

SCA is short for “Safety Code Analysis”. In order to be able to use ST (Structured Text), FBD (Function Block Diagrams) and LD (Ladder Diagrams) for safety programming in CoDeSys 2.3, you have to follow certain coding guidelines. SCA can read your CoDeSys project and check it against those guidelines, flagging any problems. The user interface of SCA resembles that of CoDeSys very closely, so you should already be familiar with most of what you see.

## 1. Installation Notes

### PC Hardware/Software Requirements:

Any standard PC with Windows OS like XP Professional (32 bit) or Windows Vista or Windows 7 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. However, this depends on the speed of your processor.

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

## 2. Workflow for project analysis

- Export the project from CoDeSys
  - In the CoDeSys main menu, select “Project > Build”.
  - Make sure that CoDeSys reports no errors or warnings.
  - In the main menu, select “Project > Export”.
  - Ctrl-click to unselect „PROFIsafe” folder and then click “OK”.
  - Select a location and filename to save the export to, and click “Save”.
- Open the exported file in SCA
  - In SCA, press “Ctrl-O”, or
  - in the main menu, select “File > Open CoDeSys export...”, or
  - click the “Open” button on the far left of the toolbar.
  - In the file open dialog, select the file just exported from CoDeSys.
  - You can also drag and drop a file onto the SCA window instead.
- SCA immediately analyses your project and displays any problems found in the message list on the bottom.
  - Click on a message to display the source of the affected module and to and highlight the exact location where this problem 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 problem” from the main menu, to call up a help page on the problem 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 problems 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 problems of the same type together, select “Sort > by problem number” from the main menu.
- Apply any changes required to your sources in CoDeSys. You don’t have to close the export in SCA in order to do this.
- Repeat until SCA doesn’t show problems 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.

## 3. Format of the problem messages

### 3.1. Example

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

### 3.2. Explanation

Each message contains the following parts:

- Severity - this may be one of
  - “Error” - major problem that you must remove;
  - “Warning” - minor problem that you must remove;
  - “Manual” - a situation where SCA cannot determine whether a problem really exists or not. Print the “Manual check items” report and manually check for these problems;
  - “Remark” - additional information.
- Problem type number.
- Location, given by
  - name of the POU, global variable list, or type declaration, followed by
  - line or network number in parentheses. If the problem 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 problem message.

## 4. Library definition files

In order to be able to correctly check certain of the coding guidelines, SCA needs to know the definitions of POUs and variables contained in libraries. Some libraries are known to SCA by default (see SCA Help for more details).

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

- Open your library project in CoDeSys 2.3.
- Make sure the library project compiles without errors and warnings.
- Export the complete library project from CoDeSys, 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.