master 2 only available for devices with 2 AS-i masters) 1 / 2 / 4 channels per AS-i slave Define number of analogue channels and slave number by means of device parameters.	No analogue IN = module is disabled	0
		004 words = 4 words analogue inputs	4
		008 words = 8 words analogue inputs	8
		012 words = 12 words analogue inputs	12
		016 words = 16 words analogue inputs	16
		020 words = 20 words analogue inputs	20
		024 words = 24 words analogue inputs	24
		028 words = 28 words analogue inputs	28
		032 words = 32 words analogue inputs	32
		036 words = 36 words analogue inputs	36
		040 words = 40 words analogue inputs	40
		044 words = 44 words analogue inputs	44
		048 words = 48 words analogue inputs	48
		052 words = 52 words analogue inputs	52
		056 words = 56 words analogue inputs	56
		060 words = 60 words analogue inputs	60
		076 words = 76 words analogue inputs	76
		092 words = 92 words analogue inputs	92
		108 words = 108 words analogue inputs	108
		124 words = 124 words analogue inputs	124

In each word, the 16 bit value of the analogue channel is transferred (→ **Configuration of the analogue channels in the slots 5 ... 6** (→ p. 187)).

The `valid` and `overflow` flags which each analogue AS-i input slaves provides for each channel are NOT represented here.

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Slot 6 – Analogue output data

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Slot	Description	Value range	Length [Words]
6	Analogue inputs of up to 31 single or A slaves, connected to AS-i master 1 or 2 (master 2 only available for devices with 2 AS-i masters) 1 / 2 / 4 channels per AS-i slave Define number of analogue channels and slave number by means of device parameters.	No analogue outputs = module is disabled	0
		004 words = 4 words analogue outputs	4
		008 words = 8 words analogue outputs	8
		012 words = 12 words analogue outputs	12
		016 words = 16 words analogue outputs	16
		020 words = 20 words analogue outputs	20
		024 words = 24 words analogue outputs	24
		028 words = 28 words analogue outputs	28
		032 words = 32 words analogue outputs	32
		036 words =36 words analogue outputs	36
		040 words = 40 words analogue outputs	40
		044 words = 44 words analogue outputs	44
		048 words = 48 words analogue outputs	48
		052 words = 52 words analogue outputs	52
		056 words = 56 words analogue outputs	56
		060 words = 60 words analogue outputs	60
		076 words = 76 words analogue outputs	76
		092 words = 92 words analogue outputs	92
		108 words = 108 words analogue outputs	108
		124 words = 124 words analogue outputs	124

In each word, the 16 bit value of the analogue channel is transferred (→ **Configuration of the analogue channels in the slots 5 ... 6** (→ p. 187)).

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Configuration of the analogue channels in the slots 5 ... 6

17782

The configuration of the device parameters [analogue channels per input slave] und [analogue channels per output slave] determines which analogue channels of the AS-i slaves are transferred. The following table shows the relevance of the parameter values that can be set:

Parameter value	Description
`1 channel`	**Fixed slave assignment** The first channel of the slave addresses 1 to 30 of AS-i master 1 and AS-i master 2 is transmitted. The assignment of the slaves is fixed (→ **Table: Fixed slave assignment for slots 5...6** (→ p. 188)). A configuration of the slave order in the device-specific parameters is ineffective.
`2 channels`	**Fixed slave assignment** Channels 1 and 2 of the slave addresses 1 to 31 of AS-i master 1 and AS-i master 2 are transmitted. The assignment of the slaves is fixed (→ **Table: Fixed slave assignment for slots 5...6** (→ p. 188)). A configuration of the slave order in the device-specific parameters is ineffective.
`4 channels`	**Variable slave assignment** From up to 31 slaves of AS-i master 1 and/or AS-i master 2 4 channels each (with 16 bits each) are transferred with analogue data (→ **Table: Variable slave assignment for slots 5...6** (→ p. 191)). Selection of the slaves to be transmitted via the following device parameters: - input data: `x. Analogue input slave` - output data: `x. Analogue output slave`

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Table: Fixed slave assignment for slots 5...6

9025

The following table shows all possible combinations of data for the parameters:

- `Analogue channels per input slave = 1`
- `Analogue channels per input slave = 2`
- `Analogue channels per output slave = 1`
- `Analogue channels per output slave = 2`

Word	Setting of the device parameters	
	1 channel	2 channels
1	AS-i master 1 / slave 1(A) / channel 1	AS-i master 1 / slave 1(A) / channel 1
2	AS-i master 1 / slave 2(A) / channel 1	AS-i master 1 / slave 1(A) / channel 2
3	AS-i master 1 / slave 3(A) / channel 1	AS-i master 1 / slave 2(A) / channel 1
4	AS-i master 1 / slave 4(A) / channel 1	AS-i master 1 / slave 2(A) / channel 2
5	AS-i master 1 / slave 5(A) / channel 1	AS-i master 1 / slave 3(A) / channel 1
6	AS-i master 1 / slave 6(A) / channel 1	AS-i master 1 / slave 3(A) / channel 2
7	AS-i master 1 / slave 7(A) / channel 1	AS-i master 1 / slave 4(A) / channel 1
8	AS-i master 1 / slave 8(A) / channel 1	AS-i master 1 / slave 4(A) / channel 2
9	AS-i master 1 / slave 9(A) / channel 1	AS-i master 1 / slave 5(A) / channel 1
10	AS-i master 1 / slave 10(A) / channel 1	AS-i master 1 / slave 5(A) / channel 2
11	AS-i master 1 / slave 11(A) / channel 1	AS-i master 1 / slave 6(A) / channel 1
12	AS-i master 1 / slave 12(A) / channel 1	AS-i master 1 / slave 6(A) / channel 2
13	AS-i master 1 / slave 13(A) / channel 1	AS-i master 1 / slave 7(A) / channel 1
14	AS-i master 1 / slave 14(A) / channel 1	AS-i master 1 / slave 7(A) / channel 2
15	AS-i master 1 / slave 15(A) / channel 1	AS-i master 1 / slave 8(A) / channel 1
16	AS-i master 1 / slave 16(A) / channel 1	AS-i master 1 / slave 8(A) / channel 2
17	AS-i master 1 / slave 17(A) / channel 1	AS-i master 1 / slave 9(A) / channel 1
18	AS-i master 1 / slave 18(A) / channel 1	AS-i master 1 / slave 9(A) / channel 2
19	AS-i master 1 / slave 19(A) / channel 1	AS-i master 1 / slave 10(A) / channel 1
20	AS-i master 1 / slave 20(A) / channel 1	AS-i master 1 / slave 10(A) / channel 2
21	AS-i master 1 / slave 21(A) / channel 1	AS-i master 1 / slave 11(A) / channel 1
22	AS-i master 1 / slave 22(A) / channel 1	AS-i master 1 / slave 11(A) / channel 2
23	AS-i master 1 / slave 23(A) / channel 1	AS-i master 1 / slave 12(A) / channel 1
24	AS-i master 1 / slave 24(A) / channel 1	AS-i master 1 / slave 12(A) / channel 2
25	AS-i master 1 / slave 25(A) / channel 1	AS-i master 1 / slave 13(A) / channel 1
26	AS-i master 1 / slave 26(A) / channel 1	AS-i master 1 / slave 13(A) / channel 2
27	AS-i master 1 / slave 27(A) / channel 1	AS-i master 1 / slave 14(A) / channel 1
28	AS-i master 1 / slave 28(A) / channel 1	AS-i master 1 / slave 14(A) / channel 2
29	AS-i master 1 / slave 29(A) / channel 1	AS-i master 1 / slave 15(A) / channel 1
30	AS-i master 1 / slave 30(A) / channel 1	AS-i master 1 / slave 15(A) / channel 2
31	AS-i master 2 / slave 1(A) / channel 1	AS-i master 1 / slave 16(A) / channel 1
32	AS-i master 2 / slave 2(A) / channel 1	AS-i master 1 / slave 16(A) / channel 2

Word	Setting of the device parameters	
	1 channel	**2 channels**
33	AS-i master 2 / slave 3(A) / channel 1	AS-i master 1 / slave 17(A) / channel 1
34	AS-i master 2 / slave 4(A) / channel 1	AS-i master 1 / slave 17(A) / channel 2
35	AS-i master 2 / slave 5(A) / channel 1	AS-i master 1 / slave 18(A) / channel 1
36	AS-i master 2 / slave 6(A) / channel 1	AS-i master 1 / slave 18(A) / channel 2
37	AS-i master 2 / slave 7(A) / channel 1	AS-i master 1 / slave 19(A) / channel 1
38	AS-i master 2 / slave 8(A) / channel 1	AS-i master 1 / slave 19(A) / channel 2
39	AS-i master 2 / slave 9(A) / channel 1	AS-i master 1 / slave 20(A) / channel 1
40	AS-i master 2 / slave 10(A) / channel 1	AS-i master 1 / slave 20(A) / channel 2
41	AS-i master 2 / slave 11(A) / channel 1	AS-i master 1 / slave 21(A) / channel 1
42	AS-i master 2 / slave 12(A) / channel 1	AS-i master 1 / slave 21(A) / channel 2
43	AS-i master 2 / slave 13(A) / channel 1	AS-i master 1 / slave 22(A) / channel 1
44	AS-i master 2 / slave 14(A) / channel 1	AS-i master 1 / slave 22(A) / channel 2
45	AS-i master 2 / slave 15(A) / channel 1	AS-i master 1 / slave 23(A) / channel 1
46	AS-i master 2 / slave 16(A) / channel 1	AS-i master 1 / slave 23(A) / channel 2
47	AS-i master 2 / slave 17(A) / channel 1	AS-i master 1 / slave 24(A) / channel 1
48	AS-i master 2 / slave 18(A) / channel 1	AS-i master 1 / slave 24(A) / channel 2
49	AS-i master 2 / slave 19(A) / channel 1	AS-i master 1 / slave 25(A) / channel 1
50	AS-i master 2 / slave 20(A) / channel 1	AS-i master 1 / slave 25(A) / channel 2
51	AS-i master 2 / slave 21(A) / channel 1	AS-i master 1 / slave 26(A) / channel 1
52	AS-i master 2 / slave 22(A) / channel 1	AS-i master 1 / slave 26(A) / channel 2
53	Master 2 / slave 23(A) / channel 1	AS-i master 1 / slave 27(A) / channel 1
54	AS-i master 2 / slave 24(A) / channel 1	AS-i master 1 / slave 27(A) / channel 2
55	AS-i master 2 / slave 25(A) / channel 1	AS-i master 1 / slave 28(A) / channel 1
56	AS-i master 2 / slave 26(A) / channel 1	AS-i master 1 / slave 28(A) / channel 2
57	AS-i master 2 / slave 27(A) / channel 1	AS-i master 1 / slave 29(A) / channel 1
58	AS-i master 2 / slave 28(A) / channel 1	AS-i master 1 / slave 29(A) / channel 2
59	AS-i master 2 / slave 29(A) / channel 1	AS-i master 1 / slave 30(A) / channel 1
60	AS-i master 2 / slave 30(A) / channel 1	AS-i master 1 / slave 30(A) / channel 2
61	–	AS-i master 1 / slave 31(A) / channel 1
62	–	AS-i master 1 / slave 31(A) / channel 2
63	–	AS-i master 2 / slave 1(A) / channel 1
64	–	AS-i master 2 / slave 1(A) / channel 2
65	–	AS-i master 2 / slave 2(A) / channel 1
66	–	AS-i master 2 / slave 2(A) / channel 2
67	–	AS-i master 2 / slave 3(A) / channel 1
68	–	AS-i master 2 / slave 3(A) / channel 2
69	–	AS-i master 2 / slave 4(A) / channel 1
70	–	AS-i master 2 / slave 4(A) / channel 2
71	–	AS-i master 2 / slave 5(A) / channel 1

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Word	Setting of the device parameters	
	1 channel	2 channels
72	–	AS-i master 2 / slave 5(A) / channel 2
73	–	AS-i master 2 / slave 6(A) / channel 1
74	–	AS-i master 2 / slave 6(A) / channel 2
75	–	AS-i master 2 / slave 7(A) / channel 1
76	–	AS-i master 2 / slave 7(A) / channel 2
77	–	AS-i master 2 / slave 8(A) / channel 1
78	–	AS-i master 2 / slave 8(A) / channel 2
79	–	AS-i master 2 / slave 9(A) / channel 1
80	–	AS-i master 2 / slave 9(A) / channel 2
81	–	AS-i master 2 / slave 10(A) / channel 1
82	–	AS-i master 2 / slave 10(A) / channel 2
83	–	AS-i master 2 / slave 11(A) / channel 1
84	–	AS-i master 2 / slave 11(A) / channel 2
85	–	AS-i master 2 / slave 12(A) / channel 1
86	–	AS-i master 2 / slave 12(A) / channel 2
87	–	AS-i master 2 / slave 13(A) / channel 1
88	–	AS-i master 2 / slave 13(A) / channel 2
89	–	AS-i master 2 / slave 14(A) / channel 1
90	–	AS-i master 2 / slave 14(A) / channel 2
91	–	AS-i master 2 / slave 15(A) / channel 1
92	–	AS-i master 2 / slave 15(A) / channel 2
93	–	AS-i master 2 / slave 16(A) / channel 1
94	–	AS-i master 2 / slave 16(A) / channel 2
95	–	AS-i master 2 / slave 17(A) / channel 1
96	–	AS-i master 2 / slave 17(A) / channel 2
97	–	AS-i master 2 / slave 18(A) / channel 1
98	–	AS-i master 2 / slave 18(A) / channel 2
99	–	AS-i master 2 / slave 19(A) / channel 1
100	–	AS-i master 2 / slave 19(A) / channel 2
101	–	AS-i master 2 / slave 20(A) / channel 1
102	–	AS-i master 2 / slave 20(A) / channel 2
103	–	AS-i master 2 / slave 21(A) / channel 1
104	–	AS-i master 2 / slave 21(A) / channel 2
105	–	AS-i master 2 / slave 22(A) / channel 1
106	–	AS-i master 2 / slave 22(A) / channel 2
107	–	AS-i master 2 / slave 23(A) / channel 1
108	–	AS-i master 2 / slave 23(A) / channel 2
109	–	AS-i master 2 / slave 24(A) / channel 1
110	–	AS-i master 2 / slave 24(A) / channel 2
111	–	AS-i master 2 / slave 25(A) / channel 1

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Word	Setting of the device parameters	
	1 channel	2 channels
112	–	AS-i master 2 / slave 25(A) / channel 2
113	–	AS-i master 2 / slave 26(A) / channel 1
114	–	AS-i master 2 / slave 26(A) / channel 2
115	–	AS-i master 2 / slave 27(A) / channel 1
116	–	AS-i master 2 / slave 27(A) / channel 2
117	–	AS-i master 2 / slave 28(A) / channel 1
118	–	AS-i master 2 / slave 28(A) / channel 2
119	–	AS-i master 2 / slave 29(A) / channel 1
120	–	AS-i master 2 / slave 29(A) / channel 2
121	–	AS-i master 2 / slave 30(A) / channel 1
122	–	AS-i master 2 / slave 30(A) / channel 2
123	–	AS-i master 2 / slave 31(A) / channel 1
124	–	AS-i master 2 / slave 31(A) / channel 2

Table: Variable slave assignment for slots 5...6

8765

The following table shows the structure of the data image to set the parameter:

- `Analogue channels per input slave = 4`
- `Analogue channels per output slave = 4`

Word Offset-Nr.	Content of the transferred word for parameter setting = `4 channels`
n	Mx / slave m(A) / channel
n+1	Mx / slave m(A) / channel
n+2	Mx / slave m(A) / channel 1 = Mx / slave mB / channel 1
n+3	Mx / slave m(A) / channel 2 = Mx / slave mB / channel 2

Legend:

n ...	Number of 4 word blocks 1 = for setting 4 words ... 15 = for setting 60 words
x ...	1 = AS-i master 1 2 = AS-i master 2
m ...	Numeric part of the selected AS-i slave address

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Slot 1ss/2ss – flex modules for analogue slaves

9211

In the PROFINET-projection software, every single analogue input/output slave can be shown as separate slot. Here, the following areas apply:

- Slot 101...131 for analogue slaves at AS-i master 1
- Slot 201...232 for analogue slaves at AS-i master 2

In the flex module representation the first digit identifies the AS-i master the analogue slave is assigned to. The two following digits stand for the address of the analogue AS-i slave.
Example: Slot 223 = AS-i master 2, analogue slave with address 23

These slots can contain the following modules in any combination you choose:

Module name	Description		
	slave type	Channel no.	Slave input/output
1 Channel analogue input (single or A slave)	Single or A slave	0	Input
1 Channel analogue input (B slave)	B slave	0	
2 Channels analogue input (single or A slave)	Single or A slave	0 + 1	
2 Channels analogue input (B slave)	B slave	0 + 1	
4 Channels analogue input (single or A&B slave)	Single slave or: A slave B slave	0…3 0 + 1 0 + 1	
1 Channel analogue output (single or A slave)	single or A slave	0	Output
1 Channel analogue output (B slave)	B slave	0	
2 Channels analogue output (single or A slave)	Single or A slave	0 + 1	
2 Channels analogue output (B slave)	B slave	0 + 1	
4 Channels analogue output (single or A&B slave)	Single slave or: A slave B slave	0…3 0 + 1 0 + 1	
1 Channel bidirectional analogue (single or A slave)	Single or A slave	0	Input and output
1 Channel bidirectional analogue (B slave)	B slave	0	
2 Channels bidirectional analogue (single or A slave)	single or A slave	0 + 1	
2 Channels bidirectional analogue (B slave)	B slave	0 + 1	
4 Channels bidirectional analogue (single or A&B slave)	Single slave or: A slave B slave	0…3 0 + 1 0 + 1	

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Slot 7 - Inputs from AC402S standard PLC

17791

Slot	Description	Value range	Length [Words]
7	Data from the device-internal standard PLC to the PROFINET PLC	Empty module = module is deactivated	0
		004 words = 4 words AC402S standard PLC >> fieldbus PLC	4
		008 words = 8 words AC402S standard PLC >> fieldbus PLC	8
		012 words = 12 words AC402S standard PLC >> fieldbus PLC	12
		016 words = 16 words AC402S standard PLC >> fieldbus PLC	16
		020 words = 20 words AC402S standard PLC >> fieldbus PLC	20
		024 words = 24 words AC402S standard PLC >> fieldbus PLC	24
		028 words = 28 words AC402S standard PLC >> fieldbus PLC	28
		032 words = 32 words AC402S standard PLC >> fieldbus PLC	32
		036 words = 36 words AC402S standard PLC >> fieldbus PLC	36
		040 words = 40 words AC402S standard PLC >> fieldbus PLC	40
		044 words = 44 words AC402S standard PLC >> fieldbus PLC	44
		048 words = 48 words AC402S standard PLC >> fieldbus PLC	48
		052 words = 52 words AC402S standard PLC >> fieldbus PLC	52
		056 words = 56 words AC402S standard PLC >> fieldbus PLC	56
		060 words = 60 words AC402S standard PLC >> fieldbus PLC	60
		076 words = 76 words AC402S standard PLC >> fieldbus PLC	76
		092 words = 92 words AC402S standard PLC >> fieldbus PLC	92
		108 words = 108 words AC402S standard PLC >> fieldbus PLC	108
		120 words = 120 words AC402S standard PLC >> fieldbus PLC	120

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Slot 8 - Outputs to AC402S standard PLC

17790

Slot	Description	Value range	Length [Words]
8	Data from the PROFINET PLC to the device-internal standard PLC	Empty module = module is deactivated	0
		004 words = 4 words fieldbus PLC >> AC402S standard PLC	4
		008 words = 8 words fieldbus PLC >> AC402S standard PLC	8
		012 words = 12 words fieldbus PLC >> AC402S standard PLC	12
		016 words = 16 words fieldbus PLC >> AC402S standard PLC	16
		020 words = 20 words fieldbus PLC >> AC402S standard PLC	20
		024 words = 24 words fieldbus PLC >> AC402S standard PLC	24
		028 words = 28 words fieldbus PLC >> AC402S standard PLC	28
		032 words = 32 words fieldbus PLC >> AC402S standard PLC	32
		036 words = 36 words fieldbus PLC >> AC402S standard PLC	36
		040 words = 40 words fieldbus PLC >> AC402S standard PLC	40
		044 words = 44 words fieldbus PLC >> AC402S standard PLC	44
		048 words = 48 words fieldbus PLC >> AC402S standard PLC	48
		052 words = 52 words fieldbus PLC >> AC402S standard PLC	52
		056 words = 56 words fieldbus PLC >> AC402S standard PLC	56
		060 words = 60 words fieldbus PLC >> AC402S standard PLC	60
		076 words = 76 words fieldbus PLC >> AC402S standard PLC	76
		092 words = 92 words fieldbus PLC >> AC402S standard PLC	92
		108 words = 108 words fieldbus PLC >> AC402S standard PLC	108
		120 words = 120 words fieldbus PLC >> AC402S standard PLC	120

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10.7.4 Acyclic data

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Overview: Acyclic process data

8752

The indices on slot 0, subslot 1, are used as follows:

Index [dec]	From byte no. [dec]	To byte no. [dec]	Contents	DS	Access r = read w = write	Number of words
0	–	–	reserved for system start	–	–	–
1	0	51	Read system information	DS1	r	26
30	0	239	System command request channel	–	r/w	120
31	0	239	System command reply channel	–	r	120
32	0	69	M1 digital slave inputs 1(A)…31(A) and 1B…31B (1 byte per slave) + M1 master flags (status AS-i master and exec.-ctl. flags and host flags)	DS2	r	35
33	0	149	M1 analogue slave inputs 1(A)…15(B)	DS3	r	75
34	0	159	M1 analogue slave inputs 16(A)…31(B)	DS4	r	80
35	0	63	M1 digital slave outputs 1(A)…31(A) and 1B…31B (1 byte per slave)	DS5	r/w	32
36	0	119	M1 analogue slave outputs 1(A)…15(B)	DS6	r/w	60
37	0	127	M1 analogue slave outputs 16(A)…31(B)	DS7	r/w	64
38	0	63	M1 status flags analogue outputs 1(A)…31(A) and 1B…31B	DS8	r	32
39	0	31	M1 LAS, LDS, LPF, LCE	DS9	r	16
40	0	7	M1 LPS	DS10	r	4
41	0	127	M1 current configuration data (CDI)	DS11	r	64
42	0	127	M1 projected configuration data (PCD)	DS12	r	64
43	0	63	M1 input parameter image (1 byte per slave)	DS13	r	32
44	0	63	M1 output parameter image (1 byte per slave)	DS14	r/w	32
46	0	143	M1 slave error counter, configuration error counter, AS-i cycle counter	DS15	r	72
47	0	23	M1 LCEMS, LCEAS, LDAE	DS17	r	12
62	0	239	M1 command request channel	–	r/w	120
63	0	239	M1 command reply channel	–	r	120
64	0	69	M2 digital slave inputs 1(A)…31(A) and 1B…31B (1 byte per slave) + M2 master flags (status AS-i master and exec.-ctl. flags and host flags)	DS2	r	35
65	0	149	M2 analogue slave inputs 1(A)…15(B)	DS3	r	75

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Index [dec]	**From byte no.** [dec]	**To byte no.** [dec]	**Contents**	**DS**	**Access** r = read w = write	**Number of words**
66	0	159	M2 analogue slave inputs 16(A)…31(B)	DS4	r	80
67	0	63	M2 digital slave outputs 1(A)…31(A) and 1B…31B (1 byte per slave)	DS5	r/w	32
68	0	119	M2 analogue slave outputs 1(A)…15(B)	DS6	r/w	60
69	0	127	M2 analogue slave outputs 16(A)…31(B)	DS7	r/w	64
70	0	63	M2 status flags analogue outputs 1(A)…31(A) and 1B…31B	DS8	r	32
71	0	31	M2 LAS, LDS, LPF, LCE	DS9	r	16
72	0	7	M2 LPS	DS10	r	4
73	0	127	M2 current configuration data (CDI)	DS11	r	64
74	0	127	M2 projected configuration data (PCD)	DS12	r	64
75	0	63	M2 input parameter image (1 byte per slave)	DS13	r	32
76	0	63	M2 output parameter image (1 byte per slave)	DS14	r/w	32
78	0	131	M2 slave error counter, configuration error counter, AS-i cycle counter	DS15	r	66
79	0	23	M2 LCEMS, LCEAS, LDAE	DS17	r	12
94	0	239	M2 command request channel	–	r/w	120
95	0	239	M2 command reply channel	–	r	120

Legend:

DS = Acyclic data set (→ **Overview: acyclic data sets (DSx)** (→ p. 197))
M1 = AS-i master 1
M2 = AS-i master 2

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Overview: acyclic data sets (DSx)

17035

Data record	Content	Access r = read w = write	Words
DS1	System information	r	26
DS2	Digital inputs of slaves 1(A)…31(A) and 1B…31B and master flags (Status AS-i master and exec.-ctl. flags and host flags)	r	36
DS3	Analogue inputs of slaves 1(A)…15(B)	r	75
DS4	Analogue inputs of slaves 16(A)…31(B)	r	80
DS5	Digitale outputs of slaves 1(A)…31(A) and 1B...31B	r/w	32
DS6	Analogue outputs of slaves 1(A)…15(B)	r/w	60
DS7	Analogue otputs of slaves 16(A)…31(B)	r/w	64
DS8	Statusflags of analogue output data of slaves 1(A)…31(A) and 1B…31B	r	32
DS9	Slave lists LAS, LDS, LPF, LCE	r	16
DS10	Slave list LPS	r	4
DS11	Actual Configuration data (CDI)	r	64
DS12	Projected Configuration data (PCD)	r	64
DS13	Image of input parameter	r	32
DS14	Image of output parameter	r/w	32
DS15	Slave error counter, configuration error counter, AS-i cycle counter	r	72
DS16	n.a.	–	–
DS17	AS-i master: Error lists LCEMS, LCEAS, LDAE	r	12
DS18	Fieldbus information (only available via CODESYS)	r	19
DS19	n.a.	–	–
DS20	n.a.	–	–

Detailed information about the acyclic data sets and the command interface is given in the supplement to the device manual of the SmartSPS SafeLine mit Profinet-Device-Schnittstelle (→ **Overview: User documentation for AC4S** (→ p. 7)).

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Overview: System commands

11078

Comm. no. [hex]	Comm. no. [dec]	Description
0101	257	Quick setup AS-i master 1/2
0103	259	Change the user language
0104	260	Change the display settings
0105	261	Set output control
0106	262	Set the standard PLC operating mode
0109	265	Set the date / time
010A	266	Configure the NTP server settings
010B	267	Read date / time / NTP settings
010C	268	Reboot the system
010D	269	Read fieldbus information (can only be executed in CODESYS!)
010F	271	Read text of an OSC entry
0110	272	Display target visualisation

Detailed information about the acyclic data sets and the command interface is given in the supplement to the device manual of the SmartSPS SafeLine mit Profinet-Device-Schnittstelle (→ **Overview: User documentation for AC4S** (→ p. 7)).

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Overview: AS-i master commands

7250

Comm. no. [hex]	Comm. no. [dec]	Description	Note
0001	1	Write parameters to a connected AS-i slave	
0003	3	Adopt and save currently connected AS-i slaves in the configuration (!) With this command the fieldbus connection is reset. The device must be rebooted!	ConfDataInput Slave → Projected Configuration Data and LDS → LPS
0004	4	Change the list of projected AS-i slaves (LPS)	
0005	5	set the operating mode of the AS-i master	
0006	6	readdress a connected AS-i slave	
0007	7	set the auto addressing mode of the AS-i master	
0009	9	change the extended ID code 1 in the connected AS-i slave	
000A	10	change PCD	
000D	13	AS-i master supply voltage, symmetry, earth fault	
0015	21	read ID string of an AS-i slave with profile S-7.4	slave profile S-7.4
001A	26	read AS-i master info	
001C	28	deactivation of the slave reset when changing to the protected mode	
0021	33	read diagnostic string of an AS-i slave with profile S-7.4	slave profile S-7.4
0022	34	read parameter string of an AS-i slave with profile S-7.4	slave profile S-7.4
0023	35	write parameter string of an AS-i slave with profile S-7.4	slave profile S-7.4
0024	36	CTT2 standard read: acyclic standard read call of an AS-i slave with CTT2 profile	CTT2 slave profile *)
0025	37	CTT2 standard write: acyclic standard write call of an AS-i slave with CTT2 profile	CTT2 slave profile *)
0026	38	CTT2 vendor specific read: acyclic manufacturer-specific read call of an AS-i slave with CTT2 profile	CTT2 slave profile *)
0027	39	CTT2 vendor specific write: acyclic manufacturer-specific write call of an AS-i slave with CTT2 profile	CTT2 slave profile *)
0040	64	CTT2 device group read: acyclic manufacturer-specific read call of an AS-i slave with CTT2 profile	CTT2 slave profile *)
0041	65	CTT2 device group write: acyclic device group write call of an AS-i slave with CTT2 profile	CTT2 slave profile *)
0042	66	CTT2 vendor specific selective read from buffer: selective standard read call of an AS-i slave with CTT2 profile	CTT2 slave profile *)
0043	67	CTT2 vendor specific selective write from buffer: selective standard write call of an AS-i slave with CTT2 profile	CTT2 slave profile *)
0044	68	CTT2 vendor specific selective read: selective manufacturer-specific read call of an AS-i slave with CTT2 profile	CTT2 slave profile *)
0045	69	CTT2 vendor specific selective write: selective manufacturer-specific write call of an AS-i slave with CTT2 profile	CTT2 slave profile *)
0046	70	CTT2 device group selective read: selective device group read call of an AS-i slave with CTT2 profile	CTT2 slave profile *)
0047	71	CTT2 device group selective write: selective device group write call of an AS-i slave with CTT2 profile	CTT2 slave profile *)

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Comm. no. [hex]	Comm. no. [dec]	Description	Note
0049	73	CTT2 vendor specific exchange: manufacturer-specific data exchange with an AS-i slave with CTT2 profile	CTT2 slave profile *)
004A	74	CTT2 device group exchange: device group data exchange with an AS-i salve with CTT2 profile	CTT2 slave profile *)
004B	75	CTT2 device group selective read from buffer: manufacturer-specific read / write call of an AS-i slave with CTT2 profile	CTT2 slave profile *)
004C	76	CTT2 device group selective write from buffer: device group read / write call of an AS-i slave with CTT2 profile	CTT2 slave profile *)
0050	80	set AS-i master settings	
0051	81	Reset the error counters	

Legend:

*) ... CTT2 profiles = S-7.5.5, S-7.A.5 or S-B.A.5
CTT → **Combined transaction – Use of analogue channels in the gateway depending on the slave profile** (→ p. 173)

Detailed information about the acyclic data sets and the command interface is given in the supplement to the device manual of the SmartSPS SafeLine mit Profinet-Device-Schnittstelle (→ **Overview: User documentation for AC4S** (→ p. 7)).

Step7 programmer's notes: call acyclic services

9215

In the projection software, standard function blocks are used for the acyclic data exchange between a PROFINET IO controller and the AC402S.

Siemens S7 controllers provide two standard function blocks:

- SFB52 RDREC for reading acyclic data
- SFB53 WRREC for writing acyclic data

For detailed information regarding SFB52 and SFB53: → operating instructions of the Siemens S7 controller!

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10.7.5 I&M data

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14840

Data structures (= data records) have been defined for identification and maintenance (I&M) in this fieldbus. I&M0 is absolutely necessary for the certification.

I&M data addressing

8869

Revision: 2011-11-16

The I&M data can be read from the device or write to the device with the following addressing (not I&M0!):

I&M	Slot / module	Sub-slot	Index *) [hex]	Length [bytes]	Read	Write	Absolutely necessary
I&M 0	0	1	AFF0	54	X	--	X
I&M 1	0	1	AFF1	54	X	X	--
I&M 2	0	1	AFF2	54	X	X	--
I&M 3	0	1	AFF3	54	X	X	--
I&M 4	0	1	AFF4	54	X	X	--

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I&M0 data

8870

I&M0 provide the user with device-specific basic information. This permits a clear identification of the device with its hardware and software components as well as the manufacturer.

Date	Bytes	Content	Description
Profinet Block Header	6		Manufacturer specific
MANUFACTURER_ID	2	310	Manufacturer ID of ifm
ORDER_ID	20	e.g. AC14xx	Device order number (ASCII characters) Unneeded characters are filled with 0x20 (blank)
SERIAL_NUMBER	16		12-digit serial number of the device (ASCII) Unneeded characters are filled with 0x20 (blank)
HARDWARE_REVISION	2	e.g. AA	Device version (2 ASCII characters)
SOFTWARE_REVISION	4	e.g. V3.0.8	e.g. V3.0.8 Byte 0 = software type (char): V (= official release) Byte 1 = major version (uint8): 3 Byte 2 = minor version (uint8): 0 Byte 3 = build version (uint8): 8
REVISION_COUNTER	2	0x0001...0xFFFF	Revision counter of the device. If changes are made to the device data, the revision counter is incremented. Changes to the device data are for example the installation of a new firmware or changed device parameters.
PROFILE_ID	2	0xF600	ID for generic device
PROFILE_SPECIFIC_TYPE	2	0x0000	No profiles are supported
IM_VERSION	2	e.g. 1.1	The currently up-to-date version of the I&M data Byte 0 = major version (uint8): 1 Byte 1 = minor version (uint8): 1
IM_SUPPORTED	2	0x001E	Supported I&M data: I&M1...I&M4

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10.7.6 Fieldbus alarms

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8871

Depending on the compatibility mode currently active the AC402S supports the following diagnosis / alarm options.

Process alarms

8872

Process alarms are used when a critical value or status occurs during the process in the plant. This can be the case e.g. when the temperature of a tank is too low or too high.

The process alarms are application-specific. For this reason, the manufacturer does not implement process alarms in this device.

Diagnosis alarms

9144

Diagnosis alarms are used where an error or event occurs in the device.

Examples:

- AS-i configuration error
- Peripheral fault on an AS-i slave

- **Slot:** 0 (corresponds to the host; in the ifm classic mapping model, this is the AC402S)
- **sub-slot:** 1 (others are not supported from some PROFINET-controllers.
- **Channel**: 0x08000 (fixed, others are not supported)
- **Channel property:** is always "diagnosis"
- **Alarm numbers:** are in the "Manufacturer Specific" area (0x0100 and 0x7FFF)
- All used alarms are "standard alarms" and use the "Add Channel Diagnosis Request" function on the Hilscher Alarm API.

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Device diagnosis alarms

8874

Alarm type ID	Description	Slot / sub-slot / channel	Alarm parameter
0x0100	internal device system error cause of error → alarm parameter	0 / 1 / 0x8000	cause of error
0x0101	excess temperature: temperature inside the device has exceeded the permitted max. value of 80 ° celsius.	0 / 1 / 0x8000	device temperature
0x0104	the gateway mode is deactivated	0 / 1 / 0x8000	--

AS-i diagnosis alarms

8875

Alarm type ID	Description	Slot / sub-slot / channel	Alarm parameters
0x0200	internal system error of an AS-i master	M / 1 / 0x8000	master number, cause of error
0x0202	AS-i master was set to the projection mode	M / 1 / 0x8000	master number
0x0203	new slave 0 was detected	M / 1 / 0x8000	master number
0x0204	earth fault was detected	M / 1 / 0x8000	master number, symmetry
0x0207	22.5 V AS-i power failure was detected (classic ASi power)	M / 1 / 0x8000	master number
0x0208	19 V AS-i power failure was detected (Power24)	M / 1 / 0x8000	master number
0x03(SLA)	configuration error, too many slaves	M / 1 / 0x8000	master number, slave address
0x04(SLA)	configuration error, slave missing	M / 1 / 0x8000	master number, slave address
0x05(SLA)	configuration error, slave has wrong profile	M / 1 / 0x8000	master number, slave address
0x06(SLA)	periphery fault	M / 1 / 0x8000	master number, slave address
0x0701...0x071F	double addressing fault	M / 1 / 0x8000	master number, slave address

Legend:

M	master no.	1 bit	0 = AS-i master 1 1 = AS-i master 2
SLA	slave address	1 byte	slaves 1(A)...31(A): 0x01…0x1F = 1…31 slaves 1B...31B: 0x21…0x3F = 33…63

Configuration and periphery faults are signalled in slot 1 for AS-i master 1 and in slot 2 for AS-i master 2. The subslot is always 1, the channel always 0x8000.

The alarm type ID indicates ...
- the type of error occurred (with the high byte of the alarm type ID)
- the slave address causing the error (with the low byte of the alarm type ID).

If there is more than one slave address causing an error, several alarms are sent. The alarms are independent of each other and remain set as long as the reason for the alarm exists.

The following tables list the complete assignment of alarm type ID by error type and slave address.

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Diagnosis data of the alarms

Contents

Alarm 0x0100 – internal device system error 205
Alarm 0x0101 – excess temperature 205
Alarm 0x0104 – Manual output control was activated 205
Alarm 0x0200 – internal system error in the AS-i master 206
Alarm 0x0202 – AS-i master set to the projection mode 206
Alarm 0x0203 – new slave 0 was detected 206
Alarm 0x0204 – earth fault detected 206
Alarm 0x0207 – 22.5 V AS-i power failure detected 207
Alarm 0x0208 – 19 V AS-i power failure detected 207
Alarm 0x03ss – configuration error, too many slaves 208
Alarm 0x04ss – configuration error, slave is missing 209
Alarm 0x05ss – configuration error, slave has an incorrect profile 210
Alarm 0x06ss – periphery fault 211
Alarm 0x07ss – double addressing fault 212

8876

After an incoming alarm the data for the diagnosis is only available in the Profinet device until the outgoing alarm is received.

Below you will find a description of which diagnosis data is available in the event of an alarm.

Alarm 0x0100 – internal device system error

8877

Offset Word no.	Bit															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	cause of error															

Please ask your AS-i specialist for more details.

Alarm 0x0101 – excess temperature

8878

Offset Word no.	Bit															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	device temperature in [°C]															

Alarm 0x0104 – Manual output control was activated

18997

Offset Word no.	Bit															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	Manual output control was recognised															

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Alarm 0x0200 – internal system error in the AS-i master

8879

Offset Word no.	Bit															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	reserved															M
1	cause of error															

Legend:

M	master no.	1 bit	0 = AS-i master 1 1 = AS-i master 2

Please ask your AS-i specialist for more details.

Alarm 0x0202 – AS-i master set to the projection mode

8881

Offset Word no.	Bit															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	reserved															M

Legend:

M	master no.	1 bit	0 = AS-i master 1 1 = AS-i master 2

Alarm 0x0203 – new slave 0 was detected

8882

Offset Word no.	Bit															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	reserved															M

Legend:

M	master no.	1 bit	0 = AS-i master 1 1 = AS-i master 2

Alarm 0x0204 – earth fault detected

8883

Offset Word no.	Bit															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	reserved															M
1	Symmetry															

Legend:

M	master no.	1 bit	0 = AS-i master 1 1 = AS-i master 2

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Alarm 0x0207 – 22.5 V AS-i power failure detected

8886

Supply voltage of the AS-i master dropped below 22.5 V.

Offset Word no.	Bit															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	reserved															M

Legend:

M	master no.	1 bit	0 = AS-i master 1 1 = AS-i master 2

Alarm 0x0208 – 19 V AS-i power failure detected

8887

Supply voltage of the AS-i master dropped below 19 V.

Offset Word no.	Bit															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	reserved															M

Legend:

M	master no.	1 bit	0 = AS-i master 1 1 = AS-i master 2

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Alarm 0x03ss – configuration error, too many slaves

9218

Alarm type ID		Slave address
[dec]	[hex]	
769	0301	1(A)
770	0302	2(A)
771	0303	3(A)
772	0304	4(A)
773	0305	5(A)
774	0306	6(A)
775	0307	7(A)
776	0308	8(A)
777	0309	9(A)
778	030A	10(A)
779	030B	11(A)
780	030C	12(A)
781	030D	13(A)
782	030E	14(A)
783	030F	15(A)
784	0310	16(A)
785	0311	17(A)
786	0312	18(A)
787	0313	19(A)
788	0314	20(A)
789	0315	21(A)
790	0316	22(A)
791	0317	23(A)
792	0318	24(A)
793	0319	25(A)
794	031A	26(A)
795	031B	27(A)
796	031C	28(A)
797	031D	29(A)
798	031E	30(A)
799	031F	31(A)

Alarm type ID		Slave address
[dec]	[hex]	
801	0321	1B
802	0322	2B
803	0323	3B
804	0324	4B
805	0325	5B
806	0326	6B
807	0327	7B
808	0328	8B
809	0329	9B
810	032A	10B
811	032B	11B
812	032C	12B
813	032D	13B
814	032E	14B
815	032F	15B
816	0330	16B
817	0331	17B
818	0332	18B
819	0333	19B
820	0334	20B
821	0335	21B
822	0336	22B
823	0337	23B
824	0338	24B
825	0339	25B
826	033A	26B
827	033B	27B
828	033C	28B
829	033D	29B
830	033E	30B
831	033F	31B

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Alarm 0x04ss – configuration error, slave is missing

9223

Alarm type ID		Slave address
[dec]	[hex]	
1025	0401	1(A)
1026	0402	2(A)
1027	0403	3(A)
1028	0404	4(A)
1029	0405	5(A)
1030	0406	6(A)
1031	0407	7(A)
1032	0408	8(A)
1033	0409	9(A)
1034	040A	10(A)
1035	040B	11(A)
1036	040C	12(A)
1037	040D	13(A)
1038	040E	14(A)
1039	040F	15(A)
1040	0410	16(A)
1041	0411	17(A)
1042	0412	18(A)
1043	0413	19(A)
1044	0414	20(A)
1045	0415	21(A)
1046	0416	22(A)
1047	0417	23(A)
1048	0418	24(A)
1049	0419	25(A)
1050	041A	26(A)
1051	041B	27(A)
1052	041C	28(A)
1053	041D	29(A)
1054	041E	30(A)
1055	041F	31(A)

Alarm type ID		Slave address
[dec]	[hex]	
1057	0421	1B
1058	0422	2B
1059	0423	3B
1060	0424	4B
1061	0425	5B
1062	0426	6B
1063	0427	7B
1064	0428	8B
1065	0429	9B
1066	042A	10B
1067	042B	11B
1068	042C	12B
1069	042D	13B
1070	042E	14B
1071	042F	15B
1072	0430	16B
1073	0431	17B
1074	0432	18B
1075	0433	19B
1076	0434	20B
1077	0435	21B
1078	0436	22B
1079	0437	23B
1080	0438	24B
1081	0439	25B
1082	043A	26B
1083	043B	27B
1084	043C	28B
1085	043D	29B
1086	043E	30B
1087	043F	31B

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Alarm 0x05ss – configuration error, slave has an incorrect profile

9224

Alarm type ID		Slave address
[dec]	[hex]	
1281	0501	1(A)
1282	0502	2(A)
1283	0503	3(A)
1284	0504	4(A)
1285	0505	5(A)
1286	0506	6(A)
1287	0507	7(A)
1288	0508	8(A)
1289	0509	9(A)
1290	050A	10(A)
1291	050B	11(A)
1292	050C	12(A)
1293	050D	13(A)
1294	050E	14(A)
1295	050F	15(A)
1296	0510	16(A)
1297	0511	17(A)
1298	0512	18(A)
1299	0513	19(A)
1300	0514	20(A)
1301	0515	21(A)
1302	0516	22(A)
1303	0517	23(A)
1304	0518	24(A)
1305	0519	25(A)
1306	051A	26(A)
1307	051B	27(A)
1308	051C	28(A)
1309	051D	29(A)
1310	051E	30(A)
1311	051F	31(A)

Alarm type ID		Slave address
[dec]	[hex]	
1313	0521	1B
1314	0522	2B
1315	0523	3B
1316	0524	4B
1317	0525	5B
1318	0526	6B
1319	0527	7B
1320	0528	8B
1321	0529	9B
1322	052A	10B
1323	052B	11B
1324	052C	12B
1325	052D	13B
1326	052E	14B
1327	052F	15B
1328	0530	16B
1329	0531	17B
1330	0532	18B
1331	0533	19B
1332	0534	20B
1333	0535	21B
1334	0536	22B
1335	0537	23B
1336	0538	24B
1337	0539	25B
1338	053A	26B
1339	053B	27B
1340	053C	28B
1341	053D	29B
1342	053E	30B
1343	053F	31B

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Alarm 0x06ss – periphery fault

9225

Alarm type ID		Slave address
[dec]	[hex]	
1537	0601	1(A)
1538	0602	2(A)
1539	0603	3(A)
1540	0604	4(A)
1541	0605	5(A)
1542	0606	6(A)
1543	0607	7(A)
1544	0608	8(A)
1545	0609	9(A)
1546	060A	10(A)
1547	060B	11(A)
1548	060C	12(A)
1549	060D	13(A)
1550	060E	14(A)
1551	060F	15(A)
1552	0610	16(A)
1553	0611	17(A)
1554	0612	18(A)
1555	0613	19(A)
1556	0614	20(A)
1557	0615	21(A)
1558	0616	22(A)
1559	0617	23(A)
1560	0618	24(A)
1561	0619	25(A)
1562	061A	26(A)
1563	061B	27(A)
1564	061C	28(A)
1565	061D	29(A)
1566	061E	30(A)
1567	061F	31(A)

Alarm type ID		Slave address
[dec]	[hex]	
1569	0621	1B
1570	0622	2B
1571	0623	3B
1572	0624	4B
1573	0625	5B
1574	0626	6B
1575	0627	7B
1576	0628	8B
1577	0629	9B
1578	062A	10B
1579	062B	11B
1580	062C	12B
1581	062D	13B
1582	062E	14B
1583	062F	15B
1584	0630	16B
1585	0631	17B
1586	0632	18B
1587	0633	19B
1588	0634	20B
1589	0635	21B
1590	0636	22B
1591	0637	23B
1592	0638	24B
1593	0639	25B
1594	063A	26B
1595	063B	27B
1596	063C	28B
1597	063D	29B
1598	063E	30B
1599	063F	31B

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Alarm 0x07ss – double addressing fault

9219

Alarm type ID		Slave address
[dec]	**[hex]**	
1793	0701	1
1794	0702	2
1795	0703	3
1796	0704	4
1797	0705	5
1798	0706	6
1799	0707	7
1800	0708	8
1801	0709	9
1802	070A	10
1803	070B	11
1804	070C	12
1805	070D	13
1806	070E	14
1807	070F	15
1808	0710	16
1809	0711	17
1810	0712	18
1811	0713	19
1812	0714	20
1813	0715	21
1814	0716	22
1815	0717	23
1816	0718	24
1817	0719	25
1818	071A	26
1819	071B	27
1820	071C	28
1821	071D	29
1822	071E	30
1823	071F	31

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Step7 programmer's notes

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Diagnostics alarm procedure:

1. As soon as a device has detected a diagnostics alarm, the alarm is automatically forwarded to the fieldbus controller.
2. When a diagnostics alarm arrives in the fieldbus controller, an interrupt of the cyclic program (OB1) processing is automatically generated.
3. In this case the Simatic operating system calls the OB82 (diagnostics alarm OB) which allows specific alarm processing.

The incoming and outgoing diagnostics alarms are signalled via OB82.

► Create OB82 (can be empty).

> If OB82 does not exist, the S7 goes into the STOP state at each alarm.

► The LED [SF] on the S7 starts to light at the first incoming alarm and goes out with the last outgoing alarm.

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10.8 OSC messages

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18959

This section contains information about the messages for events, warnings and faults of the AC402S.

10.8.1 OSC messages: System

14284

Message	Type	Corrective measures
An internal device error was detected <Fehlernummer>	Error	► Note the message and contact the ifm service center
Permitted temperature limit value inside the device was exceeded (<xxx.x> °C)	Warning	► Check thermal conditions of the system environment
First operation after delivery	Event	not necessary
The output control was set to <Gateway,manuell,SPS>	Event	not necessary
System power-up completed, <SW-Version>	Event	not necessary
A system reset was requested manually	Event	not necessary
The user-specific message history was deleted.	Event	not necessary
The device was reset to factory settings via <HMI, Feldbus>.	Event	not necessary
PLC used for more than 10 hours.	Event	not necessary
The project <Name> was loaded.	Event	not necessary
The PLC was set to the operating mode <Projektierungsmodus, geschützter Betrieb>.	Event	not necessary
The firmware was updated from <FW-Version> to version <FW-Version>.	Event	not necessary
The settings of the fieldbus interface were modified	Event	not necessary
The fieldbus connection was established	Event	not necessary
The fieldbus connection was aborted	Event	not necessary
The IP settings of the configuration interface were changed	Event	not necessary

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10.8.2 OSC messages: AS-i 1 / AS-i 2

16029

Message	Type	Corrective measures
System errors: AS-i master <1,2>	Error	► Reboot the device If the error occurs again: ► Note the message and contact the ifm service center!
Earth fault: AS-i <1,2>	Error	► Check for earth fault of AC402S
Incorrect profile: AS-i <1,2>, slave <1(A)..31(A), 1B..31B> with profile <S-x.x.x> expected, but <S-y.y.y> found.	Error	► Check profile of the AS-i slave
Config error: AS-i <1,2>, slave <1(A)..31(A), 1B..31B> with the profile <S-x.x.x> missing	Error	► Check connections of the AS-i slave ► Reconnect AS-i slave
Config error: AS-i <1,2>, slave <1(A)..31(A), 1B..31B> with the profile <S-x.x.x> is available but not projected	Error	► Carry out projection process ([Quick setup] > [Project all])
Protocol error: AS-i <1, 2>, slave <1(A)..31(A), 1B..31B> no data transmission	Error	► Improve the transmission quality on the AS-i line
Double address detected: AS-i <1, 2>, slave <1(A)..31(A), 1B..31B>	Error	► Remove an AS-i slave with a double address from the AS-i network ► Readdress the remaining AS-i slave ► Reconnect removed AS-i slave to the AS-i network
The automatic addressing is not activated for AS-i <1,2>.	Warning	► Activate automatic addressing ([AS-i1]/[AS-i2] > [Master setup])
A voltage drop of 19.0 V was detected on AS-i master <1,2>	Warning	► Check voltage supply of the device and replace if necessary
A voltage drop of 22.5 V was detected on AS-i master <1,2>	Warning	► Check voltage supply of the device and replace if necessary
Increased message error rate: AS-i <1, 2>, slave <1(A)..31(A), 1B..31B>	Warning	► Improve the transmission quality on the AS-i line
Peripheral fault: AS-i <1, 2>, slave <1(A)..31(A), 1B..31B>	Warning	► Check displayed AS-i slave
AS-i slave with address 0 cannot be automatically readdressed (wrong profile)	Warning	► Activate automatic addressing ([AS-i1]/[AS-i2] > [Master setup]
Manual output change: AS-i <1, 2>, slave <1(A)..31(A), 1B..31B>, value: <0..F, 0..32768>	Event	not necessary
Manual parameter change: AS-i <1, 2>, slave <1(A)..31(A), 1B..31B>, value: <0..F, 0..32768>	Event	not necessary
AS-i master <1,2> was switched to the <geschützten Betrieb,Projektierungsmodus>	Event	not necessary
AS-i projection process was carried out.	Event	not necessary
AS-i slave with the address 0 was detected	Event	not necessary

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10.8.3 OSC messages: Safety module

14278

Message	Type	Corrective measures
An internal fault in the safety board was detected <Fehlernummer1>, <Fehlernummer2>	Error	► Note the message and contact the ifm service centre.
Wrong code sequence on the safe slave AS-i <1,2>, Slave <1,...,31>	Error	► Replace slave with slave with unambiguous code sequence
Configured slave missing: AS-i <1,2>, slave <1,...,31>	Error	► Connect the missing AS-i slave to the AS-i network OR: ► Carry out projection adaptation ([Quick-Setup] > [Alles projektieren])
Cross-networking participant <Name> missing	Error	► Check cross networking
The safety board was switched to the operating mode <Operate, Maintenance>	Event	not necessary
The safety configuration "<Name>" was loaded	Event	not necessary
The safety configuration "<Name>" was deleted	Event	not necessary
The safety configuration is not readable	Event	not necessary
The safety configuration "<Name>" was enabled by <Kurzzeichen>	Event	not necessary

OSC messages: AS-i 1 / AS-i 2 (safety)

6977

Message	Type	Corrective measures
ASi_GlobalCom_FailureAscendingAddrSequ_e; currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Note the message and contact the ifm service centre
ASi_GlobalCom_FailureMissingBusCycleEvents_e; currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Note the message and contact the ifm service centre
At least two AS-i slaves with the same code sequence were detected: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Replace one of the slaves with slave with unambiguous code sequence
The code sequence of a safe input slave is not compliant: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Replace slave with slave with unambiguous code sequence
Error in code sequence during the teach process (0x5827): currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Check configuration of the AS-i network
Error in code sequence during the teach process (0x5820): currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Replace slave with slave with unambiguous code sequence
Safe AS-i input slave of type positively guided waiting for testing: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Carry out testing for safe AS-i slave
ASi_SYS_ERROR_CFG_CANTADDSLAVE_e; currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Maximum number of the control slaves reached; check logical interfaces of the project

OSC messages: CODESYS (safety)

6979

Message	Type	Corrective measures
CODESYS: invalid FB parameter "ASi_Master": currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Warning	► Check setting of the parameter "ASi_Master"
CODESYS: multiple use of an AS-i address: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Warning	► Check addressing of the AS-i slaves
CODESYS: FB parameter "ASi_SlaveAdr" in invalid range: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Warning	► Check setting of the parameter "ASi_SlaveAdr"
Simultaneous activation of both help signals of a safe AS-i output module: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Warning	► Check program code
CODESYS: FB parameter "ASi_SlaveAdr" refers to a non configured AS-i address: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Warning	► Check configuration of the AS-i network ► Check setting of the parameter "ASi_SlaveAdr"
CODESYS: too many instances of "SF_OUTcontrol_ASi" created: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Warning	► Check configuration of the AS-i network ► Check the number of the created logical devices for virtual control slaves

OSC messages: System (safety)

9137

Message	Type	Corrective measures
Overvoltage on the internal supply detected: tmn=%s; In=%s; p1=%s; p2=%s	Warning	► Check voltage supply of the device and replace, if necessary
Undervoltage detected on the internal supply: tmn=%s; In=%s; p1=%s; p2=%s	Warning	► Check voltage supply of the device and replace, if necessary
The internal device temperature has exceeded the warning threshold of 78°C: tmn=%s; In=%s; p1=%s; p2=%s	Warning	► Check thermal conditions of the system environment
The internal device temperature has exceeded the error threshold of 85°C: tmn=%s; In=%s; p1=%s; p2=%s	Warning	► Check thermal conditions of the system environment
The internal device temperature has fallen below the error threshold of -5°C: tmn=%s; In=%s; p1=%s; p2=%s	Warning	► Check thermal conditions of the system environment
Error in the file system (0x4045): Please contact the ifm service centre: tmn=%s; In=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
Error in the file system (0x4043): Please contact the ifm service centre: tmn=%s; In=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
Short circuit on a local output: tmn=%s; In=%s; p1=%s; p2=%s	Error	► Check connections of the local I/O interface.
Undervoltage or overvoltage detected on the internal supply: tmn=%s; In=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.

Message	Type	Corrective measures
Overvoltage detected on the external supply: tmn=%s; In=%s; p1=%s; p2=%s	Error	► Check voltage supply of the device and replace, if necessary
Undervoltage detected on the external supply: tmn=%s; In=%s; p1=%s; p2=%s	Error	► Check voltage supply of the device and replace, if necessary
The operating mode of the safe PLC was changed (tmn=%s; In=%s; p1=%s; p2=%s)	Note	not necessary
The use of safe AS-i output slaves requires at least 5 active AS-i slaves in the network.	Error	► Configure at least 5 AS-i slaves in the network.
System error: BIT_ADC_DETERMINATION_ERR_2; tmn=%s; In=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_ADCVOLT_INIT_HNDL_ERR_0; tmn=%s; In=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_ADCVOLT_INIT_STRT_ERR_0; tmn=%s; In=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_ALLOC_SFB_ERR_1; tmn=%s; In=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System information: BIT_ASI_ADD_INP_SLAVE_INFO_2; tmn=%s; In=%s; p1=%s; p2=%s	Note	► Note the message and contact the ifm service centre.
System information: BIT_ASI_ADD_OUT_SLAVE_INFO_2; tmn=%s; In=%s; p1=%s; p2=%s	Note	► Note the message and contact the ifm service centre.
System warning: BIT_ASI_CANT_ADD_IN_WARN_2; tmn=%s; In=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_ASI_CANT_ADD_OUT_WARN_2; tmn=%s; In=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System information: BIT_ASI_ENOUGH_SLAVES_INFO_2; tmn=%s; In=%s; p1=%s; p2=%s	Note	► Note the message and contact the ifm service centre.
System warning: BIT_ASI_LOST_FRMSYNC_WARN_1; tmn=%s; In=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_ASI_M1EVENT_ORDER_WARN_2; tmn=%s; In=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_ASI_M2EVENT_ORDER_WARN_2; tmn=%s; In=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System information: BIT_ASI_RX_LOST_FRMSY_INFO_1; tmn=%s; In=%s; p1=%s; p2=%s	Note	► Note the message and contact the ifm service centre.
System information: BIT_ASI_RX_WR_FRMPARI_INFO_1; tmn=%s; In=%s; p1=%s; p2=%s	Note	► Note the message and contact the ifm service centre.
System information: BIT_ASI_RX_WRG_STA_FR_INFO_1; tmn=%s; In=%s; p1=%s; p2=%s	Note	► Note the message and contact the ifm service centre.
System warning: BIT_ASI_SV_QUEUE_FULL_WARN_1; tmn=%s; In=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.

Message	Type	Corrective measures
System warning: BIT_ASI_SYNC_CODESEQ_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_ASI_TEACH_QUEUE_F_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_ASI_TX_FIFO_FULL_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_ASI_WRONG_FRMPARI_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_ASIUART_IRQ_INST_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_ASIUART_SETUP_BD_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BAD_CMD_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BAD_CRC_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BAD_DATA_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BAD_FORMAT_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BAD_SEQUENCE_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BITSPS_INTERNAL_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BSP_CLK_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BSP_DMA_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BSP_DRAM_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BSP_EXC_ABORT_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BSP_EXC_PREFETCH_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BSP_EXC_REENTRANCE_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BSP_EXC_SWI_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BSP_EXC_UNDEF_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BSP_FPGA_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BSP_HW_NO_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BSP_LOWINIT_READY_GOOD_0;	Error	► Note the message and contact the ifm service centre.

Message	Type	Corrective measures
tmn=%s; ln=%s; p1=%s; p2=%s		
System error: BIT_BSP_SEU_PROT_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_BSP_VER_GOOD_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_CBIT_ERRCNT_WARN_2; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_CC_COUNTER_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CC_CRC_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CC_FORCE_FATAL_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CC_INTERNAL_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CC_TASKSEND_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CC_WRONG_CPUID_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CC_WRONG_LENGTH_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CC_WRONG_TASKID_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_CHALCOMM_CNCT_DENIED_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_CHALCOMM_CONNECT_GOOD_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_CHALCSTHK_EXEC_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CHALSYNC_RCV_TO_WARN_2; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CHALSYNC_SND_TO_WARN_2; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CHFILE_EXEC_CMD_WARN_0; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CHFILE_FILE_LOC_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CHFILE_INPARA_CHK_WARN_0; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CHFILE_INPARA_FDE_WARN_0; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.

Message	Type	Corrective measures
System warning: BIT_CHFILE_INPARA_GET_WARN_0; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_CHFILE_MISSING_OB_WARN_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_CHFILE_PARA_OPENF_WARN_0; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CHFILE_PARA_READD_WARN_0; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CHFILE_PARA_WRFIL_WARN_0; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CHFILE_READSIZE_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CHFILE_RESP_CMD_WARN_2; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CHFILE_RSP_FILE_H_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CHFILE_RSP_FILENA_WARN_0; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CHFILE_WRITESIZE_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CIO_EXCHANGE_VAR_WARN_2; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_CNS_SETUP_FAULT_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_COM_RECV_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_COM_SEND_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_COMMON_MEM0_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_COMMON_MEM2_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_COMMON_STRING_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CORELIB_VERSION_GOOD_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CS_BGINIT_READY_GOOD_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CS_CLK_MONITOR_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.

Message	Type	Corrective measures
System error: BIT_CS_CYCLE_TIMEOUT_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CS_INIT_1OO2_GOOD_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CS_INTERN_ISYS_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CS_REMOTE_TRG_TMO_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CS_SYSTEM_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_CSP_VERSION_GOOD_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_DEV_UNINIT_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_DIAG_FATAL_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_DIAG_INTERNAL_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_DIAG_IPC_INV_DATA_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_DIAG_IPC_SND_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_DIAG_TOO_LESS_IRQS_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_DIAG_TOO_MANY_IRQS_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_DPRAM_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_EMBEX_SYSTEM_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_EXEC_RSP_TIMEOUT_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_FPGA_READY_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_FPGA_VER_GOOD_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_GFS_DPRAM_READ_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_HBIT_DETECT_LIVE_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_HBIT_INPUT_FREEZE_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_HBIT_INPUT_TST_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.

Message	Type	Corrective measures
System error: BIT_HBIT_OUTPUT_DIS_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_HBIT_OUTPUT_ENABLE_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_HBIT_OUTPUT_TST_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_HBIT_RSP_EVALUATION_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_HBIT_RSP_MAN_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_HBIT_RSP_TIMEOUT_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_HBIT_TST_MAN_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_HBIT_TST_REQ_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_HBIT_TST_RSP_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_HBIT_TST_SREG_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_HW_VER_GOOD_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_HW_WRONG_CPUID_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_IHAL_ERROR_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_IHAL_INIT_READY_GOOD_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_INIT_SFB_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_INVALID_NUMERIC_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_CONFIG_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_CPU_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_CYCLE_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_IN_SHORT_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_INIT_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_OUT_NOT_OFF_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_OUT_SHORT_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_PARA_ERR_1; tmn=%s;	Error	► Note the message and contact the ifm service centre.

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Message	Type	Corrective measures
ln=%s; p1=%s; p2=%s		
System error: BIT_LIO_RSP_HDL_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_SB_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_SSP_BUSY_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_LIO_SSP_BUSY_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_LIO_SSP_HANDLE_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_SSP_R_BUSY_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_LIO_SSP_RNOT_EMPTY_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_LIO_START_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_STATE_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_STOP_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_TIMEOUT_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_TMR_NOTRUN_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_TMR_READ_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_TMR_RUN_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_TST_HDL_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_WBIT_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_LIO_WRONG_STATE_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_LIO_X_LOC_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_X_MSG_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_X_NOMSG_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_LIO_X_Q_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_MMU_INIT_PART_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_NULLPOINTER_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_BSP_EXC_INST_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.

Message	Type	Corrective measures
System error: BIT_OS_BSP_INIT_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_BSP_IRQ_INIT_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_BSP_IRQ_INSTL_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_BSP_LOW_INIT_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_EVENT_NAME_SET_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_EVT_RECV_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_EVT_SEND_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_EVT_STRT_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_INIT_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_IOC_CL_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_IOC_OPN_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_IOC_RD_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_IOC_WR_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_MEMCPY_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_MSGQ_ACC_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_MSGQ_CREATE_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_MUTEX_CREATE_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_RETURN_OSSTART_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_SEM_CREATE_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_SEM_OVERFLOW_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_OS_SEM_OVERFLOW_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_OS_SEM_PEND_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_SEM_POST_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.

Message	Type	Corrective measures
System error: BIT_OS_SEM_QUERY_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_SEM_SET_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_SEM_TO_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_SF_EXEPTION_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_SPWN_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_TASK_CREATE_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_TASK_NAME_SET_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_TASK_NOT_CALLED_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_TASK_NOT_PRESENT_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_TASK_RESUME_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_TASK_SUSPEND_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_TASK_TOLESSTIMETICKS_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OS_VER_GOOD_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OSSP_ACCESS_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OSSP_CACHECFG_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OSSP_MPUCFG_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OSSP_PRCSS_ASSIGN_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OSSP_PRCSS_CREATE_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OSSP_SHM_ASSIGN_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OSSP_SHM_CREATE_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OSSP_STKPATTERN_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_OSSP_STKUSAGE_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.

Message	Type	Corrective measures
System error: BIT_PBIT_EXT_VOLT_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_PBIT_INPUT_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_PBIT_LEVEL_2_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_PBIT_LIFE_SIGNAL_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_PBIT_OUT_ENABLE_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_PBIT_STAND_ORDER_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_PUT_SFB_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_READY_GOOD_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_SAFESTORAGE_CRC_WARN_2; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_SAFESTORAGE_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_SAFESTORAGE_READ_WARN_2; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_SB_GETACTLEN_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_SB_INIT_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_SB_NOBUF_AVAIL_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_SB_NOBUF_RELEASED_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_SB_REC_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_SB_SEND_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_SB_SETACTLEN_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_SPS_ACK_TIMEOUT_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_SPS_APPROM_TIME_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_SPS_TMR_READ_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_SW_VER_GOOD_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.

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Message	Type	Corrective measures
System error: BIT_SYNC_SFB_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_SYSLUT_CRC_MISM_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_SYSLUT_GET_MAIN_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_SYSLUT_SAFE_MISM_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_SYSLUT_VERS_MISM_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_TEMP__INIT_HNDL_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_TEMP_I2C_ERROR_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_TEMP_MAX_POSS_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_TEMP_MIN_POSS_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_TEMP_SENSOR_ERR_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_TEMP_SENSOR_VAL_ERR_1; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_TEMP_THRSVIOL_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_TEMP_VALUE_GOOD_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System warning: BIT_TIMEOUT_MCOOKIE_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_TL_INVALID_CMD_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_TL_RD_NOT_ACCEPT_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_TL_WR_NOT_ACCEPT_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_VALID_ITEM_FOUND_GOOD_0; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_VER_MISM1OO2_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_WRONG_ASiPII_CRC32_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.
System error: BIT_WRONG_CHECKSUM_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.

Message	Type	Corrective measures
System warning: BIT_WRONG_CHID_MSG_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System warning: BIT_WRONG_MHEADER_WARN_1; tmn=%s; ln=%s; p1=%s; p2=%s	Warning	► Note the message and contact the ifm service centre.
System error: BIT_WRONG_PROG_FLOW_ERR_2; tmn=%s; ln=%s; p1=%s; p2=%s	Error	► Note the message and contact the ifm service centre.

OSC messages: Logical devices (safety)

7010

Message	Type	Corrective measures
ERROR (%s): DC=%s, DC-1=%s, AS-i %s, slave %s	Error	Logical device of the safe AS-i slave in locked error state
ERROR (%s): DC=%s, DC-1=%s, terminals %s and %s	Error	Logical device of the safe local input/output in locked error state
ERROR: (%s), DC=%s, DC-1=%s, P1=%s, P2=%s	Error	Logical device of the safe AS-i slaves or the safe local inputs/outputs in locked error state
INIT (%s): DC=%s, DC-1=%s, AS-i %s, slave %s	Note	Logical device of the safe AS-i slave in INIT state
INIT (%s): DC=%s, DC-1=%s, terminals %s and %s	Note	Logical device of the safe local input/output in INIT state
INIT: (%s), DC=%s, DC-1=%s, P1=%s, P2=%s	Note	Logical device of the safe AS-i slave or the safe local input/output in INIT state
OFF (%s): DC=%s, DC-1=%s, AS-i %s, slave %s	Note	Logical device of the safe AS-i slave provides safe OFF
OFF (%s): DC=%s, DC-1=%s, terminals %s and %s	Note	Logical device of the safe local inputs/outputs provides safe OFF
OFF: (%s), DC=%s, DC-1=%s, P1=%s, P2=%s	Note	Logical device of the safe AS-i slave or the safe local input/output provides safe OFF
ON (%s): DC=%s, DC-1=%s, AS-i %s, slave %s	Note	Logical device of the safe AS-i slave provides safe ON
ON (%s): DC=%s, DC-1=%s, terminals %s and %s	Note	Logical device of the safe local input/output provides safe ON
ON: (%s), DC=%s, DC-1=%s, P1=%s, P2=%s	Note	Logical device of the safe AS-i slave or the safe local input/output provides safe ON
TESTING (%s): DC=%s, DC-1=%s, AS-i %s, slave %s	Note	Logical device of the safe AS-i slave requests testing
TESTING (%s): DC=%s, DC-1=%s, terminals %s and %s	Note	Logical device of the safe local inputs/outputs requests testing
TEST: (%s), DC=%s, DC-1=%s, P1=%s, P2=%s	Note	Logical device of the safe AS-i slave or the safe local input/output requests testing

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OSC messages: Local inputs/outputs (safety)

20743

Message	Type	Corrective measures
Test signal for cross-fault monitoring cannot be detected: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Check settings of the parameter of the logical "SF_local_testpulse"
Cross fault on a safe input: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Check connection to local device.
CODESYS: dynamic parameter "IN_Channel" on FB "GetLocal...": currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Check setting of the parameter "IN_Channel" on FB.
CODESYS: "local_IO" Channel A = 0: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Check setting of the parameter "Channel A" an the logical device.
CODESYS: "local_IO" Channel B = 0: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Check setting of the parameter "Channel B" on the logical device.
CODESYS: "local_IO" Channel A = Channel B: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Check setting of the parameter "Channel A" and "Channel B" on the logical device.
CODESYS: "local_IO" multiple use of a channel in the configuration: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Check channel use in the configuration.
CODESYS: simultaneous use of a channel as safe and non-safe information: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Check channel use in the configuration.
CODESYS: FB parameter "IN_Channel_X" refers to a non-configured safe local input: currDev=%s; currDiagState=%s; prevDiagState=%s; addr1=%s; addr2=%s	Error	► Check channel use in the configuration.

OSC messages: FSoE (Safety)

5517

Message	Type	Corrective measures
BIT_FSOE_CONNETION_LOSS_WARN_2: Param1: Connection ID, Param2: DiagCode (FSOE)	Warning	► Check FSoE connection
BIT_FSOE_CONNECTION_ESTABLISHED_1: Param1: Connection ID	Note	▪ FSoE connection established ▪ No action required

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10.8.4 OSC messages: Safety PLCopen function blocks

20613

Diagnostic codes of the safety PLCopen function blocks are transferred to the OSC by means of the FB **Ctrl_SetDiagInfo**. The resulting OSC messages have the following structure:

```
Message #LogID: [currDevice] [hwid] [currDiagState] [prevDiagState] [Addr1] [Addr2]
```

Parameter	Description	Possible values	
Message #LogID	ID of the source of the message	0x8001 =	CODESYS_LOG_ID
currDevice	ID of the safety-PLCopen function block the diagnostic code of which is displayed; corresponds to the value defined by the programmer for "FB_Type"	→ **Ctrl_SetDiagInfo**, input parameters	
hwid	Instanz-ID des FB	→ **Ctrl_SetDiagInfo**, input parameters	
CurrDiagState	current state of the StateMachine of the safety PLCopen FB	→ operating instructions safety PLCopen library in CODESYS	
PrevDiagState	State of the StateMachine of the safety PLCopen FB in the previous PLC cycle	→ operating instructions safety PLCopen library in CODESYS	
Addr1	Instance number of the safety PLCopen function block the diagnostic code of which is displayed; corresponds to the value defined by the programmer for "FB_Number"	→ **Ctrl_SetDiagInfo**, input parameters	
Addr2	Reserved	0x0	constant

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