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GRID AUTOMATION PRODUCTS

# **MicroSCADA X SYS600 10.2**

## Process Picture Design Manual







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# Section 1      Introduction

## 1.1 Picture engineering tool - View Builder

The View Builder tool is used to engineer the SYS600 Workplace X process and supervision pictures. It can be opened from the **Application Configuration** tab of the **SYS600 Tool Launcher**.

View Builder is designed to provide a unified way to engineer the SYS600 Workplace X.

View Builder provides the following functionalities:

- Import of Functional Structure (if available) and Data Points from the backend
- Expanded Workspace Explorer and Naming editor for editing imported structure
- SLD/Process Diagram editor for topology engineering
- Process and Communication Supervision Pictures editors for SYS600 Workplace X engineering
- Typical/Instance management to allow cost efficient handling of late changes

View Builder does not allow the engineering of data points (for example, event or alarm list configuration, data point text).

## 1.2 Organization of this manual

This manual is organized as follows:

- [Section 2](#) introduces some specific concepts used in View Builder.
- [Section 3](#) introduces the View Builder user interface. This information helps in understanding the process access and edit data and to learn about Graphic User Interface features available in the different editors.
- [Section 4](#) describes the main engineering workflow of View Builder. Refer this to understand to organize the engineering of pictures and to maintain them.
- [Section 5](#) describes the usage of Typical Bays, an important engineering concept that improves efficiency and consistency of projects considerably. This information helps in understanding the process to structure workspace with Typical Bays.
- [Annexure A](#), [Annexure B](#), [Annexure C](#), and [Annexure D](#) provide in-depth information about specific areas
  - Naming convention
  - Busbar connection logic
  - Information unavailable in SYS600 process database
  - Rule file

## 1.3 Revision history

Revision	Version number	Date	History
A	10.2	31.03.2021	Updated Typicals section with new paragraph for Import and Export Typical functionality



# Section 2      Important concepts in View Builder

## 2.1      Functional structure objects

Power system projects commonly consist of engineering control, protection, and supervisory functions for primary equipment.

The primary equipment is modeled and displayed in a hierarchical tree. Any object that appears in this tree is referred to as Functional Structure object in this document.

The Functional Structure consists of a hierarchical arrangement of equipment containers (for example, a Substation, Voltage Level, and Bay) and equipment (for example, Circuit Breaker, and Capacitor Bank). The hierarchy follows certain rules (for example, Voltage Level needs to be below a Substation), these rules are typically easy to understand for engineers and end customers.

For details regarding navigation and editing the Functional Structure, see [Section 3.4](#) and [Section 4.1](#).

## 2.2      Typicals

Typicals is a basic concept often used by power system engineers. An engineer decides on a structure, which repeats often; configures the structure first and verifies with the customer. Then the configuration is applied to many such structures of the same type by copy and paste. As an example, one-line bay (the Typical Bay), which after full configuration and testing, is copied and pasted to add many line Bays. This process has a disadvantage that additional changes are applied individually after the copy-paste action is performed.

In View Builder, this concept is enhanced:

Typicals once created are kept and the instances have the reference to the Typicals. Changes done in Typicals, always automatically propagate to the instances, for example,

- The single line diagram of Typicals (including primary equipment, connections, and layout).
- The engineered process and supervision pictures.
- Data point and control pane mapping.

The benefit comes in later stages of a project, when changes required by a customer are applied to the Typicals and then, automatically propagates to all the instances; this provides consistency and efficiency.

It is defined as Standalone any element which is neither a Typical nor an Instance.

## 2.3      Naming of objects

Manufacturers and customers often have different naming conventions. The customer needs their naming scheme for efficient operation, and the manufacturer needs their own naming scheme for both efficient commissioning and for later support and expansions.

The View Builder provides a dual naming as a solution to manufacturers and customers with a dual naming scheme. For every object, View Builder provides an Internal Name or Internal Text (manufacturer specific) and a Customer Name or Customer Text (which belongs to the customer). The user interface elements can be configured to display either one or the other, or

sometimes both, if required. See [Section 3.1.2.1](#) on how to select the displayed naming scheme.

### 2.3.1 Internal names

Internal names of any object contains only characters A-Z and a-z, and digits 0-9. Furthermore, ABB adheres to the naming standard as defined in IEC 81346, which imposes further restrictions (for a more detailed description, see [Annexure A](#)).

These internal names need to be unique within one level (for example, bay names within a voltage level) and the names are also used for some efficiency enhancements logic (see [Annexure B](#)).



On import, customer names are maintained, whereas, internal names are automatically created. Manual modification of internal names might sometimes be required, in such cases, familiarize yourself with the naming scheme and the logic.

### 2.3.2 Customer names

Customer names of any object can have any Unicode characters with no restrictions. These names need not be hierarchical (however, a hierarchical naming scheme is recommended whenever possible, as it has many advantages, for example, in renaming).

Substation automation is a part of a bigger plant (for example, a power generation station or a refinery), which imposes other naming standards apart from IEC 81346, which can also be implemented with the customer name.

Manual modification of customer names is possible but not recommended for the user. In such case, it is recommended to maintain the object names in the SYS600 process database and synchronize them with View Builder using the **Import** functionality.

## 2.4 Workspace

A View Builder Workspace is used to store all engineering information in a collection of files. This includes not only the engineering work, but also the Symbol library, Functional Structure definition, and other information needed by View Builder.

A View Builder instance on another computer can open a Workspace if it is moved there.

The Workspace folder is automatically created when View Builder is first opened for an Application.

The location of the folder is:

/sc/apl/{ApplicationName}/ngtws

## 2.5 Diagrams and Pictures

Single Line Diagrams or Diagrams, in short, represent the Equipment and the Equipment Container structure of the Functional Structure network that is being engineered and visualize the topological connections between the elements.

Pictures are created to show the Operator live information about the network. Modifications here do not affect the Functional Structure in View Builder.

# Section 3 View Builder user interface

This section gives an overview of the View Builder Graphical User Interface (GUI), describes the different parts and general functionality that is provided.

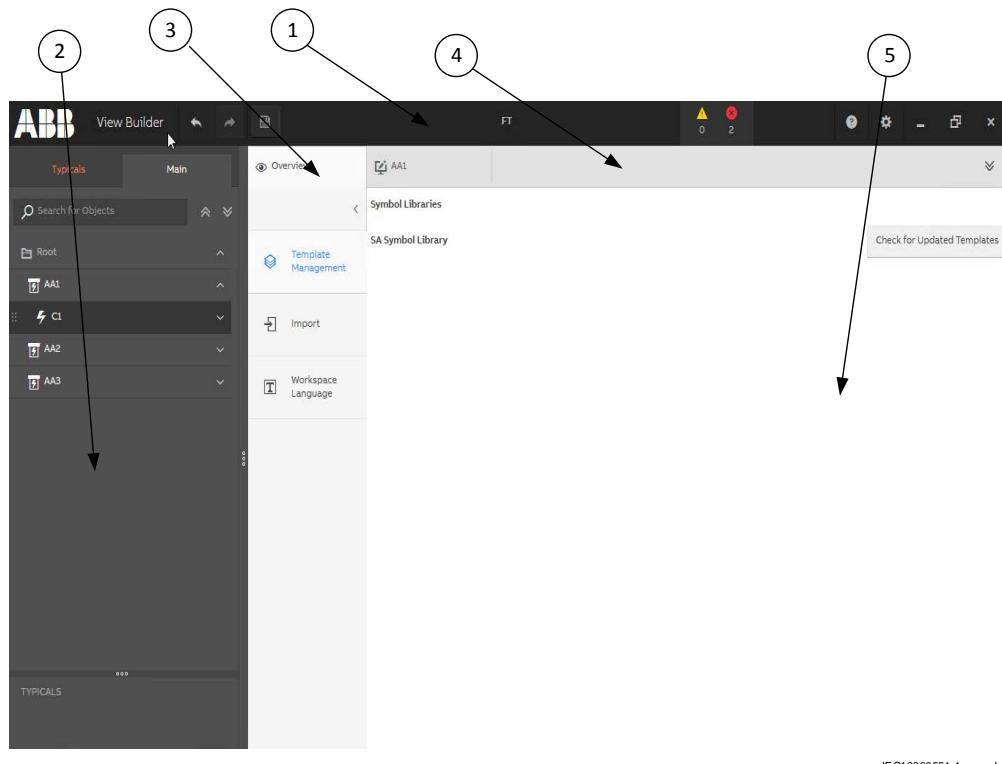


View Builder UI does not use context menus to launch editors. Editors are launched by selecting the appropriate functional structure object in the navigation tree and then selecting the editor.

## 3.1 Tool frame UI

### 3.1.1 Overview

The main View Builder user interface is composed of the following distinct sections shown in [Figure 1](#).



*Figure 1: View Builder overview with user interface sections*

Pos. No.	Functionality
1	Title bar
2	Navigation trees
3	Editor selection
4	Editor tabs
5	Main area

### 3.1.2 Title bar

The title bar includes below listed functionalities when the tool is opened, shown in [Figure 2](#).



*Figure 2: Title bar*

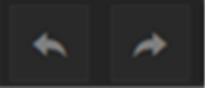
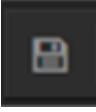
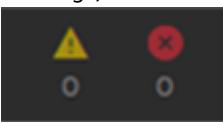
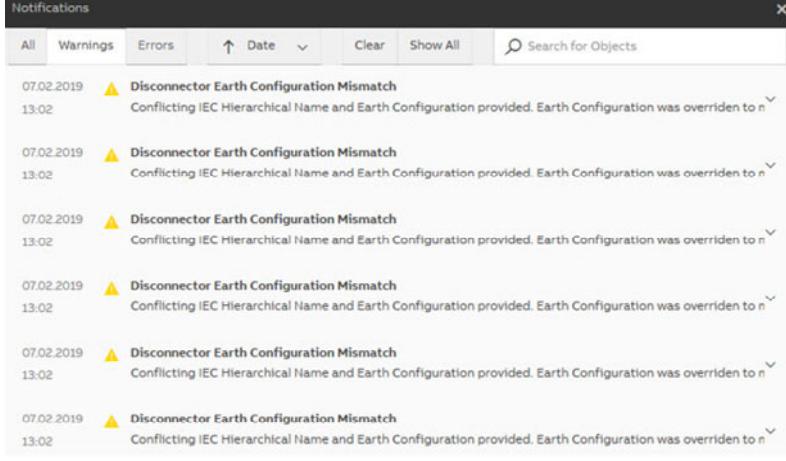
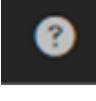
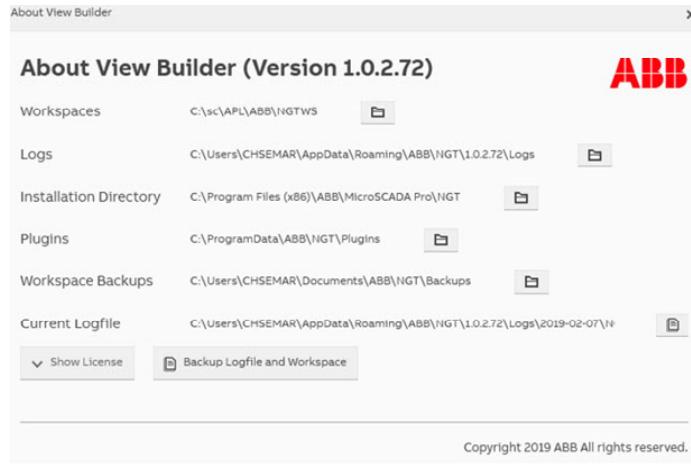
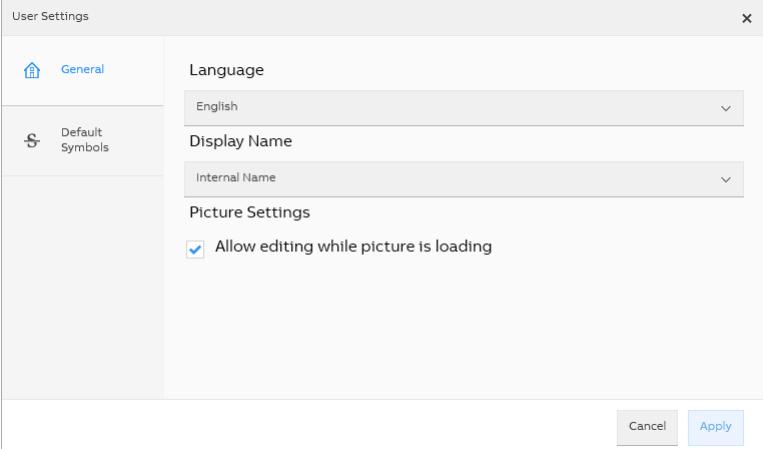
Pos. No.	Functionality	Description
1	Undo/Redo 	Click to perform undo-able and redo-able actions. Related arrows are highlighted when such actions are available and queued.
2	Save 	Click to save all the pending changes on the open workspace. Icon is highlighted and workspace title is appended with an asterisk when changes are not saved.
3	Warnings/Errors 	<p>Click to open the log window. It is then possible to filter based on the severity of the messages: errors only, warnings only or all.</p> <p>The window is then pinned to the editor page frame or freely moved around.</p> <p>The number of unacknowledged errors and warnings are displayed on the title bar below the related icons.</p> 
4	About box 	<p>Click to open a model dialog box with version and data repository information (data, log files and workspace). Mostly relevant for the manufacturer to deal with support cases.</p> 

Table continues on next page

Pos. No.	Functionality	Description
5	User settings	Click to open the <b>User Settings</b> dialog box. See <a href="#">Section 3.1.2.1</a> for related functionality.  

### 3.1.2.1 User Settings dialog box

The **User Settings** dialog box consists of two tabs such as, **General** and **Default Symbols**. The **General** tab allows the user to set the tool UI language (default, English) and the way to display the object names in the tool in the tool (see [Section 2.3](#) for the View Builder naming principles). The **Default Symbols** tab allows the user to determine the default symbol that will be used to display equipment. The **SYS600** tab, if present, allows the user to configure SYS600 specific properties.

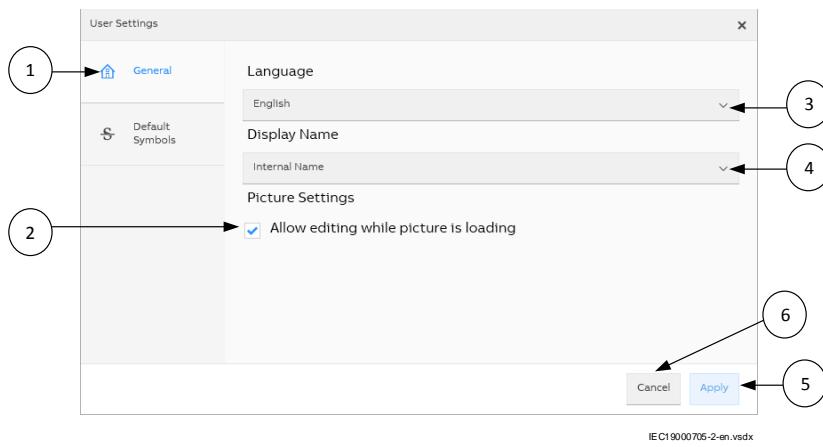


Figure 3: User Settings dialog box — General settings

Pos. No.	Description
1	Click to view general user settings.
2	By default, it is possible to start modifying a picture while it is still being rendered on the screen. This can be turned off by not selecting this setting.
3	Drop-down list to choose the active UI language.

Table continues on next page

Pos. No.	Description
4	Drop-down list to choose the strategy of how the object names are displayed in the View Builder, which can be the internal name, the customer name, or both in different combinations.
5	Click <b>Apply</b> to activate changed settings.   Language change requires a tool restart to take effect, while a display name change is immediately available.
6	Click <b>Cancel</b> to discard changes.

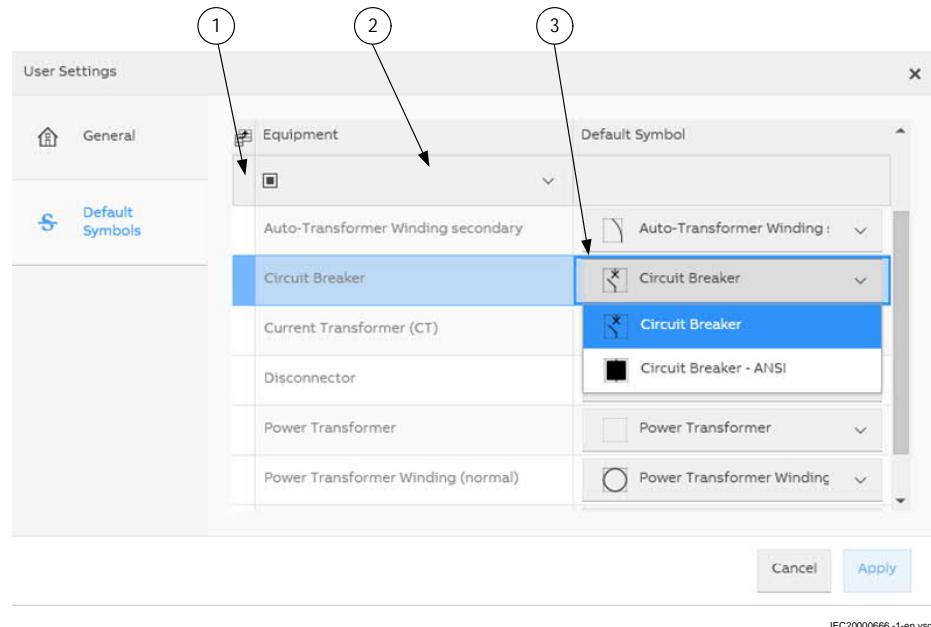


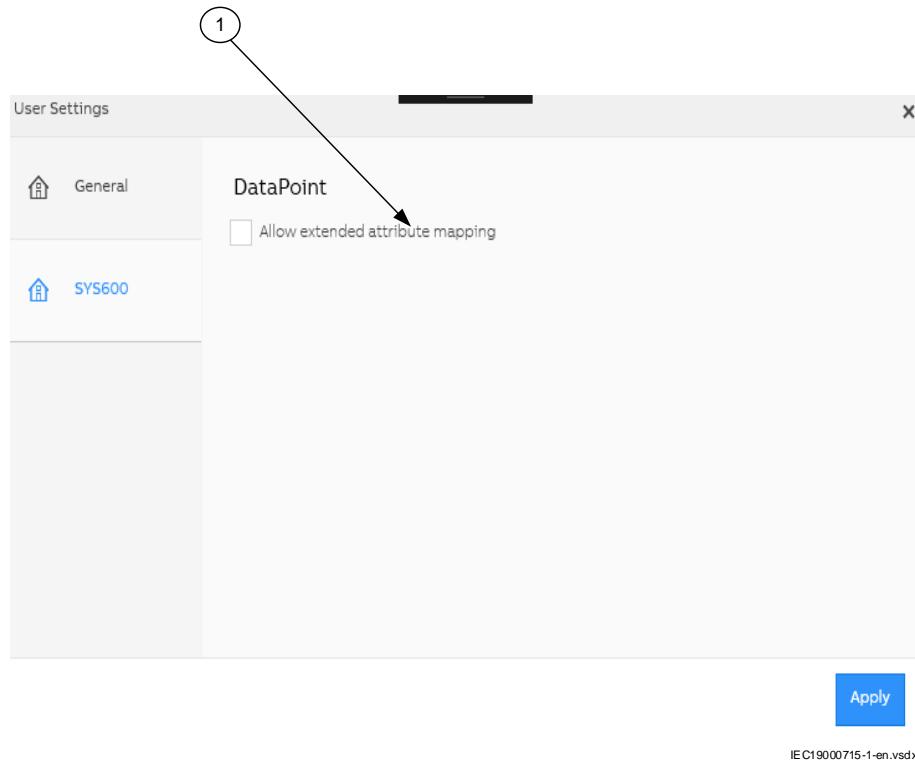
Figure 4: User Settings dialog box — Default Symbols

Table 1: User Settings dialog box — Default Symbols

Pos. No.	Description
1	Click to choose the logic for filtering the list.
2	Enter text to filter the list.
3	Drop-down list to choose the currently used default symbol.



Changing the default symbol only affect future engineering. It will not change symbols used in existing pictures.



*Figure 5: User settings dialog box for selecting datapoint*

Pos. No.	Description
1	The <b>Allow extended attribute mapping</b> check box allows the user to map the SYS600 process object attributes directly. This is helpful when specific process object attribute must be displayed in a picture. This check box can be selected or cleared as per the requirement.

### 3.1.3 Navigation trees

Navigation trees display objects in different hierarchies. The collapse and expand functionalities are available on each level to display the entire or a part of the parent or child structure. Each of the displayed items can be double-clicked or dragged to the **Editor** tab area to engineer the related picture.



The navigation tree structure is optimized to display objects, which can be opened in an editor (that is, equipment container from the functional tree structure). Leaf equipment cannot be browsed in that tree.

The following functionalities are available in navigation trees:

Navigation trees or tabs	Description
<b>Main</b> 	Displays the actual grid, region, and/or substation topologies, and the child equipment containers.
<b>Typicals</b> 	Displays the list of Typicals that are already engineered.

Figure 6 displays the list of Typicals that are already engineered.

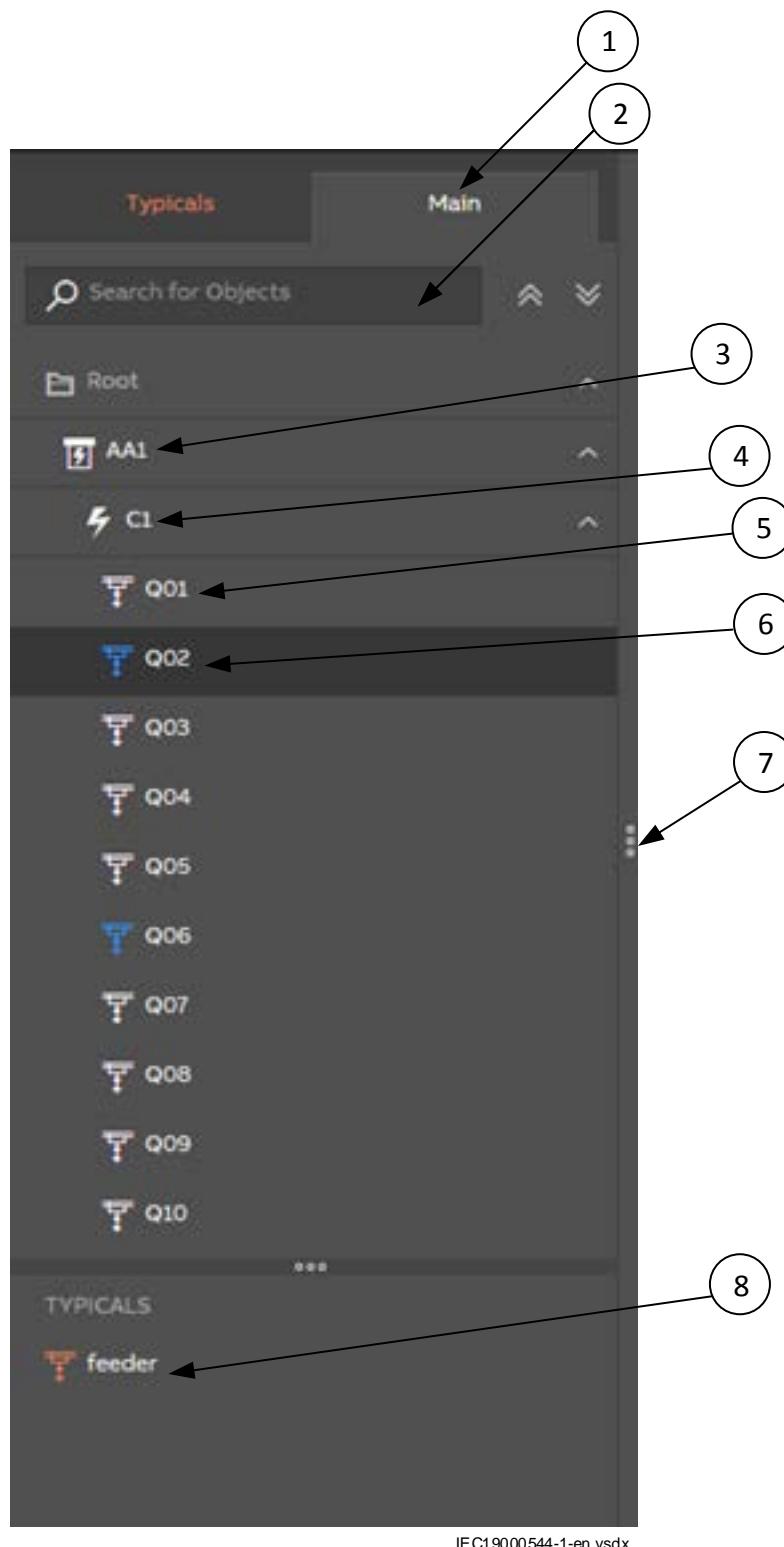
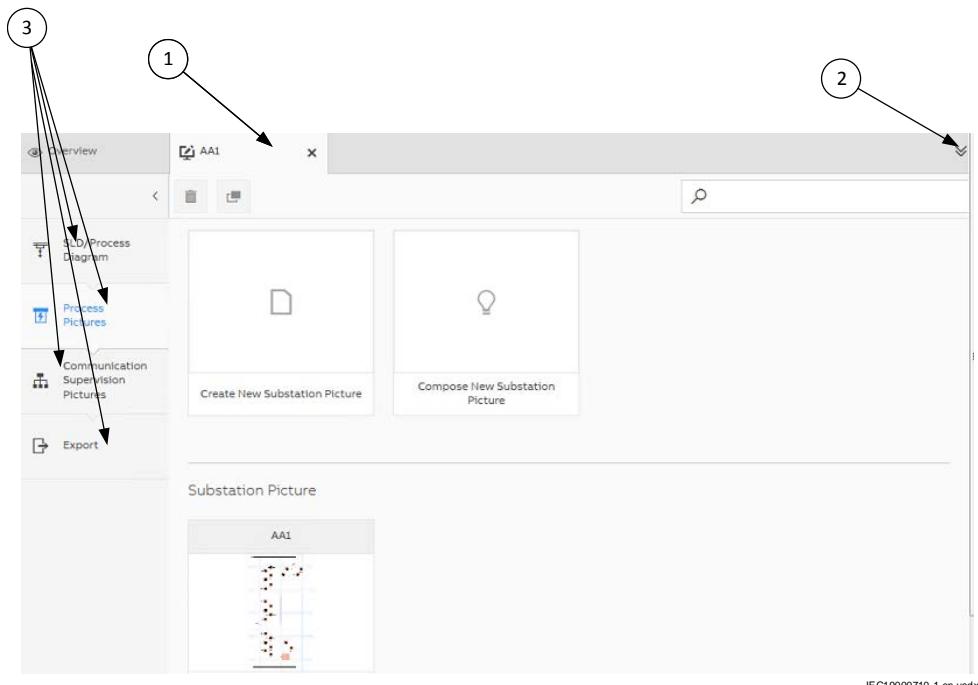


Figure 6: Navigation tree user interface

Pos. No.	Description
1	Active navigation tree. Click on the other tab to switch accordingly.
2	Type object name to filter the navigation tree accordingly.   Applicable parent structure is still shown.
3,4,5	Select an object to start related picture engineering.
6,8	When a bay is selected in the <b>Main</b> tab, any related typical is shown in the subsection. The reverse is available when navigating the typical tree.
7	When an instance bay is selected in the <b>Main</b> tab, the related typical is shown in the ( <a href="#">Section 3.2</a> ). In a similar way, when a typical bay is selected in the <b>Typical</b> tab, all the related instance bays are shown in the ( <a href="#">Section 3.2</a> ).

### 3.1.4 Editor tabs with editor selection

The following type of editor tabs are available as shown in [Figure 7](#).



*Figure 7: Equipment container tab details*

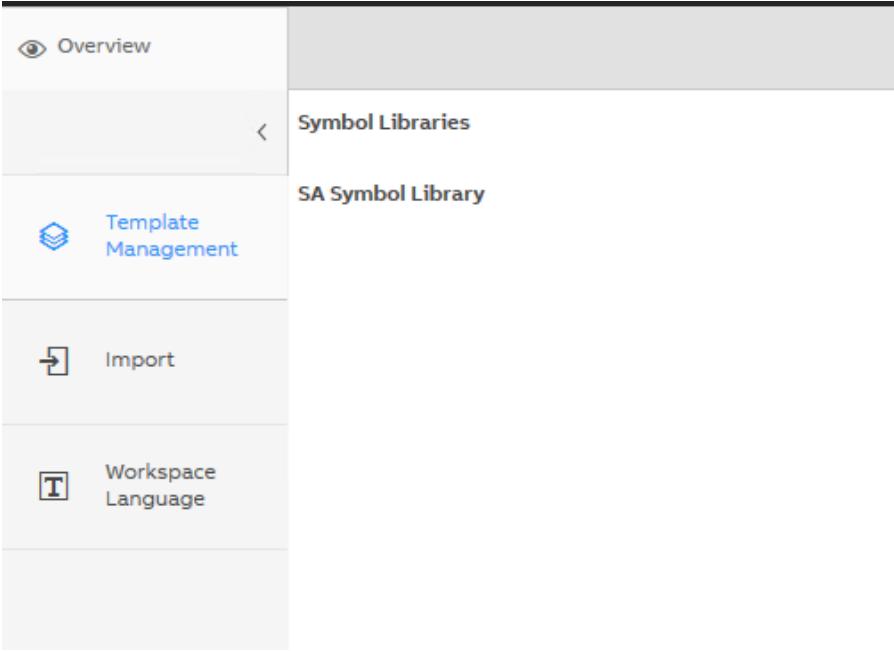
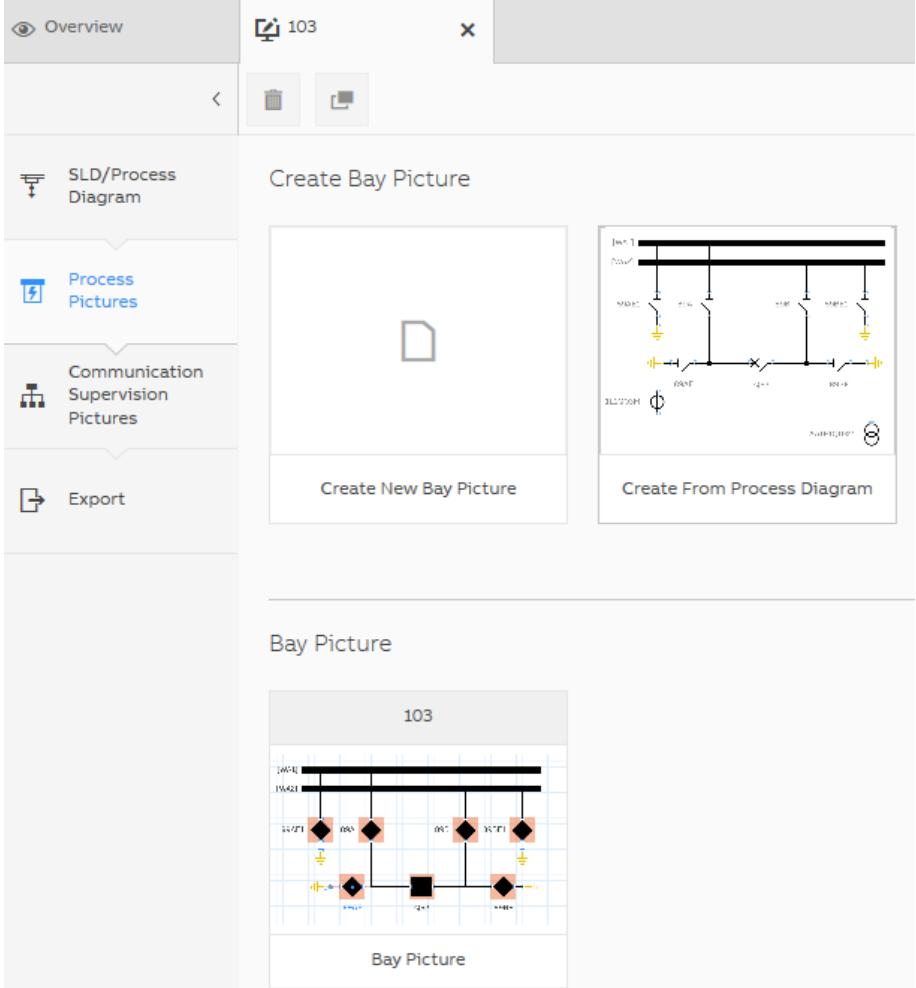
Tabs	Description
Overview tab  <b>Overview</b>	<p>The <b>Overview</b> tab is composed of general functionality, which applies to the whole workspace and is not specific to a functional structure object.</p> <p>There are three editors that can be called from this tab: <b>Import</b> (see <a href="#">Section 3.2.1</a>), <b>Template Management</b>, (see <a href="#">Section 3.3</a>), and <b>Workspace Language</b> (see <a href="#">Section 3.5</a>).</p> <p>When starting View Builder, the <b>Overview</b> tab is already opened. The <b>Overview</b> tab cannot be closed.</p> 

Table continues on next page

Tabs	Description
	<p>Equipment container tab</p> <p>Each equipment container type (from Grid to Bay) opens a tab composed of the same structure. There are three editors that can be managed from such tab: <b>SLD/Process Diagram</b> (see <a href="#">Section 3.6</a>), <b>Process Pictures</b> (see <a href="#">Section 3.7</a>, and <a href="#">Section 3.8</a>), <b>Communication Supervision Picture</b> (see <a href="#">Section 3.9</a> and <a href="#">Section 3.10</a>) and <b>Export</b> (see <a href="#">Section 3.11.1</a>).</p> 

The following table lists the detailed information about the functionalities of the equipment container tab:

Pos. No.	Description
1	Active equipment container tab. Click on another tab to switch accordingly.
2	Alternative way to select an active tab. Click to get a drop-down list with the open tab names.
3	Available editors for the active tab. The selected editor name is shown in blue. Click the editor to activate. Different editors can be activated for different editor tabs (for example, Q01 Process Picture and Q03 SLD/Process diagram can be opened concurrently).

### 3.1.4.1 Navigating around editors and editor tabs

The following possibilities are available:

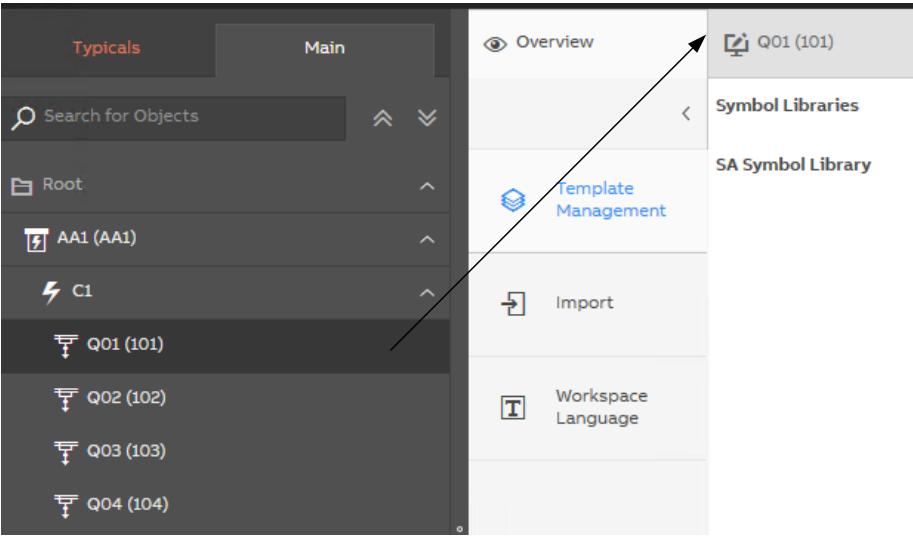
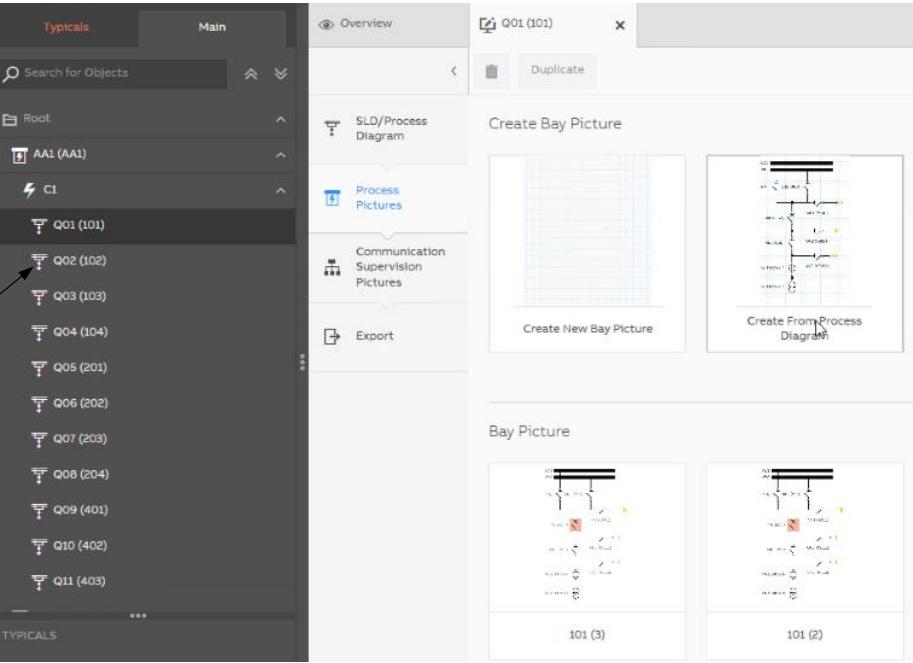
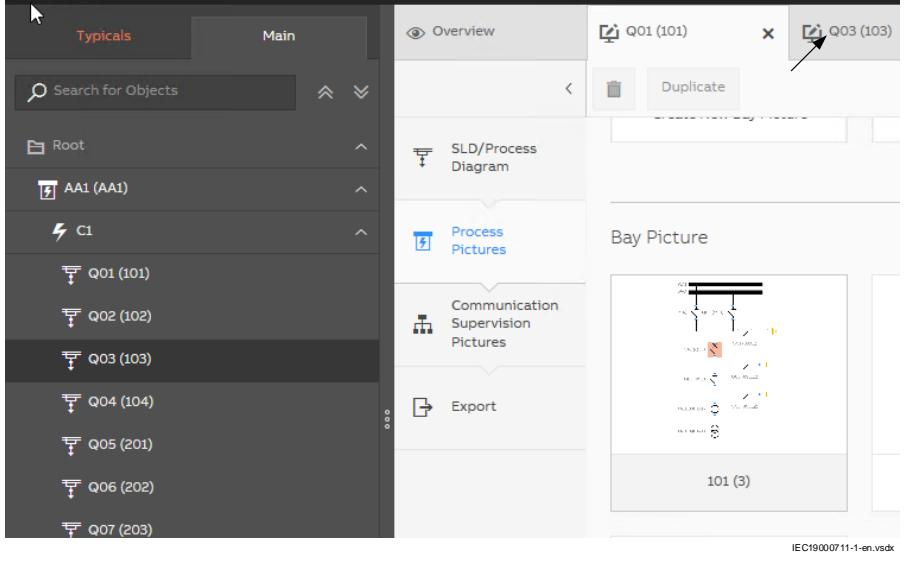
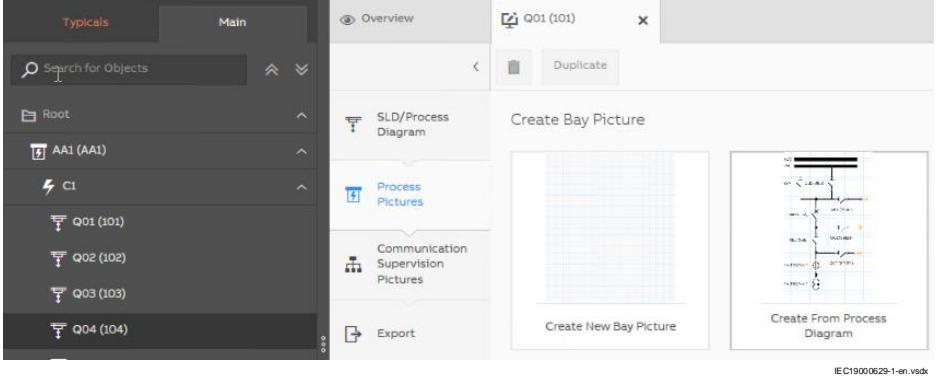
Functionality	Description
Overview tab 	Always opened, can neither be closed nor be undocked.
Open equipment container editor tab 	To open the first equipment container editor tab, double-click on the selected object in the navigation tree or drag that object from the navigation tree to the editor tab area. Editor is not selected by default.  IEC1900626-1-en.vsdx
Switch equipment container from an opened editor tab	To switch the current equipment container editor tab to another equipment container without opening a new tab, double-click the desired equipment container on the navigation tree. If a workflow step was selected, the same is active for the switched equipment container. As the <b>Overview</b> tab cannot be closed by design, the interface cannot be switched to other. Performing above operation, while the <b>Overview</b> tab is selected results in a new editor tab, opened for the equipment.  IEC1900627-1-en.vsdx

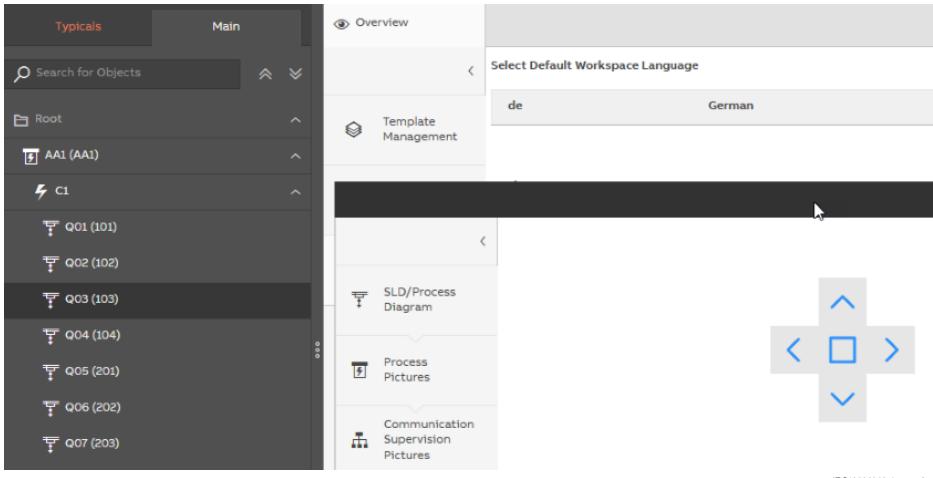
Table continues on next page

Functionality	Description
Append new editor tab	To open a subsequent editor tab without closing the current tab, drag the required equipment container to the editor tab area. This tab is added at the end of the current list and can be re-ordered.

Table continues on next page

Functionality	Description
Switch context to a different active editor Tab	<p>To switch context to a different active editor tab, click on the tab name from the top list or double-click the related equipment container from the navigation tree. Drag, in this case also, to switch context as there can only be one active editor tab per unique equipment container.</p> 
Undocking editor tab	<p>The user can undock editor tabs by dragging the tab title from the top list, to display these as separate windows.  The top right button of a separate window can be used to dock to the main window.</p> 
Table continues on next page	

Functionality	Description
Split editor tab area	The user can dock an editor tab to split the editor tab into two areas— either vertically or horizontally. The two areas can, however, host several editor tabs and behave as an independent editor tab area.



## 3.2 Import UI

### 3.2.1 Overview

The SYS600 process database is read during start-up and the user can view the **Import** dialog box and edit the functional structure before any engineering work can be started.

Click the SYS600 process database entry to re-invoke the **Import** dialog box with the import editor from the **Overview** tab.

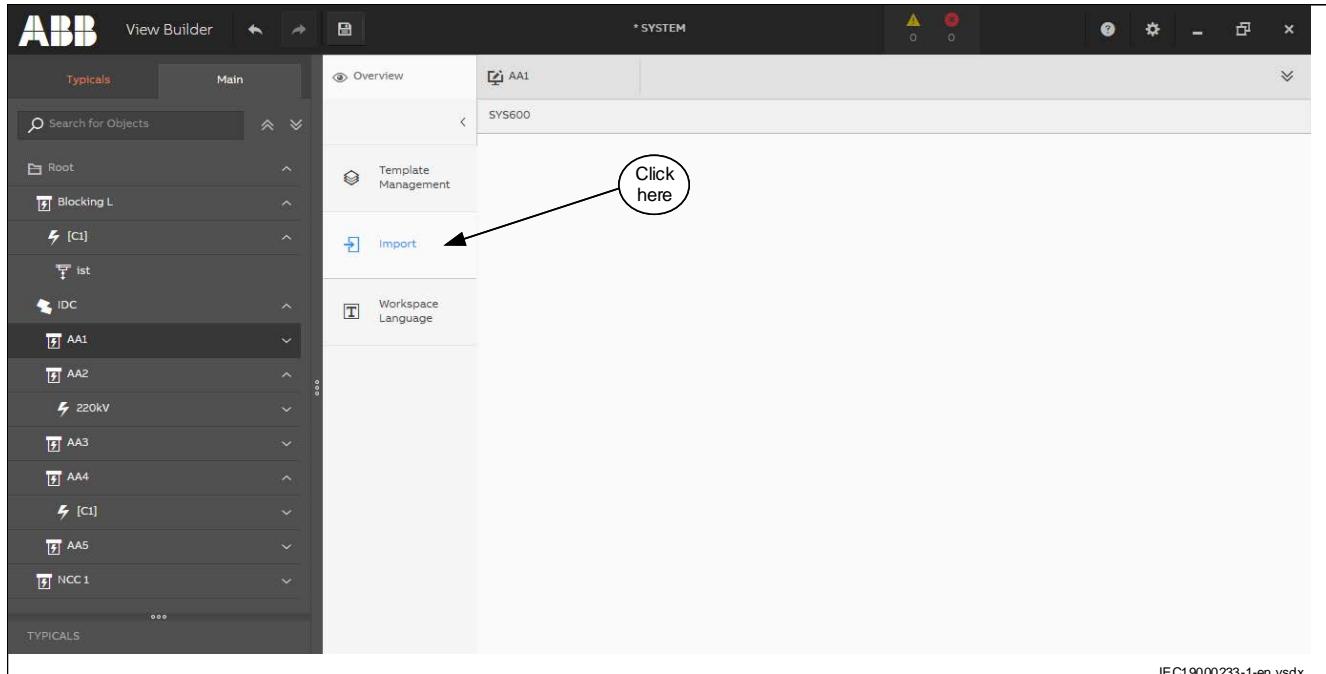


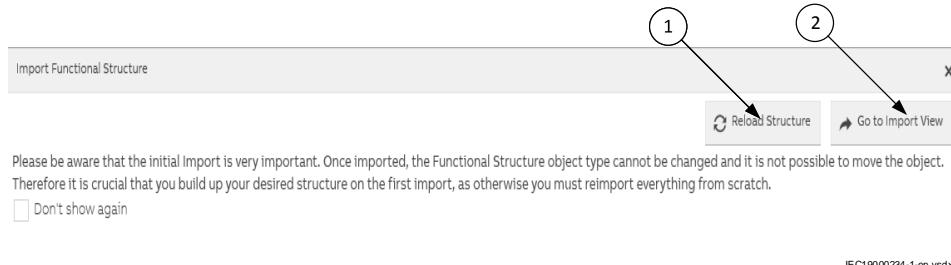
Figure 8: Invoke Import dialog box from Overview tab

### 3.2.2 Import Functional Structure dialog box

The **Import Functional Structure** dialog box first reports any warnings or errors detected during the parsing of the SYS600 process database.



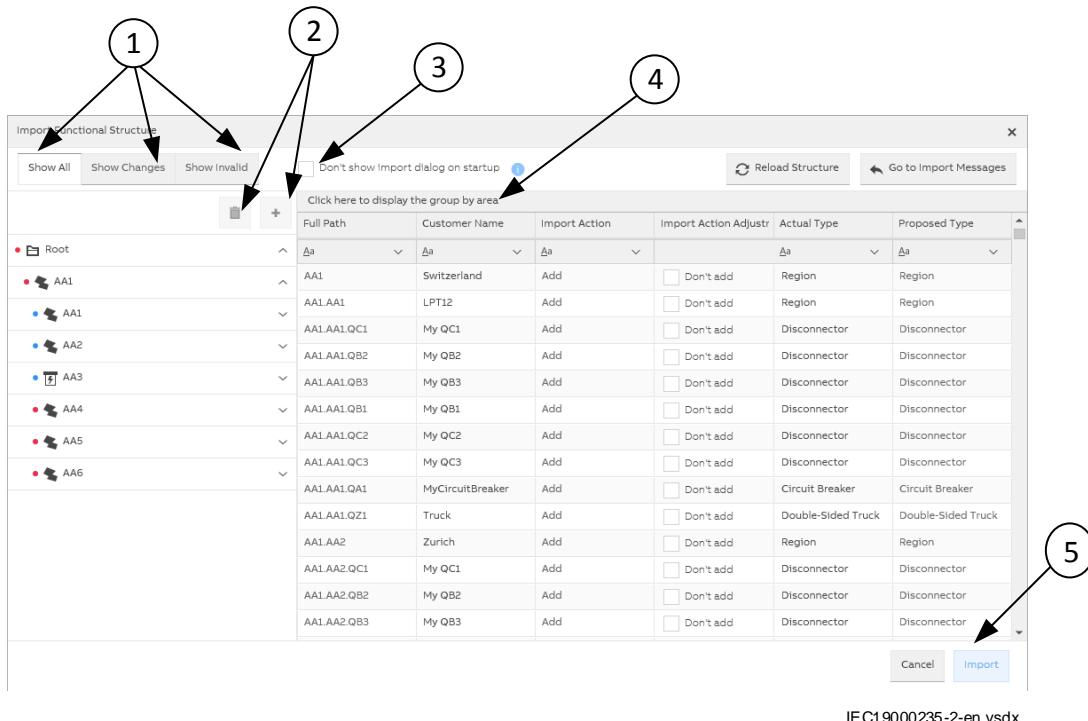
The work done in the **Import** dialog box is only saved when proceeded with an import. Reloading structure or canceling the import removes any changes from the dialog box.



*Figure 9: Import Functional Structure dialog box*

Pos. No.	Functionality	Description
1	Reload structure	It is important to review and fix or consciously accept the remaining errors or warnings before the first import. Switch to the SYS600 process database to fix the issues. Click <b>Reload Structure</b> to verify if the imported data is correct.
2	Go to import view	After completing all the reported issues or fixing the remaining ones, click <b>Go to Import</b> view.

Click **Go to Import** view and the **Import Functional Structure** dialog box changes with the below functionalities:



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*Figure 10: Import Functional Structure dialog box with changes*

Pos. No.	Functionality	Description
1	Show All, Show Changes, and Show Invalid	Built-in filtering for the displayed table information: <b>Show Changes</b> display changes compared to previous Import. <b>Show Invalid</b> displays all elements that are preventing import. Any invalid element is always also marked with a red dot on the left navigation pane. Point to the red dot to get a tooltip hinting the possible issues.
2	Delete/Add	Click + button to add equipment to the import scope. Use trash icon to remove the newly added equipment.
3	Don't show import dialog on startup	Enable this to hide the import dialog on startup. This can be changed later on.
4	Group by	Click to open an area that functions as a drag target. Drag a field name there to group the list by that field. Click the name inside the drag target area to switch the ordering ascending/descending. Drag it back away to remove grouping.
5	Import	Import is blocked (unavailable) until all problematic import actions are resolved.



**Cancel** is always enabled.

The main view area is a table with the following columns and possible actions:

Functionality	Description
Full Path	Internal name with full hierarchical structure that is automatically generated for the imported equipment, according to IEC 81346 naming conventions. This name is used in engineering automation and efficiency but not used in the displayed pictures (customer name is used).
Customer Name	Name of the equipment derived from the imported data and stored in the customer name field of the View Builder model.
Import Action	<p>Current action that is executed by the tool when import action is clicked. These actions can be:</p> <ul style="list-style-type: none"> <li>• Add: Default for new elements detected in the SYS600 process database.</li> <li>• Ignore Add: State achieved when the user decides to not add a newly detected item and overrule the add action in the <b>Import Action Adjustment</b> column. This creates inconsistency in the View Builder structure and the SYS600 process database and is difficult to add it later without rework, hence requires conscious decision and the reason be documented separately.</li> <li>• Keep: Elements already imported in a previous session; no specific action is required.</li> <li>• Ignore remove: If a structural equipment exists in the View Builder and has no equivalent in the SYS600 process database, the import proposes by default to keep the object. The assumption is that some elements may be added in View Builder compared to the SYS600 process database to handle specific automation and proper modeling as required. Those elements depend on the source products.</li> <li>• Remove: State achieved when the proposed <i>don't remove</i> action is overruled by the user as a result some engineering work could be lost. User is encouraged to delete the object in View Builder Expanded Workspace Explorer, where the exact consequences of the deletion are explained in a confirmation dialog box.</li> <li>• Add manually Additional equipment elements can be added using the + to create a different structure as compared with the imported one proposed and based on the SYS600 process database. You can drag and drop whole trees under new elements to make the desired structure.</li> <li>• Automatically added: Equipment added because of another manually added equipment.</li> </ul>
Import Action Adjustment	<p>Adjustment controllable by the user applicable to the current import action. These adjustments can be:</p> <ul style="list-style-type: none"> <li>• Don't add: Forces the import to ignore an object from SYS600 process database. As explained previously, this decision must be taken carefully, as it creates inconsistency between the View Builder structure and the SYS600 process data. If the SYS600 process database is a parent object, all its children are automatically set to <b>Don't Add</b> as well.</li> <li>• Don't remove: Usually this is pre-selected as the tool assumes that the user needs any additional View Builder equipment (cautious decisions made). By unselecting this adjustment, the tool removes the object from the View Builder during the import – main use case is cleaning up a change from the SYS600 process database and must be fully user driven.</li> <li>• No adjustment possible When the import action is available, there are no adjustments possible in the <b>Import Action Adjustment</b> column.</li> </ul>
Actual Type	<p>Equipment type is created. This can be changed by clicking on the cell and selecting another eligible type. The available drop-down list is automatically filtered according to the parent type and the structure rules.</p> <p>By default, the value matches the proposed type.</p> <p>When creating manually an equipment using the + button, a default type is always assigned, and can be changed here to the desired value.</p>
Proposed Type	<p>Type that is proposed to be used to import the related SYS600 process object.</p> <p>This is empty when the object is not existing in the SYS600 process database (added in View Builder or manually in the <b>Import</b> dialog box) or if this type is not recognized (actual type is set to unsupported).</p>

## 3.3 Template Management UI

The **Template Management** functionality is limited to allow an advanced user to update the symbol library from the existing workspace to the current version of the tool. This is only needed when dealing with a support case with the manufacturer and can be safely ignored.

**Template Management** is the second workflow step from the **Overview** tab.

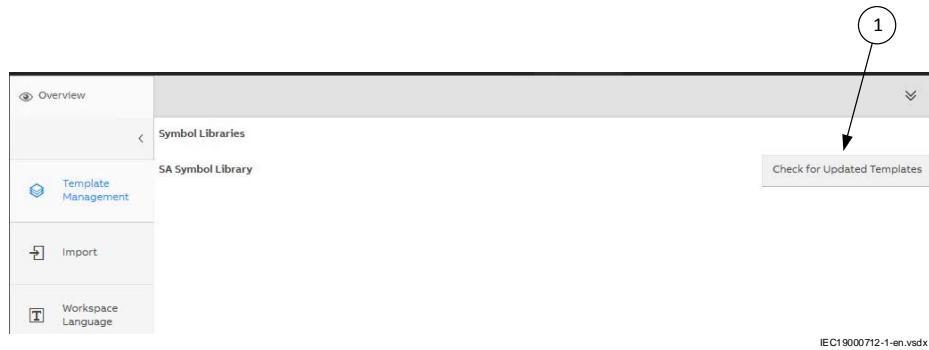


Figure 11: Template management interface

Pos. No.	Functionality	Description
1	Check for Updated Templates	When a new template is available and compatible, the button displays update templates as text.

After clicking update templates, the user is informed that a workspace backup is created, and the current workspace is updated.

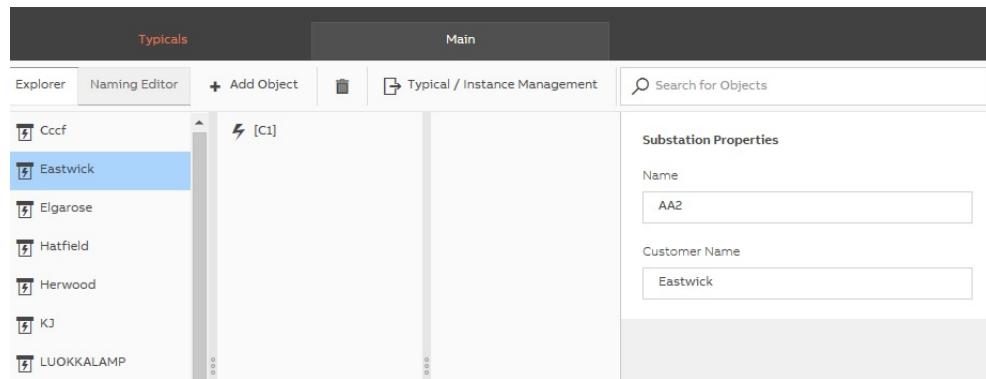
After the update is completed, the user is prompted to restart the tool for applying the changes.

## 3.4 Workspace explorer

### 3.4.1 Overview

By design, the navigation structure and the engineering of the Functional Structure are separated. The Workspace Explorer allows to navigate the Functional Structure. The Expanded Workspace Explorer allows the user to modify the Functional Structure: to expand the Workspace Explorer, drag the right border of the left (navigation) pane to the right as shown in [Figure 12](#).

The main structure is first generated after the SYS600 process database is imported. The Expanded Workspace Explorer is used to engineer Typical Instance relation out of the imported structure, when needed. This is described in detail in [Section 4](#).

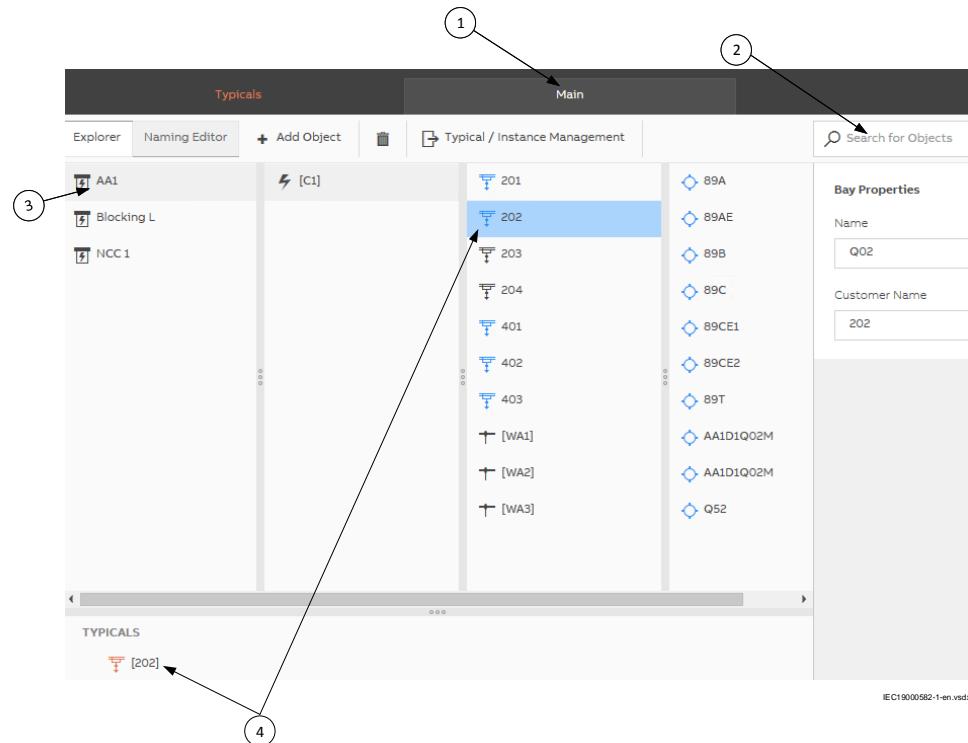


**Figure 12:** Workspace Explorer overview

The Workspace Explorer is split between the display of **Typical** and **Main** structures. Each of the displayed items can be clicked to display the list of child equipment.

Tabs	Description
<b>Main</b>	While the Main navigation tree displays equipment containers down to bay level only, the Main functional structure explorer displays all equipment containers and equipment in a list with separate columns per tree level.
<b>Typicals</b>	While the Typicals navigation tree displays Bay Typicals only, the Typicals explorer displays the bay Typicals and its child equipment in a list with separate columns per tree level.

The following Workspace Explorer functionalities are available:

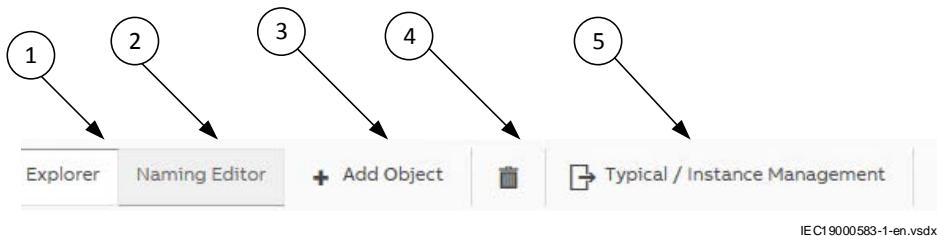


**Figure 13:** Functional Structure and Typicals explorer to select Typicals

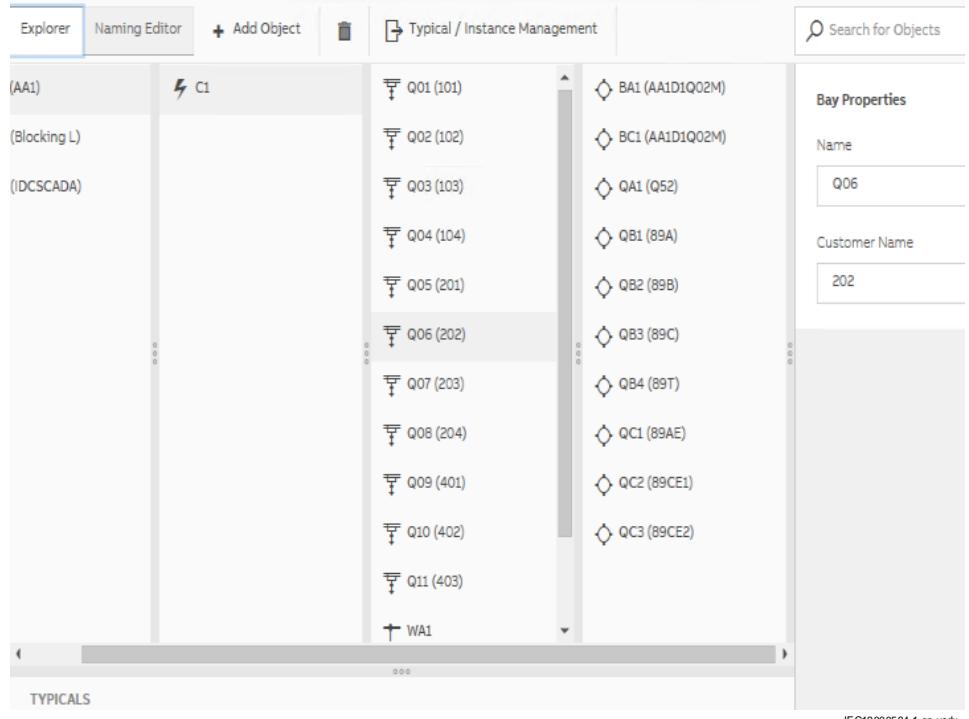
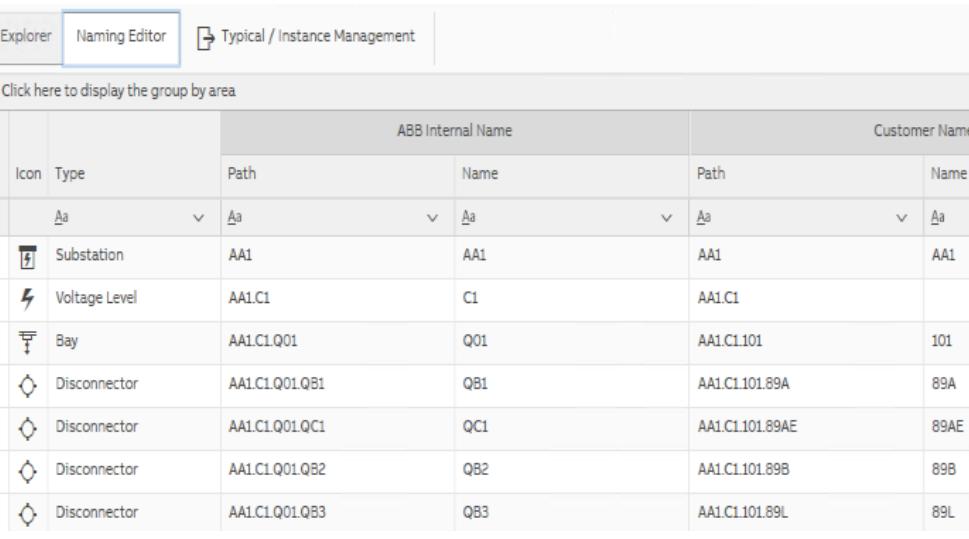
Pos. No.	Description
1	Highlights whether Main or Typicals is being visualized. Click on the other tab to switch accordingly.
2	Type an object name to filter the functional structure objects accordingly.
3	Click on object to open the child list.
4	Bay instances linked to a Typical have an icon displayed in blue. Typical bay icon is displayed in orange. When a bay is selected in the Main Structure, any related Typical is shown in the subsection. The reverse is available when navigating the Typical structure.

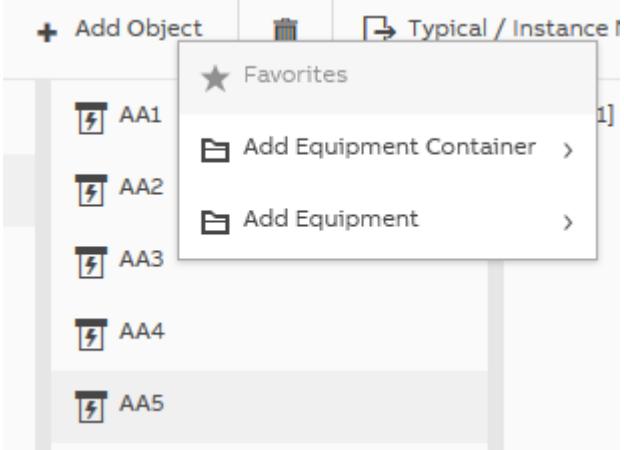
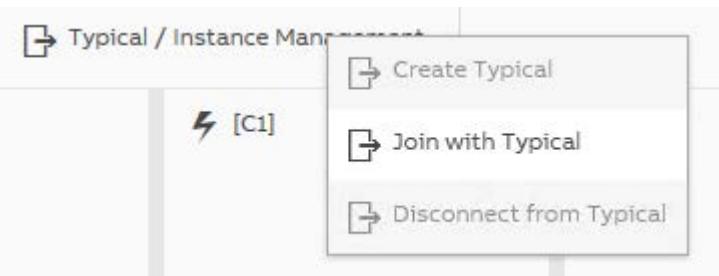
### 3.4.2 Toolbar

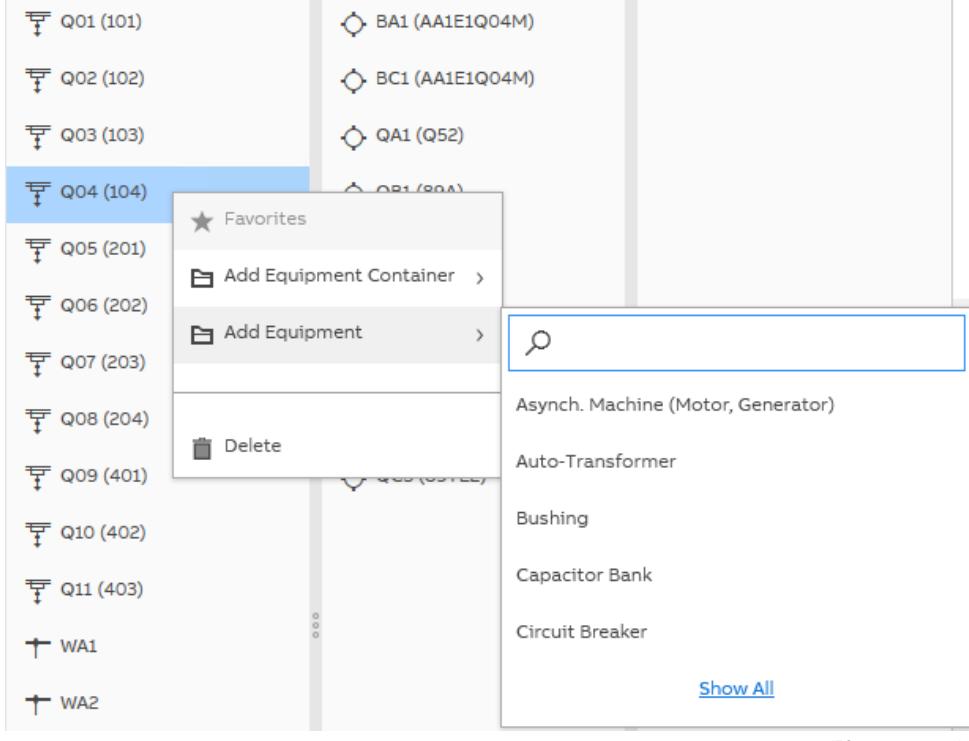
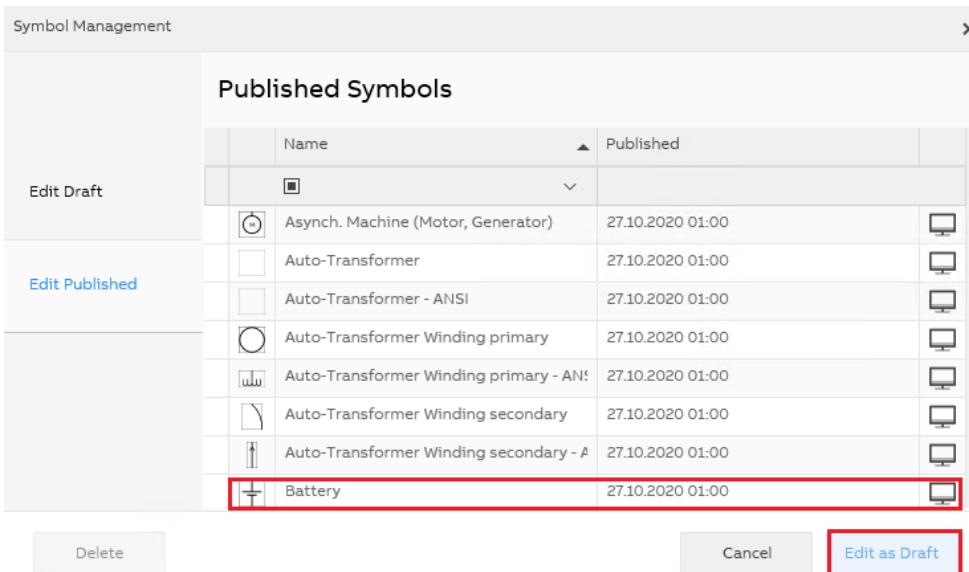
The Workspace Explorer toolbar includes the following functionalities as shown in [Figure 14](#):

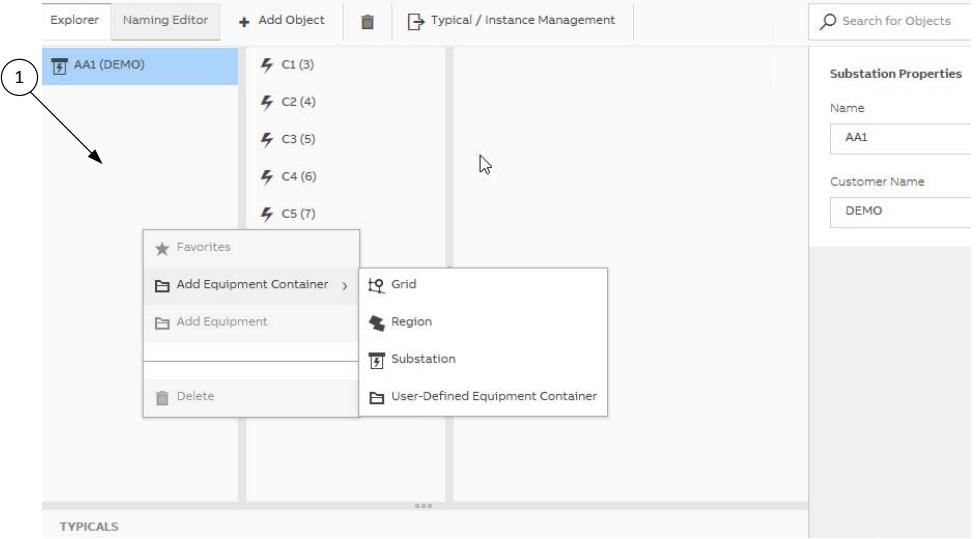


*Figure 14: Workspace Explorer tool bar*

Functionality	Description
Explorer toggle	<p>Default mode for the Workspace Explorer.</p>  <p>IEC19000584-1-en.vsdx</p>
Naming Editor tab	<p>The <b>Naming Editor</b> mode displays the full functional structure in a table format, to allow efficient bulk engineering of ABB internal name and customer name for equipment container and equipment object name changes (names can also be edited directly from an element property in the Explorer view). The name columns of ABB Internal Name and Customer Name are editable. The <b>Path</b> column is updated automatically, accordingly.</p> <p>It is recommended for the user to edit customer name in the SYS600 process database structure. Only an advanced user must rename internal names.</p>  <p>IEC19000585-1-en.vsdx</p>
Table continues on next page	

Functionality	Description
Add Object	<p>Clicking <b>Add Object</b> and selecting one from the drop-down menu does the following:</p> <ul style="list-style-type: none"> <li>• Adds a child to the currently selected functional structure object if that object is of type equipment container</li> <li>• Add a sibling functional structure object if the currently selected one is only an equipment</li> </ul> <p>The drop-down menu selection only displays the valid child type.</p>  <p>IEC19000586-1-en.vsdx</p>
Delete Object	<p>Permanently deletes the selected functional structure object and all the descendants. The tool warns about related child nodes that are removed and prompts for confirmation.</p> <p>Similarly, when used with the <b>Typical</b> tab, deleting typical structure deletes all linked instance structures.</p> <p>The delete operation of the equipment container and the descendant, as well as deleting the Typical data cannot be undone.</p>
Typical/Instance Management	<p>Available in Functional (Main) structure explorer, click <b>Typical/Instance Management</b> to open the sub-menu for handling Typical creation (instances get created elsewhere), join and disconnect operations.</p> <p>This functionality is available only while navigating the Main tab. See <a href="#">Section 6</a> for description.</p>  <p>IEC19000587-1-en.vsdx</p>
Table continues on next page	

Functionality	Description
Add Equipment	<p>Right-clicking on object-level allows to add or remove.</p>  <p>IEC19000566-1-en.vsdx</p>
Add Equipment Container	<p>Right-clicking on a structure-level (below last object of the structure) allows the add object operation on a sibling-level.</p> 
Table continues on next page	

Functionality	Description
Special case: adding a new equipment container to the workspace root	<p>The root object is not displayed in the Expanded Workspace Explorer; hence, this object cannot be selected to use the <b>+ Add Object</b> button.</p> <p>To add a child to the workspace root, the context menu on the highest structure level (left most column) must be used. Right-click in the empty area of that column, that is below the last element from that structure.</p> <p>Right-click in this area (pos no.1 in the below screenshot) to open the context menu and add a child equipment to the root.</p> 

## 3.5 Workspace Language UI

### 3.5.1 Overview

**Workspace Language** is the third workflow step of the **Overview** tab.

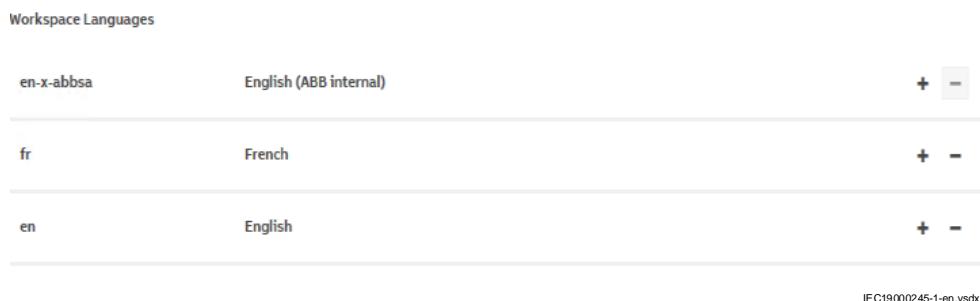


Figure 15: Workspace Language interface

Pos. No.	Functionality	Description
1	Workspace Language	This editor allows the user to centrally define the languages that must be engineered for the SYS600 Workplace X pictures (refer to the text editing functionality and translation dialog box for <b>Process Pictures</b> and <b>Communication Supervision Pictures</b> editor in <a href="#">Section 3.8.2.3</a> and <a href="#">Section 3.9</a> ).

### 3.5.2 Adding or removing Workspace Languages

Click **+** as shown in [Figure 16](#) to add more languages in **Workspace Languages**. A new row is added, where the user can select the language from a drop-down list.



*Figure 16: Adding or removing Workspace Languages*

To remove the added languages, click the minus button of the related row, as shown in [Figure 16](#).



User cannot remove the English (ABB Internal) language (the minus button is unavailable). This is to ensure that it is always possible to switch to it for support case on site.

### 3.5.3 Default Workspace Language

The **Default Workspace Language** is the language that is engineered when editing text in the picture editors outside the translation dialog box (see [Section 3.8.1](#) for more details).

The user can change this value by clicking the drop-down button, which lists all added languages.



*Figure 17: Select Default Workspace Language*

## 3.6 SLD/Process Diagram editor

Equipment and available topology information is imported from the SYS600 process database without defined layout.



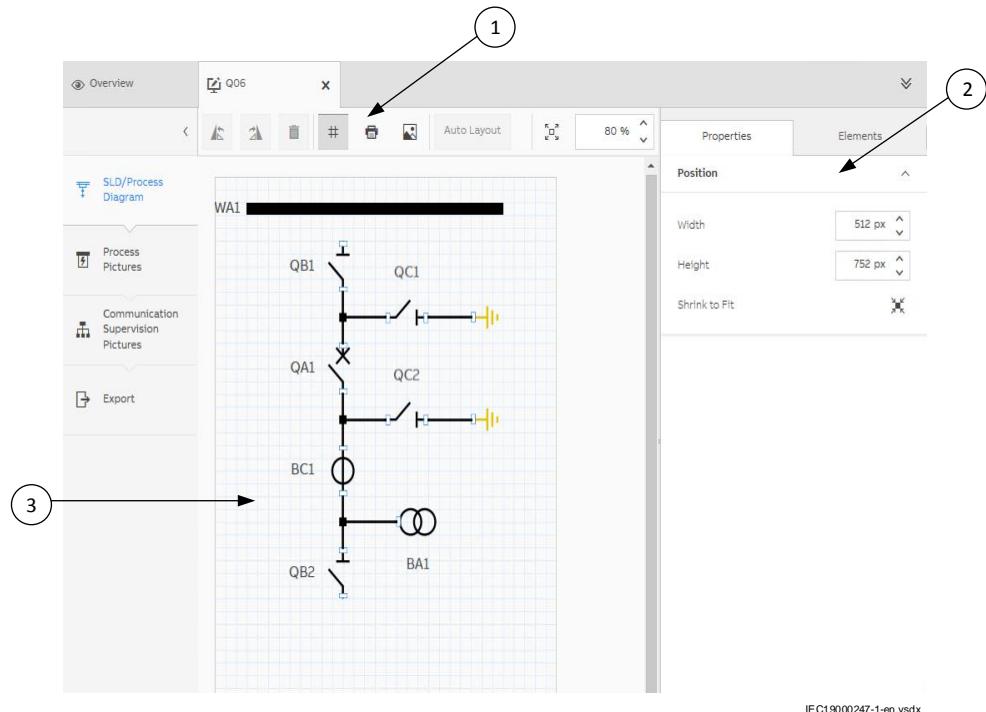
The user is still allowed to add and remove equipment using the **SLD/Process Diagram** editor. As this may create critical inconsistency with the SYS600 process product data, an average user must refrain from doing these actions.

### 3.6.1 Overview

The **SLD/Process Diagram** editor is provided to create and connect equipment graphically to engineer the product topology information. The editor provides elements for primary equipment and routing functionality to connect.

To start the **SLD/Process Diagram** engineering, double click the Equipment Container in the Workspace Explorer and select the first editor on the editor tab

The user interface is composed of the following distinct sections as shown in the [Figure 18](#).

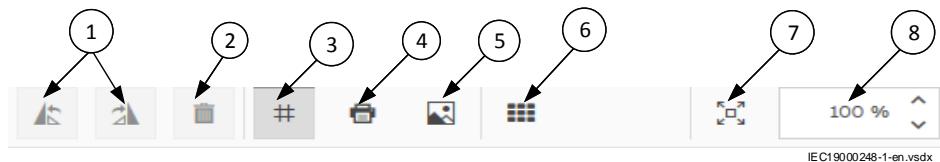


*Figure 18: Overview of SLD/Process Diagram*

Pos. No.	Functionality
1	Toolbar
2	Properties and Elements tabs
3	Diagram container

### 3.6.2 Toolbar

The SLD Editor toolbar includes the following functionalities as shown in the [Figure 19](#).



*Figure 19: Toolbar functionalities*

Pos. No.	Functionality	Description
1	Rotate element (to the left/ to the right) 	Rotate selected element by 90 –degree steps.
2	Delete 	Delete the selected element.
3	Toggle grid 	Toggle display of the background grid.
4	Print 	Print the current diagram.
5	Export as image 	Export diagram to the clipboard and save as .png image.
6	Auto layout 	Available on parent diagram, which is composed of child diagrams. Auto Layout aligns all the child diagram containers. This must be used initially as this reset additional engineered layout made between the child diagrams.
7	Auto scale/ Zoom to fit 	Click this button to change zoom level to make the diagram container fully visible. If the diagram is too big, the zoom level is set to 25%.
8	Zoom level 	User can manually change the zoom setting. The tool support settings vary from 25% to 1000% with 5% increments.

### 3.6.3 Elements tab

The **Elements** tab is composed of the following functionalities as shown in [Figure 20](#).

The **Elements** tab is context sensitive that is, there are different elements when editing Process or Supervision pictures. This picture should be changed to show the elements available for process diagrams.

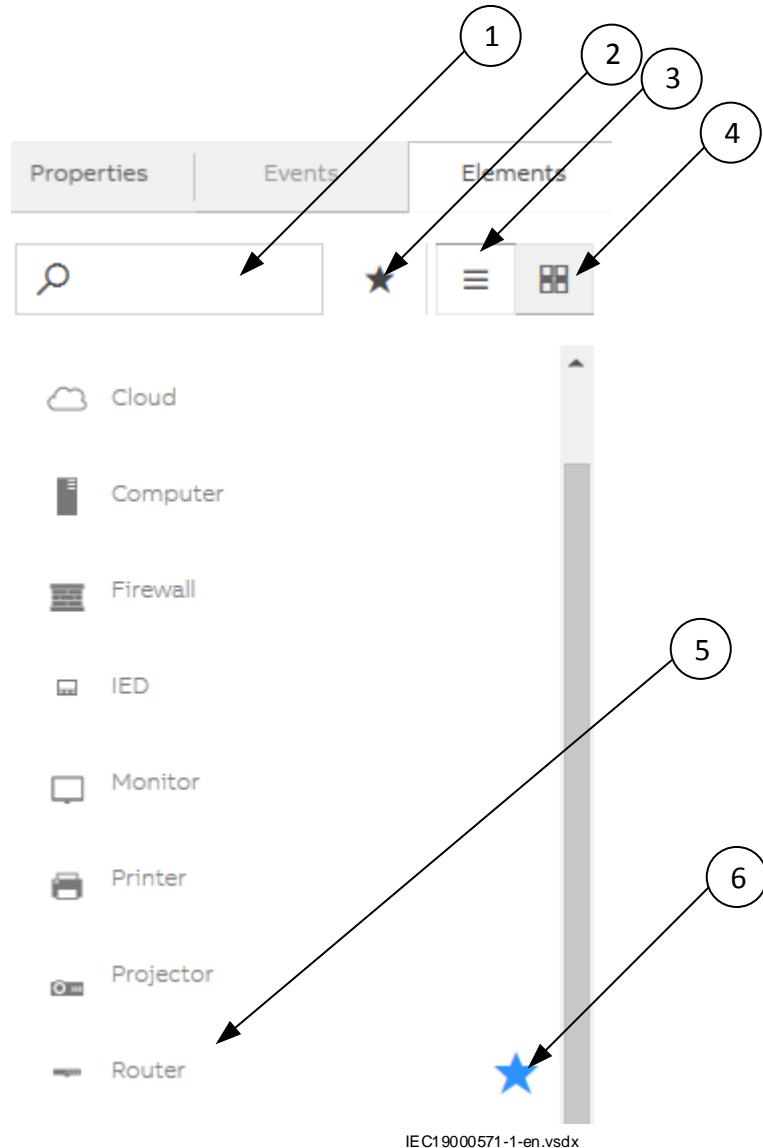


Figure 20: Elements tab for Communication Supervision Pictures

Pos. No.	Description
1	Search/Filter elements with input text.
2	Toggle to filter by favorite.
3	Toggle to show list base tab view.
4	Toggle to show icon base tab view.
5	Select element.
6	Set to favorite.

### List base tab view

Default view of the **Element** tab to browse available elements.

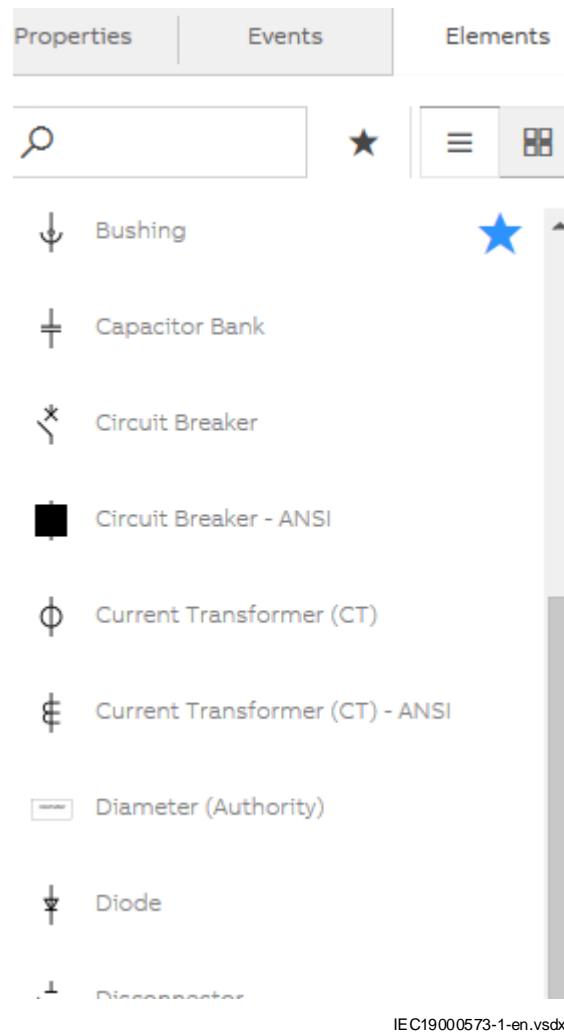


Figure 21: List base tab view

### Icon base tab view

Click the corresponding toggle icon to display the alternative view and browse the available elements. In this view, the names are available as tooltip.

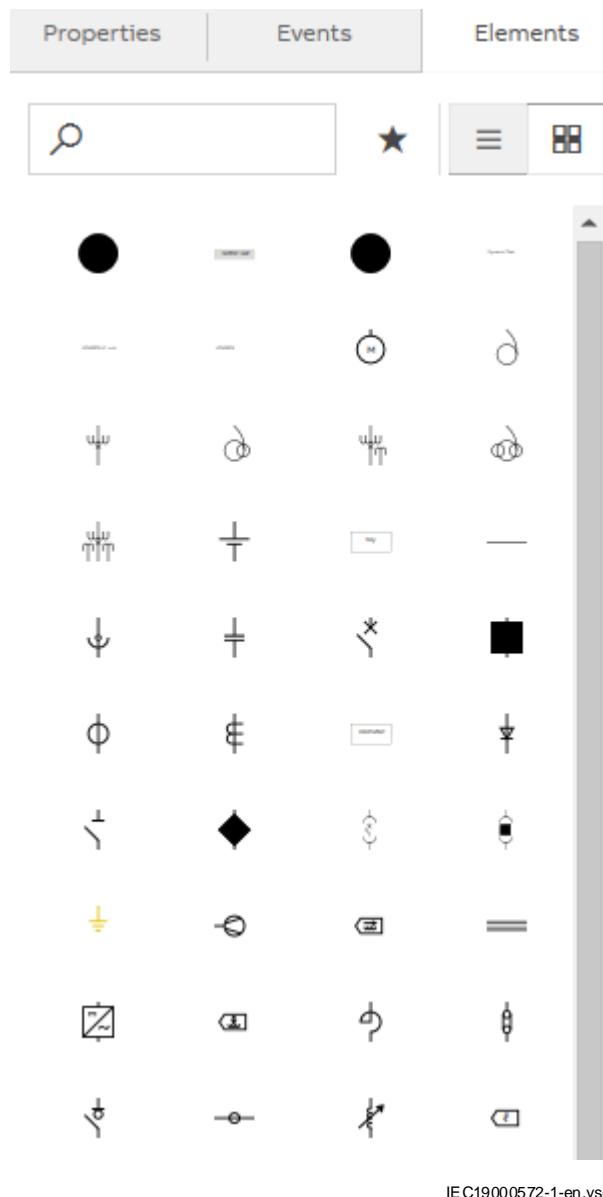
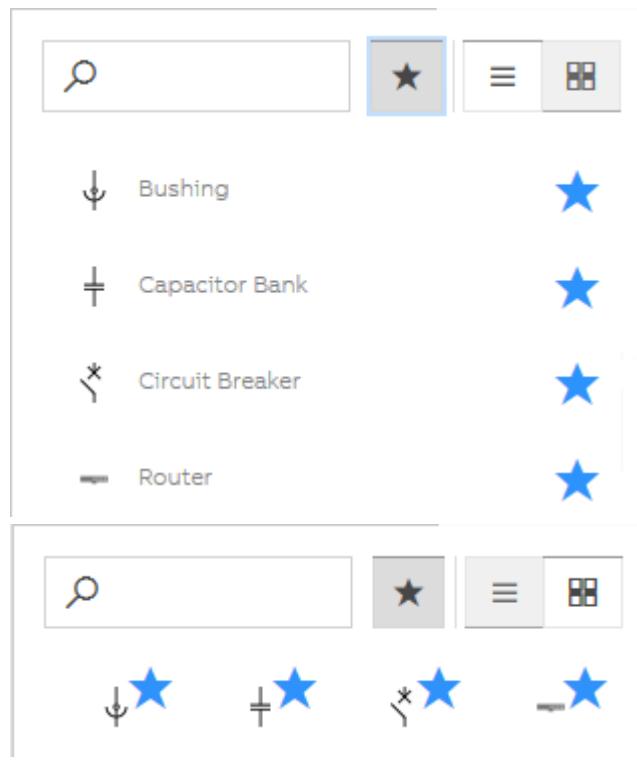


Figure 22: Icon base tab view

### Filtering favorites

Filter the available elements based on favorites. The elements are available in both list base and icon base views.



IEC19000574-1-en.vsdx

Figure 23: Filtering favorites

### Searching and filtering

Filter elements according to the text input.

When the elements are available in both views, the functionality displays an additional blue highlight functionality on element names, while using the list base view.

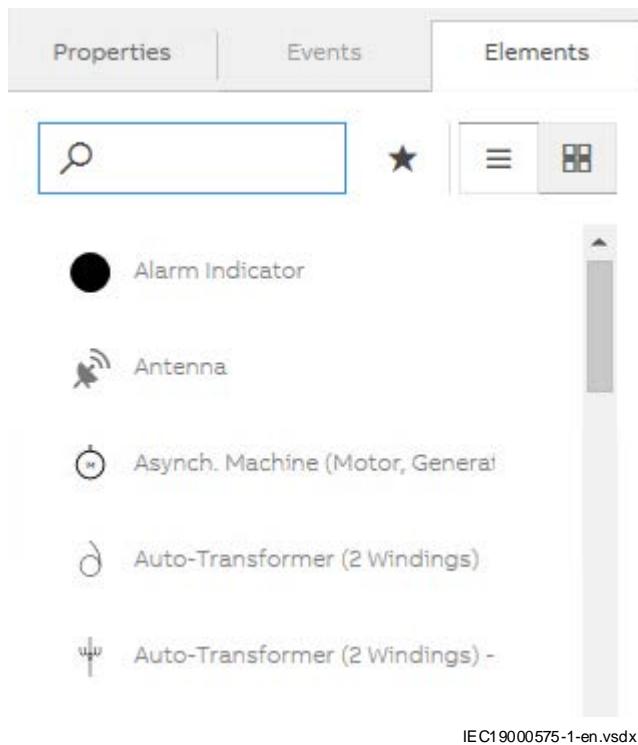


Figure 24: Searching and filtering

## Setting favorites

To set an element as favorite, point to an element from the list and click the appearing grey star.

After being clicked, the element star turns blue.

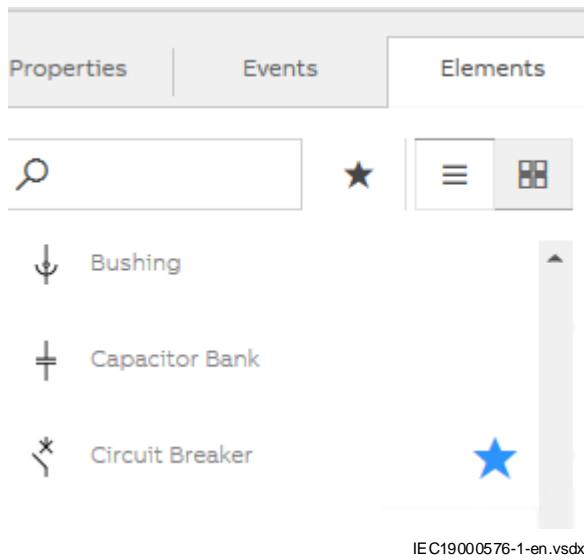


Figure 25: Setting favorites

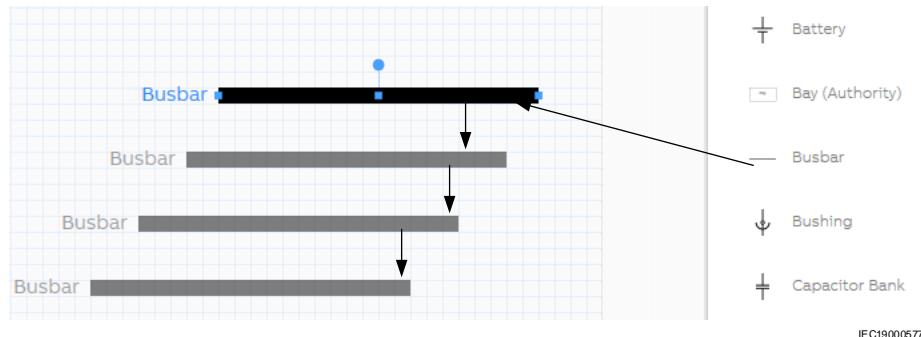
## Selecting element and drawing diagram container

To select an element for drawing in the diagram container, click the element on the list.

After clicking, the pointer changes into the element graphically, indicating stamp mode.

Left-click on the diagram to draw the element. This operation can be repeated without reselecting the element (stamp mode).

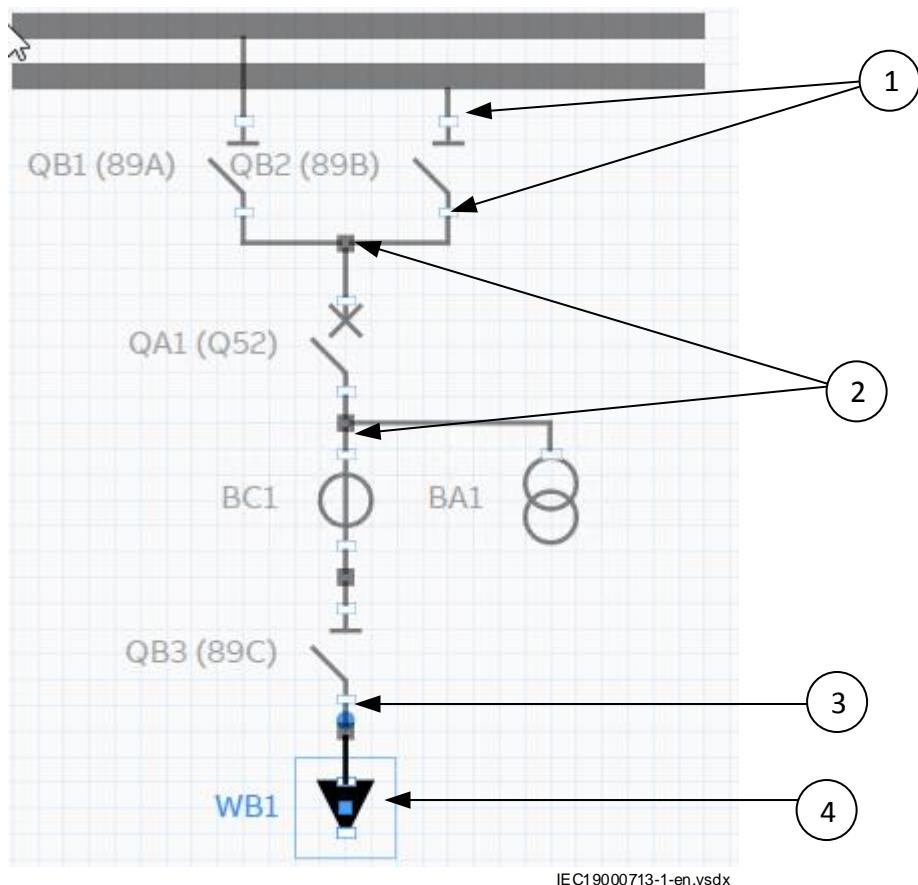
To quit stamp mode, right-click on the diagram container or press ESC.



*Figure 26: Selecting element and drawing diagram container*

### 3.6.3.1 Connecting elements in diagram container

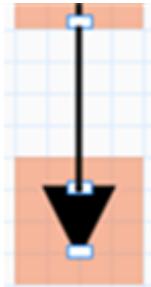
After placing the elements on the diagram container and setting all the properties correctly, complete the drawing by connecting them as needed.



*Figure 27: Connect elements in diagram container*

Pos. No.	Description
1	Symbol terminal
2	Connectivity node
3	Symbol terminal with WB1 selected.
4	Proposed routing from the drag operation.

To connect two symbols together, point to a terminal, click and drag towards the next symbol without releasing it. The link shows an arrow when the new position is valid. Release the pointer to draw the link.



IEC19000542-1-en.vsdx

In process diagrams, connection links between symbols include a connectivity node. Such node can be used to connect more than two symbols together.



In power systems, all connected equipment has the same potential. For topology-base coloring, the voltages are calculated per connectivity node and the coloring is then derived from this.

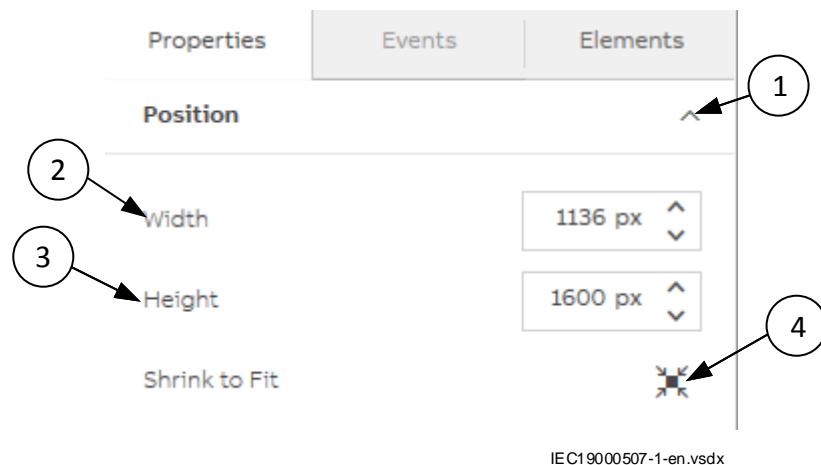
### 3.6.3.2 Adding Hierarchical Symbols

In order to add Hierarchical Symbols (for example, Circuit Breaker) in a Double-Sided Truck, see [Annexure F](#).

## 3.6.4 Property tab

### 3.6.4.1 Diagram background properties

The following properties are shown in [Figure 28](#) when the diagram background is clicked:



*Figure 28: Diagram background properties*

Pos. No.	Description
1	Expand/collapse property group.
2	Width of the diagram in pixel.
3	Height of the diagram in pixel.
4	Adjust the diagram width and height to remove white spaces from the bottom and the right side of the diagram. Diagram and pictures are top left anchored to avoid disruption alignment when changing the diagram size.

### 3.6.4.2 Element properties

The following properties are shown in [Figure 29](#) when an element is selected:

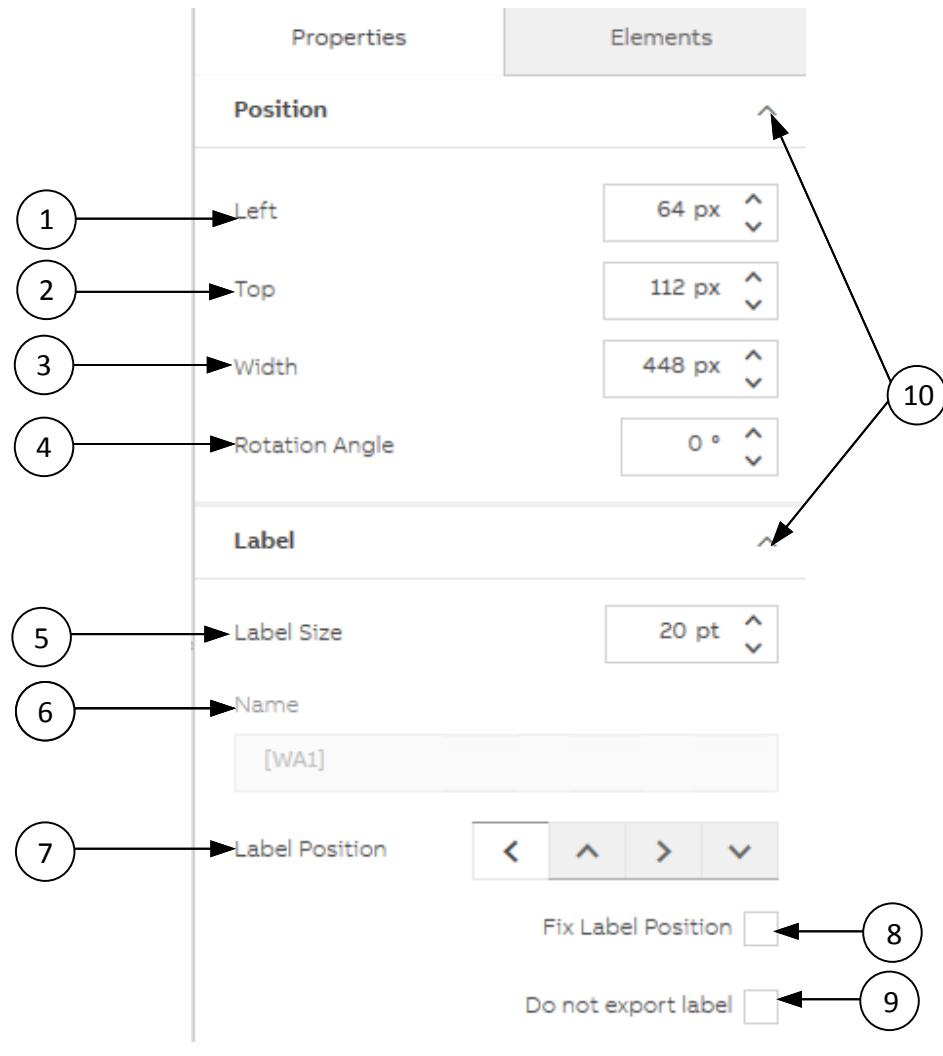


Figure 29: Element properties interface

Pos. No.	Functionality	Properties
1	Left	The main purpose of left and top properties is to reuse and repeat the defined positioning. X-axis position of the top left pixel of the selected element. Increment step is fixed to 16 pixels.
2	Top	Reversed Y-axis position of the top left pixel of the selected element. Increment step is fixed to 16 pixels.   Editing the properties directly may allow some overlapping whereas using the mouse to move an element on the diagram with drag and drop prevents this (a forbidden sign is shown on the mouse cursor and the symbol returns to the initial position on button release).
3	Width	Width of the element in pixel. Increment step is fixed to 16 pixels.   Only available as property for Busbar element in SLD.
4	Rotation Angle	Rotation angle of the selected element. Supported values are 0°, 90°, 180°, and 270°.
5	Label Size	Size of a label in pixel. Values from 12 to 36 are supported.
6	Name	Read-only property – Displays the element name using the display name setting (see <a href="#">Section 3.1.2.1</a> ).
7	Label Position	Label can be placed on the left, top, right, or bottom side of an element.
8	Fix Label Position	Fix the label position against rotation when selected the check box.
9	Do not export label	Label is not shown in SYS600 Workplace X when checked. Property is saved for UI pictures created from single line diagram (see <a href="#">Section 3.6</a> ).
10	Expand or collapse property group	This functionality is used to expand or collapse the properties.

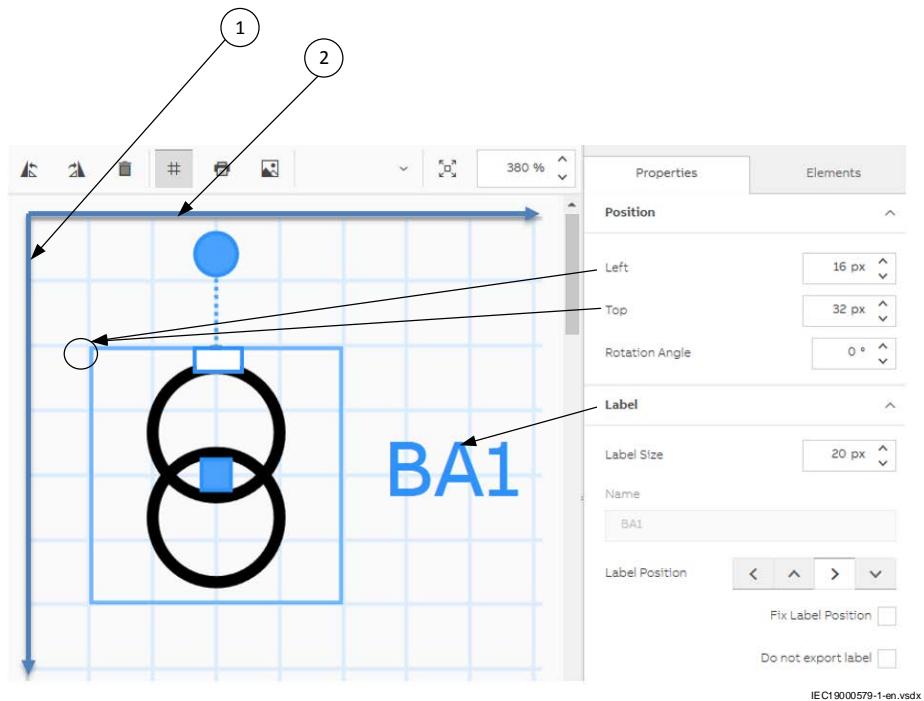


Figure 30: Picture Dashboard interface after an image is drawn

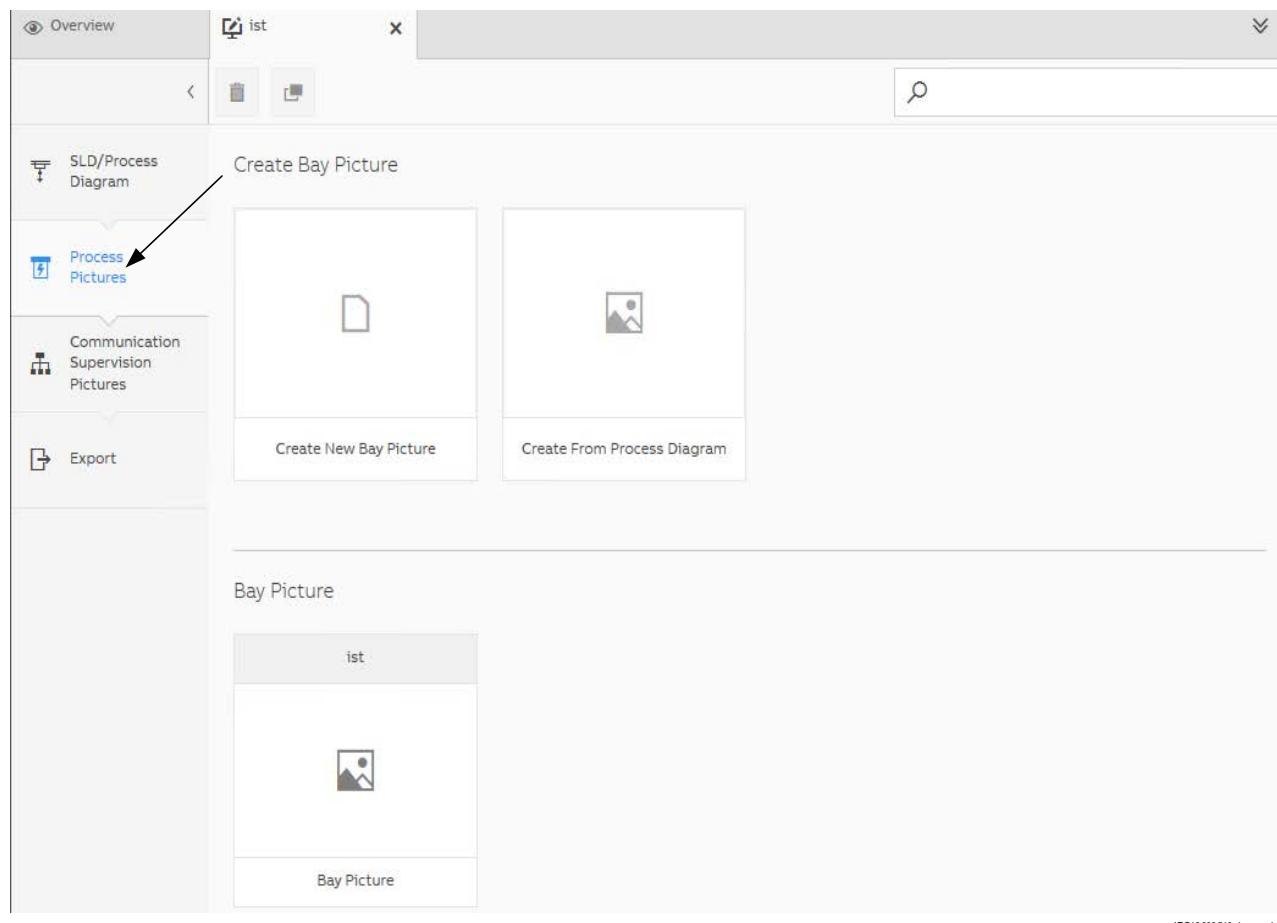
Pos. No	Description
1	X-axis — 16 pixels intervals
2	Inverted Y-axis — 16 pixels intervals

## 3.7 Process Pictures dashboard

### 3.7.1 Overview

The **Process Picture** editor is provided to engineer the SYS600 Workplace X pictures.

To start the **Process Picture** engineering, select the second editor from the selected equipment container on the editor tab.



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Figure 31: Overview of process pictures dashboard

By default, the picture dashboard is shown and composed of the following distinct sections as shown in [Figure 32](#):

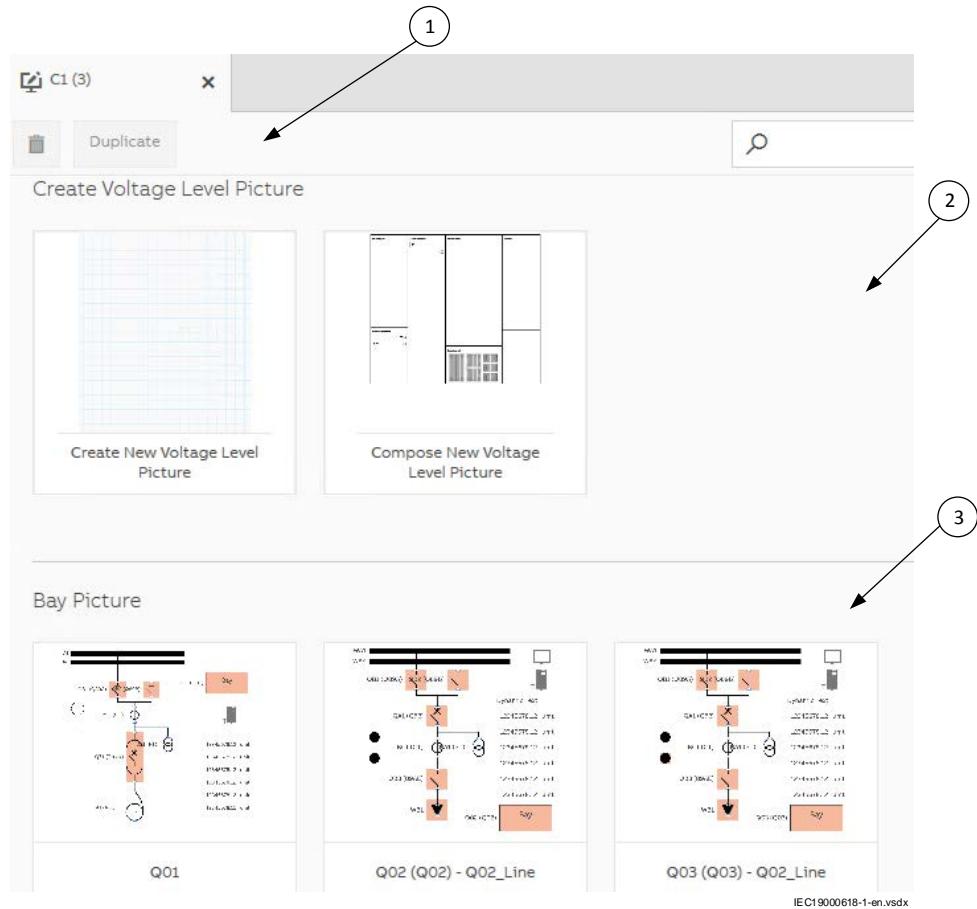


Figure 32: Different sections of process pictures dashboard

Pos. No.	Functionality
1	Toolbar
2	Create picture sections
3	Engineered picture sections

### 3.7.2 Toolbar

The process picture dashboard toolbar includes the following functionalities as shown in [Figure 33](#):

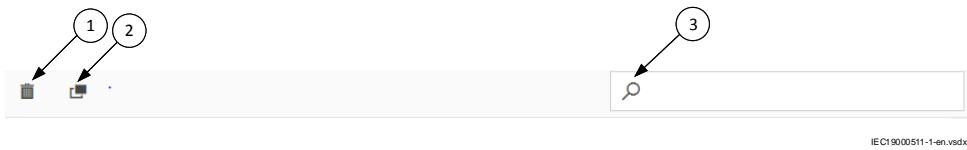


Figure 33: Toolbar interface

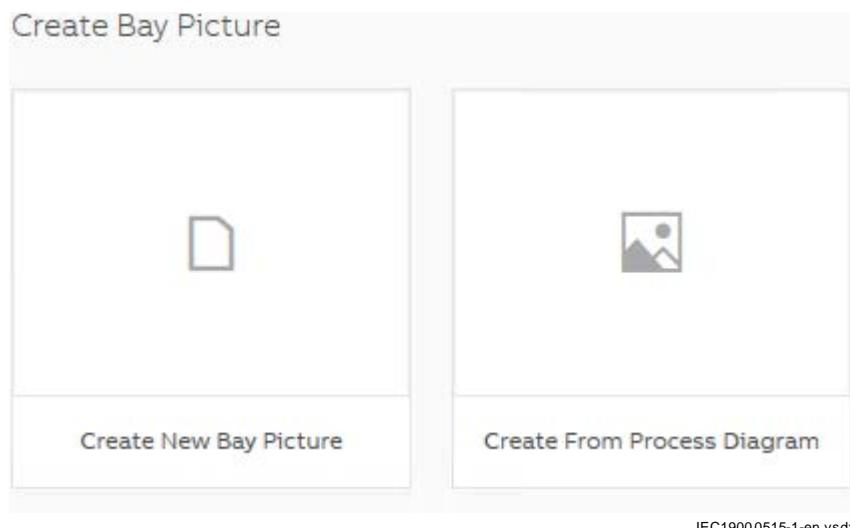
Pos. No.	Functionality	Description
1	Delete picture 	Delete the selected picture.   This operation cannot be undone.
2	Duplicate picture 	Duplicate the selected picture.
3	Search 	Filter the picture on the dashboard according to the text input.

### 3.7.3 Create a picture section

On the bay level (editor tab open for bay equipment container), the user can create pictures based on the process diagram layout by clicking **Create From Process Diagram**.

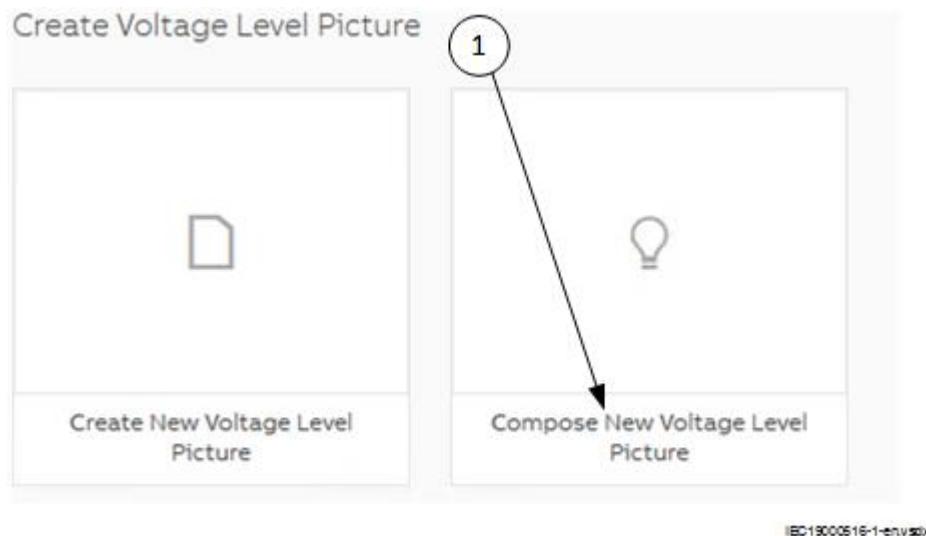
By doing so, the created picture has pre-mapped topology, equipment, and data points according to the imported SLD data are obtained. This is the most efficient workflow when the View Builder is used.

The picture can be started from scratch and data mapping can be engineered manually later (see [Section 3.8](#)) by clicking **Create New Bay Picture**.



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*Figure 34: Create picture section*



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Figure 35: Create voltage level picture

Pos. No.	Description
1	On the higher level (editor tab opens for Voltage Level, Substation, Region or Grid), View Builder provides an assistant to create complex pictures more effectively by clicking <b>Compose new Equipment Container Picture</b> .

### 3.7.3.1 Compose Picture dialog box

The **Compose Picture** dialog box is composed of the following sections:

1. **Select Typical**
2. **Select Instances**
3. **Select Standalones**
4. **Select Picture**
5. **Select Layout**
6. **Selected**

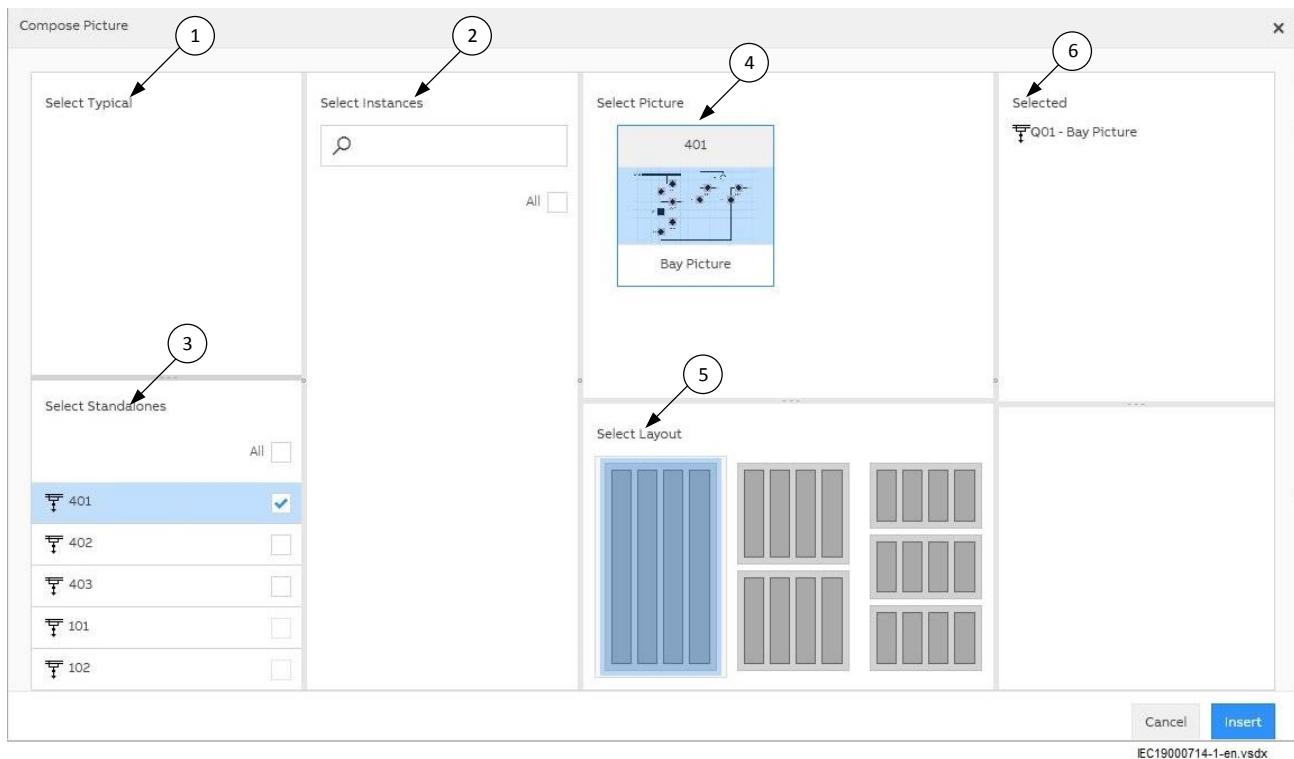


Figure 36: Overview of Compose Picture dialog box

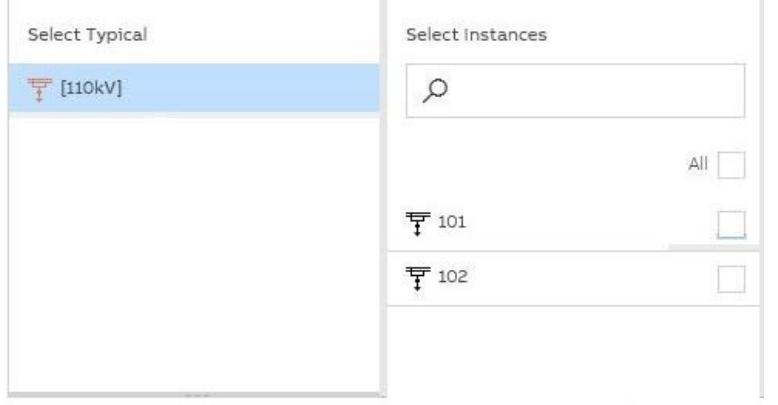
Pos. no	Functionality	Description
1	Select Typical	<p>Browse through Typical Bays of the workspace. Only Typical Bays with instances in the current functional tree are objects that are shown in this section. Such applicable instances are shown in the <b>Select Instances</b> section.</p> 
2	Select Instances	<p>If an instance bay has at least one picture, select this for composition (check the related box). If there is more than one picture for the selected instance, you can switch to a different one using select picture (see below).</p> 
3	Select Standalones	<p>Standalone bays which belong to the child hierarchy of the equipment container editor tab are shown in this section. If a standalone bay has at least one picture, select this for composition (check the related box). If there is more than one picture for the selected standalone, switch to a different one using select picture (see below).</p> 

Table continues on next page

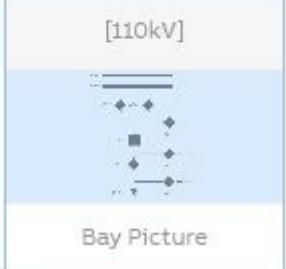
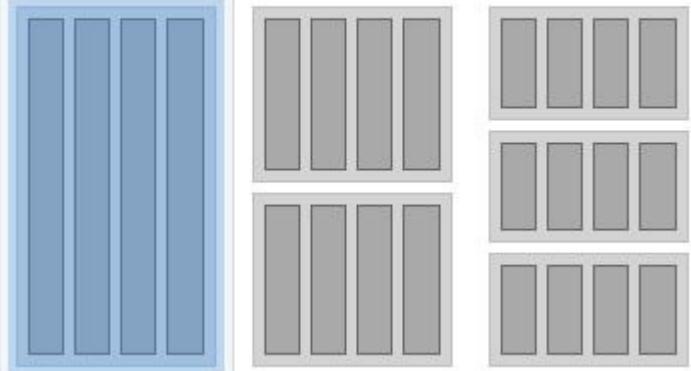
Pos. no	Functionality	Description
4	Select Picture	<p>List the pictures available on the currently selected instance or standalone bay. By default, the first picture is selected for composition. Click on another picture to switch accordingly.</p> <p>Select Picture</p>  <p>[110kV]</p> <p>Bay Picture</p>
5	Select Layout	<p>View Builder offers three initial composition layouts, choose by selecting one of the three layouts, thumbnails.</p> <p>First layout appends each selected bay pictures sequentially and next to each other in a single row.</p> <p>Second layout appends each selected bay pictures sequentially and distributes them evenly in two rows.</p> <p>Third layout appends each selected bay picture sequentially and distributes them evenly in three rows.</p> <p>After the picture is composed, the user can freely move the composed bay to adjust the final layout.</p> <p>Select Layout</p> 

Table continues on next page

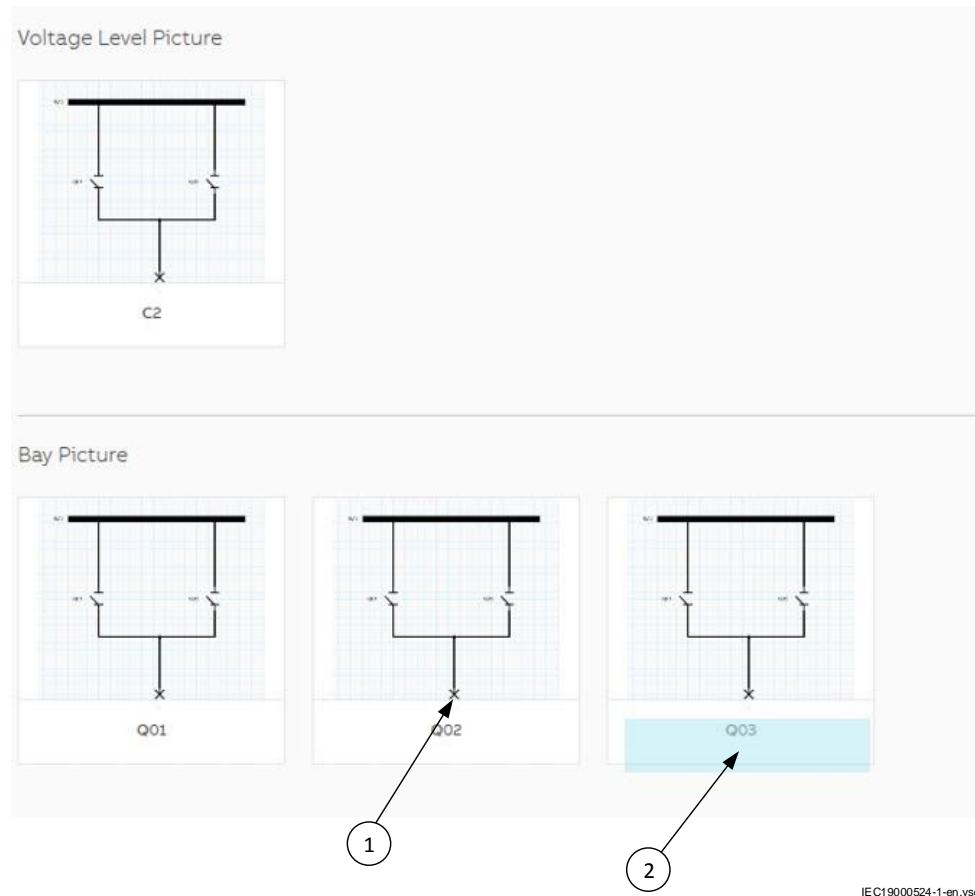
Pos. no	Functionality	Description
6	Selected	<p>Browse through all available Typical Bays and select as many instance pictures as desired, as well as standalone pictures to compose a picture. The selected section lists all such pictures.</p> <p>Each picture is referenced by the Typical name or instance name or picture name or standalone name or picture name accordingly to each source.</p> <p> The list, as well as the resulting composition, is ordered according to the internal name of the picture's parent equipment container name, not according to the selection order.</p> <p>Selected</p> <p>└─ 110kV : Q01 - Bay Picture</p> <p>└─ 110kV : Q02 - Bay Picture</p> <p>└─ Q03 - Bay Picture</p> <p>└─ Q04 - Bay Picture</p>

### 3.7.4 Created picture section

The created picture section displays the engineered pictures related to the current equipment container.

The top section is composed of the main pictures.

If the main pictures are composed of child equipment pictures, these pictures are shown in sub-section(s).



*Figure 37: Created picture section interface*

Pos. No.	Description
1	To edit a picture, double-click the thumbnail.
2	To rename a picture, double-click on the lower part of the thumbnail.

## 3.8 Process Pictures editor

### 3.8.1 Overview

The **Process Pictures** editor is opened while double-clicking a picture from the **Pictures Dashboard**.

The user interface is composed of the following distinct sections:

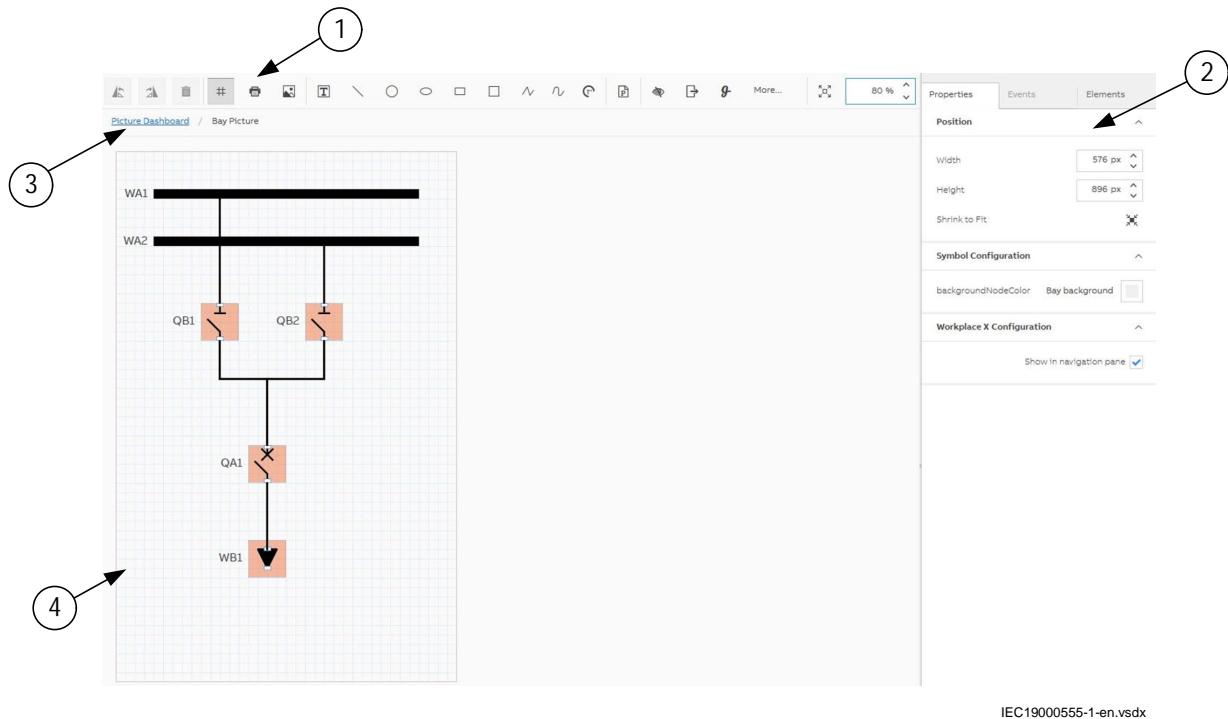


Figure 38: Process Pictures editor overview

Pos. No.	Description
1	Toolbar
2	Properties, Events, and Elements tabs
3	Navigation shortcut: Click to navigate to the parent dashboard.
4	Picture container

### 3.8.2 Toolbar

The **Process Picture** editor toolbar includes the following functionalities as shown in [Figure 39](#).

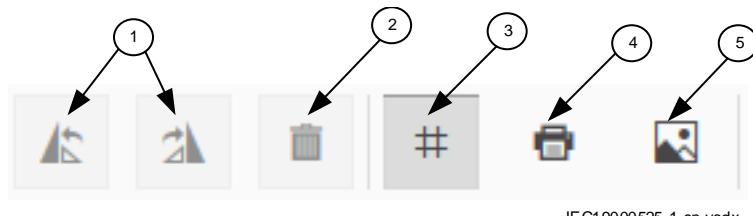
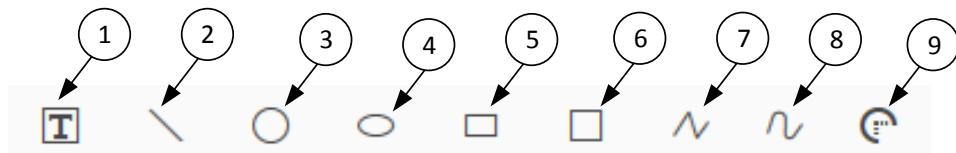


Figure 39: Process Picture editor toolbar

Pos. No.	Functionality	Description
1	Rotate element (to the left/ to the right) 	Rotate selected element by 90 -degrees steps.
2	Delete element 	Delete the selected element.
2	Toggle grid 	Toggle display of background grid.
4	Print 	Print the current diagram.
5	Export as image 	Export diagram to the clipboard and save as .png image.



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Figure 40: Primitive graphics toolbar

Pos. No.	Primitive graphics	Description
1	Text 	Primitive Graphics are the elements available on the toolbar, which can be used to enhance the picture with extra graphics and text. After clicking on a primitive graphic icon, the mouse pointer changes into the element graphically, indicating stamp mode. Click on the picture container to draw the element. This operation can be repeated without re-selecting the element (stamp mode). To quit stamp mode, right-click the mouse on the diagram container or press ESC.
2	Line 	
3	Circle 	
4	Ellipse 	
5	Rectangle 	
6	Square 	
7	Polyline 	
8	Bezier 	
9	Arc 	

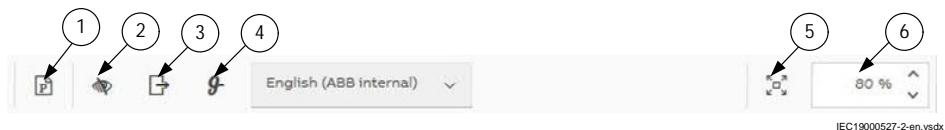
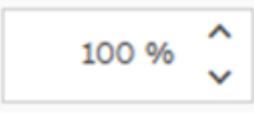
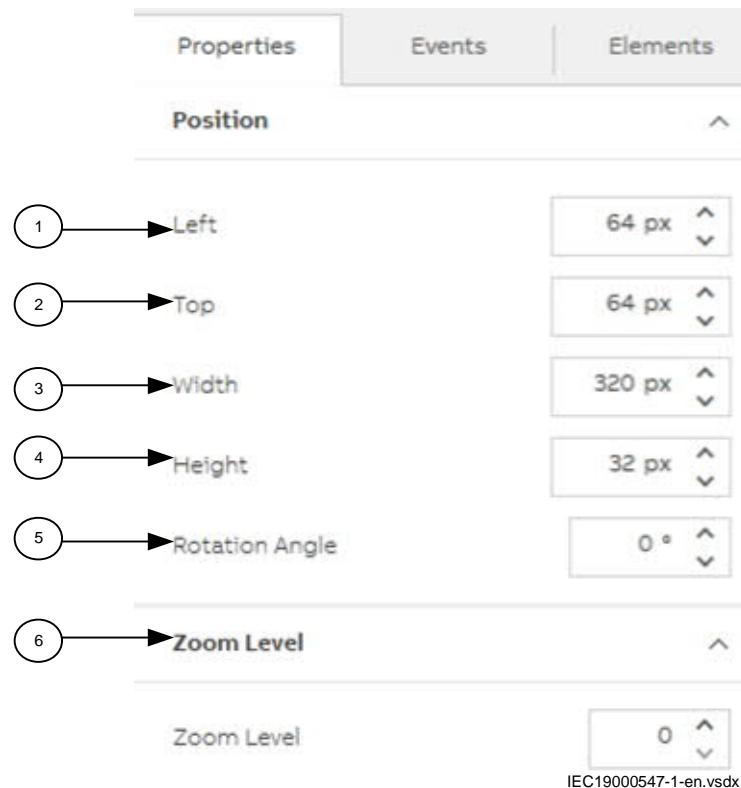


Figure 41: Additional functionality

Pos. No.	Functionality	Description
1	Picture settings 	Click to open the <b>Picture Setting</b> dialog box (see <a href="#">Section 3.8.2.1</a> ).
2	Insert element	Click to open the <b>Insert Element</b> dialog box (see <a href="#">Section 3.8.2.2</a> ).
3	Preview	Preview the current picture in a separate SYS600 Workplace X window.
4	Export Picture	Click to export the current picture to the target. If the user has any pending changes, the workspace is first saved before exporting.
5	Translation	Click to open the <b>Translation</b> dialog box (see <a href="#">Section 3.8.2.3</a> ).
6	Auto Scale / Zoom to fit 	Click this button to change the zoom level and make the diagram container fully visible. If the diagram is too big, the zoom level is set to 25%.
7	Zoom Level 	Manually changes the zoom setting. The tool supports settings from 25% to 1000% with 5% increments.

## Primitive graphics toolbar properties

This toolbar consists of different shapes such as, text, line, circle, ellipse, square, polymer, rectangle, and arc. The properties of these shapes are similar to each other. However, shapes like arc and line have different properties. Refer the Figures [42](#) and [43](#) for details.

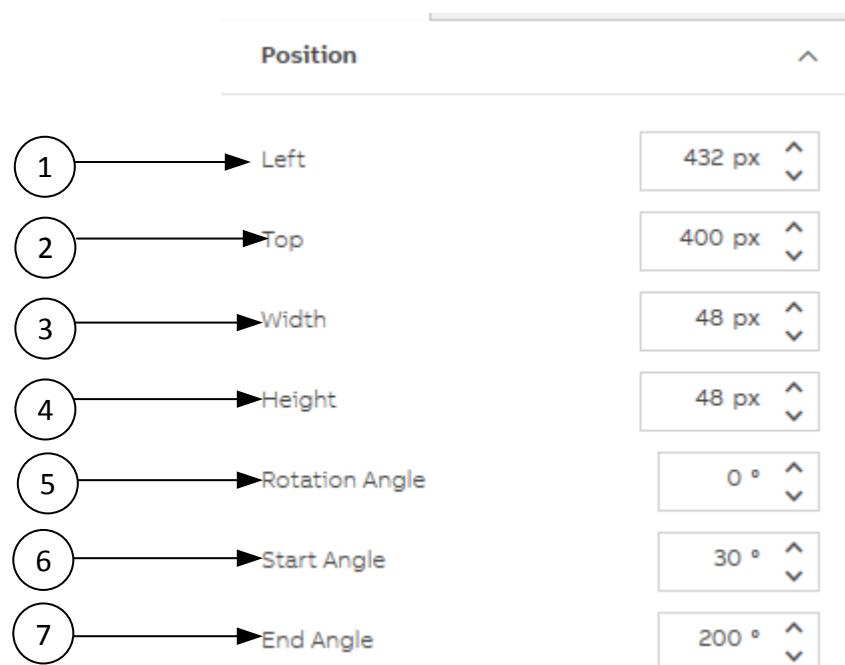


*Figure 42: Text properties*

Pos. No.	Functionality	Description
1	Left	X-axis position of the top left pixel of the selected element. Increment step is fixed to 16 pixels.  Left <input type="button" value="64 px ^ v"/>
2	Top	Reversed Y-axis position of the top left pixel of the selected element. Increment step is set to the Grid spacing (16 pixels).   Editing the properties directly may allow some overlapping, whereas using the point to move an element on the picture with drag option prevents this.  Top <input type="button" value="64 px ^ v"/>
3	Width	Width of the element in pixel. Width is only available for symbols, which can be sized horizontally. For example, LED, text, value, and Busbar. Increment step is fixed to 16 pixels.  Width <input type="button" value="320 px ^ v"/>

Table continues on next page

Pos. No.	Functionality	Description
4	Height	Height is available for symbols, which can be sized vertically, for example, LED, text, and value. Increment step is fixed to 16 pixels.
		Height <input type="button" value="32 px"/>
5	Rotation angle	Rotation angle of the selected element. Supported values are $0^\circ$ , $90^\circ$ , $180^\circ$ , and $270^\circ$ for symbol elements (from element tab).
		Rotation Angle <input type="button" value="0 °"/>
6	Zoom level	Set a value between 0 and 10 for the SYS600 Workspace X where: <ul style="list-style-type: none"> <li>• Level 0 means the object is always visible.</li> <li>• Level 5 means the object is visible when zoomed-in to the semi detail level.</li> <li>• Level 10 means the object is visible only when zoomed-in to the most detail level.</li> </ul>
		Zoom Level <input type="button" value="0"/>



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Figure 43: Arc properties

Pos. No	Functionality	Description
1	Left	X-axis position of the top left pixel of the selected element. Increment step is fixed to 16 pixels.
		Left <span style="border: 1px solid #ccc; padding: 2px;">64 px</span> 
2	Top	Reversed Y-axis position of the top left pixel of the selected element. Increment step is set to the Grid spacing (16 pixels).
		 Editing the properties directly may allow some overlapping, whereas using the pointer to move an element on the picture with drag option prevents this.
		Top <span style="border: 1px solid #ccc; padding: 2px;">64 px</span> 
3	Width	Width of the element in pixel. Width is only available for symbols, which can be sized horizontally. For example, LED, text, value, and Busbar. Increment step is fixed to 16 pixels.
		Width <span style="border: 1px solid #ccc; padding: 2px;">320 px</span> 
4	Height	Height is available for symbols, which can be sized vertically, for example, LED, text, value. Increment step is fixed to 16 pixels.
		Height <span style="border: 1px solid #ccc; padding: 2px;">32 px</span> 
5	Rotation Angle	Rotation angle of the selected element. Supported values are 0°, 90°, 180°, and 270°for symbol elements (from the <b>Elements</b> tab).
		Rotation Angle <span style="border: 1px solid #ccc; padding: 2px;">0 °</span> 
6	Start Angle	This provides the angle from where the arc should start. The range varies from 0 to 720 degrees.
		Start Angle <span style="border: 1px solid #ccc; padding: 2px;">30 °</span> 
7	End Angle	This provides the angle where the arc should end. The range varies from 0 to 720 degrees.
		End Angle <span style="border: 1px solid #ccc; padding: 2px;">200 °</span> 

### 3.8.2.1 Picture Settings dialog box

The **Picture Settings** dialog box is composed of the **Colors Settings** and **Text Styles** tabs.

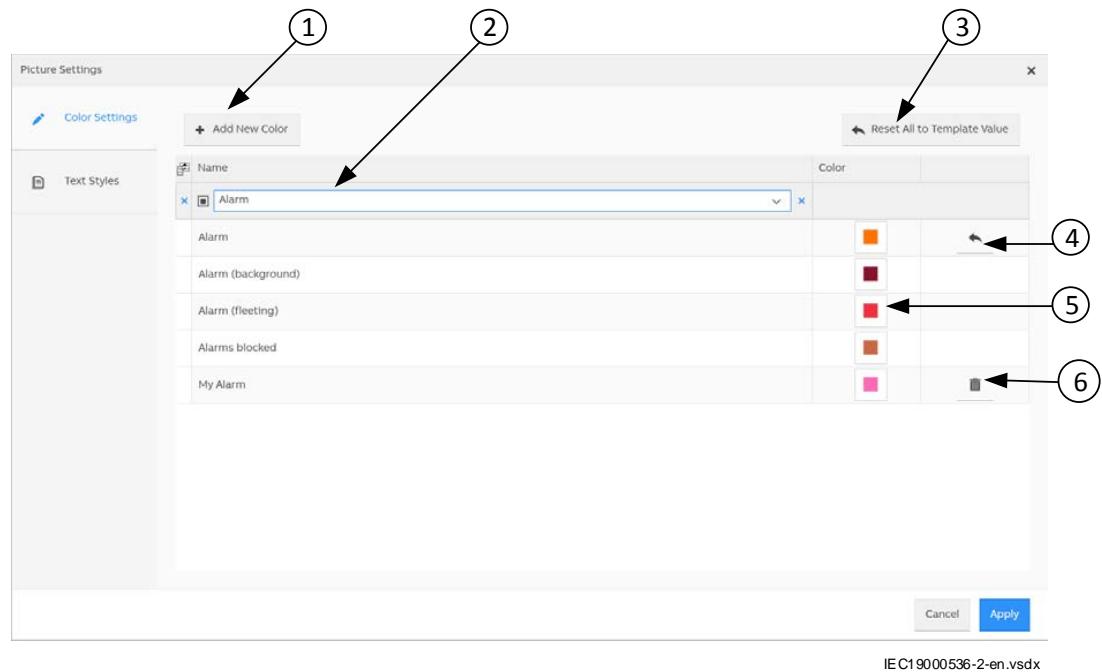


Figure 44: Picture Settings dialog box to change color settings

Pos. No.	Description
1	Adds a new user defined color.
2	Filter condition for the list of colors currently shown.
3	Reverts all overridden predefined colors to their original template value.
4	Reverts a predefined color to the original template value (only available if overridden).
5	Overrides a predefined color value or modifies a user defined color value.
6	Removes a user defined color.

The **Colors Settings** tab lists all available predefined color variables that are used for primitive graphics (see [Section 3.8.4.2](#)). The list can be filtered by providing a search text that has to be contained in the color name.

Click **+ Add New Color** button to create a new user defined color. Those colors can be renamed (click on the name) or deleted (click on the trashcan icon).

The user can change any of the assigned default colors by clicking the **Color** icon. If the color is a predefined one, the change is tracked as override and can be reverted to the original value from the template later.

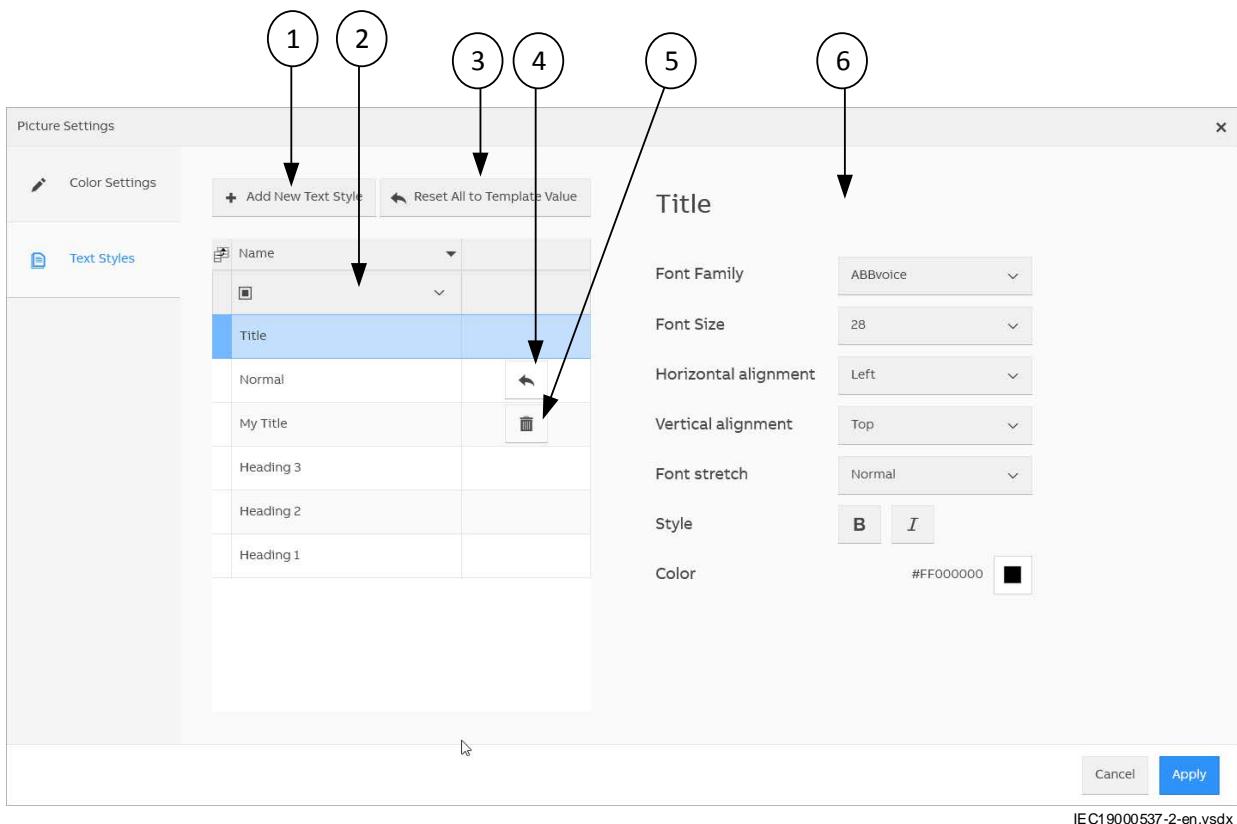


Figure 45: Picture Settings dialog box to create, modify, and delete text styles

Pos. No.	Description
1	Adds a new user defined text style.
2	Filter condition for the list of text styles currently shown.
3	Reverts all overridden predefined text styles to their original template value.
4	Reverts a predefined text style to the original template value (only available if overridden).
5	Removes a user defined text style.
6	The text style properties of the currently selected text style.

The **Text Styles** tab lists all available predefined text styles that can be applied to text properties (see [Section 3.8.4.2](#)). The list can be filtered by providing a search text that has to be contained in the text style name.

Click **+ Add New Text Style** button to create a new user defined text style. Those styles can be renamed (click on the name) or deleted (click on the trashcan icon).

The user can change any of the assigned default values for the text style currently selected in the list. If the text style is a predefined one, the change is tracked as override and can be reverted to the original value from the template later.

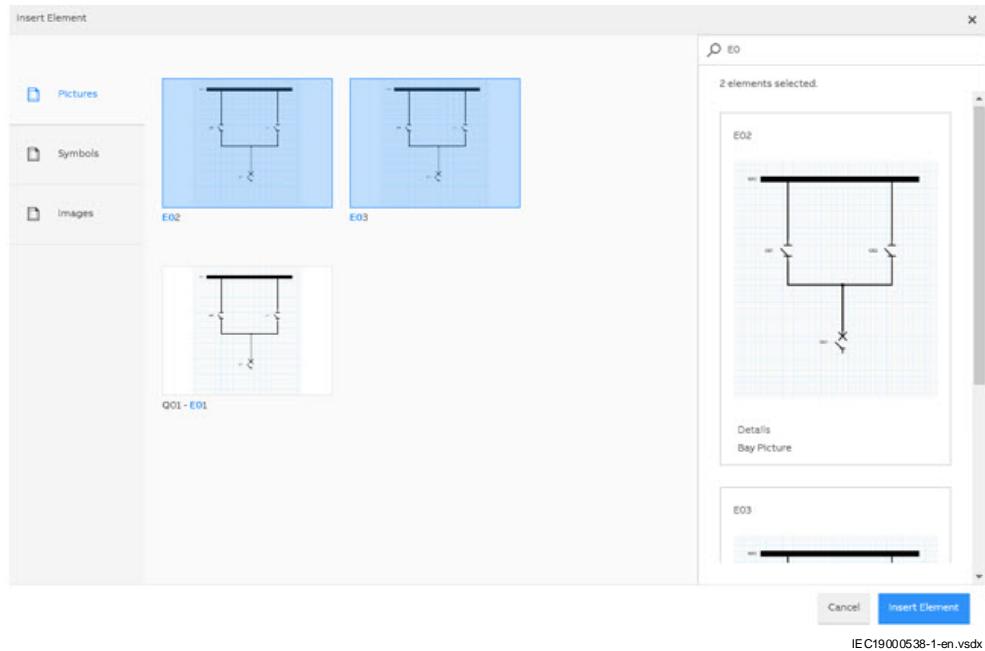
### 3.8.2.2 Insert Element dialog box

The **Insert Element** dialog box is composed of three tabs:

- **Pictures**
- **Symbols**
- **Images**

Each tab has a search feature, which filters the thumbnails shown according to the text input, similar to the previous search functionality.

Click the thumbnail to select or deselect the element for insertion. Select multiple elements in one operation.



*Figure 46: Insert Element interface*

If necessary, the picture container size is increased automatically to fit the inserted elements.

Use + button to import PNG, JPG, and JPEG image files.

Use – button to delete the imported images.



The image is removed from all pictures wherever inserted.

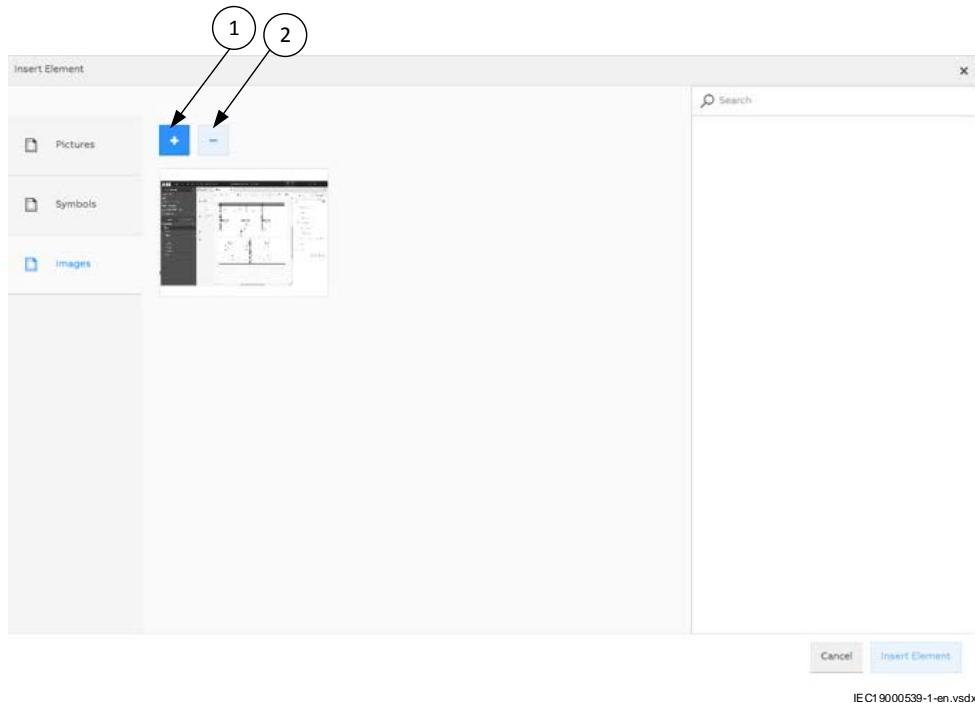


Figure 47: Insert Element dialog box to import image

Pos. No.	Description
1	Import image
2	Delete an imported image.

### 3.8.2.3 Translations dialog box



See [Section 3.5.2](#) to engineer additional workspace languages.

The **Translations** dialog box lists all the text engineered in the picture.

The first column **Display Text** is referring to the text currently displayed in the picture editor (according to the workspace language set to default).

The next columns list the different workspace languages engineered in the workspace language and needed for SYS600 Workplace X localization options.

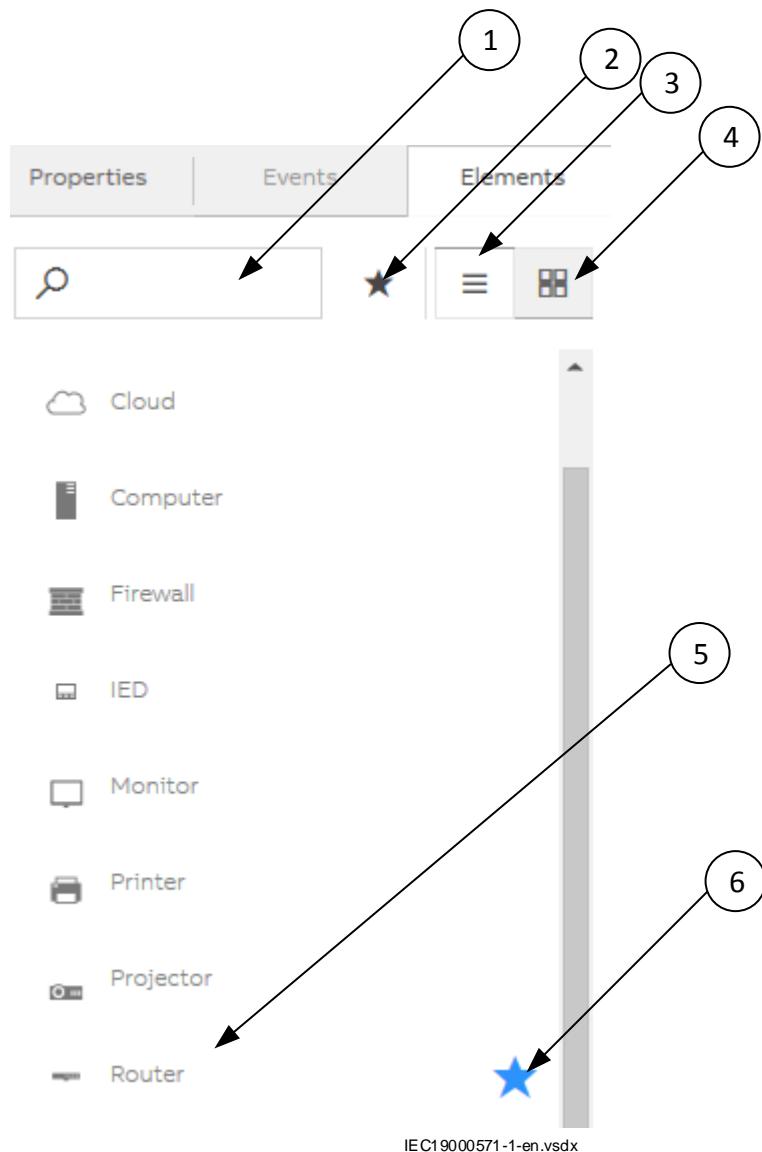
All needed translation for the current picture can be edited in the table.

When selecting a row, the text in the picture is also highlighted as visual cue.

Translations		
Display Text	English (ABB internal)	German
german text	english text	german text

### 3.8.3 Elements tab

The **Elements** tab is composed of the following functionalities as shown in [Figure 48](#).



*Figure 48: Elements tab interface*

Pos. No.	Description
1	Search or filter elements with an input text.
2	Toggle to filter by favorite.
3	Toggle to show list base tab view.
4	Toggle to show icon base tab view.
5	Select an element.
6	Set as favorite.

#### List base tab view

Default view of the **Elements** tab to browse available elements.

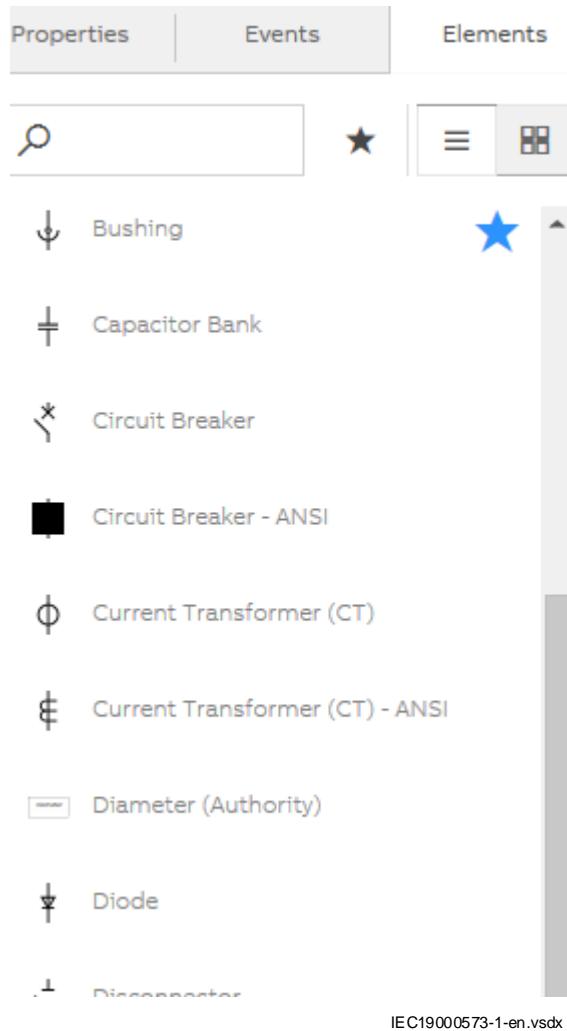
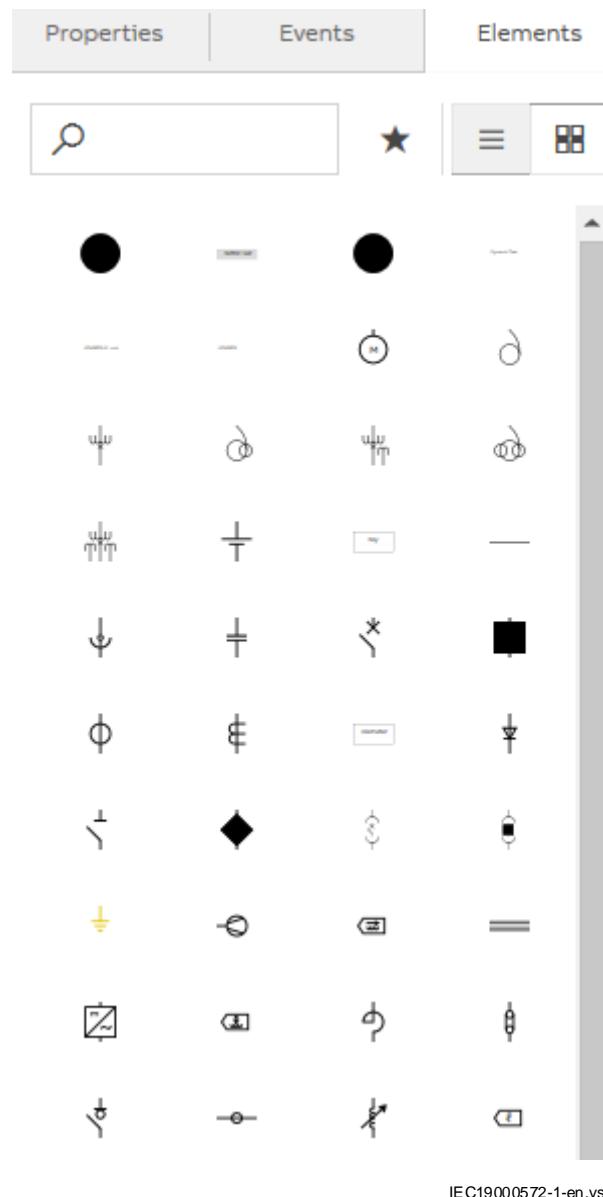


Figure 49: List base tab view

### Icon base tab view

Click the corresponding toggle icon to display the alternative view to browse available elements.



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Figure 50: Icon base tab view

### Filtering favorites

Filter the available elements based on the favorites.

The elements are available in both list base and icon base views.

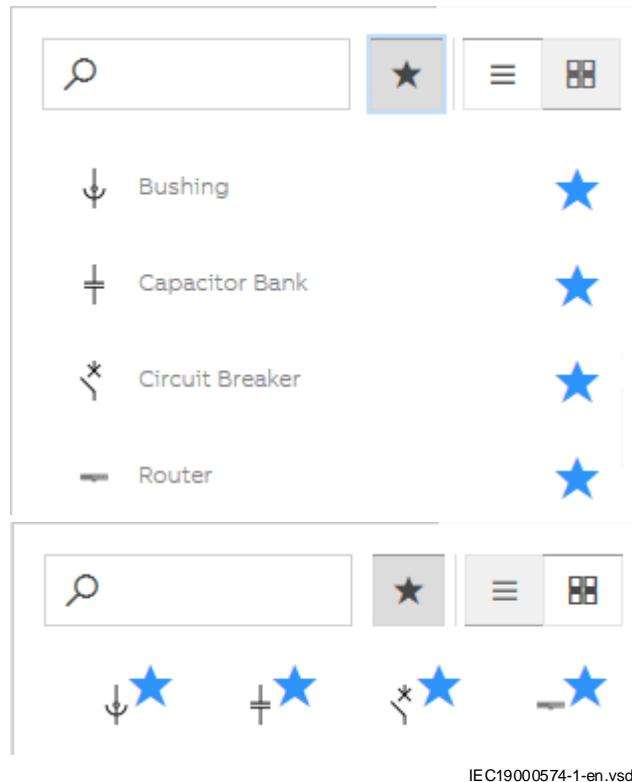
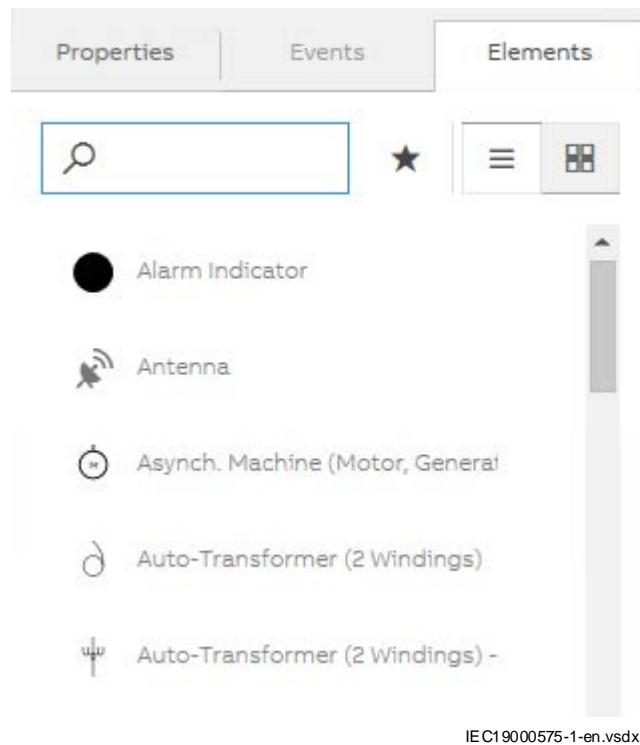


Figure 51: Filtering favorites

## Searching and filtering

Filter the elements according to the text input.

When the options are available in both views, the functionality shows additional blue highlight feature on element names while using the list base view.

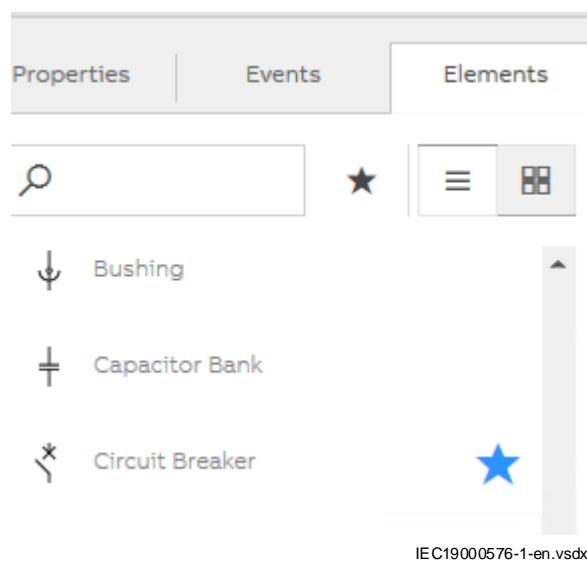


*Figure 52: Searching and filtering*

### Setting favorites

To set an element as favorite, point an element in the list and click the appearing grey star.

The element star turns blue after clicking.



*Figure 53: Setting favorites*

### Selecting element and drawing diagram container

To select an element for drawing in the diagram container, click the element on the list.

After clicking, the pointer changes into the element graphically, indicating the stamp mode.

Click on the diagram to draw the element. This operation can be repeated without reselecting the element (stamp mode).

To quit the stamp mode, right-click the diagram container or press ESC.

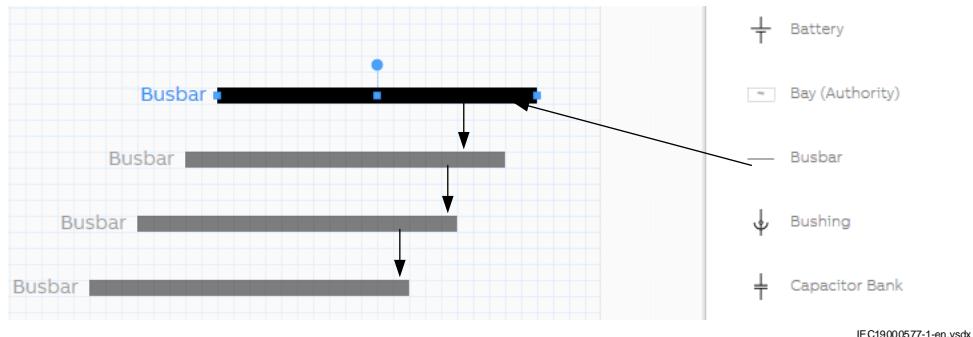
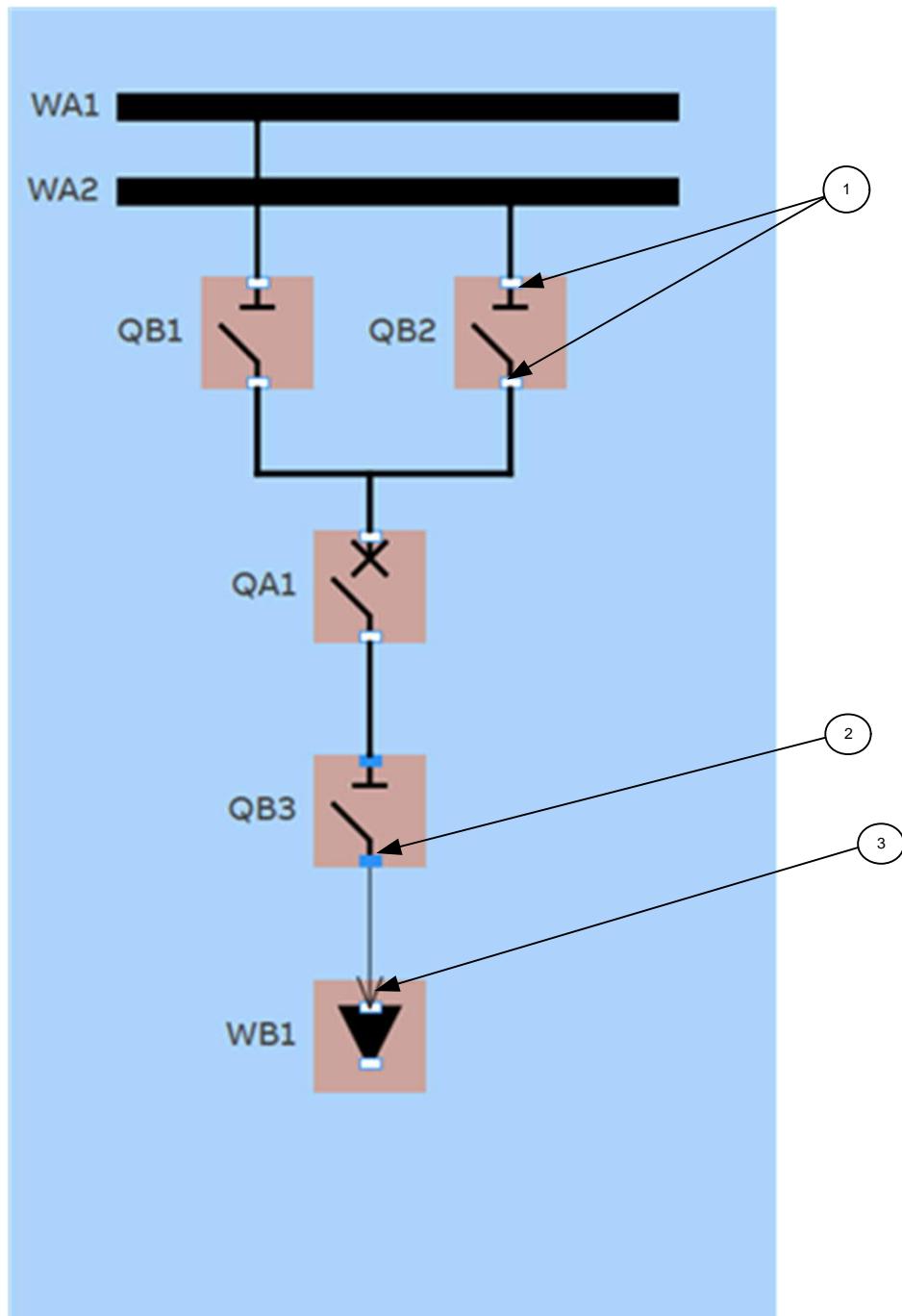


Figure 54: Selecting element and drawing diagram container

### 3.8.3.1 Connect elements in picture container

After placing the elements on the picture container and setting all the properties correctly, complete the drawing by connecting them as needed.

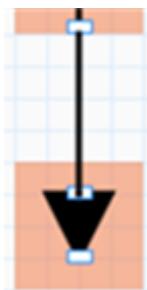


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*Figure 55: Connect elements in picture container*

<b>Pos. No.</b>	<b>Description</b>
1	Symbol terminal
2	Symbol terminal with QB3 selected.
3	Proposed routing from the drag operation.

To connect two symbols, point to a terminal, click and drag towards the next symbol without releasing. The link shows an arrow when the new position is valid. Release the pointer to draw the link.



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*Figure 56:*



There is no connectivity node in pictures.

### 3.8.3.2 Adding Hierarchical Symbols

[Annexure F](#) describes how to add and modify Hierarchical Symbols.

## 3.8.4 Property tab

### 3.8.4.1 Diagram background properties

The following properties are shown when the picture background is clicked:

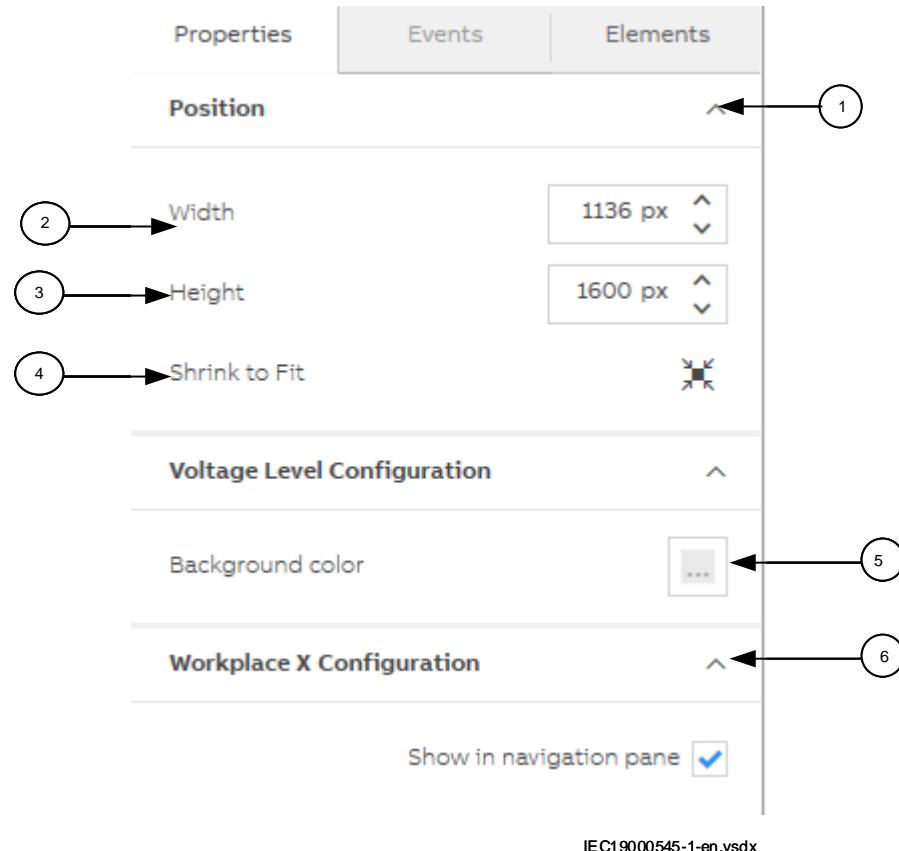


Figure 57: Diagram background properties

Pos. No	Properties	Description
1	Expand/Collapse	Click to expand or collapse property group.
2	Width	Width of the diagram in pixel.
3	Height	Height of the diagram in pixel.
4	Shrink to Fit	Adjust picture width and height to remove white spaces from the bottom and the right side of the diagram. Diagram and Pictures are top left anchored to not disrupt alignment when changing diagram size.
5	Background Color	Click the color icon to open the color select dialog box. Available pre-defined colors are engineered using picture setting (see <a href="#">Section 3.8.2.1</a> ), system color is available as quick re-use, and advance color allows very precise color picking. For consistency in picture engineering, use pre-defined color as much as possible, so changes are centrally managed for maximum efficiency.
6	Show in navigation pane	Selected by default. The picture is available in the navigation pane from the SYS600 Workplace X. When composing large pictures with several Bays, the View Builder exports the main picture and all the pictures are referred separately. To display the main picture in the SYS600 Workplace X navigation pane, clear this check box for all the referred pictures.

### 3.8.4.2 Element properties

The following group of elements are available when an element is selected on the picture:

#### Edit equipment mapping dialog box

The edit equipment mapping dialog box is composed of the following functionalities:

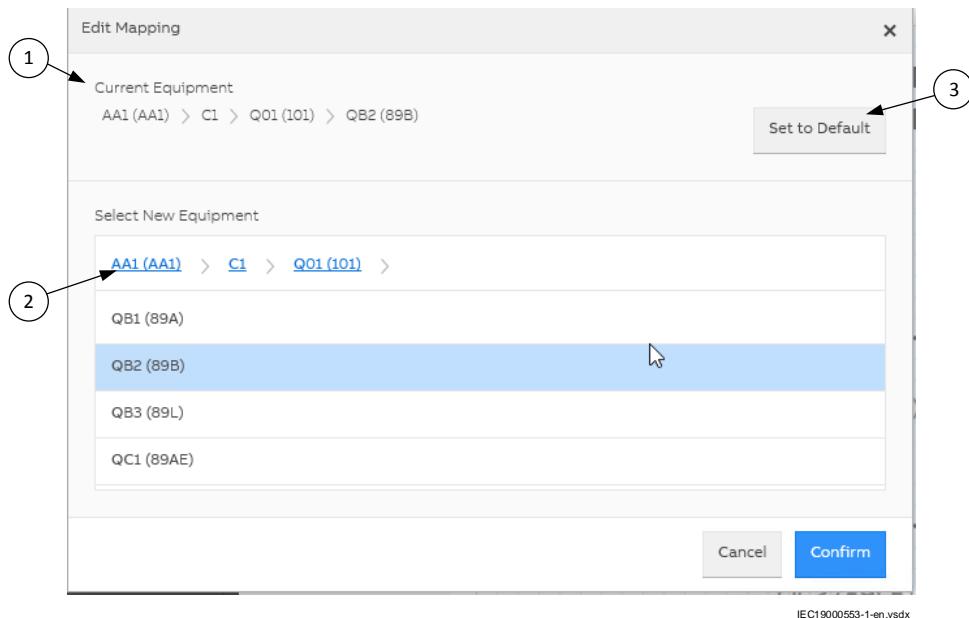


Figure 58: Edit Mapping interface

Pos. No.	Description
1	Display current mapping (full path) or label name if not mapped.
2	By default, the tool displays compatible equipment from the picture parent. If the user needs to map equipment from another bay, browse View Builder data structure by clicking element from the parent path. Child equipment which is valid for mapping has name displayed in black. Equipment with name displayed in blue can be clicked for navigating the structure.
3	Set symbol to unmapped state.

#### Edit Data Points dialog box

The **Edit Data Points** dialog box composes of:

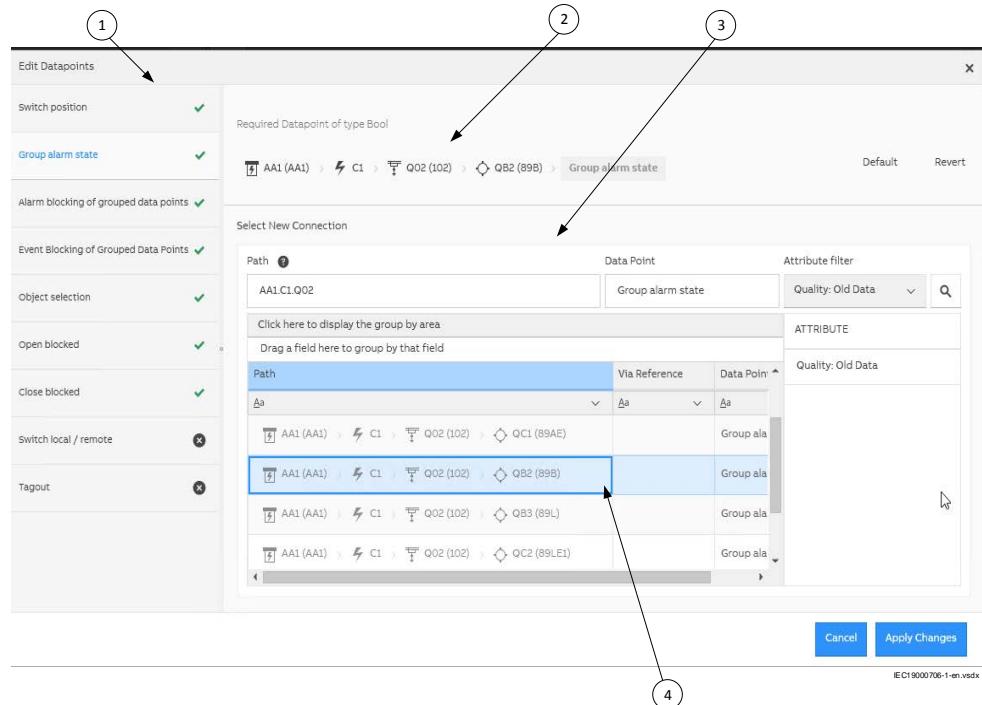
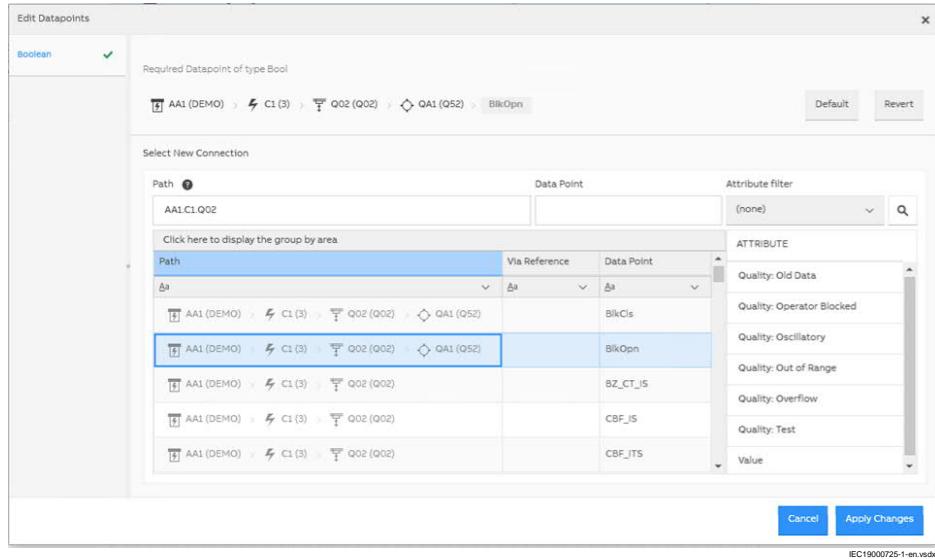


Figure 59: Edit Data Points dialog box

Pos. No.	Functionality	Description
1	Data Points tab list	<p>List all data points the SYS600 Workspace X expected to use in scope of the symbol. Valid mapping is shown with a green tick. Unmapped data point is shown with a cross in red circle for mandatory data points and a cross in black circle for optional data points. Missing mandatory Data Points reduce functionality on the SYS600 Workspace X, while optional Data Points rational depends on the integrating product functionality to support. Click to switch between Symbol data points to map.</p>
2	Mapped Datapoint information	<p>Current data point listed. During data point engineering, the undo/redo functionality is not available. Instead, Revert button reverts to the previous engineered mapping (does nothing if not changing the mapping in the current edit session). Default sets the datapoint to un-mapped state. Data Points mapping changes are synchronized for all symbols mapped to the same equipment.</p>
3	Select data points to list for mapping	<p>The first text box filters the Data Points by the functional Structure Path. Use an ‘.’ to specify more than one level. The names provided can either be the internal or the customer name. For an object without customer name, the internal name is used. Search for both the exact and partial paths. For example: AA1.C1.Q01.QB1 or C1.Q01 or MyCircuitBreaker. The second text box filters the Data Points by Data Point Name. Use full name or part of the name. For example, Breaker failure retrip or failure retrip or retrip. The drop-down button filters according to attributes. Select the attribute from the drop-down list. Click on the search icon to trigger the filtered query. To the full data point list, you can remove all the filters. Depending on the source application, this takes some time.</p>
4	Map data point	Click the data point row to map this to the symbol.



*Figure 60: Boolean Data Points*



*Figure 61: Equipment properties*

Pos. No.	Functionality	Description
1	Connections	Mapping referencing the SLD topology. This mapping is resolved automatically by the tool when all the linked equipments are mapped. This can also be manually edited using the pen icon.

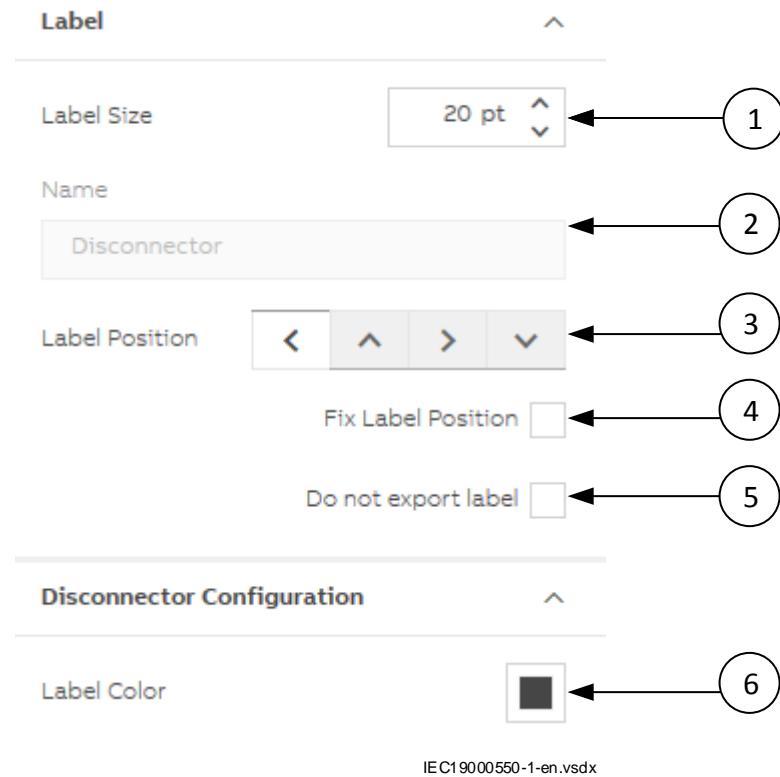


Figure 62: Label properties (equipment and equipment container symbols only)

Table 2: Details about label properties

Pos. No.	Functionality	Description
1	Label Size	<p>Size of label in pt. Values from 12 to 36 are supported.</p> <p>Label Size <input type="button" value="20 pt ^ v"/></p>
2	Label Name	<p>Read-only property – Display element name using the display name setting (refer to <a href="#">Section 3.1.2.1</a>).</p> <p>Name <input type="text" value="AA1 (DEMO)"/></p>
3	Label Position	<p>The label is restricted to four predefined positions. Use the toggle to select one of those positions.</p> <p><input type="button" value="&lt;"/> <input type="button" value="^"/> <input type="button" value="&gt;"/> <input type="button" value="v"/></p>

Table continues on next page

Pos. No.	Functionality	Description
4	Fix Label Position	Fix label position against rotation when checked.  Fix Label Position <input type="checkbox"/>
5	Do not export label	Label is not shown in SYS600 Workplace X when checked.  Do not export label <input type="checkbox"/>
6	Label Color	Click the color icon to open the color select dialog box. Available pre-defined colors are engineered using picture setting (see <a href="#">Section 3.8.2.1</a> ), System color is available as quick re-use, and advance color allows very precise color picking. For consistency in picture engineering, use pre-defined color as much as possible, so changes are centrally managed for maximum efficiency.  Label Color 

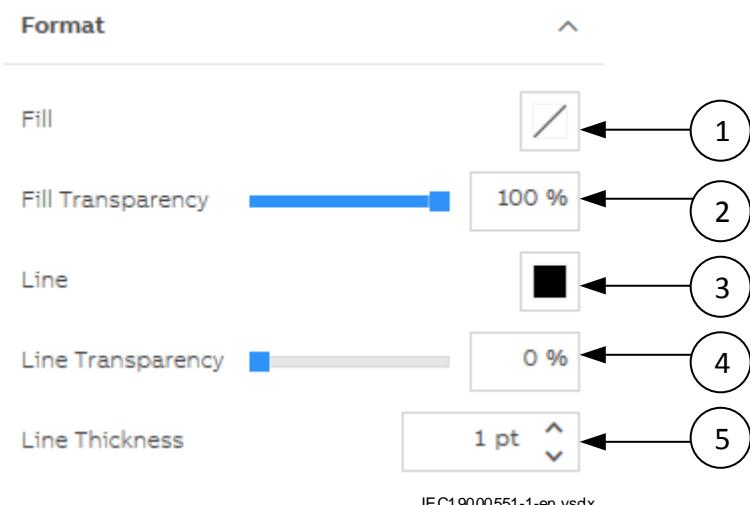
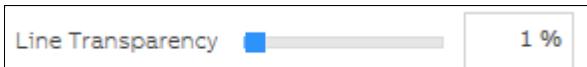
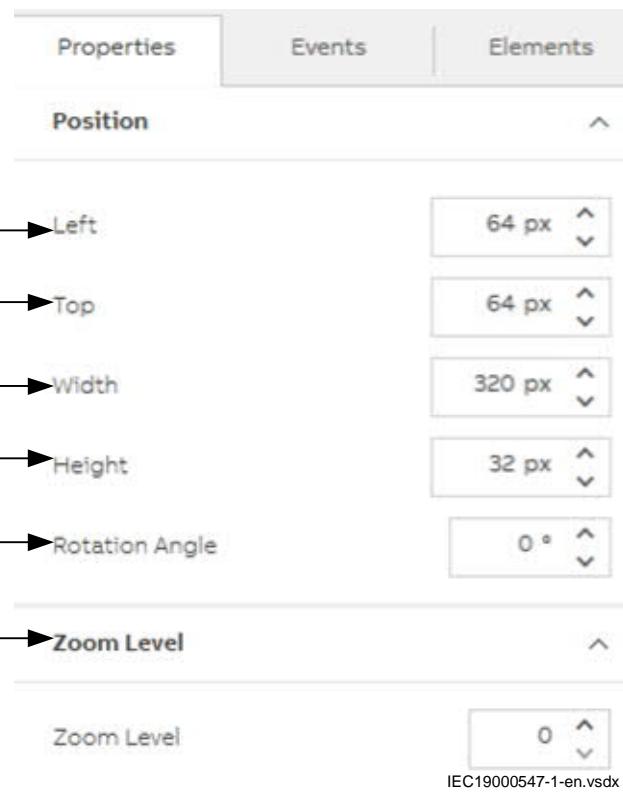


Figure 63: Format properties

Table 3: Details about format properties

Pos. No.	Functionality	Description
1	Fill (Color)	<p>Click the color icon to open the color select dialog box and set the inner color of the shape. Available pre-defined colors are engineered using picture setting (see <a href="#">Section 3.8.2.1</a>), system color are available as quick re-use, and advance color allows very precise color picking. For consistency in picture engineering, use pre-defined color as much as possible, so changes are centrally managed for maximum efficiency.</p> 
2	Fill transparency	<p>Set value between 0 and 100%. At 0% the inner element is opaque. At 100% the inner element is invisible.</p> 
3	Line color	<p>Click the color icon to open the color select dialog and set the line color of the shape. Available pre-defined colors are engineered using picture setting (see <a href="#">Section 3.8.2.1</a>), System color is available as quick re-use, and advance color allows very precise color picking. For consistency in picture engineering, use pre-defined color as much as possible, so changes are centrally managed for maximum efficiency.</p> 
4	Line Transparency	<p>Set value between 0 and 100%. At 0% the line is opaque. At 100% the line is invisible.</p> 
5	Line Thickness	<p>Line thickness in pixel, which can range from 0 (invisible) to 2000, with incremental steps of 1.</p> 

## Non-equipment symbols



*Figure 64: Text properties*

Pos. No.	Functionality	Description
1	Left	X-axis position of the top left pixel of the selected element. Increment step is fixed to 16 pixels.  Left <input type="text" value="64 px"/>
2	Top	Reversed Y-axis position of the top left pixel of the selected element. Increment step is set to the grid spacing (16 pixels).   Editing the properties directly may allow some overlapping, whereas using the mouse to move an element on the picture with drag and drop prevents this.  Top <input type="text" value="64 px"/>
3	Width	Width of the element in pixel. Width is only available for symbols which can be sized horizontally. For example, LED, text, value, busbar. Increment step is fixed to 16 pixels.  Width <input type="text" value="320 px"/>

Table continues on next page

Pos. No.	Functionality	Description
4	Height	Height is available for symbols which can be sized vertically, for example, LED, text, value. Increment step is fixed to 16 pixels.
5	Rotation angle	Rotation angle of the selected element. Supported values are $0^\circ$ , $90^\circ$ , $180^\circ$ and $270^\circ$ for symbol elements (from element tab).
6	Zoom level	Set a value between 0 and 10 for the SYS600 Workspace X where: <ul style="list-style-type: none"> <li>• Level 0 means the object is always visible.</li> <li>• Level 5 means the object is visible when zoomed-in to the semi detail level.</li> <li>• Level 10 means the object is visible only when zoomed-in to the most detail level.</li> </ul>

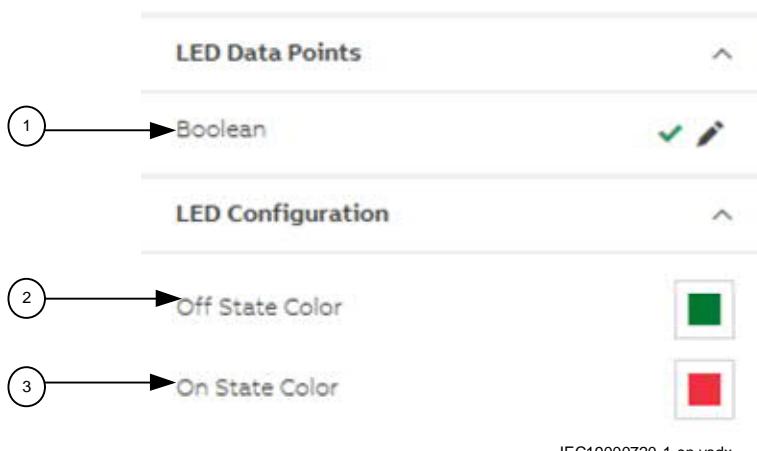


Figure 65: LED Data Points configuration

Pos. no	Functionality	Description
1	Boolean	Displays the boolean value.  
2	Off State Color	Displays the color of the LED when in OFF state.  
3	On State Color	Displays the color of the LED when in ON state.  

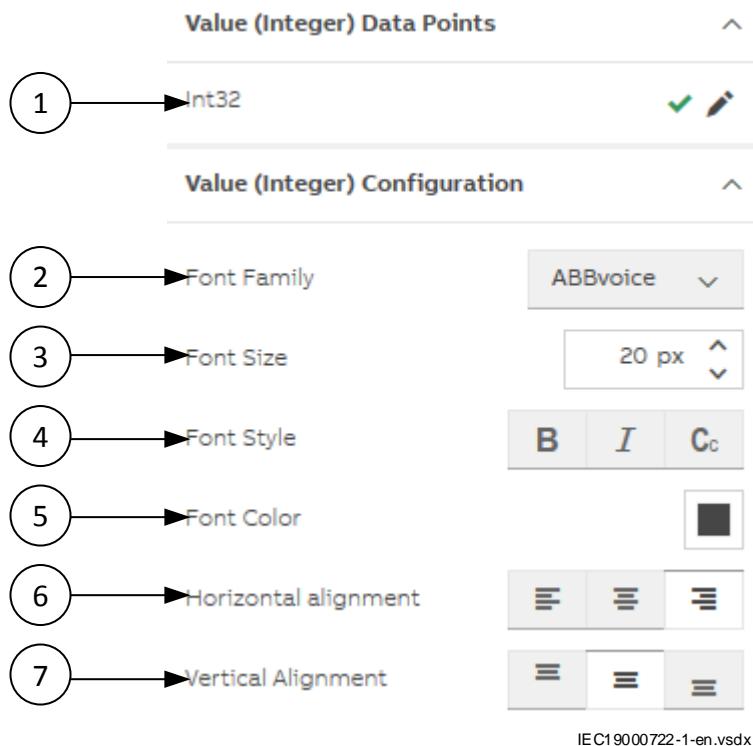
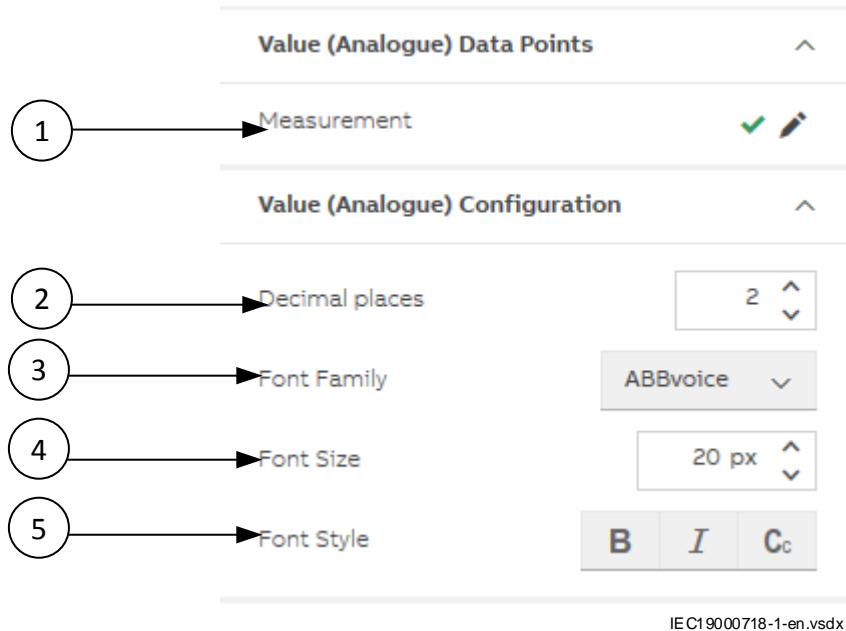


Figure 66: Non-equipment symbols value (integer configuration)

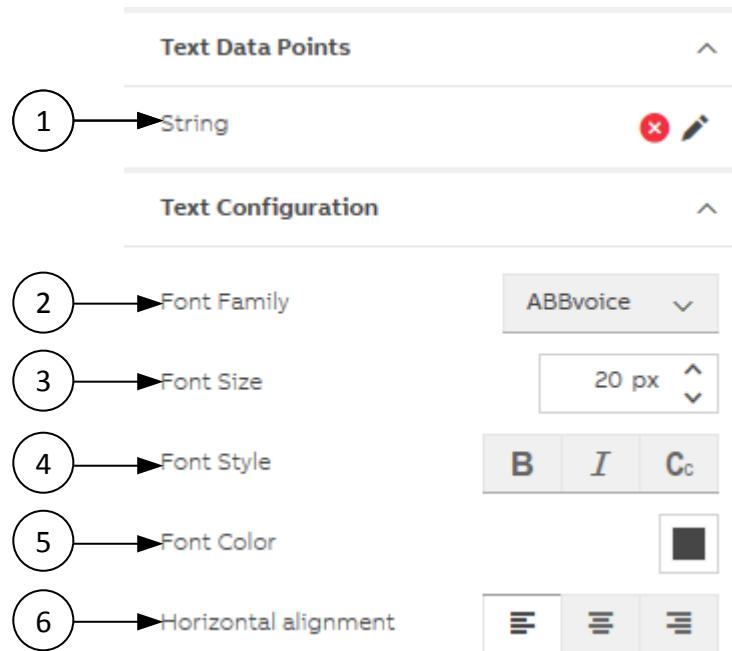
Pos. no	Functionality	Description
1	Int32	The datapoint that allows to map the integer values. For example, counters.  Int32 
2	Font Family	Allows to select the required font for Data Points. ABBvoice is the by default selected font, that is displayed.  Font Family 
3	Font Size	Allows to select the required font size for Data Points.  Font Size 
4	Font Style	Apply style to the font for Data Points. Select to apply bold, italic, or condensed style.  Font Style 
5	Font Color	Select predefined font color for the text. Click the color block to select the predefined font colors.  Font Color 
6	Horizontal alignment	Switch between left, center, or right horizontal alignment.  Horizontal alignment 
7	Vertical alignment	Switch between top, center, or bottom vertical alignment.  Vertical alignment 



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*Figure 67: Non-equipment symbols value (analogue configuration)*

Pos. no	Functionality	Description
1	Measurement	The datapoint that allows to map the analogue values. For example, current, voltage, and power.
2	Decimal places	Displays the number of decimal places selected for the value. The decimal places supported from 0 to 3.
3	Font Family	Allows to select the required font for Data Points. ABBvoice is the by default selected font, that is displayed.
4	Font Size	Allows to select the required font size for Data Points.
5	Font Style	Apply style to the font for Data Points. Select to apply bold, italic, or condensed style.



*Figure 68: Dynamic text properties*

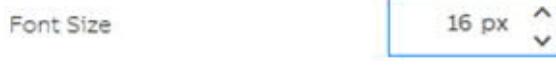
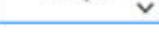
Pos. No	Functionality	Description
1	String	This is a Data Point which provides the input that is received from the database.   String 
2	Font Family	Allows to select the required font for Data Points. ABBvoice is the by default selected font, that is displayed.   Font Family 
3	Font Size	Allows to select the required font size for Data Points.   Font Size 

Table continues on next page

Pos. No	Functionality	Description
4	Font Style	Apply style to the font for Data Points. Select to apply bold, italic, or condensed style.  Font Style <b>B</b> <i>I</i> <b>C<sub>c</sub></b>
5	Font Color	Available properties for text. Select font color, including predefined color settings from <b>Picture Settings</b> dialog box. (See <a href="#">Section 3.8.2.1</a> ).
6	Horizontal alignment	Available properties for text. Switch between left, center, or right horizontal alignment.  Horizontal alignment

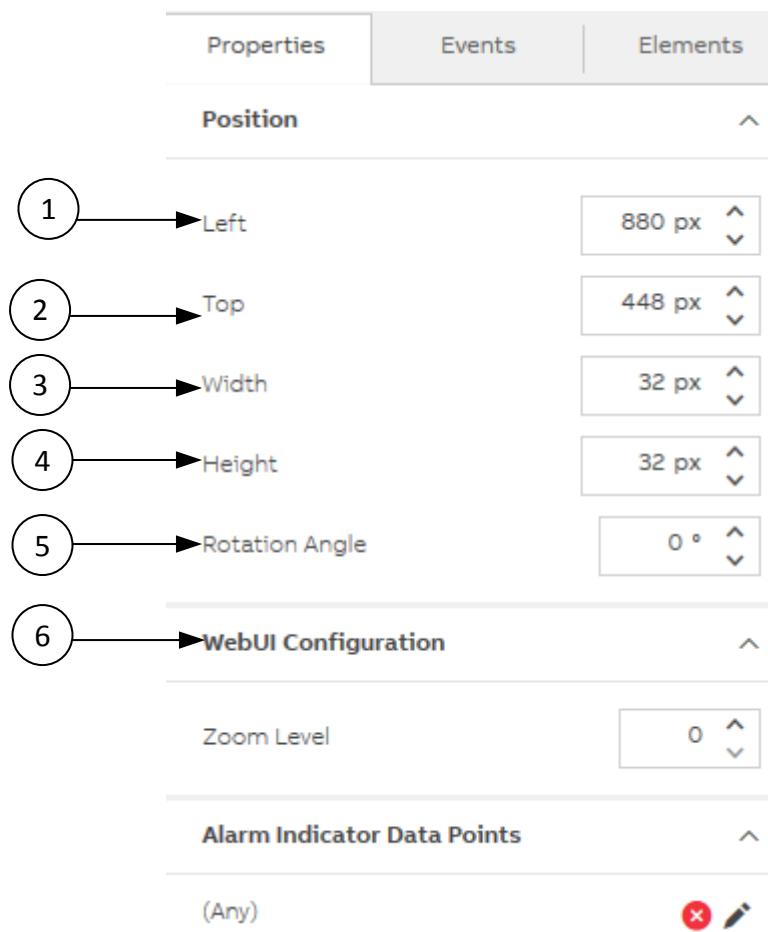
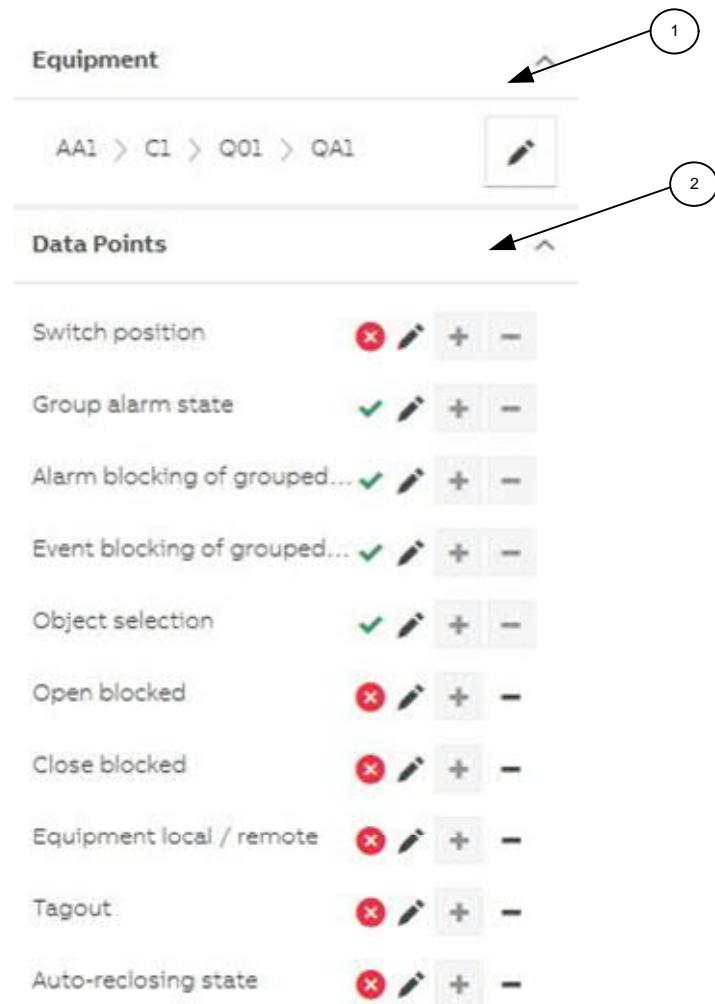


Figure 69: Alarm configuration

Pos. No	Functionality	Description
1	Left	X-axis position of the top left pixel of the selected element. Increment step is fixed to 16 pixels.
		Left
		
2	Top	Reversed Y-axis position of the top left pixel of the selected element. Increment step is set to the Grid spacing (16 pixels).
		
		Editing the properties directly may allow some overlapping, whereas using the mouse to move an element on the picture with drag and drop prevents this.
		Top
		
3	Width	Width of the element in pixel. Width is only available for symbols which can be sized horizontally. For example, LED, text, value, busbar. Increment step is fixed to 16 pixels.
		Width
		
4	Height	Height is available for symbols which can be sized vertically, for example, LED, text, value. Increment step is fixed to 16 pixels.
		Height
		
5	Rotation Angle	Rotation angle of the selected element. Supported values are 0°, 90°, 180° and 270° for symbol elements (from element tab).
		Rotation Angle
		
6	Configuration	This allows to define the zoom factor of a particular level and the output is reflected in the SYS600 Workspace X.
		
		
		Zoom Level
		

## Equipment symbols



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Figure 70: Equipment (Symbol) mapping and equipment datapoint mapping properties

Pos. No.	Functionality	Description
1	Equipment mapping	<p>Displays the full name of the SLD equipment mapped.          If unmapped, displays the symbol label name.          Click on the pen icon to open the <b>Edit Equipment Mapping</b> dialog box (see <a href="#">Section 3.8.4.2</a>).          This is not a mandatory step. However, the equipment mapping is advised as this feature triggers automated mapping for most mandatory data points (see <a href="#">Section 3.8.4.2</a>).          If the picture is created from process diagram, all equipments are pre-mapped.          Equipment (symbol) mapping and equipment datapoint mapping properties are only displayed for equipment symbols. For example, a circuit breaker or a power transformer but not for non-equipment symbols. For example, LED, text, values.</p>
2	Data point mapping	<p>List all data points that the SYS600 Workplace X is expected to use in scope of the selected symbol.          Valid mapping is shown with a green tick.          Unmapped data point is shown with a cross in red circle for mandatory data points and a cross in black circle for optional data points.          Missing mandatory data points reduces functionality on the SYS600 Workplace X, while optional data points rational depends on the integrating product functionality to support.          Click the pen icon to open the <b>Edit Data point</b> dialog box.</p> <div style="text-align: center;">  <p>Symbol background in Picture Editor is displayed orange when the mandatory data points are not mapped (both for symbol properties and control pane – refer to <a href="#">Section 3.8.5</a> for control pane data points engineering).</p> </div>

## Equipment container symbols

Equipment container displays various equipment, such as Substation (Authority), Bay (Authority), Diameter (Authority), and Section Header. This equipment allows to map the required data points, such as Control IED authority, Group alarm state, Alarm blocking of grouped data points, and Event blocking of grouped data points

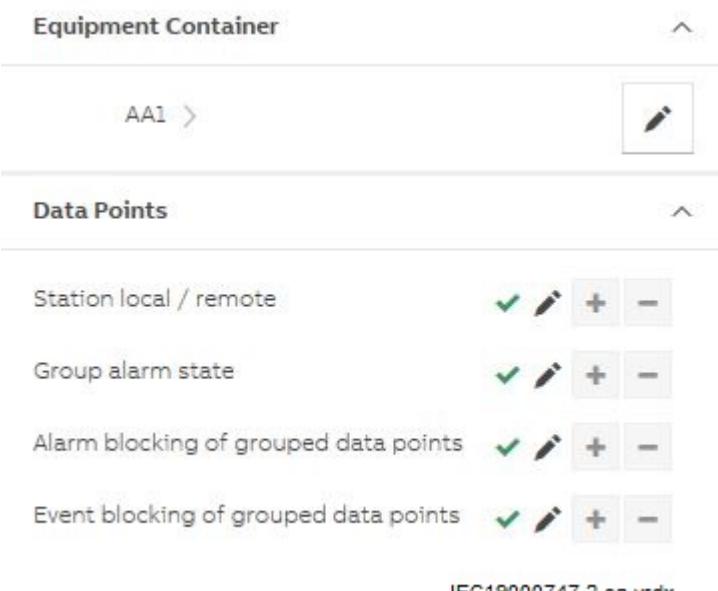


Figure 71: Substation (Data Points)

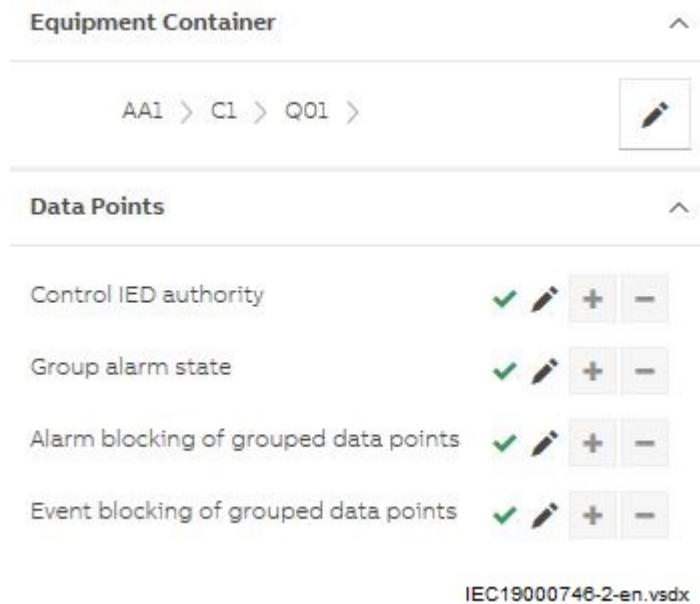


Figure 72: Bay (Authority) Data Points

## Primitive properties

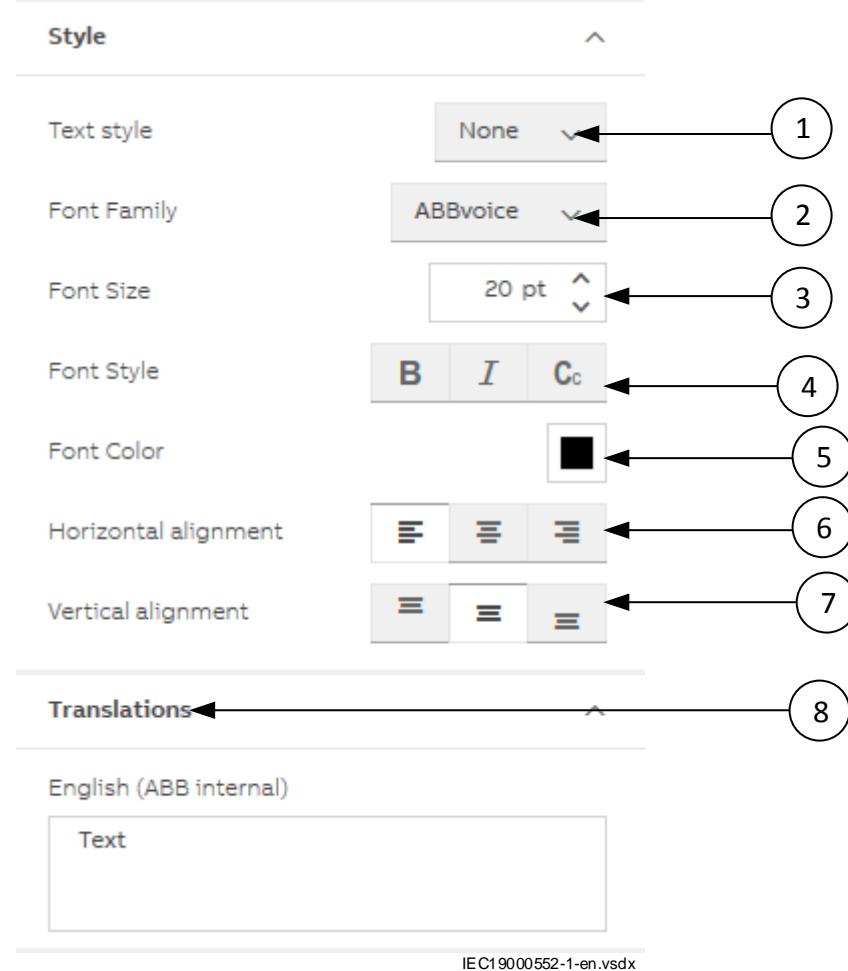
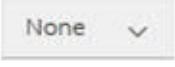
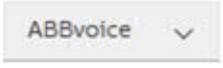


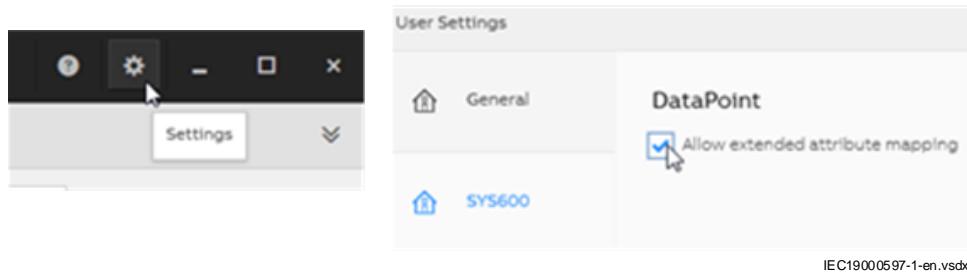
Figure 73: Text style properties

Pos. No.	Functionality	Description
1	Text style	<p>Available properties for text. Line thickness in pixel, which can range from 0 (invisible) to 2000, with incremental steps of 1.</p> <p>Text style </p>
2	Font Family	<p>Available properties for text when text style none is selected. Select one of the available Font.</p> <p>Font Family </p>
3	Font Size	<p>Available properties for text when text style none is selected. Select font Size (between 1 to 100).</p> <p>Font Size </p>
4	Font style	<p>Available properties for text when text style none is selected. Select to apply bold, italic and/or condensed style.</p> <p>Font Style </p>
5	Font color	<p>Available properties for text. Select font color, including predefined color settings from <b>Picture Settings</b> dialog box. See <a href="#">Section 3.8.2.1</a>.</p> <p>Font Color </p>
Table continues on next page		

Pos. No.	Functionality	Description
6	Horizontal alignment	<p>Available properties for the text. Switch between left, center, or right horizontal alignment.</p> <p>Horizontal alignment</p>
7	Vertical alignment	<p>Available properties for the text. Switch between top, center, or bottom vertical alignment.</p> <p>Vertical alignment</p>
8	Translations	<p>Available properties for Text. Edit the text for different workspace languages that are configured.</p> <p> All text translations related to the current picture can also be managed together using the <b>Translations</b> dialog box (see <a href="#">Section 3.8.2.3</a>).</p> <p>Translations</p> <p>English (ABB internal)</p> <p>Text</p>

### 3.8.4.3 Direct mapping of MicroSCADA process object attributes

To visualize a MicroSCADA process object attribute, which is not mapped to any **DataPoint** type, then enable the following setting as shown in [Figure 74](#).



*Figure 74: User settings tab to activate MicroSCADA process object attribute*

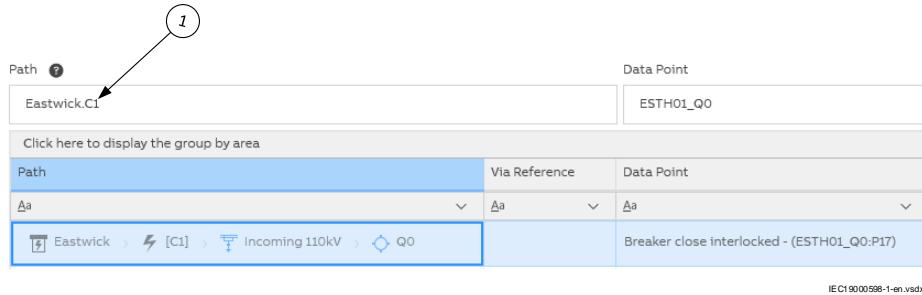
Once activated, the **Edit Datapoint Mapping** dialog box can also be used to search for process object attributes directly.

The **DataPoint** column shows the following process object information: OX – (LN:IX). The **DataPoint** column filter is used to search for any part of that text.

If the path follows an existing View Builder functional structure path or remains empty, only process objects, which can be placed under that path are shown. If an equipment is not

identified and imported into the View Builder, the process objects for that equipment is not found anywhere under the View Builder functional structure.

Searching for all process objects using the MicroSCADA OI (Object Identifier) structure can be done by adding a path, which is not part of the View Builder functional structure but is part of the OI structure.

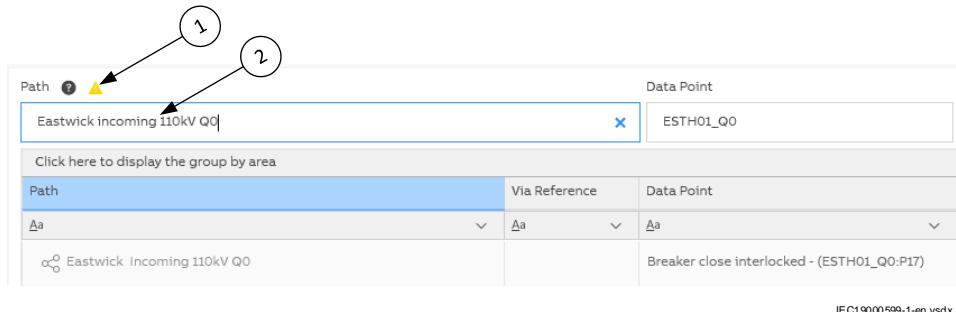


*Figure 75: Example of View Builder Functional Structure Path filtering*

*Table 4: Functional structure path filtering features*

Pos. No.	Description
1	Used in View Builder Functional Structure path.

In the above [Figure 75](#), the path filter is Eastwick.C1. Using '.' as delimiter, filter according to the imported View Builder functional structure path. The path of the identified process object is contained within the View Builder functional structure in the result.



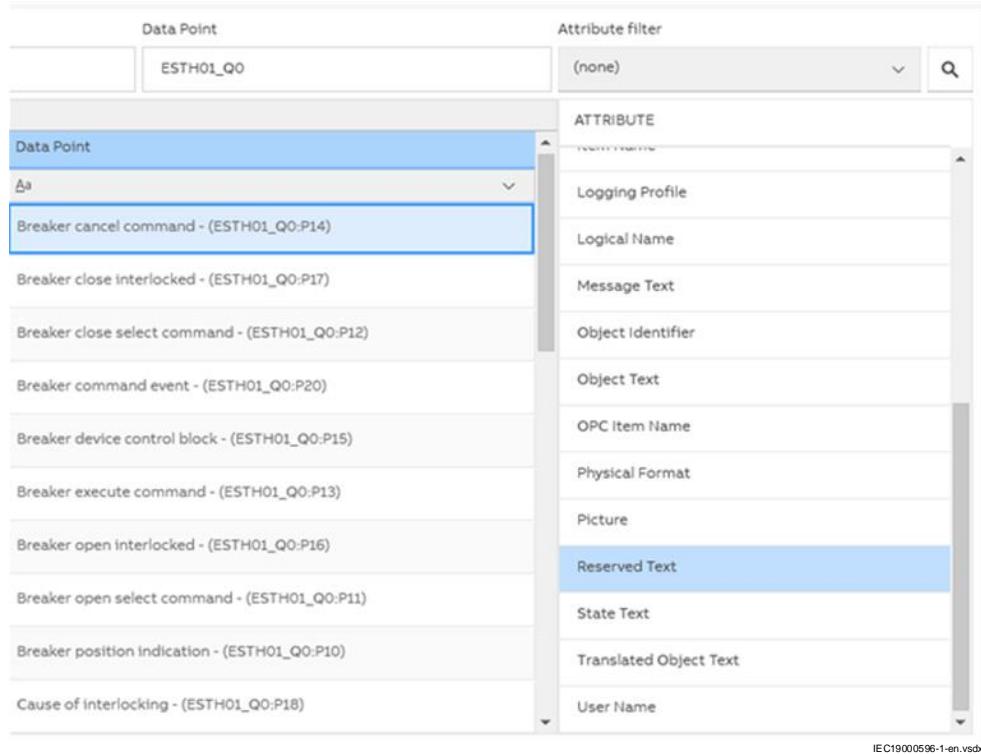
*Figure 76: Example of direct MicroSCADA OI Structure Path Filtering*

*Table 5:*

Pos. No.	Description
1	Warning icon indicating that filtering is performed on the OI structure directly.
2	Space used as delimiter to search using the MicroSCADA OI structure directly.

In the above [Figure 76](#), the path filter is Eastwick Incoming 110kV Q0. Using spaces as delimiter the search option is forced to filter according to the MicroSCADA OI Structure directly. As can be seen in the result, the path of the identified process object is contained within the MicroSCADA OI Structure, which is slightly different from the View Builder functional structure.

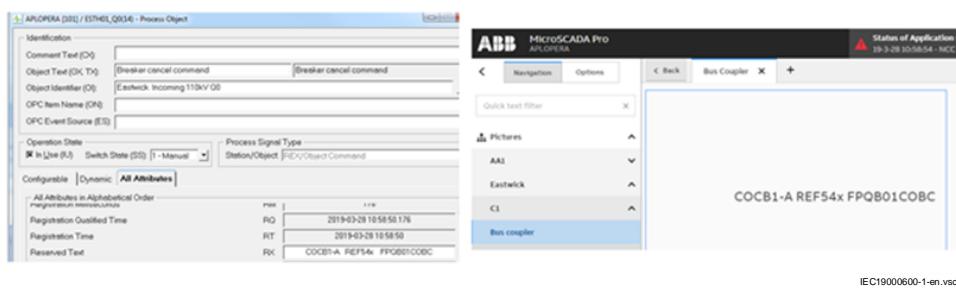
Searching via the OI structure directly identifies every process object under that OI path. Use this method of searching if the process object is not found under an imported equipment or equipment container in the View Builder functional structure.



*Figure 77: Selectable Process Object Attributes for a Text Symbol*

While the **Allow extendable attribute mapping** check box is selected, all datapoints also include the MicroSCADA process object attributes. These can be mapped like any datapoint attribute to symbols which can handle that primitive data type (string, decimal value, ...). If the symbol type to be installed is for example, *analog value*, the filter (at least OI structure path filtering) lists only data points (process objects) having analog attributes and when one data point is selected, only attributes of analog type are listed in the Attribute filter list on the right.

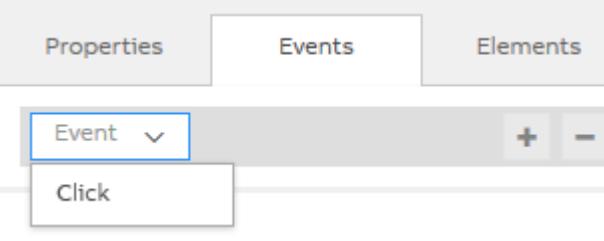
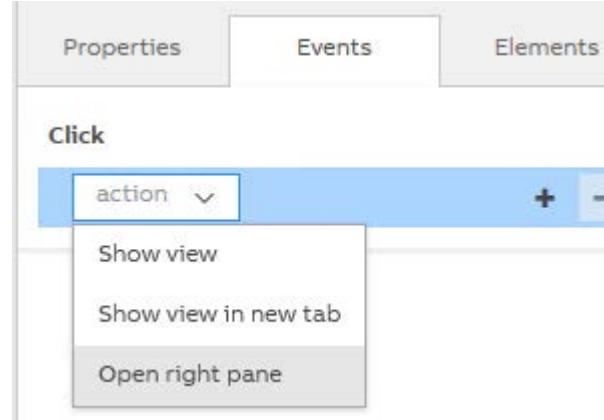
Use **Extendable Attribute Mapping** to allow for mapping a wide range of process object attributes directly to symbols, but the automated mapping functionality is lost, which is stored when the symbols are automatically mapped directly to the known datapoint types. Therefore, this type of direct target data mapping must only be performed for data which we cannot map to a symbol in any other way.



*Figure 78: Example of process object RX attribute being mapped to a text symbol*

### 3.8.5 Events tab

The **Events** tab is available for elements which support **Events** type like **Click** and is composed of the following functionalities:

Functionality	Description
Select event type	<p>Select the <b>Event</b> type from the drop-down list. If more than one type of event is supported, user can click + on that level to append another event type.</p>  <p>IEC19000707-1-en.vsdx</p>
Select action type on added event	<p>Select the <b>action</b> type from the drop-down list. User can engineer more than one action for a single event type by clicking + on that level.</p>  <p>IEC19000708-1-en.vsdx</p>
Engineer action Type	<p><b>Show view</b> changes the current view to the selected picture engineered (click the pen icon to open the <b>Select Picture</b> dialog box to define the view to be shown- see <a href="#">3.8.5.1</a>)  <b>Show view in new tab</b> creates an SYS600 Workplace X navigation action on click.  <b>Show view in new tab</b> opens a new tab in SYS600 Workplace X with the selected picture engineered.</p>
Table continues on next page	

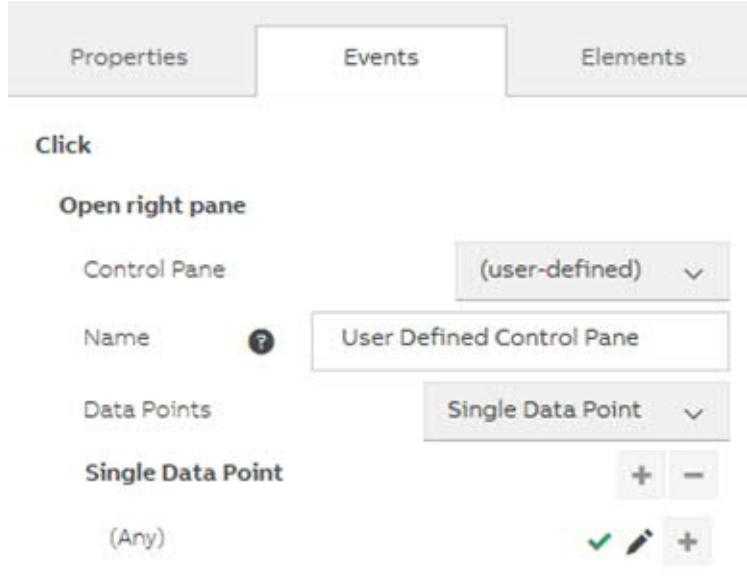
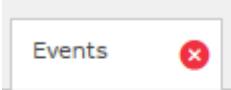
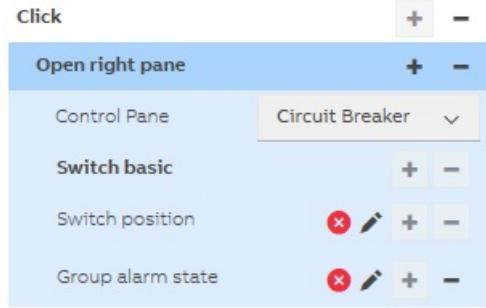
Functionality	Description
System defined control pane	<p>Some equipment and equipment containers like switching devices, tap changer, bay, and station headers have pre-engineered events with pre-selected and well-defined control pane. If control pane is not available under the <b>Events</b> tab for Equipment Symbols, it means that there is no default control possibility for that Equipment. If controlling this equipment is still required, a user defined Control Pane must be created via the View SDK and referenced by selecting <b>user defined</b> as <b>Control Pane</b> and then enter its filename into the <b>Name</b> field. The View SDK documentation can be found here: <i>View Writers Guide</i>.</p> <p>For example, when a circuit breaker symbol is mapped to the corresponding equipment, the open right pane click event is pre-engineered with a circuit breaker control pane. This can still be changed to a user defined control pane if required.</p> <p>Each control pane comes with a list of datapoints for engineering.</p> <p>The data points are organized by groups. Remove or add defined group with the + / - button. There are various groups, such as:</p> <ul style="list-style-type: none"> <li>• Mandatory groups like Switch basic which cannot be removed.</li> <li>• Default groups like Switch operation which are listed by default and can be manually removed by the - icon and added again by the + icon on another group (for example, the mandatory one).</li> <li>• Optional groups that are not listed by default and can be manually added by pressing the + icon on another group (for example, the mandatory one).</li> </ul> <p>Control pane datapoints are edited and marked exactly like symbol datapoints engineering. Datapoints get automatically mapped when the symbol is mapped to an equipment or equipment container. In addition, datapoints that are already manually mapped on the symbol (element) properties, are also mapped for the control pane respective. For group, see <a href="#">Figure 70</a>. All datapoints can be manually (re-) mapped like the symbol (element) datapoints by pressing the pen icon, see <a href="#">Figure 59</a>.</p> <p>Datapoints mapping changes are synchronized for all symbols mapped to the same equipment.</p> 

Table continues on next page

Functionality	Description
Incomplete configuration handling	<p>If there is any data point that is not mapped correctly or not yet configured, a red – cross icon will be visible next to that data point and on the Event tab.</p>  <p>IEC20000667-1-en.vsdx</p> <p><i>Figure 79: Events tab with incorrect/unconfigured data point(s).</i></p>  <p>IEC20000668-1-en.vsdx</p> <p><i>Figure 80: Incorrect mapped data point</i></p>
Events tab actions	<p><b>Show view</b> and <b>Show view in new tab</b> are not available for Typical configuration. The user must configure these actions for each individual Instances.</p>  <p>IEC20000669-1-en.vsdx</p> <p><i>Figure 81: Show View and Show view in new tab in Typicals</i></p>

### 3.8.5.1 Select Picture dialog box

The **Select Picture** dialog box is a simple list of all available process and communication supervision pictures from the current workspace. Select a single picture and click **Apply** to complete the configuration of the **Show view** or **Show view in new tab** event.

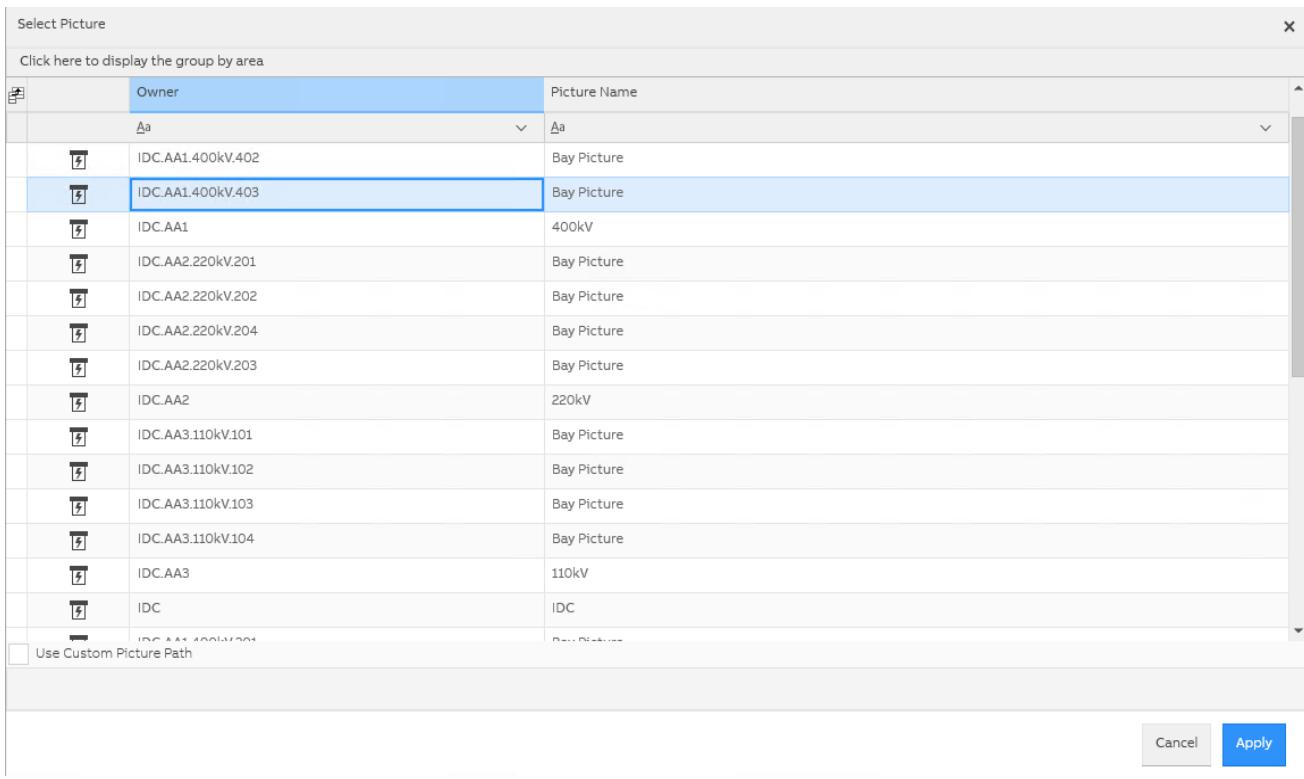


Figure 82: Select Picture dialog box

When View Builder is used, an advanced user can configure external (non-View Builder) views to be opened by selecting the **Use Custom Picture Path** option at the bottom of the list and enter the name according to the integrating product specification.

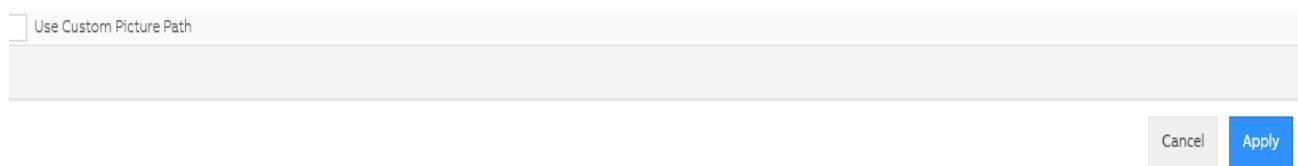


Figure 83: Use Custom Picture Path

### 3.8.5.2 Alignment grid behavior

The items in the picture automatically snap to the 16x16 pixel grid for easy placement of most items.

If placement without grid snapping is required for an item, press ALT button while moving an item with the pointer.

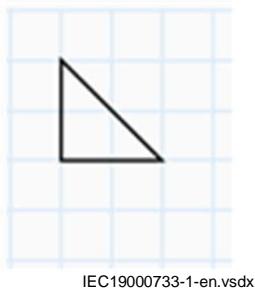


Figure 84: Automatic grid snapping of item

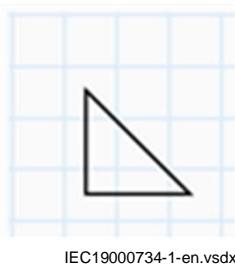


Figure 85: Grid snapping turned off while moving the item allows placement outside of the grid points

## 3.9 Communication supervision pictures dashboard

### 3.9.1 Overview

The **Communication Supervision Pictures** editor is provided to engineer another set of SYS600 Workplace X pictures. For example, to engineer SYS600 Workplace X pictures on station or voltage level with an overview of IEDs and their status (system events).

In the navigation tree, select the equipment container like Station, Voltage Level, or Bay to create using **Communication Supervision Pictures**.

Start the **Object Editor** tab and select the third editor.

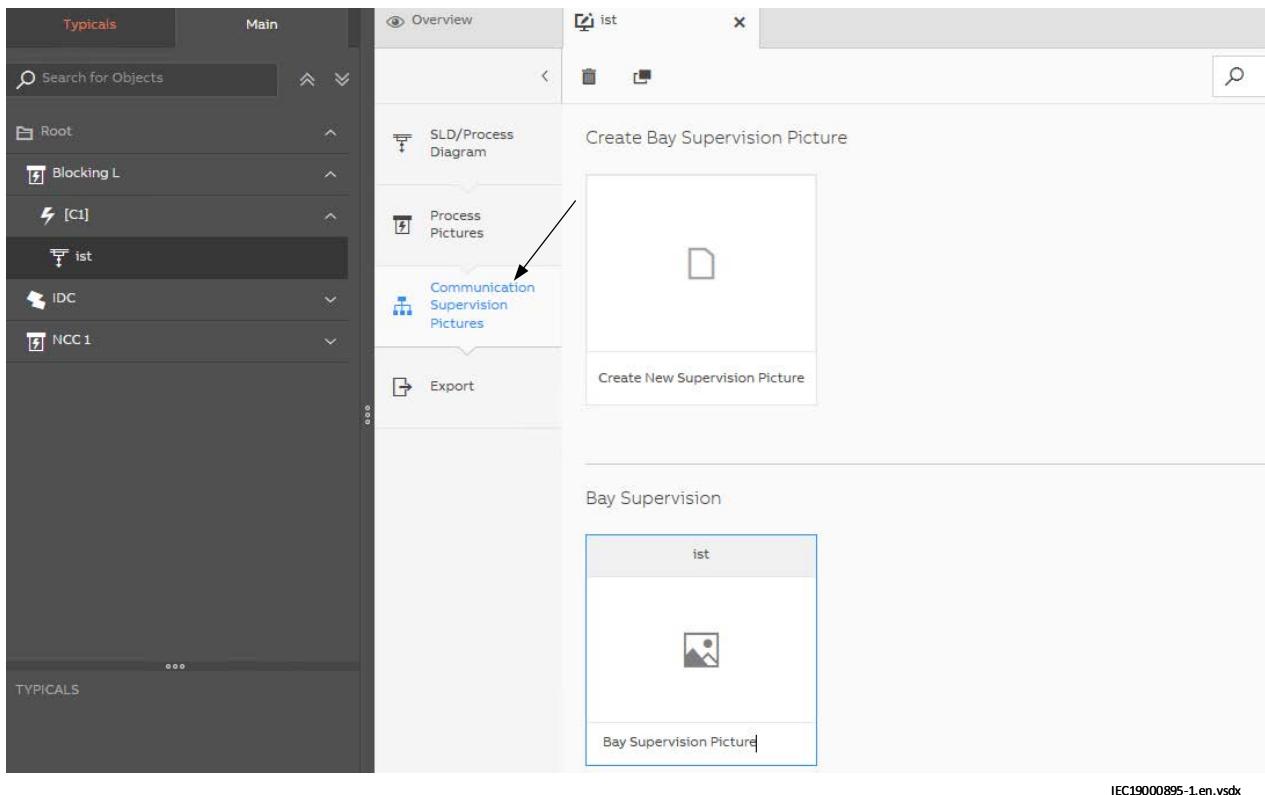


Figure 86: *Communication Supervision Pictures*

By default, the picture dashboard is shown, and composed of the following distinct sections:

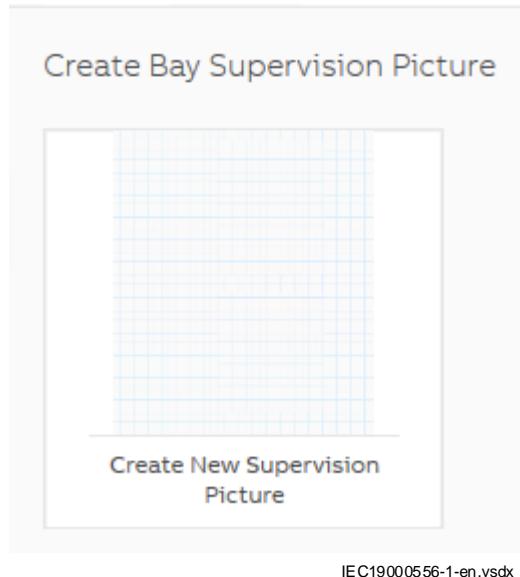
- Toolbar
- Create picture sections
- Engineered picture sections

### 3.9.2 Toolbar

The **Communication Supervision Pictures** editor toolbar includes the functionalities similar to the **Process Pictures** toolbar. See [Section 3.8.2](#).

### 3.9.3 Create picture section

Click **Create New Supervision Picture** to create a new picture.



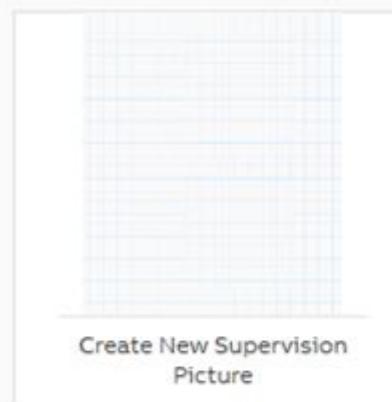
IEC19000556-1-en.vsdx

*Figure 87: Create new communication supervision user interface*

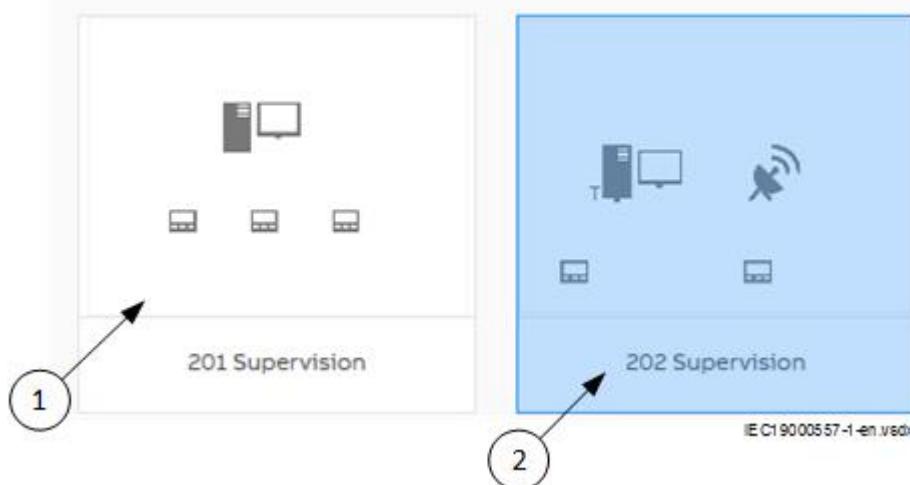
### 3.9.4 Created picture section

The created picture section displays the engineered supervision pictures related to the current equipment container and the child equipment containers.

## Create Voltage Level Supervision Picture



## Bay Supervision

*Figure 88: Created communication supervision*

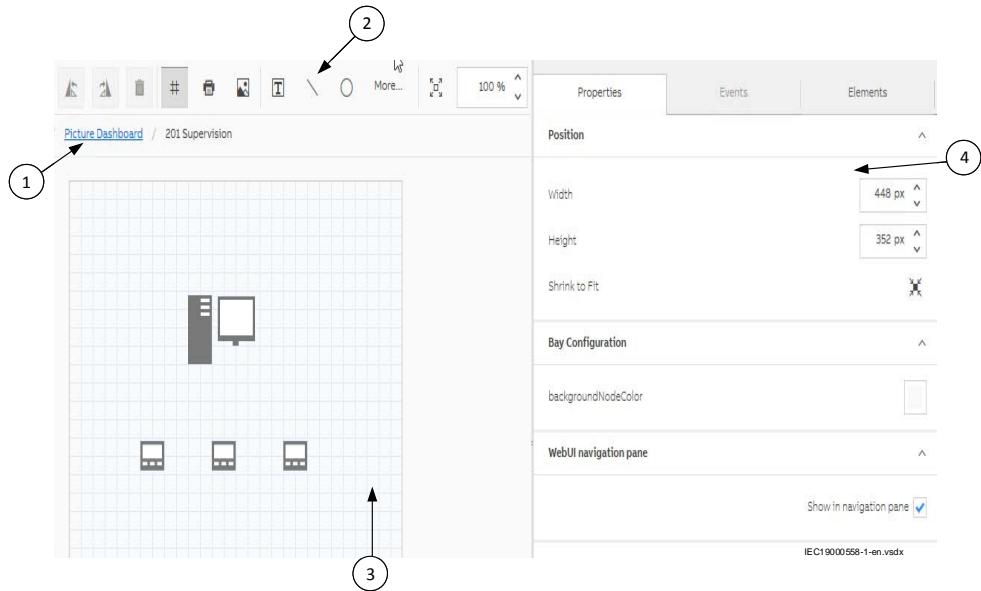
Pos. No.	Description
1	To edit a picture, double-click the thumbnail.
2	To rename a picture, double-click on the lower part of the thumbnail.

## 3.10 Communication supervision pictures editor

### 3.10.1 Overview

A communication supervision picture is opened by double-clicking a picture from the **Communication Supervision Pictures** dashboard.

The user interface is composed of the following distinct sections as shown in [Figure 89](#).



*Figure 89: Overview of Communication Supervision Pictures editor*

Pos. No.	Description
1	Navigation shortcut: Click to navigate to the parent dashboard.
2	Toolbar
3	Picture container
4	Properties, Events, and Elements tabs

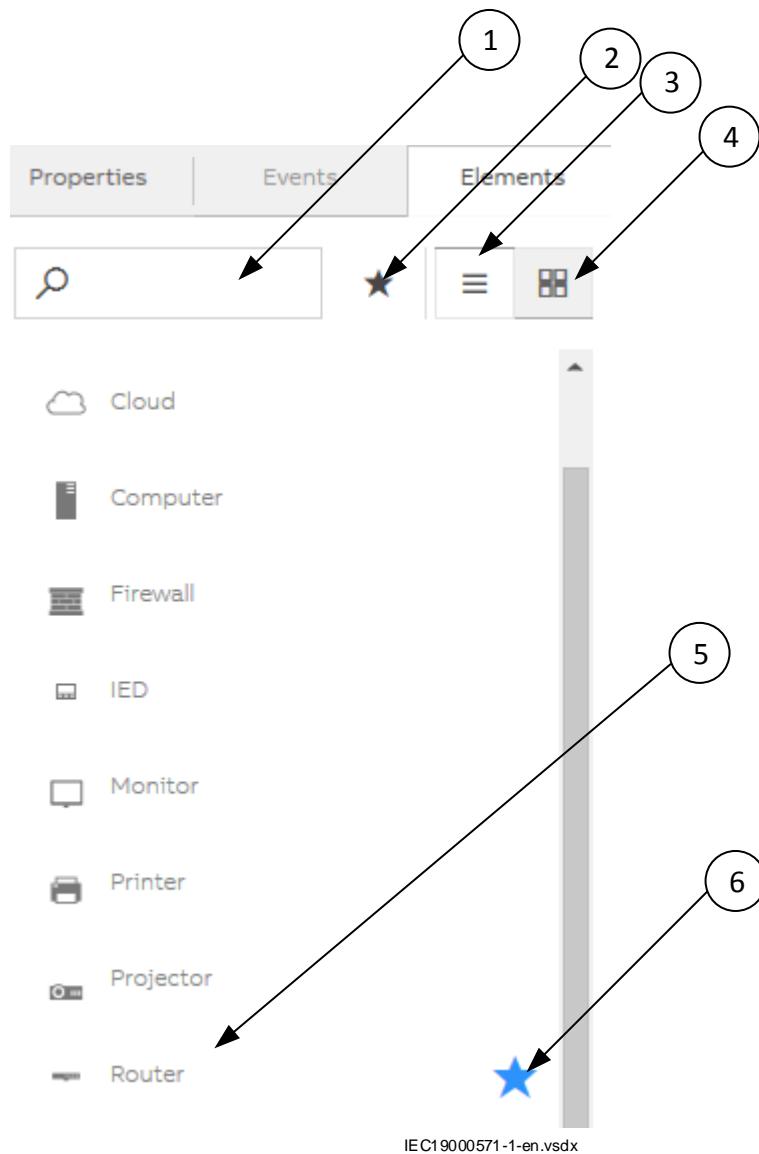
### 3.10.2 Toolbar

The **Communication Supervision Pictures** editor toolbar includes the functionalities similar to the **Process Pictures** toolbar. See [Section 3.8.2](#).

### 3.10.3 Elements tab

The **Elements** tab consists of the following functionalities as shown in [Figure 90](#):

Those features are similar to the one described for **Process Picture** editor in [Section 3.10.4.1](#).



*Figure 90: Elements tab interface for communication supervision diagrams*

Pos. No.	Description
1	Search/Filter elements with input text.
2	Toggle to filter by favorite.
3	Toggle to show list base tab view.
4	Toggle to show icon base tab view.
5	Select element.
6	Set to favorite.

### 3.10.4 Property tab

#### 3.10.4.1 Diagram background properties

The **Communication Supervision Pictures** editor's **Property** tab displays the properties similar to **Process Pictures** editor's **Property** tab. Refer [Section 3.8.4.1](#).

### Alignment grid behavior

This feature is identical in both the editors, **Process Picture editor** and **Communication Supervision editor**. Refer [Section 3.8.5.2](#).

## 3.10.5 Events tab

The **Events** tab is available for elements which support click like events and the functionality is equivalent to the one described in context of the **Process Picture** editor in [Section 3.8.5](#).

## 3.11 Export UI

### 3.11.1 Overview

Use the **Export** function to create a view file package including all engineered pictures to be downloaded to a SYS600 device. The **Export** menu is available on any equipment container level, that is select a substation, voltage level, or bay in the navigation tree and invoke the Export menu command.

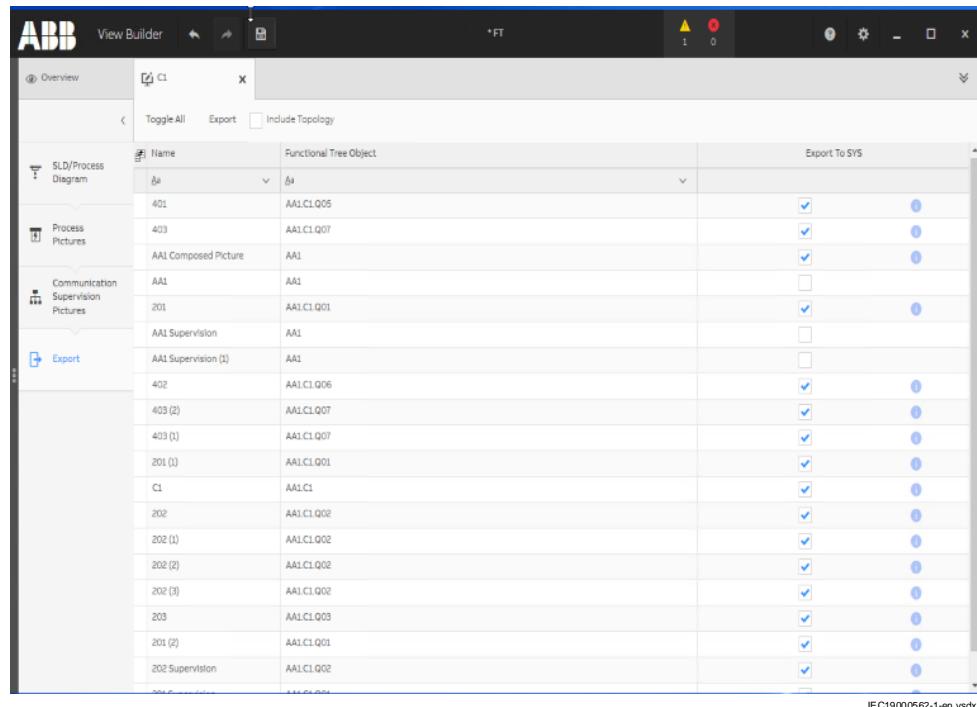


Figure 91: Overview of Export user interface

The **Export** tab always lists all the pictures available in the current workspace, independent of the equipment container selected.

You can select / clear picture to export to the SYS600 Workspace X by checking the tick box.

A blue information icon is displayed next to the tick box if the related picture was previously exported and changed since last export.

The **Name** column allows modification of the picture name.

### 3.11.2 Toolbar

The Export toolbar includes the following functionalities:

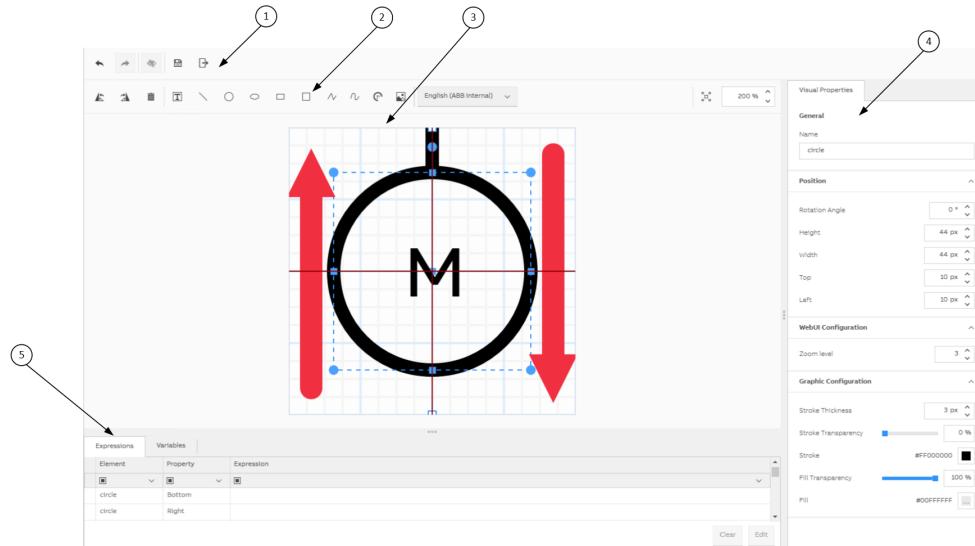


Figure 92: Toolbar

SI No.	Functionality	Description
1	Toggle All	Select / unselect all pictures
2	Export	Export selected pictures
3	Include Topology	Include engineered data from SLD/Process Diagram – Only available if supported by the integrating product



# Section 4      Engineering workflow

This section describes the main engineering workflow.

## 4.1 Import and maintain data structure

The user can import data from SYS600 process database when the tool starts and maintains the data structure in the Workspace Explorer.

### 4.1.1 Import data

SYS600 process database is read during start-up and the **Import** dialog box opens before any engineering work is started.

See [Section 3.2](#) for the description of the Import UI and functionality.

The **Default Symbol Configuration** is displayed at the start. This will let you configure which symbols are created for the imported equipments. See [Section 3.1.2.1](#) for more information.

### 4.1.2 Adding/removing objects

The main structure is first generated after the source data is imported. The average user should not adapt the structure after such import.

The Workspace Explorer is used to edit the data structure.

See [Section 3.4.1](#) for the description of the Workspace Explorer and [Section 3.4.2](#) for how to add or remove objects from the functional structure.

### 4.1.3 Typical instance management

The Typical or Instance structure is built by creating Typical from the engineered standalone bay and joining other applicable standalone, which should inherit the typical data for synchronization purpose.

See [Section 6.2](#) and [Section 6.3](#) for the functionality needed to engineer a workspace with such Typical and Instance relation.

### 4.1.4 Naming objects

The Naming Editor in the Workspace Explorer (see [Section 3.4.2](#)) is available to centrally manage name changes according to the available schemes.

Customer names are inherited from the imported data and the internal names are generated by the tool to allow specific automation. Avoid changing names in the View Builder.

See [Section 2.3](#) for the overall concept about naming of objects, [Annexure A](#) for the naming conventions used by the tool and [Annexure B](#) for details about the available automation based on the naming scheme.

## 4.2 Opening a functional structure object in an editor

See [Section 3.1.1](#) for more details on how the View Builder UI is structured, how to navigate the tree structure ([Section 3.1.3](#)) and how to navigate around the editor tabs and editor selections ([Section 3.1.4](#) and [Section 3.1.4.1](#)).

## 4.3 Creating the topology

Equipment (and possibly some topology information, as well) is imported from the SYS600 process database without a defined layout. Engineered layout can be re-used as a base for the process picture but that step is not mandatory and for some products, the data shown in the SLD/Process Diagram editor can be left as is.



The user is still allowed to add and remove equipment using the SLD/Process Diagram editor. However, an average user should not add or remove equipment to avoid inconsistencies with the SYS600 process database data, which might be hard to fix later.

See [Section 3.6](#) for the description of the SLD/Process Diagram editor, where the topology is engineered.

## 4.4 Creating process pictures

If equipment data is imported from SYS600 process database, it is recommended to create pictures from the process diagram.

As a result, the created picture has the pre-mapped topology, equipment and data points according to the engineered process diagram. This is the most efficient workflow when View Builder is used.

See [Section 3.7](#) for details See [Section 3.8](#) about the **Process Pictures** editor.

### 4.4.1 Working with primitive graphics

Primitive Graphics are the elements available on the toolbar, which can be used to enhance the picture with extra graphics and text.

See [Section 3.8.2](#) for details on how to work with primitive graphics.

### 4.4.2 Working with symbols

The symbols are the objects available in the **Elements** tab of the Process Picture editor.

See [Section 3.8.3](#) for details on how to work with symbols.

### 4.4.3 Configuring properties

See [Section 3.10.4.1](#) for details on how to edit or manage the picture properties in the Process Pictures editor.

#### 4.4.4 Mapping objects to symbols

If the picture is created from the Process Diagram, all equipment symbols will be pre-mapped.

If the picture has diverged from the Process Diagram, manually add the new symbol and its equipment mapping. See [Section 3.8.4.2](#) and [Section 3.10.4.1](#) for editing the properties of symbol's equipment mapping.

#### 4.4.5 Mapping data points to symbols

Data point mapping is automatically done by the tool when the symbol is mapped to an equipment.

An advance user can correct the mapping or map that is not found by the tool. See [Section 3.8.4.2](#) for editing symbol's data point mapping.

#### 4.4.6 Configuring events and actions for symbols

Some elements have pre-engineered events with pre-selected and well-defined Control pane.

For engineering, click events on symbols, see [Section 3.8.5](#).

#### 4.4.7 Creating composed process pictures

The View Builder structure is designed to create extensive pictures using composition.

After engineering bay pictures, the Voltage Level or Substation Level picture can be generated by re-using them.

See [Section 3.7.3.1](#) for details on how to compose pictures.

If necessary, pictures can be inserted within a picture to create specific composition, with some limitations.

See [Section 3.8.2.2](#) for details on how to use **Insert Element** dialog box.

#### 4.4.8 Editing composed process pictures

The changes made to a picture are automatically propagated to all composed pictures that include this picture.

However, it is not possible to edit a picture in the composed picture directly. Double-click the inserted picture background to edit it in a separate editor.

### 4.5 Creating communication supervision pictures

See [Section 3.9](#) and [Section 3.10](#) for details about communication supervision pictures engineering.

### 4.6 Export pictures to SYS600 Workplace X

See [Section 3.11.1](#) for details about **Export** functionality.

## 4.7 Auxiliary functionality

### 4.7.1 Updating templates

See [Section 3.3](#) for details about the Template Management functionality.

### 4.7.2 Add/modify workspace languages

See [Section 3.5.2](#) for workspace language engineering.

# Section 5      SYS600 engineering workflow

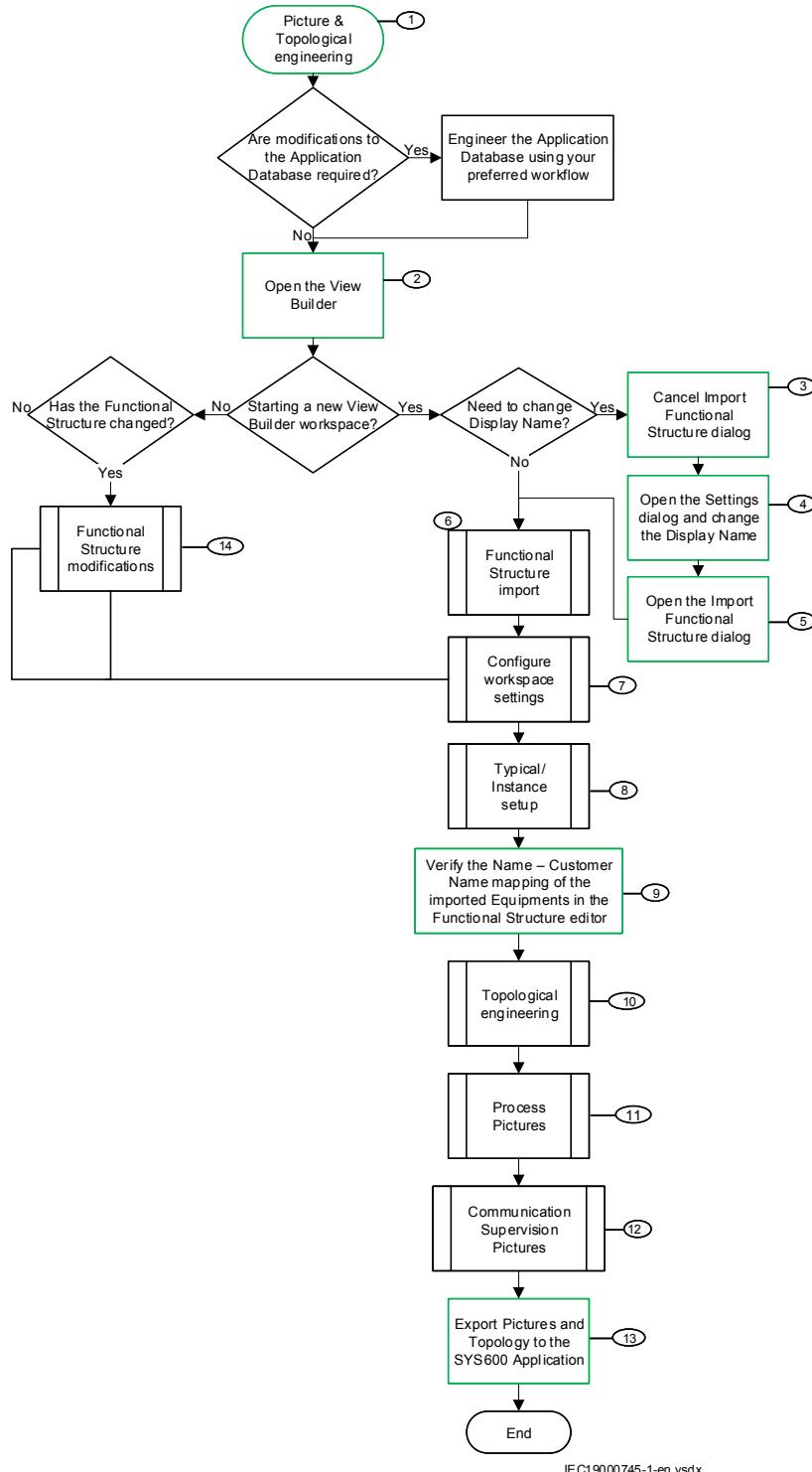


Figure 93: General workflow

Pos. No.	References
1,2	<a href="#">Picture engineering tool - View Builder</a>
3,5	<a href="#">Import UI</a>
4	<a href="#">User settings dialog box</a>
6	<a href="#">Functional Structure import</a>
7	<a href="#">Configure workspace settings</a>
8	<a href="#">Typical or Instance setup</a>
9	<a href="#">Naming of objects</a>
10	<a href="#">Topological engineering</a>
11	<a href="#">Process Pictures</a>
12	<a href="#">Communication Supervision Picture engineering</a>
13	<a href="#">Export UI</a>
14	<a href="#">Functional Structure modifications</a>

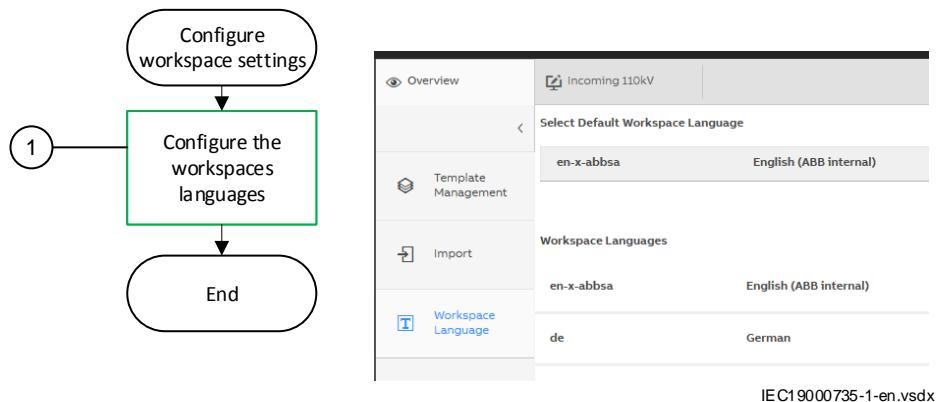


Figure 94: Configure workspace settings

Pos. No.	Reference
1	<a href="#">Workspace Language UI</a>

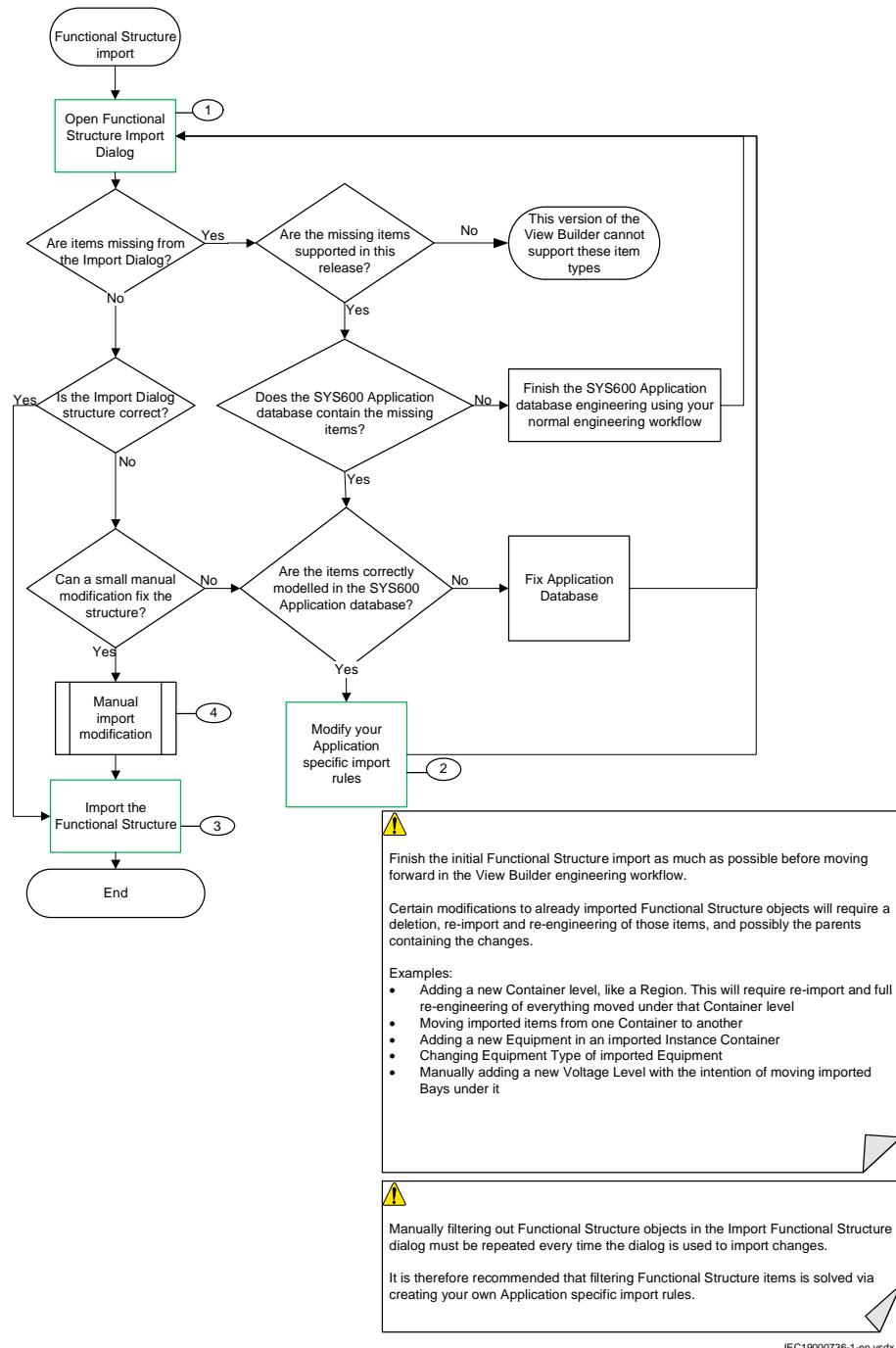
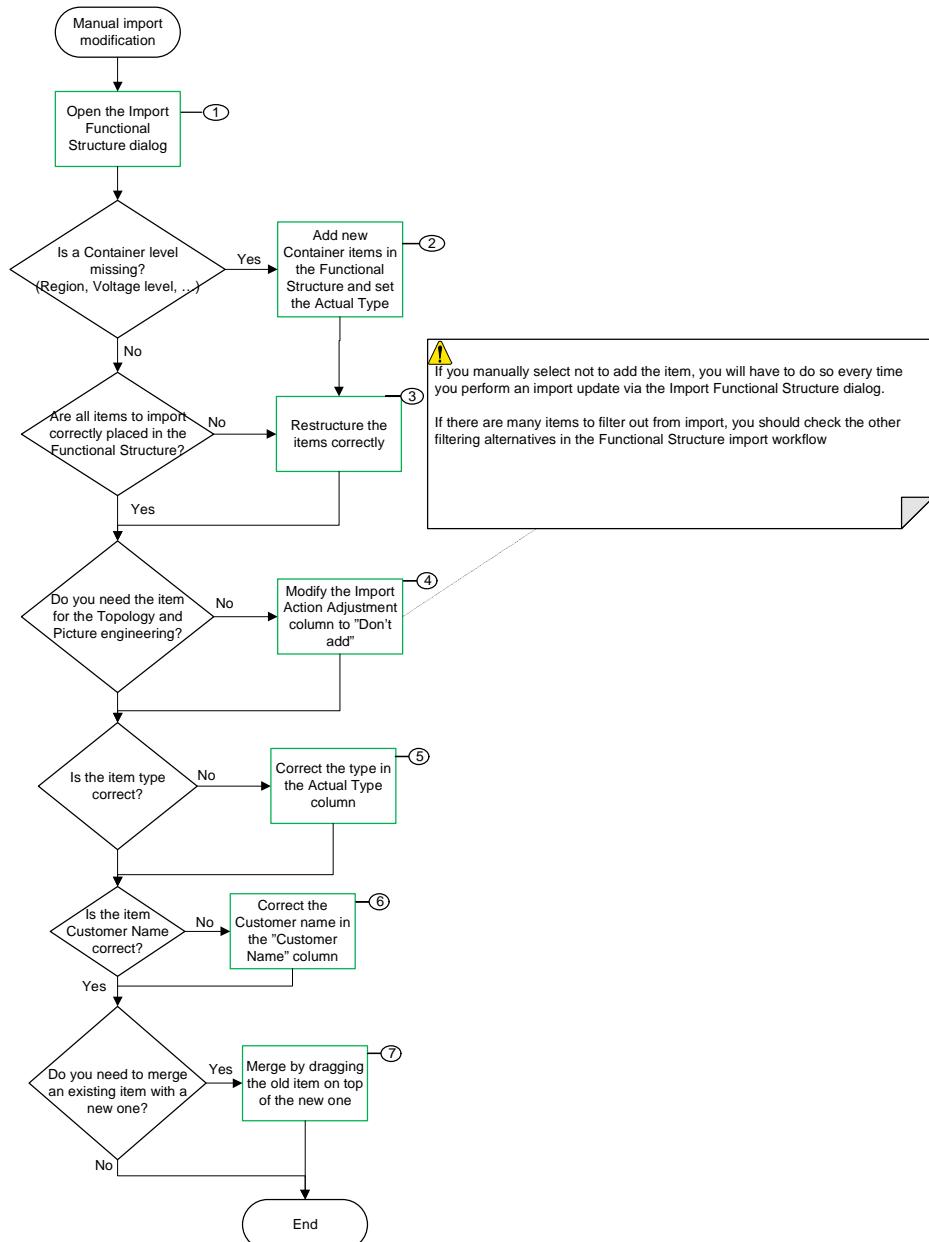


Figure 95: Functional structure import

Pos. No	References
1,3	<a href="#">Import Functional Structure dialog box</a>
2	<a href="#">Rule file</a>
4	<a href="#">Manual import modification</a>



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*Figure 96: Manual import modification*

Pos. No	References
1,2,3,4,5,6,7	<a href="#">Import Functional Structure dialog box</a>

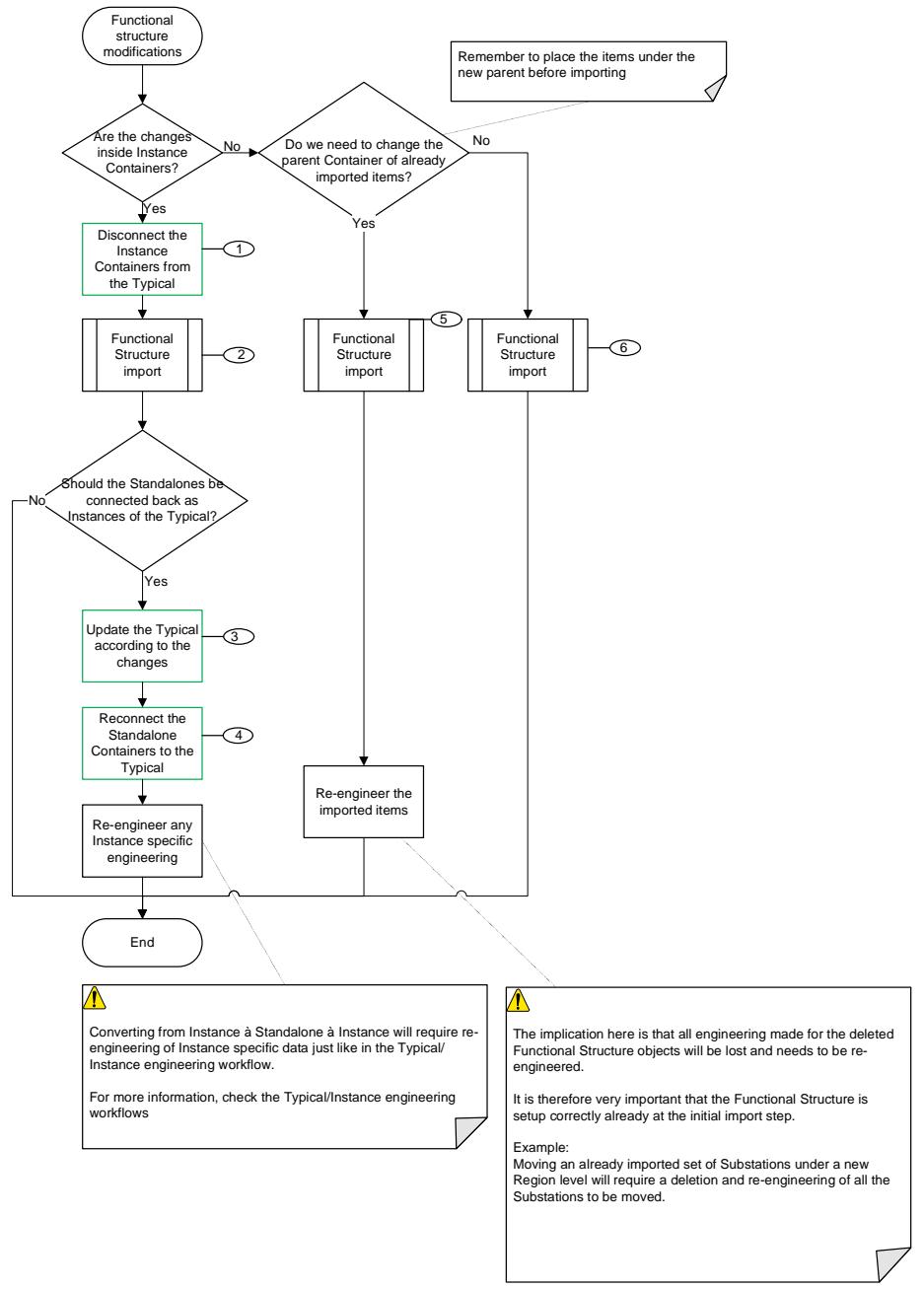


Figure 97: Functional structure modifications

Pos. No	References
1	<a href="#">Disconnecting instances from Typical Bays</a>
2	<a href="#">Functional Structure import</a>
3,4	<a href="#">Typicals</a>

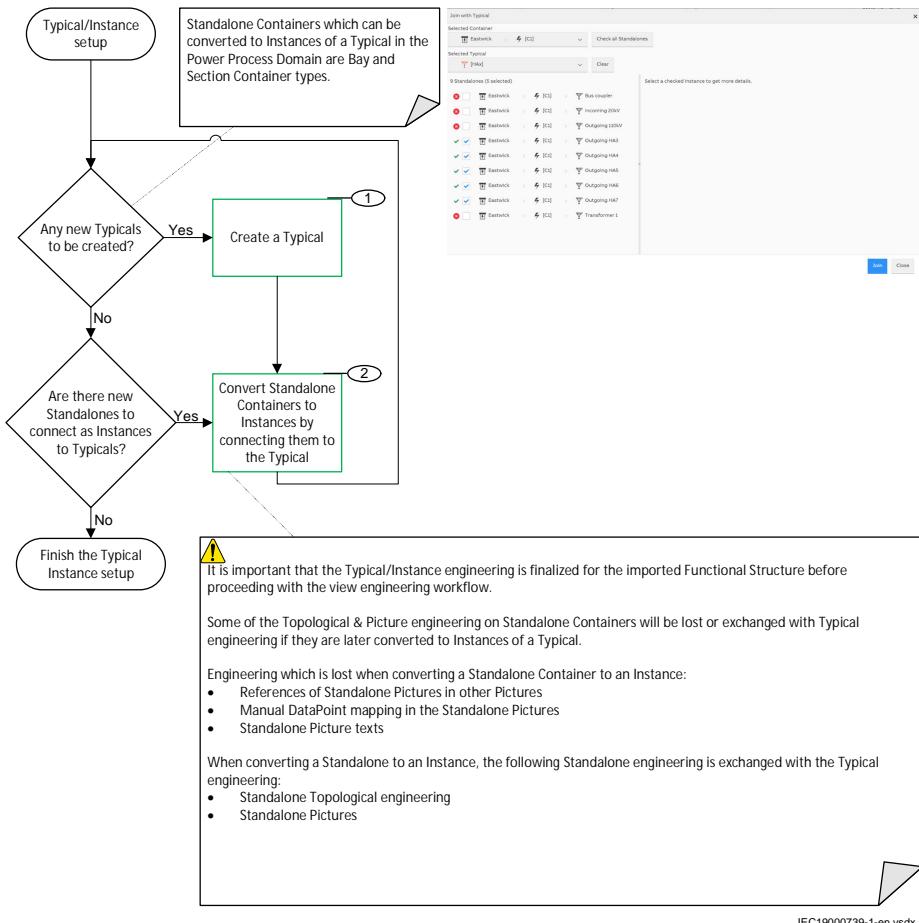
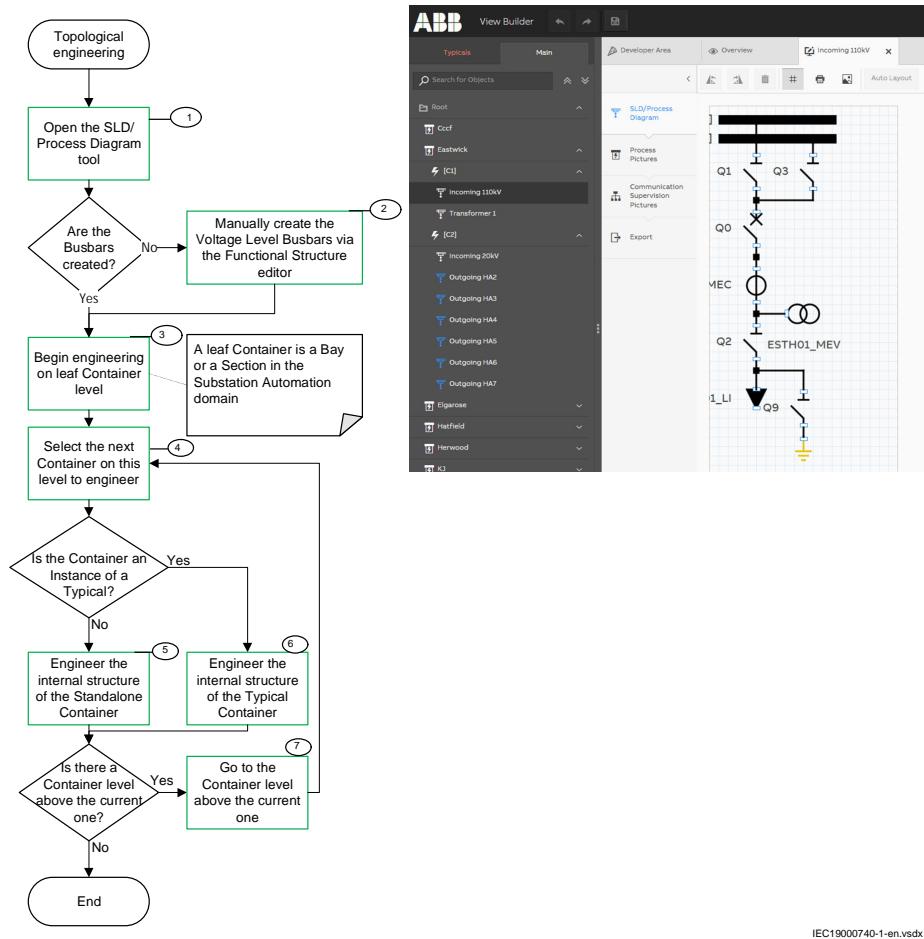


Figure 98: Typical or Instance setup

Pos. No	References
1	<a href="#">Typicals</a>
2	<a href="#">Creating Typical Bays from Bay standalone</a>



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*Figure 99: Topological engineering*

Pos. No	References
1	<a href="#">SLD or Process Diagram Editor</a>
2	<a href="#">Busbar connection logic</a>
3,4,7	<a href="#">Navigation trees</a>
5,6	<a href="#">Creating the topology</a>

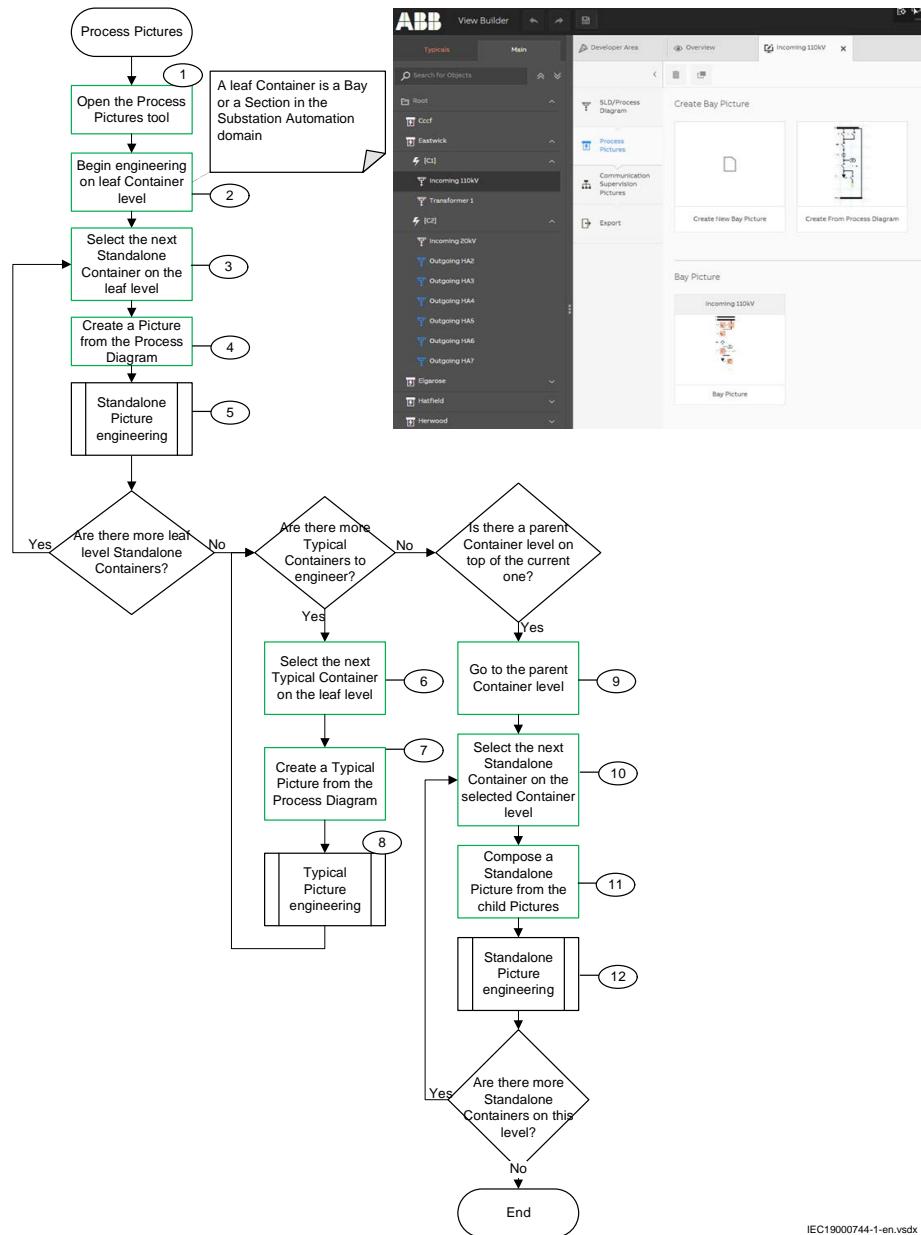


Figure 100: Process Pictures

Pos. No	References
1,4,7,11	<a href="#">Process Pictures dashboard</a>
2	<a href="#">Creating process pictures</a>
5,12	<a href="#">Standalone Picture engineering</a>
6,9,10	<a href="#">Navigation trees</a>
8	<a href="#">Typical Picture engineering</a>

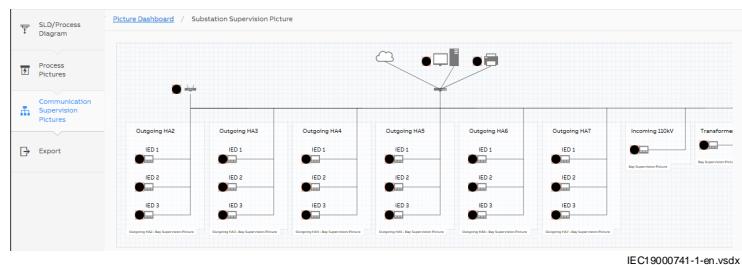
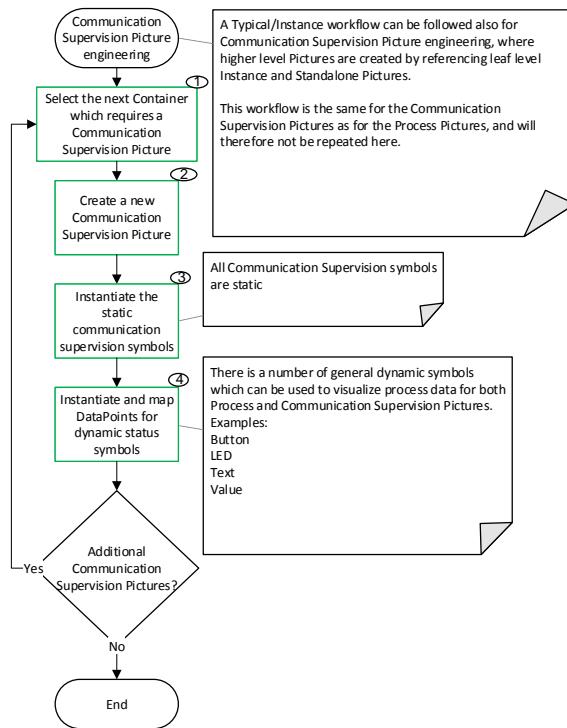


Figure 101: Communication Supervision Picture engineering

Pos. No	References
1	<a href="#">Navigation trees</a>
2,3	<a href="#">Communication Supervision pictures dashboard</a>
4	<a href="#">Element properties</a>

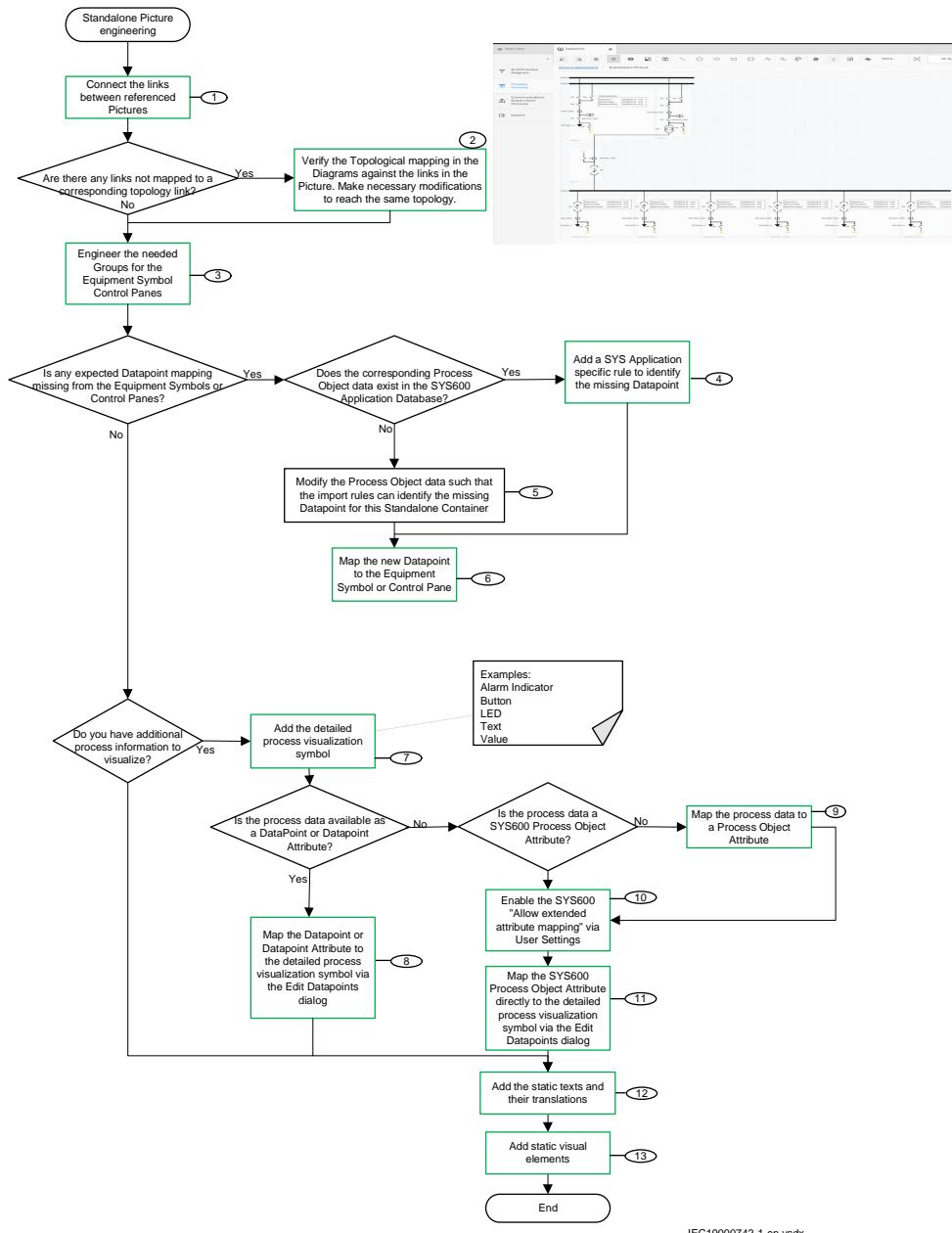


Figure 102: Standalone Picture engineering

Pos. No	References
1,7,13	<a href="#">Process Picture editor</a>
2	<a href="#">Creating the topology</a>
3	<a href="#">Events tab</a>
4,5	<a href="#">Rule file</a>
6,8,12	<a href="#">Element properties</a>
9,11	<a href="#">Information unavailable in SYS600 process database</a>
10	<a href="#">User settings dialog box</a>

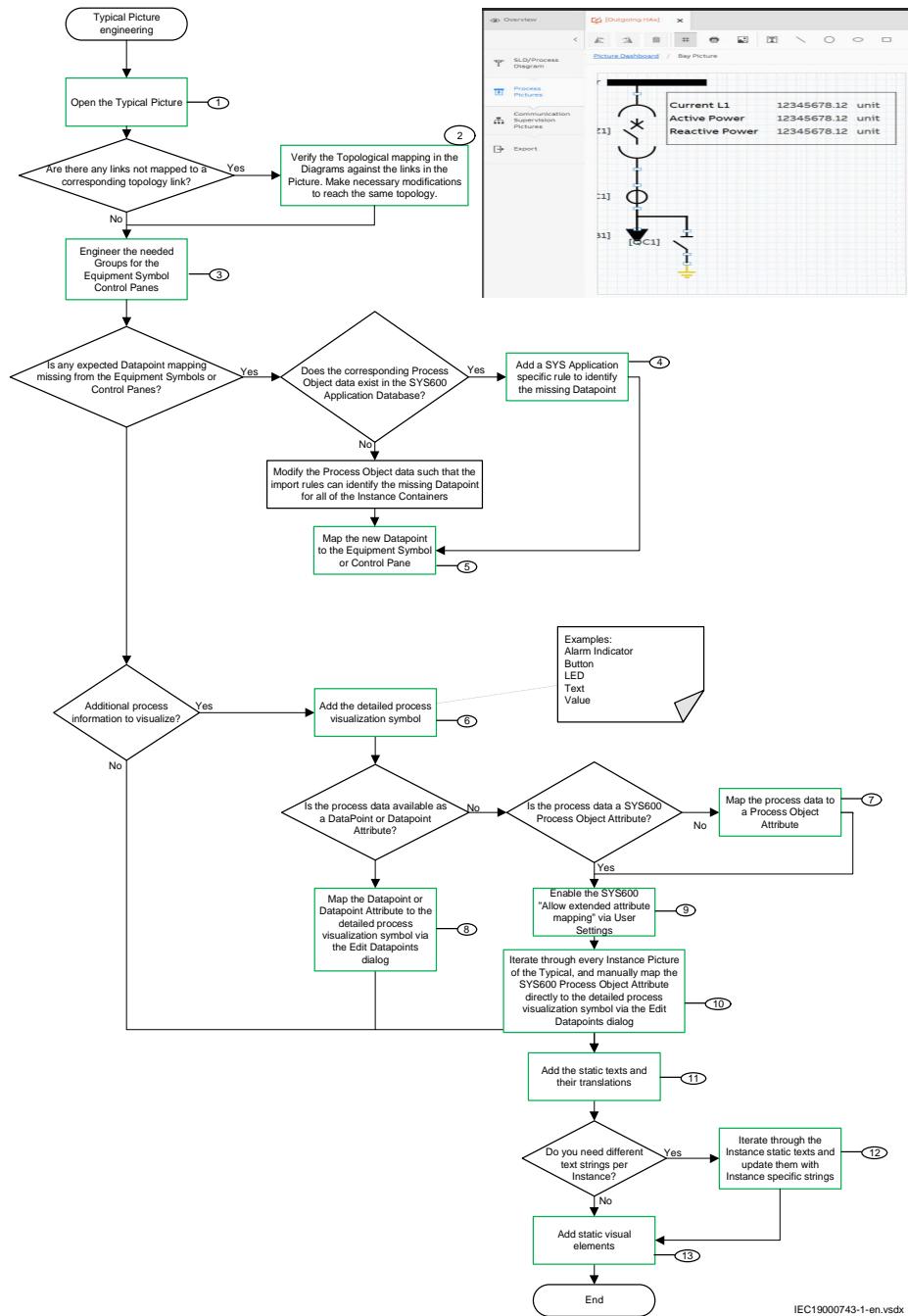


Figure 103: Typical Picture engineering

Pos. No	References
1	<a href="#">Process Pictures dashboard</a>
2	<a href="#">Creating the topology</a>
3,5,8,10,11	<a href="#">Element properties</a>
4	<a href="#">Rule file</a>

Table continues on next page

Pos. No	References
6,12,13	<a href="#">Process Picture editor</a>
7	<a href="#">Information unavailable in SYS600 process database</a>
9	<a href="#">User settings dialog box</a>

# Section 6      **Typicals**



Loss of data might occur when **Create Typical** and/or **Join to Typical** operations are performed on the Standalone Equipment Container where the user has already manually engineered the data. To minimize the potential loss of manual engineered data, always create a Typical or Instance structure following the workflow described in this section before engineering any data manually.

## 6.1      Overview

A Typical Bay can be thought of as a template for real Bays in a substation. Instead of configuring each real Bay separately, the configuration is done in the Typical Bay and is propagated automatically to the real Bays.

The Typical/Instance structure is built by creating Typical from an engineered standalone Bay, and joining other applicable standalone, which should inherit the Typical data for synchronization purpose. Joining a standalone to a Typical Bay creates a link between the Typical and the standalone, which is now considered an instantiated Bay. This link allows engineering data to be synchronized between the Typical and Instantiated Bays.

For example, Bay A1 is used to create a Typical Bay A and Bay A2 is joined to the created Typical Bay A. If a change is made to the Typical Bay A, this change is also applied to Instantiated Bay A1 and Instantiated Bay A2. This provides one-point of engineering for all Bays of the same type.

The following elements are synchronized between a Typical Bay and its instances:

- The single line diagram of a Bay including primary equipment, connections and SLD layout
- The engineered process and supervision pictures
- The signal and event mapping. For example,
  1. Given two Standalone Bays, A1 and A2
  2. Create Typical Bay A from Standalone Bay A1
  3. Bay A1 is now an Instance of Typical Bay A
  4. Join Standalone Bay A2 to Typical Bay A
  5. Bay A2 is now an Instance of Typical Bay A
  6. If a change is made to the Typical Bay A, this change is also applied to Instance Bays A1 and A2. This provides one-point of engineering for all Bays of the same type.

## 6.2      Creating Typical Bays from Bay standalone

An engineered standalone Bay should be used as a template to create a Typical Bay.

To create a Typical Bay from the standalone:

1. Switch **Navigation Pane** to **Workspace Explorer** (see [Section 3.4](#)).
2. Select the Engineered Standalone Bay from the structure.
3. Click **Typical/Instance Management/Create Typical**. The **Create a Typical from Standalone Bay** dialog box opens.

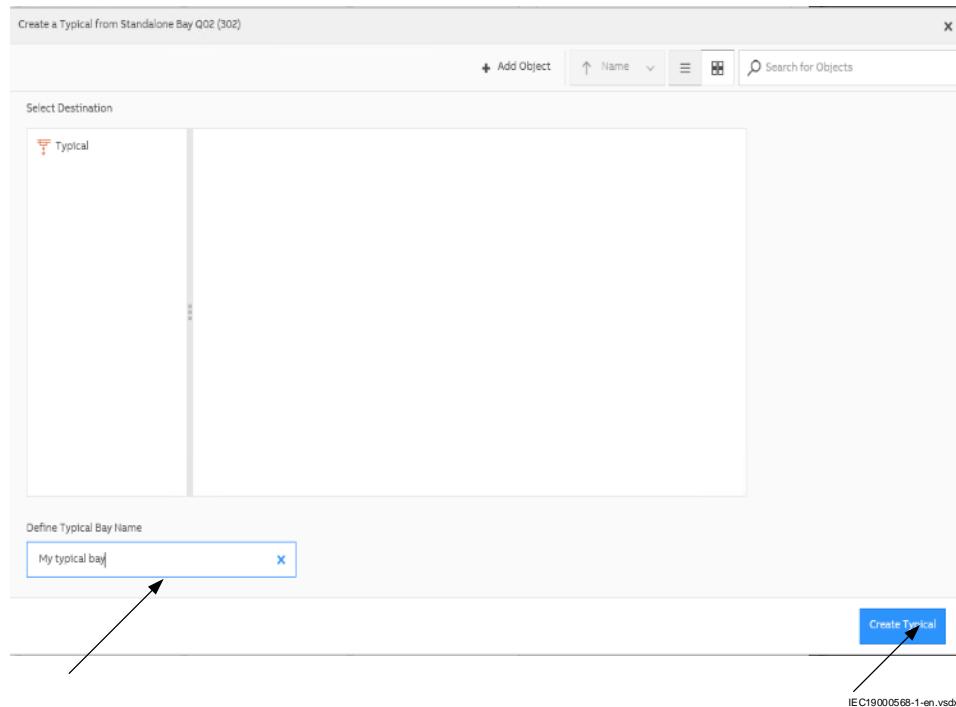


Figure 104: Create a Typical from Standalone Bay dialog box

4. Type the Typical Bay name in the **Define Typical Bay Name** field.
5. Click **Create Typical**.



Manually mapped data points might be lost while creating a Typical from a standalone. The manually created or updated data point mappings on the Typical should be re-checked after creating the Typical. The linked instances get automatically synchronized provided that the related SPI (Single Point Indication) data points use the same datapoint name relative to the Bay instance.

6. Since you have successfully created a Typical, continue the workflow and join other Bay standalones that shall get linked to the just created Typical (in case the structures fit). Click **Yes** to continue or click **No** to interrupt.

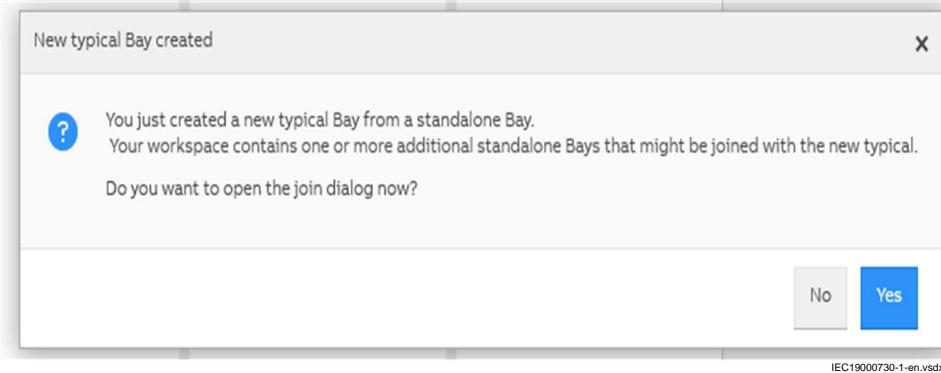
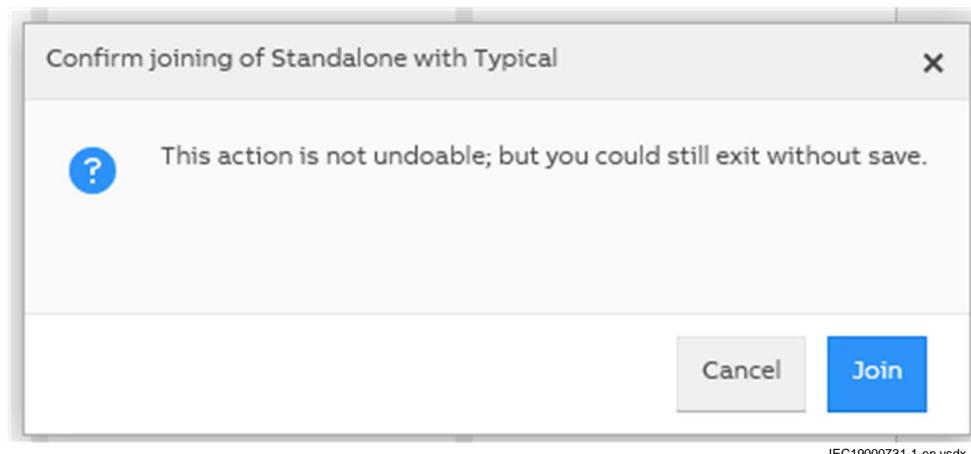


Figure 105: New Typical Bay created pop-up box

7. A pop-up displays a warning to the user that the next operation cannot be undone. Click **Join** to continue the workflow and join instances (see [Section 6.3.1](#)) or click **Cancel** to save the changes.



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*Figure 106: Pop-up for confirmation for joining of Standalone with Typical*

As a result, a new Typical Bay is added to the Typical structure and the source standalone Bay is turned into an instance of that Typical Bay. The Bay icon is changed from black (standalone) to blue (instance of Typical).

Most of the engineering related to the instance must be done on the Typical, except for a few things which can be manually engineered for each instance. See [Section 6.5](#) for a list of what can be engineered in the instances.



Select an imported Bay with its imported equipment as a base for Typical. A picture and a layout can be engineered after setting the Bay as Typical, but the imported functional object structure should not be changed. Further, the **Import** operation from the SYS600 process database is blocked when inconsistencies are detected in Typical Bays. These inconsistencies can be fixed manually.

## 6.3 Joining instances to Typical Bays



Ideally, when joining a standalone to a Typical, all specific engineering of that standalone is replaced with the Typical data; do not engineer on such standalone before the **Join** operation.

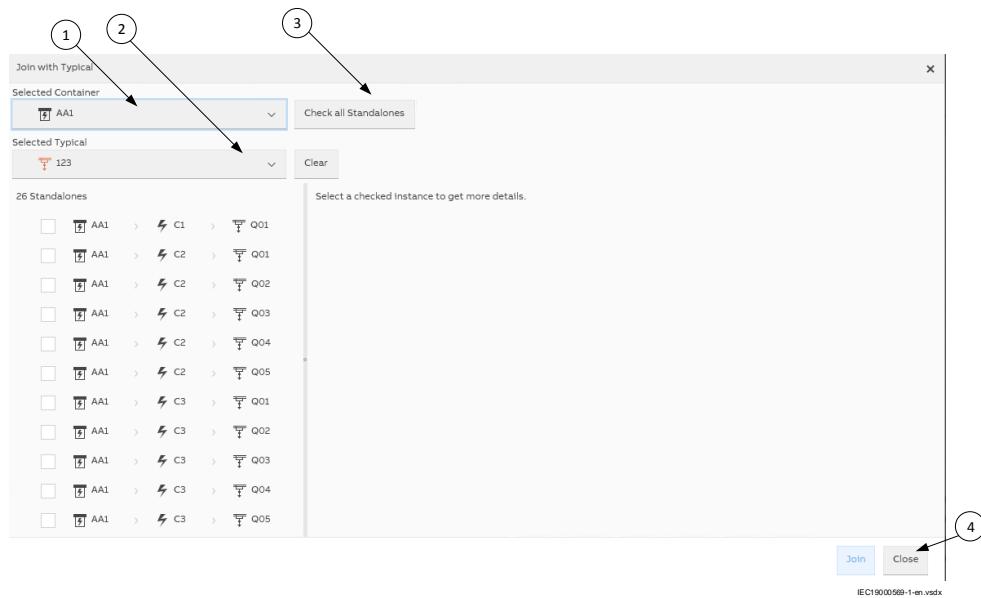
To join a standalone Bay to a Typical Bay:

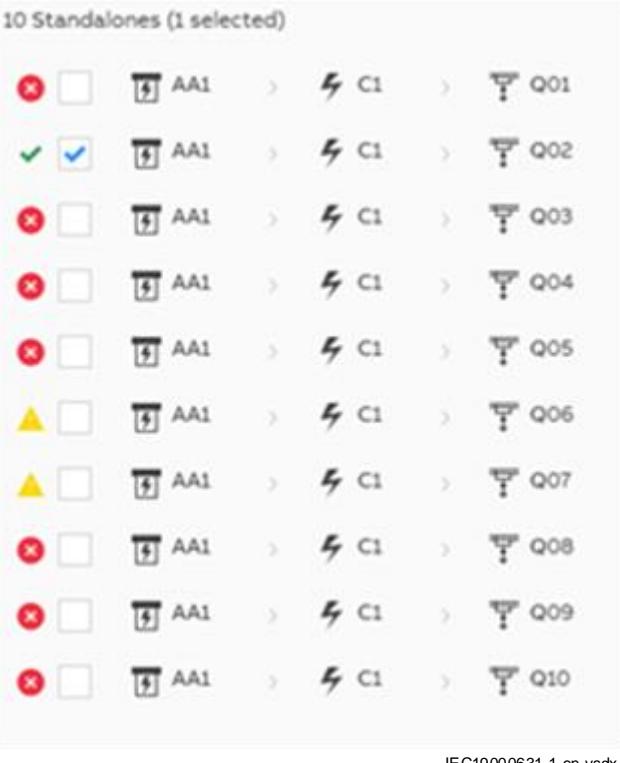
1. Switch the **Navigation Pane** to **Expanded Workspace Explorer** and **Typical** (see [Section 3.4](#)).
2. Select a standalone Bay from the structure.
3. Click **Typical/Instance Management / Join with Typical** (see [Section 6.3.1](#)).
4. Repeat steps 2 and 3 for all the standalone Bay that should be joined to a Typical or do all the joining operations available at the same time with the multi-join interface.

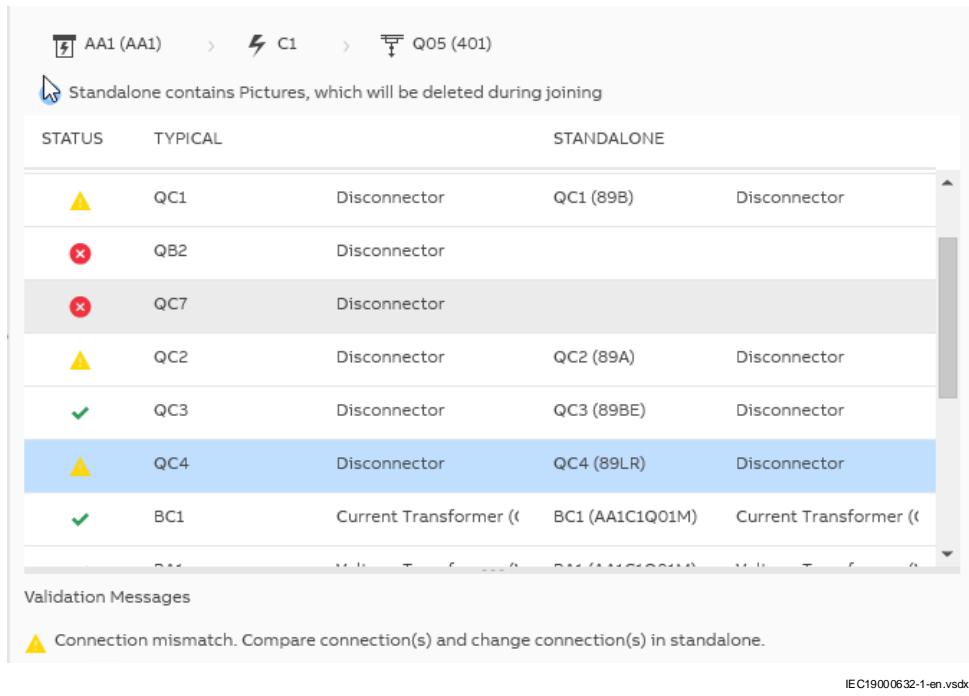
As a result, standalone Bays are changed to instances of the Typical Bay. Bay icons are changed from black (standalone) to blue (instance of Typical). Now, most of the engineering related to the instances must be done on the Typical structure (see [Section 4.5](#) for outlier cases).

### 6.3.1 Join with Typical dialog box

After clicking **Join with Typical**, the **Join with Typical** dialog box opens.



Pos. No.	Functionality	Description
1	Selected Container	Click the drop-down list to select a higher-level parent equipment container to extend the list of target standalones to be checked against the selected typical.
2	Selected Typical	Click the drop-down list to select the typical to be joined.
3	Check all Standalones	<p>Once the container with the list of candidates standalone and the typical are selected, click <b>Check all Standalones</b>.  The tool analyzes the structure of the standalone and shows whether the standalones are compatible with the selected typical.</p> <ul style="list-style-type: none"> <li>• Standalones with compatible structure are automatically checked.</li> <li>• Standalones with structures fitting the typical with warnings only get displayed with a warning icon and can be manually checked. Select the checked instance for displaying more details on the warning</li> <li>• Standalones with structures not fitting the typical get displayed with an error icon and cannot be checked. Check the problematic standalone for details on why the standalone does not fit the typical.</li> </ul>  <p>The error sign does not necessarily mean that there is an engineering error, it only means that the standalone is not compatible with the selected typical.</p>  <p>IE C19000631-1-en.vsdx</p>
4	Join/Close	Click <b>Close</b> to cancel the Join operation anytime. If there are no missing elements or incompatibility errors in the selected standalones, the <b>Join</b> button is enabled. Click <b>Join</b> to complete the join with typical operation.

Functionality	Description																																						
Status and validation message	<p>The typical and standalone bay structure is displayed side-by-side, to show how the existing elements are linked.</p> <p> The linking algorithm is based on the internal name structure; only expert user should manipulate the internal name.</p> <p>The STATUS column displays a green tick mark if the link can be resolved. The STATUS column displays a red circle with white cross, when the element only exists in one of the two structures. The validation message displays the missing standalone or typical accordingly.</p> <p> Before editing the structure to comply (preferably on the source product data), double check that the right standalone with the right typical is selected.</p> <p>The STATUS column displays a yellow warning sign when there is a connection mismatch. Such warning does not prevent the Join operation. The typical connection overrides the standalone one.</p> <p> Connection mismatch only appear if the topology engineering is done in the SLD/Process Diagram for both bays. Verifying that the topology is correct on the typical is enough – the standalone topology is corrected automatically during the join operation.</p>  <table border="1" data-bbox="468 1044 1405 1493"> <thead> <tr> <th>STATUS</th> <th>TYPICAL</th> <th>STANDALONE</th> </tr> </thead> <tbody> <tr> <td>⚠</td> <td>QC1</td> <td>Disconnecter</td> <td>QC1 (89B)</td> <td>Disconnecter</td> </tr> <tr> <td>✗</td> <td>QB2</td> <td>Disconnecter</td> <td></td> <td></td> </tr> <tr> <td>✗</td> <td>QC7</td> <td>Disconnecter</td> <td></td> <td></td> </tr> <tr> <td>⚠</td> <td>QC2</td> <td>Disconnecter</td> <td>QC2 (89A)</td> <td>Disconnecter</td> </tr> <tr> <td>✓</td> <td>QC3</td> <td>Disconnecter</td> <td>QC3 (89BE)</td> <td>Disconnecter</td> </tr> <tr> <td>⚠</td> <td>QC4</td> <td>Disconnecter</td> <td>QC4 (89LR)</td> <td>Disconnecter</td> </tr> <tr> <td>✓</td> <td>BC1</td> <td>Current Transformer (</td> <td>BC1 (AA1C1Q01M)</td> <td>Current Transformer (</td> </tr> </tbody> </table> <p>Validation Messages</p> <p>⚠ Connection mismatch. Compare connection(s) and change connection(s) in standalone.</p> <p>IEC1900632-1-en.vsdx</p>	STATUS	TYPICAL	STANDALONE	⚠	QC1	Disconnecter	QC1 (89B)	Disconnecter	✗	QB2	Disconnecter			✗	QC7	Disconnecter			⚠	QC2	Disconnecter	QC2 (89A)	Disconnecter	✓	QC3	Disconnecter	QC3 (89BE)	Disconnecter	⚠	QC4	Disconnecter	QC4 (89LR)	Disconnecter	✓	BC1	Current Transformer (	BC1 (AA1C1Q01M)	Current Transformer (
STATUS	TYPICAL	STANDALONE																																					
⚠	QC1	Disconnecter	QC1 (89B)	Disconnecter																																			
✗	QB2	Disconnecter																																					
✗	QC7	Disconnecter																																					
⚠	QC2	Disconnecter	QC2 (89A)	Disconnecter																																			
✓	QC3	Disconnecter	QC3 (89BE)	Disconnecter																																			
⚠	QC4	Disconnecter	QC4 (89LR)	Disconnecter																																			
✓	BC1	Current Transformer (	BC1 (AA1C1Q01M)	Current Transformer (																																			

## 6.4 Disconnecting instances from Typical Bays



Engineered data is not lost because of disconnecting an instance from its Typical. Engineered data is eventually lost when trying to join the new standalone to an existing Typical. For this reason, disconnection should be avoided whenever possible.

It is possible that an engineered Typical or Instance structure prevent further import from the SYS600 process database – in case a change in the source data is not compatible with the Typical or Instance structure constrains. Disconnecting instances allow to proceed with the engineering.

To disconnect an instance bay from a typical bay:

1. Switch the navigation pane to Workspace Explorer (see [Section 3.4](#)).
2. Select the instance bay from the structure.
3. Click **Typical/Instance Management/Disconnect from Typical**.

As a result, the instance bay is changed to a standalone bay. The bay icon is changed from blue (instance of typical) to black (standalone).

## 6.5 Engineering picture on instance level

After a Typical or Instance relation is created, most of the engineering is done on the Typical Bay.

[Table 5](#) lists the picture data that can be specifically engineered on an instance independent of the typical.

Picture data	Description
Primitive graphic text See <a href="#">Section 3.8.2.2</a> .	Select text area to override the text from the Typical in the instance. After being overridden, the changes for that text in the Typical will not be propagated anymore.
Translation See <a href="#">Section 3.8.2.3</a> .	Overridden text can have specific translation engineered.
Data Points See <a href="#">Section 3.8.4.2</a> .	When engineering data points in Typical, the tool tries to map instance data points accordingly. When such mapping is not automatically propagated, a red icon is displayed on the Typical data point with a list of unmapped instances. Such mapping shall then be done directly on the instance level.
Busbar Symbol equipment mapping See <a href="#">Annexure B</a>	Override the default Busbar symbol equipment mapping.

## 6.6 Typicals import or export

### 6.6.1 What does a typical contain?

A typical contains three types of diagrams such as SLD Process Diagram, Process Pictures and Communication Supervision Pictures. In each of these diagrams, you can add functional structure nodes and draw links between them. Therefore, whenever you export or import a typical, it will have all these elements.

Moreover, a typical also includes user-defined symbols. In the **Symbol Editor**, you can choose a symbol from the symbols list to modify and publish in the **Elements** tab.

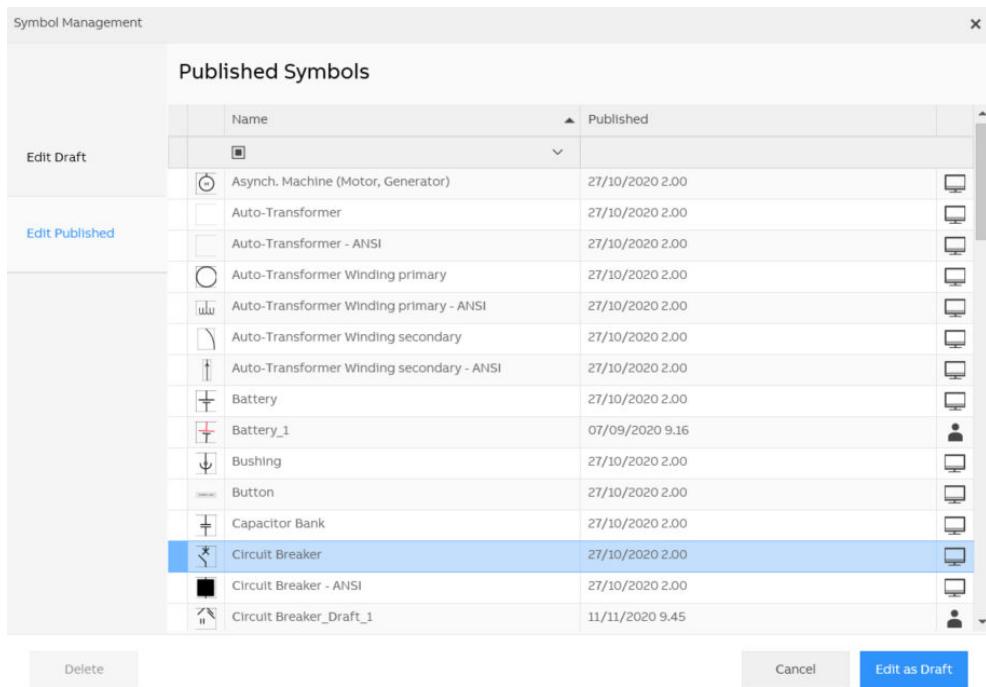


Figure 107: Symbol Editor

After importing, if the typical contains user-defined symbols, these symbols will be available in the **Symbol Editor/Elements** tab, next to the other default symbols.

[Section 6.6.2](#) and [Section 6.6.3](#) describe how to export and import typicals, respectively and [Section 6.6.4](#) lists some limitations or rules to be considered.

## 6.6.2 Exporting a typical

When a typical is exported, all the diagrams containing functional structure nodes and links are exported. The **Export** feature is available under **Data Exchange Center**.

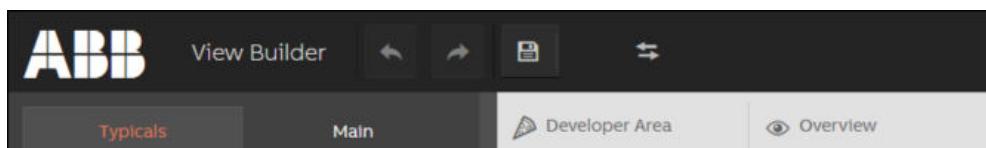
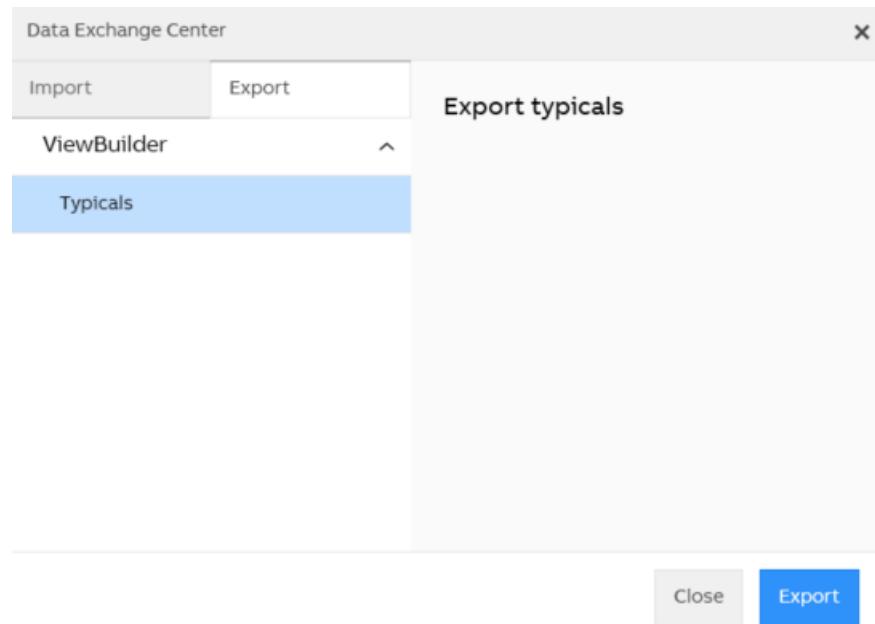


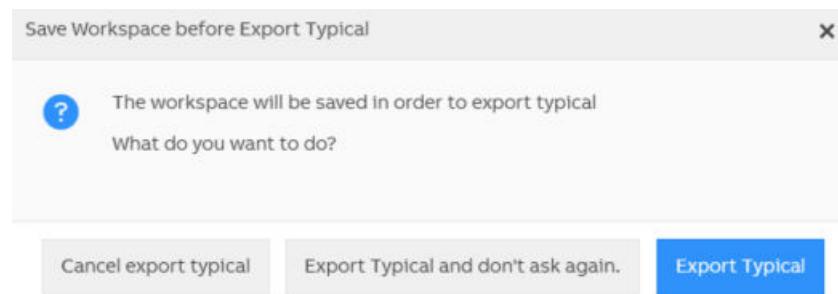
Figure 108: Data Exchange Center

1. In the **Data Exchange Center**, click the **Export** tab.



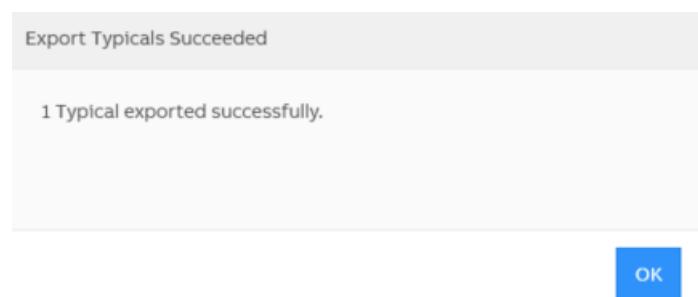
*Figure 109: Export tab*

2. Click **Export Typical** to confirm and choose the folder to export to.



*Figure 110: Confirm Export Typical*

If the export is successful, a message pop-up is displayed.



*Figure 111: Export confirmation message*

You can ensure the export by navigating to the exported folder and searching for **.saetyp** file. This is the typical file that was exported from the workspace.

## 6.6.3 Importing a typical

When you import a typical into the current workspace, all the diagrams, functional structure nodes, links and user-defined symbols will be imported.

1. From the main window, open **Data Exchange Center**.

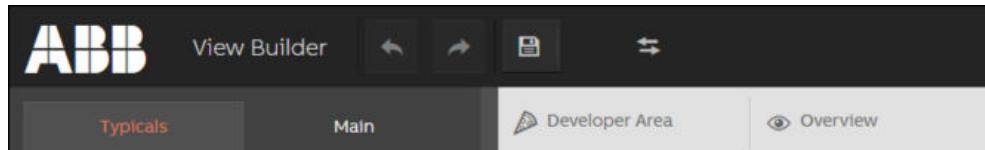


Figure 112: Data Exchange Center

2. In the **Data Exchange Center** window, click the **Import** tab.

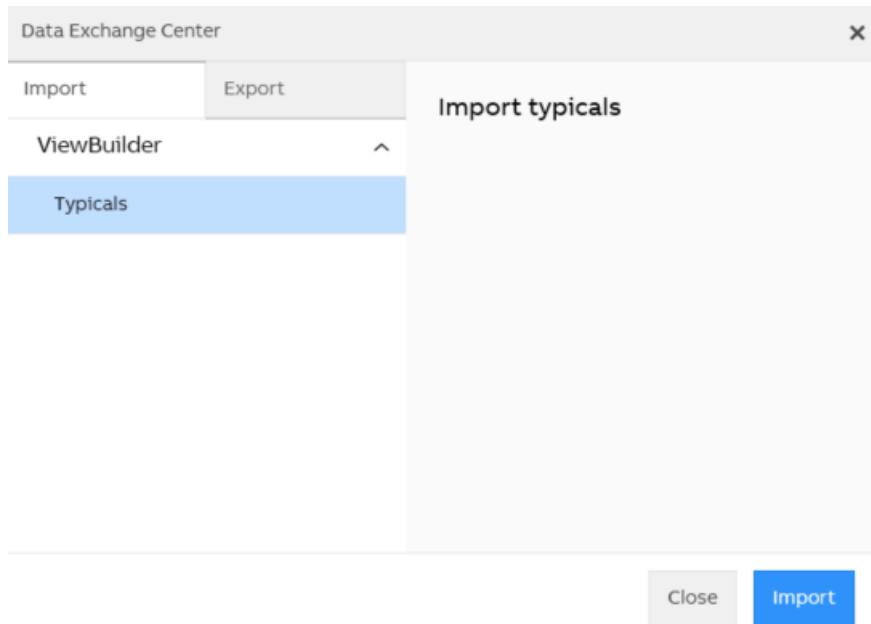


Figure 113: Import tab

3. Click **Import** and navigate to the folder in which the typical file is located.
  4. Select the typical file to be imported.
- If the import is successful, a message pop-up is displayed.

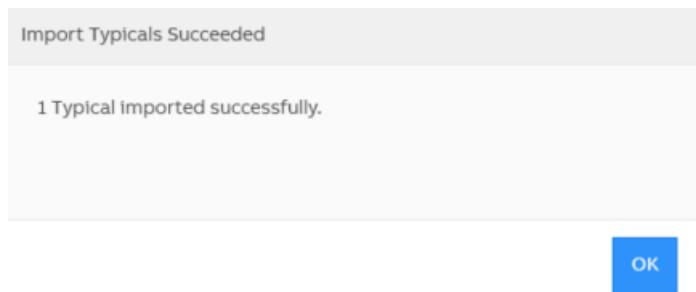
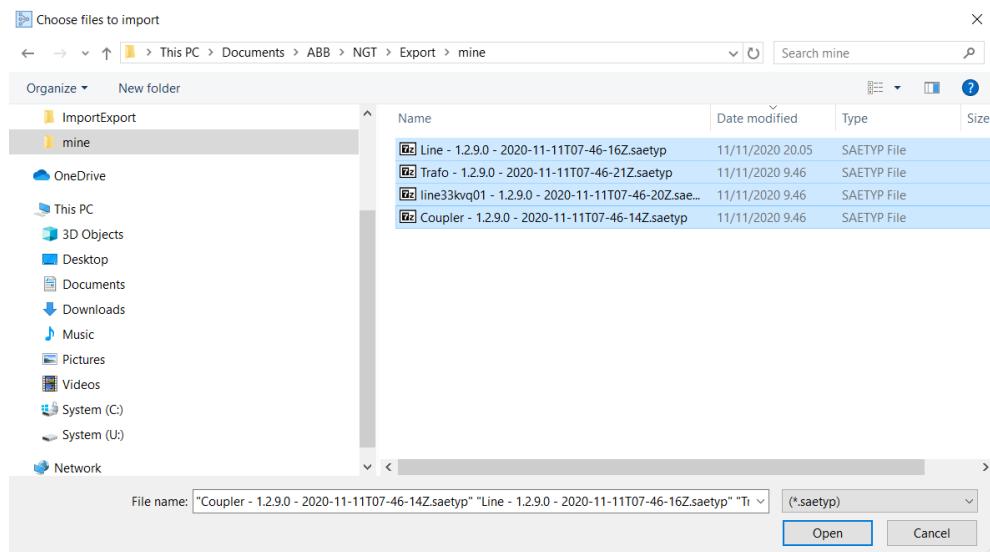


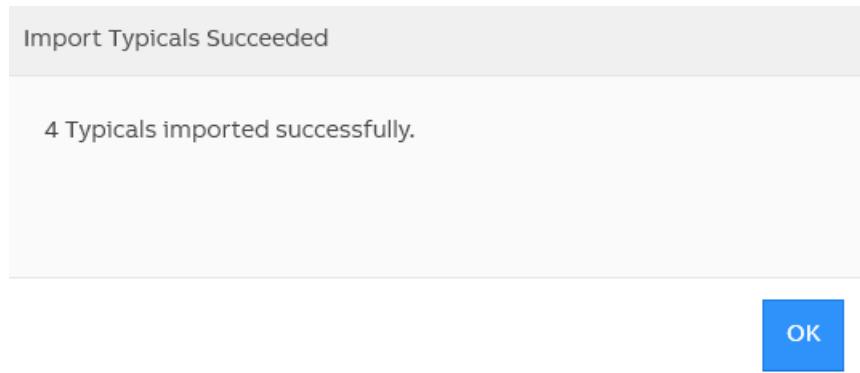
Figure 114: Import confirmation message

Additionally, it is possible to select multiple typical files to import.



*Figure 115: Import multi-selection window*

When multiple files are imported successfully, a message pop-up is displayed.



*Figure 116: Import multi-selection confirmation message*

If you re-import the same typical bay into the working workspace, then also a new bay can be added. All bays imported from the same typical file will be structurally identical except the names, which will be post-fixed with the underscore and numbers.

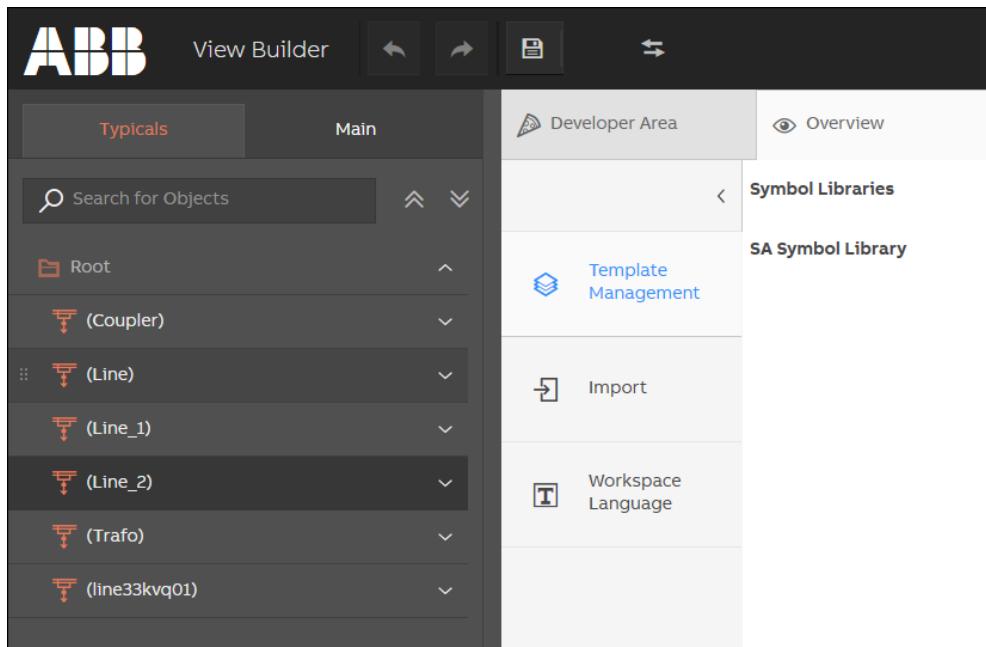


Figure 117: Import duplicate typical

## 6.6.4 Limitation and rules

- When you import a typical into the current working workspace, the version of the View Builder tool which is generated in the to-be-imported typical must not be newer than the version of the existing tool.
- When you import a typical into the current working workplace, the versions of the symbol templates in the to-be-imported typical must not be newer than the one in the existing working workspace.
- If there is any symbol that has a newer template version than the one used in the existing working workspace, the typical containing that symbol cannot be imported.

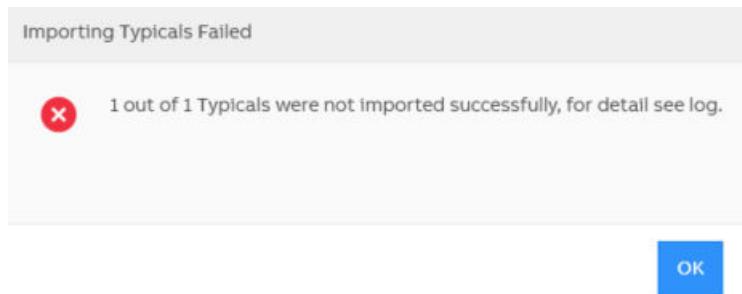


Figure 118: Import fail

- If an import fails because of the template version issue, the error messages can be viewed using the Warning or Error icons, which states that the imported Symbol Template has a newer version compared to the one in the current workspace.

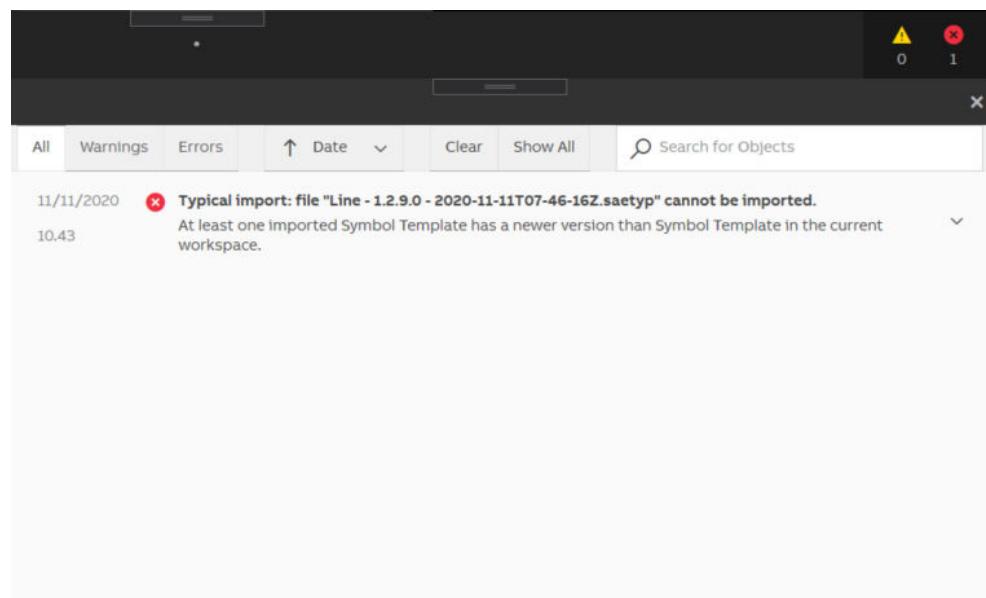


Figure 119: Import fail message

- Templates can be updated manually by navigating to the **Overview** tab and clicking **Check for Updated Templates**.

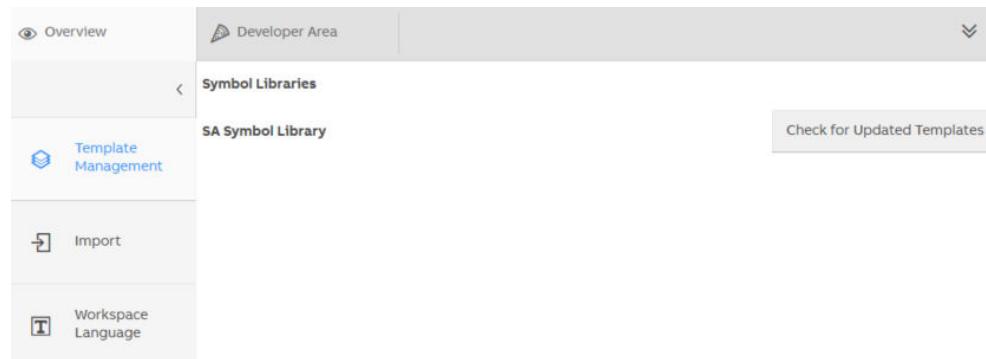


Figure 120: Update template



# Section 7      Symbol Editing



The **Symbol Editor** currently allows to modify most, but not all parts of a Symbol, for example, you cannot modify the emblems at its four corners. This section will provide the overview of what is editable currently and limitations. Note that features in the **Symbol Editor** rely on the latest version of the Symbol Template. It is recommended to update the Symbol Template to latest version before using the **Symbol Editor**. See [Section 3.3](#) for more information.

## 7.1 Overview

To efficiently assemble a Process Diagram/SLD or Picture a project, a project engineer normally uses Symbols from a Symbol Library, so that he/she need not be bothered about the detailed internal workings of a Symbol, its dynamic logic etc.

The View Builder is consciously keeping the workflow of assembling a Diagram or Picture separate from the workflow of editing a Symbol. The latter typically requires more experience, unless only a slight graphical modification is needed.

Accordingly, the View Builder provides a dedicated **Symbol Editor** which allows to configure graphics and dynamic logic of a Symbol in a quite detailed, but still user-friendly manner. While assembling or modifying a Symbol, you may separately save it and test it. Once you are satisfied with its implementation, you can then publish it to make it ready to be used on diagrams and pictures.

## 7.2 Notice on current restrictions for Symbol Editing

The **Symbol Editor** is the tool for creating new Symbols and modifying existing Symbols. However, its current implementation still has some important restrictions; consider them into account when using it.

Be aware of the following:

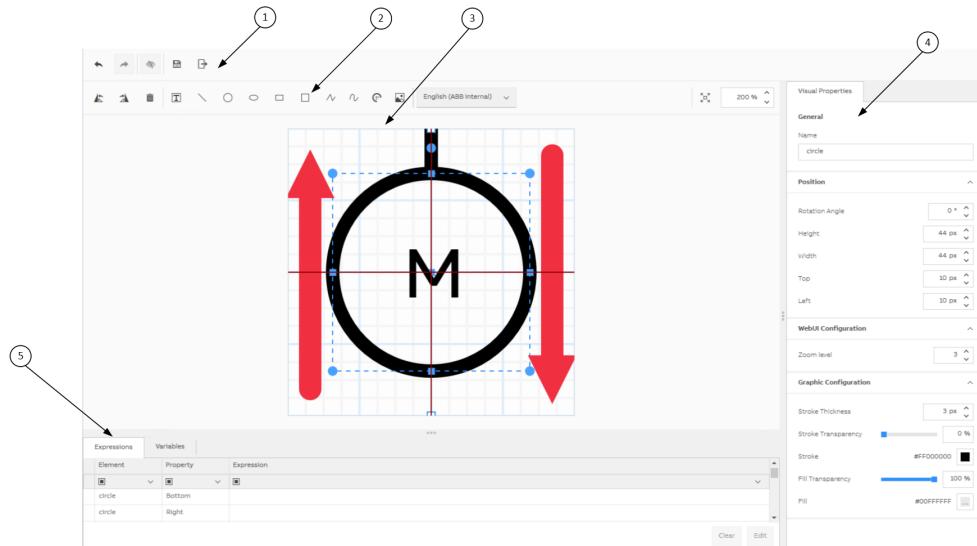
- 1) All Symbols have a common background and common behavior how they visualize certain conditions, for example, alarm and blocking emblems, etc. This visualization and logic cannot be modified in the **Symbol Editor**.
- 2) Few graphical attributes (for example, a fill color) can be set either via **Properties** pane or dynamically via expression. If you have created a complex expression, and later accidentally modify the same attribute in the **Properties** pane, your expression will be overwritten without warning by the value you set in the **Properties** pane. As a protection, it is recommended to save often and copy/paste a complex expression into a simple text file as a backup.
- 3) When some properties are set by expression (for example, the fill of a rectangle, if its border/stroke is transparent), the object may become invisible in the editor, because the editor currently cannot use the expression to display the object. You can still select it via Window Selection, if you know where the object is. Alternatively, for example, you can keep the border/stroke visible and make it invisible only after you have completely tested the expression.

4) The current Value Symbols have a complex internal logic which cannot be modified in the **Symbol Editor**. However, you can design your own Value Symbol to fit a specific purpose, if requested.

## 7.3 User interface

### 7.3.1 Overview

The editor is composed of five main regions:



Pos.No.	Region
1	Application bar
2	Tool bar
3	Main area (graphical editor)
4	Properties tab
5	Expressions tab

### 7.3.2 Application Bar



Pos.No.	Functionality	Description
1	Undo	Reverts last change
2	Redo	Brings back last undone change
3	Preview	Opens preview window
4	Save	Saves changes
5	Publish	Publishes currently edited draft

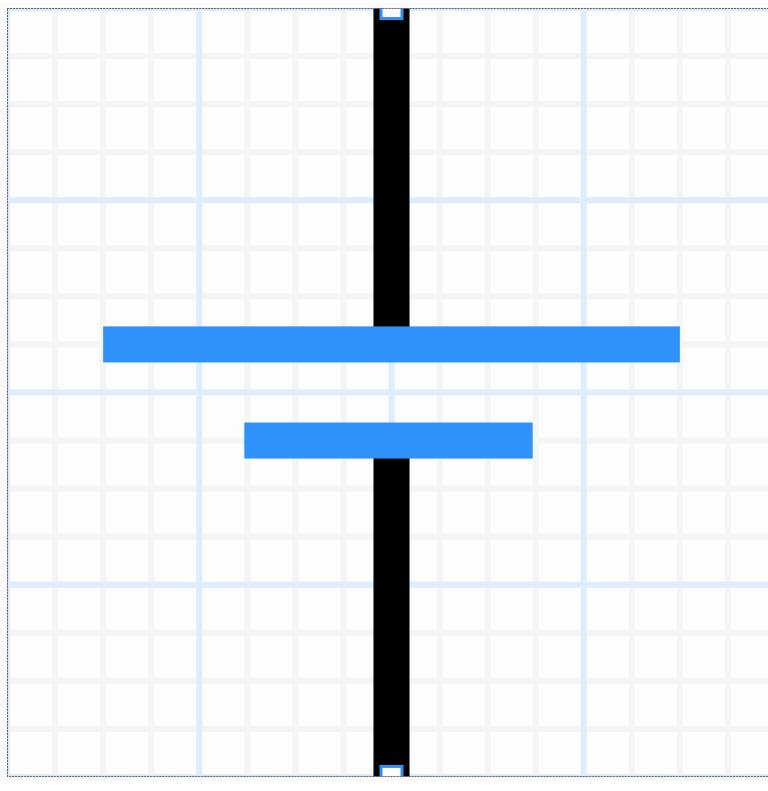
### 7.3.3 Tool Bar



Pos.No.	Functionality	Description
1	Rotate left	Rotates current selection 90 degrees left
2	Rotate right	Rotates current selection 90 degrees right
3	Delete	Deletes current selection
4	Text	Insert Text
5	Line	Insert Line
6	Circle	Insert Circle
7	Ellipse	Insert Ellipse
8	Rectangle	Insert Rectangle
9	Square	Insert Square
10	Polyline	Insert Polyline
11	Bezier	Insert Bezier
12	Arc	Insert Arc
13	Picture	Insert Picture
14	Language	Change Workspace Language
15	Zoom to fit	Sets zoom so that the content fits the Editor size
16	Zoom	Zoom to required zoom level

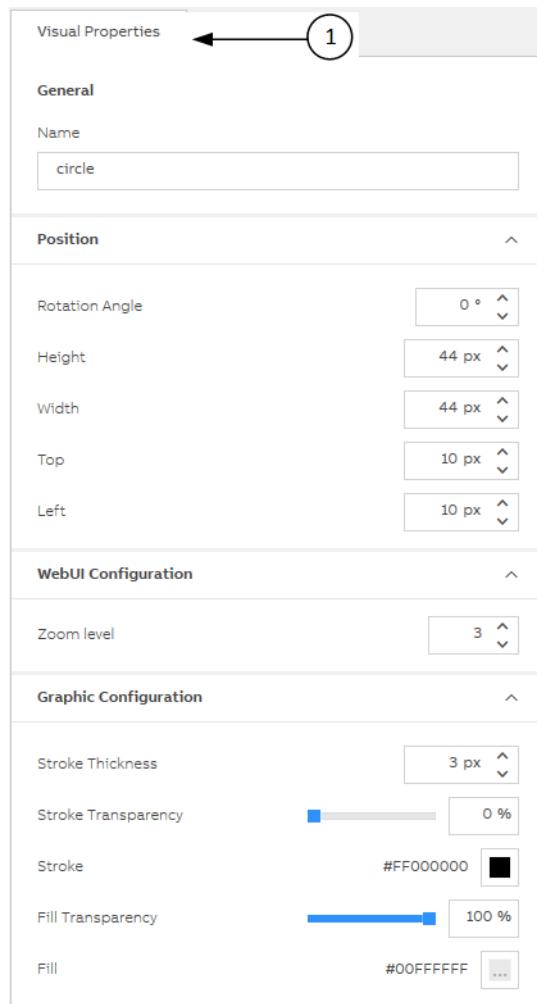
### 7.3.4 Main Area

The Main Area is the actual graphical editor and the Symbol with all its graphical elements. You can select them and modify some of their properties.



### 7.3.5 Configuration Panes

The **Visual Properties** tab is located on the right side of the main area.



The **Expressions** and the **Variables** tabs are on the bottom of the main area.

Element	Property	Expression
circle	Bottom	
circle	Right	

Pos.No.	Functionality	Description
1	<b>Visual Properties</b>	Contains editors that let you modify the visual properties of elements selected on the canvas, for example, size, colors, text, and other options. The contents of all the <b>Configuration</b> panes depend on the selection.
2	<b>Expressions</b>	For each graphical element, you can edit the existing or add new expressions to control the dynamic behavior of the symbol.
3	<b>Variables</b>	Manage the existing and new variables (primitives or Datapoints) to be used in the expression.

## 7.4 Workflow

### 7.4.1 Overview

When you edit a Symbol, it goes into a **Draft** stage. You can edit it in multiple sessions and save your changes repeatedly. You can also delete a draft, create several draft versions from the same Symbol, which can be modified and saved independently.

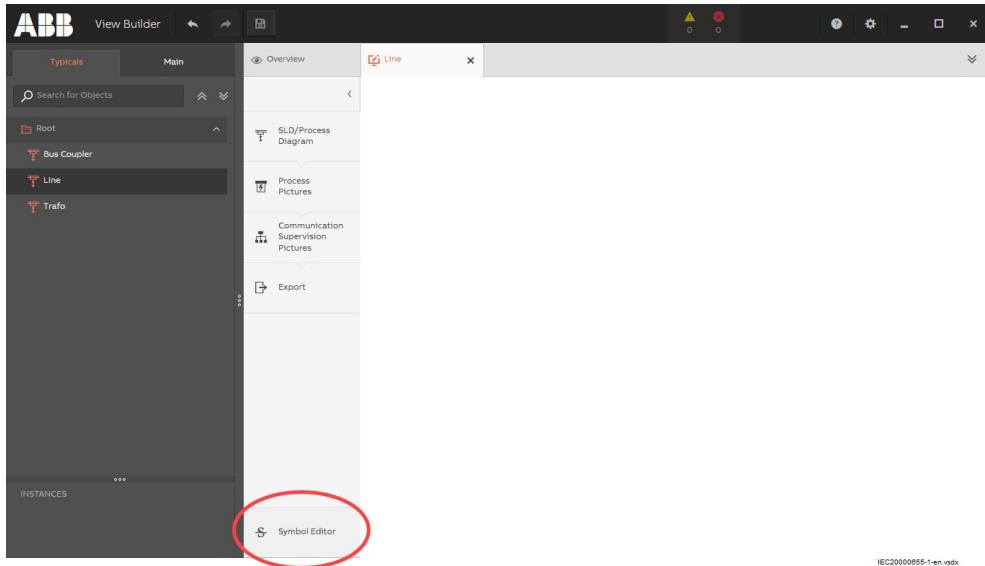
When you have done all the desired changes, you can publish the symbol. Only after publishing it, it will become available in the **Elements** tab and can be inserted onto diagrams and pictures.

The workflow to modify a Symbol is done in the following steps:

1. Open the **Symbol Editor**.
2. Open a symbol for editing.
3. Repeatedly modify it as desired and save it.
4. Once all intended modifications are done, publish it.
5. Delete Drafts which you do not need anymore.

### 7.4.2 Open the Symbol Editor

When any object is opened in a tab, the Symbol Editor is available at the bottom of the **Editors** list in the Tab.



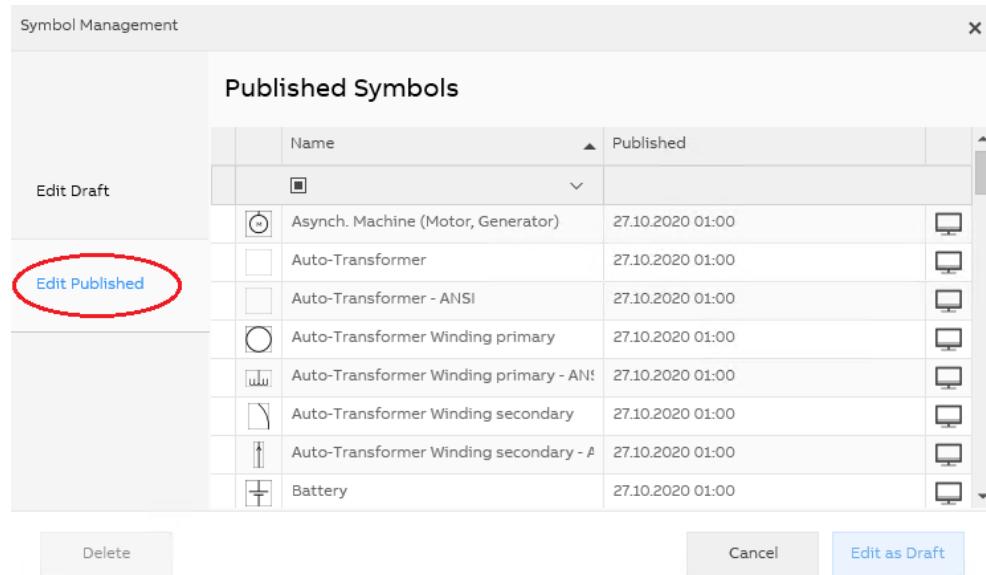
Click **Symbol Editor** to edit the Symbol, the Symbol Management Dialog opens.

### 7.4.3 Open a Published Symbol for editing

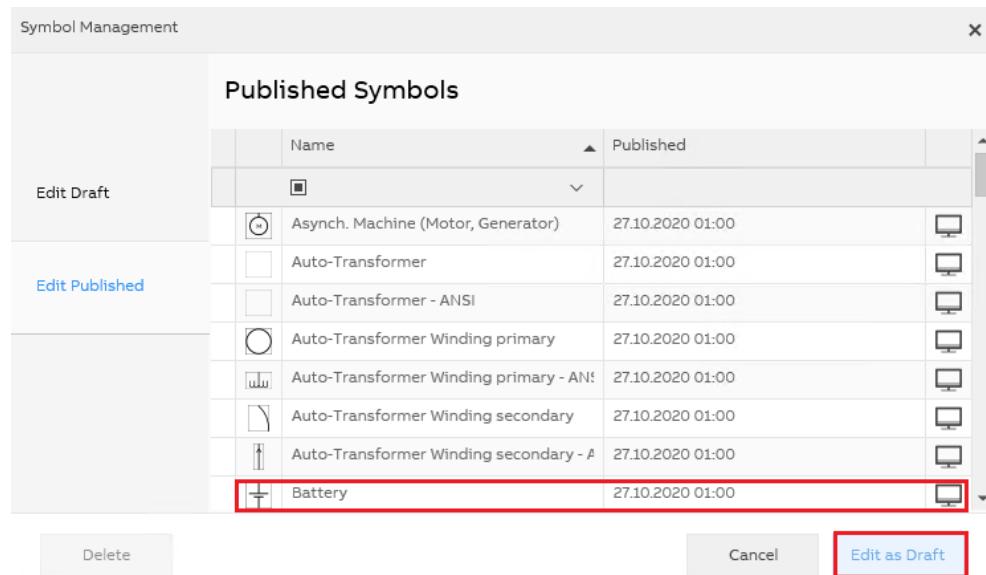
When editing a published Symbol, it will always be opened and saved as Draft, until you publish it with some changes. This will prevent the user from overwriting the existing published Symbols with inadvertent modifications.

When editing a Symbol for the first time, you will not have published Symbols available. Therefore:

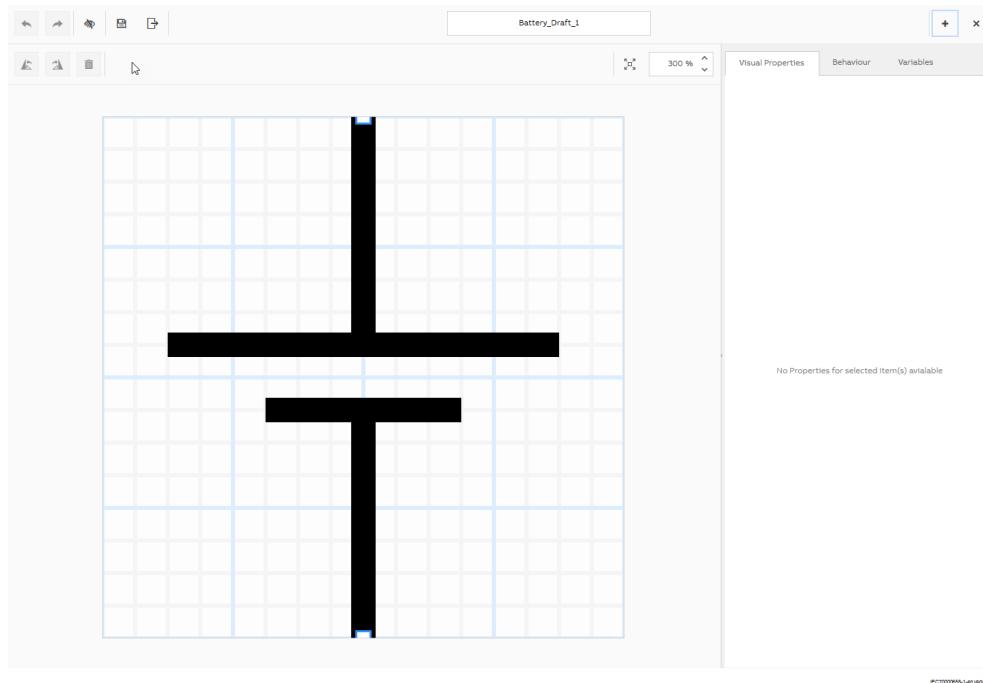
- Select the **Edit Published** tab - to see a list of all published Symbols from the **Elements** pane.



- Select the Symbol you want to edit.



- Click **Edit as Draft** to open the Symbol in a new tab.



4. The draft gets a default name (<original Symbol name>\_Draft\_1). It is recommended that you give a meaningful name to the Symbol, as the name appears in the **Drafts** list and in the **Editor** tab header. Edit the name in the text field marked above.

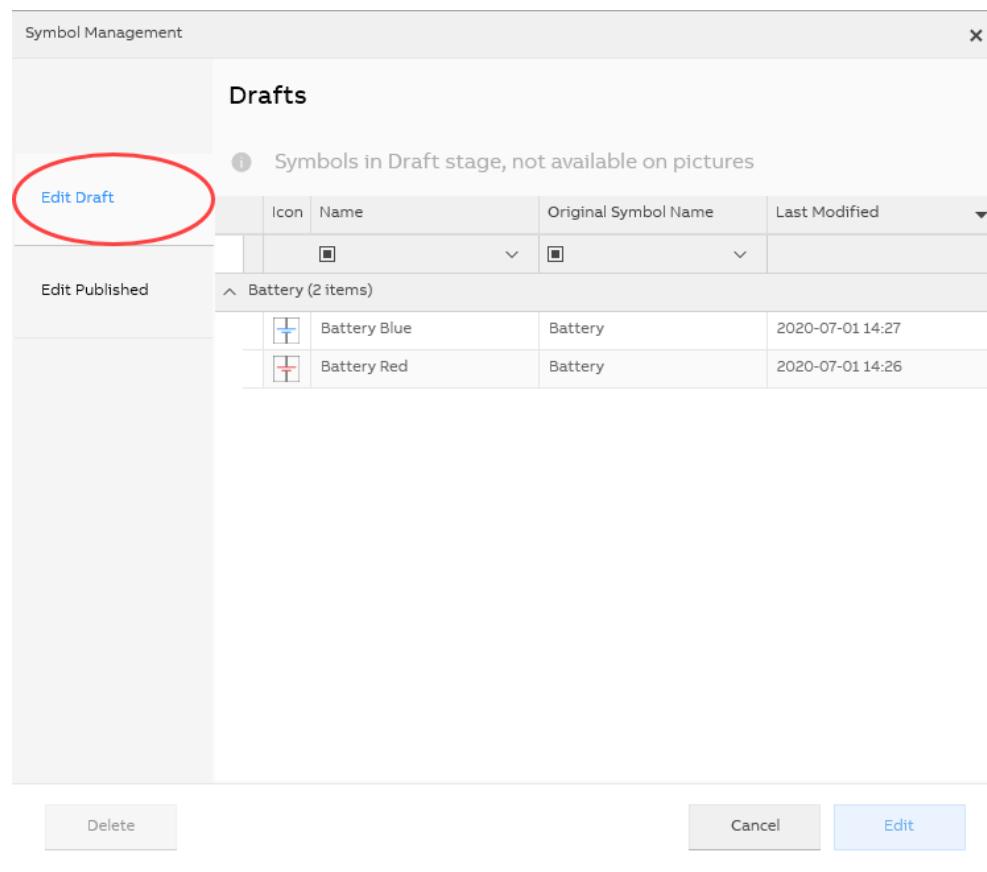
Whenever you start from the tab **Edit Published**, a new draft will be created. This allows you to try several different modifications to present to the customer or test them.

To modify an existing draft, see [Section 7.4.4](#).

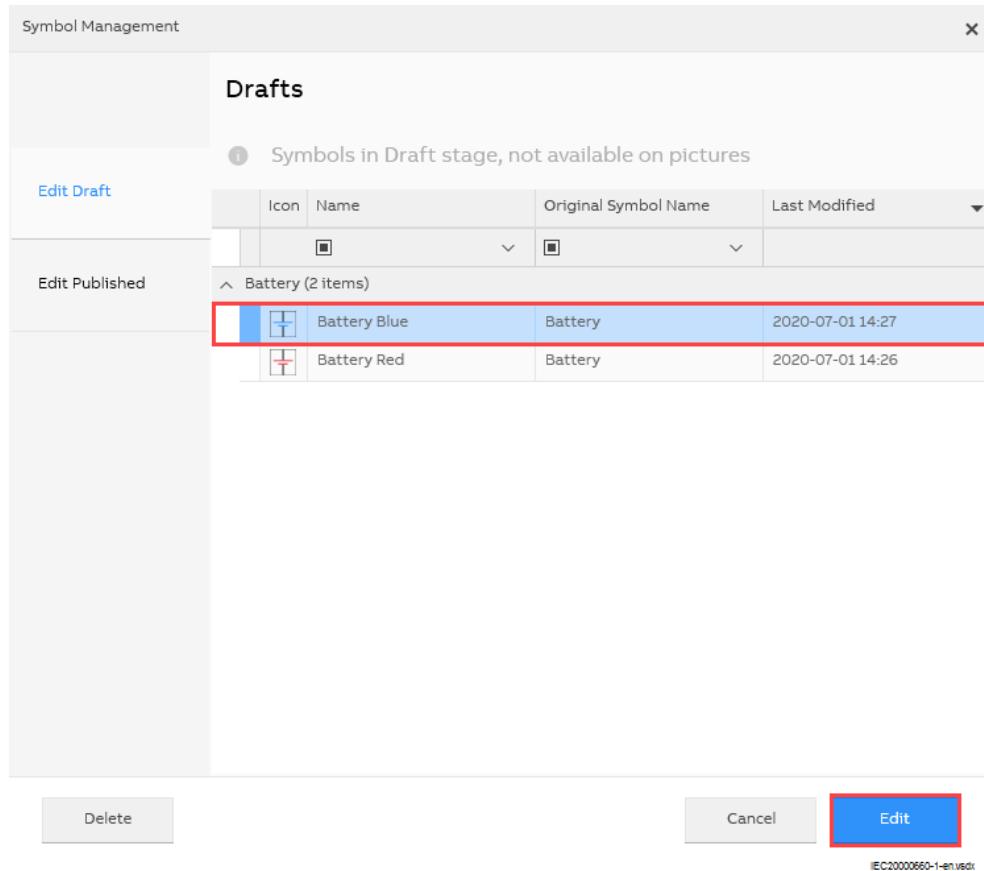
#### 7.4.4 Open a Draft for Renewed Editing

If you have already modified and saved them, then they will appear in a separate **Drafts** list. In the following example, we assume that you have created two different draft versions of a Battery Symbol. To edit one of those Drafts:

1. Select the tab **Edit Draft** to see a list of all Drafts in your workspace.



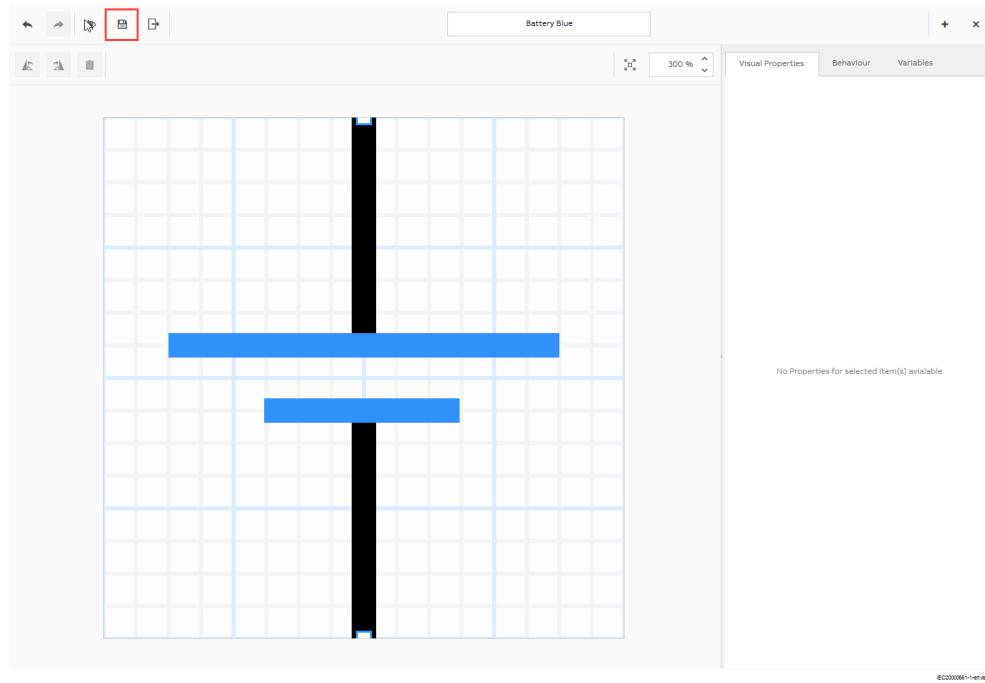
2. Select the Symbol Draft to be edited.



3. Click **Edit** to open the Draft Symbol in a tab.  
If by any chance, the Symbol is already opened in a Tab, then that particular Tab will be activated. Draft Symbol cannot be opened in two different Tabs simultaneously.

## 7.4.5 Save a Modified Symbol

As soon as the symbols are modified, the **Save** button in the tool bar will be activated. Click **Save** to save the changes.



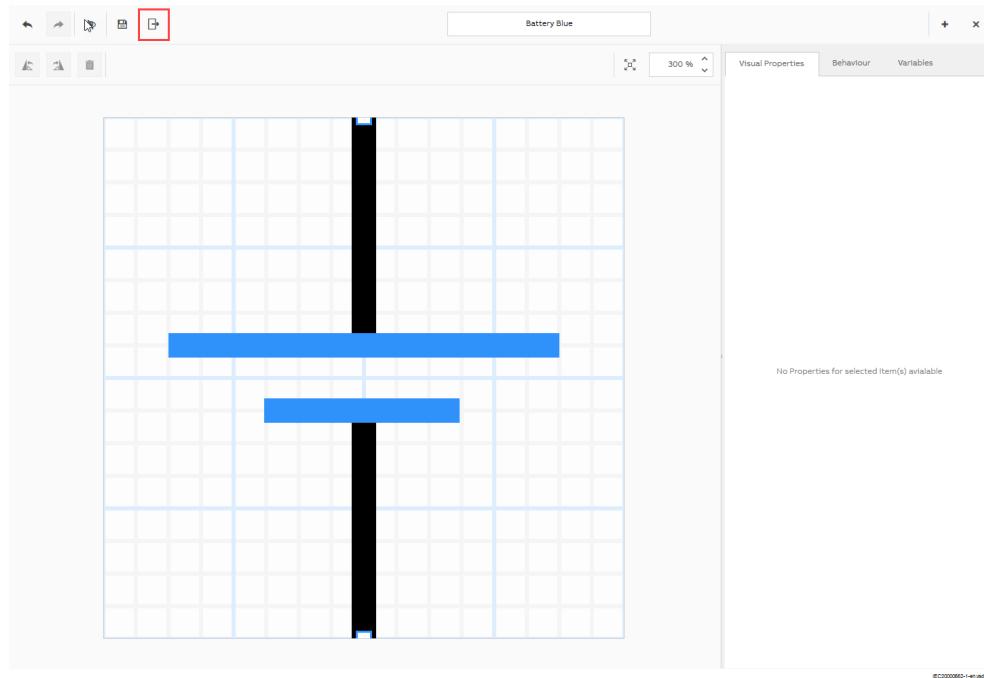
Close the **Editor** tab to discard the changes.

If you have started from **Edit Published**, and closed the **Editor** tab without saving the draft, nothing will be saved, and you will not have any draft remaining.

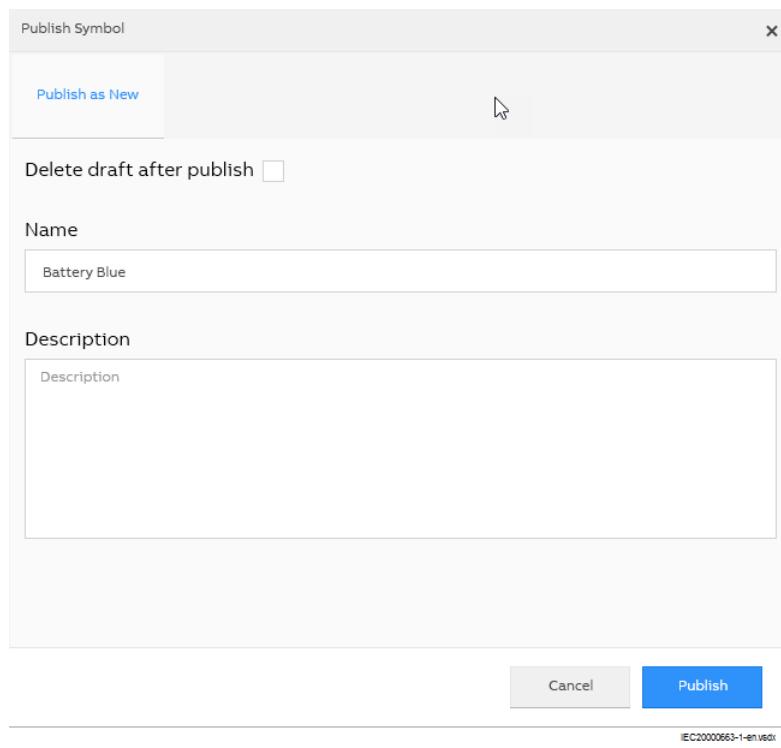
#### 7.4.6 Publish a Symbol

If satisfied with the changes and want to use the Symbol in a picture:

1. Click **Publish** button to open **Symbol Publish** dialog box.



2. The name at the moment of publishing is the name under which the Symbol will later appear in the **Elements** pane. Provide a proper name to the Symbol as the name cannot be changed later.



If satisfied with the changes, click **Publish**.

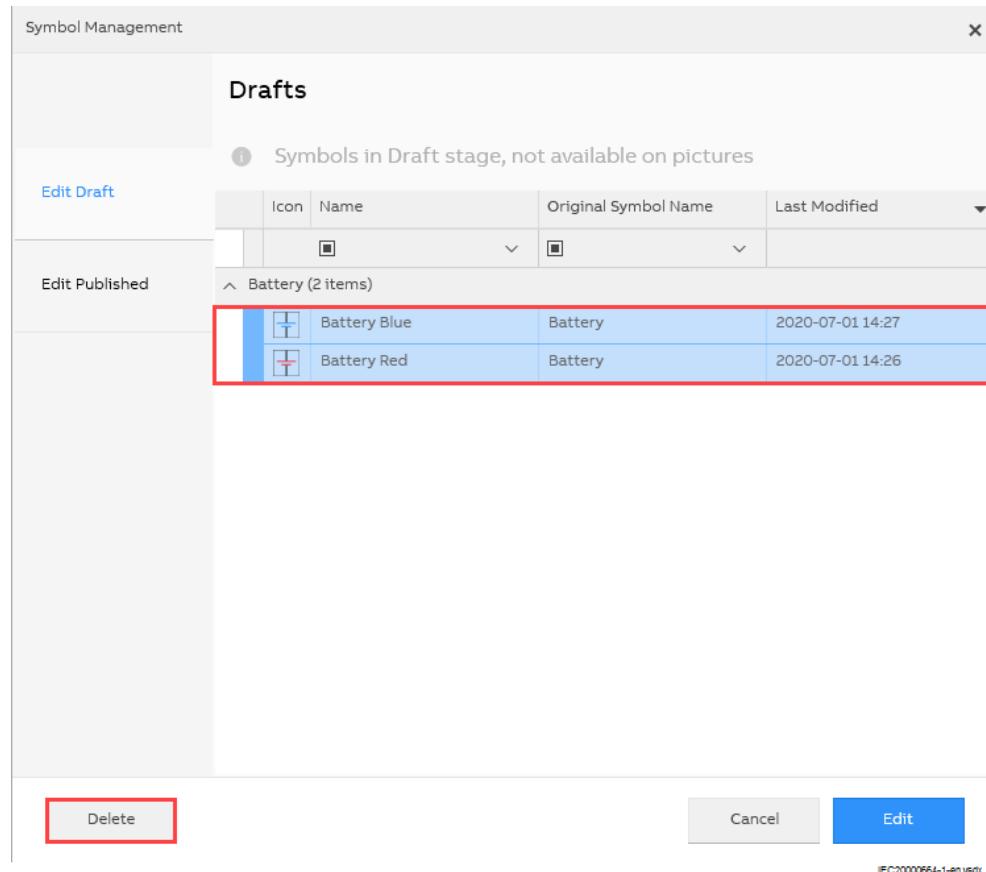
Now the Symbol will appear in the **Elements** pane in the Picture Editor and can be used in a picture.

## 7.4.7 Delete a Draft

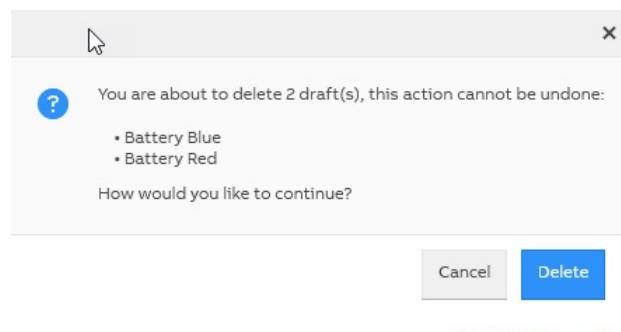
If a user has created several draft variants of a symbol but want to publish only one of them and delete the others.

To delete the draft:

1. Open the **Symbol Management** dialog.
2. Select the **Edit Drafts** Tab and select the Drafts to be deleted.



3. Click **Delete** button on the left side and a confirmation dialog appears:



4. Select the intended Drafts before clicking **Delete**. This action cannot be undone.



# Annexure A    Naming conventions

## 1.1    IEC

### 1.1.1    Introduction

IEC 81346 defines a comprehensive system to name all kinds of objects in a technical environment.

The crucial requirement of IEC 81346 is due to hierarchical structure. Each level is a combination of characters followed by a combination of ciphers. This allows to find a hierarchy from any name, independent of separators.

### 1.1.2    General conventions in IEC 81346

The internal names proposed by View Builder follow IEC 81346 as closely as possible. However, as IEC 61850 naming conventions are much less strict (for example, all Unicode characters are allowed for naming elements in the Substation Tree); customers may require to use names not consistent with IEC 81346. As per recommendations, use the Customer name for such names, when allowed for any character combination.

### 1.1.3    Hierarchies in IEC 81346 and IEC 61850

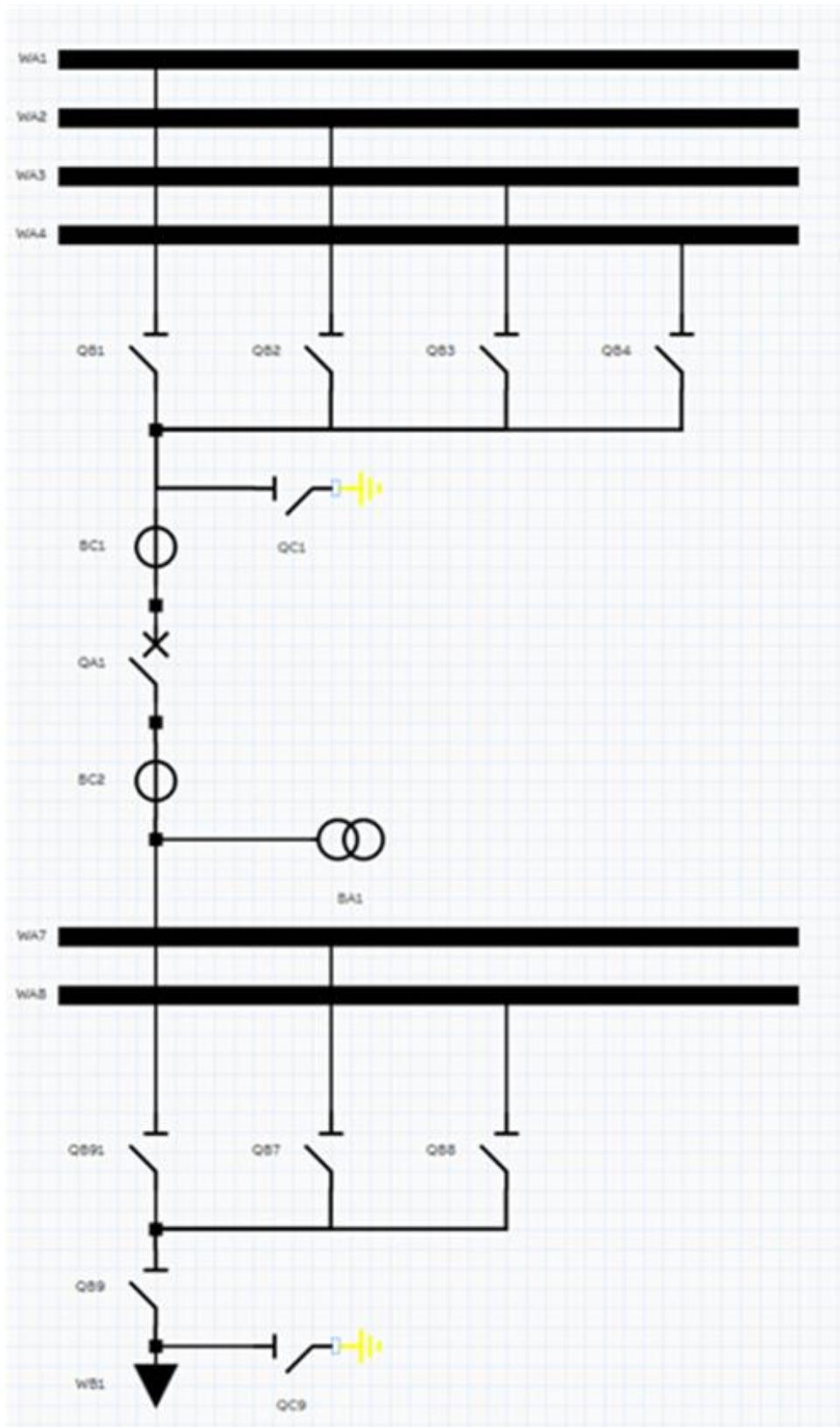
Level	IEC 81346	IEC 61850
1	Plant level	Substation
2	Subplant level	Voltage level, function
3,4,5	Further division	Bay, function, subfunction
3,4,5	Apparatus, Components	Equipment, subequipment

## 1.2    The standardized naming conventions

### 1.2.1    View Builder standardized names for a bay

See [Figure 121](#) for the standardized naming convention for internal equipment names. In certain situations, for example, automatic creation of and connection to Busbars, a correct naming scheme is mandatory to get correct results.

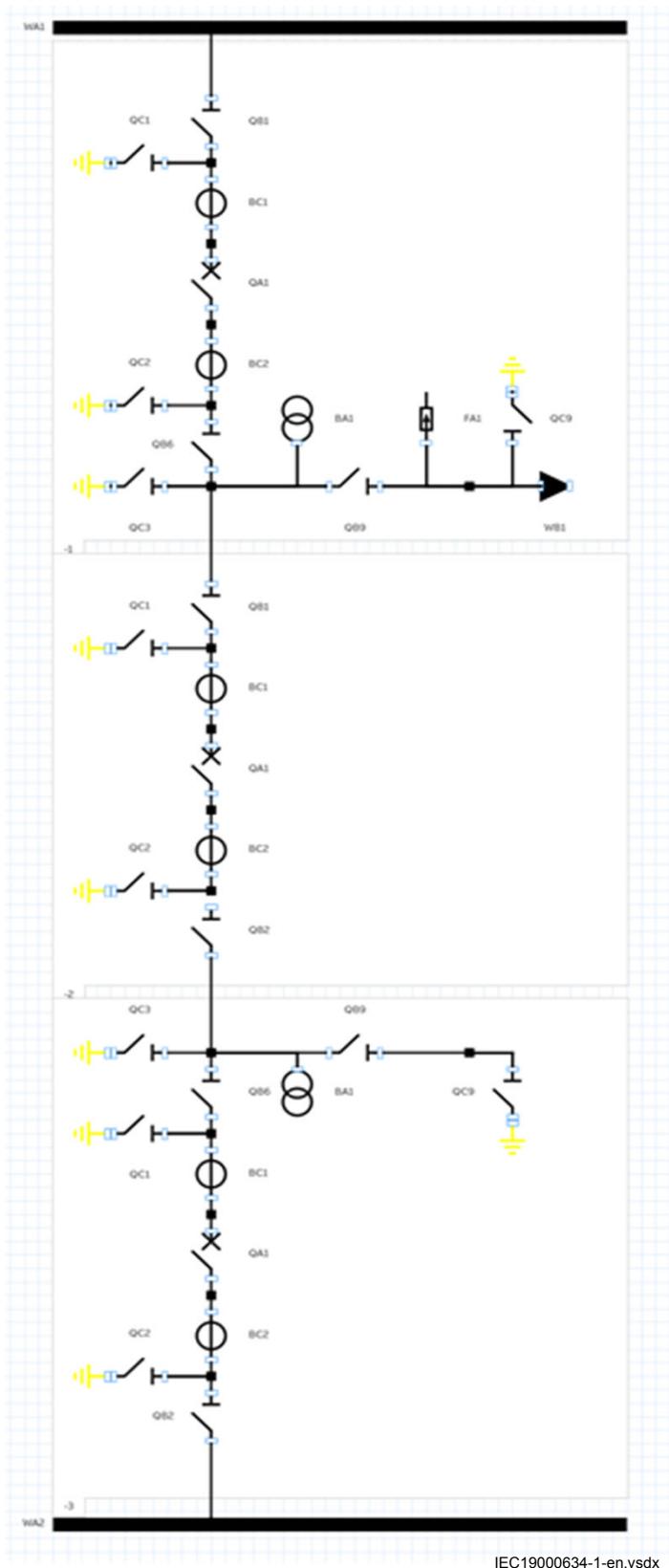
Be aware, that – when inserting equipment, e.g. Disconnectors – the default names on insertion follow a simple pattern, for example, QB1, QB2, QB3. If you, for example, create a simple Bay in a Double Busbar System, you will need QB1, QB2 and then QB9 to follow the naming convention; therefore you must rename the third disconnector – which is named QB3 by default – to QB9, otherwise QB3 may be interpreted as a Disconnector to a 3rd busbar by some logic.



IEC19000633-1-en.vsdx

Figure 121: Configuration of View Builder standardized names for a bay

## 1.2.2 View Builder standardized names for a diameter



IEC19000634-1-en.vsdx

*Figure 122: Configuration for View Builder standardized names for a diameter*



# Annexure B Busbar connection logic

## 1.1 Introduction

To increase efficiency in the View Builder, there is some automatisms regarding busbars.

These automatisms are based on a commonly followed naming scheme based on the IEC 81346 naming standard. If a user is not familiar with the background of the automatisms, in certain situations the user might not understand View Builder behavior.

This annexure explains the automation mechanisms and gives guidance on how to proceed when unusual busbar combinations occur.

## 1.2 Automation based on naming schemes

### 1.2.1 Introduction

In Substation Automation, we have structures which may repeat often: Bays and Diameter or Sections.

One of the items that repeat is the connection of one or several objects in a Typical Bay to Busbars. However, as Busbars belong to Voltage Levels (which are not available in Typicals), the View Builder uses a naming scheme to identify to which Busbar a Disconnector or Truck in a typical must be connected to instantiation.

The following chapters describe the logic and processes in irregular situations.

### 1.2.2 Assumptions

#### Typical Bay Configuration

We assume that a Typical Bay is made for a specific and determined Busbar configuration.

This has a consequence that one particular Typical Bay cannot be used for different Busbar configurations. Create another Typical Bay to cover such situations.

#### Connections to busbars to switching equipment

The customer wants to have a regularity in pictures and diagrams, because this helps to avoid errors. In different diagrams and pictures (for example, bay/diameter and voltage level) – the customer wants to view the same Busbar arrangement and sequence. (Automated mapping also has drawbacks in irregular situations, such automatically created connections are not always correct).

### 1.2.3 The naming schemes

#### Caveat

IEC 81346 does not specify a particular naming scheme for Disconnectors. Over the years, a practical standard is established; however, this practical standard does not explicitly cover all situations and is, in some situations, open to interpretation.

The Busbar Naming Scheme presented below may therefore not perfectly match some customer's interpretation. Use the customer name to implement the desired naming scheme, even if this is very similar to the ABB internal naming scheme.

## Switching equipment and Busbar naming

This topic explains the matching between busbars and circuit breakers/disconnectors/trucks.

The View Builder logic relies on the following naming scheme:

Busbar type	Busbar name	Switching equipment name
1 <sup>st</sup> Main	WA1x	QA1, QB1, QZ1
2 <sup>nd</sup> Main	WA2x	QA2, QB2, QZ2
3 <sup>rd</sup> Main	WA3x	QA3, QB3, QZ3
4 <sup>th</sup> Main	WA4x	QA4, QB4, QZ4
1 <sup>st</sup> Transfer	WA7x	QA7, QB7, QZ7
2 <sup>nd</sup> Transfer	WA8x	QA8, QB8, QZ8
(not specified)	(not specified)	QA9, QB9, QZ9

The number 9 is reserved for anything in connection with an outgoing line.

This leaves only numbers 5 and 6 for 'free' use, busbar names WA5x and WA6x have a busbar type "other" and do not participate in any automated mapping.

As elaborated below in detail, there are unconventional arrangements which must not use automation, it is recommended to use numbers 5x and 6x.



The usage of the number 8 for transfer buses is not common.

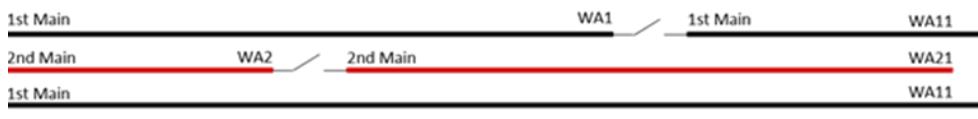
Often, the number 7 with additional classifiers (for example, 'WA71' for a 'Transfer 2' busbar). However, this usage is not well-defined as this is also used for Busbar Segments of the transfer bus, therefore in the View Builder, the number 8 is used for transfer bus 2 (which is quite rare).

## Busbar segments

In more complex Busbar arrangements, Busbars are often subdivided into Busbar segments, which are inter-connected with Disconnectors or Trucks, rarely with Circuit Breakers.

The View Builder treats Busbar segments as physically separate Busbars of the same type. For example, in the [Figure 123](#) WA1 and WA11 are Busbar segments for the Busbar type.

For the naming scheme, the first cipher in the numbering is chosen, for example, WA1, WA1.1, WA11, WA14 etc. are treated as Busbar of type "1<sup>st</sup> Main".



IEC19000638-1-en.vsdx

*Figure 123: Busbar segments*

## 1.2.4 Rules for classification/typing of Busbars

1. The Busbar Type is currently not shown. This can only be guessed from the name of the Busbar in the Voltage Level Diagrams or from the names of the connected Switching Equipment in the Typical Diagrams.
2. If a Busbar is used in a Standalone Diagram (Voltage Level), then the classification is based on the name only.
3. If a Busbar is used in a Typical, this is classified depending on the index of the Switching Equipment to which this is connected.
4. If several Switching Equipment are connected in a Typical, the classification is done according to the Switching Equipment with the lowest index.
5. If several Switching Equipment are connected in a Typical, the classification is done according to the Switching Equipment with the lowest number.
6. If as Switching Equipment is disconnected, the Busbar classification changes and is done according to the connected Switching Equipment with the lowest number.
7. Any other equipment connected to a Busbar either in a Typical diagram or Standalone Diagram does not classify the Busbar or changes the classification. Particularly if a non-Switching Equipment is connected to a Busbar in a Typical without simultaneous connection to a Switching Equipment, this does not create a classification.

## 1.3 Rules for connections of switching equipment to Busbars in Typicals

1. A Switching Equipment cannot be connected to two Busbars in a Typical. If such a configuration is used, this needs to be handled with Standalone Bays or Equipment.
2. Two Switching Equipment in a Typical with the same numbers  $nx$  must not be connected to different Busbars (do not connect QB1 to one busbar and QA1 to a different Busbar in the Typical. Rename one of the two equipment, for example, QB1 and QA2, but not QB1 and QA11, to avoid the creation of two or more busbars of the same type).

### 1.3.1 Automatic Busbar creation

1. If a Busbar is connected to a Switching Equipment in a Typical and thereby classified, in any voltage level where this Typical is already instantiated, a Busbar with a Busbar Type corresponding to this classification is created automatically except classification of <unknown>.
2. If a Busbar in a Typical is classified as <unknown>, no Busbar is created automatically.
3. A Busbar once created cannot be deleted automatically. If a Busbar with a wrong name or Busbar classification is created (for example, by a wrong connection in the Typical) delete this manually, if required.
4. If you delete a Busbar which was created automatically in a voltage level where still instances of the Typical exist which requires such a Busbar Type, the Busbar is not automatically re-created, then create the Busbar manually.

### 1.3.2 Automatic connections on instances

#### Connection rules

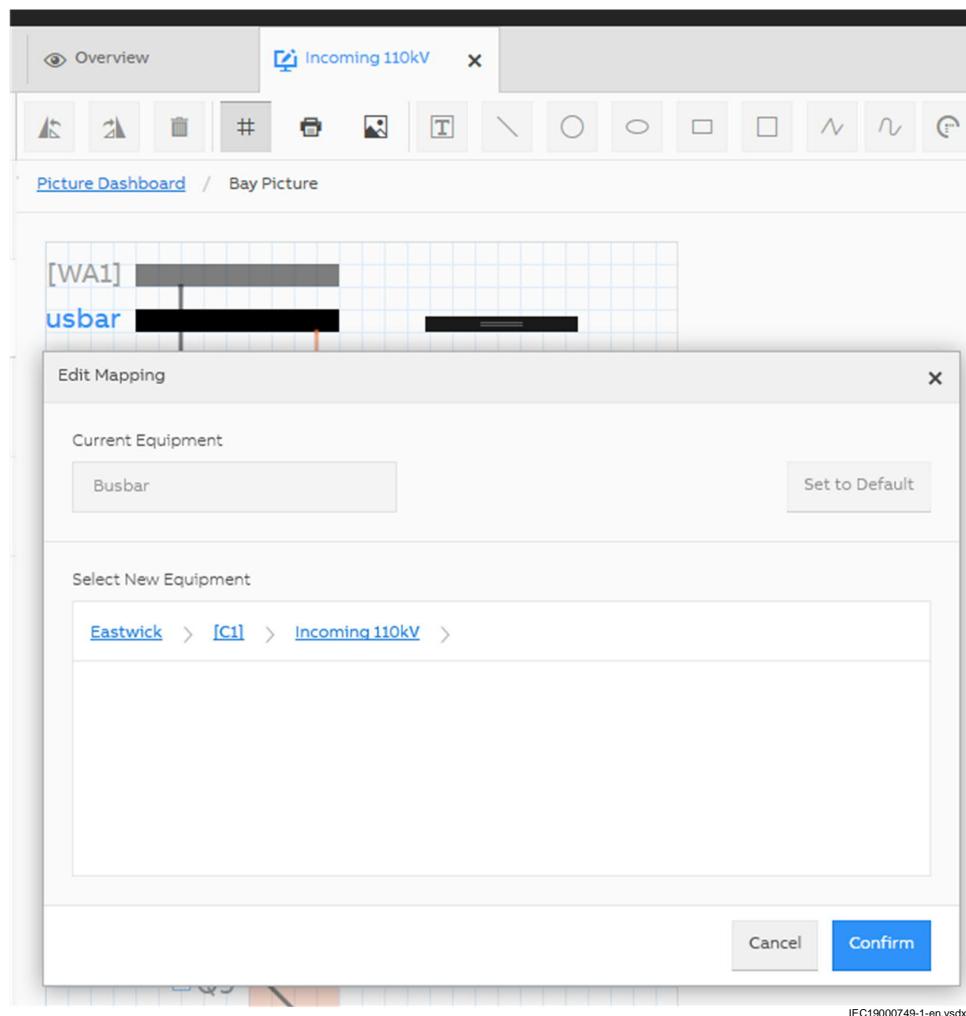
1. All rules for automatic connections apply only to instances of Typicals.

Any standalone object (be this an equipment container like a bay or an equipment like a disconnector) needs to be connected manually to a busbar which either exists already or must also be added manually to the voltage level.

2. An instance bay or section reflects exactly its typical.
3. If a Busbar of a certain type exists on a Voltage Level, and a switching equipment with a corresponding name is connected in the typical, the connection is automatically created from the busbar(s) on the voltage level to all the instances of each Typical according to the classification.
4. If a Busbar exists on a Voltage Level, and a non-switching equipment is connected in the Typical without connecting any switching equipment, the non-switching equipment is not automatically connected in a voltage level diagram. This can be connected manually.
5. If a Busbar exists on a voltage level, and switching equipment and a non-switching equipment are connected to the same busbar in the typical, the non-switching equipment is automatically connected in a voltage level diagram to the same Busbar as the switching equipment.
6. You can delete a connection from an instance to a Busbar in a Voltage Level diagram. You can recreate a connection to the same busbar type (this is required if Busbar Segments are available). However, a connection to a Busbar of another Busbar Type cannot be created.

## Busbar segment rules

1. If several Busbar Segments for one busbar type are available, the automatic connections are arbitrary; typically, these are made to the busbar segment with the lowest number.
2. To shift such a connection to another Busbar Segment, manually remove such connections and create a new one between the equipment in an instance and a Busbar; this is possible provided that the Busbar is of the same Busbar Type as is required by the Typical (which must be the same type from which you removed the connection before).
3. The Instance Picture Busbar symbols can be remapped per Instance if more than one busbar of the same kind exists in a voltage level.



*Figure 124: Busbar remapping*

### 1.3.3 Busbar layout

#### Initial placement

Any Diagram opened for the first time has items placed according to an automatic layout logic:

1. In case of Voltage Levels with Bays as children or Bays, the items are arranged in the following manner:
  - Busbars of Type Main are placed at the top.
  - Subdrawings, Equipment, Connectivity Nodes and Earths (in sequence) are placed in the available space.
  - Busbars of Type Transfer x, are placed at the bottom.
2. In case of Voltage Levels with Diameters as children or Diameter or Sections, the items are arranged in the following manner:
  - Busbars of Type 1<sup>st</sup> Main are placed at the top.
  - Subdrawings, equipment, connectivity nodes and earths are distributed over the available space.
  - Busbars of Type 2<sup>nd</sup> Main are placed at the bottom.

Any other Busbar type in this configuration is probably an error, they are placed below the Busbar of Type 2<sup>nd</sup> Main.

3. In a Voltage Level Diagram, Busbar Segments of the same type are placed on the same level side by side, equally distributed over the width of the diagram.
4. Once any object is placed, this is not automatically shifted to another place, except if the engineer triggers an automatic layout (which does the same as if all equipment were unplaced).

### Placement of added objects

Any Diagram with already equipment placed has new items placed according to the following logic:

1. Any Equipment Container is placed according to a special logic depending on the object type:
  - 1.1. For Diameters, new Sections are placed below existing sections.
  - 1.2. For Voltage Levels, new Bays and Diameters are placed to the right of existing Bays/Diameters.
2. For Substations etc. new Child Containers are placed below existing Containers.
3. Any not placed object is then placed below all of the above: first Busbars, followed by Equipment, and Connectivity Nodes and Earths are distributed over the available space.

### Auto-layout triggered by the user

Auto-Layout is highly effective for diagrams that mostly contain child containers and very few additional equipment.



This destroys any existing layout. Auto-Layout is mostly useful for Diagrams which contain mostly Child Containers and only very few additional equipment.

## 1.3.4 Engineering workflow

### Recommended workflow

To ensure efficient engineering, proceed according to the following steps:

1. If you create a Typical Bay, ensure the names of those Switching Equipment elements to connect to a Busbar are correct before inserting Busbars.
2. Insert Busbars (can be referred of as ‘virtual’ Busbars as virtual Busbars) in the Typical as required and connect them.  
If an error is committed when connecting, it is best to remove the wrong connection immediately, before doing other connections.
3. Optimally, create Instances after having the Typical Bays and the Busbars named and configured correctly.  
Normally, you should be able to create Instances at any time. However, additional cleanup is required, if something is changed related to Busbar Types later (renaming Busbars or renaming Equipment connected to Busbars in Typicals).
4. You can insert Voltage Level Equipment at any time (For example, Earthing Switches for the Busbars or Disconnectors between Busbar Segments); as these are Standalone Equipment with no effect on the Busbar Types.

### Limitations

Normally you must not use instances of the same Typical Bay for different Busbar configurations (except, if you use the “free” name ranges with numbers 5 and 6 as described in ). See [Engineering workflow \(Section Recommended workflow for usual configurations\)](#).

For example, a Typical Bays cannot be instantiated with two Busbars for a Voltage Level with Busbars WA1 and WA2, and then for another Voltage Level with Busbars WA1 and WA3, which are a different combination.

### **Recommended workflow for unusual configurations**

If there are situations where a Typical Bays makes sense, but needs to be configured to the instances individually to different Busbars (for example, 1st instance to Busbars 1 and 2, 2nd to Busbars 2 and 3 and 3rd to Busbars 1 and 3 for a generator cross-connect scheme), choose names QB5x, QB6x and WA5x, WA6x. Busbars are created automatically and Instances are not connected automatically, but you are able to connect any Busbar to any Equipment in any Instance.

## **1.3.5 Errors in automatic Busbar connections**

### **Introduction**

Sometimes, during engineering:

- Connections in a Voltage Level do not appear automatically for Instance Bays.
- You cannot connect a Disconnector or truck to a Busbar at all.
- Busbars are found which are not consciously inserted.

### **Voltage Level with unintended (automatically created) Busbars**

When instantiating Typicals, Busbars of the required Busbar Type (as defined in the Typical) are automatically created. For example, if a Typical has two Busbars connected to QB1 and QB3, then Busbars WA1 and WA3 are created in the Voltage Level, unless already existing.

Sometimes, if there is a naming error, Busbars are automatically created later. The View Builder does not automatically delete these Busbars (as may participate in some configuration which would be lost) but can be deleted manually.

### **Missing connections on Voltage Level diagrams**

Sometimes, if Bays are instantiated into a Voltage Level, connections are missing on the Voltage Level Diagram.

1. Check the Typical: Did you create Busbars there and connect them? If not, please do so now, then the corresponding connections should appear automatically in the Instances and in the Voltage Level diagram.
2. Check the Typical: Do the names of the equipment where you expect a connection match the Busbar names. If not, add the Busbar with the appropriate name (Busbars with a corresponding name and type should normally be created automatically; the situation here should only occur if you deleted or renamed a Busbar in a Voltage Level after instantiation).
3. When trying to create the missing connection and if there is an error message, *The instance equipment cannot be connected to this Busbar* is displayed, this means that the connection is missing in the Typical or there is a mismatch between the equipment name and the Busbar Type.
  - Create the connection in the Typical.  
If this seems to exist in the Typical, the Busbar type may be wrong due to an earlier misconnection or name change. Disconnect all equipment in the Typical and reconnect this correctly; now the Busbars in the Typical must have the correct Busbar type and automatically connect correctly in the Voltage Level diagram.

### **Equipment cannot be connected to Busbar**

If there is an error message, *The instance equipment cannot be connected to this Busbar* is displayed when connecting an instance, that means the connection is missing in the Typical or

there is a mismatch between the equipment name and the Busbar type. Perform the following actions to connect an instance:

1. Create the connection in the Typical.
2. If a correct connection exists in the Typical, the Busbar type is not correct due to an earlier misconnection or name change. Disconnect all equipment in the Typical and reconnect this correctly; now the Busbars in the Typical should have the correct Busbar type and automatically connect correctly in the Voltage Level diagram.

### **Wrong connections on the instance diagram or Voltage Level**

1. Verify that the names of the Equipment match the Busbar name or Busbar type you are trying to connect to.
2. If the above is correct, the Busbar type is not correct due to an earlier misconnection or name change. Disconnect all Equipment in the Typical and reconnect this correctly; now the Busbars in the Typical should have the correct Busbar type and automatically connect correctly in the Voltage Level Diagram.

### **Wrong connections to Busbar segments**

In a Typical (or Instance), it is not possible to define a specific segment of a Busbar type.

If in a Voltage Level, instances are connected to the wrong segment, delete the connections and create new connections to the correct segment. An Instance Bay picture then gets the information from the Voltage Level. Defining a specific segment on an instance diagram is not possible directly.

## Annexure C Information unavailable in SYS600 process database

There is information in SYS600 that cannot be directly read from process database. Standard pictures of SYS600 Workplace X can read only the data from SYS600 process database. The data of interest must be re-routed there.

Perform the following:

1. Create process object.
2. Create event handling object and connect this to process object. Event handling object is used for two purposes:
  - 2.1. For showing numerical values as text in process picture (SX – attribute).
  - 2.2. For a proper event in the **Event** list tab.
3. Create time channel.
4. Create command procedure that reads the data.
  - 4.1. In command procedure translate textual data to numerical if needed.
  - 4.2. Set value to process object.
5. Attach command procedure to time channel.
6. In View Builder connect process object to a graphical element for example, to text.

Example for reading application state

The example states about the local applications that are engineered to process picture

In Object Navigator select **Process objects/Object/New**.

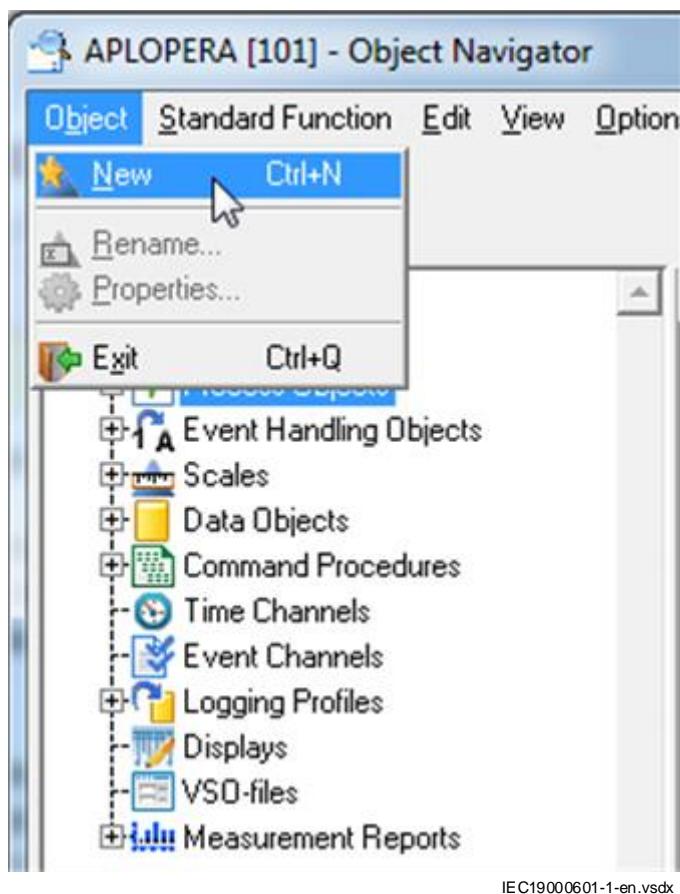


Figure 125: Create new object

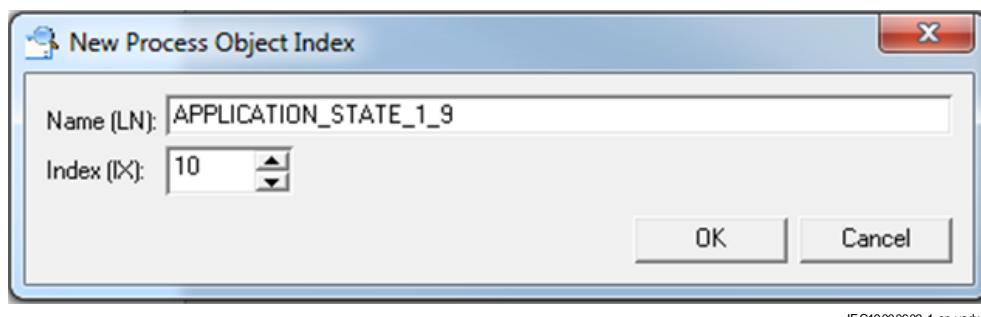


Figure 126: Give logical name and index (here apl 1 in base system node 9)

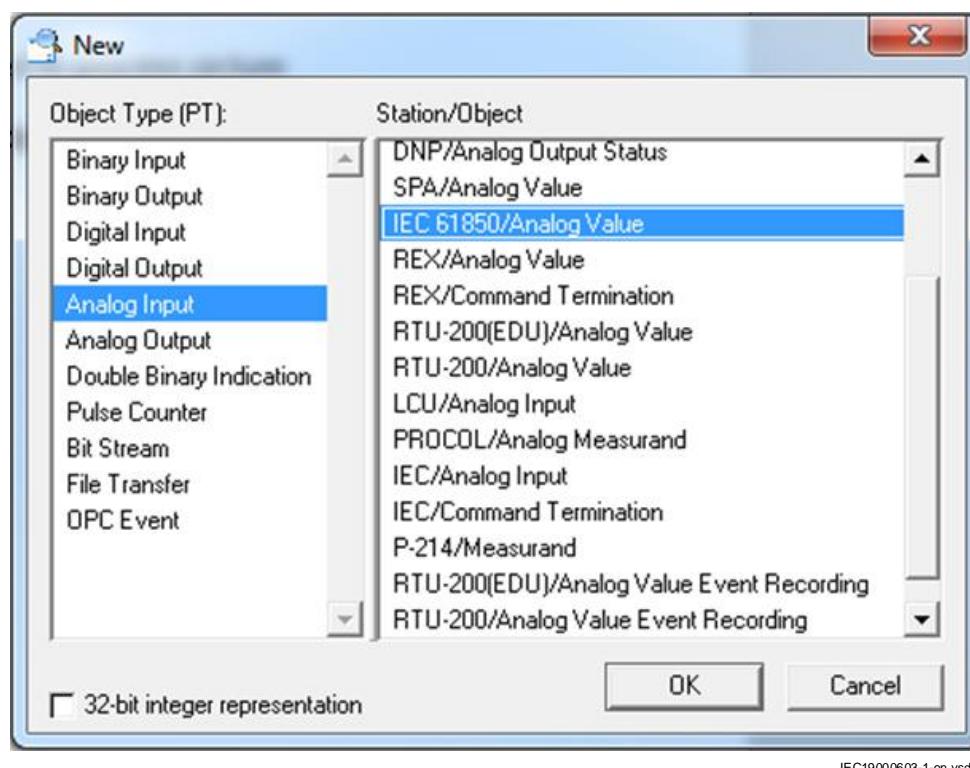


Figure 127: Select process object type and protocol

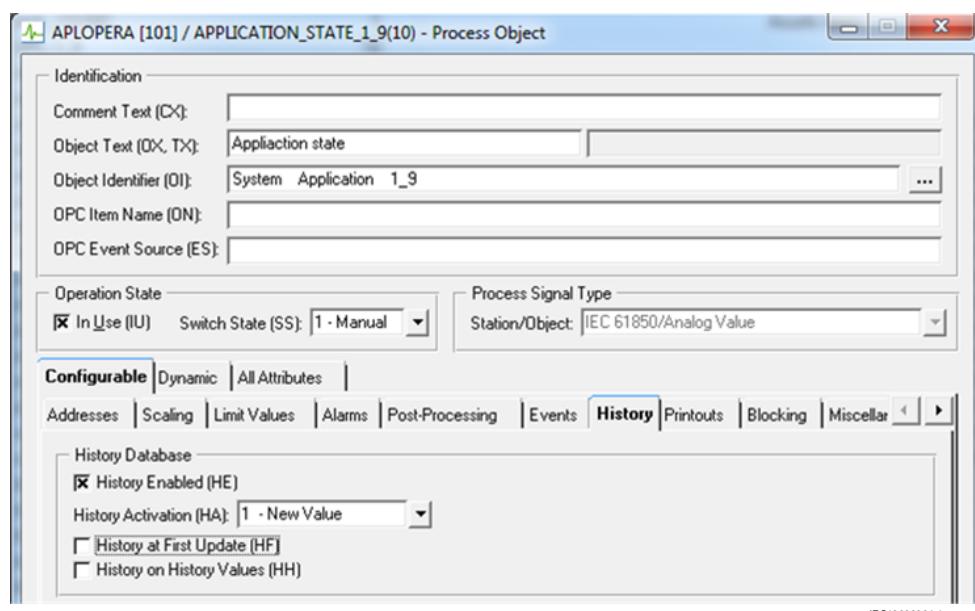


Figure 128: Define OX, OI and enable History

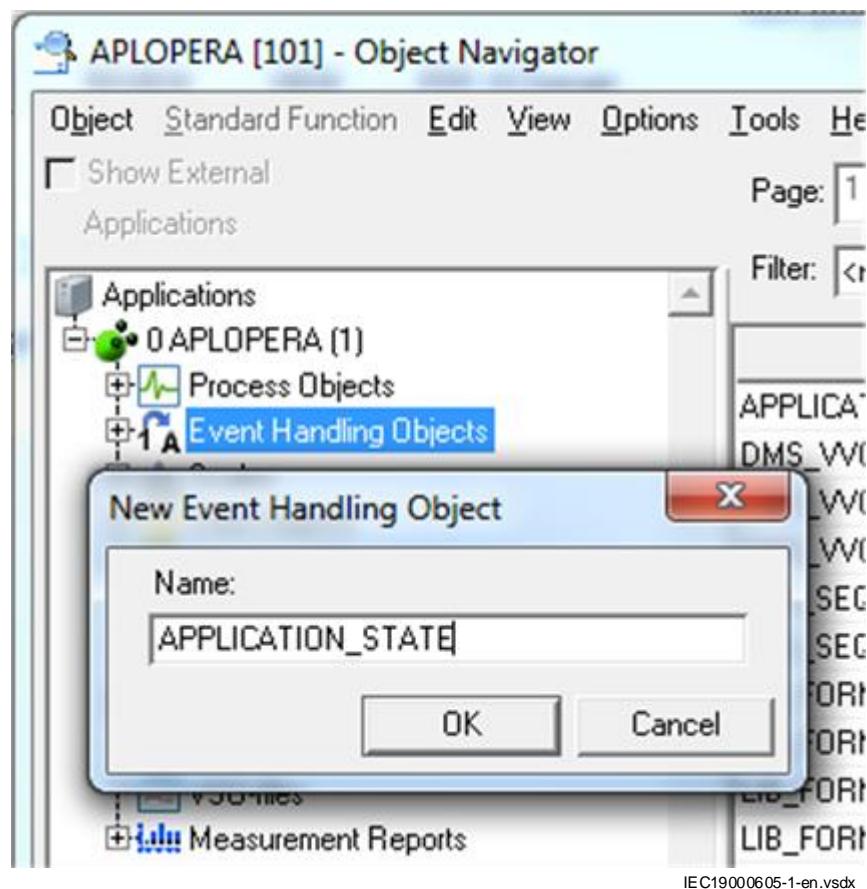
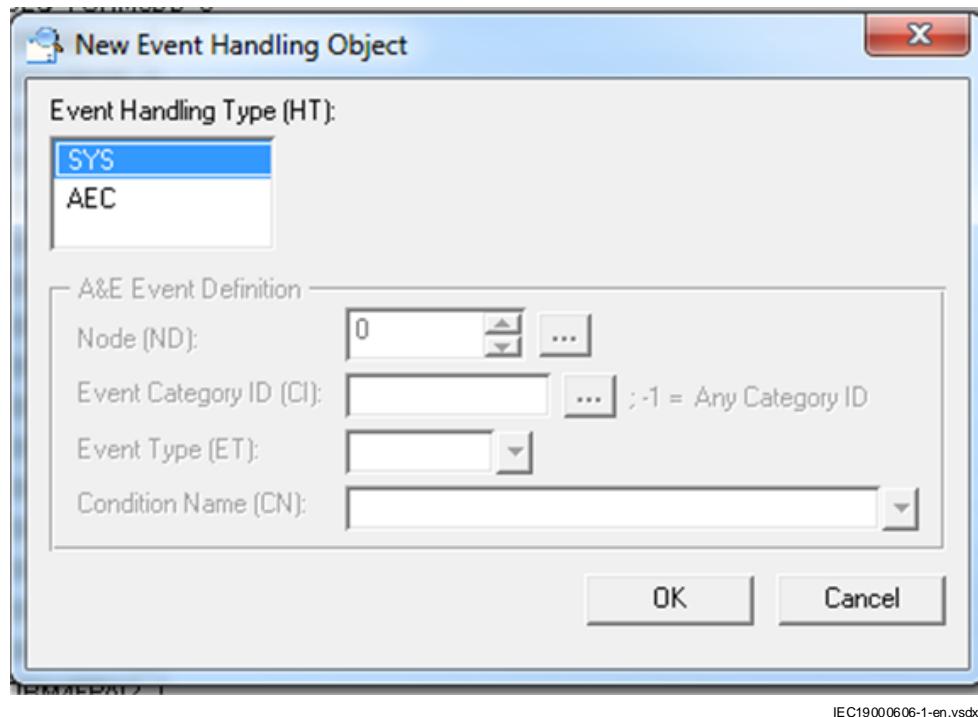
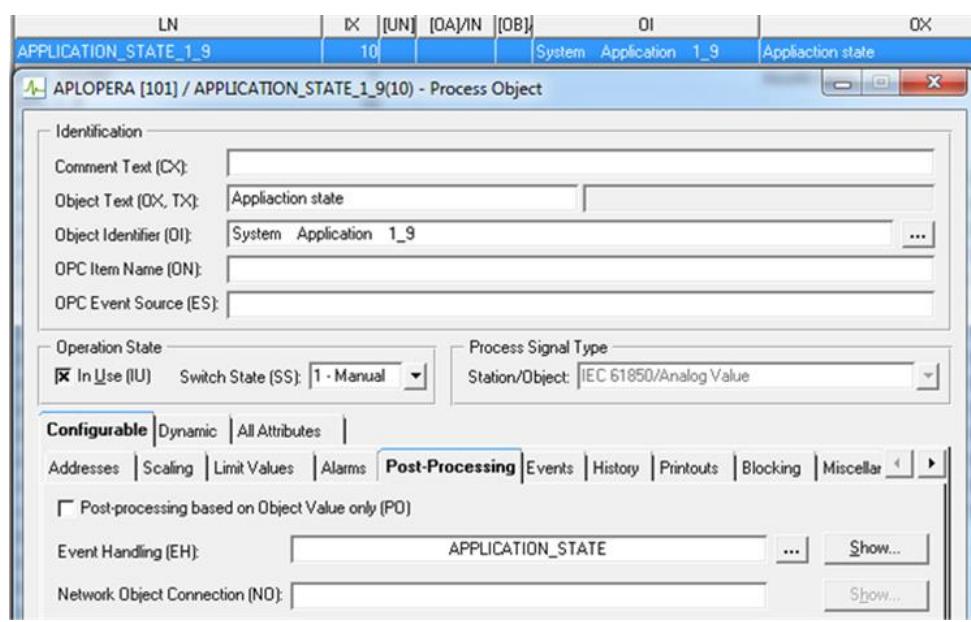
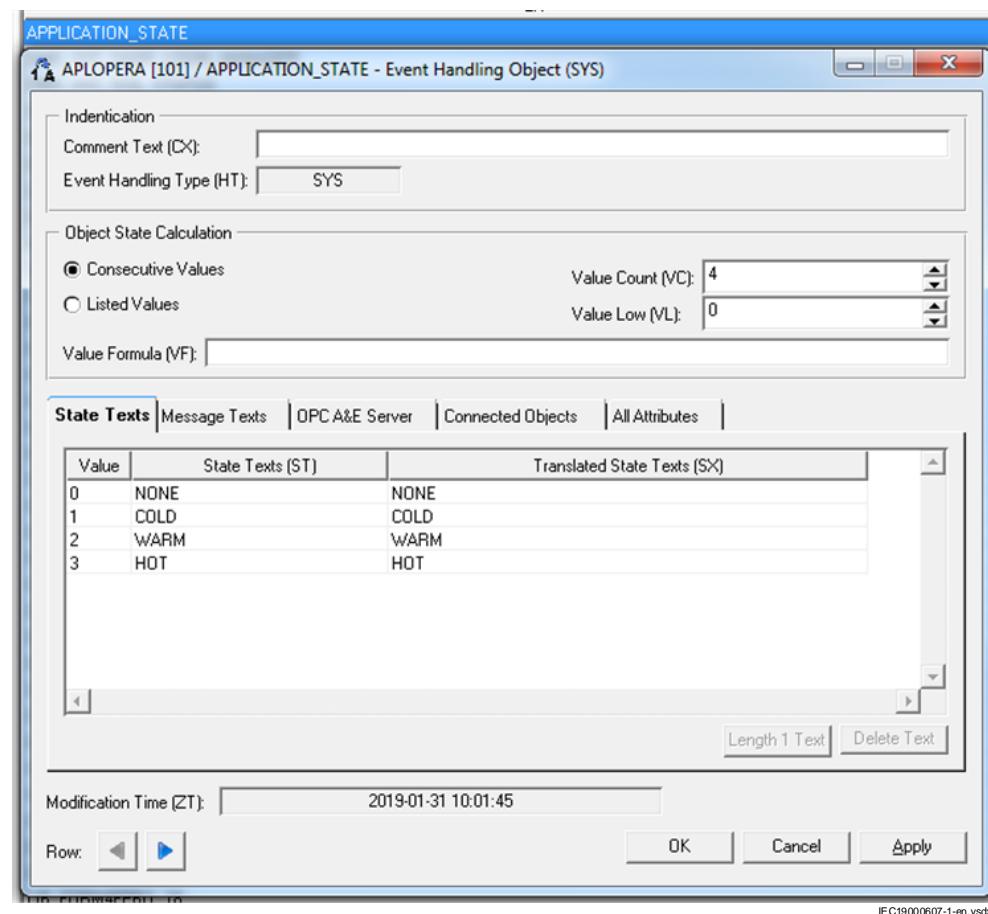


Figure 129: Create event handling object





*Figure 130: Connect event handling object to process object*

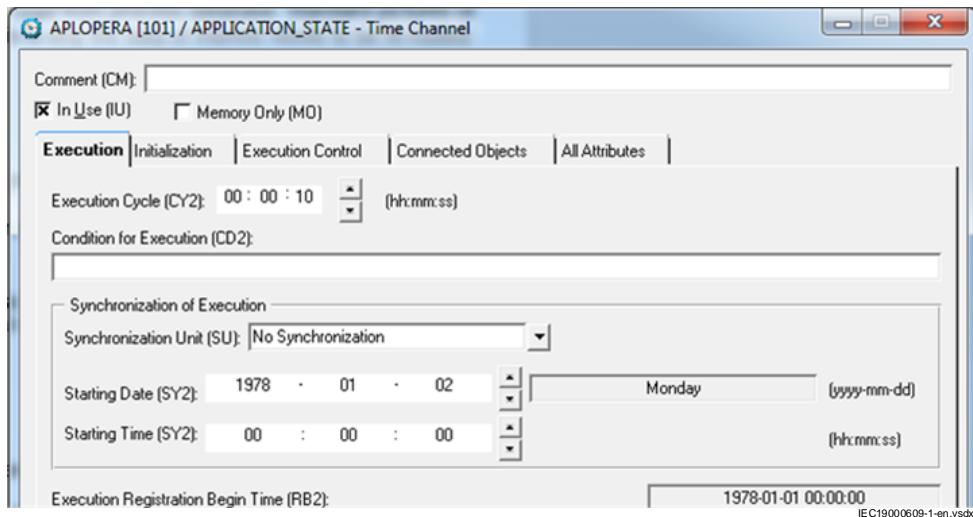


Figure 131: Create time channel

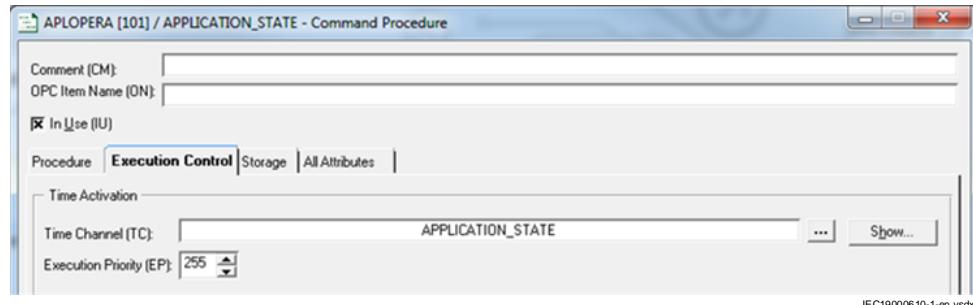


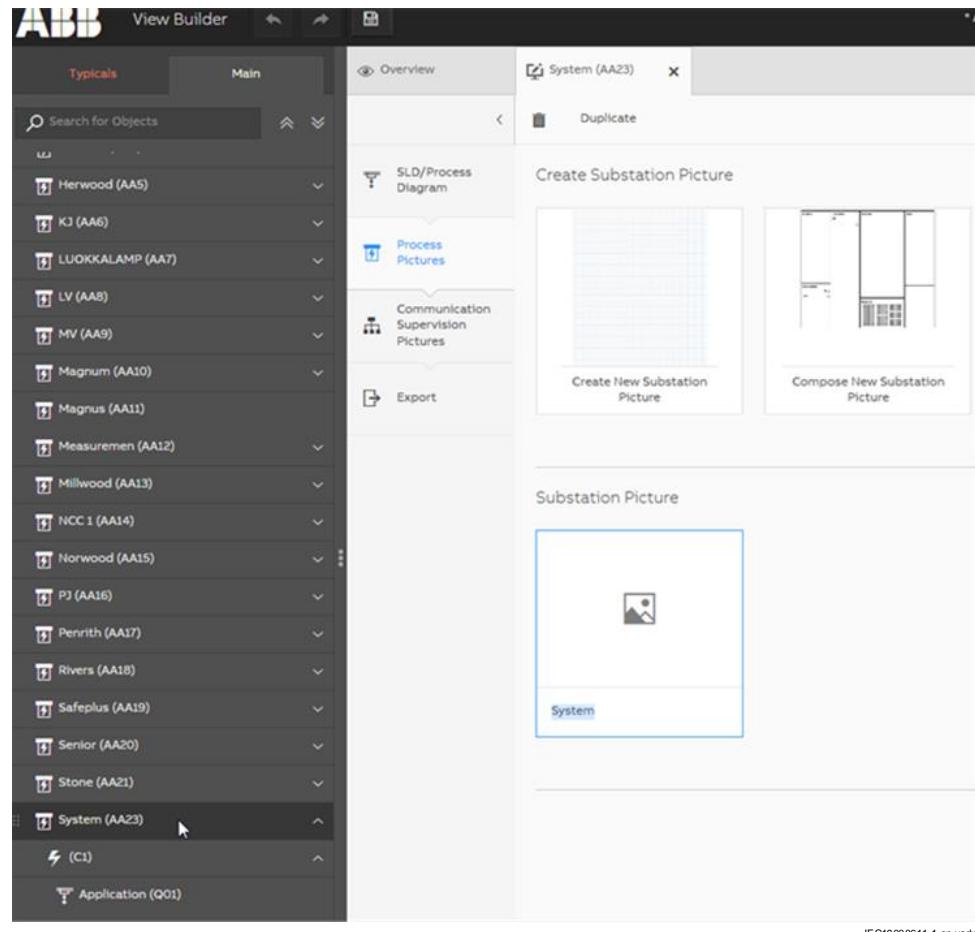
Figure 132: Create command procedure and attach it to time channel

### Example 1

```
#local -
    l_Objects,-
    i_Nr,-
    t_Value,-
    i_State,-
    i,-
    i_Node_Nr,-
    i_Apl_AS_Index = 10,-
    l_Apl_Values = list(-
        AS = list(-
            NONE = 0,-
            COLD = 1,-
            WARM = 2,-
            HOT = 3))

;search all local applications
l_Objects = base_system_object_list("APL", "TT ==""LOCAL""", vector("AS"))
i_Node_Nr = SYS:BND
#loop_with i = 1 .. l_Objects.COUNT
    i_Nr = l_Objects.BM(i)
    #if application_object_exists(0, "IX", list(LN = "APPLICATION_STATE_i_Nr'_i_Node_Nr'", IX =
i_Apl_AS_Index )) #then #block
        t_Value = l_Objects.AS(i)
        i_State = l_Apl_Values.AS.t_Value'
        #if APPLICATION_STATE_i_Nr'_i_Node_Nr':P'i_Apl_AS_Index' <> i_State #then -
            #set APPLICATION_STATE_i_Nr'_i_Node_Nr':P'i_Apl_AS_Index' = i_State
```

```
#block_end
#loop_end
```



*Figure 133: In View Builder create substation picture*

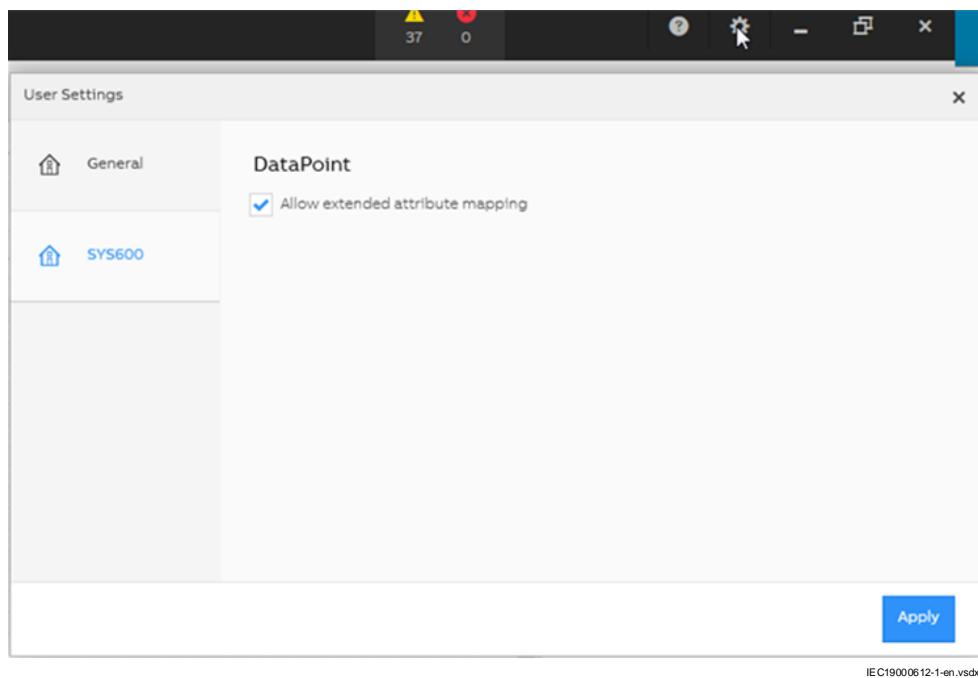


Figure 134: Allow extended attribute mapping

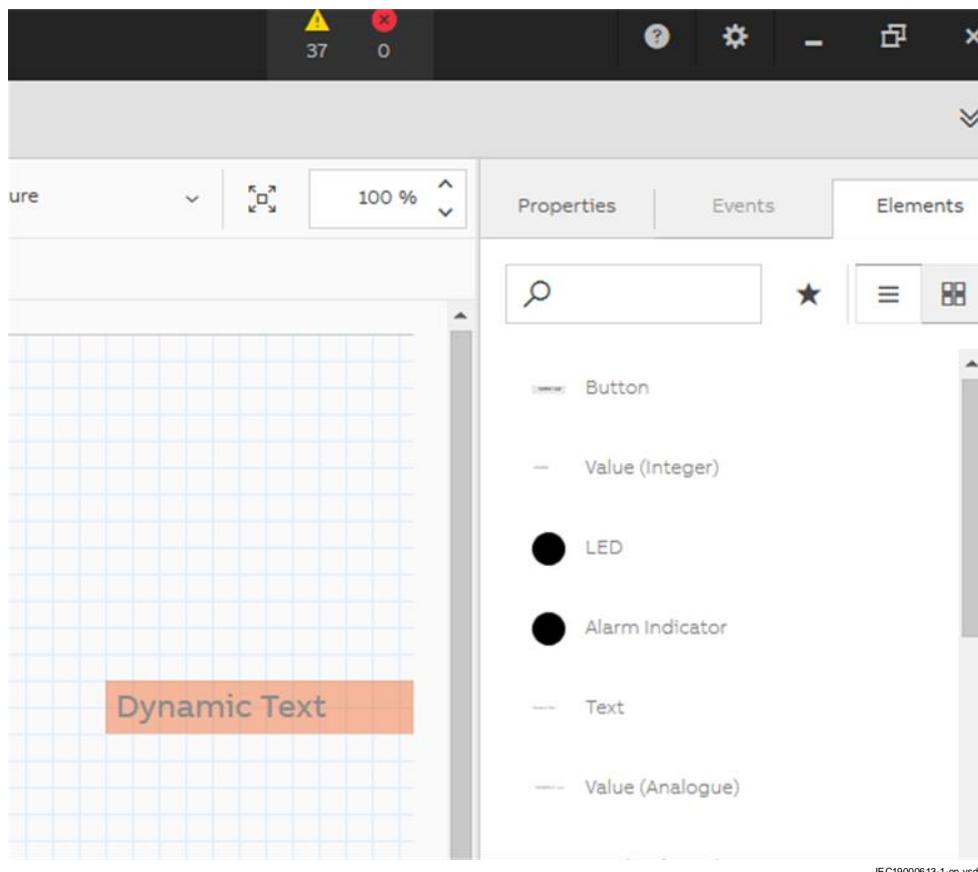


Figure 135: Add text element to picture

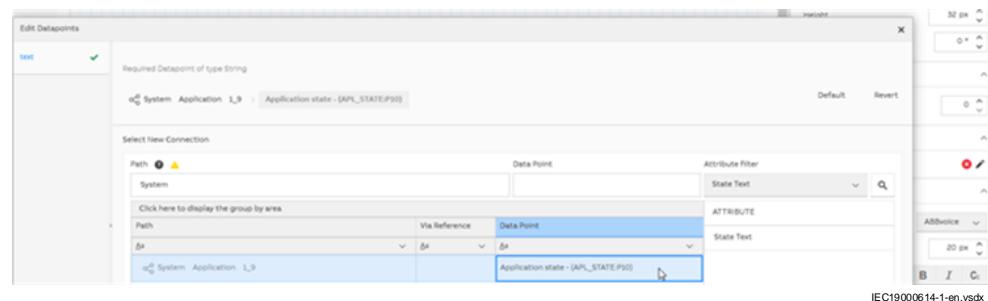


Figure 136: Map state text to element

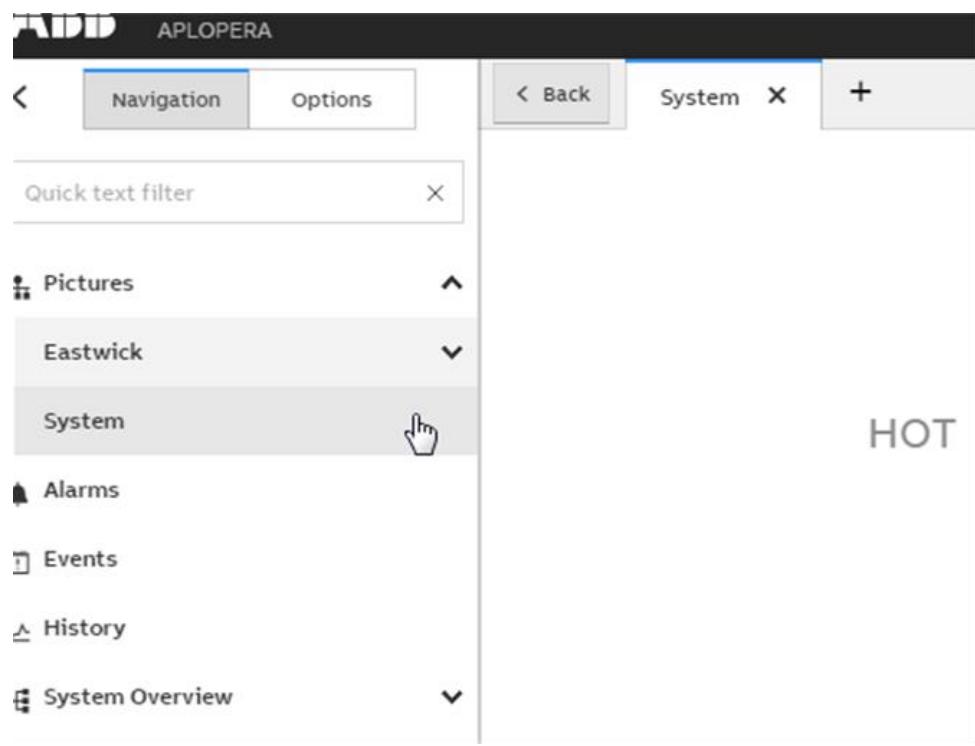


Figure 137: Export picture



# Annexure D Rule file

## Background

The standard SYS600 Workplace X symbols and Control Panes are not aware of SYS600 process database, but they are implemented according to common SA data model. Also, the View Builder functionality is based on common SA data model.

Therefore, a rule file mapping SYS600 process objects to SA Data Model is needed. Rule file describes:

- Functional structure
- Equipment and containers
- Process object to Data point mapping
- Process object attributes to Data attribute mapping
- Topology references

Based on mapping rules View Builder can:

- Organize process objects to functional structure tree during process database import
- Import topology from SYS600
- Automatically map process objects to symbols and control panes during View Builder picture engineering phase
- Export runtime SYS600 process database to common SA data model cross-reference file for the engineered symbols and control panes
- Generate SYS600 topology

The most important equipment and data points in Power Process domain are covered in the rule file. For more information about common SA data model, refer to *Data model user manual* document.

## Rule format

A rule format consists of condition and attribute value pairs. In the standard rule file, conditions are heavily based on RX – attribute. When a process objects matches to a rule condition it can be imported to View Builder.

### Example 2

```
'condition' {
    Attribute1: value
    Attribute2: value
}
```

# character is used as a comment mark.

*Table 6: Rule attributes*

Attribute name	Description	Mandatory (M)/Optional (O)
FunctionalStructurePath	Defines the location in the Functional structure tree	M
RuleId	Unique rule identification.	M
FunctionalStructureType	Description of equipment type in data model (for example, Circuit Breaker)**	O
DataProvider	Data point type name (for example, Switch Position)**	O

Table continues on next page

Attribute name	Description	Mandatory (M)/Optional (O)
DataPointAttributes	Describes data point attributes and to which process object attribute they are mapped	O
DataPointValueType	Value type in data model	O
LN	Logical name of process object	O
IX	Index of process objects	O
PT	Process object type	O
TopologyReference	Logical name of process object. Needed if equipment is part of topology coloring.	O
TopologyReferenceIndex	Index of process objects. Needed if equipment is part of topology coloring.	O
TopologySubType	One of the following: <ul style="list-style-type: none"><li>• Earth</li><li>• Power</li><li>• SwitchingDevice</li><li>• Transformer Winding</li><li>• Truck</li><li>• Generator</li></ul>	O
ValueAttribute	Describes the process object attribute to which the data point value is mapped	O

\*\* Refer to *Data model.docx* for more information.

## Rule file locations

### *Default rules*

Default rules are in file **<drive>/sc/api/apl/'apl name'/NGTWS/'workspace name'/Plugins/SYS600/Rules/rules.mscrle**.

The default rule file is treated like a template and can be updated, if a newer version is available. See also [Section 4.7.1](#) for more information.

### *Override rules*

Override rules are in file **<drive>/sc/api/'apl name'/PAR/APL/ViewBuilderImportRulesOverride.mscrle**.

If the default rule(s) do not fit to the application, they can be overwritten in this file. If the rule with same *RuleId* is found both in *rules.mscrle* and *ViewBuilderImportRulesOverride.mscrle*, the latter one will be used.

### *Additional rules*

Additional rules are in file **<drive>/sc/api/'apl name'/PAR/APL/ViewBuilderImportRulesAdditional.mscrle**.

To minimize the risk of having overlapping product rules, use some project/engineering center specific identification in *RuleId*.

## Functions and Operators

### **Functions:**

*Append*

Appends given value to list and returns the new list.

`Append(input list, value to append)`

Returns: List

*Attr*

Fetches the attribute value from current process object.

`Attr("SYS600 attribute")`

Returns: Depends on the value of SYS attribute.

*Concat*

Concatenates 2 or more string, real or integer values to a string.

`Concat(1, "abcd", 3.14)`

Returns: string

*DataPointAttribute*

Creates a datapoint attribute description.

`DataPointAttribute("name of the datapoint", ["SYS attribute to read from"], ["Subscription type"])`.

Either subscription type of SYS attribute can be left empty, if not applicable. Subscription type can be one of “*SCIL*”, “*Topology*” or “*“”* for default direct read from the attribute.

Returns: Datapoint attribute description to use in the *DataPointAttributes* list.

*IEC 81346NameOf*

Extracts IEC81346 name of a component from given string.

`IEC 81346NameOf("input string", "Component")`

Component can be one of “STA”, “VOL”, “BAY”, “DEV” or “IED”.

Returns: string

*IEC81346Split*

Splits the given input string to separate components according to IEC81346 rules.

`IEC81346("input string")`

Return: List of strings.

*If*

Evaluates condition from first argument and if true, returns 2nd argument otherwise 3rd.

If(condition, return value when true, return value when false)

Return: Depends on the values of 2nd and 3rd arguments.

Example:

If attr("FI") = 3, "Three", "Something Else") will evaluate to "Three" if FI attribute of current process object is 3, otherwise "Something else" is returned.

#### *Index*

Returns nth index from the given list, starting from index 0.

Index(input list, n)

Returns: Depends on the type of list.

#### *IndexOf*

Returns index of first occurrence of substring from input string, or -1 if input doesn't contain substring.

IndexOf("input string", "substring")

Returns: Integer

#### *Item*

Returns the value for key from key-value collection, e.g. SCIL list.

Item(key-value collection, "key")

Returns: Depends on the value.

Example:

Item(attr("IL"), "BAY") will return the bay name from IL attribute from the currently evaluated process object.

#### *OILevelOf*

Returns OI index of given component.

OILevelOf("Component")

Where component is one of the fields defined in APL:BSV(15).Process\_Objects or APL:BOI.

Returns: Integer

#### *Length*

Returns the length of given input string.

Length("input string")

Returns: Integer.

#### *List*

Creates a list from given arguments.

List("A", "B", "C", ...)

Returns: List.

#### *Skip*

Ignores n first items of given list, and returns the remaining items a list.

Skip(list, n items to ignore)

Returns: List

#### *Substr*

Returns a substring from given input string.

Substr("input string", start position, length of substring)

Returns: String.

#### *Take*

Returns n first items of given list.

Take(list, n items to returns)

Returns: List.

#### *Trim*

Removes leading and tailing whitespace from input string.

Trim("input string")

Returns: String.

### Operators

Operators	Description
<i>and</i>	Logical or between two boolean values.
<i>or</i>	Logical or between two boolean values.
<i>=, !=</i>	Equality and inequality comparison between two values.
<i>&gt;, &gt;=, &lt;, &lt;=</i>	Comparison operators are supported between numerical values.
<i>-, +, *, /</i>	Arithmetical operators are supported between numerical values.
<i>not</i>	Logical not is supported on boolean values.
<i>()</i>	Parenthesis can be used explicitly specify the grouping of operations. For example, (1 + 2) * 3.

### Rule example

# Circuit Breaker

#### Example 3

```
length(item(attr("IL"), "DEV")) > 0 and (substr(attr("RX"), 22, 2) = "QB"  
or substr(attr("RX"), 22, 2) = "QS" or substr(attr("RX"), 22, 2) = "QI")  
and attr("IX") = 10 {  
    FunctionalStructurePath: take(attr("IE"), OiLevelOf("DEV"))  
    RuleId: "CIRCUIT_BREAKER_SWITCH_POSITION_1_0"  
    FunctionalStructureType: "Circuit Breaker"  
    DataPoint: "Switch position"  
    DataPointAttributes: list(DataPointAttribute("path", "OI"),  
        DataPointAttribute("name", if(length(item(attr("IL"), "DEV")) > 0,  
            "IL[DEV]", if(length(item(attr("IL"), "BAY")) > 0, "IL[BAY]",  
            if(length(item(attr("IL"), "STA")) > 0, "IL[STA]", ""))),  
        DataPointAttribute("customer_text", "TX"), DataPointAttribute("state",  
            "SX"), DataPointAttribute("update_blocked", "UB"),  
        DataPointAttribute("alarm_blocked", "AB"),  
        DataPointAttribute("event_blocked", "HB"),  
        DataPointAttribute("printout_blocked", "PB"),  
        DataPointAttribute("active", "AL"), DataPointAttribute("acknowledged",  
            "AR"), DataPointAttribute("severity", "AV"))  
    DataPointValueType: "Dbool"  
    LN: attr("LN")  
    IX: attr("IX")  
    PT: attr("PT")  
    TopologyReference: attr("LN")  
    TopologyReferenceIndex: attr("IX")  
    TopologySubType: "SwitchingDevice"  
    ValueAttribute: "TS"  
}
```

# Annexure E Symbols

Table 7: Non-Equipment Symbols

Symbol	Dynamic or Static
Alarm indicator	Dynamic
LED	Dynamic
Button	Dynamic
Text	Dynamic
Value (Analogue)	Dynamic
Value (Integer)	Dynamic

Table 8: Equipment Container Symbols

Symbol	Dynamic or Static	Control Pane
Bay (Authority)	Dynamic	Yes
Diameter (Authority)	Dynamic	Yes
Section Header	Dynamic	Yes
Substation (Authority)	Dynamic	Yes

Table 9: Equipment Symbols

Symbol	Dynamic/Static	Control Pane
Asynch. Machine (Motor, Generator)	Dynamic	No
Auto-Transformer (2 Windings)	Dynamic	Yes, for child equipment Winding - Tap Changer
Auto-Transformer (2 Windings) - ANSI	Dynamic	Yes, for child equipment Winding - Tap Changer
Table continues on next page		

Symbol	Dynamic/Static	Control Pane
 Auto-Transformer (3 Windings)	Dynamic	Yes, for child equipment Winding - Tap Changer
 Auto-Transformer (3 Windings) - ANSI	Dynamic	Yes, for child equipment Winding - Tap Changer
 Auto-Transformer (4 Windings)	Dynamic	Yes, for child equipment Winding - Tap Changer
 Auto-Transformer (4 Windings) - ANSI	Dynamic	Yes, for child equipment Winding - Tap Changer
 Battery	Dynamic	No
 Busbar	Dynamic via Topological coloring	No
 Bushing	Static	No
 Capacitor Bank	Static	No
 Circuit Breaker	Dynamic	Yes
 Circuit Breaker - ANSI	Dynamic	Yes
 Current Transformer (CT)	Static	No
 Current Transformer (CT) - ANSI	Static	No
 Diode	Static	No
 Disconnector	Dynamic	Yes
 Disconnector - ANSI	Dynamic	Yes
 Double-Sided Truck	Dynamic	Yes, both for: <ul style="list-style-type: none"><li>• Truck</li><li>• Child Circuit Breaker</li></ul>
Table continues on next page		

Symbol	Dynamic/Static	Control Pane
 Double-Sided Truck - ANSI	Dynamic	Yes, both for: <ul style="list-style-type: none"><li>Truck</li><li>Child Circuit Breaker</li></ul>
 Earth	Static	No
 Fan	Static	No
 Flow Sensor	Dynamic	No
 Gas Insulated Cable	Static	No
 Inverter	Static	No
 Level Sensor	Dynamic	No
 Line Choke	Static	No
 Link	Static	No
 Load-Break Switch	Dynamic	Yes
 Overhead Line	Static	No
 Petersen Coil	Static	No
 Position Sensor	Dynamic	No
 Power Cable	Static	No
 Power Shunt	Static	No
Table continues on next page		

Symbol	Dynamic/Static	Control Pane
 Power Transformer (2 Windings)	Dynamic	Yes, for child equipment Winding - Tap Changer
 Power Transformer (2 Windings) - ANSI	Dynamic	Yes, for child equipment Winding - Tap Changer
 Power Transformer (3 Windings)	Dynamic	Yes, for child equipment Winding - Tap Changer
 Power Transformer (3 Windings) - ANSI	Dynamic	Yes, for child equipment Winding - Tap Changer
 Power Transformer (4 Windings)	Dynamic	Yes, for child equipment Winding - Tap Changer
 Power Transformer (4 Windings) - ANSI	Dynamic	Yes, for child equipment Winding - Tap Changer
 Pressure Sensor	Dynamic	No
 Reactor	Static	No
 Rectifier	Static	No
 Remote Power Connection	Dynamic	No
 Rotating Reactive Component	Static	No
 Safety Valve	Static	No
 Semiconductor-Controlled Rectifier	Static	No
 Single-Sided Truck	Dynamic	Yes
 Storage Tank	Static	No
 Surge Arrestor	Static	No
 Sync. Machine (Generator, Motor)	Dynamic	No
 Thyristor-Controlled Frequency Converter	Static	No
 Thyristor-Controlled Reactive Component	Static	No
Table continues on next page		

Symbol	Dynamic/Static	Control Pane
	Static	No
	Static	No
	Static	No

Table 10: Communication Supervision Symbols

Symbol	Dynamic/Static
	Static
Table continues on next page	

Symbol	Dynamic/Static
 TimeServer	Static
 Videowall	Static
 Workplace	Static

# Annexure F Hierarchical Symbols

## 1.1 Background

Certain equipment types may have other equipment types as children; graphically, this is shown by drawing them on top of one another. The most prominent examples of this are a Double-Sided Truck that allows a disconnector, circuit breaker and a few other types as children. Also, Transformers that can have Windings that in turn can have a Tap Changer.

In the first version of View Builder there was a dedicated Symbol for every possible combination. This did not allow flexibility at all; for example, the Windings of a Transformer could not be arranged to one's liking.

With the introduction of Hierarchical Symbols, it is now possible to manually arrange and configure the child equipment.

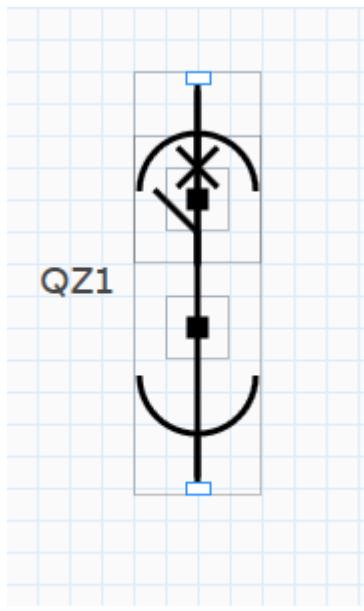
## 1.2 Creation

### 1.2.1 Process Diagram/SLD

In the Import Dialog the items will be imported as usual. When you open the Process Diagram/SLD for a container that has a Hierarchical Symbol it will be automatically created for you.

The Hierarchical Symbol must be arranged by the user. See Modification below.

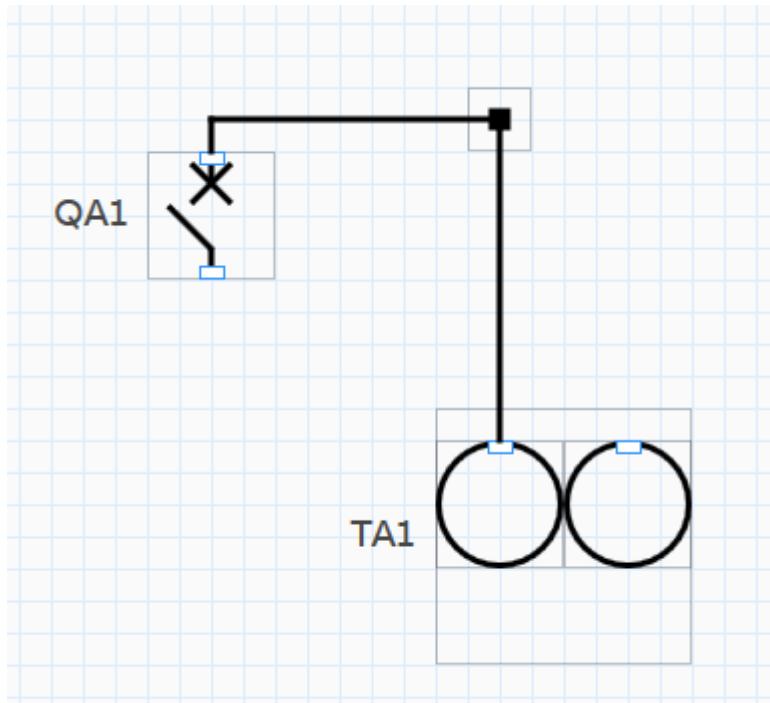
A double-sided truck might look like this directly after import:



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*Figure 138: Imported Double-Sided Truck*

The Hierarchical Symbol is not only visualizing the hierarchy of the functional structure but is also used for configuration of the topological connections. Either those are internal connections where the child equipment (for example, the Circuit Breaker) is connected to its parent item (the Truck in this example) or it's directly connected to an equipment on the Diagram:



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*Figure 139: External Connection to Windings of Power Transformer*

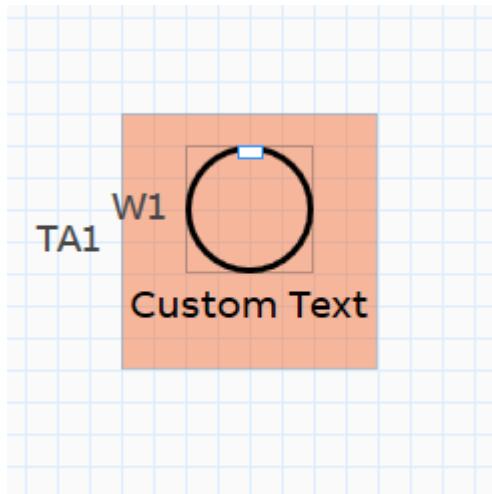


It is possible that the topological connections that are imported are interchanged (for example within a Double-Sided Truck). Ensure that the topology is correct after the initial import.

## 1.2.2 Process Picture

To create Hierarchical Symbols in the Process Picture you can either create the picture directly from the Process Diagram where the Hierarchical Symbol already exists or create it from scratch. For this you have to add a symbol that allows children (see below) and then set it in *Edit Mode* as described in the [Modification](#).

In a Process Picture you can arrange the Hierarchical Symbol more freely than in the Process Diagram – you can also add primitive shapes and texts to it if you so choose.



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*Figure 140: Hierarchical Symbol with Text*

## 1.2.3 Supported symbols

The following symbols support children:

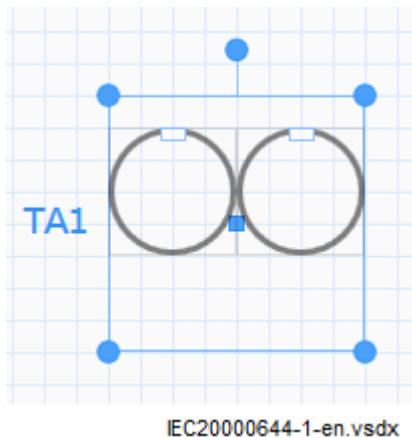
- Double-Sided Truck
- Single-Sided Truck
- Power Transformer
- Auto Transformer
- Transformer Windings

## 1.3 Modification

The Hierarchical Symbols can be configured like any other symbol. However, there are a few specialties to know about how to efficiently do this.

### 1.3.1 Selection mode

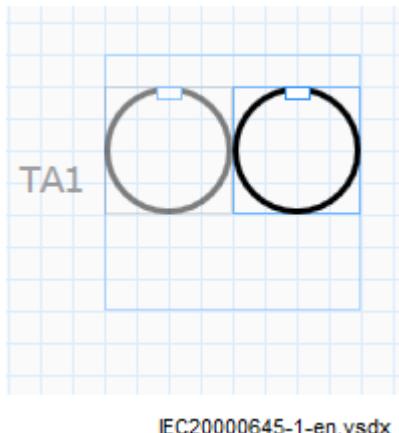
When you see a Hierarchical Symbol in a diagram, you cannot directly modify the child nodes. If you try to click a child node it will instead select the parent item.



*Figure 141: Selected Parent*

The parent item can be modified like any other symbol on the diagram.

Once you have the parent selected, you can select the child again, now you will see that it actually selected the child item:



*Figure 142: Selected Child Node*

The properties on the right side will now be shown for the child item. Some properties, however, are disabled:

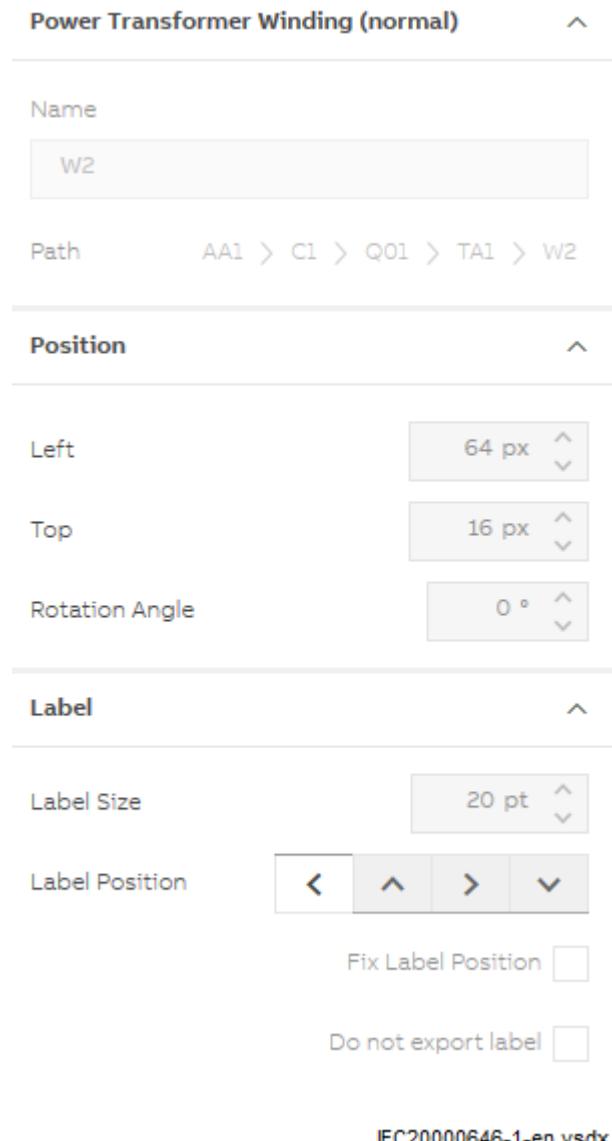


Figure 143: Selection Mode Properties

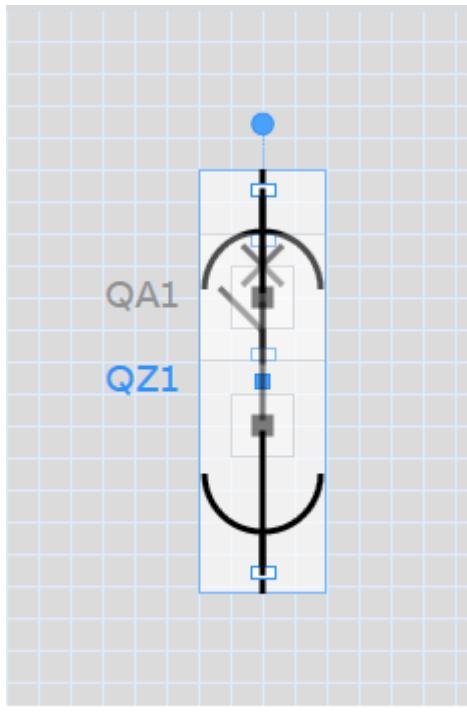
This happens because the *Selection Mode* allows modifying only properties that don't modify the graphic representation. This is done to prevent accidental changes to a nicely arranged symbol.

As a rule of thumb, you can say that everything that is not changing the look on the diagram will be modifiable from the *Selection Mode*. This includes the *Label Position* in the Process Diagram and mapping related properties (Equipment-, Datapoint-Mapping) as well as Event and Action Configuration in the Process Picture.

If you need to change rotation, size, position or the want to change the links going to a Hierarchical Symbol you need to use the *Edit Mode*.

### 1.3.2 Edit mode

If you need to make a change that is not possible with the *Selection Mode*, you can enter the Edit Mode by double clicking the Hierarchical Symbol. You will see that you entered Edit Mode by the fact that the background around the symbol turns grey:



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Figure 144: Double-Sided Truck in Edit Mode

Once in Edit Mode, you can only modify the selected item and its children. A click on the grey area or hitting the **Esc** key will leave edit mode again.

While in edit mode you can select different elements that belong to that Hierarchical Symbol and do the following:

- Delete nodes and links
- Move, rotate or resize (if allowed) graphically
- Move, rotate or resize (if allowed) via properties Panel

After the initial Import you might have to re-arrange your imported Hierarchical Symbols so that they are arranged correctly and make sure that the topological connections are correct.

### 1.3.3 Adding Child Items

Once in Edit Mode you can add new elements. For this you must click as normally on the Elements tab and select which item to add. In the Process Diagram this view will be filtered to what is allowed to add, for example, you can only add Windings to a Power Transformer.

In the Process Picture you are free to add any element.

You can also directly add items to an already existing child element. For example, if you have a Power Transformer with a Winding, you can set the Power Transformer into Edit Mode and then add a Tap Changer by selecting it in the Elements Tab and drop it on the Winding. A light-blue background on the child element will let you know to which child the Tap Changer will be added.

### 1.3.4 Modify Connections

Edit Mode allows you also to modify, add or remove connections. Removing is done as usual, just set the parent item in Edit Mode first, select the Link you want to remove and click **Delete**.

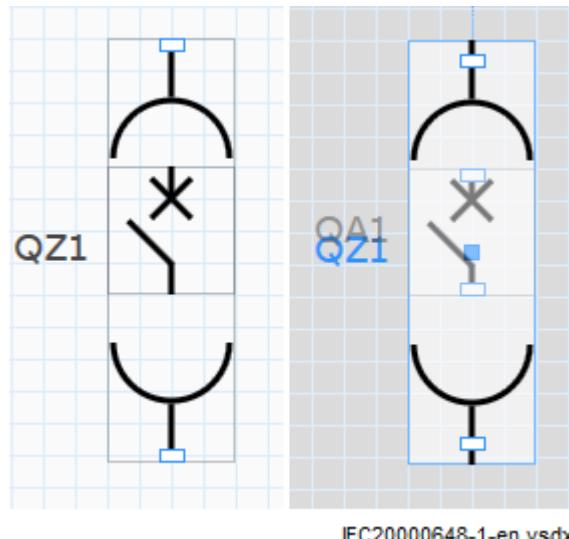
For adding connections, there are two use cases:

- Add a new *internal*/connection (for example from a Circuit Breaker within a Truck to the Truck)
- Add a new *external*/connection (for example from Winding to any element on the diagram)

#### Adding internal connection

Internal connections are possible if the parent has appropriate connection points itself (for example the Truck). These Symbols have *internal connection points* which become visible only when you enter edit mode.

In the following picture you can see the difference between a Circuit Breaker with external Connection Points (left) and one with Internal ones that is in Edit Mode (right).



*Figure 145: Internal and External Connection Points*

While in Edit Mode the Connection Points of the child symbols become visible and internal connections can be made.

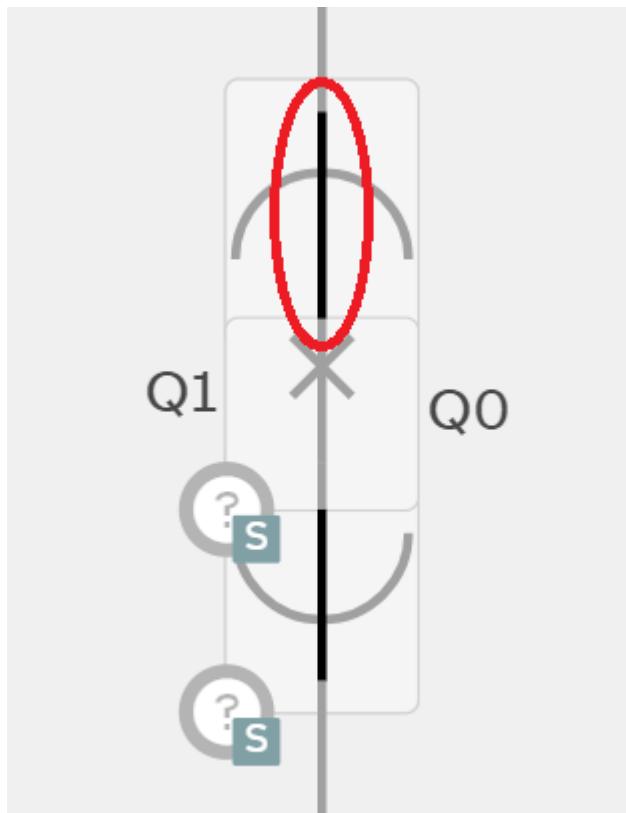
#### Adding external connection

If the parent node has no external connection points you can directly connect the child nodes to anything that is on the diagram without having to set it in edit mode. The connection points of the children are visible always.

## 1.4 Limitations

The following limitations are currently known:

- The topological connections within a Truck (for example, from a child Circuit Breaker or Disconnector) are not colored correctly when displaying it in the WebUI.



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Figure 146: Not colored Connection in WebUI

# Section 14 Abbreviations

Table 11: Terms associated with SYS600

Terms	Description
Functional structure	See <a href="#">Section 2.1</a>
Data Points	Corresponds to a small “unit” of information that cannot sensibly be split anymore, for example, a hardware input or output or a signal.
Backend	The part of the application that is not directly accessed by the user, which is responsible for storing and manipulating data.
SLD	Single Line Diagram - Process Diagram
Typical / Instance / Standalone	A prototype container for primary equipment and IEDs, and relations between such items within the Typical. A “Typical” can be instantiated; changes can then be done on the “Typical” and automatically be propagated to all instances. An item is described as standalone when it is neither a Typical nor an Instance.
Rule file	See <a href="#">Section 11</a>
UI / GUI	This stands for User Interface or Graphical User Interface.
SYS600	A shortened name for MicroSCADA X/Pro Control System .
LED	This stands for Light Emitting Diode. In this document, LED is represented as a status indicator. This reflects the status with different colors based on the values provided for respective datapoints.
IED	Intelligent Electronic Device, general term in IEC 61850 for everything programmable and electronic (for example, HMIs or NCC gateways are also IEDs, not only control and protection devices).
OI	This stands for Object Identifier. A freely chosen text that is used as a hierarchical location identifier for the object. The attribute is divided into sub-fields (hierarchy levels) according to the application specific conventions defined in the application attribute <i>APL:BOI</i> , see the <i>System Objects</i> manual.
RX Reserved Text (attribute)	A text attribute reserved for use of standard application software, such as LIB 500.
SDK	This stands for Software Development Kit.
Communication Supervision	The monitoring of secondary equipment (IEDs), their internal software and network connectivity.
Leaf container	A container is a leaf container when none of its children is a container.
SPI	This stands for Single Point Indication.
Table continues on next page	

Terms	Description
IEC	This stands for International Electrotechnical Commission.
SA	This stands for Substation Automation and refers to using data from intelligent electronic devices (IEDs) control and automation capabilities within the substation and control commands from remote users to control power system devices.
Common SA data model	Common Substation Automation Data Model. A data model is an abstract model that organizes elements of data and standardizes how they relate to one another and to the properties of real-world entities.



---

**Hitachi ABB Power Grids**  
**Grid Automation Products**  
PL 688  
65101 Vaasa, Finland

<https://hitachiabb-powergrids.com/microscadax>



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