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READ ME

SCA
SAFETY CODE ANALYSIS

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1   Overview

SCA (Safety Code Analysis) is a software tool. In order to program AC500-S safety PLC, you have to follow certain coding guidelines. SCA can read your safety project and check it against those guidelines, flagging any rule violations.

The user interface of SCA resembles that of relevant AC500-S Programming Tool parts very closely.

2   Release Notes

2.1   SCA V1.1.3

No functional changes in SCA V1.1.3 compared to SCA V1.1.2. The SCA tool is extended for usage of new available libraries for PLCopen Safety (as of Automation Builder 2.7.0):

– SafetyBlocks_PLCopen_LV101_AC500_V22.lib

– SafetyBlocks_PLCopen_LV200_AC500_V22.lib

– SafetyBlocks_PLCopenExt_LV200_AC500_V22.lib.

3   Installation Notes

System Requirements:
Any standard PC with Windows 10 will support the installation of SCA. Your PC shall have adequate memory (SCA needs around 2 MB only) and necessary administrator rights. SCA works as a stand-alone software and takes only a few seconds to complete the installation.

Click on the provided ".exe" file to start the installation process. Make sure that the necessary ".msi" file is located in the same directory with the ".exe" file. You will be guided by the software to complete the simple installation process.

While installing, a message might be shown that the setup requires a certain .NET Framework version. The message is shown if you do not have an installed .NET Framework on your system. Click "Yes" and the .NET Framework download website opens. **Important:** Install .NET Framework **V4.8**, not any newer or older version. After .NET framework installation and Windows reboot, start SCA installation process again.

4   Workflow

– Export from AC500-S Programming Tool

  • In AC500-S Programming Tool, in the main menu, select "Project > Build".
  • Make sure that AC500-S Programming Tool reports no errors or warnings.
  • In the main menu, select "Project > Export".
  • Make sure that in your safety project there are no POUs which are excluded from the compilation. If there are some, do not include them into the export file.
  • Select a location and filename to save the export to, and click "Save".

– Open export in SCA

  • In SCA, press "Ctrl-O", or
  • in the main menu, select "File > Open AC500-S export...", or
  • click the "Open" button on the far left of the toolbar.
  • In the file open dialog, select the file just exported from AC500-S Programming Tool.
  • You can also drag and drop a file onto the SCA window instead.

– SCA immediately analyses your project and displays any found issues in the message list on the bottom.

  • Click on a message to display the source of the affected module and to highlight the exact location where this issue occurred.
  • Hover the mouse pointer over the selected message to see a resolution suggestion. (You may need to select "Options > Enable tooltips" first.)
  • Press F1, or select "Help > Help on this message" from the main menu, to call up a help page on the issue selected. You can also right-click on any message and select "Help" from the context menu.
  • If you want to concentrate on the more serious issues first, select "Options > Show only errors" from the main menu. (This will add a message stating that you disabled warnings to remind you.)
  • If you want to tackle all issues of the same type together, select "Sort > by message number" from the main menu.

– Apply any changes required to your sources in AC500-S Programming Tool. You don't have to close the export in SCA in order to do this.

– Repeat until SCA doesn't show issues any more.

  • To reopen the export last opened:

    – Type "Ctrl-N", or
    – in the main menu, select "File > Reopen", or
    – click on the file name displayed in the toolbar.

  • To open an export recently opened:

    – In the main menu, select it under "File > Open recently used", or
    – click on the small arrow next to the file name displayed in the toolbar, and select the export from the list displayed.

– Print reports as needed.

5 Format of the messages

5.1 Example

Error 0180: Datatypes (H 9): Direct complex type declarations in variable lists are not allowed.

5.2 Explanation

Each message contains the following parts:

– Severity - this may be one of

- "Error" - major rule violation that you must remove;
- "Warning" - minor rule violation that you must remove;
- "Manual" - a situation where SCA cannot determine whether a rule violation really exists or not. You have to manually check for these issues;
- "Remark" - additional information.

– Message type number.

– Location, given by

- name of the POU (program organization unit), global variable list, or type declaration, followed by line or network number in parentheses. If the issue occurred in a POU,

  – "H" indicates a line number in the declaration header,
  – "B" indicates a line number in the body of an ST POU, and
  – "N" indicates a network number in an FBD or LD POU.

– The message text.

6 Library definition files

In order to be able to correctly check certain rules of the coding guidelines, SCA needs to know the definitions of POUs and variables contained in libraries. The following libraries are known to SCA by default:

– Safety_Standard.lib

– Safety_SysLibTime.lib

– SafetyBlocks_PLCopen_LV200_AC500_V22.lib

- Previous versions:

  – SafetyBlocks_PLCopen_LV101_AC500_V22.lib
  – SafetyBlocks_PLCopen_AC500_V22.lib

– SafetyBlocks_PLCopenExt_LV200_AC500_V22.lib

– SafetyExt_AC500_V22.lib

– SafetyUtil_CoDeSys_AC500_V22.lib

– SafetyDeviceExt_LV100_PROFIsafe_AC500_V27.lib

- – SafetyBase_PROFIsafe_LV210_AC500_V22.lib

  - • Previous versions:

    - – SafetyBase_PROFIsafe_LV200_AC500_V22.lib
    - – SafetyBase_PROFIsafe_AC500_V22_Ext.lib
    - – SafetyBase_PROFIsafe_AC500_V22.lib

- – SafetyExt2_LV110_AC500_V27.lib

  - • Previous version:

    - – SafetyExt2_LV100_AC500_V27.lib

If your project references libraries other than the standard libraries named above, you must provide the information contained in these libraries to SCA as follows.

- – Open your library project in AC500-S Programming Tool.

- – Make sure the library project compiles without errors and warnings.

- – Export the complete library project from AC500-S Programming Tool, as described above.

- – Open the export file in SCA.

- – In the main menu, select "File > Save library definition...".

  - • The save dialog opens in the "Library definitions" subfolder of the directory where SCA is installed. Save the library definition file only here, as SCA will otherwise not be able to find it.
  - • If, in projects using the library, it is referenced by a different name, replace the name provided by SCA by that name.

- – Click "Save" to save the library definition.

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