Programming Manual
SmartPLC DataLine AC14
with fieldbus interfaces

AC1403/04
AC1423/24
AC1433/34

Firmware release: 4.2.x
CODESYS release: 3.5.9.73 or higher

English

7391118/00 12/2017

Contents

1 Preliminary note

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1.1 Legal and copyright information

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1.2 Purpose of the document

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This document applies to the following device of the type "SmartSPS DataLine AC14":

- SmartPLC DataLine with Profinet-DP interface (AC1403/AC1404)
- SmartPLC DataLine with EtherNet/IP device interface (AC1423/AC1424)
- SmartPLC DataLine with EtherCAT slave interface (AC1433/AC1434)

It is part of the device and contains information about the correct handling of the product.

► Read this document before using the device.

► Keep this document during the service life of the device.

1.3 Symbols and styles used

13839

► ... Instructions

> ... Reaction, result

→ ... Cross-reference or internet link

123 Decimal number
0x123 Hexadecimal number
0b010 Binary number

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

1.4 Overview: User documentation for SmartPLC DataLine AC14

6998

ifm electronic provides the following user documentation for the models of the device class "SmartSPS DataLine AC14":

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

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

The user can download all documents from the ifm website.

1.5 Overview: CODESYS documentation of 3S

18296

3S GmbH provides the following user documentation for programming SPS of AC4S:

Document	Content / Description
Online help	▪ Context-sensitive help ▪ Description of the CODESYS programming system ▪ Description of components and function libraries
CODESYS installation and first steps	▪ Remarks about the installing of the CODESYS programming system ▪ First steps for handling the CODESYS programming system

After the installation of the CODESYS 3.5 programming system all documents are stored on the hard disk of the PC/laptop and can be accessed:

- Online help:
  `...\Program Files\3S CoDeSys\CoDeSys\Online-Help`
- CODESYS installation and first steps:
  `...\Program Files\3S CoDeSys\CoDeSys\Documentation`

1.6 Modification history

21676

Version	Topic	Date
00	New creation of document	12/2017

2 Safety instructions

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2.1 General safety instructions

8516

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

Only use the product for its intended purpose.

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

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

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

- ► Observe these operating instructions.
- ► Adhere to the warning notes on the product.

2.2 Required background knowledge

13323

This document is intended for people with knowledge of control technology and PLC programming to IEC 61131-3.

To program the PLC, these people should also be familiar with the CODESYS software.

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

- ► Read this document before use to familiarise yourself with operating conditions, installation and operation. Keep this document during the entire duration of use of the device.
- ► Follow the safety instructions.

2.3 Warnings used

13685

⚠ WARNING

Death or serious irreversible injuries may result.

⚠ CAUTION

Slight reversible injuries may result.

NOTICE

Property damage is to be expected or may result.

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

Information
Supplementary note.

3 System requirements

Contents

16903

3.1 Hardware

8469

- Device of the SmartSPS DataLine AC14 product family with V4.2.x firmware
- PC/laptop for the programming system CODESYS (→ system requirements CODESYS Development System V3.5)
- Ethernet connection between CODESYS-PC/laptop and configuration interface 1 (X3) or 2 (X8) of the device

3.2 Software

16905

To program the device-internal PLC of the SmartSPS DataLine AC14, the following software components are required:

Component	Description	Release
CODESYS Development System	Programming software CODESYS Development System für PLC programming according to norm IEC 61131-3	3.5 SP9 Patch 7 Hotfix 3
Package "CODESYS for ifm SmartPLC DataLine"	▪ Device and interface description of SmartPLC DataLine AC14 ▪ Function libraries for programming of the SPS	1.6.4.14

The assured characteristics and functions described in this manuals are only accessible with the indicated releases of the software components!

ifm electronic provides the software components for downloading on its website:
→ www.ifm.com > Service > Download > Industrial communication

3.3 Licensing

20254

By buying a device of the SmartSPS DataLine AC14 the buyer has also purchased a licence valid for using the CODESYS 3.5 programming software.

4 Installation

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17146

4.1 CODESYS programming software

7282

The CODESYS Development System (short: CODESYS) is a platform for the creation of PLC applications according to the standard IEC 61131-3.

4.1.1 Install CODESYS Development System

18596

To install the software "CODESYS Development System":

► Install the programming system CODESYS 3.5 SP9 Patch 7 Hotfix 3 (→ CODESYS installation and first steps).

> CODESYS 3.5 SP9 Patch 7 Hotfix 3 is installed on the programming PC/laptop.

4.2 ifm AS-i Package

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17679

► Familiarise yourself with the following CODESYS functions!
- Package Manager
  → Online help > CODESYS Development System > Manage packages and licences

4.2.1 Components of the ifm package

17550

To program the SmartPLC DataLine AC14, ifm provides the CODESYS package "CODESYS for ifm SmartPLC DataLine" (short: ifm package). The ifm package (file: `ifm_SmartPLC_DataLine_V1_6_4_14.package`) contains the following components:

Component	Description
AC14DL.devdesc.xml	Device description of the basic module
ACnnnn_EthernetAdapterDL.devdesc.xml	Device description of Ethernet interface 1
ACnnnn_EthernetAdapterDL_1.devdesc.xml	Device description of Ethernet interface 2
ACnnnn_EtherCAT_Master.devdesc.xml	Device description of the EtherCAT master (extension of the Ethernet interface)
ACnnnn_Modbus_Master.devdesc.xml	Device description of the Modbus master (extension of the Ethernet interface)
ACnnnn_Modbus_Slave.devdesc.xml	Device description of the Modbus slave device (extension of the Ethernet interface)
ACnnnn_Utils.library	Function library with SmartPLC DataLine AC14 specific CODESYS function blocks and data structures
ACnnnn_SYS_CMD.library	Function library with function block for access to the command interface of SmartPLC DataLine AC14 from a CODESYS application
AC14DL.template	Template for AC14 DataLine
AC14DL.template.project	Template for AC14 DataLine project
AC14.ico	Symbol image of the AC14

4.2.2 Install the ifm package

7283

To install the package "CODESYS for ifm SmartPLC DataLine":

Requirements:

> CODESYS 3.5 SP9 Patch 7 Hotfix 3 is installed on the programming PC/notebook.

1 Start CODESYS

► Start CODESYS with administrator rights.

> CODESYS programming interface appears.

2 Install the ifm package in CODESYS

► Select [Tools] > [Package Manager].

> Window [Package Manager] is displayed.

► Click on [Install...] to start the installation dialogue.

► Select the downloaded ifm package and carry out a complete installation.

> The [Package Manager] window displays the installed ifm package.

► Press [Exit] to close the package manager.

4.2.3 Update ifm package

12267

To update an installed package "CODESYS for ifm SmartPLC DataLine":

1 Download new version of the ifm package

► Got to the product page of the device on the ifm website.

► Download ifm_SmartPLC_DataLine_V1_6_4_14.package and save it on the CODESYS PC/laptop.

2 Uninstall the old version of the ifm package

► → **Uninstall the ifm package** (→ p. 13)

3 Install a new version of the ifm package

► → **Install the ifm package** (→ p. 12)

4 Update device libraries

► In the device tree: Click on [Device (ifm_SmartPLC_DataLine)].

► Select [Project] > [Update Device].

> [Update Device] windows appears.

► Click on [Update Device] to start the update process.

> New device libraries are loaded.

> Project tree view is updated.

► Click on [Exit] to close the Package Manager.

► Save the project.

4.2.4 Uninstall the ifm package

12270

To uninstall the package "CODESYS for ifm SmartPLC DataLine":

1 Start CODESYS

► Start CODESYS with administrator rights.

> CODESYS programming interface appears.

2 Uninstall the ifm package

► Select [Tools] > [Package Manager] to access the package manager.

> Window [Package Manager] shows the installed packages.

► Activate [Display version] checkbox.

> The window shows the version numbers of the installed packages.

► Select the package version to be uninstalled

► Click on [Uninstall...] to uninstall the selected package.

> The selected package version is uninstalled.

► Click on [Exit] to close the Package Manager.

5 Getting started

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5.1 Create CODESYS project

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17129

► Familiarise yourself with the following CODESYS functions!
- Create CODESYS project
  → Online help > CODESYS Development System > Create and configure project
- Objects of the user interface
  → Online help > CODESYS Development System > Reference user interface

5.1.1 Create new project with SmartPLC DataLine AC14

17682

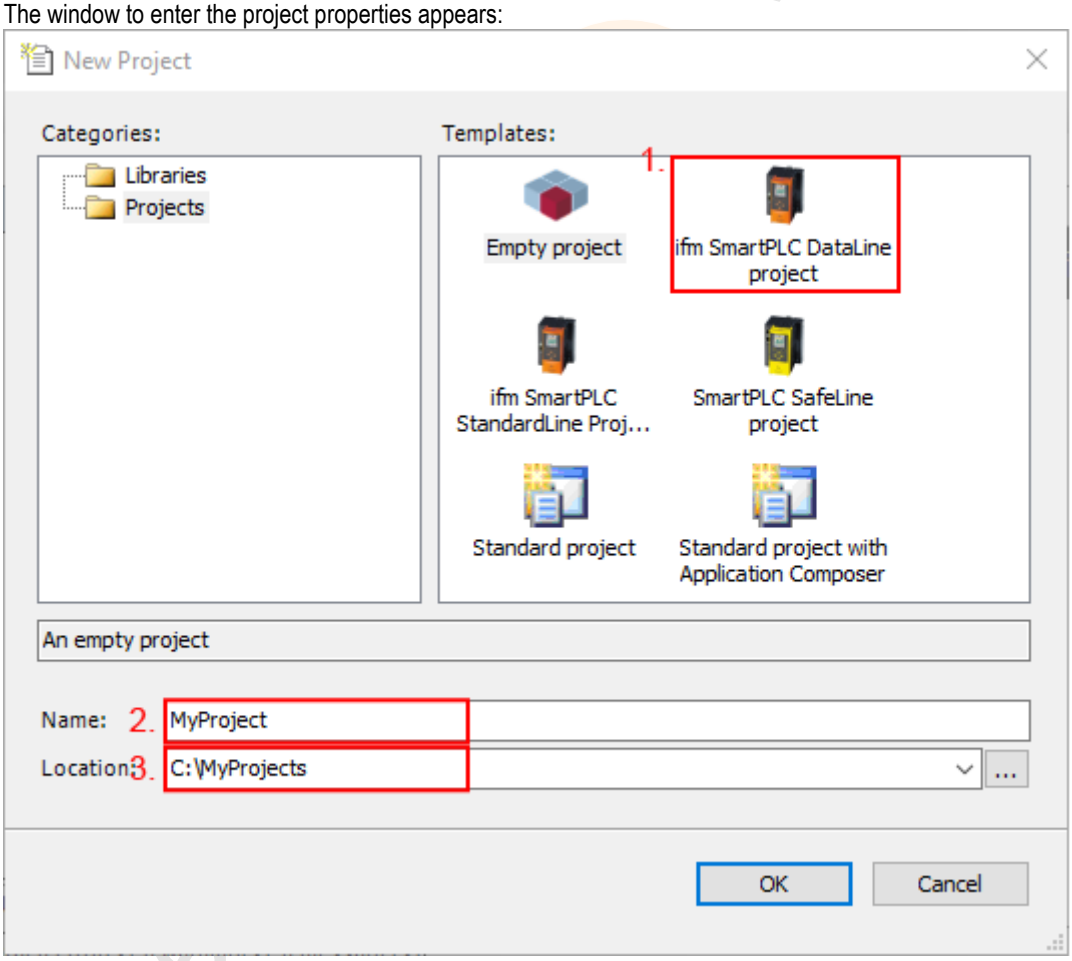
To avoid errors during manual system configuration, it is explicitly recommended to use the project template from ifm electronic when creating the SmartSPS DataLine AC14 project in CODESYS.

Qualifications

> All required software components are correctly installed (→ **Installation** (→ p. 10)).
> CODESYS successfully started.

1 Create a new project

► Select [File] > [New Project...].
> The window to enter the project properties appears:



► Set the following values:
1. [Templates]: Select [ifm_SmartPLC_DataLine Projekt].
2. [Name]: Enter project name
3. [Location]: Select the storage location of the project file.

► Click on [OK] to verify the entered values.
> CODESYS creates a new project with SmartPLC DataLine AC14.
> The window [Devices] shows the device tree of the project (→ **Overview: Project structure with SmartPLC DataLine AC14** (→ p. 17)).

2 Save the project

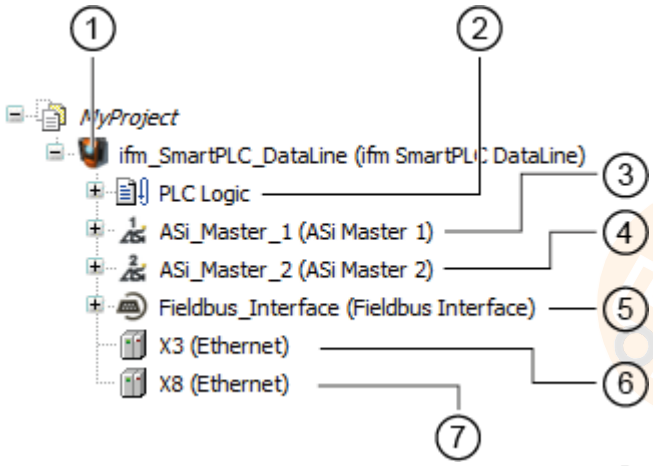
► Select [File] > [Save Project].

> CODESYS saves the project.

5.1.2 Overview: Project structure with SmartPLC DataLine AC14

8394

A CODESYS project contains all components for the programming and administration of PLC applications. All components of a project are shown in the [Device] window in a hierarchic tree view. CODESYS projects with a SmartPLC DataLine AC14 have the following structure:



(1) [ifm_SmartPLC_DataLine] provides access to the settings of the SPS of the SmartPLC DataLine AC14.
→ **Configure SPS** (→ p. 21)

(2) [PLC Logic] contains the SPS applications of SmartPLC DataLine AC14
→ **Objects of a PLC application** (→ p. 27)

(3) [ASi_Master_1] contains the process data images of the AS-i slaves at the AS-i master 1
→ **Access input and output data** (→ p. 30)

(4) [ASi_Master_2] contains the process data images of the standard AS-i slaves at the AS-i master 2
→ **Access input and output data** (→ p. 30)

(5) [Fieldbus_Interface] provides access to the input and output data of the fieldbus interface.
→ **Access input and output data** (→ p. 30)

(6) [X3] offers access to the configuration options of the configuration interface 2 (X3)
→ **Extend fieldbus functionality** (→ p. 22) and → **Change IP settings** (→ p. 21)

(7) [X8] provides access to the configuration options of the configuration interface 2 (X8)
→ **Extend fieldbus functionality** (→ p. 22) and → **Change IP settings** (→ p. 21)

5.2 Use CODESYS online help

6989

This manual only describes the integration, configuration and the programming of the SmartPLC DataLine AC14 using the CODESYS development system.

For the description of user actions and user interface elements the CODESYS terminology will be used.

Standard functions and methods of CODESYS will not be described. At the beginning of each section there will be a reference to the corresponding chapters of the CODESYS online help.

To access the online help of the CODESYS development system:

► Start CODESYS.

> The CODESYS user interface appears.

► Press [F1].

> Online help of the CODESYS development system appears.

► Familiarise yourself with the CODESYS development system! In particular with the following topics:

- Names and functions of the user interface elements
- Basic menu functions
- Programming techniques and methods for data retention

5.3 Set the programming interface

18494

To download the created projects and applications to the device a valid network path between the CODESYS programming system and the SPS of the device has to be selected.

5.3.1 Set network path of SPS

3846

The following interfaces can be configured as program interface:

- Ethernet configuration interface 1 (X3)
- Ethernet configuration interface 2 (X8)

In order to be able to set the communication path of the SPS, the device-internal SPS must be active.

To activate the SPS:

► GUI / web interface: Select  > 

► In the area [Activate CODESYS-PLC]: activate [Use PLC].

> SPS is active.

To access the device-internal SPS via the Ethernet configuration interface 2 (X8), the IP address of the interface X8 must be configured as a virtual gateway in the communication settings.

To configure the connection between the CODESYS programming system and the SPS of the SmartPLC DataLine AC14:

1 Preparations

► Connect CODESYS-PC/laptop with the required configuration interface (X3 or X8) of the device.

► Optional: Adjust IP settings of the Ethernet interfaces.

2 Select communication settings

► In the device tree: double-click on the symbol [ifm_SmartPLC_DataLine]

► In the editor window: Click on [Communication settings].

> The editor window shows the communication settings of the PLC.

3 Select gateway

► Select the required gateway from the list [Gateway].

> List shows selected gateway.

4 Set communication path

► Click on [Scan network...]

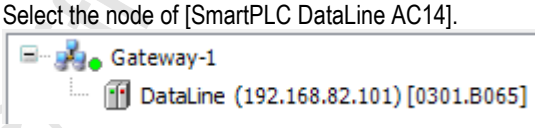
> The window [Select device] appears.

► Select the gateway node and click on [Scan network] to start the scanning process.

> CODESYS scans the network for devices.

> Window shows the network path and detected devices.

► Select the node of [SmartPLC DataLine AC14].



> Information field shows detailed information about the selected node.

► Click on [OK] to set the communication path to the SPS.

> CODESYS can transfer data to the SPS of the SmartPLC DataLine AC14.

6 System configuration

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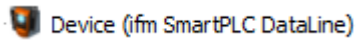
18498

6.1 Configure SPS

18961

► Familiarise yourself with the following CODESYS functions!
  - Generic device editor
    → Online help > CODESYS Development System > Reference user interface > Objects> object 'device' and generic device editor

The SPS is configured via the "Generic Device Editor" of the CODESYS programming system. The programmer can access the device editor of the SPS via the following node in the device tree:



To configure the device-internal SPS:

► In the device tree: Double-click on [ifm_SmartPLC_DataLine]
> The editor window shows device editor of the device-internal SPS.
► Configure SPS.
► Save the project to apply changes.

6.2 Change IP settings

14524

► Familiarise yourself with the following CODESYS functions!
- Ethernet adapter configurator
  → Online help > Fieldbus support > Ethernet adapter configurator

The Ethernet configuration interfaces 1 (X3) and 2 (X8) must not be participants of the same EtherNet subnet. Non-compliance may result in connection problems between the CODESYS programming system and the device.

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

To change the IP settings of the Ethernet configuration interfaces 1 (X3) and 2 (X8):

1 Select Ethernet interface

► In the device tree: Double click on the requested Ethernet interface (X3 or X8)
> The editor window shows the Ethernet device editor.

2 Change IP settings

► Change IP settings of the Ethernet interface.
> Save the project to apply changes.

6.3 Extend fieldbus functionality

Contents

15782

6.3.1 Available fieldbus stacks

13978

Besides the fieldbus functionality defined in the hardware the device can be operated as fieldbus device by a software extension. In this respect the user has to assign a fieldbus stack to the Ethernet configuration interfaces 1 (X3) or 2 (X8) in CODESYS and configure it. The device supports the following fieldbus stacks:

Description	Fieldbus	Further information
EtherCAT master	EtherCAT	→ **Use EtherCAT master** (→ p. 23)
Ethernet/IP scanner	EtherNet/IP	→ **Add fieldbus stack** (→ p. 26)
Modbus TCP master	Modbus TCP	
Modbus TCP slave device	Modbus TCP	

6.3.2 Use EtherCAT master

Contents

7474

The device can also be operated as EtherCAT master. In this respect ifm electronic provides an EtherCAT master stack for the CODESYS programming system 3.5. The user has to assign one of the two Ethernet configuration interfaces (X3 or X8) to the EtherCAT master.

Add EtherCAT master

7475

Only one EtherCAT master can be used per device.

To add the EtherCAT master stack to the project:

Requirements:

- ► Open or create project with SmartPLC DataLine AC14.

1 Add EtherCAT master stack

- ► In the device tree: Right-click on [<CODESYS _Root>]
- ► In the context menu: select [Add device...]
- > Window [Add Device] appears.
- ► Set the following values:
  1. [Vendor]: Select [ifm electronic].
  2. In table: Select [EtherCAT Master].
- ► Click on [Add Device] to add the selected device to the project.
- ► Click on [Close] to close the window.
- > CODESYS adds EtherCAT master to the device tree.

CODESYS automatically adds an EtherCAT master call to the task with the shortest cycle time.

For notes on the configuration of task processing: → **Configure task processing** (→ p. 48)

Configure EtherCAT master

7477

► Familiarise yourself with the following CODESYS functions!
  - EtherCAT master
    → Online help > Fieldbus support > EtherCAT configurator > EtherCAT master

The user has to assign the Ethernet configuration interface 1 (X3) or 2 (X8) to the added EtherCAT master.

1 Requirements

> CODESYS laptop/PC is correctly connected to the device.
> Network path of SPS is set (→ **Set the programming interface** (→ p. 19)).

2 Assign Ethernet interface

► In the device tree: Double-click on [EtherCAT_Master (EtherCAT Master)]
► Click on the [General] tab.
> The editor window shows the configuration options of the EtherCAT master.
► Click on [Browse...]
> Window [Select Network Adapter] appears.
► Select requested Ethernet interface (eth0 = X3 or eth1 = X8).
► Click on [OK] to apply the selected Ethernet interface.
> Field [Source Address (MAC)] shows the MAC address of the selected Ethernet interface.
> Field [Network Name] shows the name of the Ethernet interface.
> EtherCAT master is coupled with selected Ethernet interface.

3 Configure EtherCAT master

► Set the parameters of the EtherCAT master as requested.
> EtherCAT master is configured.

Continue with: → **Add and configure EtherCAT slave** (→ p. 25)

Add and configure EtherCAT slave

7479

► Familiarise yourself with the following CODESYS functions!
- EtherCAT slave
  → Online help > Fieldbus support > EtherCAT configurator > EtherCAT slave

To configure EtherCAT slaves for the operation with the EtherCAT master of the SmartPLC DataLine AC14:

Requirements:

> EtherCAT master is added to the project and configured (→ **Add EtherCAT master** (→ p. 23)).

> Device description file of the EtherCAT slave has been downloaded (→ manufacturer's website).

1 Optional: Add EtherCAT slave to the device repository

► Select [Tools] > [Device Repository...]

> Window [Device Repository] appears.

► Click on [Install...].

> Window [Install Device Description] appears.

► Select the device description of the EtherCAT slaves and click on [Open].

> CODESYS installs the device in the device repository.

2 Add EtherCAT slave

► In device tree: Right-click on [EtherCAT_Master (EtherCAT Master)]

► In the context menu: Select [Add device...]

> Window [Add Device] appears.

► Select the requested EtherCAT slave in the [Device] area.

► Click on [Add Device] to add the selected device to the project.

► Click on [Close] to close the window.

> CODESYS adds the EtherCAT slave to the project.

3 Configure EtherCAT slave

► In device tree: Double click on the added EtherCAT slave.

> The editor window shows the configuration options of the device.

► Configure EtherCAT slave as requested.

6.3.3 Add fieldbus stack

17702

► Familiarise yourself with the following CODESYS functions!
- Modbus configurator
  → Online help > Fieldbus support > Modbus configurator

To declare the Ethernet interface as a fieldbus interface:

1 Create/load CODESYS project

► Create or load CODESYS project with the SmartPLC DataLine AC14.

2 Add fieldbus stack

► In the device tree: Right-click on [X3 (Ethernet)] or [X8 (Ethernet)].

► In the context menu: Select [Add device...].

> Window [Add Device] appears.

► Set the following values:
1. [Vendor]: Select [<All vendors>].
2. In table: Select the requested fieldbus stack in the [Name] column.
3. [Name]: Enter name of the fieldbus stack.

► Click on [Add Device] to add the requested fieldbus stack to the project.

> In the device tree: CODESYS adds the selected fieldbus stack as sub-element of the Ethernet interface.

3 Configure the fieldbus stack

► Configure added fieldbus device.

► Save the project to apply changes.

7 Programming

Contents

7074

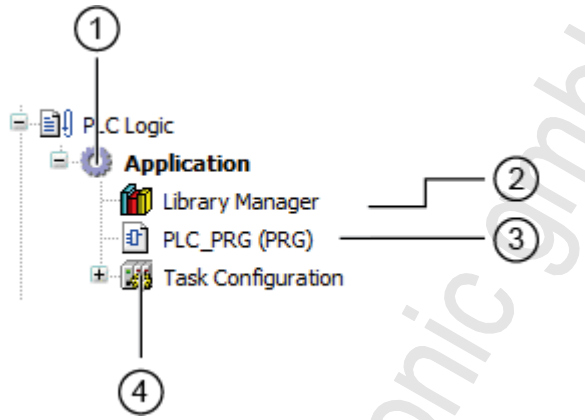
This chapter provides information about the programming of the SPS of the device.

► Familiarise yourself with the programming according to the standard IEC 61131-3!

7.1 Objects of a PLC application

7143

All objects of a SPS application are listed as subelements of the node [Application] in the device tree. In the basic configuration a SPS application contains the following objects:



(1) [Application] is the container of the SPS application

(2) [Library manager] provides access to the standard and device-specific function libraries.

(3) [PLC_PRG (PRG)] provides access to the program editor of the application
→ **Create SPS application** (→ p. 28)

(4) [Task configuration] provides access to the settings of the task processing
→ **Configure main task** (→ p. 48)

If needed, the programmer can add additional objects to the PLC application (→ **Add visualisation to a project** (→ p. 44)).

7.2 Create SPS application

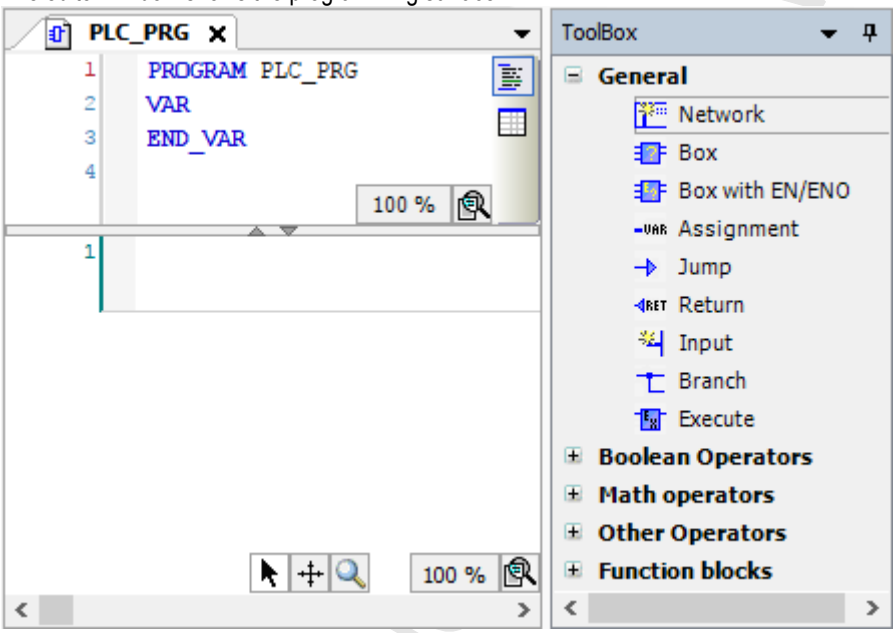
17691

► Familiarise yourself with the following CODESYS functions!
- Program application
  → Online help > CODESYS Development System > Program application
- Programming reference
  → Online help > CODESYS Development System > reference programming

To create a SPS application:

► In device tree: Double-click on [PLC_PRG (PRG)]

> The editor window shows the programming surface:



► Program the application in the editor.

7.2.1 Use remanent variables

18522

The SPS of the device supports the use of remanent variables. Variables declared as VAR RETAIN are stored in a memory area that is also maintained when the device is switched off.

The declaration of a variable as RETAIN also influences its behaviour when the SPS application is reset (→ **Supported reset variants** (→ p. 57)).

The memory area for RETAIN variables comprises 4072 bytes.

► Pay attention to the maximum size of the RETAIN memory area when declaring RETAIN variables!

7.2.2 Supported programming languages

18034

The following table shows which programming languages according to IEC 61131 are supported by the ifm function libraries:

Library	Function Block Diagram (FBD)	Sequential Function Chart (SFC)	Instruction List (IL)	Continuous Function Chart (CFC)	Ladder Diagram (LD)	Structured Text (ST)
ACnnnn_Utils.library	X	X	X	X	X	X
ACnnnn_SYS_CMD.library	X	X	X	X	X	X

Legend:
X ... is supported

7.2.3 Change system time of the device

18271

⚠ WARNING

Risk of undesired system behaviour!

The use of the CODESYS function `SysTimeRtcSet` for setting the time may lead to malfunction.

► To set the system time (date, time) of the device only use the following device-specific commands:
- Function block `Set_DateTime` (→ **Set_TimeDate** (→ p. 113))
- System command 0x1109 with function block ACnnnn_SysCmd (→ **ACnnnn_SysCmd** (→ p. 125))

7.3 Access input and output data

Contents

17447

► Familiarise yourself with the following CODESYS functions!
- Addresses according to IEC standard 61131-3:
  → Online help > CODESYS Development System > Programming Reference > Operanden > Addresses
- Access to IEC address via AT declaration:
  → Online help > CODESYS Development System > Programming Reference > Declaration > AT Declaration
- Definition of an ALIAS for an IEC address:
  → Online help > CODESYS Development System > Programming Reference > Data Types > References
- Coupling of a program variable to an address (mapping):
  → Online help > CODESYS Development System > Configuring I/O Links

7.3.1 Options to access input and output data

17621

In a CODESYS project, each input and output has a physical address according to the IEC standard (e.g. %IW5). CODESYS offers the following options to access this address from a SPS application and thereby to access the input and outputs data of the device:

- Direct access to IEC address
- Access to IEC address via AT declaration
- Definition of an ALIAS for an IEC address
- Link a program variable to an IEC address (mapping)

7.3.2 Validity of the interface data

18413

In order to facilitate the access to inputs and outputs of AS-i slaves, SmartPLC DataLine AC14 projects offer clearly defined interfaces in the device tree (→ **Overview: Project structure with SmartPLC DataLine AC14** (→ p. 17)).

Depending on the active instance for accessing the outputs of the AS-i slaves (Manual, Gateway, PLC), the CODESYS data mapper only updates certain address areas of the interfaces. The following table shows which address areas of the i/o interfaces provide valid data values while in a certain operating mode:

Output control	I/O interfaces	Updated address areas / channels
Manual	[ASi_Master_1]	AS-i 1 Input (%IB, %IW)
	[ASi_Master_2]*	AS-i 2 Input (%IB, %IW)
	[Fieldbus_Interface]	▪ AS-i 1 Output (%IB, %IW) ▪ AS-i 2 Output (%IB, %IW)
Gateway	[ASi_Master_1]	ASi 1 Input (%IB, %IW)
	[ASi_Master_2]*	AS-i 2 Input (%IB, %IW)
	[Fieldbus_Interface]	▪ AS-i 1 Output (%IB, %IW) ▪ AS-i 2 Output (%IB, %IW)
PLC	[ASi_Master_1]	▪ AS-i 1 Input (%IB, %IW) ▪ AS-i 1 Output (%QB, %QW)
	[ASi_Master_2]*	▪ AS-i 2 Input (%IB, %IW) ▪ AS-i 2 Output (%QB, %QW)
	[Fieldbus_Interface]	▪ AS-i 1 Output (%IB, %IW) ▪ AS-i 2 Output (%IB, %IW)

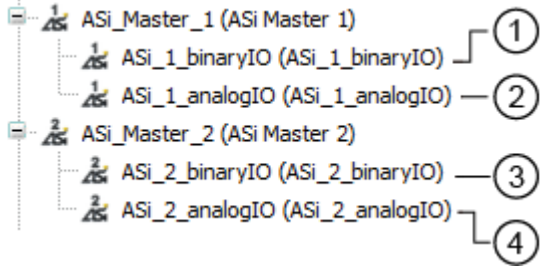
* ... only available for devices with 2 AS-i masters

► When linking variables with inputs and outputs, only use interfaces in the project tree, that are updated by the CODESYS data mapper!

7.3.3 Process data of the AS-i slaves

17584

The project tree offers direct access to the cyclically updated process images of the inputs and outputs of the AS-i slaves.



(1) Digital input and output data of the slave at AS-i master 1: → **Digital input and output data** (→ p. 33)

(2) Analogue input and output data of the slaves at AS-i master 1: → **Analogue input and output data** (→ p. 33)

(3) Digital input and output data of the slave at AS-i master 2: → **Digital input and output data** (→ p. 33)

(4) Analogue input and output data of the slaves at AS-i master 2: → **Analogue input and output data** (→ p. 33)

Consider validity of the interface data (→ **Validity of the interface data** (→ p. 31))!

The function library `ACnnnn_Utils.library` contains the complex variable `ASi_NET`. The variable represents all inputs and outputs of a completely developed AS-i network. The programmer can use this data structure to store the process images of the inputs and outputs of an AS-i network. (→ **ASI_NET (STRUCT)** (→ p. 120))

Digital input and output data

17625

To access the digital process data of the slaves at AS-i master 1:

► In the device tree: Double click on [ASi_1_binaryIO]

> The editor window shows a structured list of the digital inputs and outputs of the AS-i slaves.

Variable	Mapping	Channel	Address	Type
		ASi Input bin	%IB1	
		Digital S(A) Slave	%IB1	ARRAY [1..31] OF BYTE
		Digital B Slave	%IB32	ARRAY [1..31] OF BYTE
		ASi Output bin	%QB1	
		Digital S(A) Slave	%QB1	ARRAY [1..31] OF BYTE
		Digital B Slave	%QB32	ARRAY [1..31] OF BYTE

► In column [Variable]: Mouse click on ⊞ to make individual variables visible.

To access the digital process data of the slaves at AS-i master 2 in a system with 2 AS-i masters:

► Double click on [ASi_2_binaryIO]

Analogue input and output data

17626

To access the analogue process data of the slaves at AS-i master 1:

► In the device tree: Double-click on [ASi_1_analogIO]

> Editor window shows a structured list of the analogue inputs and outputs of the AS-i slaves.

Variable	Mapping	Channel	Address	Type
		ASi Input	%IW32	ARRAY [1..31] OF SLAVEaANAaINaTYPE
		ASi Output	%QW32	ARRAY [1..31] OF SLAVEaANAaOUTaTYPE

► In column [Variable]: Mouse click on ⊞ to make individual variables visible.

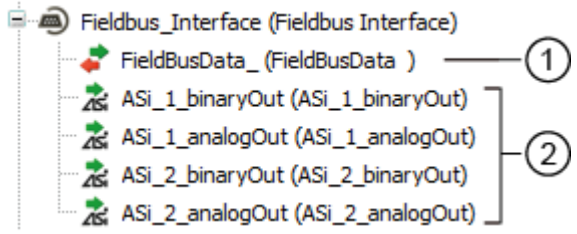
To access the analogue process data of the slaves atAS-i Master2 in a system with 2 AS-i masters:

► Double-click on [ASi_2_analogIO]

7.3.4 Fieldbus data

17585

The device tree offers direct access to the data that is transmitted between fieldbus and device.



(1) Data that the fieldbus transmits/receives via the fieldbus.
→ **Input and output data of the fieldbus interface** (→ p. 34)

(2) Output data of the AS-i slaves at AS-i master 1 and AS-i master 2 that is transmitted by the higher-level fieldbus PLC.
→ **Outputs data of the AS-i slaves** (→ p. 35)

Consider validity of the interface data (→ **Validity of the interface data** (→ p. 31))!

Input and output data of the fieldbus interface

17619

The input and output data of the fieldbus interface os transmitted in cycles of 120 words each. The programmer can access this data via IEC addresses.

To access the input and output data of the fieldbus interface:

► Device window: In the project tree, double-click on [FieldBusData_]

> Editor window shows a structured list of the inputs and outputs:

Variable	Mapping	Channel	Address	Type
⊞		Inputs from fieldbus	%IW373	ARRAY [0..119] OF WORD
⊞		Outputs to fieldbus	%QW373	ARRAY [0..119] OF WORD

► In column [Variable]: Mouse click on ⊞ to make individual variables visible.

Output data of the AS-i slaves

17620

The area contains all data, the higher-level Fieldbus controller cyclically sends to the outputs of the AS-i slaves via the fieldbus network. The data is structure like an AS-i network. The programmer can access this data via IEC addresses.

If the output access of the device is set to "PLC", the programmer can use the data bundled in this area to process the target values sent by the higher-level fieldbus controller to the CODESYS SPS.

Digital output data

17630

To access the digital output data of the slaves at AS-i master 1:

► Device window: In the project tree, double-click on [ASi_1_binaryIO]

> Editor window shows a structured list of the digital output data:

Variable	Mapping	Channel	Address	Type
		FB ASi Output bin	%IB986	
		Digital S(A) Slave	%IB986	ARRAY [1..31] OF BYTE
		Digital B Slave	%IB1017	ARRAY [1..31] OF BYTE

► In column [Variable]: Mouse click on ⊞ to make individual variables visible.

To access the digital output data of the slaves at AS-i master 2 in a system with 2 AS-i masters:

► Double-click on [ASi_2_binaryIO]

Analogue output data

17631

To access the analogue output data of the slaves at AS-i master 1:

► Device window: In the project tree, double-click on [ASi_1_analogOut]

> Editor window shows the structured list of the analogue output data:

Variable	Mapping	Channel	Address	Type
		FB ASi Output ana	%IW524	ARRAY [1..31] OF SLAVEaANAaINaTYPE

► In column [Variable]: Mouse click on ⊞ to make individual variables visible.

To access the analogue output data of the slaves at AS-i master 2 in a system with 2 AS-i masters:

► Double-click on [ASi_2_analogOut]

7.4 Use functions of the ifm package

18489

The CODESYS package "CODESYS for ifm SmartPLC DataLine" offers different functions for the programming of the device-internal CODESYS controller. In the following sections, these functions will be briefly described. To make orientation easier, the functions are grouped according to corresponding subjects and provided with a cross-reference to a detailed explanation in the document's appendix.

7.4.1 Control interface of the ifm function blocks

17660

All function blocks (FB) of the libraries ACnnnn_Utils.library and ACnnnn_SYS_CMD.library have inputs and outputs for control signals. The inputs activate the execution of the function block. The outputs provide information about the internal condition of the function block. Thanks to the signals, the programmer can create a control structure for a targeted processing of the FB and react to possible errors.

Number and designation of the FB control signals provide information about the type of FB execution:

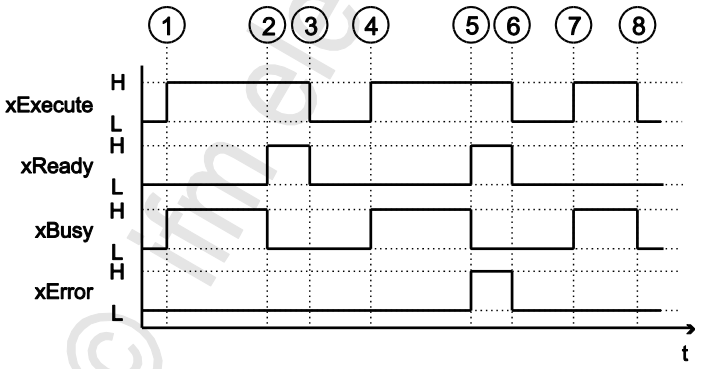
FB with one-time execution

17140

These function blocks perform their function exactly once after activation. To execute the function once again, the FB needs to be reactivated. FBs of this kind feature a control interface with the following inputs and outputs:

Designation	Type	Data type	Description	Possible values	
xExecute	Input	BOOL	Control FB execution	FALSE	Stop FB execution
				TRUE	Start FB execution
xReady	Output	BOOL	Indication of whether execution of the FB has been completed	FALSE	FB execution not yet completed
				TRUE	FB execution completed
xBusy	Output	BOOL	Indication of whether FB is active	FALSE	Function block is inactive
				TRUE	FB is active
xError	Output	BOOL	Indication of whether faults have occurred during execution of the FB	FALSE	FB executed correctly
				TRUE	Error occurred during execution of the FB
wDiagnostic	Output	WORD	Error code	FB specific	

The following figure shows the relation between the connections of the control signals:



①	xExecute = TRUE: xBusy = TRUE:	Rising edge (FALSE → TRUE) starts execution of the FB. FB execution has been started, but has not yet been completed.
②	xReady = TRUE: xBusy = FALSE: xError = FALSE:	FB execution completed; there are valid values on the data outputs. FB is no longer active. FB execution without faults.
③	xExecute = FALSE:	All signal outputs are set to FALSE and all internal states are reset.
④	→ ①	
⑤	xReady = TRUE: xBusy = FALSE: xError = TRUE:	FB execution is terminated. FB is no longer active. Errors occurred during FB execution; wDiagnostic provides error code.
⑥	→ ③	
⑦	→ ①	
⑧	xExecute = FALSE:	FB execution interrupted prior to completion; All signal outputs are set to FALSE and all internal states are reset.

FB with cyclic execution

17141

Function blocks which, when activated, cyclically perform their function until they are deactivated have the following control inputs and outputs:

Designation	Type	Data type	Description	Possible values	
xEnable	Input	BOOL	Control FB execution	FALSE	Stop FB execution
				TRUE	Start FB execution
xActive	Output	BOOL	Indication of whether execution of the FB has been completed	FALSE	FB execution not yet completed
				TRUE	FB execution completed
xError	Output	BOOL	Indication of whether faults have occurred during execution of the FB	FALSE	FB executed correctly
				TRUE	Error occurred during execution of the FB
wCycleCount	Output	WORD	Counters for the FB cycles	Integer value (hexadecimal representation)	
wDiagnostic	Output	WORD	Error code	FB specific	

7.4.2 Configure system

17450

To configure the system of the device, use the following function blocks:

Name	Description	Reference
QuickSetupASi_Master	Execute quick setup routine on an AS-i master	→ **QuickSetupASi_Master** (→ p. 111)
Set_TimeDate	Set system time (date, time) of the system	→ **Set_TimeDate** (→ p. 113)
Get_FieldbusInfo	Read fieldbus type, the status of the field bus connection and the parameters of the fieldbus interface	→ **Get_FieldbusInfo** (→ p. 109)

7.4.3 Configure AS-i master

17448

To configure the AS-i masters of the device, use the following function blocks:

Name	Description	Reference
Set_Mode	Set operating mode of the AS-i master (projecting mode or protected operation)	→ **Set_Mode** (→ p. 95)
Set_ASi_Config	Set diagnostic functions of the AS-i master (double address recognition, earth fault detection)	→ **Set_ASi_Config** (→ p. 91)
Set_AdressMode	Set automatic addressing of the AS-i master	→ **Set_AddressMode** (→ p. 89)

7.4.4 Configure AS-i slaves

17449

To configure the AS-i slaves, that are connected to the device, use the following function blocks:

Name	Description	Reference
Set_SlaveAddress	Change address of an AS-i slave	→ **Set_SlaveAddress** (→ p. 100)
Set_SlaveParameter	Change I/O configuration and ID codes (IO, ID, ID1, ID2) of an AS-i slave	→ **Set_SlaveParameter** (→ p. 104)
Set_SlaveExtendedID1	Extended ID1 of an AS-i slave	→ **Set_SlaveExtendedID1** (→ p. 102)

7.4.5 Manage AS-i network

17126

To manage the AS-i networks controlled by SmartPLC DataLine AC14, use the following function blocks:

Use complex variables

18528

There are different complex variables (STRUCT) at the programmer's disposal. They bundle logically associated data sets. Thereby, they facilitate the organisation of the data storage in the application and at the same time reduce the error rate when variables are declared.

The following complex variables are available:

Name	Description	Reference
ASI_NET	The complex variable contains the complete process image (inputs and outputs) of an AS-i network.	→ **ASI_NET (STRUCT)** (→ p. 120)
ASI_DATA	The complex variable contains the following components: ▪ Slave lists (LPS, LDS, LAS, LPF, LCE, LCEMS, LCEAS, LDAE) ▪ Parameter images (PI, PP) ▪ Configuration data of the AS-i slaves (CDI, PCD)	→ **ASI_DATA (STRUCT)** (→ p. 117) → **Get_ASi_Data** (→ p. 106)

Change network settings

17568

Name	Description	Reference
Set_ProjectAll	Execute projection adaptation on one AS-i master	→ **Set_ProjectAll** (→ p. 99)
Set_LPS	Change list of the projected slaves (LDS)	→ **Set_LPS** (→ p. 93)
Set_PCD	Change permanent projecting data (IO, ID, ID1, ID2) of all slaves on the AS-i master	→ **Set_PCD** (→ p. 97)

Read network settings

18532

To read the network settings cyclically and offer them in the application:

Name	Description	Reference
Get_ASi_Data	Read the following datasets for network management in batches and cycles: ▪ List of activated slaves (LAS) ▪ List of detected slaves (LDS) ▪ List of projected slaves (LPS) ▪ List of peripheral faults (LPF) ▪ List of configuration errors (LCE) ▪ List of configuration errors, missing slaves (LCEMS) ▪ List of configuration errors - additional slaves (LCEAS) ▪ List of double address errors (LDAE) ▪ Configuration data image (CDI) ▪ Permanent configuration data (PCD) ▪ Input parameters (PI) ▪ Output parameters (PP)	→ **Get_ASi_Data** (→ p. 106)

Alternatively, this data can be read separately with the following FB:

Read parameter images

17569

Name	Description	Reference
Get_InputParameter	Read parameters of the inputs of the slaves at the AS-i master (PI)	→ **Get_InputParameter** (→ p. 85)
Get_OutputParameter	Read parameters of the outputs of the slaves on the AS-i master (PP)	→ **Get_OutputParameter** (→ p. 87)

read slave lists

18530

Name	Description	Reference
Get_LPS	Read list of projected slaves (LPS)	→ **Get_LPS** (→ p. 69)
Get_LDS	Read list of detected slaves (LDS)	→ **Get_LDS** (→ p. 67)
Get_LAS	Read list of activated slaves (LAS)	→ **Get_LAS** (→ p. 65)
Get_LPF	Read list of peripheral faults (LPF)	→ **Get_LPF** (→ p. 79)
Get_LCE	Read list of configuration errors (LCE)	→ **Get_LCE** (→ p. 71)
Get_LCEMS	List of configuration errors - read missing slaves (LCEMS)	→ **Get_LCEMS** (→ p. 75)
Get_LCEAS	Read of the configuration errors - read additional slave (LCEAS)	→ **Get_LCEAS** (→ p. 73)
Get_LDAE	Read list of double address errors (LDAE)	→ **Get_LDAE** (→ p. 77)

Read configuration data of the slaves

18533

Name	Description	Reference
Get_CDI	Read configuration data image (IO, ID, ID1, ID2) of all slaves on the AS-i master	→ **Get_CDI** (→ p. 81)
Get_PCD	Read permanent configuration data of all slaves (IO, ID, ID1, ID2) on the AS-i master	→ **Get_PCD** (→ p. 83)

Read status of the voltage supply

18529

Name	Description	Reference
Get_ASi_PHY_Dat	Determine voltage supply status of the AS-i network	→ **Get_ASi_PHY_Dat** (→ p. 63)

7.4.6 Send commands to the system and the AS-i master

17659

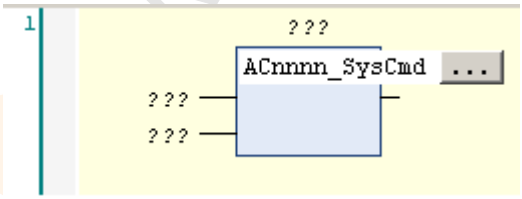
Similar to the acyclic transmission command channels and data sets of the device, the programmer can send commands to the system or an AS-i master with the FB ACnnnn_SysCmd (→ **ACnnnn_SysCmd** (→ p. 125)).

- System command overview: → **Table: System commands** (→ p. 126)
- Overview AS-i master commands: → **Table: AS-i master commands** (→ p. 127)

By default, the FB ACnnnn_SysCmd is hidden. To add the FB to a program module:

► Highlight the required network and add an empty function block with [FBD/LD/IL] > [Insert Empty Block].

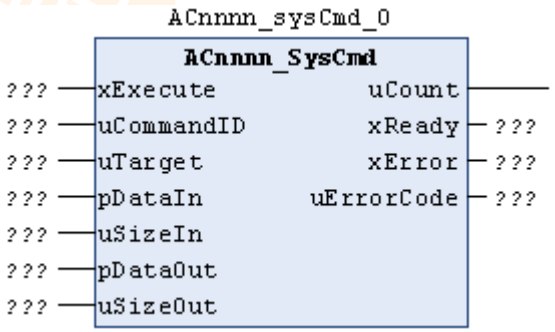
> Network shows empty FB.



► Double-click on the name field of the FB

► Enter designation ACnnnn_SysCmd and confirm with [ENTER].

> FB has inputs and outputs of the ACnnnn_SysCmd.



► Adjust inputs and outputs of the FB in accordance with the required command.

7.5 Use visualisations

Contents

17059

► Familiarise yourself with the following CODESYS functions!
- Visualisations in CODESYS
  → Online help > CODESYS visualisation

7.5.1 Supported visualisation types

17661

The SmartPLC DataLine AC14 supports the following CODESYS visualisation types:

- **Web visualisation (WebVisu)**
  A WebVisu allows graphic representation of selected process and control data of the device in a web browser by means of a user-specific visualisation.
- **Target visualisation (TargetVisu)**
  A TargetVisu allows graphic representation of selected process and control data of the device on the display of the device by means of a user-specific visualisation.

7.5.2 Add visualisation to a project

17060

To add a visualisation to a CODESYS project:

► Open CODESYS project.
OR:
Create new CODESYS project. (→ **Create new project with SmartPLC DataLine AC14** (→ p. 16))

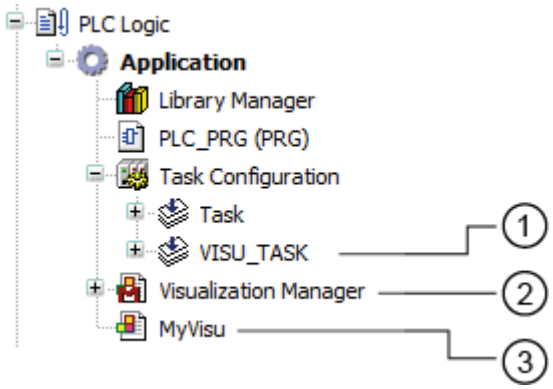
► In the device tree: Click on [Application].

► Select [Project] > [Add Object] > [Visualization...]

> [Add Visualization] window appears.

► Enter a designation for the visualization in the [Name] field and click on [Add] to apply.

> CODESYS adds the following elements to the device tree:



(1) [VISU_TASK] provides access to the visualisation task properties (→ **Set parameters for visualisation task** (→ p. 48))

(2) [Visualization Manager] provides access to the visualisation properties (→ **Configure visualisation** (→ p. 46))

(3) [MyVisu] contains the area for the creation of the visualisation objects (→ **Create a visualisation** (→ p. 45))

7.5.3 Create a visualisation

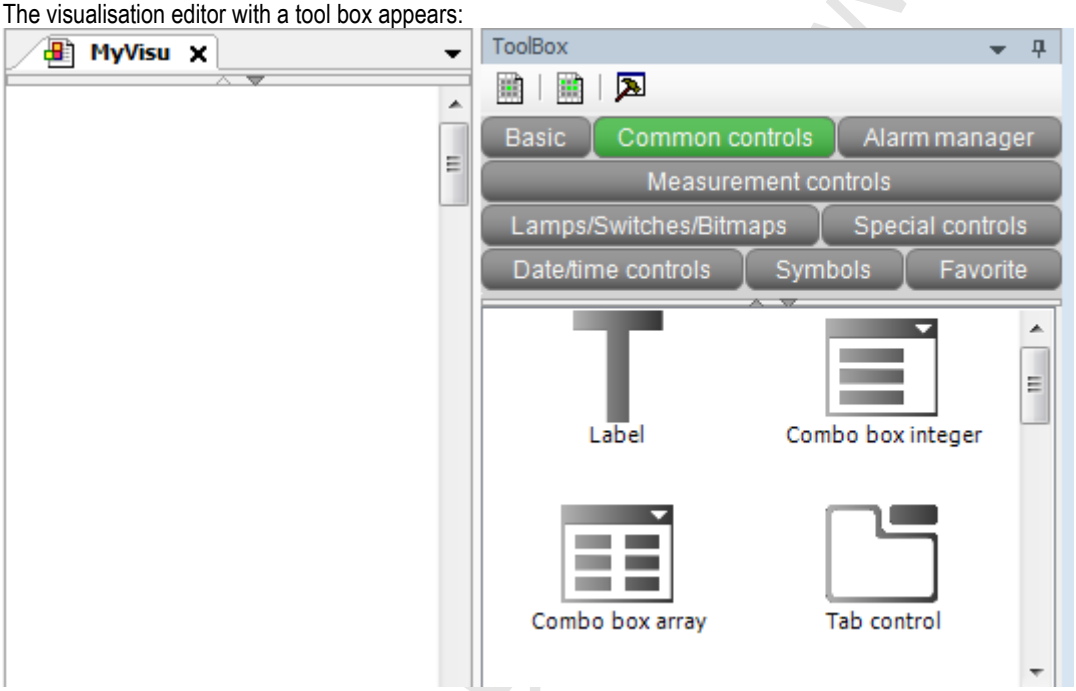
17061

Create a seperate visualisation object for each target and web visualisation.

To create a visualisation for a SPS application:

► In the device tree: double-click on [Visualization]

> The visualisation editor with a tool box appears:



► Create the visualisation using the tools.

► Save the project to apply changes.

7.5.4 Configure visualisation

6953

In order to change the properties of the created visualisations, choose one of the following options:

- **Change properties of the web visualisation** (→ p. 46)
- **Change the properties of the target visualisation** (→ p. 47)

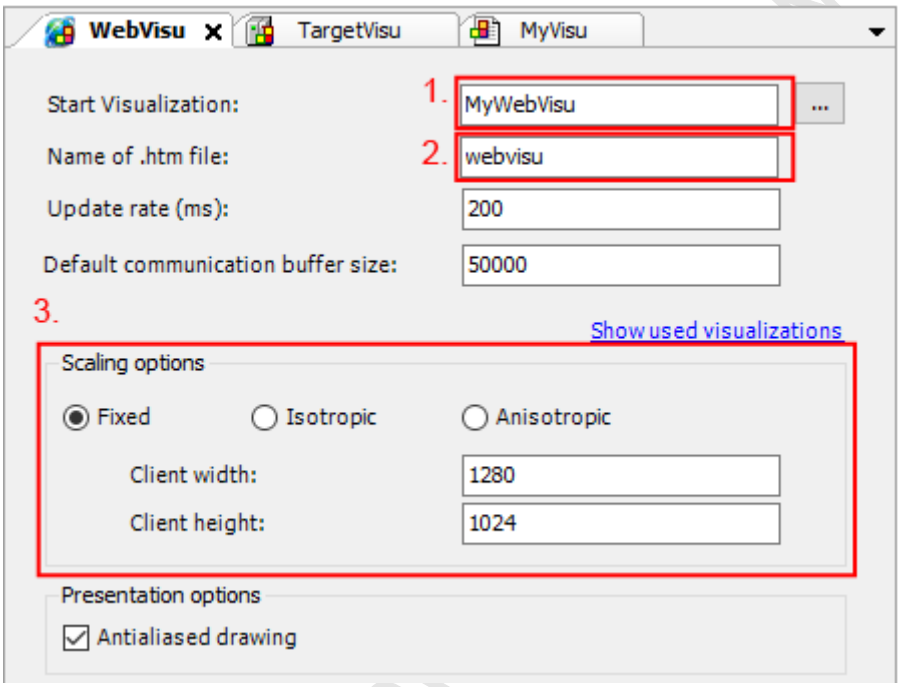
Change properties of the web visualisation

17065

To change the attributes of the web visualisation:

► In device tree: Double click on [Web-Visualisierung]

> The editor window shows attributes of the web visualisation:



► Set the following values:
1. Field [Start Visualization]: Select the created web visualisation.
2. Field [Name of .htm file]: Enter name for HTML file (→ Note).
3. Area [Scaling options]: Enter fixed width and height as shown.

In the field [Name of .htm file] enter the name by which the web visualisation is to be accessible in the web browser (→ **Display web visualisation** (→ p. 59)).

► Use only lower case when entering the name!

► Save the project to apply changes.

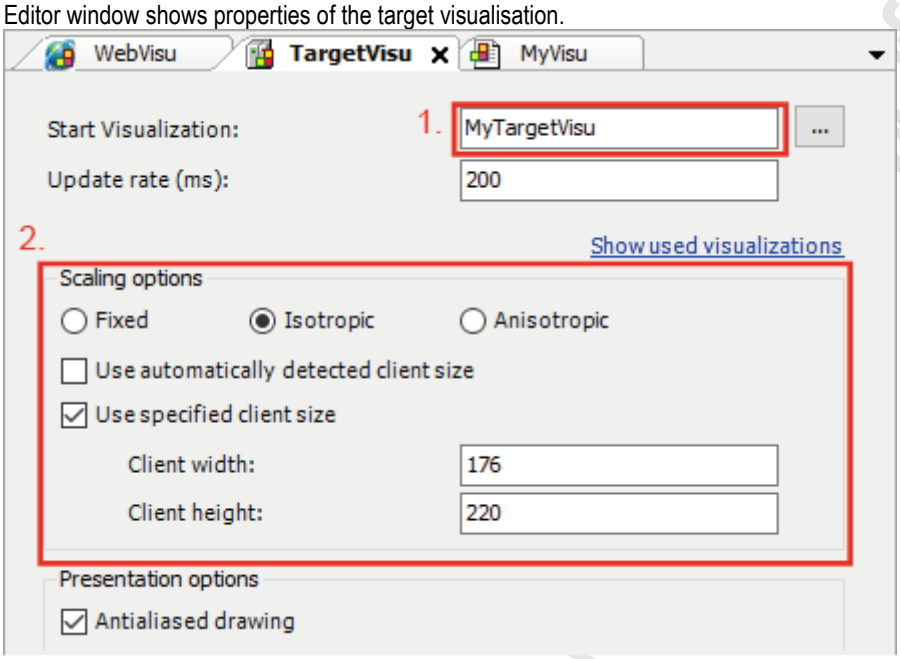
Change the properties of the target visualisation

17064

To change the properties of the target visualisation:

► In device tree: Double-click on [TargetVisu]

> Editor window shows properties of the target visualisation.



► Set the following values:
1. [Start Visualization] field: Select the created target visualisation.
2. [Scaling options] area: Enter fixed width and height as illustrated.

► Save the project to apply changes.

7.6 Configure task processing

4109

► Familiarise yourself with the following CODESYS functions!
  - Task configuration
    → Online help > CODESYS Development System > application programmable > task configuration

The processing of the tasks is controlled by parameters. The user can set the parameters for each task separately

CODESYS automatically creates the following tasks and visualisations during project creation:

Name	Description	Note
[MainTask]	Configuration of the main task (e.g. for main program [PLC_PRG (PRG)])	→ **Configure main task** (→ p. 48)
[VISU_TASK]	Configuration of the task for processing visualisation	→ **Set parameters for visualisation task** (→ p. 48)

7.6.1 Configure main task

18412

The basic settings of the task characteristics cover the requirements of many applications. In the event of non-optimum device performance the user must determine and set the optimum task characteristics himself.

To change parameters of a task:

► In device tree: Double click on [Taskkonfiguration] > [MainTask]

> The editor window shows the configuration of the main task.

► Set the parameters as requested.

> Selected value is applied.

7.6.2 Set parameters for visualisation task

17066

► Execute the visualisation task (VISU_TASK) with a priority that is as low as possible to avoid interruption of other tasks that are important for the core functions of the application.

► Execute the VISU_TASK in appropriate cyclic intervals to save the resources of the device-internal CODESYS SPS of the fieldbus network.

Each visualisation is executed separately from the program code in a separate task. To set the properties of the visualisation task:

► In the device tree: Double-click on [Task configuration] > [VISU_TASK]

> Editor window shows parameters of the visualisation task.

► Set the parameters as required.

► Save the project to apply changes.

7.7 Testing the SPS application

18594

► Familiarise yourself with the following CODESYS functions!
- Test and fault elimination
  → Online help > CODESYS Development System > Testing and Debugging

To ensure permanent operation without errors in industrial environments, the created SPS application must be tested in detail and possible faults must be remedied.

8 Operation

Contents

18492

8.1 Transfer CODESYS project to device

Contents

18490

► Familiarise yourself with the following CODESYS functions!
  - Compile project/application and transfer it to device
    → Online help > CODESYS Development System > Transferring Applications to the PLC

To save the CODESYS project on the device the following component must be transferred to the device:

- application "Application" (→ **Download the application to the device** (→ p. 53))

► Observe notes on the operating modes of the SPS of the device!
→ **Operating states of the SPS** (→ p. 55)

ifm system solutions and CODESYS applications created by the user must not be saved and executed on the device at the same time!

► Before loading an application to the device delete all ifm system solutions saved on the device (→ Device manual, Uninstall ifm apps)!

To be able to use an ifm system solution in a user project the functions must be integrated into the project via libraries to be ordered separately.

► Contact the AS-i specialist of ifm electronic!

8.1.1 Activate CODESYS SPS

17692

To enable the processing of the created SPS application, the device-internal CODESYS SPS must be activated in the setup menu of SmartPLC DataLine AC14.

If the SPS application is to have a write access to the outputs of the AS-i slaves, the CODESYS SPS must be activated additionally as controller instance of the AS-i slave outputs.

The following table shows the possible combinations of the parameters [Output access] and [Use PLC] as well as the rights of the CODESYS SPS resulting thereof.

List [Output access]	Checkbox [Use PLC]	CODESYS SPS		
		Programmable	Access to AS-i inputs	Access to AS-i outputs
Gateway	☐	no	yes	no
	☑	yes	yes	no
Manual	☐	no	yes	no
	☑	yes	yes	no
PLC	☑ *	yes	yes	yes

Legend:

* ... Value fixed (greyed out)

To set the operating mode of the device:

1 Select menu page

►  > 

► Select [System settings] tab.

2 Set the controller instance of the outputs

► Select the requested controller instance of the AS-i outputs in the [Output access] list.

► Press [Accept selection] to activate the selection.

3 Activate CODESYS SPS

► Activate [Use PLC] checkbox.

> CODESYS SPS is active.

4 Optional: Adjust device cycle

► Select the requested device cycle time in the [Device cycle] list.

► Press [Accept selection] to activate the selected value.

8.1.2 Download the application to the device

18593

To transfer the created application as boot project to the device:

Requirements:

> Network path is set (→ **Set network path of SPS** (→ p. 19)).
> Project tested.
> All ifm system solutions stored on the devie are deleted (→ device manual: **Uninstall ifm apps**)

1 Build application

► In the device tree: Highlightt application as active application.
► Use [Build] > [Rebuild] to compile the active application.
> CODESYS generates program code.

2 Load application on the device

► Use [Online] > [Login] to connect with the device.
> Active application is transfered to the device (download).
> application on the device is in STOP state.

3 Create boot application

► Use [Online] > [Create boot application] to make the application bootable.
> application storage is non-volatile.

4 Start boot application

► Use [Debug] > [Start] to start the application.
> application goes to the RUN state.

8.1.3 Delete application from SmartPLC DataLine AC14

18030

To delete an application stored on the device:

1 Connect with the device

► In the device tree: highlight application as active application.
► Use [Online] > [Login] to establish connection to the device.
> CODESYS is in the online mode.

2 Delete application

► In the editor window: Select [Device] > [Applications] tab.
► Press [Refresh List] to refresh the view.
> List shows the applications that are stored on the device.
► Delete all applications in the device with [Remove All].
OR:
Highlight requested application and press [Remove] to delete it from the device.
> Selected application will be deleted.

8.1.4 Delete boot application via SD card

15970

If after the start of a complex boot application the device is overloaded and does not respond any more to user inputs or login attempts, the boot application on the device needs to be forcibly deleted.

To delete the boot application on the device:

► Disable the write protection of the SD card.
► Create a file named `KillBootApp.txt` in the root directory of the SD card.
► Insert the SD card into the SD card slot of the device.
► Restart the device.
> Boot application on the device-internal SPS is deleted.
> The file `KillBootApp.txt` on the SD card is renamed in `KillBootApp.rdy`.

With this method the following data on the device-internal SPS is removed:

- all files of the boot application
- all CRC files
- directory with web and/or target visualisations
- data in the memory area F-RAM

8.2 Operating states of the SPS

17544

This section provides information about the operating states of the device and the states of the SPS of the device as well as information about the states of the applications.

8.2.1 Operating mode of the SPS

13769

The SPS of the device can be operated in the following modes:

- **Offline mode**
  In the offline mode the user is logged out of the SPS or there is no connection between CODESYS and the SPS (e.g. connection loss).
- **Online mode**
  In the online mode the user is logged in to the SPS.

8.2.2 States of the SPS application

4136

The applications saved on the device are executed independently in separate tasks. A application can have the following states:

- **Unload**
  No application is saved on the SPS.
- **RUN**
  The application is executed (cyclically processed).
- **STOP**
  The application is not executed.

Display operating state of the application

10272

To display the current operating state of the SPS choose one of the following options:

- **CODESYS:**
  > In the device tree: Node of the application indicates the current state.
  OR:
  > In online mode the CODESYS status bar shows the current state of the application.
- **GUI / web interface of the device:**
  ►  >  > 
  ► Select the [Applications] tab.
  > The page displays the operating states of the SPS applications saved on the device.

8.2.3 Switch operating states

10264

To switch between the operating states of the application choose one of the following options:

Start SPS application

18027

To start a SPS application stored on the device:

- **CODESYS:**
  - ► In the device tree: highlight application as active application.
  - ► Use [Online] > [Login] to establish the connection with the CODESYS SPS.
  - ► Use [Debug] > [Start] to start the processing of the active application.
  - > Application goes to RUN state.
  - ► Optional: repeat process for additional applications.
- **GUI / web interface:**
  - ►  >  > 
  - ► Select the [Applications] tab.
  - ► Use [▲] / [▼] to select the required application.
  - > Page shows the operating status of the selected application.
  - ► Press [Start] function key to start the processing of the selected application.
  - > Application goes to RUN state.
  - ► Optional: repeat process for additional applications.

Stop SPS application

18029

To stop a SPS application stored on the device:

- **CODESYS:**
  - ► In the device tree: highlight application as active application.
  - ► Use [Online] > [Login] to establish the connection with the CODESYS SPS.
  - ► Use [Debug] > [Stop] to stop the processing of the active application.
  - > Application goes to STOP state.
  - ► Optional: repeat process for additional applications.
- **GUI / web interface:**
  - ►  >  > 
  - ► Select [Applications] tab.
  - ► Use [▲] / [▼] to select the required application.
  - > Page shows the operating status of the selected application.
  - ► Press [Stop] function key to stop the processing of the selected application.
  - > Application goes to STOP state.
  - ► Optional: repeat process for additional applications.

8.3 Reset

Contents

18025

8.3.1 Supported reset variants

18613

The following table shows the reset variants supported by the device-internal CODESYS SPS and the resulting system behaviour:

Type of reset	System behaviour	Triggering actions
Reset (warm)	▪ application goes to STOP state. ▪ Standard variables (VAR) of the application are initialised. ▪ Remanent variables (VAR RETAIN) of the application keep their current values.	→ **Reset the application (warm)** (→ p. 58)
Reset (cold)	▪ application changes to the STOP state. ▪ All variables (VAR, VAR RETAIN) of the application are initialised.	→ **Reset the application (cold)** (→ p. 58)
Reset (default)	▪ application goes to STOP state. ▪ The application on the SPS is deleted. ▪ All variables (VAR, VAR RETAIN) of the application are initialised. ▪ SPS is reset to the default state.	→ **Reset the application (origin)** (→ p. 58)

A variable that has been declared without an initialisation value is initialised with the variable-specific standard value (e.g. `INT = 0`).

8.3.2 Reset the application (warm)

13131
9069

To reset the application on the SPS, choose one of the following options:

- **CODESYS: command [Reset (warm)]**
  - ► In the device tree:
    Highlight the required application as active application.
  - ► Select [Online] > [Login] to establish a connection to the CODESYS SPS.
  - > CODESYS switches to online mode.
  - ► Select [Online] > [Reset warm] to reset the application.
- **GUI: command [Reset]**
  - ►  > 
  - ► Select [All Applications] tab.
  - ► Use [Reset] to reset all applications.
- **GUI: command [Restart]**
  - ►  > 
  - ► Select [System-reset] tab.
  - ► Use [Restart] to reboot the device.

8.3.3 Reset the application (cold)

15687

To reset the application on the SPS, choose one of the following options:

- **Download the application to the device**
  - ► → **Download the application to the device** (→ p. 53)
- **CODESYS: command "Reset (cold)"**
  - ► In the device tree:
    Highlight the required application as active application.
  - ► Select [Online] > [Login] to establish a connection to the CODESYS SPS.
  - > CODESYS switches to online mode.
  - ► Select [Online] > [Reset cold] to reset the application.

8.3.4 Reset the application (origin)

18962

To reset the application on the SPS:

- **CODESYS: command "Reset (origin)"**
  - ► In the device tree:
    Highlight the required application as active application.
  - ► Select [Online] > [Login] to establish a connection to the CODESYS-SPS.
  - > CODESYS switches to online mode.
  - ► Select [Online] > [Reset origin] to reset the application.

8.4 Display web visualisation

17063

To display the created web visualisation:

Requirements:

> PC/laptop is connected to the configuration interface (X3) of the device (→ device manual: **Configuration interface: connection concepts**)

CODESYS SPS appliation

► Download SPS application with web visualisation to the device and start it (→ **Download the application to the device** (→ p. 53)).

► On PC/laptop: Start web browser.

► Enter the following in the address line and press [ENTER] to confirm:
`<IP address-of-the-device>:<8080>/myvisu.htm`

`myvisu` is the user-defined name of the visualisation (→ **Change properties of the web visualisation** (→ p. 46)).

> Web browser shows the web visualisation of the device.

ifm system solution

► Install the ifm system solution on the device and start it (→ device manual, **Install single/basic app** or **Install multi app**).

► Display informationen about the installed ifm app (→ device manual, **Show information about installed ifm apps**).

► Call hyperlink of the ifm app.

> Web browser shows the web visualisation of the ifm system solution.

8.5 Display target visualisation

20256

After compilation of the project and download to the device the user has to start the target visualisation:

- **CODESYS / higher-level Fieldbus controller:**
  ► Execute system command [Display target visualisation] (→ Device manual, **Command 0x0110 – Display target visualisation**)
- **GUI / web interface:**
  ► Activate target visualisation via the menu (→ Device manual: **Show target visualisation**)
  OR:
  Switch between target visualisation and menu with the key combination [◀] + [▶].

If the device does not react to the pressing of [◀] + [▶], the key combination is deactivated.

► Activate the key combination with the system command [Display target visualisation].

After a restart of the device the menu view of the GUI appears by default.

► With the FB **ACnnnn_SysCmd** (→ p. 125)execute the system command [Display target visualisation] at the start of the SPS application.

Further information: → Device manual: **Command 0x0110 – Display target visualisation"**

9 Appendix

Contents

7156

9.1 Library ACnnnn_Utils.library

Contents

17722

9.1.1 Overview: AS-i functions (FB_ASi)

Contents

17459

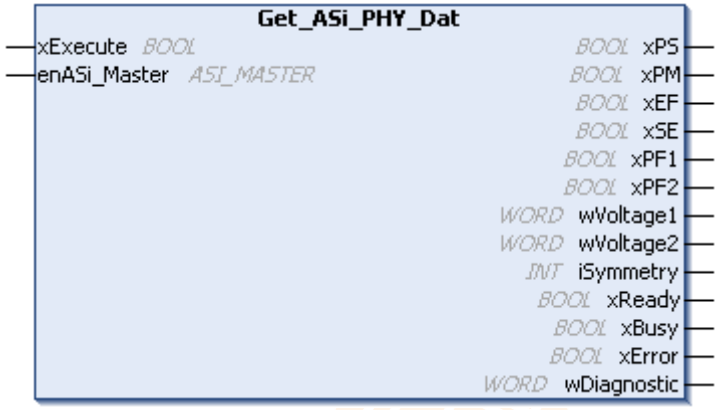
Get_ASi_PHY_Dat

16005

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:



Description

16040

The FB reads the physical data of the selected AS-i master and provides the values.

Input parameters

16041

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

16042

Parameter	Data type	Description	Possible values	
xPS	BOOL	Voltage source (Power Source)	FALSE	Unit is supplied via Aux.
			TRUE	Unit is supplied via AS-i.
xPM	BOOL	Power24-Modul (PM)	FALSE	Power24 module missing.
			TRUE	Power24 module is inserted.
xEF	BOOL	Earth fault	FALSE	No earth fault
			TRUE	Supply voltage is asymmetric, earth fault suspected.
xSE	BOOL	Status of the earth fault detection	FALSE	Earth fault detection does not provide valid data (e.g. when AS-i voltage is lacking).
			TRUE	Earth fault detection provides valid data.
xPF1	BOOL	Voltage <22.5 V (power fail 22.5 V)	FALSE	No AS-i power fault (Classic APF)
			TRUE	AS-i power fail (Classic APF), i.e. AS-i voltage is below 22.5 V
xPF2	BOOL	Voltage <19.0V (power fail 19V)	FALSE	No AS-i power fail (24V-APF)
			TRUE	AS-i power fail (24V-APF), i.e. AS-i voltage is below 19.0 V
wVoltage1	WORD	Voltage AS-i+ to AS-i- in mV		
wVoltage2	WORD	Voltage FE to AS-i in mV		
iSymmetry	INT	Symmetry in % (-100% ... +100%)	0xFF9C ... 0x0000 ... 0x0064	-100% ... 0% ... +100%
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set

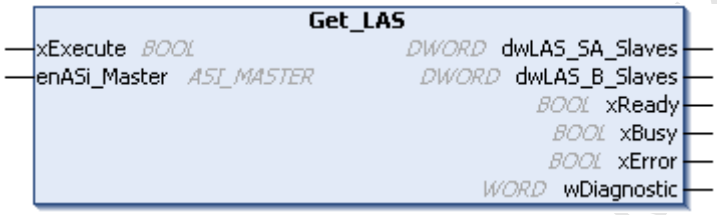
Get_LAS

16008

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:



Description

16068

The FB reads the list of activated slaves (LAS) of the selected AS-i master and provides the values.

Input parameters

16069

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

16070

Parameter	Data type	Description	Possible values	
dwLAS_SA_Slaves	DWORD	List of the active S/A slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = address 0 ... Bit 31 (MSB) = address 31/31A	Per bit:	
			0	No single/A slave available
			1	Single/A slave available
dwLAS_B_Slaves	DWORD	List of the active B slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = not used ▪ Bit 1 = address 1B ... Bit 31 (MSB) = address 31B	Per bit:	
			0	No B slave available
			1	B slave available
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0F01 Unknown error
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

Get_LDS

16013

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

16118

The FB reads the list of detected slaves (LDS) of the selected AS-i master and provides the values.

Input parameters

16119

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

16120

Parameter	Data type	Description	Possible values	
dwLDS_SA_Slaves	DWORD	List of detected S/A slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = address 0 ... ▪ Bit 31 (MSB) = address 31/31A	Per bit:	
			0	no slave detected
			1	slave detected
dwLDS_B_Slaves	DWORD	List of detected B slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = not used ▪ Bit 1 = address 1B ... ▪ Bit 31 (MSB) = address 31B	Per bit:	
			0	No slave detected
			1	Slave detected
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0F01 Unknown error
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

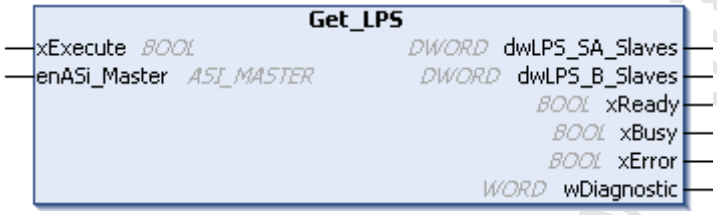
Get_LPS

16015

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:



Description

16130

The FB reads the list of projected slaves (LPS) at the selected AS-i master and provides the values.

Input parameters

16131

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

16132

Parameter	Data type	Description	Possible values	
dwLPS_SA_Slaves	DWORD	List of the projected S/A slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = address 0 ... ▪ Bit 31 (MSB) = address 31/31A	Per bit:	
			0	Slave not projected
			1	Slave projected
dwLPS_B_Slaves	DWORD	List of the projected B slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = not used ▪ Bit 1 = address 1B ... ▪ Bit 31 (MSB) = address 31B	Per bit:	
			0	slave not projected
			1	slave projected
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0F01 Unknown error
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

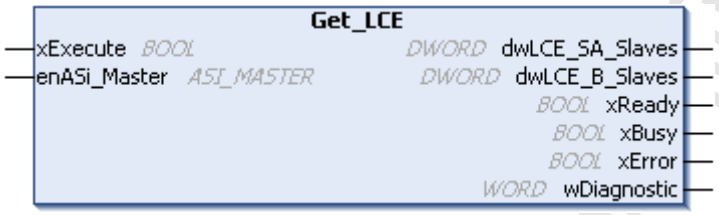
Get_LCE

16009

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:



Description

16075

The FB reads the list of configuration errors (LCE) of the selected AS-i master and provides the values.

Input parameters

16076

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

16077

Parameter	Data type	Description	Possible values	
dwLCE_SA_Slaves	DWORD	List of configuration errors of the S/A slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = address 0 ... Bit 31 (MSB) = address 31/31A	Per bit:	
			0	No configuration error
			1	Configuration error
dwLCE_B_Slaves	DWORD	List of configuration errors of the B slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = not used ▪ Bit 1 = address 1B ... Bit 31 (MSB) = address 31B	Per bit:	
			0	No configuration error
			1	Configuration error
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0F01 Unknown error
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

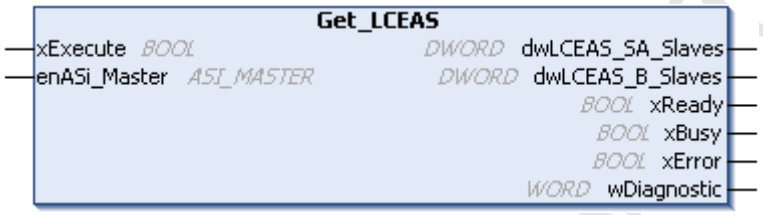
Get_LCEAS

16010

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:



Description

16098

The FB reads the list of existing but not projected slaves (List of Configuration Error – Additional Slave = LCEAS) of the selected AS-i master and provides the values.

Input parameters

16099

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

16100

Parameter	Data type	Description	Possible values	
dwLCEAS_SA_Slaves	DWORD	List of configuration errors of the S/A slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = address 0 ... Bit 31 (MSB) = address 31/31A	Per bit:	
			0	No configuration error - additional slave
			1	Slave exists, but not projected
dwLCEAS_B_Slaves	DWORD	List of configuration errors of the B slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = not used ▪ Bit 1 = address 1B ... Bit 31 (MSB) = address 31B	Per bit:	
			0	No configuration error - additional slave
			1	Slave exists, but not projected
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0F01 Unknown error
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

Get_LCEMS

16011

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

16106

The FB reads the list of projected but missing slaves (List of Configuration Error – Missing Slave = LCEMS) at the selected AS-i master and provides the values.

Input parameters

16107

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

16108

Parameter	Data type	Description	Possible values	
dwLCEMS_SA_Slaves	DWORD	List of configured but missing S/A slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = address 0 ... Bit 31 (MSB) = address 31/31A	Per bit:	
			0	No configuration error - missing slave
			1	Slave is projected but not available
sdwLCEMS_B_Slaves	DWORD	List of the configured but non-existing B slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = not used ▪ Bit 1 = address 1B ... Bit 31 (MSB) = address 31B	Per bit:	
			0	No configuration error - missing slave
			1	Slave is projected but not available
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0F01 Unknown error
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

Get_LDAE

16012

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

16112

The FB reads the double address errors (LDAE) of the selected AS-i master and provides the values in a list.

Input parameters

16113

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

16114

Parameter	Data type	Description	Possible values	
dwLDAE_SA_Slaves	DWORD	List of the double address errors. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = address 0 ... Bit 31 (MSB) = address 31/31A	Per bit:	
			0	No double address error
			1	Double address error
dwLDAE_B_Slaves	DWORD	List of double address errors. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = not used ▪ Bit 1 = address 1B ... Bit 31 (MSB) = address 31B	Per bit:	
			0	No double address error
			1	Double address error
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0F01 Unknown error
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

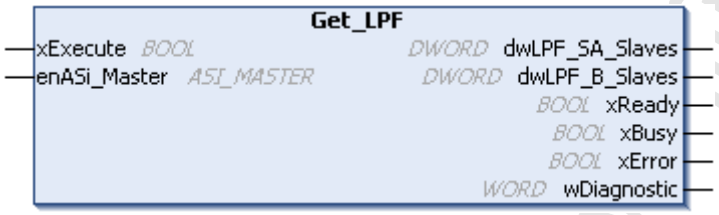
Get_LPF

16014

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:



Description

16124

The FB reads the list of peripheral faults (LPF) of the selected AS-i master and provides the values.

Input parameters

16125

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

16126

Parameter	Data type	Description	Possible values	
dwLPF_SA_Slaves	DWORD	List of peripheral faults on S/A slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = address 0 ... Bit 31 (MSB) = address 31/31A	Per bit:	
			0	No peripheral fault
			1	Peripheral fault detected
dwLPF_B_Slaves	DWORD	List of peripheral faults on B slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = not used ▪ Bit 1 = address 1B ... Bit 31 (MSB) = address 31B	Per bit:	
			0	No peripheral fault
			1	Peripheral fault detected
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0F01 Unknown error
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

Get_CDI

16006

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

16045

The FB reads the configuration data (Configuration Data Image = CDI) of the slaves at the selected AS-i master and provides the values in an array. The configuration data of a slave consists of the registers IO, ID, ID1 and ID2.

Input parameters

16046

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

16047

Parameter	Data type	Description	Possible values	
awCDI	ARRAY [0...63] OF WORD	Configuration data of the slaves at the selected AS-i master	Per Word: Bits 0...3: I/O-Code Bits 4...7: ID-Code Bits 8...11: ID1-Code Bits 12...15: ID2-Code	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0F01 Unknown error
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

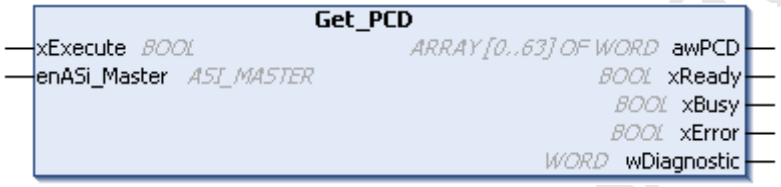
Get_PCD

16017

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:



Description

16141

The FB reads the projected configuration data (Projected Configuration Data Image = PCD) of the slaves on the selected AS-i master and provides the values in an array.

Input parameters

16142

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

16143

Parameter	Data type	Description	Possible values	
awPCD	ARRAY [0...63] OF WORD	Permanent configuration files of the slaves on the selected AS-i master	per word: Bits 0...3: I/O-Code Bits 4...7: ID-Code Bits 8-11: ID1-Code Bits 12-15: ID2-Code Data in Word 0 is invalid!	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0F01 Unknown error
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

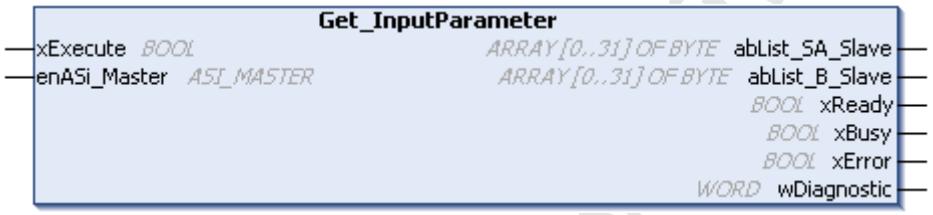
Get_InputParameter

16007

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:



Description

16056

The FB reads the input parameters of the slaves on the selected AS-i master and provides the values in 2 arrays for single A slaves and B slaves.

Input parameters

16057

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

16058

Parameter	Data type	Description	Possible values	
abList_SA_Slave	ARRAY[0..31] OF BYTE	List of output parameters of S/A slaves in the selected AS-i master. Each byte contains the output parameters of an AS-i slave. – byte 0 (LSB) = res. – byte 1 = slave with address 1(A) ... – byte 31 = slave with address 31(A)	Per byte:	
			Bits 0...3:	P0-P3
abList_B_Slave	ARRAY[0..31] OF BYTE	List of output parameters of B slaves in the selected AS-i master. Each byte contains the output parameters of an AS-i slave. – byte 0 (LSB) = res. – byte 1 = slave with address 1B ... – byte 31 = slave with address 31B	Per byte:	
			Bits 0...3:	P0-P3
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0F01 Unknown error
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

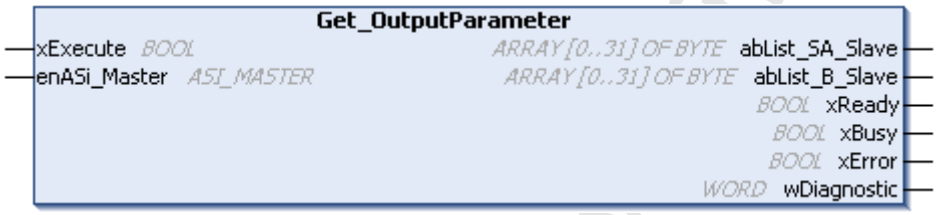
Get_OutputParameter

16016

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:



Description

16136

The FB reads the output parameters of the slaves on the selected AS-i master and provides the values for S/A slaves and B slaves in 2 separate arrays.

Input parameters

16137

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

16138

Parameter	Data type	Description	Possible values	
abList_SA_Slave	ARRAY[0..31] OF BYTE	List of output parameters of S/A slaves in the selected AS-i master. Each byte contains the output parameters of an AS-i slave. – byte 0 (LSB) = res. – byte 1 = slave with address 1(A) ... – byte 31 = slave with address 31(A)	Per byte:	
			Bits 0...3:	P0-P3
abList_B_Slave	ARRAY[0..31] OF BYTE	List of output parameters of B slaves in the selected AS-i master. Each byte contains the output parameters of an AS-i slave. – byte 0 (LSB) = res. – byte 1 = slave with address 1B ... – byte 31 = slave with address 31B	Per byte:	
			Bits 0...3:	P0-P3
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0F01 Unknown error
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

Set_AddressMode

16018

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

16146

The FB activates/deactivates the parameter "Automatic addressing" for the selected AS-i master.

Input parameters

16147

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2
enAuto_Address_Mode	ASI_ADDRESS_MODE	Parameter activates/deactivates the automatic addressing mode.	Auto_address_disable	Automatic addressing inactive
			Auto_address_enable	Automatic addressing active

Output parameters

17017

Parameter	Data type	Description	Possible values	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set

Set_ASi_Config

16019

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

16149

The FB activates/deactivates the parameters "double address recognition" and "earth fault detection" for the selected AS-i master.

Input parameters

16150

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2
xDoubleAdrDetection	BOOL	Activate/deactivate "Double address recognition"	FALSE	Double address recognition inactive
			TRUE	Double address recognition active
xEarthFaultDetection	BOOL	Activate/deactivate "Earth-fault detection"	FALSE	Earth-fault detection inactive
			TRUE	Earth-fault detection active

Output parameters

17015

Parameter	Data type	Description	Possible values	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0001 Wrong parameter transferred, setting was not adopted.

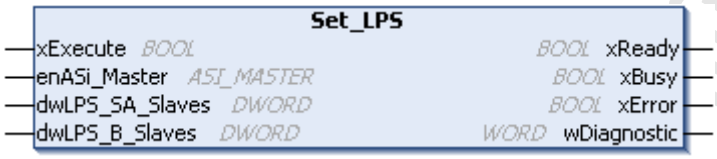
Set_LPS

16020

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:



Description

16153

The FB changes the list of projected slaves (LPS) in the selected AS-i master.

Input parameters

16154

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2
dwLPS_SA_Slaves	DWORD	List of the projected S/A slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = address 0 ... ▪ Bit 31 (MSB) = address 31/31A	Per bit:	
			0	Slave not projected
			1	Slave projected
dwLPS_B_Slaves	DWORD	List of the projected B slaves. Each bit represents an AS-i address: ▪ Bit 0 (LSB) = not used ▪ Bit 1 = address 1B ... ▪ Bit 31 (MSB) = address 31B	Per bit:	
			0	slave not projected
			1	slave projected

Output parameters

17016

Parameter	Data type	Description	Possible values	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0019 Master not in the projecting mode

Set_Mode

16021

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

16155

The FB changes the operating mode (protected operation, projection mode) of the selected AS-i master.

Input parameters

16156

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2
enMode_ASi_Master	ASI_MASTER_MODE	Operating mode of the AS-i master	Closed_mode	protected mode active
			Project_mode	projection mode active

Output parameters

17018

Parameter	Data type	Description	Possible values	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0003 Slave with address 0 found (slave not detected)

Set_PCD

16022

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

16151

The FB changes the configuration file (Permanent Configuration Data = PCD) of the slaves at the selected AS-i master.

Input parameters

16160

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2
awPCD	ARRAY [0...63] OF WORD	Permanent configuration files of the slaves on the selected AS-i master	per word: Bits 0...3: I/O-Code Bits 4...7: ID-Code Bits 8-11: ID1-Code Bits 12-15: ID2-Code Data in Word 0 is invalid!	

Output parameters

15574

Parameter	Data type	Description	Possible values	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0019 Master not in the projecting mode

Set_ProjectAll

16023

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

16161

The FB starts the projection adaptation on the selected AS-i master.

Input parameters

16125

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2

Output parameters

17020

Parameter	Data type	Description	Possible values	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0003 Slave with address 0 found (slave not detected)
- 0x0019 Master not in the projecting mode

Set_SlaveAddress

16024

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

16162

The FB changes the address of the selected AS-i slaves.

Input parameters

16165

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2
enASi_Slave	ASI_SLAVE	Address of the AS-i slave	Slave_n	AS-i slave to address n (n = 1 ... 31)
enASi_SlaveTyp	ASI_SLAVE_ TYP	Type of the AS-i slave	SA_Slave	Single or A slave
			B_Slave	B-Slave
enASi_Slave_new	ASI_SLAVE	New address of the AS-i slave	Slave_n	AS-i slave at address n (n = 1 ... 31)
enASi_SlaveTyp_new	ASI_SLAVE_ TYP	New type of the AS-i slave	SA_Slave	single slave or A slave
			B_Slave	B slave

Output parameters

17021

Parameter	Data type	Description	Possible values	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0001 Slave does not respond or change to offline mode during FB execution
- 0x0002 Slave with old address not found (slave not detected)
- 0x0003 Slave with address 0 found (slave not detected)
- 0x0004 Slave with new address found
- 0x0005 Error during deletion of the old address (Delete Error)
- 0x0006 ExtendedID1 could not be read after writing (Read Error)
- 0x0007 Error when writing ExtendedID1 (Set Error)
- 0x0008 New address temporary stored
- 0x0009 ExtendedID1 stored temporarily
- 0x0018 Master is not in normal operation.

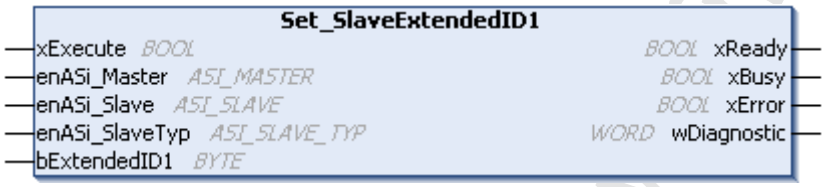
Set_SlaveExtendedID1

16025

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:



Description

16169

The FB changes the Extended ID1 of the selected AS-i slave.

Input parameters

16170

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2
enASi_Slave	ASI_SLAVE	Address of the AS-i slave	Slave_n	AS-i slave to address n (n = 1 ... 31)
enASi_SlaveTyp	ASI_SLAVE_TYP	Type of the AS-i slave	SA_Slave	Single or A slave
			B_Slave	B-Slave
bExtendedID1	BYTE	Extended ID1 code of the selected AS-i slave	Extended ID1 code (hexadecimal representation)	

Output parameters

16148

Parameter	Data type	Description	Possible values	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0003 Slave with address 0 found (slave not detected)
- 0x0005 Error during deletion of the old address (Delete Error)
- 0x0006 ExtendedID1 could not be read after writing (Read Error)
- 0x0007 Error when writing ExtendedID1 (Set Error)
- 0x0009 ExtendedID1 stored temporarily
- 0x000E Invalid slave address (e.g. 0 or 0B specified)
- 0x0018 Master is not in normal operation.
- 0x0021 Invalid ExtendedID1 code

Set_SlaveParameter

16026

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

16172

The FB changes the parameters of the selected AS-i slave.

Input parameters

16173

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2
enASi_Slave	ASI_SLAVE	Address of the AS-i slave	Slave_n	AS-i slave to address n (n = 1 ... 31)
enASi_SlaveTyp	ASI_SLAVE_TYP	Type of the AS-i slave	SA_Slave	Single or A slave
			B_Slave	B-Slave
enASi_SlaveParam	BYTE	Parameters of the selected AS-i slave	Slave parameters (hexadecimal representation)	

Output parameters

17025

Parameter	Data type	Description	Possible values	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0001 Slave does not respond or change to offline mode during FB execution
- 0x000A Sslave not in LAS
- 0x000B Data content invalid (e.g. parameter value >7 for A/B slaves)
- 0x000E Invalid slave address (e.g. 0 or 0B specified)
- 0x0018 Master is not in normal operation.

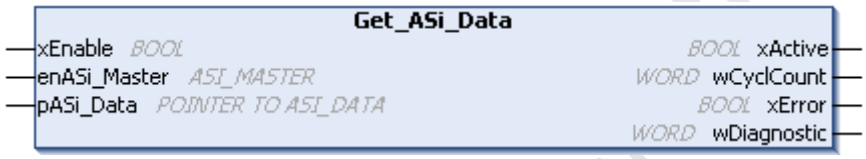
Get_ASi_Data

16000

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:



Description

16033

The FB reads the following data from the selected AS-i master and stores the values in a structure variable of data type ASI_DATA (→ **ASI_DATA (STRUCT)** (→ p. 117)):

- List of activated slaves – LAS
- List of detected slaves – LDS
- List of projected slaves – LPS
- List of configuration errors – LCE
- List of configuration errors - additional slave – LCEAS
- List of configuration errors - missing slave – LCEMS
- List of peripheral faults – LPF
- List of double address errors – LDAE
- Configuration data image – CDI
- Projected configuration data – PCD
- Input parameters of the AS-i slaves
- Outputs parameters of the AS-i slaves

Input parameters

16034

Parameter	Data type	Description	Possible values	
xEnable	BOOL	Control activiy of the FB	TRUE	FB is enabled
			FALSE	FB is disabled
enASi_Master	ASI_MASTER	Select AS-i master	Master_1	AS-i master 1
			Master_2	AS-i master 2
pASi_Data	POINTER TO ASI_DATA	Structure variable in which the read data is to be stored.	Variable must be declared!	

Output parameters

16035

Parameter	Data type	Description	Possible values	
xActive	BOOL	Signal confirms the FB execution	FALSE	Function block is inactive
			TRUE	FB is active (=is executed)
wCycleCount	WORD	Counter for FB cycles that were fully run through	Number in hexadecimal representation	
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0xnF01 Unknown error [1]
- 0xnF02 Unknown/invalid target [1]
- 0xnF03 Unknown command ID [1]
- 0xnF04 Unknown parameters [1]
- 0xnF05 Timeout during processing [1]

Legend:

[1] Get_ASi_Data executes the FB ACnnnn_SysCmd sequentially with different command IDs in order to determine the individual elements of the complex variable. In the returned error code, the nibble n indicates the command request where the error occurred. n can have the following values:

1 = error with "Get LAS, LDA, LPF, LCE"
2 = error with "Get LPS"
3 = error with "Get CDI"
4 = error with "Get PCD"
5 = error with "Get Input Parameter"
6 = error with "Get Output Parameter"
7 = error with "Get LCEMS, LCEAS, LDAE"

9.1.2 Overview: System functions (FB_System)

Contents

17460

Get_FieldbusInfo

17453

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

17454

The FB reads information about the fieldbus and provides the values in a list. The following information are read:

- Status of the fieldbus
- Fieldbus type
- Status of the Ethernet connection at port X6 and X7
- MAC addresses
- IP address of the fieldbus host

Input parameters

17455

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution

Output parameters

17456

Parameter	Data type	Description	Possible values	
aw_InfoList	ARRAY[0...18] OF WORD	Fieldbus information	Position of the data within the individual words → **DS18: Fieldbus information**	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0F01 Unknown error
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

QuickSetupASi_Master

15999

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

15902

The FB executes the quick setup routine on the selected AS-i masters.

Input parameters

15903

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
xMaster1	BOOL	Select AS-i master 1 for quick setup	FALSE	No execution of quick setup, AS-i configuration remains unchanged.
			TRUE	Execution of quick set up on AS-i master
xMaster2	BOOL	Select AS-i master 2 for quick setup	FALSE	No execution of quick setup, AS-i configuration remains unchanged.
			TRUE	Execution of quick set up on AS-i master

Output parameters

15920

Parameter	Data type	Description	Possible values	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0003 Slave with address 0 found (slave not detected)

Set_TimeDate

15998

Function block type: Function block (FB)

Library: ACnnnn_Utils.library

Symbol in CODESYS:

Description

15949

The FB sets the system time (time and date) of the device using the transmitted input values.

Input parameters

15988

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
bDay	BYTE	Day	0x01 ... 0x1F	1 ... 31
bMonth	BYTE	Month	0x01 ... 0x0C	January ... December
wYear	WORD	Year	0x07B3 ... 0x07F5	1971 ... 2037
bHour	BYTE	Hour	0x00 ... 0x17	0 ... 23
bMinute	BYTE	Minute	0x00 ... 0x3B	0 59
bSecond	BYTE	Second	0x00 ... 0x3B	0 59

Output parameters

15990

Parameter	Data type	Description	Possible values	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xBusy	BOOL	Signal indicates if the FB is executed.	FALSE	FB is deactivated or FB execution is terminated.
			TRUE	FB execution is started but not yet terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
wDiagnostic	WORD	Diagnostic information	→ List below (Diagnostic codes)	

Diagnostic codes:

- 0x0000 No specific error is set
- 0x0001 Transferred values for date/time are invalid and could not be set.
- 0x0002 NTP active, time could not be adopted.

9.1.3 Enumeration types and complex variables

Contents

15986

In addition to the standard data types, the CODESYS package from ifm electronic also features the following enumeration types (ENUM) and complex variables (STRUCT):

Enumeration types (ENUM)

16176

The library `ACnnnn_Utils` provides the following enumeration types (ENUM):

ASI_ADDRESS_MODE (ENUM)

16177

Designation	Description	Variable	Data type	Value
ASI_ADDRESS_MODE	AS-i autoaddressing mode	▪ Auto_address_enable	INT	0
		▪ Auto_address_disable	INT	1

ASI_MASTER (ENUM)

16178

Designation	Description	Variable	Data type	Value
ASI_MASTER	Identifier for AS-i masters	▪ Master_1	INT	1
		▪ Master_2	INT	2

ASI_MASTER_MODE (ENUM)

16179

Designation	Description	Variable	Data type	Value
ASI_MASTER_MODE	Operating mode of the AS-i master	▪ Closed_mode	INT	0
		▪ Project_mode	INT	1

ASI_SLAVE (ENUM)

16180

Designation	Description	Variable	Data type	Value
ASI_SLAVE	Identifier for AS-i slaves	▪ Slave_1	INT	1
		▪ Slave_2	INT	2
		▪ Slave_3	INT	3
		▪ Slave_4	INT	4
		▪ Slave_5	INT	5
		▪ Slave_6	INT	6
		▪ Slave_7	INT	7
		▪ Slave_8	INT	8
		▪ Slave_9	INT	9
		▪ Slave_10	INT	10
		▪ Slave_11	INT	11
		▪ Slave_12	INT	12
		▪ Slave_13	INT	13
		▪ Slave_14	INT	14
		▪ Slave_15	INT	15
		▪ Slave_16	INT	16
		▪ Slave_17	INT	17
		▪ Slave_18	INT	18
		▪ Slave_19	INT	19
		▪ Slave_20	INT	20
		▪ Slave_21	INT	21
		▪ Slave_22	INT	22
		▪ Slave_23	INT	23
		▪ Slave_24	INT	24
		▪ Slave_25	INT	25
		▪ Slave_26	INT	26
		▪ Slave_27	INT	27
		▪ Slave_28	INT	28
		▪ Slave_29	INT	29
		▪ Slave_30	INT	30
		▪ Slave_31	INT	31

ASI_SLAVE_TYP (ENUM)

16181

Designation	Description	Variable	Data type	Value
ASI_SLAVE_TYP	Type of the AS-i slave	▪ SA_Slave	INT	0
		▪ B_Slave	INT	1

Complex variables (STRUCT)

15991

The library `ACnnnn_Utils.library` provides complex variables of the data type STRUCT. They are used by the FBs, but they can also be used by the programmer in CODESYS projects for the device-internal SPS.

ASI_DATA (STRUCT)

15992

Name	Data type	Description	Possible values
▪ LDS_SA_Slave	DWORD	List of the active S/A slaves	Each bit represents an AS-i address: 0 = no slave active 1 = slave active → **DS9 – Slave lists LAS, LDS, LPF, LCE**, words 4...7
▪ LDS_B_Slave	DWORD	List of active B slaves	
▪ LAS_SA_Slave	DWORD	List of active S/A slaves	Each bit represents an AS-i address: 0 = no active slave 1 =active slave → **DS9 – Slave lists LAS, LDS, LPF, LCE**, words 0...3
▪ LAS_B_Slave	DWORD	List of active B slaves	
▪ LPF_SA_Slave	DWORD	List of peripheral faults (S/A slaves)	Each bit represents an AS-i address: 0 = no peripheral fault 1 = peripheral fault → **DS9 – Slave lists LAS, LDS, LPF, LCE**, words 8...11
▪ LPF_B_Slave	DWORD	List of peripheral faults (B slaves)	
▪ LCE_SA_Slave	DWORD	List with configuration errors (S/A slaves)	Each bit represents an AS-i address: 0 = no configuration error 1 = configuration error → **DS9 – Slave lists LAS, LDS, LPF, LCE**, words 12...15
▪ LCE_B_Slave	DWORD	List with configuration errors (B slaves)	
▪ LPS_SA_Slave	DWORD	List of projected S/A slaves	Each bit represents an AS-i address: 0 = no projected slave 1 = projected slave → **DS10 – Slave list LPS**
▪ LPS_B_Slave	DWORD	List of active B slaves	
▪ LCEMS_SA_Slave	DWORD	List of configuration errors: projected, but missing S/A slave	Each bit represents an AS-i address: 0 = no configuration error 1 = configuration error → **DS17 – AS-i master: Error lists LCEMS, LCEAS, LDAE**, words 0...3
▪ LCEMS_B_Slave	DWORD	List of configuration errors: projected, but missing B slave	
▪ LCEAS_SA_Slave	DWORD	List of configuration errors: additional S/A slave	Each bit represents an AS-i address: 0 = no error 1 = error → **DS17 – AS-i master: Error lists LCEMS, LCEAS, LDAE**, words 4...7
▪ LCEAS_B_Slave	DWORD	List of configuration errors: additional B slave	
▪ LDAE_SA_Slave	DWORD	List of double address errors (S/A slaves)	Each bit represents an AS-i address: 0 = no double address error 1 = double address error → **DS17 – AS-i master: Error lists LCEMS, LCEAS, LDAE**, words 8...11
▪ LDAE_B_Slave	DWORD	List of double address errors (B slaves)	
▪ CDI	ARRAY[0..63] OF WORD	Image of the current configuration data (CDI = Configuration Data Image)	One word is available per slave: Bits 0...3 = IO code Bits 4...7 = ID code Bits 8...11 = Extended ID1 code Bits 12...15 = Extended ID2 code → **DS11 – Actual configuration data (CDI)**

Name	Data type	Description	Possible values
▪ PCD	ARRAY[0..63] OF WORD	Image of the projected configuration data (PCD = Projected Configuration Data)	Each word contains data of one slave: Bits 0...3 = IO Bits 4...7 = ID Bits 8...11 = ID1 Bits 12...15 = ID2 → **DS12 – Projected configuration data (PCD)**
▪ InputParam_SA_Slave	ARRAY[0..31] OF BYTE	Input parameters of the S/A slaves	Each byte contains parameters of one S/A slave: Bits 0...3 = P0-P3 Bits 4...7 = reserved → **DS13 – Image of the input parameters of the slaves (PI)**, words 0...15
▪ InputParam_B_Slave	ARRAY[0..31] OF BYTE	Input parameters of the B slaves	Each byte contains parameters of one B slave: Bits 0...3 = P0-P3 Bits 4...7 = reserved → **DS13 – Image of the input parameters of the slaves (PI)**, words 16...31
▪ OutputParam_SA_Slave	ARRAY[0..31] OF BYTE	Output parameters of the S/A slaves	Each byte contains parameters of one S/A slave: Bits 0...3 = P0-P3 Bits 4...7 = reserved → **DS14 – Image of the output parameters of the slaves (PP)**, words 0...15
▪ OutputParam_B_Slave	ARRAY[0..31] OF BYTE	Output parameters of the B slaves	Each byte contains parameters of one B slave: Bits 0...3 = P0-P3 Bits 4...7 = reserved → **DS14 – Image of the output parameters of the slaves (PP)**, words 16...31

ASI_NET (STRUCT)

15993

The structure contains the complete process image (inputs and outputs) of an AS-i network.

Name	Data type	Description	Possible values
▪ binIO	ASI_BIN_IO	Binary input and output data	→ **ASI_BIN_IO (STRUCT)** (→ p. 120)
▪ anaIO	ASI_ANA_IO	Analogue input and output data	→ **ASI_ANA_IO (STRUCT)** (→ p. 121)

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ASI_BIN_IO (STRUCT)

16002

The structure contains the process data of the digital input and output slaves:

Name	Data type	Description	Possible values
▪ bin_IN_Slaves	ASI_BIN_IN	Input data of the digital AS-i slaves	→ **ASI_BIN_IN (STRUCT)** (→ p. 120)
▪ bin_OUT_Slaves	ASI_BIN_OUT	Output data of the digital AS-i slaves	→-**ASI_BIN_OUT (STRUCT)** (→ p. 120)

ASI_BIN_IN (STRUCT)

16004

The structure contains the input data of the digital AS-i slaves:

Name	Data type	Description	Possible values
▪ SA_Slave	ARRAY[1...31] OF BYTE	Input data of the digital S/A slaves, 1 byte per S/A slave	corresponds to the 1st to 15th word of the acyclic data record 2 (DS2) → **DS2 – Digital inputs of the slaves and master flags**
▪ B_Slave	ARRAY[1...31] OF BYTE	Input data of the digital B slaves, 1 byte per B slave	corresponds to the 16th to 31st word of the acyclic data record 2 (DS2) → **DS2 – Digital inputs of the slaves and master flags**

ASI_BIN_OUT (STRUCT)

16003

The structure contains the output data of the digital AS-i slaves.

Name	Data type	Description	Possible values
▪ SA_Slave_bin_OUT	ARRAY[1...31] OF BYTE	Output data of the digital S/A slaves (1 byte per S/A slave)	corresponds to the 1st to 15th word of the acyclic data record 5 (DS5) → **DS5 – Digital outputs of the slaves**
▪ B_Slave_bin_OUT	ARRAY[1...31] OF BYTE	Output data of the digital B slaves (1 byte per B slave)	corresponds to the 16th to 31st word of the acyclic data record 5 (DS5) → **DS5 – Digital outputs of the slaves**

ASI_ANA_IO (STRUCT)

16001

The structure contains the process data of the analogue input and output slaves.

Name	Data type	Description	Possible values
▪ ana_IN_Slave	ARRAY[1..31] OF ASI_ANALOG_IN	Input data and status flags of the analogue AS-i slaves	→ **ASI_ANALOG_IN (STRUCT)** (→ p. 121)
▪ ana_OUT_Slave	ARRAY[1..31] OF ASI_ANALOG_OUT	Output data and status flags of the analogue AS-i slaves	→ **ASI_ANALOG_OUT (STRUCT)** (→ p. 122)

ASI_ANALOG_IN (STRUCT)

15994

The structure contains the process data of the analogue input slave as well as the transmitted status flags.

Designation	Data type	Description	Possible values
▪ chan_1	INT	Analogue value channel 1: S or A input slave	corresponds to the 1st to 4th word of an area comprising 5 words in the acyclic data records 3 and 4 (DS3+4) → **DS3 – Analogue inputs of slaves 1(A)...15(B)** → **DS4 – Analogue inputs of slaves 16(A)...31(B)**
▪ chan_2	INT	Analogue value channel 2: S or A input slave	
▪ chan_3	INT	Analogue value channel 3: S or B input slave	
▪ chan_4	INT	Analogue value channel 4: S or B input slave	
▪ flags	ASI_ANALOG_OUT_FLAGS	Status flags	→ **ASI_ANALOG_IN_FLAGS (STRUCT)** (→ p. 122)

ASI_ANALOG_IN_FLAGS (STRUCT)

15996

The structure contains the status flags of the analogue input slave.

Name	Data type	Description	Possible values
▪ V0	BOOL	Valid bit, channel 1	corresponds to the fifth word of an area comprising 5 words in the acyclic data records 3 and 4 (DS3+4) → **DS3 – Analogue inputs of slaves 1(A)...15(B)** → **DS4 – Analogue inputs of slaves 16(A)...31(B)**
▪ O0	BOOL	Overflow bit, channel 1	
▪ V1	BOOL	Valid bit, channel 2	
▪ O1	BOOL	Overflow bit, channel 2	
▪ V2	BOOL	Valid bit channel 3	
▪ O2	BOOL	Overflow bit, channel 3	
▪ V3	BOOL	Valid bit, channel 4	
▪ O3	BOOL	Overflow bit, channel 5	
▪ na1	BOOL	--	
▪ TOA	BOOL	Transfer output, S/A slave	
▪ na2	BOOL	--	
▪ TOB	BOOL	Transfer output, B slave	
▪ na3	BOOL	--	
▪ TIA	BOOL	Transfer input, S/A slave	
▪ na4	BOOL	--	
▪ TIB	BOOL	Transfer input, B slave	

ASI_ANALOG_OUT (STRUCT)

15995

The structure represents the process data of the analogue output slaves as well as the transmitted flags.

Designation	Data type	Description	Possible values
▪ chan_1	INT	Analogue value channel 1: S or A output slave	corresponds to the acyclic data records 6 and 7 (DS6, DS7) → **DS6 – Analogue outputs of slaves 1(A)...15(B)** → **DS7 – Analogue outputs of slaves 16(A)...31(B)**
▪ chan_2	INT	Analogue value channel 2: S or A output slave	
▪ chan_3	INT	Analogue value channel 3: S or B output slave	
▪ chan_4	INT	Analogue value channel 4: S or B output slave	
▪ flags	ASI_ANALOG_OUT_FLAGS	Status flags	→**-ASI_ANALOG_OUT_FLAGS (STRUCT)** (→ p. 123)

ASI_ANALOG_OUT_FLAGS (STRUCT)

15997

The structure contains the status flags of the analogue output slave.

Name	Data type	Description	Possible values
▪ na1	BOOL	--	corresponds to the acyclic data record 8 (DS8) → **DS8 – Status flags of analogue output data of the slaves 1...31**
▪ na2	BOOL	--	
▪ na3	BOOL	--	
▪ na4	BOOL	--	
▪ na5	BOOL	--	
▪ na6	BOOL	--	
▪ na7	BOOL	--	
▪ na8	BOOL	--	
▪ OVA	BOOL	Output valid, S/A slave	
▪ na9	BOOL	--	
▪ OVB	BOOL	Output valid, B slave	
▪ n10	BOOL	--	
▪ TOA	BOOL	Transfer Output, S/A slave	
▪ na11	BOOL	--	
▪ TOB	BOOL	Transfer Output, B slave	
▪ na12	BOOL	--	

9.2 Library ACnnnn_SYS_CMD.library

Contents

17723

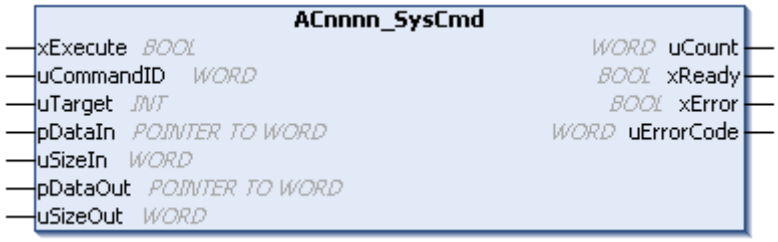
9.2.1 ACnnnn_SysCmd

15890

Function block type: Function block (FB)

Library: ACnnnn_SYS_CMD.library

Symbol in CODESYS:



Description

15893

Using the FB, individual commands can be sent to the system or to an AS-i master.
Each command refers to the data structures of one of the following elements:

- Command request channel: → **Example: Change language setting of the device** (→ p. 130)
- Command response channel: → **Example: Date / time / read NTP settings** (→ p. 131)
- Acyclic data record (DSx): → **Example: Read LCEMS, LCEAS and LDAE of AS-i master 2** (→ p. 132)

Input parameters

15895

Parameter	Data type	Description	Possible values	
xExecute	BOOL	Control execution of the FB	FALSE	Stop FB execution
			TRUE	Start one-time FB execution
uCommandID	WORD	ID of the command to be executed	→ **Table: System commands** (→ p. 126) → **Table: AS-i master commands** (→ p. 127)	
uTarget	INT	Device component to which the command is to be sent	0	system
			1	AS-i master 1
			2	AS-i master 2
pDataIn	POINTER TO WORD	Buffer for data that is assigned to the command as input parameters.	Commando parameter described in the command request channel (word 3 to 120)	
uSizeIn	WORD	Size of the buffer for the input parameters (number of bytes)		
pDataOut	POINTER TO WORD	Buffer for data that is returned as output parameters (results)	Return values described in the command reply channel (data as of word 5)	
uSizeOut	WORD	Size of the buffer for the output parameters (number of bytes)		

Table: System commands

17053

uCommandID	Description
0x0001	DS1 – System information
0x1101	Command 0x0101 – Quick set-up AS-i masters 1 + 2
0x1103	Command 0x0103 – Select user language
0x1104	Command 0x0104 – Change display settings
0x1105	Command 0x0105 – Set output control
0x1109	Command 0x0109 – Set date / time
0x110A	Command 0x010A – Configure the NTP server settings
0x110B	Command 0x010B – Read date / time / NTP settings
0x110C	Command 0x010C – Reboot system
0x110D	Command 0x010D – Read fieldbus info
0x1110	Command 0x0110 - Display target visualisation

Only execute system commands with the input parameter `uTarget = 0`!

Detailed information about the acyclic data sets and the command interface is given in the supplement to the device manual of the SmartSPS DataLine AC14 (→ **Overview: User documentation for SmartPLC DataLine AC14** (→ p. 5)).

Table: AS-i master commands

17054

uCommandID	Description / corresponding command
0x0002	DS2 – Digital slave inputs and master flags
0x0003	DS3 – Analogue inputs of the slaves 1(A)...15(B)
0x0004	DS4 – Analogue inputs of the slaves 16(A)...31(B)
0x0005	DS5 – Digital slave outputs
0x0006	DS6 – Analogue outputs of the slaves 1(A)...15(B)
0x0007	DS7 – Analogue outputs of the slaves 16(A)...31(B)
0x0008	DS8 – Status flags of the analogue outputs of slaves 1...31
0x0009	DS9 – Slave lists LAS, LDS, LPF, LCE
0x000A	DS10 – Slave list LPS
0x000B	DS11 – Current configuration data (CDI)
0x000C	DS12 – Projected configuration data (PCD)
0x000D	DS13 – Image of the input parameters of the slaves (PI)
0x000E	DS14 – Image of the outputs parameters of the slaves (PP)
0x000F	DS15 – Slave error counter, configuration error counter, AS-i cycle counter
0x0011	DS17 – AS-i master: Error lists LCEMS, LCEAS, LDAE
0x1001	Command 0x0001 – Change AS-i slave parameters
0x1003	Command 0x0003 – Project current AS-i network
0x1004	Command 0x0004 – Change LPS
0x1005	Command 0x0005 – Change the operating mode of the AS-i master
0x1006	Command 0x0006 – Change AS-i slave address
0x1007	Command 0x0007 - Set auto address mode of the AS-i master
0x1009	Command 0x0009 – Change extended ID1 in the AS-i slave
0x100A	Command 0x000A - Change PCD
0x100D	Command 0x000D – AS-i master supply voltage, symmetry, earth fault
0x1015	Command 0x0015 – Read ID string of an AS-i profile (S-7.4)
0x101A	Command 0x001A – Read AS-i master info
0x101C	Command 0x001C – Deactivate slave reset when changing to the protected mode
0x1021	Command 0x0021 - Read diagnostics string of an AS-i slave (S-7.4)
0x1022	Command 0x0022 - Read parameter string of an AS-i slave (S-7.4)
0x1023	Command 0x0022 - Write parameter string of an AS-i slave (S-7.4)
0x1024	Command 0x0024 – CTT2 standard read
0x1025	Command 0x0025 – CTT2 standard write
0x1026	Command 0x0026 – CTT2 vendor specific read
0x1027	Command 0x0027 – CTT2 vendor specific selective write
0x1040	Command 0x0040 – CTT2 device group read
0x1041	Command 0x0041 – CTT2 device group write
0x1042	Command 0x0042 – CTT2 vendor specific selective read from buffer
0x1043	Command 0x0043 – CTT2 vendor specific selective write from buffer

uCommandID	Description / corresponding command
0x1044	Command 0x0044 – CTT2 vendor specific selective read
0x1045	Command 0x0045 – CTT2 vendor specific selective write
0x1046	Command 0x0046 – CTT2 device group selective read
0x1047	Command 0x0047 – CTT2 device group selective write
0x1049	Command 0x0049 – CTT2 vendor specific exchange
0x104A	Command 0x004A – CTT2 device group exchange
0x104B	Command 0x004B – CTT2 device group selective read from buffer
0x104C	Command 0x004C – CTT2 device group selective write from buffer
0x1050	Command 0x0050 – Set AS-i master settings
0x1051	Command 0x0051 – Reset error counter

Only execute AS-i master commands with input parameter `uTarget = 1` or `2`!

Detailed information about the acyclic data sets and the command interface is given in the supplement to the device manual of the SmartSPS DataLine AC14 (→ **Overview: User documentation for SmartPLC DataLine AC14** (→ p. 5)).

Output parameters

15897

Parameter	Data type	Description	Possible values	
uCount	WORD	Number of valid bytes in pDataOut (uCount <= uSizeOut)	integer value in hexadecimal representation	
xReady	BOOL	Signal indicates if the execution of the FB is terminated.	FALSE	FB is inactive or being executed.
			TRUE	FB execution is terminated.
xError	BOOL	Signal indicates if errors occurred while the FB was executed.	FALSE	FB is disabled or presently executed or FB was executed without error.
			TRUE	An error occurred when the FB was executed.
uErrorCode	WORD	Error code of the executed command	Command error code of the corresponding command channel OR: → List below (Diagnostic codes)	

Diagnostic codes:

- 0xnF01 Unknown error [1]
- 0x0F02 Unknown/invalid target
- 0x0F03 Unknown command ID
- 0x0F04 Invalid parameters
- 0x0F05 Timeout during processing

Example: Change language setting of the device

17051

Task: Set the language of the graphic user surface of the device to "Spanish" with the FB ACnnnn_SysCmd.

Command type: Command request channel

Input parameters of the FB:

Parameter	Value	Explanation
uCommandID	0x1103	Corresponding commando channel: → **Command 0x0103 – Select user language** (→ device manual supplement)
uTarget	0	System command
pDataIn	arDataIn	▪ Variable of the data type Array of Words ▪ arDataIn contains the command parameters
uSizeIn	0x0001	arDataIn only consists of 1 line since word 1 and 2 as well as 4 to 120 of the command request channel are not considered.
pDataOut	--	irrelevant since command request channel
uSizeOut	--	irrelevant since command request channel

Content of arDataIn:

Word no.	Contents	Explanation
1	0x4553	Spanish

Example: Date / time / read NTP settings

17423

Task: Read the current system time and the NTP settings with the FB ACnnnn_SysCmd.
Command type: Command reply channel
Input parameters of the FB:

Parameter	Value	Declaration
uCommandID	0x110B	Corresponding commando channel: → **Command 0x010B – Read date / time / NTP settings** (→ device manual supplement)
uTarget	0	System command
pDataIn	--	irrelevant, since command reply channel
uSizeIn	--	irrelevant, since command reply channel
pDataOut	arDataOut	▪ variable of the data type Array of Words ▪ contains the return values of the reply channel
uSizeOut	0x0007	Array consists of 7 lines since the reply channel returns 7 words (words 5 ... 11).

Content of arDataOut:

Word no.	Content	
1	Month	Day
2	Year	Year
3	Minutes	Hours
4	reserved	Seconds
5	NTP offset	NTP status
6 ... 7	IP address NTP server	

Example: Read LCEMS, LCEAS and LDAE of AS-i master 2

17424

Task: Read the error lists LCEMS, LCEAS and LDAE of the AS-i master 2 with the FB ACnnnn_SysCmd.

Command type: acyclic data set

Input parameters of the FB:

Parameter	Value	Declaration
uCommandID	0x0011	Corresponding acyclic data set: → **DS17 – AS-i master: Error lists LCEMS, LCEAS, LDAE** (→ device manual supplement)
uTarget	1	Master command (1 = AS-i master 2))
pDataIn	--	irrelevant
uSizeIn	--	irrelevant
pDataOut	arDataOut	▪ Variable of the data type Array of Words ▪ contains the return values
uSizeOut	0x000C	Array consists of 12 lines since the data set DS17 has exactly 12 words

Content of arDataOut:

Word no.	Content
1 ... 4	LCEMS (list of configuration errors - missing slaves)
5 ... 8	LCEAS (list of configuration errors - additional slaves)
9 ... 12	LDAE (list of double address errors)

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