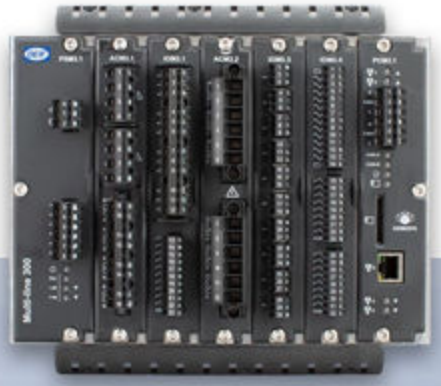
AMC 300

4189341271F

Programmable Automation Controller

CODESYS guidelines

DEIF Improve Tomorrow



1. About this manual

1.1 Software versions

The information in this document corresponds to the following software versions.

Table 1.1 Software versions

Software	Details	Version
BSP	Board Support Package	4.0.0.x
CODESYS	CODESYS runtime	3.5.15.0 or later
CODESYS IDE	PC software for development of CODESYS applications	3.5.15.0 or later
CODESYS TSP	AMC 300 CODESYS Target Support Package (TSP)	1.0.1.0

1.2 Technical support

CODESYS in general	
The CODESYS store	My question: Ask questions about CODESYS. FAQ: Frequently asked questions. Forum: Discuss different CODESYS topics with other users.
CODESYS Development System online help	Online help is available from the Help menu.

DEIF support options	
Technical documentation	Download all technical product documentation from https://www.deif.com/documentation.
Support	DEIF offers 24-hour support. See www.deif.com for contact details, there may be a DEIF subsidiary located near you. You can also e-mail support@deif.com.
Service	DEIF engineers can help with design, commissioning, operating and optimisation.
Training	DEIF regularly offers training courses at the DEIF offices worldwide.

1.3 System requirements

The requirements for the development PC to install the Development packages, PC tools and drivers are:

- Microsoft Windows 10, 32 bit version
- Microsoft Windows 10, 64 bit version (Recommended)

As the AMC 300 supports SSH (Secure Shell) and SCP (Secure Copy) as basic communication protocols, it can be accessed from any system supporting these protocols (if enabled).

NOTE Not all browsers are suitable for this software. We recommend to use Google Chrome or Mozilla Firefox.

1.4 Warnings and safety

Recommendations for data security

To minimise the risk of data security breaches we recommend to:

- As far as possible, avoid exposing controllers and controller networks to public networks and the Internet.
- Use additional security layers like a VPN for remote access, and install firewall mechanisms.
- Restrict access to authorised persons.

1.5 Legal information

Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.

Trademarks

DEIF is a trademark of DEIF A/S.

CODESYS® is a trademark of CODESYS GmbH.

All trademarks are the properties of their respective owners.

Copyright

2. Installation

2.1 AMC 300 CODESYS development package

2.1.1 About the AMC 300 CODESYS development package

The AMC 300 CODESYS development package consists of two parts:

- CODESYS IDE
- AMC 300 CODESYS TSP.

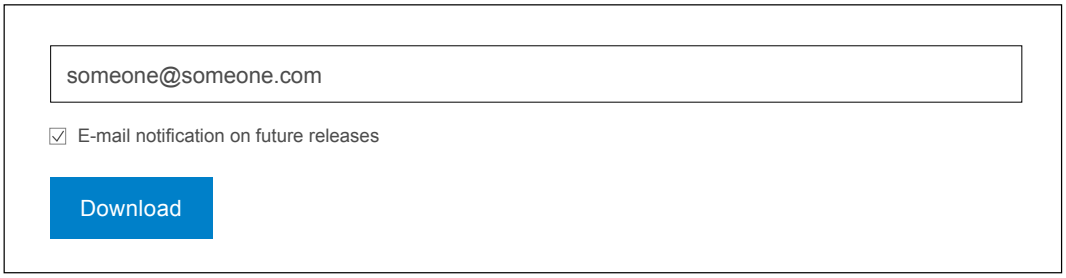
The CODESYS CONTROL (CODESYS PLC run-time) is integrated in the AMC 300 operating system.

2.1.2 Download the AMC 300 CODESYS development package

You can download the CODESYS IDE and AMC 300 CODESYS TSP by submitting your email address via the DEIF website. A link is sent to you to download the CODESYS IDE and AMC 300 CODESYS TSP respectively.

Follow these steps to download the CODESYS IDE:

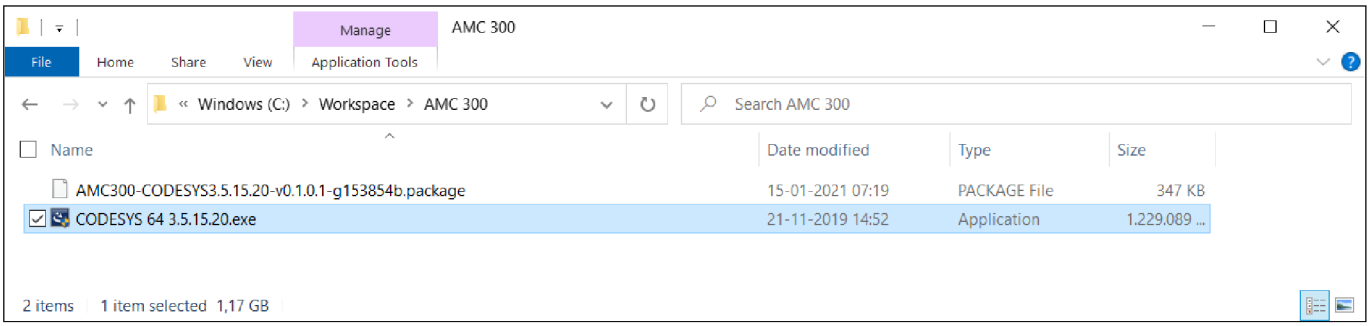
1. Go to the DEIF website www.deif.com.
2. Open the search bar, and type the controller name to open a list of product options.
3. Select the controller from the list.
4. Select the **Software** tab.
5. Open the **CODESYS** list, and select **AMC 300 CODESYS TSP v1.x.x**.
6. Submit your email address to receive a download link to the software.



7. Follow the link in the email to download the DEIF CODESYS software package to your computer.
8. Repeat the steps to download the **CODESYS IDE** installation file.

2.2 Install CODESYS V3

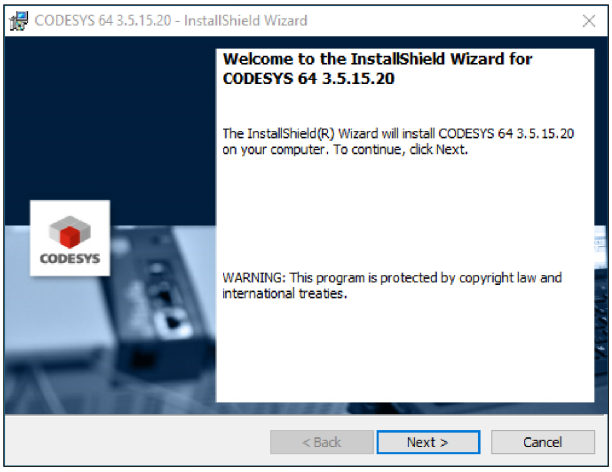
1. Run the installation file (for example, CODESYS 64 3.5.15.20.exe) to install CODESYS V3 to the development computer with default settings.



2. If you are prompted to install necessary Microsoft Visual C++ packages, follow the instructions on the screen.

The CODESYS InstallShield Wizard

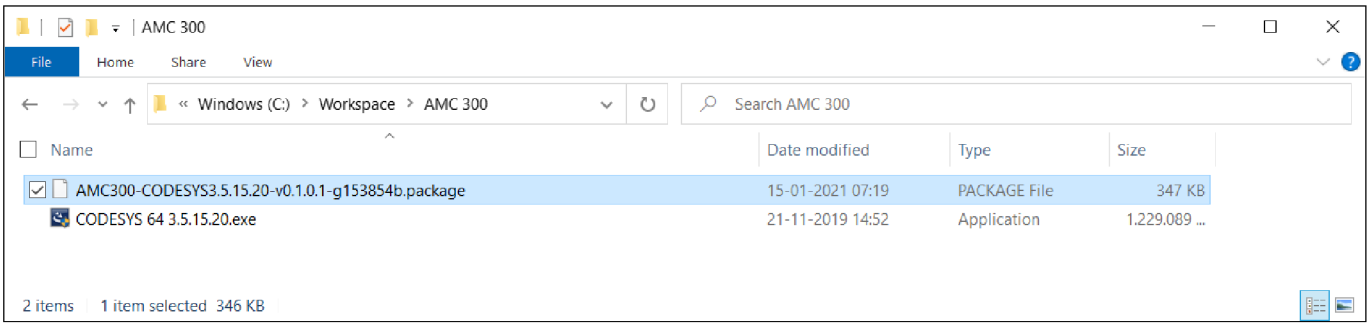
1. When the CODESYS InstallShield Wizard starts, select **Next**.



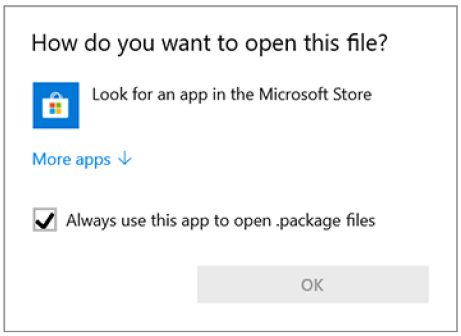
2. **Licence Agreement**: Accept the agreement and select **Next**.
3. **Choose Destination Location**: Choose a folder for the installation, and select **Next**.
4. **Select Features**: Choose the features you want to install, and select **Next**.
5. **Select Program Folder**: Choose a program folder, and select **Next**.
6. **Start Copying Files**: The chosen features and the destination folder are shown. If everything is correct, select **Next**.
7. **Very important information**: Confirm that you have read the information, and select **Next**.
8. **InstallShield Wizard Complete**: Select **Finish** to exit the installation wizard.

2.3 Install the AMC 300 CODESYS TSP

1. Run the installation file (for example, AMC300-CODESYS3.5.15.20.v1.0.0.0-g80afd0a.package) to install the AMC 300 CODESYS TSP (Target Support Package) to the development computer with default settings.



2. The file extension .package is registered with CODESYS on Windows. If CODESYS is not installed or is a wrong version you will see this message.

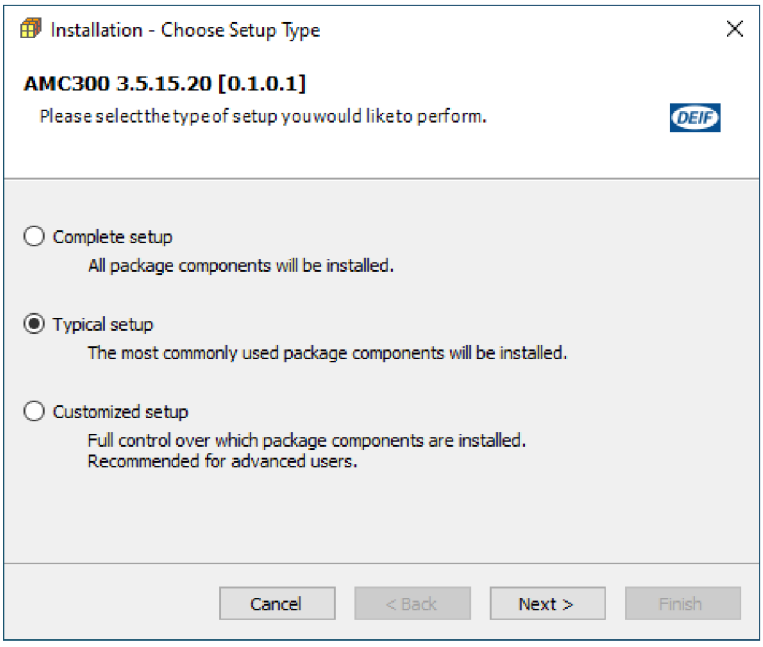


3. Install a correct version of CODESYS (see section **Install CODESYS V3**), then run the installation file again.

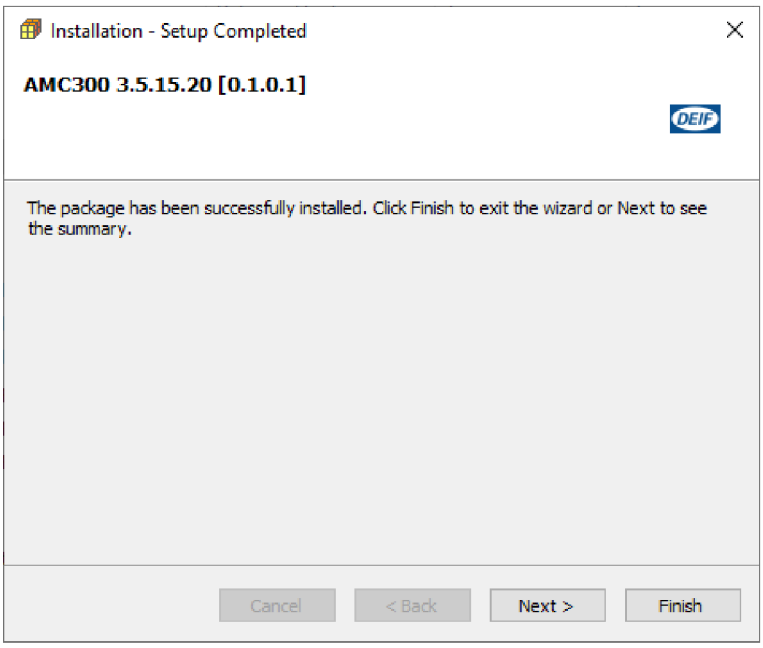
If CODESYS is installed, but you do not want the AMC 300 CODESYS TSP package associated with it, you can open CODESYS and install the package file via **Open > Install package**.

This starts the Package Manager and install the required AMC 300 Device Descriptions (and the EtherCAT Slave Information files).

1. Choose a setup, and select **Next**.



2. When the package is installed, select **Next** to finish the installation.



3. Select **Finish** to exit the installation wizard or **Next** to see a summary.

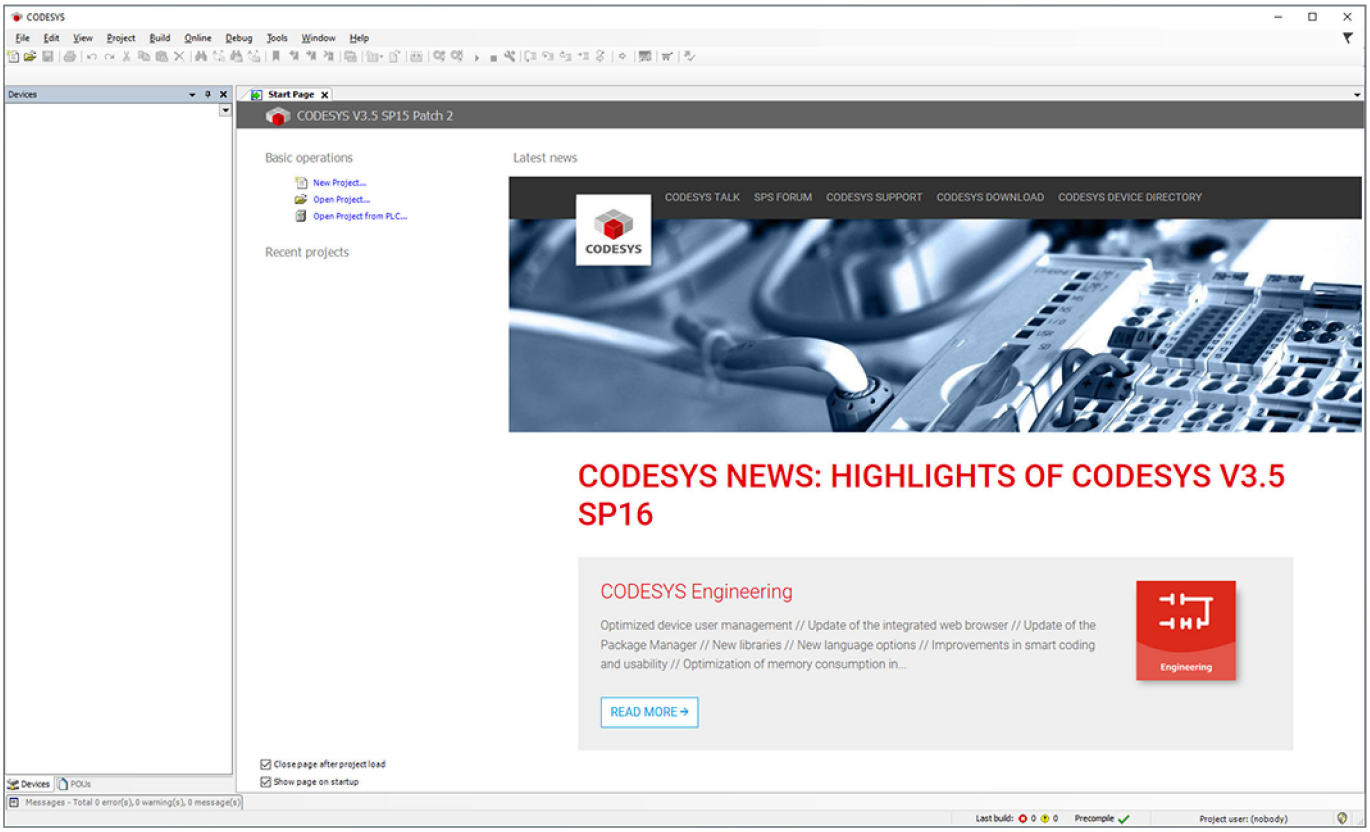
2.4 Open CODESYS for the first time

To open CODESYS you can:

- Double-click the desktop icon

- In the start menu, select **Start > 3S CODESYS > CODESYS V3.5 SP15 (or later version)**

The CODESYS start page:

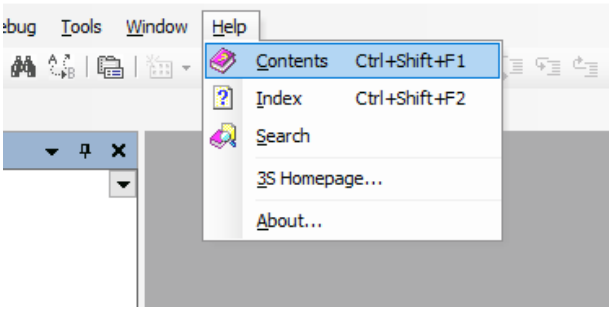


3. CODESYS Online Help

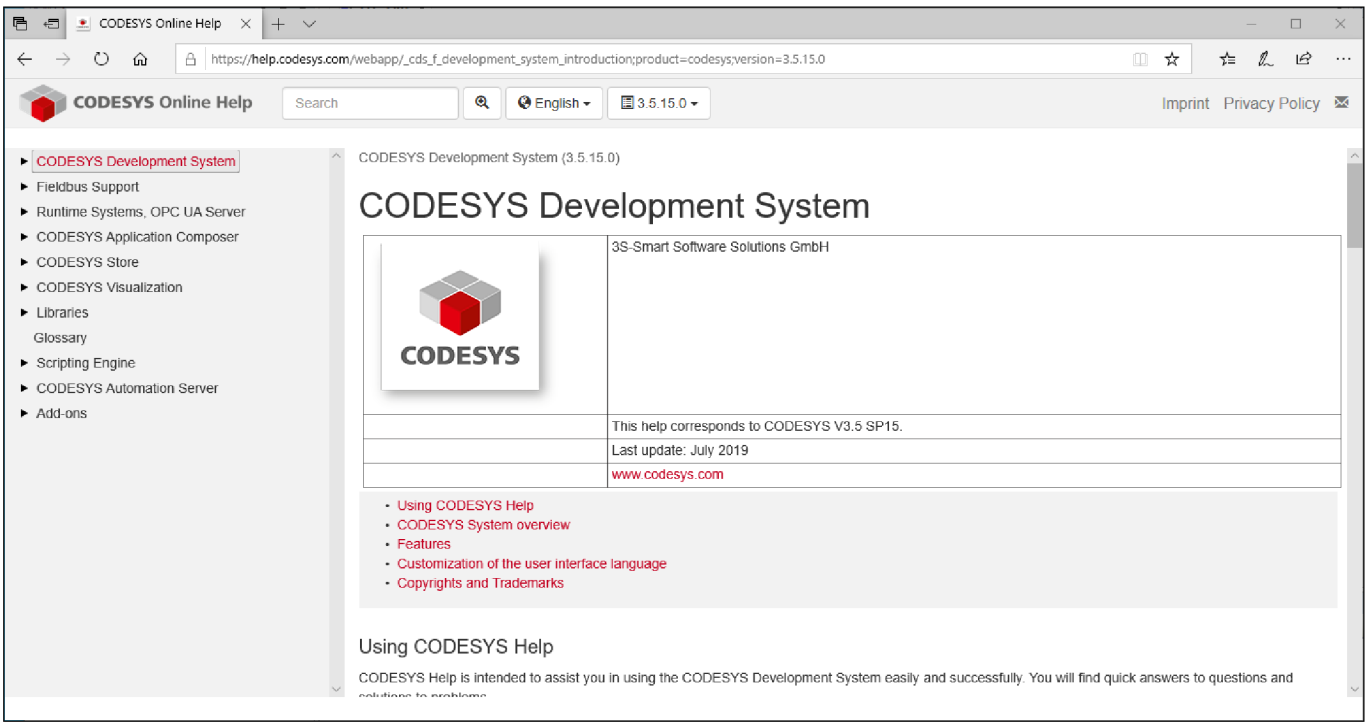
3.1 Start the CODESYS Online Help

Use the CODESYS Online Help to get more detailed information about the CODESYS programming environment.

On the CODESYS start page, select **Help > Contents** in the menu.

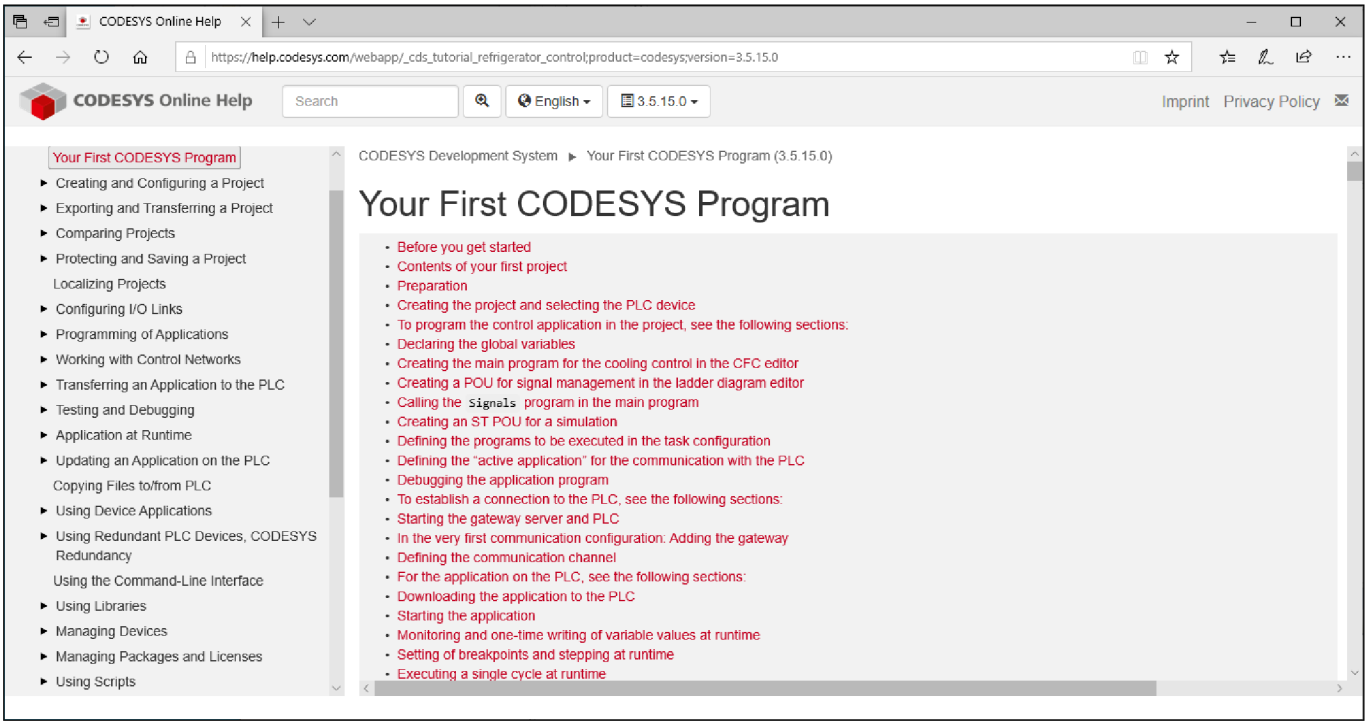


This opens the CODESYS Online Help page.



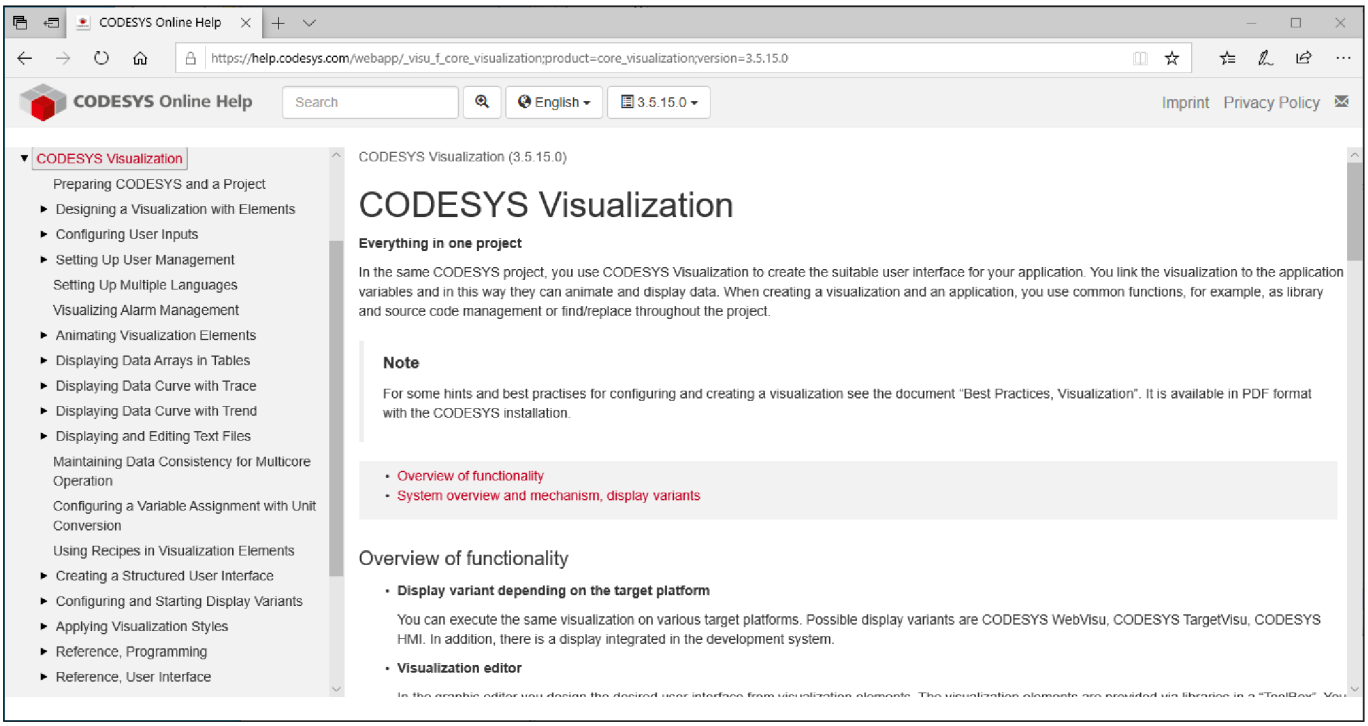
3.2 New to CODESYS

If you are new to CODESYS, we recommend to start with the guide under the menu **Your First CODESYS Program**.



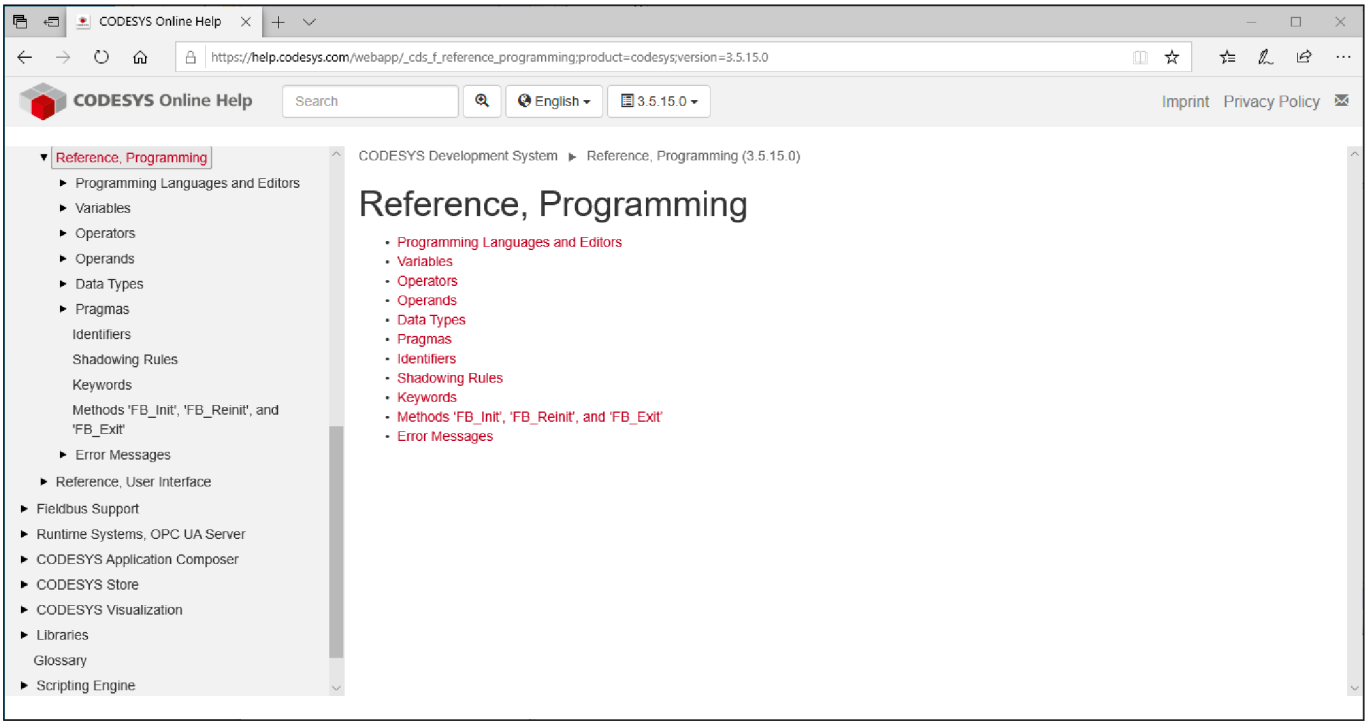
3.3 Visualization

Under the menu **CODESYS Visualization** you can read more about the possibilities with visualization.



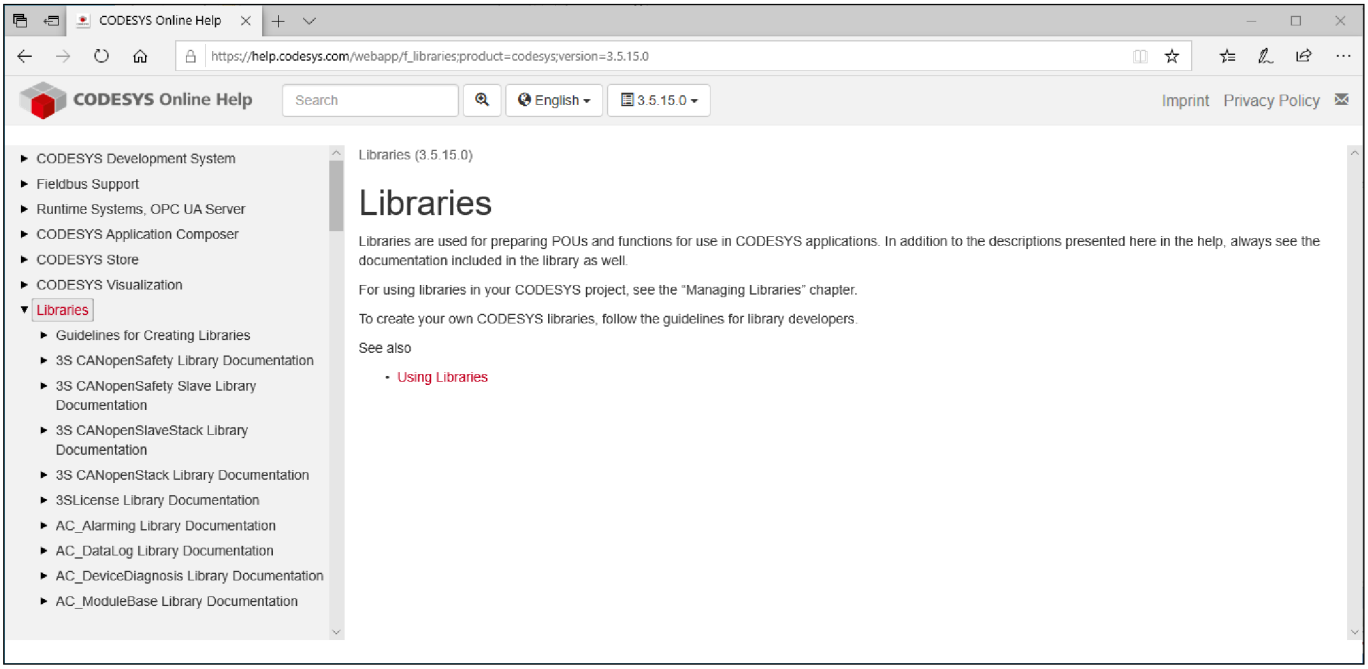
3.4 Programming references

Detailed information about programming is found under the menu **Reference, Programming**.



3.5 Libraries included in CODESYS

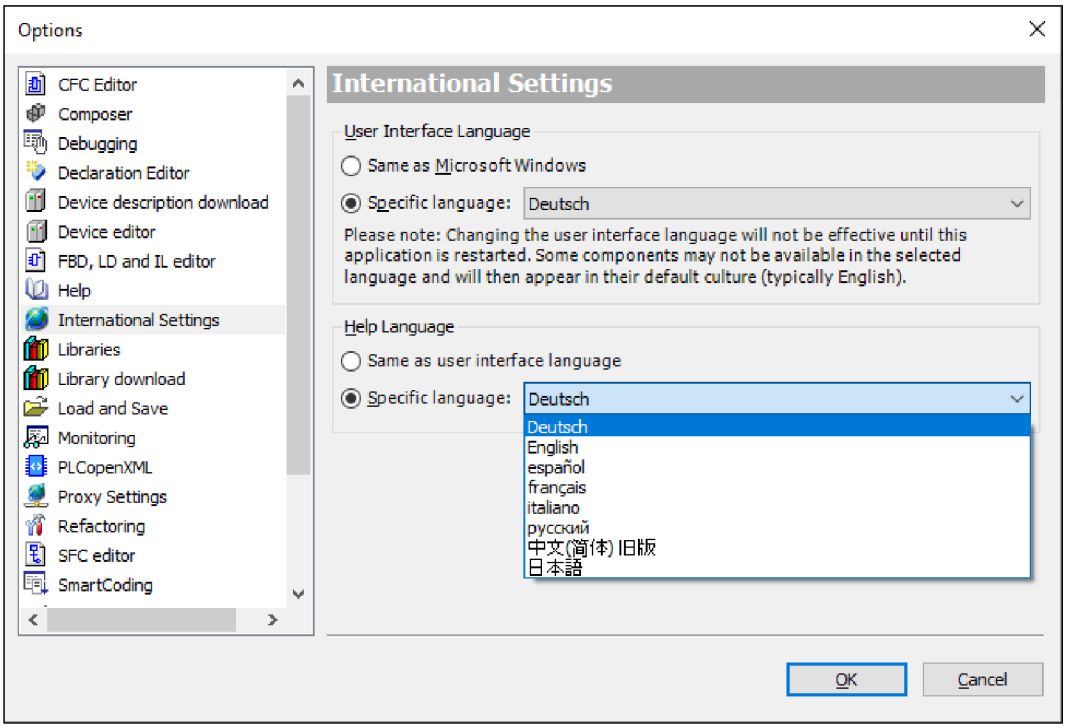
The standard libraries are described under the menu **Libraries**.



More information about libraries is found in the **Library Manager** for DEIF AMC 300 specific libraries.

3.6 Language settings

The default language for the menu and help files is English. You can change this under **Tool > Options > International Settings** to a variety of languages.



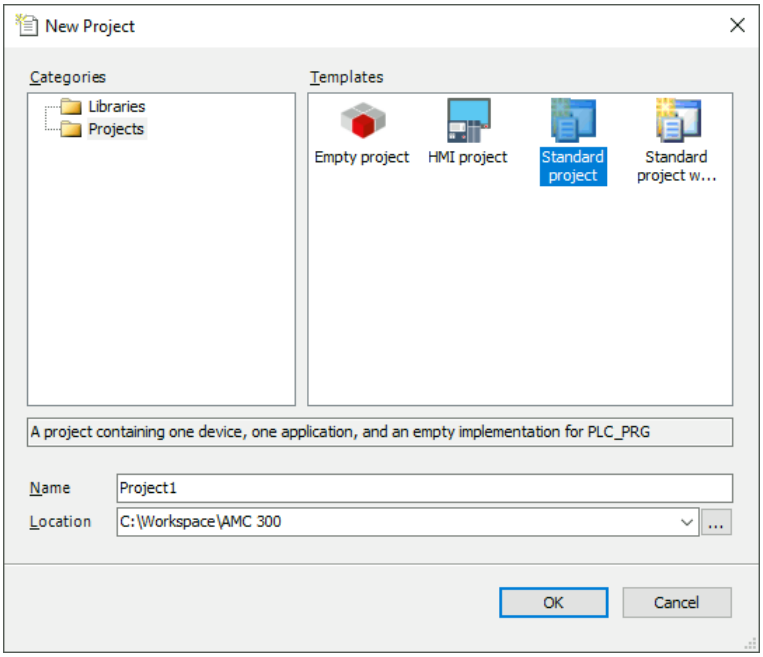
NOTE The AMC 300 CODESYS TSP must be installed before you change the language settings.

4. Create a CODESYS project

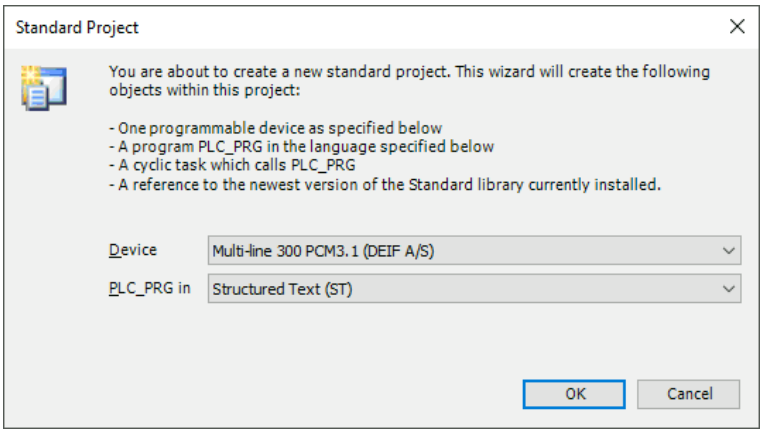
4.1 Create a new project

To create a new CODESYS project:

1. Go to **File > New Project**.*



2. Select **Standard project** in the Templates field.
3. Write a project name.
4. Select a location path for the project file.
5. Select **OK** to open the Standard Project window.

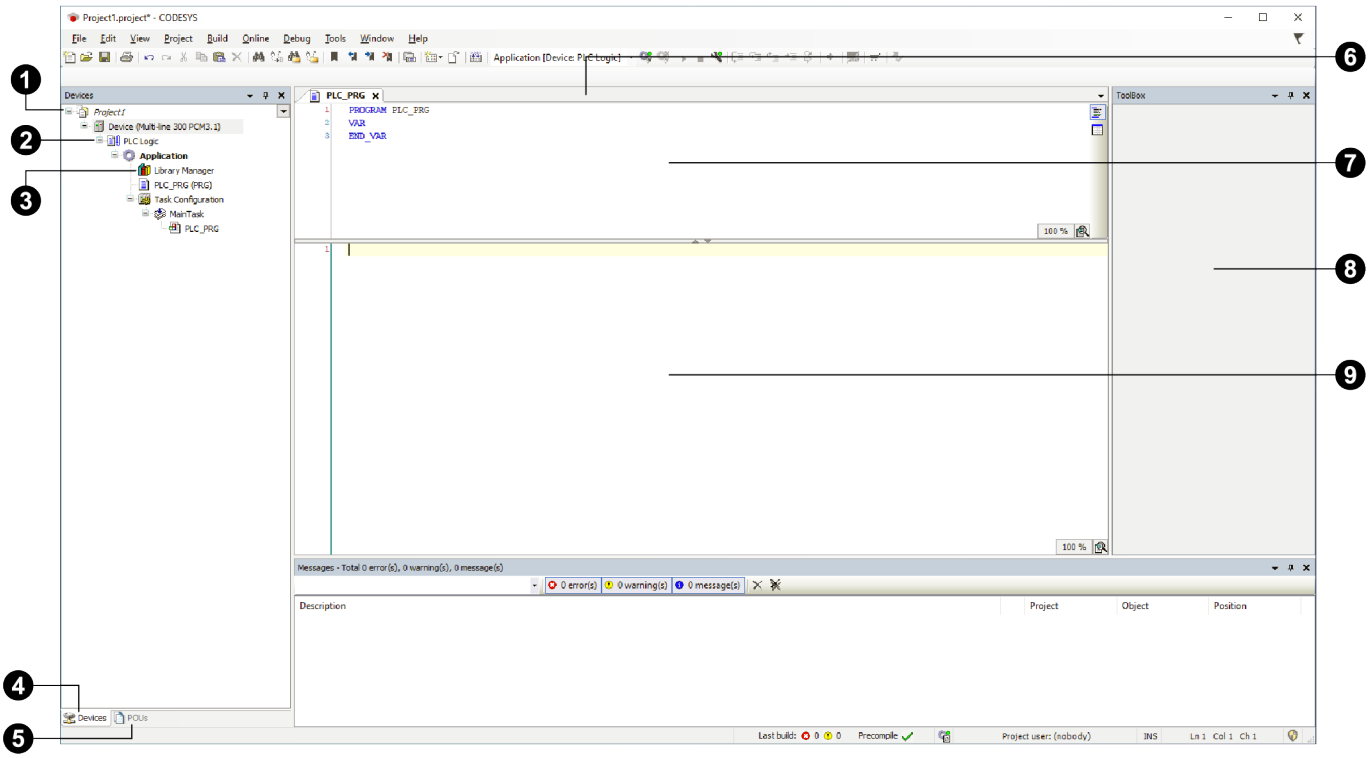


6. In the Device field, select **AMC 300 PCM 3.1 (DEIF A/S)** as the device.
7. In the PLC_PRG in field, select **Structured Text (ST)** as programming language. **
8. Select **OK** to continue.

NOTE * You can also select **Empty project** if you want to create an entire project from scratch.
NOTE ** New POUs can use a different programming language.

4.2 CODESYS layout

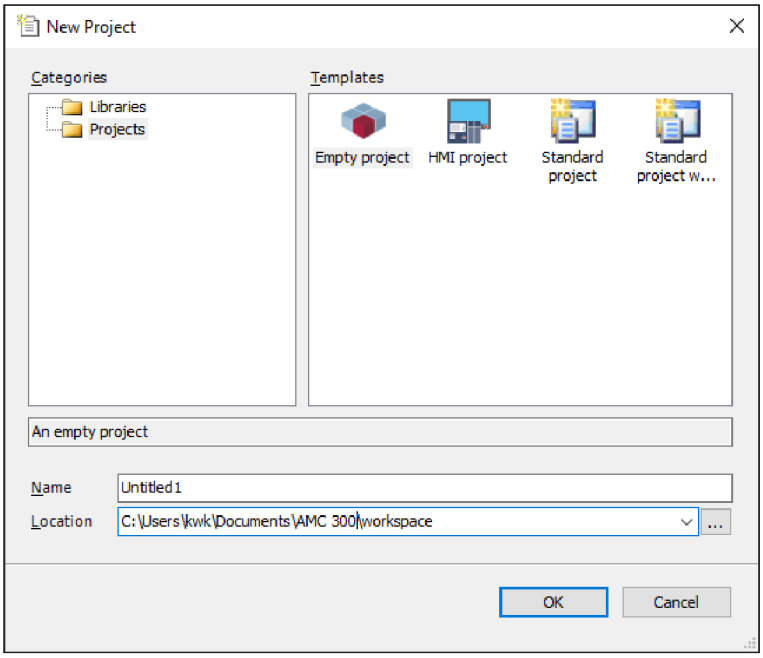
The image below shows the terminology used for the project view throughout the CODESYS manual.



No.	Item	Description
1	Project tree	The project tree is an overview of your project. A typical project will consist of: • One or more devices (AMC 300 controllers). • One or more applications containing the Libraries, POUs and tasks.
2	PLC Logic node	A PLC Logic node shows that the device is a programmable device and has no other functions associated to it.
3	Library manager	The Library manager contains the libraries for the project. Each library consists of functions and function blocks that can be used in your programs.
4	Devices tab	The Devices tab gives you quick access to the project tree.
5	POUs tab	The POUs (Program Object Units) tab gives you quick access to the device independent POUs.
6	Working area	The working area consists of tabs representing different parts of the project. These project parts can be opened from the project tree. The illustration shows the working area for the POU, PLC_PRG. The working area for this POU consists of a declaration workspace, an implementation workspace and a toolbox menu.
7	Declaration workspace	The declaration workspace consists of the variables for the POU functions.
8	Additional toolboxes	Some elements have additional toolboxes to help you build your program, for example Visualisation.
9	Implementation workspace	The implementation workspace is used to program your POU.

4.3 Build from an empty project

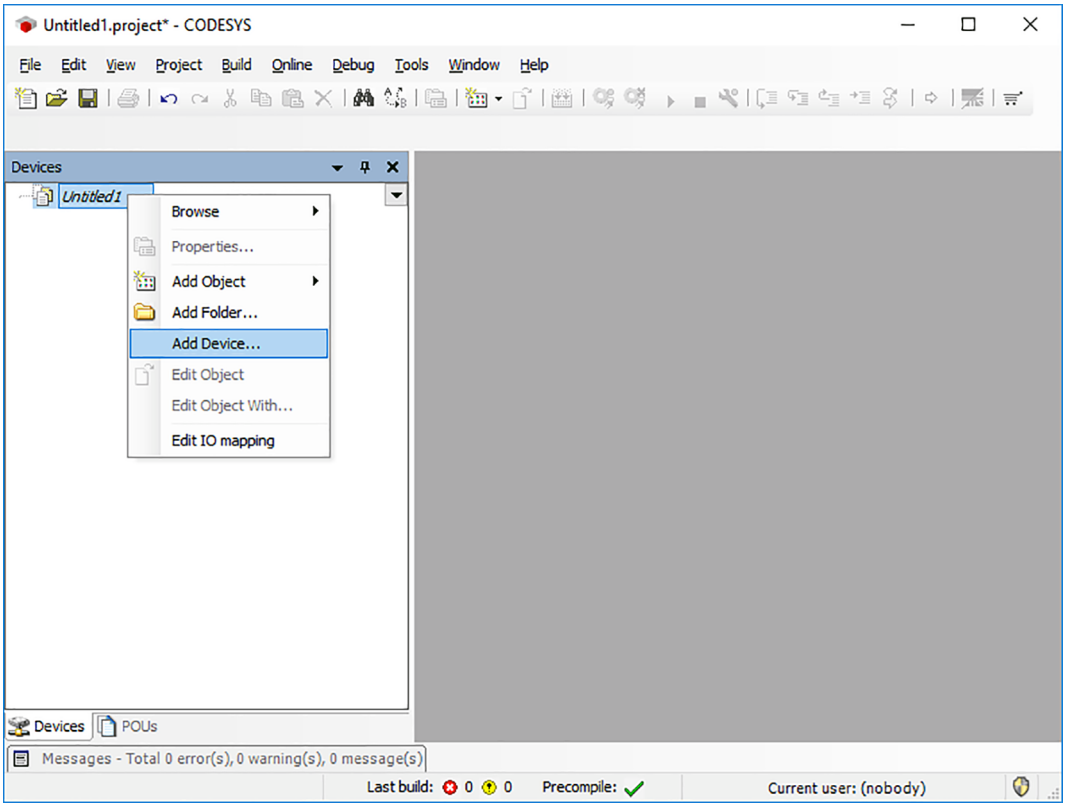
1. Select **File > New Project > Empty project**.



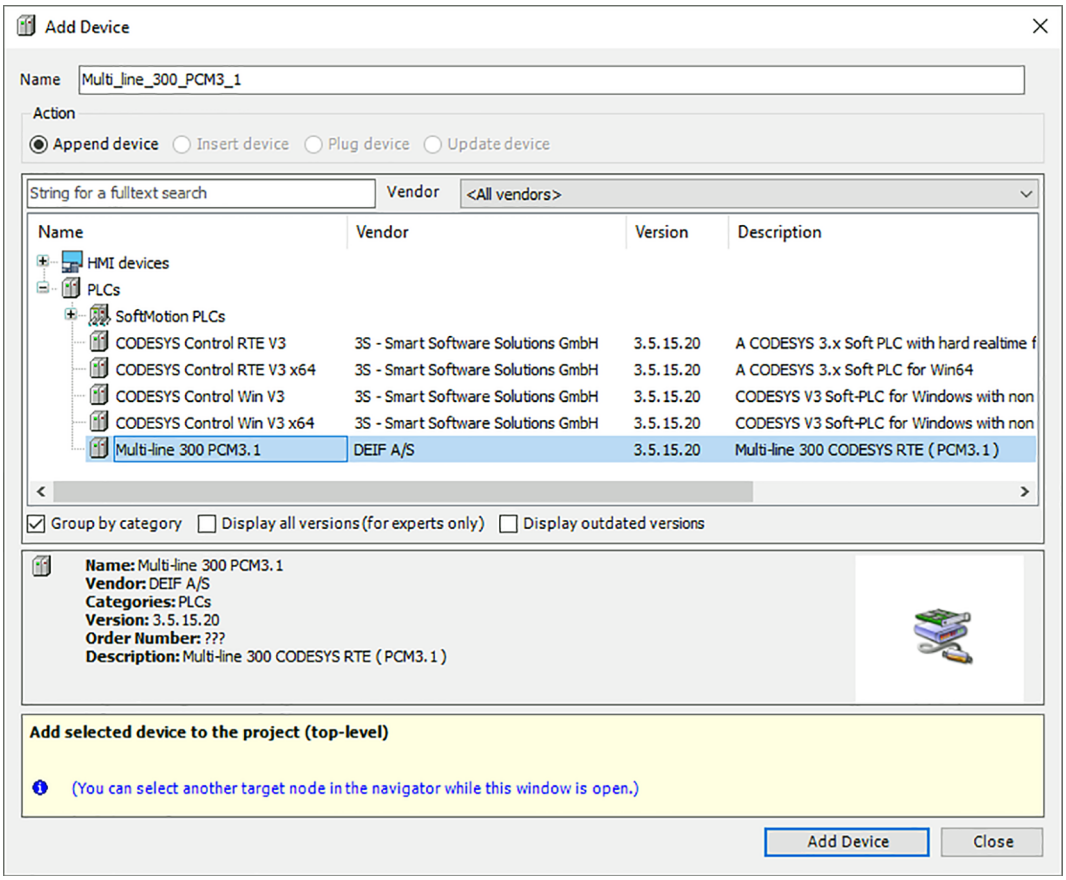
2. Write a project name in the field **Name** (for example, Project1).
3. Select a location to save the project (for example, C:\Workspace\AMC 300\).
4. Select **OK** to continue.

4.4 Add the AMC 300

1. In the project window, select **Add Device**.



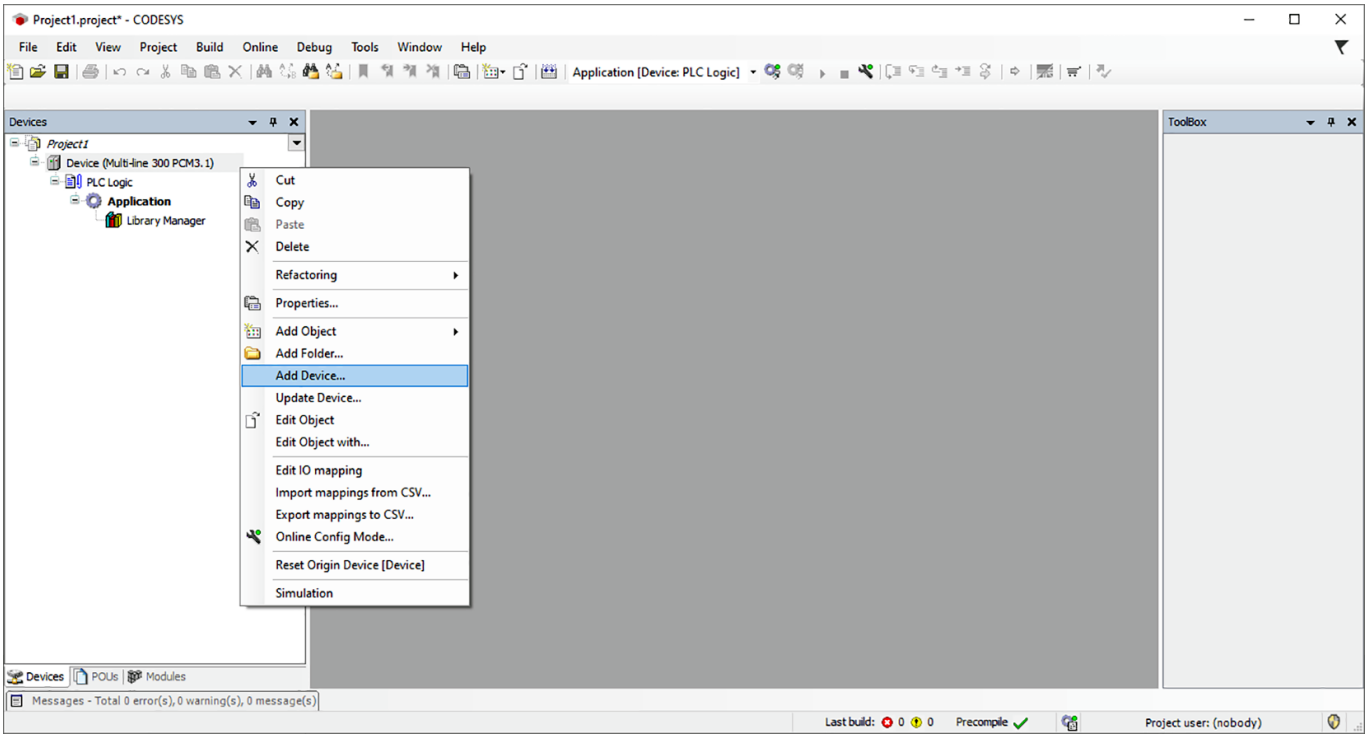
2. In the Add Device window, select a device from the list.



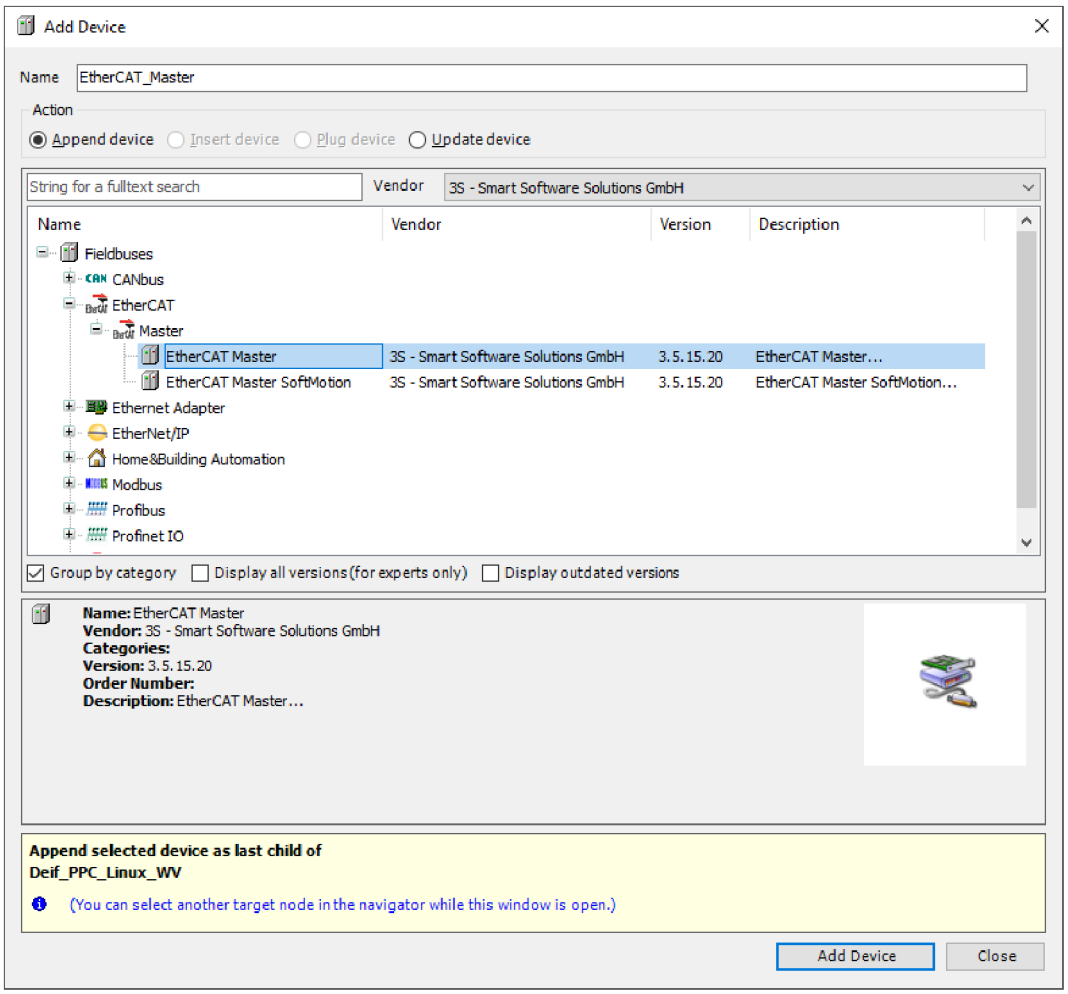
3. Select **Add Device**.

4.5 Add EtherCAT master device

1. In the project window, select **Add Device**.



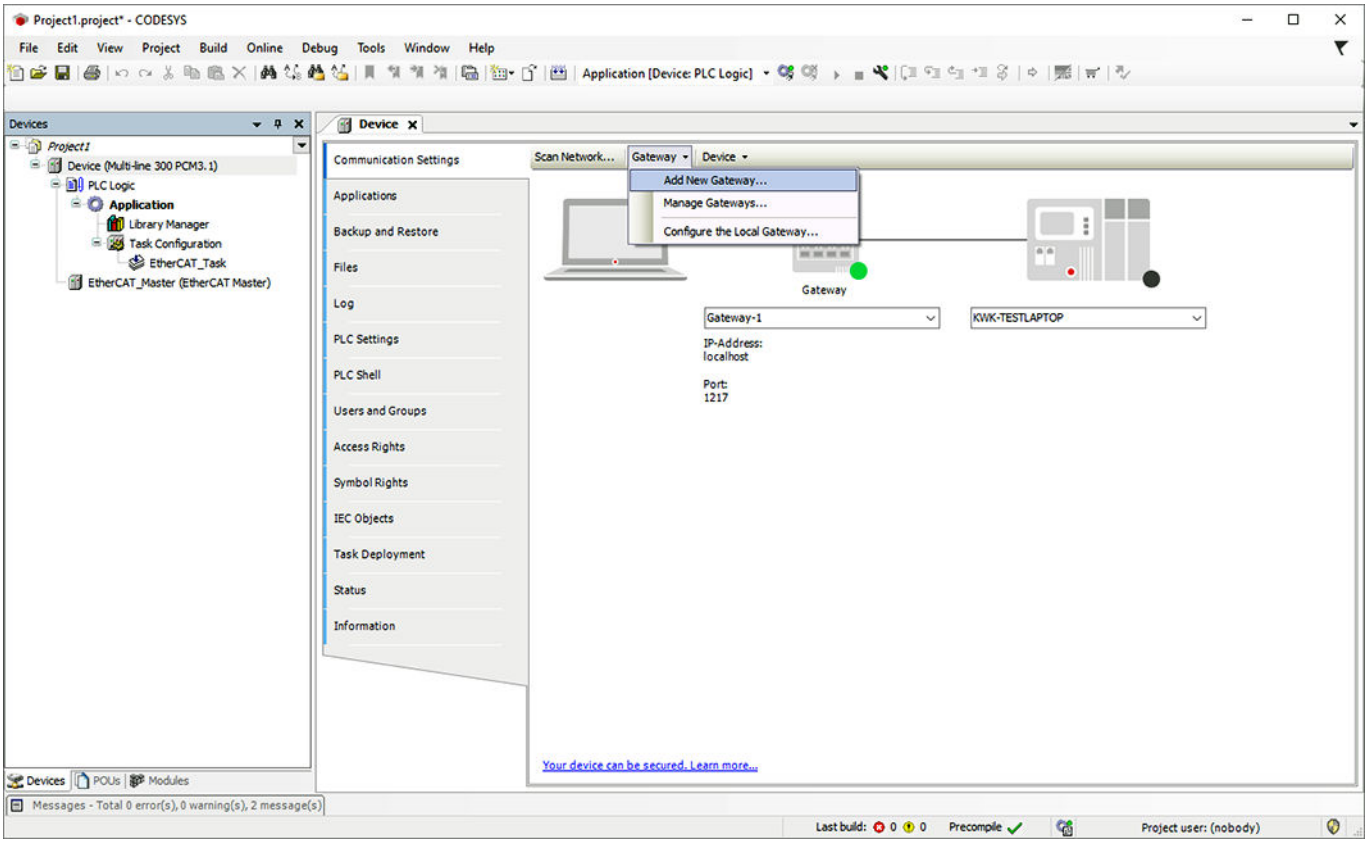
2. In the Add Device window, select a device from the list.



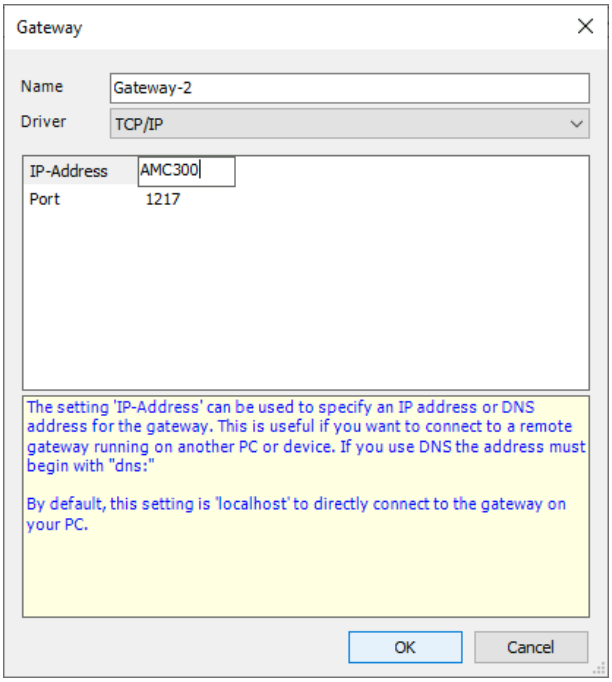
3. Select **Add Device**.

4.6 Connect to AMC 300

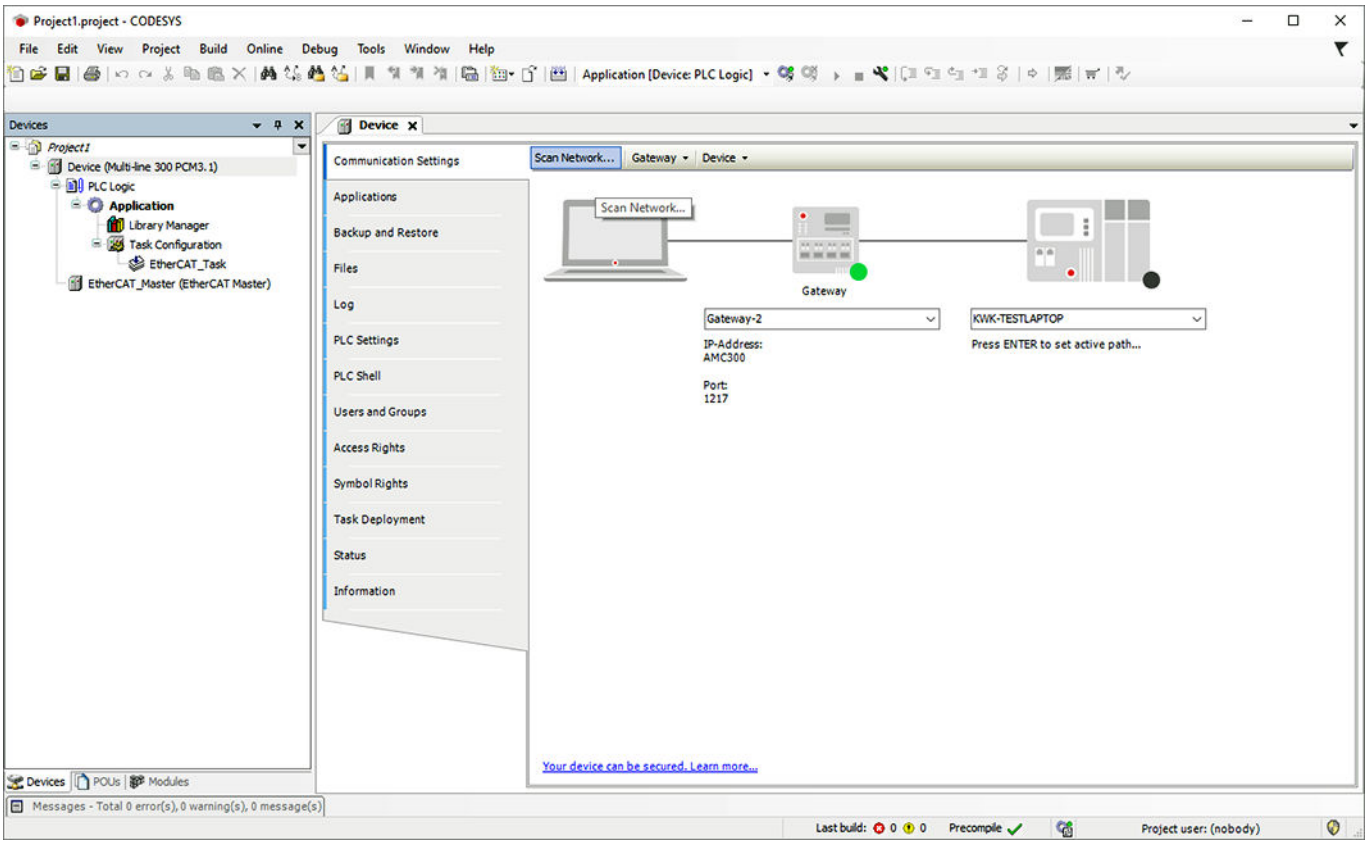
1. In the project window, double-click the AMC 300.
   - A gateway with the default IP address **localhost** is shown.
   - We recommend to create a new gateway with a new IP address or hostname for the AMC 300.
2. Select **Gateway > Add new gateway**.



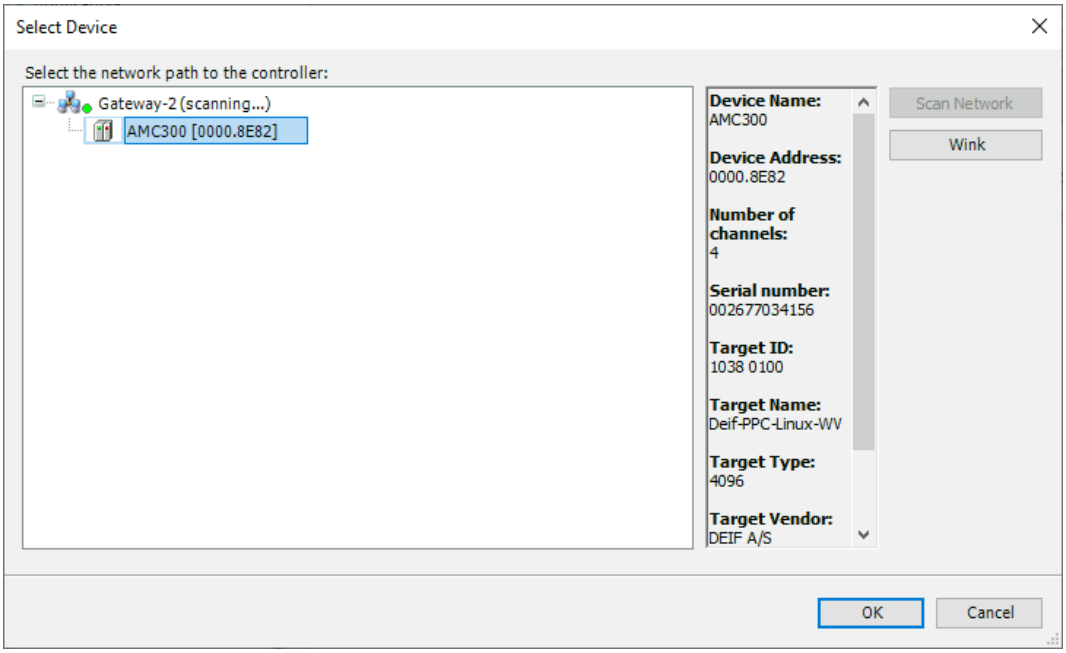
3. Enter the hostname or the IP address for AMC 300 (for example, 192.168.20.13).



4. Select **OK**.
5. Select **Scan Network** to find the AMC 300 on the network.



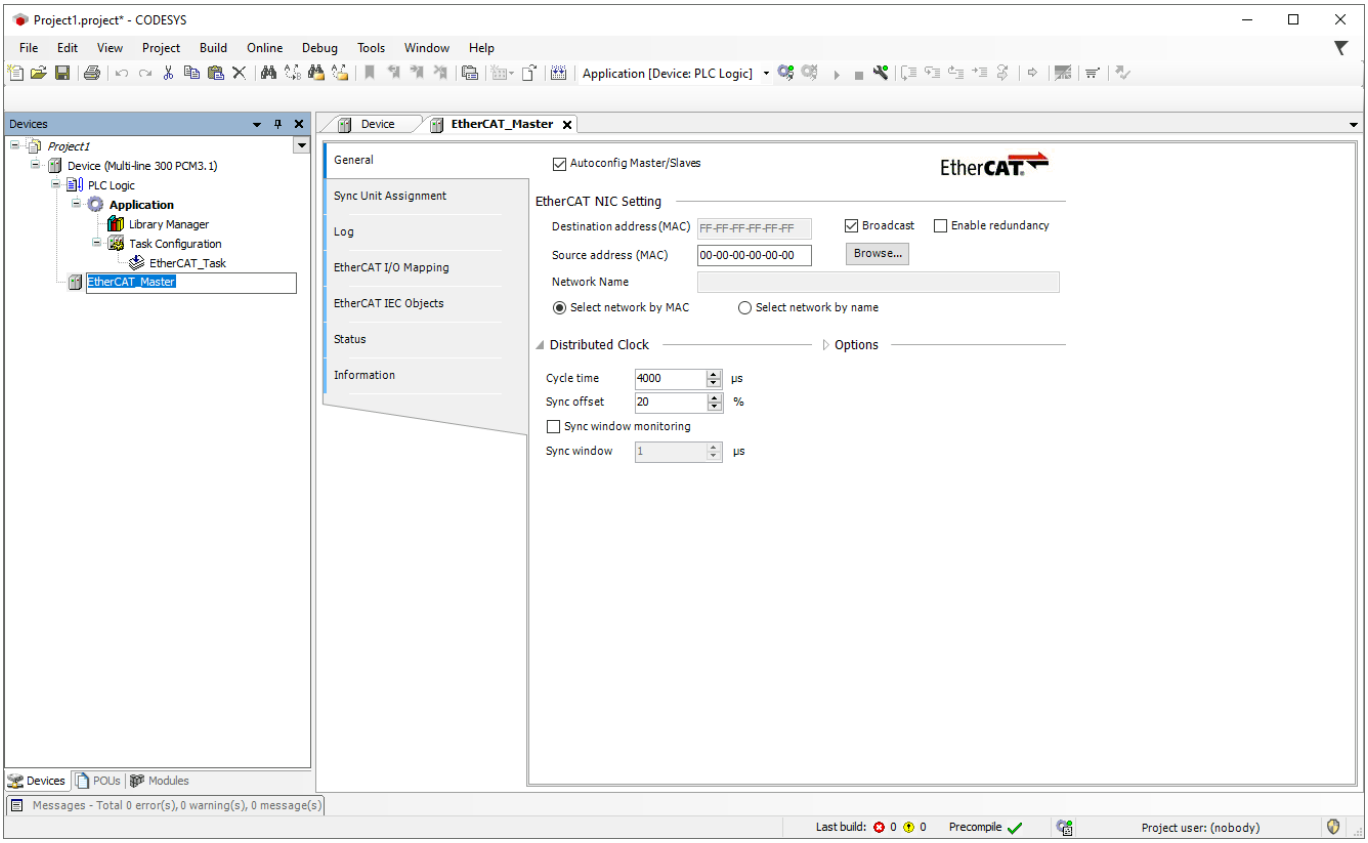
6. Select the device.
7. Select **OK**.
8. Select **Device**.
9. Select the device to set the active network path to the controller.



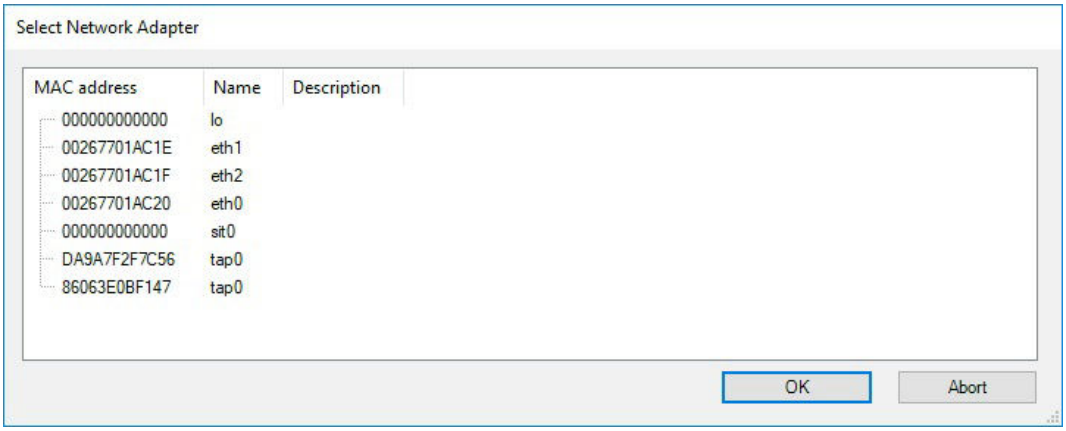
10. Select **OK**

4.7 Setup EtherCAT master

1. Open the **EtherCAT_Master** tag.



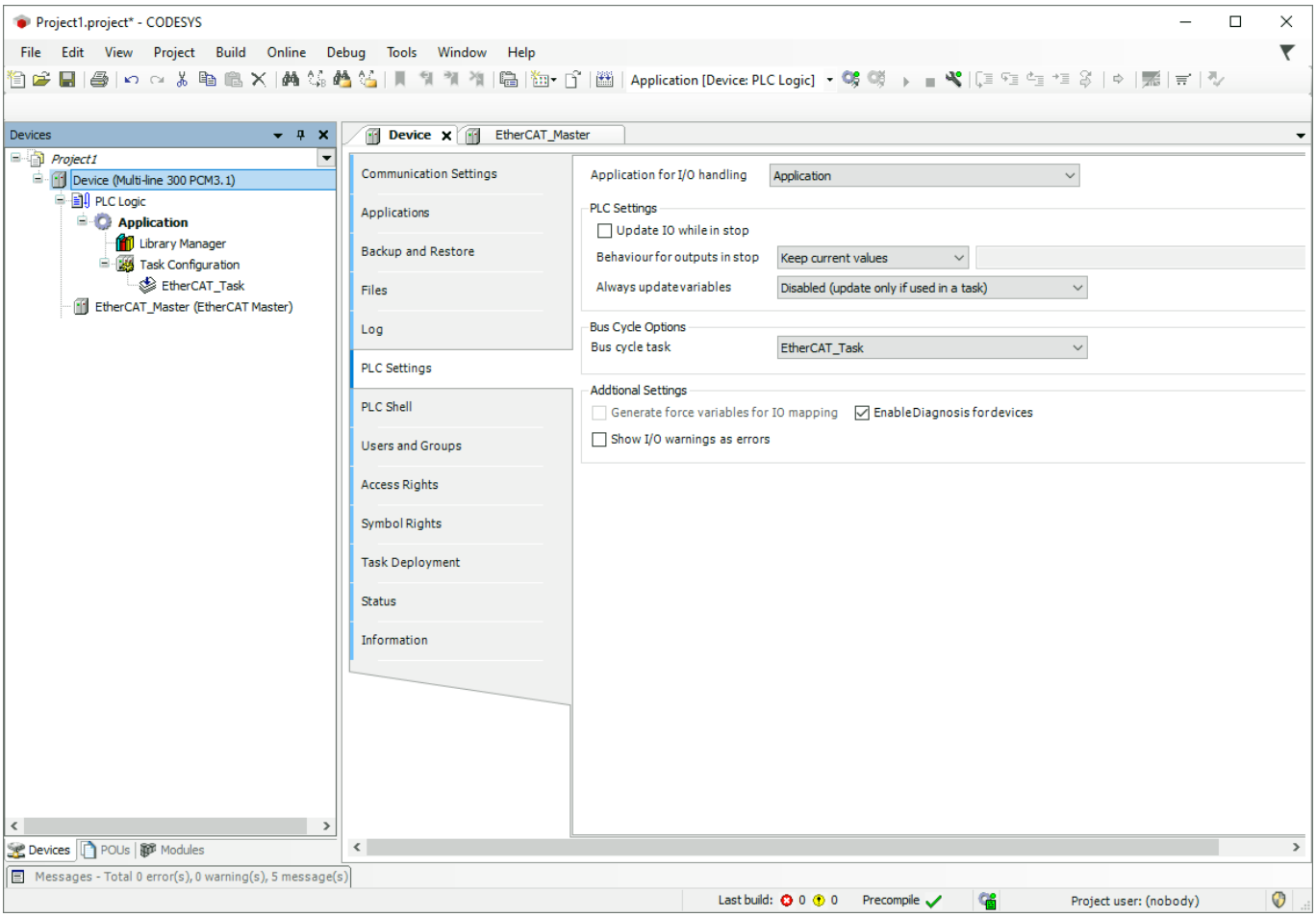
2. Select Browse.
3. Select the **eth0** adapter* (corresponding to EtherCAT OUT port 1 and EtherCAT OUT port 2).



NOTE *The same network adapter number for the eth0 (EtherCAT port) is used on all shipped devices.

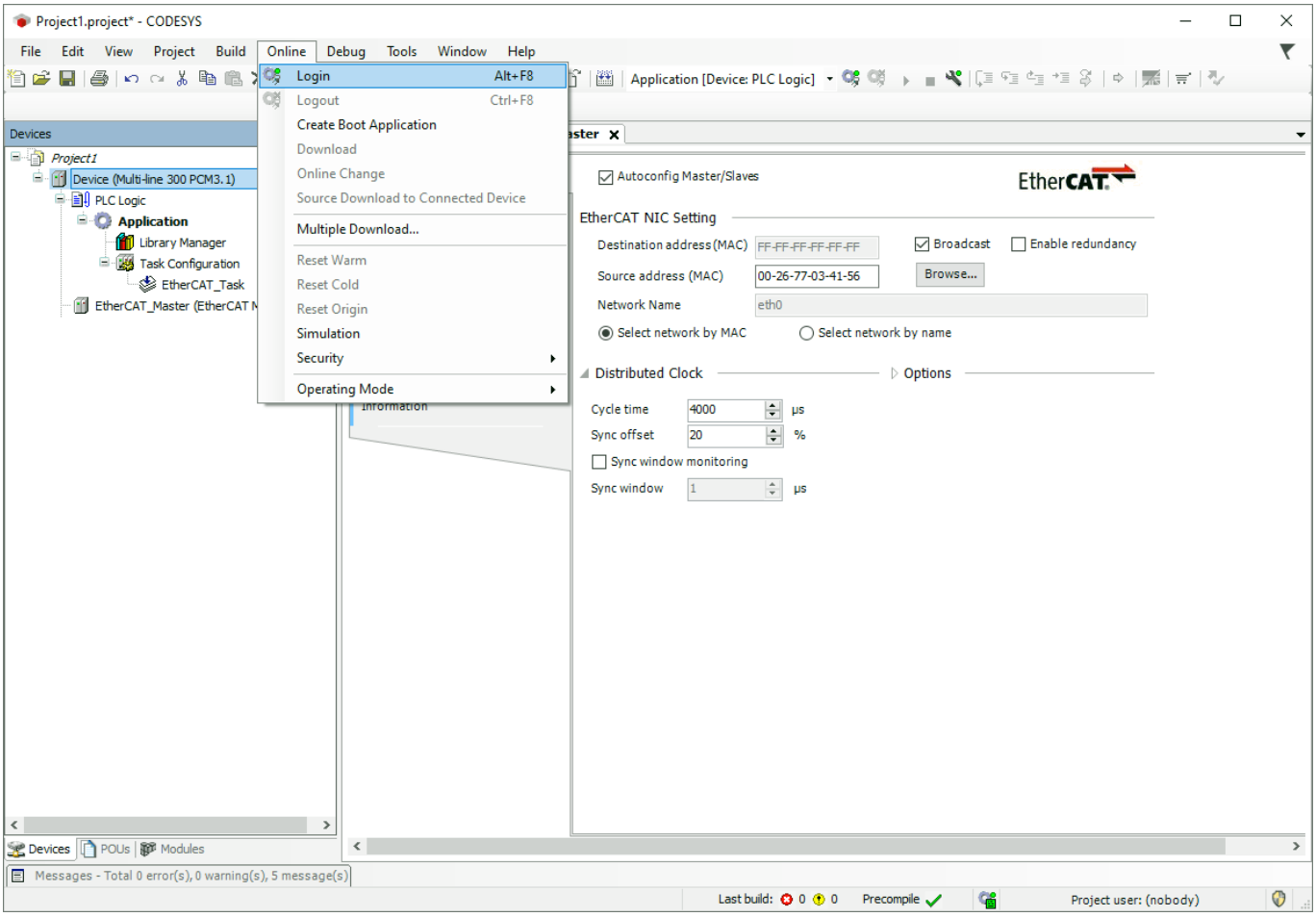
We recommend to specify which task handles the bus communication:

- In **AMC_300_PCM3_1 > PLC Settings > Bus cycle options**: ◦ Specify the **Bus cycle task** to **EtherCAT_master**.

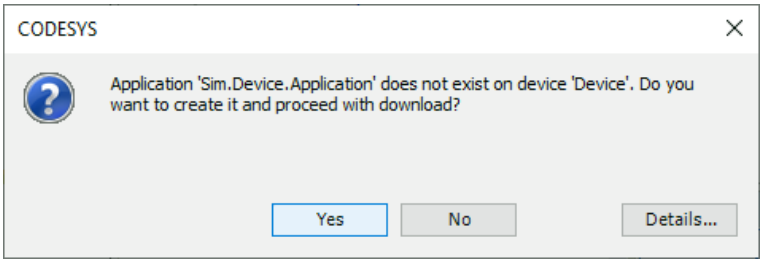

Project1.project* - CODESYS
File Edit View Project Build Online Debug Tools Window Help
Application [Device: PLC Logic]
Devices
Project1
Device (Multi-line 300 PCM3.1)
PLC Logic
Application
Library Manager
Task Configuration
EtherCAT_Task
EtherCAT_Master (EtherCAT Master)
Device
EtherCAT_Master
Communication Settings
Applications
Backup and Restore
Files
Log
PLC Settings
PLC Shell
Users and Groups
Access Rights
Symbol Rights
Task Deployment
Status
Information
Application for I/O handling
Application
PLC Settings
Update IO while in stop
Behaviour for outputs in stop
Keep current values
Always update variables
Disabled (update only if used in a task)
Bus Cycle Options
Bus cycle task
EtherCAT_Task
Addtional Settings
Generate force variables for IO mapping
Enable Diagnosis for devices
Show I/O warnings as errors
Devices
POUs
Modules
Messages - Total 0 error(s), 0 warning(s), 5 message(s)
Last build: 0 0
Precompile
Project user: (nobody)

4.8 Scan for devices

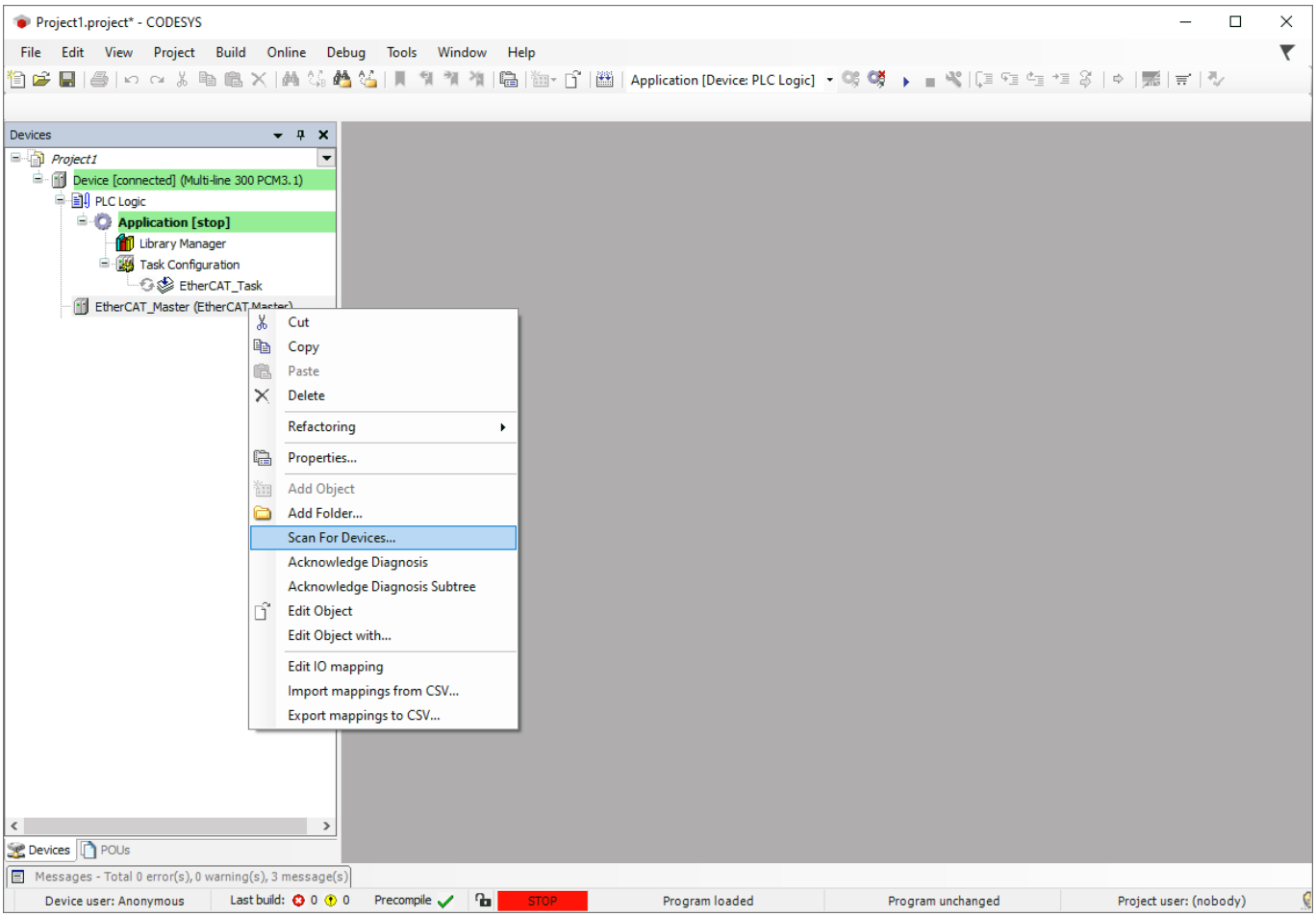
1. Login to the AMC 300.



2. In the pop-up window, select **Yes** to create an application.

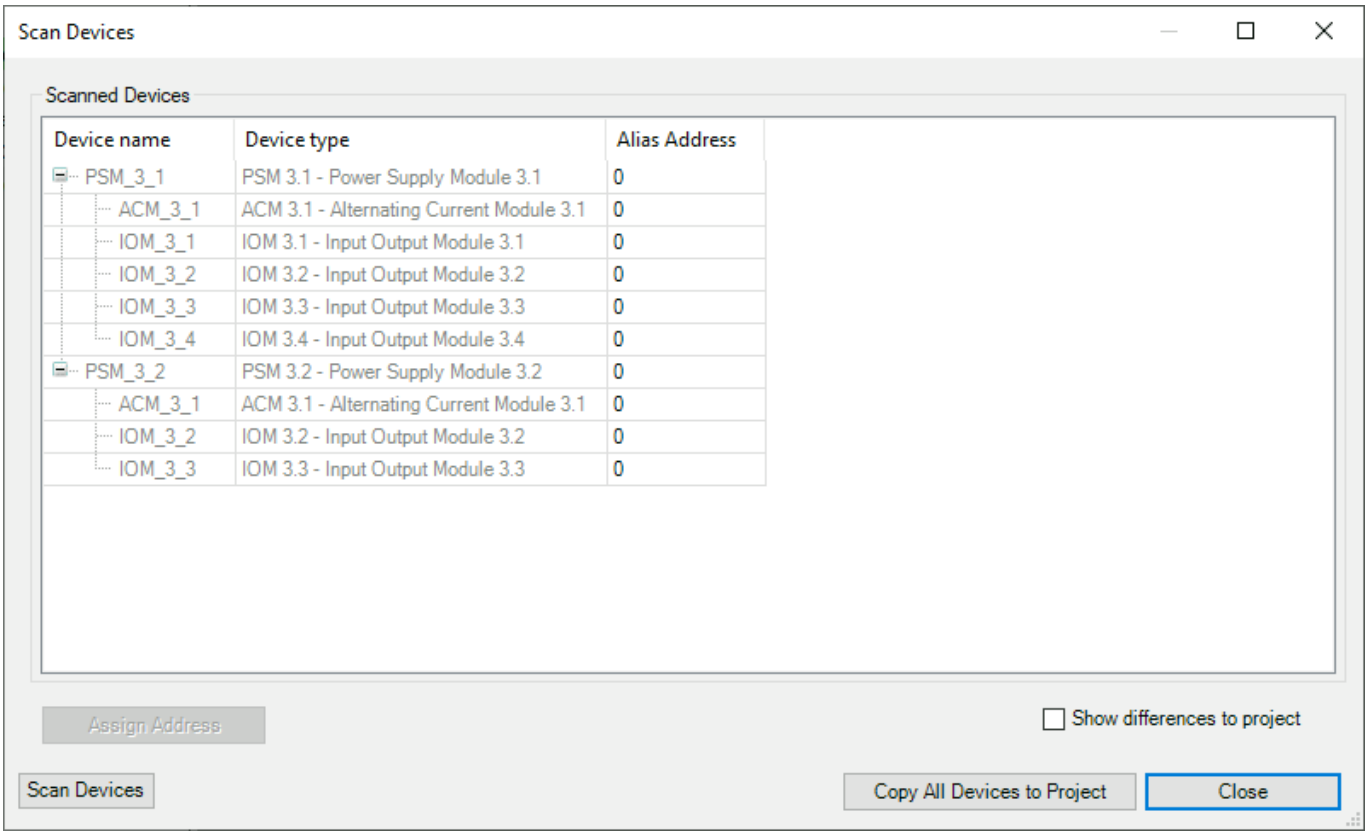


3. Select **EtherCAT_Master (EtherCAT_Master)**, and then **Scan For Devices...** in the drop-down menu.

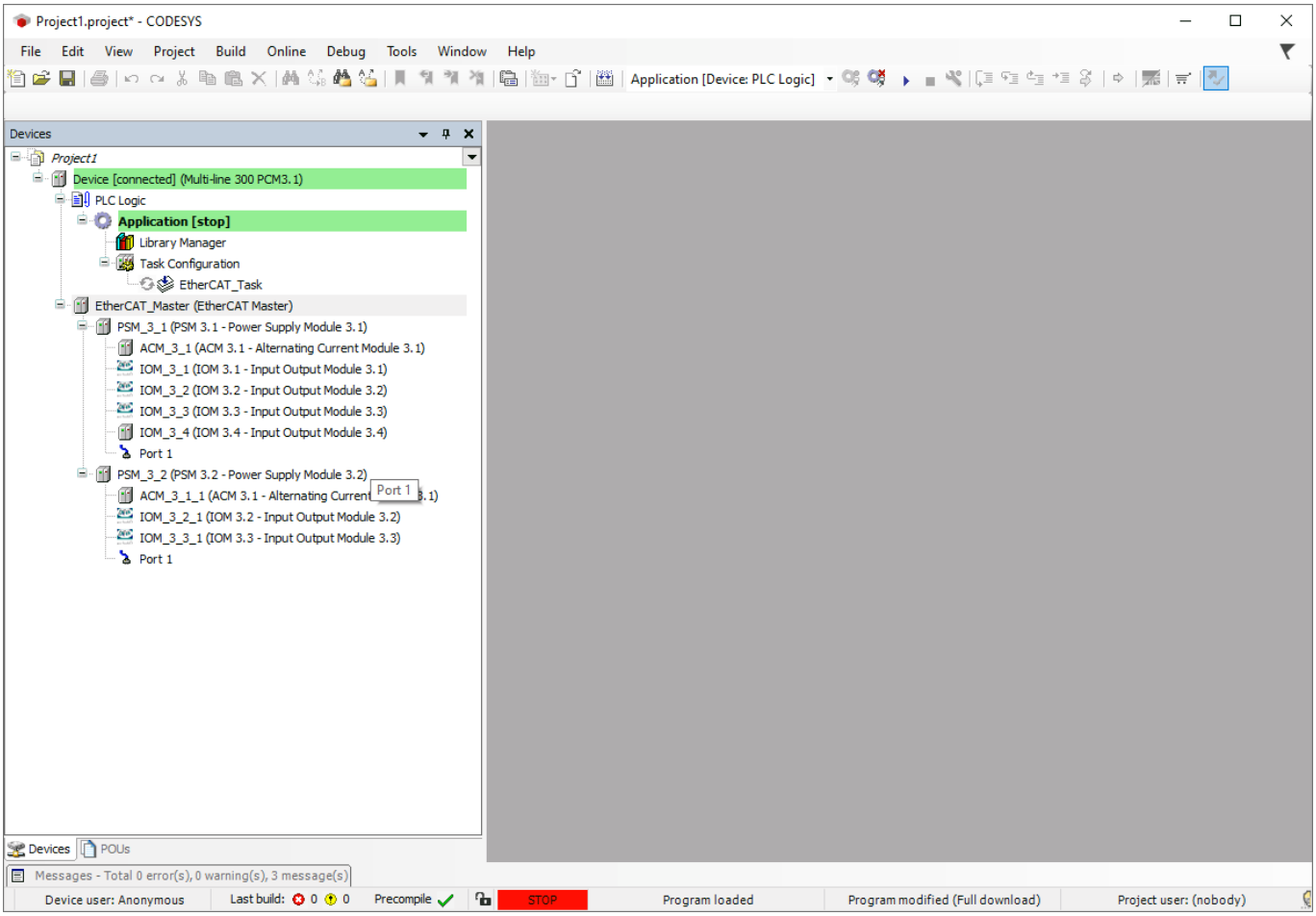


NOTE If EtherCAT Master is running on the AMC 300, you can scan for devices without being logged in. If a scan fails, then use the above procedure

4. In the devices window, select **Copy All Devices to Project**.

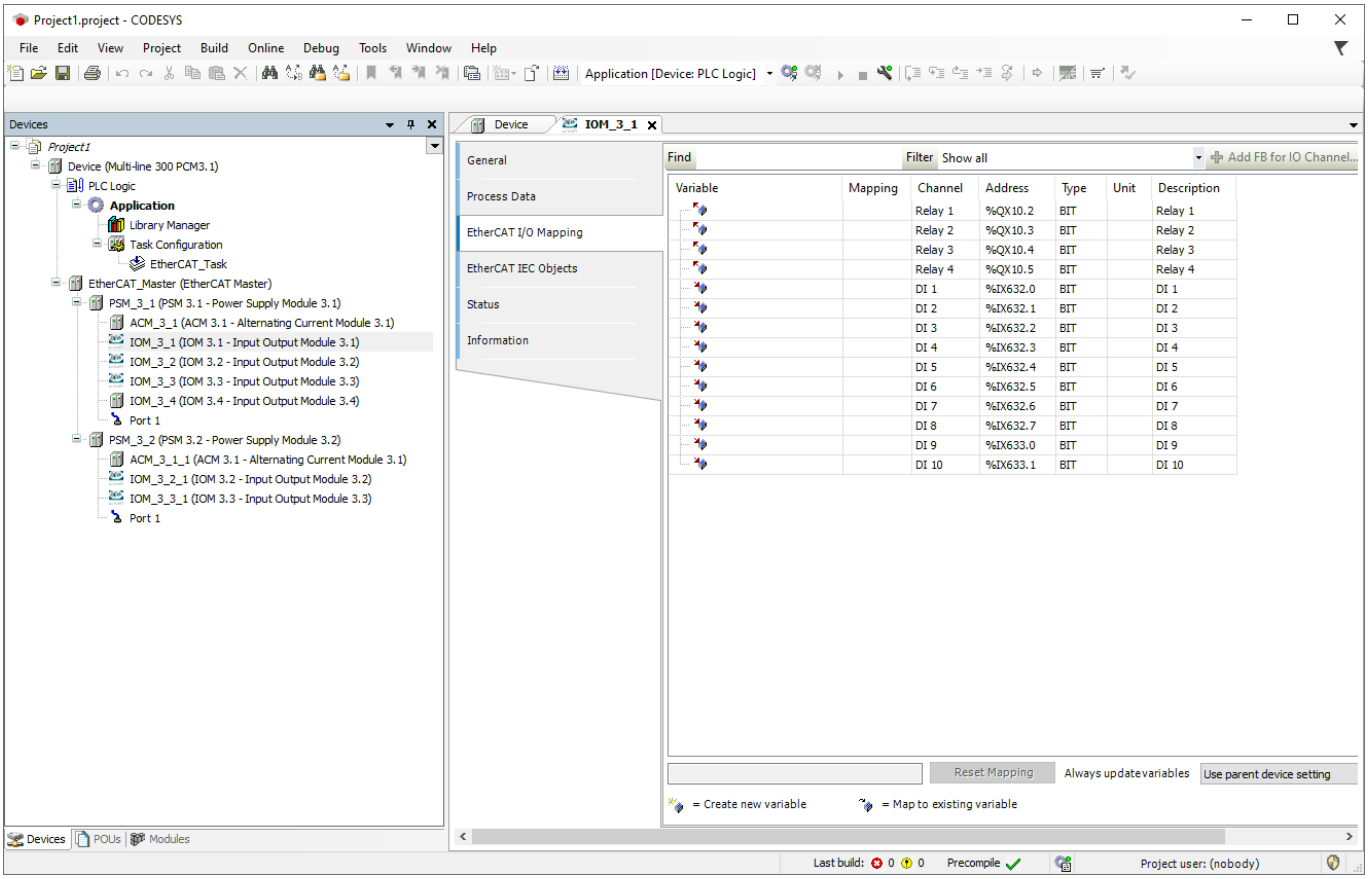


5. The devices are now displayed in the Devices tree.

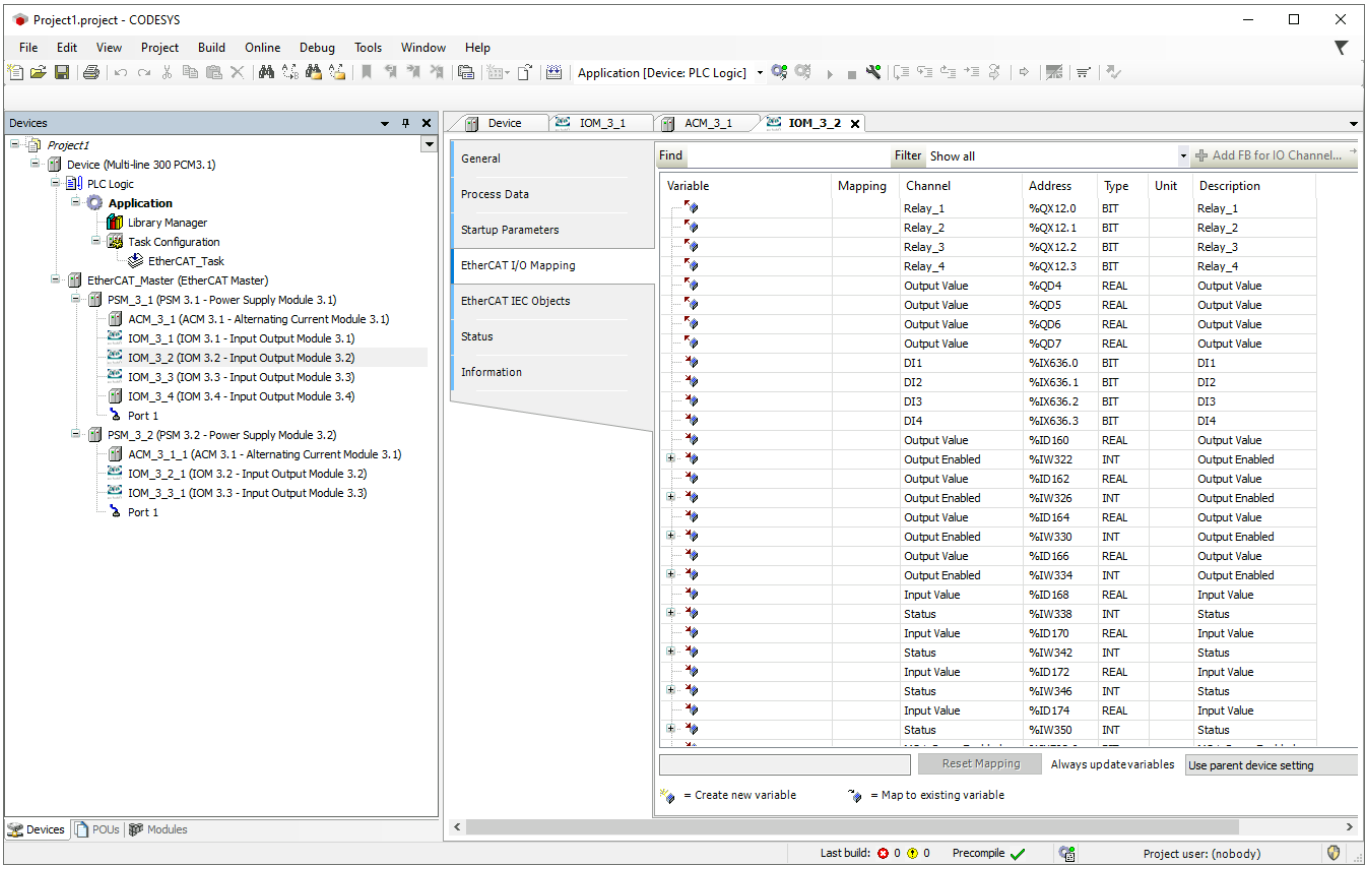


4.9 I/O module variables

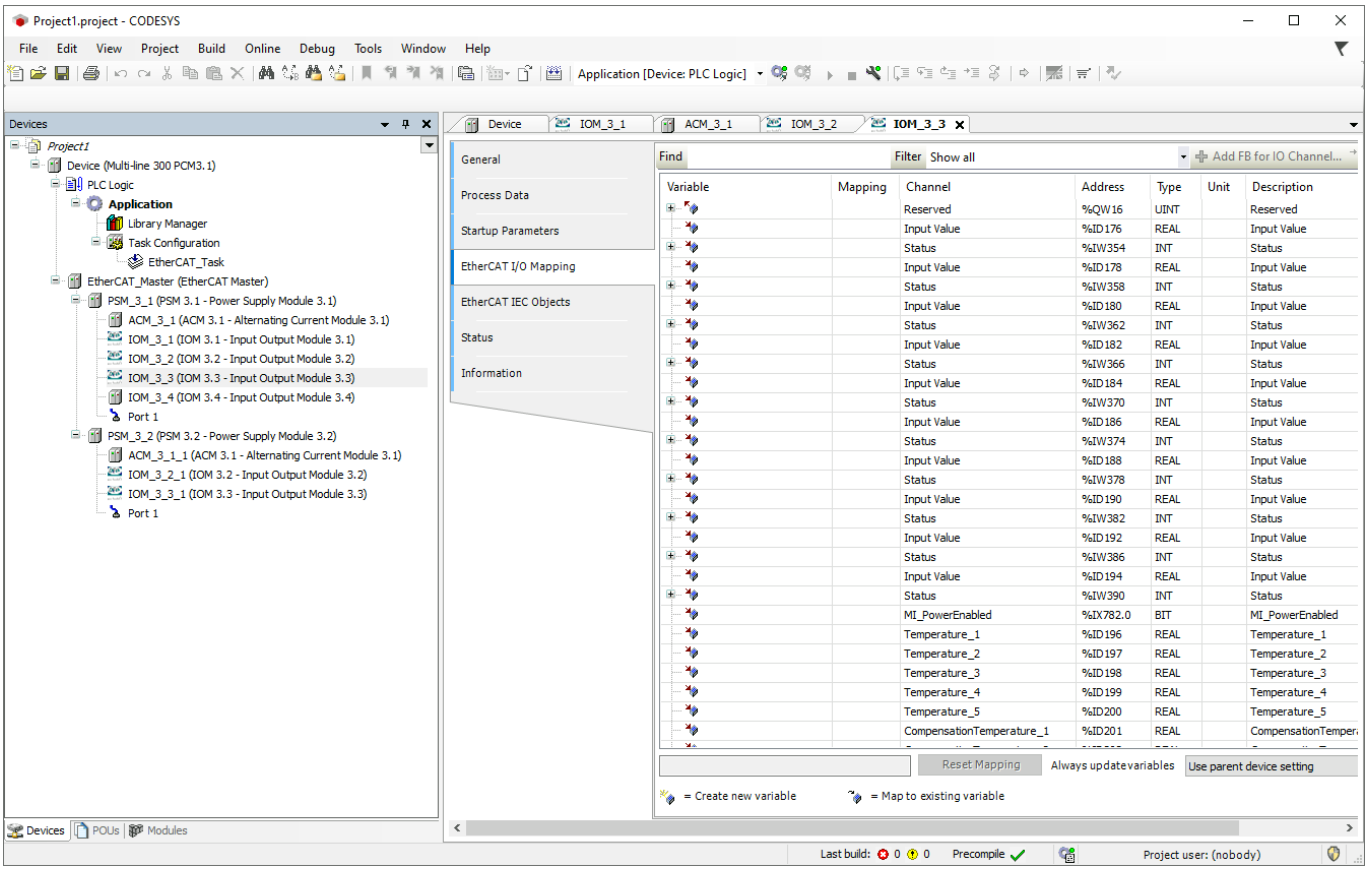
IOM3·1 variables



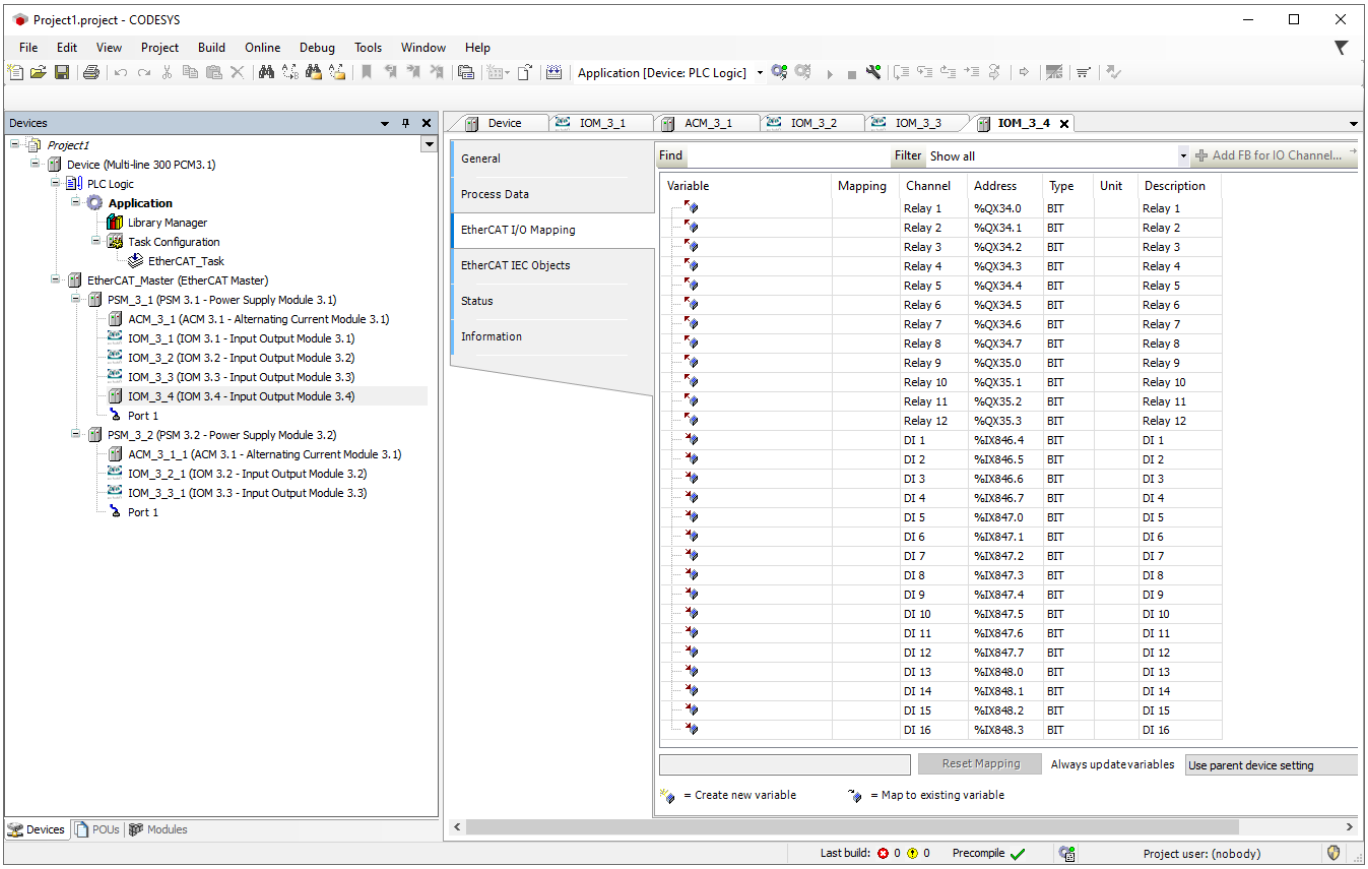
IOM3·2 variables



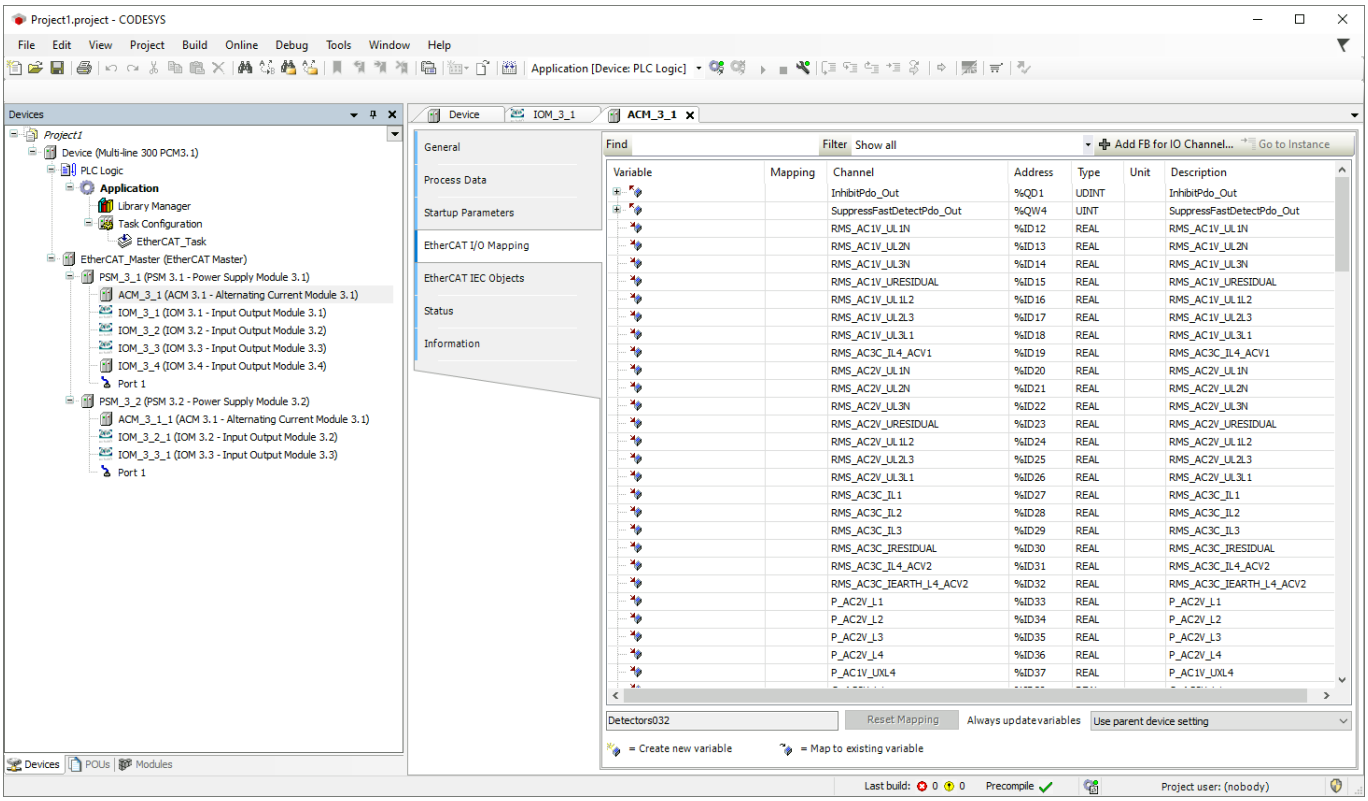
IOM3·3 variables



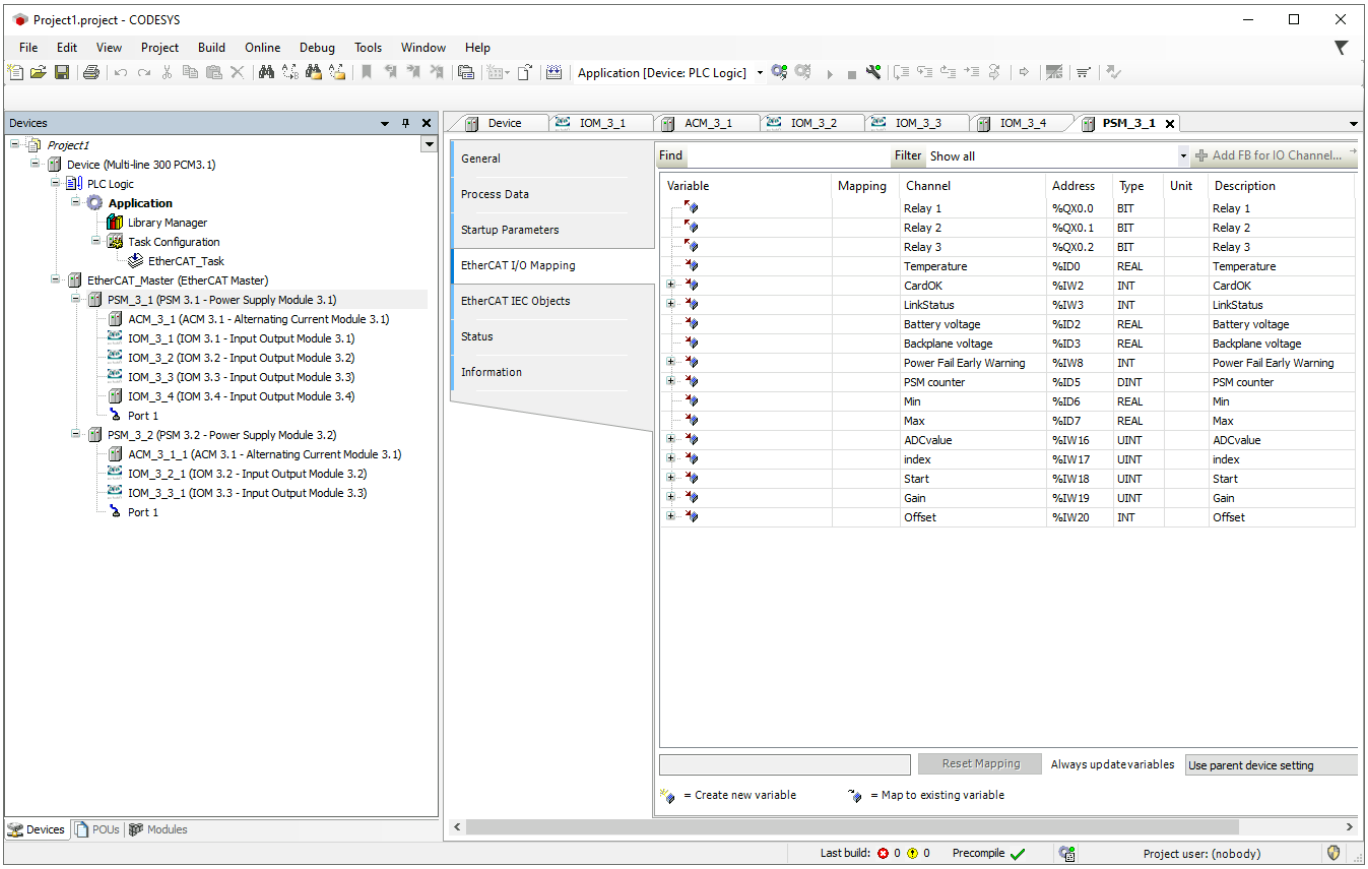
IOM3·4 variables



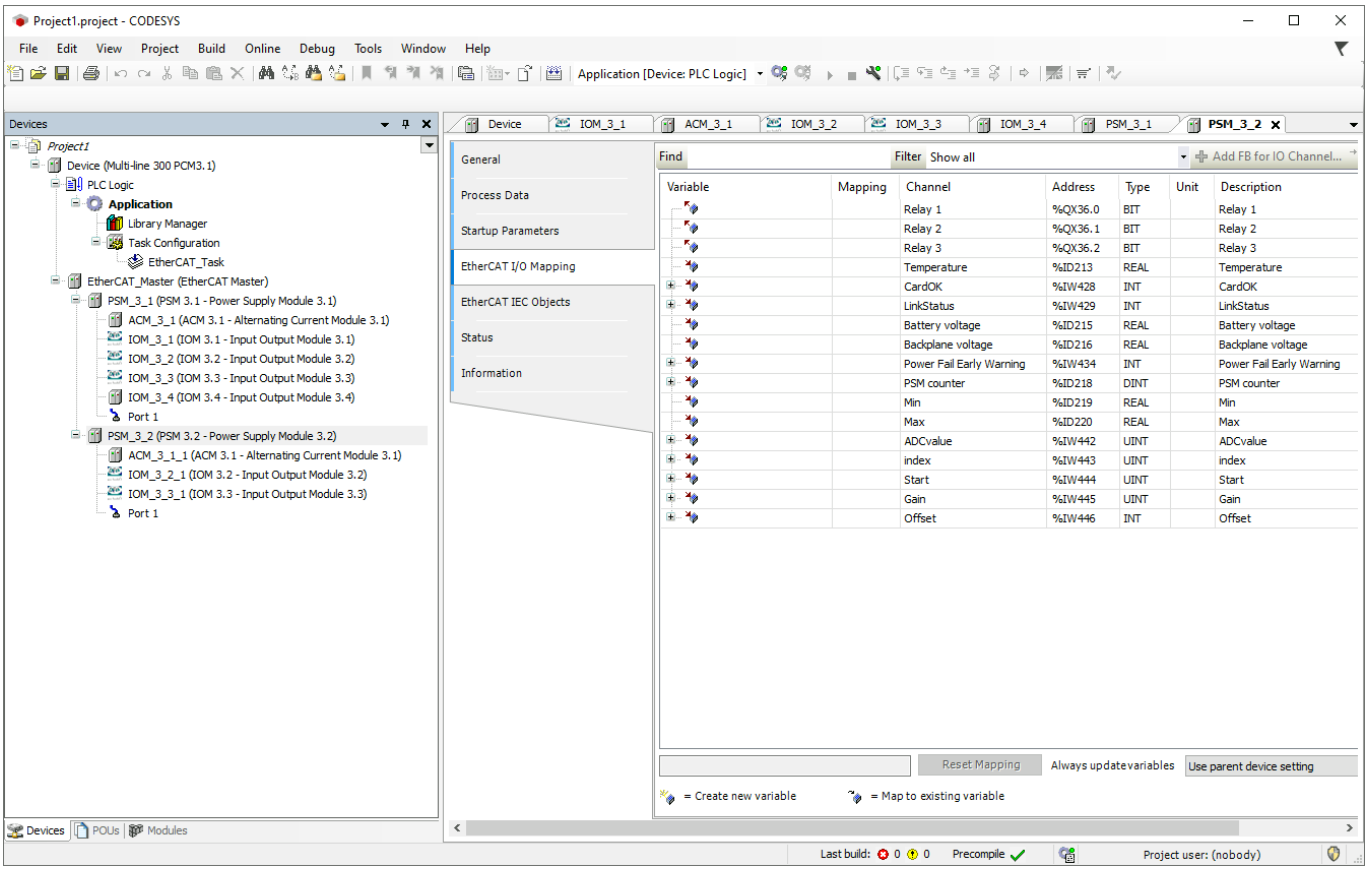
ACM3·1 variables



PSM3·1 variables

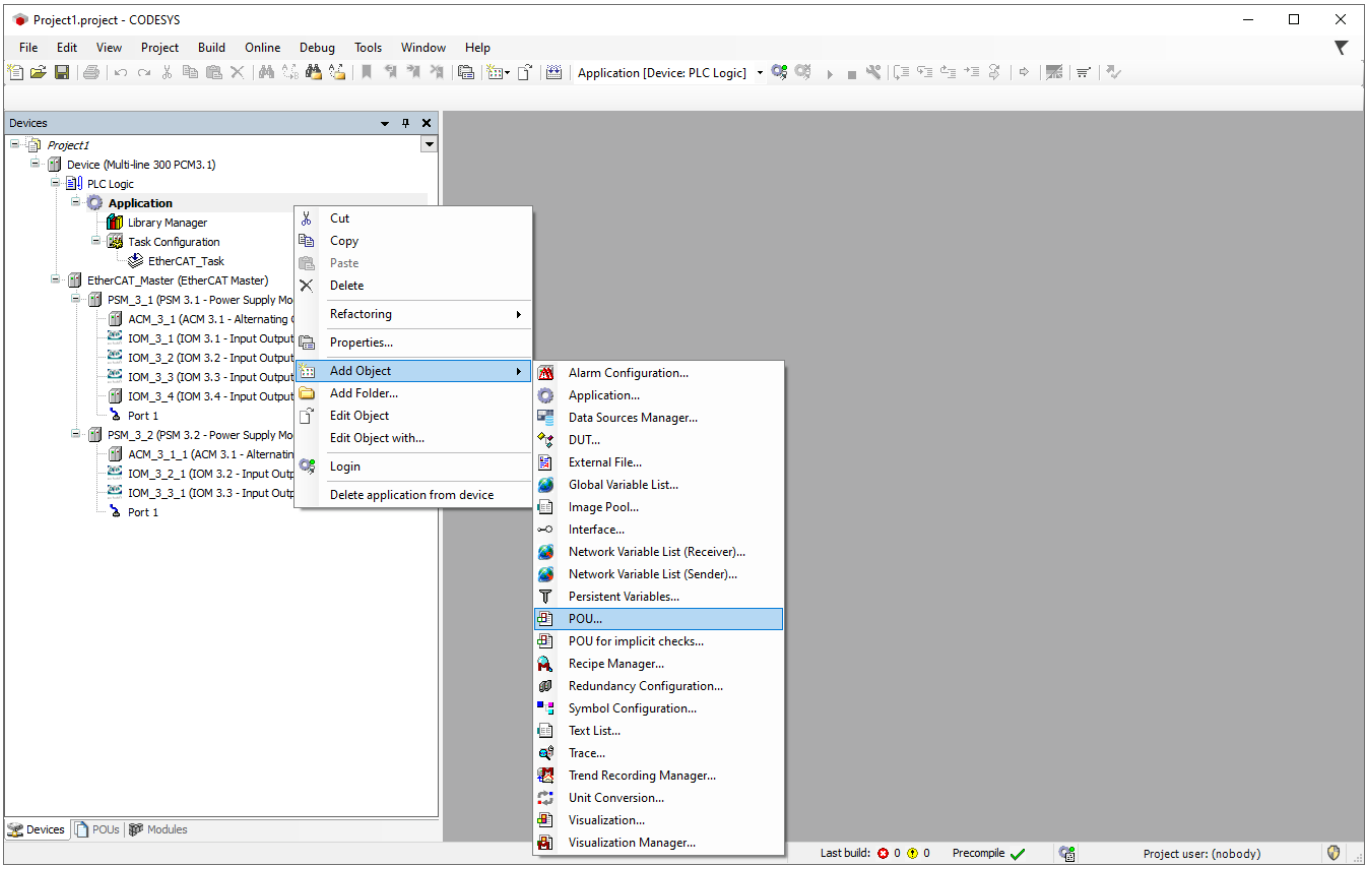


PSM3·2 variables

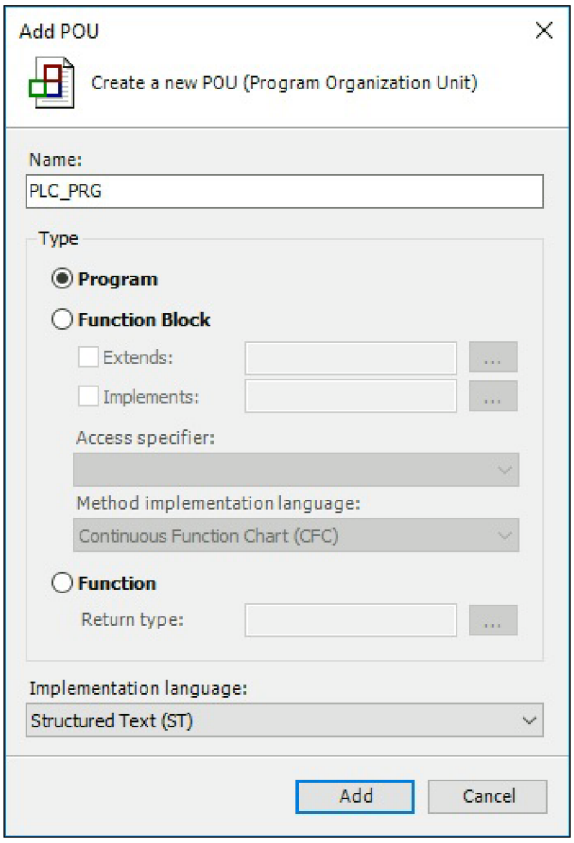


4.10 Add a program

1. Select **Application > Add Object > POU...**.

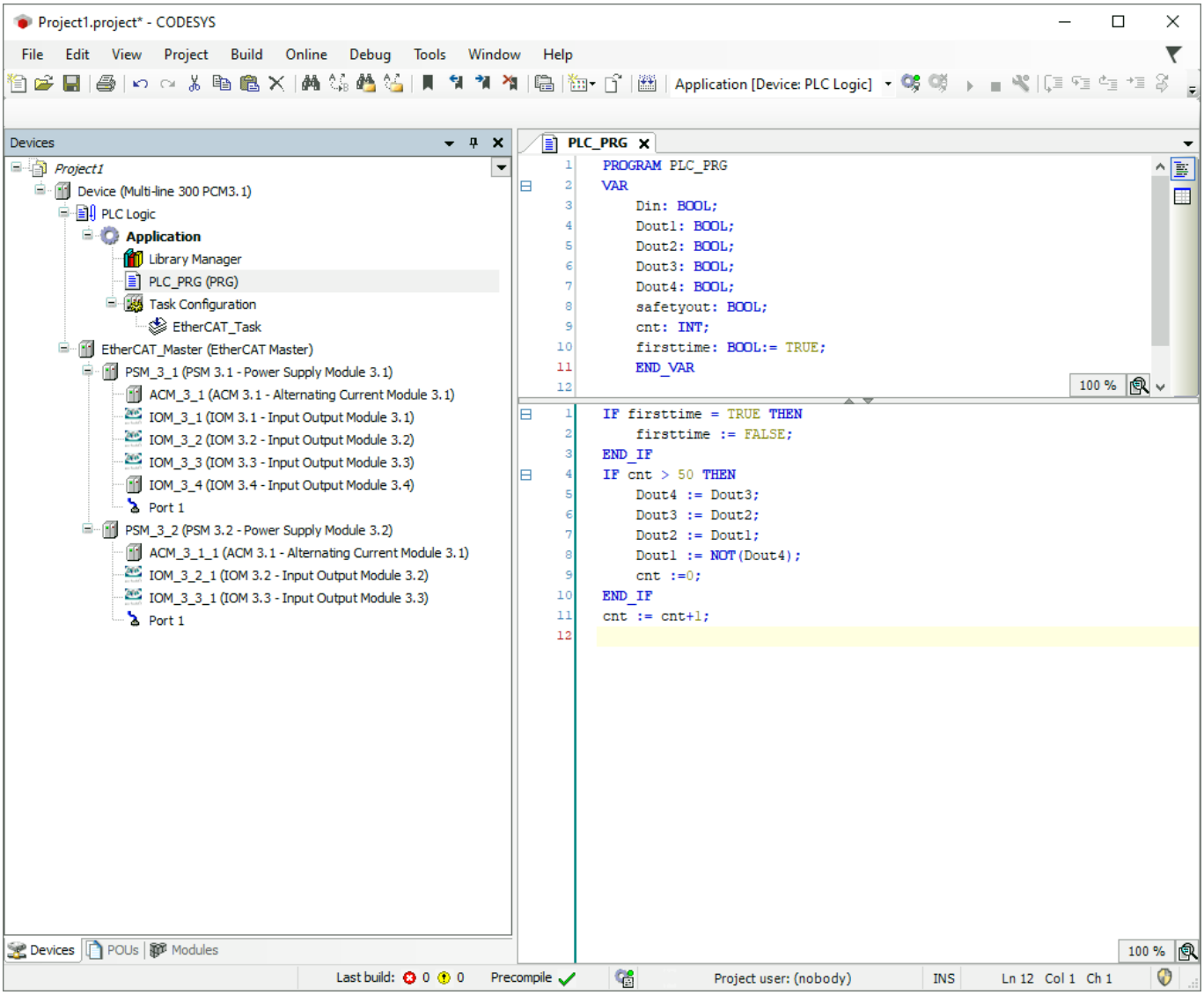


2. In the Add POU window, tick **Program** and select **Add**.



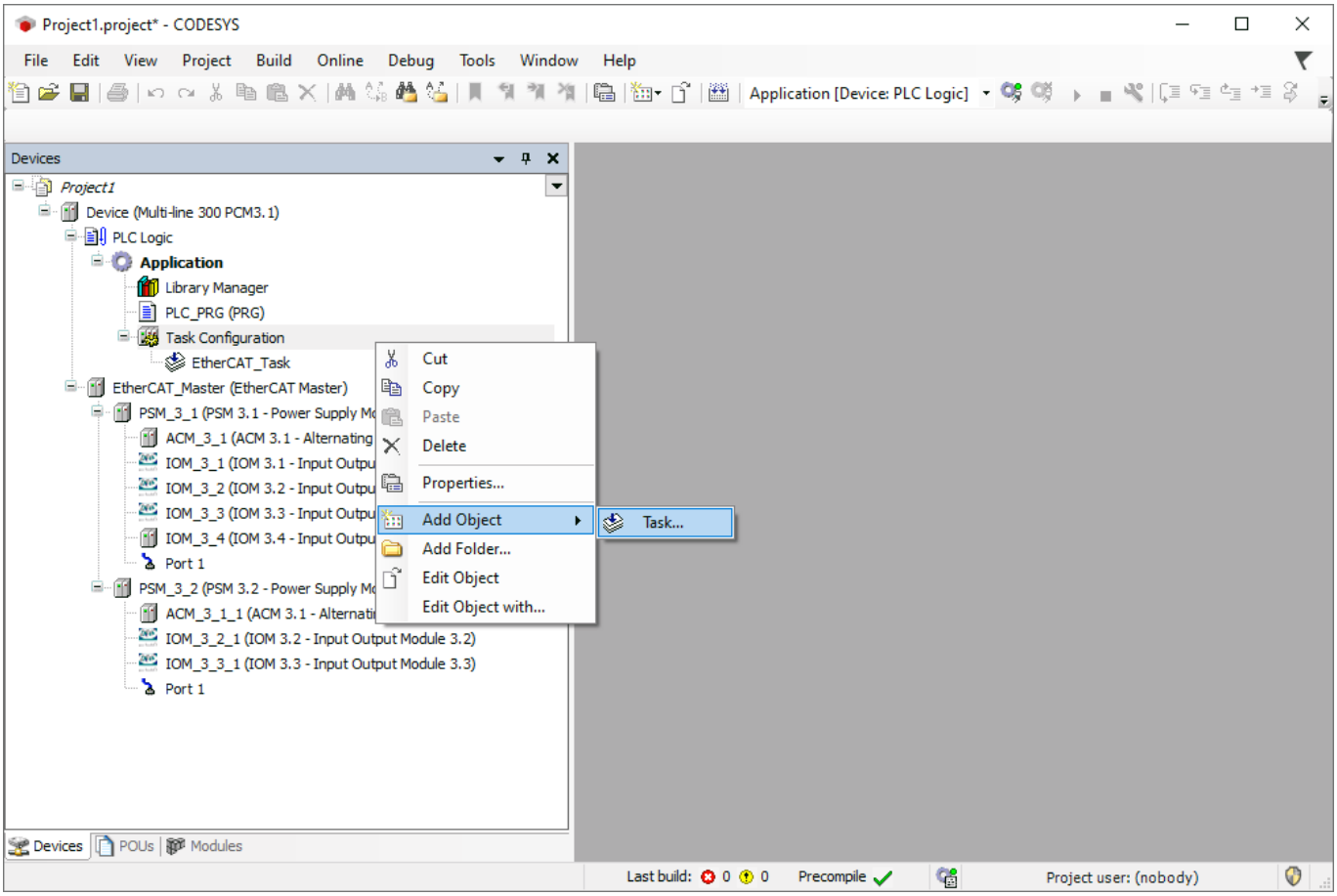
4.11 Write a program

Example of a program

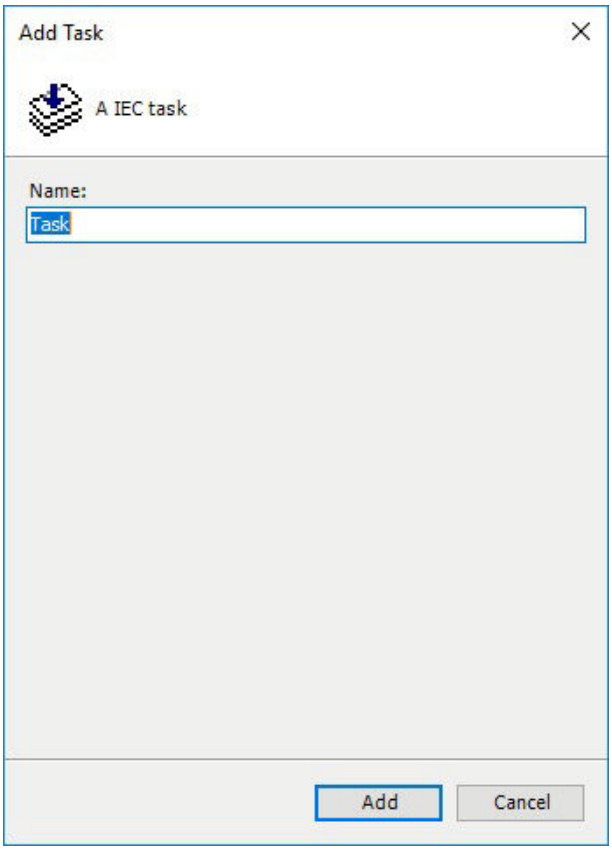


4.11.1 Add a task

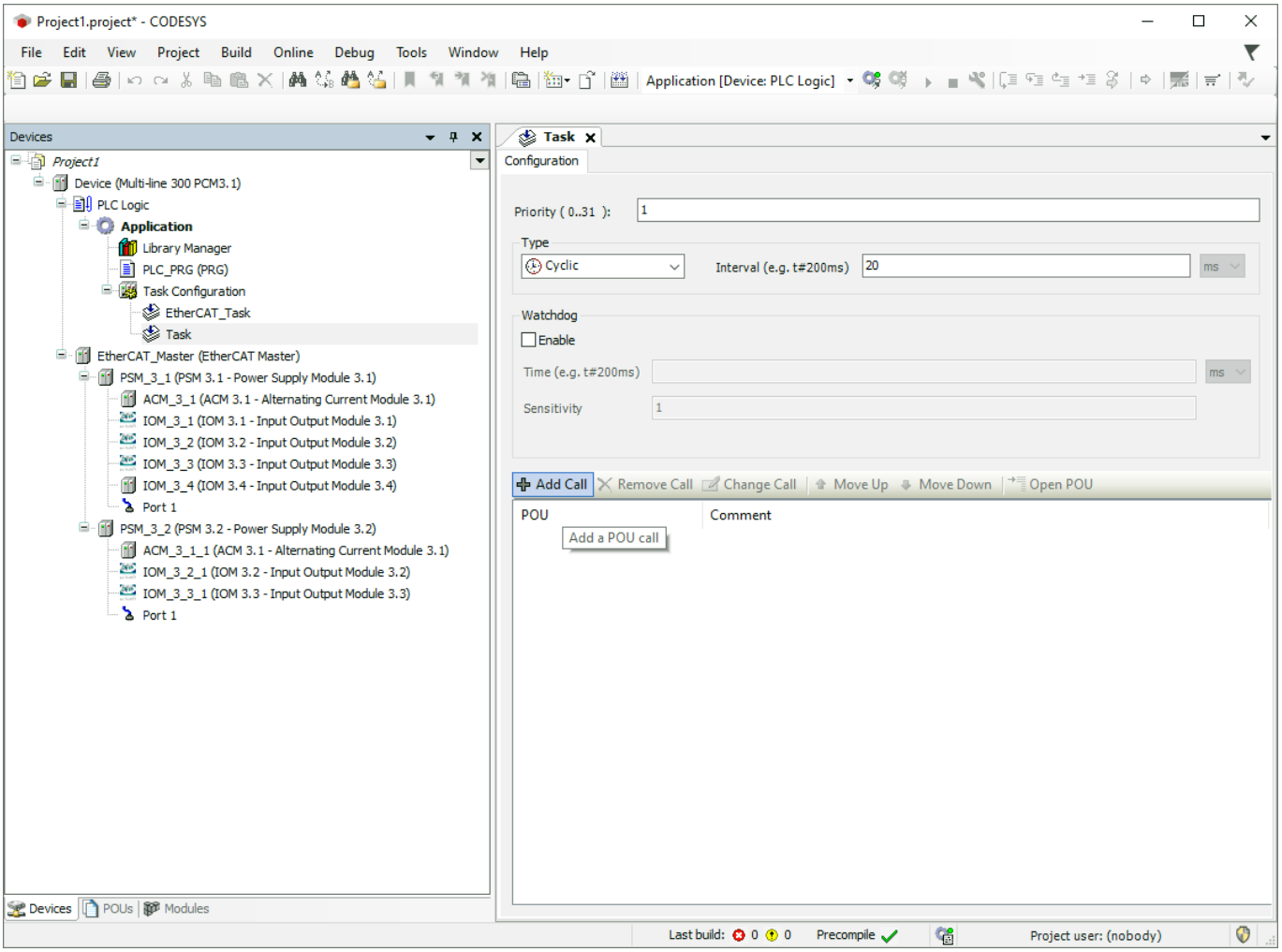
1. Select **Task configuration > Add Object > Task...**.



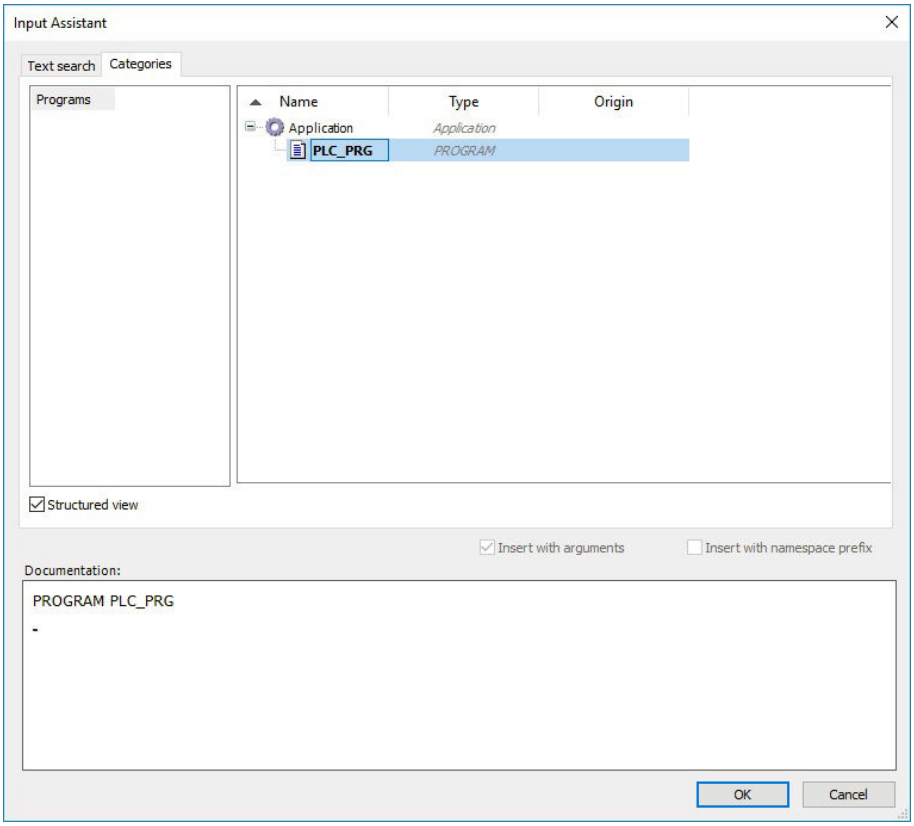
2. In the Add Task window, write a Task name and select **Add**.



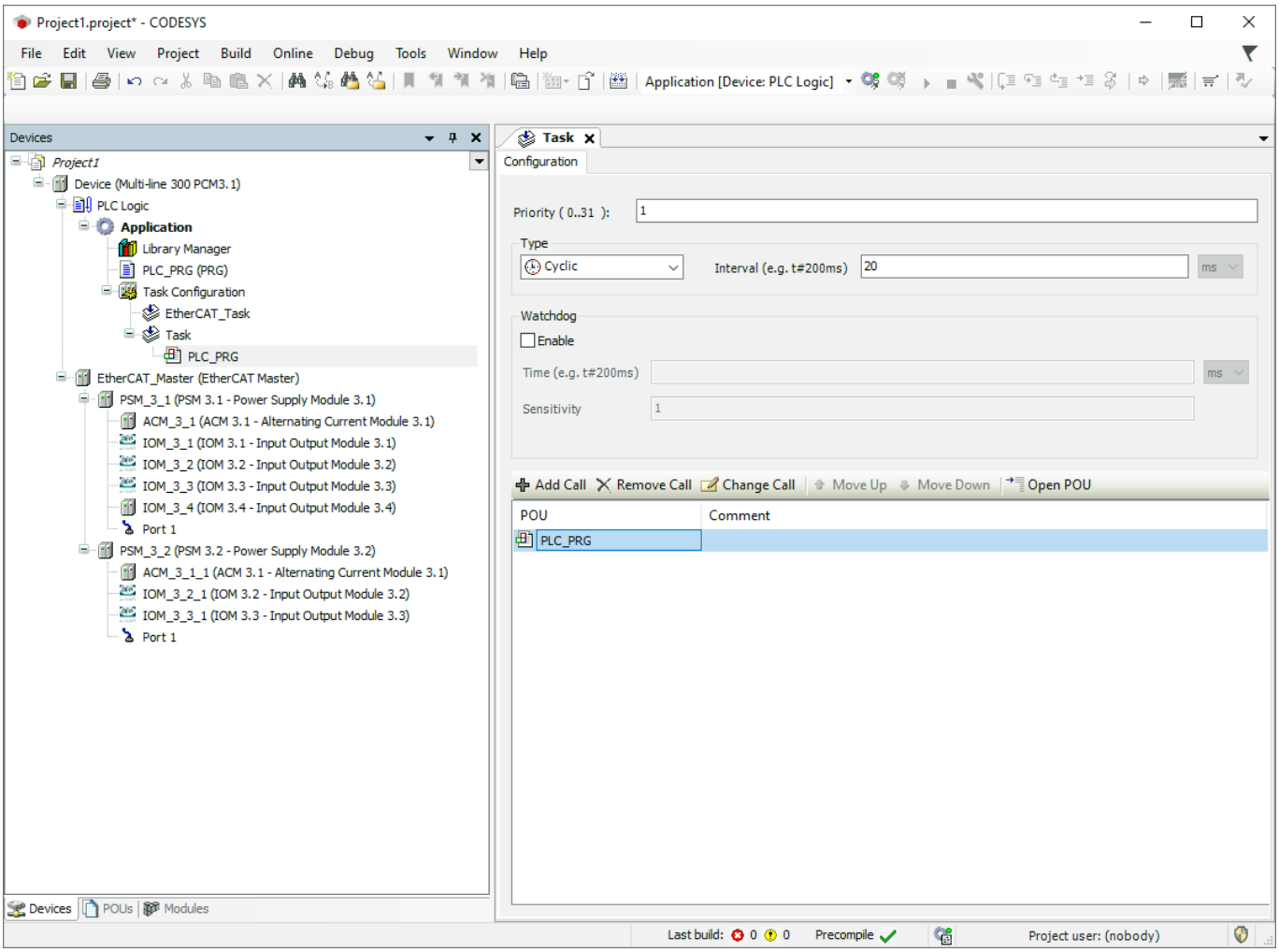
3. Select the **Add Call** tab.



4. In the Input Assistant window, select the program **PLC_PRG**.



5. The program PLC_PRG is now added to the project.

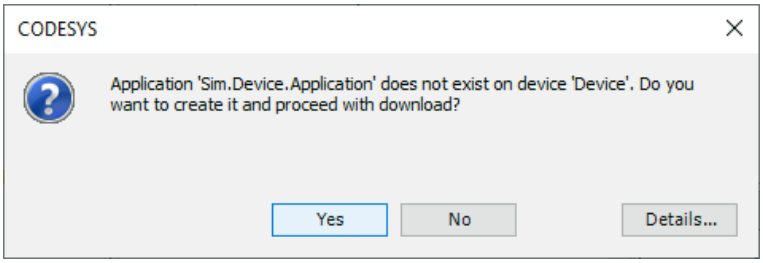


6. Login to the AMC 300.

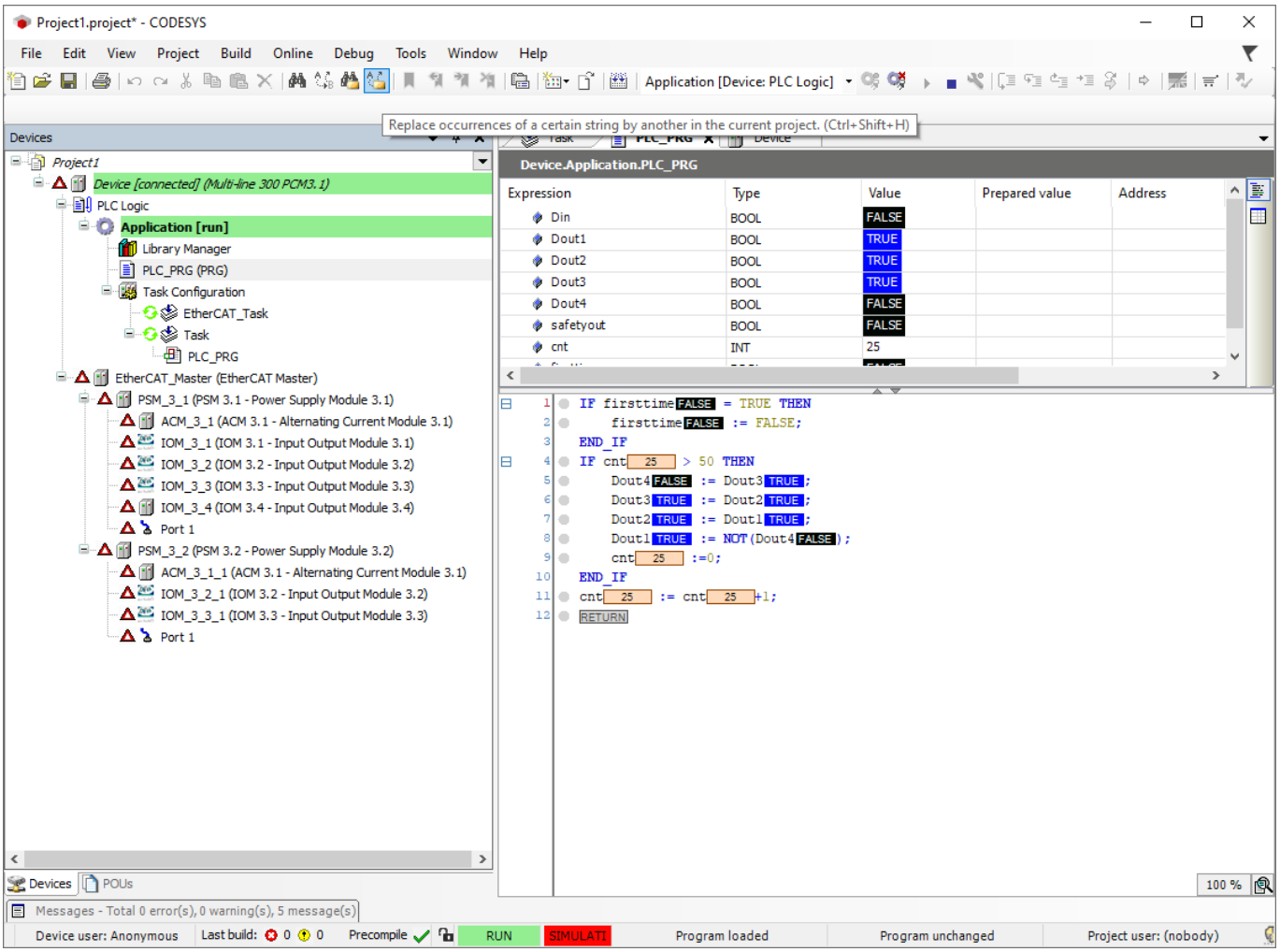
4.11.2 Simulation mode

It is possible to use Simulation mode, if an AMC 300 controller is not connected.

1. Select Simulation mode with **Online > Simulation**.
2. Login to the AMC 300 with **Online > Login**.
3. In the pop-up window, select **Yes** to create the program.

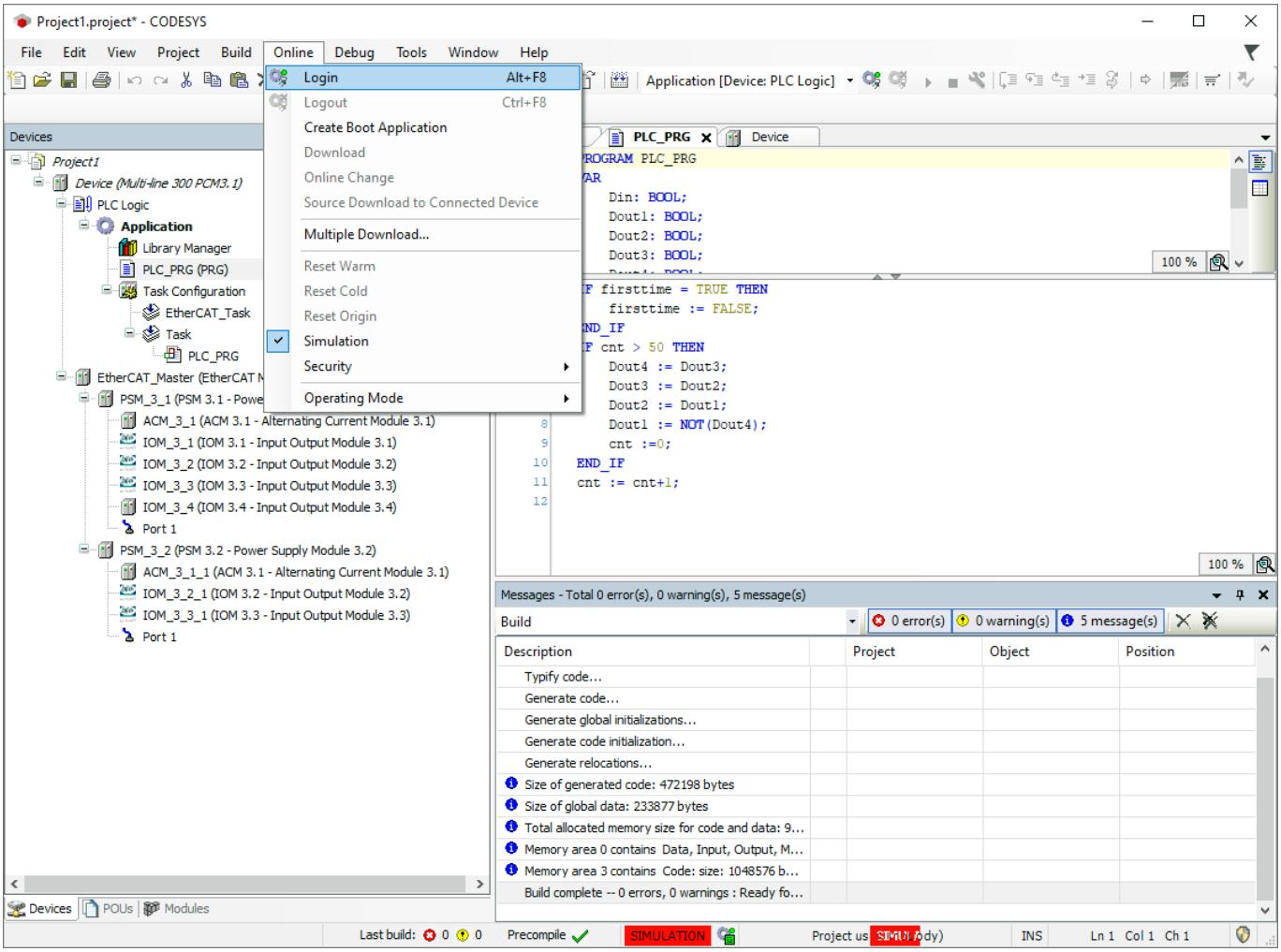


4. Select **Debug > Start** to run the program.


Project1.project* - CODESYS
File Edit View Project Build Online Debug Tools Window Help
Application [Device: PLC Logic]
Replace occurrences of a certain string by another in the current project. (Ctrl+Shift+H)
Devices
Project1
Device [connected] (Multi-line 300 PCM3.1)
PLC Logic
Application [run]
Library Manager
PLC_PRG (PRG)
Task Configuration
EtherCAT_Task
Task
PLC_PRG
EtherCAT_Master (EtherCAT Master)
PSM_3_1 (PSM 3.1 - Power Supply Module 3.1)
ACM_3_1 (ACM 3.1 - Alternating Current Module 3.1)
IOM_3_1 (IOM 3.1 - Input Output Module 3.1)
IOM_3_2 (IOM 3.2 - Input Output Module 3.2)
IOM_3_3 (IOM 3.3 - Input Output Module 3.3)
IOM_3_4 (IOM 3.4 - Input Output Module 3.4)
Port 1
PSM_3_2 (PSM 3.2 - Power Supply Module 3.2)
ACM_3_1_1 (ACM 3.1 - Alternating Current Module 3.1)
IOM_3_2_1 (IOM 3.2 - Input Output Module 3.2)
IOM_3_3_1 (IOM 3.3 - Input Output Module 3.3)
Port 1
Device.Application.PLC_PRG
Expression Type Value Prepared value Address
Din BOOL FALSE
Dout1 BOOL TRUE
Dout2 BOOL TRUE
Dout3 BOOL TRUE
Dout4 BOOL FALSE
safetyout BOOL FALSE
cnt INT 25
IF firsttime FALSE = TRUE THEN
firsttime FALSE := FALSE;
END_IF
IF cnt 25 > 50 THEN
Dout4 FALSE := Dout3 TRUE;
Dout3 TRUE := Dout2 TRUE;
Dout2 TRUE := Dout1 TRUE;
Dout1 TRUE := NOT(Dout4 FALSE);
cnt 25 :=0;
END_IF
cnt 25 := cnt 25 +1;
RETURN
100 %
Devices POUs
Messages - Total 0 error(s), 0 warning(s), 5 message(s)
Device user: Anonymous
Last build: 0 0
Precompile
RUN
SIMULATI
Program loaded
Program unchanged
Project user: (nobody)

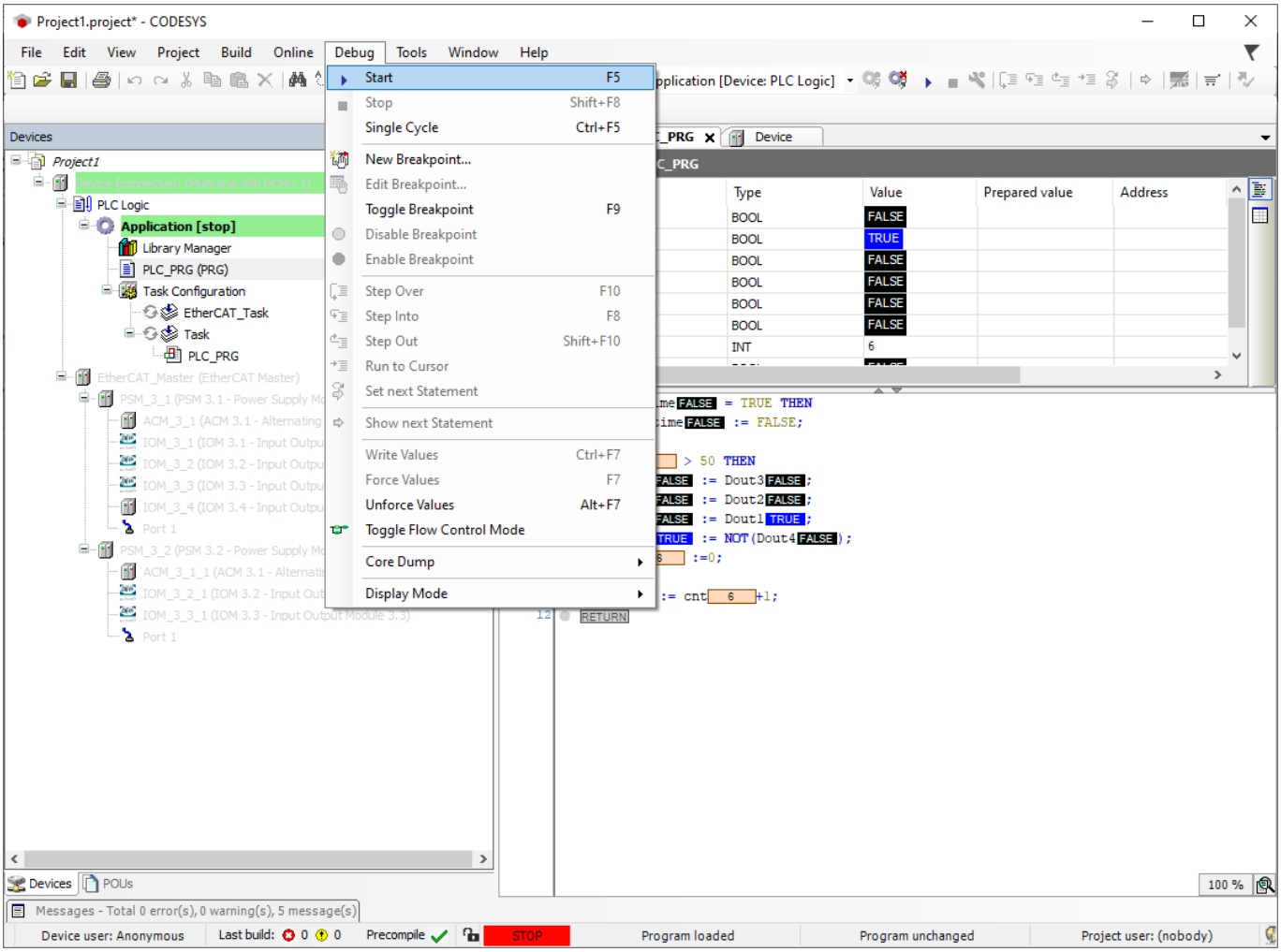
4.11.3 Login to AMC 300

Select **Online > Login**.



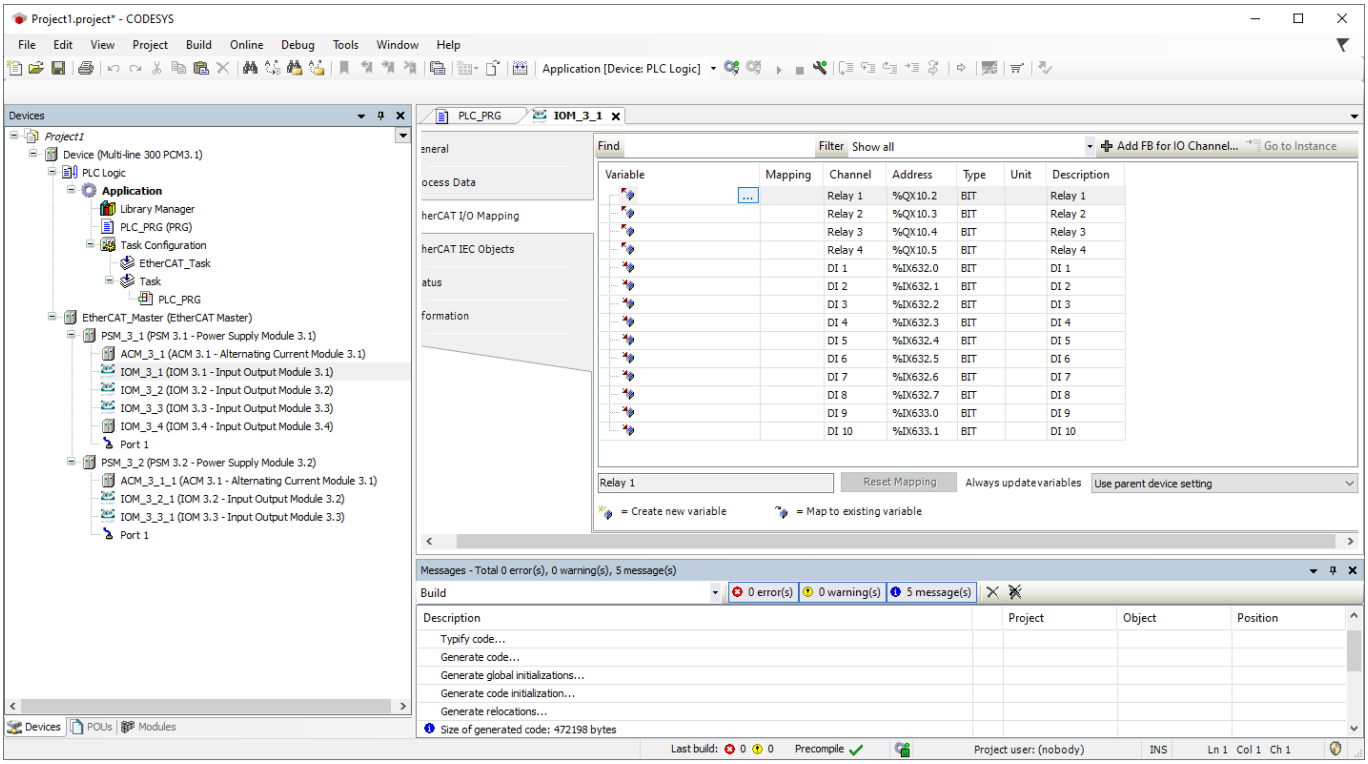
4.11.4 Start the program

To start the program, select **Debug > Start**.

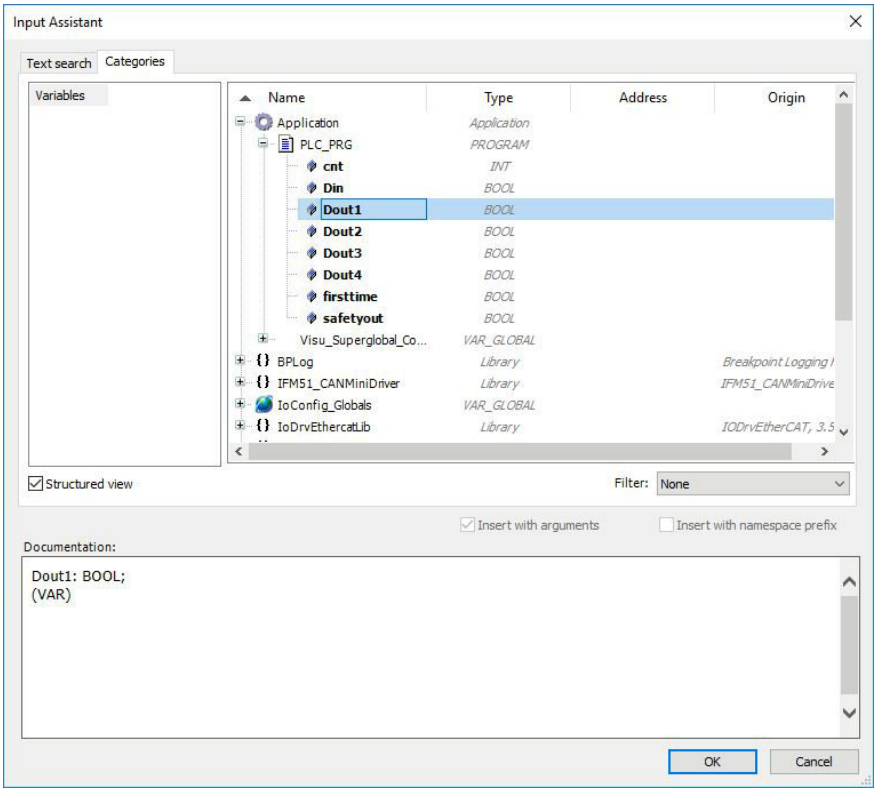


4.12 Link I/O variables to physical I/O

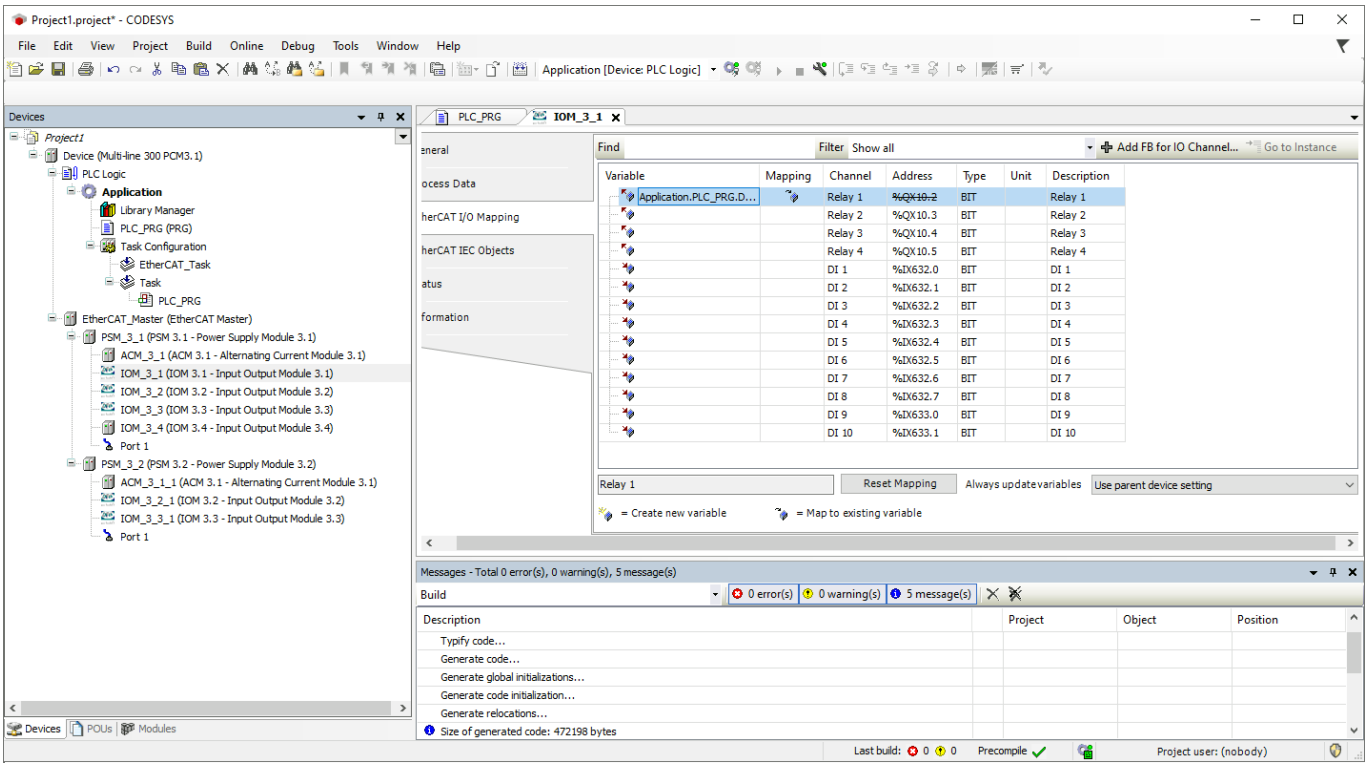
1. Select **Online > Logout** to go to offline mode.
2. Select a physical I/O.



3. Select **…** of **F2** to edit.
4. In the Input Assistant window, select a variable.



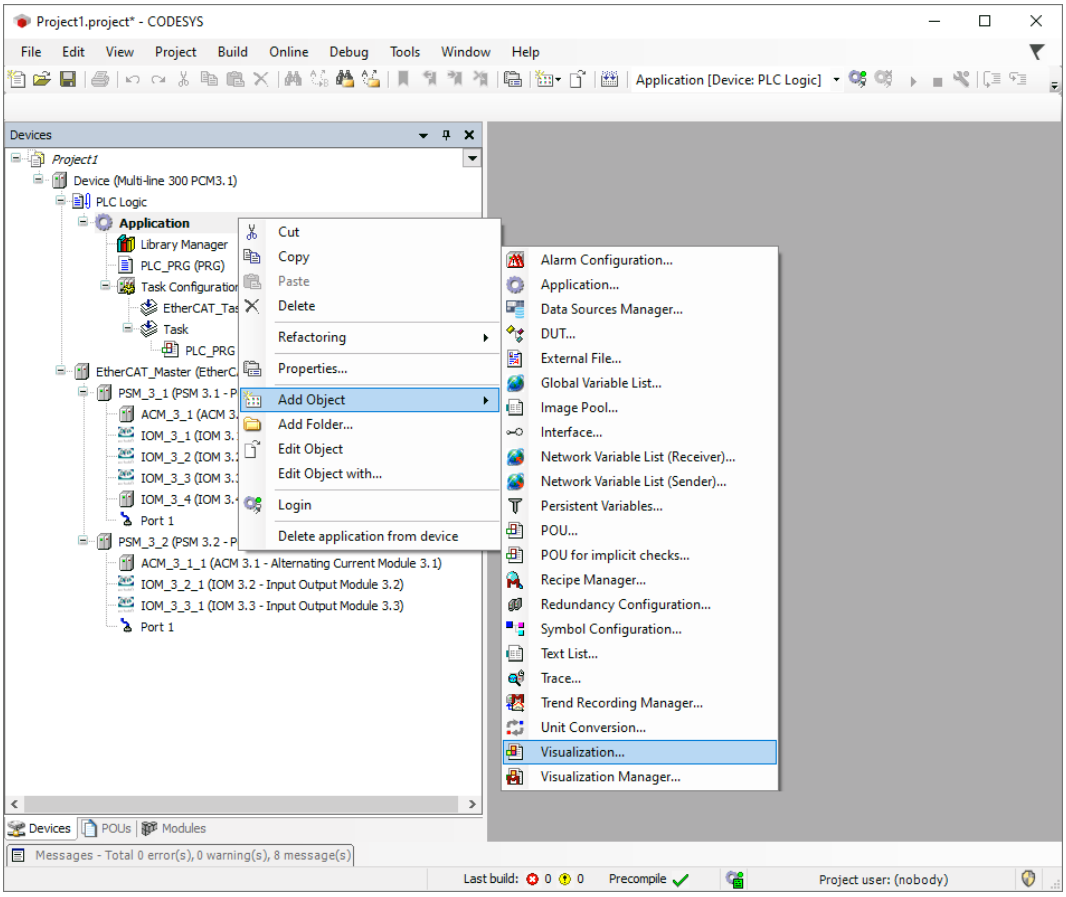
5. Select **OK** to link the variable to the physical I/O.



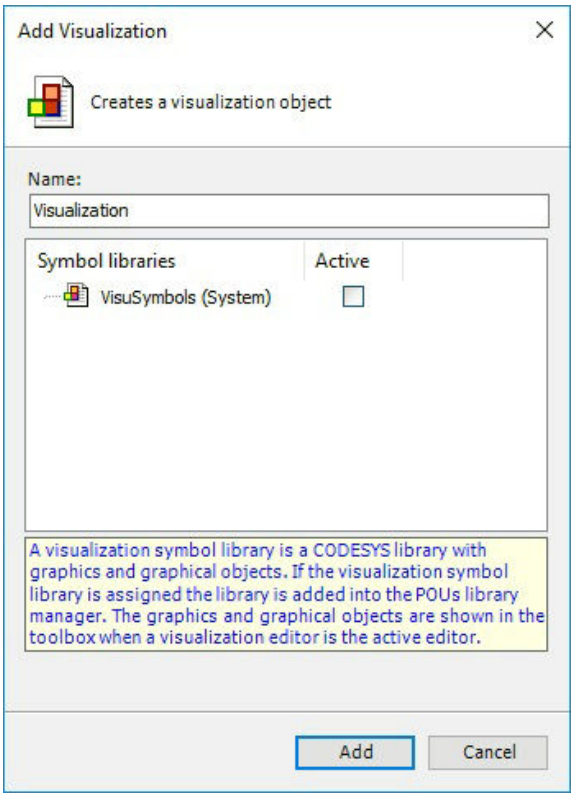
6. Repeat 1 to 5 for for all output variables.

4.13 Add visualization

1. Select **Application > Add Object > Visualization**.

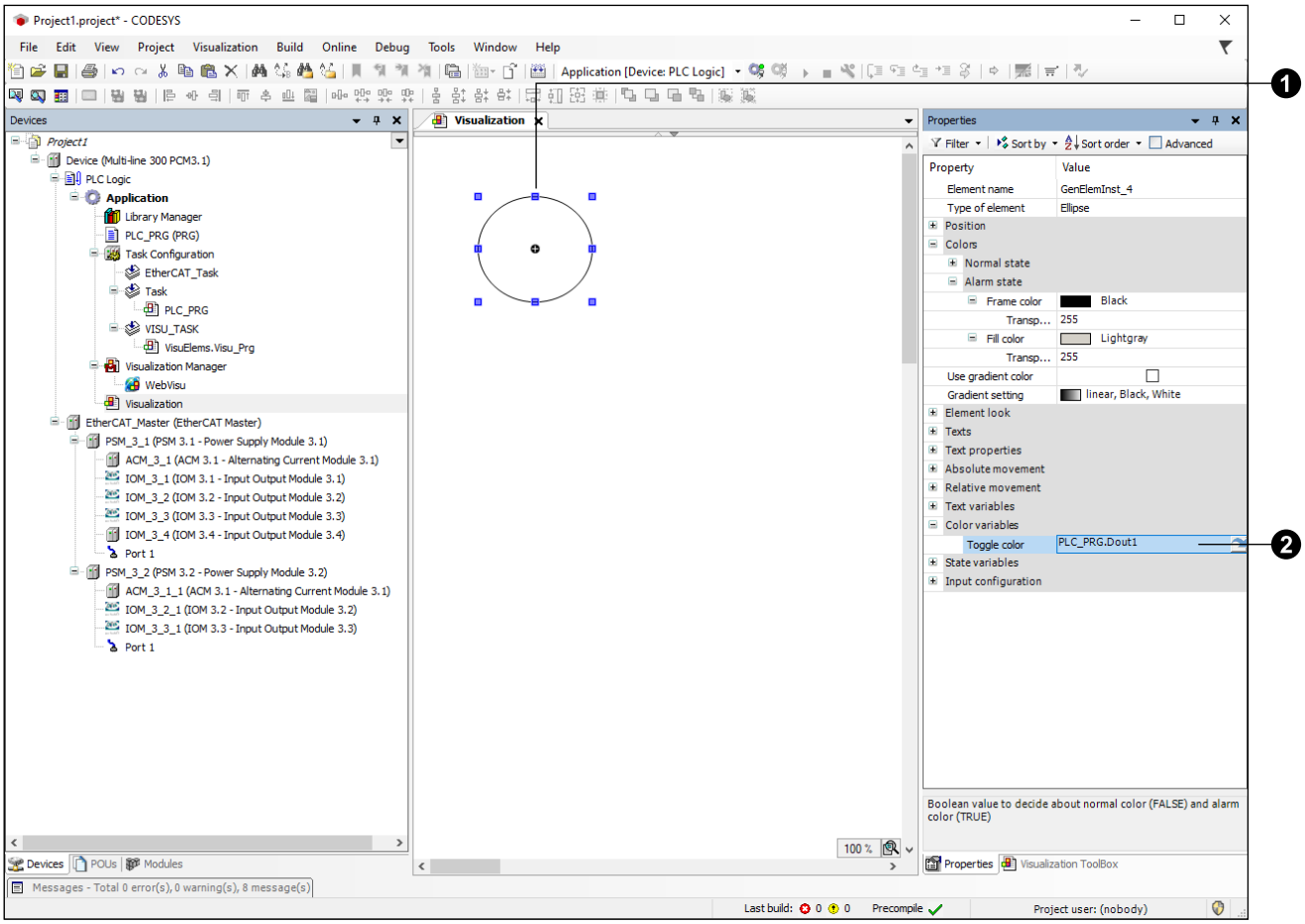


2. In the Add Visualization window, activate the **VisuSymbols (System)** library.
3. Select **Add**.

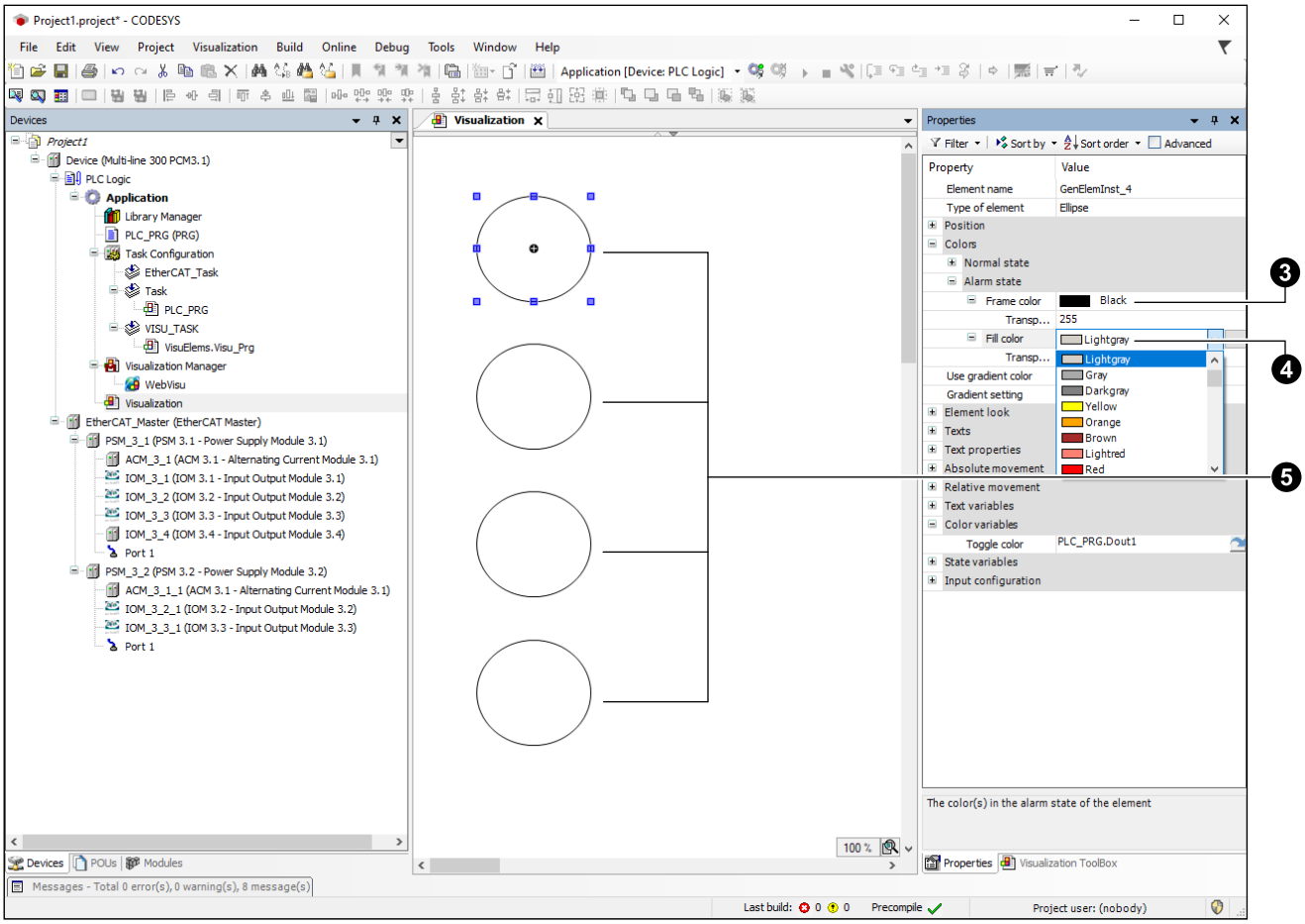


4.13.1 Drawing visualization (example)

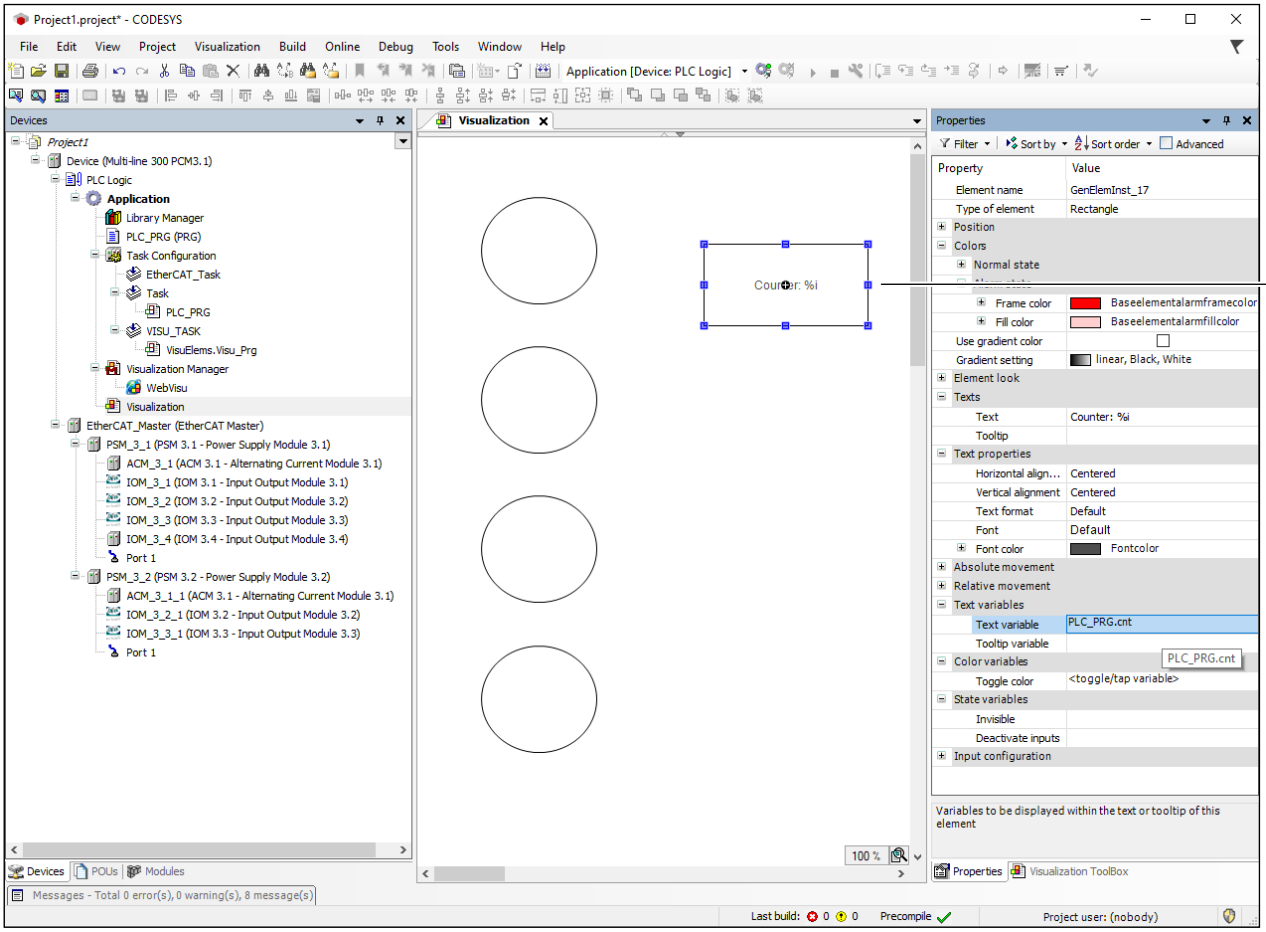
1. Draw an ellipse in the Visualization field.
2. Select **Properties > Color variation > Toggle Color** to link the ellipse to a variable.



3. Set **Properties > Colors > Alarmstate > Frame color** to Black.
4. Set **Properties > Colors > Alarmstate > Fill color** to Grey.
5. Repeat 1 to 4 (or copy-paste the ellipse) 3 times.

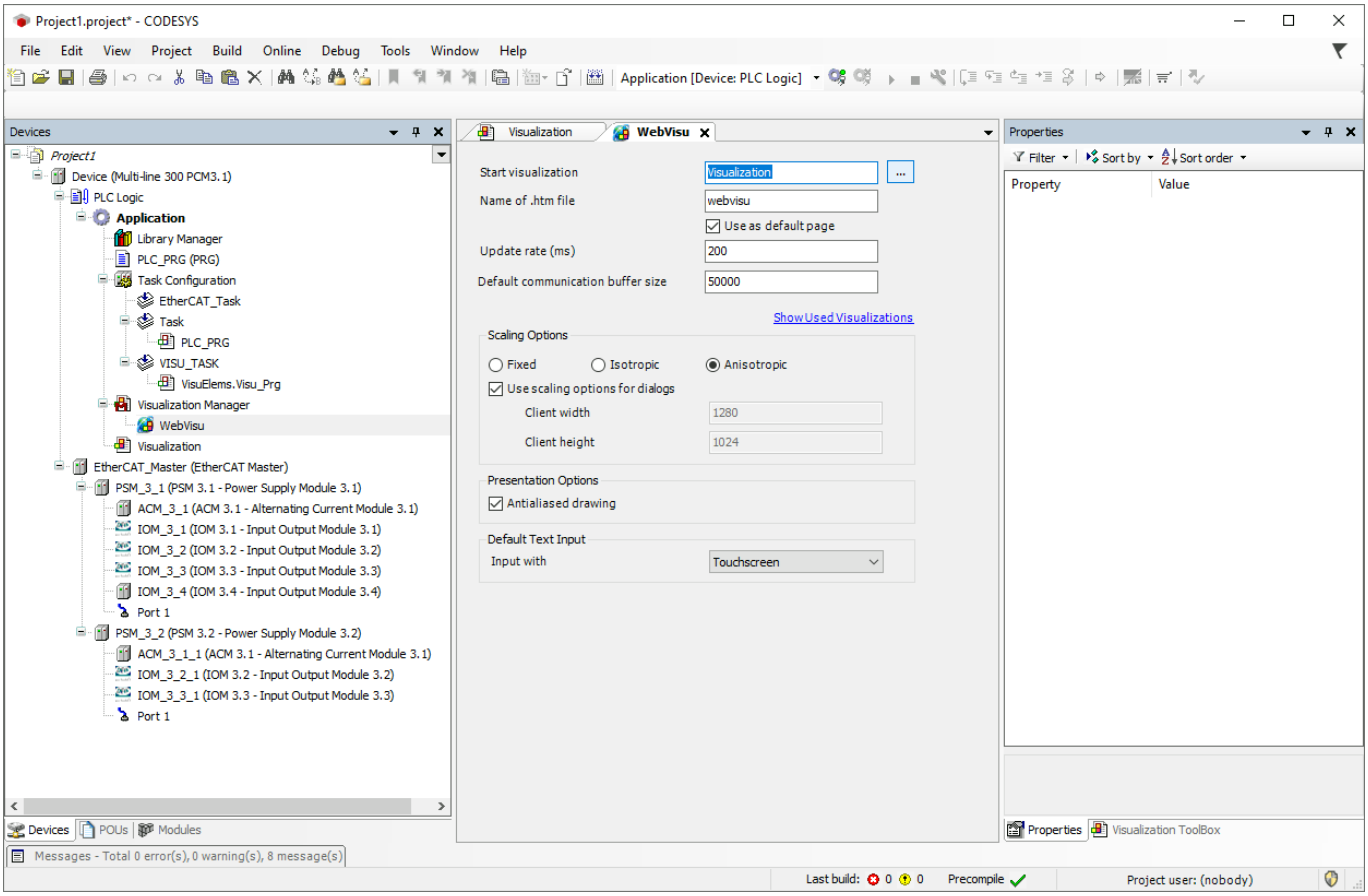


6. Use **Toggle Color** to change the new variables to other outputs.
7. Add a counter field (rectangle).

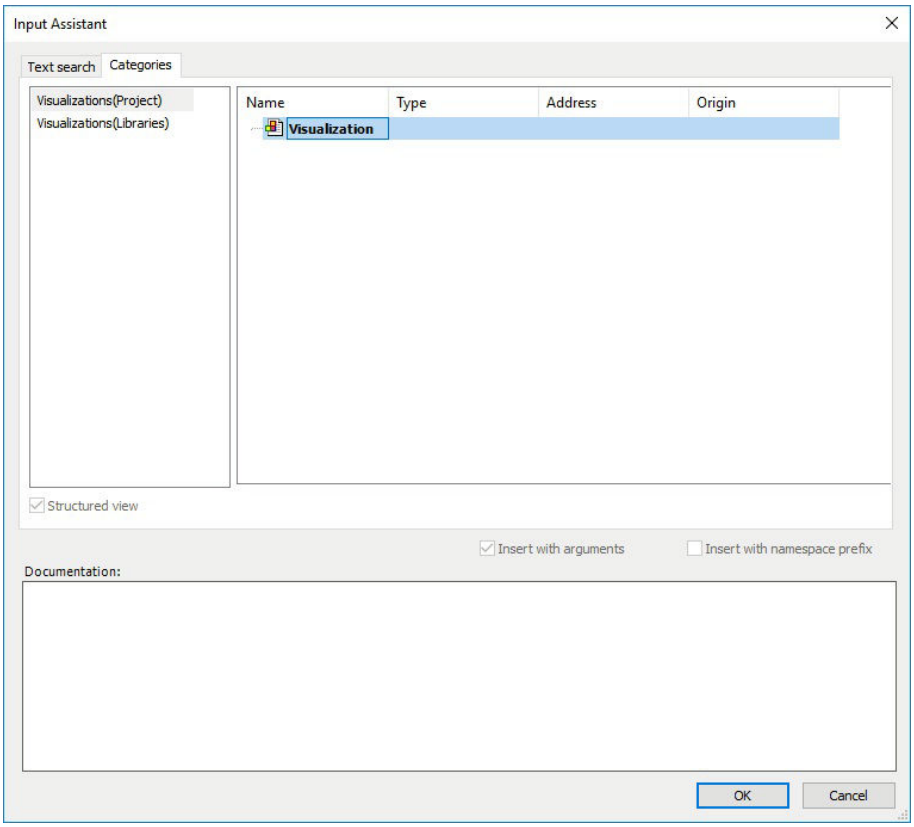

Project1.project* - CODESYS
File Edit View Project Visualization Build Online Debug Tools Window Help
Application [Device: PLC Logic]
Devices
Project1
Device (Multi-line 300 PCM3.1)
PLC Logic
Application
Library Manager
PLC_PRG (PRG)
Task Configuration
EtherCAT_Task
Task
PLC_PRG
VISU_TASK
VisuElems.Visu_Prg
Visualization Manager
WebVisu
Visualization
EtherCAT_Master (EtherCAT Master)
PSM_3_1 (PSM 3.1 - Power Supply Module 3.1)
ACM_3_1 (ACM 3.1 - Alternating Current Module 3.1)
IOM_3_1 (IOM 3.1 - Input Output Module 3.1)
IOM_3_2 (IOM 3.2 - Input Output Module 3.2)
IOM_3_3 (IOM 3.3 - Input Output Module 3.3)
IOM_3_4 (IOM 3.4 - Input Output Module 3.4)
Port 1
PSM_3_2 (PSM 3.2 - Power Supply Module 3.2)
ACM_3_1_1 (ACM 3.1 - Alternating Current Module 3.1)
IOM_3_2_1 (IOM 3.2 - Input Output Module 3.2)
IOM_3_3_1 (IOM 3.3 - Input Output Module 3.3)
Port 1
Visualization
Counter: %i
100 %
Properties
Filter Sort by Sort order Advanced
Property Value
Element name GenElemInst_17
Type of element Rectangle
Position
Colors
Normal state
Frame color Baseelementalarmframecolor
Fill color Baseelementalarmfillcolor
Use gradient color
Gradient setting linear, Black, White
Element look
Texts
Text Counter: %i
Tooltip
Text properties
Horizontal align... Centered
Vertical alignment Centered
Text format Default
Font Default
Font color Fontcolor
Absolute movement
Relative movement
Text variables
Text variable PLC_PRG.cnt
Tooltip variable
Color variables
Toggle color <toggle/tap variable>
State variables
Invisible
Deactivate inputs
Input configuration
PLC_PRG.cnt
Variables to be displayed within the text or tooltip of this element
Devices POUs Modules
Properties Visualization ToolBox
Messages - Total 0 error(s), 0 warning(s), 8 message(s)
Last build: 0 0 Precompile
Project user: (nobody)
7

4.13.2 Set main visualization

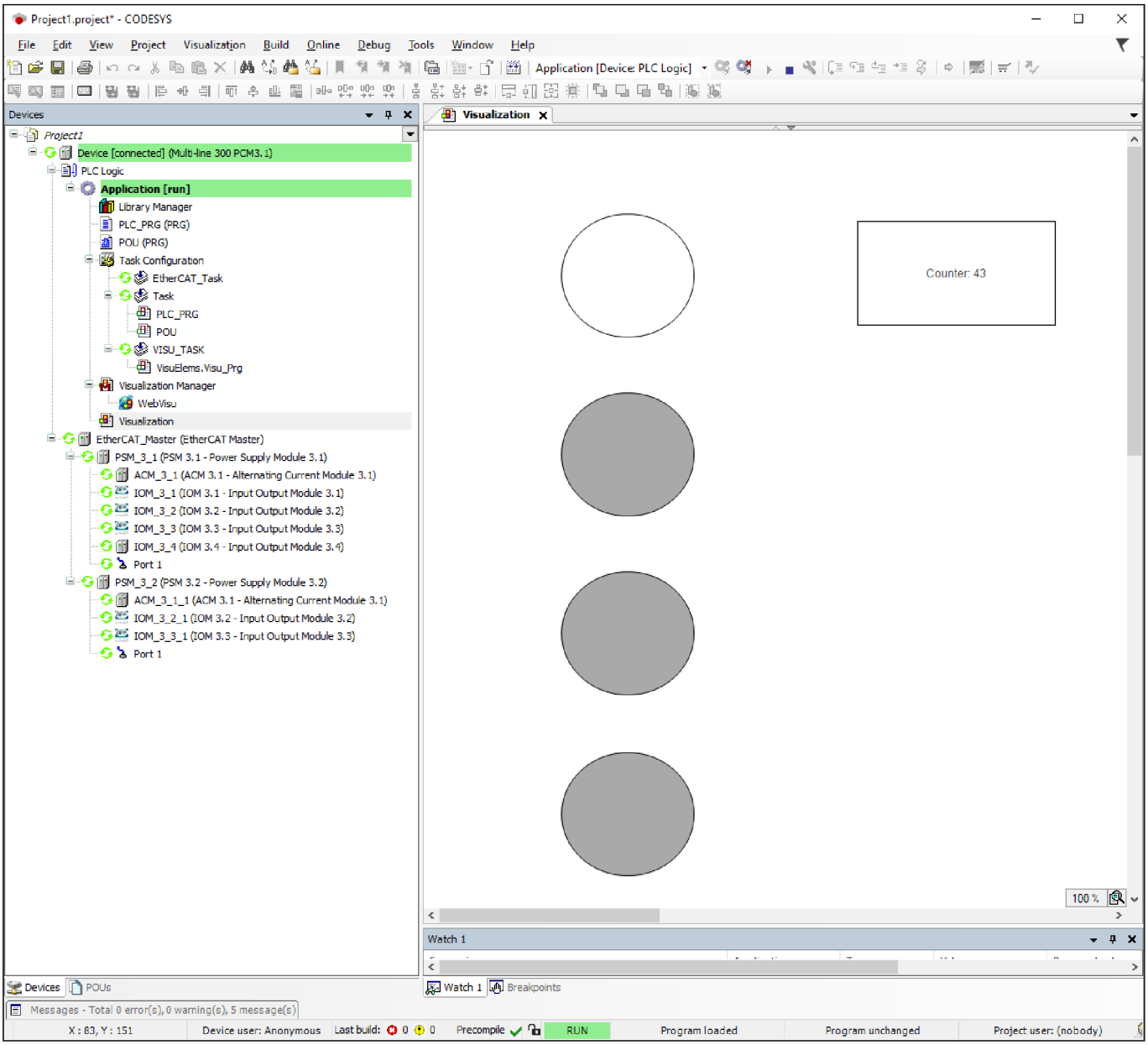
1. Select the **WebVisualization** tab.



2. In the Input Assistant window, select **Visualization**.



3. Select **OK**.
4. Login and run the program.
5. Select Visualization to view the first page.



4.13.3 View webvisualization or remote visualization

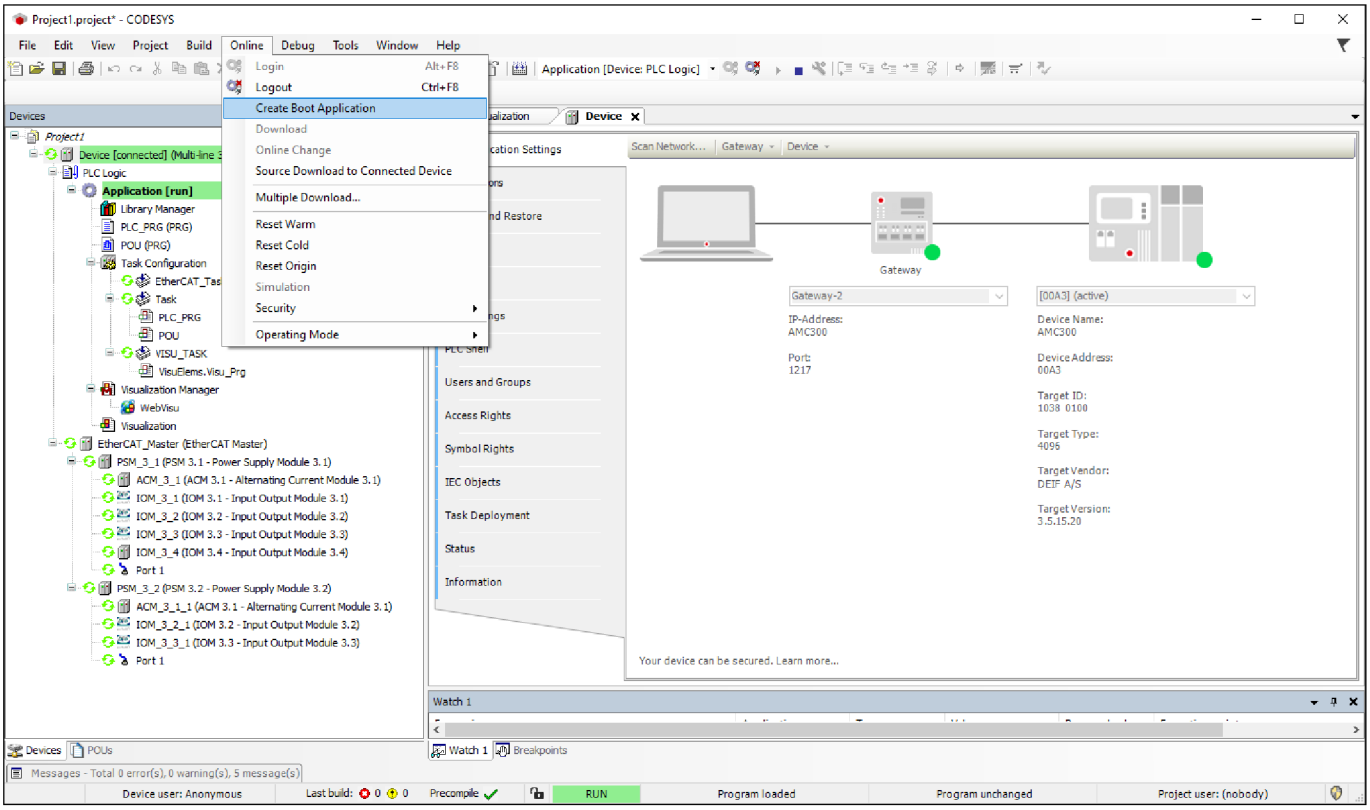
To see the webvisualization go to either

- http://[hostname or ip]:8000/webvisu.htm (for example, http://amc300.local:8000/webvisu.htm)
- *(Please note : the port is to be changed to port 8080 in later software versions)*
- via secure http to https://[hostname or ip]:8443/webvisu.htm (for example, http://amc300.local:8443/)

4.14 Create a boot project

To make the AMC 300 start with the application at power up, you can create a boot project in CODESYS.

1. Login to the AMC 300 via **Online > Login**.
2. Select **Online > Create boot application**.

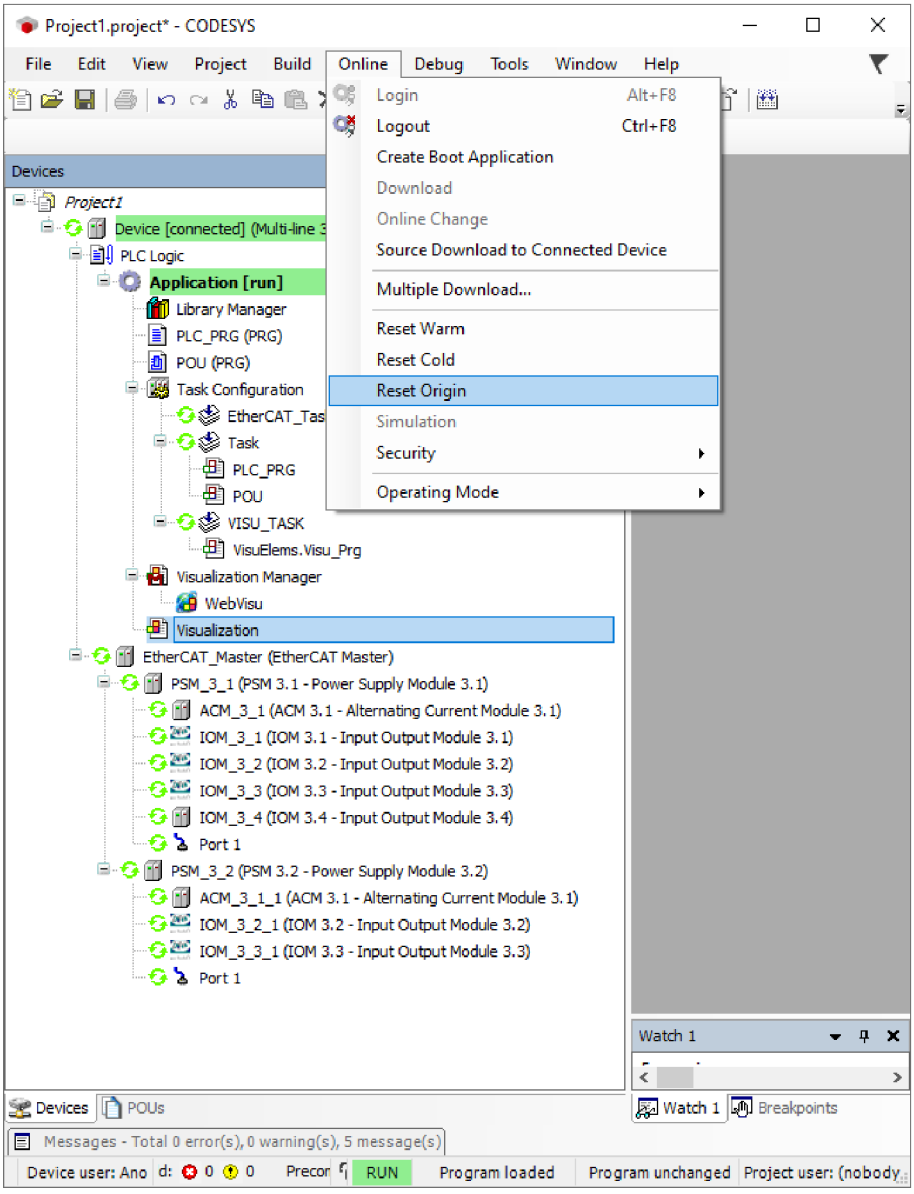


3. The boot project files are created under
   - /app/codesysapp/PlcLogic/Application
   - /app/codesysapp/PlcLogic/visu
4. Reboot the AMC 300.

Remove a boot project

Remove a boot project and clean all the application files in */app/codesysapp/PlcLogic/Application* and */app/codesysapp/PlcLogic/visu* folders.

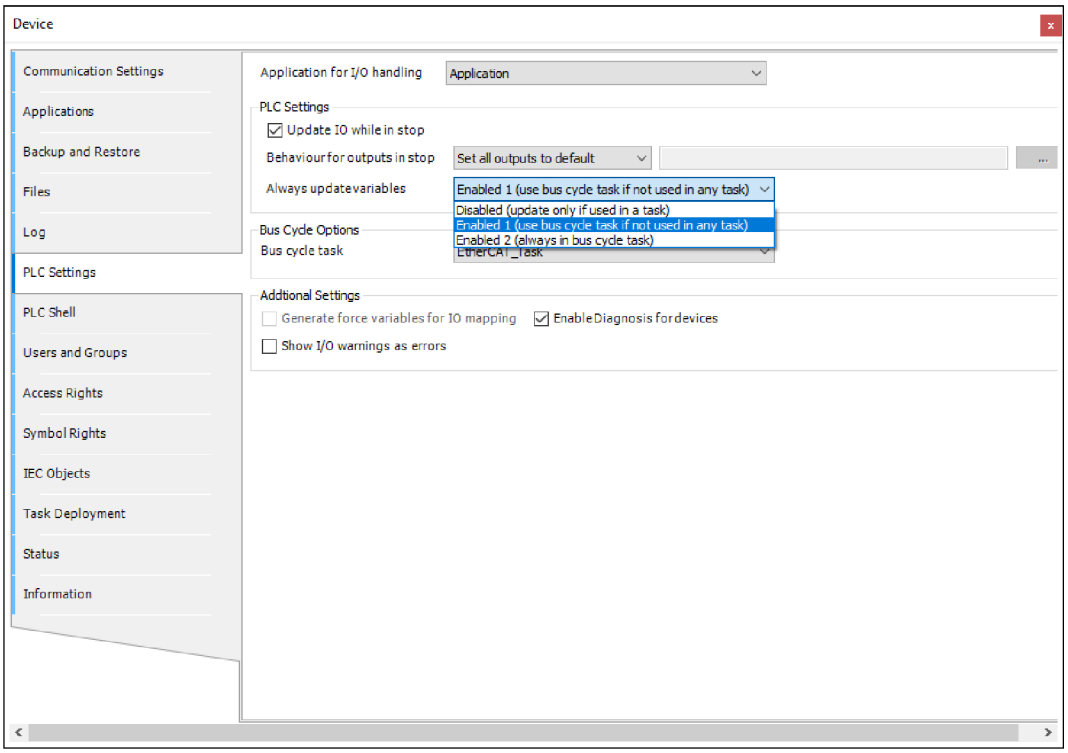
1. Login to the AMC 300 via **Online > Login**.
2. Select **Online > Reset origin**.



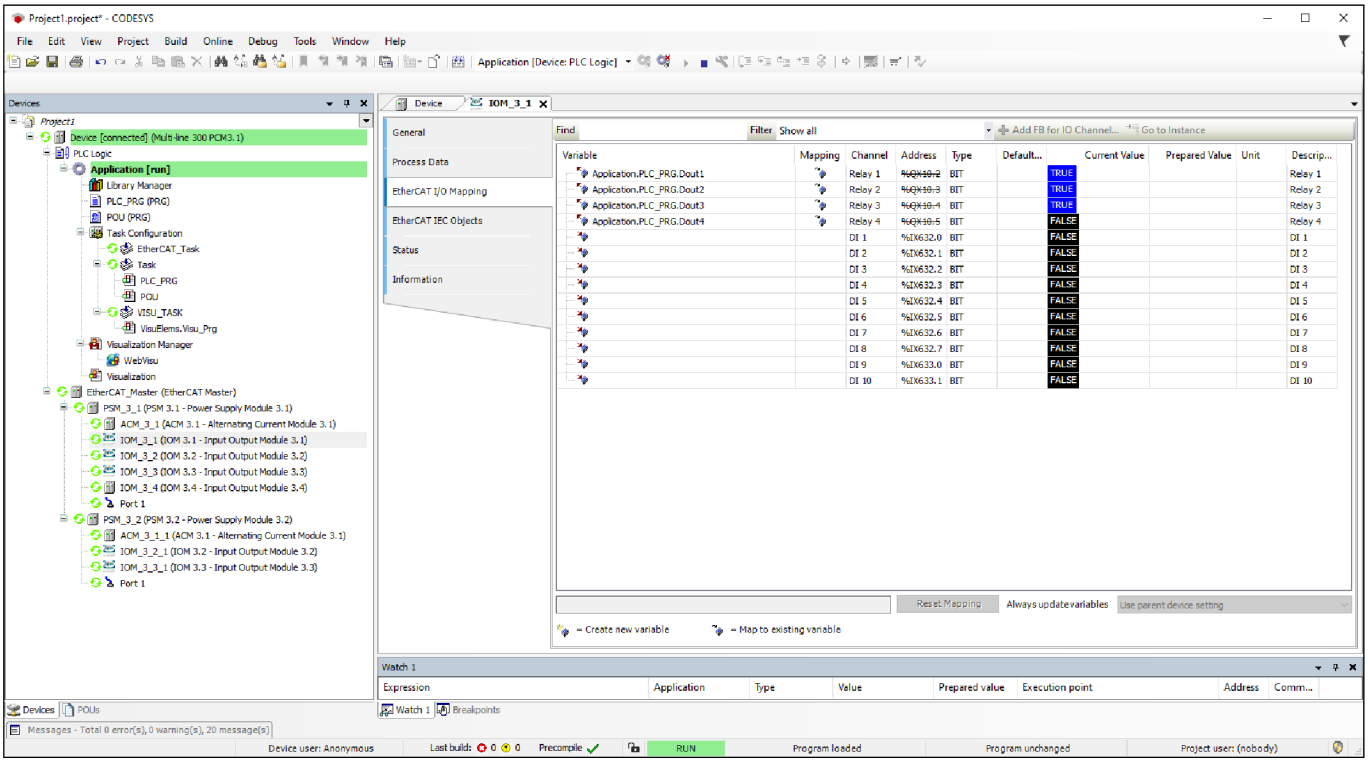
4.15 Manually force digital outputs for system testing

To manually force the digital outputs, for example for system testing, you must create a new empty project (see section **Create a new project**).

1. Scan for devices.
2. Add devices.
3. Select **AMC_300_PCM3·1 > PLC Settings**.
4. Check the box **Update IO while in stop**.
5. In the **Always update variables** drop-down list, select **Enable 1 (use bus cycle task if not used in any task)**.



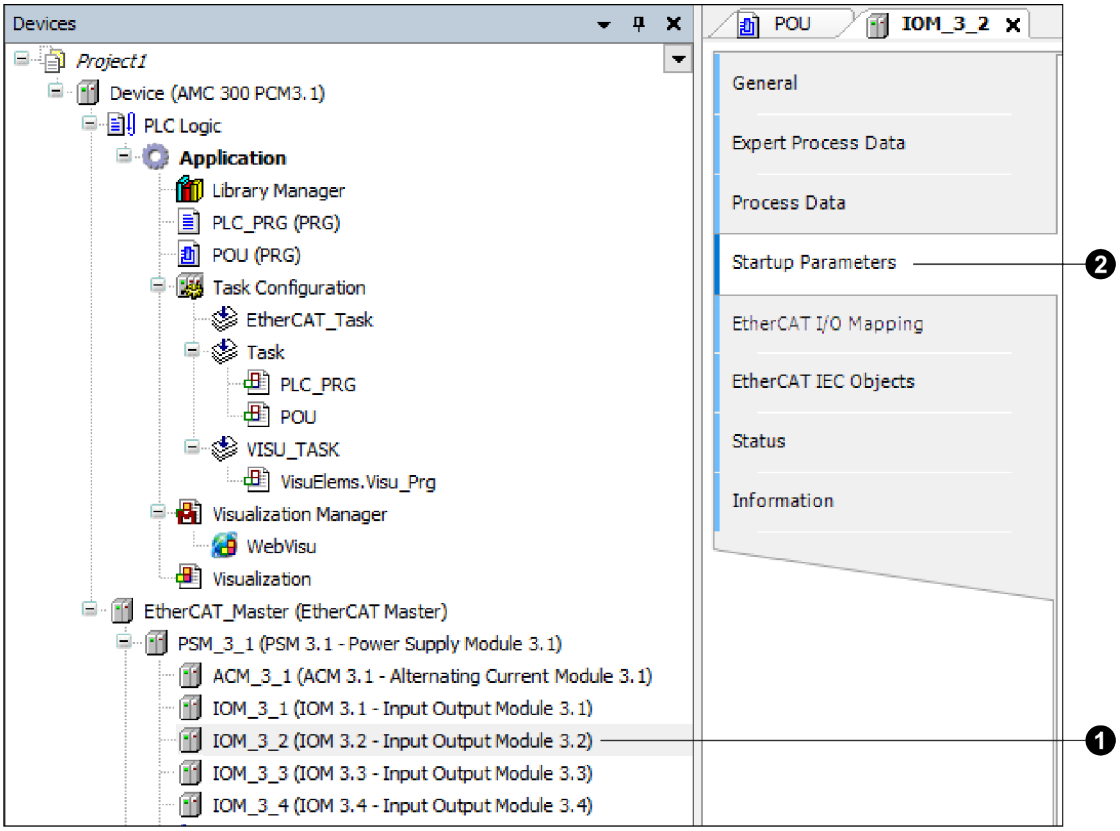
6. In the **Bus cycle task** drop-down list, select **EtherCAT_Task**.
7. Select **AMC_300_PCM3·1 > Application [run]**.
8. Under a module tab, select **EtherCAT I/O Mapping** to see the values of all inputs.
9. Double-click **Prepared value** for the value you wish to change.



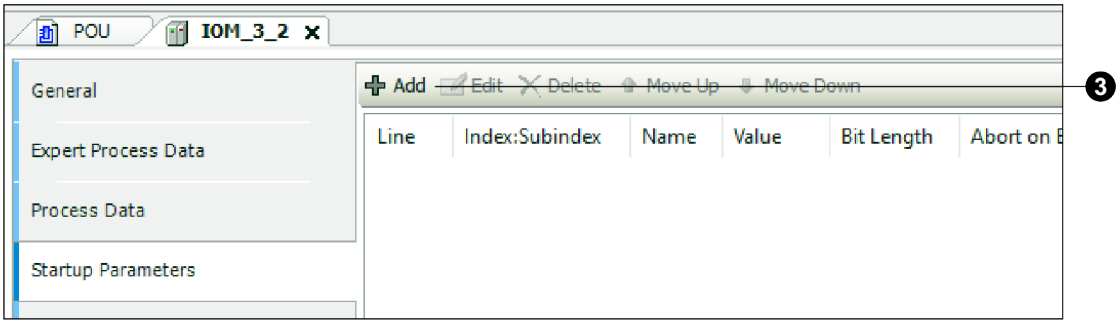
10. Select **F7** to force the new value.
11. Repeat #6 to #8 for other modules.

5. Configure Multi Inputs/Outputs

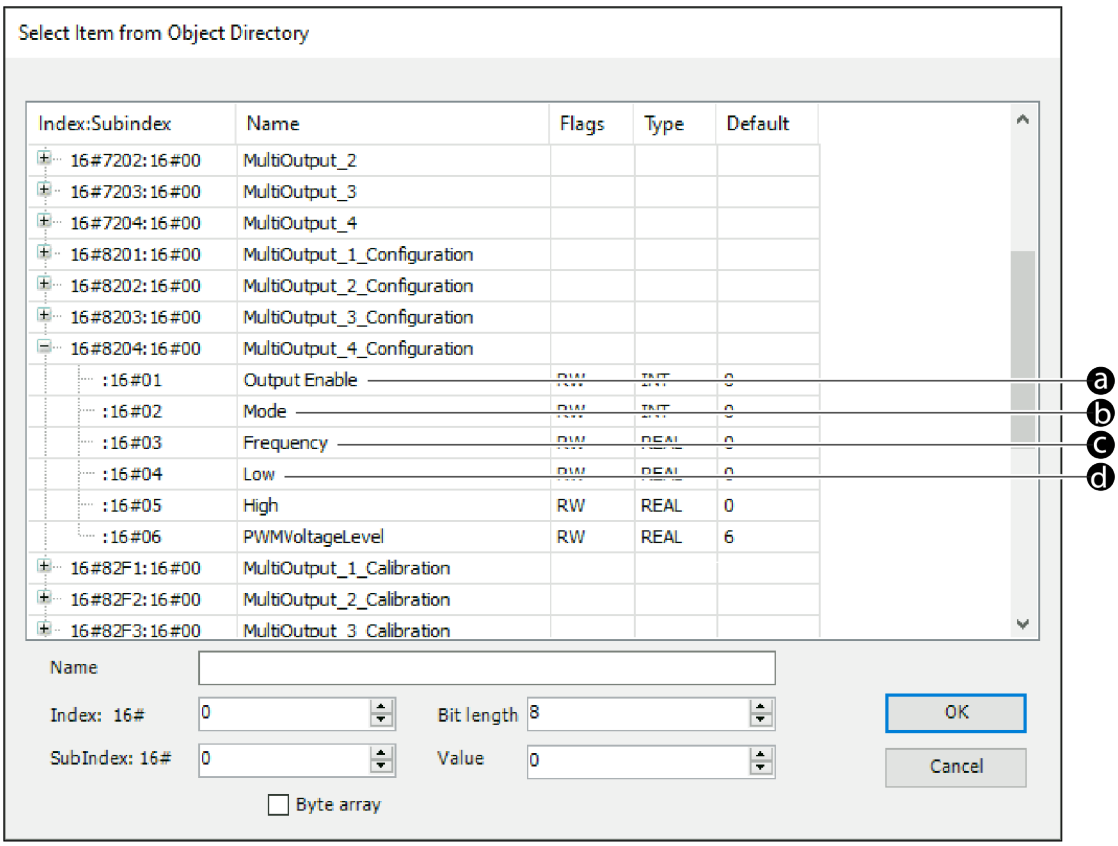
1. Select the relevant I/O module (example, IOM3.2).
2. Select *Startup parameters*.



3. Select *Add*.



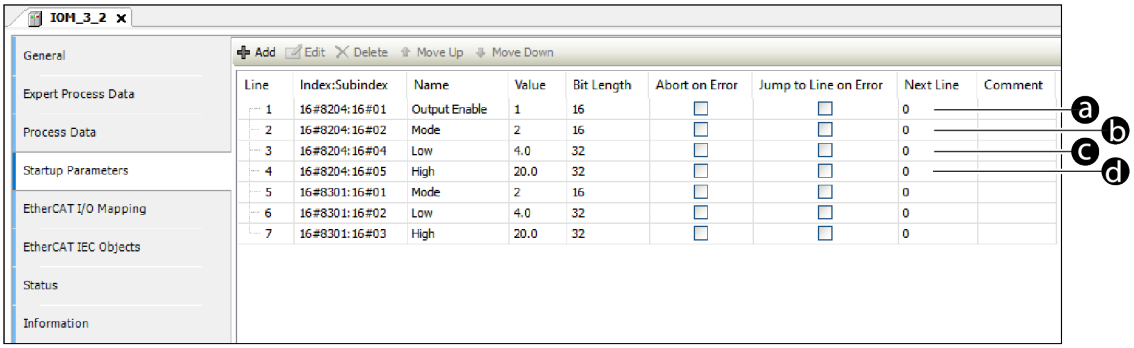
4. Select the setup parameters for an analogue output (example, MultiOutput_4).



a. Output Enable
b. Mode
c. Low
d. High

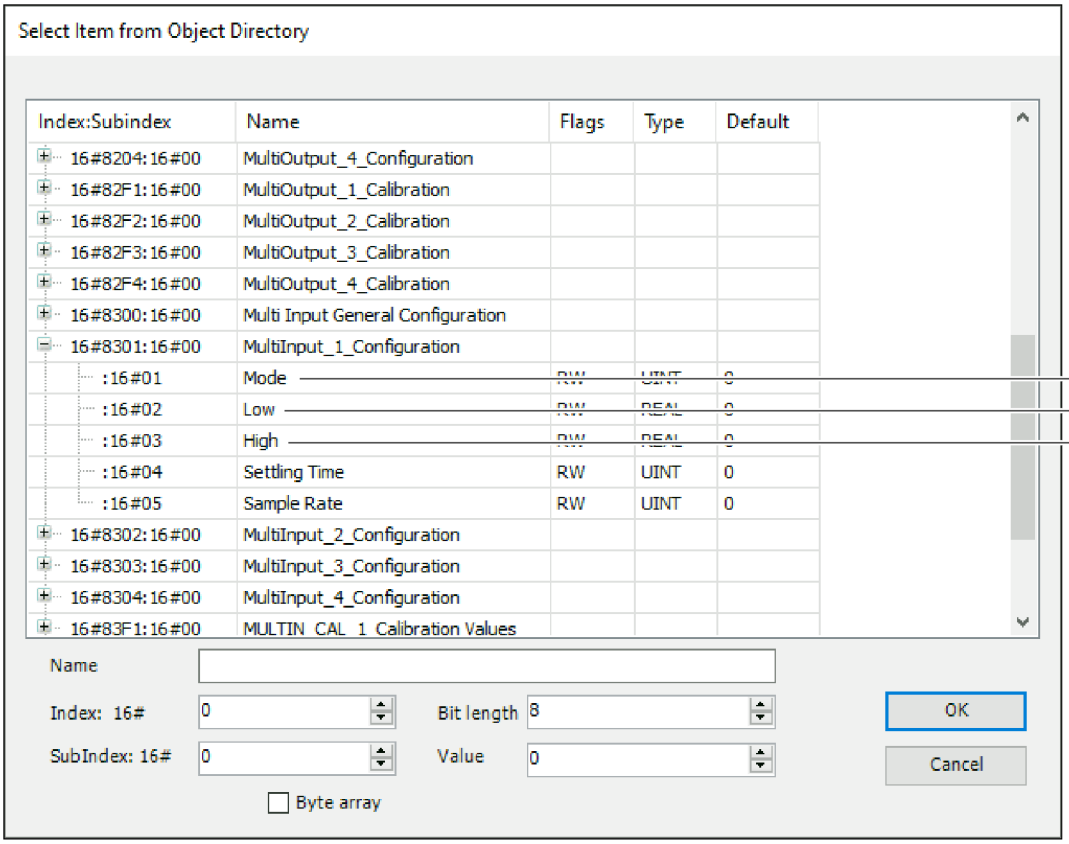
5. In the Value field, set the values for the MultiOutput Startup Parameters.

Example: Multi functional output configured as a 4-20 mA analogue current output.



Parameter	Value	Note
a. Output Enable	0 = Output not active 1 = Output active	
b. Mode	0 = Unknown 15 = Voltage out mode 16 = Current out mode	
c. Low	4.0 or -10.0	Lower measured limit. Examples: • 4-20 mA • ± 10 V
d. High	20.0 or 10.0	Upper measured limit.

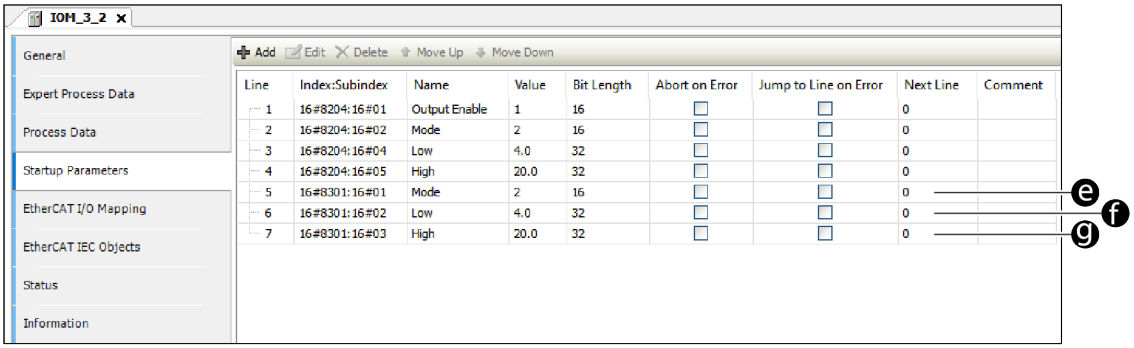
6. Configure the start parameters for a multi functional input (example, MultiInput_1).



e. Mode
f. Low
g. High

7. In the Value field, set the values for the MultiInput Startup Parameters.

Example: Multi functional output configured as a 4-20 mA analogue current output.



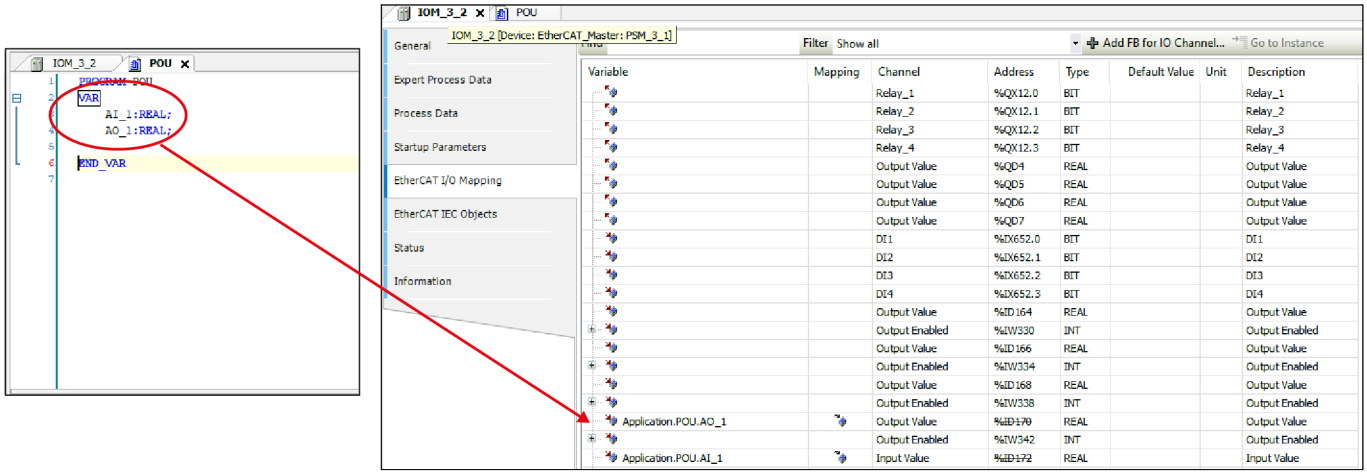
Parameter	Value	Note
e. Mode	0 = Unknown 1 = Voltage mode 2 = Current mode 3 = resistance mode 4 = Temperature mode 5 = Dry Contact mode	
f. Low	4.0 or -10.0	Lower measured limit. Examples: • 4-20 mA • ± 10 V
g. High	20.0 or 10.0	Upper measured limit.

MultiInput error codes

Parameter	Value
MI error	-10000 = Wire break -9999 = Input error -9998 = Under voltage -9997 = Over voltage -9996 = Under current -9995 = Over current -9994 = Under frequency -9993 = Over frequency -9992 = Short circuit -9991 = Over load -9990 = Unsupported mode -9989 = Unsupported range -9988 = Unsupported configuration -9987 = Invalid calibration

Attach I/Os to variables

I/Os can be attached from the POU tab to variables and used in the application logic.



A simple test is to wire the terminals of the MultiOutput as feedback to the MultiInput.

After download of the application, the MultiOutput analogue value can be forced and seen on the MultiInput analogue input.