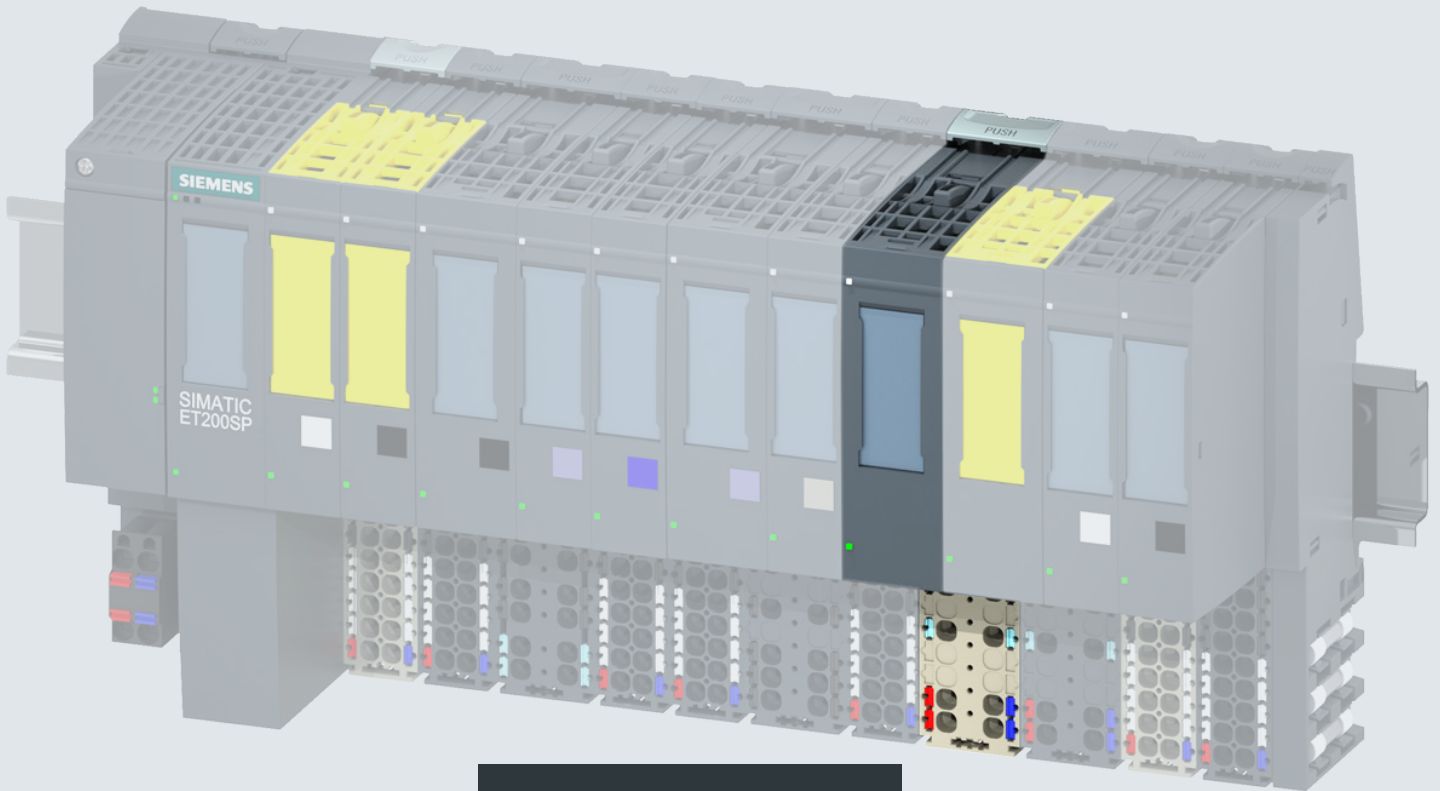


**SIEMENS**



Manual

# SIMATIC

## ET 200SP

AS-Interface Master CM AS-i Master ST  
3RK7137-6SA00-0BC1

Edition

07/2017

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# SIEMENS

## SIMATIC

### ET 200SP AS-Interface master CM AS-i Master ST (3RK7137-6SA00-0BC1)

Manual

Foreword	
Documentation guide	1
Safety instructions	2
Product overview	3
Connection	4
Configuring	5
Parameter assignment/addressing	6
Data exchange between the user program and AS-i slaves	7
Alarms, faults and system events	8
Using the command interface	9
Technical data	10
AS-Interface Protocol Implementation Conformance Statements	A
Readme Open Source Software	B
Data sets	C
List of abbreviations	D

07/2017

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## Legal information

### Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

#### **DANGER**

indicates that death or severe personal injury **will** result if proper precautions are not taken.

#### **WARNING**

indicates that death or severe personal injury **may** result if proper precautions are not taken.

#### **CAUTION**

indicates that minor personal injury can result if proper precautions are not taken.

#### **NOTICE**

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

### Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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# Foreword

## Purpose of the documentation

This device manual supplements the "ET 200SP Distributed I/O System" System Manual. Functions that pertain generally to the ET 200SP can be found in the "ET 200SP distributed I/O system (<http://support.automation.siemens.com/WW/view/en/58649293/0/en>)" System Manual.

The information provided in this device manual and the system manual enables you to commission the ET 200SP distributed I/O system.



# Table of contents

	Foreword .....	5
<b>1</b>	<b>Documentation guide .....</b>	<b>11</b>
<b>2</b>	<b>Safety instructions .....</b>	<b>13</b>
<b>3</b>	<b>Product overview .....</b>	<b>15</b>
3.1	Characteristics of the CM AS-i Master ST .....	15
3.2	Operating modes of the CM AS-i Master ST .....	19
3.3	Firmware update .....	21
<b>4</b>	<b>Connection .....</b>	<b>25</b>
4.1	Terminal assignment.....	25
4.2	Schematic circuit diagram.....	27
<b>5</b>	<b>Configuring .....</b>	<b>29</b>
5.1	Requirements.....	29
5.2	Basic configuration of the CM AS-i Master ST .....	30
5.3	Configuration of the AS-i slaves .....	31
5.3.1	Configuration of the AS-i slaves in STEP 7 .....	31
5.3.2	Configuration of the AS-i slaves using the "SET" button .....	34
5.3.3	Configuration of the AS-i slaves via the control panel in the TIA Portal .....	36
5.3.4	Configuration of the AS-i slaves using the PLC program .....	36
5.4	Online functions in the TIA Portal .....	37
5.4.1	Switching from one operating mode to another .....	37
5.4.2	Applying the slave configuration .....	38
5.4.3	Setting the address of an AS-i slave.....	39
5.5	Variable configuration .....	39
5.5.1	Option handling.....	39
5.5.1.1	DS 131 Activate/deactivate optional slaves.....	40
5.5.1.2	DS 131 Read status of option handling .....	41
5.5.2	AS-i proxy slave .....	42
<b>6</b>	<b>Parameter assignment/addressing .....</b>	<b>43</b>
6.1	Parameters .....	43
6.2	Explanation of the parameters.....	44
6.3	Address space .....	44
<b>7</b>	<b>Data exchange between the user program and AS-i slaves .....</b>	<b>45</b>
7.1	Access to AS-Interface .....	45
7.2	Transmitting AS-i digital values .....	46
7.2.1	I/O addresses when configuring AS-i slaves in STEP 7 .....	46

7.2.2	I/O addresses without configuration of the AS-i slaves in STEP 7 .....	50
7.2.3	Special characteristics of AS-i Safety slaves .....	55
7.3	AS-i analog values and transparent / digital values more than 4 bits in length are transferred.....	56
7.3.1	Accessing AS-i analog data via the process image.....	58
7.3.2	Accessing AS-i analog data via acyclic services .....	58
<b>8</b>	<b>Alarms, faults and system events .....</b>	<b>61</b>
8.1	Overview .....	61
8.2	Diagnostics in STEP 7 .....	62
8.3	LED statuses.....	63
8.3.1	Arrangement of the LEDs on the CM AS-i Master ST .....	63
8.3.2	Meaning of the LEDs .....	64
8.4	Diagnostic messages.....	69
8.4.1	Alarms .....	69
8.4.2	Possible response to the diagnostic interrupt.....	69
8.4.3	Error messages.....	70
8.5	Replacing a defective AS-i slave / automatic address programming .....	74
8.6	Duplicate address detection.....	76
8.7	Diagnosis via the web server .....	79
8.8	Fault indications/fault remedies .....	80
8.9	Data records for diagnostics .....	82
8.9.1	DS 92 Diagnostic data record (FW V1.1 and higher) .....	82
8.9.2	DS 96 Read AS-i master error counters and status messages (FW V1.1 and higher) .....	86
8.9.3	DS 97 Read and reset AS-i master error counters (FW V1.1 and higher) .....	89
8.9.4	DS 150 to DS 153 Read AS-i error counters .....	89
8.9.4.1	DS 150 Read AS-i slave error counters 1/1A to 16/16A.....	92
8.9.4.2	DS 151 Read AS-i slave error counters 16/16A to 31/31A.....	93
8.9.4.3	DS 152 Read AS-i slave error counters 1B to 16B.....	94
8.9.4.4	DS 153 Read AS-i slave error counters 16B to 31B.....	95
8.9.5	DS 154 Delete AS-i error counters (from FW V1.1).....	96
<b>9</b>	<b>Using the command interface .....</b>	<b>97</b>
9.1	Introduction .....	97
9.2	Command interface with SIMATIC S7 .....	97
9.3	Command interface with controllers of other manufacturers .....	98
9.4	Description of the AS-i commands.....	103
9.4.1	No. 00: Set_Permanent_Parameter.....	107
9.4.2	No. 01: GET_Permanent_Parameter.....	108
9.4.3	No. 02: Write_Parameter .....	109
9.4.4	No. 03: Read_Parameter .....	110
9.4.5	No. 04: Store_Actual_Parameters.....	111
9.4.6	No. A5: Set_Permanent_Configuration.....	112
9.4.7	No. A6: Get_Permanent_Configuration .....	113
9.4.8	No. 07: Store_Actual_Configuration.....	114
9.4.9	No. A8: Read_Actual_Configuration .....	115

9.4.10	No. A9: Set_LPS .....	116
9.4.11	No. 0A: SET_Offline_Mode .....	117
9.4.12	No. 08: Set_Auto_Address_Enable .....	118
9.4.13	No. 0C: Set_Operation_Mode .....	119
9.4.14	No. 0D: Change_AS-i-Slave_Address .....	120
9.4.15	No. 0F: Read_Status .....	121
9.4.16	No. B0: Get_LPS, Get_LAS, Get_LDS, Get_Flags .....	122
9.4.17	No. B9: Read_overall_configuration .....	125
9.4.18	No. BA: Write_overall_configuration .....	131
9.4.19	No. 3C: Set_PI .....	138
9.4.20	No. 33: AS-i Parameter Echolist .....	141
9.4.21	No. 44: Read_Write_CTT2_String .....	142
9.4.22	No. 14: Read_Version .....	144
9.4.23	No. 17: Read_ID_Code .....	144
9.4.24	No. 37: Read_ID1-Code .....	145
9.4.25	No. 3F: Write ID1-Code .....	145
9.4.26	No. 38: Read_ID2-Code .....	146
9.4.27	No. 18: Read_IO-Code .....	146
9.4.28	No. BE: Get_LPF .....	147
9.4.29	No. 40: Write_Parameter_String .....	148
9.4.30	No. 41: Read_String .....	149
9.4.31	No. 42: Read_String .....	150
9.4.32	No. 43: Read_String .....	151
9.4.33	No. CA: Read_Error_Counter .....	152
9.4.34	No. CB: Read_and_Delete_AS-i-Master_Error_Counter .....	155
9.4.35	No. CC: Read_AS-i_error_counter .....	156
9.4.36	No. CD: Read_and_delete_AS-i_Slave_error_counter .....	157
9.4.37	No. 13: Activate_ground_fault_detection(reset EFD) .....	158
9.4.38	No. D0: Set_Configuration_Online .....	159
9.4.39	No. D1: AS-i-Slave_ID1_schreiben_mit_Zieladresse (Write ID1 code with destination address) .....	160
<b>10</b>	<b>Technical data .....</b>	<b>161</b>
10.1	Technical data in Siemens Industry Online Support .....	161
<b>A</b>	<b>AS-Interface Protocol Implementation Conformance Statements .....</b>	<b>163</b>
A.1	AS-Interface Protocol Implementation Conformance Statement (PICS) .....	163
<b>B</b>	<b>Readme Open Source Software .....</b>	<b>167</b>
B.1	Read_me OSS .....	167
<b>C</b>	<b>Data sets .....</b>	<b>171</b>
C.1	DS 100 Switch duplicate address detection on/off .....	171
C.2	DS 100 Read setting for duplicate address detection .....	172
C.3	DS 101 Read version identifier .....	172
<b>D</b>	<b>List of abbreviations .....</b>	<b>173</b>
D.1	List of abbreviations .....	173

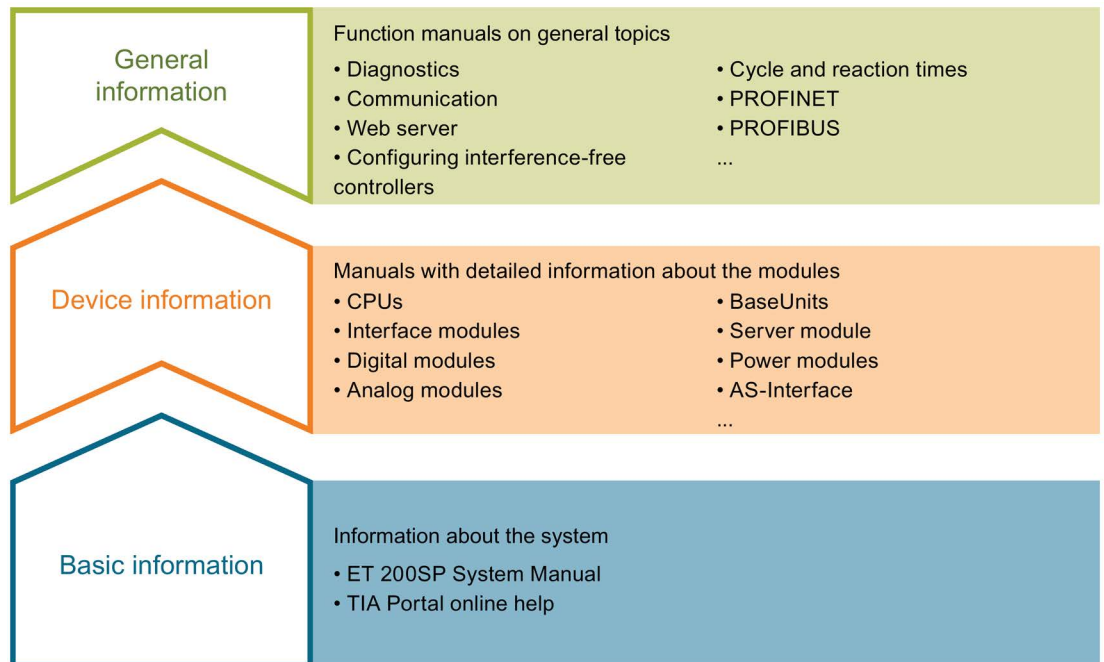
**Glossary ..... 175**  
**Index..... 181**

## Documentation guide

The following paragraph gives you an overview of the additional documentation you need to use the CM AS-i Master ST.

The documentation for the SIMATIC ET 200SP distributed I/O system is subdivided into three areas.

This enables you to access the required content quickly.



### Basic information

The System Manual describes configuration, assembly, wiring and commissioning of the SIMATIC ET 200SP distributed I/O system. The *STEP 7* online help supports you with configuration and programming.

### Device information

Manuals contain a compact description of the module-specific information, such as properties, connection diagrams, characteristics and technical specifications.

### General information

The Function Manuals contain detailed descriptions on topics relating to the SIMATIC ET 200SP environment, such as configuring diagnostics, communications, web servers and controllers for problem-free operation.

The following paragraph gives you an overview of the additional documentation you need to use the CM AS-i Master ST.

Documentation for the ET 200SP distributed I/O system with the CM AS-i master ST

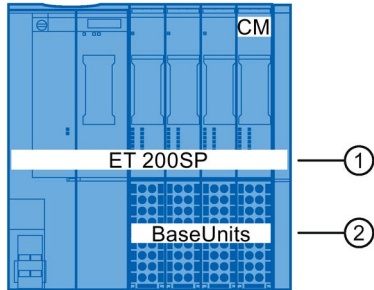


Figure 1-1 Example of a system structure

Table 1- 1 Documentation for the ET 200SP distributed I/O system with the CM AS-i master ST

No.	Component	Documentation	Most important contents
①	System	SIMATIC ET 200SP ET 200SP distributed I/O system <a href="http://support.automation.siemens.com/WW/view/en/58649293/0/en">http://support.automation.siemens.com/WW/view/en/58649293/0/en</a> SIMATIC distributed I/O ( <a href="http://w3.siemens.com/mcms/industrial-automation-systems-simatic/en/manual-overview/tech-doc-et200/Pages/Default.aspx">http://w3.siemens.com/mcms/industrial-automation-systems-simatic/en/manual-overview/tech-doc-et200/Pages/Default.aspx</a> )	<ul style="list-style-type: none"> <li>• Application planning</li> <li>• Installation</li> <li>• Connecting</li> <li>• Commissioning</li> <li>• Technical specifications</li> </ul>
②	BaseUnits	SIMATIC ET 200SP BaseUnits <a href="https://support.industry.siemens.com/cs/ww/en/view/59753521">https://support.industry.siemens.com/cs/ww/en/view/59753521</a>	<ul style="list-style-type: none"> <li>• Connecting</li> <li>• Technical specifications</li> </ul>

# Safety instructions

# 2

## Important safety instructions

 **WARNING**

**Failure to observe this information may result in death, severe injury, and serious property damage.**

For use in Pollution Degree 2 Environment.

 **WARNING**

**Failure to observe this information may result in death, severe injury, and serious property damage.**

When used in hazardous hazardous environments corresponding to Class I, Division 2 or Class I, Zone 2, the device must be installed in a cabinet or a suitable enclosure. To comply with EU Directive 94/9 (ATEX 95), this enclosure must meet the requirements of at least IP54 in compliance with EN 60529.

 **WARNING**

**Explosion Hazard; failure to observe this information may result in death, severe injury, and serious property damage.**

Do not disconnect equipment when a flammable or combustible atmosphere is present.

 **WARNING**

**Explosion hazard; failure to observe this information may result in death, severe injury, and serious property damage.**

Do not disconnect while circuit is live unless area is known to be non-hazardous.

 **WARNING**

**Explosion hazard; failure to observe this information may result in death, severe injury, and serious property damage.**

Substitution of components may impair suitability for class I, division 2 or zone 2.

 **WARNING**

**Explosion hazard; failure to observe this information may result in death, severe injury, and serious property damage.**

Do not open when energized.

 **WARNING**

**Failure to observe this information may result in death, severe injury, and serious property damage.**

The equipment is designed for operation with Safety Extra-Low Voltage (SELV) by a Limited Power Source (LPS).

This means that only SELV / LPS complying with IEC 60950-1, EN 60950-1, VDE 0805-1 must be connected to the power supply terminals.

The power supply unit for the equipment power supply must comply with NEC Class 2, as described by the National Electrical Code (r) (ANSI / NFPA 70).

 **WARNING**

**Failure to observe this information may result in death, severe injury, and serious property damage.**

Provisions shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40 %. This criteria is fulfilled if supplies are derived from SELV (Safety Extra-Low Voltage) only.

 **CAUTION**

**Failure to observe this information may result in property damage and bodily injury**

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations only.

 **CAUTION**

**Failure to observe this information may result in property damage and bodily injury**

This equipment is suitable for use in Class I, Zone 2, Group IIC or non-hazardous locations only.

# Product overview

## 3.1 Characteristics of the CM AS-i Master ST

### Article number

3RK7137-6SA00-0BC1

### Brief introduction to AS-Interface

AS-Interface or Actuator-Sensor-Interface (AS-i for short) is a fieldbus system for industrial use that is used to transmit digital and analog signals between a controller and machine or process in real-time. The system can be used for standard signals as well as for safety-related signals.

AS-Interface is designed to connect actuators and sensors to the controller as easily, flexibly and efficiently as possible.

The system consists of an AS-i master and up to 62 AS-i slaves that are simply plugged onto the yellow AS-i flat ribbon cable at any point or connected via terminals. The AS-i cable can be up to 100 m long with free choice of topology. A length of up to 200 m is possible with an additional extension plug. The system can be extended beyond that through the use of repeaters.

In addition, an AS-i power supply unit is connected to the cable such that the slaves and their connected sensors are supplied with operating voltage without additional cabling. Actuators are usually supplied with voltage by means of a 24 V cable, because they generally need more power than sensors.

A typical digital AS-i slave has up to 4 inputs and 4 outputs. The slaves are installed directly in the plant as close as possible to the sensors or actuators so that the connecting cables can be kept very short. The insulation displacement method is the preferred method for connection to the AS-i flat ribbon cable so that assembly can be completed without errors in the least amount of time. For safety-related signals, safety slaves and modules are available for safety-related processing of signals. In addition, analog slaves and complete switchgear with integrated AS-i slave are offered.

The default voltage fed in from the AS-i power supply unit is 30 V DC. As a result, sensors with a rated voltage of 24 V can be used without any problems despite the voltage drop on a longer AS-i cable. Because the AS-i cable transmits both operating DC voltage and modulated communication signals, the AS-i power supply unit contains a data decoupling unit for separating the two voltage waveforms.

A standard power supply can be used in place of the easy-to-use AS-i power supply if the AS-i cable is connected via a separate data decoupling module. When a standard power supply with 24 V DC is used, it must be ensured that the connected AS-i components and sensors are designed for operation with the corresponding lower voltage.

You will find further information on the Internet at: AS-Interface (<http://www.siemens.com/as-interface>).

## Use of the module

The CM AS-i Master ST module is a communication module for use in the SIMATIC ET 200SP Distributed I/O System.

The CM AS-i Master ST features a 20 mm wide ET 200SP module housing. A BaseUnit (BU) is required for use in the ET 200SP. The CM AS-i Master ST can be plugged into C0-type BaseUnits (BU).

You can plug several CM AS-i Master ST modules into one SIMATIC ET 200SP station. Each CM AS-i Master with firmware version V1.0 occupies 32 bytes of I/O address space. From firmware version V1.1 onwards, the CM AS-i Master ST supports up to 288 bytes of I/O address space. The number of possible AS-i master modules depends on the maximum address space of the utilized Interface Module (IM) of the ET 200SP or the utilized ET 200SP CPU.

In a SIMATIC ET 200SP station with an IM 155-6 PN ST standard interface module and a maximum address space of 256 bytes, up to eight CM AS-i Master ST modules can be plugged in (when the I/O address space is configured as 32 bytes).

Significantly more modules can be plugged into a SIMATIC ET 200SP station with High Feature Interface Module IM 156-6 PN HF and a maximum address space of 1440 bytes.

If the ET 200SP contains other modules, the available address space is reduced and the maximum number of AS-i master modules is reduced accordingly. The maximum number of modules can be increased by shortening the I/O address space of the CM AS-i Master ST module.

For further information, see the ET 200SP System Manual (<https://support.industry.siemens.com/cs/ww/en/view/84133942>).

The CM AS-i Master ST module can generally be combined with all ET 200SP interface modules. Any exceptions to this are documented in the delivery release product announcement(s) of the interface module.

The CM AS-i Master ST module (Firmware V1.1 and higher) can generally be combined with all ET 200SP CPU modules (Firmware V1.8 and higher). Any exceptions to this are documented in the delivery release product announcement(s) for a CPU module.

The interface modules and CPU modules differ, among other things, in terms of the maximum number of I/O modules, the length of the I/O process image in the station and the length of the I/O process image for each I/O module. The technical specifications of the interface modules and CPU modules can limit the selection of possible parameters of the CM AS-i Master ST module. Note, in particular, that the length of the I/O process image of the CM AS-i Master ST module must be selected in such a way that the maximum length of the I/O process image of the interface module or CPU module is not exceeded.

## View of the module



Figure 3-1 View of the CM AS-i Master ST

## Properties

- Technical properties
  - AS-i master acc. to AS-Interface Specification 3.0
  - Transmission of digital I/O values to cyclic process image
  - Transmission of analog I/O values in the cyclic process image (Firmware V1.1 and higher) or via acyclic data record communication.
  - Configuration button can be connected to terminals
- Supported functions
  - I&M identification data
  - Firmware update
  - Configuration of the AS-i master and AS-i slaves via data records (Read / Write or command interface)

The module can be used with the following engineering versions:

Table 3- 1 Version dependence of the CM AS-i Master ST engineering versions

Firmware version of the module	STEP 7 (TIA portal)	STEP 7 V5.5	GSD file
V1.0	V12 and higher	V5.5 SP3 HF5 and higher	X
V1.1	V13 SP1 and higher	V5.5 SP3 HF5 and higher	X

3.1 Characteristics of the CM AS-i Master ST

For additional information, see product announcement for: CM AS-i Master ST (<https://support.industry.siemens.com/cs/ww/en/view/72865595>)

Table 3-2 Version dependence of the CM AS-i Master ST functions

Function	Firmware version of the module
Configuring in <i>STEP 7</i> (TIA Portal) V12 and higher	V1.0 and higher
GSD file (PROFIBUS)	V1.0 and higher
GSD file (PROFINET)	V1.0 and higher
Access via command data records	V1.0 and higher
Structure of the process image: 32 bytes	V1.0 and higher
Transmission of digital I/O values in the cyclic process image	V1.0 and higher
Transmission of analog I/O values via data record transfer	V1.0 and higher
Firmware update	V1.0 and higher
Duplicate address detection	V1.0 and higher
Automatic address programming with manual writing of the ID1 code	V1.0 and higher
Write ID1 code to AS-i address "0"	V1.0 and higher
Configuring in <i>STEP 7</i> (TIA Portal) V13 SP1 and higher	V1.1 and higher
Status information for all slaves of the AS-i master system (TIA Portal)	V1.1 and higher
Detailed, device-specific diagnostics (TIA Portal)	V1.1 and higher
Configuring in <i>STEP 7</i> V5.5 and higher	V1.1 and higher
Option handling	V1.1 and higher
Proxy slave	V1.1 and higher
Structure of the process image: Up to 288 bytes, adjustable length	V1.1 and higher
Transmission of analog I/O values via process data	V1.1 and higher
Variable address area for I/O data	V1.1 and higher
Automatic address programming with automatic writing of the ID1 code	V1.1 and higher
AS-i slave_ID1_write_with_target_address	V1.1 and higher
Automatic duplicate address detection for AS-i voltage of either 24 V or 30 V	V1.1 and higher

Accessories

The following components can be used with the module:

- Labeling strips
- Reference identification label

## 3.2 Operating modes of the CM AS-i Master ST

The AS-i master has two operating modes:

- "Configuration mode"
- "Protected operation"

### "Configuration mode"

"Configuration mode" can be used for commissioning an AS-i installation. You can also use "configuration mode" for productive operation. The AS-i bus configuration is not defined in this case. This means that error messages for a change of bus configuration are not possible.

You switch the AS-i master from "protected operation" to "configuration mode" in *STEP 7*. The "CM" LED (Configuration Mode) then lights up green.

In "configuration mode", the AS-i master can exchange data with every AS-i slave that is connected to the AS-i cable. This does not apply to AS-i slaves with the address "0". The AS-i master immediately detects and activates newly added AS-i slaves and includes them in cyclic data exchange. The digital process data of the connected AS-i slaves are stored according to a fixed scheme in the process image starting from a configurable start address. See "Special characteristics of AS-i Safety slaves (Page 55)". The digital process image for the inputs of non-existent slaves is filled with the substitute value "0". Analog process data can only be accessed by means of data record communication.

In "configuration mode", configuration errors of AS-i slaves are not signaled to the higher-level station via an alarm and are not indicated by the "DIAG" LED.

### "Protected operation"

In "protected operation", the AS-i master only exchanges data with the configured AS-i slaves. In case of changes to the bus configuration, error messages are automatically generated if diagnostics is enabled. See "Parameter assignment/addressing (Page 43)".

You can configure in one of the following ways:

- Configuration of the AS i slaves in the *STEP 7* project (Configuration of the AS-i slaves in *STEP 7* (Page 31))
- Applying the slave configuration with the online "ACTUAL → CONF" function in *STEP 7* (Applying the slave configuration (Page 38))
- Calling the command interface in the SIMATIC user program with the following commands:
  - No. 07: Store\_Actual\_Configuration (Page 114)
  - No. BA: Write\_overall\_configuration (Page 131)
- Using the connected "SET" button (Configuration of the AS-i slaves using the "SET" button (Page 34))

If you have configured the AS-i slave in the *STEP 7* project, the changeover to "protected operation" occurs automatically.

### Changeover between "configuration mode" and "protected operation"

You can change between "configuration mode" and "protection operation" in one of the following ways:

- By switching the operating mode using the "Online functions in the TIA Portal (Page 37)".
- By calling the command interface in the user program of SIMATIC with command "No. 0C: Set\_Operation\_Mode (Page 119)".
- Using the connected "SET" button (Configuration of the AS-i slaves using the "SET" button (Page 34)).

Changeover is not possible if the AS-i slaves have been configured in the *STEP 7* project and the CPU is in RUN operating mode.

## 3.3 Firmware update

### Performing a firmware update

Information about updating the firmware can be found in the ET 200SP System Manual.

---

**Note**

Following a firmware update, mark the current firmware version on the housing of the CM AS-i Master ST.

---

Current firmware updates are available on the Internet for download (<https://support.industry.siemens.com/cs/ww/en/view/108742051>).

Pay careful attention to the information on performing the firmware update contained in the download entry.

### LED behavior during a firmware update

During a firmware update, the LEDs exhibit the following behavior:

- DIAG flashes red
- PWR is lit green
- Remaining AS-i LEDs are off

---

**Note****Supply voltage during a firmware update**

The AS-i voltage and the supply voltage of the ET 200SP station must not be switched off during a firmware update.

---

### LED behavior after a successfully completed firmware update

When the TIA Portal is used, an error-free firmware update is indicated by the message that the firmware was successfully transferred.

---

#### Note

##### Confirming a message after an error-free firmware update

You must confirm the message using the button before you continue. Without confirmation, the LED status remains unchanged so that the firmware update is incomplete and must be repeated.

---

When *STEP 7*V5.5 (classic) is used, there is no concluding message and the LED status changes autonomously.

If the firmware is updated without errors, the LED status is updated:

- DIAG flashes red until the AS-i voltage is switched off and back on again
- PWR is lit green
- Remaining AS-i LEDs are lit



#### WARNING

##### Required intermediate step for firmware update of a CM AS-i Master ST with FW V1.0 using an ET 200SP CPU.

Failure to perform this step causes the CM AS-i Master ST to become permanently inoperable.

If you want to perform an update to a higher firmware version for a CM AS-i Master ST module with FW V1.0 and are using an ET 200SP configuration with an ET 200SP CPU in place of an interface module (IM), you must always perform the following intermediate step:

After the update of the LED status, the CM AS-i master ST module must be removed from the ET 200SP BaseUnit. Instead of removing the module, it is also sufficient to switch off the AS-i voltage and the 24 V voltage of the ET 200SP. A TIA Portal error message appears approximately one minute after the module has been removed indicating that online access to the module is no longer possible. Confirm the error message. Then plug the module onto the BaseUnit again or switch the voltages back on.

Now repeat the firmware update. In this case, the intermediate step described here can be skipped.

The intermediate step is not required for:

- Firmware update of a CM AS-i Master ST module with active FW V1.1 or higher
- Use of an ET 200SP configuration with a PROFINET interface module (IM) and PROFINET connection to a released SIMATIC CPU
- Use of an ET 200SP configuration with a PROFIBUS interface module (IM) and PROFIBUS connection to a released SIMATIC CPU.

---

**Note**

For operation of the CM AS-i Master ST module in an ET 200SP configuration with an ET 200SP CPU in place of an interface module (IM), the following minimum requirements of the firmware and software versions apply:

- CM AS-i Master ST with FW V1.1 or higher, and
  - ET 200SP CPU with FW V1.8 or higher (CPU 1510SP-1 PN, CPU 1510SP F-1 PN, CPU 1512SP-1 PN, CPU 1512SP F-1 PN, Open Controller CPU 1515SP PC)
  - Configuration with *STEP 7*V13 SP 1 Update 4 or higher
- 

**Note**

**Restart after a firmware update**

Following a firmware update, the AS-i voltage must be switched off and back on again in order for the new firmware to be activated.

Wait for the LED status to update before performing the restart. Otherwise the firmware update is not complete and must be repeated.

---

### **LED behavior in the event of an error during a firmware update**

If an error occurs during the firmware update, the LEDs assume the following status:

- DIAG flashes red
- PWR is lit green
- Remaining AS-i LEDs indicate the status of the AS-i and are not relevant here.

In this case, switch the AS-i voltage off and back on again and repeat the firmware update.

# Connection

## 4.1 Terminal assignment

### Requirements

For connecting, you require a BaseUnit:

- Type C0 (light BaseUnit, e.g., item number 6ES7193-6BP20-0DC0)

Note that, within a BaseUnit group for AS-i consisting of light and dark BaseUnits, only the AS-i modules CM AS-i Master ST and F-CM AS-i Safety ST may be combined. Other I/O module types of the ET 200SP must always be separated from the BaseUnit group for AS-i using light BaseUnits.

Exception:

BaseUnits with power busbars without connection to the terminals of the plug-in I/O module can be used within a BaseUnit group for AS-i. These BaseUnits include the following dark BaseUnits with 20 mm width:

- BU20-P12+A0+4B (BU type B1)
- BU20-P12+A0+0B (BU type D0)
- BU20-P8+A4+0B (BU type F0)

#### NOTICE

Make sure that external voltage from adjacent BaseUnits cannot under any circumstances be connected to the AS-i modules.

#### WARNING

**Connection of the BaseUnit only to safety extra-low voltage with limiting of output voltage to max. 40 V under fault condition**

**Failure to observe this information may result in death, severe injury, and serious property damage.**

Connect the BaseUnit only to an AS-i power supply unit that meets the conditions indicated in Section "Schematic circuit diagram (Page 27)", "Power supply units for AS-Interface". Connection to a higher voltage may result in death, severe injury, and serious property damage.

**General terminal assignment**

Table 4- 1 Terminal assignment of the CM AS-i Master ST

Terminal	Assignment	Description
1	SET1	Connection of the "SET" button (optional), see "Configuration of the AS-i slaves using the "SET" button (Page 34)"
2	SET2	
3	RES	Reserved
4	RES	Reserved
5	RES	Reserved
6	RES	Reserved
1L, 2L <sup>1)</sup>	ASI+	Connection of the AS-i cable, positive polarity
1N, 2N <sup>1)</sup>	ASI-	Connection of the AS-i cable, negative polarity

1) The terminals are connected through in the BaseUnit.

**Connecting an external "SET" button**

You can connect a "SET" button to terminals "SET1" and "SET2" of the AS-i master. This enables you to apply the ACTUAL configuration of the connected AS-i slaves as the CONFIGURED configuration. This function is activated by closing the button contact on the SET1 and SET2 terminals.

The maximum cable length between the terminal and "SET" button is 0.5 m.

Use two wires routed in parallel for connecting the button (not included in the scope of delivery).

**See also**

"ET 200SP Distributed I/O System" System Manual  
<http://support.automation.siemens.com/WW/view/en/58649293/0/en>

"ET 200SP BaseUnits" Manual  
<http://support.automation.siemens.com/WW/view/en/59753521/0/en>

## 4.2 Schematic circuit diagram

### Schematic circuit diagram

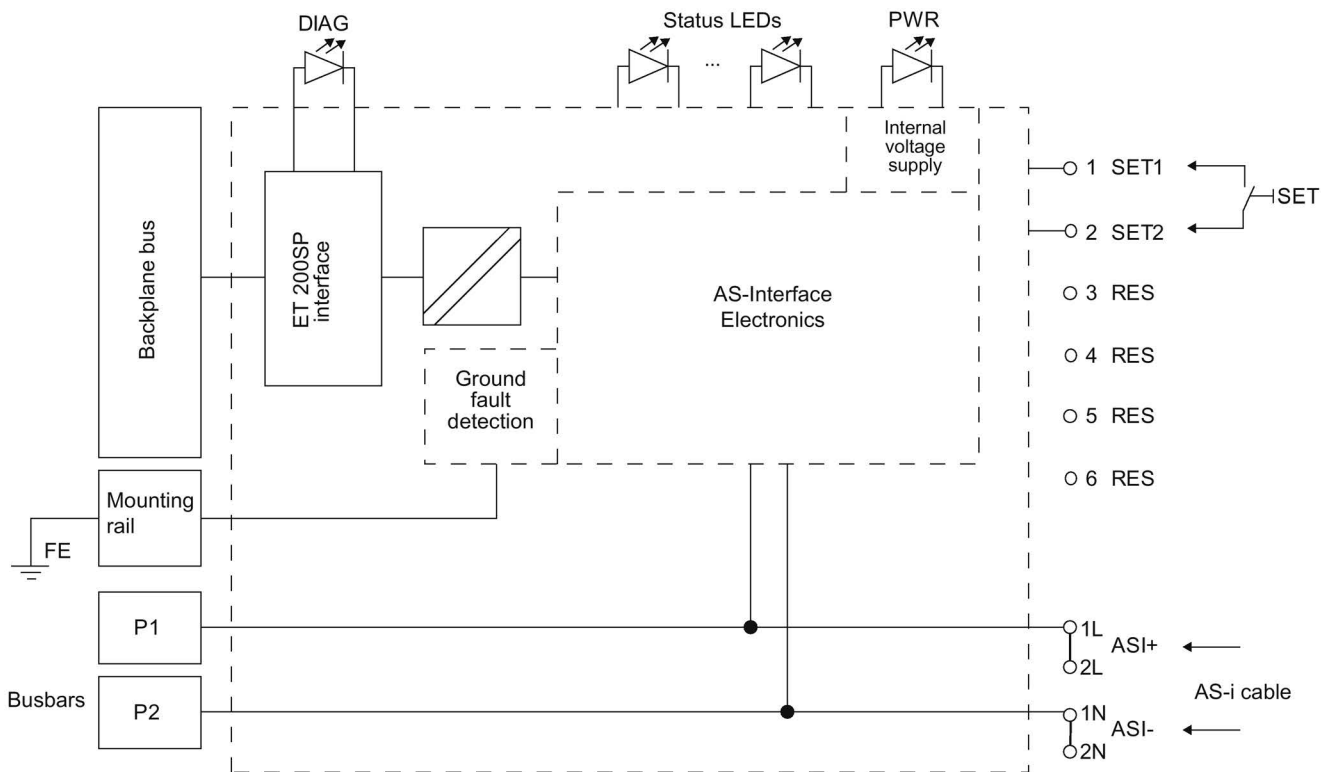


Figure 4-1 Circuit diagram of the CM AS-i Master ST

1L, 2L are connected through in the BaseUnit.

1N, 2N are connected through in the BaseUnit.

### Connection to power busbars

The following are connected via the CM AS-i Master ST:

- 1L and power busbar P1
- 1N and power busbar P2

The maximum permitted current here is 4 A. For a conducted current of 4 A, the reduced ambient temperature range applies:

- Max. 55 °C for a horizontally mounted rail
- Max. 50 °C for a vertically mounted rail

If safety-related signals are to be processed on the AS-i cable, you can arrange a dark BaseUnit type C1 to the right of the light BaseUnit type C0 with the CM AS-i Master ST module and plug a safety-related F-CM AS-i Safety ST module onto this dark BaseUnit. The AS-i cable is continued from the light BaseUnit to the dark BaseUnit via the power busbars so that the F-CM AS-i Safety ST module is connected to the AS-i network of the master without additional wiring.

It is not permitted to transmit the AS-i voltage from the connecting terminals on the front of the dark BaseUnit because a current draw of this type may cause an overload in the modules.

Connect the AS-i cable with AS-i power supply unit and AS-i slaves only to terminals 1L, 2L (ASI+) and 1N, 2N (ASI-) of the light BaseUnit.

You can find additional information on safety-related processing in the "Fail-safe module F-CM AS-i Safety ST (<https://support.industry.siemens.com/cs/ww/en/view/90265988>)" manual.

### Power supply units supported for AS-Interface

A connected power supply unit must have the following properties:

- Rated output voltage 30 V DC (AS-Interface Standard) or 24 V DC (AS-i Power24V)
- PELV/SELV (Protective/Safety Extra-Low Voltage) standard
- Residual ripple < 250 mVpp
- Limiting of output voltage to max. 40 V in the event of a fault

The Siemens power supply units for AS-Interface meet these requirements (see operating instructions of the power supply unit).

Use an AS-Interface power supply unit (with integrated data decoupling) or a combination of a standard power supply unit and a data decoupling module.

When AS-i Power24V is used, there are limitations on the cable length (max. 50 m AS-i cable) and usability of AS-i components and connected sensors/actuators due to the reduced voltage.

Additional notes:

- AS-Interface System Manual (<http://support.automation.siemens.com/WW/view/en/26250840/0/en>)
- FAQ "Compatibility for AS-i Power24V" (<http://support.automation.siemens.com/WW/view/en/42806066>)

### Power supply

The CM AS-i Master ST is fully powered from the AS-i voltage. Only the internal backplane bus interface for the ET 200SP station (including the DIAG LED) is powered from the operating voltage of the ET 200SP station.

If the operating voltage of the ET 200SP station fails, the communication between the AS-i master and AS-i slaves continues without interruption, in which case the outputs of the AS-i slave are reset to zero.

# Configuring

## 5.1 Requirements

### Introduction

You configure the ET 200SP station and its CM AS-i Master ST and assign their parameters using *STEP 7* or the configuration software of another manufacturer.

### Configuring the CM AS-i Master ST

Configuring in *STEP 7* or another configuration software is required in order to use the CM AS-i Master ST in an ET 200SP. A distinction is made here between the necessary basic configuration of the AS-i master and the optional configuration of the AS-i slaves.

You can configure the module using *STEP 7* or with a GSD file. Version dependencies:

Table 3-1 Version dependence of the CM AS-i Master ST engineering versions (Page 17)

---

#### Note

#### CM AS-i Master ST in the hardware catalog of *STEP 7*

If the CM AS-i Master ST module in the applicable firmware version is not listed in the hardware catalog of *STEP 7*, you will need a "Hardware Support Package". You can install this HSP from the Internet using the corresponding function in *STEP 7*.

Further information can be found in the documentation and in the online help for *STEP 7*.

---

Installing the HSP in <i>STEP 7</i> V5.5 (classic)	"HW Config" > "Options" menu > "Install HW Updates"
--	---

Installing the HSP in <i>STEP 7</i> V13 (TIA Portal):	"Options" menu > "Support packages"
---	-------------------------------------

You can find additional information on the HSP and download it in Internet (<https://support.industry.siemens.com/cs/ww/en/view/108742051>).

Download the GSD file from the internet:

PROFINET GSD file (<https://support.industry.siemens.com/cs/ww/en/view/57138621>)

PROFIBUS GSD file (<https://support.industry.siemens.com/cs/ww/en/view/73016883>)

Observe the *STEP 7* online help or the documentation of the configuration software manufacturer.

Configuring the AS-i system requires two steps:

1. Basic configuration of the AS-i master (Basic configuration of the CM AS-i Master ST (Page 30))
2. Configuration of the AS-i slaves

Configuring the AS-i slaves includes defining the slave modules and, if necessary, assigning the slave operating parameters.

### See also

Configuration of the AS-i slaves in STEP 7 (Page 31)

Configuration of the AS-i slaves using the "SET" button (Page 34)

Configuration of the AS-i slaves via the control panel in the TIA Portal (Page 36)

Configuration of the AS-i slaves using the PLC program (Page 36)

Characteristics of the CM AS-i Master ST (Page 15)

## 5.2 Basic configuration of the CM AS-i Master ST

The following is carried out as a result of the basic configuration:

- The AS-i master is made known with the system.
- The length of the cyclic process image is made known (length can be set in FW V1.1 and higher).
- The operating parameters of the AS-i master are assigned.

### Procedure

The basic configuration is performed by inserting the AS-i master module into the project of the configuration software.

Change the operating parameters according to their use. You will find information on operating parameters in the Sections:

- Parameters (Page 43)
- Explanation of the parameters (Page 44)

Should the need arise, you can change the size of the process image to be transferred as follows:

- In *STEP 7* in the "Properties" dialog of the AS-i master
- When the GSD file is used, by selecting the respective module variant from the GSD selection list

**Further information on the process image:**

- Address space (Page 44)

### See also

Configuration of the AS-i slaves in STEP 7 (Page 31)

## 5.3 Configuration of the AS-i slaves

### 5.3.1 Configuration of the AS-i slaves in STEP 7

During configuration of the AS-i slaves, you specify the stations that the AS-i master is to communicate with in *STEP 7*.

Configuration in *STEP 7* provides the following advantages:

- AS-i slaves are displayed graphically in the network view along with their AS-i addresses (*STEP 7* (TIA Portal)) or displayed as a list (*STEP 7* V5.5 and higher).
- The assigned I/O addresses of an AS-i slave are displayed in the Properties window of the AS-i slave.
- The slave parameters can be configured in the *STEP 7* user interface.
- The configuration of the slaves is stored in the *STEP 7* project, which makes documentation easier.
- The configuration data is stored in the PLC and transferred automatically when the AS-i master is replaced.
- During power-up, the AS-i master switches automatically to "protected operation".
- The diagnostic status of the slave is displayed in *STEP 7* (TIA portal) in the network view as a symbol (currently only in combination with S7-300 / S7-400 CPU).

---

#### Note

If you do not configure any AS-i slaves in *STEP 7* or if you configure using a GSD file, AS-Interface uses the CONFIGURED configuration saved in the AS-i master. The following sections describe how you can create the CONFIGURED configuration:

- Configuration of the AS-i slaves using the "SET" button (Page 34)
  - Configuration of the AS-i slaves via the control panel in the TIA Portal (Page 36)  
This does not apply when configuring with a GSD file.
  - Configuration of the AS-i slaves using the PLC program (Page 36)
- 

#### Procedure

You activate configuration of the AS-i slaves in *STEP 7* as follows:

- In *STEP 7* (TIA Portal): by connecting at least one AS-i slave to the AS-i master over an AS-i network in the network view.
- In *STEP 7* V5.5: by inserting at least one AS-i slave in the configuration table of the AS-i master (FW V1.1 and higher).

When the AS-i slaves are configured in *STEP 7*, configuration is not possible using the "SET" button, via the online function or the PLC program.

This configuration switches the AS-i master automatically to "protected operation".

**Option 1: Selection from the hardware catalog**

To configure the AS-i slaves, open the hardware catalog in *STEP 7*.

*STEP 7* (TIA Portal):

In *STEP 7* (TIA Portal), you will find the AS-i slaves under "Field devices".

1. Select a module from the hardware catalog.
2. Drag the module to the network view.
3. Connect the AS-i interface of the module (yellow square in the slave symbol) to the AS-i interface of the AS-i master (yellow square in the master) or directly to the yellow line of the AS-i subnet. When a connection is made to the AS-i subnet, a free AS-i address is automatically assigned in the configuration.

You can change this AS-i address in the properties dialog of the AS-i slave in the "AS-Interface" area.

*STEP 7* V5.5:

1. Open the "Object properties" dialog of the CM AS-i Master ST in the ET 200SP. To do so, select "Object properties" in the shortcut menu.
2. Click the "Slave configuration" tab (FW V1.1 and higher) in the "Properties..." dialog of the CM AS-i Master ST (FW V1.1 and higher) to open it.
3. Double-click the desired AS-i address (1A, B, 2A, B, etc.) to open the "Configuration" of the AS-i slave.
4. Click the "Select" button to open the "Slave selection dialog".
5. Select a slave in this dialog.

Alternatively: Select a slave from the "Module" list box.

**Option 2: Reading out an existing AS-i configuration**

If an AS-i cable with AS-i slaves is connected to the AS-i master, you can transfer the connected slaves to the configuration of *STEP 7*. The connected AS-i slaves must have addresses other than "0".

Procedure:

1. Switch on the AS-i voltage.
2. Compile the project and download it to the station.
3. *STEP 7* (TIA Portal):

- Right click the AS-i master.
- Select "Hardware detection" in the shortcut menu.

*STEP 7* V5.5:

- Select the ET 200SP.
- Open the "Properties" dialog of the CM AS-i Master ST by double-clicking the slot of the CM AS-i Master ST, for example.
- Change to the "Options AS-i slaves" tab.
- Click the "Upload to PG" button.

- The detected slaves are applied as universal slaves in the project.

---

**Note**

Automatic reading out of article numbers is not possible.

---

Slave addresses already present in the project are not overwritten. If you want to transfer a slave address that is already present, you must delete the existing slave in the hardware detection before the readout.

- You can now edit the slaves applied to the project as if you had taken them directly from the hardware catalog.

The following basic types are available:

- Siemens AS-i slave
- Universal slave with the following forms:
  - AS-i F Slave Universal for safety-related applications
  - AS-i Standard Slave Universal, for configuring with standard address or extended address (A/B slaves)
  - Universal AS-i Proxy Slave

The article numbers for the slaves are only saved in the offline project. Comparison of the article numbers in the offline project with those of the slaves on the AS-i cable is not performed. The AS-i master uses the configuration data of the slave profile (IO.ID.ID2) and ID1 code of the AS-i slave for comparison of the actual status with the configured status.

## Configuring the properties of Siemens AS-i slaves

When you use an AS-i slave from Siemens, you select the slave directly from the hardware catalog.

This selection offers the following properties:

- The device type is represented in *STEP 7* (TIA Portal) using an image.
- The meaning of the slave parameters is displayed as text.
- The underlying slave profile is already set. The IO, ID and ID2 identifiers do not need to be entered.

Parameter bits that are irrelevant for the Siemens slave are set to the default value "1". They cannot be changed.

The ID1 code is preassigned according to the factory setting of the Siemens slave. If you change the ID1 code of the slave, you must also change the setting in the slave configuration.

See also the command "No. D1: AS-i-Slave\_ID1\_schreiben\_mit\_Zieladresse (Write ID1 code with destination address) (Page 160)".

### Configuring the properties of universal AS-i slaves

When configuring with the universal AS-i slave or universal AS-i F slave, you must make the following settings:

- Profile identification of the AS-i slave (IO, ID, ID2)
- Parameters of the AS-i slave

You will find the profile identification, the ID1 code, and the meaning of the AS-i slave parameters in the documentation for the AS-i slave.

The I/O assignment of the slave is shown, depending on the specified profile identification, in the "Configuration" section.

#### See also

Applying the slave configuration (Page 38)

No. 07: Store\_Actual\_Configuration (Page 114)

### 5.3.2 Configuration of the AS-i slaves using the "SET" button

#### Functional principle

You can connect a "SET" button to terminals "SET1" and "SET2" of the AS-i master. This supports the teaching procedure for the connected AS-i slaves. This function is activated by closing the button contact on the SET1 and SET2 terminals.

#### Behavior in "configuration mode" and in "protected operation"

Table 5- 1 "Configuration mode"/"Protected operation"

Mode of the CM AS-i Master ST	Behavior of the "CM" LED
"Configuration mode"	The "CM" LED lights up.
"Protected operation"	The "CM" LED does not light up.

When the AS-i master is in "configuration mode", the AS-i master is configured automatically when the "SET" button is pressed. Configuration is carried out as follows:

1. The CM AS-i Master ST saves the AS-i slave configuration present on the AS-i cable as the CONF configuration in non-volatile memory.
2. The AS-i master then switches over to "protected operation".

If the AS-i master is in "protected operation", it will switch to "configuration mode" when the "SET" button is pressed.

The "SET" button is only activated when the CPU is in "STOP" state or after disconnecting the bus from the IM module of the ET 200SP.

## Requirements

Ensure the following states exist:

1. The CPU is in "STOP" state or the bus is disconnected from the IM module of the ET 200SP.
2. The AS-i master and all AS-i slaves are connected to the AS-Interface and supplied with voltage.
3. No AS-i slave with address 0 is connected to AS-Interface. The AS-i slaves have unique addresses that differ from one another.

## Procedure

1. Check whether the AS-i master is in "configuration mode". (The "CM" LED lights up.)  
If the "CM" LED does not light up, switch the AS-i master to "configuration mode" by pressing the "SET" button once.
2. Press the "SET" button. This configures the AS-i master. In so doing, the ACTUAL configuration detected is saved as the CONF configuration in non-volatile memory in the CM AS-i Master ST. At the same time, the AS-i master switches over to "protected operation". The "CM" LED goes out.

---

### Note

#### Parameter setting when configuring with the "SET" button

If no AS-i slaves are connected, all internal lists are set to default values. In particular, the following are set: all AS-i parameters = F<sub>Hex</sub> and bit "AutoAddress\_Enable = 1".

When configuring is performed using the "SET" button, the parameter value in the volatile memory of the AS-i master for each slave applied to the CONF configuration is saved as a non-volatile parameter. For slaves that are not present, the default value F<sub>H</sub> is applied to the non-volatile memory. This corresponds to the function of the No. 00: Set\_Permanent\_Parameter (Page 107) command.

---

### Note

#### The existing configuration can be overwritten using the "SET" button

Note regarding the CM AS-i Master ST:

A configuration of AS-i slaves specified using *STEP 7* and downloaded to the S7 station is transferred to the AS-i master again during S7 station start-up or after station recovery of the head module. Any configuration implemented using the "SET" button will be overwritten.

---

When configuring with the "SET" button, if no slaves are connected to AS-Interface, the CONFIGURED configuration in the master is deleted along with the profile definition for proxy slaves (see Section "AS-i proxy slave (Page 42)"). The AS-i voltage must be present.

## See also

Terminal assignment (Page 25)

### 5.3.3 Configuration of the AS-i slaves via the control panel in the TIA Portal

You can also execute the functionality of the "SET" button described in Section "Configuration of the AS-i slaves using the "SET" button (Page 34)" via the control panel in *STEP 7*.

When configuring the AS-i slaves over the control panel in TIA Portal, if no slaves are connected to AS-Interface, the CONFIGURED configuration in the master is deleted along with the profile definition for proxy slaves (see Section "AS-i proxy slave (Page 42)"). The AS-i voltage must be present.

### 5.3.4 Configuration of the AS-i slaves using the PLC program

You can use the PLC program to completely define the configuration of the AS-i slaves.

The command interface of the AS-i master is available for this. You use the No. BA: Write\_overall\_configuration (Page 131) command to specify the CONF configuration of the AS-i slaves in the AS-i master, similarly as when configuring the slave in the TIA Portal.

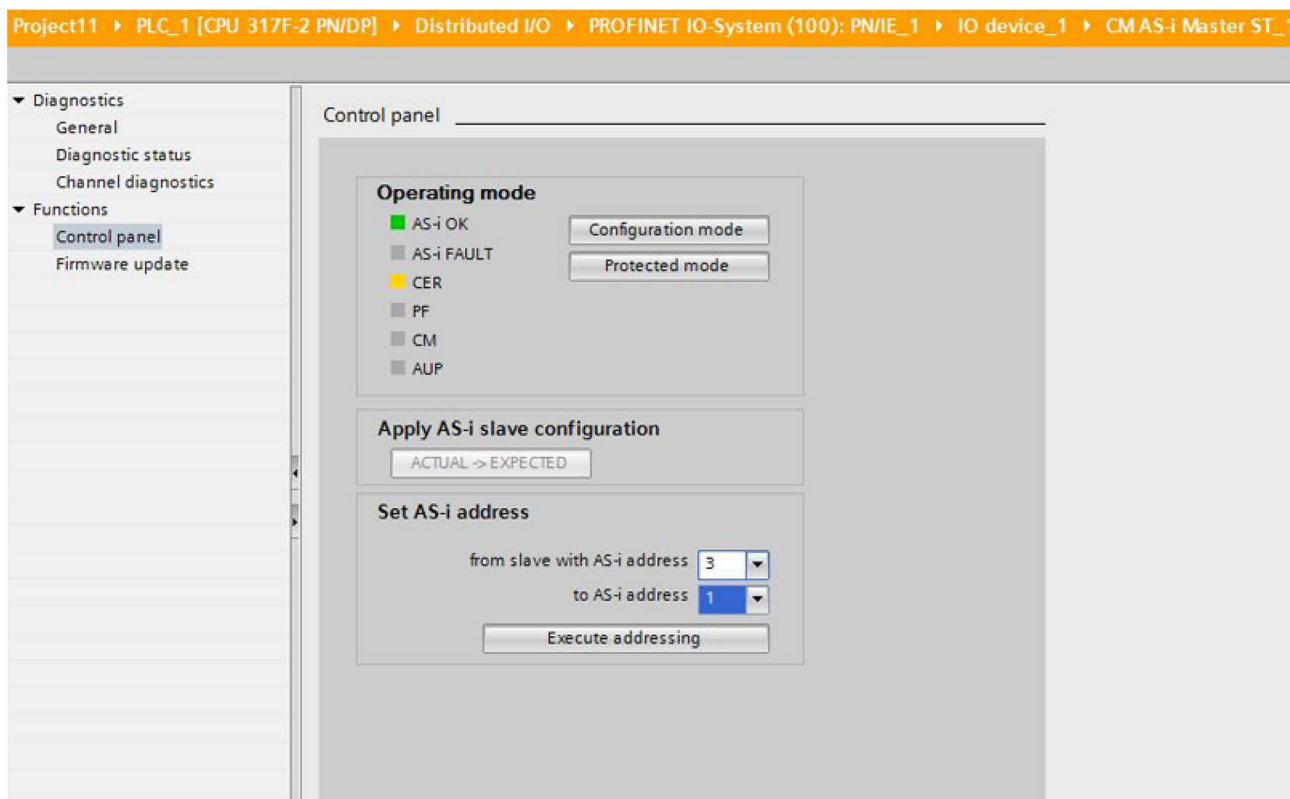
The No. 07: Store\_Actual\_Configuration (Page 114) command allows you to save the ACTUAL configuration as the CONF configuration in the AS-i master, similarly as when using the "SET" button for this.

## 5.4 Online functions in the TIA Portal

### 5.4.1 Switching from one operating mode to another

In *STEP 7* "Online" > "Diagnostics", you can switch between "protected operation" and "configuration mode" under "Functions". There are two buttons:

- "Configuration mode"
- "Protected operation"



The LEDs on the AS-i master and in *STEP 7* indicate the current operating mode of the AS-i master. You will find additional information in Section "Meaning of the LEDs (Page 64)".

**The operating mode can only be switched when the CPU is in "STOP" state.**

---

#### Note

##### Online functions

The online functions can only be performed when at least the basic configuration has been completed and the configuration has been loaded into the ET 200SP station.

---

## 5.4.2 Applying the slave configuration

### Application

This step is only necessary if AS-i slaves have not been configured in *STEP 7* and the configuration of the AS-i slaves is not performed using the "SET" button.

If AS-i slaves have already been configured in *STEP 7* and the slave configuration has been downloaded to the AS-i master, the system deactivates the function for applying the slave configuration. It is then no longer possible for this function to be called.

### Requirements

The following requirements must be satisfied to do this:

- The CPU is in "STOP" state.
- The AS-i master and all AS-i slaves are connected to the AS-Interface and supplied with voltage.
- No AS-i slave with address 0 is connected to AS-Interface. The AS-i slaves have unique addresses that differ from one another.
- The AS-i master is in "configuration mode".

### Applying the slave configuration

The "ACTUAL → CONF" button in the "Online" > "Diagnostics" window can be used to apply the configuration of slaves connected to the master.

The following data of the AS-i slaves is saved in non-volatile memory in the AS-i master:

- AS-i addresses
- The slave profile for each AS-i slave: IO code, ID code, ID2 code
- ID1 code for each AS-i slave

It is not possible to apply the slave configuration via the "ACTUAL → CONF" button if AS-i slaves have already been configured in *STEP 7* and downloaded to the AS-i master or if the CPU is in "RUN" state. You reactivate the function "ACTUAL → CONF" by reloading the AS-i master in *STEP 7* with the basic configuration only - that is, without configured AS-i slaves.

---

#### Note

##### Parameter setting when applying the slave configuration

When configuring is performed using the "ACTUAL→CONF" button, the parameter value in the volatile memory of the AS-i master for each slave applied to the CONF configuration is saved as a non-volatile parameter. For slaves that are not present, the default value F<sub>H</sub> is applied to the non-volatile memory. This corresponds to the function of the No. 00: Set\_Permanent\_Parameter (Page 107) command.

---

### 5.4.3 Setting the address of an AS-i slave

In the "Online" > "Diagnostics" window, you can assign a new address to an AS-i slave using a selection menu and the "Execute addressing" button. Only free AS-i addresses are available here.

## 5.5 Variable configuration

Option handling and proxy slaves can be combined.

### 5.5.1 Option handling

A machine consists of a basic configuration and several expansion stages. The overall configuration is configured in the *STEP 7* project. The slaves that belong to an expansion stage are configured as optional slaves. When the system is commissioned, the user program (PLC) defines which expansion stages are installed. The configuration in *STEP 7* remains unchanged.

You can use option handling to activate and deactivate AS-i slaves that you have defined in HW Config in the user program during operation.

You configure the AS-i slaves in the AS-i master as described in Section "Configuration of the AS-i slaves in STEP 7 (Page 31)":

1. Activate option handling.

*STEP 7* (TIA Portal):

- Select "Options > Option handling" in the slave properties dialog.
- Select the "Option handling" check box.

*STEP 7 V5.5*:

- Select the "Slave configuration" tab in the "Properties..." dialog of the CM AS-i Master ST.
- Double-click the desired AS-i address (1A, B, 2A, B, etc.) to open the "Configuration" of the AS-i slave.
- Select the "Option handling" check box.

This activates the option handling for this slave.

2. Activate the slave using the user program (PLC).

You can also deactivate the slave in the user program.

The AS-i master treats an optional slave that is not activated like a slave that is not configured. The AS-i master treats an activated optional slave like a slave that is configured without option handling.

**Procedure**

1. Define the AS-i slaves in *STEP 7* (TIA Portal) > Network view or in *STEP 7 V5.5* > "HW Config".
2. Specify whether option handling is enabled for each AS-i slave.
3. In the user program, you can activate or deactivate AS-i slaves for which option handling is activated during runtime. To do this, a combination of 2 bits must be set or reset in data record DS 131.

**Note**

**Option handling and safe AS-i slaves**

When data record DS 131 is written to the CM AS-i Master ST module, the signals of the safety-related slaves on the same bus are reset. Before transferring the option data record DS 131, ensure that the system is in an operating state in which a safety signal reset will not adversely affect the course of operation. Before restarting, error acknowledgement or reintegration must be performed for the safe AS-i inputs and, where applicable, the safe AS-i outputs. The correct procedure for the fail-safe evaluation system used must be observed.

**See also**

- DS 131 Activate/deactivate optional slaves (Page 40)
- DS 131 Read status of option handling (Page 41)
- No. D0: Set\_Configuration\_Online (Page 159)

**5.5.1.1 DS 131 Activate/deactivate optional slaves**

**Description**

By writing this data record, you activate or deactivate slaves configured as optional on the AS-i bus.

Table 5- 2 Structure of DS 131 write

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 ... 1	Reserved							
2 ... 9	List of slaves to be activated							
	Bit = 0	No action						
	Bit = 1	The slave will be activated.						
10 ... 17	List of slaves to be deactivated							
	Bit = 0	The slave will not be deactivated.						
	Bit = 1	The slave will be deactivated.						

**Note**

**Identical entries in each list**

If a "1" is entered for an AS-i slave in both lists, the slave will be deactivated.

**Note**

**Activated/deactivated status of the optional slaves**

The activated/deactivated status of the optional slaves is stored in non-volatile memory of the master and is retained even if a new configuration is downloaded to the master. The status of an optional slave is set to deactivated if the slave is not set as optional in a configuration.

If a configuration contains slaves without option handling, the status stored internally in the master for these slaves is reset (bit = 0).

**See also**

Address space (Page 44)

Option handling (Page 39)

**5.5.1.2 DS 131 Read status of option handling**

**Description**

The current status of the slaves configured as optional is returned by reading this data record.

Table 5- 3 Structure of DS 131 read

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 ... 1	Reserved							
2 ... 9	List of activated, optional slaves							
	Bit = 0	The optional slave is deactivated or the optional slave is not an optional slave.						
	Bit = 1	The optional slave is activated.						
10 ... 17	List of configured, optional slaves							
	Bit = 0	The slave is not configured as an optional slave or it is not contained in the configuration.						
	Bit = 1	The slave is configured as an optional slave.						

If a slave is configured as not optional, then the associated bit in the list of activated optional slaves in the non-volatile memory of the master is reset to the value 0.

**See also**

Option handling (Page 39)

## 5.5.2 AS-i proxy slave

### Description

A proxy slave is used to represent any given slave. This means you define the I/O addresses in the PLC program in advance. You define the slave itself at runtime.

### Procedure

- Configure a proxy slave in "*STEP 7*> HW Config" with the associated digital and / or analog I/O addresses. You can then use these I/O addresses in the user program to access the data of the proxy slave once you have defined the slave profile at runtime.  
To do this, select the proxy slave from the universal AS-i slaves in the hardware catalog.
- At runtime, specify in the PLC program which slave type should be operated under this address.
- You define the slave profile of the proxy slave by changing the overall configuration ("No. D0: Set\_Configuration\_Online (Page 159)" command). In this case, the AS-i branch is not reset.
- The slave type defined in the user program is retained in the CM AS-i Master ST module, even after the power supply has been switched off.
- The slave type of a proxy slave defined in the user program is retained in the CM AS-i Master ST module, even after the hardware configuration has been reloaded into the station.

### Applications

- Variable machine configurations that can be changed at runtime.
- Flexible expansion of the system in the future, without the need to specify the actual type of slave beforehand.

# Parameter assignment/addressing

## 6.1 Parameters

### Parameters of the AS-i master

Table 6- 1 Assignable parameters and their default setting (GSD file)

Parameters	Value range	Default
Diagnostic interrupt in case of errors in AS-i configuration	<ul style="list-style-type: none"> <li>• Enable</li> <li>• Disable</li> </ul>	Enable
Diagnostic interrupt in case of AS-i cable fault	<ul style="list-style-type: none"> <li>• Enable</li> <li>• Disable</li> </ul>	Enable
Automatic address programming	<ul style="list-style-type: none"> <li>• Enable</li> <li>• Disable</li> </ul>	Enable
Ground-fault monitoring activated	<ul style="list-style-type: none"> <li>• Enable</li> <li>• Disable</li> </ul>	Enable
Automatic ID1 code assignment (Firmware V1.1 and higher)	<ul style="list-style-type: none"> <li>• Enable</li> <li>• Disable</li> </ul>	Disable
Duplicate address detection <sup>1)</sup>	<ul style="list-style-type: none"> <li>• Enable for AS-i voltage 24 V</li> <li>• Enable for AS-i voltage 30 V</li> <li>• Disable</li> </ul>	Disable

1) This parameter is divided into "Deactivate duplicate address detection" and "Duplicate address detection for 24 V" depending on the GSD variant.

## 6.2 Explanation of the parameters

### Diagnostic interrupt if AS-i configuration error:

With this parameter, you specify whether AS-i configuration errors will be signaled to the higher-level system. The following are signaled as a configuration error:

- A surplus slave
- A missing slave
- A slave of the wrong type

### Diagnostic interrupt if AS-i cable fault:

This parameter is used to specify whether faults concerning the AS-i cable should be reported to the higher-level system. Possible AS-i cable faults are:

- Ground fault
- Insufficient AS-i voltage
- Peripheral fault of an AS-i slave

### Automatic address programming:

When a defective AS-i slave is being replaced, you use this parameter to specify whether the configured AS-i address will be automatically assigned to the new device.

For details on this functionality, see Section "Replacing a defective AS-i slave / automatic address programming (Page 74)"

### Ground-fault monitoring activated:

This parameter is used to specify whether ground faults on the AS-i cable should be detected by the AS-i master. Deactivate this setting if you are using an external unit for ground fault detection.

### Automatic ID1 code assignment:

When you activate this parameter, in the case of automatic address programming the ID1 code of a slave is written to the value specified during configuring.

### Duplicate address detection:

The duplicate address detection function can identify inadvertent duplicate addressing. When you activate it, you must select the AS-i line voltage in use.

This parameter is divided into "Deactivate duplicate address detection" and "Duplicate address detection for 24 V" depending on the GSD variant.

## 6.3 Address space

The assignment of the address space is described in the following Section:

Data exchange between the user program and AS-i slaves (Page 45)

# Data exchange between the user program and AS-i slaves

# 7

## 7.1 Access to AS-Interface

The distributed I/O system communicates with the AS-i slaves via the CM AS-i Master ST. The AS-i communication objects are mapped onto a continuous data area for input and output data.

### What's new in firmware V1.1 and higher

The following options are available as of firmware V1.1:

- You can design the process image flexibly according to your needs.
- You can reduce the length of the reserved I/O area (depending on the configuration software version).

### Designing the process image flexibly.

You can design the process image in the following way:

- Reduce or increase the process image (default length 32 bytes):
  - If the AS-i slaves are configured in STEP 7: the length can be set in steps in the range 4 ... 288 bytes. In this case, the maximum length of the process image depends on the ET 200SP interface module (IM) or ET 200SP CPU used.
  - If the AS-i slaves are not configured in STEP 7 length can be set to 16 or 32 bytes
- Variable division of the process image if AS-i slaves are configured in STEP 7:
  - Analog values and digital values can be mapped in one process image.
  - The slave address is not bound to a specific position in the process image.
  - The number of bits per slave can vary. For example, the digital input data of the slave at address 1 can be one bit long and the analog data of the slave at address 5 can be two bytes long.

### Length of the reserved I/O area can be reduced

If your configuration contains fewer AS-i slaves, you may reduce the length of the reserved I/O area (depending on the configuration software version). This reduces the volume of data to be transmitted on PROFIBUS or PROFINET.

You set the length of the I/O area in *STEP 7* (TIA Portal) in the properties of the AS-i master. This does not change the assignment of the slave address to the offset.

This means: When the length is reduced, the higher AS-i bus addresses can no longer be addressed.

### Address overview

In the Properties dialog box of module CM AS-i master ST under "I/O Addresses", you can call up an address overview in which the I/O addresses are assigned to the AS-i slaves (as of TIA Portal V14 SP1 extended for any configuration)

## 7.2 Transmitting AS-i digital values

A missing or failed digital slave results in the substitute value 0 in the input data. In the output direction, the non-assigned values have no effect.

Refer to the information about display of transparent values / digital values in Section Accessing AS-i analog data via the process image (Page 58).

### 7.2.1 I/O addresses when configuring AS-i slaves in STEP 7

#### Process image transmission time

The time it takes to transmit a process image depends on its size:

- If the length of the process image is set to up to 32 bytes, the I/O data in the ET 200SP station are transmitted within 1 backplane bus cycle. This setting results in the shortest transmission time on the backplane bus.
- If the length of the process image is set to more than 32 bytes, the I/O data of the CM AS-i master°ST in the ET 200SP station are transmitted in several consecutive backplane bus cycles. Data consistency is maintained from the point of view of the IM or the CPU. Division into several backplane bus cycles is performed automatically by the ET 200SP system. The number of required backplane bus cycles is automatically determined and depends on the set length of the process image. In this case, the maximum length of the process image depends on the ET 200SP interface module (IM) or ET 200SP CPU used. For more detailed information, see the technical data of the IM or CPU.

#### CM AS-i Master ST with configured AS-i slaves

If you configure the AS-i slaves as described in Section "Configuration of the AS-i slaves in STEP 7 (Page 31)", you will set the I/O addresses of the slaves using the Properties dialog box of the AS-i slave. The I/O address can be set individually in the area of the defined process image of the AS-i master. The input/output bits x.4 to x.7 in the first byte of the process image of the AS-i°master cannot be used for AS-i slaves. The process image can contain input/output data of digital and analog slaves. The bit length of a slave depends on the configured profile.

If the option "Reserve 4 bits length" is activated, 4 input bits and 4 output bits will be reserved for the slave. In this case, the real I/O data of the AS-i slave fall within the 4 bit range as described in Table 7-6 "Standard assignment table for inputs/outputs of digital AS-i slaves" in Section I/O addresses without configuration of the AS-i slaves in STEP 7 (Page 50).

## Arrangement of the AS-i slaves in the process image (Sort)

In TIA Portal V14 SP1 and higher, the arrangement of the AS-i slaves in the process image can be sorted automatically. 3 options are offered in the Properties of the AS-i master under "I/O Addresses > Arrangement":

- **Sort - CLASSIC:**  
The digital inputs/outputs of the slaves are sorted into the process image as described in Table 7-1 "Bit assignment per digital slave (CLASSIC sorting)", starting from the set start address of module CM AS-i master ST. CLASSIC sorting is the same as that described in Section I/O addresses without configuration of the AS-i slaves in STEP 7 (Page 50). After the digital inputs/outputs, the analog inputs/outputs are sorted into the process image. The status information (EFD, CM, CFGOK, DIAG) is displayed if the option "Process image for status information" (FW V1.1 and higher) is activated, see Table 7-3 "Overview of status information".
- **Sort - LINEAR:**  
The digital inputs/outputs of the slaves are sorted into the process image as described in Table 7-2 "Bit assignment per digital slave (LINEAR sorting)": The digital inputs/outputs of the slaves with a standard address or A address are mapped in bits 0 ... 3, whereas the digital inputs/outputs of the slaves with a B address are mapped in bits 4 ... 7. After the digital inputs/outputs, the analog inputs/outputs are sorted into the process image. The status information (EFD, CM, CFGOK, DIAG) is displayed if the option "Process image for status information" (FW V1.1 and higher) is activated, see Table 7-3 "Overview of status information".
- **Packing:**  
Address usage for the inputs/outputs of the slaves is optimized, i.e. all gaps are eliminated and the length of the I/O area is adapted. You can see the selected I/O addresses directly in the address overview of the I/O addresses in the configuration of the CM AS-i master ST.

7.2 Transmitting AS-i digital values

Table 7- 1 Bit assignment per digital slave (CLASSIC sorting)

Byte number <sup>1)</sup>	Bit 7 ... 4				Bit 3 ... 0				
	Bit 3	Bit 2	Bit 1	Bit 0	Bit 3	Bit 2	Bit 1	Bit 0	
n+0	Reserved				Slave 1 or 1A				
n+1	Slave 2 or 2A				Slave 3 or 3A				
n+2	Slave 4 or 4A				Slave 5 or 5A				
n+3	Slave 6 or 6A				Slave 7 or 7A				
n+4	Slave 8 or 8A				Slave 9 or 9A				
n+5	Slave 10 or 10A				Slave 11 or 11A				
n+6	Slave 12 or 12A				Slave 13 or 13A				
n+7	Slave 14 or 14A				Slave 15 or 15A				
n+8	Slave 16 or 16A				Slave 17 or 17A				
n+9	Slave 18 or 18A				Slave 19 or 19A				
n+10	Slave 20 or 20A				Slave 21 or 21A				
n+11	Slave 22 or 22A				Slave 23 or 23A				
n+12	Slave 24 or 24A				Slave 25 or 25A				
n+13	Slave 26 or 26A				Slave 27 or 27A				
n+14	Slave 28 or 28A				Slave 29 or 29A				
n+15	Slave 30 or 30A				Slave 31 or 31A				
n+16	FW V1.0	Reserved				Slave 1B			
	FW V1.1 and higher	EFD	CM	CFGOK	DIAG				
n+17	Slave 2B				Slave 3B				
n+18	Slave 4B				Slave 5B				
n+19	Slave 6B				Slave 7B				
n+20	Slave 8B				Slave 9B				
n+21	Slave 10B				Slave 11B				
n+22	Slave 12B				Slave 13B				
n+23	Slave 14B				Slave 15B				
n+24	Slave 16B				Slave 17B				
n+25	Slave 18B				Slave 19B				
n+26	Slave 20B				Slave 21B				
n+27	Slave 22B				Slave 23B				
n+28	Slave 24B				Slave 25B				
n+29	Slave 26B				Slave 27B				
n+30	Slave 28B				Slave 29B				
n+31	Slave 30B				Slave 31B				
	Bit 3	Bit 2	Bit 1	Bit 0	Bit 3	Bit 2	Bit 1	Bit 0	

1) n = Start address

Table 7- 2 Bit assignment per digital slave (LINEAR sorting)

Byte number <sup>1)</sup>		Bit 7 ... 4				Bit 3 ... 0			
		Bit 3	Bit 2	Bit 1	Bit 0	Bit 3	Bit 2	Bit 1	Bit 0
n+0	FW V1.0	Reserved				Reserved			
	FW V1.1 and higher								
n+1		Slave 1B				Slave 1 or 1A			
n+2		Slave 2B				Slave 2 or 2A			
n+3		Slave 3B				Slave 3 or 3A			
n+4		Slave 4B				Slave 4 or 4A			
n+5		Slave 5B				Slave 5 or 5A			
n+6		Slave 6B				Slave 6 or 6A			
n+7		Slave 7B				Slave 7 or 7A			
n+8		Slave 8B				Slave 8 or 8A			
n+9		Slave 9B				Slave 9 or 9A			
n+10		Slave 10B				Slave 10 or 10A			
n+11		Slave 11B				Slave 11 or 11A			
n+12		Slave 12B				Slave 12 or 12A			
n+13		Slave 13B				Slave 13 or 13A			
n+14		Slave 14B				Slave 14 or 14A			
n+15		Slave 15B				Slave 15 or 15A			
n+16		Slave 16B				Slave 16 or 16A			
n+17		Slave 17B				Slave 17 or 17A			
n+18		Slave 18B				Slave 18 or 18A			
n+19		Slave 19B				Slave 19 or 19A			
n+20		Slave 20B				Slave 20 or 20A			
n+21		Slave 21B				Slave 21 or 21A			
n+22		Slave 22B				Slave 22 or 22A			
n+23		Slave 23B				Slave 23 or 23A			
n+24		Slave 24B				Slave 24 or 24A			
n+25		Slave 25B				Slave 25 or 25A			
n+26		Slave 26B				Slave 26 or 26A			
n+27		Slave 27B				Slave 27 or 27A			
n+28		Slave 28B				Slave 28 or 28A			
n+29		Slave 29B				Slave 29 or 29A			
n+30		Slave 30B				Slave 30 or 30A			
n+31		Slave 31B				Slave 31 or 31A			
		Bit 3	Bit 2	Bit 1	Bit 0	Bit 3	Bit 2	Bit 1	Bit 0

1) n = Start address

**Status information in input process image**

To provide a quick summary diagnosis, the following status information can optionally be transferred to a selectable address in the input process image (FW V1.1 and higher).

Table 7- 3 Overview of status information

EFD	0 = No ground fault detected 1 = Ground fault detected
CM	0 = Master in protected operation 1 = Master in configuration mode
CFGOK	0 = Configuration not OK or slave exists with address 0 1 = Configuration OK
DIAG	0 = No diagnostics pending 1 = Diagnostics pending. This information is set for the following events: -The AS-i master is in "offline" mode. - The AS-i voltage is not OK. - Multiple addressing was detected. - An I/O error was detected. - A configuration error was detected. - A slave with address 0 exists.

**7.2.2 I/O addresses without configuration of the AS-i slaves in STEP 7**

**I/O addresses of the slaves in the process image**

If you configure according to Sections "Configuration of the AS-i slaves using the "SET" button (Page 34)" to "Configuration of the AS-i slaves using the PLC program (Page 36)", the I/O addresses of digital slaves in the process image of the AS-i master are located at a fixed position according to the following table. The I/O data of analog slaves can be accessed via a data record.

Input data and output data of the AS-i slaves are exchanged with the controller via an I/O area of 16 or 32 bytes. As a result, the digital values of up to 62 AS-i slaves are transmitted. In doing so, 4 bits are assigned to each digital slave. The offset for accessing this data depends on the AS-i address of the AS-i slave.

In a project in which the AS-i slaves are not configured in STEP 7, the standard length of the process image is 32 bytes. In firmware V1.1 and higher, the length can be set to 16 or 32 bytes.

In an I/O address area of 16 bytes, you can only assign standard addresses or A addresses for slaves. In an I/O address area of 32 bytes, you can also assign B addresses for slaves.

Table 7- 4 Bit assignment per digital slave

Byte number <sup>1)</sup>	Bit 7 ... 4				Bit 3 ... 0				
	Bit 3	Bit 2	Bit 1	Bit 0	Bit 3	Bit 2	Bit 1	Bit 0	
n+0	Reserved				Slave 1 or 1A				
n+1	Slave 2 or 2A				Slave 3 or 3A				
n+2	Slave 4 or 4A				Slave 5 or 5A				
n+3	Slave 6 or 6A				Slave 7 or 7A				
n+4	Slave 8 or 8A				Slave 9 or 9A				
n+5	Slave 10 or 10A				Slave 11 or 11A				
n+6	Slave 12 or 12A				Slave 13 or 13A				
n+7	Slave 14 or 14A				Slave 15 or 15A				
n+8	Slave 16 or 16A				Slave 17 or 17A				
n+9	Slave 18 or 18A				Slave 19 or 19A				
n+10	Slave 20 or 20A				Slave 21 or 21A				
n+11	Slave 22 or 22A				Slave 23 or 23A				
n+12	Slave 24 or 24A				Slave 25 or 25A				
n+13	Slave 26 or 26A				Slave 27 or 27A				
n+14	Slave 28 or 28A				Slave 29 or 29A				
n+15	Slave 30 or 30A				Slave 31 or 31A				
n+16	FW V1.0	Reserved				Slave 1B			
	FW V1.1 and higher	EFD	CM	CFGOK	DIAG				
n+17	Slave 2B				Slave 3B				
n+18	Slave 4B				Slave 5B				
n+19	Slave 6B				Slave 7B				
n+20	Slave 8B				Slave 9B				
n+21	Slave 10B				Slave 11B				
n+22	Slave 12B				Slave 13B				
n+23	Slave 14B				Slave 15B				
n+24	Slave 16B				Slave 17B				
n+25	Slave 18B				Slave 19B				
n+26	Slave 20B				Slave 21B				
n+27	Slave 22B				Slave 23B				
n+28	Slave 24B				Slave 25B				
n+29	Slave 26B				Slave 27B				
n+30	Slave 28B				Slave 29B				
n+31	Slave 30B				Slave 31B				
	Bit 3	Bit 2	Bit 1	Bit 0	Bit 3	Bit 2	Bit 1	Bit 0	

1) n = Start address

**Status information for process image with 32 bytes**

For a process image that is 32 bytes long, the following information is transferred in byte n+16 (FW V1.1 and higher):

Table 7- 5 Status information in byte n+16 for a process image that is 32 bytes long:

Bit 7: EFD	0 = No ground fault detected 1 = Ground fault detected
Bit 6: CM	0 = Master in protected operation 1 = Master in configuration mode
Bit 5: CFGOK	0 = Configuration not OK or slave exists with address 0 1 = Configuration OK
Bit 4: DIAG	0 = No diagnostics pending 1 = Diagnostics pending. This information is set for the following events: -The AS-i master is in "offline" mode. - The AS-i voltage is not OK. - Multiple addressing was detected. - An I/O error was detected. - A configuration error was detected. - A slave with address 0 exists.

The status information provides a quick summary diagnosis.

If a process image is 16 bytes long, only the first 16 bytes (byte n to byte n+15) are transferred.

### Bit assignment of the process image

In a project in which the AS-i slaves are not configured in STEP 7, 4 bits of digital input data and 4 bits of digital output data are assigned to the process image. I/O bits that are not assigned by the slave contain the substitute value 0. The assignment of the process image depends on the AS-i slave type. For digital slaves with up to 4-bit inputs and 4-bit outputs, the following standard assignment table applies:

Table 7-6 Standard assignment table for inputs/outputs of digital AS-i slaves

IO code (Hex value)	Number Inputs/ outputs	Input process image				Output process image			
		Bit 3	Bit 2	Bit 1	Bit 0	Bit 3	Bit 2	Bit 1	Bit 0
0	4 DI	IN 3	IN 2	IN 1	IN 0	-	-	-	-
1	3 DI / 1 DQ	-	IN 2	IN 1	IN 0	OUT 0	-	-	-
2	4 DI / 1 DQ	IN 3	IN 2	IN 1	IN 0	OUT 0	-	-	-
3	2 DI / 2 DQ	-	-	IN 1	IN 0	OUT 1	OUT 0	-	-
4	4 DI / 2 DQ	IN 3	IN 2	IN 1	IN 0	OUT 1	OUT 0	-	-
5	1 DI / 3 DQ	-	-	-	IN 0	OUT 2	OUT 1	OUT 0	-
6	4 DI / 3 DQ	IN 3	IN 2	IN 1	IN 0	OUT 2	OUT 1	OUT 0	-
7	4 DI/4 DQ	IN 3	IN 2	IN 1	IN 0	OUT 3	OUT 2	OUT 1	OUT 0
8	4 DQ	-	-	-	-	OUT 3	OUT 2	OUT 1	OUT 0
9	1 DI / 3 DQ	IN 0	-	-	-	-	OUT 2	OUT 1	OUT 0
A	1 DI / 4 DQ	IN 0	-	-	-	OUT 3	OUT 2	OUT 1	OUT 0
B	2 DI / 2 DQ	IN 1	IN 0	-	-	-	-	OUT 1	OUT 0
C	2 DI / 4 DQ	IN 1	IN 0	-	-	OUT 3	OUT 2	OUT 1	OUT 0
D	3 DI / 1 DQ	IN 2	IN 1	IN 0	-	-	-	-	OUT 0
E	3 DI / 4 DQ	IN 2	IN 1	IN 0	-	OUT 3	OUT 2	OUT 1	OUT 0

#### Information about the table:

DI: Digital input  
DQ: Digital output

The actual numbering of the inputs/outputs of the AS-i slaves depends on the manufacturer of the slave.

In the case of slaves with extended addressing (A/B slaves), column "Bit 3" of the output process image is not assigned data. Exception: In the case of slaves with profile IO.ID.ID2 = 7.A.7, "Bit 3" of the output process image is also assigned.

In particular, the table does not apply to slaves of Combined Transaction Type (CTT) with profiles 6.0, 7.3, 7.4, 7.5.5, 7.A.5, 7.A.8, 7.A.9, 7.A.A, B.A.5 (IO.ID or IO.ID.ID2), see data sheet of slave. For assignment of safety slaves (profile 0.B and 7.B), see Section 7.2.3 "Special characteristics of AS-i Safety Slaves".

**Configuration example**

The following graphic shows an example of addressing 4 digital slaves. In the example, you configure the start addresses n = 40 for the I/O data in *STEP 7*.

The bits with a gray background are relevant for the user program. The bits with a white background are not relevant for the user program, because AS-i slave bits are not assigned here.

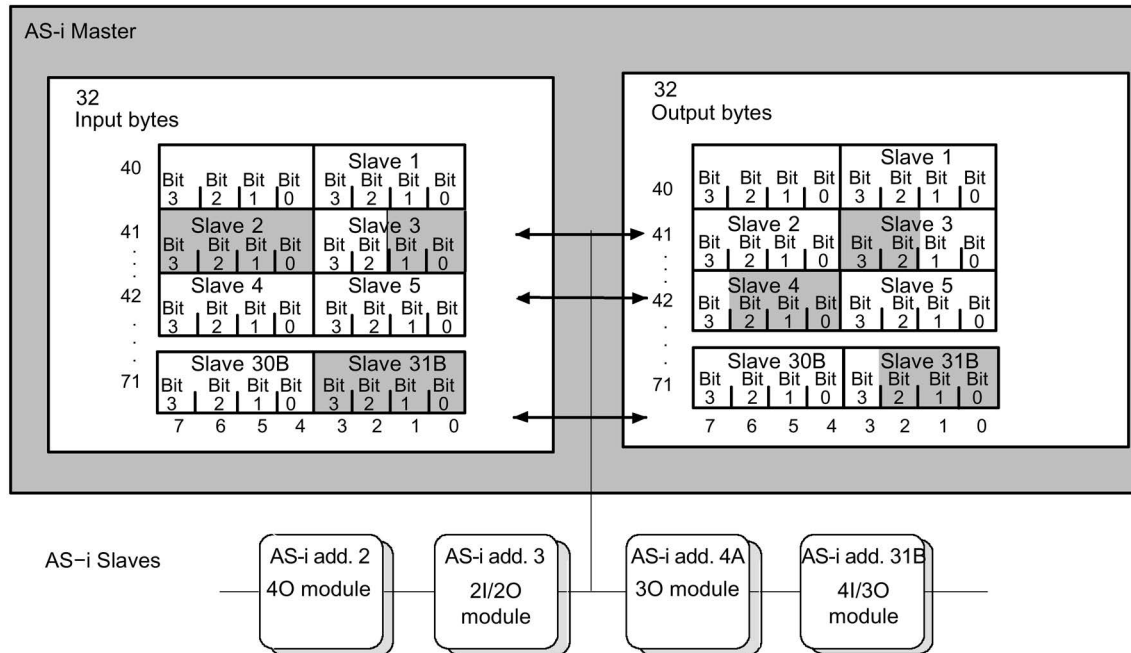


Figure 7-1 Example of addressing 4 digital slaves

The AS-i slave with address 3 and with two inputs and two outputs, referred to as a 2I/2O module, occupies bits 0 and 1 in input byte 41 and bits 2 and 3 in output byte 41 in the graphic, for example.

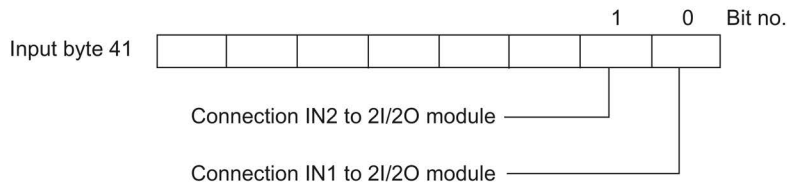


Figure 7-2 Example to show assignment of the AS-i connections of the 2I/2O modules to the data bits of the input bytes for slave with address 3

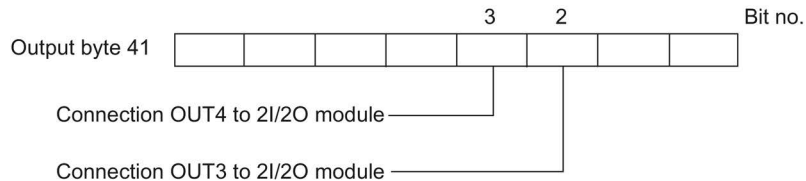


Figure 7-3 Example to show assignment of the AS-i connections of the 2I/2O modules to the data bits of the output bytes for slave with address 3

### 7.2.3 Special characteristics of AS-i Safety slaves

The AS-i master performs a non-safe evaluation for the data of safe input slaves. The evaluation is represented in the process image of a Safety input slave as follows:

Table 7-7 Input process image of a Safety input slave

Bit 3	Bit 2	Bit 1	Bit 0	Meaning
0	0	0	0	All contacts are open.
0	0	0	1	F-IN1 is closed.
0	1	0	0	F-IN2 is closed.
0	1	0	1	F-IN1 and F-IN2 are closed.

In addition, the AS-i master evaluates in a non-safe manner how a safe AS-i output is to be addressed. The information is in the input process image of the standard controller:

Table 7-8 Input process image of the control unit for a safe AS-i output.

Bit 3	Bit 2	Bit 1	Bit 0	Meaning
0	0	0	0	The safe AS-i output is controlled with status OFF position.
1	1	1	1	The safe AS-i output is controlled with status ON position.

---

#### Note

This involves a non-safe evaluation of the safe signals for diagnostic purposes.

Non-safe evaluation must not be used for safety-related switching.

---

#### See also

List of abbreviations (Page 173)

## 7.3 AS-i analog values and transparent / digital values more than 4 bits in length are transferred

The following information only applies to AS-i slaves whose data is stored as analog values or as transparent or digital values more than 4 bits in length.

---

### Note

The CM AS-i Master ST does not support the transmission of analog values in accordance with AS-i Slave Profile 7.1 / 7.2. Transmission of analog values must be implemented in the software for these slaves.

---

### Analog interface between the CPU and the CM AS-i Master ST

In the user program, you use the process image (Firmware V1.1 and higher) or data records to access I/O data of analog slaves.

For more detailed information, refer to Section "Accessing AS-i analog data via the process image (Page 58)".

### Representation of the analog values or the transparent values

The analog values are to be interpreted as 16-bit values in two's complement.

The transparent/digital values must be interpreted as two independent bytes.

In the case of AS-i slave profiles for transparent/digital data, the AS-i master passes through the data of the AS-i slave to the controller without interpreting the content.

For universal AS-i slaves, the following is displayed in the "Configuration" field in *STEP 7*:

- Information about the number of channels
- Information about the resolution
- Information about the data frame of transparent I/O data

In the documentation for the respective AS-i slave, you will find further information about:

- Value range
- Measuring range
- Accuracy of analog slaves
- Meaning of transparent data

### Special cases in analog value transfer

- In the input direction, the AS-i master sends a substitute value in the event of a slave failure or AS-i communication error:
  - For slaves with analog transmission, the AS-i master always supplies the substitute value 7FFF<sub>H</sub>, if the slave fails after power-up of the master.

"Transparent" mode exception:

For slaves according to the following profiles, the AS-i master supplies the substitute value 0000<sub>H</sub>:

  - 7.3.0 to 7.3.3 (Type CTT1, output slave 16 DO in "Transparent" mode)
  - 7.3.8 to 7.3.A (Type CTT1, input slave 16 DI in "Transparent" mode)
  - 7.A.A (CTT3, 8 DI / 8 DO slave with A/B address)
  - 7.A.8 (ID1 = 3, 4, 5) (Type CTT4, max. 16 DI slave with A/B address)
  - 7.A.5, 7.5.5 and B.A.5, if you have transparent input (Type CTT2)
  - 6.0.x where x = 2 ... 7 (Type CTT5, in "Transparent" mode)
- In the output direction, the AS-i master sends logic "0" to all slaves in the event of a failure or in "STOP" state.
- If the AS-i master or the communication between the AS-i master and PLC fails, data record access to the analog values or transparent/digital input values is not possible. Note that the analog input values and transparent/digital input values are not updated in your user program in this case, and ensure a substitute value processing via the program.

<b>NOTICE</b>
<p><b>Behavior in the event of a slave failure</b></p> <p>If the slave fails prior to or during the power-up of the AS-i master, the substitute value 7FFF<sub>H</sub> may also be supplied. That is, the input bits of these transparent or digital slaves have the substitute value 1. For this reason, check whether the diagnostic data of these slaves indicate a slave failure and, if required, ensure an appropriate substitute value processing via the program.</p>

### Special characteristics of combined transaction type slaves

When using slaves in accordance with CTT 1 to 5, all or some I/O bits are used for special transfer functions in the process image for AS-i digital values. For further details, please refer to the documentation of the respective AS-i slave.

The following applies to these protocol bits:

- In the input direction, the AS-i master sets the value "0".
- In the output direction, the AS-i master ignores the bits.

### 7.3.1 Accessing AS-i analog data via the process image

If you assigned I/O addresses to the analog slaves when configuring, you can access the AS-i analog values with word commands (Firmware V1.1 and higher).

#### Analog and transparent I/O addresses for configured AS-i slaves

The analog and transparent I/O addresses of an AS-i slave can be freely assigned within the overall process image of the CM AS-i Master ST. This is regardless of the size of the process image. If you only require a few analog inputs and outputs in the process image and want to save space, you can change the length of the I/O data of an AS-i slave. If the set length is less than the actual length of the I/O data of the AS-i slaves, you cannot access the data at addresses greater than the set length via the process image. You can also deactivate the process image for analog inputs/outputs. Please also see the description of the options "Sorting" and "Packing" in Section I/O addresses when configuring AS-i slaves in STEP 7 (Page 46).

Access to analog I/O data is also possible via data records independent of the process image. You can find more detailed information on this in Section "Accessing AS-i analog data via acyclic services (Page 58)".

### 7.3.2 Accessing AS-i analog data via acyclic services

#### Representation of the analog values in the data records

Analog values are transferred in the data records numbered from 140 to 147.

- You access the analog input values using system functions for reading data records.
- You output analog values using system functions for writing data records.

In combination with SIMATIC S7, system function blocks SFB 52 "RDREC" and SFB 53 "WRREC" enable this.

Access to analog data via acyclic services can also be selected, for example, if there is a need to save I/O address space in SIMATIC S7.

#### NOTICE

##### Simultaneous write access via cyclic and acyclic services not possible

Simultaneous write access to analog data of a slave is not permissible with different process values either via cyclic or acyclic services. If both services are used the analog output values that are output via cyclic and acyclic services to the same slave address must be synchronized with each other via the user program.

You can use data record lengths ranging from 2 bytes to 240 bytes for each data record number. For each slave address, an area of 8 bytes is available to address 4 analog channels.

## 7.3 AS-i analog values and transparent / digital values more than 4 bits in length are transferred

The table below shows which data record is used by each AS-i slave to transfer the analog values. The subsequent table shows the assignment of analog values to the respective analog slaves.

The tables are applicable to analog inputs and analog outputs.

Table 7- 9 Access to analog values via data records

AS-I address of the slave	Start addresses for analog values in the data record							
	DS 140	DS 141	DS 142	DS 143	DS 144	DS 145	DS 146	DS 147
1	0	—	—	—	—	—	—	—
2	8	—	—	—	—	—	—	—
3	16	—	—	—	—	—	—	—
4	24	—	—	—	—	—	—	—
5	32	0	—	—	—	—	—	—
6	40	8	—	—	—	—	—	—
7	48	16	—	—	—	—	—	—
8	56	24	—	—	—	—	—	—
9	64	32	0	—	—	—	—	—
10	72	40	8	—	—	—	—	—
11	80	48	16	—	—	—	—	—
12	88	56	24	—	—	—	—	—
13	96	64	32	0	—	—	—	—
14	104	72	40	8	—	—	—	—
15	112	80	48	16	—	—	—	—
16	120	88	56	24	—	—	—	—
17	128	96	64	32	0	—	—	—
18	136	104	72	40	8	—	—	—
19	144	112	80	48	16	—	—	—
20	152	120	88	56	24	—	—	—
21	160	128	96	64	32	0	—	—
22	168	136	104	72	40	8	—	—
23	176	144	112	80	48	16	—	—
24	184	152	120	88	56	24	—	—
25	192	160	128	96	64	32	0	—
26	200	168	136	104	72	40	8	—
27	208	176	144	112	80	48	16	—
28	216	184	152	120	88	56	24	—
29	224	192	160	128	96	64	32	0
30	232	200	168	136	104	72	40	8
31	—	208	176	144	112	80	48	16

**Examples / notes on reading this table:**

The subsequent table shows the assignment of analog values to the respective analog slaves.

For additional information, refer to the operating instructions of the slaves.

Table 7- 10 Address range for the analog values of an AS-i slave

Byte no. (start address + offset)	Analog value channel
Start address + 0	Channel 1 / high byte
Start address + 1	Channel 1 / low byte
Start address + 2	Channel 2 / high byte
Start address + 3	Channel 2 / low byte
Start address + 4	Channel 3 / high byte
Start address + 5	Channel 3 / low byte
Start address + 6	Channel 4 / high byte
Start address + 7	Channel 4 / low byte

Analog A/B slaves with 2 channels only reserve half the address range. A slaves occupy bytes 0 to 3 and B slaves bytes 4 to 7.

Examples of the configuration:

1. Configuration:

Analog slaves have the AS-i addresses 1 to 6.

You use data record 140 and enter 48 as data record length.

2. Configuration:

1 analog slave with AS-i address 7 is used.

You use data record 141 and enter 24 as data record length. Only bytes 16 to 23 are relevant.

3. Configuration:

The full address range for 31 analog slaves is used.

You use data record 140 and enter 224 as data record length. You can then address analog slaves 1 to 28.

For the remaining analog slaves 29 to 31, you use data record 147 in a second job and enter 24 as data record length.

4. Configuration:

Analog slaves have the addresses 29 to 31.

You use data record 147 and enter 24 as data record length.

Mixed access:

- Configuration:

You want to access slaves 1 to 12 using I/O commands and slaves 13 to 31 using data records.

You use data record 143 for slaves 13 to 31.

# Alarms, faults and system events

## 8.1 Overview

### Diagnostics options

The following diagnostics options are available for the AS-i master:

- LEDs on the module
- Diagnostics in *STEP 7*:
  - Online presentation of the network and device view
  - Diagnostic buffer
- Alarm messages in user program
- Creation of user-specific web pages via the web server of a connected SIMATIC controller

You will find information on the LEDs in Section "Meaning of the LEDs (Page 64)".

The diagnostic possibilities in *STEP 7* and in the user program are described in the following sections.

## 8.2 Diagnostics in STEP 7

### Diagnostics in STEP 7

For diagnostics of the AS-i master and the AS-i slave, use the "Go online" function to switch *STEP 7* to "Online" status.

If you have configured AS-i slaves in *STEP 7*, the diagnostic information about slaves can be displayed in *STEP 7*.

The diagnostics of the AS-i slaves in *STEP 7 V13 SP1* (TIA Portal) are not displayed via the online network view function. The information of the AS-i master is displayed symbolically in the device view. The status of these devices will also be displayed to the right of the device in the project navigation by means of a symbol. For an explanation of the different status symbols, please refer to the relevant tool tip.

*STEP 7* offers several possibilities for requesting the diagnostic information of the AS-i master:

- Special diagnostic symbols indicate the status of the AS-i master in the network view of the device configuration. Red symbols signal an error, and green symbols indicate that the devices are OK.
- In *STEP 7 V13 SP1* (TIA Portal), you can call up information about the status of the AS-i master and AS-i slaves. To do so, open the diagnostics as follows:
  - Select the AS-i master.
  - Select "Online & diagnostics" in the shortcut menu.
  - In the "Online & diagnostics" view, select "Detailed diagnostics > Error overview".

Here you see the current status of every AS-i slave address.

To analyze sporadic errors, you can read out the error counter for the AS-i network.

Diagnostics are also available in *STEP 7 V5.5 HSP 2092 V3.0* and higher.

- The control panel of the AS-i master can also be called up in this display. This shows the status of the LEDs.
- All the relevant events are stored in the diagnostic buffer of the CPU. You can display the diagnostic buffer in the "Online & Diagnostics" window for a selected CPU.

## 8.3 LED statuses

### 8.3.1 Arrangement of the LEDs on the CM AS-i Master ST

#### Introduction

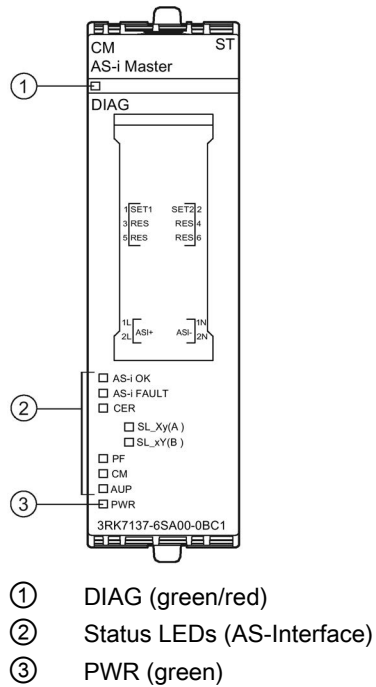


Figure 8-1 Arrangement of the LEDs on the CM AS-i Master ST



## 8.3.2 Meaning of the LEDs

### Meaning of the LEDs

The tables below explain the status and fault indications. Remedies for the diagnostic messages are in Section "Diagnostic messages (Page 69)".





#### "PWR" LED

Table 8- 1 Meaning of the "PWR" LED

PWR	Meaning
 OFF	The AS-i voltage is not provided (terminals L+, M).
 Green ON	The AS-i voltage is provided (terminals L+, M).

#### "DIAG" LED

Table 8- 2 Meaning of the DIAG LED

DIAG	Meaning
 OFF	The supply voltage for the interface module of the ET 200SP is not provided.
 Green flashes	The AS-i master parameters have not been assigned.
 Green ON	The AS-i master parameters have been assigned and are error-free. No diagnostic message of the AS-i master is pending.
 Red flashes	The AS-i master parameters have been assigned and the AS-i master signals diagnostic errors for the AS-i master or an AS-i slave or an active firmware update.

**"AS-i OK" LED**

Table 8- 3 Meaning of the AS-i OK LED

AS-i OK	Meaning
<input type="checkbox"/> OFF	An error has occurred (see AS-i FAULT LED) or the AS-i master is offline. This means: No I/O data exchange is taking place, e.g., during power-up.
<input checked="" type="checkbox"/> Green ON	The AS-i bus is fault-free. I/O data exchange takes place.

**"AS-i FAULT" LED**



Table 8- 4 Meaning of the AS-i FAULT LED

AS-i FAULT	Meaning
<input type="checkbox"/> Red OFF	No AS-i cable faults have occurred. The AS-i master is in "Offline" mode.
<input checked="" type="checkbox"/> Red ON	The AS-i bus has failed, e.g. the supply voltage for AS-Interface is too low, ground fault.
* Red "flashes"	A fault has occurred, e.g. a duplicate address or parameterization error has been detected.

**"PF" LED**

This LED indicates peripheral faults.

Table 8- 5 Meaning of the "PF" LED



PF	Meaning
 Red OFF	No peripheral fault is being signaled.
 Red ON	At least one AS-i slave is signaling a peripheral fault. Refer to the operating instructions for the respective slave for the meaning of the peripheral fault, e.g., overload at the standard outputs and/or overload of the sensor power supply of the standard inputs.

Firmware update (Page 21)

**"CER" LED**

This LED indicates configuration errors. It lights when the slave configuration detected on the AS-i cable does not match the CONFIGURED configuration in the AS-i master.

Table 8- 6 Meaning of the "CER" LED

CER	Meaning
 Yellow OFF	No AS-i configuration error.
 Yellow ON	Failure of an AS-i slave: <ul style="list-style-type: none"> <li>• A configured AS-i slave is not present on the AS-i cable.</li> <li>• An excess slave not configured beforehand is present on the AS-i cable.</li> <li>• A connected slave has different configuration data (IO, ID, ID1, ID2) than the slave configured in the AS-i master.</li> <li>• A slave with address "0" is in "Configuration mode" on the AS-i bus.</li> </ul>

**"CM" LED**

This LED indicates the operating status (Configuration Mode).

Table 8- 7 Meaning of the "CM" LED

CM	Meaning
<input type="checkbox"/> Green OFF	The AS-i master is in "protected operation".
<input checked="" type="checkbox"/> Green ON	The AS-i master is in "configuration mode".
* Green flashes	During a firmware update: Errors have occurred during the firmware update.

**"AUP" LED**

This LED indicates whether automatic address programming is possible or not.

Table 8- 8 Meaning of the "AUP" LED

AUP	Meaning
<input type="checkbox"/> Green OFF	Automatic address programming is not possible. This LED is always off in configuration mode.
<input checked="" type="checkbox"/> Green ON	When the AS-i master is in "protected operation", this LED indicates that automatic address programming of an AS-i slave is possible. Automatic address programming makes it easier to replace a defective AS-i slave on the AS-i cable. For more detailed information, refer to Section "Replacing a defective AS-i slave / automatic address programming (Page 74)".

"SL\_Xy(A)" and "SL\_xY(B)" LEDs

These LEDs indicate the slave addresses to which an error is signaled. The following states are taken into account:

- The slave has failed.
- The slave is an excess slave.
- The slave type is incorrect.
- Double addressing detected.

The following diagram shows the indication sequence:

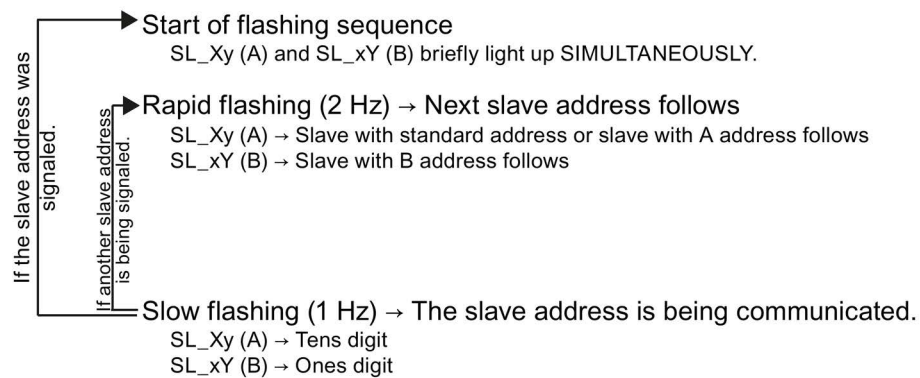


Figure 8-2 Indication sequence

Example: Slave 15 and 21B have failed

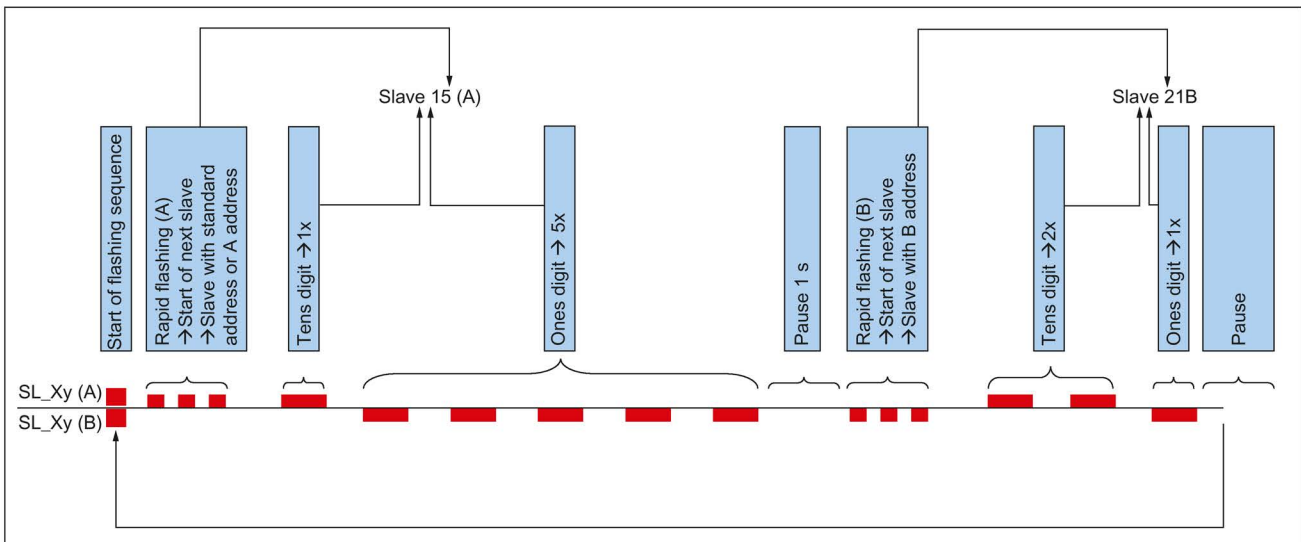


Figure 8-3 Example: Slave 15 and 21B have failed

## 8.4 Diagnostic messages

### 8.4.1 Alarms

The AS-i master sends a diagnostic interrupt request to the CPU in the following situations:

- The AS-i master has detected a problem, e.g. failure of a slave (incoming event).
- The problem was rectified or no longer exists (outgoing event).

If there is no OB 82 in the user program, a CPU of the S7-300 / S7-400 product range will switch to "STOP".

If an OB 82 exists, the operating system responds to an incoming event by calling the OB 82. The S7 CPU then interrupts the cyclic user program and enters the event in the system diagnostic buffer as a "Module fault" message.

Some diagnostic information is made available to the user in the local data of the OB 82, e.g.: Which module triggered the interrupt? What type of error has occurred?

Following execution of the OB 82, the S7 CPU continues the cyclic program from the point of interruption.

When parameterizing the CM AS-i Master ST, you can specify whether and in what cases a diagnostics interrupt should be triggered.

See Section "Parameter assignment/addressing (Page 43)"

See Section "Fault indications/fault remedies (Page 80)" for a list of possible error cases.

### 8.4.2 Possible response to the diagnostic interrupt

Diagnostic events of the AS-i master and all AS-i slaves are signaled by means of OB82, e.g. No voltage on AS-Interface, peripheral fault

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#### Note

##### Diagnostic buffer

Please note that OB 82 is only called for the first error event. If an error caused by an AS-i slave is already active, subsequent AS-i slave errors will only be noted in the diagnostic buffer of the CPU.

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The cause of the interrupt can be determined by reading out data records with diagnostic data during execution of the OB 82 block or during cyclic program execution. See Section "Data records for diagnostics (Page 82)".

### 8.4.3 Error messages

#### AS-i-specific faults

The following AS-i-specific faults are possible:

Channel / Fault type	Fault		Cause	Remedial measures
	No.	Message		
0400 <sub>H</sub>	1024	AS-i slave failed	<p>An AS-i slave on an A address or a slave with standard address has failed. The channel number of the message shows the address of the affected AS-i slave.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>• The slave is defective.</li> <li>• There is a break in the cable</li> <li>• An overload of the sensor supply at the input slave or an overload of the actuator supply</li> <li>• Overload at the output for some slaves</li> </ul>	<p>Check:</p> <ul style="list-style-type: none"> <li>• AS-i slave</li> <li>• Connecting cables</li> <li>• Overload</li> <li>• EMC environment</li> <li>• Connected sensors and actuators</li> </ul>
0401 <sub>H</sub>	1025	AS-i slave on B address failed	<p>An AS-i slave on a B address has failed. The channel number of the message shows the address of the affected AS-i slave.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>• The slave is defective.</li> <li>• The cable is interrupted.</li> <li>• An overload of the sensor supply at the input slave or an overload of the actuator supply</li> <li>• Overload at the output for some slaves</li> </ul>	<p>Check:</p> <ul style="list-style-type: none"> <li>• AS-i slave</li> <li>• Connecting cables</li> <li>• Overload</li> <li>• EMC environment</li> <li>• Connected sensors and actuators</li> </ul>

Channel / Fault type	Fault		Cause	Remedial measures
	No.	Message		
0402 <sub>H</sub>	1026	Peripheral fault in AS-i slave	<p>An AS-i slave on an A address or a slave with a standard address signals a peripheral fault. The channel number of the message shows the address of the affected AS-i slave.</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• An overload at the output of a digital slave or an overload at the actuator</li> <li>• Measuring range exceeded for analog input slaves</li> <li>• Overload of the sensor supply at the input slave (only for some slave types)</li> <li>• Group fault message for M200D motor starters</li> </ul>	<p>Note the information in the manual for the AS-i slave.</p> <p>Check:</p> <ul style="list-style-type: none"> <li>• Slave</li> <li>• Overload</li> <li>• Connected sensors and actuators</li> </ul>
0403 <sub>H</sub>	1027	Peripheral fault in AS-i slave on B address	<p>An AS-i slave on a "B" address signals a peripheral fault. The channel number of the message shows the address of the affected AS-i slave.</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• An overload at the output of a digital slave or an overload at the actuator</li> <li>• Measuring range exceeded for analog input slaves</li> <li>• Overload of the sensor supply at the input slave (only for some slave types)</li> <li>• Group fault message for M200D motor starters</li> </ul>	<p>Note the information in the manual for the AS-i slave.</p> <p>Check:</p> <ul style="list-style-type: none"> <li>• Slave</li> <li>• Overload</li> <li>• Connected sensors and actuators</li> </ul>
0404 <sub>H</sub>	1028	AS-i address used multiple times	<p>Multiple AS-i slaves with the same profile and address are located on the AS-i bus. The affected slaves have a standard address or A address. The channel number of the message shows the address of the affected AS-i slave.</p>	<p>Change the addresses of the AS-i slaves to addresses that are unique in the network.</p>
0405 <sub>H</sub>	1029	AS-i B address used multiple times	<p>Multiple AS-i slaves with the same profile and address are located on the AS-i bus. The affected slaves have a B address. The channel number of the message shows the address of the affected AS-i slave.</p>	<p>Change the addresses of the AS-i slaves to addresses that are unique in the network.</p>

Channel / Fault type	Fault		Cause	Remedial measures
	No.	Message		
0406 <sub>H</sub>	1030	No or erroneous voltage on the AS-i cable	The AS-i master has detected insufficient voltage on the AS-i cable. Data exchange on the AS-Interface has been stopped.	Check: <ul style="list-style-type: none"> <li>• Voltage</li> <li>• Polarity on AS-i cable</li> <li>• Power supply</li> </ul>
0407 <sub>H</sub>	1031	AS-i configuration error (CER)	The ACTUAL configuration of the AS-i slaves on the AS-i cable differs from the CONFIGURED configuration saved in the AS-i master. Possible causes of short-term failures: <ul style="list-style-type: none"> <li>• High levels of electromagnetic interference are affecting the AS-i installation.</li> </ul> Other possible causes: <ul style="list-style-type: none"> <li>• The functional ground connection to the AS-i power supply unit or AS-i data decoupling module is not connected to ground potential.</li> <li>• Protected operation: <p>A configured slave has failed or there is an excess slave on the bus.</p> </li> <li>• Configuration mode: <p>A slave with address "0" has been detected on the bus.</p> </li> </ul>	Check: <ul style="list-style-type: none"> <li>• AS-i slave failure</li> <li>• Overload</li> <li>• Excess slave</li> <li>• Incorrect address</li> <li>• Incorrect slave type</li> <li>• EMC environment</li> </ul> Remove the electromagnetic interference.
0408 <sub>H</sub>	1032	Ground fault on AS-i cable	A ground fault is present between AS-i+ and ground or between AS-i- and ground. Possible consequences: <ul style="list-style-type: none"> <li>• Disruption of communication</li> <li>• Slave failure</li> <li>• Configuration error</li> <li>• Hazard as a result of secondary faults</li> </ul>	Check: <ul style="list-style-type: none"> <li>• Insulation fault on AS-i cable</li> <li>• Sensor/actuator cable</li> </ul> Ensure that the ground fault is rectified.
040A <sub>H</sub>	1034	Excess AS-i slave	There is an unconfigured AS-i slave with a default address or an A address on the AS-i bus. The channel number of the message shows the address of the affected AS-i slave.	Change the CONFIGURED configuration in the AS-i master or remove the AS-i slave.
040B <sub>H</sub>	1035	Excess AS-i slave at B address	On the AS-i bus there is an unconfigured AS-i slave with a B address. The channel number of the message indicates the B address of the affected AS-i slave	Change the CONFIGURED configuration in the AS-i master or remove the AS-i slave.

Channel / Fault type	Fault		Cause	Remedial measures
	No.	Message		
040C <sub>H</sub>	1036	Incorrect AS-i slave	On the AS-i bus there is an incorrect AS-i slave with a default address or an A address. The channel number of the message shows the address of the AS-i slave involved.	<ul style="list-style-type: none"> <li>• Use the correct slave type.</li> <li>• Set the ID1 code on the slave in accordance with the CONFIGURED configuration.</li> </ul>
040D <sub>H</sub>	1037	Incorrect AS-i slave at B address	There is an incorrect AS-i slave with a B address on the AS-i bus. The channel number indicates the B address of the affected slave.	<ul style="list-style-type: none"> <li>• Use the correct slave type.</li> <li>• Set the ID1 code on the slave in accordance with the CONFIGURED configuration.</li> </ul>

## 8.5 Replacing a defective AS-i slave / automatic address programming

### Automatic address programming after failure of one or more AS-i slaves - replacement of AS-i slave

The "Automatic address programming" function allows you to easily replace defective AS-i slaves.

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#### Note

##### Automatic address programming

Automatic address programming is only possible if the AS-i master is operating in "protected operation" and **one or more** AS-i slaves have failed.

If several AS-i slaves have failed, you must uniquely identify the failed slaves in the configuration using the slave profile:

- IO code
- ID code
- ID2 code
- ID1 code

The automatic address programming function also supports slaves with the "CTT5" profile (multi-address slaves) and AS-i devices that contain multiple internal slave addresses. This requires each internal slave to have different identifications (IO code, ID code, ID2 code, and ID1 code).

---

#### Note

The automatic address programming function does not work if two identical slaves have failed.

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Examples of devices with multiple internal slave addresses which support automatic address programming:

- Module K60 with 8DI/2DO (3RK2400-1HQ00-0AA3)
- Motor Starter M200D AS-i Standard (3RK1325-...).

If no address has yet been assigned to these devices (delivery state), only **one** address "0" is visible on the bus. The device automatically suppresses the other internal "0" addresses.

**Note****Exceptions**

The automatic address programming function is not available for the following devices, because the identifications of each internal slave are identical (IO code, ID code, ID2 code, and ID1 code).

- Module K60 with 8 DI (3RK1200-0DQ00-0AA3, 3RK2200-0DQ00-0AA3, 3RK2200-1DQ00-1AA3)
  - Safety-related module K45 with 4 F-DI (3RK1205-0CQ00-0AA3).
- 

**Detection of a defective AS-i slave**

An illuminated "AUP" LED signals the following in "protected operation":

- Slave failure was detected:
  - Exactly **one** slave has failed, or
  - A device containing multiple different slaves has failed, **or**
  - Multiple slaves or devices have failed, each of the failed slaves having a different configuration
- Automatic address programming by the AS-i master is possible.

If an AS-i slave fails, the AS-i master indicates the address of the failed slave via the "SL\_Xy (A)" and "SL\_xY (B)" LEDs.

If a device with multiple internal slave addresses fails, the AS-i master indicates the failure of multiple slaves.

**Replacement of a defective AS-i slave**

- Replace the defective AS-i slave with an **identical** AS-i slave with address "0" (setting in delivery state).
  - Replace the defective AS-I device containing multiple internal slave addresses with an identical AS-i device with address "0" on all internal slaves (setting in delivery state).
- 

**Note****Replacement of a defective AS-i slave**

Only one address "0" may be configured on the bus at any one time. If you want to replace several slaves or devices, you must replace them one after the other with the AS-i master switched on.

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For the new slave or device, the AS-i master programs the address or addresses of the original failed device.

The LEDs "AUP" and "CER" go out once all slaves have been correctly replaced.

## 8.6 Duplicate address detection

To ensure that the AS-Interface system functions correctly, all the AS-i slaves must have a unique AS-i address on the bus.

If the same AS-i address is assigned to one or more slaves, this incorrect assignment is referred to herein as a duplicate address.

---

### Note

For slaves without cyclic data communication, the duplicate address detection function of the CM AS-i master ST cannot be executed.

---

### **Duplicate addresses where slave types are different and where the states at the inputs are different.**

As part of standard operation, the AS-i master monitors the data exchange for errors and thus often excludes slaves with a duplicate address automatically from the cyclic data exchange. This is the case for duplicate addresses in which the slave types are different (profile identification IO code, ID code, ID2 code, and ID1 code) and duplicate addresses for slaves having a different status at their inputs.

In "protected operation", this fault condition is displayed on the AS-i master as a configuration error with the relevant AS-i address and the affected slaves detect a communication error.

### **Duplicate addresses where the slave types are identical and where the states at the inputs are identical or there are no inputs.**

The duplicate address detection function of the CM AS-i Master ST also detects cases of slaves with duplicate address in which the cyclic data exchange is not excluded by standard mechanisms. Such cases include duplicate addresses in which the slave types are identical (profile identification, IO code, ID code, ID2 code, and ID1 code) and in which the slaves either have the same status at their inputs or have no inputs (output slaves).

When a duplicate address is detected, the AS-i master signals a duplicate address error and automatically resets the output data of the address concerned to "0" so that the outputs of the affected slaves are switched off. Communication with the affected slaves is not interrupted, i.e. the slaves do not signal a communication error.

**Note****System behavior according to AS-i specification**

If you connect a slave with duplicate address to the AS-i cable while the bus is operating, the added slave is initially excluded from cyclic data communication and its LEDs indicate a communication error. According to the specification, the AS-i master does not activate an AS-i slave until its address is recognized as a new address on the bus, e.g., when a power-up of the bus takes place. If the bus contains an active slave, no further automatic slave activation occurs on the same address during operation, even if an additional slave with the same address (duplicate address) is added.

However, manual activation of the the slave can be initiated via the command interface by writing parameters to the slave address.

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For physical reasons, the duplicate address detection function of the CM AS-i Master ST cannot detect a duplicate address during cyclic data exchange in every configuration. Therefore, like for any AS-i system, it is essential to ensure when assigning AS-i addresses that each AS-i slave contains a unique AS-i address on the bus, e.g., by using addressing device 3RK1904-32AB02.

The duplicate address detection function can assist in identifying inadvertent duplicate addressing.

The duplicate address detection of the CM AS-i Master ST from firmware V1.1 and higher has been optimized for an AS-i cable length up to 100 m without branches.

The duplicate address detection function of firmware V1.0 is designed for shorter cable lengths.

The duplicate address detection function can be used in the specified and additional configurations, but it cannot be guaranteed that duplicate addresses will be uniquely detected in every case.

For configurations with an AS-i repeater, the duplicate address detection function does not work due to the separation of the cable into multiple segments.

**Enabling the duplicate address detection function**

For the CM AS-i master ST with firmware V1.1 and higher, the duplicate address detection function is activated in the configuration via HW Config or the GSD setting. After a start or restart of the CM AS-i Master ST V1.1 and higher, the setting is accepted from HW Config or the GSD setting.

For the CM AS-i master ST with firmware V1.0 and higher, the duplicate address detection function is deactivated when the AS-i master is switched on and can be set by writing data record DS 100, see Section "DS 100 Switch duplicate address detection on/off (Page 171)". The activation status is saved in volatile memory of the AS-i master. After a startup or restart of the CM AS-i Master ST V1.0, the duplicate address detection function must be activated via the user program, if required.

## Function description

The duplicate address detection function assists you in identifying inadvertent duplicate addressing.

When commissioning the AS-i system, check that duplicate address detection can be used for the AS-i configuration used.

- Install the complete AS-i system and ensure that the specified addresses of the slaves are correct and unique.
- Enable the duplicate address detection function. In firmware V1.1 and higher, you can do this for AS-i voltages of either 24 V or 30 V.
- Check whether the CM AS-i Master ST signals a duplicate address in spite of correct slave address assignment. If a duplicate address is signaled on the AS-i master even though the bus configuration is correct, this means that duplicate address detection cannot be used for this bus configuration. Should this occur, disable the duplicate address detection function.
- Note that when the duplicate address detection function is enabled, the presence of a duplicate address may not be detected, depending on the bus configuration.

---

### Note

The activation status is saved in volatile memory of the AS-i master. After a startup or restart of the CM AS-i Master ST, duplicate address detection must be activated again via the user program, if required.

---

The CM AS-i Master ST signals a detected duplicate address as follows:

- The "CER" LED lights up to indicate a configuration error.
- The "SL\_Xy (A)" and "SL\_xY (B)" LEDs signal the AS-i address concerned.
- The message "AS-i address used multiple times" is output.

To rectify the fault, check and change the address of the affected AS-i slave, e.g. using the addressing unit. Via the online function of *STEP 7* it is not possible to change the AS-i address of an individual slave if there are multiple slaves with the same address on the AS-i cable.

## See also

DS 100 Read setting for duplicate address detection (Page 172)

## 8.7 Diagnosis via the web server

### Web server functionality

Many SIMATIC controllers provide integrated web server functionality. This enables access via a web browser to the data of the CPU and its connected components, e.g. the AS-i master.

A *STEP 7* library is available as a download for diagnosing the AS-i master via a web browser. It presents the most important diagnostic information in a clear overview. The package is based on the concept of user-defined web pages. You can obtain the package from the Siemens Service & Support Portal under the following link:

Service and support portal (<http://support.automation.siemens.com/WW/view/en/50897766>)

## 8.8 Fault indications/fault remedies

### Fault indications/remedies for faults on the CM AS-i Master ST

Below are possible fault indications during operation of the AS-i master and potential remedial measures.

Table 8-9 Fault indications and remedies for faults on the AS-i Master

Fault	Possible cause	Remedy
"AS-i fault" LED lights up red	The current consumption of the AS-i slaves is too high. Result: Voltage on the AS-i cable is too low.	Check the current consumption of the AS-i slaves.
	No voltage is present on the AS-i cable or the voltage is too low.	Check the connection with the AS-i power supply unit.
	Short-circuit on the AS-i cable	Check the AS-i cable and the connected AS-i slaves.
"DIAG" LED not lit	There is no supply over the communications bus.	Check whether the module is inserted correctly.
"DIAG" LED flashes green, but does not switch to constant green light	The AS-i master is not configured.	Configure the AS-i master in <i>STEP 7</i> .
"CER" LED is lit.	A configured AS-i slave has failed. <ul style="list-style-type: none"> <li>Evaluate the slave indication.</li> </ul>	Replace the defective AS-i slave or configure the AS-i master again if the AS-i slave is not required.
	A non-configured AS-i slave was connected to the AS-i cable.	Remove the AS-i slave or configure the AS-i master again.
	An AS-i slave has been connected whose configuration data, e.g., IO code, ID codes, does not match the values of the configured AS-i slave.	Check whether an incorrect AS-i slave has been connected. Configure the AS-i master again, if necessary.
"CER" LED flashes erratically, i.e. a configured AS-i slave fails sporadically.	Loose connection	Check the connections of the AS-i slaves.
	Injection of interference on the AS-i cable.	Check that the grounding of the AS-i master and routing of the AS-i cable are correct. Check whether the shield of the AS-i power supply unit is connected correctly.
	The connected sensor is causing an overload.	Check the sensor and the sensor cable for damage.
The AS-i master does not switch from "configuration mode" to "protected operation".	An AS-i slave with address 0 is connected to the AS-i cable. The AS-i master is unable to switch to "protected operation" as long as this slave is connected.	Remove the AS-i slave with address 0 or set the correct address using the AS-i addressing device.
In <i>STEP 7</i> it is not possible to switch between "configuration mode" and "protected operation"	The automation system is in the "RUN" state.	Switch the automation system to the "STOP" state.

<b>Fault</b>	<b>Possible cause</b>	<b>Remedy</b>
The AS-i master does not switch from "protected operation" to "configuration mode".	The automation system is in the "RUN" state.	Switch the automation system to the "STOP" state.
Automatic address programming does not take place.	The configuration data, e.g., IO code, ID code, ID2 code, and ID1 code, of the replaced AS-i slave does not match the values of the original slave.	Check that the correct replacement slave was used. Compare the manufacturer's information with regard to configuration data. If the original slave is to be replaced by a different type, assign the address with the AS-i addressing device and configure the AS-i master again.
	Replaced AS-i slave does not have the address "0".	Set the address of the replaced slave with the AS-i addressing device.
	Replaced AS-i slave is not correctly connected or is defective.	Check the connections of the slave. Replace the slave, if necessary.
	The AS-i master is in "configuration mode".	Program the address of the new AS-i slave with the AS-i addressing device or via the command interface of the AS-i master.
	Several slaves with the same profile have failed.	Program the addresses of the new AS-i slaves with the AS-i addressing device.
No LEDs are lit, except possibly for the "DIAG" LED	The AS-i voltage is missing.	
"PF" LED is lit	One or more AS-i slaves signal a fault in the connected I/O.	Check the I/O components connected to the AS-i slaves and the cabling for wire break or short-circuit.

## Reference

You will find further information about the LEDs on the AS-i master in Section "Meaning of the LEDs (Page 64)".

## 8.9 Data records for diagnostics

### 8.9.1 DS 92 Diagnostic data record (FW V1.1 and higher)

The operating status of the AS-i master, the connected AS-i network and the AS-i slave is stored as diagnostic data record DS 92 in the CM AS-i Master ST module.

#### Description

This data record provides information about the status of an AS-i network.

Table 8- 10 Structure of diagnostic data record DS 92, read

Byte	Description							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved							
1	Reserved							
2	MA30V	MA24V	Res.	Res.	Res.	MADDR	PF	CER
3	Reserved				EFD	CM	CFGOK	DIAG
4	<b>Flags_1</b> (See Table "AS-i master flags")							
5	<b>Flags_2</b> (See Table "AS-i master flags")							
6	Reserved							
7	Reserved							
<b>Slave diagnostics</b>								
8 ... 15	List of active slaves (see Table "Structure of bit fields")							
	Bit = 0	Slave is not in the list of active slaves.						
	Bit = 1	Slave is in the list of active slaves.						
16 ... 23	List of failed slaves (see Table "Structure of bit fields")							
	Bit = 0	The configured slave has not failed.						
	Bit = 1	The configured slave has failed.						
24 ... 31	List of incorrect slaves (see Table "Structure of bit fields")							
	Bit = 0	The profile of the connected slave is correct.						
	Bit = 1	The profile of the connected slave is incorrect.						
32 ... 39	List of excess slaves (see Table "Structure of bit fields")							
	Bit = 0	The connected slave is configured or no slave is connected.						
	Bit = 1	The connected slave is not configured.						
40 ... 47	List of multiple addressing (see Table "Structure of bit fields")							
	Bit = 0	The AS-i address is not assigned or is only assigned once.						
	Bit = 1	The AS-i address is assigned more than once.						
48 ... 55	List of I/O errors (see Table "Structure of bit fields")							
	Bit = 0	The slave at the AS-i address does not have an I/O error.						
	Bit = 1	The slave at the AS-i address has an I/O error.						

Byte	Description							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
56 ... 63	List of configured ID = A (see Table "Structure of bit fields")							
	Bit = 0	A standard slave is configured at the AS-i address.						
	Bit = 1	An A/B slave is configured at the AS-i°address.						
64 ... 71	List of actual ID = A (see Table "Structure of bit fields")							
	Bit = 0	A standard slave is connected at the AS-i address.						
	Bit = 1	An A/B slave is connected at the AS-i°address.						
72 ... 79	List of detected slaves (see Table "Structure of bit fields")							
	Bit = 0	No slave detected at the AS-i°address.						
	Bit = 1	Slave detected at the AS-i°address.						
80 ... 87	List of configured slaves (see Table "Structure of bit fields")							
	Bit = 0	No slave configured at the AS-i°address.						
	Bit = 1	Slave configured at the AS-i°address.						

#### Structure of the bit fields:

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	SLAVE 7/7A	SLAVE 6/6A	SLAVE 5/5A	SLAVE 4/4A	SLAVE 3/3A	SLAVE 2/2A	SLAVE 1/1A	SLAVE 0/Reserved
1	SLAVE 15/15A	SLAVE 14/14A	SLAVE 13/13A	SLAVE 12/12A	SLAVE 11/11A	SLAVE 10/10A	SLAVE 9/9A	SLAVE 8/8A
2	SLAVE 23/23A	SLAVE 22/22A	SLAVE 21/21A	SLAVE 20/20A	SLAVE 19/19A	SLAVE 18/18A	SLAVE 17/17A	SLAVE 16/16A
3	SLAVE 31/31A	SLAVE 30/30A	SLAVE 29/29A	SLAVE 28/28A	SLAVE 27/27A	SLAVE 26/26A	SLAVE 25/25A	SLAVE 24/24A
4	SLAVE 7B	SLAVE 6B	SLAVE 5B	SLAVE 4B	SLAVE 3B	SLAVE 2B	SLAVE 1B	Reserved
5	SLAVE 15B	SLAVE 14B	SLAVE 13B	SLAVE 12B	SLAVE 11B	SLAVE 10B	SLAVE 9B	SLAVE 8B
6	SLAVE 23B	SLAVE 22B	SLAVE 21B	SLAVE 20B	SLAVE 19B	SLAVE 18B	SLAVE 17B	SLAVE 16B
7	SLAVE 31B	SLAVE 30B	SLAVE 29B	SLAVE 28B	SLAVE 27B	SLAVE 26B	SLAVE 25B	SLAVE 24B

**Explanation of bit information in bytes 2 and 3:**

MA30V	= 0	Multiple address detection for AS-i 30 V is deactivated.
	= 1	Multiple address detection for AS-i 30 V is activated.
MA24V	= 0	Multiple address detection for Power24V is deactivated.
	= 1	Multiple address detection for Power24V is activated.
MADDR	= 0	No multiple addresses detected on the AS-i° cable.
	= 1	Multiple addressing detected for at least one AS-i address on the AS-i cable. This means that multiple slaves have the same AS-i address.
PF	= 0	No I/O errors detected.
	= 1	I/O errors detected.
CER	= 0	No AS-i configuration errors detected.
	= 1	AS-i configuration errors detected.
EFD	0 =	No ground fault detected
	1 =	Ground fault detected
CM	0 =	Master in protected operation
	1 =	Master in configuration mode
CFGOK	0 =	Configuration not OK or slave exists with address 0.
	1 =	Configuration OK
DIAG	0 =	No diagnostics pending
	1 =	Diagnostics pending. It is set when: <ul style="list-style-type: none"><li>• The AS-i master is in "offline" mode.</li><li>• The AS-i voltage is not OK.</li><li>• Multiple addresses were detected.</li><li>• An I/O error was detected.</li><li>• A configuration error was detected.</li><li>• A slave with address 0 exists.</li></ul>

**AS-i master flags:**

Flag	Bit	Name of the bit	Meaning
Flag_1	0	Config_OK	The flag is set when the CONFIGURED configuration and the ACTUAL configuration match.
	1	LDS.0	The flag is set when an AS-i slave with address 0 is present. (List of Detected Slaves)
	2	Auto_Address_Assign	The flag is set if automatic address programming is possible. This means that AUTO_ADDR_ENABLE = 1 and no "incorrect" AS-i slaves is connected to AS-Interface.
	3	Auto_Address_Available	The flag is set when automatic address programming is performed as soon as a slave with a valid configuration is connected at address zero.
	4	Configuration_Active	The flag is set in "configuration mode" and reset in "protected operation".
	5	Normal_Operation_Active	The flag is set when the AS-i master is in "protected operation".
	6	APF	The flag is set when the voltage on the AS-i cable is too low, or a power down was detected during data transmission. (AS-i Power Fail)
	7	Offline_Ready	The flag is set if the offline phase is active.
Flag_2	0	Periphery_OK	The flag is set if none of the AS-i slaves signal a peripheral fault. All bits in the LPF are zero.
	1	Data_Exchange_Active	Controlling: When the flag is set, data transfer starts between the master and slave.
	2	Off_Line	Controlling: When the flag is set, the device is switched "OFFLINE" or is "Offline".
	3	AUTO_ADDR_ENABLE	The flag is set when automatic address programming is enabled by the user.
	4	GROUND_FAULT	The flag is set if a ground fault has been detected on the AS-i cable.
	5	EEPROM_OK	The flag is set if the test of the internal EEPROM was successful.
	6	EFD_Disable	The flag indicates whether ground fault detection is switched on (BIT = 0) or off (BIT = 1).
	7	Reserved	--

## 8.9.2 DS 96 Read AS-i master error counters and status messages (FW V1.1 and higher)

### Meaning

This data record reads out error counters that pertain to the overall AS-i network.

If the AS-i power supply is missing, the overall device fails. This leads to all counters being reset. The count starts again each time the device is powered up.

Table 8- 11 Meaning of error counter

Count value / Information	Meaning
AS-i Power Fail	The count value is incremented when the AS-i power supply drops to a value that is too low.
Ground fault	The count value is increased when a ground fault has been detected on the AS-i cable.
Slave failure	The count value is increased when an active slave fails, that is, when process data transmission has been interrupted. An active slave only fails when it does not respond to six consecutive master calls.
Missing slave message frame	The count value is increased when a slave does not respond to a master call or the master does not receive the response. Process data transmission is not interrupted in this case.
Erroneous slave message frame	The count value is increased when the master receives an incomplete slave response, such as when slaves are added during operation. Process data transmission is not interrupted in this case.
I/O fault	The count value is increased when a slave signals an I/O error.
Protocol error	The count value is increased when the master detects a transmission error for a slave that needs multiple cycles for transmission of data, e.g. for analog data.
Erroneous master frame	The count value is incremented when a master call cannot be sent correctly, e.g. in the event of strong interfering signals on the AS-i cable. Process data transmission is not interrupted in this case.
Sent master frames	<p>Number of master frames</p> <p>This counter counts all frames sent by the master, regardless of whether or not a slave response was received.</p> <p>The total number of master frames is calculated as follows:  <math>MT\_CNT\_TOTAL = (MT\_CNT\_HIGH \times MT\_CNT\_BASE) + MT\_CNT\_LOW</math></p> <p>The error count starts over each time the device is powered up.</p> <p>By dividing the absolute values of the error counters by the number of master frames, it is possible to calculate the percentage of errors and thus the error frequency.</p>

Table 8- 12 Structure of the data record

Byte	Meaning		
0	Reserved		High byte
1			Low byte
2	Summation counter: AS-i Power Fail		High byte
3			Low byte
4	Summation counter: Ground fault		High byte
5			Low byte
6	Summation counter: Slave failure		High word, high byte
7			High word, low byte
8			Low word, high byte
9			Low word, low byte
10	Summation counter: Missing slave frame		High word, high byte
11			High word, low byte
12			Low word, high byte
13			Low word, low byte
14	Summation counter: Erroneous slave frame		High word, high byte
15			High word, low byte
16			Low word, high byte
17			Low word, low byte
18	Summation counter: Slave peripheral fault		High word, high byte
19			High word, low byte
20			Low word, high byte
21			Low word, low byte
22	Summation counter: Slave protocol error (for slaves according to CTT1 ... CTT5)		High word, high byte
23			High word, low byte
24			Low word, high byte
25			Low word, low byte
26	Summation counter: Erroneous master frame		High word, high byte
27			High word, low byte
28			Low word, high byte
29			Low word, low byte
30 ... 37	List of count values > 0 (see "Structure of bit fields")		
	Bit = 0	Count value = 0 for all error counters of the AS-i address	
	Bit = 1	Count value > 0 for at least one error counter of the AS-i address	
38	Summation counter: Sent master frames, less significant part (MT_CNT_LOW)		High word, high byte
39			High word, low byte
40			Low word, high byte
41			Low word, low byte
42	Summation counter: Sent master frames, more significant part (MT_CNT_HIGH)		High word, high byte
43			High word, low byte
44			Low word, high byte
45			Low word, low byte

Byte	Meaning	
46	Summation counter: Sent master frames, factor (MT_CNT_BASE)	
47		
48		
49		
50	Reserved	Bit 0 = MADDR
51	Reserved	
52 ... 59	List of multiple addressing (see Table "Structure of bit fields")	
	Bit = 0	The AS-i address is assigned once or is not present.
	Bit = 1	The AS-i address is assigned more than once.

The counters are integer values (2 bytes or 4 bytes).

**Structure of the bit fields:**

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	SLAVE 7/7A	SLAVE 6/6A	SLAVE 5/5A	SLAVE 4/4A	SLAVE 3/3A	SLAVE 2/2A	SLAVE 1/1A	SLAVE 0/Reserved
1	SLAVE 15/15A	SLAVE 14/14A	SLAVE 13/13A	SLAVE 12/12A	SLAVE 11/11A	SLAVE 10/10A	SLAVE 9/9A	SLAVE 8/8A
2	SLAVE 23/23A	SLAVE 22/22A	SLAVE 21/21A	SLAVE 20/20A	SLAVE 19/19A	SLAVE 18/18A	SLAVE 17/17A	SLAVE 16/16A
3	SLAVE 31/31A	SLAVE 30/30A	SLAVE 29/29A	SLAVE 28/28A	SLAVE 27/27A	SLAVE 26/26A	SLAVE 25/25A	SLAVE 24/24A
4	SLAVE 7B	SLAVE 6B	SLAVE 5B	SLAVE 4B	SLAVE 3B	SLAVE 2B	SLAVE 1B	Reserved
5	SLAVE 15B	SLAVE 14B	SLAVE 13B	SLAVE 12B	SLAVE 11B	SLAVE 10B	SLAVE 9B	SLAVE 8B
6	SLAVE 23B	SLAVE 22B	SLAVE 21B	SLAVE 20B	SLAVE 19B	SLAVE 18B	SLAVE 17B	SLAVE 16B
7	SLAVE 31B	SLAVE 30B	SLAVE 29B	SLAVE 28B	SLAVE 27B	SLAVE 26B	SLAVE 25B	SLAVE 24B

**Explanation of the status bits**

- MADDR = 0 No multiple addressing detected on the AS-i° cable.
- = 1 Multiple addressing detected for at least one AS-i address on the AS-i cable.  
This means that multiple slaves have the same AS-i address.

### 8.9.3 DS 97 Read and reset AS-i master error counters (FW V1.1 and higher)

#### Description

This data record functions in the same manner as the "DS 96 Read AS-i slave error counters" data record. After the DS 97 data record is read, all error counters in the AS-i master are reset to "0".

The structure of the DS 97 data record is identical to the structure of the DS 96 data record. For an explanation of the error counter see Section "DS 96 Read AS-i master error counters and status messages (FW V1.1 and higher) (Page 86)".

### 8.9.4 DS 150 to DS 153 Read AS-i error counters

These data records read the error counters of the AS-i slaves. Data records DS 150 and DS 151 access the standard addresses and the A addresses. Data records DS 152 and DS 153 access the B addresses. The counters for addresses 16 / 16A exist identically in data records DS 150 and DS 151. The counters for address 16B exist identically in data records DS 152 and DS 153.

#### Error counter

The CM AS-i Master ST module manages several counters internally which log the number of master frames sent and the number of different error occurrences.

These counter values can be read out using data records DS 150 to DS 153:

- DS 150 contains counter values for slave addresses 1(A) to 16(A).
- DS 151 contains counter values for slave addresses 16(A) to 31(A).
- DS 152 contains counter values for slave addresses 1B to 16B
- DS 153 contains counter values for slave addresses 16B to 31B

Each data record also contains the total count of master frames sent. To determine a relative error rate, divide the count of error occurrences by the number of master frames sent.

The bus system allows the automatic sending of repeat message frames. This ensures that the process data is reliably transferred between master and slave in the industrial environment, even in the case of brief interruptions in transmission, e.g. due to switching operations. If the fault limit value is exceeded, or the slave is not functioning correctly due to a defect, communication to the slave cannot be performed within the defined time period. In this case, transmission of the process data is interrupted. The master signals failure of the slave address and tries to establish communication again.

8.9 Data records for diagnostics

Under error-free conditions, one master frame is sent to every available slave address for cyclic data transfer per AS-i bus cycle. The addressed slave responds with a corresponding slave frame. Depending on the configuration of the bus, between 1 and 31 slaves are addressed in each AS-i bus cycle. This results in a maximum bus cycle time of 5 ms. When two slaves with extended addressing have the same numerical address, but one is the A address and one the B address, these two slaves are automatically addressed in two consecutive bus cycles. It can be assumed that around 64 000 master frames are sent per second.

Table 8- 13 Meaning of error counter

Count value / Information	Meaning
Slave failure	The count value is increased when an active slave fails, that is, when process data transmission has been interrupted. An active slave only fails when it does not respond to six consecutive master calls.
Missing slave frame	The count value is increased when a slave does not respond to a master call or the master does not receive the response. Transmission of process data is not interrupted in this case.
Erroneous slave frame	The count value is increased when the master receives an incomplete slave response, such as when slaves are added during operation. Transmission of process data is not interrupted in this case.
I/O fault	The count value is increased when a slave signals an I/O error.
Protocol error	The count value is increased when the master detects a transmission error for a slave that needs multiple cycles for transmission of data, e.g. for analog data.
Erroneous master frame	The count value is incremented when a master call cannot be sent correctly, e.g. in the event of strong interfering signals on the AS-i cable. Transmission of process data is not interrupted in this case.
Sent master frames	<p>Number of master frames</p> <p>This counter counts all frames sent by the master, regardless of whether or not a slave response was received.</p> <p>The total number of master frames is calculated as follows:</p> $MT\_CNT\_TOTAL = (MT\_CNT\_HIGH \times MT\_CNT\_BASE) + MT\_CNT\_LOW$ <p>The error count starts over each time the device is powered up.</p> <p>By dividing the absolute values of the error counters by the number of master frames, it is possible to calculate the percentage of errors and thus the error frequency.</p>

Table 8- 14 Slave address structure of the counters

Byte	Counter	
0	Counter: Slave failure	High byte
1		Low byte
2	Counter: Missing slave frame	High byte
3		Low byte
4	Counter: Erroneous slave frame	High byte
5		Low byte
6	Counter: I/O fault	High byte
7		Low byte
8	Counter: Protocol error	High byte
9		Low byte
10	Counter: Erroneous master frame	High byte
11		Low byte

The counters are integer values (2 bytes).

Table 8- 15 Master frame structure of the counters

Byte	Meaning	
0	Summation counter: Sent master frames, less significant part (MT_CNT_LOW)	High word, high byte
1		High word, low byte
2		Low word, high byte
3		Low word, low byte
4	Summation counter: Sent master frames, more significant part (MT_CNT_HIGH)	High word, high byte
5		High word, low byte
6		Low word, high byte
7		Low word, low byte
8	Summation counter: Sent master frames, factor (MT_CNT_BASE)	High word, high byte
9		High word, low byte
10		Low word, high byte
11		Low word, low byte

The counters are integer values (4 bytes).

8.9.4.1 DS 150 Read AS-i slave error counters 1/1A to 16/16A

Table 8- 16 Structure of data record DS 150

Byte	Meaning
0	Version High
1	Version Low
2 ... 13	Counter for slave address 1 / 1A
14 ... 25	Counter for slave address 2 / 2A
26 ... 37	Counter for slave address 3 / 3A
38 ... 49	Counter for slave address 4 / 4A
50 ... 61	Counter for slave address 5 / 5A
62 ... 73	Counter for slave address 6 / 6A
74 ... 85	Counter for slave address 7 / 7A
86 ... 97	Counter for slave address 8 / 8A
98 ... 109	Counter for slave address 9 / 9A
110 ... 121	Counter for slave address 10 / 10A
122 ... 133	Counter for slave address 11 / 11A
134 ... 145	Counter for slave address 12 / 12A
146 ... 157	Counter for slave address 13 / 13A
158 ... 169	Counter for slave address 14 / 14A
170 ... 181	Counter for slave address 15 / 15A
182 ... 193	Counter for slave address 16 / 16A
194 ... 205	Master frame counter

### 8.9.4.2 DS 151 Read AS-i slave error counters 16/16A to 31/31A

Table 8- 17 Structure of data record DS 151

Byte	Meaning
0	Version High
1	Version Low
2 ... 13	Counter for slave address 16 / 16A
14 ... 25	Counter for slave address 17 / 17A
26 ... 37	Counter for slave address 18 / 18A
38 ... 49	Counter for slave address 19 / 19A
50 ... 61	Counter for slave address 20 / 20A
62 ... 73	Counter for slave address 21 / 21A
74 ... 85	Counter for slave address 22 / 22A
86 ... 97	Counter for slave address 23 / 23A
98 ... 109	Counter for slave address 24 / 24A
110 ... 121	Counter for slave address 25 / 25A
122 ... 133	Counter for slave address 26 / 26A
134 ... 145	Counter for slave address 27 / 27A
146 ... 157	Counter for slave address 28 / 28A
158 ... 169	Counter for slave address 29 / 29A
170 ... 181	Counter for slave address 30 / 30A
182 ... 193	Counter for slave address 31 / 31A
194 ... 205	Master frame counter

**8.9.4.3 DS 152 Read AS-i slave error counters 1B to 16B**

Table 8- 18 Structure of data record DS152

Byte	Meaning
0	Version High
1	Version Low
2 ... 13	Counter for slave address 1B
14 ... 25	Counter for slave address 2B
26 ... 37	Counter for slave address 3B
38 ... 49	Counter for slave address 4B
50 ... 61	Counter for slave address 5B
62 ... 73	Counter for slave address 6B
74 ... 85	Counter for slave address 7B
86 ... 97	Counter for slave address 8B
98 ... 109	Counter for slave address 9B
110 ... 121	Counter for slave address 10B
122 ... 133	Counter for slave address 11B
134 ... 145	Counter for slave address 12B
146 ... 157	Counter for slave address 13B
158 ... 169	Counter for slave address 14B
170 ... 181	Counter for slave address 15B
182 ... 193	Counter for slave address 16B
194 ... 205	Master frame counter

#### 8.9.4.4 DS 153 Read AS-i slave error counters 16B to 31B

Table 8- 19 Structure of data record DS 153

Byte	Meaning
0	Version High
1	Version Low
2 ... 13	Counter for slave address 16B
14 ... 25	Counter for slave address 17B
26 ... 37	Counter for slave address 18B
38 ... 49	Counter for slave address 19B
50 ... 61	Counter for slave address 20B
62 ... 73	Counter for slave address 21B
74 ... 85	Counter for slave address 22B
86 ... 97	Counter for slave address 23B
98 ... 109	Counter for slave address 24B
110 ... 121	Counter for slave address 25B
122 ... 133	Counter for slave address 26B
134 ... 145	Counter for slave address 27B
146 ... 157	Counter for slave address 28B
158 ... 169	Counter for slave address 29B
170 ... 181	Counter for slave address 30B
182 ... 193	Counter for slave address 31B
194 ... 205	Master frame counter

### 8.9.5 DS 154 Delete AS-i error counters (from FW V1.1)

#### Description

When writing this data record all the error counters are reset.

The content of the data record has to be filled with zero values.

Table 8- 20 Structure of DS 154 write

Byte	Meaning
0	0
1	0
2	0
3	0

# Using the command interface

## 9.1 Introduction

You control the behavior of the AS-i master in your user program entirely through the command interface.

This chapter contains the information you need for accessing the command interface of the CM AS-i Master ST.

## 9.2 Command interface with SIMATIC S7

### Instruction "ASI\_CTRL"

The instruction "ASI\_CTRL" is available for controlling the command interface. You will find this instruction in *STEP 7* in the task card "Instructions" under "Advanced instructions" > "Distributed I/O" > "Others" > "ASI".

For detailed instructions on using the instruction "ASI\_CTRL", see: ASI\_CTRL (<http://support.automation.siemens.com/WW/view/en/51678777>).

## 9.3 Command interface with controllers of other manufacturers

### Functional principle

AS-i commands are read and written via the acyclic services of PROFINET/PROFIBUS. You use the "Read\_data\_record" and "Write\_data\_record" (data record 2) services in the user program of the IO controller/DP master for this.

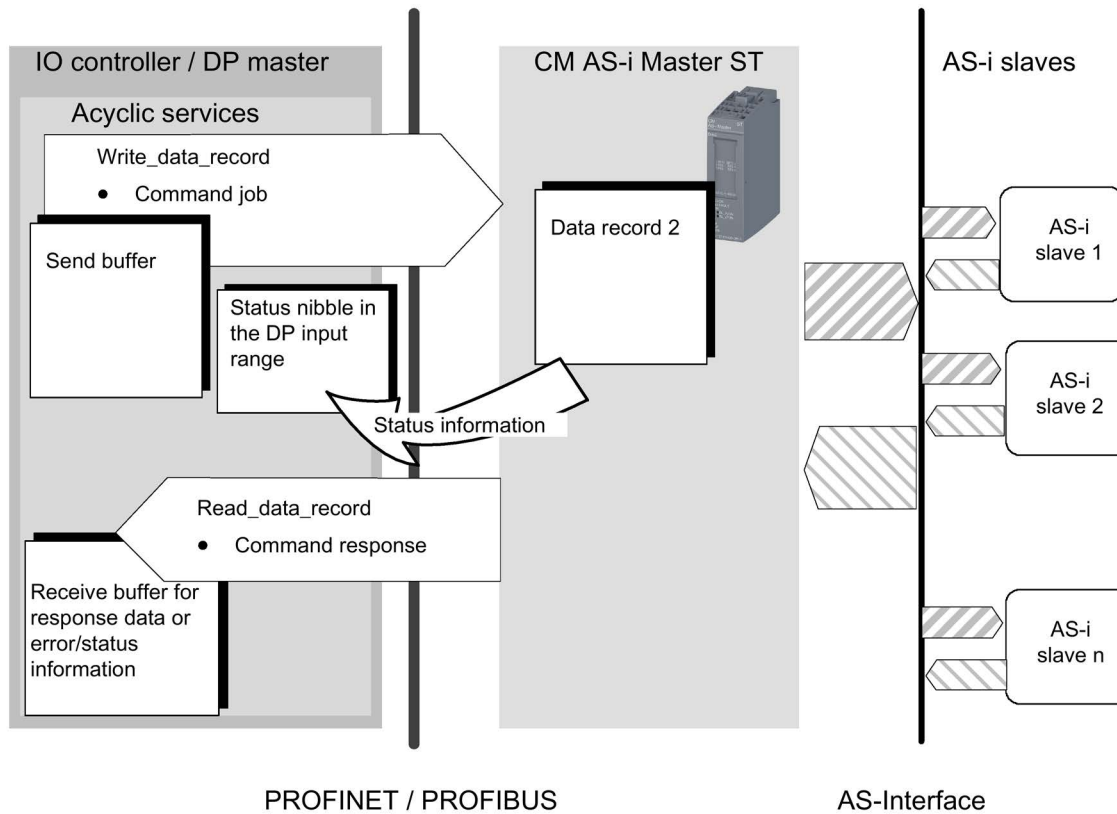


Figure 9-1 Functional principle

### Job parameters

You assign parameters for the "Read\_data\_record" and "Write\_data\_record" jobs. The following parameters control the issuance of the commands:

- Index:
  - Defines the data record number = 2
- Length:
  - With "Write\_data\_record", you specify the length of the send data depending on the command.
  - With "Read\_data\_record", the CM AS-i Master ST signals the length of the receive data via the status nibble.

## Command processing in the user program

Structure the command processing in the user program as follows:

1. Specify the command call (Page 103) in a send buffer in the user program.
2. Send this data record call to the CM AS-i Master ST with `Write_data_record` (data record 2).
3. Then, query the status of the command processing in the input range for digital values (cyclic services). The status information is stored in the first byte reserved for it (byte 0) in bits 4 to 7 of the input range (status nibble).
4. Different reactions occur depending on the result of the status evaluation. You can find these in the following sequence chart. Details on the meaning of the status nibble can be found in the "Coding of the status nibble" table.

To complete the command processing, you must always issue a `Read_data_record` (data record 2) job either to obtain further information or to apply the response data.

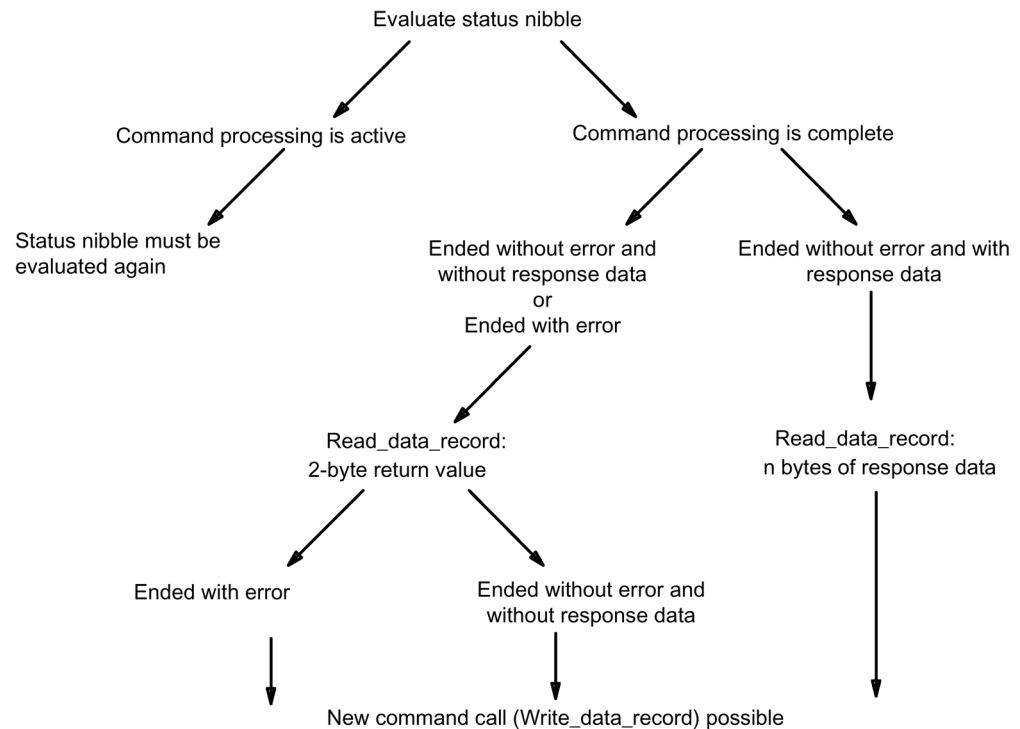


Figure 9-2 Flowchart

Table 9- 1 Coding of the status nibble

Status nibble (byte 1 of the digital input data)				Meaning
Bit 7	Bit 6	Bit 5	Bit 4	
1	0	0	0	Startup detection 1: The status nibble switches between the values 1000 <sub>B</sub> and 1110 <sub>B</sub> following a startup/restart of the AS-i master. Initiation of a command by the user program is possible.
1	1	1	0	Startup detection 2: The status nibble switches between the values 1000 <sub>B</sub> and 1110 <sub>B</sub> following a startup/restart of the AS-i master. Initiation of a command by the user program is possible.
1	1	0	0	Reserved for SIMATIC S7 use FB ASI_CTRL Initiation of a command by the user program is possible.
0	0	1	0	The command processing is active Initiation of a command by the user program is not possible.
0	0	0	1	Command processing has ended. An asynchronous read access can be used to retrieve a <b>2-byte</b> return value from the AS-i master. Two cases are distinguished here: <ul style="list-style-type: none"> <li>The return value is 0: A command without response data has been ended without errors.</li> <li>The return value is a value <b>other than 0</b>: The command has been ended <b>with error</b> (see "Return value in response buffer" table).</li> </ul> Initiation of a new command by the user program is possible.
0	0	1	1	Command processing has been ended without errors. An asynchronous read access can be used to retrieve <b>1 byte</b> of response data from the AS-i master. Initiation of a new command by the user program is possible.
0	1	0	1	Command processing has been ended without errors. An asynchronous read access can be used to retrieve <b>4 bytes</b> of response data from the AS-i master. Initiation of a new command by the user program is possible.
0	1	1	1	Command processing has been ended without errors. An asynchronous read access can be used to retrieve <b>14 bytes</b> of response data from the AS-i master. Initiation of a new command by the user program is possible.
1	0	0	1	Command processing has been ended without errors. An asynchronous read access can be used to retrieve <b>16 bytes</b> of response data from the AS-i master. Initiation of a new command by the user program is possible.
1	0	1	1	Command processing has been ended without errors. An asynchronous read access can be used to retrieve <b>32 bytes</b> of response data from the AS-i master. Initiation of a new command by the user program is possible.

Status nibble (byte 1 of the digital input data)				Meaning
Bit 7	Bit 6	Bit 5	Bit 4	
1	1	0	1	Command processing has been ended without errors. An asynchronous read access can be used to retrieve <b>56 bytes</b> of response data from the AS-i master. Initiation of a new command by the user program is possible.
1	1	1	1	Command processing has been ended without errors. An asynchronous read access can be used to retrieve <b>221 bytes</b> of response data from the AS-i master. Initiation of a new command by the user program is possible.
0	1	0	0	Job processing is complete. The response data or return value of the previous job has already been read by the user. Initiation of a new command by the user program is possible.

### Example

The table below indicates the behavior of the status nibble display as a result of the device status and the command processing in the user program:

	Action	Response in the status nibble
1.	Switching on the AS-i voltage of the CM AS-i Master ST.	1110 <sub>B</sub> ... 1000 <sub>B</sub> ... 1110 <sub>B</sub> ...
2.	The user program transfers a command (e.g., Write_parameter) to the CM AS-i Master ST with an asynchronous write access.	0010 <sub>B</sub> (briefly, dependent on command)
3.	The AS-i master ends the command. The user program can read the return value	0001 <sub>B</sub>
4.	The user program reads the 2 byte return value with an asynchronous read access.	0100 <sub>B</sub>
5.	... Further program processing ...	...
6.	The user program transfers a command (e.g., Read_expanded_lists_and_flags) to the CM AS-i Master ST with an asynchronous write access.	0010 <sub>B</sub> (briefly, dependent on command)
7.	The AS-i master ends the command without errors. The user program can read the response data.	1011 <sub>B</sub>
8.	The user program reads 32 bytes of response data with an asynchronous read access.	1011 <sub>B</sub>

**Return value**

Processing errors are itemized in the return value of the response buffer, if necessary. An error indication exists when "ended without error and without response data or ended with error" is displayed in the status nibble (coding: 0001<sub>H</sub>).

Table 9- 2 Return value in the response buffer

STATUS	Meaning
0000 <sub>H</sub>	<b>Job completed without errors</b>
8381 <sub>H</sub>	The AS-i slave address is incorrect.
8382 <sub>H</sub>	The AS-i slave is not activated (not in LAS).
8383 <sub>H</sub>	Error on the AS-Interface
8384 <sub>H</sub>	The command is not permitted in the current state of the AS-i master.
8385 <sub>H</sub>	An AS-i slave with address 0 exists.
8386 <sub>H</sub>	The AS-i slave has impermissible configuration data (IO, ID, ID2, or ID1 code).
83A1 <sub>H</sub>	The referenced AS-i slave was not found on the AS-Interface.
83A2 <sub>H</sub>	An AS-i slave with address 0 exists.
83A3 <sub>H</sub>	An AS-i slave with the new address already exists on the AS-Interface.
83A4 <sub>H</sub>	The AS-i slave address cannot be deleted.
83A5 <sub>H</sub>	The AS-i slave address cannot be set.
83A6 <sub>H</sub>	The AS-i slave address cannot be permanently saved.
83A7 <sub>H</sub>	Error while reading the ID1 code
83A8 <sub>H</sub>	The destination address is not plausible: e.g. a B slave address is used for a standard slave.
83B1 <sub>H</sub>	A length error occurred during the string transfer in accordance with Profile 7.4.
83B2 <sub>H</sub>	A protocol error occurred during the string transfer in accordance with Profile 7.4.
83C0 <sub>H</sub>	The AS-i slave has an invalid profile, e.g. the standard slave or A slave is configured at a B address.
83C1 <sub>H</sub>	The standard slave cannot be configured, because the B address is already assigned.
83F8 <sub>H</sub>	The job number or the job parameter is not known.
83F9 <sub>H</sub>	The AS-i master has detected an EEPROM error.

**Note**

Errors that occur during processing of acyclic services and are reported via call parameters, such as "Return Value", can be found in the documentation of the relevant programming interface.

## 9.4 Description of the AS-i commands

### Overview

The commands that the user program can issue to the CM AS-i Master ST are described below. With these commands, the AS-i master makes available the complete functionality of the M4 master profile of the AS-i master specification.

#### Note

##### Adaptations when using existing user programs

Please observe the following adaptations when using existing user programs:

For some commands of the CM AS-i Master ST, the command numbers have been changed and the data structures belonging to the command have been optimized compared to other AS-i masters (e.g., DP/AS-i LINK Advanced).

The following table provides an overview of the modified command numbers:

Command name	Coding for DP/AS-i LINK Advanced	Coding for CM AS-i Master ST
No. A5: Set_Permanent_Configuration (Page 112)	25 <sub>H</sub>	A5 <sub>H</sub>
No. A6: Get_Permanent_Configuration (Page 113)	26 <sub>H</sub>	A6 <sub>H</sub>
No. A8: Read_Actual_Configuration (Page 115)	28 <sub>H</sub>	A8 <sub>H</sub>
No. A9: Set_LPS (Page 116)	29 <sub>H</sub>	A9 <sub>H</sub>
No. B0: Get_LPS, Get_LAS, Get_LDS, Get_Flags (Page 122)	30 <sub>H</sub>	B0 <sub>H</sub>
No. B9: Read_overall_configuration (Page 125)	39 <sub>H</sub>	B9 <sub>H</sub>
No. BA: Write_overall_configuration (Page 131)	3A <sub>H</sub>	BA <sub>H</sub>
No. BE: Get_LPF (Page 147)	3E <sub>H</sub>	BE <sub>H</sub>
No. CA: Read_Error_Counter (Page 152)	4A <sub>H</sub>	CA <sub>H</sub>
No. CB: Read_and_Delete_AS-i-Master_Error_Counter (Page 155)	4B <sub>H</sub>	CB <sub>H</sub>
No. CC: Read_AS-i_error_counter (Page 156)	4C <sub>H</sub>	CC <sub>H</sub>
No. CD: Read_and_delete_AS-i_Slave_error_counter (Page 157)	4D <sub>H</sub>	CD <sub>H</sub>

The following table lists the commands that can be executed with the CM AS-i Master ST.

Table 9- 3 AS-i commands

Name	Parameters	Return value	Coding
No. 00: Set_Permanent_Parameter (Page 107)	Slave address, parameter	—	00 <sub>H</sub>
No. 01: GET_Permanent_Parameter (Page 108)	Slave address	Parameter	01 <sub>H</sub>
No. 02: Write_Parameter (Page 109)	Slave address, parameter	Optional: Parameter echo	02 <sub>H</sub>
No. 03: Read_Parameter (Page 110)	Slave address	Parameter value	03 <sub>H</sub>
No. 04: Store_Actual_Parameters (Page 111)	—	—	04 <sub>H</sub>
No. A5: Set_Permanent_Configuration (Page 112)	Slave address, configuration data to be configured	—	A5 <sub>H</sub>
No. A6: Get_Permanent_Configuration (Page 113)	Slave address	Configured configuration data	A6 <sub>H</sub>
No. 07: Store_Actual_Configuration (Page 114)	—	—	07 <sub>H</sub>
No. A8: Read_Actual_Configuration (Page 115)	Slave address	ACTUAL configuration	A8 <sub>H</sub>
No. A9: Set_LPS (Page 116)	LPS	—	A9 <sub>H</sub>
No. 0A: SET_Offline_Mode (Page 117)	Mode	—	0A <sub>H</sub>
No. 08: Set_Auto_Address_Enable (Page 118)	Mode	—	0B <sub>H</sub>
No. 0C: Set_Operation_Mode (Page 119)	Mode	—	0C <sub>H</sub>
No. 0D: Change_AS-i-Slave_Address (Page 120)	Address 1, Address 2	—	0D <sub>H</sub>
No. 0F: Read_Status (Page 121)	Slave address	Error data record of AS-i slave	0F <sub>H</sub>
No. B0: Get_LPS, Get_LAS, Get_LDS, Get_Flags (Page 122)	—	LDS, LAS, LPS, flags	B0 <sub>H</sub>
No. B9: Read_overall_configuration (Page 125)	—	ACTUAL configuration data, actual parameters, LAS, flags	B9 <sub>H</sub>
No. BA: Write_overall_configuration (Page 131)	Overall configuration	—	BA <sub>H</sub>
No. 3C: Set_PI (Page 138)	Parameter list	—	3C <sub>H</sub>
No. 33: AS-i Parameter Echolist (Page 141)	—	Parameter echo list	33 <sub>H</sub>
No. 44: Read_Write_CTT2_String (Page 142)	Slave address CTT2 string	CTT2 string	44 <sub>H</sub>
No. 14: Read_Version (Page 144)	—	Version string	14 <sub>H</sub>
No. 17: Read_ID_Code (Page 144)	Slave address	ID code	17 <sub>H</sub>
No. 37: Read_ID1-Code (Page 145)	Slave address	ID1 code	37 <sub>H</sub>
No. 3F: Write ID1-Code (Page 145)	ID1 code	—	3F <sub>H</sub>
No. 38: Read_ID2-Code (Page 146)	Slave address	ID2 code	38 <sub>H</sub>
No. 18: Read_IO-Code (Page 146)	Slave address	IO code	18 <sub>H</sub>
No. BE: Get_LPF (Page 147)	—	LPF	BE <sub>H</sub>

Name	Parameters	Return value	Coding
No. 40: Write_Parameter_String (Page 148)	Slave address, parameter string	—	40 <sub>H</sub>
No. 41: Read_String (Page 149)	Slave address	Parameter string	41 <sub>H</sub>
No. 42: Read_String (Page 150)	Slave address	Identification string	42 <sub>H</sub>
No. 43: Read_String (Page 151)	Slave address	Diagnostics string	43 <sub>H</sub>
No. CA: Read_Error_Counter (Page 152)	—	—	CA <sub>H</sub>
No. CB: Read_and_Delete_AS-i-Master_Error_Counter (Page 155)	—	—	CB <sub>H</sub>
No. CC: Read_AS-i_error_counter (Page 156)	Slave address	—	CC <sub>H</sub>
No. CD: Read_and_delete_AS-i_Slave_error_counter (Page 157)	Slave address	—	CD <sub>H</sub>
No. 13: Activate_ground fault detection (reset EFD) (Page 158)	Mode	—	13 <sub>H</sub>
No. D0: Set_Configuration_Online (Page 159)	Slave address, configuration data to be configured, parameters	—	D0 <sub>H</sub>
No. D1: AS-i-Slave_ID1_schreiben_mit_Zieladresse (Write ID1 code with destination address) (Page 160)	Address, ID1 code	—	D1 <sub>H</sub>

### General structure of the send buffer

The basic structure of the send buffer for commands is shown below.

The length of the job data depends on the respective command. Some commands do not require any job data. In this case, the send buffer only has one byte (byte 0).

Table 9- 4 Basic structure of the send buffer for commands

Byte	Meaning
0	Number of the command
1	<b>Job data</b>
...	<b>Job data</b>

### General structure of the receive buffer

The basic structure of the receive buffer for commands is shown below. The length of the response data depends on the respective command.

Some commands do not supply any response data. In this case, there is no receive buffer.

Table 9- 5 Basic structure of the receive buffer

Byte	Meaning
0	Response data
1	Response data
...	Response data

### General operating state of the AS-i slave address

If an AS-i slave must be addressed in a command or in a response, it must be addressed as follows:

Table 9- 6 Structure of the AS-i slave address

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	Select bit	Slave address				

The Select bit for the selection of the slave type is specified as follows:

- Select bit = 0  
AS-i slave with standard-address (0 to 31) or AS-i slave with extended address in address area A (1A to 31A)
- Select bit = 1:  
AS-i slave with extended address in address area B (1B to 31B)

## 9.4.1 No. 00: Set\_Permanent\_Parameter

### Meaning

This command configures a parameter value for the specified AS-i slave in the AS-i master. The value is stored in the non-volatile EEPROM of the CM AS-i Master ST. The parameter value is additionally forwarded to the addressed AS-i slave.

However, the "parameter echo" of the AS-i slave cannot be read out with this command (see No. 02: Write\_Parameter (Page 109) command).

---

#### Note

##### Use of other Siemens AS-i masters

Other Siemens AS-i masters do not transfer the configured parameters to the AS-i slave immediately.

For AS-i slaves that meet the AS-i standard slave profile 7.4, this command is not permitted. For these slaves, the AS-i master itself administers the parameter assignment of the AS-i slave. In this case, the configured parameters are always equal to F<sub>H</sub>.

---

#### Note

##### Configuration data are overwritten

If you configure the AS-i slaves using HW Config, there is normally no need to use the command described here.

If you use this command, you will overwrite the respective configuration data that resulted from SET button configuration or HW Config configuration.

When this command is executed, the AS-i master switches to the offline phase and then switches back to "normal operation". The AS-i master restarts.

---

### Structure of the job data in the send buffer

Table 9- 7 Structure of the job data in the send buffer

Byte	Meaning		
	Bit 7	Bit 4	Bit 3
0	Command number: 00 <sub>H</sub>		
1	Slave address		
2	0	Parameters	

### 9.4.2 No. 01: GET\_Permanent\_Parameter

#### Significance

This command reads a slave-specific parameter value that has been saved in EEPROM of the CM AS-i Master ST.

#### Structure of the job data in the send buffer

Table 9- 8 Structure of the job data in the send buffer

Byte	Significance
0	Command number: 01 <sub>H</sub>
1	Slave address

#### Structure of the reply data in the receive buffer

Table 9- 9 Structure of the reply data in the receive buffer

Byte	Significance			
	Bit 7	Bit 4	Bit 3	Bit 0
0	0			Configured parameters

### 9.4.3 No. 02: Write\_Parameter

#### Meaning of the command

The command transfers an AS-i slave parameter value. The AS-i master subsequently makes a parameter call to the addressed AS-i slave and passes the parameter value to the AS-i slave in this call. The slave sends the parameter echo as receipt acknowledgment to the master. The value of the parameter echo is sent in the reply data of the command.

The parameter value is only stored in the volatile memory of the AS-i master and is not transferred to the EEPROM as a configured parameter!

The AS-i slave can provide any parameter echo value. As a general rule, the returned parameter echo value is not a "mirror image" of the parameter value that is sent by the master to the slave. If necessary, refer to the documentation of the AS-i slave to ascertain whether the echo value has a special meaning.

This command is not permissible for AS-i slaves that meet AS-i slave standard profile 7.4. For these slaves, the AS-i master itself administers the AS-i slave parameter assignment.

#### Structure of the job data in the send buffer

Table 9- 10 Structure of the job data in the send buffer

Byte	Meaning		
	Bit 7	Bit 4	Bit 3
0	Command number: 02 <sub>H</sub>		
1	Slave address		
2	0	Parameter value	

#### Structure of the response data in the receive buffer

Table 9- 11 Structure of the response data in the receive buffer

Byte	Meaning		
	Bit 7	Bit 4	Bit 3
0	0	Parameter echo	

### 9.4.4 No. 03: Read\_Parameter

#### Meaning

This command returns the parameter value (ACT parameter) active in the slave.

The returned parameter value corresponds to the value that was transferred from the master to the slave in the last parameter call. Because read-back of the parameter value from the AS-i slave is not possible according to the AS-i specification, the master stores the parameter values of all slaves internally in a volatile memory as "ACT parameters". The command reads out the ACT parameter value from the memory, so that the command is executed without a query from the AS-i slave.

You must not confuse this value with the parameter echo that the AS-i slave supplies as reply to Write\_Parameter.

#### Structure of the job data in the send buffer

Table 9- 12 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 03 <sub>H</sub>
1	Slave address

#### Structure of the response data in the receive buffer

Table 9- 13 Structure of the response data in the receive buffer

Byte	Meaning			
	Bit 7	Bit 4	Bit 3	Bit 0
0	0			Parameters

## 9.4.5 No. 04: Store\_Actual\_Parameters

### Meaning

This command overwrites the configured parameters stored in the EEPROM with the current ACTUAL parameters stored in volatile memory of the AS-i slave. As a result, the ACTUAL parameters in the non-volatile memory of the master are stored as the configuration definition for the next time the slaves are powered up.

The AS-i master parameterizes the AS-i slaves itself in the case of AS-i slaves that meet AS-i slave standard profile 7.4. The configured parameters for these AS-i slaves are always equal to F<sub>H</sub>.

### Structure of the job data in the send buffer

Table 9- 14 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 04 <sub>H</sub>

### 9.4.6 No. A5: Set\_Permanent\_Configuration

#### Meaning

With this command, the following configuration data are configured for the addressed AS-i slave:

- IO code
- ID code
- ID1 code
- ID2 code

The configuration data are stored in the non-volatile EEPROM of the CM AS-i Master ST. The AS-i master uses these configuration data as the specified expected configuration data for "protected operation". The configuration data are defined by the manufacturer of the AS-i slave. The meaning of the configuration data is described in the "AS-Interface Complete Specification".

If the addressed AS-i slave does not support ID code 1 or ID code 2, the value F<sub>H</sub> must be specified for this in the command.

When this command is executed, the AS-i master switches to the offline phase and then switches back to "normal operation". The AS-i master restarts.

This command is not executed in "protected operation".

---

#### Note

##### Configuration data are overwritten

If you configure the AS-i slaves using HW Config, there is normally no need to use the command described here.

If you use this command, you will overwrite the respective configuration data that resulted from SET button configuration or HW Config configuration.

---

#### Structure of the job data in the send buffer

Table 9- 15 Structure of the job data in the send buffer

Byte	Meaning			
	Bit 7	Bit 4	Bit 3	Bit 0
0	Command number: A5 <sub>H</sub>			
1	Slave address			
2	IO code		ID code	
3	ID1 code		ID2 code	

## 9.4.7 No. A6: Get\_Permanent\_Configuration

### Meaning

The configuration data (configured CONF data) of an addressed AS-i slave stored on the EEPROM of the AS-i master are read with this command:

- IO code
- ID code
- ID1 code
- ID2 code

The configuration data are defined by the manufacturer of the AS-i slave. The meaning of the configuration data is described in the "AS-Interface Complete Specification".

### Structure of the job data in the send buffer

Table 9- 16 Structure of the job data in the send buffer

Byte	Meaning
0	Command number A6 <sub>H</sub>
1	Slave address

### Structure of the response data in the receive buffer

Table 9- 17 Structure of the response data in the receive buffer

Byte	Meaning			
	Bit 7	Bit 4	Bit 3	Bit 0
0	IO code			ID code
1	ID1 code		ID2 code	
2	0			
3	0			

### 9.4.8 No. 07: Store\_Actual\_Configuration

#### Meaning

The following ACTUAL configuration data of all AS-i slaves is obtained from the AS-i master:

- Slave profile (IO, ID, ID2 codes)
- ID1 code

This command saves the obtained ACTUAL configuration data as CONF configuration data in the non-volatile EEPROM. The List of activated AS-i slaves (LAS) is also loaded into the List of configured AS-i slaves (LPS).

When this command is executed, the AS-i master switches to the offline phase and then switches back to "protected operation". The AS-i master restarts.

This command is not executed in "protected operation".

The slave parameter values in volatile memory of the AS-i master and the content of the non-volatile memory for the parameters are not changed. The "Set\_Permanent\_Parameter" command must be executed, if necessary.

---

#### Note

##### Configuration data are overwritten

If you configure the AS-i slaves using HW Config, there is normally no need to use the command described here.

If you use this command, you will overwrite the respective configuration data that resulted from SET button configuration or HW Config configuration.

---

#### Structure of the job data in the send buffer

Table 9- 18 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 07 <sub>H</sub>

## 9.4.9 No. A8: Read\_Actual\_Configuration

### Meaning

This command reads the following configuration data of an addressed AS-i slave obtained from the AS-i master on the AS-Interface:

- IO code
- ID code
- ID1 code
- ID2 code

The configuration data are defined by the manufacturer of the AS-i slave. The meaning of the configuration data is described in the "AS-Interface Complete Specification".

### Structure of the job data in the send buffer

Table 9- 19 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: A8 <sub>H</sub>
1	Slave address

### Structure of the response data in the receive buffer

Table 9- 20 Structure of the response data in the receive buffer

Byte	Meaning			
	Bit 7	Bit 4	Bit 3	Bit 0
0	IO code		ID code	
1	ID1 code		ID2 code	
2	Reserved			
3	Reserved			

### 9.4.10 No. A9: Set\_LPS

#### Meaning

This command transfers the list of configured AS-i slaves for non-volatile storage in the EEPROM of the master.

When this command is executed, the AS-i master switches to the offline phase and then switches back to "normal operation". The AS-i master restarts.

This command is not executed in "protected operation".

---

#### Note

##### Configuration data are overwritten

If you configure the AS-i slaves using HW Config, there is normally no need to use the command described here.

If you use this command, you will overwrite the respective configuration data that resulted from SET button configuration or HW Config configuration.

---

#### Structure of the job data in the send buffer

Table 9- 21 Structure of the job data in the send buffer

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Command number: A9 <sub>H</sub>							
1	00 <sub>H</sub>							
2	Slave 7(A)	Slave 6(A)	Slave 5(A)	Slave 4(A)	Slave 3(A)	Slave 2(A)	Slave 1(A)	0
3	Slave 15(A)	Slave 14(A)	Slave 13(A)	Slave 12(A)	Slave 11(A)	Slave 10(A)	Slave 9(A)	Slave 8(A)
4	Slave 23(A)	Slave 22(A)	Slave 21(A)	Slave 20(A)	Slave 19(A)	Slave 18(A)	Slave 17(A)	Slave 16(A)
5	Slave 31(A)	Slave 30(A)	Slave 29(A)	Slave 28(A)	Slave 27(A)	Slave 26(A)	Slave 25(A)	Slave 24(A)
6	Slave 7B	Slave 6B	Slave 5B	Slave 4B	Slave 3B	Slave 2B	Slave 1B	0
7	Slave 15B	Slave 14B	Slave 13B	Slave 12B	Slave 11B	Slave 10B	Slave 9B	Slave 8B
8	Slave 23B	Slave 22B	Slave 21B	Slave 20B	Slave 19B	Slave 18B	Slave 17B	Slave 16B
9	Slave 31B	Slave 30B	Slave 29B	Slave 28B	Slave 27B	Slave 26B	Slave 25B	Slave 24B

The bits have the following meanings in the LPS data:

0: AS-i slave is not configured

1: AS-i slave is configured

### 9.4.11 No. 0A: SET\_Offline\_Mode

#### Meaning

This command switches between online and offline mode.

Online mode is the normal mode for the AS-i master. The following jobs are processed in online mode:

1. In the data exchange phase, the fields of the output data are transferred to the slave outputs for all AS-i slaves of the LAS. In error-free transmission, the addressed AS-i slaves transfer the values of the slave inputs to the master.
2. In the loading phase, a search is conducted for the existing AS-i slaves. Newly added AS-i slaves are inserted in the LDS or LAS.
3. In the management phase, jobs forwarded by the user, such as writing parameters, are executed.

In offline mode, the AS-i master only processes jobs from the user. Jobs that immediately activate an AS-i slave are rejected with an error. Cyclic data exchange is not performed with the AS-i slaves.

The bit OFFLINE=TRUE is not stored permanently. This means that after startup or restart, the AS-i master is in online mode again.

#### Structure of the job data in the send buffer

Table 9- 22 Structure of the job data in the send buffer

Byte	Meaning		
	Bit 7	Bit 1	Bit 0
0	Command number: 0A <sub>H</sub>		
1	0		Mode 0 = Online 1 = Offline

### 9.4.12 No. 08: Set\_Auto\_Address\_Enable

#### Meaning

This command enables or disables the "Automatic address programming" function.

The bit AUTO\_ADDR\_ENABLE is stored in non-volatile memory. It is retained even after startup or warm restart of the AS-i master.

#### Structure of the job data in the send buffer

Table 9- 23 Structure of the job data in the send buffer

Byte	Meaning		
	Bit 7	Bit 1	Bit 0
0	Command number: 0BH		
1	0	Value for AUTO_ADDR_ENABLE 1 = Automatic address programming enabled 0 = Automatic address programming disabled	

### 9.4.13 No. 0C: Set\_Operation\_Mode

#### Meaning

This command chooses between "configuration mode" and "protected operation".

In "**protected operation**", only the AS-i slaves that are flagged in the LPS and whose CONFIGURED and ACTUAL configurations match are activated. This is the case when the I/O code and the ID codes of the detected AS-i slaves are identical to the configured values.

In "**configuration mode**", all the detected AS-i slaves are activated - with the exception of AS-i slave "0". This also applies to AS-i slaves that differ in their CONFIGURED and ACTUAL configurations.

The "OPERATING MODE" bit is saved in **non-volatile** memory. As a result, this bit is retained in the event of startup or restart.

On switching from "configuration mode" to "protected operation", the AS-i master restarts. It enters the offline phase and then switches to online mode.

---

#### Note

##### **AS-i slave with address 0 prevents switchover to "protected operation"**

If an AS-i slave with address 0 is present on the AS-i bus, the AS-i master cannot switch from "configuration mode" to "protected operation".

---

#### Structure of the job data in the send buffer

Table 9- 24 Structure of the job data in the send buffer

Byte	Meaning		
	Bit 7	Bit 1	Bit 0
0	Command number: 0C <sub>H</sub>		
1	0	Operating mode 0 = "Protected operation" 1 = "Configuration mode"	

### 9.4.14 No. 0D: Change\_AS-i-Slave\_Address

#### Meaning of the command

This command changes the AS-i slave address of an AS-i slave.

This command is used predominantly for adding a new AS-i slave with the default address "0". In this case, the address is changed from "AS-i slave address, old" = 0 to "AS-i slave address, new".

The change is only executed if the following conditions are met:

1. An AS-i slave with "AS-i slave address, old" must exist.
2. If "AS-i address, old" is not equal to "0", an AS-i slave with the address "0" must not be connected at the same time.
3. "AS-i slave address, new" must have a valid value.
4. An AS-i slave with "AS-i slave address, new" must not already exist.

---

#### Note

When changing the AS-i slave address, the AS-i slave is not reset. The output data of the AS-i slave are retained until the slave resets its data automatically by internal time watchdog monitoring or the slave receives new data at the new address.

Today's AS-i slaves mostly feature watchdog monitoring that reset the internal I/O data of the slave when cyclic communication with the AS-i master is interrupted. Check the technical data of the slave to find out whether it features watchdog monitoring.

---

#### Structure of the job data in the send buffer

Table 9- 25 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 0D <sub>H</sub>
1	Slave address, old
2	Slave address, new

## 9.4.15 No. 0F: Read\_Status

### Meaning

This command reads the status register for the addressed AS-i slave. Generally, this command is not required because the slave status is automatically managed by the AS-i master. The following functions are available for detecting an I/O fault: alarm message, read diagnostic data sets, execution of command "Get\_LPS, Get\_LAS, Get\_LDS, Get\_Flags" command number B0 hex.

The flags of the status register have the following meaning depending on the type of the AS-i slave:

Table 9- 26 Meaning of the flags of the status register depending on the type of the AS-i slave

Status bit	AS-i slave according to AS-i specification V2.0	AS-i slave AS-i specification V2.1 and higher
S0	<b>Address volatile</b>	<b>Address/ID code volatile</b>
	This flag is set if <ul style="list-style-type: none"> <li>The internal routine of the AS-i slave for permanent storage of the AS-i slave address is running. This can last up to 15 ms and must not be interrupted by another addressing call.</li> <li>The internal address comparison of the AS-i slave determines that the permanently saved address is not identical to the entry in the address register.</li> </ul>	
S1	<b>Parity error detected</b> This flag is set if the AS-i slave has detected a parity error in a receive frame since the last "Read and delete status" job.	<b>Peripheral fault detected</b> An AS-i slave can set this flag if it detects a fault, e.g. wire break, on the connected I/O.
S2	<b>End bit error detected</b> This flag is set if the AS-i slave has detected an end bit error in a message frame since the last "Read and delete status" job.	Reserved
S3	<b>Read error in non-volatile memory (EEPROM)</b> This bit is set if the AS-i slave has discovered a read error when reading the non-volatile memory.	

### Structure of the job data in the send buffer

Table 9- 27 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 0F <sub>H</sub>
1	Slave address

### Structure of the job data in the receive buffer

Table 9- 28 Structure of the response data in the receive buffer

Byte	Meaning					
	Bit 7	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0		S 3	S 2	S 1	S 0

### 9.4.16 No. B0: Get\_LPS, Get\_LAS, Get\_LDS, Get\_Flags

#### Meaning

This command reads the following entries from the AS-i master:

- List of activated AS-i slaves, LAS
- List of detected AS-i slaves, LDS
- List of configured AS-i slaves, LPS
- The flags in accordance with the AS-i slave specification

#### Structure of the job data in the send buffer

Table 9- 29 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: B0 <sub>H</sub>

#### Structure of the response data in the receive buffer

Table 9- 30 Structure of the response data in the receive buffer

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	LAS Slave 7(A)	LAS Slave 6(A)	LAS Slave 5(A)	LAS Slave 4(A)	LAS Slave 3(A)	LAS Slave 2(A)	LAS Slave 1(A)	Reserved
1	LAS Slave 15(A)	LAS Slave 14(A)	LAS Slave 13(A)	LAS Slave 12(A)	LAS Slave 11(A)	LAS Slave 10(A)	LAS Slave 9(A)	LAS Slave 8(A)
2	LAS Slave 23(A)	LAS Slave 22(A)	LAS Slave 21(A)	LAS Slave 20(A)	LAS Slave 19(A)	LAS Slave 18(A)	LAS Slave 17(A)	LAS Slave 16(A)
3	LAS Slave 31(A)	LAS Slave 30(A)	LAS Slave 29(A)	LAS Slave 28(A)	LAS Slave 27(A)	LAS Slave 26(A)	LAS Slave 25(A)	LAS Slave 24(A)
4	LAS Slave 7B	LAS Slave 6B	LAS Slave 5B	LAS Slave 4B	LAS Slave 3B	LAS Slave 2B	LAS Slave 1B	Reserved
5	LAS Slave 15B	LAS Slave 14B	LAS Slave 13B	LAS Slave 12B	LAS Slave 11B	LAS Slave 10B	LAS Slave 9B	LAS Slave 8B
6	LAS Slave 23B	LAS Slave 22B	LAS Slave 21B	LAS Slave 20B	LAS Slave 19B	LAS Slave 18B	LAS Slave 17B	LAS Slave 16B
7	LAS Slave 31B	LAS Slave 30B	LAS Slave 29B	LAS Slave 28B	LAS Slave 27B	LAS Slave 26B	LAS Slave 25B	LAS Slave 24B
8	LDS Slave 7(A)	LDS Slave 6(A)	LDS Slave 5(A)	LDS Slave 4(A)	LDS Slave 3(A)	LDS Slave 2(A)	LDS Slave 1(A)	LDS Slave 0

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
9	LDS Slave 15(A)	LDS Slave 14(A)	LDS Slave 13(A)	LDS Slave 12(A)	LDS Slave 11(A)	LDS Slave 10(A)	LDS Slave 9(A)	LDS Slave 8(A)
10	LDS Slave 23(A)	LDS Slave 22(A)	LDS Slave 21(A)	LDS Slave 20(A)	LDS Slave 19(A)	LDS Slave 18(A)	LDS Slave 17(A)	LDS Slave 16(A)
11	LDS Slave 31(A)	LDS Slave 30(A)	LDS Slave 29(A)	LDS Slave 28(A)	LDS Slave 27(A)	LDS Slave 26(A)	LDS Slave 25(A)	LDS Slave 24(A)
12	LDS Slave 7B	LDS Slave 6B	LDS Slave 5B	LDS Slave 4B	LDS Slave 3B	LDS Slave 2B	LDS Slave 1B	Reserved
13	LDS Slave 15B	LDS Slave 14B	LDS Slave 13B	LDS Slave 12B	LDS Slave 11B	LDS Slave 10B	LDS Slave 9B	LDS Slave 8B
14	LDS Slave 23B	LDS Slave 22B	LDS Slave 21B	LDS Slave 20B	LDS Slave 19B	LDS Slave 18B	LDS Slave 17B	LDS Slave 16B
15	LDS Slave 31B	LDS Slave 30B	LDS Slave 29B	LDS Slave 28B	LDS Slave 27B	LDS Slave 26B	LDS Slave 25B	LDS Slave 24B
16	LPS Slave 7(A)	LPS Slave 6(A)	LPS S Slave 5(A)	LPS Slave 4(A)	LPS Slave 3(A)	LPS Slave 2(A)	LPS Slave 1(A)	Reserved
17	LPS Slave 15(A)	LPS Slave 14(A)	LPS Slave 13(A)	LPS Slave 12(A)	LPS Slave 11(A)	LPS Slave 10(A)	LPS Slave 9(A)	LPS Slave 8(A)
18	LPS Slave 23(A)	LPS Slave 22(A)	LPS Slave 21(A)	LPS Slave 20(A)	LPS Slave 19(A)	LPS Slave 18(A)	LPS Slave 17(A)	LPS Slave 16(A)
19	LPS Slave 31(A)	LPS Slave 30(A)	LPS Slave 29(A)	LPS Slave 28(A)	LPS Slave 27(A)	LPS Slave 26(A)	LPS Slave 25(A)	LPS Slave 24(A)
20	LPS Slave 7B	LPS Slave 6B	LPS Slave 5B	LPS Slave 4B	LPS Slave 3B	LPS Slave 2B	LPS Slave 1B	Reserved
21	LPS Slave 15B	LPS Slave 14B	LPS Slave 13B	LPS Slave 12B	LPS Slave 11B	LPS Slave 10B	LPS Slave 9B	LPS Slave 8B
22	LPS Slave 23B	LPS Slave 22B	LPS Slave 21B	LPS Slave 20B	LPS Slave 19B	LPS Slave 18B	LPS Slave 17B	LPS Slave 16B
23	LPS Slave 31B	LPS Slave 30B	LPS Slave 29B	LPS Slave 28B	LPS Slave 27B	LPS Slave 26B	LPS Slave 25B	LPS Slave 24B
24	Flag 1							
25	Flag 2							
26 ... 31	Reserved							

#### Meaning of the bits in Byte 0 to 23

- Bit = 0:  
The AS-i slave is **not** activated, detected or configured.
- Bit = 1:  
The AS-i slave **is** activated, detected or configured.

9.4 Description of the AS-i commands

Table 9- 31 Structure of flag 1 and flag 2

Flag 1		Flag 2	
Bit	Meaning	Bit	Meaning
0	Config_OK	0	Periphery_OK
1	LDS.0	1	Data_Exchange_Active
2	Auto_Address_Assign	2	Off_Line
3	Auto_Address_Available	3	AUTO_ADDR_ENABLE
4	Configuration_Active	4	Earth_Fault
5	Normal_Operation_Active	5	EEPROM_OK
6	APF	6	EFD-ENABLE
7	Offline_Ready	7	Reserved

Table 9- 32 Meaning of the flags

Flag	Meaning
Config_OK	The flag is set when the CONFIGURED configuration and the ACTUAL configuration match.
LDS.0	The flag is set when an AS-i slave with address 0 is present. (List of Detected Slaves)
Auto_Address_Assign	The flag is set if automatic address programming is possible. This means that AUTO_ADDR_ENABLE = 1 and no "incorrect" AS-i slaves are connected to AS-Interface.
Auto_Address_Available	The flag is set if automatic address programming can be performed. This means that one AS-i slave has failed.
Configuration_Active	The flag is set in "configuration mode" and reset in "protected operation".
Normal_Operation_Active	The flag is set when the AS-i master is in "protected operation".
APF	The flag is set when the voltage on the AS-i cable is too low (AS-i Power Fail).
Offline_Ready	The flag is set if the offline phase is active.
Periphery_OK	The flag is set if none of the AS-i slaves signal a peripheral fault.
Data_Exchange_Active	The "Data_Exchange_Active" flag is set when cyclic data exchange is in "protected operation".
Off_Line	The flag is set if the "OFFLINE" operating status is to be adopted or has already been adopted.
AUTO_ADDR_ENABLE	The flag indicates whether automatic address programming is disabled (BIT = 0) or enabled (BIT = 1) by the user.
Earth_Fault	The flag is set if a ground fault has been detected on the AS-i cable.
EEPROM_OK	The flag is set if the test of the internal EEPROM was successful.
EFD Disable	The flag indicates whether ground fault detection is enabled (BIT = 0) or disabled (BIT = 1) by the user.

## 9.4.17 No. B9: Read\_overall\_configuration

### Meaning

This command reads the following data from the AS-i master:

- List of activated AS-i slaves (LAS).  
It specifies which of the connected AS-i slaves are activated
- The current configuration data for the connected AS-i slaves:
  - IO code
  - ID code
  - ID1 code
  - ID2 code
- The current parameters of the AS-i slaves (ACTUAL parameters)
- The current status of the AS-i master (Flag 1, Flag 2)

After commissioning, you can use this command, for example, to determine the configuration of the stations connected to the AS-i cable. You can modify this read-in configuration data if required and store it as the CONFIGURED configuration in the AS-i master with the "Write\_overall\_configuration" command.

No. BA: Write\_overall\_configuration (Page 131)

### Structure of the job data in the send buffer

Table 9- 33 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: B9 <sub>H</sub>

**Structure of the response data in the receive buffer**

Table 9- 34 Structure of the response data in the receive buffer

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	00H							
1	00H							
2	LAS Slave 7(A)	LAS Slave 6(A)	LAS Slave 5(A)	LAS Slave 4(A)	LAS Slave 3(A)	LAS Slave 2(A)	LAS Slave 1(A)	Reserved
3	LAS Slave 15(A)	LAS Slave 14(A)	LAS Slave 13(A)	LAS Slave 12(A)	LAS Slave 11(A)	LAS Slave 10(A)	LAS Slave 9(A)	LAS Slave 8(A)
4	LAS Slave 23(A)	LAS Slave 22(A)	LAS Slave 21(A)	LAS Slave 20(A)	LAS Slave 19(A)	LAS Slave 18(A)	LAS Slave 17(A)	LAS Slave 16(A)
5	LAS Slave 31(A)	LAS Slave 30(A)	LAS Slave 29(A)	LAS Slave 28(A)	LAS Slave 27(A)	LAS Slave 26(A)	LAS Slave 25(A)	LAS Slave 24(A)
6	LAS Slave 7B	LAS Slave 6B	LAS Slave 5B	LAS Slave 4B	LAS Slave 3B	LAS Slave 2B	LAS Slave 1B	Reserved
7	LAS Slave 15B	LAS Slave 14B	LAS Slave 13B	LAS Slave 12B	LAS Slave 11B	LAS Slave 10B	LAS Slave 9B	LAS Slave 8B
8	LAS Slave 23B	LAS Slave 22B	LAS Slave 21B	LAS Slave 20B	LAS Slave 19B	LAS Slave 18B	LAS Slave 17B	LAS Slave 16B
9	LAS Slave 31B	LAS Slave 30B	LAS Slave 29B	LAS Slave 28B	LAS Slave 27B	LAS Slave 26B	LAS Slave 25B	LAS Slave 24B
10	IO code Slave 0				ID_CODE Slave 0			
11	ID1 Slave 0				ID2 Slave 0			
12	IO code Slave 1 / 1A				ID_CODE Slave 1 / 1A			
13	ID1 Slave 1 / 1A				ID2 Slave 1 / 1A			
14	IO code Slave 2 / 2A				ID_CODE Slave 2 / 2A			
15	ID1 Slave 2 / 2A				ID2 Slave 2 / 2A			
16	IO code Slave 3 / 3A				ID_CODE Slave 3 / 3A			
17	ID1 Slave 3 / 3A				ID2 Slave 3 / 3A			
18	IO code Slave 4 / 4A				ID_CODE Slave 4 / 4A			
19	ID1 Slave 4 / 4A				ID2 Slave 4 / 4A			
20	IO code Slave 5 / 5A				ID_CODE Slave 5 / 5A			
21	ID1 Slave 5 / 5A				ID2 Slave 5 / 5A			
22	IO code Slave 6 / 6A				ID_CODE Slave 6 / 6A			
23	ID1 Slave 6 / 6A				ID2 Slave 6 / 6A			
24	IO code Slave 7 / 7A				ID_CODE Slave 7 / 7A			
25	ID1 Slave 7 / 7A				ID2 Slave 7 / 7A			
26	IO code Slave 8 / 8A				ID_CODE Slave 8 / 8A			
27	ID1 Slave 8 / 8A				ID2 Slave 8 / 8A			
28	IO code Slave 9 / 9A				ID_CODE Slave 9 / 9A			
29	ID1 Slave 9 / 9A				ID2 Slave 9 / 9A			
30	IO code Slave 10 / 10A				ID_CODE Slave 10 / 10A			

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
31	ID1 Slave 10 / 10A				ID2 Slave 10 / 10A			
32	IO code Slave 11 / 11A				ID_CODE Slave 11 / 11A			
33	ID1 Slave 11 / 11A				ID2 Slave 11 / 11A			
34	IO code Slave 12 / 12A				ID_CODE Slave 12 / 12A			
35	ID1 Slave 12 / 12A				ID2 Slave 12 / 12A			
36	IO code Slave 13 / 13A				ID_CODE Slave 13 / 13A			
37	ID1 Slave 13 / 13A				ID2 Slave 13 / 13A			
38	IO code Slave 14 / 14A				ID_CODE Slave 14 / 14A			
39	ID1 Slave 14 / 14A				ID2 Slave 14 / 14A			
40	IO code Slave 15 / 15A				ID_CODE Slave 15 / 15A			
41	ID1 Slave 15 / 15A				ID2 Slave 15 / 15A			
42	IO code Slave 16 / 16A				ID_CODE Slave 16 / 16A			
43	ID1 Slave 16 / 16A				ID2 Slave 16 / 16A			
44	IO code Slave 17 / 17A				ID_CODE Slave 17 / 17A			
45	ID1 Slave 17 / 17A				ID2 Slave 17 / 17A			
46	IO code Slave 18 / 18A				ID_CODE Slave 18 / 18A			
47	ID1 Slave 18 / 18A				ID2 Slave 18 / 18A			
48	IO code Slave 19 / 19A				ID_CODE Slave 19 / 19A			
49	ID1 Slave 19 / 19A				ID2 Slave 19 / 19A			
50	IO code Slave 20 / 20A				ID_CODE Slave 20 / 20A			
51	ID1 Slave 20 / 20A				ID2 Slave 20 / 20A			
52	IO code Slave 21 / 21A				ID_CODE Slave 21 / 21A			
53	ID1 Slave 21 / 21A				ID2 Slave 21 / 21A			
54	IO code Slave 22 / 22A				ID_CODE Slave 22 / 22A			
55	ID1 Slave 22 / 22A				ID2 Slave 22 / 22A			
56	IO code Slave 23 / 23A				ID_CODE Slave 23 / 23A			
57	ID1 Slave 23 / 23A				ID2 Slave 23 / 23A			
58	IO code Slave 24 / 24A				ID_CODE Slave 24 / 24A			
59	ID1 Slave 24 / 24A				ID2 Slave 24 / 24A			
60	IO code Slave 25 / 25A				ID_CODE Slave 25 / 25A			
61	ID1 Slave 25 / 25A				ID2 Slave 25 / 25A			
62	IO code Slave 26 / 26A				ID_CODE Slave 26 / 26A			
63	ID1 Slave 26 / 26A				ID2 Slave 26 / 26A			
64	IO code Slave 27 / 27A				ID_CODE Slave 27 / 27A			
65	ID1 Slave 27 / 27A				ID2 Slave 27 / 27A			
66	IO code Slave 28 / 28A				ID_CODE Slave 28 / 28A			
67	ID1 Slave 28 / 28A				ID2 Slave 28 / 28A			
68	IO code Slave 29 / 29A				ID_CODE Slave 29 / 29A			
69	ID1 Slave 29 / 29A				ID2 Slave 29 / 29A			
70	IO code Slave 30 / 30A				ID_CODE Slave 30 / 30A			
71	ID1 Slave 30 / 30A				ID2 Slave 30 / 30A			

9.4 Description of the AS-i commands

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
72	IO code Slave 31 / 31A				ID_CODE Slave 31 / 31A			
73	ID1 Slave 31 / 31A				ID2 Slave 31 / 31A			
74	Reserved				Reserved			
75	Reserved				Reserved			
76	IO code Slave 1B				ID_CODE Slave 1B			
77	ID1 Slave 1B				ID2 Slave 1B			
78	IO code Slave 2B				ID_CODE Slave 2B			
79	ID1 Slave 2B				ID2 Slave 2B			
80	IO code Slave 3B				ID_CODE Slave 3B			
81	ID1 Slave 3B				ID2 Slave 3B			
82	IO code Slave 4B				ID_CODE Slave 4B			
83	ID1 Slave 4B				ID2 Slave 4B			
84	IO code Slave 5B				ID_CODE Slave 5B			
85	ID1 Slave 5B				ID2 Slave 5B			
86	IO code Slave 6B				ID_CODE Slave 6B			
87	ID1 Slave 6B				ID2 Slave 6B			
88	IO code Slave 7B				ID_CODE Slave 7B			
89	ID1 Slave 7B				ID2 Slave 7B			
90	IO code Slave 8B				ID_CODE Slave 8B			
91	ID1 Slave 8B				ID2 Slave 8B			
92	IO code Slave 9B				ID_CODE Slave 9B			
93	ID1 Slave 9B				ID2 Slave 9B			
94	IO code Slave 10B				ID_CODE Slave 10B			
95	ID1 Slave 10B				ID2 Slave 10B			
96	IO code Slave 11B				ID_CODE Slave 11B			
97	ID1 Slave 11B				ID2 Slave 11B			
98	IO code Slave 12B				ID_CODE Slave 12B			
99	ID1 Slave 12B				ID2 Slave 12B			
100	IO code Slave 13B				ID_CODE Slave 13B			
101	ID1 Slave 13B				ID2 Slave 13B			
102	IO code Slave 14B				ID_CODE Slave 14B			
103	ID1 Slave 14B				ID2 Slave 14B			
104	IO code Slave 15B				ID_CODE Slave 15B			
105	ID1 Slave 15B				ID2 Slave 15B			
106	IO code Slave 16B				ID_CODE Slave 16B			
107	ID1 Slave 16B				ID2 Slave 16B			
108	IO code Slave 17B				ID_CODE Slave 17B			
109	ID1 Slave 17B				ID2 Slave 17B			
110	IO code Slave 18B				ID_CODE Slave 18B			
111	ID1 Slave 18B				ID2 Slave 18B			
112	IO code Slave 19B				ID_CODE Slave 19B			

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
113	ID1 Slave 19B				ID2 Slave 19B			
114	IO code Slave 20B				ID_CODE Slave 20B			
115	ID1 Slave 20B				ID2 Slave 20B			
116	IO code Slave 21B				ID_CODE Slave 21B			
117	ID1 Slave 21B				ID2 Slave 21B			
118	IO code Slave 22B				ID_CODE Slave 22B			
119	ID1 Slave 22B				ID2 Slave 22B			
120	IO code Slave 23B				ID_CODE Slave 23B			
121	ID1 Slave 23B				ID2 Slave 23B			
122	IO code Slave 24B				ID_CODE Slave 24B			
123	ID1 Slave 24B				ID2 Slave 24B			
124	IO code Slave 25B				ID_CODE Slave 25B			
125	ID1 Slave 25B				ID2 Slave 25B			
126	IO code Slave 26B				ID_CODE Slave 26B			
127	ID1 Slave 26B				ID2 Slave 26B			
128	IO code Slave 27B				ID_CODE Slave 27B			
129	ID1 Slave 27B				ID2 Slave 27B			
130	IO code Slave 28B				ID_CODE Slave 28B			
131	ID1 Slave 28B				ID2 Slave 28B			
132	IO code Slave 29B				ID_CODE Slave 29B			
133	ID1 Slave 29B				ID2 Slave 29B			
134	IO code Slave 30B				ID_CODE Slave 30B			
135	ID1 Slave 30B				ID2 Slave 30B			
136	IO code Slave 31B				ID_CODE Slave 31B			
137	ID1 Slave 31B				ID2 Slave 31B			
138	Reserved				Parameter Slave 1 / 1A			
139	Parameter Slave 2 / 2A				Parameter Slave 3 / 3A			
140	Parameter Slave 4 / 4A				Parameter Slave 5 / 5A			
141	Parameter Slave 6 / 6A				Parameter Slave 7 / 7A			
142	Parameter Slave 8 / 8A				Parameter Slave 9 / 9A			
143	Parameter Slave 10 / 10A				Parameter Slave 11 / 11A			
144	Parameter Slave 12 / 12A				Parameter Slave 13 / 13A			
145	Parameter Slave 14 / 14A				Parameter Slave 15 / 15A			
146	Parameter Slave 16 / 16A				Parameter Slave 17 / 17A			
147	Parameter Slave 18 / 18A				Parameter Slave 19 / 19A			
148	Parameter Slave 20 / 20A				Parameter Slave 21 / 21A			
149	Parameter Slave 22 / 22A				Parameter Slave 23 / 23A			
150	Parameter Slave 24 / 24A				Parameter Slave 25 / 25A			
151	Parameter Slave 26 / 26A				Parameter Slave 27 / 27A			
152	Parameter Slave 28 / 28A				Parameter Slave 29 / 29A			
153	Parameter Slave 30 / 30A				Parameter Slave 31 / 31A			

9.4 Description of the AS-i commands

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
154	Reserved				Parameter Slave 1B			
155	Parameter Slave 2B				Parameter Slave 3B			
156	Parameter Slave 4B				Parameter Slave 5B			
157	Parameter Slave 6B				Parameter Slave 7B			
158	Parameter Slave 8B				Parameter Slave 9B			
159	Parameter Slave 10B				Parameter Slave 11B			
160	Parameter Slave 12B				Parameter Slave 13B			
161	Parameter Slave 14B				Parameter Slave 15B			
162	Parameter Slave 16B				Parameter Slave 17B			
163	Parameter Slave 18B				Parameter Slave 19B			
164	Parameter Slave 20B				Parameter Slave 21B			
165	Parameter Slave 22B				Parameter Slave 23B			
166	Parameter Slave 24B				Parameter Slave 25B			
167	Parameter Slave 26B				Parameter Slave 27B			
168	Parameter Slave 28B				Parameter Slave 29B			
169	Parameter Slave 30B				Parameter Slave 31B			
170	Flag 1							
171	Flag 2							
172 ... 218	Reserved							

Table 9- 35 Structure of flag 1 and flag 2

Flag 1		Flag 2	
Bit number	Meaning	Bit number	Meaning
0	Config_OK	0	Periphery_OK
1	LDS.0	1	Data_Exchange_Active
2	Auto_Address_Assign	2	Off_Line
3	Auto_Address_Available	3	AUTO_ADDR_ENABLE
4	Configuration_Active	4	Earth_Fault
5	Normal_Operation_Active	5	EEPROM_OK
6	APF	6	EFD-ENABLE
7	Offline_Ready	7	Reserved

For the meanings of flags, refer to Chapter:

No. B0: Get\_LPS, Get\_LAS, Get\_LDS, Get\_Flags (Page 122)

## 9.4.18 No. BA: Write\_overall\_configuration

### Meaning

This command transfers the desired overall configuration of AS-Interface to the AS-i master and saves it as the CONFIGURED configuration in the non-volatile EEPROM. This configures the AS-i master.

When this command is executed, the AS-i master changes to the offline phase and then switches back over to "normal operation". The AS-i master restarts.

The "Protected operation" or "Configuration mode" operating mode of the AS-i master after execution of the command is determined by the "Configuration\_Active" flag (see Table "Structure of Flag 1 and Flag 2").

This command is permissible both in "Protected operation" and "Configuration mode."

---

### Note

#### Configuration data are overwritten

If you configure the AS-i slaves using *STEP 7*, there is normally no need to use the command described here. If you have configured proxy slaves, you can specify the configuration data of the proxy slaves with this command. To avoid the offline changeover, the configuration data of the proxy slaves can be specified preferentially with the "No. D0: Set\_Configuration\_Online (Page 159)" command.

If you use this command, you will overwrite the corresponding configuration data that resulted from configuring the AS-i master using the "SET" button or configuring using *STEP 7*.

---

Specifically, the following data are transferred:

- List of configured AS-i slaves  
This specifies which AS-i slaves are permitted to be activated by the AS-i master in "protected operation".
- List of configuration data.  
This specifies the ID codes and the IO code that the connected AS-i slaves must have.
- The list of the AS-i slave parameters that have been configured in the AS-i master and stored in non-volatile memory. These parameters are transferred to the AS-i slaves when the AS-i master starts up.
- The flags that determine the operating state of the AS-i master after startup.

9.4 Description of the AS-i commands

The AS-i master parameterizes the AS-i slaves itself in the case of AS-i slaves that comply with standard profile 7.4. For slaves in accordance with standard profile 7.4, the AS-i master ignores the parameter values specified in the command.

<b>NOTICE</b>
<b>Note the size of the I/O image</b>
If you have configured the AS-i slaves in <i>STEP 7</i> , the size of the I/O image of the individual slaves is defined using <i>STEP 7</i> . When using this command, ensure that the I/O image of the individual slaves corresponds to the slaves configured using the command. If the size of the I/O image does not match, only the lower-order data will be transferred. The data that do not fit into the image are truncated or are filled with substitute value "0" in the case of digital values and with substitute value 7FFF (Hex) in the case of analog values.

Structure of the job data in the send buffer

Table 9- 36 Structure of the job data in the send buffer

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Command number: BA <sub>H</sub>							
1	00 <sub>H</sub>							
2	LPS Slave 7(A)	LPS Slave 6(A)	LPS Slave 5(A)	LPS Slave 4(A)	LPS Slave 3(A)	LPS Slave 2(A)	LPS Slave 1(A)	0
3	LPS Slave 15(A)	LPS Slave 14(A)	LPS Slave 13(A)	LPS Slave 12(A)	LPS Slave 11(A)	LPS Slave 10(A)	LPS Slave 9(A)	LPS Slave 8(A)
4	LPS Slave 23(A)	LPS Slave 22(A)	LPS Slave 21(A)	LPS Slave 20(A)	LPS Slave 19(A)	LPS Slave 18(A)	LPS Slave 17(A)	LPS Slave 16(A)
5	LPS Slave 31(A)	LPS Slave 30(A)	LPS Slave 29(A)	LPS Slave 28(A)	LPS Slave 27(A)	LPS Slave 26(A)	LPS Slave 25(A)	LPS Slave 24(A)
6	LPS Slave 7B	LPS Slave 6B	LPS Slave 5B	LPS Slave 4B	LPS Slave 3B	LPS Slave 2B	LPS Slave 1B	0
7	LPS Slave 15B	LPS Slave 14B	LPS Slave 13B	LPS Slave 12B	LPS Slave 11B	LPS Slave 10B	LPS Slave 9B	LPS Slave 8B
8	LPS Slave 23B	LPS Slave 22B	LPS Slave 21B	LPS Slave 20B	LPS Slave 19B	LPS Slave 18B	LPS Slave 17B	LPS Slave 16B
9	LPS Slave 31B	LPS Slave 30B	LPS Slave 29B	LPS Slave 28B	LPS Slave 27B	LPS Slave 26B	LPS Slave 25B	LPS Slave 24B
10	IO code Slave 0				ID_CODE Slave 0			
11	ID1 Slave 0				ID2 Slave 0			
12	IO code Slave 1 / 1A				ID_CODE Slave 1 / 1A			
13	ID1 Slave 1 / 1A				ID2 Slave 1 / 1A			
14	IO code Slave 2 / 2A				ID_CODE Slave 2 / 2A			
15	ID1 Slave 2 / 2A				ID2 Slave 2 / 2A			
16	IO code Slave 3 / 3A				ID_CODE Slave 3 / 3A			

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
17	ID1 Slave 3 / 3A				ID2 Slave 3 / 3A			
18	IO code Slave 4 / 4A				ID_CODE Slave 4 / 4A			
19	ID1 Slave 4 / 4A				ID2 Slave 4 / 4A			
20	IO code Slave 5 / 5A				ID_CODE Slave 5 / 5A			
21	ID1 Slave 5 / 5A				ID2 Slave 5 / 5A			
22	IO code Slave 6 / 6A				ID_CODE Slave 6 / 6A			
23	ID1 Slave 6 / 6A				ID2 Slave 6 / 6A			
24	IO code Slave 7 / 7A				ID_CODE Slave 7 / 7A			
25	ID1 Slave 7 / 7A				ID2 Slave 7 / 7A			
26	IO code Slave 8 / 8A				ID_CODE Slave 8 / 8A			
27	ID1 Slave 8 / 8A				ID2 Slave 8 / 8A			
28	IO code Slave 9 / 9A				ID_CODE Slave 9 / 9A			
29	ID1 Slave 9 / 9A				ID2 Slave 9 / 9A			
30	IO code Slave 10 / 10A				ID_CODE Slave 10 / 10A			
31	ID1 Slave 10 / 10A				ID2 Slave 10 / 10A			
32	IO code Slave 11 / 11A				ID_CODE Slave 11 / 11A			
33	ID1 Slave 11 / 11A				ID2 Slave 11 / 11A			
34	IO code Slave 12 / 12A				ID_CODE Slave 12 / 12A			
35	ID1 Slave 12 / 12A				ID2 Slave 12 / 12A			
36	IO code Slave 13 / 13A				ID_CODE Slave 13 / 13A			
37	ID1 Slave 13 / 13A				ID2 Slave 13 / 13A			
38	IO code Slave 14 / 14A				ID_CODE Slave 14 / 14A			
39	ID1 Slave 14 / 14A				ID2 Slave 14 / 14A			
40	IO code Slave 15 / 15A				ID_CODE Slave 15 / 15A			
41	ID1 Slave 15 / 15A				ID2 Slave 15 / 15A			
42	IO code Slave 16 / 16A				ID_CODE Slave 16 / 16A			
43	ID1 Slave 16 / 16A				ID2 Slave 16 / 16A			
44	IO code Slave 17 / 17A				ID_CODE Slave 17 / 17A			
45	ID1 Slave 17 / 17A				ID2 Slave 17 / 17A			
46	IO code Slave 18 / 18A				ID_CODE Slave 18 / 18A			
47	ID1 Slave 18 / 18A				ID2 Slave 18 / 18A			
48	IO code Slave 19 / 19A				ID_CODE Slave 19 / 19A			
49	ID1 Slave 19 / 19A				ID2 Slave 19 / 19A			
50	IO code Slave 20 / 20A				ID_CODE Slave 20 / 20A			
51	ID1 Slave 20 / 20A				ID2 Slave 20 / 20A			
52	IO code Slave 21 / 21A				ID_CODE Slave 21 / 21A			
53	ID1 Slave 21 / 21A				ID2 Slave 21 / 21A			
54	IO code Slave 22 / 22A				ID_CODE Slave 22 / 21A			
55	ID1 Slave 22 / 22A				ID2 Slave 22 / 22A			
56	IO code Slave 23 / 23A				ID_CODE Slave 23 / 23A			
57	ID1 Slave 23 / 23A				ID2 Slave 23 / 23A			

9.4 Description of the AS-i commands

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
58	IO code Slave 24 / 24A				ID_CODE Slave 24 / 24A			
59	ID1 Slave 24 / 24A				ID2 Slave 24 / 24A			
60	IO code Slave 25 / 25A				ID_CODE Slave 25 / 25A			
61	ID1 Slave 25 / 25A				ID2 Slave 25 / 25A			
62	IO code Slave 26 / 26A				ID_CODE Slave 26 / 26A			
63	ID1 Slave 26 / 26A				ID2 Slave 26 / 26A			
64	IO code Slave 27 / 27A				ID_CODE Slave 27 / 27A			
65	ID1 Slave 27 / 27A				ID2 Slave 27 / 27A			
66	IO code Slave 28 / 28A				ID_CODE Slave 28 / 28A			
67	ID1 Slave 28 / 28A				ID2 Slave 28 / 28A			
68	IO code Slave 29 / 29A				ID_CODE Slave 29 / 29A			
69	ID1 Slave 29 / 29A				ID2 Slave 29 / 29A			
70	IO code Slave 30 / 30A				ID_CODE Slave 30 / 30A			
71	ID1 Slave 30 / 30A				ID2 Slave 30 / 30A			
72	IO code Slave 31 / 31A				ID_CODE Slave 31 / 31A			
73	ID1 Slave 31 / 31A				ID2 Slave 31 / 31A			
74	0				0			
75	0				0			
76	IO code Slave 1B				ID_CODE Slave 1B			
77	ID1 Slave 1B				ID2 Slave 1B			
78	IO code Slave 2B				ID_CODE Slave 2B			
79	ID1 Slave 2B				ID2 Slave 2B			
80	IO code Slave 3B				ID_CODE Slave 3B			
81	ID1 Slave 3B				ID2 Slave 3B			
82	IO code Slave 4B				ID_CODE Slave 4B			
83	ID1 Slave 4B				ID2 Slave 4B			
84	IO code Slave 5B				ID_CODE Slave 5B			
85	ID1 Slave 5B				ID2 Slave 5B			
86	IO code Slave 6B				ID_CODE Slave 6B			
87	ID1 Slave 6B				ID2 Slave 6B			
88	IO code Slave 7B				ID_CODE Slave 7B			
89	ID1 Slave 7B				ID2 Slave 7B			
90	IO code Slave 8B				ID_CODE Slave 8B			
91	ID1 Slave 8B				ID2 Slave 8B			
92	IO code Slave 9B				ID_CODE Slave 9B			
93	ID1 Slave 9B				ID2 Slave 9B			
94	IO code Slave 10B				ID_CODE Slave 10B			
95	ID1 Slave 10B				ID2 Slave 10B			
96	IO code Slave 11B				ID_CODE Slave 11B			
97	ID1 Slave 11B				ID2 Slave 11B			
98	IO code Slave 12B				ID_CODE Slave 12B			

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
99	ID1 Slave 12B				ID2 Slave 12B			
100	IO code Slave 13B				ID_CODE Slave 13B			
101	ID1 Slave 13B				ID2 Slave 13B			
102	IO code Slave 14B				ID_CODE Slave 14B			
103	ID1 Slave 14B				ID2 Slave 14B			
104	IO code Slave 15B				ID_CODE Slave 15B			
105	ID1 Slave 15B				ID2 Slave 15B			
106	IO code Slave 16B				ID_CODE Slave 16B			
107	ID1 Slave 16B				ID2 Slave 16B			
108	IO code Slave 17B				ID_CODE Slave 17B			
109	ID1 Slave 17B				ID2 Slave 17B			
110	IO code Slave 18B				ID_CODE Slave 18B			
111	ID1 Slave 18B				ID2 Slave 18B			
112	IO code Slave 19B				ID_CODE Slave 19B			
113	ID1 Slave 19B				ID2 Slave 19B			
114	IO code Slave 20B				ID_CODE Slave 20B			
115	ID1 Slave 20B				ID2 Slave 20B			
116	IO code Slave 21B				ID_CODE Slave 21B			
117	ID1 Slave 21B				ID2 Slave 21B			
118	IO code Slave 22B				ID_CODE Slave 22B			
119	ID1 Slave 22B				ID2 Slave 22B			
120	IO code Slave 23B				ID_CODE Slave 23B			
121	ID1 Slave 23B				ID2 Slave 23B			
122	IO code Slave 24B				ID_CODE Slave 24B			
123	ID1 Slave 24B				ID2 Slave 24B			
124	IO code Slave 25B				ID_CODE Slave 25B			
125	ID1 Slave 25B				ID2 Slave 25B			
126	IO code Slave 26B				ID_CODE Slave 26B			
127	ID1 Slave 26B				ID2 Slave 26B			
128	IO code Slave 27B				ID_CODE Slave 27B			
129	ID1 Slave 27B				ID2 Slave 27B			
130	IO code Slave 28B				ID_CODE Slave 28B			
131	ID1 Slave 28B				ID2 Slave 28B			
132	IO code Slave 29B				ID_CODE Slave 29B			
133	ID1 Slave 29B				ID2 Slave 29B			
134	IO code Slave 30B				ID_CODE Slave 30B			
135	ID1 Slave 30B				ID2 Slave 30B			
136	IO code Slave 31B				ID_CODE Slave 31B			
137	ID1 Slave 31B				ID2 Slave 31B			
138	0				Parameter Slave 1 / 1A			
139	Parameter Slave 2 / 2A				Parameter Slave 3 / 3A			

9.4 Description of the AS-i commands

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
140	Parameter Slave 4 / 4A				Parameter Slave 5 / 5A			
141	Parameter Slave 6 / 6A				Parameter Slave 7 / 7A			
142	Parameter Slave 8 / 8A				Parameter Slave 9 / 9A			
143	Parameter Slave 10 / 10A				Parameter Slave 11 / 11A			
144	Parameter Slave 12 / 12A				Parameter Slave 13 / 13A			
145	Parameter Slave 14 / 14A				Parameter Slave 15 / 15A			
146	Parameter Slave 16 / 16A				Parameter Slave 17 / 17A			
147	Parameter Slave 18 / 18A				Parameter Slave 19 / 19A			
148	Parameter Slave 20 / 20A				Parameter Slave 21 / 21A			
149	Parameter Slave 22 / 22A				Parameter Slave 23 / 23A			
150	Parameter Slave 24 / 24A				Parameter Slave 25 / 25A			
151	Parameter Slave 26 / 26A				Parameter Slave 27 / 27A			
152	Parameter Slave 28 / 28A				Parameter Slave 29 / 29A			
153	Parameter Slave 30 / 30A				Parameter Slave 31 / 31A			
154	0				Parameter Slave 1B			
155	Parameter Slave 2B				Parameter Slave 3B			
156	Parameter Slave 4B				Parameter Slave 5B			
157	Parameter Slave 6B				Parameter Slave 7B			
158	Parameter Slave 8B				Parameter Slave 9B			
159	Parameter Slave 10B				Parameter Slave 11B			
160	Parameter Slave 12B				Parameter Slave 13B			
161	Parameter Slave 14B				Parameter Slave 15B			
162	Parameter Slave 16B				Parameter Slave 17B			
163	Parameter Slave 18B				Parameter Slave 19B			
164	Parameter Slave 20B				Parameter Slave 21B			
165	Parameter Slave 22B				Parameter Slave 23B			
166	Parameter Slave 24B				Parameter Slave 25B			
167	Parameter Slave 26B				Parameter Slave 27B			
168	Parameter Slave 28B				Parameter Slave 29B			
169	Parameter Slave 30B				Parameter Slave 31B			
170	Flag 1							
171	Flag 2							

Table 9- 37 Structure of flag 1 and flag 2

Flag 1		Flag 2	
Bit number	Meaning	Bit number	Meaning
0	Config_OK	0	Periphery_OK
1	LDS.0	1	Data_Exchange_Active
2	Auto_Address_Assign	2	Off_Line
3	Auto_Address_Available	3	<b>AUTO_ADDR_ENABLE</b> <sup>1)</sup>
4	<b>Configuration_Active</b> <sup>1)</sup>	4	Earth_Fault
5	Normal_Operation_Active	5	EEPROM_OK
6	APF	6	EFD-ENABLE
7	Offline_Ready	7	Reserved

1) The "Configuration\_Active" and "AUTO\_ADDR\_ENABLE" flags change the operating mode of the AS-i master. The values of the remaining flags are insignificant for the command "Set\_LPS, Set\_PCD, Set\_PP, Set\_Flags" and cannot be modified in the AS-i master by this call.

Configuration_Active	"0" means: After the command has been executed, the AS-i master will switch to "protected operation". "1" means: The AS-i master runs in "configuration mode" after completion of the job.
AUTO_ADDR_ENABLE	"0" means: Automatic address programming is disabled. "1" means: Automatic address programming is enabled.

For the meanings of flags, refer to Chapter:

No. B0: Get\_LPS, Get\_LAS, Get\_LDS, Get\_Flags (Page 122)

### 9.4.19 No. 3C: Set\_PI

#### Meaning

This command passes parameter values for all AS-i°slaves to the AS-i master. The AS-i master only sends a parameter call to the slaves whose parameter value passed in the command deviates from the ACTUAL parameter value of the slave. If all parameter values passed in the command are identical to the current parameter values (ACT parameters) of the AS-i slaves, no parameters are passed from the AS-i master to the AS-i slaves.

#### Control via the function code

The response of the command can be set using the value of the "function code" in byte 1 of the job data (firmware V1.1.16 and higher)

- As of firmware V1.1.16, the function code is defined for values 0, 1, and 2.
- For firmware versions up to and including V1.1.15, the function code is only defined for the value 0.

Other values are not permissible.

The function code determines the response of the command as described below.

The new parameter values are transferred via 3 subfunctions in byte 1 with different responses.

##### **Function code = 0:**

The passed parameter values are stored in the non-volatile EEPROM of the CM AS-i master ST.

If the passed parameter value of at least one AS-i slave differs from the parameter value previously active in the slave, the AS-i master powers up on the AS-i bus (offline-online transition). This resets and restarts all slaves with the parameter values currently stored in the EEPROM.

If there are no changes in the passed parameter values, the master does not power up.

##### **Function code = 1 (firmware V1.1.16 and higher):**

The passed parameter values are only stored in the volatile memory of the CM AS-i master ST module, i.e. the EEPROM remains unchanged.

For every AS-i slave, the AS-i master checks whether the passed parameter value differs from the parameter value previously active in the slave (ACT parameter). If it does differ, the AS-i master calls a parameter from that AS-i slave and returns a new parameter value.

The AS-i master does not call a parameter from the AS-i slave if the passed parameter value is identical to the parameter value previously active in the slave.

The AS-i master does not perform a power-up on the AS-i bus.

The command is considered completed without errors when the parameter values have been passed to the master. Subsequently, the parameters are passed to the slaves in parameter calls with no time monitoring.

**Function code = 2** (firmware V1.1.16 and higher):

The passed parameter values are stored in the non-volatile EEPROM of the CM AS-i master ST.

For every AS-i slave, the AS-i master checks whether the passed parameter value differs from the parameter value previously active in the slave (ACT parameter). If it does differ, the AS-i master calls a parameter from that AS-i slave and returns a new parameter value.

The AS-i master does not call a parameter from the AS-i slave if the passed parameter value is identical to the parameter value previously active in the slave.

The AS-i master does not perform a power-up on the AS-i bus.

The command is considered completed without errors when the parameter values have been passed to the master. Subsequently, the parameters are passed to the slaves in parameter calls with no time monitoring.

---

**Note**

**Limited number of write accesses to an EEPROM**

If function code = 0 and function code = 2, the EEPROM is written to. Because the number of write accesses to an EEPROM is in principle limited (100 000 write accesses), these function codes should not be used in cyclic mode. Write access always means the actual change of a value in the EEPROM.

---

**Structure of the job data in the send buffer**

Table 9- 38 Structure of the job data

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Command number: 3C <sub>H</sub>							
1	Function code							
2	0				Parameter value slave 1 / 1A			
3	Parameter value slave 2 / 2A				Parameter value slave 3 / 3A			
4	Parameter value slave 4 / 4A				Parameter value slave 5 / 5A			
5	Parameter value slave 6 / 6A				Parameter value slave 7 / 7A			
6	Parameter value slave 8 / 8A				Parameter value slave 9 / 9A			
7	Parameter value slave 10 / 10A				Parameter value slave 11 / 11A			
8	Parameter value slave 12 / 12A				Parameter value slave 13 / 13A			
9	Parameter value slave 14 / 14A				Parameter value slave 15 / 15A			
10	Parameter value slave 16 / 16A				Parameter value slave 17 / 17A			
11	Parameter value slave 18 / 18A				Parameter value slave 19 / 19A			
12	Parameter value slave 20 / 20A				Parameter value slave 21 / 21A			
13	Parameter value slave 22 / 22A				Parameter value slave 23 / 23A			
14	Parameter value slave 24 / 24A				Parameter value slave 25 / 25A			
15	Parameter value slave 26 / 26A				Parameter value slave 27 / 27A			
16	Parameter value slave 28 / 28A				Parameter value slave 29 / 29A			
17	Parameter value slave 30 / 30A				Parameter value slave 31 / 31A			
18	0				Parameter value slave 1B			
19	Parameter value slave 2B				Parameter value slave 3B			
20	Parameter value slave 4B				Parameter value slave 5B			
21	Parameter value slave 6B				Parameter value slave 7B			
22	Parameter value slave 8B				Parameter value slave 9B			
23	Parameter value slave 10B				Parameter value slave 11B			
24	Parameter value slave 12B				Parameter value slave 13B			
25	Parameter value slave 14B				Parameter value slave 15B			
26	Parameter value slave 16B				Parameter value slave 17B			
27	Parameter value slave 18B				Parameter value slave 19B			
28	Parameter value slave 20B				Parameter value slave 21B			
29	Parameter value slave 22B				Parameter value slave 23B			
30	Parameter value slave 24B				Parameter value slave 25B			
31	Parameter value slave 26B				Parameter value slave 27B			
32	Parameter value slave 28B				Parameter value slave 29B			
33	Parameter value slave 30B				Parameter value slave 31B			

## 9.4.20 No. 33: AS-i Parameter Echolist

### Meaning

This command returns the parameter echo values of all AS-i slaves. The parameter echo of an AS-i slave originates in the last parameter call that was sent to this AS-i slave. The AS-i slave can provide any parameter echo value. As a general rule, the returned parameter echo value is not a "mirror image" of the parameter value that is sent by the master to the slave. If necessary, refer to the documentation of the AS-i slave to ascertain whether the echo value has a special meaning.

### Structure of the job data in the send buffer

Table 9- 39 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 33 <sub>H</sub>
1	00 <sub>H</sub>

### Structure of the reply data in the receive buffer f(ParEcho = parameter echo)

Table 9- 40 Structure of the job data in the receive buffer

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved				Par.Echo Slave 1			
1	Par.Echo Slave 2				Par.Echo Slave 3			
2	Par.Echo Slave 4				Par.Echo Slave 5			
3	Par.Echo Slave 6				Par.Echo Slave 7			
4	Par.Echo Slave 8				Par.Echo Slave 9			
5	Par.Echo Slave 10				Par.Echo Slave 11			
6	Par.Echo Slave 12				Par.Echo Slave 13			
7	Par.Echo Slave 14				Par.Echo Slave 15			
8	Par.Echo Slave 16				Par.Echo Slave 17			
9	Par.Echo Slave 18				Par.Echo Slave 19			
10	Par.Echo Slave 20				Par.Echo Slave 21			
11	Par.Echo Slave 22				Par.Echo Slave 23			
12	Par.Echo Slave 24				Par.Echo Slave 25			
13	Par.Echo Slave 26				Par.Echo Slave 27			
14	Par.Echo Slave 28				Par.Echo Slave 29			
15	Par.Echo Slave 30				Par.Echo Slave 31			
16	Reserved				Par.Echo Slave 1B			
17	Par.Echo Slave 2B				Par.Echo Slave 3B			
18	Par.Echo Slave 4B				Par.Echo Slave 5B			

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
19	Par.Echo Slave 6B				Par.Echo Slave 7B			
20	Par.Echo Slave 8B				Par.Echo Slave 9B			
21	Par.Echo Slave 10B				Par.Echo Slave 11B			
22	Par.Echo Slave 12B				Par.Echo Slave 13B			
23	Par.Echo Slave 14B				Par.Echo Slave 15B			
24	Par.Echo Slave 16B				Par.Echo Slave 17B			
25	Par.Echo Slave 18B				Par.Echo Slave 19B			
26	Par.Echo Slave 20B				Par.Echo Slave 21B			
27	Par.Echo Slave 22B				Par.Echo Slave 23B			
28	Par.Echo Slave 24B				Par.Echo Slave 25B			
29	Par.Echo Slave 26B				Par.Echo Slave 27B			
30	Par.Echo Slave 28B				Par.Echo Slave 29B			
31	Par.Echo Slave 30B				Par.Echo Slave 31B			

**9.4.21 No. 44: Read\_Write\_CTT2\_String**

**Meaning**

This command sends a CTT2 request according to the AS-i slave profile "CombinedTransactionType2" to the AS-i master with a byte string. The master forwards the string bytes to the AS-i slave address specified in the send buffer.

This command transfers a send buffer with up to 222 bytes to the AS-i master. The AS-i master calculates the actual number of string bytes to be sent to the AS-i slave from byte 2 of the send buffer.

The addressed AS-i slave answers the CTT2 request with a CTT2 response. The AS-i master communicates this response as a byte string in the receive buffer. The strings are transmitted by the AS-i master with the response.

The structure of the CTT2 request or CTT2 response (code, index, etc.) starts with string byte 1 in each case. You will find details about this in the respective AS-i slave description.

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**Note**

While transmission of the strings is being executed on AS-i, there is no cyclic data transfer with the addressed AS-i slave. The type of protocol used means that transfer of up to 200 bytes can take up to half a minute.

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### Structure of the job data in the send buffer

Table 9- 41 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 44 <sub>H</sub>
1	Slave address
2	Number of string bytes
3	String byte 1
4	String byte 2
...	—
n + 1	String byte n-1
n + 2	String byte n

Maximum value for n = 220

### Structure of the response data in the receive buffer

Table 9- 42 Structure of the response data in the receive buffer

Byte	Meaning
0	Number of string bytes
1	String byte 1
2	String byte 2
...	...
m - 1	String byte m - 1
m	String byte m

Maximum value for m = 220

### 9.4.22 No. 14: Read\_Version

#### Meaning

This command reads the version ID for the firmware of the AS-i master.

#### Structure of the job data in the send buffer

Table 9- 43 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 14 <sub>H</sub>

#### Structure of the response data in the receive buffer

Table 9- 44 Structure of the response data in the receive buffer

Byte	Meaning
0 ... 31	Versions string <sup>1)</sup>

1) "Siemens AG CM ASi M V aa.bb.cc.dd"

### 9.4.23 No. 17: Read ID\_Code

#### Significance

This command reads the ID code of an AS-i slave directly over the AS-i cable.

#### Structure of the job data in the send buffer

Table 9- 45 Structure of the job data in the send buffer

Byte	Significance
0	Command number: 17 <sub>H</sub>
1	Slave address

#### Structure of the reply data in the receive buffer

Table 9- 46 Structure of the reply data in the receive buffer

Byte	Significance			
	Bit 7	Bit 4	Bit 3	Bit 0
0	Reserved		ID code	

## 9.4.24 No. 37: Read\_ID1-Code

### Meaning

This command reads the ID1 code of an AS-i slave directly over the AS-i cable.

### Structure of the job data in the send buffer

Table 9- 47 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 37 <sub>H</sub>
1	Slave address

### Structure of the response data in the receive buffer

Table 9- 48 Structure of the response data in the receive buffer

Byte	Meaning			
	Bit 7	Bit 4	Bit 3	Bit 0
0	Reserved	ID1 code		

## 9.4.25 No. 3F: Write ID1-Code

### Meaning

This command writes the ID1 code of an AS-i slave with the address "0" directly over the AS-i cable.

The AS-i master forwards the ID1 code to the AS-i slave without a plausibility check.

### Structure of the job data in the send buffer

Table 9- 49 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 3F <sub>H</sub>
1	Not relevant
	ID1 code

**9.4.26 No. 38: Read\_ID2-Code**

**Meaning**

This command reads the ID2 code of an AS-i slave directly over the AS-i cable.

**Structure of the job data in the send buffer**

Table 9- 50 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 38 <sub>H</sub>
1	Slave address

**Structure of the response data in the receive buffer**

Table 9- 51 Structure of the response data in the receive buffer

Byte	Meaning		
	Bit 7	Bit 4	Bit 3
0	Reserved		ID2 code

**9.4.27 No. 18: Read\_IO-Code**

**Meaning**

This command reads the IO code of an AS-i slave directly over the AS-i cable.

**Structure of the job data in the send buffer**

Table 9- 52 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 18 <sub>H</sub>
1	Slave address

**Structure of the response data in the receive buffer**

Table 9- 53 Structure of the response data in the receive buffer

Byte	Meaning		
	Bit 7	Bit 4	Bit 3
0	Reserved		IO code

## 9.4.28 No. BE: Get\_LPF

### Meaning

This command reads the list of I/O faults (periphery faults) (LPF) signaled by the AS-i slaves from the AS-i master. The AS-i master updates the LPF cyclically. Refer to the description of the AS-i slave to learn whether the slave can detect a fault in the connected I/O, e.g. wire break, and when it signals the fault.

### Structure of the job data in the send buffer

Table 9- 54 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: BE <sub>H</sub>

### Structure of the responses in the receive buffer

Table 9- 55 Structure of the responses in the receive buffer

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Slave 7(A)	Slave 6(A)	Slave 5(A)	Slave 4(A)	Slave 3(A)	Slave 2(A)	Slave 1(A)	Reserved
1	Slave 15(A)	Slave 14(A)	Slave 13(A)	Slave 12(A)	Slave 11(A)	Slave 10(A)	Slave 9(A)	Slave 8(A)
2	Slave 23(A)	Slave 22(A)	Slave 21(A)	Slave 20(A)	Slave 19(A)	Slave 18(A)	Slave 17(A)	Slave 16(A)
3	Slave 31(A)	Slave 30(A)	Slave 29(A)	Slave 28(A)	Slave 27(A)	Slave 26(A)	Slave 25(A)	Slave 24(A)
4	Slave 7B	Slave 6B	Slave 5B	Slave 4B	Slave 3B	Slave 2B	Slave 1B	Reserved
5	Slave 15B	Slave 14B	Slave 13B	Slave 12B	Slave 11B	Slave 10B	Slave 9B	Slave 8B
6	Slave 23B	Slave 22B	Slave 21B	Slave 20B	Slave 19B	Slave 18B	Slave 17B	Slave 16B
7	Slave 31B	Slave 30B	Slave 29B	Slave 28B	Slave 27B	Slave 26B	Slave 25B	Slave 24B
8 ... 13	Reserved							

The bits have the following meanings in the LPF data:

Bit = 0: The slave signals no I/O fault.

Bit = 1: The slave signals I/O fault.

### 9.4.29 No. 40: Write\_Parameter\_String

#### Meaning

This command sends a parameter string in accordance with AS-i slave profile 7.4 to the AS-i master. The master forwards the parameter string to the AS-i slave address specified in the send buffer.

This command transfers a send buffer with up to 223 bytes to the AS-i master. The AS-i master calculates the actual number of parameter bytes to be sent to the AS-i slave from byte 2 of the send buffer.

The AS-i master does not evaluate any other information in the parameter string. It transfers this to the AS-i slave transparently. While transmission of the parameter string is being executed, there is no transfer of user data / analog data with the addressed AS-i slave.

#### Structure of the job data in the send buffer

Table 9- 56 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 40 <sub>H</sub>
1	Slave address
2	Number of parameter bytes
3	Parameter string byte 1
4	Parameter string byte 2
...	...
n + 1	Parameter string byte n - 1
n + 2	Parameter string byte n

Maximum value for n = 220

### 9.4.30 No. 41: Read\_String

#### Meaning

This command causes the AS-i slave to read a parameter string in accordance with AS-i slave profile 7.4 with the AS-i slave address specified in the send buffer.

The AS-i master supplies up to 221 bytes of response data. The AS-i master signals the actual number of parameter bytes sent by the AS-i slave in Byte 0 of the receive buffer.

If the AS-i slave sends a parameter string longer than 220 bytes, the AS-i master aborts string transfer and terminates the job with an error. The received data is not made available to the job program.

While transmission of the parameter string is being executed, there is no transfer of user data / analog data with the addressed AS-i slave.

#### Structure of the job data in the send buffer

Table 9- 57 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 41 <sub>H</sub>
1	Slave address

#### Structure of the response data in the receive buffer

Table 9- 58 Structure of the response data in the receive buffer

Byte	Meaning
0	Number of parameter bytes
1	Parameter string byte 1
2	Parameter string byte 2
...	...
n - 1	Parameter string byte n - 1
n	Parameter string byte n

Maximum value for n = 220

### 9.4.31 No. 42: Read\_String

#### Meaning

This command causes the AS-i slave to read an identification string in accordance with AS-i slave profile 7.4 with the AS-i slave address specified in the send buffer. The AS-i master supplies up to 221 bytes of reply data. The AS-i master signals the actual number of ID bytes sent by the AS-i slave in Byte 0 of the receive buffer.

If the AS-i slave sends an ID string longer than 220 bytes, the AS-i master aborts string transfer and terminates the job with an error. The received data is not made available to the user program.

As long as the transmission of the identification string is running, there is no transfer of user/analog data with the addressed AS-i slave.

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#### Note

In a deviation from normal procedure, this command also transfers the bytes that contain the bits "Follows" and "Valid".

For further details, refer to AS-i slave profile 7.4

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#### Structure of the job data in the send buffer

Table 9- 59 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: 42H
1	Slave address

#### Structure of the reply data in the receive buffer

Table 9- 60 Structure of the reply data in the receive buffer

Byte	Meaning
0	Number of ID bytes
1	ID string byte 1
2	ID string byte 2
...	...
n - 1	ID string byte n - 1
n	ID string byte n

Maximum value for n = 220

## 9.4.32 No. 43: Read\_String

### Significance

This command causes the AS-i slave to read a diagnostics string in accordance with AS-i slave profile 7.4 with the AS-i slave address specified in the send buffer. The AS-i master supplies up to 221 bytes of reply data. The AS-i master signals the actual number of diagnostics bytes sent by the AS-i slave in Byte 0 of the receive buffer.

If the AS-i slave sends a diagnostics string longer than 220 bytes, the AS-i master aborts string transfer and terminates the job with an error. The received data is not made available to the user program.

While transmission of the diagnostics string is being executed, there is no transfer of user data / analog data with the addressed AS-i slave.

### Structure of the job data in the send buffer

Table 9- 61 Structure of the job data in the send buffer

Byte	Significance
0	Command number: 43 <sub>H</sub>
1	Slave address

### Structure of the reply data in the receive buffer

Table 9- 62 Structure of the reply data in the receive buffer

Byte	Significance
0	Number of diagnostics bytes
1	Diagnostic string byte 1
2	Diagnostic string byte 2
...	...
n - 1	Diagnostic string byte n - 1
n	Diagnostic string byte n

Maximum value for n = 220

### 9.4.33 No. CA: Read\_Error\_Counter

**Note**

With Firmware V1.1 or higher, use data record "DS 96 Read AS-i master error counters and status messages (FW V1.1 and higher) (Page 86)" for reading out the error counters. The Read\_AS-i\_Master\_Error\_Counters command continues to exist for compatibility reasons.

**Meaning**

This command reads out error counters that concern the overall AS-i network.

If the AS-i power supply is missing, the overall device fails. This leads to all counters being reset. The counting starts over each time the device is powered up.

For the meaning of the error counters, refer to Table "Table 8-11 Meaning of error counter (Page 86)".

**Structure of the job data in the send buffer**

Table 9- 63 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: CA <sub>H</sub>

**Structure of the responses in the receive buffer**

Table 9- 64 Structure of the data record

Byte	Meaning	
0	Summation counter: AS-i Power Fail	High byte
1		Low byte
2	Summation counter: Ground fault	High byte
3		Low byte
4	Summation counter: Slave failure	High word, high byte
5		High word, low byte
6		Low word, high byte
7		Low word, low byte
8	Summation counter: Missing slave frame	High word, high byte
9		High word, low byte
10		Low word, high byte
11		Low word, low byte

Byte	Meaning		
12	Summation counter: Erroneous slave frame		High word, high byte
13			High word, low byte
14			Low word, high byte
15			Low word, low byte
16	Summation counter: Slave peripheral fault		High word, high byte
17			High word, low byte
18			Low word, high byte
19			Low word, low byte
20	Summation counter: Slave protocol error (for slaves according to CTT1 ... CTT5)		High word, high byte
21			High word, low byte
22			Low word, high byte
23			Low word, low byte
24	Summation counter: Erroneous master frame		High word, high byte
25			High word, low byte
26			Low word, high byte
27			Low word, low byte
28 ... 35	List of count values > 0 (see Table "Structure of bit fields")		
	Bit = 0	Count value = 0 for all error counters of the AS-i address	
	Bit = 1	Count value > 0 for at least one error counter of the AS-i address	
36	Summation counter: Sent master frames, less significant part (MT_CNT_LOW)		High word, high byte
37			High word, low byte
38			Low word, high byte
39			Low word, low byte
40	Summation counter: Sent master frames, more significant part (MT_CNT_HIGH)		High word, high byte
41			High word, low byte
42			Low word, high byte
43			Low word, low byte
44	Summation counter: Sent master frames, factor (MT_CNT_BASE)		High word, high byte
45			High word, low byte
46			Low word, high byte
47			Low word, low byte
48	Reserved		Bit 0 = MADDR
49	Reserved		
50 ... 57	List of multiple addressing (see Table "Structure of bit fields")		
	Bit = 0	The AS-i address is assigned once or is not present.	
	Bit = 1	The AS-i address is assigned more than once.	
58 ... 220	Reserved		

The counters are integer values (2 bytes or 4 bytes).

Multiple addressing has been detected for at least one AS-i address on the AS-i cable. This means that multiple slaves have the same AS-i address.

**Structure of the bit fields**

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	SLAVE 7/7A	SLAVE 6/6A	SLAVE 5/5A	SLAVE 4/4A	SLAVE 3/3A	SLAVE 2/2A	SLAVE 1/1A	Reserved
1	SLAVE 15/15A	SLAVE 14/14A	SLAVE 13/13A	SLAVE 12/12A	SLAVE 11/11A	SLAVE 10/10A	SLAVE 9/9A	SLAVE 8/8A
2	SLAVE 23/23A	SLAVE 22/22A	SLAVE 21/21A	SLAVE 20/20A	SLAVE 19/19A	SLAVE 18/18A	SLAVE 17/17A	SLAVE 16/16A
3	SLAVE 31/31A	SLAVE 30/30A	SLAVE 29/29A	SLAVE 28/28A	SLAVE 27/27A	SLAVE 26/26A	SLAVE 25/25A	SLAVE 24/24A
4	SLAVE 7B	SLAVE 6B	SLAVE 5B	SLAVE 4B	SLAVE 3B	SLAVE 2B	SLAVE 1B	Reserved
5	SLAVE 15B	SLAVE 14B	SLAVE 13B	SLAVE 12B	SLAVE 11B	SLAVE 10B	SLAVE 9B	SLAVE 8B
6	SLAVE 23B	SLAVE 22B	SLAVE 21B	SLAVE 20B	SLAVE 19B	SLAVE 18B	SLAVE 17B	SLAVE 16B
7	SLAVE 31B	SLAVE 30B	SLAVE 29B	SLAVE 28B	SLAVE 27B	SLAVE 26B	SLAVE 25B	SLAVE 24B

### 9.4.34 No. CB: Read\_and\_Delete\_AS-i-Master\_Error\_Counter

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**Note**

With Firmware V1.1 or higher, use data record "DS 97 Read and reset AS-i master error counters (FW V1.1 and higher) (Page 89)" for reading out the error counters. The Read\_and\_Reset\_AS-i\_Master\_Error\_Counters command continues to exist for compatibility reasons.

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**Meaning**

This command functions like the "Read\_AS-i-Master\_Error\_Counter" command. In addition, the AS-i master then sets all error counters to 0.

**Structure of the job data in the send buffer**

Table 9- 65 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: CB <sub>H</sub>

**Structure of the responses in the receive buffer**

The receive buffer is identical to the receive buffer of the "No. CA: Read\_Error\_Counter (Page 152)" command.

**9.4.35 No. CC: Read\_AS-i\_error\_counter**

**Note**

With Firmware V1.1 or higher, use data records "DS 150 to DS 153 Read AS-i error counters (Page 89)". The Read\_AS-i\_Slave\_Error\_Counters command continues to exist for compatibility reasons.

**Meaning**

This command reads out AS-i slave-specific error counters. For the meaning of the error counters, refer to Section "Table 8-13 Meaning of error counter (Page 90)".

**Structure of the job data in the send buffer**

Table 9- 66 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: CCH
1	AS-i slave address

**Structure of the responses in the receive buffer**

Table 9- 67 Structure of the responses in the receive buffer

Byte	Meaning	
0	Counter: Slave failure	High byte
1		Low byte
2	Counter: Missing slave frame	High byte
3		Low byte
4	Counter: Faulty slave frame	High byte
5		Low byte
6	Counter: Peripheral fault	High byte
7		Low byte
8	Counter: Protocol error	High byte
9		Low byte
10	Counter: Faulty master frame	High byte
11		Low byte
12	Summation counter: Sent master frames, less significant part (MT_CNT_LOW)	High word / high byte
13		High word / low byte
14		Low word / high byte
15		Low word / low byte

Byte	Meaning	
16	Summation counter: Sent master frames, more significant part (MT_CNT_HIGH)	High word / high byte
17		High word / low byte
18		Low word / high byte
19		Low word / low byte
20	Summation counter: Sent master frames, factor (MT_CNT_BASE)	High word / high byte
21		High word / low byte
22		Low word / high byte
23		Low word / low byte
24 ... 31	Reserved	

### 9.4.36 No. CD: Read\_and\_delete\_AS-i\_Slave\_error\_counter

**Note**

With Firmware V1.1 or higher, use data records "DS 150 to DS 153 Read AS-i error counters (Page 89)" and "DS 154 Delete AS-i error counters (from FW V1.1) (Page 96)". The Read\_and\_Reset\_AS-i\_Slave\_Error\_Counters command continues to exist for compatibility reasons.

**Meaning**

This command reads out the error counters of the AS-i slaves. Data records DS 150 and DS 151 access the standard addresses and the A addresses. Data records DS 152 and DS 153 access the B addresses. The counters for addresses 16 / 16A exist identically in data records DS 150 and DS 151. The counters for address 16B exist identically in data records DS 152 and DS 153. Data record DS 154 resets all AS-i slave error counters.

**Structure of the job data in the send buffer**

Table 9- 68 Structure of the job data in the send buffer

Byte	Meaning
0	Command number: CD <sub>H</sub>
1	AS-i slave address

**Structure of the responses in the receive buffer**

The receive buffer is identical to the receive buffer of the "No. CC: Read\_AS-i\_error\_counter (Page 156)" command.

### 9.4.37 No. 13: Activate\_ground fault detection (reset EFD)

#### Meaning

The setting for enabling the integrated ground fault detection is always made when configuring the CM AS-i Master.

This command is used to enable or disable the ground fault detection via the user program so as to overwrite the configured setting.

After a startup or restart, the configured setting is applied again.

#### Structure of the job data in the send buffer

Table 9- 69 Structure of the job data in the send buffer

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Command number 13H							
1	0						0 = Ground fault detection is enabled 1 = Ground fault detection is disabled	

## 9.4.38 No. D0: Set\_Configuration\_Online

### Meaning

The following configuration data for the addressed AS-i slave is configured with this command:

- IO code
- ID code
- ID1 code
- ID2 code
- Parameter value

The configuration data is stored in the non-volatile EEPROM of the CM AS-i Master ST. The AS-i master uses this configuration data as the specified expected configuration for "protected operation". The configuration data are defined by the manufacturer of the AS-i slave. The meaning of the configuration data is described in the "AS-Interface Complete Specification". If the addressed AS-i slave does not support an ID1 code or ID2 code, ID1 code = F (hex) and ID2 code = F (hex) must be used as the preset values. When this command is executed, the AS-i master remains in the online phase. This means that the AS-i master is not restarted. The command can be executed in "Protected operation".

The command can be executed for any slaves including proxy slaves. Ensure that you have defined an adequate length for the I/O image when configuring the slave. If the the I/O image for the slave is not long enough, surplus input data are truncated and surplus output data are transmitted with substitute value 0. This applies to a digital I/O image and an analog I/O image.

If the value F (hex) is written to a proxy slave for all four codes (IO code, ID code, ID1 code and ID2 code), any slave type at this AS-i address is activated by the AS-i master.

---

### Note

#### Configuration data are overwritten

If you use this command, you will overwrite the corresponding configuration data that resulted from configuring using the "SET" button or configuring using HW Config.

---

### Note

The configuration data for all proxy slaves can be reset to value F (hex) in the CM AS-i Master ST module by configuring the AS-i slaves using the "SET" button with no slaves connected (see Section "Configuration of the AS-i slaves using the "SET" button (Page 34)").

---

**Structure of the job data in the send buffer**

Table 9- 70 Structure of the job data in the send buffer

Byte	Meaning		
	Bit 7	Bit 4	Bit 3
0	Command: D0 <sub>H</sub>		
1	Slave address		
2	IO code	ID code	
3	ID1 code	ID2 code	
4	0	Parameter	

**9.4.39 No. D1: AS-i-Slave\_ID1\_schreiben\_mit\_Zieladresse (Write ID1 code with destination address)**

**Meaning**

This command writes the ID1 code of an AS-i slave with the specified address directly via the AS-i cable.

The AS-i master forwards the ID1 code to the AS-i slave without a plausibility check.

**Requirements**

- The AS-i slave at the target address must support writing of the ID1 code.
- There are no AS-i slaves on the AS-i bus with address "0".

**Structure of the job data in the send buffer**

Table 9- 71 Structure of the job data in the send buffer

Byte	Meaning		
	Bit 7	Bit 4	Bit 3
0	Command: D1 <sub>H</sub>		
1	AS-i slave address		
2	0	ID1 code	

## Technical data

### 10.1 Technical data in Siemens Industry Online Support

#### Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/ps/15756/td>).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data link.

The screenshot shows the Siemens Industry Online Support search interface. At the top, there is a search bar with the text "Enter keyword...". Below the search bar, there are three input fields: "Product", "Entry type", and "Date". The "Product" field contains the article number "3RK7137-6SA00-0BC1" and is highlighted with a red box. The "Entry type" field contains "Technical data (1)" and is also highlighted with a red box. The "Date" field has "From" and "To" sub-fields. Below the search bar, there is a "Search product" button. The search results are displayed in a list. The first result is for the product "3RK7137-6SA00-0BC1" and is highlighted with a red box. The description of the product is: "CIRCUIT BREAKER, SCREW TYPE, 20 A, CIRCUIT BREAKER SIZE S2, FOR MOTOR PROTECTION, CLASS 10, A-RELEASE 14... 20A, N-RELEASE 20DA, SCREW TERMINAL, STANDARD BREAKING CAPACITY". Below the description, there are three links: "Product details", "Technical data" (highlighted with a red box), and "CAx data".



# AS-Interface Protocol Implementation Conformance Statements



## A.1 AS-Interface Protocol Implementation Conformance Statement (PICS)

### PICS for the CM AS-i Master ST

Vendor	SIEMENS AG
Product name	CM AS-i Master ST
Article number	3RK137-6SA00-0BC1
Firmware version	V1.0, V1.1
Master profile	M4
Date	—

### List of available master functions

Character	Meaning
X	Function available
—	Function not available

No.	Function or command to the host interface (symbolic representation)	M4	Remark / implementation of the function with
1	Image, Status = Read_IDI()	X	Through automation system access to the I/O data of the AS-i master
2	Status = Write_ODI(Image)	X	
3	Status = Set_Permanent_Parameter (Addr, Param)	X	
4	Param, Status = Get_Permanent_Parameter (Addr)	X	
5	Status, Param = Write_Parameter (Addr, Param)	X	
6	Status, Param = Read_Parameter(Addr)	X	
7	Status = Store_Actual_Parameters()	X	
8	Status = Set_Permanent_Configuration (Addr, Config)	X	
9	Status, Config = Get_Permanent_Configuration (Addr)	X	
10	Status = Store_Actual_Configuration()	X	In <i>STEP 7</i> , in the control panel, by pressing the "ACTUAL → CONFIGURED" button.

AS-Interface Protocol Implementation Conformance Statements

A.1 AS-Interface Protocol Implementation Conformance Statement (PICS)

No.	Function or command to the host interface (symbolic representation)	M4	Remark / implementation of the function with
11	Status, Config = Read_Actual_Configuration (Addr)	X	See Section "Description of the AS-i commands (Page 103)". Access to data record 84.
12	Status = Set_LPS(List31)	X	
13	Status, LPS = Get_LPS()	X	
14	Status, LAS = Get_LAS()	X	
15	Status, LDS = Get_LDS()	X	
16.0	Status = Get_Flags()	X	
16.1	Status, Flag = Get_Flag_Config_OK()	X	
16.2	Status, Flag = Get_Flag_LDS.0()	X	
16.3	Status, Flag = Get_Flag_Auto_Address_Assign()	X	
16.4	Status, Flag = Get_Flag_Auto_Prog_Available()	X	
16.5	Status, Flag = Get_Flag_Configuration_Active()	X	
16.6	Status, Flag = Get_Flag_Normal_Operation_Active()	X	
16.7	Status, Flag = Get_Flag_APF()	X	
16.8	Status, Flag = Get_Flag_Offline_Ready()	X	Access to data record 84.
16.9	Status, Flag = Get_Flag_Periphery_OK()	X	
17	Status = Set_Operation_Mode(Mode)	X	By pressing the "Configuration mode" or "Protected operation" button in the control panel of <i>STEP 7</i> .
18	Status = Set_Offline_Mode(Mode)	X	See section "Description of the AS-i commands (Page 103)"
19	Status = Activate_Data_Exchange(Mode)	-	Optional command; not implemented
20	Status = Change_Slave_Address (Addr1, Addr2)	X	See Section "Description of the AS-i commands (Page 103)".
21.1	Status = Set_Auto_Address_Enable	X	
21.2	Status = Get_Auto_Address_Enable	X	
22.1	Status, Resp = Cmd_Reset_ASI_Slave (Addr, RESET)	-	
22.2	Status, Resp = Cmd_Read_IO_Configuration (Addr, CONF)	X	
22.3	Status, Resp = Cmd_Read_Identification_Code(Addr, IDCOD)	X	
22.4	Status, Resp = Cmd_Read_Status (Addr, STAT)	X	
22.5	Status, Resp = Cmd_Read_Reset_Status (Addr, STATRES)	-	Not relevant for AS-i master acc. to profile M4; not implemented
22.6	Status, Resp = Cmd_Read_ID-Code_1(Addr, IDCOD1)	X	Not implemented
22.7	Status, Resp = Cmd_Read_ID-Code_2(Addr, IDCOD2)	X	
23	Status, S_List = Get_LPF()	X	See Section "Description of the AS-i commands (Page 103)". Access to data record 84.
24	Status = Write_ID-Code_11(S_ID-Code_1)	X	See Section "Description of the AS-i commands (Page 103)". Not implemented

No.	Function or command to the host interface (symbolic representation)	M4	Remark / implementation of the function with
25	Almage, Status = Read_AIDI()	X	See Section Description of the AS-i commands (Page 103). Through automation system access to the I/O data of the AS-i master
26	Status = Write_AODI(Almage)	X	
27	String, Status = Read_ParamStr(S_Addr)	X	See "Read_Parameter_String" in Section Description of the AS-i commands (Page 103)
28	Status = Write_ParamStr(S_Addr, String)	X	See Section Description of the AS-i commands (Page 103)
29	String, Status = Read_DiagStr(S_Addr)	X	See Section Description of the AS-i commands (Page 103)
30	String, Status = Read_IdentStr(S_Addr)	X	See Section Description of the AS-i commands (Page 103)
B	Supported slave profiles		
1	Support of extended address mode	X	—
2	Support of Combined transaction type 1 integrated (S-7.3 only)	X	—
3	Full support of Combined transaction type 1 integrated	X	Support for profiles 7.3 and 7.4 only.
4	Support of Combined transaction type 2 integrated	X	—
5	Support of Combined transaction type 3 integrated	X	—
6	Support of Combined transaction type 4 integrated	X	—
7	Support of Combined transaction type 5 integrated	X	—



## Readme Open Source Software

### B.1 Read\_me OSS

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## Data sets

### C.1 DS 100 Switch duplicate address detection on/off

#### Description

The duplicate address detection function can be activated/deactivated via the user program by means of write access to data record DS 100.

For the CM AS-i Master firmware V1.0 the status is stored in the AS-i Master volatile memory, i.e. if the AS-i voltage fails, duplicate address detection is deactivated.

For the CM AS-i Master firmware V1.0 and higher, duplicate address detection is adopted according to the setting in HW Config or GSD after failure of the AS-i voltage.

---

#### Note

From firmware V1.1 onwards use the setting option via HW Config or GSD to activate duplicate address detection. Data record DS 100 continues to exist for compatibility reasons.

---

Table C- 1 Structure of DS 100 write

Byte	Meaning								
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
0	0								
1	0								
2	0							0 / 1	
3	0								

Bit 0 = 0 Duplicate address detection is activated.

= 1 Duplicate address detection is deactivated (default setting for FW V1.0).

The setting for which AS-i voltage duplicate address detection is activated (possible for FW V1.1 and higher) cannot be changed in this case.

#### See also

Duplicate address detection (Page 76)

## C.2 DS 100 Read setting for duplicate address detection

### Description

Via read access to data record DS 100 the enable status of duplicate address detection can be read back.

Table C- 2 Structure of DS 100 read

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 ... 1	Reserved							
2	Reserved							0 / 1
3	Reserved							

Bit 0 = 0 Duplicate address detection is activated  
 = 1 Duplicate address detection is deactivated (default setting for FW V1.0).

The setting for which AS-i voltage duplicate address detection is activated (possible for FW V1.1 and higher) cannot be read out in this case.

### See also

Duplicate address detection (Page 76)

## C.3 DS 101 Read version identifier

### Description

This data record reads the version identifier.

Table C- 3 Structure of data record DS 101

Byte	Meaning							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 ... 1	Reserved							
2 ... 33	Version identifier as a string e. g.: Siemens AG CM ASi M V01.00.00 1.....1.....1.....1..							

# List of abbreviations

## D.1 List of abbreviations

### Meaning of abbreviations

Abbreviation	Meaning
APF	AS-i Power Fail (problem with the AS-i supply voltage)
AS-i	AS-Interface
ATEX	Atmosphere Explosive
AUP	Automatic address programming
AWP	Automation Web Pages
CER	Configuration error
CBA	Component Based Automation
CDI	Configuration Data Image
CFGOK	Configuration OK
CM	Configuration mode; Communication module Configuration mode activated
CPU	Central Processing Unit
CTT	Combined Transaction Type Glossary (Page 175)
DIAG	Diagnosis Diagnostics available
DIN	Deutsches Institut für Normierung e. V.
DP	Distributed peripherals
DS	Data record/data set
I/O	Input/Output
EEPROM	Electrically Erasable Programmable Read-Only Memory
EFD	Ground fault detection
EN	Europäische Norm (European standard)
FB	Function Block
FC	Function Code
GSD	Device master data
GSDML	Generic Station Description Markup Language
HSP	Hardware support package
HW	Hardware
HW ID	Hardware identifier
I&M	Identification and Maintenance
ID	Identifier (Identification number, e.g., ID1 code)
IEC	International Electrotechnical Commission

## List of abbreviations

### D.1 List of abbreviations

Abbreviation	Meaning
IEEE	Institute of Electrical and Electronics Engineers
IO	Input Output
IP	Ingress Protection (enclosure class)
ISO	International Organization for Standardization
LAS	List of Activated Slaves
LDS	List of Detected Slaves
LED	Light Emitting Diode
LPF	List of peripheral faults (list of peripheral faults signaled by the AS-i slaves)
LPS	List of configured AS-i slaves (list of "projected" slaves)
MPO	Master Power On
NEC	National Electrical Code
NFPA	National Fire Protection Association
OB	Organization block
PIQ	Process Image Output
PII	Process image input
PCD	Permanent Configuration Data
PELV	Protective extra low voltage
PF	Peripheral fault
PI	Parameter Image
PP	Permanent Parameter
RDREC	Read record
SELV	Safety Extra Low Voltage
SIL	Safety Integrity Level
GF, CF	System fault
SFB	System function block
PLC	Programmable logic controller
SNMP	Simple Network Management Protocol
TCP/IP	Transmission Control Protocol / Internet Protocol
TIA	Totally Integrated Automation
USB	Universal Serial Bus
WRREC	Write record

# Glossary

## **"Protected operation"**

In "protected operation", the AS-i master only exchanges data with the configured AS-i slaves. "Configured" means that the slave addresses and configuration data stored in the AS-i master agree with the values of existing AS-i slaves.

## **APF**

AS-i Power Fail. Flag or LED display that indicates that the supply voltage on the AS-i cable is too low or has failed, e.g., failure of the AS-i power supply unit.

## **AS-i (AS-Interface)**

Actuator-Sensor-Interface. A networking system for the plant-floor automation layer. It is suitable for networking sensors and actuators with controllers.

## **AS-i analog slave**

AS-i analog slaves are special AS-i standard slaves that exchange analog values with the AS-i master; see also CTT.

## **AS-i master**

The AS-i master monitors and controls simple digital or analog sensors and actuators via AS-i modules or AS-i slaves.

## **AS-i slave**

All devices that can be addressed by an AS-i master are referred to as AS-i slaves. AS-i slaves are distinguished according to their design (AS-i modules as well as sensors or actuators with integrated AS-i connection) and their addressing type (AS-i slave with standard address in the range 0 ... 31 and AS-i slave with A/B address in the range 0, 1A ... 31A, 1B, 31B) or their functionality (standard slave for non-safety-related data transmission and ASIsafe slave for safety-related data).

### **AS-i slave with A/B address**

AS-i slaves with A/B address use extended addressing. A (numerical) address can thus be used by two slaves with A/B address, e.g., 1A and 1B. Based on the address organization, up to 62 slaves with A/B address can be connected to the AS-Interface.

For cyclic data transmission, the master accesses each (numerical) address once per AS-i cycle (max. 5 ms). If two slaves use a (numerical) address on the bus both as an A address and a B address, two consecutive AS-i cycles are required for their data transmission (max. 10 ms rms). If a (numerical) address is used only as an A address or as a B address on the bus, the data transmission for these slaves occurs in every AS-i cycle.

### **AS-i slave with standard address**

Each AS-i slave with standard address occupies one address on the AS-Interface; based on the address organization, up to 31 AS-i slaves with standard address can therefore be connected to the AS-Interface. If a slave with standard address occupies an address, this address is no longer available for slaves with A/B address.

For cyclic data transmission, the master accesses each address once per AS-i cycle (max. 5 ms).

### **CER**

Configuration Error (Indication of configuration errors). The configuration error is indicated by an LED if the actual bus configuration does not match the specified configuration.

### **CM**

Communication module

Module for communication tasks that is used in an automation system as an interface expansion for the CPU.

### **CPU**

Central Processing Unit

## CTT

Combined Transaction Type. Special AS-i slave profile:

CTT slaves require several AS-i cycles or several AS-i addresses for updating process data between an AS-I slave and AS-i master.

The following CTT variants are defined:

### **CTT1: Slave profiles S-7.3, S-7.4**

For cyclic data transmission of analog values or transparent data (up to 16 bits per channel).

Depending on the slave, the data transmission is in the direction of the input or output.

The S-7.1 and S-7.2 profiles are outdated profiles that are not managed automatically by the AS-i master (function blocks are required for decoding the process data).

### **CTT2: Slave profiles S-7.5.5, S-7.A.5, S-B.A.5**

For transmission of data blocks similar to data record transmission in PROFIBUS/PROFINET.

The transmission can be initiated individually via the user program (acyclically, see "CTT2-Request\_lesen\_schreiben (Read\_Write\_CTT2\_String)") or automatically by the master (cyclically, same as for analog values). Refer to the slave documentation.

The transmission process is managed automatically by the master and corresponds to a serial data transmission with approximately 12 bytes (or 6 bytes for A/B address with maximum configuration).

Depending on the slave, in parallel to the data block transmission, digital data of up to 2 DI / DO are also transmitted per AS-i cycle (5 ms or 10 ms for A/B address with maximum configuration).

### **CTT3: Slave profiles S-7.A.7, S-7.A.A**

For cyclic transmission of digital data.

Slave profile S-7.A.7 transmits 4 DI / 4 DO using a slave with A/B address. Like for standard slaves, the inputs are transmitted in each AS-i cycle (5 ms or 10 ms for A/B address with maximum configuration). The outputs require double the transmission time.

Slave profile S-7.A.A transmits 8 DI / 8 DO using a slave with A/B address. The inputs and outputs are transmitted using four AS-i cycles.

### **CTT4: Slave profiles S-7.A.8, S-7.A.9**

For cyclic transmission of analog values or transparent data (up to 16 bits per channel) in the input direction using a slave with A/B address.

Depending on the slave, in parallel to the data block transmission, digital data of up to 1 DO can also be transmitted per AS-i cycle (5 ms or 10 ms for A/B address with maximum configuration).

### **CTT5: Slave profile S-6.0.x, where x = 2 ... 7, A ... C**

For cyclic transmission of analog values or transparent data (up to 16 bits) in the input and output direction.

The CTT5 types each occupy 2, 3, or 4 slave addresses simultaneously, depending on the data record, so that consistent transmission of the full data width occurs in each AS-i cycle (5 ms).

**DIAG**

Diagnosis

**EFD**

Ground fault detection

**GSD file**

Generic station description file for PROFIBUS or PROFINET devices

**GSDML file**

GSD file for PROFINET devices. As a generic station description, this file contains all of the properties of a PROFINET device necessary for its configuration.

**HSP**

The Hardware Support Package supplements the hardware catalog of *STEP 7*.

**ID code**

Fixed identification code saved in the AS-i slave; part of the slave profile.

See also: Slave profile

**ID1 code**

Also called: Extended ID1 code

Fixed or editable identification code saved in the AS-i slave.

See also: Slave profile

**ID2 code**

Also called: Extended ID2 code

Fixed identification code saved in the AS-i slave; part of the slave profile.

See also: Slave profile

**Inspector window**

The inspector window of *STEP 7* TIA Portal displays additional information about a selected object or executed actions. The indicated properties and parameters of the selected object can be edited within the inspector window.

**IO code**

Also called: I/O configuration

Fixed identification code saved in the AS-i slave; part of the slave profile.

See also: Slave profile

**LAS**

List of Activated Slaves

**LDS**

List of Detected Slaves

**LED**

A light-emitting diode that is used to display the signal status.

**LPF**

List of periphery faults This list in the AS-i master designates the status of the peripheral fault of the activated slaves.

**LPS**

List of Projected Slave (list of configured slaves)

**Nibble**

A nibble is a unit of information that comprises four bits.

**Option handling**

Option handling allows the user program to activate optional functions during normal operation without the need for reconfiguration.

**PF**

Peripheral fault: Error message of an active AS-i slave to the master, e.g., overload at output (depending on slave, see documentation of the AS-i slave).

## Slave profile

The slave profile classifies the basic properties of an AS-i slave. The slave profile consists of the IO code, ID code, and ID2 code, which are stored as fixed, uneditable codes in each slave. In addition, a slave has an ID1 code, which is saved in the slave as a fixed code or a code that is editable by the user (e.g., with an addressing device). The value of the ID1 code usually has no effect on the operating characteristics of the slave. In this case, the user should not change the value, so that compatibility problems do not occur if the device is replaced. Note the documentation of the slave for the ID1 setting.

Each of the four identification codes consists of a 4-bit value that is usually written in hexadecimal notation with a value range of 0 to F. On power-up, the AS-i master reads the codes automatically from each slave and saves this ACTUAL configuration in the volatile memory of the AS-i master.

If the AS-i master is in “protected operation”, it compares the ACTUAL configuration with a CONFIGURED configuration, which is normally stored in non-volatile memory in the AS-i master. Slaves whose ACTUAL configuration matches the CONFIGURED configuration are activated and then participate in the cyclic data exchange. Slaves without a match are not activated and do not exchange cyclic data. A configuration error is also signaled.

ID2 and ID1 are optional codes. That is, some slaves do not have these two codes. In this case, the master enters the hexadecimal value “F” as a substitute value in the ACTUAL configuration.

Slaves with extended addressing, the so-called A/B slaves, use only the three less significant bits of the ID1 code as the slave identification. The most significant bit of the ID1 code is reserved and is used by the AS-i system to distinguish between an A address or B address. The effective value range of the ID1 code is thus 0 ... 7. For the read-out of the ID code, only the 3 less significant bits or all 4 bits are displayed, depending on the system, so that the displayed ID1 code can be within the value range 8 to F for slaves with B address. The user or programmer can ignore the most significant bit of the ID1 code for A/B slaves since it is managed automatically by the system.

The slave profile is usually shown in the documentation with the S prefix and a hyphen (in some cases), followed by the IO, ID, and ID2 codes, each separated by a dot.

Example: S-7.0.F

Since the ID1 code is usually editable, the value is often not documented or documented only as a default value.

# Index

"

"CM" LED, 34  
"SET" button, 26, 31, 34  
"SET1" terminal, 26, 34  
"SET2" terminal, 26, 34

## 2

2I/2O module, 54

## A

A/B slave, 33  
Accessories, 18  
Activate slaves configured as optional on the AS-i bus, 40  
Acyclic data record communication, 17  
Acyclic services, 102  
Ambient temperature range  
    Reduced, 27  
Analog channel, 58  
Analog data transfer, 148, 149  
Analog I/O value, 17  
Analog input, 59  
Analog output, 59  
Analog slave, 59  
Analog value, 58  
AS-i cable error, 43, 44  
AS-i command, 98  
AS-i configuration error, 43, 44  
AS-i F Slave Universal, 33  
AS-i master  
    Basic configuration, 30  
AS-i network, 31  
AS-i output, 55  
AS-i Power Fail, 87, 152  
AS-i slave  
    Configuration, 34  
    Configuring, 35  
    Profile identification, 34  
AS-i slave address  
    Structure, 106  
AS-i Standard Slave Universal,, 33  
Asynchronous read access, 100  
Automatic address programming, 43, 44

Automatic ID1 code assignment, 43, 44

## B

BaseUnits, 16, 28  
Basic configuration of the AS-i master, 30  
Basic information, 11  
Bus cycle time, 90  
Button contact, 34

## C

Combined transaction type slave, 57  
Command interface, 17  
Configuration, 29, 31  
    Options, 19  
Configuration button, 17  
Configuration data, 31, 112  
Configuration mode, 19, 34, 37, 38, 119, 137, 164  
Configuration of the AS-i slaves, 30  
Configuration software, 29  
Configuring, 34  
Cyclic data exchange, 124  
Cyclic data transfer, 142  
Cyclic process image, 17  
Cyclic services, 99

## D

Data decoupling, 28  
Deactivate slaves configured as optional on the AS-i bus, 40  
Device information, 11  
Device type, 33  
Diagnostic interrupt in case of AS-i cable fault, 43, 44  
Diagnostic interrupt in case of errors in AS-i configuration, 43, 44  
Diagnostic status of the slaves, 31  
Digital I/O value, 17  
Digital process data, 19  
Digital value, 99  
Duplicate address detection, 43, 44  
    Read status, 172  
    Switch off, 171  
    Switch on, 171

## E

End bit error, 121  
Error counter, 89  
ET 200SP  
    Assigning parameters, 29  
    Configuring, 29, 29

## F

FB ASI\_CTRL, 100  
Firmware update, 17

## G

General information, 11  
Ground fault, 87, 152  
Ground-fault monitoring activated, 43, 44  
GSD file, 29, 30, 31, 43

## H

Hardware support package, 29  
HSP, 29

## I

I&M identification data, 17  
I/O address, 31  
I/O address space, 16  
I/O assignment of the slave, 34  
I/O data, 54, 163  
I/O fault, 85, 87  
I/O module, 29  
Input byte, 54  
Input process image, 55  
Interface module, 29  
IO code, 119, 131, 146

## L

Labeling strips, 18  
LDS, 85, 124  
Limited Power Source, 14  
LPF, 147  
LPS, 14, 119  
LPS data, 116

## N

Negative polarity, 26  
Network view, 31

## O

OB 82, 69  
Operating parameters, 30  
Operational voltage, 28  
Option handling, 39, 41  
Output byte, 54

## P

Parameter string, 148, 149  
Parity error, 121  
PELV, 28  
Peripheral fault, 121, 124, 147, 153  
PLC program, 31  
Pollution degree 2, 13  
Positive polarity, 26  
Process data, 90  
Process image, 17, 30, 45, 45  
    Cyclic, 30  
    flexibly, 45  
    Reducing, 45  
PROFIBUS, 29  
PROFINET, 29  
Protected  
operation, 19, 31, 34, 37, 85, 112, 114, 116, 119, 124,  
131, 164  
Protective Extra-Low Voltage, 28  
Protocol error, 87, 102, 153  
Proxy slave, 33, 42

## R

Rated voltage, 14  
Read access  
    Asynchronous, 100  
Read status of option handling, 41  
Reference identification label, 18  
Residual ripple, 28  
Return value, 102

## S

Safety Extra-Low Voltage, 14  
Safety input slave, 55  
SELV, 14, 28

Server module, 29  
Siemens AS-i slave, 33  
Slave configuration, 38  
Slave diagnostics, 82  
Slave failure, 87, 152  
Slave parameters, 33  
Slave profile, 33, 38  
Startup detection, 100  
Status evaluation, 99  
Status information, 99  
Status nibble, 98, 99  
Status register, 121  
String transfer, 102, 149  
Supported power supply units, 28

## **T**

Technical properties, 17  
Terminal assignment, 26  
Transient disturbance, 14

## **U**

Universal AS-i Slave, 34  
Universal slave, 33  
User data transfer, 148, 149  
User program, 31

