System 800xA

Interlock Viewer for AC800M
User Manual

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Purpose

The purpose of this document is to describe the PC Interlock Viewer for System 800xA and AC800M Connect. The PC Interlock Viewer is the successor of the PC Interlock Display with new features.

Notice

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1. About This Book

1.1 General

This instruction describes how to use the Interlock Viewer for AC800M.

The aspect type Interlock Viewer for AC800M shows the binary incoming interlock and priority command criteria for the selected object types motor or valve. Depending on the status of the variable, criteria that are met are shown in green and criteria not met are shown in red. Priority and interlocking parameters can be used to control the behavior of the process objects in certain situations, for example, stopping an object from running into a certain state or forcing it into a certain state.

1.2 Use of Caution, Information, and Tip Icons

This publication includes **Caution** and **Information** where appropriate to point out safety related or other important information. It also includes **Tip** to point out useful hints to the reader. The corresponding Function Designer Components should be interpreted as follows:

Caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in corruption of software or damage to equipment/property.

Information icon alerts the reader to pertinent facts and conditions.

Tip icon indicates advice on, for example, how to design your project or how to use a certain function

Although **Caution** hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all **Caution** notices.

1.3 Terminology

A complete and comprehensive list of Terms is included in the Industrial IT, 800xA - System, Engineering Concepts instruction (3BDS100972).

The following listing includes terms and definitions as they apply to the 800xA system and specifically to the Interlock Viewer for AC800M.

2. How to get started

The Interlock Viewer system extension consists of the following sw package.

- ABB PC Interlock Viewer 5.1-1/8 (Build: 5.1.5637.13935)

Execute the following steps to get it installed.

- Install Interlock Viewer program – refer to 2.1
- Load Interlock Viewer programs – refer to chapter 2.2
- Select a start object in the object browser and generate the Viewer Aspects refer to chapter 2.4
- For a start, customizing the Interlock Viewer settings is not needed. - refer to chapter 3
- Select Interlock Viewer window by means of a locked motor or valve faceplate or by means of the faceplates context menu. – refer to chapter 4

2.1 Program Installation

> Install the Interlock Viewer for AC800M Setup on all 800xA aspect server and all engineering client nodes.

1. Start the program "Setup.exe" from the installation folder. Follow the instructions of the Installation Wizard.
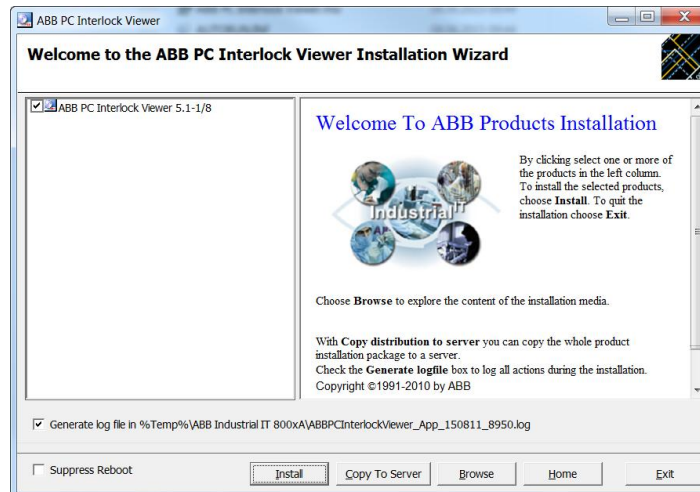
2. Activate the option „ ABB PC Interlock Viewer 5.1-1/8".Clicking **Install** and some **Next** buttons starts the installation.

3. You can view the successful installation via the log file.
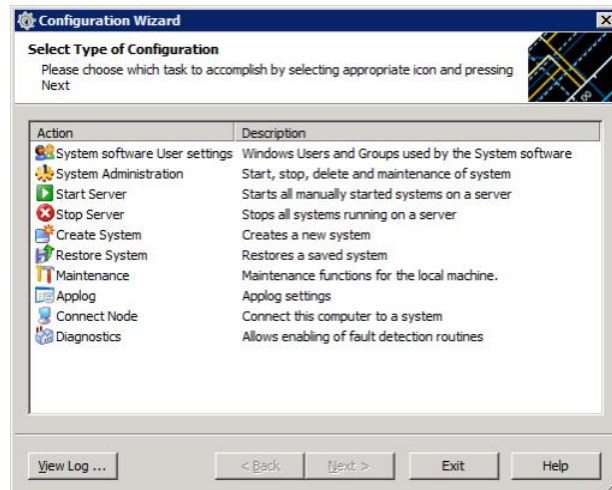
2.2 System Extension Loading

After completing the installation procedures on all 800xA nodes, load the Interlock Viewer for AC800M system extension. This procedure has to be executed once.

> Make sure that the 800xA System, including the system extensions for the needed control libraries has been loaded prior to starting the following procedure.

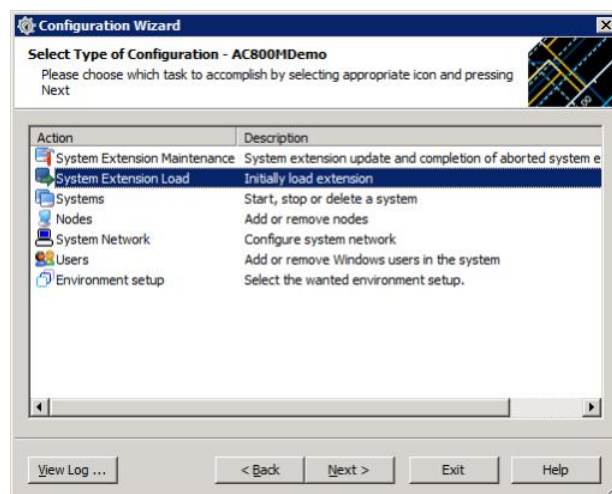Loading the system extension ABB PC Interlock Viewer 5.1-1/8:

1. Start the 800xA Configuration Wizard.

   Start -> All Programs -> ABB Industrial IT 800xA -> System -> Configuration Wizard.

2. When the dialog appears select **System Administration** as type of configuration and confirm your selection with **Next.**
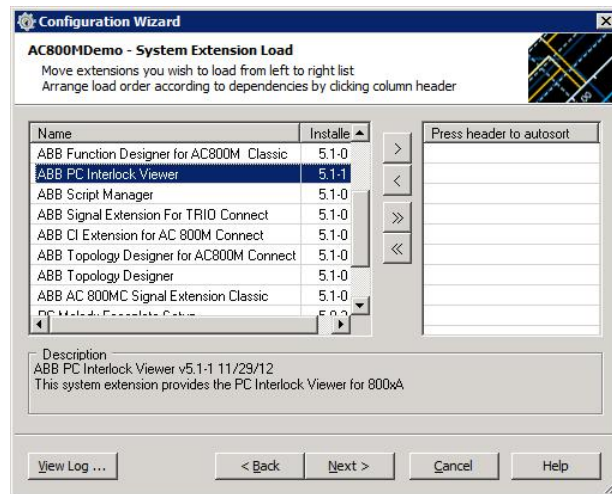
3. Select your 800xA System Name and continue with **Next**.
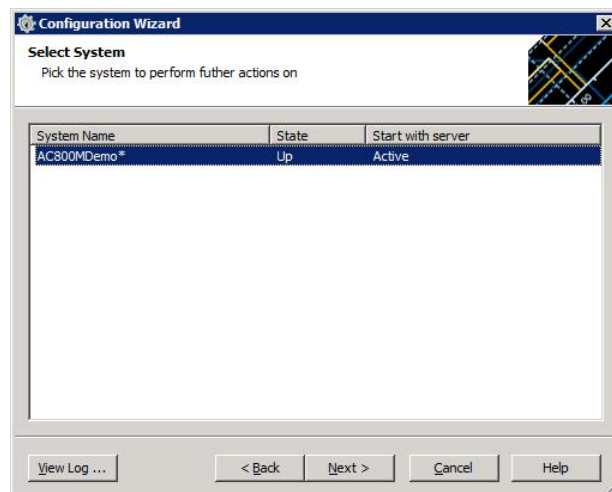
4. Choose **System Extension Load** to initially load the ABB PC Interlock Viewer extension. Continue with **Next**. When updating ABB PC Interlock Viewer, choose **System Extension Maintenance**

5. Move extension **ABB PC Interlock Viewer** to the right list. Clicking **Next** brings the next dialog.

6. Confirm the start of the loading process with **Finish**.
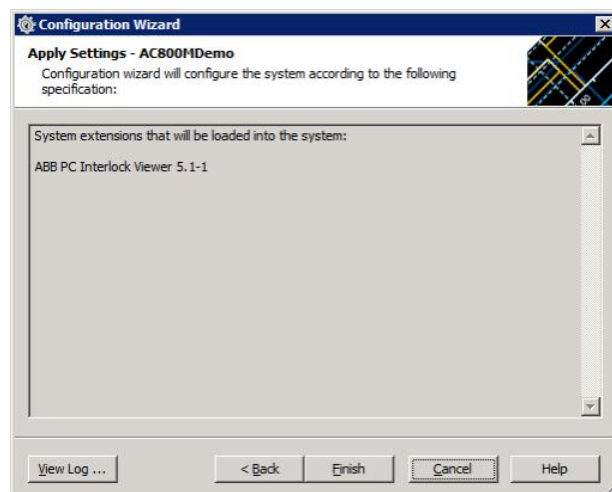
7. The following window appears after the completion of the load operation. Proceed with **Finished** to the Configuration Wizard.

8. **Exit** closes the Configuration Wizard dialog.

2.3   Upgrading former PC AC800M Interlock Display installations

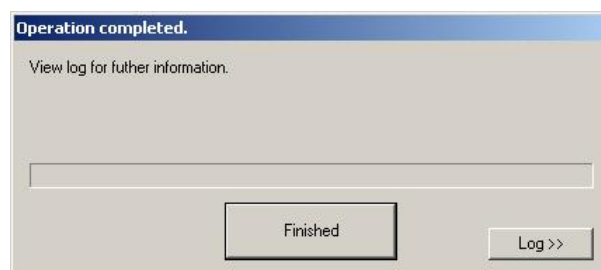This task should be executed by someone who is familiar with 800xA administration. It will last approximately 1 to 2 hours. Please follow this instruction thoroughly. Misuse can damage the system configuration. Alternatively we offer our services. Contact your local ABB representative or e-mail us via mailto:tech-support-system-solution@de.abb.com

> Both versions can run in parallel. The PC AC800M Interlock Display should only be removed if all new Interlock Viewer aspects are generated and all references from graphics and faceplates are changed to the new Interlock Viewer aspects.

To upgrade the ABB PC AC800M Interlock Display to the new PC Interlock Viewer follow the upgrade steps.

- Install the PC Interlock Viewer software as described in chapter 2.1.

- Load the PC Interlock Viewer system extension as described in chapter 2.2

- Start the Uploader tool as described in chapter 2.5.

  When the Uploader tool is first started, a window appears which allows transferring the available "old" configuration aspects (Interlock Display) into the new Interlock Viewer aspects (if there is any configuration data that is not already part of the common or library specific configuration).
 Select the items (object types, data types and modules) you want to transfer to the Interlock Viewers project definition and click OK.
  If you have selected any object type, the needed aspects will also be created on the object type. In case the Override functionality is used, answers the question "Proceed also Override State aspect" with "Yes".

- Select each project (or applications) in your system and perform an upload to update the Interlock Viewer aspects.

- Add the PC Interlock Viewer aspect category to the filter settings used for operation and engineering.

- Open one Interlock Viewer aspect and in parallel an Interlock Display and compare the indicated logic. This is to ensure that the settings of the Interlock Viewer are equal to the current Interlock Display configuration.

- Change all references in graphics and faceplates to the new Interlock Viewer. For the PC Library objects this can be done by importing the adapted faceplates and graphic elements or updating the PC Toolkit Library to version 5.1-3 or above.

- Remove all interlock display aspects from your system, starting at the object types. It is mandatory to create an 800xA backup before execute these steps.

Delete the Interlock Display aspect on each object type in the object type structure. This can be done by using the Find Tool with the settings Aspect Category = "PC AC800M Interlock Display" and Structure = "Object Type Structure"
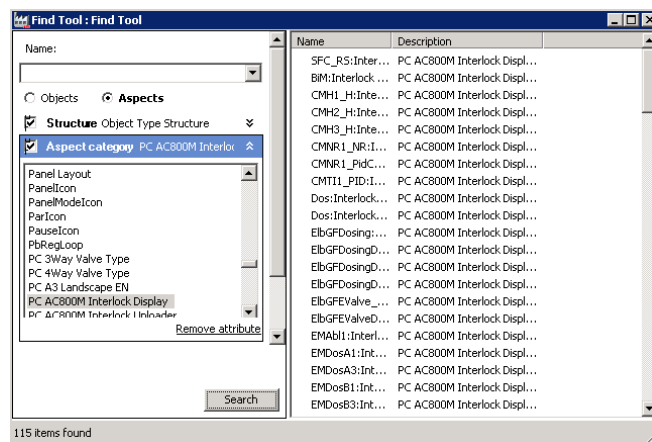
> As it is allowed to have instances also in the Object type structure (as part of other object types), it is mandatory to delete the aspects for basic object types first. Select only those names which represent object types and no instances. Deletion may also be aborted when objects are reserved by any user. So search them and release them first before deletion.

2. Delete the Interlock Display aspect on each instance. This can be done by using the Find Tool with the settings Aspect Category = PC AC800M Interlock Display.

   If the following message occurs during deletion
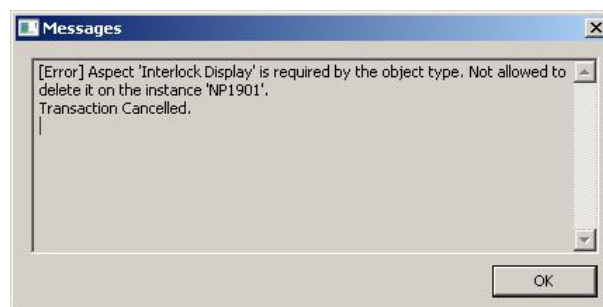
   Open the Consistency Check tool and insert the object(s) by drag and drop to the left pane of the consistency check tool. Click the Check button.
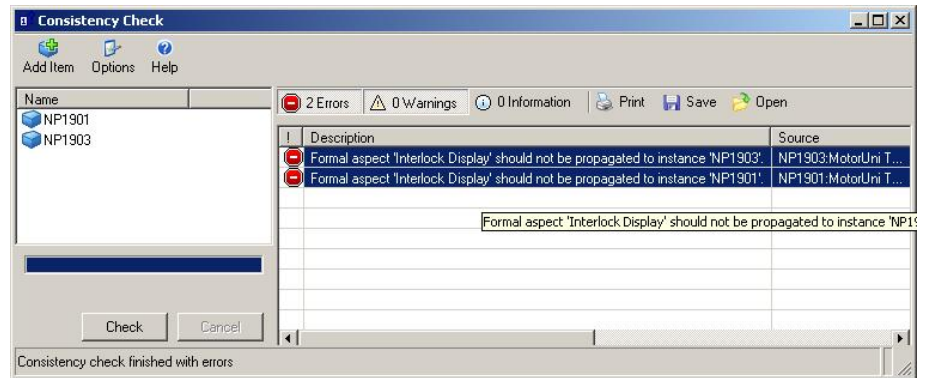
Select the reported error messages, open the context menu and click "Repair aspect". Accept the following message box with click on Yes.

Repeat step 1 and 2 also for all aspects of category "PC AC800M Interlock Uploader" (if available in the 800xA system).

3. Remove the definition of the Interlock Display aspect type and category definition from the 800xA system.
Use the Plant Explorer Workplace (or Engineering Workplace) and go to the Aspect System Structure and navigate to the object "PC AC800M Interlock Display, Aspect System". Select this object and delete it.

4. Remove the system extension entries from the 800xA system.

    a. Navigate to the system definition in Admin Structure (located under [Admin Structure]Administrative Objects/Domains) and open the System Extensions aspect.
    Select the PC AC800M Interlock Display item in the upper pane and then select the first entry in the lower pane, open the context menu and click delete.
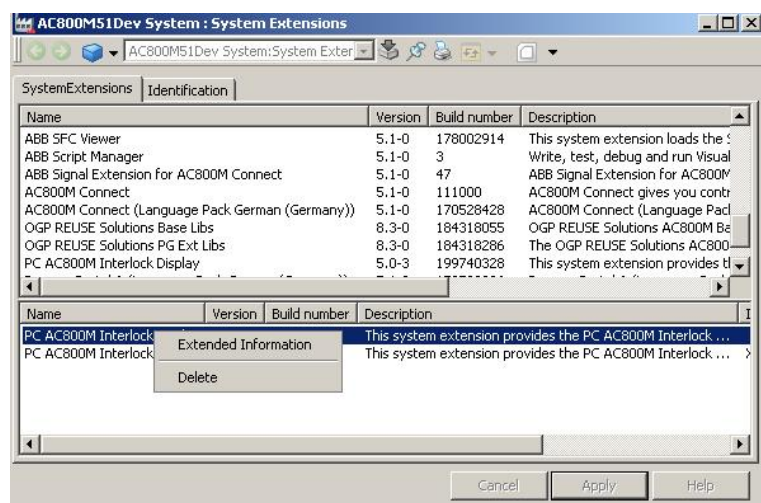
Answer the following message box with „No" (Yes is not implemented).

Repeat this step for each entry in the lower pane.

  b. Navigate to the system extension object in the Admin structure ([Admin Structure]Administrative Inventory/Objects Object/System Extension/PC AC800M Interlock Display) and delete this object.

▪ Uninstall interlock display on all nodes

2.4 The Interlock Viewer Uploader Tool

The Interlock Viewer aspect is generated by means of the PC Interlock Viewer Uploader Tool. It can either be started by opening the program execution file from

■ the installation folder C:\Program Files\ABB Industrial IT\Control IT\ABB PC Interlock Viewer\bin\PC Interlock Viewer Uploader.exe on 32bit OS

■ the installation folder C:\Program Files (x86)\ABB Industrial IT\Control IT\ABB PC Interlock Viewer\bin\PC Interlock Viewer Uploader.exe on 64bit OS

■ the "Interlock Viewer Uploader" aspect from the Root object of the Functional Structure
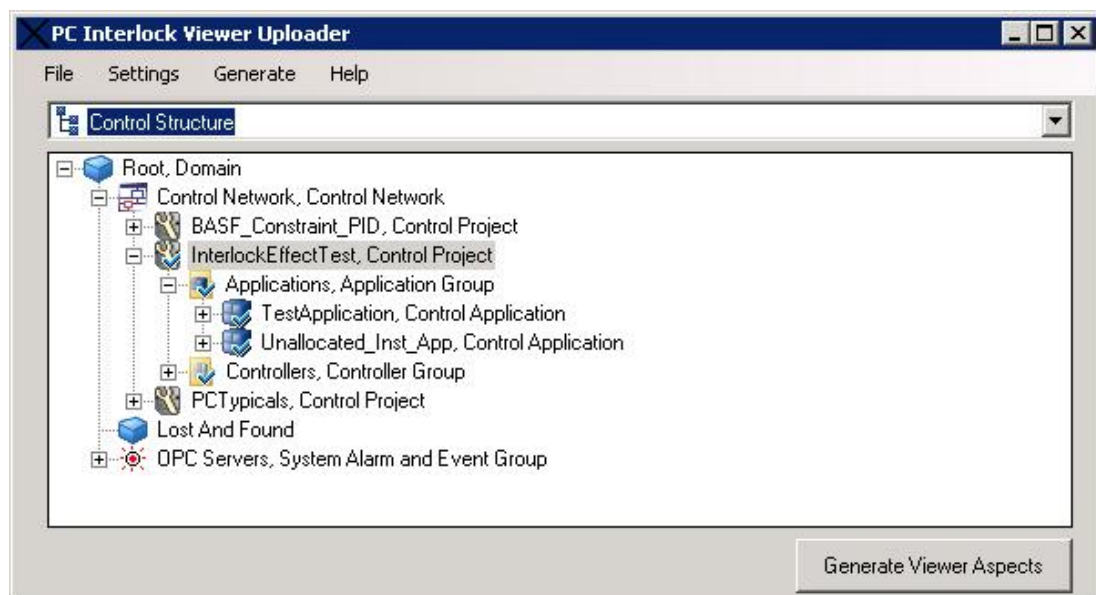

Figure 2-1: PC Interlock Viewer Uploader main window

Select a valid start object and start generation

First select a start object in the object browser. Valid object types are Control Project, Control Application Group and all objects below. It is also possible to select a single object; in this case the generation of the Interlock Viewer aspect will only be performed for this object. But the application data will always refresh (if any configuration change is found) for the entire application where the object is located.

After a mouse click on the "Generate Viewer Aspects" button (or select menu Generate → Generate Viewer Aspects) an options window shows up. Here you can set additional options for aspect generation.
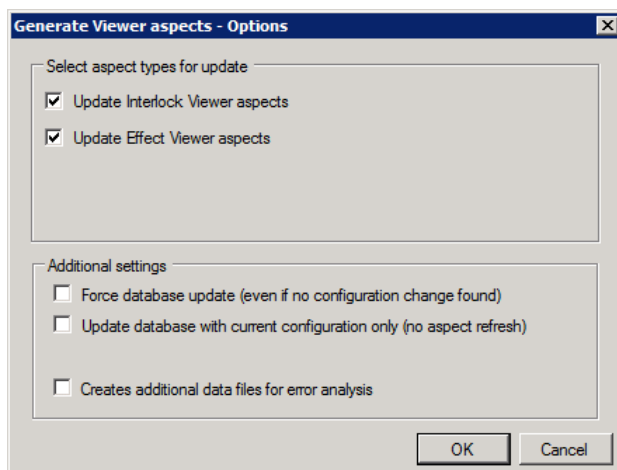

Figure 2-2: Aspect generation – Options

- ▪ Select aspect types for update

  - o Update Interlock Viewer aspects
    Perform the recreation of the contents of the Interlock Viewer aspects

  - o Update Effect Viewer aspects
    Perform the recreation of the contents of the PC Effect Viewer aspects. This option is only available if the PC Effect Viewer system extension is installed (see document 3BDA035403 Effect Viewer for AC800M)

  At least one option must be select in order to proceed!

- ▪ Additional settings

  - o Force database update
    Forces an update of configuration data in the internal database, even if no configuration change is detected during the check of the modification date.

  - o Update database with current configuration only
    If set, the Uploader is updating the configuration data in the internal database, but the viewer aspects will not refresh.

  - o Create additional data files for error analysis
    If this option is set, some intermediate XML files are created in the Data subdirectory (C:\Program Files\ABB Industrial IT\Control IT\ABB PC Interlock Viewer\bin\Data).
    This option should only be set on request by ABB service personnel.

A mouse click on the OK button starts analysis of the control application(s), the upload of the configuration data (if needed) and the generation of graphics data of all Interlock Viewer aspects located at the selected 800xA object and its child objects.

A progress window is shown, in which the upper bar indicates the overall progress and the lower bar the progress of the current step. The text field contains the actions that are executed as text.
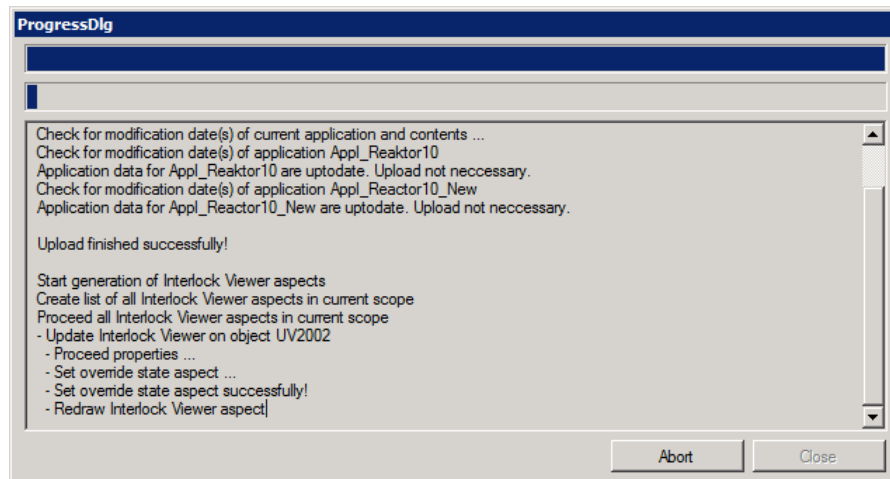
```
ProgressDlg

Check for modification date(s) of current application and contents ...
Check for modification date(s) of application Appl_Reaktor10
Application data for Appl_Reaktor10 are uptodate. Upload not neccessary.
Check for modification date(s) of application Appl_Reactor10_New
Application data for Appl_Reactor10_New are uptodate. Upload not neccessary.

Upload finished successfully!

Start generation of Interlock Viewer aspects
Create list of all Interlock Viewer aspects in current scope
Proceed all Interlock Viewer aspects in current scope
- Update Interlock Viewer on object UV2002
  - Proceed properties ...
  - Set override state aspect ...
  - Set override state aspect successfully!
  - Redraw Interlock Viewer aspect

                                          Abort        Close
```

Figure 2-3: Aspect generation – Progress dialog

The upload is finished if a completed message is shown and the Close button is enabled.
The upload may abort either by clicking the Abort button or automatically due to an error reported during upload. The abort request must be confirmed in the Abort dialog. It may take a while until the confirmation dialog is shown.

In case of an error, check the upload log file and session log file (available from the main window menu File → View last upload log and File → View session log) and may needed corrections or contact your service organization. The session log file contains more detailed information.

2.5   Updating control data for Interlock Viewer

After every configuration change (If interlock relevant configuration is changed or the object has moved to another location in the control structure) an upload is necessary. The tool analyses the inputs of the interlock relevant ports (as described in "Define upload settings") of the object where the Interlock Viewer aspect is located.

The Interlock Viewer Uploader is analyzing the complete control application (where the selected object is located) and stores interim data in a local database. Prior to the start of the Interlock Viewer aspects generation, the modification dates of the aspects of the current application will be checked against the last upload time and performs a configuration data upload from the CBM if necessary.

> It is recommended that the upload should always run on one engineering client (or server).
>
> Analyzing an application or project may take some time depending of the contents of the application.

> Control Builder M must be installed on the client node in order to successfully launch the tool to generate or update the Interlock Viewer content.

> ⚠ Be sure that no reserved entities exist during the run of the Uploader tool! The execution may fail if an object is reserved by another user.

2.6 Limitations

The Uploader tool has some limitations for reading and analyzing the current configuration from Control Builder M. Configurations that exceed these limitations will either not be displayed or do not work properly.

■ Programs, Single Control Modules or Control Module types must be configured as FBD (function block diagram) or diagram code. The Function Designer creates FBD (for function diagrams based on single control modules) or diagram code inside the CBM. Connections between Control Modules created by the CMD editor or manually by assigning variables in the connection window of a control module are possible.

■ Limited support for structured text (ST) is available. Excluded from analysis are statements like selections (if, case) and loops (for, while, repeat) and their inner code.

■ Contents of control modules or function blocks that are marked as protected will not be analyzed, even if the protection is currently overridden in the ControlBuilder M.

■ The use of communication variables (IAC - Inter Application Communication) and MMS requires that the source application of a communication variable is analyzed prior the target application; otherwise the source is not show in the interlock viewer). Use the option "Update database with current configuration only" to analyze the applications only before starting the "normal" generation of the interlock viewer aspects.

■ The direction of control module parameters must be defined either by using the direction entry on the control module parameter definition or by defining the direction in the description (description starts with IN …, OUT …, etc). The definition of the direction will be used prior to the definition in the parameter description.
Parameters with direction "in_out" are analyzed as input parameters, except the direction is defined in data type definition for each component (in the description) of a structured data type! This can be overridden in the configuration settings (see chapter 3.5 Customize object type definitions).
Please take care especially when using nested object types with mixed parameters (input and output values in the same parameter). It should not be used in order to create proper Interlock Viewer displays.

■ Deleted or renamed applications must remove from the data base prior start a new upload. This can be done by delete the complete data base or the single application using the "Delete database" or "Delete application from database" menu item in the Generate menu.

■ The code analysis will stop, if:

- "Deep Search" option is not enabled and acontrol module or function block with a faceplate is found. The name and the port of object will be added to the interlock display.

- No source for a variable / connection was found in the uploaded configuration data. This may happen if a variable is defined on an input without any source. The name and description of the variable will be added as variable to the interlock display.

- "Stop analyze at FD reference" is enabled:
  If function designer is used to configure the control logic and the Uploader found an external or communication variable.

- The Function Designer is used to configure the control logic and an external or communication variable description ends with "#IVBreak" (case sensitive). This is used to break the code analysis at a defined point (normally used to simplify the shown logic).

- The module type found during the code analysis is listed in the "Stop analysis on modules" list in the configuration (see chapter 3.8 Exclude module types from content analyze).

3. Customizing Interlock Viewer

3.1 Customizing Generation behavior and layout

The contents and generation settings for the Interlock Viewer are stored within the 800xA system.

There are several aspects located at the object "[Object Type Structure]Object Types/PC Interlock Viewer Definitions/PC Interlock Viewer Settings".

Aspects of category "PC Interlock Settings" contain solution specific configuration settings for OGP REUSE Solution Library for Oil & Gas projects (ABB OGP Norway) and PC Library for the Process Industries (ABB OGP Germany). These aspects must not be changed by a project team. Original aspects that are customized will be overwritten when upgrading the Interlock Viewer software

An additional aspect of category "PC Interlock User Settings" allows further customization. This aspect contains project specific configuration data. Project specific settings for the same object type and port are higher prior than the library settings.

To transfer the project settings from one system to another system export the "IV project settings" aspect from the source system and transfer it to the target system

To edit the settings open the Interlock Uploader tool and select "Settings" -> "Edit Interlock Viewer settings". The configuration dialog is shown.

Change and create library specific configuration settings (Developer mode)

As default only the Project Defined settings can be changed. Library developer can access the library specific configuration settings by entering a password. For password send a request to tech-support-system-solution@de.abb.com. Select the menu "Settings" → "Developer mode" in the Interlock Uploader main window and enter the password to enable the developer mode.

After enabling the developer mode, each predefined configuration setting can be changed. Select the current scope drop-down box (in the lower left corner of the configuration window) and select the configuration that should change.
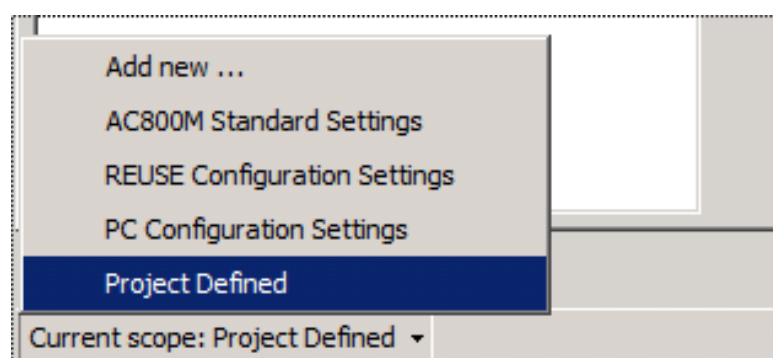

Figure 3-1: Change current configuration setting for editing

The "Add new …" choice allows creating a new setting. The name specified is also the name of the configuration aspect. Only numbers, letters and some other characters (space, underscore) are allowed in the setting name.

Existing configuration settings are deleted by removing the configuration aspect for 800xA.

Library specific settings are valid for object types, data types and modules. Generation and layout settings are always project specific.

3.2 Customize common setting

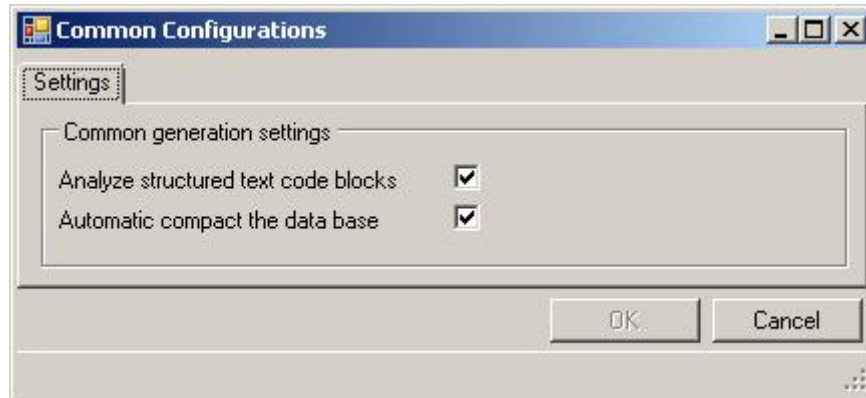Common settings will the defined basic behavior of the uploader tool.

Figure 3.2 Interlock Viewer Common settings

Analyze structured text code blocks

This will enable the analyses of structure text code blocks during the upload of a control application.

Automatic compact the data base

This will enable the automatic compacting of the data base after upload of application contents. Depending on the size of the data base this may take some minutes.

To avoid unnecessary waiting time if planned to upload more than one application in separate steps, it is possible to disable the automatic data base compacting. If this is disabled it is possible to compact the data base manually by the menu Generate – Compact data base.

3.3 Customizing Generation settings

The "Generation settings" can be modified to the project needs.

Modification on the Generations settings require a recreation of the Interlock Viewer aspects by performing a new upload.
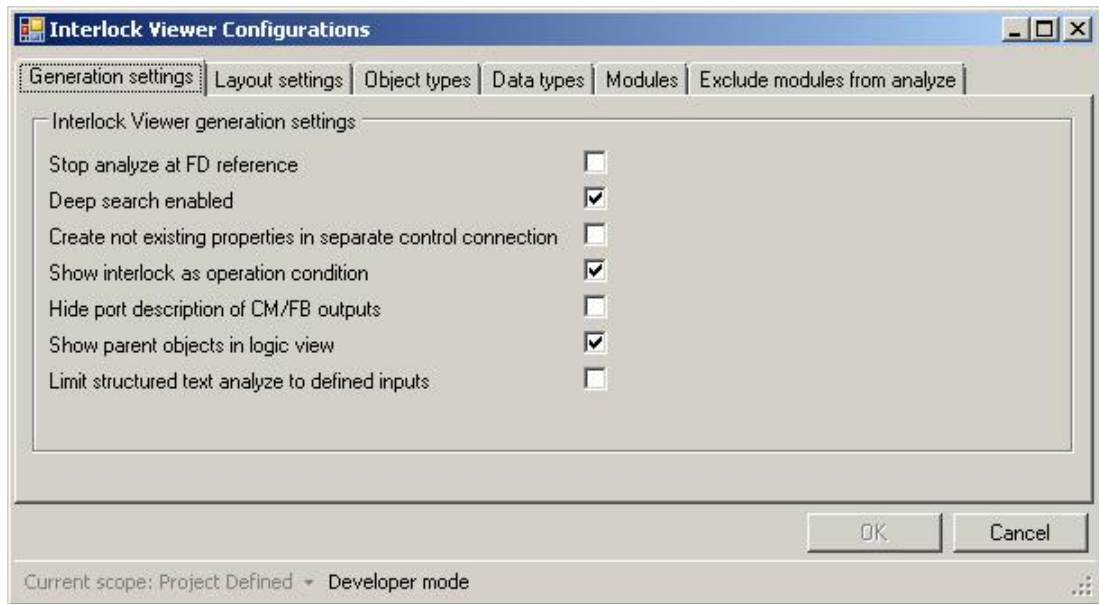
Figure 3-3: Interlock Viewer Generation settings

Stop analyze at FD reference

The Interlock Viewer Uploader is also able to analyze configurations that might consist of more than the current POU (Diagram, Single Control Module).

The choice "Stop analyze at FD reference" will create data for the current Function Designer diagram only. Input references from other diagrams are shown as the variable name.

By activating this option, the same behavior on the upload is achieved as it was in the former PC Interlock Display for AC800M 5.0-3.
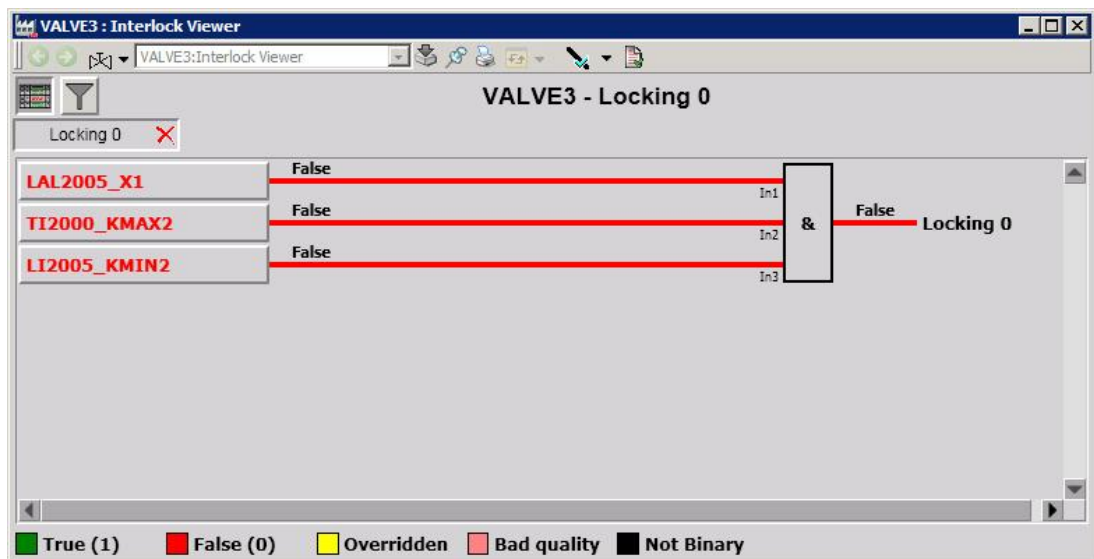
Figure 3-4: Interlock Viewer with setting Stop analyze at FD reference = True
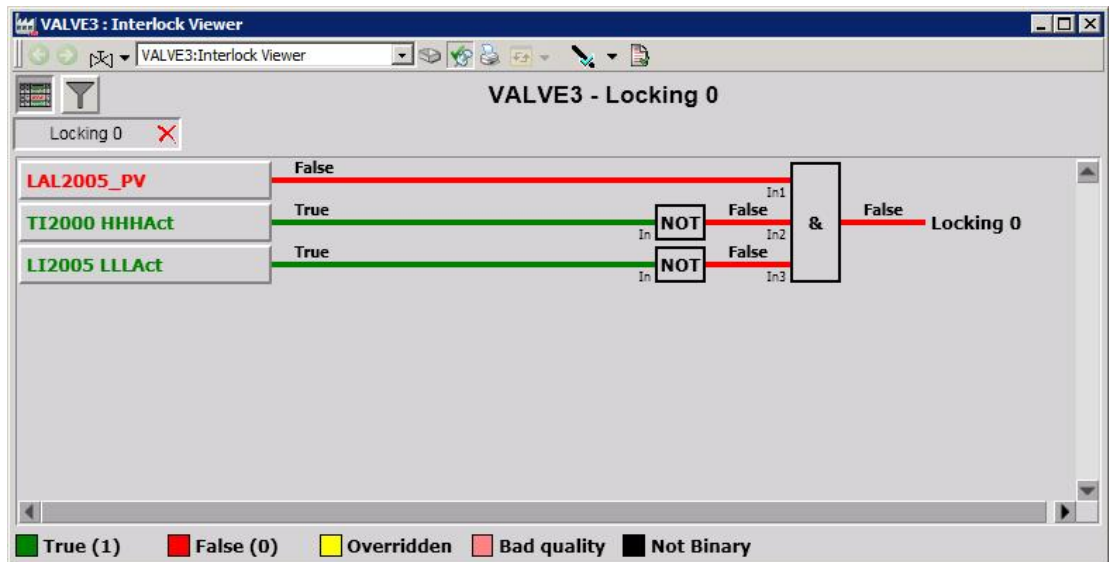
Figure 3-5: Interlock Viewer with setting Stop analyze at FD reference = False

Deep search

Normally the code analysis is stopped if an object with faceplate was found. Then a reference to the objects output is placed as input variable for the Interlock Viewer.

In some configurations it might be useful, to see the complete path from the current interlock input up to the objects that have impact on the interlock. This can be achieved by setting the "Deep search enabled" option.

If this option is set, the code analyze will not stop at modules with a faceplate, it will also be examined as a "normal" module and its inputs will also be analyzed. Such a module is displayed in the logic view as a module with a 3D frame. A mouse click on this frame opens the default aspect of this 800xA object (normally the faceplate). With a right mouse click the context menu is shown.

> Deep search may result in very complex logic views. In order to reduce the complexity, constant inputs of modules will be hidden and the input values of the Interlock Viewer will be the first module output in the logic chain (if any).

Example:

This basic example shows the behavior of deep search. It consist of 2 AI, 1 PID and 1 Valve control modules.
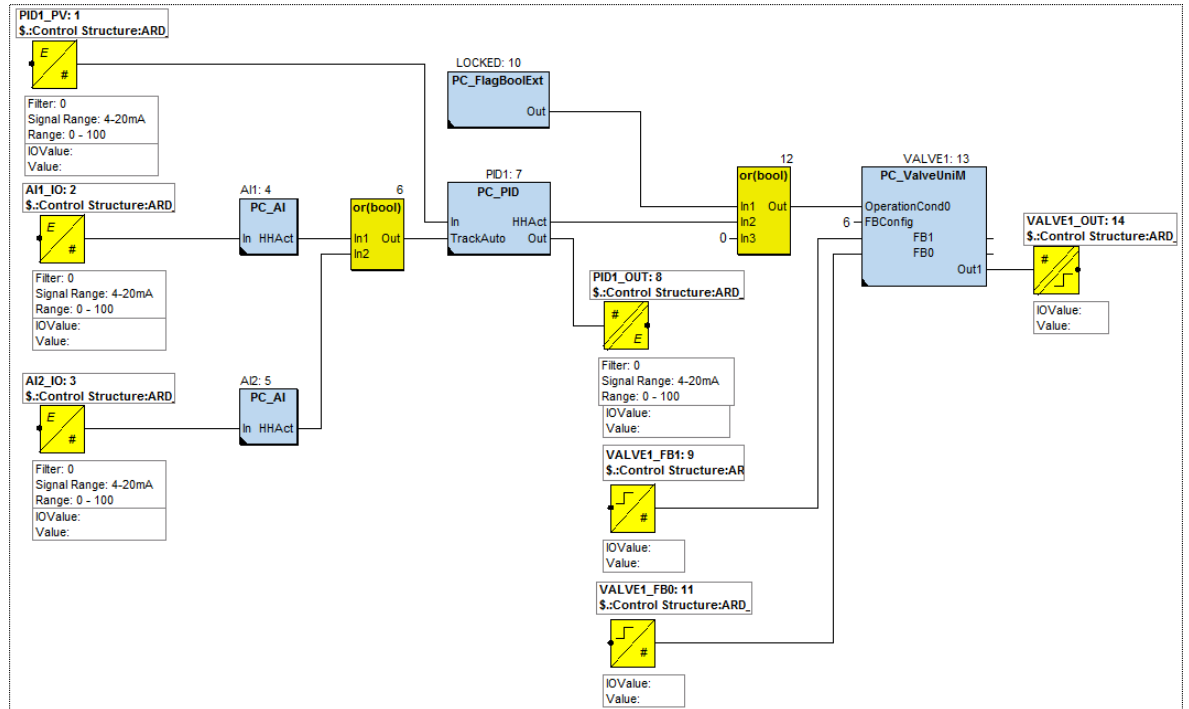
Figure 3-6: Deep search example configuration

If "Deep Search" is not enabled the Interlock Viewer of the valve shows only the connection to the HHAct output of the PID module and the Out of the LOCKED module.
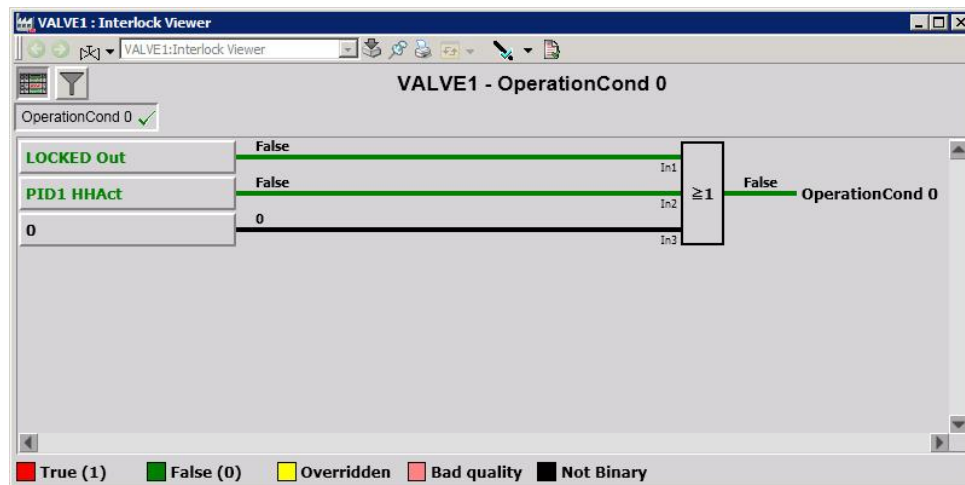

Figure 3-7: Valve Interlock Viewer without Deep Search enabled

The "Deep Search" option shows the connections between the AI's and the PID which is indicated as lifted square sign. On click on the PID square in the interlock logic, the default aspect (normally the faceplate) will open.
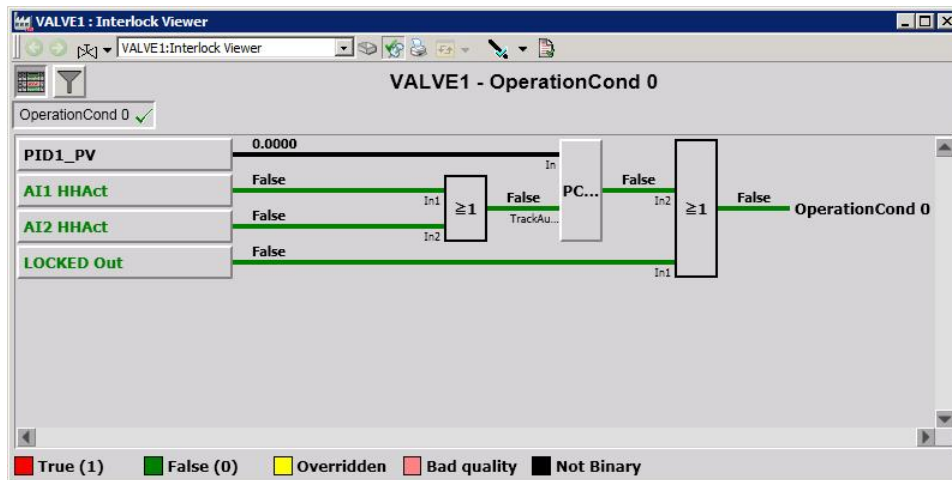
Figure 3-8: Valve Interlock Viewer with Deep Search enabled

Create non existing properties in separate control connection

Depending on the configuration, it might be that value references in the Interlock Viewer are not available as properties in 800xA, but in the AC800M OPC server. This is the case if values of control modules or functions blocks are used, that are not available as 800xA objects.

In this case these items can be added to the 800xA system as properties of an additional "Interlock Control Connection" aspect. This aspect is created automatically if this option is set and one or more properties are not found within 800xA. If the Interlock Control Connection aspect is no longer needed it is removed automatically on next upload.

Show interlock as operation conditions

Depending on the customer requirements the interlocks can be displayed as operation conditions. Interlocks are normally active with "1"-signal at the modules input, whereas operation conditions must have a "1"-signal to avoid interlocking the control module.

As the interlock inputs at the modules cannot be changed, the indication inside the Interlock Viewer can be adjusted. To enable the adjustment the "Show of interlock as operation condition" option must set.

If this option is set and the interlock logic is configured with as inverted at the interlock input or the last module in the interlock logic is an inverter module (defined as type "Not" in the modules definition - see "Configuring the module presentation of the PC Interlock Viewer"), the interlock will display as an operation condition. In this case the colors for true and false signals are swapped (0 = red = Bad state, 1 = green = good state) and the inverter module is removed from the logic display view.

The example below shows the same interlock with the same values with both settings.
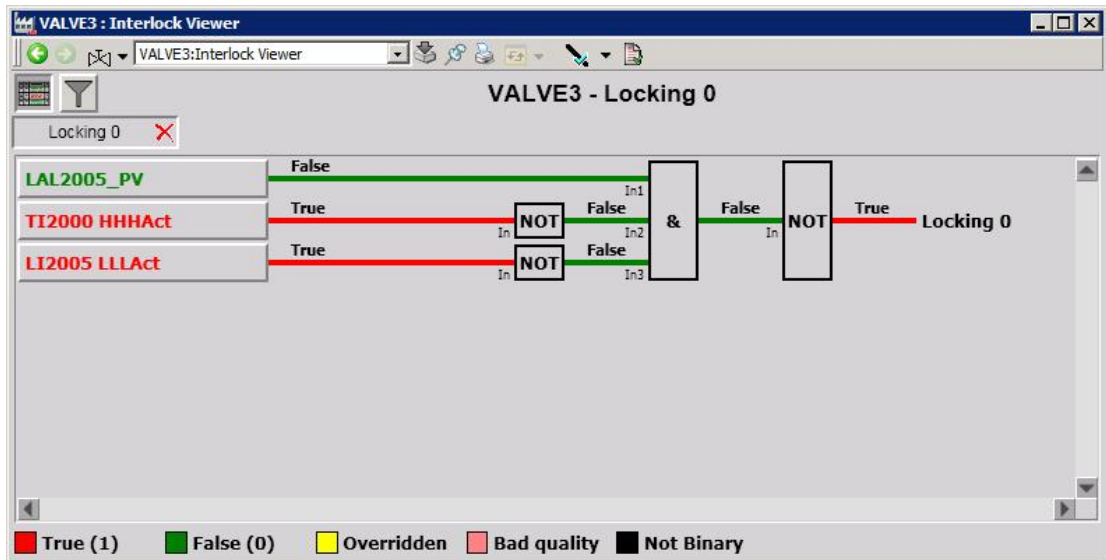

Figure 3-9: Interlock Viewer in default mode (Indication of interlock as operation condition = False)
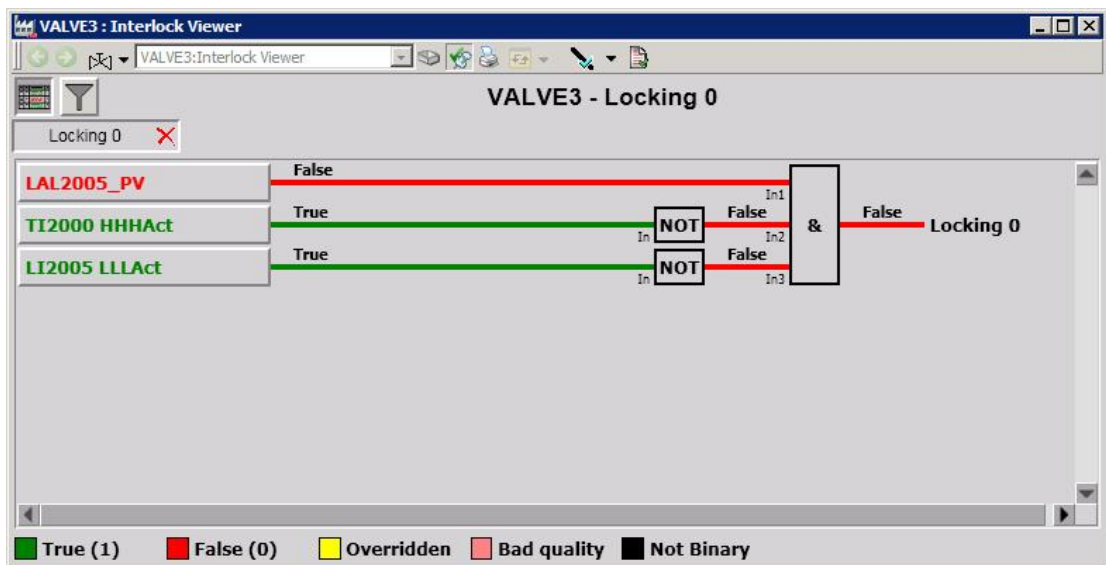

Figure 3-10: Interlock Display with option Display Interlock as Operation Condition = True

Hide port descriptions of CM/FB outputs

Depending on the customer requirements the inputs in the logic view can be displayed with or without descriptions texts (see chapter 3.4 Customize Layout settings, Show input variable description as second row in logic view).

If this checkbox is set only the description of the object will show, but not the description of the module parameter.
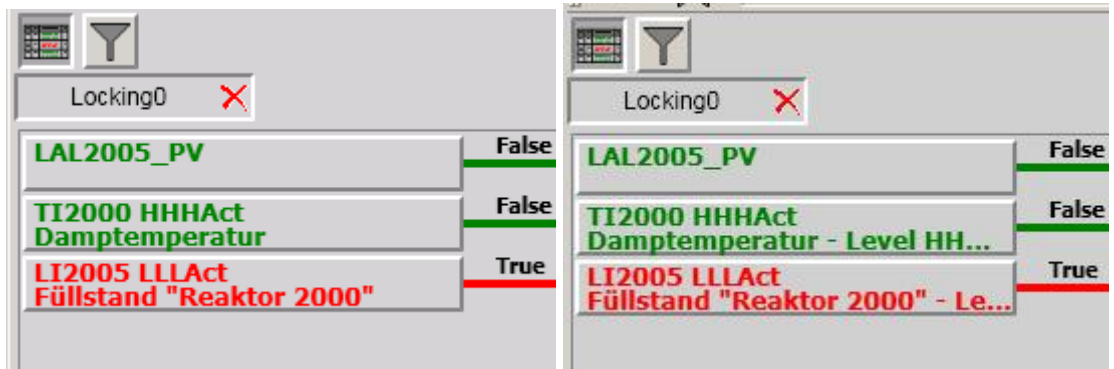
Figure 3.11 Interlock Viewer with and without setting "Hide port descriptions of CM/FB outputs"

Show parent objects in logic view

If "Deep Search" is enabled it might happen that the uploader generates logic from inside the modules that also have a faceplate, but this faceplate is not addressable from the Interlock Viewer display.

To have the possibility to navigate to this object, set this option. As a result the parent object is shown as a frame in the background of the modules that are part of this parent object. Left clicking this frame the default aspect of the parent object will open, on right click the parent object context menu opens.
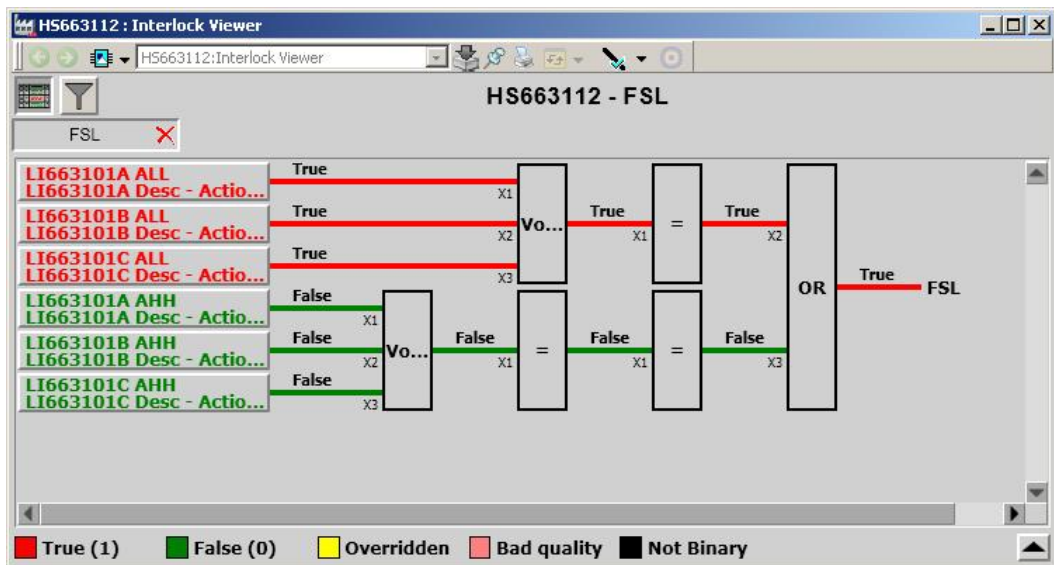
Figure 3-12: Interlock Viewer without indication of parent objects (Show parent objects in logic view = False)
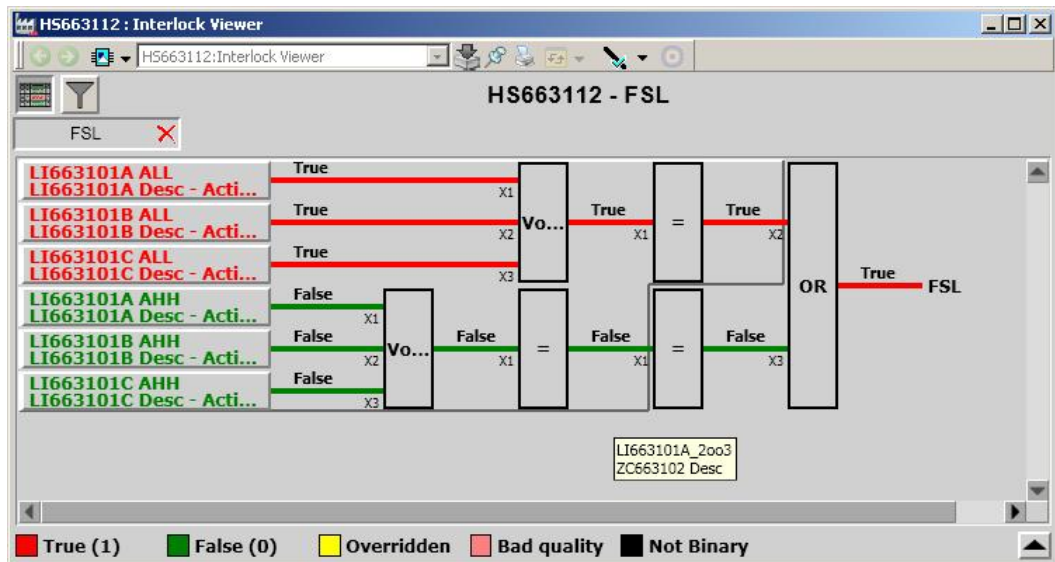
Figure 3-13: Interlock Viewer with indication of parent objects (Show parent objects in logic view = True)

Limit structured text analyze to defined inputs

Depending on the customer requirements the interlocks can limit the display of connections configured by structured text. If this option is set, connections to a port will be shown only

- if the source of this connection was calculated not by structured text or
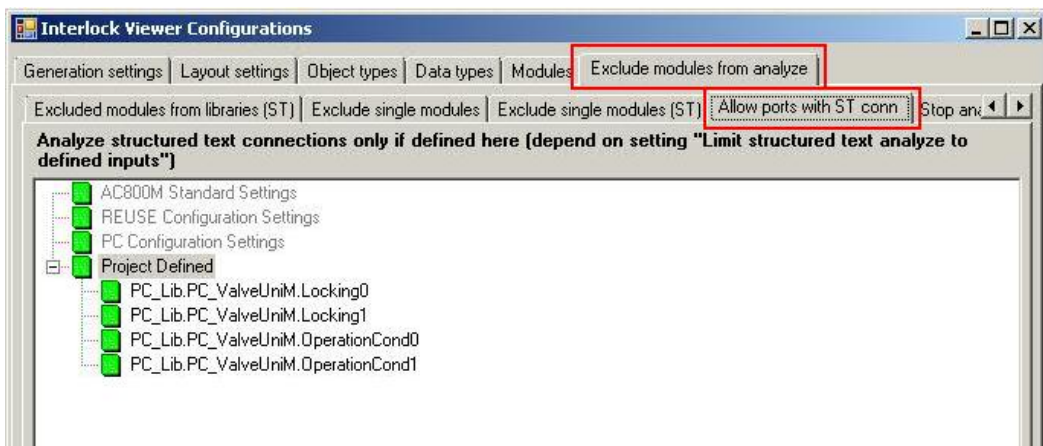
- if the port of the object type is defined in the "Allow ports with ST conn" tab

Figure 3-14: Interlock Viewer configuration settings

3.4 Customize Layout settings

The layout of the Interlock Viewer (sizing of the graphic items, sizing of the elements and many others) can be adjust without the need of recreating the Interlock Viewer.

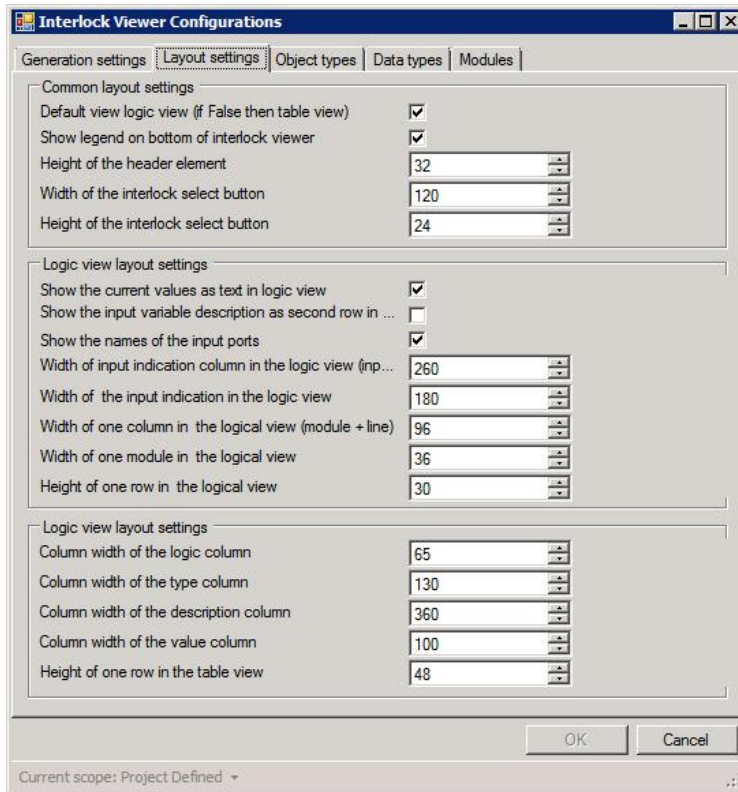Changes on these settings will become active directly after clicking the OK button.

Figure 3-15: Interlock Viewer Layout settings

Common layout settings

This section contains general layout settings.

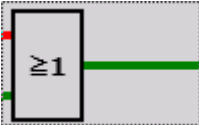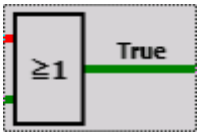| ID	Check Box	Description
	Default logic view	The Interlock Viewer will show up in logic viewer or table view.
A	Show legend on bottom of Interlock Viewer	Display the legend (color values for the different signal values)
B	Height of the header element	Height in pixel of the header element
C	Width of the interlock select button	Width in pixel of the buttons to select an interlock
D	Height of the interlock select button	Height in pixel of the buttons to select an interlock

Table 3-1: Common layout settings
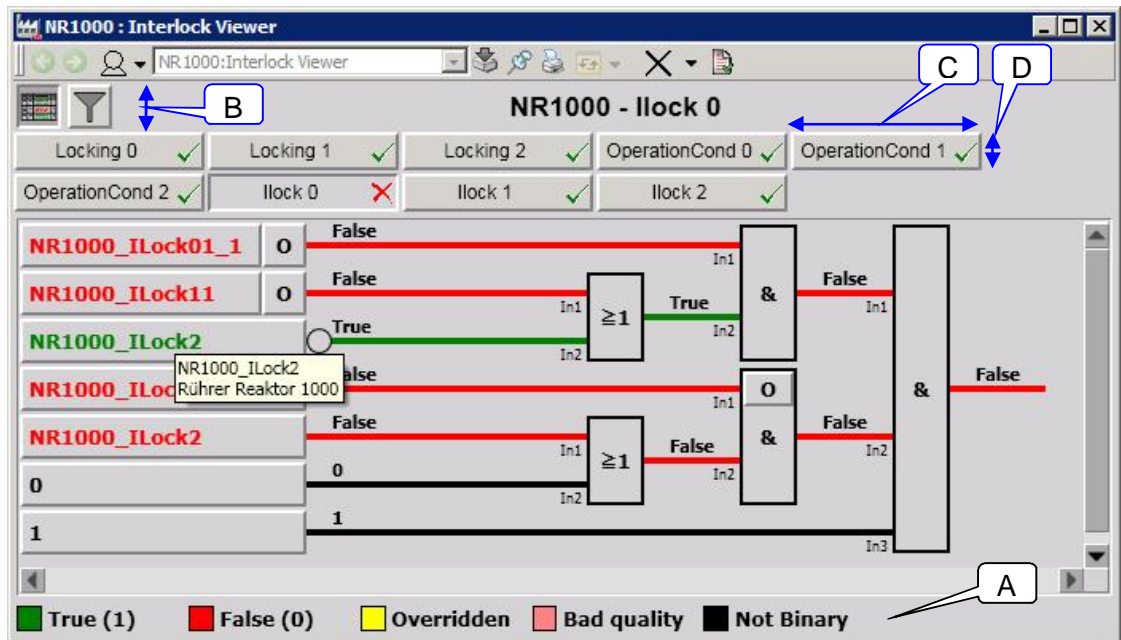
Figure 3-16: Common layout settings

Logic view layout settings

This section contains layout settings for the logic view. The logic view is basically a kind of table with rows and columns, where the elements are located (one column for the input variables and min. 4 columns for the logic modules).

ID	Setting	Description
	Show the current value as text in logic view	Displays the current value of each input variable and module Not set: Is set:

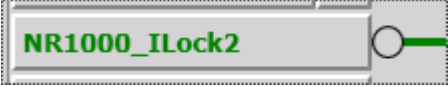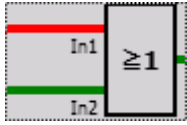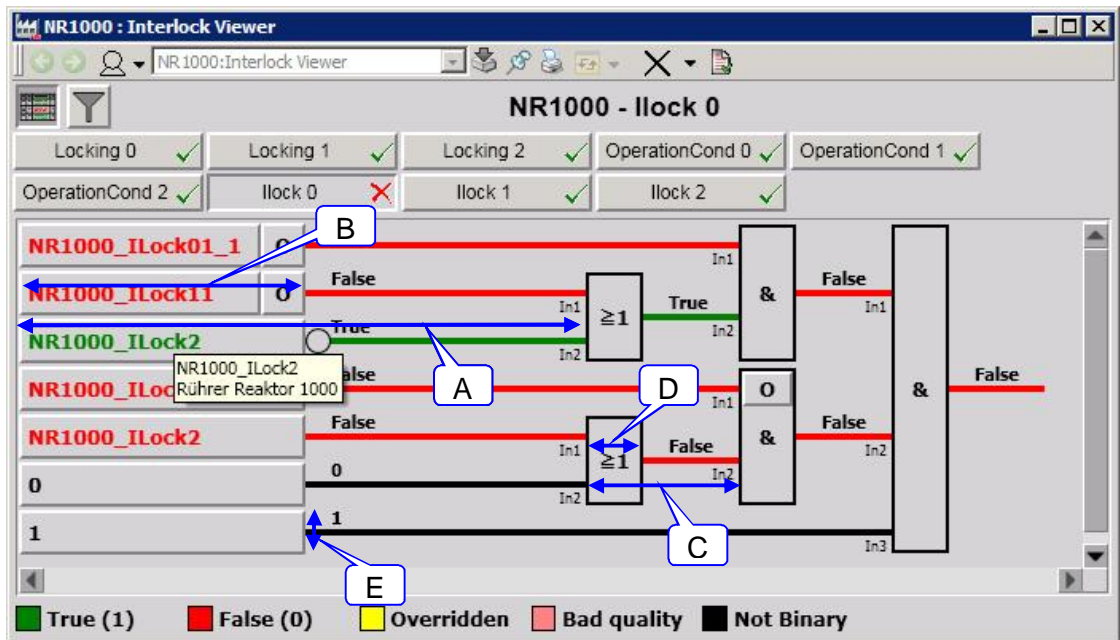| ID	Setting	Description
	Show input variable description as second row in logic view	The name of the input is indicated [Default]. If set, the variable description is indicated additionally. Adjustment on the setting "Height of one row in the logical view" may be needed for a proper indication. Not set: Is set:
	Show name of the input ports	The name of the modules port is indicated Not set: Is set:
A	Width of the input indication column in the logic view	Width of the input indication and the line to the next module (in pixel)
B	Width of the input indication in the logic view	Width of the input indication without the line to the next module (in pixel)
C	Width of one column in the logical view	Width of a module and the line to the next module (in pixel)
D	Width of one module in the logical view	Width of a module without the line to the next module (in pixel)
E	Height of one row in the logical view	Height of one row. This is the same as the height of an input variable or a module with only one input.

Table 3-2: Logic view layout settings

Figure 3-17: Logic view layout settings

Logic table layout settings

This section contains layout settings for the logic view.

| ID	Setting	Description
A	Column width of the logic column	Width of the column with the logic information (type name of the next module) in pixel.
B	Column width of the type column	Width of the Type column (Name of the interlock input of the current object) in pixel.
C	Column width of the description column	Width of the Description column (Name and description of the variable) in pixel.
D	Column width of the value column	Width of the Value column (Current value of the variable) in pixel.
E	Height of one row in the table view	Height of a single row.

Table 3-3: Table view layout settings
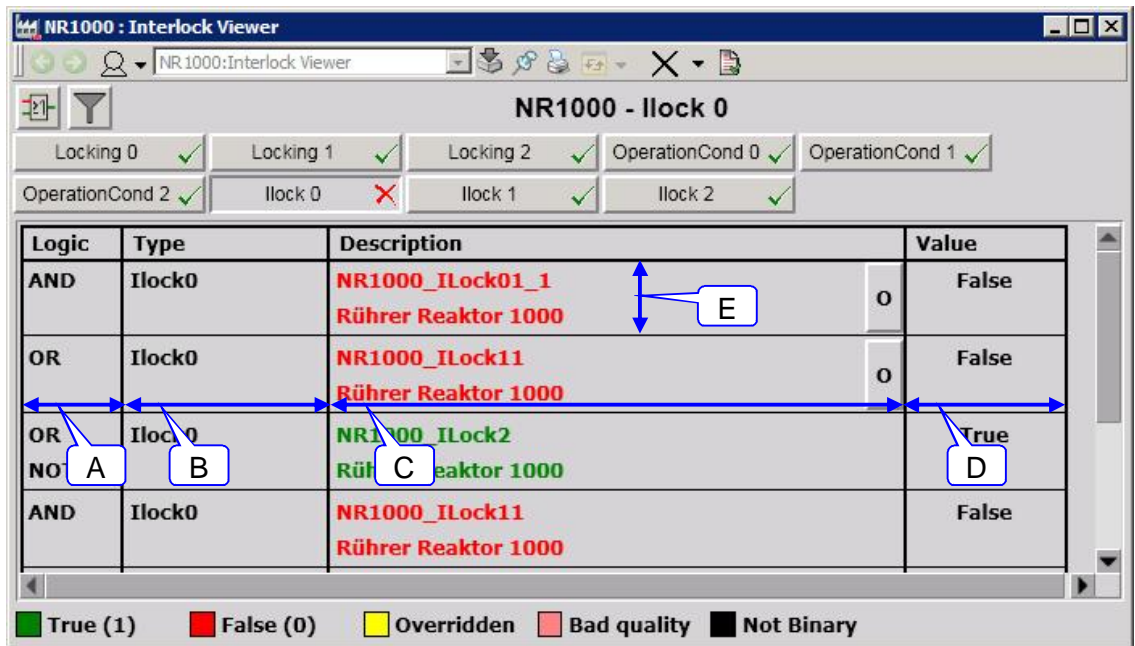
Figure 3-18: Table view layout settings

3.5   Customize object type definitions

In addition to the predefined control modules and their interlock relevant ports (for example PC-Lib or REUSE object types) it is possible to add own control module types and additional ports or override predefined settings to be displayed in the PC Interlock Viewer.

To edit the settings open the PC Interlock Viewer Uploader program and select from the menu "Settings" -> "Edit Interlock Viewer settings". Navigate to the "Object types" tab. In this tab it is possible to define the ports that will show up in the Interlock Viewers (tab Interlock ports) and the direction of parameters that are defined as IN/OUT (tab IN/OUT Port directions).
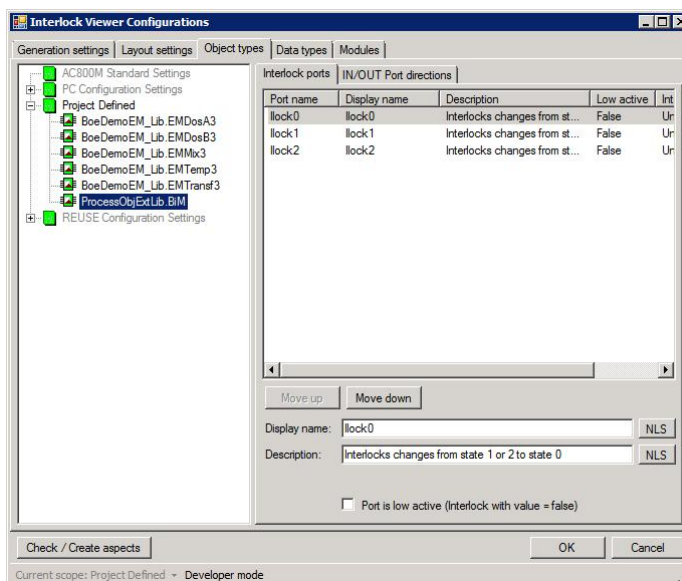

Figure 3-19: Object type configuration

Configuring interlock relevant ports of object types

For each of the configured interlock or condition ports of an object type, the Interlock Viewer shows a buttons. This is created during the upload if the port is connected to a logic or constant. Leave a port or constant value empty to avoid showing this port in the Interlock Viewer. New control modules or adding ports to existing control modules can be added by selecting "Add control module type/ports" in the Edit menu.

Note: The Control Builder must be available on the current node and a project must be loaded for this operation.

A window with a list of the connected libraries for the current project including their control modules on the left pane will open. By selecting a control module all ports of the known data types will be shown on the right pane. Data types can be edited on the fifth tab.

Select one and more ports and mouse click the "Add ports" button to add the selected ports to the configuration definition. If a port is not listed in the "Select object types and ports" dialog, the data type of the port must be added to the data type definition. (see 3.5 Customize object type definitions) or check the direction of the port. Only ports those are defined as input will be listed here.
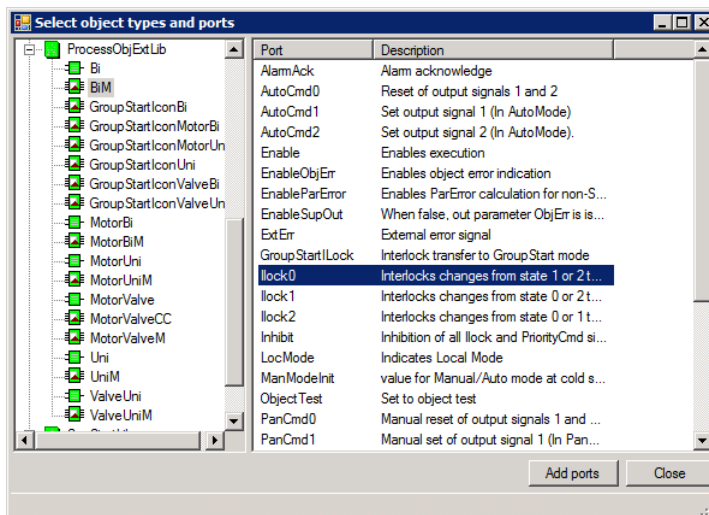

Figure 3-20: Add ports to object type definition

Added ports can be configured separately. Select the port and change the display name (used as text for an interlock selection), description (tooltip of a tab) and/or the active state (Default: Interlock is active with true value) in lower right pane. The interlock class is currently not used (reserved for further use).

Display name and description it is also prepared for NLS (National Language Support). Click on the NLS button right of the text field and select a valid NLS resource name. It can also be defined manually by using the following syntax "nt::<Object name>:<NLSID>". The object name is the name of the object where the NLS aspect is located.

The Interlock Viewer shows the relevant inputs in the same order as it is shown in the configuration. The order of the interlock relevant inputs can be changed using the Move up/Move down buttons.

The needed aspects are created automatically on the defined object types. After defining the object types and interlock relevant ports click on the button "Check / Create aspects". This will check all defined object types, if an Interlock Viewer aspect exists). If not, the aspect is created with the required settings (copy to all instances). The aspect creation may take some time. An upload is not possible at this time.

On mouse click on the button the question "Proceed also Override State aspects" will show up. Answer with Yes if you want to use the Override functionality and the Overridden information in graphics and/or faceplates to be displayed.

Configuring single components of structured data type inputs as single interlocks

As of Interlock Viewer version 5.1-1/3 it is possible to define single components of input ports of control modules. It is even possible to define more than one component of the same port as different interlocks.

If the user selects a port of a structured data type, which is not already defined in the data type tab), the list of available components will be filled and the user can select the desired component to indicate in the Interlock Viewer.
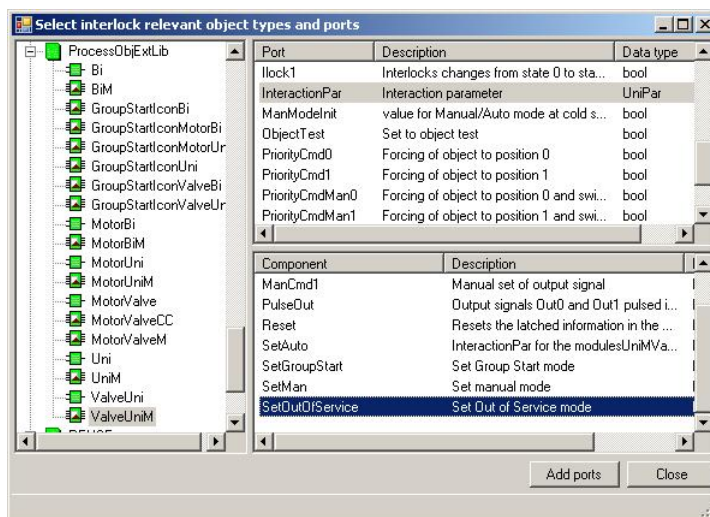

Figure 3-21: Add component of a port to the object type definition

Configuring parameter directions of control modules or function blocks

For analyzing the configured logic, the Uploader needs to know which parameter of a module (control module or function block) is an input or an output parameter. This is done by reading the direction definition of the parameter or if the direction is not defined by analyzing the direction information from the parameter description during the upload.

Special cases are IN/OUT parameters. By default such parameters will be used as IN parameters. But there might be parameters defined as IN/OUT in the Control Builder that should be used as OUT parameters for analyzing the control logic.

New control modules or adding ports to existing control modules can be added by selecting "Add control module type/ports" in the Edit menu.

Note: The Control Builder must be available on the current node and a project must be loaded for this operation.

A window with a list of the connected libraries for the current project including their control modules will open on the left pane. By selecting a control module all ports of direction IN/OUT will be shown on the right pane.

Select one and more ports and mouse click the "Add ports" button to add the selected ports to the configuration definition.
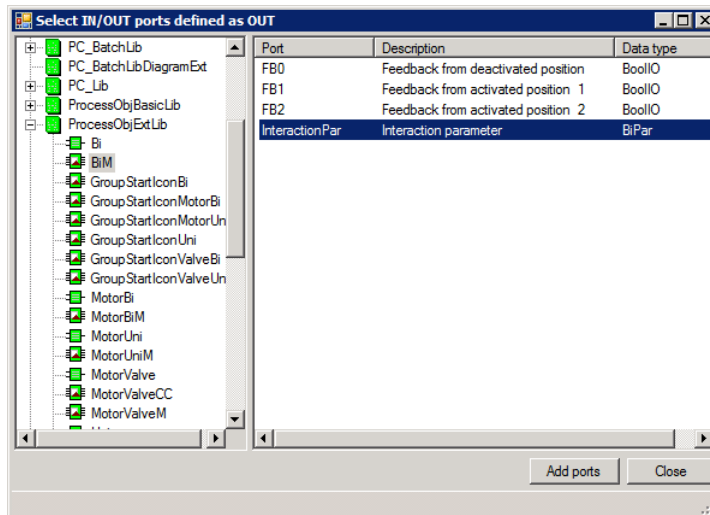

Figure 3-22: Add parameters direction to object type definition

After adding the parameter, the direction definition can be changed by selecting the desired direction in the Direction combo box. Setting the direction to IN or IN/OUT has the same effect as delete the parameter from the direction definition tab.

3.6   Data type handling

The PC Interlock Viewer can display binary signals or a component of a structured data type (all other signal types are displayed in black). To display also the state of a component of a structured data types, the data types and the component can be defined.

In the "Data types" tab of the Interlock Viewer Configuration window, data type and their default component can be defined (Example: Data type = BoolIO, Component = Value).

> The component defined here, must have a binary value (True or False)!

Also an override component can be defined (see Block and Release of Interlock conditions).
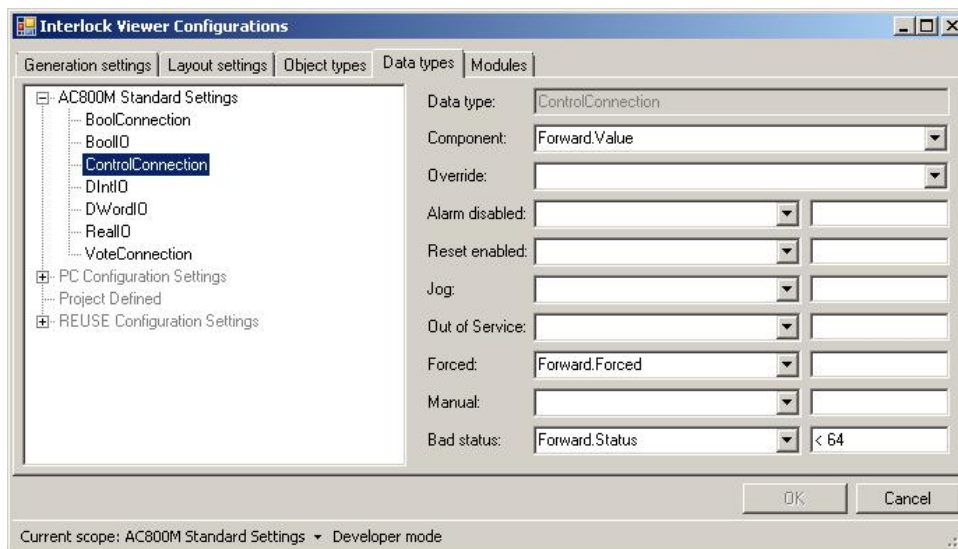
Figure 3-23: Data type definition

Configuring additional information components

As of Interlock Viewer version 5.1-1/3 it is possible to define the indication of additional components of a data type.

Each definition consists of the component of the data type (selectable in the drop down box and an optional logic entry (text).

The logic entry is needed if the selected component is not a Boolean value or the indication should not show if the current value is true. The resulting expression in the Interlock Viewer graphic is always the defined component of the current variable followed by the logic (if defined). Leave the logic blank means the same as "== True".

> The logic entry has to define in PG2 syntax (for example "< 5" or "== False" or "!= True")

There are a number of additional information that are indicateed in the Interlock Viewer aspect by extent the value display with text and color.

Component	Description
Alarm disabled	Component that indicates an disabled alarm
Reset enabled	Component that indicates reset is enabled
Jog	Component that indicates jog start
Out of Service	Component that indicates Out Of Service mode is active
Forced	Component that indicates a forced state of the variable value
Manual	Component that indicates a manual state
Bad status	Component that indicates a bad value state

Table 3-4: Additional data type component definition

3.7 Configuring the module presentation of the PC Interlock Viewer

During the upload the logic connected to a port is analyzed. If an unknown function block is found, it will be indicated with the block type name. Unknown block types should be defined in the "Modules" tab of the Interlock Viewer window.

This function block can be added to the definition in the second tab of the configuration tool. For each function block three information must be defined:

■ Module (The name of the function block type)

■ Symbol (What text should be displayed inside the rectangle in the interlock logic view)

■ Text (What text should be displayed in the logic column in the interlock table view)

■ Type (The type of the module. Is used for calculation of live values if not able to read the value via 800xA properties, for example for modules that are not set as aspect object). Available module types are:

| Type	Description
(none)	Undefined module type
ADD	Addition (numeric)
AND	And (binary)
DIV	Division (numeric)
EQ	Equal (binary or numeric)
GE	Greater or equal (numeric)
GT	Greater than (numeric)
LE	Less or equal (numeric)
LT	Less than (numeric)
MOVE	Assignment
MUL	Multiply (numeric)
NE	Not equal (numeric)
NEQ	Not equal (numeric)
NOT	Inverter (binary)
OR	Or (binary)
SUB	Subtraction (numeric)
XOR	Exclusive or (binary)

Table 3-5: Available object types
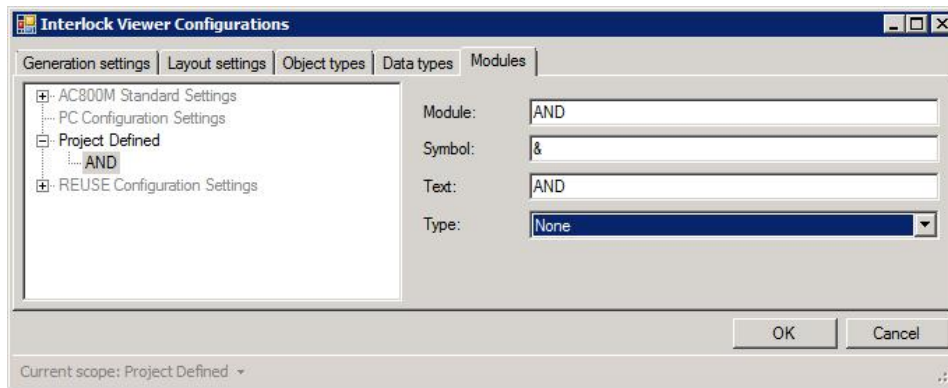
Figure 3-24: Module definition

3.8 Exclude module types from content analyze

During the upload of the Control Builder application(s) to the internal data base, each configured module (control modules or function blocks) will be analyzed for the connections and also the contents of the modules, except the module (type) is set to protected in the CBM.

But for some modules it is not useful to analyze the contents (the internal logic of this module), especially since the support for structured text was added. This module is displayed as a single block. One way to avoid analysis of module contents is to set the module to "Protected" in the CBM. But this is only possible for user defined libraries or module types, but not for standard.

Therefore the interlock viewer contains an exclude list for libraries and module types.

There are 6 tabs in the "Exclude modules from analyze" area:

- Exclude modules from libraries
  Each module of the defined libraries will excluded from content analyze

- Exclude modules from libraries (ST)
  Each module of the defined libraries will excluded from structured text content analyze

- Exclude single modules
  Each here defined module will excluded from content analyze

- Exclude single modules (ST)
  Each defined module will excluded from structured text content analyze

- Allow ports with ST conn
  If the option "Limit structured text analyze to defined inputs" is set, define here the ports of object types that will be analyzed, if connected by structured text. All not listed ports will be ignored (except the modules from the BasicLib and system functions).

- Stop analysis on modules
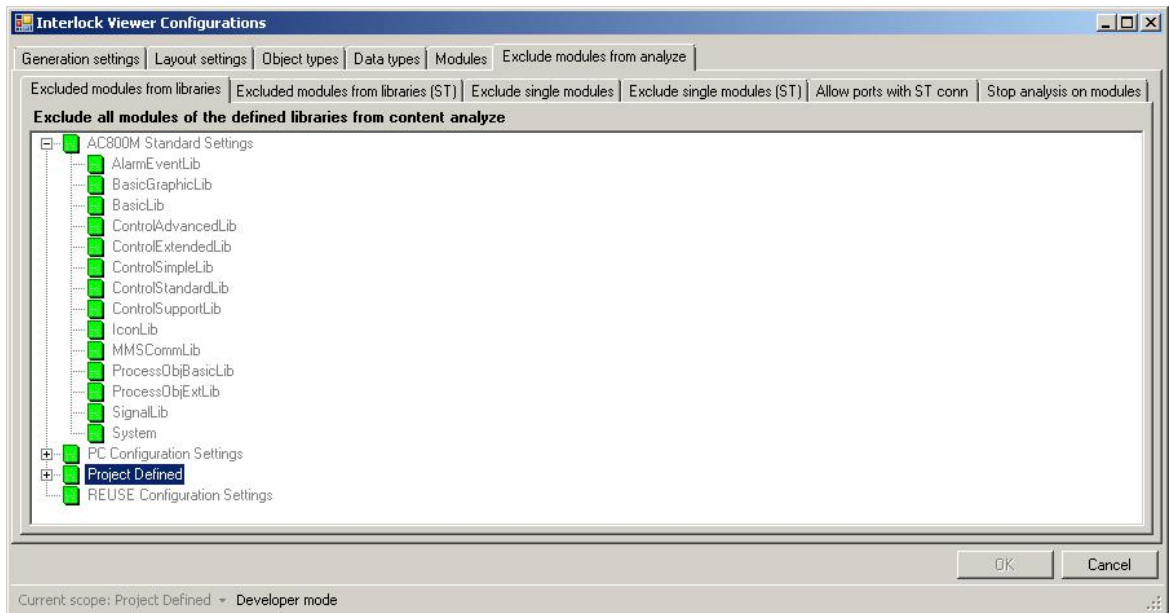 The analysis will stop on each here defined module (even in deep search mode)

Figure 3.25 Exclude libraries and modules from analyzing

Additional libraries can be added to the definition by activating the needed tab, open the context menu of the tree view (right click) and click "Add item". In the next window you can select the library or the control module or function block type to add it into the exclusion list.

For the "Allow ports with ST conn" you have to select the port instead of a module.

3.9 Define Colors

The colors used to display interlocks can be defined in the "PC Interlock Viewer Colors" aspect (located at [Workplace Structure]Web System Workplace). Color names starting with PCILD… where defined for the former Interlock Display but are valid also for the Interlock Viewer. Color names starting with PCIV… are additional colors that are used by the Interlock Viewer. Color names starting with PCEV… are used for the Effect Viewer only (are not shown in this Table 3-6: Color Settings).

Color Name	Default value	Color	Description
PCIVResetEnabled	RGB(0,128,0)		Background color of value field if Reset Enabled component is active
PCIVOutOfService	RGB(255,128,0)		Background color of value field if Out Of Service component is active
PCIVManual	RGB(0,128,255)		Background color of value field if Manual component is active
PCIVJog	RGB(0,128,0)		Background color of value field if Jog component is active
PCIVForced	RGB(255,255,0)		Background color of value field if Forced component is active
PCIVBadStatus	RGB(255,128,128)		Background color of value field if Bad status component is active
PCIVAEDisabled	RGB(255,128,0)		Background color of value field if Alarm disabled component is active

Color Name	Default value	Color	Description
PCILDVariableBackgroundColor	RGB(208,208,208)		Background of variable field in logic view
PCILDTextColor	RGB(0,0,0)		Text color for static texts
PCILDStateTrueColor	RGB(255,0,0)		Signal color if signal state Bad (True or False depends on configuration, Default = True)
PCILDStateOverrideColor	RGB(255,255,0)		Signal color if signal state is Overridden.
PCILDStateFalseColor	RGB(0,128,0)		Signal color if signal state Good (True or False depends on configuration, Default = False)
PCILDStateDefColor	RGB(0,0,0)		Signal color if signal type is not binary
PCILDStateBadColor	RGB(255,128,128)		Signal color if signal quality code = Bad
PCILDFilteredElementColor	RGB(143,143,143)		Color of module and variable output line in logic view, if not relevant for current interlock
PCILDElementColor	RGB(0,0,0)		Frame color of modules in logic view
PCILDDisabledText	RGB(100,100,100)		Color of disabled text
PCILDBackgroundColor	RGB(208,208,208)		Background of logic or table view
PCILDButtonDefBkgColor	RGB(192,192,192)		Not used
PCILDButtonApplyBkgColor	RGB(0,255,0)		Not used

Table 3-6: Color Settings

4. Operating Interlock Viewer

The Interlock Viewer window is available at faceplates or graphic elements for the object types motor or valve which can have interlocks or operating conditions. Select the Viewers window by a mouse click on the Interlock tab of the faceplate or by using the context menu of a faceplate or graphic element.
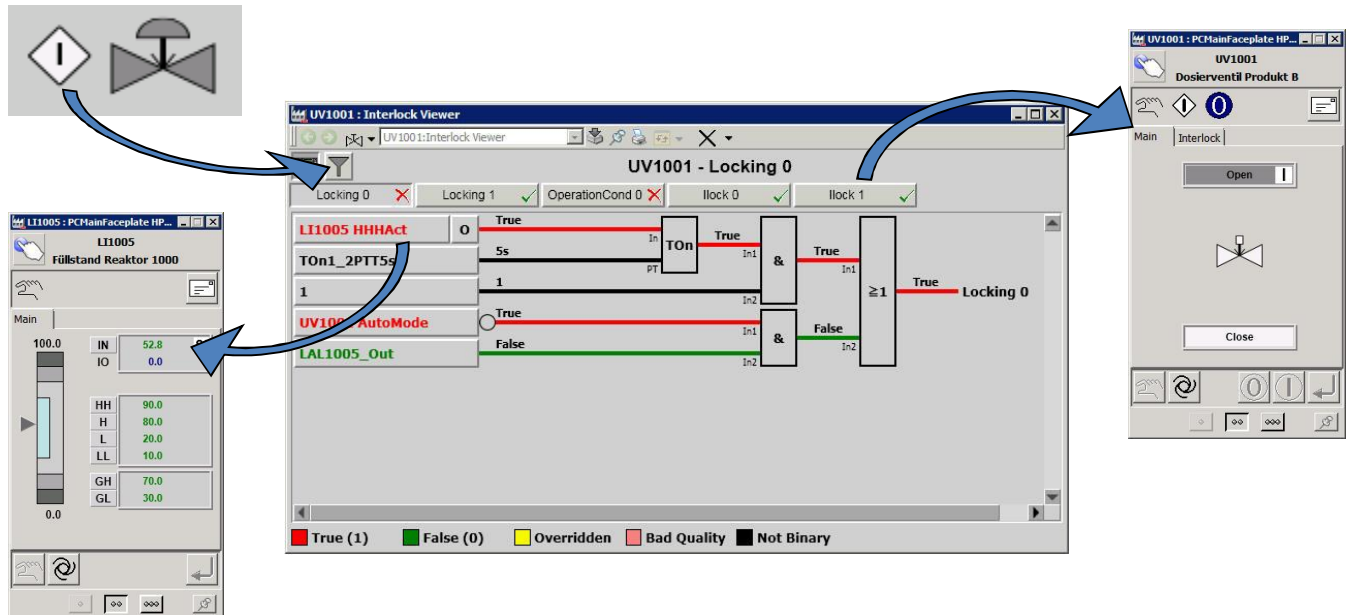
Figure 4-1: Navigate on Interlock Viewer

The Interlock Viewer has two views to display the interlocks, a table view and a logic view. Also a filter option is available.

Button	Description
	Switch to table view
	Switch to logic view
	Enables filter mode
	Disables filter mode

Table 4-1: Buttons

Figure 4-2: Table view

Figure 4-3: Logic view

Navigate to signal source

By left click of an input in the table or logic view, the default aspect (normally the faceplate) of the input's object (if any) will open. On right click the context menu of the input's object (if any) is shown up.

> If the source is not a reference to an 800xA object output, the object name is calculated by the name of the variable.

The name of the variable will be cut at the last underscore character and the Interlock Uploader checks, if an object exists with this name in 800xA. This will run until an

object is found or no more underscore available.

Example (see picture below): For the variable "LI1005_GTHHH_Out" the source object is LI1005 (an object named "LI1005_GTHHH" doesn't exist for this example configuration).
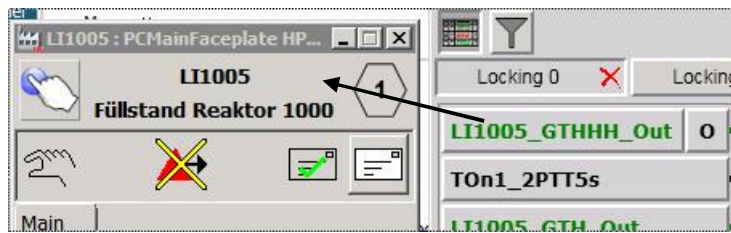

Figure 4-4: Navigation example

Filter settings

By activating the filter, the displayed entries are filtered by the signal state. In the table view the entries with "Good" state are hidden. In the logic view the variables and modules with good state are displayed in gray.

> The calculation of the "Good" and "Bad" states is done only by the variable value (True or False). There is no consideration to the type of the module and the module algorithm.

All modules and variables connected to a module are hidden, if the output of the module has the good state (consider the inverting at the next module).
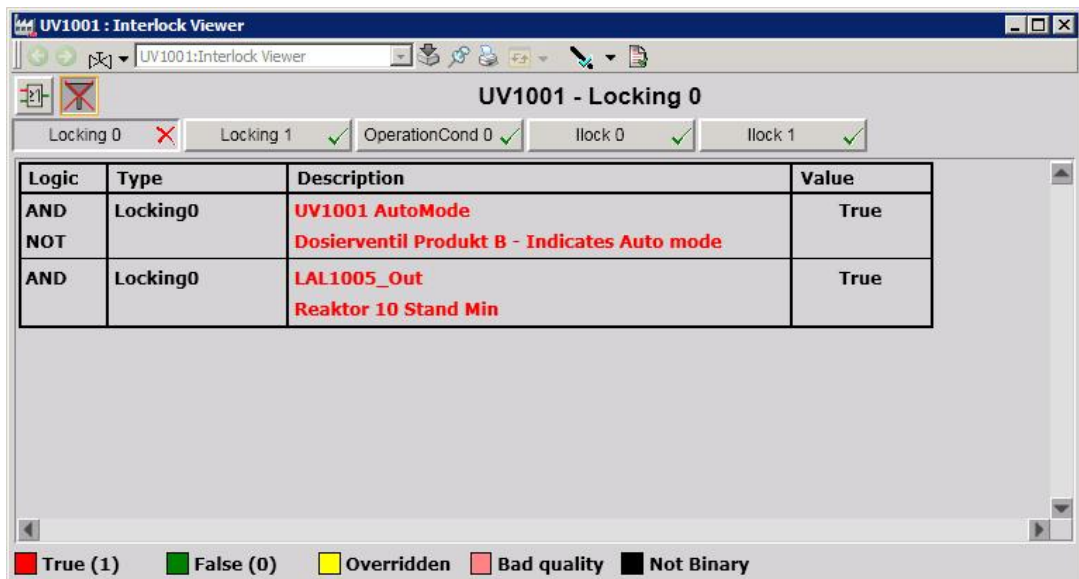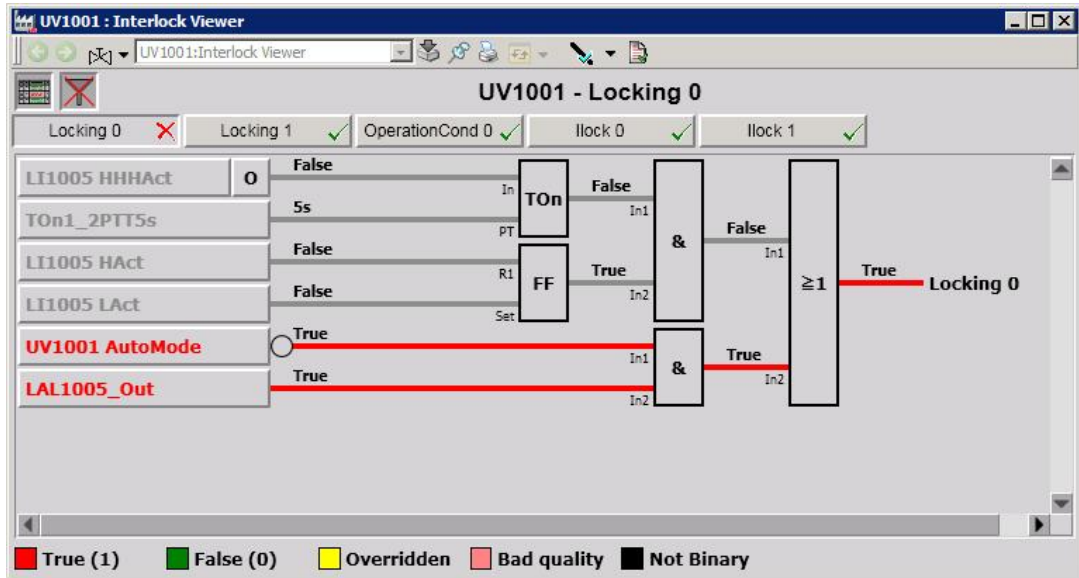

Figure 4-5: Table view in filter mode

Figure 4-6: Logic view in filter mode

Loop indication

Loops in control logic are indicated by a letter surrounded by a circle. The loop source is located at the output of a module (below the connection line) and the loop target is show as input of the module (instead of a variable) where the loop destination is connected.
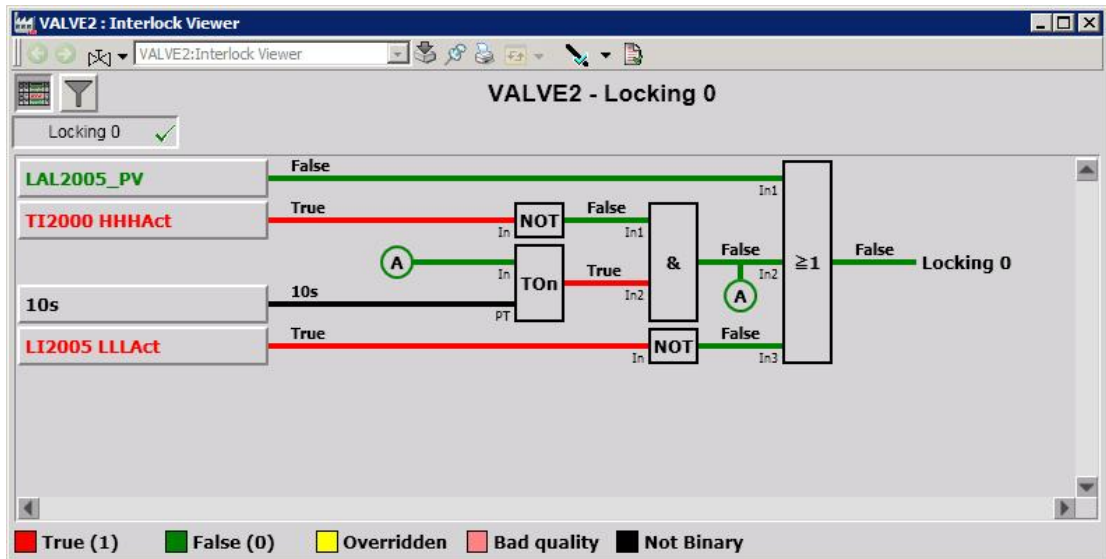

Figure 4-7: Logic view with loop (indicated as "A")

Indication of additional data type components

If additional components of structured data type are defined and currently active, the value indication in the logic and table view are extended by additional text and background color.

The additional components are indicated as a letter after the value, if they are active. If more the one additional component is active, all states are shown separated with a comma.

The value field is filled with a background color. If more than one additional component is active the color is selected in the same order as in the table below

Component	Letter	Color (see color definition)
Reset enabled	R	PCIVResetEnabled
Alarm disabled	D	PCIVAEDisabled
Jog	J	PCIVJog
Out of Service	OOS	PCIVOutOfService
Forced	F	PCIVForced
Manual	M	PCIVManual
Bad status	B	PCIVBadStatus

Table 4-2: Additional data type component identification
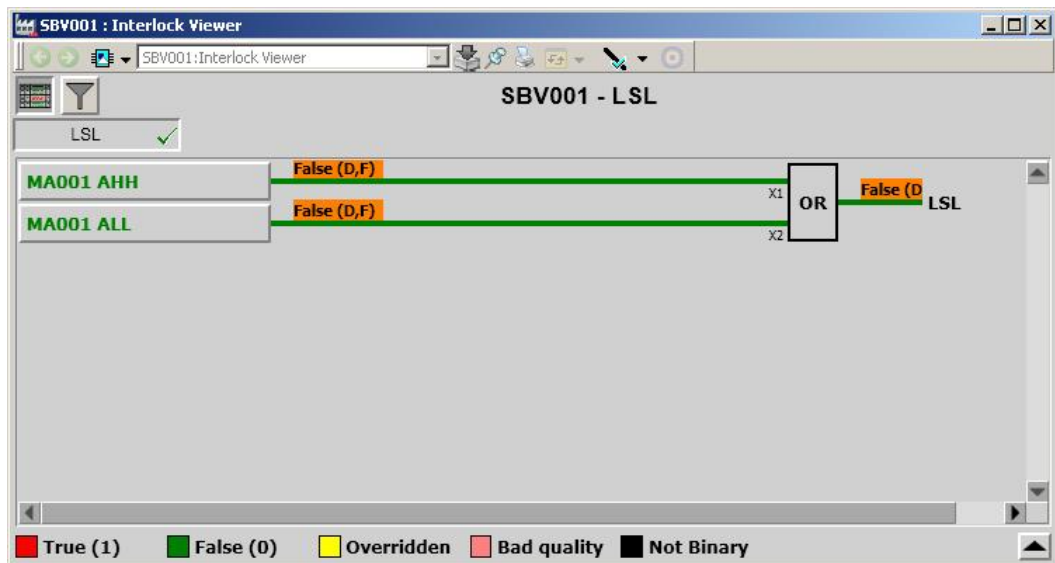
Figure 4-8: Logic view with alarm disabled and forced input values

Figure 4-9: Table view with alarm disabled and forced input values

The letter and color meaning (legend) can display by click on the up arrow button on the lower right edge of the legend area. To hide the additional legend info click this button again.
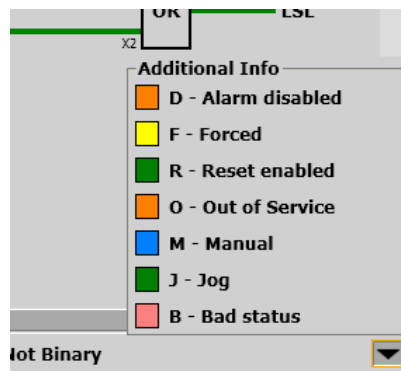

Figure 4-10: Legend of the additional components

Override Interlock conditions

In some cases it might be necessary to override certain interlocks. To block or release an interlock, a function block called BlockIL or ReleaseIL must be placed in the function diagram, were the interlock should be blocked or released. These function blocks are provided within the PC_Lib and similar function blocks are also part of the chemical extension for OGP REUSE Solutions Lib.

The BlockIL and ReleaseIL function blocks are not shown in the PC Interlock Viewer. Instead, the variable or module located before the BlockIL or ReleaseIL module are displayed with a button to switch the override on or off.

To override an interlock, the user must have the permission "Override interlock". If this permission is not granted, the override button to switch the override is disabled.
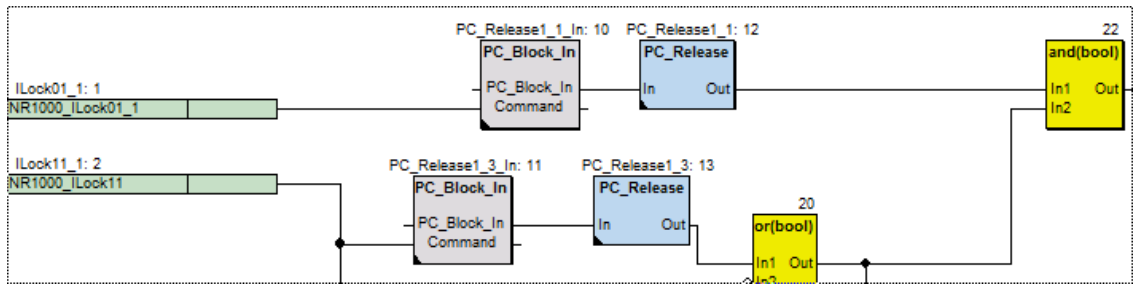
Figure 4-11: Example configuration for Override functionality

Logic	Type	Description		Value
AND	Ilock0	NR1000_ILock01_1 Rührer Reaktor 1000	O	(True)
OR	Ilock0	NR1000_ILock11 Rührer Reaktor 1000	O	False
OR	Ilock0	NR1000_ILock2		True

Figure 4-12: Overridden signals will be display in yellow by default
(see Interlock Display Colors).

If the "Show the current values as text in logic view" setting is set, the overridden values are surround by ( ), to indicate an override also for color blind humans.
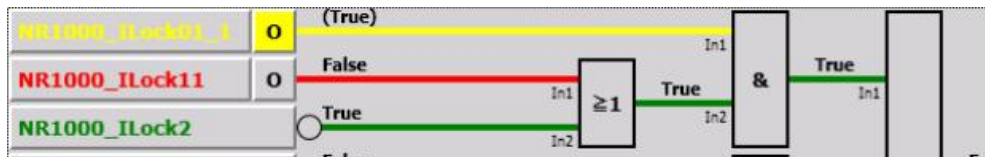

Figure 4-13: Overridden signals redundantly coded for color blind humans.