EcoStruxure™ Control Engineering

Verification

User Manual

Original instructions

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Schneider Electric

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Table of Contents

Safety Information

Important Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

Before You Begin

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

⚠ WARNING

UNGUARDED EQUIPMENT

- Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.
- Do not reach into machinery during operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and

serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

> **NOTE:** Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

Start-up and Test

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check are made and that enough time is allowed to perform complete and satisfactory testing.

⚠ **WARNING**

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.

- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

Operation and Adjustments

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

Introduction

EcoStruxure Control Engineering - Verification (formerly known as PLC Checker) is a static analysis tool that analyses PLC and PAC codes to verify if they respect programming and conception rules, and to measure metrics, as defined in a rules file. Following the analysis, the results are generated in two formats:

- Dashboard view – A graphical overview of the results, useful for monitoring the evolution of the program throughout the development process.
- Result Detail view – A list of all the non-conformity messages generated by the analysis, to support the automation engineers in improving their code.

The use of EcoStruxure Control Engineering - Verification is valuable at different stages of the software lifecycle, but it is generally used during program development, with two typical use cases:

- Regular use throughout the development to help find bugs as early as possible when it is cheapest and easiest to deal with them.
- Automate final code review step / Audit code – Two runs of the tool at the end of development. The first run to find any non-conformities and to support code improvement, and the second run to confirm the improvements have been made.

EcoStruxure Control Engineering - Verification is a SaaS application and is accessible via a web platform. How to access and use the web platform is explained in part two of this user guide.

EcoStruxure Control Engineering - Verification is an agnostic tool and supports programs written for a number of different PLC and PAC makes and models, including: Schneider Electric Control Expert (formerly Unity Pro), Schneider Electric Machine Expert, Schneider Electric PL7-PRO, Siemens TIA Portal, Siemens Symatic Step 7, Rockwell Automation RS Logix 5000, and many more.

Highlights

The reverse engineering method used to develop the product is unable to guaranty the support for all the possible constructions of control codes, this may result in missing elements during the analysis of the control codes.

NOTICE
RISK OF INACCURATE OR INCOMPLETE ANALYSIS DUE TO REVERSE ENGINEERING TECHNIQUES
• The user should consider that the results may be inaccurate or incomplete when interpreting them.
Failure to follow these instructions can result in equipment damage.

Software development tools provide code protection features to prevent access to intellectual property, EcoStruxure Control Engineering tools are not able to read these locked codes. If your program contains any locked code, this code will not be analyzed. The user is responsible for providing a complete code export of their PLC code. If some code is missing in input files, this code will not be analyzed. The user is responsible for providing a complete, up-to-date code export of their PLC code. If some code is missing in your program, this code will not be converted, analyzed or documented.

NOTICE
RISK OF INACCURATE OR INCOMPLETE ANALYSIS DUE TO QUALITY OF INPUT FILES
Before using EcoStruxure Control Engineering – Verification to analyze their program, the user must:
• Unlock the program elements in the input files.
• Check the completeness of the input files.
• Check that the input files contain the up to date version of the program.
Failure to follow these instructions can result in equipment damage.

The Schneider Electric default rules files are provided as is. If you create or modify a rules file, it is your responsibility to test it and ensure that it functions correctly. The filters (regular expressions, selectors...) are powerful tools that allows you to customize precisely which entities are selected and/or checked. They can be semantically invalid while being syntactically correct. It is up to you to test them with the appropriate test cases before using them for your programs analyses..

NOTICE

RISK OF INACCURATE OR INCOMPLETE ANALYSIS DUE TO RULES FILE

• The user must provide a valid and tested rules file

Failure to follow these instructions can result in equipment damage.

Usages

In order to use EcoStruxure Control Engineering - Verification, there are some elements that you need to have before getting started.

1. First, the user needs to **access the EcoStruxure Control Engineering platform**. Depending on your setup, it can be an access to the Cloud server or on an on-premise server. The corresponding procedure is described in the chapter Register on EcoStruxure Control Engineering, page 14. Your account needs to be activated before being able to continue.

2. Secondly, once you have access to the platform, a specific program directory or repository should be created for the analysis. The different program directories can be ordered into a specific project. The procedure is explained in chapters Project and Program creation, page 16. Once created, you can invite other users to work on you program (to allow them to do the next steps).

3. Then, you may need to prepare your **rules file**. The rules file describes what will be verified in your program. If you will use a default rules file, no preparation is required as this is available directly on the platform and can be chosen during the program creation process. If you will use a custom rules file, you will need to get this from your client, quality service, or Schneider Electric services. If you get this rules file in advance, you can upload this during the program creation process. Otherwise, you can upload the rules file later on the already created program directory.

4. Then, you need to have an **export in the right format of your PLC application**. The export format and the export procedure are dependent on the type of PLC you are using. Refer to the chapter **5. PLC export file generation**, page 46 to learn more about the different exportation processes. If you get this export file(s) in advance, you can upload this during the program creation process. Otherwise, you can upload the export file(s) later on the already created program directory.

5. Lastly, you will need to have a **valid licence** to use EcoStruxure Control Engineering - Verification. A licence could already have been purchased and owned by you, otherwise contact your project leader or your local Schneider Electric vendor for more information. If you get this license in advance, you can upload this during the program creation process. Otherwise, you can associate the license later to the already created program directory. In all cases, chapter Manage licenses, page 15 provides more details about licences.

6. Once all the prerequisites are fulfilled, learn how to launch the tool in chapter Analyze a Program, page 29.

7. The chapter View Verification results, page 31 will help you benefit from the results of the static analysis.

EcoStruxure Control Engineering

What's in This Part

Register on EcoStruxure Control Engineering

Before using the tools available in EcoStruxure Control Engineering, user should first register and the account should be activated. This section presents the registration process.

A user account is required to use EcoStruxure Control Engineering. If you are using the cloud version of the tool, the server is **https://ecostruxure-control-engineering.se.app/**. If you are using a private server installed on premise, you need to check with the server administrator for the URL. In both cases, the creation of a user account is required.

Once on the platform home, click on **Not registered? Sign up here** and fill in the form with your first and last names, your phone number, your email address (which will be used as your identifier) and choose a password. The password needs to contain at least one upper case character, one lower case character, one digit, one special character (such as "{", "/", "$"…) and needs to be between 8 and 32 characters long.

When the form is filled in with the valid information, click on **Sign Up**.

Depending on the setup, the created account should be activated:

- On the cloud, to verify your email address, you will receive **an email with a link** that you need to **click on**. Once done, your account will be reviewed by our validation process which will **validate** your account within 48 working hours.

- On premise, the activation is automatic as the server's mails are usually not available.

Manage licenses

Different license options are available to best meet your use case requirements.

Paid license plans

Please contact your local Schneider Electric representative or partner for more information on the different license types available and how to acquire one. Or you can purchase a limited selection of EcoStruxure Control Engineering - Documentation license types directly from the Schneider Electric Exchange shop (**https://exchange.se.com/shop**).

Free trial licenses

Starting with the version 22.1 of the web platform, you have the opportunity to use free trial licenses to evaluate some of the products. These free trial licenses are associated with your user account on sign up and are available in a limited amount. They allow you to access the major functionalities of the products with a limitation on the number of results displayed.

Project and Program creation

What's in This Part

Creation of a program stored inside the default project

Creation of a program stored inside the default project

To create a new EcoStruxure Control Engineering - Verification application with the wizard, you can either click on the **New Verification** button or click on **Tools** then **Verification** in the menu on the top left of the page.
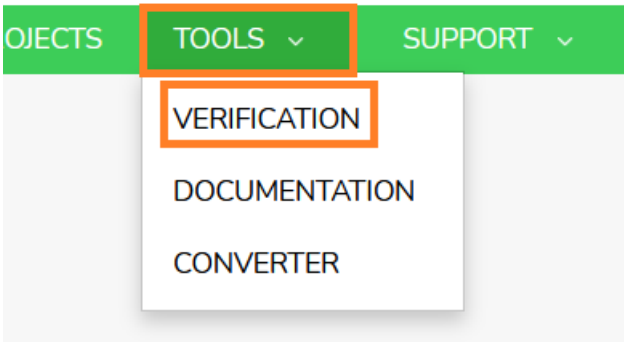
The application is created by default in your default project (usually named default). You can move it to another project after creation.

Once clicked, you are redirected to a program creation wizard. The different steps of this wizard are described in the chapter **Program creation wizard**, page 20.

Creation of a program and assignation to a project

To organize your programs, you can store them into projects. A project can contain several programs. This procedure describes how to create a project and how to put a program inside.

First, to create your project, you need to access the projects page by clicking **Projects** in the top menu.
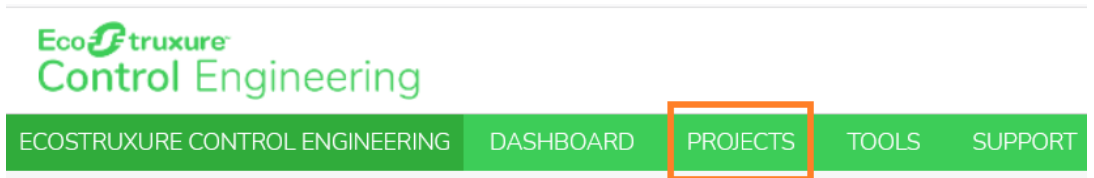
Then, press **Actions** followed by **New project**.
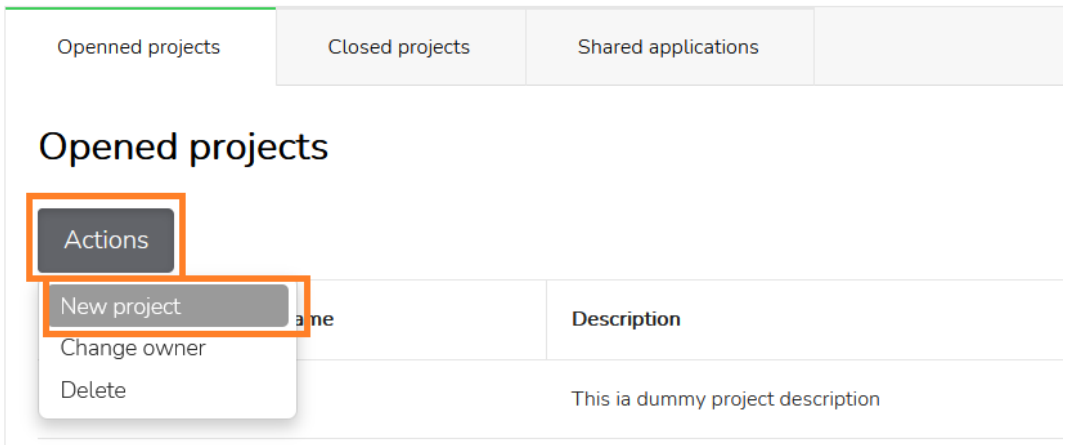
Provide a name for your project and click on **Add** to create it. You cannot create a project with the same name as another one (even if the case of the two projects is not the same).

Once created (you will find it into the "Opened projects" table), click on it to access its content. Once inside, two tabs are available. The first one, called "Overview" is the project's overview, that provides you with some statistics about the programs it contains. The second one, called "Programs", is the list of your programs.

To create a new program using the creation wizard, click on the tab **Programs**, then on **Actions** followed by **New program**.
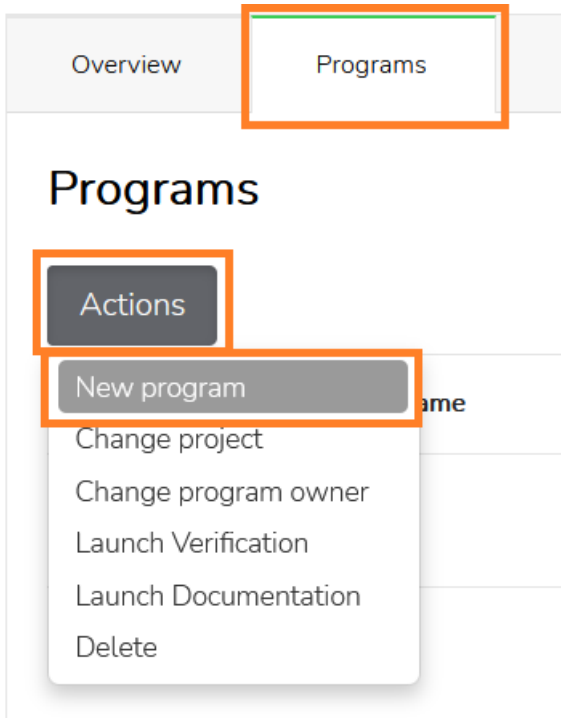
Select the corresponding tool in EcoStruxure Control Engineering web platform and click on **Launch assistant** to start the creation wizard.

Once clicked, you are redirected to a program creation wizard. The different steps of this wizard are described in the chapter **Program creation wizard**, page 20.

Program creation wizard

A wizard can be used to guide you through the different steps required to create your EcoStruxure Control Engineering - Verification program and launch the analysis. Here is a step by step description of how to proceed.

The **first step** consists of identifying the program.

To proceed, you are asked to provide some information :

1. The fields **Program name** and **Customer name** are mandatory. The "Program name" will be used to identify the program in the different views of the EcoStruxure Control Engineering web platform.

2. Some complementary information can be specified for the program based on your needs.

3. You can choose a project in which the new program will be created.

Once the information has been provided, to proceed to the next step, click on the **Validate And Next Step** button.

The **second step** consists of identifying the source PLC/development environment used to develop the PLC application and select a Rules file to use.

You need to select the PLC type and the rules file you want to use. Some default rules files are available for you to choose from directly on the platform or you may choose to upload a custom rules file later, during the step 4.

EcoStruxure Control Engineering - Verification assistant

① **Start**
    Setup program information

② **Parameters**
    Verification parameters

③ **License**
    Associate license

④ **Source file**
    Upload source files

⑤ **Summary**
    Summary of your program

PLC brand*:   Schneider-Electric Control Expert   ⌄

Rules set*:   PLCChecker-standard-en.gqr   ⌄

Previous Step   Validate And Next Step

The **third step** is where you choose the license that you want to use with your new program.

To achieve that, a list of your licenses is displayed and you can choose the one you want to use for the project being created.

If no license is available for this action, you can still continue creating the program by pressing **Validate And Next Step**, in such a case, a license can be added to the program once the creation process has been completed. Without a valid license, you will not be able to run EcoStruxure Control Engineering - Verification.

If you have a license available for this action and want to use it, then select the license to associate with this application from the drop-down menu and press **Validate And Next Step** to continue.

In the case that your license has not yet been assigned to your current user account, you can use it by providing its identifier in the "License #id" box and click on the **Validate And Next Step** button.

Starting with the version 22.1 of the web platform, trial license(s) may be provided with your user account in order for you to try the product for free. If you want to use it, you will need to click on the checkbox **Use a free Documentation trial license on this program**. This action is not possible if you have already used all the trial licenses that have been associated with your user account. For more information about the result you will get with this license, please read the Limitations of the free trial version, page 44 chapter. Once the checkbox is checked, click on the **Validate And Next Step** button to go further with the creation of your program.

EcoStruxure Control Engineering - Documentation assistant

① Start
    Setup program information
② Parameters
    Documentation parameters
③ License
    Associate license
④ Source file
    Upload source files
⑤ Summary
    Summary of your program
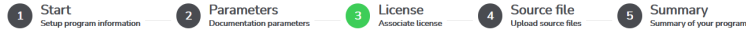
Select a license from the drop-down list OR enter the license ID (15 characters) in the field below.
This step is optional, you can assign a licence later.

Available license(s):   [▼]
                        Listed by Type (e.g. Subscription) - Name - Key (e.g. AXAXAXAXAXAXAXA)

License #id: [   ]
                        e.g. AXAXAXAXAXAXAXA

Free trial: ☐ Use a free Documentation trial license on this program

[Previous Step]   [Validate And Next Step]

The **fourth step** is where you can upload an exported version of the PLC program to analyze and, if not provided in step two, the rules file.

To do so, click on the "SELECT FILES …" button to import the source files of the application and the rules file (if needed), and then click **Validate And Next Step** to validate.

As a reminder, the interface displays the type of source files that you need to provide to start an analysis based on your choice of development environment made in step 2.

In the case that you prefer to send your files later or if a third party will send the files for you, you can click on **Validate And Next Step** to continue and send them later. Consider that unless files are uploaded, the EcoStruxure Control Engineering - Verification tool will not be able to run.

EcoStruxure Control Engineering - Verification assistant

① Start
    Setup program information
② Parameters
    Verification parameters
③ License
    Associate license
④ Source file
    Upload source files
⑤ Summary
    Summary of your program

This step is optional, you can choose to upload the source code files later.

DRAG YOUR FILES HERE

OR

[Select Files...]

Supported files
*.ZEF
*.XEF

Please provide a complete, up-to-date code export of
your PLC code. If some code is missing in your
program, this code will not be analyzed.

[Associate tag to this application]

More about the allowed files for your PLC brand

[Previous Step]   [Validate And Next Step]

The **fifth step** is a summary of what has been done using the wizard.

In this step, you find the information you have entered during the application creation process.

To modify them, you can click on the **Backward** button, otherwise click on **Create** to create the application or **Launch** to create and then launch EcoStruxure Control Engineering - Verification (this is possible if you have chosen a valid license and if you have sent all the required files).

EcoStruxure Control Engineering - Verification assistant

1 Start Setup program information	2 Parameters Verification parameters	3 License Associate license	4 Source file Upload source files	5 Summary Summary of your program

Application name	newProject	Customer name	Schneider-Electric
PLC site city	N/A		
		PLC reference	N/A
PLC site address	N/A		
		PLC function	N/A

PLC brand	Schneider-Electric Control Expert
License	N/A
Rules set	PLCChecker-standard-en.gqr

Previous Step   Launch

Access to a shared Program

When a program is shared with you, or its access is not restricted, you can add it to your list of programs by providing its unique 6-digit key. The unique 6-digit key can be found in the program overview, under **Application key**.

To add a program to your list of programs using its unique 6-digit key, proceed as follows:

First, access the projects page by clicking on **PROJECTS** in the top menu.
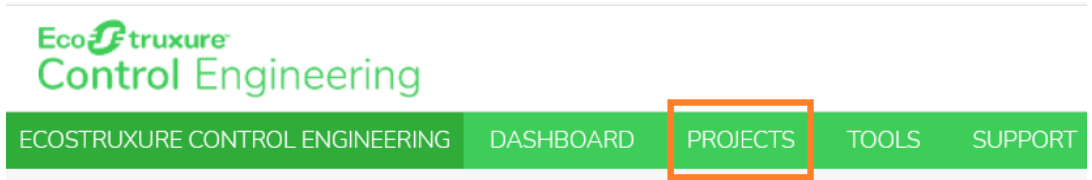
Then click on the tab **Shared applications**.
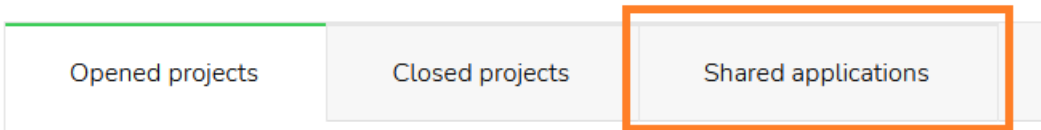
Enter the program's unique 6-digit key in the **Application key** box below **User History** or **One time access**, depending if you want to save this program into your personal records for easier access later, or if you want to see it without saving it, then click on **Add to my history** or **One time access**.

Opened projects	Closed projects	Shared applications	

Shared applications

User history

Add a new application

You can save any application shared with you in your personnal history for future visit by providing the application key below.

Application key	Add To My History

List of Applications

Your visited applications history is currently empty. When an application is visited, an history is created and displayed on this page.

One time access

You can access any application shared with you without saving it in your visited applications history by providing the application key below.

Application key	One Time Access

Share programs with other users

Your programs can be shared with other users in order for you and your collaborators or your commercial contacts to be able to work on a project together. To share a program, you need to be its owner, the other users cannot delegate their access.

There are 2 ways to share a program :

- User by user: You choose who can access your program. By default, the other users cannot do this.
- For everyone: Everyone can access your program, which is the opposite of the default behaviour.

To **share your program with a selected user**, open the program page and then go to the program users using the tabs **Admin** and **Users management**. Then, under "Invited collaborators", click on **Actions** and select **Add**. You are prompted to provide the invited user e-mail address. You can give the e-mail address used by this user to register on EcoStruxure Control Engineering platform if the user is already registered, or any other e-mail address if the user is not yet registered. You can also choose to send an invitation, which is recommended, to tell the user that the program is now shared with them.

Once another user is added to the invited users list, they will be able to perform the same actions as you, except sharing the program and accessing its settings (if your program is also using the EcoStruxure Control Engineering - Verification tool, then the rules file update and the justifications functionality may also be unusable by the invited user, for more details, please report to the EcoStruxure Control Engineering - Verification documentation). If you do not want your invited users to be able to update your program, then it is recommended to deactivate the program using the program settings. This action will put your program in a read-only state. You can revoke the invitation at any time by selecting the user(s) you want to remove from your program and then using the **Actions** button to select **Remove access**.

To **share your program with everyone**, open the program page and then go to the program settings using the tabs **Admin** and **Settings**. Simply enable the checkbox under **External share** to share your program with everyone.

Once another user accesses your program, they will be able to perform the same actions as you, except sharing the program and accessing its settings (if your program is also using the EcoStruxure Control Engineering - Verification tool, then the rules file update and the justifications functionality may also be unusable by the invited user, for more details, please report to the EcoStruxure Control Engineering - Verification documentation). If you do not want these users to be able to update your program, then it is recommended to deactivate the program using the program settings. This action will put your program in a read-only state. You can revoke the access to your program at any time by disabling the checkbox. Once your program access is revoked, then no user can access it, even if previously accessed, and unless being in the invited users list (see below for more details).

EcoStruxure Control Engineering - Verification

What's in This Part

Analyze a Program

When the program is created, it is possible to run several analyses with EcoStruxure Control Engineering - Verification (depending on your license type).

To run a new analysis on an existing program, proceed as follows:

Go to your program page (accessible through the list of your projects).

Then click on **Launch Verification**.

A wizard will ask you if you want to upload new files.

If you have already sent the necessary files for execution (source files and possibly a rules file), click on **Launch** to start the EcoStruxure Control Engineering - Verification analysis.

Otherwise, you can click on **Upload**, which will redirect you to step 4 of the program creation wizard, allowing you to send new files. When done, you can click on **Validate And Next Step** to continue, and then on **Launch** to run the analysis.

EcoStruxure Control Engineering - Verification assistant

| ① **Start** Setup program information | ② **Parameters** Verification parameters | ③ **License** Associate license | ④ **Source file** Upload source files | ⑤ **Summary** Summary of your program |

Application name	NewProject	Customer name	ACME
PLC site city	N/A	PLC reference	N/A
PLC site address	N/A	PLC function	N/A

PLC brand	Schneider-Electric Control Expert
License	N/A
Rules set	PLCChecker-standard-en.gqr

Previous Step   Create   Launch

View Verification results

Once EcoStruxure Control Engineering - Verification analysis is done, a tab with the name "Verification" is added to the application page.
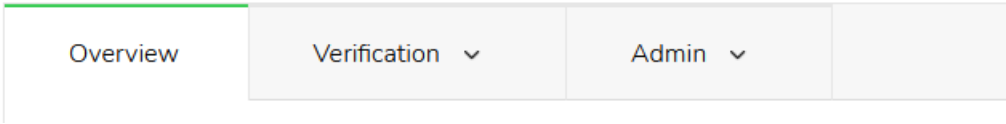
To get an overview of the analyze result, click on the tab **Verification** and then **Dashboard**. You can find graphs showing the evolution of the results between the different analyses and a classification of the results by category of rule and by severity.

To get a detailed results, click on the tab **Verification** and then **Result details**. Here you will find the list of non-conformity and information messages that were generated during the analysis. You can click on the list of rules on the left-hand side to display the messages generated for each rule.

Manage set of rules files

The rules file is required to adapt the verifications performed by EcoStruxure Control Engineering - Verification. When verifying a PLC program, only the rules described and configured in the rules files will be applied.

This file is, by default, managed like every other project file, meaning it can be updated or deleted. It is possible but not recommended to have more than one rules file in a PLC program repository.

If you share your program with other users, then it could be of a great value to restrict them from updating or deleting this file. To achieve that, go on the **Verification** tab and then **Settings**. Under **Rules file updates**, uncheck the checkbox to revoke the permission for the other users than yourself to update or delete the rules file.

When using the EcoStruxure Control Expert plugin for EcoStruxure Control Engineering - Verification, it is required to select a default rules file before a user can launch a verification from the plugin. To do that, you need to select the rules file in the list and click on the button "Set default GQR".
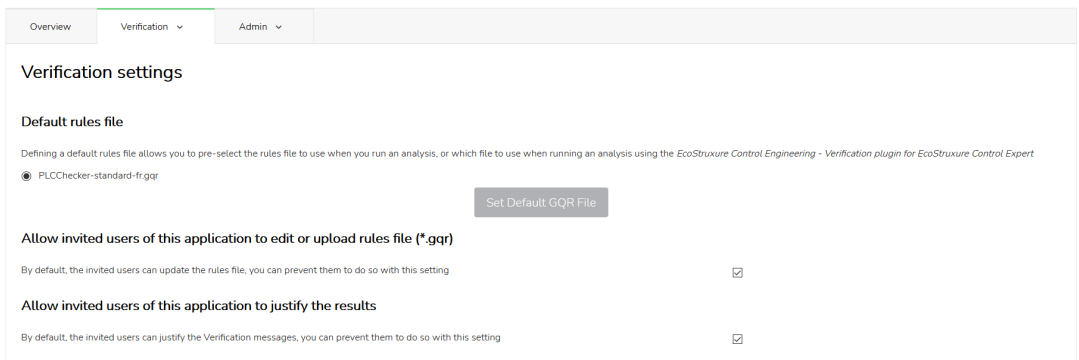
Use justifications

EcoStruxure Control Engineering - Verification emits a message for each rule transgression it detects. Sometimes, some messages should not have been emitted, as for example when they are relative to codes on which the developer have no impact or because of technical choices that should not be considered by the analyze.

In such cases, it is possible to tell to EcoStruxure Control Engineering - Verification that the message have to be ignored. This mechanism is called **justification**. It consists of removing a message from the results when a good reason to do so exists.

To justify a message, go to your analyze results, from your program view, open the menus **Verification** and then **Results details**. Navigate up the the message(s) to justify, select its (their) checkbox and click on **Actions** then **Justify**. Then, provide the reason of your justification, and validate. The checkbox will disappear and won't be reported in the future analysis.

To see the list of the justifications, their reasons and their authors, then go on your program view, open the menus **Verification** and then **Justification**.

From this view, you are able to un-justify a justification by selecting its checkbox and clicking on **Actions** then **Delete**. In the next analyzes, the message will now be reported again.

EcoStruxure Control Expert plugin for EcoStruxure Control Engineering

What's in This Chapter

EcoStruxure Control Expert plugin for EcoStruxure Control Engineering - Verification is a plugin designed to be used with EcoStruxure Control Expert and Schneider Electric Unity Pro programming environments.

It is used to launch analysis directly within EcoStruxure Control Expert or Schneider Electric Unity Pro. The project is automatically exported and uploaded on the server in order to be analyzed. Results of the analysis are fetched back in a dedicated view in the tool. The plugin integrates the back to source feature to allow the developers to correct their code quickly by helping them navigate to the location highlighted by the message.

Compatibility and system requirements

To date, EcoStruxure Control Expert plugin for EcoStruxure Control Engineering - Verification is compatible with the following versions or EcoStruxure Control Expert and Schneider Electric Unity Pro:

- Schneider Electric Unity Pro: From version 8.2 to version 13.1 (included)
- EcoStruxure Control Expert: From version 14 to version 15

The EcoStruxure Control Expert plugin for EcoStruxure Control Engineering - Verification uses a connection to the EcoStruxure Control Engineering web platform to perform the analyzes that the users are asking for. In such a way, using the plugin without Internet connection and access to the EcoStruxure Control Engineering web platform is not possible.

Download and installation

EcoStruxure Control Expert plugin for EcoStruxure Control Engineering - Verification is available for download on the Schneider Electric Exchange platform.

Once downloaded, the user needs to run the installation wizard and follow the different installation steps. This wizard checks that the version of the plugin is compatible with the user environment.

Then, when the installation is done, the user can see a new menu entry in the EcoStruxure Control Expert menu under **Tools** and then **Verification for Control Expert**:
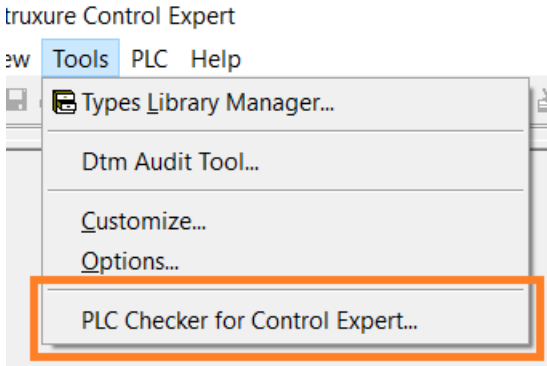
Project configuration

The analysis that are launched from the EcoStruxure Control Expert plugin for EcoStruxure Control Engineering - Verification are executed by the EcoStruxure Control Engineering web platform. This means that the project upon which the plugin is executed is exported and then uploaded to the web platform, which proceed with the analyze and send back the results to the plugin.

To do so, the EcoStruxure Control Expert code export needs to be sent to an existing program in the web platform. This program will hold the information and the history of the EcoStruxure Control Expert code development. A default rules files, which will be used for the analyze process, needs to be set in the web platform program. A valid license or a way to automatically get a valid license upon demand is required for the analysis to be able to start.

More information about how to create a program on the web platform can be found on the chapter **Project and program creation**, page 16. The user is invited to configure the license that will be used to perform the analyzes prior to start the analyzes. If all the collaborators of the plugin are members of a contract that includes an unlimited usage of the tool, then the configuration of a license is not necessary. Otherwise, it is necessary to configure a valid license during the phase 3 of the program creation assistant, or, if preferred, once the program is created, under the menu **Admin**, **Licenses**, **Actions** and then **Associate new license**. More information on how to set a default rules file can be found on the chapter **Manage a set of Rules file**, page 32.

Once the project is configured, the user is invited to share it with whoever will work on it using the sharing functionalities described in the chapter **Share programs with others user**, page 26 otherwise the access to the project will be denied to these collaborators.

Finally, the user should share the 6-digits program identifier with the collaborators that will use the plugin.

Plugin usage

Using the EcoStruxure Control Expert plugin for EcoStruxure Control Engineering - Verification is possible when a EcoStruxure Control Expert project is being edited.

As a starting point, the user will have to compile their program, and then click on **Tools**, then **Verification for Control Expert**. If the program has never been associated to the EcoStruxure Control Engineering - Verification project mentioned as a pre-requisite in the previous chapter, then the user will be invited to provide a 6-digits program key to perform the association:
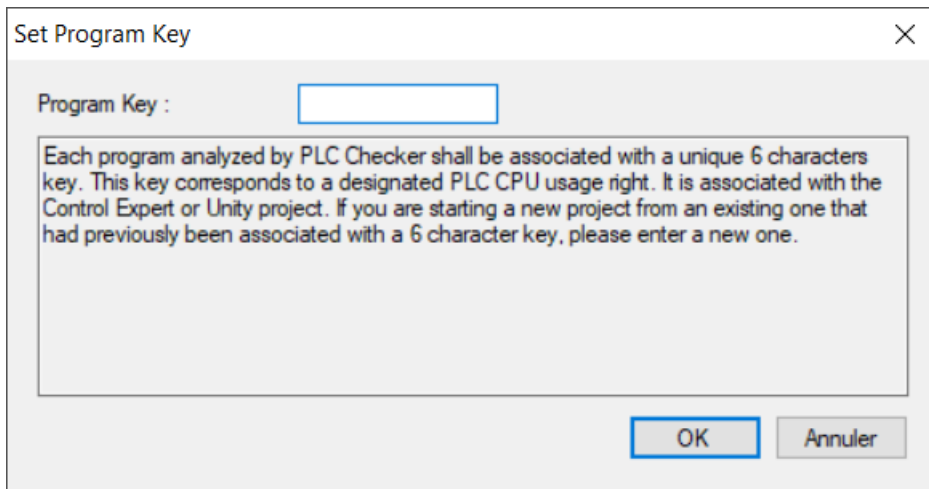
Once the 6-digits code has been provided, then the plugin will try to contact the EcoStruxure Control Engineering web platform. If the user is not authenticated on it, then a new screen will allow the user to provide a custom proxy configuration. This screen is be to used only in the case the user IT department uses a proxy for the outgoing Internet queries. If so, the user shall contact their IT department to gather the correct information to fill the form. Then, a third window appears to ask the user for their credentials. The user can update these settings at any time by going on the menu entries **?**, then **Preferences**.

The first time the user authenticates, an analyze is started. The user can follow the progress of the analyze with the progress bar displayed on the bottom of the screen:

Glips semantic check - Analyze entity unity_lib.max_word

The next times, the user can manually start an analyze by using the menu
entries **Actions** then **Launch analysis**.

Once the analyze is complete, the result is downloaded from the platform and displayed in
the plugin screen. If the user choose not to run an analyze, then they can consult the last
results using the menu entries **Actions** and then **Get remote last results**. If the results are
already downloaded, the user can display them by clicking on **Actions** and then **Display
local results** (these results may not reflect the user's collaborators work if the project is
done collaboratively).

id	message	severity	variable	location
I13a	The POU MAST_section.main is called 1 times	info		
C1a	Variable ECPU_HSBY_1 has no comment	error	ECPU_HSBY_1	Database-ECPU_HSBY_1
S7a	Variable ECPU_HSBY_1 is not used	error	ECPU_HSBY_1	Database-ECPU_HSBY_1
C1a	Variable BMEP58_ECPU_EXT has no comment	error	BMEP58_ECPU_EXT	Database-BMEP58_ECPU_
S7a	Variable BMEP58_ECPU_EXT is not used	error	BMEP58_ECPU_EXT	Database-BMEP58_ECPU_
C1b	Type at unity_hardware.BusRIODIO has no comment	error		
N2e	Type unity_hardware.XBusM580_BMEXBP0800_BMEH584040 name is longer than required	warning		
C1b	Type at unity_hardware.XBusM580_BMEXBP0800_BMEH584040 has no comment	error		
N2e	Type unity_hardware.XBusM580_BMEXBP0800_BMXCPS4002 name is longer than required	warning		
C1b	Type at unity_hardware.XBusM580_BMEXBP0800_BMXCPS4002 has no comment	error		
C1a	Variable XBusM580_BMEXBP0800.BMXCPS4002_ has no comment	error	XBusM580_BMEXBP0800.BMXCPS4002_	
S7a	Variable XBusM580_BMEXBP0800.BMXCPS4002_ is not used	error	XBusM580_BMEXBP0800.BMXCPS4002_	
C1a	Variable XBusM580_BMEXBP0800.BMEH584040_ has no comment	error	XBusM580_BMEXBP0800.BMEH584040_	
S7a	Variable XBusM580_BMEXBP0800.BMEH584040_ is not used	error	XBusM580_BMEXBP0800.BMEH584040_	
C1b	Type at unity_hardware.XBusM580_BMEXBP0800 has no comment	error		
C1a	Variable XBusM580.BMEXBP0800_ has no comment	error	XBusM580.BMEXBP0800_	

In this view, the user can find the list of messages that has been emitted during the analyze.
The reporting is made through a table-oriented view, the columns are the following:

- id : Identifier of the rule that generated the message
- message : The generated message
- severity : The message severity (for instance "error" or "warning"), defined at the rules
  file level
- variable : The variable name that matched the applied coding rule
- location : The location in the code where the coding rule is not respected
- address : The topological address of the variable that matched the applied coding rule

The user can consult the location in the project where the highlighted elements are by right-
clicking on a message and then selecting **Display Data Editor** or **Display Code Editor**,
according to the kind of the element.

If relevant, the user can proceed with a justification (see **Use justifications**, page 33 for
more information), by right-clicking on the message to be justified and then selecting **Justify**

exceptions…. It is possible to select several messages to be justified, but these messages needs to have been emitted by the same rule.

Additionally to the analyze feature, the user can interrogate the web platform from the plugin using the tabs displayed in the view to display the rules file, display the program history or to list the justifications that has been done for the program.

Online rules file configuration

What's in This Chapter

Introduction

From the EcoStruxure Control Engineering version 21.2 (released in October 2021), an online rules editor is integrated into the platform.

A Verification rule is composed of two elements:

1. A type, which defines what is the verification operated by the rule (for instance, the rule can focus on the comments, or on computing some statistics)

2. Some configuration attributes which allows to configure the rule behavior (for instance, the attributes are used to select the elements on which the rule is applied, what message should be displayed when an error is detected, how many messages should be reported)

The online rules editor allows the user to customize the second component of their programs rules files. T

The rules editor requires a network connection to save the user updates. A loss of connection during the edition time may lead to data loss.

NOTICE
RISK OF DATA LOSS DUE TO INSTABLE NETWORK CONNECTION
The user must use the product by the mean of a stable network connection.
Failure to follow these instructions can result in equipment damage.

Select the rules file to edit

The rules editor only supports the edition of a program default rules file. This means that the user needs to define a default rules file prior to access the rules editor.

To do so, the user needs, in the program where the rules file is located, to go on the **Verification** tab and then click on **Settings**.

A list of the program rules files is displayed in the **Default rules files** section. The user needs to select the one they want to edit, and then click on **Set Default Rules File**.

If a precedent rules file were under edition, then an informational message is displayed to invite the user to save the pending updates that may be pending (see the chapter about the edition of rules to get more information about the pending updates). If the user finally wants to save their updates, then it is recommended to change the default rules file after the user has ensured that all the updates are saved.

Edit the default rules file

Once the user has selected a default rules file, it is possible to edit it.

To do so, the user needs to go on the **Verification** tab, then select **Rules set** and click on **Rules editor**.

The rules editor should be displayed, and user will see the following panel:

In this view, on the top, the user can see two buttons:

- **SAVE PROJECT** which allows them to save the updates into the default rules file
- **DROP UPDATES** which allows them to drop all the updates that has not been saved yet

On the left, the user can see the rules hierarchy. They can navigate inside it by deploying the folders.

On the central part, the user can access a list of the editable attributes and some help about the goal of the rules.

A click on a rule in the left part displays the editable configuration attributes and help for that rule on the central part.

To edit a rule, the user needs to click on it, eventually after having navigated to it, and then use the central part to see the attributes that are editable. On that list, the user can freely update the attributes values.

C1a - All program variables must be commented

Rule parameter	Parameter value	Edition actions
Enabled	✅	
Error Message	Variable {VARIABLE} has no comment	
Min Length	1	
Name	C1a - All program variables must be commented	
Severity	error ⌄	
Variables	-#PARAM_COPY-#EN_ENO-#ROCKWELL_MODULES_ELMT-#PARAM_IN_FB_S7 GRAPH-#PARAM_OUT_FB_S7GRAPH-#PARAM_STATE_FB_S7GRAPH	
Treatments	*This attribute is empty*	
Max Length		
No Match Message		

Once done, a validation and cancellation buttons appear near to the attribute, on the **Edition actions** column. The validation button applies the update and store it until the user decide to save their changes to the rules file. If the validation of the update makes another update required (for instance if the activation of a given rule leads to the activation of another one), then a summary of the updates is displayed to the user after the validation operation. The cancellation button resets the attribute value to its original value.

Edition actions
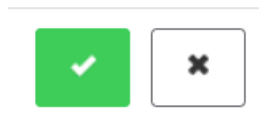
In order for the user to be able to work quietly without having any impact on their project analyses until the updates on the rules file are completely done, the updates that are validated are stored in a temporary storage area and are not applied directly on the rules file. Due to that behavior, the user need to save the rules file using the **SAVE PROJECT** button to apply their updates and use them on their program future analysis.

List of the configuration attributes

The rules editor allows the user to configure the attributes described below. The meaning of the attributes can vary depending on the rule type. The user can consult the help tab to get more information about the meaning of each attribute.

Attribute name	Meaning	Special behavior
Enabled	Tells whether a rule is activated and will be executed or not	If a rule's parent is not itself enabled, then the rule inherits this behavior and is not enabled too, regardless of their own activation state. Some rules activation are depending on other rules activation state. In such a case, the rule cannot be enabled by its own.
Name	Name of the rule, visible in the rules trees (in the editor and in the Verification results)	
Error Message	Message displayed when the rule matches an error	
No Match Message	Message displayed when the rule does not match any error	
severity	Indication of the importance of resolving the errors reported by the rule	The special severity "nolog" allows to not emit the rule error message while still counting the match in the statistics
Min Length	Minimum length of a verified element in the program	The behavior depends on the rule type, please report to the help tab for more information
Max Length	Maximum length of a verified element in the program	The behavior depends on the rule type, please report to the help tab for more information

Additionally to these editable attributes, two other configuration attributes are displayed in an informational purpose: variables and treatments. These two attributes explains on which set of elements in the user program the rules are applied.

Configuration of the Schneider Electric rules files

The default rules files provided by Schneider Electric are organized in 3 main parts (their names depend on the rules file language and for this documentation, the English version of the rules file is used as an example):

- **IAS Generic rules file version X.Y.Z** (the version number depends on the rules file that you are using), which contains the PLC configuration
- **Sets definition** which contains several lists of the elements in the PLC program that can be matched by the rules
- **Coding rules** which contains the list of rules to be executed

If the goal is to **change the PLC type** to be checked by EcoStruxure Control Engineering - Verification using this rules file, the user can customize the first part, **IAS Generic rules file version X.Y.Z**, of the rules file. The updating of these elements may result in several changes in the rest of the rules file as some rules may be dependent on the PLC type and thus may be enabled or disabled by this change.

If the goal of the configuration is to **update the messages, the severity or the activation state** of a particular rule, then the user needs to use the last part, **Coding rules**, of the rules file.

No action is required within the **Sets definition** part of the rules file.

Information on how to modify the rules using the rules editor is described in the paragraph **Edit the default rules file**.

Limitations of the free trial version

If the Verification program has been created and run with a free trial license, then the result of the execution will be in trial version. This version of the product allows you to use the major functionalities for free with some limitations, so that you can try the tool and get an idea of how it works. These limitations are listed below:

Functionality	Trial version	Paid license
Result details summary	Included	Included
Amount of messages shown by rule	Limited to 2	All
Rules set visualizer	Included	Included
Message justifications	Included	Included
Comparison of results between program versions	Unavailable	Included
Download results list importable to Microsoft Excel	Unavailable	Included
Download result details as an archivable PDF	Unavailable	Included
Download rules set documentation as an archivable PDF	Unavailable	Included
Program versions comparison as an archivable PDF	Unavailable	Included
Online Rules editor	Unavailable	Included

Due to the variety of behavioural characteristics of different PLCs, variable operations and programmable units, it is not always possible to retrieve all information during the program analysis process. The messages and non-conformities reported by EcoStruxure Control Engineering - Verification only reflect those that the tool has been able to detect.

The functionalities that are not available or limited are signalled in the Verification tab in your program:

- The "Trial" tag means that the functionality is limited
- The "Unavailable" tag means that the functionality is not accessible
- No tag means that the functionality is fully available.
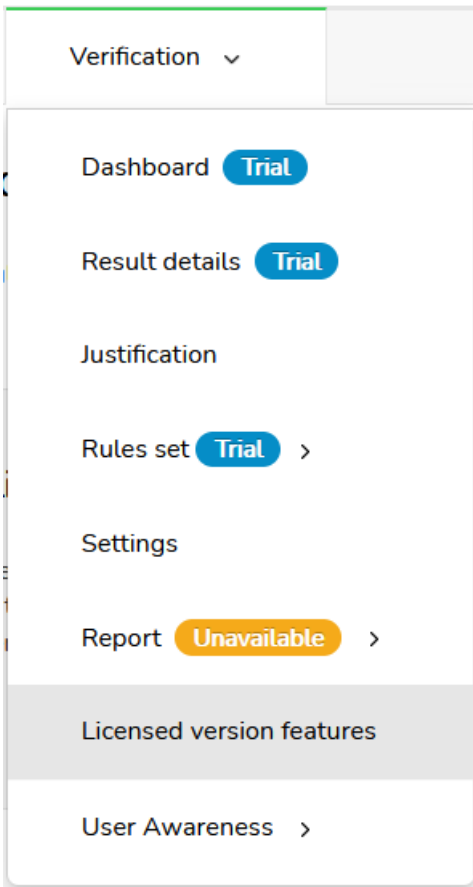
Once you have tried Verification, you can upgrade your program with a Paid license to get all of the product functionalities.

Brand dependant export procedures

What's in This Part

EcoStruxure Control Engineering tools read PLC application files. The exact required files depend on the kind of PLC. This section details for the PAC/PLC/DCS/RTU supported what is the procedure to get the file.

Each subsection is dedicated to a specific Control system (PAC/PLC/DCS/RTU) model.

Schneider Electric EcoStruxure Control Expert (.XEF / ZEF file export)

EcoStruxure Control Expert (formerly Unity Pro) applications need to be exported in a XEF or ZEF export file in order to be analyzed by EcoStruxure Control Engineering products. This export could be done manually, using the procedure described below or automatically with the help of the Import/Export tool. The procedure requires the installation of EcoStruxure Control Engineering Import/Export product available on Exchange.

You can create a XEF or ZEF export file with the **File** and **Export application…** menu entries in the EcoStruxure Control Expert software.

1. In EcoStruxure Control Expert menu, select **File** then **Export application…**

2. In the "Export application" dialog box, give a **name** to the XEF or ZEF file

3. If needed, change directory where the XEF or ZEF file will be created

4. Click on **Save**

Schneider Electric EcoStruxure Machine Expert (.EXPORT file export)
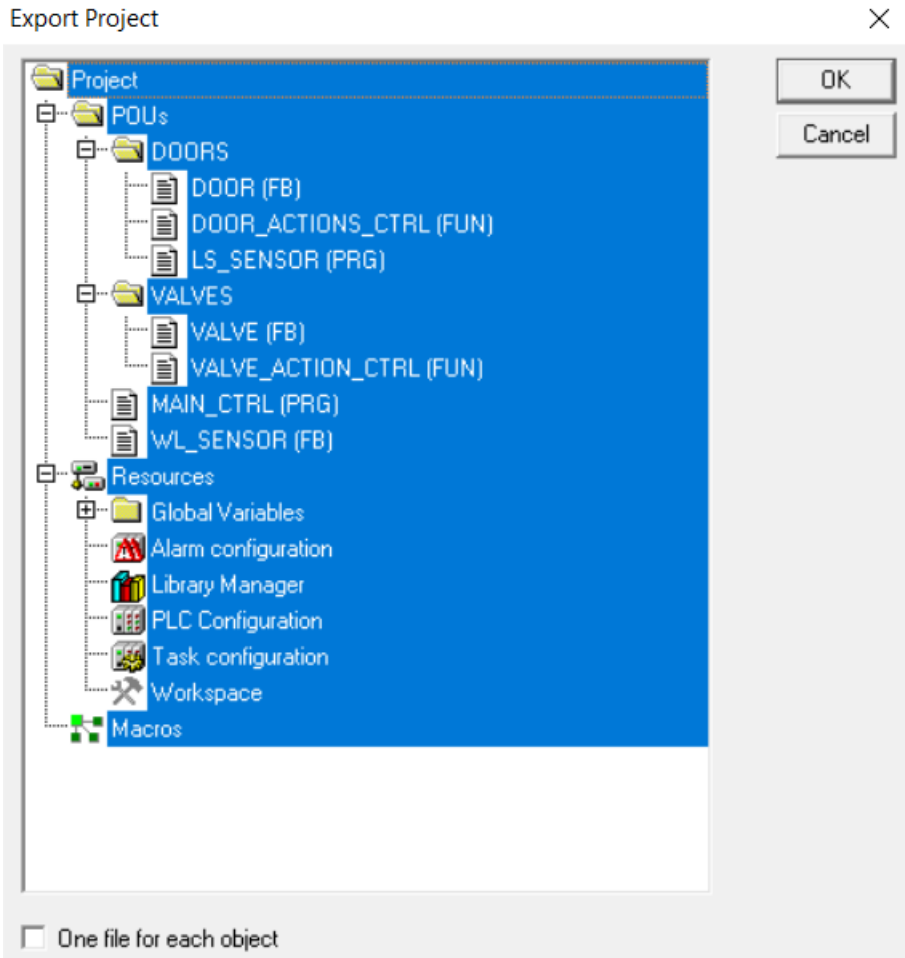
EcoStruxure Machine Expert (formerly SoMachine) applications need to be exported in an XML export file in order to be analyzed by EcoStruxure Control Engineering products.

You can create an XML export file with the **Project** then **Export…** menu entries in the EcoStruxure Machine Expert software.

1. In EcoStruxure Machine Expert menu, select **Project** then **Export…**
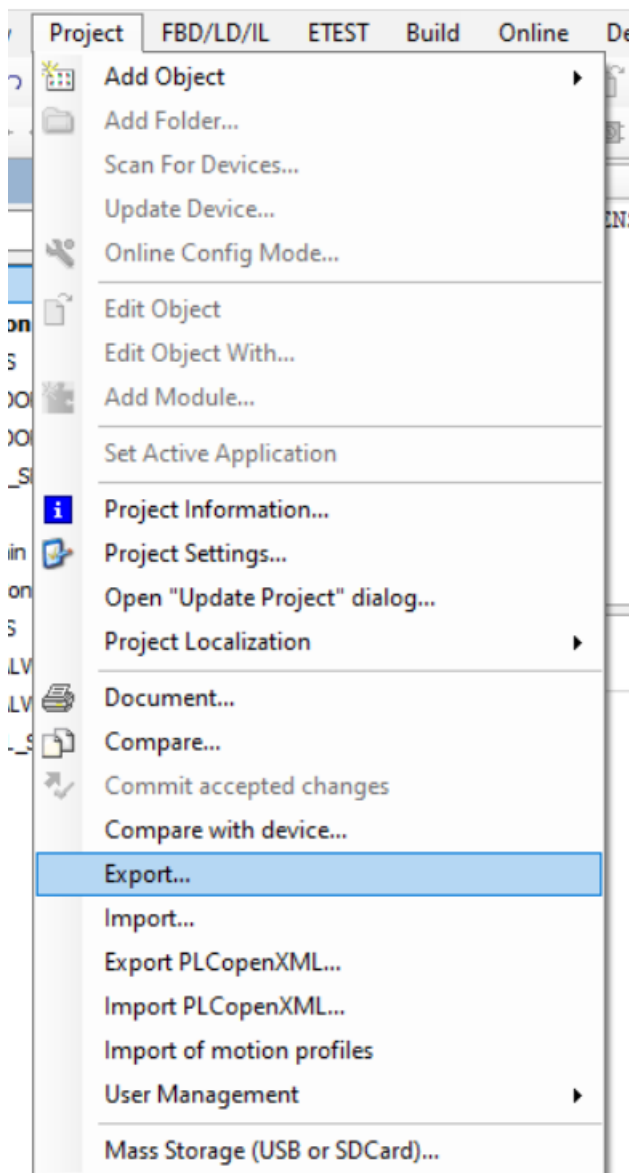
2. Choose the code blocks that you want to include in your export file, and if needed, change the storage version
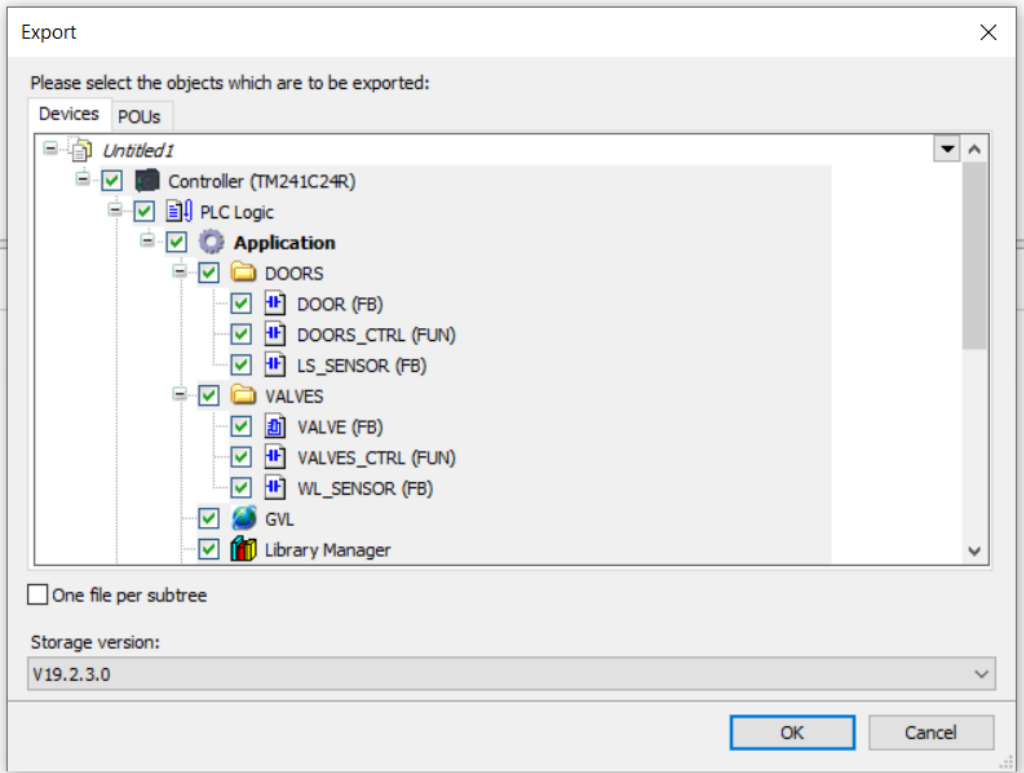
3. Click on **OK** and select a name and a location for the export file when prompted

FEF export file generation from PL7 Pro
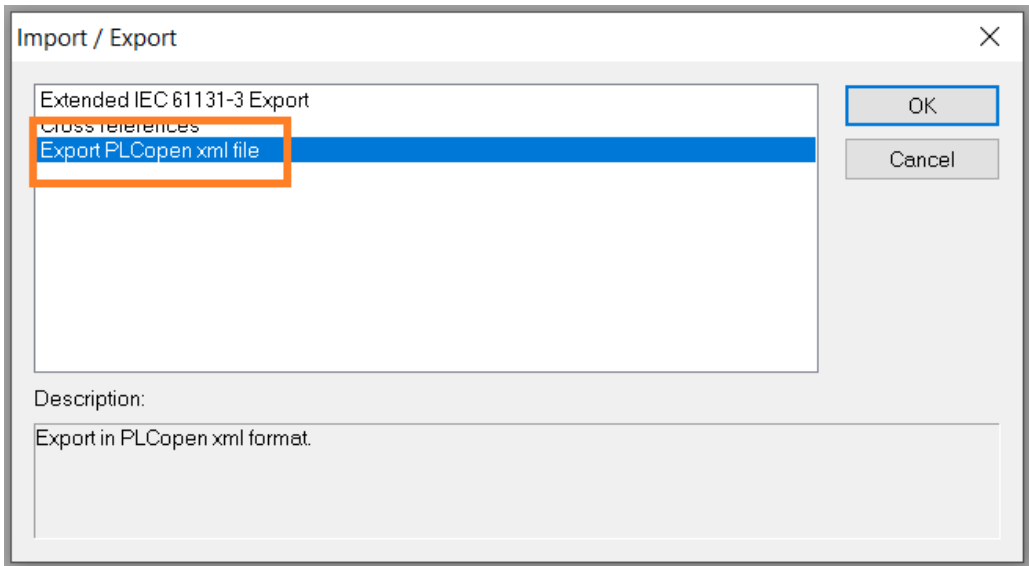
PL7 Pro application need to be exported in a FEF export file in order to be analyzed by EcoStruxure Control Engineering products.

You can create a FEF export file with the **File** and **Export application…** menu entries in PL7 Pro software.

1. In PL7 Pro menu, select **File**, then **Export application…**
2. In the "Export application" dialog box, give a **name** to the FEF file
3. If needed, change directory where the FEF file will be created,
4. and click on **Save**

3S CODESYS V3 (.EXPORT file export)

CODESYS V3 application need to be exported in a XML file (with the extension **.export**) in order to be analyzed by EcoStruxure Control Engineering - Verification.

You can create an export file with the **Project** then **Export…** menu entries in the CODESYS V3 software.

1. In CODESYS V3 menu, select **Project** then **Export…**
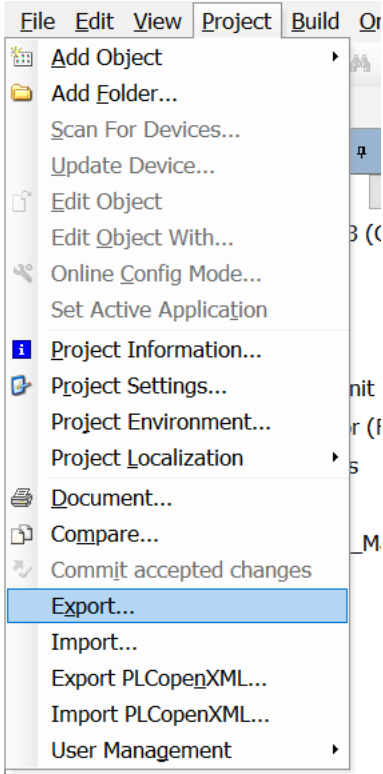
1. In the exportation window, select the code units that you want to include in your export, if needed, you can also choose the export format (if you are using EcoStruxure Control Engineering - Verification for CODESYS V3, make sure to select a format from the version 3 family (**CODESYS V3 …**))
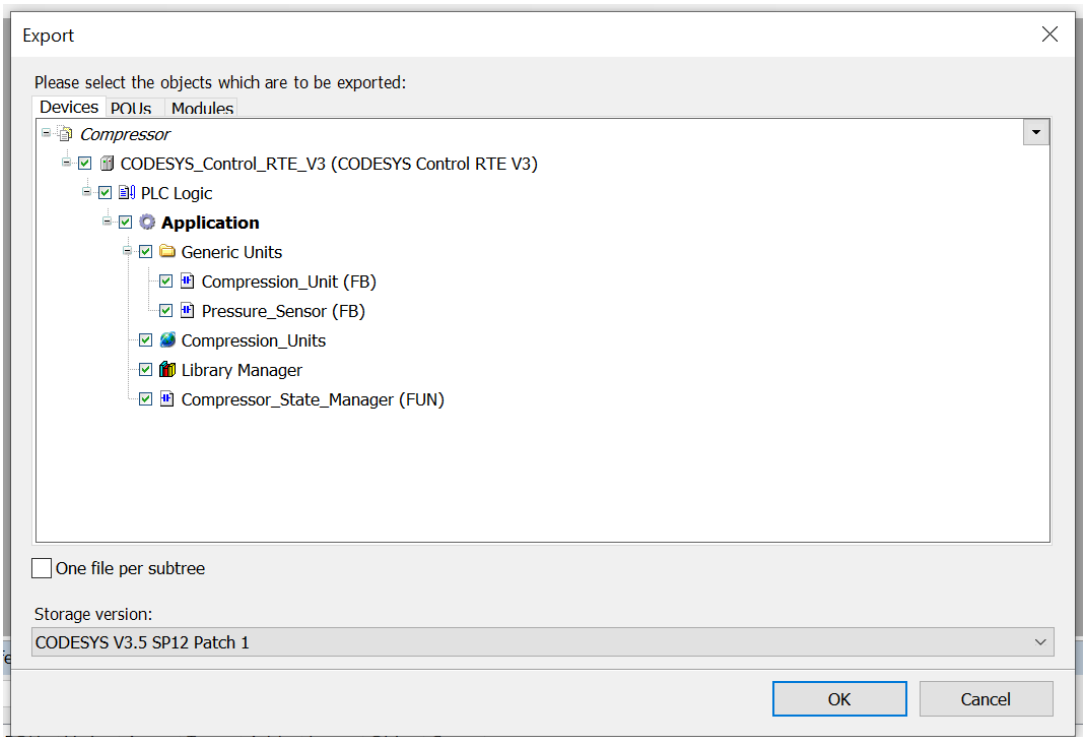
1. Click on **OK** and select a location to save your export file

3S CODESYS V2 (.EXP file export)

CODESYS V2 application need to be exported in a **.EXP** export file in order to be analyzed by EcoStruxure Control Engineering products.

You can create a **.EXP** export file with the **Project** then **Export…** menu entries in CODESYS V2 software.

1. In CODESYS V2 menu, select **Project** then **Export…**
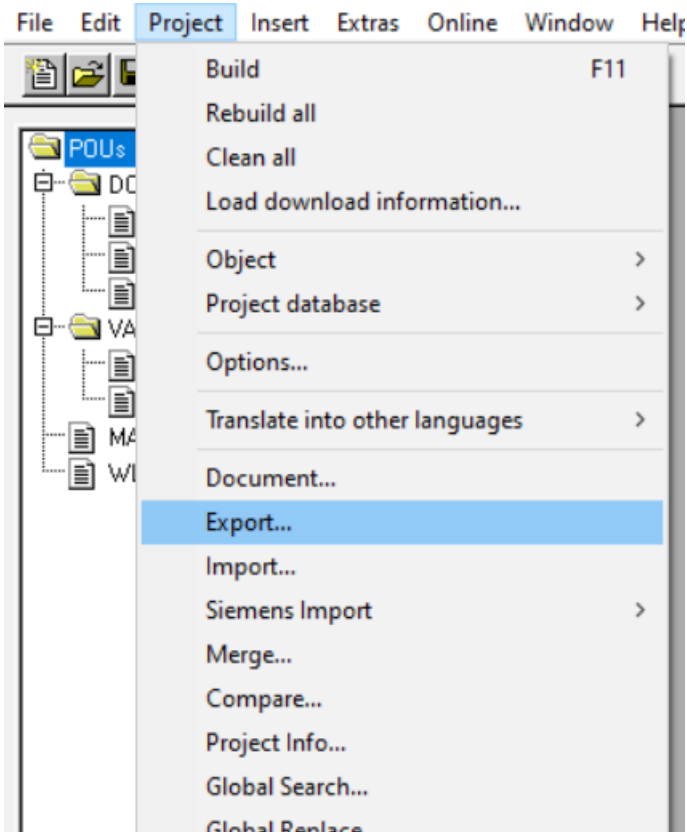
2. In the "Export application" dialog box, ensure that all your code is selected (a selected item background is usually in blue), then click on **OK**

3. When prompted, give a **name** and choose a **location** for the EXP file and then click on **Save**

BECKHOFF TwinCAT V3 (.XML file export)

Beckhoff TwinCAT application needs to be exported in an PLCopen XML file in order to be analyzed by EcoStruxure Control Engineering - Verification.

You can create a PLCopen XML export file with the **Solution Explorer** then **Export PLCopenXML…** menu entries.

1. In the Solution Explorer window , select the project
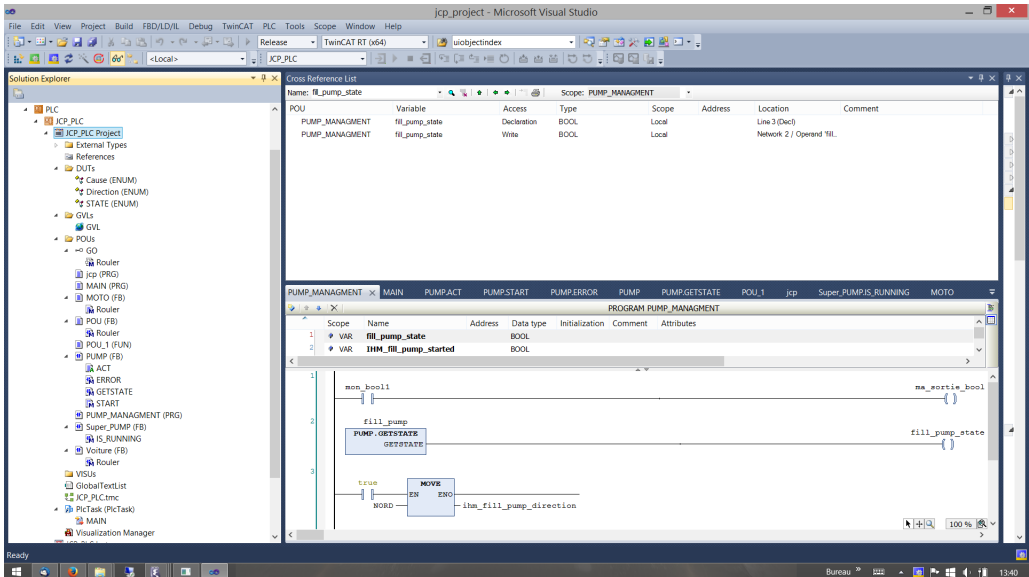
2. Open the contextual menu by clicking on the right button and choose **Export PLCopenXML…**
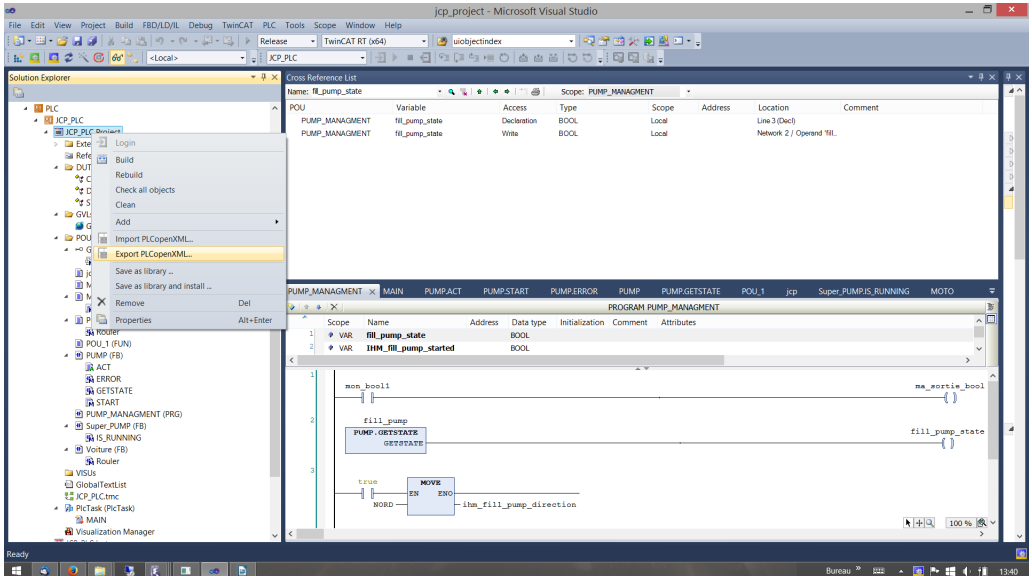
3. Click on **Save**
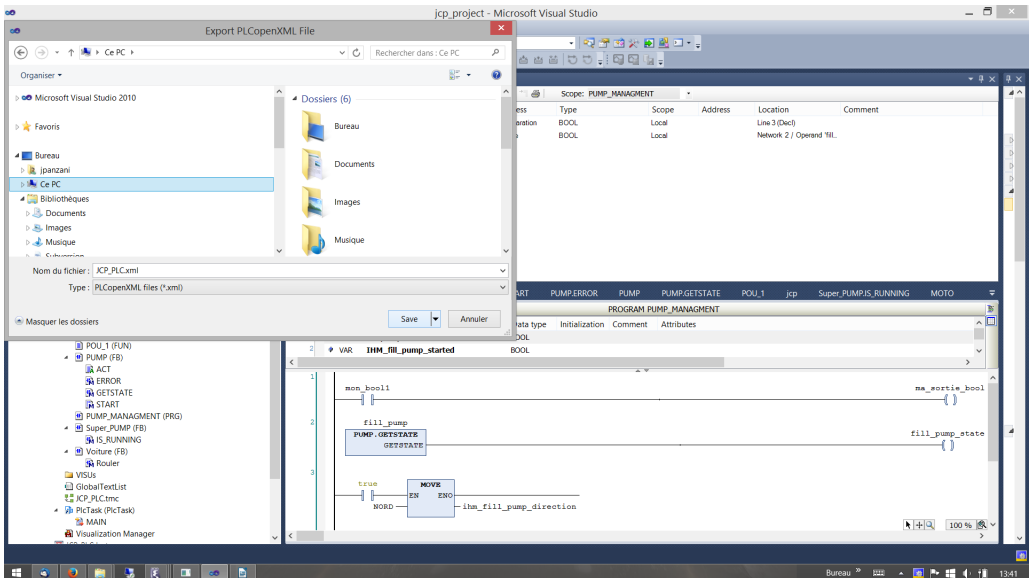
PHOENIX CONTACT Multiprog v5.5 (.XML export)

KW-Software GmbH MULTIPROG applications need to be exported in an XML export file in order to be analyzed by EcoStruxure Control Engineering - Verification.

You can create an XML export file with the **File** and **Export…** menu in KW-Software GmbH MULTIPROG software.

1. In the KW-Software GmbH MULTIPROG menu, select **File**, then **Export…**
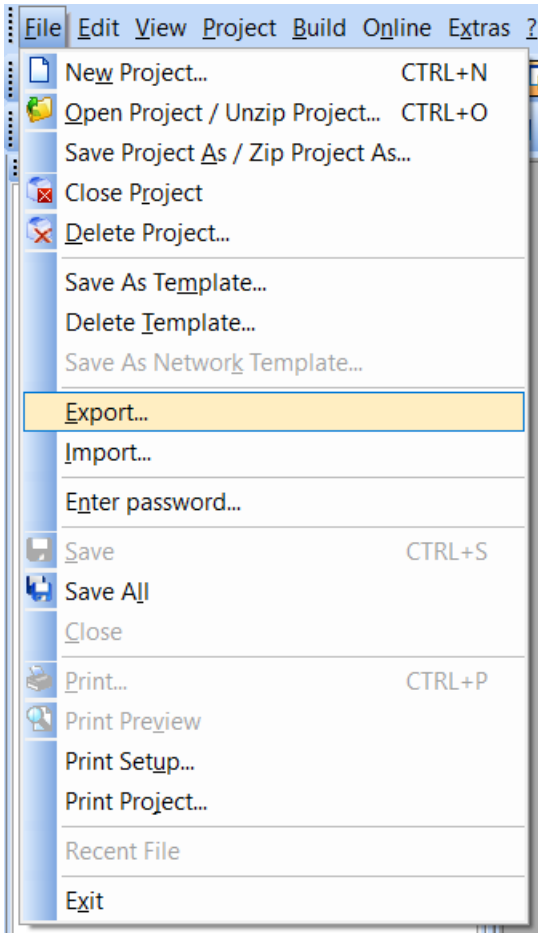
2. Choose "Export PLCopen XML file…"

3. Rename the export file and then click on **Save**

As MULTIPROG is able to export the application in different versions of the PLCopen format, you may find some differences between the EcoStruxure Control Engineering - Verification results as the amount of exported elements and their format depends on the version of PLCopen.

Rockwell Automation RSLogix 5000® or Studio 5000 (.L5K export file)

Rockwell Automation RSLogix 5000® applications need to be exported in a L5K export file in order to be analyzed by EcoStruxure Control Engineering - products.

You can create an L5K export file with the **File** and **Save as…** menu entries in RSLogix 5000® software.

1. In RSLogix 5000® menu, select **File** and then **Save as…**

2. In the "Save as" dialog box, give a **name** to the L5K file

3. Choose the file type : **RSLogix 5000 Import/Export File (*.L5K)**

4. If needed, change directory where the L5K file will be created and then click on **Save** to create the L5K file

Siemens SIMATIC STEP 7 (ASC, AWL, GR7 and SCL Export files)

To analyze a Siemens SIMATIC STEP 7 application with EcoStruxure Control Engineering products, you need to:

- Create and export the symbols of this application in an **.ASC** file, using the German abbreviations,

- Create and export the contact code (CONT) in an **.AWL** file,

- Create and export all graph blocks (GRAPH) in **.GR7** files (if any),

- Compile CFC codes, if any, to create the corresponding **SCL** sources,

- Export structural codes (SCL) in **.SCL** files.

To create the export files, you must first make sure that your SIMATIC STEP 7 workshop uses the German abbreviations (they can be enabled using the menus **Options** and then **Customize…**)
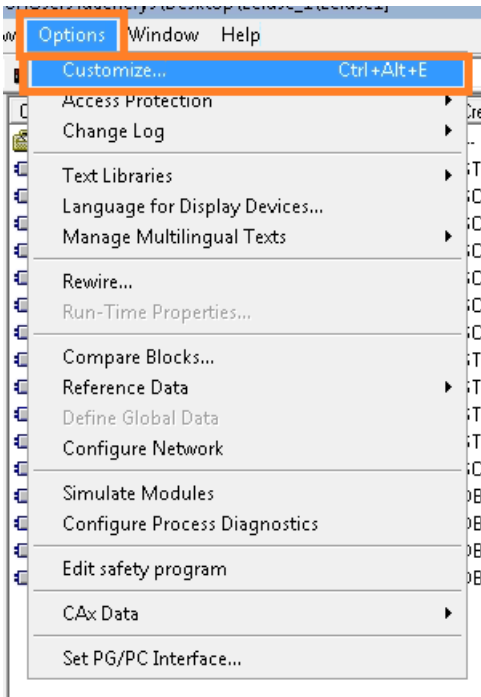
In **Language** tab, select **German mnemonics** and then click on **OK**.
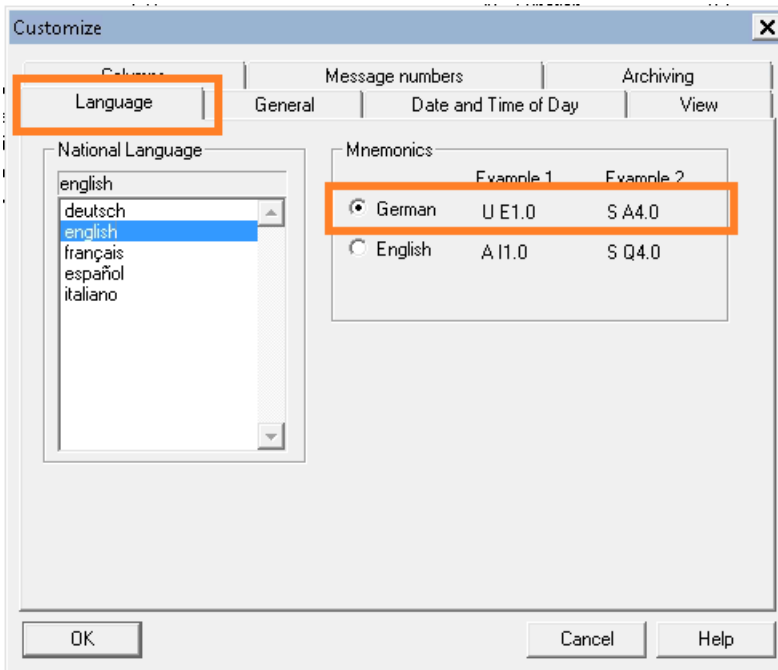
Create ASC file

To create an **.ASC** file, you need to open the symbols editor by going on your program folder and right-clicking on your Symbols table, then select **Open object**
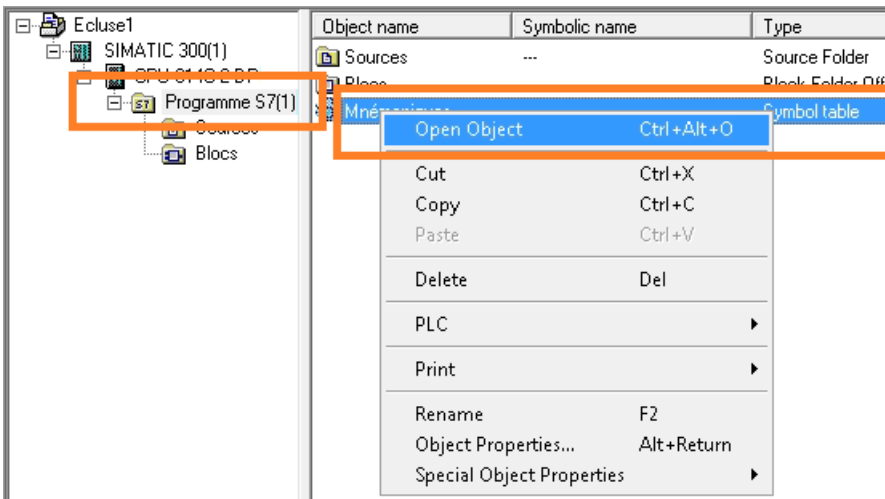
In the symbols editor, click on the **Symbol Table** menu and then select the **Export…** entry
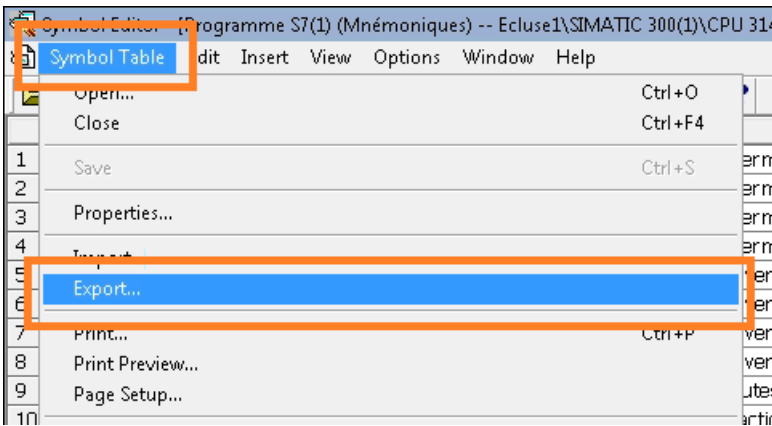
When prompted to save your symbols table, choose the **ASCII Format** (*.ASC) file type, the **name** and the **directory** where **.ASC** will be created, and click on **Save**.
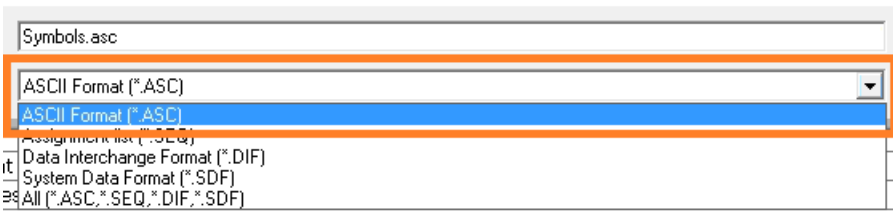
Create AWL file

To create the **.AWL** file, you first need to generate the LIST source for the blocks developed in languages CONT, LIST and LOG.

Open the CONT/LIST/LOG code editor by right-clicking on a CONT, LIST or LOG source and selecting **Open object**
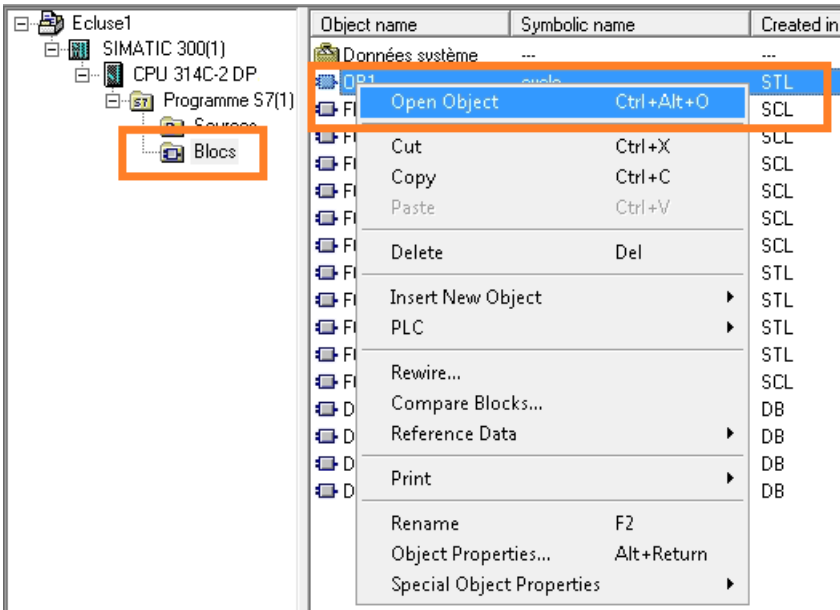
Close all objects being edited by clicking on the menu entries **File** and **Close**
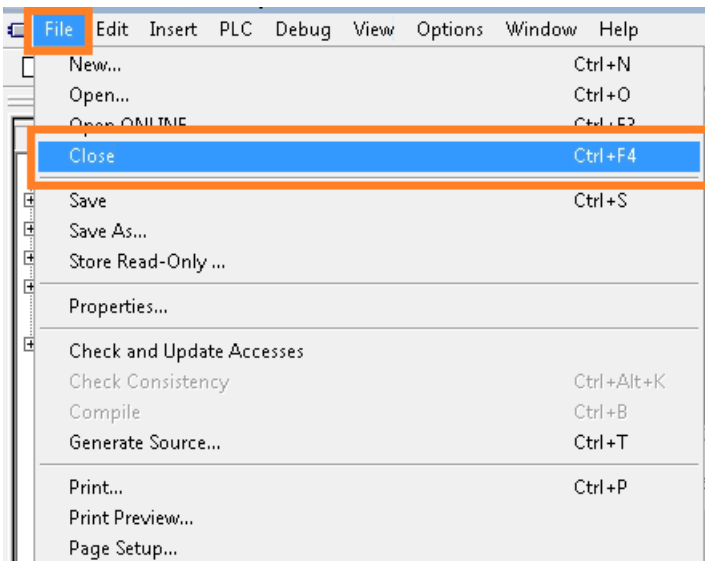
Then, generate the program source with the menu entries **File** and then **Generate source…**
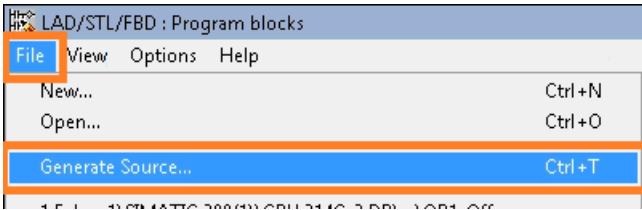
Give a name to the object to be generated
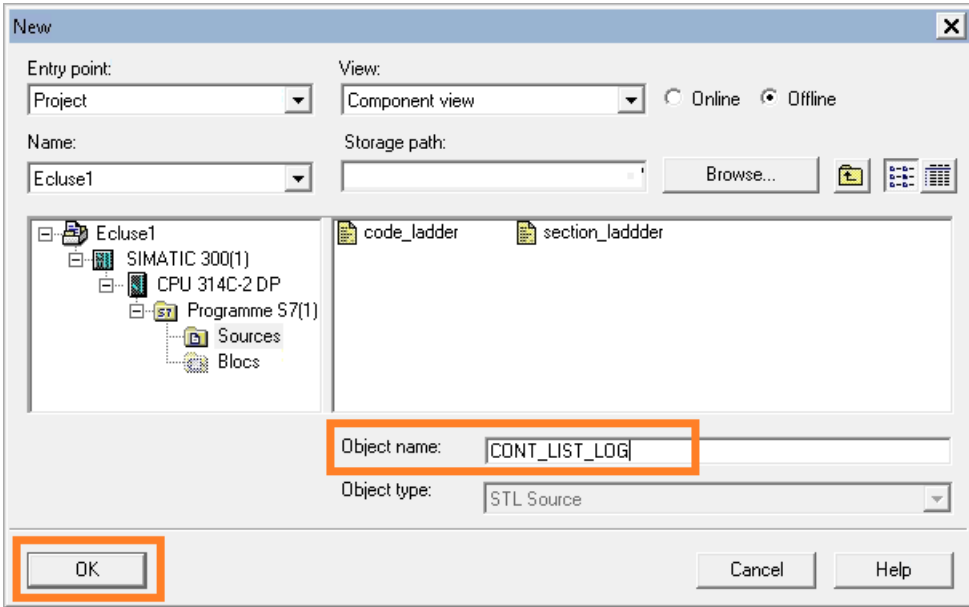
On the selection window, click on the button **All** to select all the program's blocks, select the options **Sort according to program structure** and **symbolic operands**, then click on **OK**
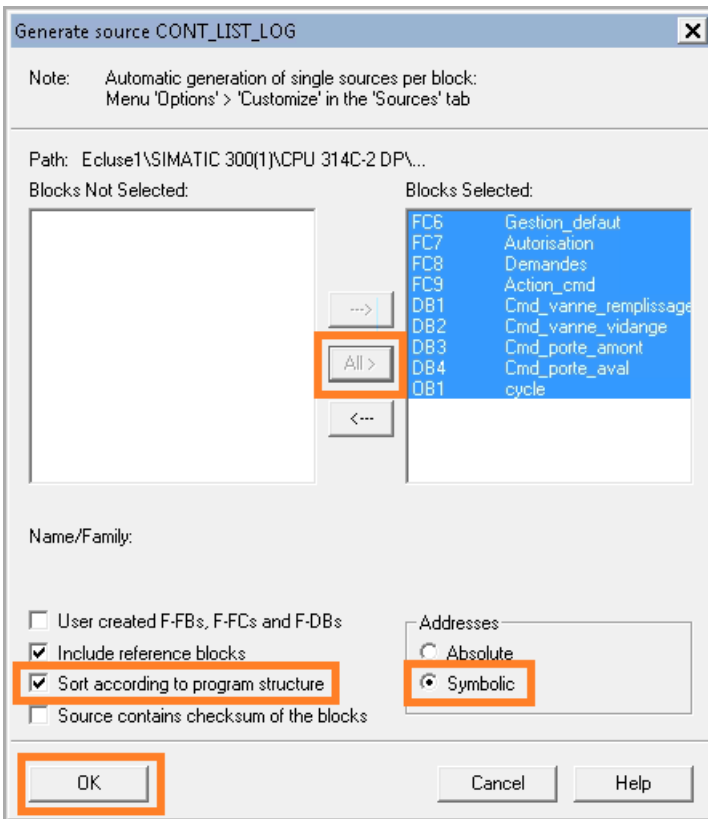
If your application contains Safety blocks, you need to export those blocks in a
separated **AWL** file, more information is available below on how to proceed in the dedicated
chapter.

Create GR7 file

To create the **.GR7** sources, select **all** the GRAPH blocks and open the GRAPH editor by
right-clicking on the selected elements and then selecting the **Open object** menu entry.
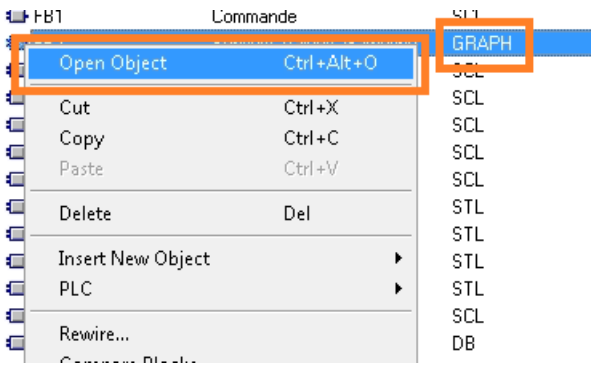
For **each** GRAPH block, generate the source using the menu entries **File** and **Generate source file**
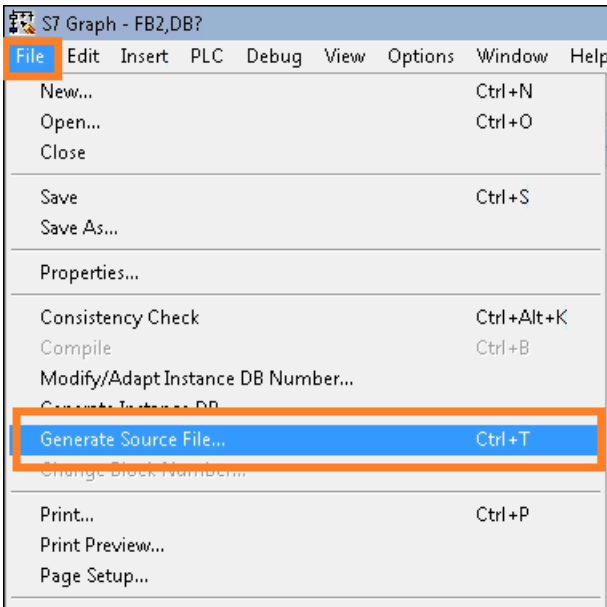
Give a name to **each** GRAPH source file and press **OK**
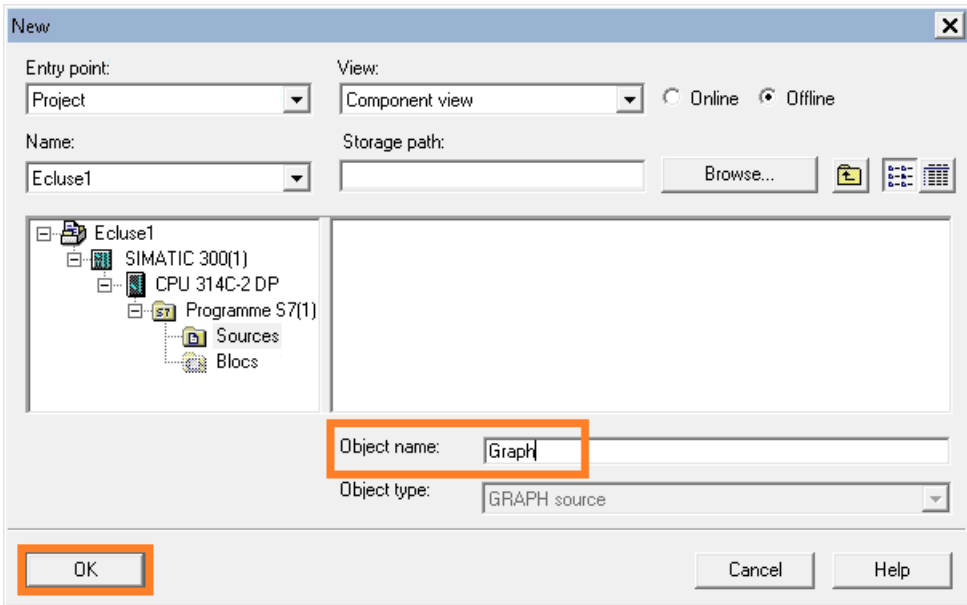
Create CFG file

The CFG file is required for analyzing the communication and the hardware configuration of the Station.

To get the CFG, you need to open the NetPro utility to edit the network configuration by double-clicking on your CPU's links, in the main window.

On NetPro window, select the station that you want to export by double clicking on its CPU, this opens the HW Config utility.

In the **Station** menu, select **Export…** to export your Station configuration (the default settings in the window are sufficient).

Create SCL source for CFC codes

If the application contains some CFC codes, those codes need to be compiled to generate the corresponding SCL source files which are the files analyzed by EcoStruxure Control Engineering products.

Open the CFC code editor by clicking on its icon on the main window menu.
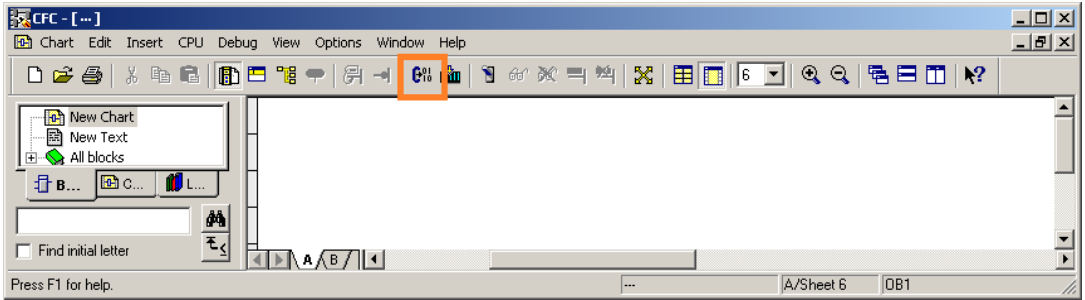
Then, compile the code with the options **Entire Program** and **Generate SCL sources**
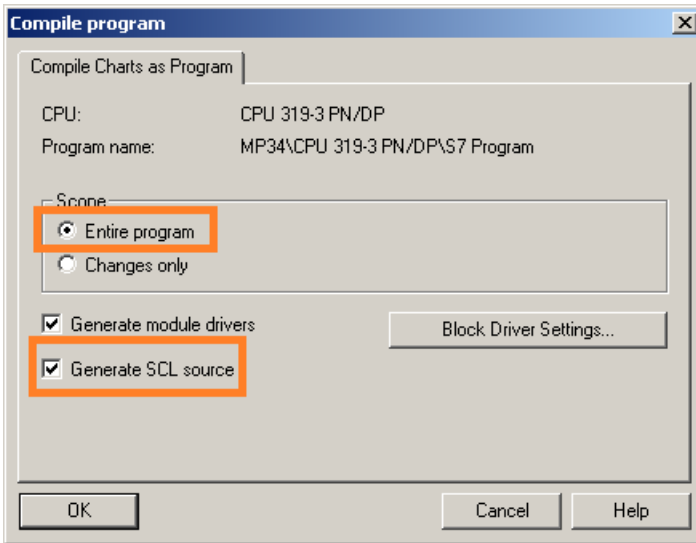
The generated SCL source file can then be exported like other source files, see **export files**
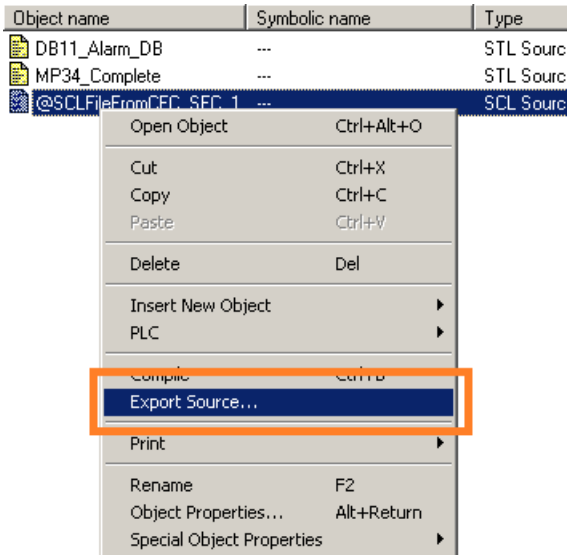
Safety applications

A Safety application contains two parts:

- The standard code part
- The safety code part

Exports for safety applications

The export for safety applications is made with the following steps :

First export the **.ASC** file that contains the database for the program's Safety and standard
codes, see above how to export the **.ASC** file

Then, generate the sources for the standard part (non-safety), see above how to generate **.
AWL** and **.GR7** files
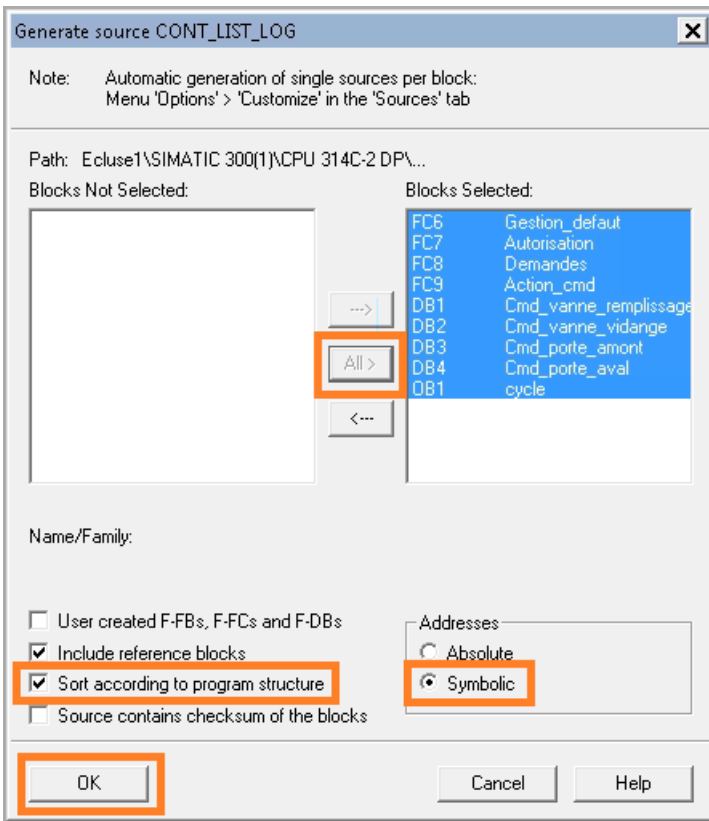
Continue by Generating the source for the safety part in a different **.AWL** file by following the same procedure until the **Generate Source Safety** window, where you need to select the **User-created F-FBs, F-FCs and F-DBs** option.
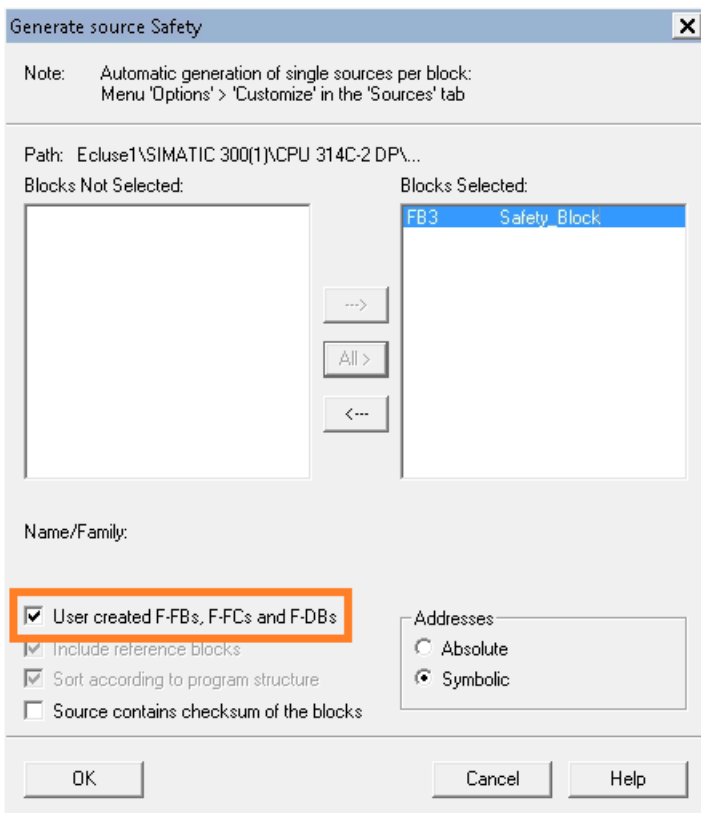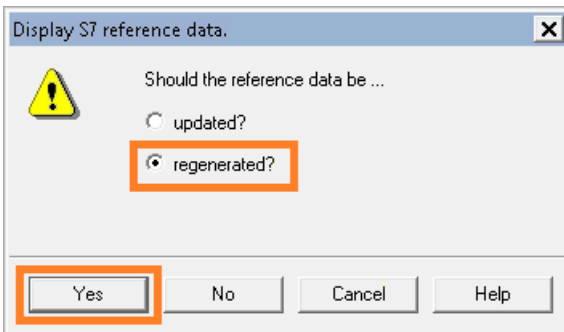
Finally, export the program structure in a **.dif** file (it will be used to determine whether a module is Safety or not)
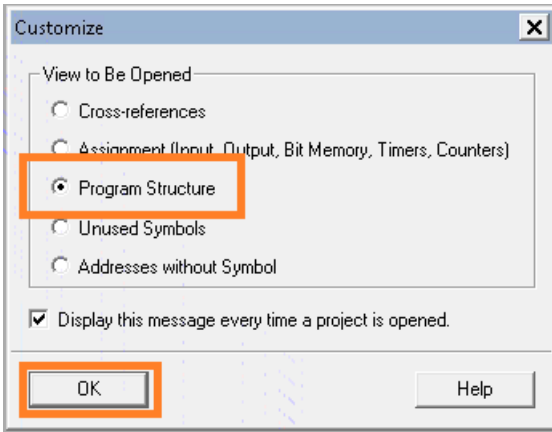
Create dif file

To create the **.dif** file, in the SIMATIC Manager of SIMATIC STEP 7, use the menu **Options**, **Reference Data** then **Display**
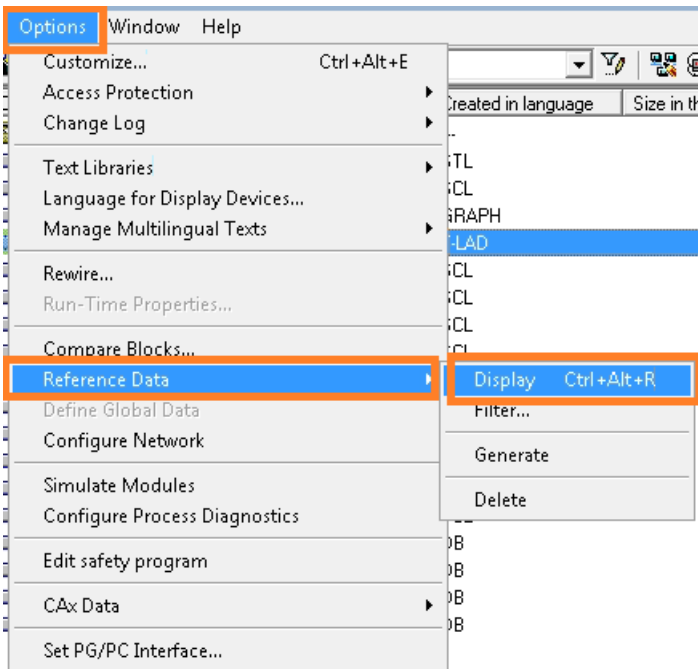
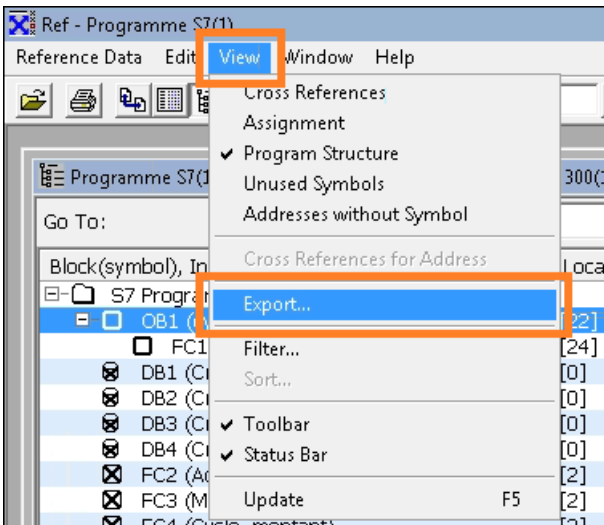If prompted, let SIMATIC STEP 7 regenerate the references

In the **Customize** window, select the **Program structure** entry and click on **OK**

The program structure is displayed

Use the menu entries **View** and **Export** to open the save dialog box
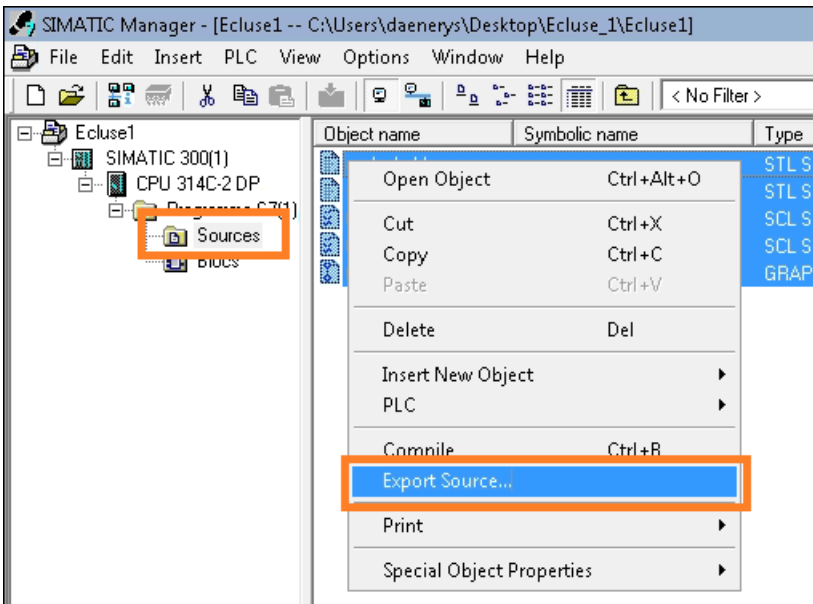

Give a name to the file (for instance structure.dif) and save it

Export files

Once the files are exported, then you need to extract them from SIMATIC STEP 7 to get them into a folder of your choice.

Select the LIST, GRAPH(resp. **.AWL** and **.GR7** files) and SCL sources that have been previously generated (when applicable)

Copy these sources using the contextual menu **Export source…**

Select the folder where you want to export the source files

Siemens TIAPortal SIMATIC STEP 7 (.zip export file)

Siemens TIA Portal SIMATIC STEP 7 application can be exported in a ZIP file in order to be analyzed by EcoStruxure Control Engineering products.

This export is done automatically with the help of the EcoStruxure Control Engineering - Import/Export tool, which can be downloaded from the Schneider Electric Exchange shop (**https://exchange.se.com/shop**).

Please refer to the EcoStruxure Control Engineering - Import/Export tool documentation for more information on how to proceed.

As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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