CODESYS Control for PLCnext SL

CODESYS app version 1.2.0 | Document revision 003

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Warning notes

Safety warnings



DANGER

This label indicates a hazard with a high risk level.
If this hazardous situation is not avoided, it will result in death or serious injury.



WARNING

This label indicates a hazard with a medium risk level.
If this hazardous situation is not avoided, it could result in death or serious injury.



CAUTION

This label indicates a hazard with a low risk level.
If this hazardous situation is not avoided, it could result in minor or moderate injury.



NOTICE

Indicates a risk for severe property damage or a malfunction.

Security warning



Security Note

This label indicates a risk for security issues in industrial automation.
You will find information on how to prevent security issues, such as data protection, or unauthorized access to sources that deserve protection.

Notes



With this symbol, find additional information or detailed sources of information.

Qualification of users

The use of products described in this user information is oriented exclusively to qualified application programmers and software engineers. The users must be familiar with the relevant safety concepts of automation technology as well as applicable standards and other regulations. Programming applications requires familiarity with IEC 61131-3 languages, C/C++, C#, and/or MATLAB®/Simulink®.

In addition, users must always regard the general warning notes !

General information

Description of the app

CODESYS Control for PLCnext SL (in the following also called CODESYS app for short) is an adapted CODESYS Control runtime system for the PLCnext Control AXC F 2152 and AXC F 3152.

The CODESYS Runtime is available as a separate app:

- CODESYS Runtime for ARM32
- CODESYS Runtime for x86

The CODESYS Gateway is available as a separate app:

- CODESYS Gateway for ARM32
- CODESYS Gateway for x86

Prerequisites

Firmware requirements

Available from PLCnext Technology firmware 2026.0 LTS .

Software requirements

Available from CODESYS version 3.5.21.

Firewall configuration

- Configure the firewall according to the requirements of your system.

For further information on how to configure a firewall, refer to the PLCnext Technology - Info Center.

Note the following default communication ports in your settings:

Ports	Protocol	Communication purpose	Reconfiguration possible?
1740-1743 (input)	UDP	Programming and client interface of the CODESYS Control runtime system	No
11740 (input)	TCP	Programming and client interface of the CODESYS Control runtime system	Yes
1217 (input)	TCP	Communication between the CODESYS Gateway Client and the CODESYS Gateway. Most CODESYS clients (for example the CODESYS Development System) talk via the Gateway to the runtime systems.	Yes
4841 (input)	TCP	CODESYS OPC UA® server	Yes

For further information, also refer to the CODESYS Security content.

CODESYS packages via CODESYS installer

The following packages must be installed via the CODESYS installer:

- For **AXC F 2152**: The CODESYS Control for Linux ARM SL package must be installed.
- For **AXC F 3152**: The CODESYS Control for Linux SL package must be installed.

CODESYS package via PLCnext Store

The following package must be installed via the PLCnext Store:

- CODESYS Engineering Package

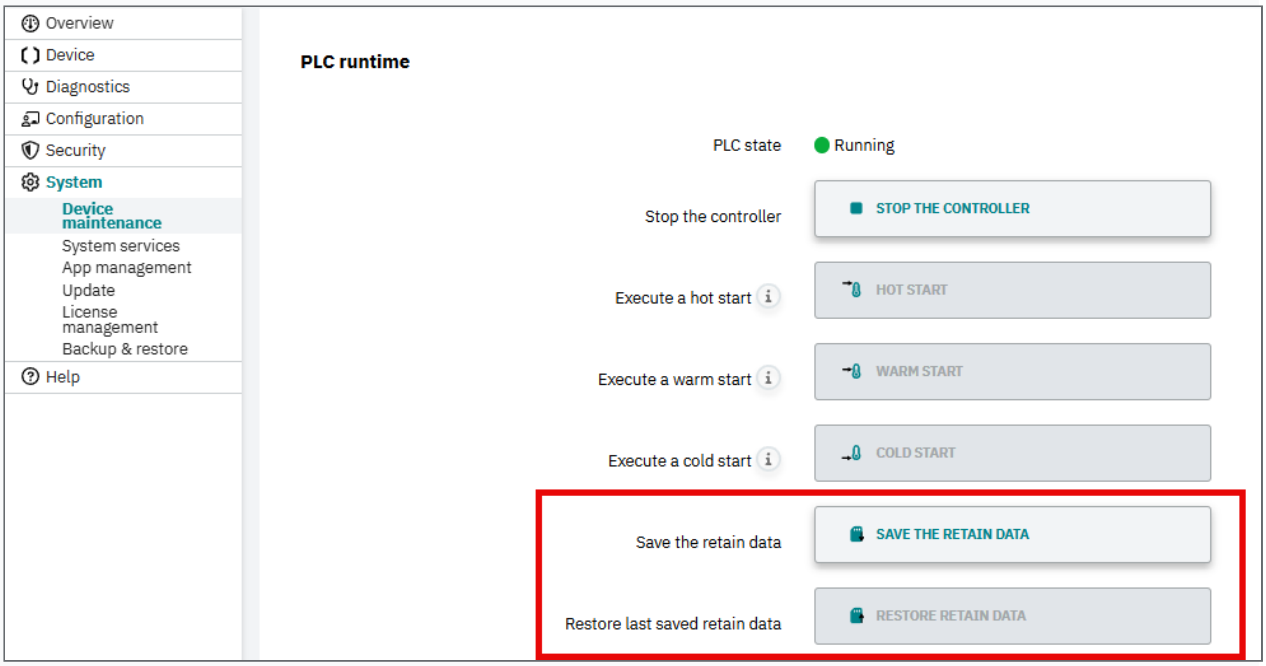
Licenses and demo mode

The CODESYS app requires a CODESYS license for productive operation. You purchase the license via the CODESYS Store and then activate it on the controller in the usual way via CODESYS engineering.

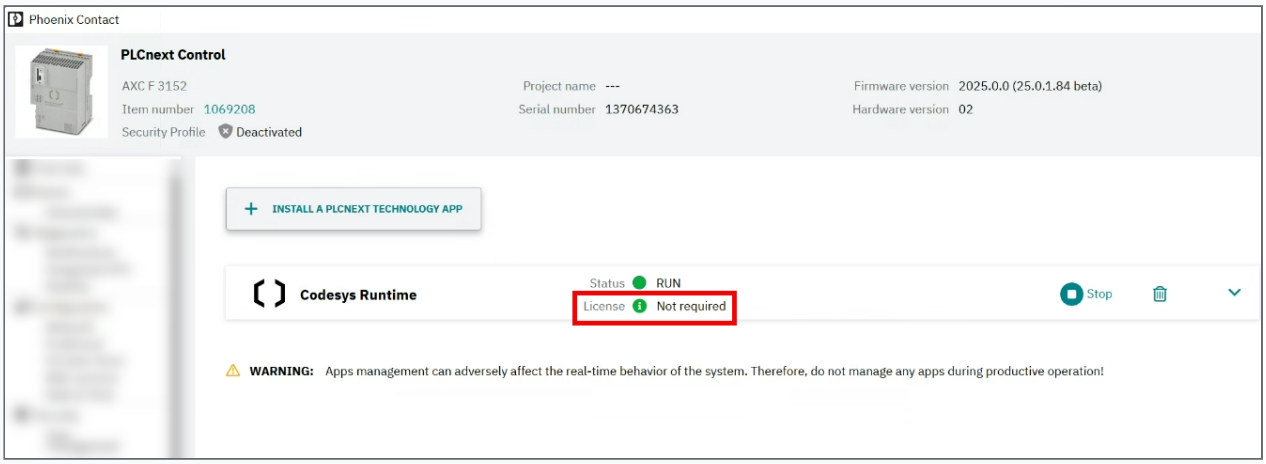
The CODESYS app can be used in demo mode. In demo mode, the software runs for two hours without a license. After that, a manual restart is required.

Known issues

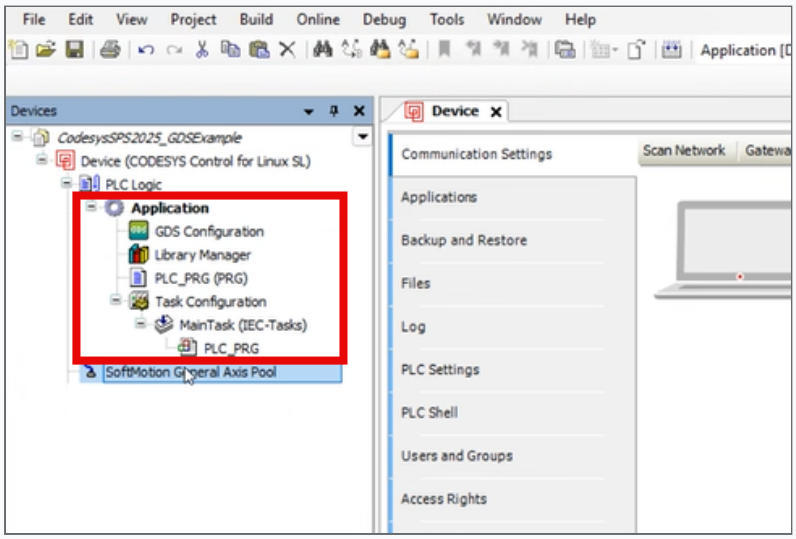
– The retain data cannot yet be saved or restored via the WBM (System → Device maintenance) when using the CODESYS app.



– The license information for the CODESYS app is only available in the CODESYS License Manager. The note below on the App management page (System → App management) in the WBM is incorrect.



– Only one CODESYS application per target is supported.



– For PLCnext Control firmware version 2026.0 LTS, all time and date data types in the Arp namespace for C++ are defined as unsigned.
– In some cases, the Axioline F bus scan may fail to scan modules or may scan unknown modules. If this occurs, the bus configuration can be set up manually.
– The CODESYS "Online Config Mode" currently does not function as described in the CODESYS user manual.
– When changing from a project with Axioline to a project without Axioline, the bus configuration will stay in the file system. As a workaround, perform a reset origin in CODESYS.
– The Axioline bus does not start reliably if the PLC setting "Update I/O while in stop" is enabled.
– Changes in the GDS configuration are not applied with "Download Changes". If this happens, use "Clean all" to clear the download data.
– The Axioline bus status register shows a wrong state in CODESYS when the PLC is stopped.

Installing the app

Installing the CODESYS app involves installing the actual app on the one hand and installing the package on the other.

Before you install the CODESYS app, you must make sure that the controller uses the correct system time.

Setting date and time

Make sure that the controller uses the correct system time. If the controller does not use the correct system time, you must adjust it manually via the shell.

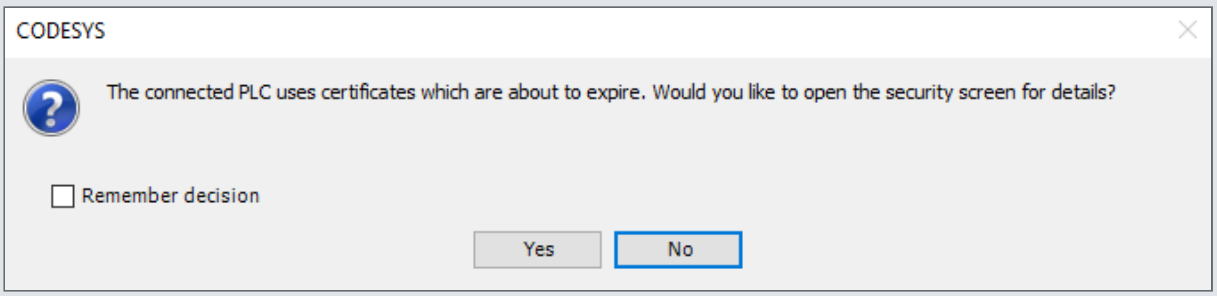
Requesting the system time

- Open the shell with administrator rights:
  - User name: admin
  - Password: The default password is printed on the controller's housing.
    Security note: Use the default `admin` user password only for initial access and change it as soon as possible!
- Request the system time via the `date` command.

Setting the system time

- Enter shell command `sudo date -s "YYYY-MM-DD hh:mm:ss"` , with
  - `YYYY` : year
  - `MM` : month
  - `TT` : day
  - `hh` : hours
  - `mm` : minutes
  - `ss` : seconds

Note: If you have not adjusted the system time of the controller, you may receive an error message about invalid certificates.



In this case, adjust the system time of the controller and renew the certificates on the `Security Screen` tab.

Installing the CODESYS **app**

- Go to the PLCnext Store and search for the CODESYS Control for PLCnext SL.

There are two possibilities to install the app:

- Download the CODESYS app in the PLCnext Store via the DOWNLOAD button and install it via the Web-based Management (WBM).

Or:

- Add the device to your PLCnext Store account and install the CODESYS app via the INSTALL button on the app's detail page.

For further information on how to install apps, refer to the PLCnext Store - Info Center .

Installing the package

- Download the CODESYS Control for PLCnext SL package in the PLCnext Store.
- Start the installation via doubleclick or via the CODESYS installer.

Security

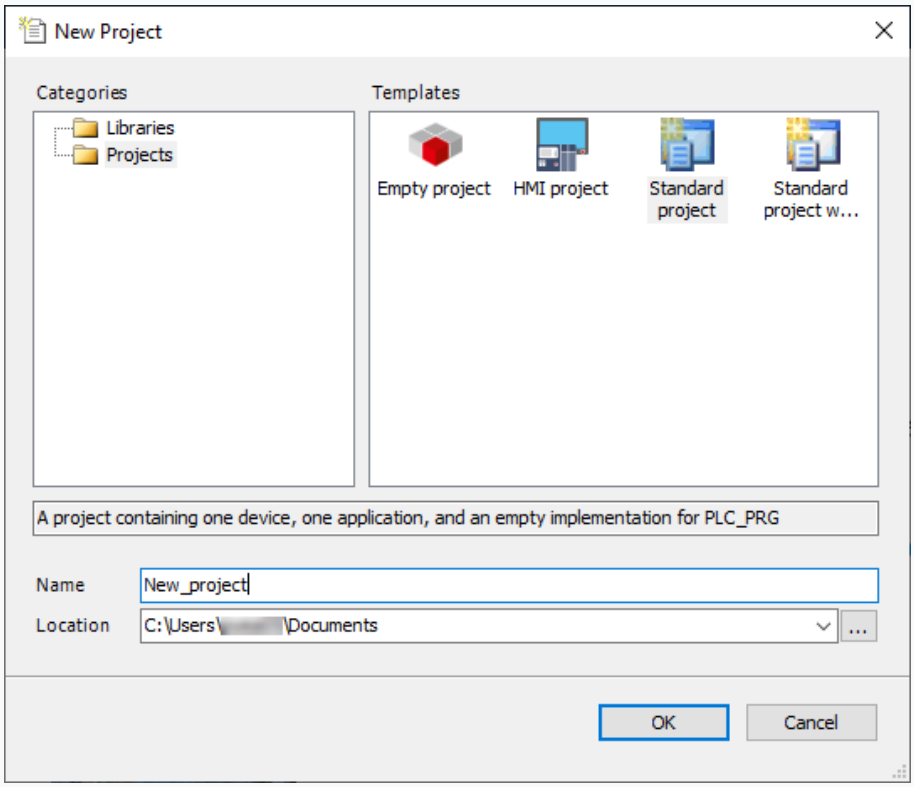
Note the following information for the secure use of the CODESYS app:

- To be able to use the CODESYS app in a secure environment, you must first activate the App Manager. You can find information on this under Activating the App Manager in the PLCnext Technology - Security Info Center.
- Detailed information on security in automation can be found in the Security Guideline in the PLCnext Technology - Security Info Center.
- For further information on security, also refer to the CODESYS Security content.

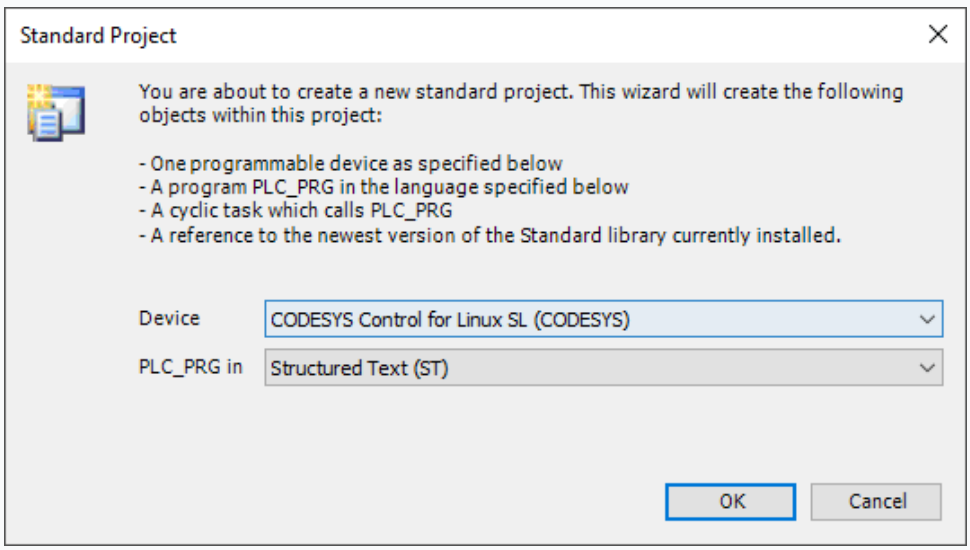
First steps

Creating a project

- Create a new project via the start page or via the File → Standard project menu.
  ↪ The New Project window opens.



- Enter a name and select the location where you want the project to be saved.
- Click the OK button.
  ↪ The Standard Project window opens.



- Select the device CODESYS Control for Linux SL (CODESYS) and your preferred program language.
- Click the OK button.
  ↪ The project is created.

Setting the bus cycle task

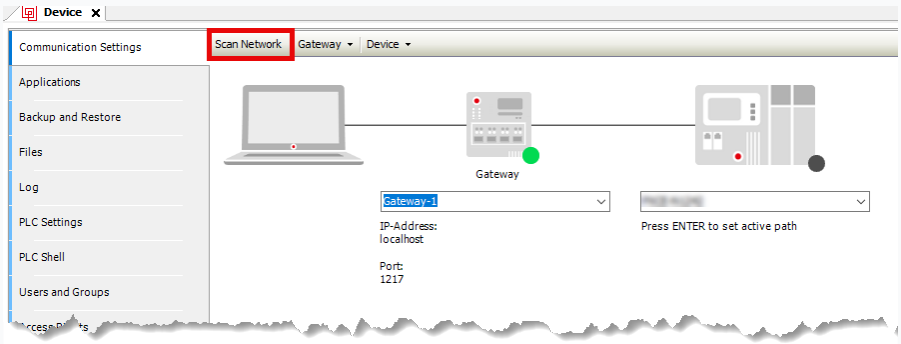
- In the Devices area, double-click on the device.
  ↪ The Device tab opens.
- On the Device tab, open the PLC Settings tab.
- In the Bus Cycle Options area, open the drop-down menu and select MainTask.

Connecting

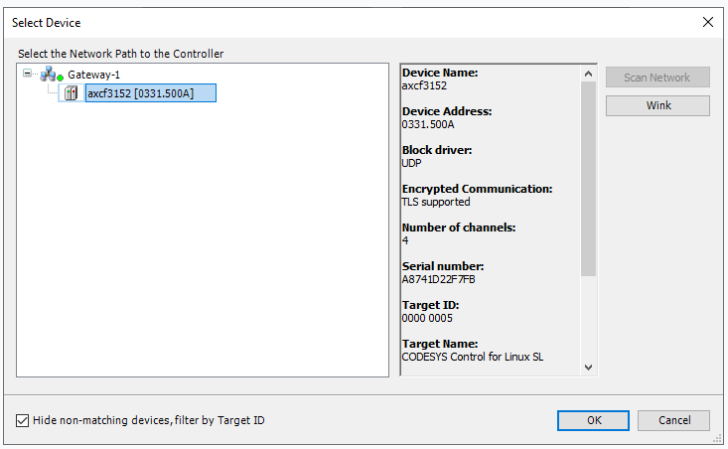
To run the project on your controller, you must first establish a connection to your controller.

Proceed as follows:

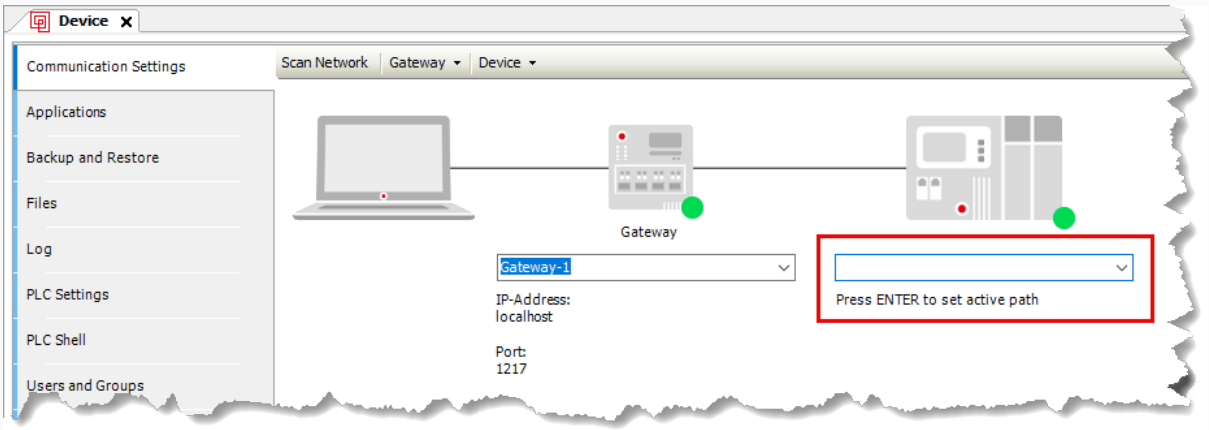
- In the Devices area, double-click on the device.
  ↪ The Device tab opens.
- On the Communication Settings tab, click the Scan Network button.



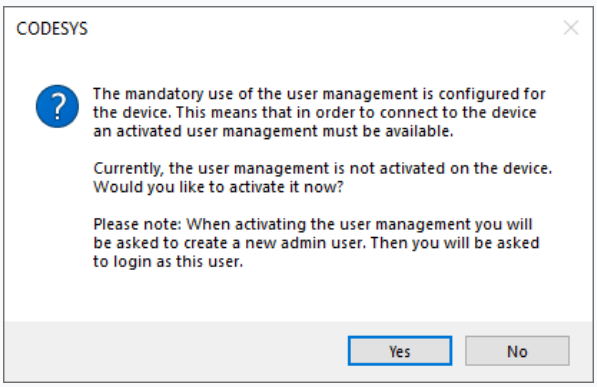
↪ The Select Device window opens.



Note: If the network scan does not work, you can enter the IP address of your controller manually:

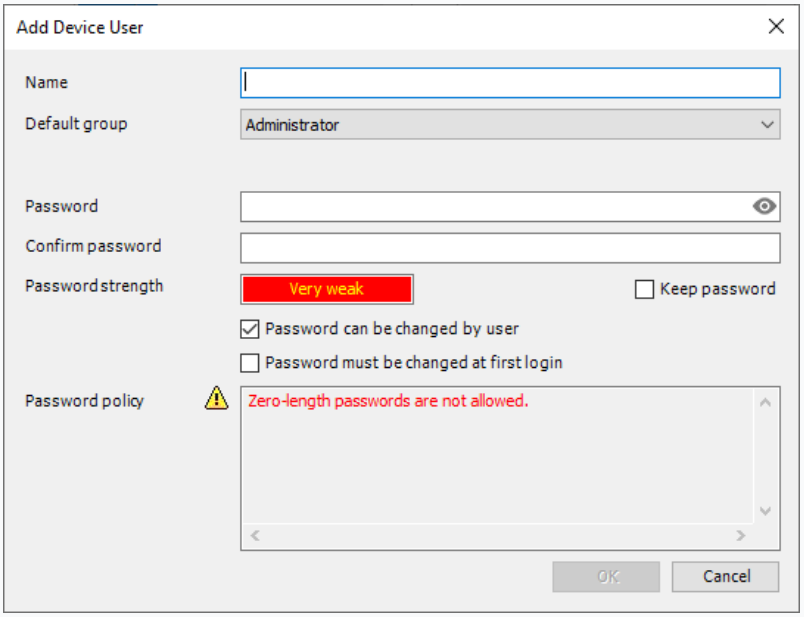


- Select your device and click the OK button.
  ↪ A window with information on CODESYS user management opens.

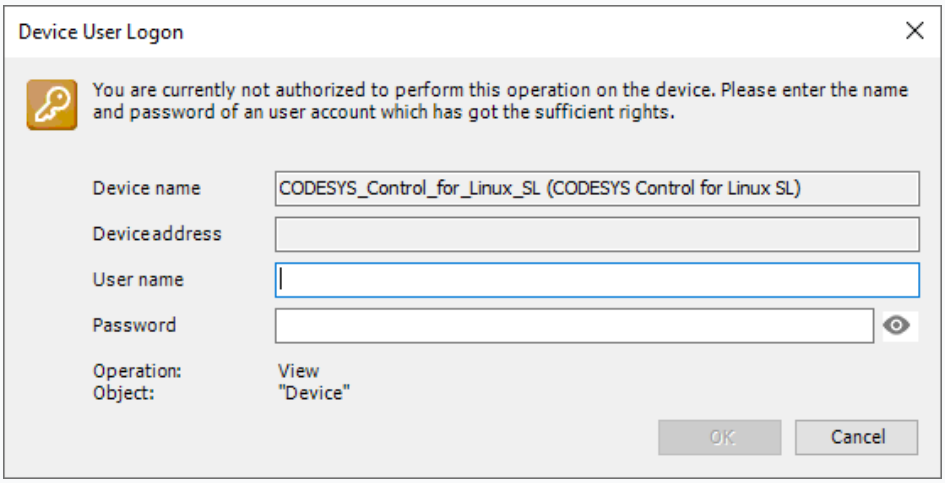


Note: The CODESYS user management is independent of the PLCnext Technology user management and requires its own login credentials. To reset your CODESYS user management credentials, delete the CODESYS app via the WBM and reinstall it. Then log in again with new credentials.

- Read the information and click the Yes button.
  ↪ The Add Device User window opens.



- Enter new CODESYS user management credentials and click the OK button.
  ↪ The Device User Logon window opens.



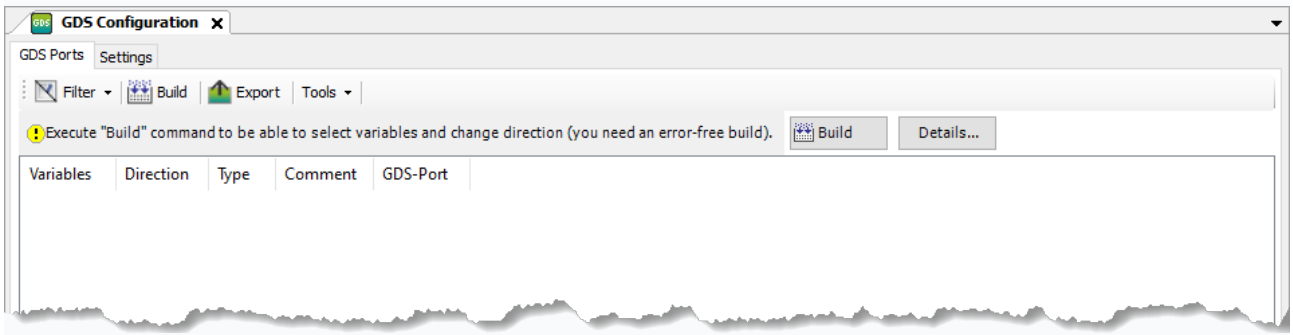
- Log in with your CODESYS user management credentials.
  ↪ The CODESYS app is connected to your controller. Now you can download your project.

GDS configuration

The GDS configuration is used for data exchange between the CODESYS Runtime and the PLCnext Technology Global Data Space (GDS). It can be used, for example, to exchange data with a PLCnext Engineer application or any other application that accesses the GDS.

On the GDS Configuration tab, you configure the variables and make the variables known to the GDS.

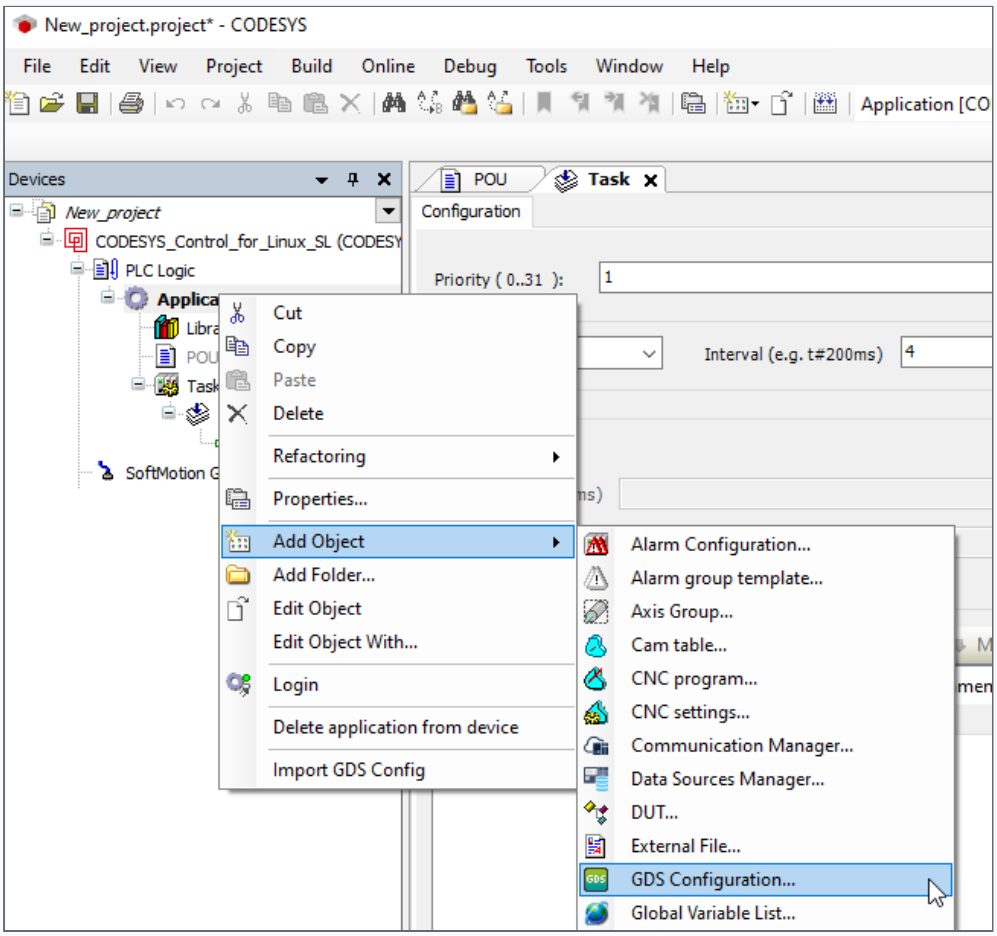
The GDS Configuration tab contains 2 further tabs: the GDS Ports tab and the Settings tab.



Adding the GDS configuration

To add a GDS configuration, proceed as follows:

- In the Devices area, right-click on Application, select Add Object and then select GDS Configuration... .



  ↪ The Add GDS Configuration window opens.

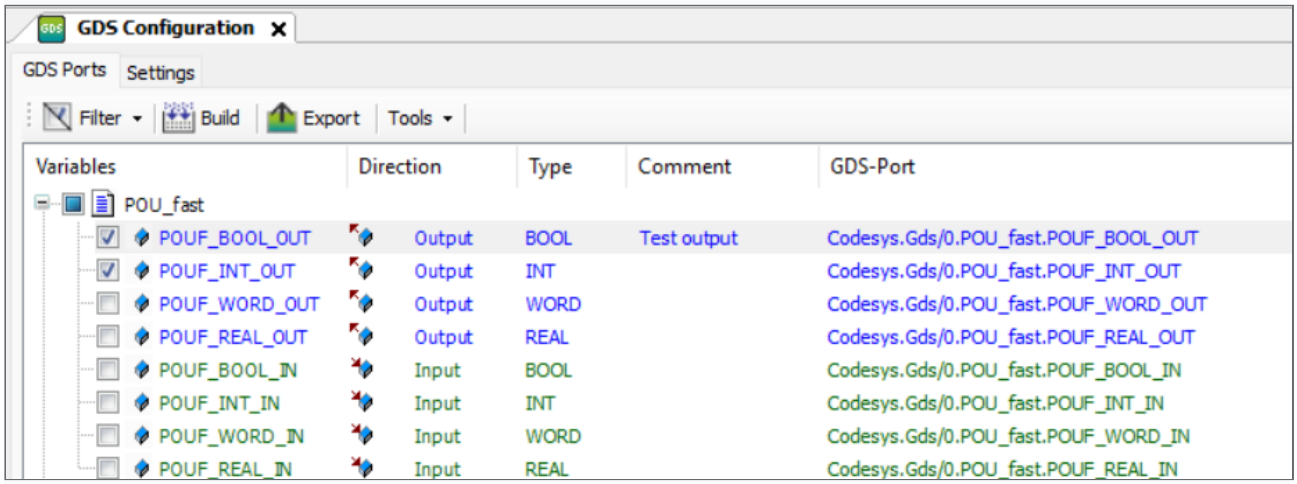
- Click the Add button.

GDS Ports tab

Configuring variables

On the GDS Ports tab, you configure the variables.

Note: To be able to select variables and change direction, you must first execute the Build command.

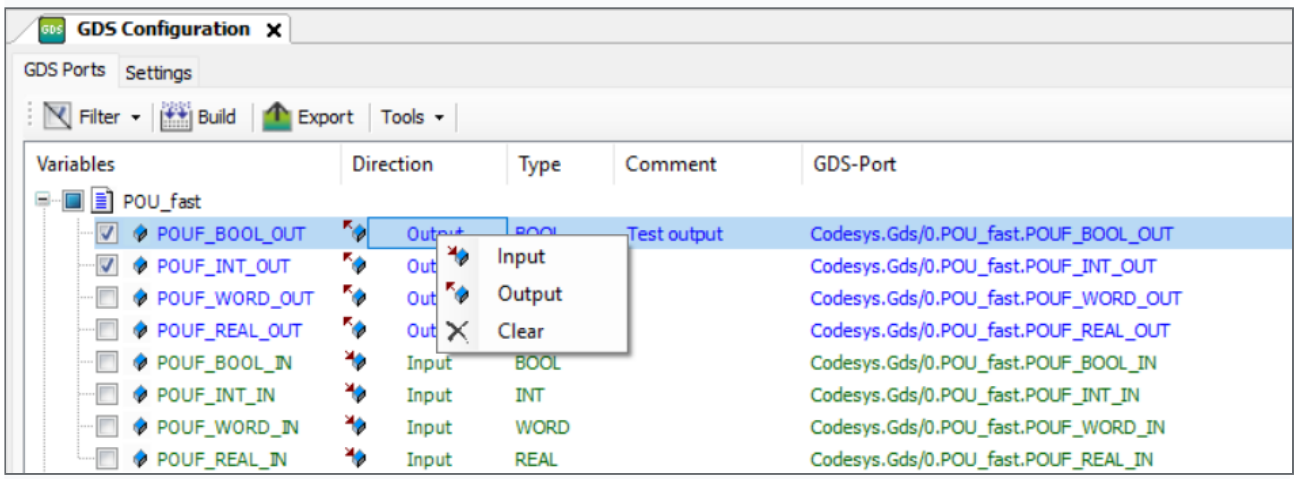


You can activate and deactivate variables using the check box. Multiple selection is possible. Only the configured variables are connected to the GDS. If the checkbox of a variable is not activated, it is not considered configured and is not connected to the GDS.

If you double-click in the Direction column, you change the direction of the respective variable.

Inputs can be read in the application, outputs can be written.

If you right-click in the Direction column, you can also change the direction or clear the entry.



There are also variables that cannot be configured because they have a default direction.

The following table defines the data type mapping between CODESYS, the Arp namespace in C++ and PLCnext Engineer. Note the data types listed in the table when configuring your variables.
For more information on datatypes and connectors, see Supported port connectors in the PLCnext Technology - Info Center.

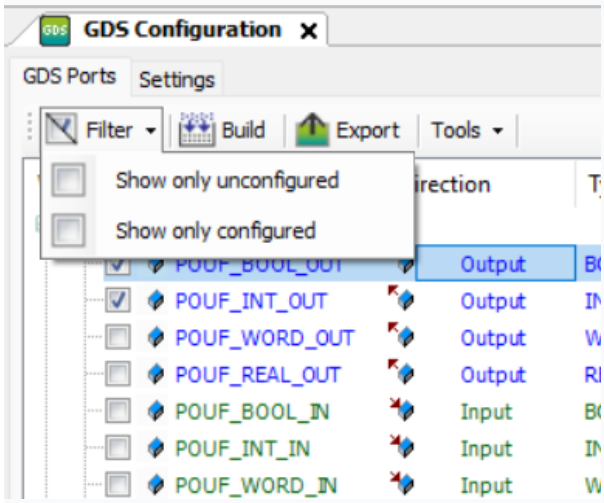
Bits	CODESYS **IEC 61131-3**	**Arp namespace** C++	**PLCnext Engineer IEC 61131-3**
1	BOOL	boolean	BOOL
8	BYTE	uint8	BYTE
8	SINT	int8	SINT
8	USINT	uint8	USINT
16	INT	int16	INT
16	UINT	uint16	UINT
16	WORD	uint16	WORD
32	DINT	int32	DINT
32	DWORD	uint32	UDINT
32	DWORD	uint32	DWORD
32	REAL	float32	REAL
32	TIME [1]	int32	TIME
32	DATE [1]	int32	-
32	DATE_AND_TIME [1]	int32	-
32	DT [1]	int32	-
32	TIME_OF_DAY [1]	int32	-
32	TOD [1]	int32	-
64	LINT	int64	LINT
64	ULINT	uint64	ULINT
64	LWORD	uint64	LWORD
64	LREAL	float64	LREAL
64	LTIME [1]	int64	LTIME
64	LDATE [1]	int64	LDATE
64	LDATE_AND_TIME [1]	int64	LDATE_AND_TIME
64	LDT [1]	int64	-
64	LTIME_OF_DAY [1]	int64	LTIME_OF_DAY
64	LTOD [1]	int64	-
81*8	STRING	unit8[81]	ARRAY [1..81] OF BYTE
(n+1)*8	STRING(n)	unit8[n+1]	ARRAY [1..n+1] OF BYTE
81*16	WSTRING	unit8[162]	ARRAY [1..162] OF BYTE
(n+1)*16	WSTRING(n)	unit8[2*(n+1)]	ARRAY [1..2*(n+1)] OF BYTE
n*8	ARRAY	uint8[n]	ARRAY [1..n] OF BYTE
n*8	STRUCT	uint8[n]	ARRAY [1..n] OF BYTE
platform spec.: 32/64	__XINT	64bit: int64 / 32bit: int32	64bit: LINT / 32bit: DINT
platform spec.: 32/64	__UXINT	64bit: uint64 / 32bit: uint32	64bit: ULINT / 32bit: UDINT
platform spec.: 32/64	__XWORD	64bit: uint64 / 32bit: uint32	64bit: LWORD / 32bit: DWORD

[1] *CODESYS uses internally unsigned data types, the loss of data is possible.*

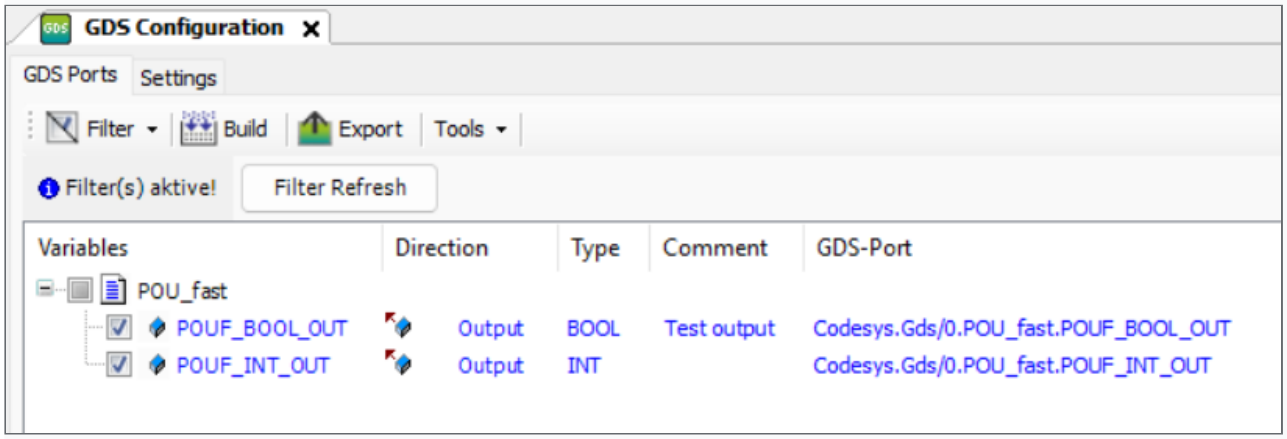
Tool bar

Filter function

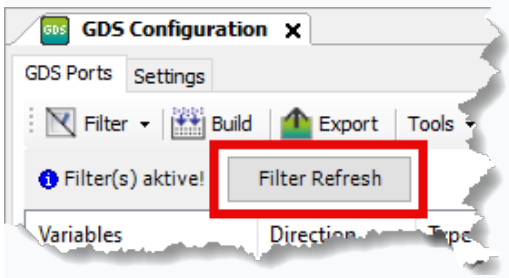
You can use the filter function to display only configured or only unconfigured variables.



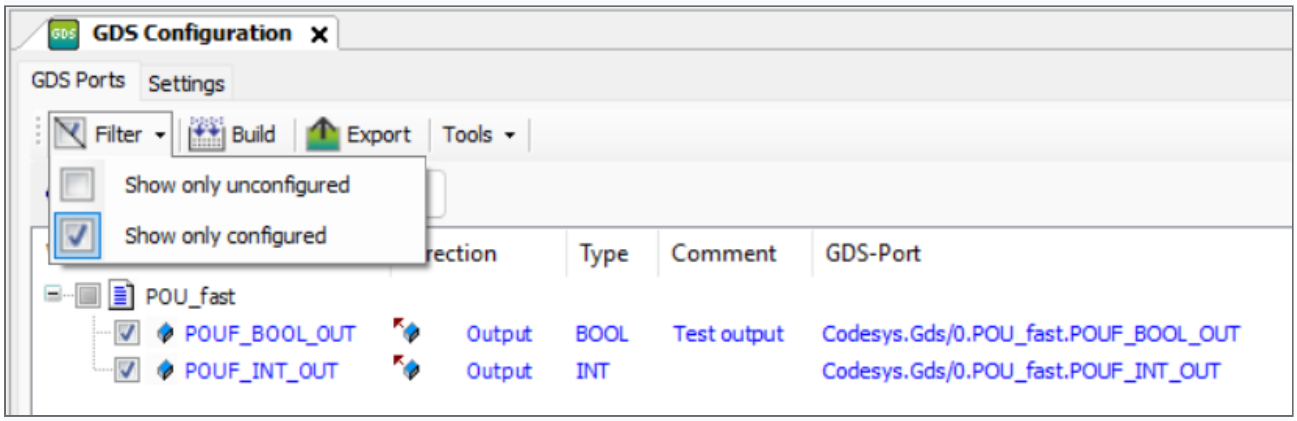
In this example, only configured variables are shown:



The table is updated via `Filter Refresh` if you make a change in the filtered table.

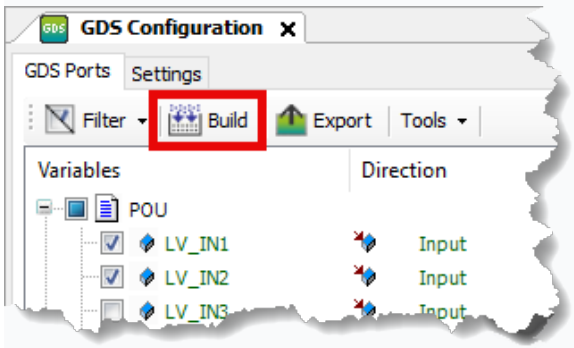


To reset the filter function, you must deactivate the respective checkbox again.



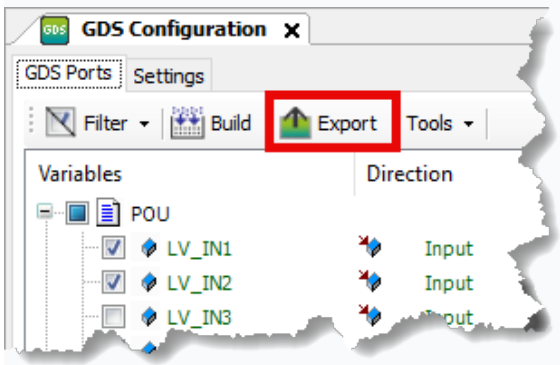
Build

The entire project is build and updated via the `Build` button.



Export

If you export the project, a PLCnext Engineer Library (*.pcwlx file) is created and can be used in PLCnext Engineer. You can find out how to add libraries to your project in the online help.



Settings tab

On the Settings tab, you select a folder to which the *.pcwlx file is exported.



Axioline configuration

The PLCnext Technology local bus Axioline is supported by CODESYS.

Limitations

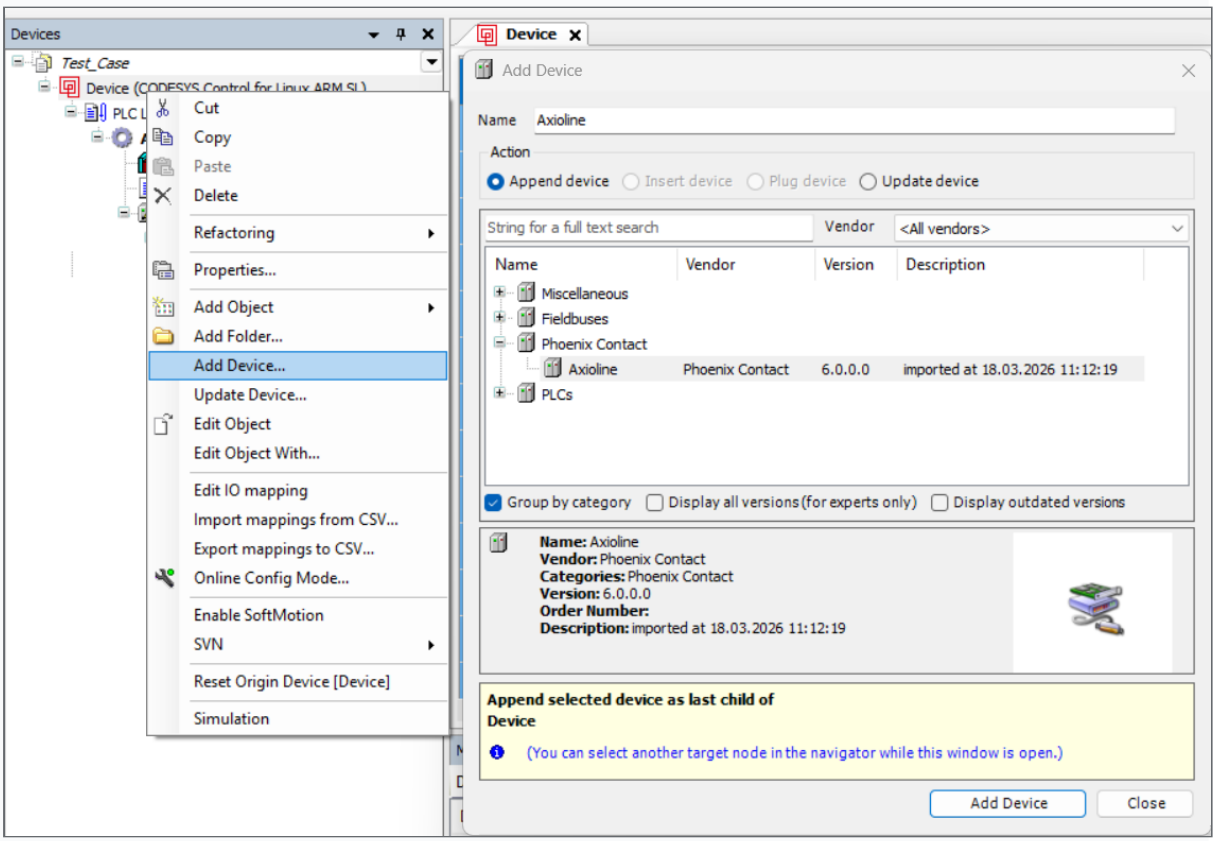
Not every Axioline module is supported by CODESYS. Please refer to the dedicated list of supported modules on the app's detail page in the PLCnext Store.

The Axioline bus can only be configured by either the PLCnext Engineer or CODESYS. If an Axioline bus is configured in CODESYS, the export of a PLCnext Engineer library with the CODESYS boot project is disabled. For more information, refer to the use cases topic.

Adding an Axioline device

To add an Axioline device, proceed as follows:

- In the Devices area, right-click on your root device and select Add Device... .
- Open the Axioline folder and select the PLCnext Axioline device.
- Click the Add Device button and close the window.



↪ Now you have a PLCnext Axioline device in your Devices area.

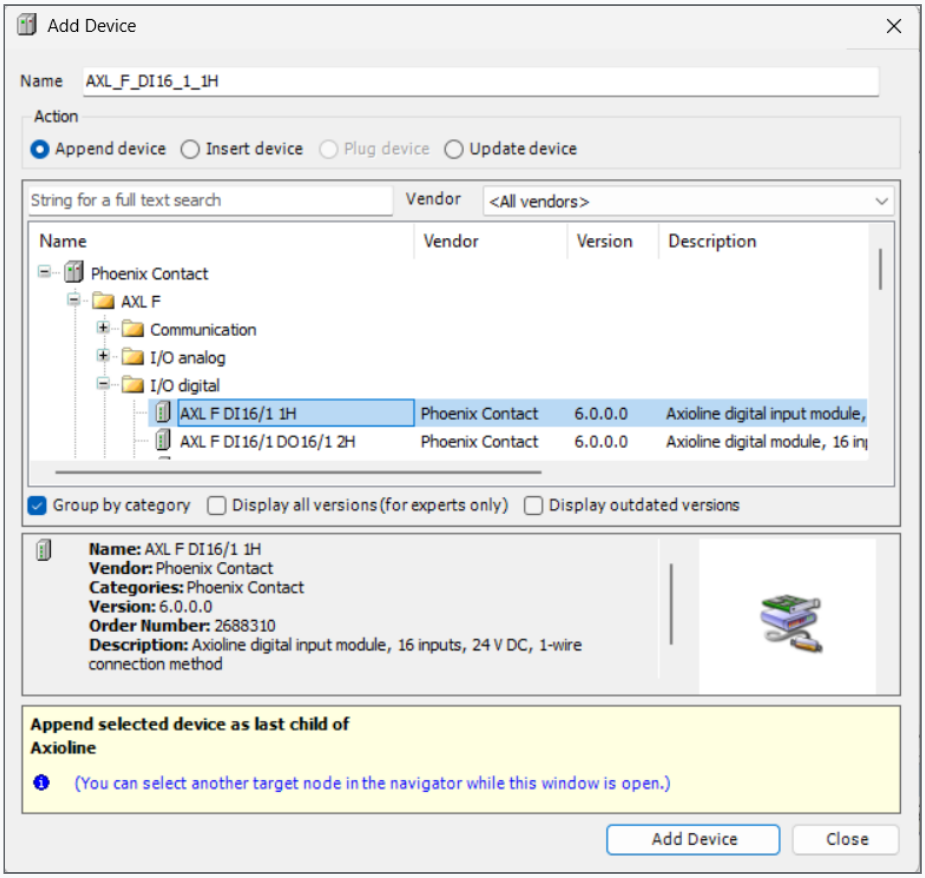
Adding modules

Modules can be added either manually or by scanning the Axioline bus.

Adding modules manually

To add a module manually, proceed as follows:

- In the `Devices` area, right-click on the `PLCnext Axioline` device and select `Add Device...`.
- Search for the first module in your bus configuration and click `Add Device`.



- Continue searching for and adding modules until the entire bus configuration matches the physical Axioline bus.

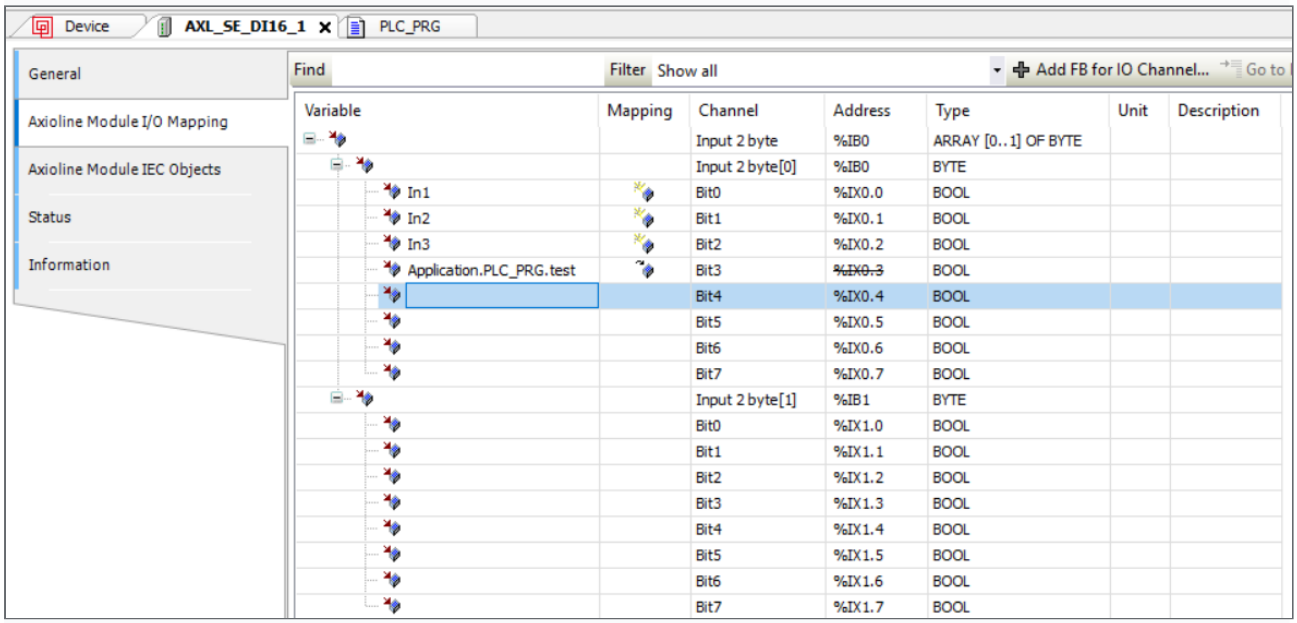
Adding modules by scan

To add a module by scanning the Axioline bus, proceed as follows:

- Connect to your device.
- Download the project without a bus configuration and start/run the application.
- In the `Devices` area, right-click on the `PLCnext Axioline` device and select `Scan for Devices...`.
- After a successfull scan, all connected modules are shown. You can also compare the scanned configuration with the project configuration.
- To add the scanned bus configuration to your project, click on `Copy All Devices to Project`.

Connecting variables to the bus

- In the `Devices` area, double-click on the module.
- Open the `Axioline Module I/O Mapping` tab.
- In the first column, either select an existing variable and use the ellipsis (`...`) or enter a name for a new variable.


Device
AXL_SE_DI16_1
PLC_PRG
General
Axioline Module I/O Mapping
Axioline Module IEC Objects
Status
Information
Find
Filter
Show all
Add FB for IO Channel...
Go to
Variable
Mapping
Channel
Address
Type
Unit
Description
Input 2 byte
%IB0
ARRAY [0..1] OF BYTE
Input 2 byte[0]
%IB0
BYTE
In1
Bit0
%IX0.0
BOOL
In2
Bit1
%IX0.1
BOOL
In3
Bit2
%IX0.2
BOOL
Application.PLC_PRG.test
Bit3
%IX0.3
BOOL
Bit4
%IX0.4
BOOL
Bit5
%IX0.5
BOOL
Bit6
%IX0.6
BOOL
Bit7
%IX0.7
BOOL
Input 2 byte[1]
%IB1
BYTE
Bit0
%IX1.0
BOOL
Bit1
%IX1.1
BOOL
Bit2
%IX1.2
BOOL
Bit3
%IX1.3
BOOL
Bit4
%IX1.4
BOOL
Bit5
%IX1.5
BOOL
Bit6
%IX1.6
BOOL
Bit7
%IX1.7
BOOL

Use cases

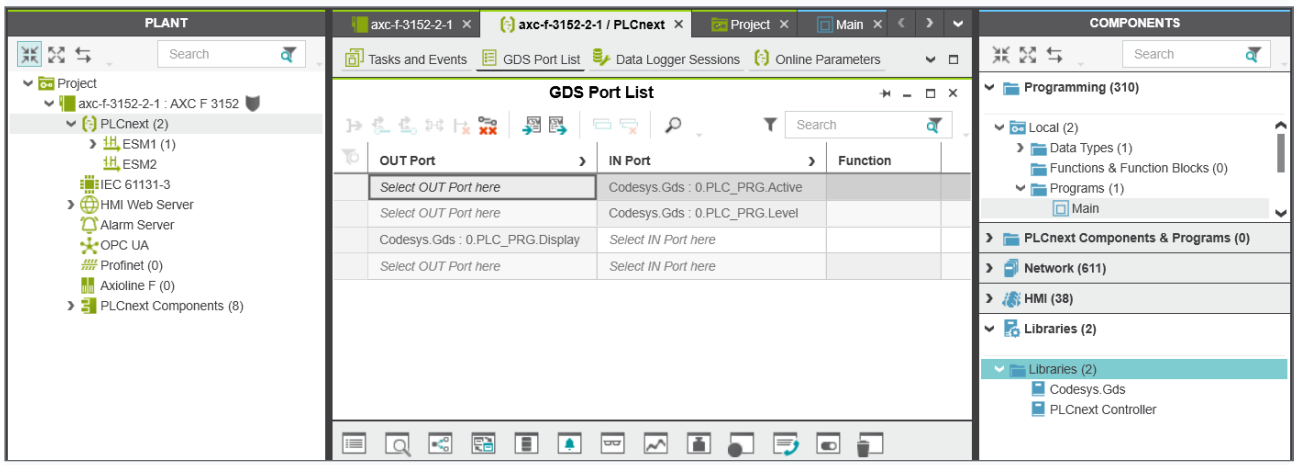
We have to differ between two use cases: CODESYS standalone and CODESYS project via PLCnext Engineer library.

CODESYS **standalone**

The first use case is to use CODESYS standalone with all its features and use the GDS for any data exchange, but without a PLCnext Engineer project.
All CODESYS features and protocols are available and data can be exchanged via GDS with PLCnext Technology realtime and non-realtime applications like apps or C++ components.

CODESYS project via **PLCnext Engineer user library**

The second use case is to export your CODESYS project as PLCnext Engineer user library and import it into a PLCnext Engineer project as *Codesys.Gds* library and being able to exchange data via the GDS ports configured in your CODESYS project.



The PLCnext Engineer user library includes the CODESYS boot project and port definitions. If once downloaded via the PLCnext Engineer, this boot project is used.
If you want to update the CODESYS project, export the library again, update the library in the PLCnext Engineer (is done automatically, if the imported file is changed) and download the project via PLCnext Engineer.
Projects downloaded directly via CODESYS will be ignored. CODESYS can still be used for debugging.

In case you want to return to CODESYS standalone: For productive use it is recommended to perform a reset type 1 and reinstall the CODESYS app. Alternatively, you can download an empty PLCnext Engineer project to switch back to CODESYS standalone.

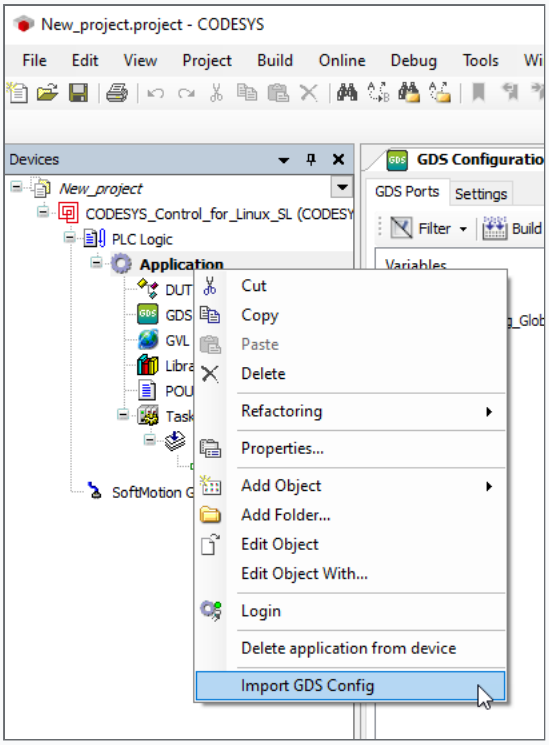
Third party fieldbus

An optional third party fieldbus can be integrated into the PLCnext Technology system via a separate app.

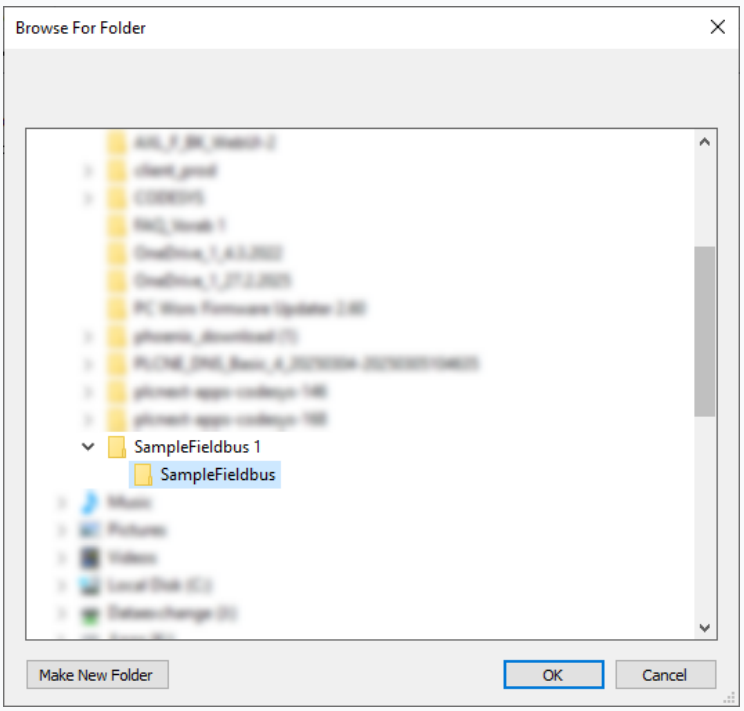
Importing variables

To import variables from a third party fieldbus, you need the respective *.tic file and a links.xml file. To import the necessary files, proceed as follows:

- In the Devices area, right-click on Application and select Import GDS Config .

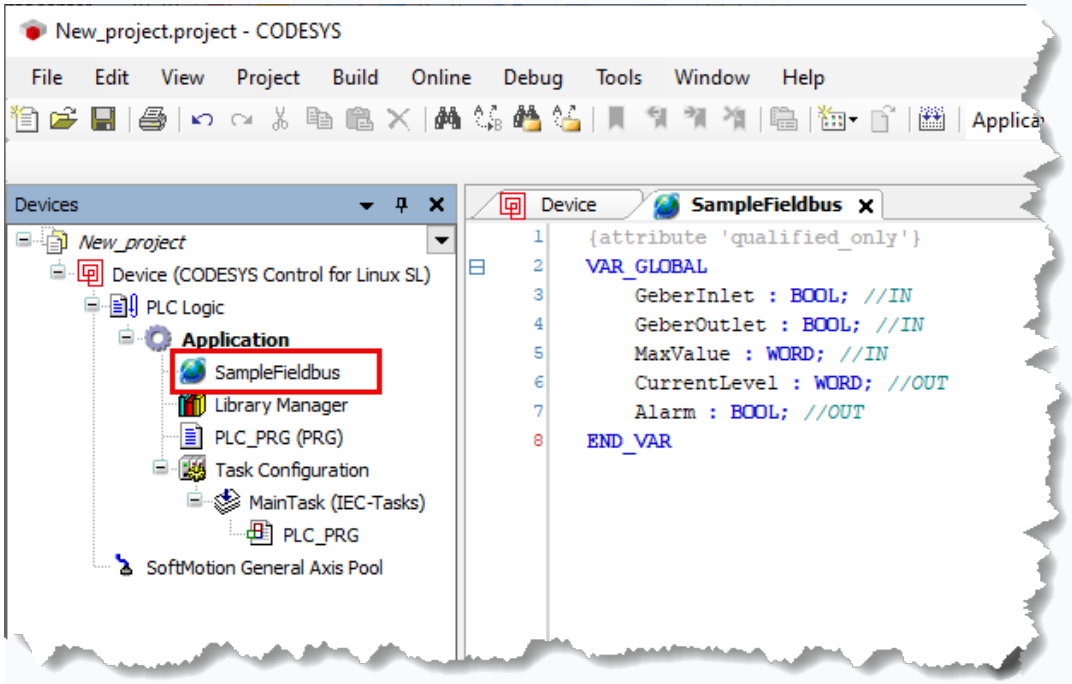


↪ The Browse For Folder window opens.



- Select the folder in which the *.tic file and the links.xml file are located and click the OK button.

During the import, a GVL sheet with the name of the respective fieldbus is added to the Devices area.



Bool handling

All bool variables that come from a fieldbus are typically stored in an enclosing variable such as a BYTE (can also be a WORD, DWORD or LWORD). Either the BYTE or each separate bool can be used to read from the variable. Only the bool variables can be written. Data that is written to the BYTE will be overwritten. Missing digits in the BYTE are false by default.

CODESYS Control for PLCnext SL

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