# SIEMENS

# Automation EI&C Administration

**Operating Manual** 

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indicates that death or severe personal injury will result if proper precautions are not taken.

### 🛕 WARNING

indicates that death or severe personal injury may result if proper precautions are not taken.

### 

indicates that minor personal injury can result if proper precautions are not taken.

#### NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

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### 1.1 "General settings > Project data" category

### **Relevant control groups**

- "Links" control group:
  - Here you define the defaults of the planning project. The defaults define the unit structures available for the project, for example.
  - Presetting (general default): "@30 > M00 > A20 > A10 Project default, global"
  - Default for electrical engineering: "@30 > M41 > A20 > A10 Project settings E&IC"
- "Customer" and "User project" control groups: Here you enter the general customer data and project data.

1.2 "Automation > El&C" category

# 1.2 "Automation > EI&C" category

### 1.2.1 "General" control group

The following table describes the control elements of the "General" control group.

Control element	Description
"Potential tracking" option	COMOS can forward logical potentials within the data structure via the connections. If you are not working with logical potentials, deactivate this option.
	Potential tracking is only conducted for the types "EE/EI&C", "Single line" and "Fluid".
	The potential is passed on via:
	The connected connector
	A special transfer for terminals
	<ul> <li>And as an additional option through specified feed-through connections</li> </ul>
	Base objects for potentials are located in the node "@10 > A50 > A20 > B30 > A10 Poten- tials".
"Write '_' for empty request val- ues to the device" option	Requirement: The "Combination" option is activated in the properties of the attribute on the "Link" tab in the "Product data, request" control group.
	The activated option has the effect that the underscore "_" is written into empty request values at the following actions.
	Transition request to the manufacturer device
	Direct selection of the manufacturer device
	In many cases, the base objects of the requests already contain values in the attributes. If no entry takes place in the engineering view, this can have two reasons:
	They accept the inherited value.
	• You do not want to have a value. In this case you cannot delete the inherited value for technical reasons. If the field is empty in the engineering view, inheriting is activated automatically.
	You can activate this option, and the underscore is used as a wildcard for a blank entry during the transition.
"Device labeling group" list	For defining the device labeling output on interactive reports. See also chapter "Device labeling group" list (Page 10).
"Reference document label- ing" and "Original document la- beling" options	These options are only evaluated if the value "Label / Path" or "Label / Number" is set in the "Device labeling group" list. The options determine whether the original document or the reference document is evaluated for the sheet number of the item designation. See also chapter "Device labeling group" list (Page 10).

### 1.2.2 "Device labeling group" list

Use this list to determine which device labeling will appear on interactive reports. The following is a description of the entries in the list:

1.2 "Automation > EI&C" category

### "Normal" entry

The selected device labeling follows the DIN standard. It is composed of:



Device label	Description
Prefix	Defined by the "Prefix and delimiter" edit group of the "General settings > Standard" category.
Label and consecutive number	Corresponds to the label of the engineering object. If no label exists, the name of the engineering object is accepted. If the object name is based on the masks predefined in COMOS, it is automatically composed of a label and a consecutive number.

### "Label / Path" entry

The selected device labeling does not conform to DIN standards. It is composed of:



Device label	Description
Prefix	See above.
Sheet number	"Label of the reference document" option activated:
	- The label of the reference document or, if it missing, its name.
	<ul> <li>If there is no reference document, the label of the original document is used.</li> </ul>
	<ul> <li>If the label is missing, the name of the original document is used.</li> </ul>
	When the reference document is created automatically, the label corresponds to the sheet page. Subsequent changes to the label will update the device label. This happens even if the label is updated due to subsequently inserted pages.
	<ul> <li>"Label of the original document" option activated:</li> </ul>
	<ul> <li>The label of the original document is used.</li> </ul>
	– If the label of the original document is missing, its name is used.

1.2 "Automation > EI&C" category

Device label	Description
Label	Corresponds to the base object label.
Path number	Specifies the path on which the engineering object was placed in the interactive report. If an object is placed on a path on which there is already another object, a period suffixes the path number and is counted upwards in chronological placement sequence.

### "Label / Number" entry

The selected device labeling does not conform to DIN standards. It is composed of:



Device label	Description	
Sheet number and prefix	See above.	
Label and consecutive number	Corresponds to the label of the engineering object.	
	• If no label exists, the name of the engineering object is accepted.	
	<ul> <li>The name is applied initially when an engineering object is created.</li> </ul>	
	• If the object name is based on the masks predefined in COMOS, it is composed of a label and a consecutive number.	

If a different unit or location is assigned to the engineering object than the one assigned to the plan on which it is placed, this information is also mapped. The selected device labeling is irrelevant in this case.

### Example



### 1.2.3 "Signal tracking" control group

If you are not working with signals or with signals that are forwarded, deactivate this option.

Option	Description
"Complete"	Signal tracking is activated. The signals are searched for as described below.
"Ignore bridge connection"	Signal tracking is activated, but no tracking is done via the terminal strip bridges. Terminal strip bridges are used to short-circuit terminals. The signals are searched for as described below.
"None"	Signal tracking is deactivated.
"Check signal tracking"	Checks that the existing signal assignments are identical for connections.

### Options of the "Signal tracking" section

### Sequence of signal search:

- "Signal of owner" deactivated: The signals are taken over only from the connected counterpart connectors. You can control whether bridges are ignored.
- "Signal of owner" activated: Signals are automatically searched for and taken over if they are found at one of the following objects. The following search sequence is used:
  - 1. Owner of owner
  - 2. Unit pointer of the owner
  - (Unit pointers can point to units, elements, functions or to signals)
  - 3. Back pointer to device with implementation
  - 4. Owner of 3.

### 1.2.4 "Device selection" control group

#### Note

### Project-based selection of manufacturer devices.

You can only activate the option if you have previously defined a local path for the projectspecific selection of manufacturer devices. See also Defining a project-based selection of manufacturer devices. (Page 109).

### "List only local manufacturer devices" option

The activated option has the effect that only a project-based selection of manufacturer devices is taken into consideration during the manufacturer device selection.

### "Local manufacturer devices" field

You can use this field to define a path for a project-specific selection of manufacturer devices.

1.2 "Automation > EI&C" category

### 1.2.5 "Settings" control group

### "Implementation" list

Specifies how request objects are handled after the implementation.

Entry	Description	
"Object will not be replaced (by pointer)"	The request objects in your engineering project are retained. An implementation object is assigned to the request objects by means	
"Object will not be replaced (by merge)"	of a reference and you can navigate between the two objects.	
"Object will be replaced (by pointer)"	The request objects in your engineering object are replaced by implemented objects.	
"Object will be replaced (by merge)"		

### "Output relative label" list

A device label that is determined relative to the document is assigned to objects on circuit diagrams. If the object lies next to the document, the device label consist only of the object label.

If the object lies under a different owner, the "Output relative label" list decides how the device label is displayed.

Entry	Description
"No"	The FullLabel is output.
	Supplies the labels of the owners.
	Objects with the "Folder" property are ignored.
	You can find more information on this topic in the "Class Doc- umentation COMOS_dll" manual, keyword "FullLabel".
"Yes (up to V8.1, remove common part)"	The RelativLabel is output.
	<ul> <li>This setting searches for the common owner of the two objects and combines the labels from this point on.</li> </ul>
	You can find more information on this topic in the "Class Doc- umentation COMOS_dll" manual, keyword "RelativLabel".
"Yes (up to V8.1, with =./+., remove common part)"	<ul> <li>Corresponds to the option "Yes (up to V8.1, with =./+., remove common part)" with the following addition: If the highest owner is a plant, an "=" is set additionally as the prefix.</li> </ul>
	<ul> <li>If the highest owner is a location, a "+" is set additionally as the prefix. The "=" and the "+" are independent of the signs set in the properties of the project.</li> </ul>

### 1.2 "Automation > El&C" category

Entry	Description	
"Yes (as of V8.2, remove hierarchical part)"	The RelativLabel2 is output.	
	• One object must be a direct owner of the other object.	
	<ul> <li>If this is the case, the RelativLabel is supplied with reference to this direct owner.</li> </ul>	
	<ul> <li>If this is not the case (meaning that no direct owner relationship exists), the FullLabel is supplied. In this case the project is thus regarded as the owner.</li> </ul>	
	<ul> <li>RelativLabel2 has the advantage that the objects placed on reports are always labeled uniquely.</li> </ul>	
	<ul> <li>If an owner relationship exists, the FullLabel of the document plus the RelativLabel of the placed objects together form the FullLabel of the objects.</li> </ul>	
	<ul> <li>If no owner relationship exists, the FullLabel of the placed objects is output. In order to differentiate the substrings "=" and "+" are prefixed. Example: Overall label: +S3.A7-A33Relativ becomes +S3:</li> </ul>	
	+A7-A33	
	You can find more information on this topic in the "Class Doc- umentation COMOS_dll" manual, keyword "RelativLabel2".	
"Always"	• The property AliasFullLabelWithoutFolder is always output for each device placed on the report.	
	• This also applies for the case that the report and the placed object lie in the same plant or in the same location.	
	• If the placed object is located in a labeling segment, the label is split.	
	You can find more information on this topic in the "Class Doc- umentation COMOS_dll" manual, keyword "AliasFullLabelWi- thoutFolder".	

If @Alias structures have been created and activated in the engineering project, folders in the @Alias branch are included and, depending on the option used above, filtered out in the relative label.

You can find additional information on this topic in the "Administration" manual, keyword "Alias for labels".

### "Output relative references" list

The "Output relative references" list controls whether and how references to interactive reports are output:

Entry	Description
"Analog to relative label"	The setting selected in the "Output relative label" list is used for the output of the references.
"Yes"	The RelativLabel is output.
"No"	The FullLabel is output.
"with fixed = & +"	The plant label and the location label are included in the RelativLabel.

1.2 "Automation > El&C" category

### Further control elements

Control element	Description
"Include rotation of *V* variables" option	Deals with the technology of additional symbols or subsymbols. The option defines how the integra- ted subsymbols are treated when the main symbol is placed:
	<ul> <li>Activated: The subsymbols are rotated into the position of the placeholder text.</li> </ul>
	• Deactivated: Subsymbols always appear with a horizontal base line.
"ANSI Standards" option	Specifies whether the representation is based on ANSI standards.
"Print Language 1" list "Print Language 2" list	<ul> <li>"Print Language 1" list: Specifies the default language used when printing interactive reports.</li> </ul>
	<ul> <li>"Print Language 2" list: Specifies the alternative language used when printing interactive reports.</li> </ul>
	Requirements:
	<ul> <li>The "Activate language output on reports" option is activated.</li> </ul>
	• The reports have been prepared accordingly in the options script.
"Activate language output on reports" option	Activates the bilingual printout of interactive reports.
	See chapter Preparing printing in two languages (Page 125).
"Behavior potential manager" list	"Selection via filter"
	"Selection via main table"
"Number auxiliary contacts to DIN/IEC" option	Switches the label at auxiliary contacts.
	<ul> <li>Option activated: The 10th auxiliary contact contains the label "0".</li> </ul>
	Result (conforming to DIN/IEC): 1, 2, 3, 4, 5, 6, 7, 8, 9, 0,
	<ul> <li>Option deactivated: The 10th auxiliary contact contains the label "10".</li> </ul>
	Result: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
"Print internal circuits of macro blocks" option	Controls the printing of macro blocks.
	the manual "Logical Operation", keyword "Print in- ternal circuit".
"Assignment of line numbers" option	Activates the calculation of line numbers. For this purpose the "Number" tab is displayed in the "Characteristics for connections" dialog. Further information is available from the COMOS Support.

1.2 "Automation > EI&C" category

Control element	Description
"Use search via classification for loops" option	If the classification search for loops is activated, only classified objects are used as start objects.
	See also chapter Controlling search methods for placeable objects (Page 22).
"Move contact mirror" list	Controls the possibility of moving the contact mir- ror for relays and contactors on the interactive re- port.
	See also chapter Base object for relays, contac- tors (Page 140).
"Keep object after merge" option	If the option is activated, the slave object is not deleted after a merge operation.
	You can find additional information on this topic in the "Administration" manual, keyword "Merging objects".
"Mnemonic address" list	This option determines which type of identifier is added for the addresses.
	The mnemonic is "E" is prefixed for channel 01 "Digital input". The "Value 2" column corresponds to STEP 7 notation and is based on the standard IEC 61131 in German. The "Value 4" column is based on the standard IEC 61131 in English. The "Value 5" column is reserved for user-defined mne- monics.

### 1.2.6 "Miscellaneous" control group

### "Sort documents" list

Use the "Sort documents" list to specify the order in which the documents are addressed internally. This project option allows the user to quickly browse between the individual document pages in the printed documentation.

The internal order specifies in turn which documents are shown as predecessors or successors in the corresponding diagram cross-references. The documents are printed in the PrintManager in a user-defined order.

If you change the parameter, objects running across multiple documents can have a label at their edge showing on which document this object continues.

#### Example for potential references

If the Sort documents project option is changed, the labels in the margin will show another document as the successor. If the same potential object is used on different diagrams, potential references are created automatically.

The parameter is also taken into consideration in the output of predecessors and successors on interactive reports. This is a label on documents that states which document is before and

1.2 "Automation > El&C" category

after it in the sequence. The same applies here: If the Sort documents project option is changed, then another document is shown as the predecessor / successor in these labels.

#### Note

The "Sort documents" parameter does not change the printing order of the documents.

Entry	Description
"Standard"	The documents that are located underneath the corresponding owner are sorted. All other options sort project-wide. Only the same diagram type as the initial document is taken into consideration.
"Name"	The documents that are located underneath the corresponding owner are sorted.
"Unit / Name"	The plant is written into the reference if it is different for the reference documents to be compared.
"Location / Name"	The location is written into the reference if it is different for the reference documents to be compared.
"Unit / Location / Name"	The plant and location are written into the reference if they are different for the reference documents to be compared.
"Location / Unit / Name"	The location and plant are written into the reference if they are different for the reference documents to be compared.
"Document group / Name"	The document group is written into the reference if it is different for the reference documents to be compared.
"Page number"	See chapter Document references (Page 54).
"Reference documents"	The sequence of the references is used internally and sorting only takes place within the corresponding document group.
	Depending on the configuration, documents are referenced automatically on the "Documents" tab. These reference entries have a different order.

The following table describes the entries in the "Sort documents" list:

### "Relative output to segments" option

You can label half-open connections with references. The reference text describes the parameter. If you activate this option, the ID segment will be taken into account in the reference text.

### "Ignore linked location for output" option

If a location in the database is linked to another location, by default there is a reference to the linked location in the reference and reference designation.

The activated option means that this link is ignored for reference and reference designation.

### See also

Page numbers in page links (Page 55)

1.3 "Automation > El&C references" category

# 1.3 "Automation > EI&C references" category

### 1.3.1 "Reference display" control group

Control element	Description
"Unit label" list	Controls the handling of unit labels within a reference on interactive reports.
"Location label" list	Controls the handling of location designations within a reference on interac- tive reports.
"^Document group label" list	Controls the handling of document group labels within a reference on inter- active reports.
"Sheet label" list	Controls the handling of sheet labels within a reference on interactive reports.
"Path (vertical)" list	"Yes" entry: Takes the path in the reference text into consideration. The path is a component of a standard sheet.
"Zone (horizontal)" list	"Yes" entry: Takes the zone in the reference text into consideration. The zone is a component of a standard sheet.
"Remove document group prefix" option	When the reference evaluates the document groups ("Document group/ Name" and "Reference documents"), you can here set whether or not the name of the document group is to be displayed as well.
"Text for not solved references" field	The string defined here is assigned to semi-open connections without a coun- terpart.
"Reference behavior" list	Controls the sequence in which the references are formed.
"Reference version" list	Controls the display of references.
	• Reference behavior up to COMOS 10.1 SP2 This display corresponds to the previous standard in COMOS. References are displayed without leading delimiter.
	• Reference behavior according to EN61082-1 Display in the style of EN 61082-1. Mainly applies to the leading delimiter for unit/location.

You can find more information on this topic in the "EI&C Operation" manual, keyword "Representation of automatic links".

### 1.3.2 "Separator" control group

Field	Description
"Unit/Location to page"	Enter one or several separators here.
"Page to path"	Enter one or several separators here. The path is the hori- zontal component of a standard sheet.
"Path to zone"	Enter one or several separators here. The zone is the vertical component of a standard sheet.
"Prefix"	The characters you enter here are written to the beginning of the reference.
"Suffix"	The characters you enter here are written to the end of the reference.

1.3 "Automation > El&C references" category

# **Basic engineering/ Preparing IC engineering**

### 2.1 Requests and implementations

### 2.1.1 Implementation of channel requests

### Implementation of channel requests

You have the following options when implementing channel requests:

- Implement channel requests individually
- Implement channel requests using queries

If you only want to implement individual channel requests, perform the implementation by means of the channel request properties.

If you want to implement the channel requests in bulk, perform the implementation using the "Implement requests" query.

### 2.1.2 Implementation using a script

### Automatic implementation

A function for automatic implementation is available in the script:

Workset.Lib.Elo.AutoImplementation Node, Device

### Example:

"@10 > A50 > A10 > B40 > A20 > A20 Three-phase motor, single speed, with GRD"

### "Script" tab

The script block "OnReferencedByDevice" is activated in the properties of the object in the "Script" tab.

The automatic implementation sets a flag at the element of the device. Even when the requirements for automatic implementation are given once again, it is still not executed due to the marking.

The "RestoreRequest (Request)" function otherwise leads to all restored requests being immediately implemented once again.

### 2.2 Position diagrams (loops)

### 2.2.1 Controlling search methods for placeable objects

### Overview of the effect of the "B940" classification

The functional classification "B940 Loop Placeable" controls the following areas:

- AutoLoop
- Up-to-dateness check with the "Loop Document Manager"
- "Signal/Device assignment manager" plugin

### Effect of "B940" classification for AutoLoop: the loop classification search

Requirement: The project option "AutoLoopUseSearchManager Use search via classification for loops" is activated.

Only the objects classified with "B940" are used as start objects of the loop in the classification search for loops. The associated objects are found through the connections.

If signals are present as well, these are also evaluated. The signals find the objects that are not connected but still associated. Example: If marshalling has not taken place yet.

See also chapter AutoLoop, AutoConnect (Page 23).

The user view for this topic is available in the "EI&C operation" manual, keyword "Connecting and marshaling with the loop diagram".

### Effect of the "B940" classification on the "Signal/Device assignment manager" plugin

Requirement: The project option "AutoLoopUseSearchManager Use search via classification for loops" is activated.

If the classification search for loops is activated, only classified objects are used as start objects.

Find more information on this topic in the "EI&C Operation" manual, keyword "Signal/Device assignment manager".

### Identifying placeable objects in the Loop Document Manager

The Loop Document Manager identifies the objects that should be placed on the loop.

There are two options for this identification:

- Identification of the objects by means of classification This is the faster method. Requirement:
  - The objects have the classification "B940 Loop Placeable".
  - The project option "AutoLoopUseSearchManager Use search via classification for loops" is activated.
- Identification of objects via assignment to a sheet area on the loop. This assignment takes place via labeling segments. Requirement: The "Sheet area" attribute must be set.

### Considering manual editing of loops in the Loop Document Manager

The "Loop Document Manager" uses the following additional attributes to detect manual editing of loops:

- "System" tab, "Y00A03072 original AutoLoop position" attribute.
- "System" tab, "Y00A03519 AutoLoop offset" attribute.

The attributes can be used for all devices and terminals that can be placed on a loop.

### 2.2.2 AutoLoop, AutoConnect

### 2.2.2.1 Basic conditions in the base objects

#### Sheet area

In order for the objects to be placed in the correct areas, the "sheet area" attribute of the objects must be set accordingly and a signal assignment must have been performed via the signal path.

The objects have the "Y00A00179 sheet area" attribute on the "System data" tab. The attribute is stored with the following standard table: "10 > M00 > A20 > Y10M00N00027 Sheet area"

You use the "sheet area" attribute in the base project to specify the sheet area on the loop diagram where the "Automatic placing" function will place the object.

#### Note

### **Deviating label**

The sheet area is sometimes also called a "segment".

### Automatic placing / automatic connection

When opening the loop diagram the first time, COMOS automatically executes the "Automatic placing" (AutoLoop) and "Automatic connecting" (AutoConnect) functions. All devices and channels that belong to the signals of the position are placed on the diagram and are connected.

### Automatic page break

If necessary, the diagram is created on multiple pages. The following are retained completely:

- All the object data
- Connectors
- Cables
- Wires
- Potentials
- etc.

#### Subsequent content changes

If, after the first opening, you make changes to objects below the position or objects associated with these objects, these changes will not be automatically mapped to the loop diagram. Use one of the following commands of the shortcut menu to apply the changes:

- "Options > Place automatically"
- "Options > Connect automatically"

### Subsequent manual changes

In order to retain manual changes during an update select the corresponding options.

The following attributes are used:

- Properties of the base object, "Y00T00001 system data" tab
  - "Y00A03072 Original AutoLoop position"
  - "Y00A03519 AutoLoop offset"

The attributes are not visible on the tab and can be edited in the Navigator.

### 2.2.2.2 Search algorithm for automatic placement

### Precise search algorithm when performing the "Place automatically" function

COMOS searches for the objects to be placed according to the following rules:

- Device: The objects located below the device are checked recursively. If the device is actually a request which has an implementation, the implementation and the objects below it are also checked.
- Elements: The element and the objects that are located below it are checked recursively.
- Information objects (device with the "Data set" class, "User address" subclass): These information objects are placed on the loop diagram.
- Signal: The objects located below the signal are searched recursively. If a channel has been assigned, it is placed on the loop diagram, along with its address.
- Objects that are based on a base object with the "Device request" class: If the object has an implementation, the implementation is placed on the loop diagram.
- Objects which are assigned to a signal path are placed below one another.

### Connections which are not evaluated when performing the "Place automatically" function

The following connection types are ignored by the "Place automatically" function and objects lying under them are not placed on the loop diagram.

- Bridge
- Connection with potential In this case, the connector is joined with the connector of a physical potential.
- Connector has a pointer (Pointer) to a logical potential In this case, the connector has a reference or is provided with a logical potential via prosecution tracking.

### Special cases when performing the "Place automatically" function

The following special cases may arise when performing the "Automatic Placing" function:

- If the "Sheet area" attribute of an object has the value "Not set", COMOS proceeds as follows:
  - In the case of an element, COMOS checks the "Sheet area" attribute at the associated MainDevice.

MainDevice: The MainDevice text function is obsolete and only remains available due to compatibility reasons. Do not use this text function any longer; use the Device text function instead.

You can find additional information on this topic in the "Administration" manual, keyword "Device".

- In the case of a request with an implementation, COMOS checks the "Sheet area" attribute at the implementation.
- If the object is located in the "Locations" tab in the Navigator or if it has a location pointer, COMOS runs upward through the location structure until an object with a set "Sheet area" attribute is found.
- If the "Sheet area" attribute is not found or if the attribute value does not correspond to any sheet area on the loop diagram, the objects are placed at the left margin of the drawing.
- If a sheet area does not have a name (sheet area = " "), no objects are placed in this sheet area. Objects which have been assigned to the sheet area = " " are treated like objects whose "Sheet area" attribute has the value "Not set".
- If the "Sheet area" attribute of an object has the "Do not place" value, the object is not
  placed on the loop diagram.

### 2.2.2.3 Options script of the report template

### **Control parameters**

You set the control parameters for the "Place automatically" and "Connect automatically" automatic functions in the options script. The following table shows the configuration of the control parameters:

Control parameters	Data type	Default	Description
AutoConnectExternObjects	Boolean	False	Enables the creation of half-open connections during automatic connecting.
AutoConnectX	Long	0	The "Connect automatically" function links all objects on the loop diagram which are joined via their connectors. The "AutoConnectX" control parameter specifies whether the objects which are placed next to and/or below one another in graphical format on the loop diagram are also connected to each other:
			• "AutoConnectX" = 0: No additional connections
			• "AutoConnectX" = 1: Vertical connections
			• "AutoConnectX" = 2: Horizontal connections
			• "AutoConnectX" = 3: Vertical and horizontal connections
AutoDistributeTerminals	Boolean	False	"AutoDistributeTerminals" = False:
			Specifies that the terminals are placed at the margin of the corre- sponding sheet area, with a preset gap, when the "Place automat- ically" function is executed.
			"AutoDistributeTerminals" = True:
			Specifies that the terminals are distributed evenly throughout the sheet area when the "Place automatically" function is executed.
AutoLoop	Boolean	False	Specifies whether the "Option > Place automatically" command appears in the context menu on the loop diagram. This control parameter must be set to "True".
AutoLoopCables	Boolean	True	"AutoLoopCables"= True:
			Specifies that the in the database laid lines are placed on the loop diagram.
			The "Line" engineering object does not have the "sheet area" at- tribute in the database. The "Line" engineering object is placed at the middle of the first connection segment of the two joined chan- nels.
			If the "Line" engineering object has a "sheet area" attribute, the line is placed in the selected sheet area of the loop diagram.
			"AutoLoopCables"= False:
			Specifies that the lines are not placed on the loop diagram.
AutoLoopConnectorLayers	Long	0	Specifies via which connector types it is to be searches for to be placed objects.
			"AutoLoopConnectorLayers" = 0: All connector types
			"AutoLoopConnectorLayers" = 1: Only EE/I&C connections
			"AutoLoopConnectorLayers" = 2: Only single-line connectors
			"AutoLoopConnectorLayers" = 3: EE/I&C and single-line connec- tors

Control parameters	Data type	Default	Description
AutoLoopDebug	Boolean	False	Specifies whether debug texts are output, which can be read with DBMon, for example.
AutoLoopFactor	Long	5	Specifies the gap between the individual objects within a sheet area for the "Place automatically" function.
			[AutoLoopFactor] * [grid width] = [gap between the individual ob- jects]
			Default setting: 5 * 4 mm = 20 mm
AutoLoopFilter	String		AutoLoopFilter = " <tab>.<attribute>"</attribute></tab>
			Specifies that the objects whose corresponding attributes have the value "1" are not placed on the loop diagram when the "Place automatically" function is executed. This means that the "Place automatically" function can be filtered according to documents.
AutoLoopLogging	Boolean	False	Controls the generation of a log file.
			True: The file is saved as follows: c\Documents and settings\%User name%\Local settings\Temp\ <uid of="" report="">.txt. The log file con- tains the following information: a. Initial quantity of objects to be placed b. Result for where objects were placed.</uid>
			False: No log file.
AutoLoopPageBreak	String		Page break for loops
			0: If there is no more space on the page, then a page break is created.
			1: If the function changes, a page break is created.
			2: If the position changes, a page break is created.
AutoLoopStartObjectsSor- tingMode	String	1	Controls the sequence in which the objects are placed on a loop. The sequence depends on the SystemFullName.
			Value:
			<ul> <li>1: The pipe sign that separates the individual components of the SystemFullName is not interpreted as a name component. The objects are placed in the same sequence which they have in the COMOS-internal sorting in the Navigator (ASCII sorting).</li> </ul>
			• 0: The pipe sign is interpreted as a name component. The order of placement can deviate from the order that the objects have in the internal COMOS sorting in the Navigator.
			Example:
			Sequence in the Navigator:
			<ul> <li>" &gt; C &gt; Y01 Actuator, Channel request"</li> </ul>
			– " > C_1 > Y01 Actuator, Channel request"
			<ul> <li>Sequence for placing: Mode 1: As in the Navigator Mode 0: Actuator under "C_1" before actuator under "C"</li> </ul>
AutoLoopTerminalMultiPlac- ing	Boolean	True	If the terminals have already been placed on a different report with the same symbol type, this parameter specifies that the terminals are not placed on the loop diagram.

Control parameters	Data type	Default	Description
AutoLoopTerminalStrip	Boolean	False	Specifies whether terminals or terminal strips are placed on the loop diagram.
			"AutoLoopTerminalStrip" = False: Terminals are placed
			"AutoLoopTerminalStrip" = True: Terminal strips are placed
AutoStartLoop	Boolean	False	Specifies whether the "Place automatically" and "Connect auto- matically" automatic functions are executed the first time the loop diagram is opened.
			If the "AutoStartLoop" control parameter is set to False, the "Place automatically" and "Connect automatically" functions need to be manually executed on the loop diagram.
PreferredConnectionDirec- tion	String	"Y"	Specifies in which direction objects are placed on the loop diagram when the "Place automatically" function is executed.
			"PreferredConnectionDirection" = "X": horizontal
			"PreferredConnectionDirection" = "Y": vertical

### 2.2.2.4 Segmentation of the loop diagram

### Introduction

To use the "Place automatically" function correctly, you need to divide the loop diagram into segments. The segments are specified as targets for the "Place automatically" function.

The "Place automatically" function can also work without segmenting the loop diagram, in which case the objects will all be placed at the left margin of the loop diagram.

#### Segmenting the loop diagram

If segments have not yet been prepared on the loop diagram, insert the prepared segments from the database into the loop diagram. To insert segments into the loop diagram, proceed as follows:

- 1. Open the loop diagram.
- Open the following path in the "Base objects" tab in the Navigator: @10 > A50 > A20 > A20 > A10 > A40 Sheet area EI&C".
- 3. Use drag&drop to move the required segments below the "Sheet area EI&C" node from the navigator to the loop diagram.
- 4. Use the grab points to drag the segments to the required size.
- 5. Place the segments at the desired position on the loop diagram.

The loop diagram is divided into several segments. You need to specify the name of the segment in the properties. The "Place automatically" function uses the segment name to insert the corresponding objects into the segment on the loop diagram.

### Specifying the properties of a segment

- 1. Select the "Properties" command from the context menu of the segment.
- 2. Select the relevant entry from the "Name" list in the "Sheet area" control group.
- 3. If you need to use a different name for a segment on the loop diagram, enter the required name in the "Name" field.
- 4. To apply the changes, close the "Properties" field by clicking "OK".

#### Note

The control group "Label is valid for:" is required in connection with abbreviated labels. The information is not relevant for the "Place automatically" function. Apply the default settings.

Names are assigned to the segments of the loop diagram. To ensure that your loop diagrams have a uniform appearance, you can use the prepared loop diagram as a document template.

### Direction of a segment

The segments of a loop diagram have a direction. The direction determines how the placed object are aligned on the loop diagram. You specify the direction in the options script of the report template, using the "PreferredConnectionDirection" control parameter.

### Exceeding the segment limits

If the placing frame on a loop diagram is too small for the number of objects when the "Place automatically" function is executed, one or more new pages are automatically created.

If you have created a multipage loop diagram, the context menu on the last sheet offers the "Delete page" command. As soon as the loop diagram only consists of one remaining sheet, the "Delete page" command disappears.

### 2.2.3 "FS\_A10 Loop diagram"

### Function of the "FS Loop diagram" IC detail report

The "FS Loop diagram" IC detail report shows the loop of a position or of an I&C point based on IEC.

Find more information on this topic in the "EI&C Operation" manual, keyword "Structure of the loop diagram".

### **Report template**

The report template of the "FS\_A10 Loop diagram" IC detail report is found in the "Documents" tab in the base project at the following location:

"A30 > F > FS > FS\_A10 > FS\_A10 Loop diagram"

### Base object

The base object of the "FS\_A10 Loop diagram" IC detail report is found at the following location: "@30 > M00 > A80 > A10 > F > FS > A10 Loop diagram" Basic engineering/ Preparing IC engineering

2.2 Position diagrams (loops)

# Preparing functional engineering in the layout

If you wish to place objects on the unit layout, use the symbol type M40\_P2.

The unit layout is not a standardized document, so there is no comprehensive symbol library in COMOS. Alternatively, you can copy symbols of other drawing types or create your own meaningful symbols.

# Preparing engineering tasks

### Definition of engineering tasks

• Engineering tasks are modules (a set of objects), which form a functional unit (objects with a common purpose).

They dispose of the ability to be inserted automatically into an environment and to adapt themselves to it. Tasks allow you to configure an entire plant with the aid of a company-specific building block made up of functional units. All tasks for the hardware and software that are required to specify the functional units are included.

### Important capabilities of engineering tasks

With a task, all necessary object structures are set up in the engineering project. Both, the required hardware objects and all software blocks and channel assignments that are required in order to meet the requirements of the function are queried or, if unique, assigned directly. The unit documentation (circuit diagrams, etc.) is automatically generated. The execution of the tasks is logged to allow a redesign to be performed at any time if a decision is reversed and to execute the tasks again with new parameters.

### Engineering tasks in EI&C with special details area

- See chapter Administering the Implementation manager (Page 36).
- See chapter Administering the Potential manager (Page 37).
- See chapter Administer template search (Page 40).
- See chapter Administer target search (Page 42).

#### Additional information

You can find additional information on this topic in the "Administration" manual, keywords "Merging objects" and "Preparing engineering tasks".

4.1 Administering the Implementation manager

### 4.1 Administering the Implementation manager

### 4.1.1 Integrating the new Implementation manager in the customer database

### Requirement

- The overview of engineering tasks for EI&C is known. See chapter Preparing engineering tasks (Page 35).
- Base object and standard tables for the old Implementation manager are available.

### Objective

Adapt the existing standard tables and the task base object that is using the old Implementation manager in such a way that the new Implementation manager is used in the tasks user interface.

### Procedure

- Supplement the "@SYSTEM > @eBlock > @DetailOCX" standard table with the following entry:
  - "Name": Continue counter
  - "Description": Description of the new Implementation manager, for example, "Implementation manager (new)"
  - "Value 1": "Comos.eBlock.WpfDetailControls.Views.ImplementationManager"
  - "Value 2": "Comos.eBlock.WpfDetailControls.Views"
- 2. Open the properties of the base object of the task "Implement PLC channels" or "Implement safety-related PLC channels".
- 3. In the "Detail area" list on the "Attributes > System data" tab in the "General" control group, select the entry created in step 1 of the "@DetailOCX" standard table.
- Create two queries in the base data under the "@System > @Profiles > @AllUsers > AssemblyAction" node:
  - Name:
     "<Path for task from step 2>.<Name of task from step 2>QBLeft" and "<...>QBRight"
     Example: "@02.200.ADC.@Z1.A.05.<Name from Step 2>QBLeft"

### See also

Using the old or new Implementation manager (Page 36)

### 4.1.2 Using the old or new Implementation manager

In the COMOS DB, there is an older and a newer version of the Implementation manager.
4.2 Administering the Potential manager

The properties of the task base object determine which version is used by a task: Tab "Attributes > System data" > Control group "General" > List "Detail area":

- Value "Implementation manager (new)": The new version is used.
- Value "Implementation manager": The old version is used.

#### See also

Integrating the new Implementation manager in the customer database (Page 36)

# 4.2 Administering the Potential manager

# 4.2.1 Integrating the new Potential manager in the customer database

#### Requirement

 The overview of engineering tasks for EI&C is known. See chapter Preparing engineering tasks (Page 35).

#### Objective

To create a task base object that uses the new Potential manager.

#### Procedure

- Supplement the "@SYSTEM > @eBlock > @DetailOCX" standard table with the following entry:
  - "Name": Continue counter
  - "Description": Description of the new Potential manager, for example, "Potential manager (new)"
  - "Value 1": "Comos.eBlock.WpfDetailControls.Views.PotentialManager"
  - "Value 2": "Comos.eBlock.WpfDetailControls.Views"
- Adjust standard table "@SYSTEM > @eBlock > ImplMgrFilter": Specify the filters of the "Object filter" area which users apply to filter the potential table. See also chapter Setting up filters for the new Potential manager (Page 38).

4.2 Administering the Potential manager

- 3. Create a task base object for the Potential manager. Properties:
  - "Name": Any
  - "Description": The text describing the Potential manager
  - Tab "Attributes > System data" > Control group "General":

Attribute	Value
"Function"	"Apply detail area"
"Detail area"	The entry created in step 1 in the "@Detai- IOCX" standard table

- Tab "Attributes > System data" > Control group "Detail area" > Field "Standard table": During the definition of filters in step 2, you created a new entry for the main filter in the "@SYSTEM > @eBlock > ImplMgrFilter" standard table. Select this entry.
- Tab "System properties", functional classification: "CO"
- 4. Create the task as an element of a function group base object, for example, a terminal box.

#### Result

If planning objects are created that are derived from the function group base object, the new Potential manager is used on the tasks user interface.

#### See also

Using the old or new Potential manager (Page 40)

# 4.2.2 Setting up filters for the new Potential manager

#### Procedure

To set up the filters that are available in the new Potential manager in the "Object filter" area, proceed as follows:

- 1. Register the main filter.
- 2. Register the secondary filter.
- 3. In the project properties, specify which filters are displayed.

4.2 Administering the Potential manager

# Setting up the main filter

1. Create a new entry for the main filter in the "@SYSTEM > @eBlock > ImplMgrFilter" standard table:

Property	Value
"Name"	Continuing counters of the other entries
"Description"	Name of main filter
"Value 2"	"Layout Implementation"

 Under the "@SYSTEM > @eBlock > ImplMgrFilter" node, create a standard table for the main filter.

"Name": Same name as the standard table entry in Step 1.

3. Create a standard table entry for each filter value of the main filter.

Property	Value
"Name"	Continuous counter
"Description"	Filter criterion
"Value 1"	Unique value, used internally within the system
"Value 2"	Enter the classifications that the objects shown in the Potential manager need to have when the user selects this filter value.
	Sample: "C1: <hierarchical classifica-<br="">tion&gt;,C2:<functional classification="">"</functional></hierarchical>
	Example: "C1:ECHW, C2:CN"

 "@SYSTEM > @eBlock > ImplMgrFilter" standard table, "Value 3" of the entry for the main filter: To define a start value, enter a value of the "Value 2" column from the standard table of step 2.

#### Setting up the secondary filter

1. Under the standard table for the main filter, create additional standard tables - one for each entry of the main filter:

Names of standard tables: Same as names of the standard table entries of the main filter

2. Create standard table entries for the standard tables.

4.3 Administer template search

# Setting the display of the filters in the project properties

- 1. Open the project properties, "Options > ET/I&C Options 2" tab.
- 2. In the "Settings" control group, "Potential manager behavior" list, specify which filters users will see in the Potential manager in the "Object filter" area:
  - Value "Selection via main table"
     Users see only the main filter. It contains the entries of the standard table which you created for the main filter under the node "@SYSTEM > @eBlock > ImplMgrFilter".
  - Value "Selection via filter" Users see three filters:

Filter	Description
Left filter	Filters the tables based on the functional clas- sification of the potentials. No adaptations pos- sible in the database.
Center filter	The main filter
Right filter	The secondary filter
	The filter values offered depend on the filter value that is set in the main filter.

#### See also

Integrating the new Potential manager in the customer database (Page 37)

# 4.2.3 Using the old or new Potential manager

In the COMOS DB, there is an older and a newer version of the Potential manager.

The properties of the task base object determine which version is used by a task: Tab "Attributes > System data" > Control group "General" > List "Detail area":

- Value "Potential manager (new)": The new version is used.
- Value "Potential manager": The old version is used.

#### See also

Integrating the new Potential manager in the customer database (Page 37)

# 4.3 Administer template search

#### Requirement

• The overview of engineering tasks for EI&C is known. See chapter Preparing engineering tasks (Page 35).

#### Objective

Search for templates in the @Template branch and use in the current project.

# Procedure

Refer to the "Administration" manual to learn about the general use and administration of engineering tasks.

- 1. Open the "System data" tab for the base object of the engineering task.
- 2. Select the "Template search" entry from the "Detail area" drop-down list.
- 3. Click on the "Set reference" button for the "Start object for target search" option.
  - Select a folder below the "@Template" node.
  - Confirm your entry.
     The "Start object for target search" window closes.
- 4. If necessary, set an additional functional classification.
- 5. Optional: Configure the other options of the engineering task.
- 6. Confirm your entries.

# Using local base objects

Engineering tasks are administered in the base project. Use local base objects to customize an engineering task for a project.

- 1. Edit the base object of the engineering task as described.
- 2. Change to the engineering project.
- 3. Create a base object with the desired properties in the "@Local" branch.
- 4. Select the "System" tab for the generated base object.
- Link a base object of the based project in the "Link > Base object" field. You can find additional information on local base objects in "iDB Administration" manual, keyword "The @Local branch for local base objects".
- 6. Confirm your entries.

Effect during the performance of the engineering task:

The tree in the detail area shows the local base object instead of the global base object.

4.4 Administer target search

# Examples

The following engineering tasks are prepared for template search:

- "@20 > B20 > M41 > A10 > A10 Create sheet macro" Functional classification: B810
- "@20 > B20 > M41 > A10 > A20 Generate path macro" Functional classification: B810
- "@20 > B20 > M41 > A30 > A10 Control loop" (Create assembly) / "@20 > B20 > M41 > A30 > A10 Control loop" (Merge) Functional classification: B800

# 4.4 Administer target search

# Requirement

• The overview of engineering tasks for EI&C is known. See chapter Preparing engineering tasks (Page 35).

# Objective

To set the destination for moving a set of objects with the "Move" function.

#### Procedure

Refer to the "Administration" manual to learn about the general use and administration of engineering tasks.

- 1. Open the "System data" tab for the base object of the engineering task.
- 2. Select "Move" entry from the "Function" drop-down list.
- 3. Select the "Target search" entry from the "Detail area" drop-down list.

- 4. Click on the "Set reference" button for the "Base object for new target" option. The "Creation option" setting is evaluated for the set base object:
  - Creation option: Normal Exactly this base object is permitted.
  - Creation option: Structure (alternative 1)
     The base objects in the substructure are permitted. The base objects below have the "Normal" creation option.
  - Creation option: Structure (alternative 2)
     The base objects in the substructure are permitted. The base objects below have
     "Normal" or "Block" creation option. The Device Group-pointer is also set. The module set in the DeviceGroup pointer determines the components that can be created.
  - Creation option: Block/Normal
     The DeviceGroup pointer must be set. One of objects defined in the module is permitted.

This setting has the following consequences:

- Restriction of existing objects that are allowed as a target.
- Restriction of the objects of "New" context menu that can be generated as the target object.
- Sets the base object when a new object is created as a target for using the engineering task, .
- 5. Optional: Click on the "Set reference" button for the "Start object for target search" option. When a start object is set, the target must be below the start object.
- 6. Optional: Configure the other options of the engineering task.
- 7. Confirm your entries.

#### Final step in the performance of the engineering task

Text boxes that appear for performing the engineering task. You specify name, label and description of the target object in the fields.

#### Using local base objects

Engineering tasks are administered in the base project. Use local base objects to customize an engineering task for a project.

- 1. Edit the base object of the engineering task as described.
- 2. Change to the engineering project.
- 3. Create a base object with the desired properties in the "@Local" branch.
- 4. Select the "System" tab for the generated base object.
- Link a base object of the based project in the "Link > Base object" field. You can find additional information on local base objects in "iDB Administration" manual, keyword "The @Local branch for local base objects".
- 6. Confirm your entries.

Effect during the performance of the engineering task:

The tree in the detail area shows the local base object instead of the global base object.

Preparing engineering tasks

4.4 Administer target search

# Preparing the electrical design

# 5.1 Controlling circuit diagrams

# 5.1.1 Basic options for EE reports

Important script options for EE reports:

# **Fundamental options**

- Option: "Application" Example: "Application" = "ELO"" In this case, "Xdoc\_Elo.dll" is used.
- Option: "ContactMirror\_X", "ContactMirror\_Y" You can find additional information on this topic in the "Administration" manual, keyword "ContactMirror\_X (Double)" and "ContactMirror\_Y (Double)".
- Option: "RestoreReferencesAfterCopy" You can find additional information on this topic in the "Administration" manual, keyword "RestoreReferencesAfterCopy (Boolean)".
- Option: "CableObjectVersion" This specifies which DLL is used for internal calculation of the cables. The follows must be set mandatorily: Up to and including COMOS 7: CableObjectVersion = 1 COMOS 7 and higher: CableObjectVersion = 2
- Option: "EnablePaging"

This option requires the following additional setting: Properties of the project, category "General properties > Documents", "Document options" control group, list "Browse": Value "With drawing type, by option" If the "With drawing type, by option" property is activated, the "EnablePaging" option activates the button for browsing in the report. You can find additional information on this topic in the "Administration" manual, keyword "Reference of the project properties".

#### 5.1 Controlling circuit diagrams

- "SegmentULMode" option: You can find additional information on this topic in the "Administration" manual, keyword "SegmentULMode".
- "RefreshDeviceLabel" option Controls when the automatic common device label of terminals and connectors is updated:
  - Value 1: COMOS updates the device label as soon as one of the following options is executed for one of the objects on the report: Cut and paste Solve grayboxes Move Move (transform) Delete Drag&drop Assign object

#### Note

In the case of reports with a large number of objects this setting can slow down work on the report.

If appropriate, set the option to "0" in this case so that the user can update the device label manually when required.

 Value 0 or the option is missing: Users have to update the device label manually, by using the context menu of the report: Command "Options > Update device label"

#### Preparing additional symbols ("Graphical settings")

"Graphical settings"

This command is only available for objects which have a prepared additional symbol. The representation of the device changes in this case. The symbol is typically supplemented by other graphical components (hence "additional symbol").

To control the additional symbol, the following "DrawText" command is used in the symbol script:

"\*V\*P S:<Tab>.<Attribute>\*"

Example: "@10 > A50 > A10 > B40 > A10 > A10 AC motor"

You can find additional information on this topic in the "Administration" document, keyword "Reference of the subsymbols / additional symbols".

# 5.1.2 Default for control of transformation tool

#### "Transform" function

The "LockTransformationModes" script option controls the "transformation of objects" on interactive reports.

Additional information on this topic is available in the "EI&C Operation" manual, keyword "Controlling transformation tools".

# LockTransformationModes

"LockTransformationModes (Long)" option

Example: "LockTransformationModes = 14"

The option controls the following mode:

Mode	Bit	ID
Move	0	1
Rotate	1	2
Mirror	2	4
Scale	3	8
Distort	4	16
Align	5	32

The "LockTransformationModes" option is set by adding the IDs of the modes you want to deactivate.

# Example

If you want to prevent Rotate, Mirror and Scaling, enter 2+4+8 = 14.

# 5.1.3 Options for tools in the toolbar

#### Option for the "Spline" tool

Option: "EnableButtonSpline"

You can find additional information on this topic in the "Administration" manual keyword "EnableButtonSpline (Boolean)".

# 5.1.4 Paths and zones for references

5.1.4.1 Overview of paths and zones

#### Aim

The "Paths and zone" technique divides interactive reports of the EI&C module into a checkerboard pattern. In this pattern, the columns are designated as "paths", the rows as "zones".

5.1 Controlling circuit diagrams

You have two options:

- Paths
  - All paths have the same width.
  - The width of each path is determined individually.
- Zones
  - All zones have the same height.
  - The height of each zone is determined individually.

The settings at paths and zones can be different.

# 5.1.4.2 Project options for paths and zones

# Controlling paths or zones for the project

Properties of the project, "Automation > EI&C references" category

- "Reference display" group, "Path (vertical)" field
  - "Calculated (5)"
     The path text is calculated by COMOS. This option belongs to the technology "path text and zone text". See section Path texts and zone texts (Page 51).
  - "Yes"

The path appears in the reference texts.

– "No"

The path does not appears in the reference texts.

- "Reference display" group, "Zone (horizontal)" field
  - "Calculated (5)"

The zone text is calculated by COMOS. This option belongs to the technology "path text and zone text". See section Path texts and zone texts (Page 51).

- "Yes" The zone appears in the reference texts.
- "No"

The zone does not appears in the reference texts.

#### Separator for the information on path and zone

Properties of the project, "Automation > EI&C references" category

- "Separator" group, "Page to path" field
- "Separator" group, "Path to zone" field

# 5.1.4.3 Paths and zones with constant size

# Creating paths and zones

- 1. Open the project template.
- 2. Select the "Options" command in the context menu of the work area.
- 3. Adjust the following options:
  - QuadrantOffsetTop/ QuadrantOffsetLeft
     Sets the distance of the first path / of the first zone to the point of origin of the report.
     Negative and positive data is permitted. Negative data is particularly useful if the point of origin of the report is located on the inside of the report working area.
  - QuadrantSizeX/ QuadrantSizeY
     Sets the constant size of the paths / zones. Unit: mm
  - QuadrantNumberX/ QuadrantNumberY
     Sets the constant number of the paths and zones.

# Creating text fields for paths and zones

The text fields show the user the location of paths and zones.

- 1. Create a text in each path and each zone in the interactive report, e.g. at the top margin of the report.
- 2. Open the properties of the text.
  - "General" tab, "Name" field: Enter any text.
  - "Properties" tab, "Quadrants" group: Select the "Text box" option.
- 3. Confirm with "OK". A text frame appears.
- 4. Change the width/height of the text frame. The frame must as wide as the path or zone.

#### See also

Paths and zones with variable size (Page 49)

# 5.1.4.4 Paths and zones with variable size

#### Interaction with the work method "Paths and zones with constant size"

As soon as a text with the "Path box" option appears in the report template, the following options are ignored:

- QuadrantOffsetTop
- QuadrantSizeX
- QuadrantNumberX

#### 5.1 Controlling circuit diagrams

As soon as a text with the "Zone box" option appears in the report template, the following options are ignored:

- QuadrantOffsetLeft
- QuadrantSizeY
- QuadrantNumberY

#### Creating a path

- 1. Create a text in each path in the interactive report. For example at the margin of the report.
- 2. Open the properties of the text.
- 3. Select the "General" tab.
- 4. Enter any text in the "Name" field in order to specify the path name.
- 5. Select the "Properties" tab.
- 6. In order to activate the "Path box" property, select the "Path box" entry in the "Quadrants" field.
- 7. Confirm your entries. A text frame appears.
- 8. Change the width/height of the text frame.

#### Creating a zone

- 1. Create a text in each zone in the interactive report. For example at the margin of the report.
- 2. Open the properties of the text.
- 3. Select the "General" tab.
- 4. Enter any text in the "Name" field in order to specify the zone name.
- 5. Select the "Properties" tab.
- 6. In order to activate the "Zone box" property, select the "Zone box" entry in the "Quadrants" field.
- 7. Confirm your entries. A text frame appears.
- 8. Change the width/height of the text frame.

#### Overlapping paths or zones

If zones overlap or there are gaps, the following applies based on the report direction (in the case of IEC, that is from left to right and from top to bottom): The first zone found is reduced or enlarged to the close the gap.

The same applies for the paths.

A report object is allocated to the path where its point of origin lies. The point of origin is also known as an insertion point.

# See also

Paths and zones with constant size (Page 49)

# 5.1.4.5 Path texts and zone texts

#### Options for path names

Set the variables described below in the options script of the report.

- QuadrantStartChrX/ QuadrantStartChrY
   Start value for the name of the first path or first zone. All other paths or zones obtain a sequential name based on these values.
   You can find additional information on this topic in the "Administration" manual, keyword "QuadrantStartChrX" and keyword "QuadrantStartChrY".
- QuadrantStepX/ QuadrantStepY Supplement to QuadrantStartChrX/ QuadrantStartChrY: Increment for the sequential name.

If a fixed name is desire instead of a sequential name, a fixed namespace for the name in the path or direction zone direction can be determined in the QuadrantLineX/ QuadrantLineY script option.

QuadrantLineX/ QuadrantLineY

Alternative to QuadrantStartChrX/ QuadrantStartChrY.

These options defines ranges of namespaces for the quadrant names in circuit diagrams. Letters ("I" and "O" are used in this example) or numbers can be skipped. The namespaces must be described fully and only the entered identifiers used. Example:

```
QuadrantLineX = "A;B;C;.....;H;J ....."
QuadrantLineY = "1;2;3;....."
```

The path text is only displayed for objects that did not have a description yet.

# 5.1.4.6 Old method

#### Generating a path and zone per script

The generation of paths and zones per script is still possible to maintain compatibility.

You can find additional information on this topic in the COMOS 9.0 manuals, keyword "Paths and zones".

5.1 Controlling circuit diagrams

# 5.1.5 Sheet zone

#### 5.1.5.1 "Sheet area" attribute

#### "Y10M00N00027 Sheet area" attribute

The I&C objects have the "Y10M00N00027 Sheet area" attribute on the "Y00T00001 System data" tab. You use the "Sheet area" attribute to specify the sheet area of the loop diagram where the "Place automatically" automatic function places the object.

#### "Sheet area" standard table of the "Sheet area" attribute

The "Sheet area" attribute is stored with the following standard table:

"10 > M00 > A20 > Y10M00N00027 Sheet area"

#### (Old: AREANAME)

Sheet areas are combined with label segments. Sheet areas control where objects are drawn on automatically created interactive reports.

- Value 1: Offered as a standard table at the AREA objects.
- Value 2: Toggles field-control view.

You can find more information on this topic in the "EI&C Operation" manual, keyword "Label segments".

#### See also

"A30 Identification frame" (Page 142)

# 5.1.6 Text function Elm...VW: Control the search order of the output references

#### Introduction

The symbol of an engineering object can contain information about its elements. It can for example output a reference to a report on which an element of the engineering object is placed. This is done through the text function Elm..VW.

Example: An I/O card has been placed on a circuit diagram. In addition to the identifiers of the I/O channels, references to the loop diagram on which the channels are placed are output at the symbol of the I/O card.

You can find additional information on this topic in the "Administration" manual, keyword "Elm..VW".

# **Reference determination**

The following diagram shows how COMOS proceeds when a symbol that uses the text function Elm..VW is placed on a diagram. COMOS checks the following for each element for which Elm..VW is called:



When evaluating the standard table COMOS checks for the first standard table entry whether the element is placed on a drawing of this drawing type. If so, the corresponding reference is output. If not, the next standard table entry is checked.

5.2 References and labels

# Controlling the reference output via the standard table

When the elements are placed on drawings with a different drawing type than their engineering object, you use a standard table to specify which placement the reference points to.

Proceed as follows:

- 1. Open the standard table "Y10 > M00 > A20 > Y10M00N00030 Search sequence for references".
- 2. Enter for which drawing types COMOS searches for DocObj objects. Begin with the drawing type for which COMOS is to search first.
  - "Name": Continuous counter
  - "Description": Description of the drawing type
  - "Drawing type": The name of the drawing type from the "Name" column of the standard table for drawing types

# 5.2 References and labels

# 5.2.1 Document references

#### Creating references for reports with multiple sheets

When creating a reference, COMOS takes into account that a report may have multiple sheets. To use this function select the entry "Page number" from the "Document order" list in the project options in the "Automation > El&C" category of the "Further settings" control group.

#### Example

You have four reports. Of these four reports the first three are single sheets and the fourth one has two sheets. You now set a reference from the first report to the second sheet of the fourth report. "4.2.1" is displayed in the reference.

Syntax: Sheet.Page.Path.

#### Bridge references: DocumentOrderBridgeReference

References to half-open bridges are as a default labeled in a way that the reference is built according to the connected COMOS connectors.

Script	Description
DocumentOrderBridgeReference = False	Default
	The bridge references are calculated solely via the informa- tion of the COMOS connectors (database wins).
DocumentOrderBridgeReference = True	The bridge references are first calculated via the placing (drawing wins). If the calculation is not possible, the reference is constructed via the COMOS connectors.

# Displaying and calculating the links

You can control how links are displayed and calculated, which may also change their order.

You can find additional information on this topic in the "COMOS Administration" manual.

#### Displaying the label

You can control how device labels are displayed.

You can find additional information on this topic in the "COMOS Administration" manual.

#### Cross-diagram references

You create references in which you enter a corresponding script or function into a symbol. When the symbol is placed on the report, the script or the function is evaluated and the reference is written.

See chapter Symbol templates (Page 72).

# 5.2.2 Page numbers in page links

#### Page numbers in page links

The following table describes the different reference types:

Reference type	Description
"Name"	The documents in the Owner collection of the document are counted.
"Page number" "Reference documents", "Standard"	The documents in the Owner collection of the ref- erence document are counted. If there is no refer- ence document, this mode behaves like the "Name" mode.
"Unit / Location / Name",	All documents in the project are counted.
"Location / Unit / Name"	
"Unit/Name"	All documents in the project that are either on the Unit tab or else have a unit pointer are counted.
"Location/Name"	All documents in the project that are either on the Locations tab or else have a location pointer are counted.
"Document group / Name"	All project reference documents with the symbol type currently being investigated are counted.

No searches are performed across unit or location boundaries in the base project. For the reference sequence "Unit / Name" or "Location / Name", only the particular unit / particular location in question is still taken into consideration. This can reduce the total number of pages displayed.

5.2 References and labels

#### See also

"Miscellaneous" control group (Page 17)

# 5.2.3 References to open connections

#### Requirement

- A circuit diagram is opened.
- A connection is not connected at one end (semi-open).

#### Reference brackets / Collected references

If multiple open connections point to the same target, you can set a reference bracket:

The connection direction runs from the memorized connector to the current connector. The memorized connector receives the "From" property, the current connector the "To" property.

#### Note

#### Transforming reference brackets

When you use the "Transform" tool with reference brackets, unexpected behavior can occur with the "Mirror", "Scale", and "Distort" functions.

#### Note

If a connection has a reference bracket, the standard table "Y10 > M00 > A20 > Y10M00N00029 Connection" is evaluated for the texts of the connection arrow symbol. If this standard table is not available, an empty string will be output.

You can find more information on this topic in the "EI&C Operation" manual, keyword "Reference bracket/collected reference".

#### **Text function RefHierarchical**

%N RefHierarchical(x)

You control the reference brackets through this text function. If the object to be referenced is not placed, "X" is the number of levels which are searched to the top.

Example application: A component is already placed, but the connectors derive from an unplaced element.

5.3 Options for the output of potential rails

# Adjusting reference symbols or reference texts

In the cases which have already been described, the information output at the reference end is taken from the standard table "Y10 > M00 > A20 > Y10M00N00029 Connection". If you want to see different text or an additional graphic, or format the text differently, then you have to change the corresponding entry in this standard table. To open the standard table, select the "Administrator > Base data > Standard tables" menu command.

# 5.2.4 Options for controlling the label

#### Controlling the display of the label

The device label is calculated in "ROUtilities". If the "Label visible" option is deactivated, "ROUtilities" only still returns the following %N texts:

• %N Device.Name

You can find additional information on this topic in the "Administration" manual, keyword "Device".

In contrast to "DevName", for example, which is covered by the "Label visible" option.

- %N DevSpec
   You can find additional information on this topic in the "Administration" manual, keyword "ComosDevSpec".
- %N ElmSpec
   You can find additional information on this topic in the "Administration" manual, keyword "ComosElmSpec".
- %N ComosSpec
   You can find additional information on this topic in the "Administration" manual, keyword "ComosSpec".

If the %N texts do not exist, and the "Label visible" option is deactivated, only an empty string is returned.

# 5.3 Options for the output of potential rails

#### Variable for the output of potential rails

- Option: "RightBorder" If the right limit is defined when placing a potential, the potentials will be right justified.
- Option: "SignByEmptyReference" You can find additional information on this topic in the "Administration" manual, keyword "SignByEmptyReference (Boolean)".

5.4 Connection-dependent objects

# 5.4 Connection-dependent objects

# 5.4.1 Overview of connection-dependent objects

#### Aim

You use connection-dependent objects to create a template, This template can be used in the engineering data. You can match objects on the report with the objects in the engineering data.

# 5.4.2 Connection-dependent objects

#### Procedure

- 1. Select the object which you want to mark as connection-dependent.
- 2. Right-click on the selected object.
- 3. Select the "Settings > Connection dependent" command in the context menu.

#### Result

The object is labeled as connection-dependent. Connected objects are then displayed in blue (synonymous with the display of reading connections in blue). By contrast, non-connected objects are marked in red.

#### Example

The example below demonstrates the technique involving connection-dependent objects:

- 1. Place a motor and a terminal on the report.
- 2. Connect them.
- 3. Mark the terminal as connection-dependent. The terminal is displayed in blue.
- 4. Open the properties of the motor.

5.4 Connection-dependent objects

- 5. Select the "Connectors" tab.
- 6. Drag&drop any terminal from the Navigator to the "Connected with" column on the "Connectors" tab.

The motor is now connected with the terminal in the engineering data, but not on the report.

🖃 🚞 A40 Clamping / contact strips	Ge	neral	Attributes	Elements	Connectors	Status
🖃 🔤 XD001 🛛 Terminal strip, general						
I Lead-through terminal, 2 conductors						
	Туре	IO	Connector	Description	connected to	D
<ul> <li>              ß      </li> <li>             T             Lead-through terminal, 2 conductors     </li> </ul>	••	-₩	U		=A01.U01->	D0017A10:7
A10 Lead-through terminal, 2 conc	••	-141	N			
B 8 Lead-through terminal, 2 conductors		->1	I			
I Barbara Barba Barbara Barbara Bar						

#### Result

The connection-dependent terminal on the report connects to the terminal which you have dragged onto the "Connectors" tab of the motor. The terminal information is displayed on the report. The connection on the report is consistent, since it matches the corresponding information on the connection and the connectors in the engineering data.

# 5.4.3 Borders of the "connection dependent objects" technique

#### Overview

There are a number of different cases in which it is not possible to work on the report with connection dependent objects.

The following cases are based on connections with the "Read" option. There is no inconsistency in the case of writing connections, as the information from the report overwrites the engineering data.

#### Example

A device has a connector and an auxiliary connector The connectors EA1 and EA1(1) exist on the device. From a technical standpoint, this is a connector which is represented by two objects on the software side.

The "Connectors" tab in the device properties now displays two instances of a connector "2", since the connector and the auxiliary connector have the same label. This representation can be helpful because electronically it is the same connector.

Both connectors are linked to a separate terminal.

Two connection-dependent terminals are available on the report. Connect the terminals to the device.

Both of the connections on the report are marked as inconsistent, i.e. in red.

#### 5.4 Connection-dependent objects

#### Reason

A piece of information is missing if two connection-dependent objects run together at technically the same connector. COMOS cannot determine which of the connection-dependent terminals on the report is to be allocated to a given terminal in the engineering data. The engineering data is correct, but COMOS cannot transfer the engineering data onto the report. For that reason the connection-dependent terminals are not assigned on the report and the connections are displayed in red.

#### Assessment in practice

In practice, terminals are usually connected on both sides. If the second connector supplies useful information, COMOS can allocate the terminals and the data thus becomes consistent:



#### Differing number of connections

If two connectors have been joined in the database but only one connection has been drawn on the report, two errors are possible:

- 1. Not enough connections are available in the report.
- 2. The connection drawn on the report cannot be uniquely assigned to one of the two connectors that were joined.

If more connections are drawn on the report than actually exist in the engineering data, you create a similar case .

#### **Bridges**

Bridges are not evaluated in the connection logic.

# 5.5 Deleting inconsistent elements

# Requirement

The inconsistent elements must be grouped on the report with the device.

#### Aim

Elements are an integral part of a device. If a user deletes an element placed on the report in the Navigator, the element is retained on the report, but it is displayed inconsistently.

All inconsistent elements, which belong to a device determined by a user, can be deleted on the report using script. If additional elements of the main object are placed, the remaining elements are moved up on the report to close any gaps.

# Procedure

- 1. Open the object debugger.
- 2. Drag a device into field "A".
- 3. Drag the document that has elements to be deleted into field "B".
- 4. Use the following script: Set GU = CreateObject('ComosRoUtilities.GlobalUtilities') GU.GU DeleteInconsistentGroupedReportObjects a, b, "M41 P2"
- 5. Activate the "Calculate" button.

# 5.6 Preparing grayboxes

# 5.6.1 Base object in the database

# **Hierarchical storage**

Base object of the graybox in the database:

"@20 > B20 > G > 01 Path position"

# **Functional classification**

The grayboxes are functionally classified as follows: "N6 > A680" 5.6 Preparing grayboxes

# 5.6.2 Overview of the use of grayboxes

You can use grayboxes in two ways:

- Using grayboxes with drag&drop You can find more information on this topic in the "EI&C Operation" manual, keyword "Assemblies".
- Using grayboxes by means of placeholder text in a symbol

#### Interaction between graybox use and the graybox symbol

Grayboxes feature a symbol which you can use to select and move them. This symbol is generated automatically in two sizes:

- Large symbol If you generate the graybox by means of drag&drop, a large symbol is created. This is because grayboxes generated via drag&drop often have to be repositioned manually.
- Small symbol If you generate the graybox by means of placeholder text, a small symbol is created. The position of the graybox is usually defined via AutoLoop. It is not necessary to move the graybox subsequently.

# 5.6.3 Preparing assemblies using grayboxes

#### Procedure

- 1. Create an engineering object on the basis of a graybox base object.
- Create a cabinet design or assembly diagram below the graybox. Observe the scale. If the assembly is placed on a cabinet design "1:10", then the document in the assembly must also have this scale.
- Create the required component below the graybox. If the assembly is prepared for the cabinet construction, create a rail and a terminal strip, for example. The terminal strip must have mounting positions.
- 4. Open the cabinet design or an assembly diagram.
- 5. Place the component, which is under the graybox, on the diagram.
- In the context menu, select "Options >Set point of origin" and click next to the placed components.
   The point of origin is set

The point of origin is set.

# 5.6.4 Preparing grayboxes using placeholder text

# Preparing a graybox as placeholder text in a symbol (\*V\*P E text placeholder)

- 1. Prepare a symbol in a base object.
- 2. Create the placeholder text in the symbol using the text tool:

Text	Description
"*V*P E:Graybox*"	The first document with a matching symbol type takes this place- holder text.
"*V*P E:Graybox(Name)*"	The document with the specified name takes this placeholder text, but only if the symbol type matches.

- 3. Create a document.
- 4. Create engineering objects.
- Place these engineering objects on the document. If the subdocument to which the graybox refers is not found, the grayboxes created via "\*V\*P E:Graybox" are deleted. Instead, the graybox sets its own document cross-reference internally to "Nothing".

# 5.6.5 Old method: Preparing a template area for grayboxes

#### Overview

Prepare a template area, which will be applied later by means of an implementation, specifically for the automatic placement of objects.

#### Procedure

- 1. Use the "Line" tool to draw the lines which form the outline of the template area.
- 2. Open the properties of the lines.
- 3. Enter the value "HID" in the "Label" field.
- 4. Click "OK" to save your entry.

#### Result

When you place the graybox on the report, all the graphic elements marked with "HID" are shown enclosed and are reserved as the area of the graybox. If you now implement an object on the graybox, the graphic elements with the HID label are hidden.

5.7 Connectors and connector information on the construction representation

# 5.6.6 Notes on implementing grayboxes

# Overview

The basic technology used when replacing grayboxes with implementations is the familiar "request and implementation" technology. You implement an engineering object at the object whose script contains "\*V\*P E:Graybox\*". When doing so, the document is searched for below the COMOS object and generated as a graybox at the point of origin of the report object. The graybox placeholder is not only evaluated below the implementation, the subdocument is also searched for below the current COMOS object. You can disconnect the implementation again or change it at any time.

# 5.7 Connectors and connector information on the construction representation

# 5.7.1 Contact surface for relays and contactors

# Aim

Use on the report as a relay or coil, including a tabular listing of the connector points (contact surface).

# Displaying the contact surface

The following requirements must be met to make a contact surface visible:

- Base object "340 Relays, contactors"
   "@10 > A50 > A10 > A90 Relays, contactors"
   Class: "Device", subclass: "Coils/Relays"
   The base object must have the subclass "Coils/Relays".
- Preparing an element and creating it in the engineering data Properties of the "Coils/Relays" object, "Elements" tab: The possible versions of the component are prepared as elements. The elements have the following properties: "Virtual": "N times".

#### Note

#### Visibility of the contact surface

If at least one of the virtual elements has been created, the contact surface becomes visible on the diagram.

5.7 Connectors and connector information on the construction representation

- Standard table "Contact surface" Base project, "Y10 > M41 > A10 > Y10M41N00003 Contact surface" If an object has the "Contactor / Relay" subclass, the names of the created elements are compared with the "Contact surface" list. If the name is found in this standard table, the object on the report gets a contact surface.
- Controlling the display: You can define for all the objects with auxiliary contacts whether the elements are displayed as a contact surface or as a contact bridge on the "System data" tab in the "Display reference elements" attribute. Selection list: "@40 > Y00 > A10 > C10 > Y00N00471 Reference elements display"

#### Determining the position

 CONTACTMIRROR\_X and CONTACTMIRROR\_Y The options specify at which position the contact surface is created on the report. The other behavior of the contact surface is controlled by the "Move contact surface" option.

#### Controlling moving of the contact surface

 Project properties, "Automation > El&C references" category, "Settings" control group: "Move contact surface" field

This option determines in which direction a contact surface can be moved after the initial positioning.

#### Displaying the action line

There is no action line in the symbols. The action line is displayed when at least two elements (e.g., normally closed or normally open contacts) are listed in the contact surface. The display of the action line is based on EN 60617-2. Action lines are displayed for relays and contactors, for example.

#### Note

#### Modified display of action lines

As of COMOS 10.1, action lines are displayed in the style of EN 60617-2. When COMOS is upgraded from an older version to an up-to-date version and a database of the type iDB is used, the display of the action lines also changes for documents which have already been revisioned.

#### Numbering auxiliary contacts by means of a script

The auxiliary contacts for the elements of an auxiliary contactor can be continuously numbered by means of a script.

Function OnMenuExecute (ID,Context)
If ID = "PMID\_RenameStructure" Then
Set ELOLib = Context.ComosObject.Workset.Elo.Lib
ELOLib.RelabelContactStructure(Context.ComosObject)

5.7 Connectors and connector information on the construction representation

End If

End Function

The numbered structures

RelabelContactStructure requires a device. The device should be the MainDevice. Example: One auxiliary contactor with multiple auxiliary switch blocks.

RelabelContactStructure collects all elements concerned in two arrays and assigns a new label in ascending order.

First array: "Y00T00001 > Y00A03392"

Takes into account all elements which have set any value at this attribute. The element is labeled as component of a contact surface in this case.

#### Note

For an element to be taken into consideration, the OwnLabel must be numerical or empty. Labels of main contacts are not taken into consideration. No new label is assigned for Main Contact until certain settings have been made.

Second array: Functional classification "D050" This classification permits automatic numbering for auxiliary switch blocks. Each array is sorted according to the Label.

All elements are numbered consecutively according to the following order:

- 1. Elements directly below MainDevice
- 2. Elements below the auxiliary switch blocks according to sorting by label

#### Additional information

Additional information on this topic is available in the "EI&C Operation" manual, keyword "Using the contact surface for relay and contactor".

# 5.7.2 Contact bridges

#### Determining the position

If you drag-and-drop a device that has a contact bridge to an interactive report, the point of origin of the first element of the contact bridge is shown in a defined position. The grab point for the contact bridge is also at this position.

- ContactBridge\_X
  - Default value =12

The distance in direction X from the point of origin of the MainDevice to the point of origin of the first element of the contact bridge in millimeters.

- ContactBridge\_Y
  - Default value = 0

The distance in direction Y from the point of origin of the MainDevice to the point of origin of the first element of the contact bridge in millimeters.

5.8 Preparing connections on the construction representation

# Note

#### Moving the contact bridge

If you move the contact bridge on the report, for example by moving the grab point, the default value no longer affects the position of the contact bridge.

# %N WWL3% - Insertion point of the first element

If you use the text "%N WWL3%" in the symbol script of the MainDevice, the insertion point of this text specifies the insertion point of the first element of the contact bridge.

# 5.8 Preparing connections on the construction representation

# 5.8.1 Options in the report template

#### **Controlling connections**

- Option: "ConnectionHook" Controls the display of the connection hook. If a connection is a bridge, dynamic connectors are always displayed in the form of a hook, regardless of the script entry. You can find additional information on this topic in the "Administration" manual, keyword "ConnectionHook (Double)".
- Option: "ConnectionReference" The script method "ConnectionReference" in the template document has been dropped and is provided only for compatibility reasons in COMOS. It is now possible to deviate from the default standard for cross-sheet references by defining symbols with scripted texts (standard table: "Y10 > M00 > A20 > Y10M00N00029 Connection").
- Option: "DrawDirectionArrow" Activates the direction arrows at the beginning and end of the connections.
  - "0": Direction arrows off.
  - "1": Direction arrows on. The setting can be changed in the report using the context menu. The setting is saved.
  - "2": As for "1", but the setting is not saved.
- Option: "ShowConnectionInfo" Shows the connection characteristics of the connection. You can find additional information on this topic in the "Administration" manual, keyword "ShowConnectionInfo (Boolean)".

#### 5.8 Preparing connections on the construction representation

- Option: "SetWireNumberByCoord" Syntax: "SetWireNumbersByCoord(ByVal ReportDocument As REPORTLib.Document)" All connection end points are provided with a unique number per quadrant ("ladder"). This information is input instead of the quadrant label if the connection owns a logical potential.
- Option: "DisplayConnectedWith" Enables the automatic execution of a script at closed connections. The requirement for this is an entry in the "Y10 > M00 > A20 > Y10M00N00029 Connection" standard table with the standard value "ConnectedWith". If a script has been stored for this standard value, it is then executed.
- Option: "PreferredConnectionDirection" Controls the preferred output direction when a connector is joined to a connection on the report.

# Changing the connection mode

- Option: "ConnectionLineMode" You can find additional information on this topic in the "Administration" manual, keyword "ConnectionLineMode (String)".
- Option: "ShowLineModeControl"
   To use the context menu in interactive reports to change the connection mode, the
   "ShowLineModeControl = TRUE" entry must exist in the options script of the master report.
   To hide the context menu, set the value to "FALSE".
   You can find additional information on this topic in the "Administration" manual, keyword
   "ShowLineModeControl (Boolean)".

# 5.8.2 Preparing attributes of the connections

#### Procedure

To work with the "FS Circuit diagram" document template, make the following settings:

- 1. Open the properties of the document.
- 2. Select the "Attributes > Connection information" tab.
- 3. Select the required entries from the lists of the "All non-labeled connections have" control group.
- 4. Click "OK" to save the changes.

5.8 Preparing connections on the construction representation

# "All non-specified connections are" control group

The three lists of the control group use the following standard tables:

List	Assigned standard table
"Wire color"	Y10 > M41 > A10 > Y10M41N00004 Wire colors
"Cross section"	Y10 > M41 > A10 > Y10M41N00005 Wire cross-sec- tions
"Cable type"	Y10 > M41 > A10 > Y10M41N00007 Type information for wires

#### Result

If you have selected an entry from each of these lists and no cable object has been assigned to a connection on the report, the corresponding information is written to the relevant connectors of the connected objects.

# 5.8.3 Connection information for parallel connections

# Preparing the base object "Connection information"

The following base object shows the connection information on a report:

"@10 > A50 > A20 > B40 > A40 W Connection information"

The base object "A 10 W Graphical element" lies below.

The base object "A40 W Connection information" draws a long horizontal line. The base object "A10 W Graphical element" draws a diagonal line and distributes connection information to the individual texts. To this purpose the suffix #1,..,#N is appended to the script from the element "A10 W Graphical element".

If parallel connections have various items of connection information, then the respective information is also shown at the intersection point. The prerequisite for this is:

- The graphic symbol below the cross section symbol has the text "%N CONNECTIONINFO %" with the label "eNA".
- If no graphic element is available, the default symbol is used. Connecting text is then "Nr ("%N CONNECTIONINFO%#1")". The "%N CONNECTIONINFO%" text of the main symbol is suppressed.

# 5.8.4 Preparing consistent/inconsistent information

#### Aim

If the semi-open connection has been labeled with the option "Connection > Always display consistently", you can display a symbol at the end of a semi-open connection.

5.9 Path texts

# End of connection for "Always display consistently" option

- 1. Change to the base project.
- 2. Open the standard table via the command "Administrator > Base data > Standard tables".
- 3. Select the "Current" value for the "Project" option. Since the base project is open, in this case "Current" is equivalent to "Base".
- 4. Open the "Y10 > M00 > A20 > Y10M00N00029 Connection" standard tables.
- 5. Select the "New > Standard table value" command from the context menu of the standard table.
- 6. Enter the following properties:
  - Name: "CONNECTIONEND"
  - Description: Any
  - Value 1: Any, but must not be empty
- 7. Confirm the new standard table value with "OK".
- 8. Open the "Select drawing type" command from the standard table header.
- 9. Select the drawing type for which you would like to create the end of connection symbol.
- 10. Double-click on the "CONNECTIONEND" line in the "Drawing type" column.
- 11.Draw the end of connection symbol. The standard drawing direction for this symbol is from left to right.
- 12. Save and close the drawing pane.

# 5.9 Path texts

#### Requirement

"PreferredConnectionDirection = Y" script option

#### Option for path text

PathTextBehaviour

- 0: Default setting and compatibility setting The first path text found in the report whose coordinate boundaries contain the point of origin of the object in the x direction, is used as a description.
- 1: Path texts have an additive effect from top to bottom When the point of origin of the object is within the x limits of the path text and the object is located below the path text, which means below its y2 component, path texts are considered.
- 2: Path texts have an additive effect from bottom to top When the point of origin of the object is within the x limits of the path text and the object is located above the path text, which means above its y1 component, path texts are considered.

#### 5.10 Administering connection types and line types

- 3: First path text above The path text closest to the object above is used to describe the object.
- 4: First path text below The path text closest to the object below is used to describe the object.

The direction changes with "PreferredConnectionDirection = X".

You can find more information on this topic in the "EI&C Operation" manual, keyword "Creating and editing path texts".

# 5.10 Administering connection types and line types

# 5.10.1 Templates for line types

# Templates system for line types

General templates for line types are created using the following standard table: "Y10 > M00 > A10 > Y10M00N00002 Line type"

Connection-specific line types are contained in the standard tables under "Y10 > M00 > A10 > Y10M00N00006":

- For El&C:
  - "... > Y10M00N00006E Contact point types (EE/EI&C)"
  - "...> Y10M00N00006E Contact point types (single line)"
  - "... > Y10M00N00006E Contact point types (signals)"
- For fluid: "... > Y10M00N00006E Contact point types fluidics"

User-defined line types are created under the following node: "Y10 > M00 > A10 > Y10M00N00008 User-defined line types"

You can find additional information on this topic in the "Administration" manual, keyword "Line types".

#### See also

Standard tables for contact point types (Page 156)

# 5.10.2 Standard tables for user-defined connections

You use standard tables for user-defined connections wherever the "Settings" shortcut menu is offered for connectors or connections.

- See also "Y10M41N00004 Wire colors" (Page 160)
- See also "Y10M41N00005 Wire cross sections" (Page 161)

5.11 Symbol templates

- See also "Y10M41N00006 Wire end handling" (Page 161)
- See also "Y10M41N00007 Type information for wires" (Page 159)

# 5.11 Symbol templates

# 5.11.1 Properties of texts

# Drawing type-specific properties

The properties of a symbol change depending on the drawing type.

# "Identifier" for the "Detail" drawing type

Every entry in the "Identifier" field belongs to a "Header.Class".

"All texts"	"???"
"Description"	"eAE"
"Device labeling"	"eB?"
"Cable label"	"eBC"
"Label left"	"eBTL"
"Label right"	"eBTR"
"Wire graphic"	"eGA"
"Cable graphics"	"eGR"
"Contact point"	"eK?"
"Wire text"	"eNA"
"Type information"	"eNT"
"Shield start"	"eSB"
"Shield end"	"eSE"
"Technical data"	"eTD"
"Type description"	"eTP"
"Reference"	"eVW"
"Reference left"	"eVWL"
"Reference right"	"eVWR"

See also Options for labels ("Header.Class") (Page 73).
# 5.11.2 Options for labels ("Header.Class")

#### Objective

Graphical objects in EE reports can be identified by means of a label. Therefore, you enter one or more options with the name "Header.Class" in the symbol script.

Commands are often available in the context menu to hide or display certain parts of the symbol. This hiding and displaying is controlled by the Header.Class, for example. You can find an example further on, in the section "Identifiers for shieldings".

You can find additional information on this topic in the "Administration" manual, keyword "Advantage of layers and labels".

#### Standard tables on Header.Class

"@SYSTEM > @CLASS > <Drawing type>"

The name of the standard table must match the name of the drawing type.

- "Name" Internal COMOS designation for the identifier. This information also appears in the symbol script.
- "Value1" Designation in the "Identifier" field.

#### Identifiers for device labels

- eBC" (electrical component cable) Device label for cables placed on reports
- eBTL" (electrical component left) Device label for components placed on reports
- eBTR" (electrical component right) Device label for components placed on reports

#### Identifiers for general labeling

General labeling of graphics:

- eGR" (electrical graphic) Application example: Base object of the cable "01 Material > EIC > 01 > 850 cables, lines".
- eGA" (electrical graphic wire)

#### 5.11 Symbol templates

#### Identifiers for connector points

Select the "Contact point" label, which is connected internally with the Header.Class "eK?", in the properties window of a text. The classification into "eKP", "eK0", and so on is made by means of the selection of options in the "Connector point" and "Text only" groups.

- "eKP" (electrical contact point) Label visible, connector point can be used
- "eK0"
   Label not visible, connector point can be used
- "eK1" Connector point cannot be connected, text output only of the connector label
- "eK2" Connector point cannot be connected, text output only of the connector description

#### Identifiers for elements

- "eNA" (electrical name wire) Application example: Base object of the connection information. See also chapter Connection information for parallel connections (Page 69).
- "eNT" (electrical name type) Application example: Base object of the cable "01 Material > EIC > 01 > 850 cables, lines".

#### Identifiers for shieldings

- "eSB" (electronic shield start) Start of shielding Application example: Base object of the shielding "01 Material > EIC > 02 > 850 > SH shield".
- "eSE" (electronic shield end) End of the shielding Application example: Base object of the shielding "01 Material > EIC > 02 > 850 > SH shield".

When you open the symbol script. you find the following code point:

```
Header.Class = "eSB"
DrawArc p5, p3, p1
...
Header.Class = "eSE"
DrawArc p6, p2, p4
```

This causes a semi circle to be drawn on the right of the symbol and assigned the "eSB" label. Afterwards a semi circle is drawn on the left and assigned the "eSE" label.

If you open the context menu of the shield at the symbol on the report and deactivate the command "Settings > Start of shield", the "eSB" label is hidden: the right-hand semi circle is missing.

If you open the context menu of the shield at the symbol on the report and deactivate the command "Settings > End of shield", the "eSE" label is hidden: the left-hand semi circle is missing.

#### Identifiers for references

- eVW" (electrical reference)
- eVWL" (electrical reference left)
- eVWR" (electrical reference right)

#### Setting more than one "Header.Class"

Different types of "Header.Class" can be used within a script. While processing the script, the corresponding "Header.Class" is then switched. This can cause different components of a symbol to have different labels.

#### "Header.Class" for fixed texts

If you want to change a fixed text in the report, you make the fixed text available via a symbol. If you place a fixed text in the symbol and then replace the default "New Text" by another text, COMOS assigns the text a random "Header.Class" at this point.

The user can then change the text of the symbol in the report by using the " Options > Edit symbol text" context menu.

#### 5.11.3 Text functions

#### Objective

The following techniques are available to manage two unit devices together in a symbol:

- At base objects you use the "Element of a base object" technique. You can find additional information in this topic from the user view in the "Operation" manual, keyword ""Element" tab". You can find additional information in this topic from the administrator view in the "Administration" manual, keyword "Objective Element collection".
- At documents you use the "Element of a symbol" technique. You can find additional information in this topic from the administrator view in the "Administration" manual, keyword "Subsymbols/additional symbols".

#### Inserting subsymbols with "\*V\*P E"

An example structure is presented in the following.

There is the base object "ET". Below the "ET" base object is the "ET\_2" base object and below base object "ET\_2" is the "ET\_3" base object:

ΕT

5.11 Symbol templates

+ET\_2

++ET\_3

Each of the three base objects have a symbol. The three symbols are to be combined into one symbol and placed together.

You can use this example structure to control the subsymbols in the Automation module:

- Inserting using "Subsymbols> By element": \*V\*P E:ET\_2|ET\_3\*
- Inserting using "Elements > Element": \*V\*P E:Symbol("ET\_2|ET\_3")\*

The delimiter is the vertical bar.

You can find additional information on this topic in the "Administration" manual, keyword "Subsymbols / additional symbols".

The "\*V\*P E:Symbol("...")\*" technique is described below.

The following applies for \*V\*P E:Symbol()\* in cabinet diagrams and other design diagrams:

- A placed element is automatically adjusted to the depth of the underlying object. Application example: A PLC card is plugged into a terminal connector. When the terminal connector is placed, the PLC card is automatically placed as well and has the same installation height.
- The rotation of the \*V\*P text is taken into consideration. This option is controlled via a script option at the document. Application example: There are horizontal and vertical plugs, in each of which the same PLC board is plugged.
- If you embed the same base object as base object subsymbol more than once at different positions in a symbol, the subsymbol is only shown once.

#### 5.11.4 Documents references in symbols

#### GetReferenceStringBySymbolType

The GetReferenceStringBySymbolType function controls cross-diagram references.

Transfer parameters:

- The desired object
- The current document
- SymbolType (string)

GetReferenceStringBySymbolType is similar to GetReferenceString. GetReferenceString does not have the parameter SymbolType.

A search is performed for a DocObj with the required SymbolType below the desired object using this information. The object reference is calculated using the DocObj and the BuildReferenceString. This object reference is the return value of the function and is displayed on the report as a reference.

If you pass SymbolType as an empty string, the GetReferenceString function is used to calculate the reference instead of GetReferenceStringBySymbolType.

#### ObjectReference

The ObjectReference function supports reference calculations. A user only has know the ObjectReference function and not the individual functions RefSimple, RefFromOwner and Reference.

Transfer parameters:

- Action 1 4 (integer)
- SymbolType (string)
- Four parameters (variant) (reserved for future uses)

The following uses of ObjectReference are possible (here are some examples of the symbol type "DETAIL"):

- Call with action 1 ObjectReference(1, "M41\_P2", "", "", "", "") Result: RefSimple (m\_Device)
- Call with action 2 ObjectReference(2, "M41\_P2", "", "", "", "") Result: RefFromOwner (m\_Device.owner)
- Call with action 3 ObjectReference(3, "M41\_P2", "", "", "", "") Result: Reference (MainDevice)
- Call with action 4 ObjectReference(4, "M41\_P2", "..\..\K2\OA1", "", "", "") Result: Hierarchical reference. Syntax:
  - "..\"
     Selection of the next higher element.
  - "\<string>"
     Selection of the named (next lowest) element.
  - "\(number)"
     Selection of the (next lowest) element specified by its index.
     Example: "..\(2)" searches for the second element of the owner.

The search is first performed in the "Elements" collection, then in the "Devices" collection. Object types (IComosDProject, IComosDDevice) are not treated specially. Example: %N ObjectReference(4, ", '..\..\K2\OA1',",") %

#### Note

#### Relation between ObjectReference and EvalSearchString

Action 4 enables the display of references through the use of search texts, which address the related object in the Navigator using the functionality of the EBlock-Lib "EvalSearchString".

#### Relation between "Drawing type" and "Symbol type"

The "Drawing type" of the symbol corresponds to the "Symbol type" in the report template options.

5.11 Symbol templates

## 5.11.5 Support of references in PDF export

During the export of interactive reports to PDF, references on the report are converted to hyperlinks. This also applies to document references with the help of ObjectReference.

You can find additional information on this topic in the manual "Interfaces", keyword "PDF export".

# Preparing automatic labeling

# 6.1 Base object for segments

Refer to chapter "A30 Identification frame" (Page 142).

# 6.2 Preparing line numbers

#### Activating line number allocation in the properties of the project

- 1. Open the project properties.
- 2. Select the "Automation > EI&C" category.
- 3. Select the "Assignment of line numbers" option in the "Settings" control group.

#### Activating the display of the connection information in the options of the report template

- 1. Open the project template.
- 2. To open the options double-click in an empty area of the report.
- 3. Enter the following option: ShowConnectionInfo = True

#### Preparing the sheet number in the document names

The line number allocation requires the sheet number to be included as part of the document name.

Example of circuit diagrams: A newly generated circuit diagram is given the name "FS.001". In this case, "01" is the sheet number, which is taken from the line number allocation.

#### Preparing a base object of the cable object

If a cable object has been prepared, line numbers are displayed on the electrical connection in the report.

- 1. Copy a cable object.
- 2. Open the properties of the copied object.
- 3. Go to the "Elements" tab.
- 4. Delete all wires until only one wire element is left.
- 5. Click the remaining wire element in the "Virtual" column.
- 6. Select the "N-times" entry from the list.

6.2 Preparing line numbers

#### Suppressing the transfer of line numbers to the component

If the "SYS.CNSeparation" attribute is activated at a component (= true), line number allocation is not continued through the internal connection (InternalConnection).

#### Preparing line numbers in templates

If you prepare line numbers in templates (documents for grayboxes; @Template documents), they retain their line numbers. The line numbers are not overwritten by the line number allocation in the engineering project.

#### Note

- If line numbers are prepared in the template, a cable object must also be created and placed on the wires in the report.
- The template itself must also have the circuit diagram type.

If a template does not have line numbers, the connections in the engineering document are used for the line number allocation.

#### Entering special variants

Special variants cannot be entered in the interface. Instead, they must be entered in an extended attribute on the connector using scripts.

- 1. Create the extended attribute "Special variant" at the connection.
- Set value: SetExtendedAttributes
   Adhere to the system for line numbering. You can find additional information on this topic
   in the "EI&C Operation" manual, keyword "Calculation system for line numbers".
   "~": Reserved for assigning consecutive numbers.
   "2" to "9": Reserved by the code of the German railway.
- 3. Read value: GetSpecialVariant

# Preparing single line diagrams

# 7.1 Report template

Single-line diagrams use the following setting in the script option of the report template: Application = "ELO.SLINE"

# 7.2 Allocating EE/I&C connectors and single line connectors

#### Overview

If both EE/I&C connectors and single-line connectors are available for a base object, an additional control element is available in the properties of the connector.

- In the case of EE/I&C connectors, this is the list "Single-line connector".
- In the case of single-line connectors", the "EE/EI&C connectors" field.

You use this control element to assign exactly one single-line connector to an EE/I&C connector. You can assign several EE/I&C connectors to a single-line connector.

All connectors must belong to the same base object.

7.2 Allocating EE/I&C connectors and single line connectors

# Preparing load estimation with single line diagrams

#### Formulas for calculating the starting values of motors

P\_elec = P\_n / (E \* cos\_phi) \* CRat\_start \* cos\_phi\_start I\_max = I\_n \* CRat\_start Q\_elec = P\_n / (E \* cos\_phi) \* CRat\_start \* sin\_phi\_start S\_elec = sqrt (P\_elec^2 + Q\_elec^2) Whereby: CRat\_start = Starting current quotient, cos\_phi\_start = Starting power factor

#### Advanced power calculation for transformer design

The following attributes are available for advanced power calculation for the transformers:

Output

Group "Calculation > Runtime values"

- "Calculated runtime current" (Y00T00003.Y00A02239)
- "Calculated runtime power" (Y00T00003.Y00A02240)
- "Calculated runtime apparent power" (Y00T00003.Y00A02241)
- "Calculated runtime reactive power" (Y00T00003.Y00A02242)

For transformers with multiple windings on the secondary, the output values of the elements that correspond to the windings on the secondary are calculated first. The output power of the elements are summed and entered into the fields for the output values for the transformer itself (same as for the amount of current). Then these values are used determine the transformer design and calculate the values for the primary.

If a value in kVA is specified for the nominal power of the transformer or other consumers, the apparent power is meant. In this case, the "cos\_phi" value is not used in further calculations of the nominal current or absorbed power.

The "cos\_phi" formula is only used for values with the KW unit.

#### Formulas for transformer design

I\_max = P\_n / (U\_noload \* sqrt(3)) P\_max = P\_n \* cos\_phi – P\_tr

Q\_max = P\_n \* sin\_phi - Q\_tr

 $S_max = sqrt (P_max^2 + Q_max^2)$ 

Whereby:

Loss\_load = Power loss, U\_cc = Short-circuit voltage, U\_load = Load voltage, U\_noload = No load voltage

P\_tr = Loss\_load Q\_tr = (3 \* X\_tr \* I\_max^2) / 1000 X\_tr = sqrt(Z\_tr^2 - R\_tr^2) Z\_tr = U\_cc \* U\_noload^2 \* 10 R\_tr = (Loss\_load \* U\_noload^2 \* 1000) / S\_tr^2

# Preparing object-based processing of connections

# 9.1 Preparing connectors and signals

#### 9.1.1 Defining the connection pattern:

#### 9.1.1.1 Objective of the connection patterns

A connection pattern is the template for a device connector.

A device connector consists of several COMOS connectors. Define the following properties of the COMOS connections:

- Number
- Sequence
- Connector subtypes

#### 9.1.1.2 Standard table "@PatternTypes"

#### Standard table "@PatternTypes"

Connection patterns are prepared in the following standard table:

System project, standard table: "Y10 > M00 > A10 > Y10M00N00006 > Y10M00N00006E > @PatternTypes"

#### Administering connection patterns in the "@PatternTypes" standard table

 Click the following command in the COMOS menu: "Administrator > Base data > Standard tables"

#### Note

#### Read access in the Navigator

You can only open the standard table in read access in the Navigator.

- Create the standard table "Y10 > M00 > A10 > Y10M00N00006 > Y10M00N00006E > @PatternTypes" or open it.
- Create a standard table value by using the following context menu: "New > Standard table value".

You can find additional information on this topic in the "Administration" manual, keyword "Creating a standard table value".

- 4. Open the properties of the standard table value. Each standard table value corresponds to a connection pattern.
- 5. Enter a unique name.
- 6. Optional: Enter a description.
- 7. Enter the subtypes in "Value 1", separated by commas. The number and sequence of the information separated by commas represent the number and sequence of the COMOS connectors. The information separated by commas also determines the subtype of the COMOS connector. The subtypes that can be entered are shown as follows:
  - See the standard table "Y10M00N00006E Contact point types (EE/EI&C)".
  - Alternatively: Open the properties of the connector and select an entry in the "Type" list.
     Then, check the "Subtype" list.

#### Example of a standard table value

Value 1: +,-,N

Effect: Three COMOS connectors are occupied.

- + is assigned to the first connector.
- - is assigned to the second connector.
- N is assigned to the third connector.

#### 9.1.1.3 Preparing reserve terminals

Reserve terminals are identified as follows:

Attribute "Y00T00001.Y00A00642 Reserve terminal"

These terminals are used as follows:

- "Connection pattern definition" tab: Reserve terminals are preallocated with the "Reserve, #" pattern.
- No other pattern can be assigned.
- These terminals are not connected during the wiring.

You can alternatively assign the "#" pattern to standard terminals in the definition of the connection patterns. The terminals are then treated as reserve terminals and therefore not connected.

#### See also

Terminal strip: Activating the "Connection pattern definition" tab (Page 87)

#### 9.1.1.4 Terminal strip: Activating the "Connection pattern definition" tab

#### Show the "Connection pattern definition" tab

The "Connection pattern definition" tab is available for terminal strips.

To display the tab at terminal strips, proceed as follows:

- 1. Open the base object properties of a terminal strip.
- 2. Select the "Configuration" tab.
- 3. Enter the following text in the "Prog ID for user defined component" field: "@NET.PatternDefinitionControl"
- 4. Apply the Prog ID with the arrow button in the "Current components" list.

#### Standard patterns for connection patterns

If you activate the "Connection pattern definition" tab, different standard patterns are available for connection patterns. The standard patterns are structured in accordance with the table "Y10M00N00006E Connection point types (EE/EI&C)".

If you want to define your own connection patterns, use the "@PatternTypes" standard table.

#### See also

Preparing reserve terminals (Page 86)

#### 9.1.1.5 Operation mode of partial assignment in the Marshalling designer

#### Support of connection patterns in the Marshalling designer

The Marshalling designer evaluates the connection patterns for terminal strips. You can find additional information on this topic in the "El&C Operation" manual, keyword "Working with several terminal strips and connection patterns".

#### Example of using several, specialized terminal strips

Here is the example taken from the additional information mentioned above:







#### Technical support in the connection patterns

The example in the Marshalling designer is based on the following example in the connection patterns:



The following sequence applies here:

- The user connects the collector with the first terminal strip in the "Terminal strips field distributors" area, and then with the second terminal strip using dynamic connection.
- When the first connection is set, the following steps are automatically executed in the background:
  - The connectors of the devices are combined into connection patterns in the collector. In this example, into connection pattern (+,-,A,B).
  - COMOS attempts to find an exact counterpart on the terminal strip for this connection pattern. However, only the connection patterns (+,-) exist in the first terminal strip, so an exact counterpart cannot be found.
  - Afterwards COMOS attempts a partial assignment. Because the first pattern (+,-) at terminals 1 and 2 is a subset of the G1 pattern, the + and – connections of G1 are assigned to terminals 1 and 2.
  - The same partial assignment is also effected with the second device G2 using terminals 3 and 4.
  - The connectors A and B of the devices initially do not have a counterpart and are only connected with terminals 1, 2, 3 and 4 when the second terminal strip is connected. In this way, the connectors have been distributed to two different terminals during the connection.
- During the connection of the two terminal strips from the distribution box (control side) level, the connectors of the terminal strips are once again combined with the connectors of the channels.

#### Implementation in the base data

The following base objects are affected:

"@10 > A50 > A20 > A20 > A10 > <Base objects of the group fields>"

The script block Connect(Connector) must support the evaluation of connection patterns for these base objects. The base data are already prepared in the supplied database.

#### 9.1.1.6 Additional information

See also chapter Bulk transfer of connection patterns (Page 91).

Additional information on this topic is available in the "EI&C Operation" manual, keyword "Using connection patterns".

## 9.1.2 Bulk transfer of connection patterns

#### 9.1.2.1 Plugin: Opening and initializing the "Connection pattern definition"

#### Requirement

The connection patterns are defined.

See chapter Defining the connection pattern: (Page 85).

#### Open the "Connection pattern definition" plugin

COMOS menu: "Plugins > Automation > Connection pattern definition"

#### Initializing the "Connection pattern definition" plugin

- Drag an object from the "Locations" tab to the "Start object" field. The list shows all terminal strips below the start object. The search is recursive. Only objects with the hierarchical classification "M40 > A210 > A040" are displayed.
- In order to set a terminal strip with connection pattern as a template, select one of the two options:
  - Drag a terminal strip from the list into the "Terminal strip (default)" field.
  - Select a terminal strip in the list and select the shortcut menu command: "Set terminal strip as default".
- 3. Click on the "Display connection pattern" button. The "Terminal strip" and "Patterns" lists are displayed.
- Optional: Edit the "Terminal strip" list as if you were working in the "Connection pattern definition" tab of the terminal strip. Additional information on this topic is available in the "EI&C Operation" manual, keyword "Assigning connection patterns with drag&drop".

#### See also

Checking terminal strips (Page 91)

Transferring connection patterns (Page 92)

#### 9.1.2.2 Checking terminal strips

#### Requirement

The "Connection pattern definition" plugin is open and initialized.

See chapter Plugin: Opening and initializing the "Connection pattern definition" (Page 91).

#### Procedure

- 1. Select an entry in the "Terminal strip" column.
- 2. Select the "Properties" command in the context menu of the selection.
- 3. Optional: Select the "Navigate > ..." command in the context menu of the selection.

#### See also

Transferring connection patterns (Page 92)

#### 9.1.2.3 Transferring connection patterns

#### Requirement

The "Connection pattern definition" plugin is open and initialized. See chapter Plugin: Opening and initializing the "Connection pattern definition" (Page 91).

#### Transferring connection patterns

- 1. Set a terminal strip as template.
- 2. Select as many other terminal strips as necessary.
- 3. Transfer the connection pattern by selecting one of two options:
  - Select the context menu command "Transfer connection patter to terminal strips" in the selection.
  - Click the "Transfer connection pattern" button.

#### Transferring connection patterns to base object

- 1. Set a terminal strip as template.
- Click the "Transfer to base object" button. The connection pattern is transferred to the base object of the template. All terminal strips with this base object apply the connection pattern.

#### See also

Deleting a connection pattern (Page 92)

#### 9.1.2.4 Deleting a connection pattern

#### Requirement

Connection patterns have been transferred.

See chapter Transferring connection patterns (Page 92).

#### **Removing connection patterns**

- 1. Select as many terminal strips as necessary.
- 2. Remove the connection pattern by selecting one of two options:
  - Select the context menu command "Remove connection patter at terminal strips" in the selection.
  - Click on the "Remove connection pattern" button.

#### 9.1.3 Preallocating connectors with logical potentials

#### Introduction

You can prepare connectors so that a potential is already available when the engineering object is created.

#### Procedure

- 1. Open the base project.
- 2. Open the properties of the base object whose connector you want to preassign.
- 3. Switch to the "Elements" tab. The potential must be available as an object; a link is not sufficient.
- 4. Right-click in the lower table area of the "Elements" tab.
- 5. Select the "New > Element" command in the context menu. The properties of the new element open.
- 6. Enter the following details:

Control element	Description
"Class" list	Select the "Device" entry.
"Subclass" list	Select the "Potential" entry.
"Name" field	Enter the name of the connector at which you want to create the potential in this field. The name of the connector and that of the potential must match exactly.
"Label" field	This field displays the label of the element. Enter any label.
"Virtual" control group	Select the "Off" option.

7. Click "OK" to save your entries and close the properties.

#### Result on the base object

The element has been created. The element is listed on the "Elements" tab of the selected object.

#### Result in the engineering project

- If you create the engineering object without having set a potential, the connector is assigned the potential of the same name. The "Log. potential" column must be made visible by means of the shortcut menu so that you can see the result on the "Connectors" tab.
- If a signal is located under a fuse, the label of the fuse is added to that of the potential in the form of a prefix.

Note: Potentials support the "NestedLabel" function. You can therefore also query the label using a script.

You can find additional information on this topic in the "EI&C Operation" manual, keyword "Interaction with connection information at the cable object".

#### 9.1.4 Connector: Signal from owner

#### Introduction

In COMOS, signals are also used to identify objects that belong together. Element requests that inherit the relevant signal information are created below the signal to do this. The element requests then pass on the signal information to be inherited later. The "Signal from owner" option of the connectors must have been prepared to ensure that the inheriting of the signal information functions in all cases.

The "Signal of owner" option is located in the properties of the connectors.

If you activate the option, the connector inherits the signal from the owner of the engineering object that belongs to the connector. However, the term "owner" should be taken in the broader sense in the context of this option. There are the following options:

#### **Direct owner**



A signal passes on the signal information to the connector via the device.

#### Owner has a pointer to a request



The owner of the connector has a request pointer and this request is located below a signal.

This case arises when a device is implemented and the "Implementation" list has the value "Object is not replaced (by pointer)" in the project properties, category "Automation > EI&C" in the "Settings" control group.

#### Owner has a unit pointer to a signal



The owner of the connector has a unit pointer to a signal. Background: The "unit pointer" can point not only to objects of the class "Unit" but also to objects of the class "Signal".

In this case the signal information can be transferred via the unit pointer to a device (any) and from there to the connector.

This case arises when a device is implemented and the project option "Implementation replaces objects" has been activated.

#### Owner has an implementation pointer to a signal



This case arises when a signal is implemented. Here the following does not play a role in the project property, because signals are never deleted ("replaced"): "Automation > El&C" category category, "Settings" control group, "Implementation" list

The effect of this control parameter is primarily obvious in the Marshalling Designer.

#### See also

"Settings" control group (Page 14)

# 9.1.5 Controlling extended attributes

#### Application

The following function is used when the "Synchronize" property is enabled in the extended attributes of a connector's properties.

#### Synchronizing connections for extended attributes

EloLib:SetAllNetConnectorAttributes

Calls the following function:

IComosDConnector:GetAllNetConnectors(IgnoreBridge)

Function task: Collects all associated electrical connectors and sets an attribute. All the array, terminal and feed-through connectors are included here. This function is therefore very similar to potential tracking and signal tracking.

The "IgnoreBridge" parameter determines if tracking should be performed across bridges.

Syntax:

9.2 Base object switch for cables or wires

SetAllNetConnectorAttributes (StartConnector, AttributeName, NewValue, IgnoreBridge,Synchronize(opt.),StandardTable(opt.))

#### Example

a.Workset.Lib.Elo.SetAllNetConnectorAttributes(b, "Test1", "ja", false, true,c)

- Object A: is the connector with the extended attribute.
- Object B: is the linked connector.
- C: is the standard table.

Find more information on this topic in the "EI&C Operation" manual, keyword "Working with the extended attributes of connectors".

#### 9.1.6 Auxiliary connectors / array connectors

#### Auxiliary connectors / array connectors

According to DIN, connectors may only carry one connection. Based on the norm each connector can only have one counterpart connector in COMOS.

In practice, it may occur that multiple connections are made to a terminal, for example. In order to display engineering data in such a case, you use auxiliary connectors.

Auxiliary connectors always relate to an existing connector. Auxiliary connectors get the name of the existing connection plus a counter, e.g. [1], in the "Name" field.

If the connections are deleted, the gap is filled with new connections whenever possible. A gap remains, if there is a half-open connection for the index on the report.

#### 9.1.7 Connector type combinations

#### Permitted connector type combinations

The definition of connector type combinations is only available for Logical.

You can find additional information on this topic in the manual "Logical Administration", keyword "Allowed connection type combinations".

# 9.2 Base object switch for cables or wires

If you change the base object, special rules apply for cables and wires. You can find additional information on this topic in the "Administration" manual, keyword ""COMOS" category".

See also chapter Auto-Hotspot.

# Preparing terminal strips

# 10.1 "02 Terminal/plug strips, grounding"

#### Database

"@30 > M41 > A50 > A30 > A10 > A20 Terminal-, plug strips, ground" Class: "Device", subclass: "(None)"

#### Aim

In COMOS, terminals and terminal strips represent a unit. Since only the terminals can have connections, a terminal strip must be used with terminals. You cannot use a terminal without a terminal strip.

#### **Two-level structure**

1st level: Base objects with class "Device", subclass "Terminal strip"

2nd level: Base objects with class "Element", subclass "Terminal"

The "Terminal strip" and "Terminal" subclasses cause TerminalStrip.dll to be evaluated. This dll shows, for example, the additional tabs.

Terminal strips and terminals can be named as desired.

Terminal strips do not have symbols, since they are not placed on reports.

The terminal symbol represents the terminal and provides the connectors.

#### **Three-level structure**

Terminal strips can be organized over three levels: terminal strip - deck - terminal. This structure is similar to that in multi-tier terminals. The "decks" in the case of terminals are also often called "positions". They are intended to display the installation position of the relevant terminal in the cabinet.

These objects can have any number of terminals per deck.

The deck elements of the terminal strip are controlled via the "Equipment" subclass. This subclass has the following effects, among others:

- The connectors of the terminals are displayed on the "Connectors" tab of the terminal strip.
- If you drag the terminal strip onto the report, then one terminal is placed, this being the first free terminal of the first free deck. If there are no more decks with free terminals, then a deck and a terminal are created automatically. This also applies in the event that a terminal strip from the base data is dragged onto the report: The terminal strip, the deck and the terminal are created automatically in the Navigator.

The label of the terminal strip and the label of the deck appear separately on the report at the terminal.

# 10.2 Base object for terminals

#### **Terminal connectors**

Terminals typically have two connectors. In COMOS the two terminal connectors are distinguished by the "internal" ((N I )) and "external" ((N O )) sides.

The external connector is marked by a point in the diagram:

This point is not defined in the symbol of the terminal; it is inserted by the RO\_Device.dll. If you would like to disable this point, you can set the following options: DrawTerminalSideMark = 0.

By default, the internal connector is above and the external one is below. This arrangement is reversed using context menu command "Options > Direction".

If you drag&drop a terminal strip onto an interactive report with an electrical engineering template, the next unused terminal is placed instead of the object of the terminal strip. The procedure creates a new terminal if a free terminal cannot be found but there are virtual terminals available.

#### "Y00T00001 System data" tab

Control element	Description
"Grid spacing from multiple placement"	The default gap between the terminals is one grid point. The placing gap can be changed here.

#### Level in multi-tier terminals

Multi-tier terminals can only be bridged in a certain way.

To this purpose the "Y00A00186 Level" attribute exists on the "Y00T00001 System data" tab. If the levels differ, bridges cannot be made.

All objects below the following node have this attribute: "@10 > A50 > A10 > A20 > A20 Terminals, plugs".

This attribute must be set with the correct value at all applications of multi-tier terminals. To this purpose a new level value is assigned to all the objects via the attribute under the base object "@10 > A50 > A10 > A20 > A20 > A10 > A20 Multi-tier terminals".

# 10.3 Base object for plugs

Plugs are elements of plug strips.

- Class: "Element"
- Subclass: "Plug"



10.5 Standard tables

- Functional classification: "N9C3 element/plug"
- Base object: "@30 > M41 > A50 > A10 > A10 > A20 > A20 > A30 Plugs and links" Prepared use cases:
- Hook-up
- EE circuit diagram
- EI&C loop diagram
- EE/EI&C single line representation
- Design diagram

# 10.4 Queries

#### Wire list

Base data: "@20 > A70 > Y10 > M41 > Y00R00028 Wire list"

To disable the default "Set of objects" and instead use the functionality of wire list query, you need to disable the "Object settable" property in the column properties of the "ConnectorFrom" and "ConnectorTo" columns. A script is used for this.

#### See also

Base objects of the queries (Page 163)

# 10.5 Standard tables

#### Important standard tables

The most important standard tables are listed below.

- "Y10M41N00002 Bridge symbols" (Page 162)
- "Y10M41N00001 Bridge types" (Page 159)
- "Y10M41N00004 Wire colors" (Page 160)
- "Y10M41N00005 Wire cross sections" (Page 161)
- "Y10M41N00006 Wire end handling" (Page 161)

Preparing terminal strips

10.5 Standard tables

# Preparing product data and manufacturer devices

#### Manufacturer devices

Manufacturer catalogs lie in the following node in the database: "@50 Manufacturer devices" If you create manufacturer devices from product data, these are created below the request base object.

# 11.1 Preparing the requirements

#### Aim

The identification as "Requirement" is used for the following purposes:

- As preparation for implementations
- As preparation for product data and manufacturer devices

#### Identifying an object as a requirement

- 1. Open the base object properties.
- 2. Select the "System settings" tab.

11.1 Preparing the requirements

- Activate the "Requirement" option in the "Implement requirement" control group. The object is a requirement. It is possible to set an implementation. It is possible to edit the "Project setting" option.
- 4. Edit the "Project setting" option
  - Activated:
    - When setting an implementation reference, the behavior defined under "Implementation" in the "Automation > EE/EI&C" category in the project properties applies.

The list for definition of the implementation behavior is locked.

- Deactivated:

The project setting is overwritten by the value set in the list as the definition of the implementation behavior.

Value	Effect
"Object will be replaced (by merge)"	The requirement object is replaced using the merge technique.
"Object will be replaced (by pointer)"	The requirement object is deleted and completely replaced by the manufacturer device.
"Object will not be replaced (by merge)"	The requirement object will not be replaced using the merge technique.
"Object will not be replaced (by pointer)"	The requirement object is retained. It is given a reference to the man- ufacturer device and the manufacturer device is given a reference to the requirement.

You can find additional information on this topic in the "EI&C Administration" manual, keyword "Project properties".

#### Rejecting settings / Restoring the inheritance

• "Restore inheritance" option

 $\times$ 

The settings for the "Project setting" option and for the "Implementation behavior" list are deleted. The settings of the owner apply.

#### Assignment of device requests and manufacturer devices

As standard, device requests and manufacturer devices are assigned via links. For this purpose, the following attribute is used:

Attributes of the base object, "System data" tab: Attribute "Y00A04982 Link to product request"

This attribute is evaluated in the following cases:

- In the case of a base object change When changing the base object, the "Link to product request" attribute is used in order to find the accompanying device request, if required.
- For the "Return to request" function In the case of an engineering object, this function sets the device request as the base object

11.2 Administering the manufacturer catalog

Due to the attribute, the link to a device request also works when a base object change takes place.

In the iDB, the attribute is located here: "@40 > A10 > Y00 > A05 > Y00A05202 > Y00A04982"

# 11.2 Administering the manufacturer catalog

#### 11.2.1 Automatically creating structure branches for manufacturer details

#### Overview

This chapter supplements the following information: "EI&C Operation" manual, keyword "Special devices: creating manufacturer devices from requests".

The methods presented there generate manufacturer devices through feedback. If a manufacturer is entered in the "Y00A00370 Manufacturer" attribute on the "Order data" tab, a node for the manufacturer is created automatically under the base object.

#### Result

When the feedback is triggered, a node with the name of the manufacturer is created first in the base project. The new base objects for the manufacturer devices are created below this node.

#### 11.2.2 Integrate the Siemens PIA LCP as a catalog

#### Requirement

Microsoft Internet Explorer version 6.0 or higher is installed and JavaScript and cookies are activated.

#### Objective

Connection of the "PIA Life Cycle Portal" catalog to COMOS using an online connection. Data exchange using XML messages.

11.2 Administering the manufacturer catalog

#### Preparing standard tables for assignments

Assignment of unit system
 Purpose: Assignment of units in COMOS and units in PIA LCP
 "Standard tables > Y40 > M01 > A10 > Y40M01N00001 Unit mapping"
 Column 1 ("Name"): Owner and name of the COMOS value
 Column 2 ("Description"): Description in COMOS
 Column 3 ("Value 1"): Consecutive numbering
 Column 4 ("Value 2"): Unit
 Column 5 ("Value 3"): DIN labels

Attribute assignment
 Purpose: Assignment of attributes in COMOS and units in PIA LCP
 "Standard tables > Y40 > Z10 > Y40Z10N00001 Assignment of attributes (Themis)"
 Column 1 ("Name"): Consecutive numbering
 Column 2 ("Description"): Description in COMOS
 Column 3 ("Value 1"): Owner and name of the COMOS value
 Column 4 ("Value 2"): PMD-ID of the characteristic as well as min. value for min./max.
 assignments

#### Preparing product identifier

Purpose: Describes the number of the product group in PIA LCP

- "Standard tables > @40 > Y00 > C10 > Y00N00459 Product identifier" Assigned attribute with the base objects: "HSD Order data" tab, "BAS1144 Product identifier " attribute
- DUMMY value for product identifier: DUMMY values are attributes which are available in PIA LCP, but not in COMOS. To work with these attributes, you must create them yourself and change the DUMMY value accordingly. DUMMY values must have a "0" entered in column 11 ("Value 9").
- Z value in column 12 ("Value 10") Optional. The Z value is inserted in standard tables if additional matching is necessary between COMOS and PIA LCP. Example: In the case of alphanumeric data, it is often the case that COMOS and PIA LCP interpret the content of the alphanumeric string differently.

#### Base object of the PIA LCP catalog

Purpose: To contain the interface to the online catalog on the "Read processor" tab.

"@50 > A20 > PIA PIA LCM Siemens AG"

#### **Test examples**

Examples for base objects in the style of PIA are available here:

"@30 > M41 > B20 PIA LCM device requirements"

11.3 Preparing available catalogs for manufacturer devices

#### Project option "debug mode"

Project properties, "General settings > COMOS" category, "Debug mode" control group, "Display PIA messages" attribute

Purpose: To activate the display and storage of error messages.

Log file: " Local Settings\Temp\<prefix>COMOSEXPORT<time stamp.csv"

# 11.3 Preparing available catalogs for manufacturer devices

#### Requirement

• A manufacturer catalog is available. See chapter Administering the manufacturer catalog (Page 103).

#### Overview of the technical procedure

A base object is placed at the base object in the "Available catalogs" group.

If the "Lookup manufacturer device" dialog is open at the engineering object, it will be checked at the base object which attribute is active in the "Available catalogs" group.

For each active attribute, a check is performed as to whether additional permissible base objects are available directly under the base object which has been set. If this is the case, these base objects are offered in the "Look up manufacturer device" dialog.

#### **Preparing attributes**

- 1. Determine the type and amount of properties which should be used in COMOS from the manufacturer device catalog.
- 2. Create the attribute which should house these properties in the base data.

#### Assigning a catalog

- 1. Open the base object properties with write access.
- 2. Change to the "Attributes > Order data" tab.
- Set a base object in the "Available catalogs" group. The manufacturer device base objects must be directly under the base object which has been set.
- 4. Activate the "Activate Y00A00248AA0<Counter>" attribute.

11.4 Preparing the product data

# 11.4 Preparing the product data

#### 11.4.1 Definition and area of application

#### **Technical implementation**

The technical basis for the use of product data is a base object change.

- 1. Configure a base object, which will serve as a basis for the request.
- 2. Create the base objects for the manufacturer devices or import a catalog of manufacturer devices.
- Based on the base object which serves as the request, create an engineering object in the engineering project. Enter all information that is relevant to product data in the properties of the engineering object.
- 4. When all the required information has been entered, the request becomes a manufacturer device:
  - If the engineering objects are one-off or special production items, the base project does not contain any manufacturer devices from which you can make a selection. In such cases, use the entries in the engineering project to create a manufacturer device in the base project. The details of the previous engineering object and the new manufacturer device then match. This enables you to verify that the previous entries are valid and relevant for orders.
  - Manufacturer devices have been prepared in the base object. From all the manufacturer devices, COMOS provides the subset which matches the specific engineering entries made in the attributes that are relevant to product data. The user selects one of the manufacturer devices on offer and COMOS sets this device as the new base object for the engineering object.

#### Supported base object classes

Product data supports the following base object classes:

- Class "Device"
- Class "Element"
- Class "Accessories"
- Class "Position"
- Class "Location"
- Class "Function"

The "Device request" class is not supported.

11.4 Preparing the product data

# 11.4.2 Editing comparison methods of the base object

Properties of the base object, "System settings" tab:

• Control group "Product data", "Recursive" option Activated: The same comparison method runs recursively for elements that are not virtual as for the object.

# 11.4.3 Preparing attributes

# Overview

Product data is handled as attributes. This means that all attributes that appear both in the requirements and in the specifications of the manufacturer device are identified as relevant to product data.

The product data relevance is furthermore required as a basis for or against a manufacturer device.

#### Procedure

- 1. Navigate to the base object in the base project whose attributes you want to edit.
- 2. Open the properties of the attribute.
- 3. On the "Links" tab, activate the "Combination" option. The "Operator" list is displayed. The operator stipulates what relationships are to be considered as valid between the templates at the base object, the request, and the engineering data, the product.
- 4. Select the required entry from the list.
  Example:
  If you select the "=" entry from the list, the entry in the engineering data must be the same as the template from the base data in order for the entry to be valid.
- 5. Click "OK" to save the changes and close the attribute properties.

#### Input the defaults for the request

After you have set the product data relevance and turned on the operator, the display of the attribute changes. Another field is added next to the attribute field on the "Ordering data" tab. This additional field is grayed out. You cannot enter any information here. If a manufacturer device is available, the entries in the first field are transferred and displayed here.

11.4 Preparing the product data

#### 11.4.4 List of the operators

#### Requirement

Only available for the following display types:

- "Edit field"
- "Edit (Min Max)"

#### Entries in the "Operator" list

Exactly which entries in the "Operator" list are available depends on the display type of the attribute. The following table describes the operators:

Operator	Description
"<", "<=", "=", ">", ">="	Numeric comparison between the input on the engineering side and the template.
"None"	An input must be made on the engineering side, but it the input does not matter.
"Within, Outside"	Only for range attributes. The input on the engineering side must be within or outside the values of the template from the base object.
"Prefix"	Alphanumeric comparison. The input on the engineering side must be the prefix of the template from the base object. This is very useful for order numbers. Within the order numbers the first digits often give type details and the remaining digits merely add additional ordering details. For example, if the order number for a motor is M4x0815, where the "M"
	stands for motor and the "4" for a four-pole connector, it is then sufficient to input the prefix "M4" on the engineering side to describe the product adequately.
"Script"	The script block "CheckProductRequestValues" is executed.
"Subset"	This allows a subset of the elements created for an object can be taken into account. If one or more of the elements defined here exists in an engineering object, the entry is valid. The check is based on identical names.
	This is also used with the "SYS.ELMSTRING" attribute on contactors.
"Partial string (Include)"	String comparison between the input on the engineering side and the template. If the input on the engineering side is included in the string in the default, the input is valid.

# 11.4.5 Controlling the display of product relevant attributes

#### Overview

You can use the "Y00A00183 Data display from" attribute on the "Y00T00001 System data" tab to control how attributes with the "Combination" property (= "product request") are displayed in the engineering project.
11.5 Defining a project-based selection of manufacturer devices.

If the attribute does not exist, create it at the base object in the base project. This attribute must be defined as a list with three statuses.

Name	Description
0	Data display of request / manufacturer device
1	Data display of request
2	Data display of manufacturer device

When switching the combobox, the properties display is not automatically updated. Therefore, you need to initiate this update in the Sub OnChange script function: Sub OnChange ()

```
'After editing the unit or the value
Set App = Workset.Globals.AppCommand
App.Execute "RefreshDeviceForm", ""
End Sub
```

## 11.5 Defining a project-based selection of manufacturer devices.

#### Introduction

You can store the manufacturer devices for your device request in a local path in COMOS. Through this you have the option to define a project based selection of manufacturer devices. This makes sense if, for example, you want to only consider devices from a certain manufacturer for the purposes of manufacturer device selection.

#### Procedure

- 1. Select the "Base objects" tab in the Navigator.
- To create a new base object, right-click on the project node and select the "New > New base object in engineering project" command in the context menu. The properties of the new object open.
- 3. Enter "@Device", for example, in the "Name" field.
- Click "OK" to save your entry and close the object properties. The new base object is displayed below the project node in the Navigator.
- 5. Create the manufacturer device structure you need below the base object.
- 6. Open the project properties.
- 7. Select the "Automation > EI&C" category.
- 8. Drag&drop the newly created base object "@Device" from the Navigator into the "Local manufacturer devices" field of the "Manufacturer device selection" control group.
- 9. Activate the "List only local manufacturer devices" option.
- 10.Click "OK" to confirm your entry.

11.6 Exporting product data using a script

#### Result

When selecting manufacturer devices, only those which you have created as part of the manufacturer device structure below the "@Device" base object are taken into account.

## 11.6 Exporting product data using a script

#### Function

<workset>.Lib.ProductRequestDisplayText<Spec>

This function supplies the output text of a ProductRequest attribute, whereby individual values such as Min/Max and unit are separated by the "|" character (vertical bar) (e.g. "100|200|cm").

The manufacturer device data is supplied as a complete string (e.g. "100 - 200 cm") as in the tabs.

# 12

## Preparing mounting catalog and hook-ups

## 12.1 Customization overview of the mounting catalog

#### Introduction

You modify the mounting catalog at various points in the base project. When modifying the mounting catalog, regard the following order:

- Create the mounting accessories
- · Create the report templates of a mounting object with the new mounting accessories
- Create the hook-up templates
- Assign the report template of the new mounting object to the hook-up template

#### Create the mounting accessories

You create the mounting accessories on the "Base objects" tab in the base project. The mounting accessories are found at the following location, structured into categories:

"@10 > A50 > A10 > C60 > A50 Mounting accessories"

#### Creating the report templates of a mounting object

You create the report templates for the mounting objects on the "Units" tab in the base project. The report templates of the mounting objects are composed of mounting accessories. The report templates are found at the following location, structured into categories:

"@Template > M41 > A10 Hook-up"

#### Create the hook-up templates

You use the hook-up templates to create mounting objects on the "Units" tab in the engineering project via the context menu in the "@Template" node. The hook-up templates are found on the "Base objects" tab in the base project at the following location:

"@30 > M41 > B10 > A10 Hook-up templates"

#### Assign the report template of the new mounting object to the hook-up template

To insert the report template of the mounting objects via the hook-up template, add a reference to the report template of the corresponding mounting object in the properties of the hook-up template.

12.3 Creating the report template for the mounting objects

#### Cost objects

Cost objects work together with the mounting catalog and are on the base data side but are not contained directly in it.

## 12.2 Create templates for mounting accessories

#### Introduction

Mounting accessories have already been prepared in the base objects of the database. However, if you require additional mounting accessories, you can create them in the base objects of the base project. Mounting accessories are stored in categories. If required you supplement the categories of the mounting accessories.

#### Procedure

- 1. On the "Base objects" tab in the base project, open the "@10 > A50 > A10 > C60 > A50 Mounting accessories" path to the mounting accessories.
- To create a new category for the mounting accessories, select the "New > New base object" command from the context menu of the "Z Mounting accessories" object. The properties of the new object open.
- 3. Enter a name for the new mounting accessory category in the "Name" field in the "General" control group.
- 4. Select the "Structure" entry from the list in the "Creation option" control group.
- 5. Apply the changes and close the properties of the new mounting accessory category.
- To create a new mounting accessory, select the "New > New base object" command from the context menu of the corresponding category. The properties of the new mounting accessory open.
- 7. Enter a name for the new mounting accessory in the "Name" field in the "General" control group.
- 8. Apply the changes and close the properties of the new mounting accessory.

## 12.3 Creating the report template for the mounting objects

#### Introduction

To create the mounting objects with the mounting accessories and the expense object in the engineering project at once, create report templates for the mounting objects in the base project. The mounting objects are divided into categories. Categories and templates for mounting objects have already been created in the database. You may supplement the categories and templates of the mounting objects if required.

## Requirement

The mounting accessories for the report template have been created on the "Base objects" tab in the base project, at the "@10 > A50 > A10 > C60 > A50 Mounting accessories" path.

#### Creating a category for the report templates for the mounting objects

- 1. On the "Units" tab in the base project, open the "@Template > M41 > A10 Hook-up" path to the report templates of the mounting objects.
- To create a new category for the mounting objects, select the "New > General > New object" command from the context menu of the "A10 Hook-up" object. The properties of the new category for the report templates open.
- 3. Set the reference to the "@20 > A10 > A20 > M41 > A40 Hook-up" base object on the "General" tab in the "Base object" field.
- 4. Enter a name for the new category of the report templates for the mounting objects in the "Name" field.
- 5. Apply the changes and close the properties of the category for the report templates of the mounting objects.

#### Creating the template for the mounting objects

- 1. Select the "New > General > New object" command from the context menu of a category. The properties of the new templates for a mounting object open.
- 2. Set the reference to the "@20 > B70 > M41 > A20 Mounting catalog (hook-up)" base object on the "General" tab in the "Base object" field.
- 3. Enter a name for the new template of a mounting object in the "Name" field.
- 4. Apply the changes and close the properties of the template for the mounting object.
- 5. Select the required mounting accessories for the report template under "New > ..." in the context menu of the new report template.

## 12.4 Creating a template for the hook-up

#### Introduction

You insert the mounting objects by means of the hook-up templates in the "@Template" node on the "Units" tab in the engineering project.

#### Procedure

- 1. On the "Base objects" tab in the base project, open the "@30 > M41 > B10 > A10 Hook-up templates" path to the hook-up templates.
- To create a new category for the hook-up templates, select the "New > New base object" command from the context menu of the "A10 Hook-up templates" object. The properties of the new category open.

12.5 Assigning the report template of a mounting object to the HookUp template

- 3. Enter a name for the new category of the hook-up templates in the "Name" field in the "General" control group.
- 4. Select the "Structure" entry from the list in the "Creation option" control group.
- 5. Apply the changes and close the properties of the new category for the hook-up templates.
- 6. Select the "New > New base object" command from the context menu of a category for the hook-up templates.
- 7. Enter a name for the hook-up template in the "Name" field in the "Reference" control group.
- 8. Apply the changes and close the hook-up template properties.

## 12.5 Assigning the report template of a mounting object to the HookUp template

#### Introduction

To insert a mounting object into the engineering project based on a template, assign the template of the mounting object to the hook-up template.

#### Requirement

- The template for a mounting object has been created.
- Hook up template has been created.

#### Procedure

- 1. Open the properties of the hook-up template.
- 2. Set the reference to the corresponding report template in the base project on the "Units" tab in the "Report template" field in the "Reference" control group.
- 3. Select the "Normal" entry from the list in the "Creation option" control group.
- 4. Apply the changes and close the hook-up template properties.

Preparing cabinet engineering

## 13.1 Preparing the mechanical design (design diagrams)

#### 13.1.1 Symbol variants for views

#### View-specific drawing types and symbols

There can be up to six views in design diagrams. Therefore, there can be up to six different forms of display for each object that you place on the report. However, the display of objects on a report is done by means of symbols.

For this reason objects that are used in design diagrams must own six different symbols. There are six drawing types for this purpose, with each drawing type relating to just one of the six views.

An example is provided here:

"@10 > A70 > A20 > A10 > A10 Cabinet system"

However, the symbols of these six drawing types are not created by drawing them in the Symbol Editor. Instead they are the result of a script. If you change the dimensions of the component, the displays resulting from this are then automatically made available as symbols.

You can also draw six symbols, which are then automatically used in the correct view.

Base objects were prepared for the cabinet engineering. These have a symbol script on the "Symbols" tab, which must not be deleted.

#### Effect on interactive reports: @SECTION objects

When you place a view on a design diagram, a corresponding engineering object "@SECTION..." is created in the engineering data below the report.

The main task of the view frame is to read out exactly one of the engineering modes and to display the according symbol.

A base object was developed for each view. You can find the base objects in the base project:

"@10 > A70 > A20 > A10 > A30 Views".

13.1 Preparing the mechanical design (design diagrams)

#### 13.1.2 Attributes of the cabinet objects

#### Database

The base data of the control cabinets can be found in the following nodes:

- "@10 > A70 > A10 Physical objects".
- "@10 > A70 > A20 Logical objects".

#### 13.1.2.1 "Assembly/3D data" tab for design diagrams

All objects that are placed on design diagrams are equipped with the "Assembly/3D data" tab in the base data.

#### "Assembly/3D data" tab

The following table offers an overview of the fields that are part of the "Assembly/3D data" tab:

"Settings for installation diagran	n / 3D viewer" control group
------------------------------------	------------------------------

Control element	Description
Field "Outer outline"	Points to a base object in branch "Z Symbol structure". On the "Symbols" tab, the base objects each have their own scripts that point to a DLL in which the outline - a rectangle - is calculated. It is not possible to create symbols of your own here.
	A number of different variants are stored in the iDB. These variations do not differ in their external dimensions, but rather through their different points of origin and the calculation of their level/working depth.
Field "Graphic"	Here you can call additional graphics that were placed on the external outline. The "graphic" covers the external outline. The format of the "graphic" is one of the usual ones in COMOS; it can be a COMOS symbol, a BMP, or a JPG. The size of the "graphic" should be matched to the size of the external outline to produce a meaningful image.
List "Output of device label in"	Displays the label either in the symbol of the front VIEW or rear view, and at the position that was defined in the symbol of the front view or rear view.
Field "Legend tag"	Is filled automatically when a legend is placed on the drawing.
Field "Contact points top"	This information controls if the connections from the top should be displayed.
	CP1;CP3;CP5 (which means without blank)
	Wildcard; * for all on top/* for all on bottom
	Empty entry, - for empty
Field "Contact points bottom"	This information determines if the connectors should be displayed at the bottom.
	Enumeration: CP1;CP3;CP5 (without a blank character!), Wildcard; * for all on top/ * for all on bottom, Empty entry , - for empty.
List "Mounting"	Type of mounting.
List "Equipment"	Controls if another device can be mounted on it. There is a warning message if an error occurs.
Field "3D model"	The file path for a STEP model to be displayed in 3D format is specified here.
"Subordinate object"	Automatically filled with the object on which items are being placed.

13.1 Preparing the mechanical design (design diagrams)

Control element	Description
List "3D type"	Controls the displayed 3D body, i.e. cuboid, cylinder, and cabinet struts.
"Layer" list	Sets a level. If this level is then hidden in the 3D view, the component is no longer visible.
List "Cabinet type"	Classifies an object. This attribute works with the tab.
List "Background color"	Determines the fill color of the object.
Option "Show grid"	When activated, this option displays the grid on the design diagram.
Field "Grid (x, y)"	The grid is drawn on the design diagram in a box structure and also offers snap points to place other objects.

#### Position of the point of origin

The options below the "Point of origin" control group control the point of origin of the cuboid and, therefore, its positioning in 3D.

#### Rule

Do not change the settings stored here.

#### Control group Diagram <- display -> printer

You can activate the following options independently of each other for the plan (the report) and for printing. This is why the text "Diagram <- Display -> Printer" is set there in order to emphasize that the left option is the display in the plan, and the option on the right option controls the information for printing.

Control element	Description
"Help lines" option	Construction help lines, centered, vertical, and horizontal.
"Mounting distance" option	Dashed frame of the outline.
"Mounting area" option	Dashed frame inside the symbol.
"Instruction" field	Comment field to indicate special instructions
"Weight" field	Installation weight of the object
	Select the desired unit of mass from the adjacent list.

#### Control group "Installation data"

Control group	Description
"Cubic dimensions"	You enter real values for cubic objects here.
"Mounting distance up to (mm)"	You can enter optional gaps to other components in the fields below the "Mounting dis- tance (mm) to" column.
"Area for mounting (mm) from"	below the "Cube" and "Cylinder" columns you can select values for cubic objects and for cylindrical objects.
"Cylindrical dimensions"	You enter real values for cylindrical objects here.

13.1 Preparing the mechanical design (design diagrams)

#### 13.1.2.2 "Mounting key" tab

#### Purpose

Using the "Y00T00107 Mounting key" tab, you define the components on which you may place objects during cabinet engineering. If, for example, the user erroneously places the objects on component elements which do not conform to the definitions stated here, then an automatic check is performed; the corresponding component element changes to red. The placing itself is not prevented. When the objects are placed correctly regarding the statements you made the color will change to yellow.

#### Base data

This tab lists the entries found in the "@40 > Y00 > A10 > A10|Y00N00005 Cabinet type" standard table. See also chapter ""Y00N00005 Cabinet type" (Page 155)", keyword "Comparison with the "Mounting key" tab". Here, the "Name" of the options must be written in the same way as the "Description" in the standard table.

#### Display in the engineering data

The "Mounting key" tab is not visible in the engineering data. The working area "~" is entered in the properties of the tab to make it visible and all other working areas are deactivated.

#### 13.1.2.3 Views

#### Database

There is a base object for every view. The base objects of the views are located in: "@10 > A70 > A20 > A10 > A30 Views"

You can find more information on this topic in the "EI&C Operation" manual, keyword "Preparing views".

#### See also

Managing multiple placement of rails (Page 123)

#### 13.1.3 Report template

#### **Options script**

- Symboltype = "M41\_P5"
- Application = "ELO.DESIGN"

13.3 Preparing installation/3D data

	<ul> <li>ConstructionMode = 1         In design diagrams it makes sense to work with the construction mode:         "ConstructionMode = 1". This activates the extended placing points. In the construction mode lines and dimensioning not only snap on the raster but also on the capture points of the objects.     </li> </ul>
	<ul> <li>ConnectionLineMode= "R"</li> <li>Only allows reading connections for autorouting.</li> </ul>
	<ul> <li>MainDocument.DrawingScale         This controls the scale of a DESIGN diagram. Example:         "MainDocument.DrawingScale = 1/10"         This reduces the size of the display of the symbols on the report. The report itself remains the same.     </li> </ul>
	A report template has been prepared in the database: "A30 > L > LU> LU_A10 > LU_A10 Cabinet design"
See also	
	"Mounting key" tab (Page 118)

## 13.2 Preparing 3D display

#### Procedure

The integrated 3D display of COMOS requires the following properties at the base objects:

- 1. Open the "Attributes > Installation/3D data" tab.
- 2. Create the attributes for the installation data. The attributes must lie on the "Y00T00011" tab.
- Activate the following control element in the attributes: "Link" tab, "3D > Mode" list.
- 4. Enter a default value in the "Value" list on the "General" tab.

## 13.3 Preparing installation/3D data

#### Example of a base object with 3D attributes

Example: "0 Factory > L001 Building > G001 Floor > R001 Room, Control > UZ01 Cabinet system > A50 Channels > U1 Channel, undefined entry points"

13.3 Preparing installation/3D data

#### Enter 3D type

- 1. Open the base object properties.
- 2. Switch to the "Attributes > Installation/3D data" tab.
- 3. Select an entry in the "Settings for installation diagram / 3D viewer" group in the "3D type" list.

#### Checking the display type of the 3D type

The objects managed as 3D bodies must use a 3D display type.

- 1. Select the base object on which the 3D attributes should be entered.
- In the Navigator, open the structure below the above base object up to the following attribute: "Y00T00011 Installation/3D data > Y00A00009 3D type"
- 3. Open the properties of the attribute.
- 4. The following standard table has to be set in the "Standard table" field: "@40 > Y00 > A10 > A10 > Y00N00006 Display type".
- 5. Navigate to the standard table and open it.
- 6. Check the entries in the "Value 1" column. The following entries are permissible:
  - Cabinet frame: ELO.ControlCabinet
  - Cube: ELO.EloFlexQuader
  - Cylinder: ELO.EloCylinder
  - Cylinder segment: ELO.EloFlexCylinderSeg

#### Preparing installation/3D data

- 1. Select the base object on which the 3D attributes should be entered.
- 2. Open the properties and switch to the "Attributes > Installation/3D data" tab.
- 3. Select the "Design mode" command in the context menu of the tab.
- 4. Select the "Properties > Attribute" command in the context menu of the attribute.
- Check the "Value" field on the "General" tab. The "Value" field must not be empty. If required, enter a "0".
- 6. Check the entry in the "Mode" list on the "Link" tab. In the "Mode" list, the "On" entry must be selected.

#### **Entering dimensions**

- 1. Open the object properties.
- 2. Switch to the "Installation/3D data" tab.

- 3. If the entry "Cabinet frame" or "Cube" was selected in the "3D type" list, the following applies: Fill in the "Cubic dimensions" fields in the "Installation data" control group.
  - "Y00A00180 Width" attribute
  - "Y00A00202 Height" attribute
  - "Y00A00237 Depth" attribute
- 4. If the entry "Cylinder" or "Cylinder segment" was selected in the "3D type" list, the following applies:

Fill in the "Cylindrical dimensions" fields in the "Installation data" control group.

- "Y00A00657 Diameter" attribute
- "Y00A00209 Length" attribute
- "Y00A00049 Angle (cyl. segment)" attribute
   The "Y00A00049 Angle (cyl. segment)" attribute defines until which angle the segment is displayed as filled. The start value 0 degrees is calculated from the top and the segment filled in the clockwise direction.

#### Entering the mounting distance

- 1. Open the object properties.
- 2. Switch to the "Installation/3D data" tab.
- 3. Fill in the "Mounting distance (mm) to" fields in the "Installation data" control group.

#### Entering the mounting area

- 1. Open the object properties.
- 2. Switch to the "Installation/3D data" tab.
- 3. Fill in the "Area for mounting (mm) from" fields in the "Installation data" control group. The distance from the dimensions of the body is entered for this purpose. Example: If the value -50 is entered for a plate in the "Left" field, the mounting area to the left is 50 mm smaller than the dimension of the component.

## 13.4 Managing cabinet design

#### Definition of cabinet diagrams

From a COMOS perspective, cabinet diagrams belong in the design diagram group. Cabinet diagrams are true to scale, two dimensional drawings in which the size and location of components are displayed.

You can detect that they belong in the design diagram group from the following properties:

- Symbol type of the report template: "M41\_P5 Design diagram
- The description of the interactive report template contains the term "Cabinet diagram"

#### 13.5 Accessories in cabinet construction

In the following section, the general term "design diagram" is avoided where possible and only "cabinet diagram" is used.

#### Placing objects

Objects which you may place on cabinet diagrams are located in the base objects under "@10 > A70 > A10 Physical objects" and "@10 > A70 > A20 Logical objects". Placeable objects must have the "Y00T00011 Installation/3D data" attribute tab.

The components are displayed in the proportions that are specified in the data of the "Installation/3D data" attribute tab:

- "Installation data" group
- "Width" attribute
- "Depth" attribute
- "Height" attribute

Terminal strips are usually placed completely on design diagrams, hence with free and occupied rails.

#### Effect in the engineering data

The views are created below the report, the engineering object of the cabinet next to the report.

In contrast to the usual structures, engineering objects of the cabinets have multiple DocObj objects: always one per view. If a design diagram has three views, the engineering objects also have three DocObj objects.

## 13.5 Accessories in cabinet construction

#### Accessories with the "Element" class

The accessories of the terminal strip are taken into consideration in the rail editor if the following properties have been set:

- "Element" class, "Equipment" subclass
- Functional classification "A870"

#### Accessories with the "Accessories" class

The accessories of the terminal strip are taken into consideration in the rail editor if the following properties have been set:

- Class "Accessories"
- Functional classification "A870"

## 13.6 Managing multiple placement of rails

#### Controlling distributed view

In order for a rail to be automatically distributed over multiple views with the same viewing direction, the following attribute must be set:

 "Y00T00011.Y00A03521 Distributed representation" Value: -1

The attribute stores the sequence and views involved in a distributed representation. If an additional view is created, the value is incremented. The first additional view is assigned the value 0.

The default value of "-1" indicates:

- Distributed representation is supported for this view.
- The current view is not already part of a distributed view.

#### Controlling offset

"Y00T00011 > Y00A00729 Offset"

Specifies the left offset of the rail. In this way, the display of the rail can be controlled in different scales.

#### Example

"@10 > A70 > A20 > A10 > A30 Views"

You can find more information on this topic in the "EI&C Operation" manual, keyword "Placing components in a view".

#### See also

Views (Page 118)

## 13.7 Printing

#### Printing symbol backgrounds

Symbols can get a colored background on design diagrams. The symbol for displaying a control cabinet or a strip, etc., is filled with a color. These colored backgrounds are also printed.

#### Printing view frames

Views in design diagrams are displayed and bordered by means of a frame. These frames are not printed by default. You can use the following attribute in the base data to specify whether these frames should be printed or not:

Preparing cabinet engineering

13.7 Printing

"@10 > A70 > A20 > A10 > A30 Views": "Settings" tab, "Do not print frame" attribute.

## Preparing evaluation and printing

## 14.1 Preparing printing in two languages

#### Core statement

To activate operator mode, proceed as follows:

- 1. Specify the two languages that are to be printed. See chapter "Settings" control group (Page 14)
- 2. Activate the "Activate language output on reports" option See chapter "Settings" control group (Page 14).
- 3. Control the DisplayValue of the objects placed on the report by means of a script. The following shows an example for the attribute of a document:

```
Function GetDisplayValue()
  If GetSpecOwner.SystemType = 13 Then Exit Function
  Set objStartObject = ThisObj
  strReferenceObject = "ProjectAttribute"
  strObjectDetail = "COM01.COM0001"
  strReferenceProperty = "DescriptionPlusDisplayValue"
  GetDisplayValue = GetBilingualPrintText(objStartObject,
strReferenceObject, strReferenceProperty, strObjectDetail)
End Function
and
Function GetBilingualPrintText(objStartObject,
strReferenceObject, strReferenceProperty, strObjectDetail)
  GetBilingualPrintText = Project.Workset.Lib.CallScriptLib("@02]
200|BAS|S|10|01", "GetBilingualPrintText", objStartObject,
strReferenceObject, strReferenceProperty, strObjectDetail)
End Function
```

4. Edit the general script block accordingly at the objects for the devices.

## 14.2 Report templates for evaluating reports

#### General

COMOS offers individually configurable automatic lists, which aid in the efficient collection and listing of materials and parts available for order. The following lists rare contained in the database:

- Parts list (EI&C)
- Order list (EI&C)

14.2 Report templates for evaluating reports

These lists only contain objects which meet the following criteria:

- 1. The objects are in a direct ownership relationship, meaning that links and references are not evaluated.
- 2. In the unit or location view, only objects within the unit structure or location structure are evaluated.
- 3. The planning object has a a base object.
- 4. The engineering object is not of type "Logical potential".
- 5. The engineering object is not of type "Cable".
- 6. The engineering object has the "Installation/3D data" tab.
- 7. The engineering object has the "Order data" tab.
- 8. The "Order relevant" property is not active.
- 9. The "Article number" field is not blank.

#### **Receiving lists**

- 1. Create a new document at the desired location.
- 2. Assign Name, Label and Description as required.
- 3. Open the "Report" tab and there assign one of the following report templates to the "Report template" field via the "..." button:
  - "A30 > P > PB > PB\_A20 > PB\_A20 Parts list (EI&C)"
  - "A30 > P > PC > PC\_A10 > PC\_A10 Order list (EI&C)"
- 4. Confirm your entries.

## Reference: Base data

#### 15.1 Base objects

#### 15.1.1 Finding base objects

#### Introduction

The base objects are stored in particular categories. These categories structure the base objects and simplify the search for required objects.

You can find additional information on this topic in the "Administration" manual, keyword "Classifying objects" and "Meanings of the main levels in the iDB".

#### Searching for base objects

To search for base objects in the electrical engineering area, proceed as follows:

Full-text search

You can find additional information on this topic in the "Operation" manual, keyword "Using the full-text search", and in the "Administration" manual, keyword "Preparing a full-text search for document contents".

 Classification You can use specialized queries to find a specific object or objects of the same type. You can find additional information on this topic in the "Administration" manual, keyword "Database search".

#### 15.1.2 "Text block design" tab

#### Availability

At all the objects whose base object lies under the following node or inherits from it: "@10 > A50 > A10 Physical objects".

#### Purpose

You define the position of the device label output for the following drawing types on the tab:

- EE circuit diagram
- EIC loop diagram
- EE/EIC single line representation

- Design diagram
- FUP\_IEC
- Fluidics diagram

#### Attributes

Attribute	Description
"Alignment"	Determines the alignment of the device label text.
"Output of device label"*	Specifies the structure of the device label: Number of lines and structure of the device label.
"With description"	Determines whether the description of the device also forms part of the device label.
	Value "Only own": The description is only output if it is checked in at the engineering object.
"With attribute(s)"	Determines whether the attributes specified in the "Attribute(s)" field form part of the device label.
"Attribute(s)"	The values of the attributes entered here can be output with the device label.
	Delimiter: ";"
"Reference"	Determines whether references to other objects are attached. The objects concerned depend on the script.

#### 15.1.3 Structure of base objects

#### Introduction

The base objects are stored in particular categories. These categories structure the base objects and simplify the search for required objects.

#### "@10 Material"

All physical objects are located below the "@10 Material" node.

All the devices from the fields of electrical engineering and cabinet engineering lie in the following branches:

- "@10 > A50 Electrical engineering"
- "@10 > A70 Cabinet engineering"

The devices collected in this branch have certain basic properties. See also chapter Device view (Page 152).

#### "@20 General objects"

For example, the following objects are located below the "@20 General objects" node:

- Signals
- Queries and scripts
- Search objects

#### "@30 Structures"

The structures for the "New" context menu of the objects are located below the "@30 Structures" node.

#### "@40 @Y Attributes and tabs"

The tabs and attributes are located below the "@40 @Y Attributes and tabs" node. They are used multiple times.

#### "@50 Manufacturer devices"

Some manufacturer devices that have been prepared as examples are available below the @50 Manufacturer devices" node.

#### 15.1.4 Base objects of the unit structures

#### Base objects of the unit structures

- Project setting El&C:
   "@30 > M41 > A20 > A10 > A10 > A10 > A50 El&C"
   The folder "A50 I&C (Instrumentation & Control)" is located directly below the subunit.
- Project setting General:
- "@30 > M00 > A20 > A10 > A10 > A40 > A10 > A10 > A50 El&C"
   Provides the structures in the style of DIN/IEC, Alias and KKS via the context menu.
- Project presetting "@30 > M00 > A20 > A10 > A10 Project presetting, general example."

#### "A50 EI&C" folder

The "A50 EI&C" folder contains prepared objects for positions and functions.

"@10 General position": Functions are prepared under the positions.

#### 15.1.5 Base objects of the positions

#### 15.1.5.1 A10 Positions

#### Base objects of the positions

Base objects based on DIN/IEC "@20 > A25 > A10 > M00 > A10 General position"

You usually create the positions as part of P&ID planning. You can find additional information on this topic in the "P&ID" manual, keyword "Positions".

#### 15.1.5.2 Objects underneath the positions

#### Introduction

You create the following objects in the "Units" tab of the Navigator via the "New" context menu of the position.

#### Measuring and actuating functions

The measuring and actuating functions applicable for a given position are located below this position. The measuring and actuating functions will usually already have been created during P&ID planning.

#### "FF.001 function diagram"

The "Function diagram" interactive report is only required for functional planning. You can find additional information on this topic in the manual "Logical Operation" keyword "Configuring function diagrams".

#### "FS.001 loop diagram"

The loop diagram shows the loop.

#### Additional information

You can find more information on this topic in the "EI&C Operation" manual, keyword "Structure of the point diagram".

#### 15.1.5.3 Tabs/attributes of the positions

#### Introduction

The attributes of a position are for informational purposes only and do not trigger any automated functions. They are statically linked with the corresponding attributes of the subunit. The information on the tabs is required for signal selection.

When you create a position, COMOS automatically refreshes all static connections. However, if you then make additional changes to the attribute values, you will need to refresh them manually by selecting the "Refresh values" command from the context menu of the tab.

#### "Y00T00108 Safety requirements" tab

The "Y00T00108 Safety requirements" tab is located in the following tab collection in the database:

"@40 > A20 > Y00 > A10 > A50 > Y00T00108 > A01 > A02 > Y00T00108 Safety requirements"

#### "Y00T00269 Position data" tab

The "Y00T00269 Position data" tab is located in the following tab collection in the database:

"@40 > A20 > Y00 > A10 > B20 > Y00T00269 > A01 > Y00T00269 Position data"

#### "Y00T00020 Environmental conditions" tab

The "Y00T00020 Environmental conditions" tab is located in the following tab collection in the database:

"@40 > A20 > Y00 > A10 > A10 > Y00T00020 > A01 > Y00T00020 Environmental conditions"

#### "Y00T00001 System data" tab

The "Y00T00001 System data" tab is located in the following tab collection in the database:

"@40 > A20 > Y00 > A10 > A10 > Y00T00001 > A15 > Y00T00001 System data"

#### 15.1.6 Base objects of the functions

#### 15.1.6.1 A10 Predefined functions

#### Base objects of the functions

You can find the base objects for functions based on DIN/IEC under the following node: "@20 > A30 > A10 Vordefinierte Funktionen"

You usually create the functions as part of P&ID planning. You can find more information on this topic in the "P&ID Operation" manual, keyword "Working with functions".

#### 15.1.6.2 Objects underneath the functions

#### Introduction

You create the following objects in the "Units" tab of the Navigator via the "New" context menu of the function.

#### "A10 Basic engineering"

You create devices and channel requests, for example, below the "A10 Basic engineering" folder.

#### "A20 Signal engineering"

You create signals, for example, below the "20 Signal engineering" folder.

#### "A30 Detail engineering"

The function components are only required for functional planning. You can find additional information on this topic in the manual "Logical Operation", keyword "Using the function block".

#### Evaluating reports and interactive reports

From the second level below the functions different evaluating reports and interactive reports are available in the database.

#### 15.1.6.3 Tabs/attributes of the functions

#### "Y00T00028 Signals" tab

The "Y00T00028 Signals" tab is located in the following tab collection in the database:

"@40 > A20 > Y00 > A10 > A20 > Y00T00028 > A01 > Y00T00028 Signals"

#### "Y00T00108 Safety requirements" tab

The "Y00T00108 Safety requirements" tab is located in the following tab collection in the database:

"@40 > A20 > Y00 > A10 > A50 > Y00T00108 > A01 > A03 > Y00T00108 Safety requirements"

#### "Y00T00020 Environmental conditions" tab

The "IC020 Environmental conditions" tab is located in the following tab collection in the database:

"@40 > A20 > Y00 > A10 > A10 > Y00T00020 > A01 > Y00T00020 Environmental conditions"

#### "Y00T00007 Function data" tab

The "Y00T00007 Function data" tab is located in the following tab collection in the database:

For measuring functions: "@40 > A20 > Y00 > A10 > A10 > Y00T00007 > A01 > A02 > Y00T00007 Function data measuring point" tab

For actuating functions: "@40 > A20 > Y00 > A10 > A10 > Y00T00007 > A01 > A01 > Y00T00007 Function data actuating point

#### "Y00T00106 Merge" tab

The "Y00T00106 Merge" tab is located in the following tab collection in the database:

"@40 > A20 > Y00 > A10 > A50 > Y00T00106 > A01 > Y00T00106 Merge"

#### "Y00T00039 Graphical options" tab

The "Y00T00039 Graphical options" tab is located in the following tab collection in the database:

"@40 > A20 > Y00 > A10 > A20 > Y00T00039 > A02 > Y00T00039 Graphical options"

You can find additional information on this topic in the "P&ID" manual, keyword "Display of functions".

#### "Y00T00001 System data" tab

The "Y00T00001 System data" tab is located in the following tab collection in the database:

"@40 > A20 > Y00 > A10 > A10 > Y00T00001 > A16 > Y00T00001 System data"

The attributes of the "Y00T00001 System data" tab are divided into two areas:

• "Function settings - PI":

These attributes belong to the base data administration of P&ID planning. You can find additional information on this topic in the "P&ID Administration" manual, keyword "Structure of the base objects of functions".

"Process control system"

#### See also

Basic conditions in the base objects (Page 23)

#### 15.1.7 Base objects of the signals

15.1.7.1 A40 Signals

#### Base objects of the signals

The base objects for signals are located here: "@20 > A40 Signals" A signal in the style of IEC 1175 is located in the node: "@20 > A40 > A10 General signal"

#### 15.1.7.2 Tabs/attributes of the signals

#### "Y00T00027 Signal data" tab

The "Y00T00027 Signal data" tab is located in the following tab collection in the database: "@40 > A20 > Y00 > A10 > A20 > Y00T00027 Signal data"

#### "Y00T00021 Extended signal data" tab

The "Y00T00021 Extended signal data" tab is located in the following tab collection in the database:

"@40 > A20 > Y00 > A10 > A10 > Y00T00021 Extended signal data"

#### "Y00T00024 OPC" tab

The "Y00T00024 OPC" tab is located in the following tab collection in the database: "@40 > A20 > Y00 > A10 > A10 > Y00T00024 OPC"

#### "SYS System data" tab

You need these tabs for functional planning. You can find additional information on function diagramming in the "Logical Operation" manual, keyword "Configuring function diagrams". The "FUP01 Signal data" tab is located in the following tab collection in the database: "@40 > A20 > Y00 > A10 > A10 > Y00T00001 > A01 System data (signals to IEC 11759)"

#### 15.1.7.3 Scripts

#### Function of the scripts

The following scripts have been prepared on the "Script" tab of the base object of a signal:

- "OnMenuCreate"
- "OnMenuExecute"

The context menu of a signal is extended by these two scripts. If a signal is set by an action block within a set of steps, then all steps with which the signal is connected to are listed in the context menu of the signal. If you select a step, COMOS navigates to the corresponding action block.

#### 15.1.8 Device symbols

#### Symbol definitions

All simple devices have symbol definitions on the "Symbols" tab for displaying on reports. The symbol is shown in a different way, depending on the selected report. You can individually adapt the symbols in the Symbol Editor. The symbol definitions are inherited downward in a hierarchical manner.

The symbols have a fixed size, which is optimized for a grid and a scale. However, the symbols can also be used on reports with a different grid and scale.

The symbols feature a placing point for positioning them on the grid. This placing point is created in such a way that the connectors of the device are located on the grid.

The following drawing types are important for I&C:

- "M41\_P3 EI&C Loop diagram" This drawing type is used for point diagrams in I&C.
- "M22\_P1 R&I (ISO 10628)" I&C requires as input the functions placed in the P&ID reports.
- "M41\_P4 EE/EI&C single line representation" Single line display in EI&C reports. Resembles block diagrams.
- "M41\_P2 EE circuit diagram"
   Wiring is performed in this type of diagram.

#### **Text symbols**

In addition to the graphical symbol, many objects also have a text symbol, which is called in the graphical symbol as follows:

"\*V\*P TXTPOINT\*"

The text symbol is inherited downward in a hierarchical manner. However, it is not evaluated for all base objects. The text symbol is only evaluated when it is called in the graphical symbol.

The text symbol puts out the following information and attribute values:

- Attribute "Y00A00302 Article number" from the "Y00T00025 Order data" tab
- Attribute "Y00A00370 Manufacturer" from the "Y00T00025 Order data" tab
- Name of the engineering object

You can find additional information on this topic in the "Administration" manual, keyword "Text symbol".

#### See also

Symbols (Page 152)

#### 15.1.9 Base objects for cables

#### "Wires" tab

The "Wires" tab gives a quick overview of all connectors (devices) linked with a cable. This tab is only available in the following cases:

- Class "Device", subclass "Cable"
- Class: "Element", subclass: "Wire"

#### See also

Attributes for cables and wires (Page 148)

#### 15.1.10 Base objects of document groups

#### Base objects of document groups

The base objects of the document group are found at the following location:

"@30 > M00 > A90 > A10 Document groups to IEC 61355"

#### Using document groups

Document groups have already been prepared on the "Documents" tab in the base project in the Navigator, and these follow a specific naming scheme. You create document groups according to this scheme in the engineering project, on the "Documents" tab in the Navigator. The documents which you create according to this naming scheme on the "Units" and "Locations" tab in the Navigator are automatically referenced below the appropriate document group on the "Documents" tab.

You can find additional information on this topic in the "Administration" manual, keyword "Document groups".

#### Document group of the project setting "Project presetting, common example"

If you select the project setting "@30 > M00 > A20 > A10 > A10 Project presetting, common example" in the project properties, a document group is created automatically on the "Documents" tab in the navigator in the engineering project. The base object of the document groups inherits from the following base object:

"@30 > M00 > A90 > A10 Document groups to IEC 61355"

#### Elements of the document group

Subfolders are located below the document group. These subfolders are hierarchy groups. The hierarchy groups are elements of the document group. The base object of the hierarchy groups is located at the following location:

"@20 > A60 > A20 > A10 > A10 Hierarchy group"

Subfolders are located below the hierarchy groups. These subfolders are document groups. The document groups are elements of the hierarchy groups. The base object of the document groups is located at the following location:

"@20 > A60 > A20 > A10 > A20 Document group"

In order to create the hierarchy and document groups automatically when the highest-level document group is generated on the "Documents" tab in the navigator in the engineering project, the elements have the following settings:

- "Inheritance mode" list: "Active"
- "Virtual" option: "Off"

#### Important document groups for I&C work

The following document groups are significant for I&C work:

- "@30 > M00 > A90 > A10 > D > DA Data sheets"
- "@30 > M00 > A90 > A10 > F Function-describing documents"
  - "FA Functional overview documents" Contains the single line representations of loop diagrams.
  - "FF Function diagrams" You can find additional information on this topic in the manual "Logical Operation", keyword "Configuring function diagrams".
  - "FP Signal descriptions"
  - "FS Circuitry documents"
     The "FS Circuitry documents" document group contains the documents "FS Loop diagram" and "FS Circuit diagram".
- "@30 > M00 > A90 > A10 > P > PC Parts lists"
- "@30 > M00 > A90 > A10 > Q Quality management documents and safety-describing documents"

#### 15.1.11 Base objects of the documents

#### IEC base objects

Each report has a report template and a base object. The base objects of the reports inherit from the following base object:

"@30 > M00 > A80 > A10 Document objects acc. to IEC 61335"

#### **Design diagrams**

Design plans are part of the layout diagrams module and are used in the design of a cabinet structure. You have the following base object:

"@30 > M00 > A80 > A10 > E > ED Dimensioning, calculation"

#### 15.1.12 Base objects of the location structure

#### Base objects of the location structure

- From the project setting for EI&C:
  - "@30 > M41 > A20 > A10 > A20 Factory"
  - "@30 > M41 > A20 > A10 > A40 Location, two-level"
- From the project settings "@30 > M00 > A20 > A10 > A10 Project presetting, common example": The objects "B10 Level 1" to "B50 Location to KKS (7-level)"

The specification of the local structure determines the objects offered to users in the "Locations" of "New" context menu. If you change the default local structures, these changes become effective immediately in the context menu.

#### Basic objects of the location structure

The base objects of the basic objects of the location structure are found at the following location:

"@20 > A20 > A10 Locations, general"

The base objects from the location structures have a base object reference to these basic objects.

#### 15.1.13 Base objects of the mounting catalog

#### Introduction

The base objects of the mounting catalog are found at various locations in the base project.

#### Note

To ensure the mounting catalog to function correctly, do not change its structure when adapting it to meet your requirements.

#### Base objects of the mounting catalog

The base objects of the mounting accessories are found at the following location:

"@10 > A50 > A10 > C60 > A50 Mounting accessories"

The base objects of the hook-up templates are found at the following location:

"@30 > M41 > B10 > A10 Hook-up templates"

The hook-up templates have a reference to the report templates of the mounting objects on the "Units" tab in the base project. The report templates of the mounting objects are found on the "Units" tab at the following location:

"@Template > M41 > A10 Hook-up"

The base object for the report templates of the mounting objects of the mounting catalog is found at the following location:

"@20 > A10 > A20 > M41 > A40 Hook-up"

The base object of the cost object is found at the following location:

"@20 > B50 Expenses"

The base object of the "Mounting LinkObject" is found at the following location:

"@20 > B70 > M41 > A10 Mounting LinkObject (hook up)"

Find more information on this topic in the "EI&C Operation" manual, keyword "Using a mounting catalog and hook-ups".

#### 15.1.14 Base objects for tray, ducts, channel parts

#### **Channel classification**

- Tray, undefined entry points
  - Classification: P4 A990 Channel with undefined entry points
  - COMOS standard storage:
     "@10 > A70 > A10 > A30 > A10 Channel, open entry points"
- Tray, defined entry points
  - Classification:P4 B010 Channel with defined entry points
  - COMOS standard storage:
     "@10 > A70 > A10 > A30 > A20 Channel, defined entry points"

#### Channel classification, virtual

- Channel
  - Classification: P40 B020 Virtual channel
  - COMOS standard storage:
     "@10 > A70 > A20 > A10 > A20 > A40 Virtual channel"

#### **Duct classification**

- Duct
  - Classification: N9 B040 Duct
  - COMOS standard storage:
     "@10 > A70 > A20 > A10 > A20 > A10 Duct"

#### Attributes

- "Width" (Y00T00003.Y00A00180)/Height (Y00T00003.Y00A00202) or diameter (Y00T00003.Y00A00185)
   Purpose: Diameter calculation, Fill level calculation.
- "Cable type" (Y00T00003.Y00A00204) Definition of the permissible cable types.
   "Not defined" value: All types of cables may be laid.
- "Used to" (Y00T00003.Y00A00648) Display the current fill level. The fill level calculation is performed a script for ducts.

#### 15.1.15 Base object for relays, contactors

#### Database

"@10 > A50 > A10 > A90 Relays, contactors" Class: "Device", subclass: "Coils/Relays"

#### Aim

Use on the report as a relay or coil, including a tabular listing of the connector points (contact surface).

See also chapter Contact surface for relays and contactors (Page 64).

### 15.1.16 Configuring base objects for the Master Version

The object which serves as template must meet the following criteria:

- The "Y00T00005 COMOS system" tab exists.
- The "Y00A05563 Template version" attribute exists on the "Y00T00005 COMOS system" tab. The attribute is read-only because the value is set by the script. It is only visible at the base object.
- The "Y00A05564 Generate version" button exists on the "Y00T00005 COMOS system" tab. The following script is stored:
   Sub OnClick()
   'Event: After pressing the button
   Set ObjicUtils = CreateObject("Comos.IC.Utilities.Utilities")
   strRes = ObjicUtils.UpdateTemplateVersion(ThisObj.GetSpecOwner)
   If strRes <> "" Then
   MsgBox strRes
   End If
   End Sub
- 15.1.17 Logical objects: Other base objects
- 15.1.17.1 "A10 Black box, automatic contact points"

#### Attributes

"@10 > A50 > A20 > A20 > A10 > A10 Black box, automatic contact points"

Properties of the base object, "Attributes > Display" tab, "Graphical settings" group:

- Minimum width
- Minimum height
- With references Shows the reference texts in the black box.

You can find more information on this topic in the "EI&C Operation" manual, keyword "Blackbox".

#### 15.1.17.2 "A20 Black box, COMOS device"

#### Aim

Blackbox with predefined contacts. This blackbox is primarily intended to be used to connect plug-in cards. In this case there are only connectors going in one direction based on the plug-in card.

#### Control of the extended capabilities

By means of a symbol script.

#### Application

This blackbox owns a symbol with four prepared connectors. Additional connectors are generated on the report if the blackbox is placed and drawn out to make it bigger.

All connectors initially lie on the upper edge of the symbol, however, the symbol can be rotated and thus the outgoing direction of the connectors can be stipulated retrospectively.

No COMOS connector is generated if a connection is open-ended. A connector is generated automatically if a connection ends at a RODevice.

#### **Multiple placing**

The blackbox with predefined contacts can be continued across multiple reports. A corresponding cross-reference is displayed if a connection is made on one of the reports to a grid point connector that has already been used on another report.

#### 15.1.17.3 "A30 Identification frame"

#### Database

"@10 > A50 > A20 > A20 > A10 > A30 Identification frame"

Class: "Element", subclass: "Segment"

#### Aim

ID segments (label segments) are rectangular areas on circuit diagrams that group objects belonging to one location to enable clearer labeling. This abbreviation of texts at the devices also covers cables (class: "Device", subclass: "Cable").

These segments are stipulated in addition as the target for the automatic placing function ("AutoLoop").

#### Control of the extended capabilities

COMOS controls the ID segments as soon as a base object has the class "Element", subclass "Segment". You can use any name you wish. The symbol does not contain specialties: it draws the display of the segment and outputs a text.

#### Rules for abbreviating labels

For label segments the %N DevDescription% option is evaluated (OwnDescription of the MainDevice). The %N DevDescription% option only displays checked in descriptions.

The segment uses ULLabel to calculate a shortened text from it.

#### Properties of the base project, "System data" tab

Open the properties of the base object and select the "Attributes > System data" tab.

Object settings	
Consider unit	Default for the "Unit" field in the properties of the ID seg- ment on the report.
Consider location	Default for the "Location" field in the properties of the ID segment on the report.
Set device	Considers the device identifier in the ID text in the ID seg- ment.
Text block multilined	Default for the "Multiline output" field in the properties of the ID segment on the report.
As polygon	The ID segment can be drawn as a rectangular polygon.
	Note: Polygon base objects have differences in addition to this setting.
Calculate shared amount	The lowest common denominator of all the objects in the segment is calculated as the unit/location and only this common part is indicated. The device labeling becomes longer accordingly.

Additional information on this topic is available in the "EI&C Operation" manual, keyword "Using segments".

#### See also

"Sheet area" attribute (Page 52)

#### 15.1.17.4 "A40 Sheet areas El&C"

#### Database

"@10 > A50 > A20 > A20 > A10 > A40 Sheet areas EI&C" Class: "Element", subclass: "Segment"

#### Aim

This object has the same aim as the "A30 Identification frame" object, but is optimized for EI&C and, therefore, has different attributes and symbols accordingly.

#### 15.1.17.5 "A70 Polygon"

#### Database

"@10 > A50 > A20 > A20 > A10 > A70 Polygons" Class: "Element", subclass: "Segment"

#### ID segments with a polygon shape (SegmentDefaultIsPolygon)

ID segments are used to structure the device label.

ID segments are rectangular by default. but you can also create a polygon shape.

In order to use the identification frame as a polygon, its base object requires the following attribute: Check box "Y00T00001.Y00A00523 As polygon"

When you then place an ID segment on the report, the initial symbol will be taken from the script. Afterwards, you can use the grab points to change the symbol.

You have the option of nesting polygons.

#### Example

If all the polygon points of polygon A lie within polygon B, polygon A is within polygon B.

#### "Options" context menu

The following table describes the commands which you can perform via the context menu of the selected polygon under "Options":

Option	Description
"Redraw"	Select this option to redraw the symbol.
"Restore the original symbol"	Select this option to reject the redrawn symbol and restore the original one.
"Stretch"	Select the area of the polygon which you want to stretch. Then select the "Stretch" option.

#### 15.1.18 Logical objects: Potential information

#### 15.1.18.1 "B30 Potential information"

#### Database

"@10 > A50 > A20 > B30 Potential information"

Class "Device", subclass "Logical potential"

#### Aim

Potential rails are used on the report or in the database like a busbar: as many outlets as required can be made available at any desired point, which all have the same current potential. Among others, potential rails are also needed for the construction of control cabinets.

The potential is often created below a location, since the potential has to supply the location with electricity. However, in principle a potential can be created anywhere.
## Output in bill of materials

Potentials are normally not displayed in part lists.

## Control of the extended capabilities

Control through COMOS as soon as a base object has the "Potential" subclass. You can use any name you wish. A symbol is not created, instead it is included by the subclass.

## Connectors

Potentials typically do not have a fixed number of connectors. Instead, they can be connected to as many devices as desired. That is why the potential objects are only set up with one connection, and to this connection there are as many auxiliary connections created as devices that are to be connected to the potential.

The auxiliary connectors are usually generated automatically when the user performs one of two actions:

Alternative 1:	Create a new output of the potential rail on the report by connecting a new connection.
Alternative 2:	Drag a free device connection onto the "Connectors" tab of the potential.

You can also create auxiliary connectors manually via the context menu.

## Displaying the connectors

If you place a potential on a report, the information output at the reference end is taken from the standard table "Y10 > M00 > A20 > Y10M00N00029 Connection". If you want to see different text or an additional graphic, or format the text differently, then you have to change the corresponding entry in this standard table.

## Overlap

Potentials can own an overlap which reaches beyond the grab points. This overlap is controlled through the <code>PotentialProlongation</code> variable in the options script of the template file. Default of the variable is zero [0]. The overlap is only visible if the description is turned off on the according line ends. To do this, mark the potential and select the "Label right" or "Label left" command in the context menu.

## Display and use on the report

The potential rail can have one or more outputs on a desired position, whereby the outputs, as all other object, are aligned to the grid. Each output generates an additional connector.

## Alternative display type:

The potential is shown as point from which an output starts. Therefore one of the two grabs is dragged onto the other. In this case the display of the left label is turned off automatically because both texts would otherwise lie on top of each other.

#### See also

"Y10M00N00029 Connection" (Page 163)

## 15.1.18.2 "A10 Potential"

#### Database

"@10 > A50 > A20 > B30 > A10 Potential"

Class "Device", subclass "Potential"

#### Overview

A potential is - similar to the wire information - an additional piece of information on an electrical connection.

As opposed to potential rails, potentials do not own any connectors of their own. The information has its origin on a connector (as a rule, on a protective device). It is passed on by means of links and terminals to the relevant connections. You can deactivate this forwarding of information using a parameter in the project options. If you take the current supply input as given, you can then only work with potentials, otherwise you would have to plan both a potential and a potential rail.

#### Connection hooks for potentials

To show the connection hooks at the potentials once they have been placed, use a script to enter the "PotentialHook" option in the report template of the circuit diagram. For example, if you enter a value of "2" for the option, the connection hooks are displayed on the report with a length of 2 mm.

## 15.1.18.3 "A20 Potential bundle - request"

#### Database

"@10 > A50 > A20 > B30 > A20 Potential bundle - request" and "... > A30 Potential bundle" Class "Device", subclass "Potential"

#### Aim

Potential bundles and also the potential rails belong to the group of physical potentials, and are part of the power supply. Potential bundles are used in connection with single line diagrams (SingleLine reports). A potential bundle always has the following structure:

- The potential bundle itself that is used on the single line diagrams. The potential bundle only has one SL connector.
- Underneath the potential bundle there are potential rails as elements that are used on "normal" EE reports.

The single SL connector and the EE connectors recognize each other.

The potential bundles have been prepared for three-phase devices, hence there are three rails below the bundle.

If you drag&drop a potential bundle from the "Base objects" tab to the report, the object is created at the level of the report in the Navigator. The elements of the associated potential are no longer generated with CreateDeviceObject; the existing elements are used instead. Elements that are not potentials are ignored.

If you select all elements of the potential, followed by the "Delete > Object" command in the context menu, the potential bundle is deleted.

## Example

On the single line diagram you can connect a motor with the potential bundle and see only one line. In the background COMOS also automatically connects the three EE connectors of the motor with the three potential rails that have been created as elements of the potential bundle.

#### 15.1.18.4 Preparing and managing potentials

#### Allocating a connector

Connectors can be prepared in such a way that the allocation of a potential already exists when the engineering object is created.

See also section Preallocating connectors with logical potentials (Page 93).

#### Scripts for potential references

The PotName, PotDescription, PotUnit and PotLocation functions are available for potential references. The functions work similar to the DevUnit and DevName functions.

## 15.1.19 Base objects for cables

#### Database

"@10 > A50 > A10 > A40 Cable" Class "Device", subclass "Cable"

#### Aim

EE connections usually have no objects. This means that the connectors of two devices are connected directly with each other. A connection is drawn on the report, but this connection itself has no counterpart in the database. Only the end points of the connection have counterparts in the database.

In some cases it is necessary to define the connections more precisely. Therefore the objects have prepared. Cable systems that can be specified down to the level of the wires are provided.

## Control of the extended capabilities

Cable systems are two-level.

- 1. level: Base objects with the class "Device", subclass "Cable"
- 2. level: Base objects with the class "Element", subclass "Wire" (wire elements and shield elements)

The subclasses "Cable" and "Wire" have the effect that additional tabs are displayed and that RO\_Cable.dll is evaluated.

Wires and shields have the same "Wire" subclass. In principle, shields can thus be described as wires. In other words: "indirect shields" are used in the default libraries that are taken along to shield the cable.

In order to distinguish shields from normal wires, it is necessary to additionally activate the "Shielded display" option on the "System data" tab.

Cables, wires and shields also have special attributes and symbol scripts, especially a description. See chapter Options in the report template (Page 67).

## "Y00A05557 Placing information" attribute

The "Object information" control group exists at the wire and at the shield on the "System data" tab. The control group includes the attribute "Y00A05557 Placing information". The field "Placing information" includes the following information:

Document.Label; Page Nr.; X-Quadrant; Y-Quadrant; X-Coord; Y-Coord

## 15.1.19.1 Attributes for cables and wires

## Requirement

A cable can only be placed correctly on a report once the wires have been created. Select one of the basic cables and create the required wires yourself, for example, "@10 > A50 > A10 > A40 > A10 Cable, unspecified".

## Basic cable, "Technical data" tab (Create cable)

The basic cable initially does not have any wires. To create wires, open the properties of the object in the base project and select the "Technical data" tab. First create a copy of the basic cable in the base data before you generate the wires. In this way the original basic cable thus remains unchanged.

Control element	Description
"Number of wires" field	The total number of wires, including a potential conductor if applicable.
"Number of shields" field	Number of shields.
"With protective conductor" option	The activated option turns one of the created wires into a protective conductor. The label is also changed.
"Separator (cable designa- tion)" field	This separator is used when the "Number of wires" and the "Cross section" are added to the "Cable cross section" details.
"Cable cross section" field	Is transferred into the "Cable cross section" field on the "System" tab, along with the "Number of wires".
"Wire label" list	A number of color libraries have been prepared in branch "ZZZ Other objects". These are displayed in this list. The wires are created according to the library, depending on the "Number of wires". If the number of wires is greater than that of the predefined wires in the library, the remaining wires are created numerically.
"Calculate loss" button	After having completely filled out the "Cable data" control group, you can then click on the "Calculate loss" button in the "Cable calculation" control group. The loss values are then automatically calculated.

The following procedure is independent of whether you are working with a base object or an engineering object.

## "System data" tab

The "System settings" control group contains the following settings:

Control element	Description
"Sheet area" list	Used for automatic placement and in EI&C for automatic connection.
"Data display of" list	Switches the display of the attributes in the properties.
"Unit change" list	Switches the display of the attributes in the properties.
"Standard structure" list	Used in EI&C and switches the standard tables.
"Allow multiple placing" option	When activated, this option allows the object to be placed multiple times.

The "Object settings" control group contains the following settings:

Control element	Description
"Cable type" field	Describes the cable type.
"Cable cross section" field	Set by the system if the [Create cable] option is used for a VDE cable.
"Wire node" field	Evaluated by the system if the [Create cable] option is used for a VDE cable.
"Number of parallel cables" field	Defines the number of parallel cables.

The "Cross sections and conversions" control group contains the following settings:

Control element	Description
"Label left/top" option	-
"Shielded display" option	The cable gets a graphical shield symbol on the report. However, this option has no effect on the shield object

Control element	Description
"Wire label vertical" option	-
"DESINA conform" list	Controls the color of the cables on the report according to the DESINA code.

#### See also

Base objects for cables (Page 136)

## 15.1.19.2 Symbols for cables

The behavior of cables is primarily controlled by the symbol script. This is done, for example, by marking the "M41\_P2 EE Circuit diagram" drawing type and then clicking the "S" button in the "Symbol" group.

#### Note

## Name of the grabs

The grabs must be called "RU" and "LO"; otherwise, the cable objects on the report will not function correctly.

## 15.1.19.3 Complete cable

## Connection information

"@10 > A50 > A20 > B40 > A40 W Connection information"

This object is also offered in the toolbar of a circuit diagram. Place the object next to one or multiple connections and activate the grab points. Then extend the object until it overlaps the desired number of connections.

In the context menu of the "Connection information" object you then have access to the "Settings > Connection information" command.

All details you enter in this dialog are assigned to all overlapped connections.

## 15.1.19.4 Stranding

## Stranding

The stranding is used in the branch "@10 > A50 > A20 > B40 > A30 Stranding".

The stranding object is used instead of a normal cable object.

## 15.1.19.5 Pre-allocating wires to connectors

#### Procedure

- 1. Open the properties of a connector.
- 2. Set the wire base object in the "Wire" field.

#### 15.1.19.6 Base object for bridges

#### **Base object**

"@10 > A50 > A10 > A40 > B90 Bridge, unspecified"

#### Classification

Functional classification: "O4D5 B950"

#### Functionality

The bridge object works like a cable without wires. This is why the pointer "Cable" is set when the bridge object is placed on a connector.

## 15.1.20 "C30 Symbol construction"

#### Database

"@20 > C30 Symbol construction"

Class "Element", subclass: "Graphic"

Objects of this subclass are used solely to hold a graphic. Symbols can be defined in the usual way for the base object and placed on an interactive report. However, no engineering object is created. Thus the symbol can never be inconsistent and hence also will not be displayed in red.

## 15.1.21 Base objects for terminal/plug strips, grounding

#### 15.1.21.1 Base objects for terminal strips, plug strips, grounding

See chapter Preparing terminal strips (Page 97).

## 15.1.22 Device view

15.1.22.1 Symbols

#### Basic symbol (graphical symbol)

All simple devices have one or more symbols on the "Symbols" tab. As a rule, the drawing types "M41\_P5 Design diagram", "M41\_P2 EE Circuit diagram", "DETAIL" and "M41\_P4 EE/ El&C Single line representation" are equipped with symbols.

As long as drawn symbols are involved, they can be adjusted.

Scripts for the drawing types of "M41\_P5 Design diagram" should not be modified. These are no fixed symbols, but instead an automatic display calculation for the 2D design diagrams.

The plan mode symbols initially own a fixed size and are optimized for a particular grid and scale. However, various options can be used so that the symbols can also be used on reports with a different grid and a different scale.

Each symbol has a placing point which is used for the positioning on the grid. The placing point is only seldom at the top left-hand corner, but is created in such a way that the connectors lie on the grid.

## Rule

Please note that the symbols are hierarchically inherited downwards.

## Text symbol

A text symbol is created in the "@10 > A50 > A10 Physical objects" node for some drawing types.

This text symbol is inherited to all base objects underneath it, but it is not evaluated in all base objects. It is only evaluated at the base objects that call the text symbol by means of \*V\* P Textpoint\*.

The "Attributes > Text output" tab is relevant for the output.

You can find additional information on this topic in the "Administration" manual, keyword "Symbol construction".

## Additional symbol / placeholder texts

\*V\*P CD: <Stammobjekt>\*

This function allows additional graphics to be incorporated via the base object structure. The SystemFullName of the base object is used as the parameter, whereby the individual hierarchy levels are separated by periods (full stops). Example: @1EA.A001.

Placeholders can be rotated just like any other type of text so that they are easier to read. Normally a rotation of the text in this way has no effect on the to be placed object, and hence the object always appears in the default direction. If the rotation of the text is to affect the rotation of the object to be placed, the following option must be activated in the project properties:

- 1. Change to the "Automation > EI&C" category, "Settings" control group.
- 2. Activate the "Consider rotation of \*V\* variables" option.

#### See also

Device symbols (Page 135)

## 15.1.22.2 Connectors and auxiliary connectors

In COMOS, each connector can only have one counterpart connector.

#### See also

Auxiliary connectors / array connectors (Page 96)

#### 15.1.22.3 Attributes and calculated attributes

Each device is provided with its own special attributes on the "Attributes" tab. The attributes are inherited hierarchically and are supplemented or modified by additional ones at each level, if required.

The catalog is available for this purpose:

"@40 > A10 @Y Attribute catalog".

The attributes simply have to be called for EE devices.

## 15.1.22.4 Request properties

The base data is prepared to the extent that the "Request and implementation" technology can be used.

To this end, the "Request" option is activated on the "System settings" tab in the properties of primary objects.

For secondary objects, the manufacturer devices are incorporated and the "Request" option is deactivated in the relevant properties.

## 15.1.22.5 Product data

The base data is prepared to the extent that the "Product data and manufacturer device" technology can be used.

For this, the attributes on the "Technical data" attribute tab and the "Manufacturer" attribute on the "Order data" tab are declared as relevant to product data.

You can find more information on this topic in the "EI&C Operation" manual, keyword "Using product data and manufacturer devices".

## 15.1.22.6 Device labeling

For each project you can - via the project properties - define which device labeling is supposed to be used.

# 15.2 Storing manufacturer devices (catalog objects)

## Base data structure

See section Preparing product data and manufacturer devices (Page 101).

# 15.3 Reference: Standard tables

## 15.3.1 System of standard tables

The standard tables for the "EI&C" area are located under the following standard table node: "Y10 > M41 EI&C"

## See also

Standard tables from the "M41 EI&C" node (Page 159)

## 15.3.2 Editing symbols in standard tables

## Procedure

- 1. Open the properties of the standard table.
- To switch to the required drawing type, right-click in the column header of the "Drawing type" column and select the "Select drawing type > <desired drawing type>" command in the context menu. The symbols are shown in the table.
- 3. Then double-click on the required symbol in the "Drawing type" column. The symbol opens in the Symbol Editor.
- 4. Make the required adjustments.
- 5. Save your changes.

## 15.3.3 "Y00N00005 Cabinet type"

#### Occurrence

Base project, "@40 > Y00 > A10 > A10 > Y00N00005 Cabinet type"

#### Purpose

The standard table is used for mounting control in control cabinets.

## Structure

Name	Unique string
Description	Any. This is the visible text in the "Cabinet type" table.
Value 1	The cabinet type
Value 2	Contains data for export to Triathlon:
	• MP = mounting plate
	• MS = mounting rail
	• BT = component
	• KK = cable conduit

Value = 1: Cabinet frame, is excluded from all controls and checks. Value = 1 must be set for the cabinet frame.

Value > 20 and not placed on the plate/rail, etc.: Message: Floats freely in space.

Call of the list: "Installation/3D data" tab, "Y00A00228 Cabinet type" attribute.

#### Comparison with the "Mounting key" tab

"Y00T00107 Mounting key" tab: The entries from the above standard table are listed once again on this tab. The mounting key is calculated from the activated check boxes. It is made up of the values entered in "Value 1" of the "Cabinet type" standard table

During mounting a check is carried out whether cabinet type set in the "Cabinet type" tab of the "Assembly / 3D data" tab belongs to the types allowed on the "Mounting key" tab.

- "Mounting key" tab does not exist: All cabinet types are allowed.
- "Mounting key" tab exists, but no entry was checked (the collective string of the permitted cabinet types is blank): All cabinet types are allowed.
- "Mounting key" tab exists and at least one entry has been activated: Only those cabinet types that have been input here and activated are permitted.

The user receives a message if an attempt is made to install a prohibited cabinet type.

## See also

"Mounting key" tab (Page 118)

## 15.3.4 "Y10M00N00004 RGB colors"

## Area of application

This table contains colors which are used in the "BridgeType" table.

## Node

"Standard tables > Y10 > M00 > A10 > Y10M00N00004 RGB colors"

(Old: RGB\_COLOUR)

Column	Description
"Name"	Unique string
	The names in the database are formed according to the international standard for the color coding of wires:
	For example, this name is called in the "Value 2" column of @BridgeType.
"Description"	The visible text.
"Value 1"	Unique value. COMOS identifies the entries with this value. The values correspond to the AutoCAD scheme.
"Value 2 - Value 4"	RGB values.

## See also

"Y10M41N00001 Bridge types" (Page 159)

## 15.3.5 Standard tables for contact point types

## Occurrence

Base project "Y10 > M00 > A10 > Y10M00N00006 Contact point types": You can find the standard tables for the contact point types under this node.

## Purpose/Usage

In the properties of a connector, "Subtype" field.

It is permissible to connect a connector with subtype to a connector without subtype.

It is not permissible to connect connectors with different subtypes. A connection is prevented in the Navigator. In the report the according connections are marked as inconsistent.

#### See also

Templates for line types (Page 71)

## 15.3.6 "Y10M00N00027 Sheet area"

#### Occurrence

Base project "Y10 > M00 > A20 > Y10M00N00027 Sheet area"

#### Purpose

This standard table is used to define sheet areas.

Sheet areas are used to place engineering objects in the report via the "Options > Place automatically" command from the context menu.

## 15.3.7 "Y10M00N00031 Assembly updater property assignment"

#### Area of application

This list includes attributes that are matched in the "Assembly updater" plugin in "General" mode and are updated, if necessary.

#### Node

"Standard tables > Y10 > M00 > A20 > Y10M00N00031 Assembly updater property assignment"

## User-defined attributes for the matching

- Name (abbreviation: @N)
- Label (abbreviation: @L)
- Description (abbreviation: @D)
- CDevice (abbreviation: @C)
- MappingTableXML (abbreviation: @M)
- BackpointerSpecificationsWithLinkObjectAndName (abbreviation: @BS). Example "@BS:Y00T00093.Y00A00159"
- All attributes (if LinkObjects exist, they are taken; otherwise Values). Example "Y00T00093.Y00A00159"

The abbreviations refer to the VSUI Notation.

Reference: Base data

15.3 Reference: Standard tables

## Attributes that are always matched

- Connector (ConnectedWith, Connector Attribute)
- Backpointer
- DocObjs
- Owner
- Unit
- Location
- Implementation

## Structure

Column	Description
"Name"	You enter a name according to the following scheme in this column: A+ 3 numbers incremented in steps of 10. For example: "A010"
	Default: "A010"
"Description"	Enter the description of the object whose attributes are eval- uated in this column. For example: "Action"
	Default: "Default"
"Value 1"	Enter the hierarchical or functional classification of the base object in this column. User classifications are permitted. For example: "C1: M00.A010.A040"
	Defaults: "Default"
"Value 2"	Enter the attributes of the object that are to be matched. For example: "@N;@L;@D;Y00T00001.Y00A03136"
	Default: "@N;@L;@D;Y00T00093.Y00A02222;Y00T00093.Y00A02 224;SIE0006.SIE0060;SIE0006.COM0002;Y00T00025.Y00 A00253;BMK.BMK32_FUE;BMK.BMK32_DET"

The "Assembly updater" plugin first checks whether a classification has been stored for the object in the standard table. If the plugin does not find a classification, it uses the default definition.

## Example

An example of a filled standard table is available here: Standard tables > Y10 > M00 > A20 > Y10M00N00032 Assembly updater property assignment PCS 7". When you are using the "Assembly updater" plugin in "PCS 7" mode, this standard table is evaluated.

## 15.3.8 Standard tables from the "M41 EI&C" node

## 15.3.8.1 "Y10M41N00007 Type information for wires"

#### Occurrence

Base project "Y10 > M41 > A10 > Y10M41N00007 Type information for wires"

## Purpose/Usage

Anywhere the "Type info" list is offered for connectors or connections. Examples:

- Properties of engineering objects, "Connectors" tab, "Type info" context menu.
- Report, context menu of a connection: "Settings > Type info".
- Report, context menu of a connection: "Settings > Connection information".

## 15.3.8.2 "Y10M41N00001 Bridge types"

#### Occurrence

Base project, standard table "Y10 > M41 > A10 > Y10M41N00001 Bridge types".

## Purpose/Usage

In the properties of a terminal strip, "Strip" tab, "Bridge/Connection" context menu. In the report, context menu of a connection when the connection points to a bridge.

## Bridges by means of own terminal types ED and EC

Bridge management has been enhanced with separate bridge connectors: ED = Bridge external and EC= Bridge internal. The terminal connectors, ED and EC, are considered as follows:

- Properties of a connector: subtype "Bridge"
   Cable index: uses the standard table: "Y10M41N00001 Bridge types"
- Terminal strip engineering objects: On the "Strip" tab
- In the queries for the connection list of the terminal strip engineering object
- In AutoLoopTerminals
   The new BE and BI connectors are addressed in queries by means of an extension interface: "Options > Column editing > Extended ProgID":
   "ComosExtendedObjects.TermStripIExtended".

## Structure of the standard table

Column	Description
"Name"	This column displays a consecutive number.
"Description"	This column displays the description of the bridge type.
"Value 1"	This column displays the cable index.
"Value 2"	This column displays the color in which the bridge is shown on the "Strip" tab:
	BU: blue
	BK: black
	RD: red
	BN: brown
	GN: green
"Value 3"	This column displays the names of the icon sets.
	• T1 to T7
"Value 4"	This column displays the line width in mm.
"Value 5"	This column displays the values for the line type.
"Value 6"	This column displays the type of the bridge connector:
	I: Ridge bridge (default setting)
	BE: external bridge
	Bl: Internal bridge

You can find more information on this topic in the "EI&C Operation" manual, keyword "Editing bridges in the tab".

## See also

"Y10M00N00004 RGB colors" (Page 156)

## 15.3.8.3 "Y10M41N00003 Contact surface"

Base project, standard table "Y10 > M41 > A10 > Y10M41N00003 Contact surface"

## Purpose/Usage

If an object has the "Coil/Relay" subclass, COMOS checks the name of the object against this list. The object on the report only gets a contact surface if the name is also found in this standard table.

## 15.3.8.4 "Y10M41N00004 Wire colors"

## Occurrence

Base project Y10 > M41 > A10 > Y10M41N00004 Wire colors"

## Purpose/Usage

Anywhere the "Color" list is offered for connectors or connections. Examples:

- Properties of engineering objects, "Connectors" tab, "Color" context menu.
- Report, context menu of a connection: "Settings > Color".
- Report, context menu of a connection: "Settings > Connection information".

#### See also

Standard tables for user-defined connections (Page 71)

15.3.8.5 "Y10M41N00005 Wire cross sections"

#### Occurrence

"Y10 > M41 > A10 > Y10M41N00005 Wire cross sections"

## Purpose/Usage

Anywhere the "Cross section" list is offered for connectors or connections. Examples:

- Properties of engineering objects, "Connectors" tab, "Cross section" context menu.
- Report, context menu of a connection: "Settings > Cross section".
- Report, context menu of a connection: "Settings > Connection information".

#### See also

Standard tables for user-defined connections (Page 71)

15.3.8.6 "Y10M41N00006 Wire end handling"

#### Occurrence

Base project, "Y10 > M41 > A10 > Y10M41N00006 Wire end handling"

#### See also

Standard tables for user-defined connections (Page 71)

## 15.3.8.7 "Y10M41N0000<Number> Text selection <Diagram type>"

#### Occurrence

Base project:

- "Y10 > M41 > A10 > Y10M41N00008 Text selection for detail symbols"
- "Y10 > M41 > A10 > Y10M41N00009 Text selection for single line"

#### Purpose

The text functions input here are made available in the Symbol Designer when you create a text and fold out the "Text functions" branch within the text properties.

The relevant description is offered according to which drawing type the symbol was created for.

## 15.3.8.8 "Y10M41N00002 Bridge symbols"

#### Occurrence

Base project, "Y10 > M41 > A10 > Y10M41N00002 Bridge symbols"

#### Purpose

Contains the graphical symbols that belong to the "Symbolic display" option of graphical terminal diagrams. This option only functions if the graphical terminal diagram is used in the "GRPLAN" drawing type:

- On: The symbols defined on the "Symbols" tab are displayed on the graphical terminal diagram.
- Off: The objects are displayed in the form of simple rectangles that are provided by COMOS in this drawing type.

## 15.3.8.9 "Y10M41N00012 Text identifiers"

#### Occurrence

Base project, "Y10 > M41 > A10 > Y10M41N00012 Text identifiers"

## Purpose

Contains the header classes that can be used in EE to set up symbols. A header class identifies a text. Thus this text can be shown or hidden in a targeted way. Ultimately the same can be done with the header class as with a layer. Layers and header classes can be mixed.

## Example: Header.Class = "eBTL"

eBTL = Output device label left

## 15.3.8.10 "Y10M00N00029 Connection"

#### Occurrence

Base object, "Standard tables > Y10 > M00 > A20 > Y10M00N00029 Connection"

## Purpose/Usage

This node contains the symbols for EE connections. If a connection is drawn in ET that has a reference at the end, this standard table controls what information appears there and how this information is formatted.

The symbols created in the standard table are displayed at the connection interruption.

#### See also

"A10 Potential" (Page 146)

# 15.4 Queries

## 15.4.1 Base objects of the queries

## Introduction

The base objects of the queries are collected at the following location: "@20 > A70 Queries" The queries for the El&C module are located here:

- "@20 > A70 > Y10 > M41 EI&C"
- "@20 > A70 > Y20 > M41 EI&C"

## "Terminal strip editing"

Purpose: The query "Terminal strip editing" is offered in the context menu of terminal strips and plug strips.

Base object: "@20 > A70 > Y10 > M41 > Y00R00027 Terminal strip editing"

## "Wire list"

Purpose: The query "Wire list" is offered in the context menu of cables and lines.

Reference: Base data

15.4 Queries

Base object: "@20 > A70 > Y10 > M41 > Y00R00028 Wire list"