Virtual Product

Release 15.5.0.12

CONTACT Software

Sep 04, 2018

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CHAPTER 1

Introduction

CONTACT Virtual Product provides a comprehensive model of the growing virtual product as support for work in progress. Its carefully harmonized components include products and product portfolios, variability models and product variants, components and their logistical variants in the form of articles or materials, product structures and BOMs, as well as configuration management for the control of product changes.

CHAPTER 2

Products

CONTACT Virtual Product helps you make all information for a product accessible via the system. During this process, the relationships between the subparts of a product are established in a hierarchical structure. To do so, a part master data record is generated for each component of a part. The components are set in relation to one another such that they reflect the product structure. Thus the relationships between the product components (subparts or assemblies) form the product structure, which can be visualized accordingly.

Note: A user must be assigned to the role *Product: Manager* to be able to edit and manage products.

Note: Reusable product modules with their own virtual model are also entered in the system as products.

The dialogs for creating or changing a product enable you to define the essential master data for a product. For details on this, refer to the chapter *Master data* (page 2).

2.1 Menu Access

The products can be accessed in the navigation menu under *Products* → *Products*. Here you can search for products, enter new products or modify existing products. Different views can also be implemented on the product using the flexible relationship configuration. These views can be used for generating special BOMs or a part usage reference.

Additional access points provide you with the different relationship contexts for a product. For example, you can find all products assigned to a project or part in the corresponding *Product* tab of the data sheet of such a context object. In a context such as this, you can also enter new products, which automatically assigns them to the context object. For a complete overview of which technical objects a product can be correlated with, see the *Relationships* (page 4) chapter.

2.2 Master data

The standard versions of products are described by the attributes listed here. You can find the attributes on the product data sheet and in the tabular list of its reference objects, e.g. Projects, Documents, Defects and Actions. You can find a complete list of the technical objects related to a product in the *Relationships* (page 4) chapter.

The master data critical for editing the product characteristics is described here.

Note: Consider that many of the statements below regarding *New* and *Search* can differ from one another.

Name Here you enter the product description. The value entered here is the value displayed in a search for products or used for linking to other objects. This is a mandatory field

Marketing Name Here you can enter the description of the product used for marketing purposes. This value is optional.

Maturity Level Here you select the current maturity level of the product from a list of options. In standard versions, the maturity levels "Idea" or "Prototype" are available as selections, for example.

Responsible Here you select the parties responsible for the product from a table. Typically, the company's employee list is made available here.

Template When creating a product, you can decide whether you wish to use its resulting product structure as the template for future products. If so, click the checkmark next to *Template*.

ERP code The ERP code is required for exchanging product models with an ERP system. Typically, the product receives the product key in the ERP system. The system enters it here during importing.

Status Upon being created, the product receives the *Draft* status from the system. You can change the status of the product via the *Change Status* standard operation. You can find the overview of all possible statuses in the *Status Network* (page 3) chapter.

Created by Name of the user who created the product. The attribute is automatically entered by the system and can be found in the data sheet on the *Change log* tab.

Created on Date and time when the product was created. The attribute is automatically entered by the system and can be found in the data sheet on the *Change log* tab.

Last changed by Name of the user who last changed the product. The attribute is automatically entered by the system and can be found in the data sheet on the *Change log* tab.

Last changed at Date and time when the product was last changed. The attribute is automatically entered by the system and can be found in the data sheet on the *Change log* tab.

2.3 Status Network

A product can have different statuses. The status of a product provides information about which processing status the product is currently in. Moreover, for each status, you can specify which subsequent status can be selected. The status network of a product provides for the following statuses:

Draft If a new product is created, the system assigns it the status *Draft*. Only products in the *Draft* status are allowed to be changed. The product status is also assessed by other elements of the virtual product model. This means, for example, that the objects of variant management can be edited only as long as the product has the *Draft* status.

Review The product is checked to see whether it has been entered completely (then it receives the status *Released*) or whether any details are missing (then it is reset to the status *Draft*).

Released A product with the status *Released* is complete.

Blocked The status of a product can be set to *Blocked* for multiple reasons. One reason can be that the further development of the product has been discontinued.

2.3.1 Status transitions

The graphic below shows all the statuses defined in the system as well as each of the status transitions specified by the system.

2.4 Operations

The operations described here can be carried out on the basis of the product context. Right-click on the name of the product to reach the operations via the pop-up menu.

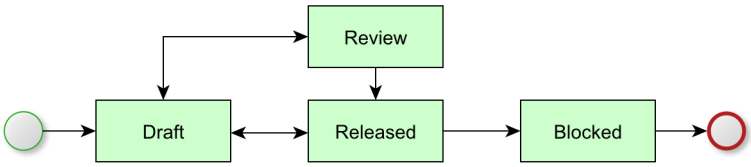


Fig. 2.1: Status network of a product

2.4.1 KPI Cockpit

This operation opens the KPI Cockpit for the product (see *CONTACT Metrics* application manual)

2.4.2 Product Overview

This operation opens a structure tree for the product.

2.4.3 Variant Editor

This operation opens the Variant Editor for the product (see also Chapter *Variant Editor* (page 61))

2.4.4 Create from Template

You can select a template to create a new product. To do so, use the *Create from template* pop-up menu operation. This way not only the product master data from the template is taken over, but also all defined elements of the virtual product model in the template, for example, the objects of variant management or the request catalog.

2.4.5 Import Image

A representative image can be assigned to a product. This is done with the *Import image* pop-up menu operation. The assigned image is displayed, for example, in the Variant Editor or Portfolio Navigator.

2.4.6 Copy

If a product is copied, the entire product model is copied along with it. Therefore, the requirements and the variant model of the copied product, among other specifications, are available in the new product. The product copy can be considered an ad hoc template of sorts. In contrast to the *Create from template* operation, a product is duplicate for a one-time procedure when copying a product.

2.5 Relationships

Person Only one person can be assigned to each product as the responsible party for that product. This assignment is made in the product's master data sheet via the list of options in the "Responsible" field.

Note: Alternatively, a role can also be entered as responsible party for a product.

Errors Defects arising in connection to a product can be assigned to that product. A defect to a product is assigned to a product in the defect's master data sheet via the list of options in the "Product" field (see *CONTACT Quality Issues* application manual)

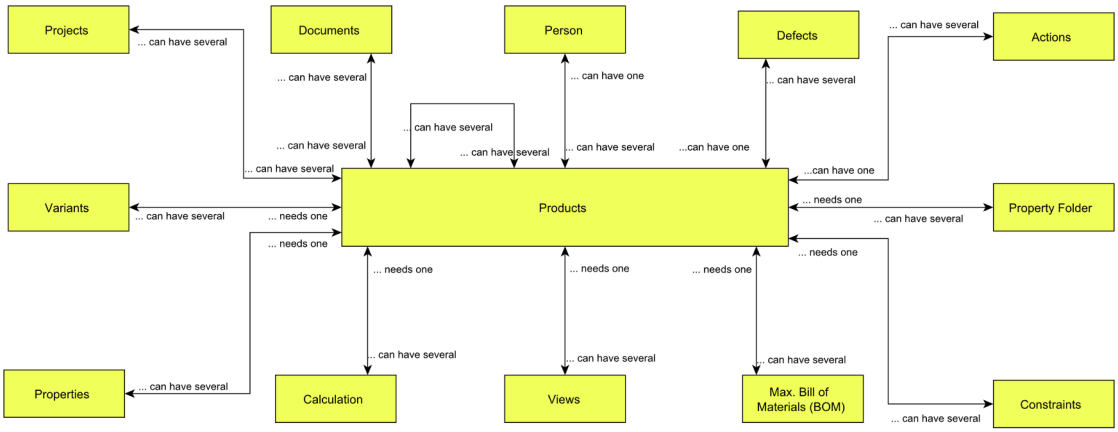


Fig. 2.2: Relationships of a product

Actions Actions necessary to correct the defect or improve the product, for example, can be assigned to a product. An action is assigned to a product in the action's master data sheet via the list of options in the *Product* field (see *CONTACT Actions* application manual)

Documents Documents can be assigned to a product, to record the product and its properties or to record the product development process (see *CONTACT Documents* application manual). A document can be assigned to a product using Drag&Drop onto the *Documents* tab of the product's master data sheet.

Product modules A product can be constructed in a modular fashion, on the basis of other products (modules). In this case, several different products are assigned to one product as modules. A product is assigned to another, higher-level product as a module using Drag&Drop onto the *Modules* tab of the parent product.

Projects A product can be assigned to one or more projects when the product is newly developed or redesigned, for example. Furthermore, multiple products can also be assigned to a project when they are developed within the framework of that project (see *Project management* application manual). Assignments between the product and projects are usually carried out using Drag&Drop on the one object to the corresponding relationship tab in the data sheet of the other object.

Calculations Multiple cost, price or profitability calculations for a product can be processed (see *CONTACT Product Costing* application manual). A new calculation for a product is processed in the *Calculations* relationship tab on the product data sheet via the *New* or *New from template* operation.

Views Various views can be defined for a product via the *Variant management* (page 53) (see *Working with views* (page 59)). These make it possible to describe product variants from different viewpoints, i.e. using different properties.

MAX BOMs *Variant management* (page 53) can be used to assign parts to a product; the BOMs for these parts represent what are known as maximum BOMs for the product. These are BOMs that contain all possible options and alternatives. Maximum BOMs form the basis for instantiating variant parts.

Constraints *Variant management* (page 53) can be used to assign product constraints. Valid, rule-based product variants are defined based on constraints.

Property folders *Variant management* (page 53) can be used to assign property folders. Property folders can be used to arrange features assigned to a product by any desired criteria.

Properties *Variant management* (page 53) can be used to define product properties. Product Variants are described based on properties.

Variants *Variant management* (page 53) is used to generate the valid and allowed variants of the product using views, properties and constraints.

2.6 PowerReports

The standard version of the *CONTACT Virtual Product* application does not contain PowerReports.

2.7 KPIs

Products are preconfigured for the use of KPIs. Some examples of product KPIs are available in the standard versions (see *CONTACT Product Costing* application manual).

CHAPTER 3

Part

3.1 Introduction

You can maintain parts, their master data and assigned aspects such as supplier of the part using the part master. A part refers to a component (subpart) or an assembly. This corresponds to a part or material in a PPS or ERP system.

Each part is managed as a standalone object with a unique number in the system and described by certain master data (attributes such as number, material, description, etc.).

Any number of documents can be assigned to a part. Whereas previously, this was usually only a drawing, now, other documents are added like 3D models, specifications, inspection reports, operating manuals, etc. Its assigned documents, for which the management is described in the *CONTACT Documents* application manual, are to be distinguished from a part. In conjunction with other modules, various other objects can be assigned to a part and used, such as characteristics, BOM items, checklists, open issues, etc.

The part master is a component of *CONTACT Virtual Product*. This module provides functionality that can be configured to an extent, including the following:

- Automatic number generation
- Assignment and management of selected master data (metadata)
- Consistent data during input using catalog support and using test routines as needed
- Flexible searching using part master data
- Management of individual change states
- Checking access rights of the specified objects when creating, indexing and deleting.

3.2 Menu Access

You can access part management via the navigation tree. This requires selecting the *Products* → *Parts* menu item.

You can use this menu item to create a part or to search for existing parts; you can gather information or edit individual parts.

Creating a new part data record

1. This requires selecting the pop-up menu item *New...* in the menu tree under *Products* → *Parts*.
2. The dialog for entering the part data opens.

Searching a part data record

1. This requires selecting the pop-up menu item *Search...* in the menu tree under *Products* → *Parts*.
2. Enter the search conditions for the data record to be edited. The results of the search are displayed in the result list.
3. You can now apply the operations from the pop-up menu to one or more hits from the result list, see *Pop-up menu of the part* (page 9).

Other operations from this pop-up menu

- *Sorting*: Sorting standard operation.
- *Object Plan*: Part creation or searching using a multi-media based classification plan, see *Class List of Characteristics Configuration* (page 38).

3.3 Master data

Parts are described by the attributes summarized in the part data sheet.

The default configuration uses the following part attributes:

Part No. / Index The part no. and the corresponding index uniquely identify the part. The number and index are issued automatically when creating a new part. The part number cannot be changed for an existing entry.

Material No. (ERP) The material No. (ERP) uniquely identifies a part across indices in the ERP system. In the standard package, the part number is set as soon as it is created. Although, the assignment of the material number (ERP) can be adapted easily in a customer-specific manner. The assignment often occurs automatically, for example, from a ERP number range in the course of committing the article to the ERP system. For more details on the material no. (ERP), see *Production BOM* (page 29).

Name A name briefly describes the part in a content-related manner. A catalog is used to make the assignment. The name also populates the *Category* and *Quantity Unit* attribute if they are entered in the name browser.

Additional Name An additional name that describes the part in more detail beyond the name. It is entered as free text.

Category The category of the part (*Assembly*, *Component*, *Semi-finished Part*, etc). Also determines which workflow is used for the part. This is selected using a list of options or is already preset by selecting the name.

Division The division responsible for the part, such as a department. It is selected from the list of options. This field is preset automatically with the department of the user.

Project No. The project no. of the assigned project. This is selected using a list of options.

Condition The condition of the part (*Active*, *Phased Out* or *Replacement Part*). This is selected using a list of options.

Status Name of the status (*Draft*, *Released*, etc.) in which the part is located. This attribute is influenced by the *Change status* operation.

Maturity Level The maturity level of the part. It can be used to configure EC *Assignment rules* (s.a. User manual for *CONTACT Engineering Changes*).

Replacem. for / Replaced by In the *Replacem. for* field, a part is selected from a list of options that is to replace the existing part.

If the present part itself has been replaced by another, the new part is automatically displayed in the *Replaced by* field.

Quantity Unit The quantity unit of the part. This is selected using a list of options or is already preset by selecting the *Name*.

Weight (kg) Weight specification of the part in kilograms. A period is used as a decimal separator.

Material Material name of the part. The materials are selected from a list of options.

Surface Part surface. The surface is selected from a list of options.

Standards Standards relevant to the part. The standards are entered as free text.

Techn. data Additional technical data (dimensions, etc.) for the part. The technical data is entered as free text.

Remarks Remarks about the part. The remarks are entered as free text.

Manufacturing View Defines whether the part displays a manufacturing view and, therefore, has a manufacturing BOM instead of a development BOM. For more details on manufacturing views, see *Production BOM* (page 29).

Engineering View Defines the associated engineering view for a manufacturing view. For more details on the engineering view, see *Production BOM* (page 29).

Manufactured on site Defines for which site a manufacturing view is defined. For more details about this, see *Production BOM* (page 29).

3.4 Operations and relationships

3.4.1 Pop-up menu of the part

Once you have received a result list from a search, you can edit the parts in the result list via their pop-up menu. Select a part data record in the result list and open the corresponding pop-up menu by right-clicking.

The pop-up menu contains both general operations (explained in the *CONTACT Elements Client Reference*) and special part operations and commands for calling up the relationships of parts to other objects.

Pop-up menu items

Dependency Graph Visually depicts reference information between parts, see application manual for the *CONTACT Requirements*.

Create Index Create a new index for the part, see *Generating an index* (page 10).

Product Structure Graphic depiction of the product structure, see *Product Structure* (page 26).

Usage Structure Graphic depiction of the usage structure, see *Usage Structure* (page 11).

Structure Comparison Displays a comparison of BOMs between two selected parts.

Object Plan Part creation or searching using a multi-media based object plan, see *Class List of Characteristics Configuration* (page 38).

Variant Management References and operations from the variant management. They are only related to parts that are versions of a maximum BOM.

- ***Filtered BOM*** Shows the maximum BOM, filtered based on the corresponding variants. For more details, refer to *Instantiating parts* (page 66) and *Filtering Maximum BOMs* (page 65).
- ***MAX BOMs*** Reference to the maximum BOM.
- ***Product*** Reference to the product object to which the variant model belongs.

mBOM Manager For more details about *mBOM Manager*, see *Production BOM* (page 29).

Create manufacturing view Creating a new manufacturing view for an existing part. For more details about *Create manufacturing view*, see *Production BOM* (page 29).

Apply manufacturing view Apply one of the manufacturing views of a previous index for a new part index. For more details on *Apply manufacturing view*, see *Production BOM* (page 29).

Relationships Calls up other relationships of the part for the following objects:

Create checklist from template Create a checklist from a template for the part, see *CONTACT Projects* application manual.

Checklists Display checklists for the part, see *CONTACT Projects* application manual.

Status Protocol All of the status changes to date for the part are documented in the status protocol and showed in a separate dialog in the form of a list.

Batch Operation new ... Create a new batch operation for this part.

Project Pop-up menu for the project assigned to the part. If a project is assigned to the part, you can run operations on the project, see *CONTACT Projects* application manual.

Engineering Change Reference to the engineering change to the part, if set. Also refer to the *CONTACT Projects* application manual.

Documents Displays the documents assigned to the part, refer to *CONTACT Documents* application manual.

Change Notification Reference to the change notification relating to the engineering change to the part. Also refer to *CONTACT Engineering Changes* application manual.

Exceptional Authorizations

General Exceptions Display general exceptions.

Project-specific exceptions Display project-specific exceptions.

3.4.2 Generating an index

No more changes can be made in a part's released state (index). Changes have to be made in a new part version with a separate index value.

How to generate a new index for a part

1. Highlight the part for which you would like to generate a new index in the parts result list and open the pop-up menu.
2. Select the *Generate index* pop-up menu item or click on the corresponding button on the toolbar ( ).

   Note: You can only generate a new index if this has been scheduled for the current status of the previous version in the workflow. In addition, you must be assigned a role that has the rights to generate an index.

3. The index dialog is opened.

   #### Fields of the index dialog

   Part No. The part number of the selected part.

   Part Index The index of the selected part.

   New Index The new, now automatically generated index.

4. The system automatically generates and presets the new index number. Confirm by clicking *OK*.
5. The new index is generated. The attributes and the class list of characteristics and BOM information of the previous part index are taken over automatically. The status is automatically reset for the new index (e.g. from *Released* to *Draft*).

3.4.3 BOM Reports

Usage reference

If a part is to be changed or replaced in the PDM system or if a quality problem with a part is reported, the PDM system must ensure a very quick search of which assemblies this part is used in. The *Usage reference* report allows a very quick and convenient search of part usages throughout the entire usage structure by using high-performance database technologies.

The *Usage reference* also gives you the ability specify exactly which usage levels the report is to resolve and display. Thus, the report can be called up either using the "Only the top level" setting or by specifying exactly the maximum usage level to display.

Multi-level BOM

The multi-level BOM Report shows the structure of assemblies. The maximum depth in which the structure is to be resolved and displayed can be specified here. The *Reports* operation is available in the pop-up menu for generating BOM reports.

BOM Comparison

The *BOM Comparison* report makes it possible to compare two assemblies, where the comparison depth can be specified. The difference is determined based on the quantity BOMs of the two assemblies being compared. As such, for each part that occurs in one of the two quantity BOMs, it is determined whether it has the same amount in both assemblies. The "Difference" column in the report displays the value "none" for each part if the amount of the part is the same in both assemblies, the value "amount" if the amounts differ, and the value "occurrence" if the part is installed in only one of the two assemblies.

How to display a BOM report:

1. (a) If you would like to run the *Usage List* or *multi-level BOM* reports, select a part in the result list.

   (b) If you would like to run the *BOM comparison* report, select two parts in the result list.
2. By right-clicking, open the part management pop-up menu and select the *Reports* menu item.
3. Select one of the reports from the list of options.
4. In the dialog that is now open, you can also determine the structure depth of the reports being exported. Confirm again by clicking *OK*.
5. The BOM report in question is then displayed in Excel.

3.4.4 Usage Structure

You can have the system display the assemblies in which a certain part is used. This is displayed in the *Usage reference* (page 11) report.

Structural View

The graphic usage list is accessed from the part master management using the *Usage Structure* part's pop-up menu item. From the (CAD) document management, you can reach this menu via the *Assigned Part* pop-up menu item.

A multi-level graphic usage list is available upon selecting the *Usage Structure* command from the part master pop-up menu. A similar functionality can also be reached from *Product Structure* (page 26).

3.4.5 Batch Operations

With the operation *Batch operation new ...* you can run an operation on many parts in one step, without blocking the client (i.e. in batch mode).

The following batch operations are configured in the standard:

- *Status Change*

To start a batch operation proceed as follows:

1. Choose one or more parts in a result list.
2. Click in the pop-up menu on the operation *Batch operation new ...*.
3. Choose an operation in the following mask.
4. If your operation requires additional parameters (e.g. the target state, for the operation *Status Change*), you can enter them in the following mask.
5. The batch operation will be opened in a new tab. Here you can add additional parts to the operation.
6. In the data sheet, press the button *Execute*, to start the operation.
7. The operation will run in background. In the tab *Parts* you can see the state of the operation for each part.

CHAPTER 4

CAD documents

4.1 Introduction

You can maintain document files and master data of drawings and CAD models using CAD document management. This is based on operations and dialogs, which are also available in the document management area.

CAD documents form a special category of documents. This chapter addresses substantial features, insofar as they can also be used without being integrated into the respective CAD systems. Please refer to the documentation of the respective CAD integration for any features other than these.

CAD document management provides additional functionality, which can be configured to an extent, including the following, which extends beyond the document management functionality:

- Easy creation of a new part in the dialog context of the creation of a new CAD document
- Search for documents based on the master data of the part assigned to the document
- Maintenance of Change Notifications
- In combination with CAD integration, automatic filling out of title blocks based on the document master data
- Management of document references (assembly / components, model / drawing etc.)
- Marking of documents for later loading into your CAD system

4.2 Menu Access

You can access CAD document management via the menu tree. This requires selecting the *Products* → *CAD documents* menu item.

You can use this menu item to create a CAD document or search for existing CAD documents in order to gather information or edit the master data of individual CAD documents:

Note: You can create a new CAD document without CAD integration, for example, by defining a document data record for a drawing that exists only on paper or for which the system has no original CAD format, but only an archive format, such as `TIFF` or `PDF`.

Creating a new CAD document

- 1. This requires selecting the pop-up menu item *New ...* in the menu tree under *Products* → *CAD documents*.

2. The dialog for entering the document data opens.

This operation is used to create a CAD document data record without CAD integration. Then there is still no file assigned to this CAD document data record. The CAD document data record uses the `PAPIER` application label at first.

You can assign a file to this CAD document data record later on as needed using the *Import* operation (see *Import* (page 16)).

Searching for a CAD document data record

- 1. This requires selecting the pop-up menu item *Search ...* in the menu tree under *Products → CAD documents*.
  2. Enter the search conditions for the data record to be edited. The results of the search are displayed in the result list; see *CONTACT Elements Client Reference*.
  3. You can now apply the operations from the pop-up menu to one or more hits from the result list; see *Pop-up menu of the CAD document* (page 16).

The description of the *Sorting* standard operation is in the *CONTACT Elements Client Reference*.

Tip: The pop-up menu items described in this chapter and their operations as well as the categories of the CAD documents can also be accessed via the *Products → CAD documents* menu item.

4.3 Master Data

CAD documents are described in the system by the attributes summarized in the CAD document data sheet.

The document data sheet for CAD documents is divided into two areas: *Description* and *Assignment*.

The default configuration from the system uses the same document attributes as in (general) document management. The following attributes are also added:

4.3.1 *Description* area

Note: Only the master data deviating from the creation or revision of a standard document is described here. For the description of master data for a standard document, refer to the *CONTACT Documents* application manual.

Title You can enter the title of the CAD document here. The title of a CAD document is optional, unlike for a standard document.

Main Category / Category Click the symbol for a list of options next to the *Main category* field. This opens a list of options with a sublevel. If you select a category from the second level, the system enters the first level as Main category and the second level as Category. The values for these two fields can be freely selected. For CAD documents, however, it is advisable always to select a fixed value here, specifically *Product/Part* as the Main category and *CAD Drawing* as the Category (if it is a 2D document) or *CAD Model* (if it is a 3D document). The *Main category* and *Category* fields are mandatory fields.

Note: If a CAD document is assigned to the :guilabel‘*drawing‘ category (production drawing, quotation drawing, etc.), there is another *Drawing* tab available for adding typical drawing information. The default configuration of the system provides the following attributes for this:

Frame Format Format of the drawing. This is usually set automatically by the system’s CAD integration.

Frame Group Name of the group from which the frame and title block come (corporate standard, standard customer xyz, etc.). This is usually set automatically by the system's CAD integration.

Sheet No. / Sheets Information in the case of multi-sheet drawings. Sheet no. and no. of sheets are usually determined automatically by the system. The number range is determined by the part and the CAD application. These attributes may be filled with particular values in conjunction with certain types of system CAD integration.

Scale The scale of the drawing

Created by / on The person who created the first version of the drawing. The date of creation is also recorded. This information remains unchanged across all drawing versions.

Released by / on Person who has inspected and released the drawing as part of the drawing workflow. The release date is also recorded.

In addition, another *Source information* tab is available for retaining certain information about documents that were only available externally before, but have now been uploaded into the system.

4.3.2 *Assignment* area

In this area, you have to select a part that is assigned to the CAD document

Part No. For CAD documents, a relationship to a part has to be specified. If this part already exists, select it from the list of options, or enter the complete number or a search criterion for the number and press the catalog button. The *Part No.* field is a mandatory field

If the part does not exist yet, press the Create button on the right next to the input field for the part number. This causes the dialog for creating a new part to appear.

A description of the dialog and the part master data is in the *CONTACT Elements Client Reference*. When you close the dialog, you are taken back to the original document dialog. Selected attributes of the part are now shown in the document data sheet.

After selecting a part in the *Part No.* field, the following fields:

- *Index*
- *Name*
- *Additional Name*
- *Category*
- *Status*
- *Division*
- *Project No.*
- *Quantity Unit*
- *Material*

describing the part are filled in by the system.

Optionally, you can assign a project to the CAD document.

Project No. Assign a project to the CAD document in this field. Assigning a project is optional.

4.4 Operations and relationships

4.4.1 Pop-up menu of the CAD document

Once you have received a result list from a search (see *CONTACT Elements Client Reference*), you can edit the CAD documents in the result list via their pop-up menu. To do so, select a CAD document data record in the result list and open the corresponding pop-up menu by right-clicking.

Note: The pop-up menu of the CAD document data record does not substantially differ from the pop-up menu of the document data record (also refer to the *CONTACT Documents* application manual). In the following, therefore, only the pop-up menu items containing the special CAD document operations and commands for calling up the relationships of a CAD document to other objects are explained.

Pop-up menu items

Note: Refer to the *CONTACT Elements Client Reference* for an explanation of the symbols in the pop-up menu.

Import Import a CAD document into the system; see *Import* (page 16).

Export Export a CAD document from the system; see *Export* (page 16).

Reference Structure The reference structure represents the documents that are referenced by the original document; see *Reference Structure* (page 17).

Usage Structure The usage structure represents the documents that reference the original document; see *Usage Structure* (page 17).

Change history Displays the changes made to the CAD document; see *Change Notification / Change History* (page 17).

Relationships

BOM Lists the BOM; see *CONTACT Elements Client Reference*.

Status Protocol All of the status changes to date for a part are documented in the status protocol and showed in a separate dialog in the form of a list.

4.4.2 Import

You can use the *Import* operation to assign a file to a CAD document. A prerequisite for importing a file is that the associated document data record has already been created in the system. For a more exact description, also refer to the *CONTACT Documents* application manual.

Note: Please note that most CAD documents can be imported only by means of CAD integration of the system.

4.4.3 Export

You can use the *Export* operation to export a reference to a CAD document or a copy of the file assigned to a CAD document; see *CONTACT Elements Client Reference*.

Note: Please note that entire assemblies or otherwise associated CAD documents can be exported only using CAD integration or in conjunction with *CONTACT Product Data Exchange* (PDX).

4.4.4 Reference Structure

Documents produced particularly by 3D CAD systems are generally part of a quantity of interrelated documents. Such relationships are, for example, 3D model / drawing or assembly / component. The system automatically registers such relationships if these documents are maintained in the system by means of CAD integration. Exactly which relationships are entered depends on the CAD system and the system integration.

The reference structure represents the documents that are referenced by the original document. An example is the components referenced by an assembly.

4.4.5 Usage Structure

The representation is carried out the same as the *Reference Structure* (page 17). Unlike that, however, the documents listed here are the ones that reference the original document. These would be, for example, all assemblies in which the original document represents a component of the respective assembly.

4.4.6 Change Notification / Change History

Changes to CAD documents from one version to the next are usually documented for reasons of traceability. The change notification operation of this module provides you with corresponding options for this.

Each index of a CAD document contains an entry in the change history in the document data sheet; after creating the version, the change history at first contains only the new index. Change information is maintained in the change data sheet.

You can get to the change history of a CAD document version either by way of the *Change history* pop-up menu option of the CAD document entry in the CAD document result list, or by way of the *Change history* tab in the CAD document data sheet.

The individual change data sheets of the change history can be opened as follows:

- Double-click (left mouse button) the entry in the change history.
- By having selected the *Open modification note* check box when creating an index (also refer to the *CONTACT Documents* application manual).
- By carrying out a search in the menu tree under *Products* → *Engineering Changes* → *Change Notifications (Documents)*.

In the change data sheet, change information is edited that refers to a certain document version. The version (the index) and the corresponding document number are listed in the upper area of the mask.

Change Notification Attributes

Change No. A relationship to a collective change notification is produced via the change number. Each change notification has to be assigned to a collective change notification. You can select the number via the list of options.

Document No. / Index The corresponding document number for which the change notification is to be created is shown. You can also change the number manually or select another document number from the list of options to assign the change notification to another document. The index (that is, the version) is automatically entered after selecting the document.

Index Created by / Index Created on Who created the index and when this happened are automatically entered into these fields. This information is taken from the personnel master data and the current date. Your system administrator determines which part of the personnel master data is used; for example, there is the login name, name or personnel number of the registered user.

Reason The reason for the change has to be selected via a list of options.

Source The source for the change has to be defined via a list of options.

Type of Modification The type of change has to be indicated via a list of options.

Change Reason The reason for the change has to be entered as free text.

Short Description A short description of the change has to be entered as free text.

CHAPTER 5

BOMs and Product Structures

5.1 Introduction

The product structure management is used to make all information for a product accessible using the system. During this process, the relationships are established between the subparts of a product in a hierarchical structure.

To do so, a part master data record is generated for each component of a part. The components are then related to each other so that they reflect the product structure. Thus, the relationships between the product components (subparts or assemblies) form the product structure, which can be displayed in the system accordingly.

The starting point is the *Parts* menu item provided in the navigation under *Products*. Different views can also be implemented on the product using the flexible relationship configuration. These views can be used for generating special BOMs or a part usage reference.

BOMs

The BOM is a company-specific display of all assemblies and subparts of a product. The BOM, for instance, contains materials, dimensions, parts and assemblies with the input of the number of parts as a predefined structure. Various types of BOMs can be necessary for the different operational requirements derived from the product structure.

The system only manages the product structure in terms of the BOM, i.e. the relationships between the product components, but no additional BOMs as separate documents. Displaying a BOM is always connected with the derivation from the product structure. Therefore, a change in the product structure will immediately affect all BOMs in question in the product structure.

This mechanism guarantees:

- The data in the BOMs is up-to-date,
- Consistency between the various BOM types,
- The option to export individualized lists.

The BOM module provides functionality that can be configured to an extent, including the following:

- Creation and maintenance of BOM items of an assembly,
- Consistent data during input using catalog support and using test routines as needed,
- Automatic numbering of BOM items,
- Creating, maintaining and displaying assemblies, sub-assemblies, etc. in a joint visual context of the graphical product structure,
- Checking access rights on BOM items (who may create, change and delete items?)
- Creating and maintaining maximum BOMs and product configurations,
- Creation of document printouts for selected views in Microsoft Excel, so that, if needed, BOMs can be supplemented by data externally and forwarded to third parties,

- In combination with CAD interfaces: automatic export of BOM items from the CAD system using the CAD document structure.

The system offers various options to generate or create BOMs via report operations or to export them as tables (Microsoft Excel). These types of BOM files can, of course, be managed in the system as documents - with the default document management operation scope.

or more information, refer to *CONTACT Elements Client Reference* and *Part* (page 7).

5.2 Modular BOM and BOM Items

Maintain BOM items and modular BOMs by means of the BOM and product structure management, in order to define assemblies and complete product structures in the system. BOM items that are directly assigned to an assembly determine the *modular BOM* of this assembly. A *BOM item* characterizes the use of a component part in an assembly. A BOM item is described by master data. This is partially determined by the component part itself. Examples for this are the name or the quantity unit. In part, however, they characterize the *usage* of the component in a certain assembly. Examples of such properties include the quantity with which the component is installed to the item, or the installation instructions.

5.2.1 Menu Access

You can get to the BOM management of a part via the tab of the corresponding part master. To do so, select the *Change* menu item in the pop-up menu of a part and the *BOM* tab in the dialog that appears.

You can also get to the BOM and its items via the *Product Structure* pop-up menu item.

For more details on working with the product structure, refer to *Structure View* (page 26).

Creating a New BOM Item

1. In the BOM, select the *New ...* pop-up menu item in the part data sheet.
2. The new record dialog opens.
3. Fill out this dialog and confirm it by pressing *OK*. All fields labeled *red* in this dialog are mandatory fields and must be filled out to create a new BOM item.

5.2.2 Master data for BOM items

The attributes of a BOM item consist of the following:

- Attributes that apply for the BOM item and, therefore, are set in the BOM dialog and
- Attributes automatically taken over for informational purposes from the master data of the part used on the BOM item.

The default configuration uses the following item attributes:

Assembly No. / Index Number of the created part to which this BOM item is assigned, with index. Displayed automatically.

Component No. / Index Number of the component to which this BOM item is assigned, with index. The component is selected upon creation using a catalog and cannot be changed retroactively. If another already existing component is to be used in the same item, the item must be deleted and a new one created accordingly. If a new component is to replace the previous one, use the *Replace by copy* operation, see *Replace by Copy* (page 22).

Quantity Unit The quantity unit of the part. Is filled using the selected component.

Name Name of the part used. Is filled using the selected component.

Engineering Data Other Engineering Data of the part used. Is filled using the selected component.

Status Name of the status (*Draft*, *Released* etc.) in which the part used is located. Is filled using the selected components.

Part Condition The condition of the part used. Is filled using the selected components.

Position The position number determines the order within the BOM of the part used. The number is suggested automatically as an increment (e.g. +10) of the highest item number to date and can be changed upon creation. The increment is determined by the system configuration. For more information, contact your system administrator.

Note: Various parts can be installed at the same position and the same part at different positions, but the same part cannot be installed multiple times at the same position.

Quantity The amount the part uses in the assembly in question. Is displayed or entered as a decimal number. The amount is related to the parts quantity unit.

Notice Entry of a comment for the BOM item (e.g. installation instructions) as free text.

Length (mm) The length of the part in use in millimeters, usually used for semi-finished parts such as pipes, bars and panels.

Width (mm) The length of the part in use in millimeters, usually used for semi-finished parts such as panels.

CAD source The source from which the BOM item has been created is displayed automatically. The value `manuell` is used for an item directly entered by the user. When creating from a CAD system, the identification of the respective CAD application is displayed.

5.2.3 Operations and relationships

BOM Item pop-up menu

If you call up the *BOM* entry in the BOM Item pop-up menu, the BOM result list appears. This can be used to edit any result list entry.

The pop-up menu contains both general operations explained in the *CONTACT Elements Client Reference* as well as special BOM operations.

Pop-up menu items

Replace by copy Replace the BOM item with another, see *Replace by Copy* (page 22).

Delete... Standard operation, see *CONTACT Elements Client Reference*

Important: Only the BOM item is deleted here. The part belonging to the BOM item is not removed from the system.

Replace with Manufacturing View Replace the current component with one of your existing manufacturing views or with a new one. For more details on *Replace with Manufacturing View*, see *Production BOM* (page 29).

Assembly Using this menu, you can carry out operations on the assembly to which the selected BOM entry belongs, see *Pop-up menu of the part* (page 9).

Component Using this menu, you can carry out operations on the component to which the selected BOM entry belongs, see *Pop-up menu of the part* (page 9).

Batch operation new ... Create a new batch operation, associated to this BOM item

Replace by Copy

The component part of the selected BOM item is used as a master copy for creating a new part. Finally, this new part is inserted at the selected BOM item to replace the previous part at that position.

Maintaining Modular BOM

The multi-level BOMs and the product structure are created based on the modular BOM. Before a modular BOM can be created for a part, an entry must first be created in the part master for this part (assembly).

The modular BOM of the assembly is already available after creation. However, it does not contain any entries. The modular BOM can be displayed, for instance, by selecting the *BOM* tab in the part data sheet. There, you can generate, change and delete BOM entries.

If the part is divided into subassemblies later, maintaining the BOM is more convenient and useful using the product structure catalog, see *Product Structure* (page 26).

Only directly subordinate parts are displayed in the modular BOM of an assembly. Parts in sub-assemblies are not listed.

Note: The system does not distinguish between assemblies and individual parts. Any part can be assigned to a BOM at any time. The part then becomes an assembly. If necessary, your configuration in the part master data can directly include information to distinguish between an individual part or an assembly for a part.

BOM Comparison

The comparison operation for BOMs is intended to give users a quick and detailed overview about the differences of the BOMs of selected assemblies.

Right click the selected part and select *Structure Comparison* in the pop-up menu. The selected part will be entered automatically outgoing Assembly A in the entry window for the BOM comparison. Here, you must select the Assembly B using the catalog. For Assembly B, the browser is based on the part managed in your system. The *Display equal items* check box is useful for increasing clarity, where necessary, by hiding the identical items. The number of assembly levels that are to be compared are configured using the *Comparison Depth*.

The result of the BOM comparison is displayed graphically in the structure view. The starting data for the comparison appears in the upper area of the structure tree. The comparison results are displayed graphically in the middle area. During this process, the BOM items of *Assembly A* are compared to those of *Assembly B*. The comparison result is symbolized by the preset icon. Attribute values deviating from each other are displayed under the BOM item in question based on the attribute and the values deviating from one another. The bottom area includes the representation of the comparison in table form. Here, the BOM items from the (sub)assemblies up to the individual components can be navigated using the individual objects in the result list.

Meaning of the icons for results view for the BOM comparison

 **Icon for the BOM comparison** Icon in front of the assemblies to be compared.

 **Icon “only available in BOM A”** The item is only available in A.

 **Icon “only available in BOM B”** The item is only available in B.

 **Icon “Part difference”** The items differ by a part.

 **Icon “Version difference”** The items differ by a part version.

 **Icon "Attribute difference"** The items differ in the values of the item attributes.

 **Icon "Completely different"** The items differ completely.

 Icon "Identical item" The items of both BOMs are identical.

Attributes to be compared in the BOM comparison

During the BOM comparison, the attributes of the respective BOM items compared as Assemblies A and B are of importance. These are primarily the attributes that uniquely label the objects to be compared and, therefore, form the key for identifying the BOM components. By default, these are the Assembly No., Assembly index, Component No., Component index and the BOM item. Furthermore, all other describing attributes for the BOM items as well as attributes from the part classified by the BOM item can be included for the comparison.

Assembly No. and/or assembly index will differ from each other in a normal case since the actual objective is to compare different assemblies.

The comparison begins with the component number and the component index which are compared for the same BOM item. If these are the same, the other BOM item attributes like amount and length are compared in greater depth. These attributes are included in the default configuration as an example for the BOM comparison and must be adapted for the specific application and, where necessary, for the customer-specific application.

Searching and comparing equal components with different item entries does not usually make sense because components could have been used in different items deliberately and comparison entries are not very helpful. Therefore, multiple usages in different items are also not treated differently during a BOM comparison.

The BOM items of two assemblies can also differ by their actual part attributes. This means that for identical items with different components, the attributes of the part in question can also become relevant to comparison along with the BOM item attributes. This type of BOM comparison must be configured in a customer-specific manner based on their specific requirements.

Each of the comparison results are represented by the *Icons* (page 22) described above.

Batch Operations

With the operation *Batch Operation New ...* you can run an operation on many BOM items in one step, without blocking the client (i.e. in batch mode).

The following batch operations are configured in the standard:

- *Replace Component*
- *Delete Component*
- *Complete BOMs*
- *Complete BOMs with variant*

To start a batch operation proceed as follows:

1. Choose one or more BOM items in a result list.
2. Click in the pop-up menu on the operation *Batch operation new ...*.
3. Choose an operation in the following mask.
4. If your operation requires additional parameters, you can enter them in the following mask.
5. The batch operation will be opened in a new tab. Here you can add additional BOM items to the operation.
6. To start the operation, click on the button *Execute*.
7. The operation will run in background. In the tab *Selected uses* you can see the state of the operation for each BOM item.

5.2.4 BOM export from CAD systems

In the classic integration, the export is the modular BOM component of the respective integration module. The description of the operations can be found in the manuals for the links.

In combination with the *Workspace Manager*, the BOMs can be exported by a central operation on the server. This allows you to adapt the export to the needs of the individual companies better and more easily. CONTACT provides two standard processes for exporting BOMs. They can be configured very extensively and, if needed, the method can be adapted via PowerScript programming.

The method used is determined by the administrator in accordance with the company guidelines. The methods can be configured depending on the CAD system or in certain cases, depending on the project. If a project-dependent export is desired, the method used is taken from the document data record on which the export is carried out.

Exporting from CAD component structures

This is the default method that can usually be used with every CAD system and corresponds to the method of the previous classic CAD integration to the greatest possible extent. The installations in an assembly are analyzed. Components installed multiple times are counted together and entered as one BOM item. Certain parts can be excluded from the BOM using rules. For details, refer to *CONTACT Virtual Product* administration manual in the section "BOM export from CAD systems/Excluding components using object rules."

The *Workspace Manager* supports the option to assign multiple files to a document. Thus, an assembly and two phantom assemblies can be part of one document, for instance. The phantom assemblies are not taken into account when exporting the BOM.

In the depicted example (*Example of the CAD component structure* (page 24)), the files "Upper part.prt", "Lower part.prt" and "Screw1.prt" are each assigned to a separate document master record with a separate part number. The files "housing.asm" and "Mounting screws.asm" belong to the shared document master record. Here, the file "housing.asm" is the anchor file (main file) of the document data record.

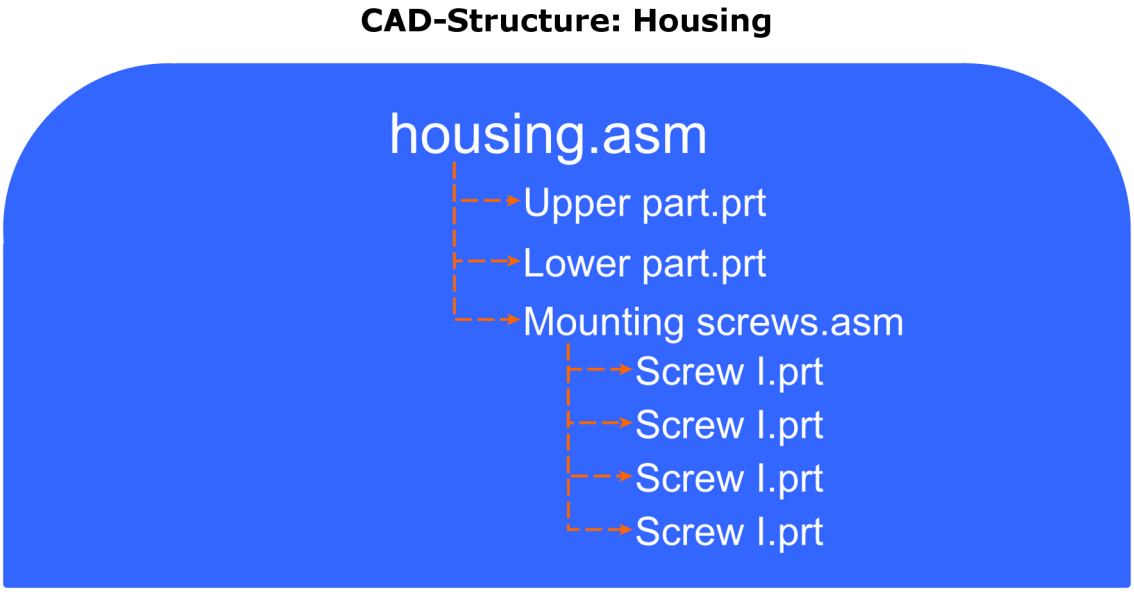


Fig. 5.1: Example of the CAD component structure

Table 5.1: Example of an exported BOM

Part	Name	Amount
002000	Screw1	4
001010	Upper part	1
001020	Lower part	1

The BOM of the part "001000" (housing) is now formed as follows: All references of the components installed in the anchor file ("housing.asm") and linked to anchor files in referenced documents are added to the BOM. The cited example results in a BOM with three items (see *Example of an exported BOM* (page 25)).

For the BOM items created in this manner, the item numbers are assigned at determined intervals (e.g. `10`, `20`, `30`, etc.). The size of the interval can be configured for your CAD system by the administrator.

This export method requires that the references are limited to the workspace that is checked in. Nested workspaces with subdirectories cannot be exported. Therefore, this export method cannot function on these types of workspace structures since referenced files cannot be found.

Exporting from CAD BOM information

Some *Workspace Manager* integrations are capable of exporting BOM information from the BOM editors of the CAD system. These are also transferred to the server when checking in. This makes it possible to use the BOM created in the CAD system as a basis for the BOM created here.

During this process, the item numbers are usually taken over from the CAD system.

Using the BOM export

The *BOM export* operation is called up in the pop-up menu of the document. The method configured for each CAD system is used for export. The exported BOM is displayed in a form. Here, the changes to the previously available BOM are listed as well. This makes it possible to compare the changes before saving the BOM. If a recursive export of the BOM is switched on, all BOMs of the subordinate assemblies area are also included in the form.

Potential instructions and error messages are displayed for each BOM. For example, it would be possible that the document for the "Oberteil.prt" file does not contain a part assignment when exporting the BOMs from the component structure. In this case, it would not be taken into account for the BOM. This is output in the form as a note.

You can select the BOMs to be saved in a check box. Then, you confirm the selection using *Save*. You can only change the check box if you have the authorization for BOM export. If this is not the case, you still can compare the BOM saved here with the BOM currently exported from the CAD system.

Note: The BOM is initially saved in the system when the form is confirmed with Save.

The BOM is only aligned for BOM items with the same CAD source. This also offers the option to expand BOMs for a part manually or combine BOMs from a ECAD and MCAD system.

Yet it is possible to replace manual positions automatically. This can be accomplished by configuration (for details see administration manual for *CONTACT Virtual Product*

Using variants

When using CAD systems that supply information using variants to the *Workspace Manager* (e.g. Pro/ENGINEER in the form of family tables), this information can be taken into account for creating BOMs. They are then used to resolve references correctly if references include a relationship to a variant.

To do so, you must first enable transfer of variants in the *Workspace Manager*. More details can be found in the "Options" chapter of the *Workspace Manager* administration manual.

After successfully transferring a component with an assigned CAD document, you can find its variants in the mask of the CAD document under the *CAD variants* tab. Typically, it is required to assign parts to these variants manually. This is done with the *Change...* operation.

Attention: In the standard configuration, the *CAD variants* tab is not visible. However, it can be activated by configuring the setting *Show as mask register* of the "CAD variant" relationship ("document_to_variants").

Variants inherit the necessary access rights of the assigned document. To be able to assign a part to a variant, you have to be authorized to modify the document.

5.3 Product Structure

In *CONTACT Virtual Product*, subparts and assemblies connected to each other form a *product structure* in tree form. This is used to make all information about a product accessible in a clear manner. The relationships between the subparts and their assemblies are displayed in a hierarchical structure view.

The *Multi-level BOM* is the display of such a structure in list form. It is a *Quantity BOM* if the subpart quantities of a product structure are compiled. In all cases, this involves derived views that are based on the previously mentioned *Modular BOM and BOM Items* (page 20).

Usage Structure

When the relationships between the components follow from bottom (subpart) to the top (end product) in the product structure, this is referred to as a view of the part usage list.

In accordance with DIN 199 Part 5, the usage reference for a part number is a directory in which all objects compiled according to certain aspects are listed that contain or can contain this part number. The usage reference is used to recognize the use of a certain part or assembly in different assemblies or products.

CONTACT Virtual Product provides the *Usage Structure* menu item to display part usage for the selected part in its pop-up menu. The usage structure is then displayed using the structure view in which the installation of the subpart (or assembly) is displayed.

5.3.1 Menu Access

You can access the product structure via the parts result list. This requires selecting the *Product Structure* menu item of a part in the pop-up menu.

The *Usage Structure* is also located one context menu item lower.

5.3.2 Structure View

In principle, the basic setup of the view corresponds to the elements described in the *CONTACT Elements Client Reference*, under *Structure views*

Note: Along with the product structure display described here, *CONTACT Virtual Product* also supports a version in which no selection box for relationships is available in the bottom area. Instead, you can select the *BOM*, *Documents/CAD documents for the part* and *Usage reference* relationships using a radio button.

Top Window Area

No metadata of a head object (here, the uppermost assembly) is displayed in the upper window area in order to have as much space possible available for the actual structure view. Instead, the area contains two additional control attributes for the display:

Allow Zero-Amounts

Using the *Zero amount allowed* check box, you can define whether parts entered in the BOM of the assembly in question with the `0` amount are to be displayed or hidden in the product structure.

Configuration

Using a catalog, select a *variant* (page 55) so that a concrete product structure is derived from a structure that displays a product module with maximum BOMs by using *Selection conditions from the variant management* (page 64). The list of options may not be available depending on your environment.

Tip: The table area can be collapsed using or reopened using .

Defining number of structure levels

By selecting *Max. viewable hierarchy depth*, you can define the maximum nesting depth to be displayed in the product structure, if you show more of the structure using the *Expand* menu command.

Center window area

The middle area displays the actual product structure - starting from the part for which the structure view has been called up. The display depth depends on the selected amount of levels to be opened. Then, the levels can be opened or closed manually.

Node Information

The following attributes and symbols of the respective part are displayed for each node (assembly or subpart) in the default configuration:

- *Part No.*
- *Name*
- *Status*

Pop-up Menu

If you opened a product structure view by selecting the *Product Structure* command from the pop-up menu of the part master, you can edit the product structure using the following pop-up menu operations:

- Assigned part, see *Assigned Part* (page 28)
- BOM item, see *BOM Items* (page 28)
- Update, see *Update* (page 28)
- Search entries, see *Search Entries* (page 28)
- Expand, see *Expand* (page 28)
- Collapse, see *Collapse* (page 28)

Note: If you select the pop-up menu of the head part, only the *New...* and *Sort* operations are available under the *BOM Item* menu item.

Assigned Part

You can access the part pop-up menu of the selected part via the *Assigned Part* pop-up menu item (see *Operations and relationships* (page 9)). If you select the *Copy...* pop-up menu item from the part pop-up menu of the head part in this way, note the following special feature:

Copying BOMs

1. The message is displayed after carrying out the copy procedure:

   ```
   Should the copied object be viewed instead?
   ```

2. If you confirm the query, the structure of the copied part is displayed.

Use this special feature if you want to modify an assembly for an order, for example.

BOM Items

You can access the BOMs pop-up menu of the selected part via the *BOM Item* pop-up menu item (see *BOM Item pop-up menu* (page 21)).

Update

The product structure is reloaded using the *Update* pop-up menu item to make any changes carried out visible. (You can also update using the `F5` button).

Search Entries

Using the *Search entries* pop-up menu item or the `Ctrl-F` key combination, you can search the node texts (not the data records/data sheets!) for certain entries. A dialog appears in which you can enter the search condition. The occurrences are highlighted in the structure.

Clicking *Find Next* in the dialog takes you to the next occurrences.

Expand

The *Expand* pop-up menu item opens other display levels below the part selected in the product structure. By selecting *Max. viewable hierarchy depth* in the product structure window, you can define the maximum nesting depth to be displayed when expanding the product structure.

Collapse

The *Collapse* pop-up menu item closes other display levels below the part selected in the product structure. Unlike exiting by clicking on the “x”, all subtrees are collapsed so that only one level is visible when reopening the node.

Drag&Drop

You can easily add one or multiple positions from a list display of the modular BOM item of any other assembly into this window via Drag&Drop. If necessary, change the part data in the create dialog that opens here.

Note: Nodes of the middle window area can not be used as a source for a Drag&Drop operation.

Bottom window area (table area)

The bottom window area displays all objects in the form of a result list located in a relationship for each selected part of the middle window area. Which objects these are depends on the settings that have been selected using the catalog of the bottom window area. The modular BOM of the part is displayed here by default.

Possible result lists

All Documents The documents associated with the selected BOM items.

General Exceptions The general exceptions for the rights system of the selected BOM item.

Change History The change history of the selected BOM item.

Tasks The tasks associated with the selected BOM item.

CAD Documents The CAD documents associated with the selected BOM item.

Open Issues The open issues of the selected BOM item.

Project-specific exceptions The project-specific exceptions for the rights system of the selected BOM item.

Batch Operations The batch operations associated with the selected BOM item.

Status Protocol The status protocol of the selected BOM item.

BOM The BOM of the selected BOM item.

BOM result list

Pop-up Menu

You can call up the pop-up menu of the BOM items by right-clicking in the result list. The pop-up menu entries correspond to those of the pop-up menu described in *BOM Item pop-up menu* (page 21).

Drag&Drop

You can easily add one or multiple items from a list display of the modular BOM items of any other assembly into this window via Drag&Drop. If necessary, change the part data in the create dialog that opens here.

5.4 Production BOM

5.4.1 Glossary

eBOM Part

An eBOM part is a part that defines a engineering view, i.e. has a development BOM.

eBOM

eBOM is a BOM of an eBOM part.

mBOM Part

An mBOM part is a part that has a manufacturing view, i.e. has a manufacturing BOM.

mBOM

mBOM is a BOM of a mBOM part.

5.4.2 Introduction

A part and its BOM specify the development or design view of a product or product component. However, for this type of part, one or multiple manufacturing views can be defined, for example plant-specific views. Manufacturing views are also managed as parts, but parts that each have a manufacturing BOM instead of a development BOM. These parts have special properties and relationships and can be generated and maintained on parts and BOM items with special operations, which are explained below.

5.4.3 Master data

The following special attributes are available on the *Details* tab of the part data sheet to label a part a mBOM part:

Manufacturing view Defines that the part is a manufacturing view, i.e. an mBOM, instead of an eBOM part, and, therefore, has a manufacturing BOM instead of a development BOM (an mBOM instead of an eBOM).

Engineering View Defines the associated engineering view for an mBOM part, i.e. the reference to an eBOM part. It is only defined if the mBOM part is dependent on a eBOM part. Usually, the system automatically sets the engineering view to an mBOM part if it has been generated via one of the operations *Create manufacturing view* or *Apply manufacturing view* from the context of an eBOM part.

As long as the manufacturing view has not been released, the assignment of the engineering view can be changed using a catalog. In that case all the indexes of an mBOM part must be assigned to the same eBOM part. The indexes of an mBOM part cannot be assigned to completely different eBOM parts. They must belong exclusively to different indexes of exactly the same eBOM part. As long as there exists only one index of an mBOM part, the eBOM assignment is changeable without restrictions.

The mBOM indexes can be assigned to eBOM indexes using any definition and do not have to be synchronous and do not require a logical order for the index scheme. When using Object Life Cycle logic for parts and the rights system for parts, any mBOM index can be indexed at any time. This means even older manufacturing BOMs for older eBOM states can still be indexed and modified. During indexing, the highest available index is determined and increased according to the index scheme. The assignment for the Engineering View remains in place in this case, but can subsequently be changed to another eBOM index. This means the mBOM indexes of an eBOM index do not absolutely have to have a gapless progression in numbering.

If an eBOM part is indexed, no mBOM part is initially assigned to the new eBOM part index. They must then each be created or carried over from an earlier development state (copied) via the operation *Carry over manufacturing view*.

Manufactured on site Defines for which site an mBOM part and, therefore, its mBOM is defined.

Note:

- The *Material No. (ERP)* attribute is automatically compared across indices with the *Material No. (ERP)* of the assigned eBOM part for all mBOM parts with an assigned engineering view.
- For each *Material No. (ERP)* and plant, only one released mBOM part may exist in the system at any time. A corresponding assessment occurs upon release of an mBOM part. If another released mBOM part is found during this, an intermediate dialog is shown with the corresponding information. Confirming this dialog transfers the other released mBOM part to the status *Blocked* and releases the new mBOM. Otherwise, the entire release is canceled. A requirement for releasing a mBOM part is that the associated eBOM part can no longer be changed. When using the life cycles for parts, the eBOM part's status can no longer be *Draft* or *Review*.
- Due to the free assignment of mBOMs to eBOM indexes, no further automatic mechanisms for changing statuses between a predecessor and successor index exist for mBOM parts. Thus, the automatic mechanisms applicable to parts for changing statuses do not apply to mBOM parts. The *Revision* status in particular is not used for mBOM parts as a result.

5.4.4 Relationships

Manufacturing views

As described above, one or multiple dependent mBOM parts and, therefore, mBOMs can be defined to an eBOM part. These mBOM parts, assigned to an eBOM part, are displayed in the *Manufacturing View* mask tab of the part data sheet.

5.4.5 Operations

Part operations

Create manufacturing view

New manufacturing views, i.e. mBOM parts and their mBOM can be created by copying an eBOM part and its eBOM. Alternatively a new mBOM part can be created via the part operation *Create manufacturing view*. Here, an new mBOM part is created optionally including its modular BOM (i.e. only the uppermost level). The newly created mBOM part is labeled an mBOM part via the master data field *Manufacturing View*. The relationship to the copied eBOM part is set via the master data field *Engineering View*. The mBOM of the new mBOM part can then be processed manually. When calling the operation, first, a dialog opens. In this dialog it can be determined, whether the first level of the BOM is to be applied or not.

Apply manufacturing view

No manufacturing views exist for a new index of an eBOM part, even if at least one dependent mBOM part exists for this eBOM part, i.e. no mBOM parts are assigned to it initially. However, using the part operation *Carry over manufacturing view*, it is easy to carry over (namely: copy) mBOM parts from earlier versions of the eBOM part to the current development state. Calling the operation initially opens a selection window that lists all mBOM parts for earlier development states. Here, the user can select a fitting mBOM part, which is then copied when confirming the selection and is assigned to the current development state as a new manufacturing view.

mBOM Manager

The part operation *mBOM Manager* is used to start the application of the same name that is described in detail in Chapter *mBOM Manager* (page 32). The *mBOM Manager* makes it possible to analyze the differences between eBOM and mBOM and supports the user in eliminating unwanted differences.

BOM operations

Replace with Manufacturing View

If an mBOM part has been generated from an eBOM part via the operation *Create manufacturing view*, eBOM and mBOM are completely identical at first, i.e. only eBOM parts are initially embedded *deep* in the mBOM. If the user would then like to replace one of these eBOM parts with an mBOM part in the mBOM at a certain BOM item, the BOM operation *Replace with Manufacturing View* gives the user the option, for the eBOM part at the item in the first step,

- to select an existing manufacturing view, i.e. an already existing, dependent mBOM part.
- to select a new manufacturing view, i.e. a new dependent mBOM part.
- to apply an mBOM part to an earlier development state.

In the second step, the user can replace the eBOM part at the corresponding BOM item with the selected or newly created mBOM part.

5.4.6 mBOM Manager

Introduction

The *mBOM Manager* makes it possible to analyze the differences between eBOM and mBOM and supports the user in eliminating unwanted differences. This is particularly necessary if changes have been carried out in the new state of an eBOM and these changes must be committed into the dependent mBOMs.

Note: eBOM and mBOM do not necessarily have to agree in their structural symmetry.

On the one hand it is not required necessarily that they exhibit any equivalence at the subassembly level. But, on the other hand, there is a high level match regarding the containing subparts and their total quantities.

With the operations of the *mBOM Manager*, which are primarily based on an analysis of the quantity difference between eBOM and mBOM at the assembly level and subpart level, you have, nevertheless, the possibility to establish an agreement on structural level and the total amount of the subpart level.

Surface elements and operations

Open the *mBOM Manager* and select from eBOM and mBOM

The *mBOM Manager* is called up via the operation of the same name in the part pop-up menu. If the *mBOM Manager* is called up from the pop-up menu of an eBOM part, the corresponding eBOM is already preselected after opening. The associated, dependent mBOM must then still be selected by selecting the corresponding mBOM part. If the *mBOM Manager*, on the other hand, is opened from the pop-up menu of an mBOM part, both the eBOM and mBOM are already pre-selected after opening.

Opening *mBOM Manager* from the context of Variant Management

It is also possible to call up *mBOM Manager* from a variant. In this case, the structure trees of eBOM and mBOM are pre-filtered according to the properties and property values of the variant. In addition, it is possible to open *mBOM Manager* from the *Variant Editor*. The call can be made through a stored or virtual variant. The structure trees of eBOMs and mBOMs are pre-filtered according to the properties and property values of the variant in this case as well.

Table for display of quantity difference between eBOM and mBOM

After the selection of the eBOM and mBOM, all parts that are embedded in the eBOM and mBOM and occur there in total at different quantities are automatically listed in the quantity difference table in the lower area of *mBOM Manager*. The quantity difference table can be collapsed so that more room is available for working with the structure trees. The number of differences present is shown on the right in parentheses next to the header.

The table columns have the following meanings:

Part No. and index Uniquely identify the part with quantity differences

Structure level Shows the hierarchical level where the part is embedded

Name Name of the part with a quantity difference

Category Category of the part with quantity difference

eBOM Quantity of the part in the eBOM throughout all installations

mBOM Quantity of the part in the mBOM throughout all installations

mBOM action Action necessary in the mBOM to eliminate the difference

Ignored Display of ignored differences or parts

Filtering for differences

The quantity difference table can be filtered in various ways:

- About the two buttons immediately above the quantity difference table: The left button can be used to hide differences in assemblies; the right button can be used to hide differences in components. By default, both buttons are active at the same time. As a result, differences in assemblies and differences in components are both displayed.
- About the filter function for the `Category` and `Ignored` columns: In order to filter the quantity difference table, you have to click the filter icon in the respective column and make the filter entries in the menu that appears.

The table can be sorted in a multi-level way and configured/changed by clicking the corresponding column header.

Search for differences

The search field in the table area can also be used to search for parts across columns. The search is carried out in the search field via *typeahead* with each entry.

Ignore differences and articles

To further decrease the size of the quantity difference table, there is an option to ignore differences and parts. There are buttons for each entry in the quantity difference table in the `Part No.` and `Action mBOM` columns for doing so. The buttons first become visible if you hover the mouse over the respective entry in the columns.

Differences and parts can be ignored by pressing their associated buttons on the entries in the `Action mBOM` and `Part No.` columns. If a part is ignored, this means that all of the differences with this part no. (index neutral) are ignored. If, in contrast, a difference is ignored, this means that all of the differences with this part no. and the corresponding `Action mBOM` value (index neutral) are ignored.

To display the ignored parts and differences again, you can use the filter function of the `Ignored` column and can elect to display differences and articles again. In the same column - regardless of the filter choice - all of the ignored differences and parts are subsequently displayed. In order for the ignored difference or ignored part to be taken into consideration in the quantity difference calculation once again, you have to click the button on the respective entry in the `Ignored` column.

Automatic update of the difference table

After the execution of modifying operations inside the mbom manager the difference table will be recomputed. This can take a long time when working with big product structures.

You can disable the automatic update by clicking on the button *Update table automatically*. Clicking on the button again will reactivate the automatic update.

Assembly structures of the eBOM and mBOM

After the selection of the eBOM and mBOM, their assembly structures are displayed in the center area of the *mBOM Manager*.

In the structures it is possible

- to search for parts.
- to call part operations and BOM operations for a selected node.
- to synchronize the eBOM and mBOM views.
- to copy parts from the eBOM into the mBOM via Drag&Drop.

The operations in detail:

Search for parts

You can use the two search fields in the structure areas to search for parts in the eBOM and mBOM. The search must first be initiated with the return key after making an entry into the search field. This is used to highlight the first item found (bold font and light-red background). In the upper area of the structure you see a red navigation

area which displays the total number of items found. With the navigation buttons you can navigate the search results forward and backward. You can also jump to the first and the last search result.

Calling up part operations and BOM operations

For an item selected in the eBOM or mBOM, selected operations on the selected BOM item as well as on the corresponding assembly part can be called up via the assigned operation selection box in the right hand area of the structure tree at the level of the corresponding item. The most recently selected operation can also be activated easily by clicking directly on the left-hand area of the selection box. After making a multiple selection in the mBOM, you can only call up the operation *Delete BOM Items*.

Note: For items selected in the eBOM, only *readonly* operations can be called up for information since eBOMs can usually no longer be adjusted within the *mBOM Manager*.

Drag and drop items from the eBOM into the mBOM

Selected eBOM items (either one or several) can be applied (copied) by Drag&Drop into the mBOM. You can select multiple items in the standard way, similar to Windows Explorer. For example, you can use the control key if selecting multiple items individually, or use the shift key if selecting multiple items, located at the same structure level, at the same time. After dropping the items to be copied, the drop destination, i.e. the item in the mBOM, is updated automatically and the new copied sub-items are displayed. The initial item numbers from the eBOM will be transfered to mBOM during Drag&Drop.

Drag and drop items within the mBOM

Positions selected in the mBOM can be moved within the mBOM using Drag&Drop.

View synchronization between eBOM and mBOM

If an eBOM part is selected in the eBOM, you have the option to search for the occurrence of this eBOM part or its potentially existing dependent mBOM parts in the mBOM and synchronize the view according to the hits. To do so, you have to click the button with the eye in the top-right area of the eBOM after selecting the desired part. The first occurrence of the selected part in the mBOM is the highlighted by automatically scrolling to the hit and a color animation.

Selection of variants

A button is provided on the right-side area above the quantity difference table that can be used to select variants. In the dialog that appears for selecting the variant, you have the option of displaying variants for various products using the selection box. As soon as a variant has been selected in the table and the dialog has been confirmed with the `OK` button, both the structure trees of eBOM and mBOM as well as the quantity difference table are filtered based on the properties and property values of the selected variant.

Note: This button is only made available for BOMs that are maximum BOMs and if stored variants are available.

Analysis of quantity differences between eBOM and mBOM

Use the *mBOM Manager* to analyze the cause of a quantity difference listed in the table and how this quantity difference must be eliminated. Eliminating the quantity difference automatically elimintates its cause.

The row to be examined in the table is selected for this purpose. Then, all occurrences of this part are searched for automatically in the eBOM and mBOM structure. Similarly to the free search in the structures, this is used to highlight the first item found (bold font and light-blue background). In the upper area of the structure you see a blue navigation area which displays the total number of items found. With the navigation buttons you can navigate the search results forward and backward. You can also jump to the first and the last search result.

To simplify the search for the cause of a difference, *mBOM Manager* only highlights the relevant points. Items that do not have any differences are not highlighted:

- In this process, *mBOM Manager* examines all of the BOM items with instances of the part from the selected table row.

- For each eBOM item, mBOM Manager searches for an equivalent in the mBOM. If it finds an equivalent and it does not have a difference compared to the examined eBOM item, then the eBOM item and its equivalent are not taken into account in the set of results.

2D and 3D preview for selected parts

If a part is selected in the quantity difference table or in one of the structure views of an eBOM or mBOM, a preview can be displayed using the *mBOM Manager* header. To do so, click the button on the right next to the 2D/3D selection. Depending on which of the two buttons you click, you activate either the 2D or 3D view. A prerequisite is that a preview exists for the selected part, i.e. that a CAD model or CAD drawing is assigned to the part with a corresponding view format. Clicking on a quantity difference or a node in the structure views opens a separate tab where the preview is displayed. It should then be located vertically or horizontally next to the *mBOM Manager* tab. Clicking on the button again disables the preview function in *mBOM Manager*.

CHAPTER 6

Class List of Characteristics and Characteristics Groups

6.1 Introduction

CONTACT Virtual Product includes, among others, operations for managing and using characteristics groups and class lists of characteristics based on DIN 4000, 4001 and 4002. This chapter explains how to maintain and use these elements. The configuration elements provided for the administrator for characteristics groups and characteristics, on the other hand, are described in the *CONTACT Virtual Product* administration manual.

A characteristic is a certain property of a part. A property of a screw, for instance, is its length. A class list of characteristics is the quantity of all characteristics of a certain part class. In the case of a screw, for instance, it is its length, thread pitch, diameter, etc. Various screws can have different lengths, pitches or diameters as well as various combinations of versions of these characteristics. What they have in common, however, is that they have the same characteristics and, therefore, (where applicable) the same class list of characteristics. A class list of characteristics is assigned to a characteristics group (if needed, other characteristics groups can be assigned). In the above-mentioned example, it is the screws characteristics group. Multiple characteristics groups can then be combined into a parent characteristics group. For example, screws and nuts can be grouped in the parent characteristics group Standard Parts. The sub characteristics groups of a parent characteristics group are called sub characteristics groups. This type of hierarchical organization of characteristics groups can extend over multiple levels. This hierarchical organization also reflects the system interface, see *A Characteristics Group Hierarchy* (page 37).

Only the lowest characteristics groups (sheets) of a classification hierarchy can be assigned to a class list of characteristics. This can also be more than one class list of characteristics per characteristics group. The overall structure of the characteristics groups and class lists of characteristics is also called an object plan.

CONTACT Virtual Product, in this regard, provides functionality that can be configured to an extent, including the following:

Configuration of Class Lists of Characteristics

- Creation and maintenance of characteristics and characteristic categories.
- Creation and maintenance of characteristics groups and their relationships in a characteristics group hierarchy.
- Creation and maintenance of class lists of characteristics and characteristics associations.

Using the class lists of characteristics

- Accessing parts in class lists of characteristics and assigning characteristics with characteristic values.
- Searching and finding parts based on characteristics group names, classification codes and/or characteristic values; researching using a graphic, illustrated object plan.

The following documentation explains step-by-step how to create a class lists of characteristics with characteristics and how to then use them for searching and finding parts. Users not yet familiar with *CONTACT Virtual Product* are recommended to take exact note of the documented sequence and procedures. The steps are:

1. Prepare the *Characteristics Catalog*.

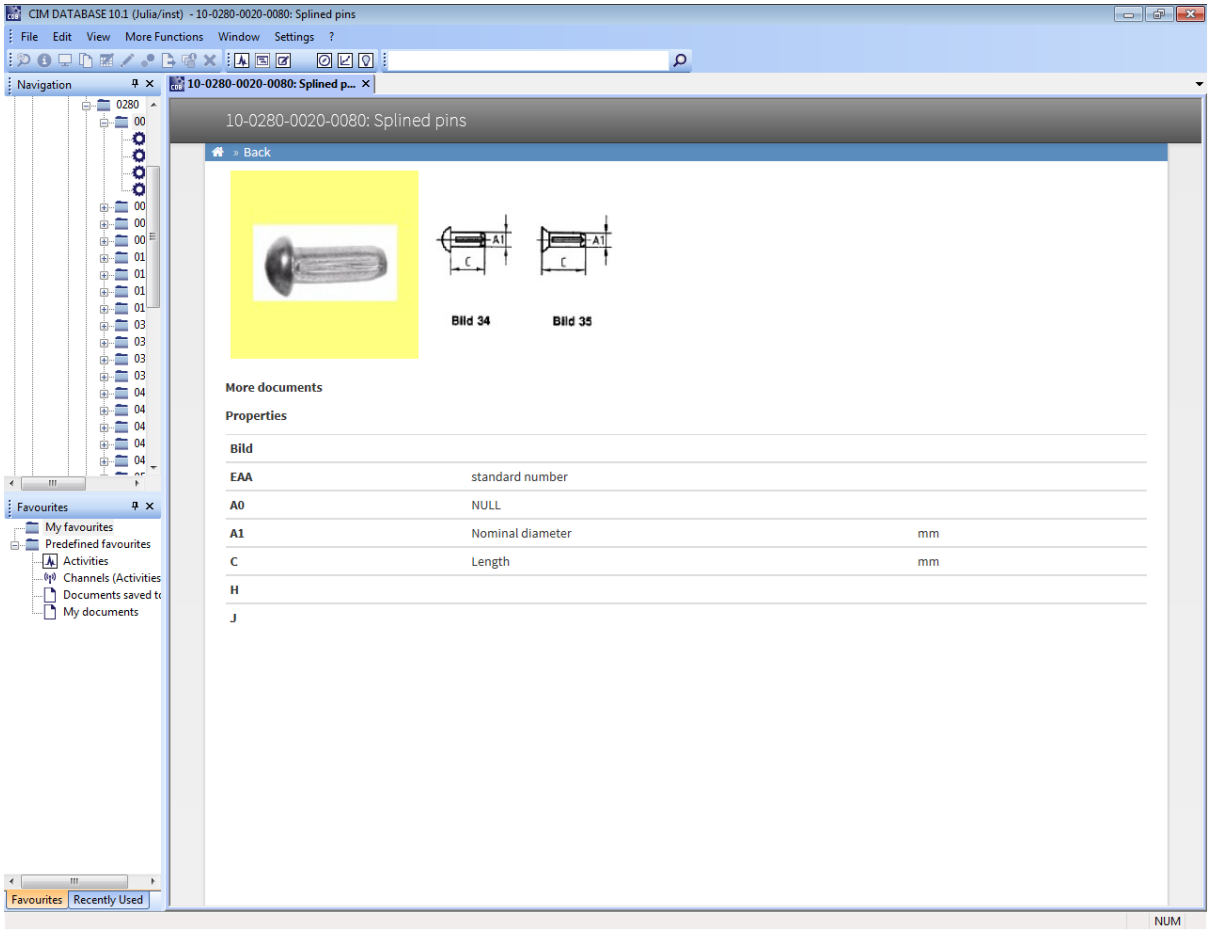


Fig. 6.1: A Characteristics Group Hierarchy

The catalog consists of *Characteristics Categories* that can be organized in a hierarchical manner if needed. Examples of typical categories are “Geometric characteristics”, “Functional characteristics” or “Physical characteristics”.

2. Create *characteristics* and assign each to a characteristic category.

   These characteristics are initially listed in individual class lists of characteristics regardless of their later use. Use-independent characteristics, for example, do not yet bear any descriptors such as “d1”, “d2”, etc. in order to differentiate various characteristics describing one diameter in a class list of characteristics from one another.

3. Create *characteristics group* and organize in a hierarchical manner as part of an *classification plan*.
4. Create *class lists of characteristics* and assign characteristics groups in the object plan.
5. Assign *characteristics* from the characteristic catalog to the class lists of characteristics.

Now, class lists of characteristics can be used:

1. Assign parts to a class list of characteristics upon creation or later.
2. Provide the class list of characteristics of the part with values.

Parts can be found as a result of this procedure based on the characteristic value

- or
- be developed automatically with support of a suitable CAD integration as a 2D drawing or 3D model.

6.2 Class List of Characteristics Configuration

This section describes the creation and maintenance of specific characteristics for parts that form the foundation when using class lists of characteristics. These activities are usually carried out by employees that are involved with standardization, standards management or catalog management in the company - as a cross-function responsibility between IT admin and users. *CONTACT Virtual Product* gives you the ability to create characteristic categories first and then group the required characteristics in this category. Characteristic categories can be structured in a hierarchical manner for a better overview. The overall structure of the characteristic categories is referred to as a characteristic catalog. Characteristic are initially defined in certain class lists of characteristics regardless of later use. Thus, characteristics can be taken into account for suitable definitions in more than one class list of characteristics.

6.2.1 Characteristic catalog and characteristic categories

Menu Access

The characteristic catalog is accessible in the navigation area under *Products* → *CLC* → *Characteristics catalog*. The *All* characteristics category is initially available using the *Search ...* operation without a restrictive search condition.

This category represents the top category in the characteristics catalog. All other categories are arranged below this.

Note: If you foresee using the characteristic catalog frequently, it is recommended that you store the *All* category as personal favorites (see *CONTACT Elements Client Reference*) with the *Characteristic Catalog* operation. This operation is recommended for creating and maintaining the characteristic categories; for more details, see *Characteristic catalog* (page 40).

Creating a new subcategory

1. Use the corresponding node *Sub Characteristics Groups* in the structure view to select the *New ...* pop-up menu item. A hierarchy, which may also have multiple levels, is structured through the successive creation of categories from top down.
2. The input dialog opens.
3. Fill out this dialog and confirm it by pressing *OK*. This saves the new characteristic category in the system and files it in the selected level of the characteristic catalog. Alternatively, use the *New Characteristic Hierarchy ...* pop-up menu item if the desired category has been created beforehand and now needs only to be filed in the hierarchy as a subcategory. The dialog for creating a relationship between the main category and subcategory appears.

Note: Filling out the dialog requires knowledge of the *ID* of the category to be filed. Please note that the category itself is not created here; instead, only the relationship between the main category and subcategory is established.

Master Data

Characteristic categories are described in *CONTACT Virtual Product* with the attributes compiled in the characteristic category data sheet.

The default configuration uses the following attributes:

ID Unique label for the characteristic category. This value is preset with `...` and is automatically generated when creating in the respective languages.

In addition, the *Subcategories* and *Characteristics in this Category* tabs are available. The *Subcategories* tab lists the categories with the corresponding IDs, which are assigned to this characteristic category as subcategories. The list can be expanded and edited using the pop-up menu. The *Characteristics in this Category* tab lists all characteristic assigned to the characteristic category so far.

Operations and relationships

Pop-up menu for the characteristic category

Once you have received a result list from a search (see *CONTACT Elements Client Reference*), you can edit the characteristic categories in the result list via their pop-up menu. To do so, select a characteristic category in the result list and open the corresponding pop-up menu by right-clicking.

The pop-up menu contains both general operations explained in the *CONTACT Elements Client Reference* as well as special characteristic category operations.

Pop-up menu items

New... To create a new category, see *Creating a new subcategory* (page 39) in *Menu Access* (page 38).

Characteristic catalog To display the structure view of the characteristic catalog, see *Characteristic catalog* (page 40).

Rebuild Characteristic catalog To rebuild the characteristic catalog, see *Rebuild Characteristic Catalog* (page 40).

Characteristic catalog

The *Characteristic catalog* operation is for displaying the structure view of the characteristic catalog. This view is recommended for creating and editing characteristic categories.

You can get to this view by executing the *Characteristic catalog* operation on the *All* category.

Rebuild Characteristic Catalog

The *Rebuild Characteristic Catalog* operation is for updating the display of the characteristics in the menu tree under *Products* → *CLC* → *Characteristics*. Changes to the characteristic categories in the characteristic catalog do not become visible until after a client is restarted in the menu tree.

6.2.2 Characteristics

Menu Access

Characteristics can be initially defined in class lists of characteristics regardless of later use. The following first describes the method via the structure view of the characteristic catalog. For information on how to reach the structure view, refer to *Menu Access* (page 38).

Creating a new Characteristic

1. In the structure view of the characteristic catalog for the desired characteristic category in the *Characteristics in this category* node, select the pop-up menu item *New ...*.
2. The new record dialog opens. All fields labeled *red* in this dialog must be filled out to create a new characteristic.

Master Data

Characteristics are described in *CONTACT Virtual Product* with the attributes compiled in the characteristic category data sheet.

The default configuration uses the following attributes:

Labeling (de) German label of the characteristic. In particular, appears in the part dialog when entering characteristic values.

Category ID of the characteristic category to which this characteristic is to belong. When a new characteristic is created using the characteristic catalog, the attribute is already filled.

Preferred Identification Abbreviated name of the characteristic independent of the use in characteristics. This identification must be assigned if the characteristic is to be used later in class lists of characteristics. An additional use-specific identifier is issued if a characteristic is allocated to a class list of characteristics.

Unit (display) Unit of the characteristic, such as `kg`, `mm`, `m` etc. This value can be entered directly or selected via a catalog. In particular, appears in the part dialog when entering characteristic values.

Data type Text, Boolean value, floating point number or integer, specifying the number of places before and after the decimal point. Also determines the data type of the database attribute of the characteristic values. If, in the case of data type `Z` (floating point), the value `0` is selected for the number of decimal places, the system creates an integer data type for adding the characteristic values in the database. Otherwise, it creates a floating point data type. In the case of data type `T` (text), the number of places before the decimal point defines the maximum length of the text field. For data type `B` (Boolean value), the length is always `1`. Otherwise, specifying the number of places for floating point numbers and integers has no impact. Note that the information can be transmitted via interfaces to third-party systems (e.g. PPS) and take effect there. Thus the information must be chosen carefully.

Characteristic definition Description (long text field) of the characteristic.

The following attributes are located on the *Details* tab of the characteristic data sheet:

ID Unique key of the characteristic. This value is assigned automatically when the characteristic is created.

Dimension Letter Unit (e.g. `mm`) from the value range of units of the physical quantity based on DIN 4000/4001/4002. The information has no impact on the function.

Physical Quantity Physical quantity of the characteristic (refer also to the administration manual for *CONTACT Virtual Product* or ask your administrator). Select a physical quantity only if you want a characteristic value to be able to be specified in different units of measure (e.g. *m*, *cm* or *mm*). In this case, only *Data Type = Z* (floating point) is permitted.

Value Range If set, the definition of a value range is taken into account, see *Value range* (page 41).

Only catalog values allowed Enabling this dialog field specifies that when specifying a value later, only values from the generated catalog can be selected.

Catalog Catalog to be used in the part dialog for selecting a characteristic value. Specifying a browser is logical only if this browser has been defined in advance by the system administrator. These types of browsers used if its requirements go beyond simply determining value ranges.

Characteristic type, responsible, status, version These fields are used for information for a characteristic according to DIN 4000/4001/4002 and do not have influence on function. However, the status must be provided with the value `1` (default) so that system takes the characteristic into account.

In addition, the *Value Range* and *Class Lists of Characteristics* tabs are available:

In the *Value Range* tab, the values can be determined for which the amount is to be able to be selected later when issuing a characteristic value to a part. Individual values are created and edited by activating the pop-up menu for a hit in the list or in the empty tab.

The *Class Lists of Characteristics* tab lists the class lists of characteristics in which the selected characteristic is used. The list can be expanded and edited using the pop-up menu.

Operations and relationships

Within the structure view of the characteristic catalog, you can edit the characteristics via their pop-up menu. To do so, select a characteristic in the structure view and open the corresponding pop-up menu by right-clicking.

The pop-up menu contains both general operations explained in the *CONTACT Elements Client Reference* as well as special operations that are self-explanatory.

6.2.3 Characteristics group

Menu Access

The characteristics group hierarchy is accessible in the menu navigation under *Products* → *CLC* → *Characteristics Group Hierarchy*. Initially, the *root* characteristics category with *object plan* type and name is available with the *Search ...* operation without a restrictive search condition.

This is the top entry in the hierarchy. All other characteristics groups have to be arranged below this. If you foresee using the classification hierarchy frequently, it is recommended that you store the *root* entry under the *Object Plan* name as personal favorites (to do so, see *CONTACT Elements Client Reference*) with the *Characteristics Group Hierarchy* operation for fast access.

Creating a new Characteristics Group

1. Use the corresponding node *Sub characteristics groups* in the structure view to select the *New ...* pop-up menu item. A hierarchy, which may also have multiple levels, is structured through the successive creation of characteristics groups from top down.

2. The new record dialog opens. Fill out this dialog and confirm it by pressing *OK*.

   Note: Class lists of characteristics and characteristics groups are not allowed to have identical names. Their names must be different.

3. Now a second dialog appears, with which the new child characteristics group is defined in the context of its parent characteristics group.
4. Fill out the *Classification* attribute here and confirm it by pressing *OK*. The new characteristics group is now arranged in the object plan.

   Note: *Classification*

   A characteristics group is coded as part of the classification plan. This coding is also used for the representation in the application area if the `smfm` property is suitably assigned. The coding forms a subcomponent of the identifier (logically: class key or class path) in the system, which is composed of the classifications along the characeristics group hierarchy. Example: 0010-0280-0100-0200 for Area-Class-Group-CLC.

Master Data

Characteristics groups are described in *CONTACT Virtual Product* by the attributes summarized in the characteristics group data sheet.

The default configuration uses the following attributes:

Characteristics group Unique short label for the characteristics group. This label is also used for the representation in the system.

Type Typification as part of the characteristics group hierarchy. We recommend the following hierarchy:

1. *Division*
2. *Class*
3. *Group*

The use of these values has no impact on the system function. An assigned class list of characteristics is automatically typified as *Family*.

Labeling (de) German designation for the characteristics group.

Labeling (en) English label for the characteristics group.

Icon Icon identifier from the icon configuration, which is used to determine the symbol displayed in the characteristics group hierarchy.

Usually, no icons are specified for class lists of characteristics. In the standard distribution, therefore, only administrators have authorization to create new icons.

In addition, the *Sub Characteristics Groups*, *Associated documents* and *Class Lists of Characteristics* tabs are available. The *Sub Characteristics Groups* tab lists the sub characteristics groups with the attributes *Characteristics Group*, *Type* and *Labeling (de)*. The *Associated documents* tab lists the documents assigned to this characteristics group. The *Class Lists of Characteristics* tab lists the class lists of characteristics used in this characteristics group. The lists in these three tabs can be expanded and edited via their pop-up menu.

Operations and relationships

Pop-up menu for the characteristics group

Once you have received a result list from a search, you can edit the characteristics groups in the result list via their pop-up menu. To do so, select a characteristics group in the result list and right-click to open the corresponding

pop-up menu.

The pop-up menu contains both general operations explained in the *CONTACT Elements Client Reference* as well as special characteristics group operations.

Pop-up menu items

New... To create a new characteristics group, see *Creating a new Characteristics Group* (page 41) in *Menu Access* (page 41).

Generating a characteristics group hierarchy To generate a characteristics group hierarchy, see *Rebuild Characteristics Groups Hierarchy* (page 43).

Characteristics Group Hierarchy To display the structure view of the characteristics group hierarchy, see *Characteristics Group Hierarchy* (page 43).

Object Plan To display the object plan, see *Object Plan* (page 43).

Sub Characteristics Group To display the sub characteristics groups, see *Sub Characteristics Groups* (page 43).

Associated documents To display the documents associated with the characteristics group, see *Associated documents* (page 43).

Class List of Characteristics To display the class lists of characteristics associated with a characteristics group, see *Class Lists of Characteristics* (page 44).

Rebuild Characteristics Groups Hierarchy

The *Rebuild classification tree* operation is for updating the display of the characteristics groups in the menu tree under *Products* → *CLC* → *Class Lists of Characteristics*. Changes to the characteristics groups in the characteristics hierarchy do not become visible in the menu tree until after the client has been restarted.

Characteristics Group Hierarchy

The *Characteristics Group Hierarchy* operation is for displaying the structure view of the characteristics group hierarchy. This view is recommended for creating and editing characteristics groups.

You can get to this view by executing the *Characteristics Group Hierarchy* operation on the *root* category.

Object Plan

Object Plan calls up the multimedia object plan. This makes it possible to navigate within the characteristics groups while visualizations (images, drawings) of the characteristic groups are displayed at the same time; also refer to *Selecting from the graphic object plan* (page 49).

Sub Characteristics Groups

Sub Characteristics Groups calls up a result list with the characteristics groups that are under the selected characteristics group. The characteristics groups can then be edited in this list as usual via the pop-up menu.

Associated documents

Associated documents calls up a result list with the documents assigned to the characteristics group. The documents can then be edited in this list as usual via the pop-up menu; to do so, see the *CONTACT Documents* application manual.

Class Lists of Characteristics

Class Lists of Characteristics calls up a result list with the class lists of characteristics that the characteristics groups are based on. The class lists of characteristics can then be edited in this list as usual via the pop-up menu.

6.2.4 Class Lists of Characteristics

Menu Access

The class lists of characteristics are accessible in the menu navigation under *Products* → *CLC* → *Class Lists of Characteristics*. You can use this menu item to create a class list of characteristics or search for an existing one.

Creating a new Class List of Characteristics

1. Select the *New ...* operation in the pop-up menu of the menu tree.
2. The new record dialog opens. All fields labeled *red* in this dialog must be filled out to create a new class list of characteristics. Fill out this dialog and confirm it by pressing *OK*.
3. Alternatively, you can also create a new class list of characteristics in the *Class List of Characteristics* relationship of a characteristics group. Creating in this way automatically assigns the class list of characteristics to the characteristics group. Now the assignment dialog appears, with which the new class list of characteristics is defined in the context of its characteristics group. Only the *Classification* attribute has to be specified in the dialog.

   Note: *Classification*

   A class list of characteristics is coded as part of the classification plan. This coding is also used for the representation in the application area when the `smfm` property is suitably assigned. In addition, the coding forms a subcomponent of the identifier (logically: class key or class path), which is composed of the classifications along the characteristics group hierarchy. Example: 0010-0280-0100-0200 for Area-Class-Group-CLC.

   ---

4. Confirm the dialog with *OK*. As a result, the new class list of characteristics is arranged in the object plan.

Master data

Class Lists of Characteristics are described by the attributes summarized in the data sheet.

The default configuration uses the following attributes:

Class List of Characteristics Unique short label for the class list of characteristics (mandatory field). This label is also used for the representation in the application area when the `smfm` property is suitably assigned. To do so, please contact your administrator.

Note: The short label has to differ from the assigned characteristics group! We recommend specialization of the designation for the characteristics group, particularly if multiple class lists of characteristics (part families) are expected to be created for a characteristics group.

Label Label of the class list of characteristics in the currently set language. Translations for other languages are in the *Translations* tab.

Description Detailed description of the class list of characteristics.

Norm number, Norm title Information about a class list of characteristics corresponding to DIN 4000/4001/4002. These have no impact on the function.

Icon Icon identifier from the Icon configuration, which is used to determine the symbol displayed in the characteristics group hierarchy.

Usually, no icons are specified for class lists of characteristics. In the standard distribution, therefore, only administrators have authorization to create new icons.

More information is also in the *Details* tab. The *Labeling Rule* field enables input of a regulation to create a text from the data of a classified part. By programming a user exit, the texts generated this way can be used at any place in the system, for example, to automatically fill in a short text in the part, or to supply an ERP system. For a description of the input options, see *Labeling Rules* (page 47).

The fields *Norm labeling*, *Issue date of norm*, *Version of Characteristic File*, *Version of programs*, *Responsible division* and *Format version of file* can accept information from standardization organizations such as DIN.

Operations and relationships

Pop-up menu for the class list of characteristics

Once you have received a result list from a search, you can edit the CLCs in the result list via their pop-up menu. To do so, select a data record in the result list and open the corresponding pop-up menu by right-clicking.

The pop-up menu contains both general operations (explained in the *CONTACT Elements Client Reference*) and special document operations and commands for calling up the relationships of a document to other objects.

Pop-up menu items

Rebuild this Class Lists of Characteristics To save this class list of characteristics, see *Rebuild this Class Lists of Characteristics / Rebuild Class Lists of Characteristics* (page 45).

CLC Overview To display the CLC overview, see *CLC Overview* (page 45).

Rebuild Class Lists of Characteristics To save a class list of characteristics, see *Rebuild this Class Lists of Characteristics / Rebuild Class Lists of Characteristics* (page 45).

Documents To display the documents assigned to the class list of characteristics, see *Documents* (page 46).

Classified parts To display the parts classified with the class list of characteristics, see *Classified parts* (page 46).

CAD views To display the CAD views assigned to the class list of characteristics, see *CAD views* (page 46).

Presettings To display the presettings assigned to the class list of characteristics, see *Presettings* (page 46).

CLC Overview

CLC Overview calls up the structure view of the selected class list of characteristics.

Rebuild this Class Lists of Characteristics / Rebuild Class Lists of Characteristics

After you have created or changed class lists of characteristics, corresponding definitions have to be provided in the remaining areas, particularly in the part data sheet. To do so, select the operation *Rebuild this Class Lists of Characteristics* to make available the changes to the just selected class list of characteristics, or select *Rebuild Class Lists of Characteristics* to make available all previous changes in the class lists of characteristics.

Note: Please note that your changes will not take effect until one of the two operations has been carried out for other users! For you, the changes will not become visible until after a client restart.

Documents

Documents calls up a result list with the documents that have been assigned to the class list of characteristics so far. The documents can then be edited in this list as usual via the pop-up menu (see the *CONTACT Documents* application manual).

Classified parts

Classified parts calls up a result list of the parts that have been assigned to the class list of characteristics so far. The parts can then be edited in this list as usual via the pop-up menu; see *Pop-up menu of the part* (page 9).

CAD views

CAD views are for highlighting prototypes (master models), which are used for the parametric design in combination with corresponding integration modules for CAD systems.

How to define a CAD view

1. Select the *CAD views* tab in the *Change* dialog of the class list of characteristics in question and the *New ...* pop-up menu item.
2. The new record dialog opens. All fields labeled *red* in this dialog must be filled out to define a CAD view.

Attributes of the Create dialog

Class List of Characteristics Name of the class list of characteristics for which a view is to be defined. The system enters the value of the class list of characteristics here for which the CAD view is to be defined.

Model No., Model index CAD document that defines the view. Select the document from the list of options.

View Name of the view.

Additional fields These are to be specified depending on the CAD system to be supplied.

3. Fill out this dialog and confirm the input by pressing *OK*. This establishes the assignment of a document to a class list of characteristics as a CAD view. Particularly in the case of 2D CAD systems, it may be necessary to specify multiple views (front, side view, etc.). Depending on the CAD system, a selection dialog may appear for selecting a particular view.

Note: The exact significance of CAD views and their attributes depends on the CAD system used and can vary from system to system.

Presettings

For the creation of classified parts, it is possible to configure the settings so that fields of the part dialog are preset with constants or determined values. In doing so, it is possible to configure general presettings (valid for all class lists of characteristics) and CLC-specific presettings.

How to configure the presetting for creating a new part

1. This requires selecting the *New ...* pop-up menu item in the menu tree under *Products* → *CLC* → *Details...* → *Presettings*.
2. The new record dialog opens. All fields labeled *red* in this dialog must be filled out to configure a presetting.

Attributes for the presetting

Class List of Characteristics This attribute concerns the unique short label of the class list of characteristics for which this presetting is to apply. Put an asterisk (*) here if this presetting is to refer to all class lists of characteristics.

Attribute Target attribute of the dialog for creating a new part, to which this presetting refers.

Relation If it concerns a presetting to be determined for the runtime, enter a relation here. When specifying a relation, it absolutely must include an attribute named `pset_id`. On the other hand, if the targeted field of the dialog for creating a new part is to be preset with a constant character string, the *Relation* field remains empty.

Value If the *Relation* field above is filled, specify the attribute of this relation relevant for the presetting here. If the *Relation* field is empty, a constant character string with which the presetting is carried out is specified here.

Condition If the *Relation* field contains a relation name, you can enter an additional condition at this place.

Presettings specific to class lists of characteristics can also be configured via the *Presettings* tab of a class list of characteristics data sheet. There, the *Class List of Characteristics* field is already preset with the corresponding class list of characteristics short label (ID).

Labeling Rules

A labeling rule is a sample text into which the values of the attributes and characteristics of a part are inserted. The fields to be inserted are specified for this in brackets, for example: *Measurements [Name1]x[Name2]*.

To access characteristics of a part, their characteristic identification must be specified. Other part characteristics can be referenced using the name of the respective database attributes.

For a metric screw with the characteristics *D* (diameter) and *L* (length), a labeling rule format `M[D]x[L]` would result in designations such as *M5x60*, *M10x80* etc.

Characteristics for which the values are in physical sizes, are normalized automatically to the basic unit of the respective unit definition.

In addition to the simple option of specifying the name of the desired characteristic in brackets, extensions can be used to format and prepare the fields to the smallest detail. Using these extensions requires basic knowledge of Python programming language.

Labeling rules can be used in Powerscript code, e.g. with the API-Method `cs.vp.classification.sml.AddDescriptiveText()`.

Syntax for fields in designation rules

The general syntax for referencing characteristics is:

[Modifier(Name)!Expression\Format]

The elements *Modifier()*, *!Expression* and *\Format* are optional for this. However, the order of the specifications is binding.

Do not use normalization of physical sizes

For some characteristics, normalizing to the basic unit of the underlying unit is undesirable. In this case, handling the field in the labeling rule can be modified using the `asgiven()` modifier so that value and unit are entered into the sample text as specified by the user when evaluating the characteristic.

For example, for capacitors with a capacitance *C*, a rule in the `C [asgiven(C)]` format causes the desired outputs *C 10nF*, *C 500pF*, etc.

By default, the modifier `normalized()` is used for unit-based sizes. This modifier provides the value normalized to the basic unit of the size definition used.

Output Formatting

Formatting rules can be added to fields by entering them behind a vertical line, for example: `[name|%0.1f]`. Here, the formatting rules of the Python programming language are permitted. Unit-based values require two inputs: one for the value and one for the unit. The default for characteristic values that are floating points is `%g` and `%s` for all other values. For the output of unit-based values, the unit is formatted with `%s` by default and attached to the value without a separator.

Using Expressions

Python programming language expressions can be added to fields by entering them behind an exclamation point. Here, the determined characteristic value with the label `prop` can be accessed. The value to be entered in the sample text is the result of the Python expression. An example would be a conversion into another unit using multiplication: `[L!prop*1000.0]`.

Assigning Characteristics

Characteristics can be generated using the operations in the *Pop-up menu for the class list of characteristics* (page 45). However, this does not yet assign characteristics to one or multiple class lists of characteristics. This type of assignment is best carried out in the known structure tree of the characteristics group hierarchy. Desired characteristics must already have been listed previously as part of the characteristic catalog.

Starting from the class list of characteristics in question, navigate to the *Characteristics* subfolder. Use the *New...* command in the folder's pop-up window to assign a characteristic. The create dialog appears with the following attributes:

How to Assign a characteristic to an CLC:

1. Select the *New...* command in the classification hierarchy structure view in the *Characteristics* subfolder of the corresponding class list of characteristics.
2. The assignment dialog opens. All fields in this dialog labeled in *red* must be filled out to assign a characteristic to a CLC.

Attributes

Class List of Characteristics List to which the characteristic is to be assigned; preset by the system.

Position Unique integer used to determine a sequence of characteristics in the class list of characteristics (mandatory field).

Characteristic Characteristic to be assigned. The characteristic catalog is ready for selection here. If no characteristic is selected, for instance because the desired characteristic has not yet been created in the characteristic catalog, the (pseudo)characteristic *not yet filled* is assigned by the system automatically. However, a regular assignment should be made before using the class list of characteristics!

Identification Identification specifically for using the characteristic in this class list of characteristics. The identification must be assigned uniquely in the context of the class list of characteristics, since it forms the characteristic reference code along with the class list of characteristics. The identification is also displayed in the part data sheet. It is usually used to identify the characteristic in schematic diagrams. In combination with CAD parametric modeling, the identification must be identical to the symbol/placeholder of this characteristic in the generic part of the respective CAD system. Thus,

the characteristic identification is used to map the characteristic value to the parameters of a (CAD) document.

The identification is also used for generating the attribute name in the data dictionary. Therefore, SQL keywords, such as `create`, `delete`, `update`, `table`, `lower`, etc., cannot be used.

The following attribute is also located on the *Details* tab:

Catalog A catalog for using the characteristic in this class list of characteristics can be defined here, which deviates from a browser definition of the characteristic. The browser is provided when selecting a characteristic value in the part data sheet.

3. Fill out these dialogs and confirm them by pressing *OK*. The characteristic is now assigned a class list of characteristics.

Note: Alternatively, you can assign an entered characteristic to a class list of characteristics using Drag&Drop.

6.3 Using the class lists of characteristics

This section deals with handling the class lists of characteristics. It describes how to select, search and assign class lists of characteristics.

6.3.1 Selecting a class list of characteristics

To use a part in the context of a class list of characteristics, it must be determined. The options described below are available for this purpose.

6.3.2 Selection in the menu navigation

Navigate to the desired subject class list of characteristics starting from the *Products* → *Parts* → *CLC* section in the menu navigation. If the *New...* or *Search...* command is selected in its pop-up menu, the command is carried out in the context of the class list of characteristics. The *Create dialog of a part family* (page 50) shows a corresponding create dialog for a part family as an example, which is displayed after selecting the class list of characteristics and setting the *New...* command. The characteristics of the class list of characteristics can be edited in the *Characteristics* tab.

6.3.3 Selecting from the selection dialog

The *Characteristics Group* is provided with a selection dialog in the part master masks. You can assign a class list of characteristics to the part using this selection dialog.

After determining the class list of characteristics in the selection dialog, the tabs for entering the characteristics are added in the displayed masks automatically. This occurs if the input focus is switched from the *Characteristics Group* field to another field.

6.3.4 Selecting from the graphic object plan

Along with the navigation through the classification hierarchy based on a conventional folder structure or directly entering the class list of characteristics, the *Graphic object plan* is available as an alternative. This variant makes it possible to navigate through the classification hierarchy based on an illustrated list of options.

The object plan can be called up via the *Object Plan* pop-up menu item from the menu navigation *Products* → *Parts* and via each of the underlying hierarchy nodes. The object plan is displayed in an eLink window with

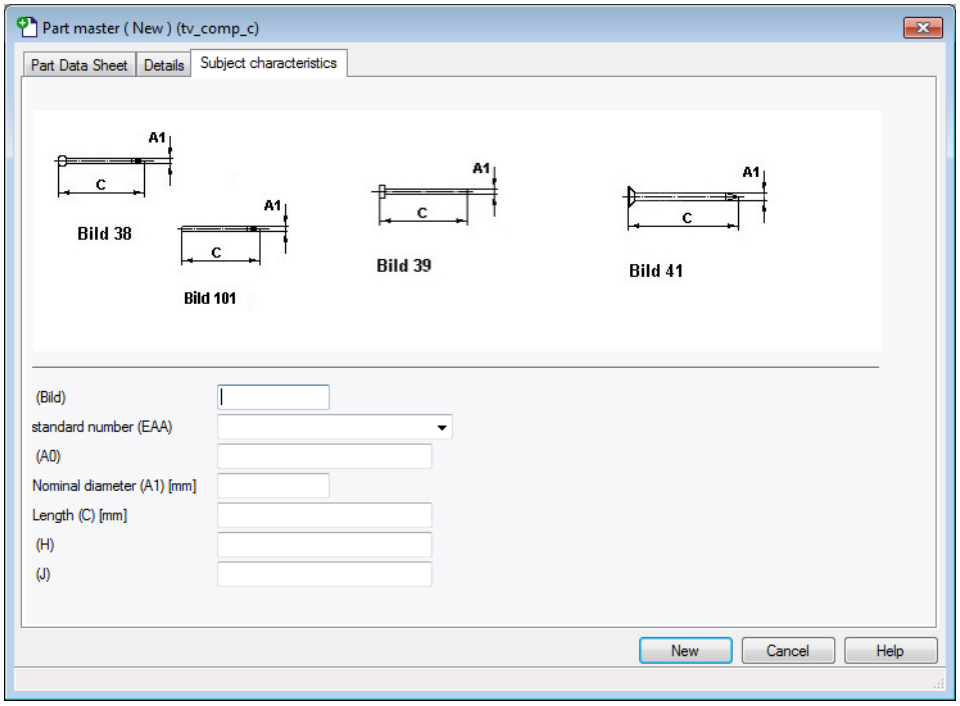


Fig. 6.2: Create dialog of a part family

the title *Object Plan*. After being called up, it displays the characteristics groups directly under the node of the classification hierarchy used to call up the object plan. Each characteristics group is displayed and illustrated by an image (if previously created by the position involved - usually standardization), the short label and a full designation. Each of the mentioned elements represent a hyperlink, which, when activated, branches to the underlying characteristics group structures. Similarly to navigating on the Internet or intranet, the object plan can be navigated by simply clicking. The class lists of characteristics (part families) are located on the sheets of the object plan. See *Part families in the graphic object plan* (page 51).

Clicking the image, the search dialog symbol or the *Search* link opens the search dialog for the class list of characteristics in question. The create dialog for the class list of characteristics in question opens by clicking the create symbol or the *New* link.

6.3.5 Searching a part based on characteristics

For a search in the part master without a previously selected class list of characteristics context, all parts are considered regardless of whether and to which class lists of characteristics they are assigned. For a search in the part master with a previously selected class list of characteristics context, only parts assigned to the class list of characteristics are considered. Furthermore, the search can be limited further based on the characteristics from the search dialog tab of the same name.

Searching with or without a context is determined by whether the *Characteristics Group* field has been filled with a value. If this is the case, the *Characteristics* tab is also available for entering characteristic values.

Selection by searching all class lists of characteristics

Along with searching based on characteristics in the context of a certain class list of characteristics, *CONTACT Virtual Product* also offers the option to search based on characteristics regardless of a class list of characteristics. This must meet the following requirements:

1. Characteristics that can be used in more than one class list of characteristics have been defined in the characteristic catalog. This is only a content-related assigned task and not based on the technical system!
2. These types of characteristics are actually used in more than one class list of characteristics.

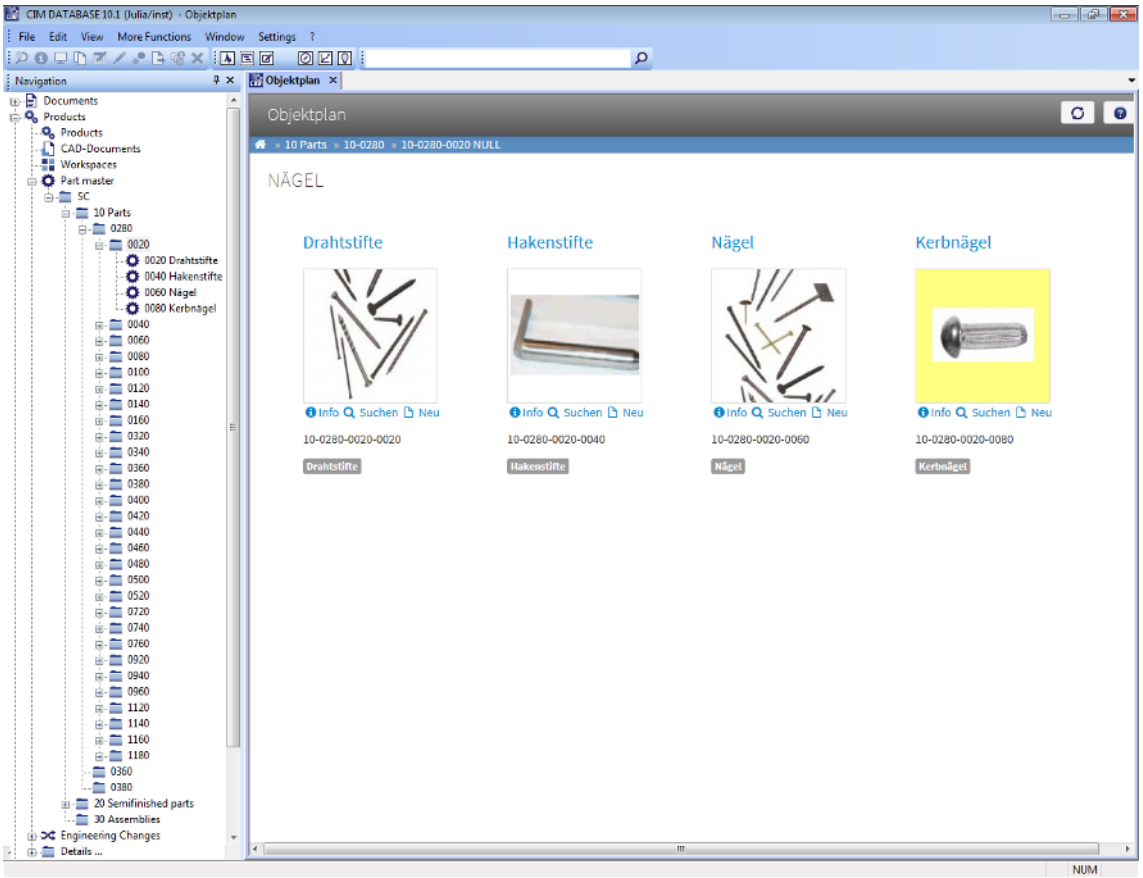


Fig. 6.3: Part families in the graphic object plan

3. The part search dialogs independent of the class list of characteristics must be adapted to be able to search for these types of characteristics.

The preparation and coordination of your administrator and the person in charge of maintaining the characteristic catalog and class lists of characteristics are necessary to meet these requirements. If a search that covers all class lists of characteristics is not yet available or not yet available in the desired form, please contact the relevant personnel.

If the requirements are met, a search that covers all class lists of characteristics is possible as follows:

Along with the usual part master attributes, the part search dialog offers search attributes in a *Characteristics* tab that consider characteristics from the characteristic catalog. Select the desired characteristics from the list of options and assign these characteristics in a characteristic values class list of characteristics for the search as is done for a conventional search. The search is now listed on all class lists of characteristics that contain all of the specified characteristics. In the result list, the selected characteristics are shown at the beginning (left). It is not possible to sort the result list according to multiple criteria.

6.3.6 Assigning Parts to a Class List of Characteristics

Assigning upon Creation

If you would like to assign a part to a class list of characteristics upon creation, you should select the context-related introduction via the menu navigation or the *graphic object plan* (page 49), since the entire context is created immediately in this case. You can also select the class list of characteristics for the *Characteristics Group* upon creation using the list of options.

Subsequent Assignment

How to assign an already existing part to a CLC:

1. Open the pop-up menu of the desired part in the result list and select the *Change* command.
2. Select the class list of characteristics using the list of options for the *Characteristics Group* field.
3. Fill out the part data sheet and, if necessary, the attributes in the *Characteristics* tab. Confirm your entry with *OK*
4. After confirming, another tab is added to the part data sheet.

Changing an Assignment

To assign a part that is already assigned to a class list of characteristics to another list, proceed as for a subsequent assignment.

Important: The characteristic values for the original class list of characteristics are lost when changing the assignment!

Removing an Assignment

How to remove an assigned part from a CLC:

1. Open the pop-up menu of the desired part in the result list and select the *Change* command.
2. Empty the characteristics group field and exit the dialog with *OK*.

The part assignment for the CLC is now removed.

Important: The characteristic values for the original class list of characteristics are lost when removing the assignment!

CHAPTER 7

Variant management

7.1 Introduction

The increasing variety of product variants is increasing the complexity of development; at the same time, cost pressure within global competition continues to increase at a faster and faster pace. Variant management provides a way out of this dilemma. The solution makes a simple definition of the solution space possible thanks to reliable handling of even the most extreme variability models. Variants can also be modeled in early draft phases without a part reference. The development process of products with a great number of variants is systematically supported in the PLM system and downstream areas such as Purchasing and Logistics. In other words, the ERP system can be supplied with the required information automatically.

7.2 Property catalog

Properties are used to describe the variability of a product. *CONTACT Virtual Product* gives you the ability to manage properties in the form of a property catalog in order to support or make it easier to reuse properties. Usually, the property catalog is synchronized with the corresponding catalog from a ERP system.

Note: A user must be assigned to the role *Administration Variant Management* to be able to edit and manage the property catalog.

7.2.1 Catalog folders

Catalog properties can be structured via folders. You can obtain an overview using the folder structure of the property catalog by clicking *Overview* in the pop-up menu of the navigation node *Administration/Configuration → Catalog Administration → Products → Catalog properties* Here, you can find a pre-defined top-level folder called *Property catalog*. You can create subfolders in the context of a catalog folder. To do so, use the *New* operation in the catalog folder pop-up menu.

Assigning properties

Catalog properties require a folder context. Assigning to multiple folders is usually carried out via Drag&Drop in the catalog overview.

If you delete the folder assignment of a property not assigned to another folder, the property is assigned to the top-level folder automatically.

7.2.2 Catalog properties

You can only create catalog properties in the context of a catalog folder. If you create a catalog property without a context, for instance using the navigation nodes *Administration/Configuration -> Catalog Administration -> Products -> Catalog properties*, the property is assigned automatically to the predefined top-level folder *Property catalog*.

Create

To create a new catalog property, open the catalog property pop-up menu and select the *New* entry there. This opens the create mask for catalog properties. You can enter the data of the new property here. While doing so, note the following instructions:

Name (de) Here, enter the description for the catalog property. This is a mandatory field.

Name (en) Here, enter the description for the catalog property in English. This field is optional. If nothing is entered here, the system automatically enters a value according to the pattern *{<Name (de)>}* (German name in curly brackets).

Data type Select a value here using a list of options. You can choose between `alphanumeric`, `numeric` and `boolean`. The selection made influences the definition of property values for the new property.

Description You can describe the defined catalog property in this free text field.

ERP code You can enter a unique description for the property in this field. The field is preset with the value `--auto--`. If you do not change this value, the ERP code is preset automatically by the system based on the entered data. For properties imported from an ERP system, the ERP code is usually configured with the unique description from the ERP system.

Status For new creation, the system enters the value *New*.

Note:

When you change the data type of a catalog property the following constraints apply:

- A catalog property with data type `alphanumeric` cannot be changed to data type `numeric`.
- A catalog property with data type `alphanumeric` cannot be changed to data type `boolean`.
- A catalog property with data type `numeric` cannot be changed to data type `boolean`.

Life cycle

A catalog property can assume the status values *New*, *Valid* and *Invalid*.

New Newly created properties are initially in the status *New* and cannot be used in a product yet.

Valid You can approve a catalog property for use by changing the status to *Valid*. The status can no longer be changed after this.

Invalid You can change a catalog property in the *New* status to the *Invalid* status. The status can no longer be changed after this.

Usages

You can obtain an overview about the usages of a catalog property in the modification/information mask. To do so, activate the *Usages* tab.

7.2.3 Catalog property values

Properties have a discrete amount of values which describe the variability of a product. In the product context, the relevant variants are a result of selecting a value for each property.

Create

You can create property values in the context of a catalog property. Here, you distinguish between numeric, alphanumeric and boolean property values. For numeric property values, it is sufficient to enter a decimal number in the create mask. For alphanumeric property values, a describing text is entered for each configured language, as well as an ERP code. The following instructions apply for doing this:

Value Folder You have the option to structure the values within a catalog property using folders called value folders. This allows you to map and import property values from ERP systems in a hierarchical manner. However, these folder structures are not taken over in the usages, i.e. the property values always form a flat list in their usages. Value folders are created in the *Value Folder* tab of the catalog property.

Value (de) Here, enter the description for the catalog property value in German. This is a mandatory field.

Value (en) Here, enter the description for the catalog property value in English. This field is optional. If nothing is entered here, the system automatically enters a value according to the pattern `{<Name (de)>}` (German name in curly brackets).

ERP code You can enter a unique description for the property value in this field. The field is preset with the value `--auto--`. If you do not change this value, the ERP code is preset automatically by the system based on the entered data. For property values imported from a ERP system, the ERP code is usually configured with the unique description from the ERP system.

Note: Note that property values can only be changed, deleted or created for properties with an *New* status.

Note: If you create a catalog property with data type `boolean`, two catalog property values will be created and assigned automatically while creating the property. Those values are 0 and 1 and can neither be changed nor deleted. As well, no further property values can be added.

Note: You cannot apply calculated property values to a boolean property.

7.2.4 Rights

The setting preconfigured by default only allows access to the property catalog for the administrator and catalog manager roles. Using catalog properties in a product is permitted for every user.

7.3 Modeling variability

7.3.1 Properties

The variability of a product is described by its properties. These are similar to the catalog properties in many aspects.

Note: A user must have the role *Administration: Variant Management* in order to be able to edit and manage the variability model.

Create

You can create a property either in the context of a product or in the context of a view. In the create mask, you can decide whether you would like to use a template from the property catalog or whether you would like to create a new property manually without a template.

If you use a template from the catalog, the property values are also taken from the catalog upon creation along with the master data of the property. Upon creation, note the following instructions:

Catalog property Catalog properties can be defined by a user specifically authorized to do so. If there is a list of catalog properties, a value can be selected from it. In general, the catalog consists of general product properties such as "comfort", "luxury", "standard", etc.

Product The system already preassigns this field with the name of the product if you create the property from the context of a product. The value cannot be changed.

Name (de) Here, enter the German description for the property. This is a mandatory field.

Name (en) You can enter the description for the property in English here. This is optional.

Data type As a data type, you have the choice between `alphanumeric`, `numeric` and `boolean`. The selection made influences the property value entry.

Variant relevant If activated, the property is taken into account when generating variants.

Interface property If activated, the property can or must be used to use the product as a module within another product (see *Modular Design* (page 65)).

Description Here, you can enter another additional description of the property as free text.

ERP code The ERP code must be unique within a product. By default, the field is prefilled with `--auto--`. If this presetting is not changed, the system automatically generates a unique value using the values that have been defined for the attributes mentioned here (e.g. *Name (de)*).

Note:

When you change the data type of a property the following constraints apply:

- A property with data type `alphanumeric` cannot be changed to data type `numeric`.
- A property with data type `alphanumeric` cannot be changed to data type `boolean`.
- A property with data type `numeric` cannot be changed to data type `boolean`.

Sorting

You can resort the properties within a result list or structure tree. For this purpose, use the pop-up menu operations *Move up* and *Move down*.

Note: If you resort the properties in a structure tree, you have to reload the structure by pressing `F5` to see the effect.

Property Hierarchy

You can create property hierarchies using sub properties.

You can create sub properties in the context of a catalog property. Here the same hints apply as they do when you create new catalog properties. A sub property always needs to have a parent property.

Property values

Create a property value in the context of a property. Here, *CONTACT Virtual Product* distinguishes between numeric, alphanumeric and boolean property values. For numeric property values, it is sufficient to enter a decimal number in the create mask. When creating alphanumeric property values, note the following instructions:

Name (de) Here, enter the description for the property value in German. This is a mandatory field.

Name (en) You can enter the description for the property value in English here. This is optional.

ERP code The ERP code must be unique within a property. By default, the field is prefilled with `--auto--`. If this default is not changed, the system automatically generates a value using the other attributes.

Note: If you create a property with data type `boolean`, two property values will be created and assigned automatically while creating the property. Those values are 0 and 1 and can neither be changed nor deleted. As well, no further property values can be added.

Calculated property values

CONTACT Virtual Product gives you the option to generate new property values automatically by combining the values of dependent properties.

To do so, you first have to assign the dependent properties to the new property. This can be carried out easily using Drag&Drop. To do so, simply drag the dependent properties onto the new property using the mouse.

To automatically generate the property values for the new property, call up the variant editor from the property pop-up menu.

You will then see a table that lists all possible value combinations. Select the combinations that are to be generated as a value for the new property and press the Save button.

You can also delete generated property values at this position.

Note: You cannot apply calculated property values to a boolean property.

7.3.2 Constraints

The possible combinations of property evaluations represent the variants. In many cases, however, not all possible combinations are desired. You can exclude certain combinations by defining constraints.

Constraints are rules that all valid variants must fulfill. However, they are also used to define mapping between product variants and view variants (see *Mapping Constraints* (page 59)).

Constraints always use the following pattern:

```
<Property> <Operator> <Value> <Connective> <Expression>
```

Where:

- `<Property>` is a property configured in the product
- `<Operator>` is either = or != (equal or unequal)
- `<Value>` is a value of the property
- `<Connective>` is either `IF` or `IF AND ONLY IF`
- `<Expression>` is an expression set up via the known predicates/term logic (see *Predicates and terms* (page 58))

Example

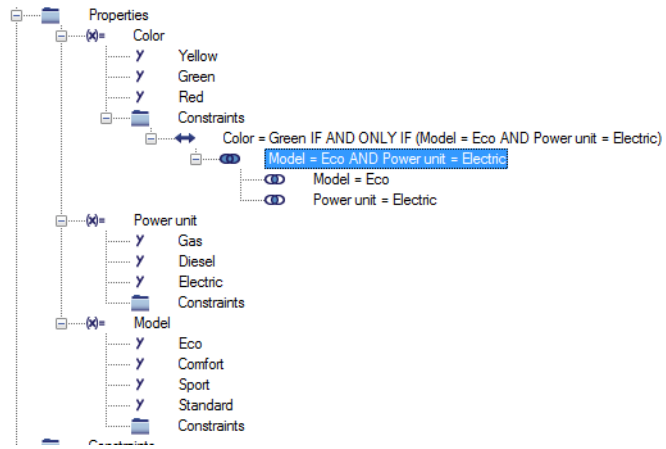
```
Color = Green IF AND ONLY IF Model = ECO AND Power Unit=Electric
```

Predicates and terms

A constraint consists of a head part (e.g. *Color != Red*) and a structure of predicates and terms.

Terms display possible evaluations of properties (e.g. *Color = Red* or *Color = Yellow*). Predicates are collections of terms. Semantically, all terms of a predicate are linked with a logical `AND`. The predicates for a constraint are, in turn, linked with a logical `OR`.

Example



Constraint *Color = Green IF AND ONLY IF Model = ECO AND Power Unit=Electric*

Create

Constraints are defined via Drag&Drop. Drag a property value onto the *Constraints* folder below the property. This is done to create a constraint that, at first, only shows the head part (e.g. *Color = Green*). Then, drag a property value onto the new constraint to add a property evaluation. This creates a new predicate with the desired property evaluation as a term.

Drag a property value onto the predicate to add additional terms to a predicate. To add additional predicates to a constraint, drag a property value onto the constraint. You can also change the operator or the connective in the data sheet.

Example

For example, if you would like to define the constraint,

```
Color != Black IF AND ONLY IF Model = ECO AND Power Unit=Electric
```

proceed as follows.

- First, drag the value `Black` onto the *Constraint* folder below the `Color` property. This creates the constraint `Color = Black`.
- Then, drag the value `ECO` of the `Model` property onto the new constraint. This expands the constraint as follows: `Color = Black IF Model = Eco`.

- Now, drag the value `Electric` of the `Power Unit` property onto the predicate `Model = Eco` below the constraint. This completes the constraint: `Color = Black IF Model = Eco AND Power Unit=Electric`.
- Now, in the pop-up menu of the constraint, select the *Modify* operation to change the operator and the connective (`Color != Black IF AND ONLY IF Model = ECO AND Power Unit=Electric`).

Automatically generated constraints

The variant management gives you the ability to generate constraints automatically that accurately exclude exactly one variant from the solution space (see *Toolbar* (page 61)).

These constraints are highlighted visually by a special icon and cannot be changed manually.

Note: Note here that constraints generated by the system can become invalid if properties or property values are added or deleted. The system can then no longer guarantee that these constraints exclude exactly one property.

7.3.3 Working with views

Views permit describing the product variability from different perspectives. *Views* are considered a differentiated setup of product structures. The design engineer views the product preferably via a functional view. The work planner likely prefers a production and assembly-oriented view, whereas Sales looks at the product from more of a sales-oriented view.

You can create a new view in the context of a product. Here, you can decide in each case whether the new view is to be used for assessing the maximum BOM. In this case, the maximum BOMs can be filtered only based on the properties of this view. If no view has been selected accordingly for assessing the maximum BOMs, the maximum BOMs are filtered based on the product properties, i.e. the properties not associated with a view. Note that you may select only one view for evaluating the maximum BOMs.

Separate properties, constraints and variants can each be assigned for a view in a way similar to that for the product.

Mapping Constraints

Constraints used only to map product variants to view variants are called *Mapping Constraints* in the system. Each constraint between product and view properties is considered a mapping constraint.

Mapping constraints are treated specially by the system compared to *normal* constraints. For example, its type is `IF AND ONLY IF` by default if this is created via Drag&Drop. Furthermore, mapping constraints may only be defined for views. If you attempt to define a mapping constraint at the product level, the system issues a corresponding error message. Mapping constraints between different views are not allowed either.

Variant Mapping

You can assign view variants to a product variant manually, which means that you manually create a mapping between a view variant and a product variant. To do so, drag the view variant onto the product variant in the product overview. Alternatively, you can also generate these types of variant mappings directly in the variant editor (see *Combined view* (page 62)).

Variant mapping is evaluated both when filtering maximum BOMs as well as when instantiating parts.

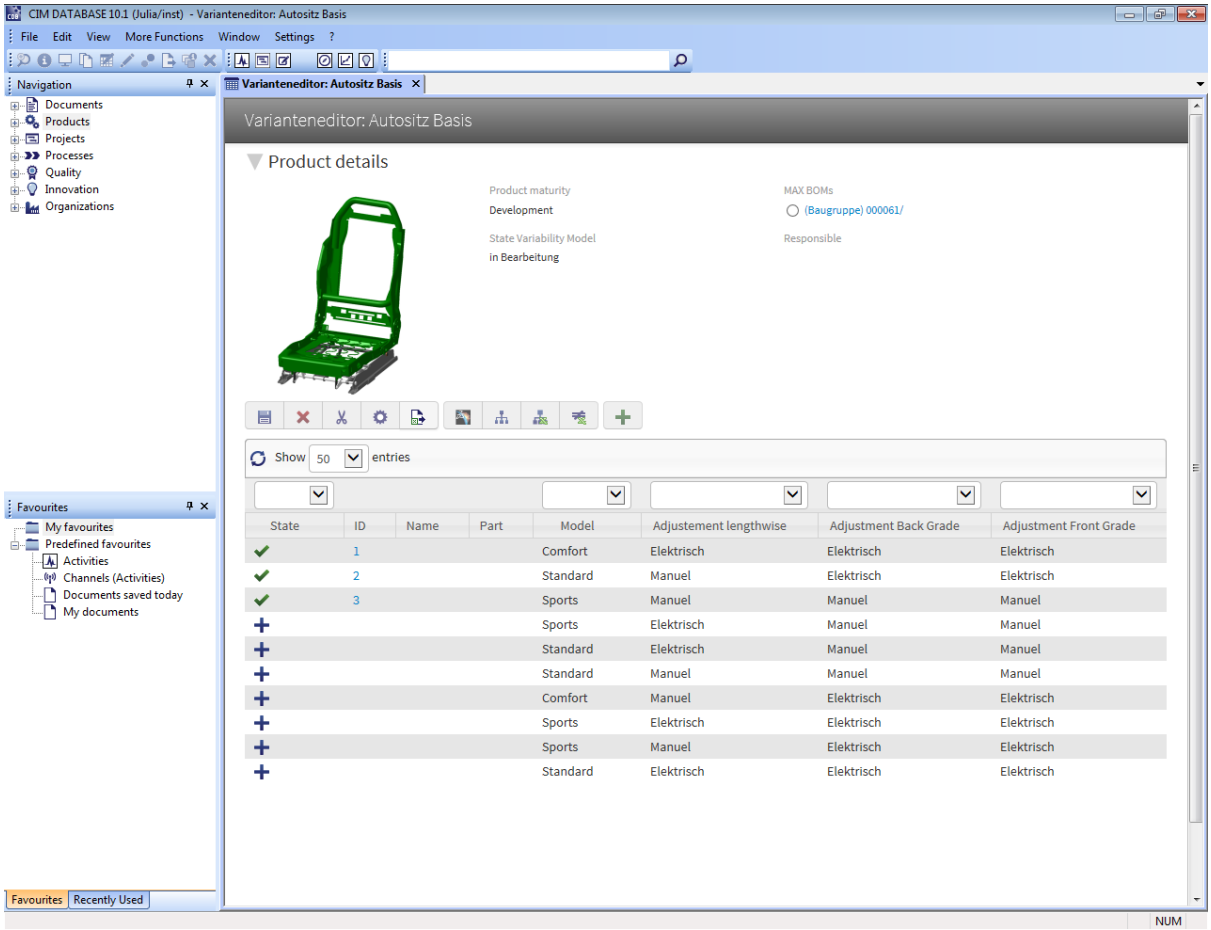


Fig. 7.1: Variant Editor

7.4 Variant Editor

The Variant Editor lets you observe and individually specify a variant of a product along with all of its properties, constraints and views (refer to the beginning of the *Variant management* (page 53) chapter for details).

Start the Variant Editor using the pop-up menu for the product.

An overview of the master data for the product is shown in the upper area of the Variant Editor. The product image is also shown there. At this point, you have the option of changing the product image or importing a new image if the product does not have one yet. In this area, you can also select a maximum BOM that the Variant Editor is to use for bill of material operations.

In the lower area, the Variant Editor shows a table-based overview of the variants resulting from the defined criteria and constraints. The overview of the lower area is called the variant space and shows the collection of different variants for the selected product.

The first four columns of this table describe the individual variants:

Status Shows the status of the variant graphically using an icon. (see *Status* (page 61))

ID If the row is showing a previously saved variant, this row contains the ID for the variant.

Name The manually entered name for the variant (only for saved variants).

Part Hyperlinks to distinct parts, if available (only for saved variants).

You have the option of filtering the columns using a property value or a status.

You can also click on variants to select them in the table. The buttons in the toolbar then refer to the currently selected variants. To select several variants, use the control and shift keys. You can also fix the first four columns of the table, so that they remain visible, when you have many columns.

7.4.1 Variants

The Variant Editor calculates and initially shows all possible combinations of property values that do not contradict the defined constraints. These kinds of variants are called *virtual variants* or *unsaved variants* that exist only in the current session and only in the Variant Editor.

You can, however, subsequently save these virtual variants with the Variant Editor. This creates what are known as *saved variants* in the system. The saved variants then exist across sessions, including outside the Variant Editor. In addition, you can enter a name and a description for saved variants; you can assign other objects to them or develop a new part from them.

7.4.2 Status

Variants have a state that shows whether the variant has been saved and, if yes, if it still continues to meet all of the defined constraints. The following states are possible here:

new Unsaved variants have the *new* state;

ok Saved variants that meet all constraints have the *ok* state;

invalid Saved variants that contradict a constraint have the *invalid* state;

manual Manually created variants have the *manual* state.

A graphic indicates the state in the Variant Editor. The object icon depends on the state for saved variants.

7.4.3 Toolbar

The toolbar in the Variant Editor provides various operations.

Save variant Saves the selected variants.

Delete saved variants Deletes the selected saved variants.

Exclude variants from solution space Generates a separate constraint for each of the selected variants that invalidates the variant being viewed. (see *Automatically generated constraints* (page 59))

Instantiate part Creates a new part from the maximum BOM filtered using the currently selected variant.

Export CSV Exports the displayed table as a CSV file.

Show product structure Filters the maximum BOM using the selected variant and opens its product structure.

Generate BOM Report Filters the maximum BOM using the selected variant and opens its multi-level BOM as a PowerReport.

BOM Comparison Displays a comparison of the selected variants as a PowerReport. Both the filtered BOMs and the variants themselves are compared in the report.

Show variant in CATIA If a corresponding Max CATIA model is assigned to the maximum BOM, the selected variant is shown in CATIA. The entry *Show variant in CATIA* for the CAD-System *CATIA* is preset by default. You can find a description in the administration manual for *CONTACT Virtual Product* how you can add further authoring systems.

Create variant manually If you define a filter for all of the columns of the variant table, it is possible that the Variant Editor cannot display any corresponding variants, e.g. because the selected evaluations contradict a defined constraint. In this case, you have the option of creating a new variant manually that specifically meets the defined filter; you can do this using the *Create variant manually* operation.

7.4.4 Combined view

The Variant Editor gives you the ability to display product properties and product variants as well as view properties and view variants. This requires selecting one or more views from the drop-down menu next to the toolbar.

The variant table then displays all of the permitted combinations of product and view variants. The columns on the left refer to the product variant, then there is a column group for each of the selected views. The additional column *Mapping* is also displayed for each view. An icon is used here to indicate whether a mapping between the product and view variant is saved in the database and if the saved mapping is valid (if applicable).

Toolbar

Some buttons in the toolbar have special actions in the combined view.

Save variants This saves the product and view variants as well as the mapping between them.

Delete saved variants This deletes the product variants and the associated mappings. However, the view variants are not deleted.

Exclude variants from solution space This excludes just the product variants from the solution space.

BOM Comparison This compares the variants of the view highlighted for evaluating the maximum BOM.

Show or hide view properties

The Variant Editor in the combined view also gives you the option of hiding view properties. This allows you to easily check the defined constraints.

Use the *Show or hide view properties* menu next to the toolbar to hide view properties.

If you have hidden at least one view property, the Variant Editor no longer displays the variant state and the variant mapping. The number of view variants for each row is displayed instead; the number is reduced to the displayed value combination after the hide action.

In addition, all of the toolbar operations except for *Export CSV* are disabled in this mode.

7.4.5 Variant Editor in the view context

You can also open the variant editor from the context of a view. You can work with view variants the same way as product variants here.

7.5 Variant matrix

The variant matrix allows you to view and filter all existing variants of a product or create new variants.

Start the variant matrix using the pop-up menu for the product.

The variant matrix displays a table on the left-hand side with all properties and the variants consistent with such properties.

An overview of the selected variants is displayed with the instantiated assembly groups on the right-hand side.

7.5.1 Variant table

The variant table allows you to filter variants by properties or create new variants.

Use the *filter field* above the table to filter the variants by their names. You can also hide variants by clicking the hovering *x icon*. Click the *eye icon* to display all previously hidden variants.

The first two columns of this table describe the individual variants:

Properties Displays the available properties hierarchically.

Evaluation You can filter the variants by property values. Use the check box or the dropdown to filter by any or by specific property values, respectively. You can create a new variant according to the selected property values by clicking the icon in the header of the evaluation column. This requires that the selected properties correspond to a valid variant.

The next columns describe the variants that match the selected evaluations. If no further columns are displayed, then no variants exist for the selected property values.

7.5.2 Variant overview

The variant overview shows additional information on the variant selected in the variant table. You can collapse or expand the variant overview using the *button in the top right*.

The toolbar provides the following operations:

Display product structure Filters the maximum BOM using the selected variant and opens its product structure.

Instantiate part Creates a new part from the filtered maximum BOM using the currently selected variant, see *Instantiating parts* (page 66).

Generate BOM Report Filters the maximum BOM using the selected variant and opens its multi-level BOM as a PowerReport.

Display in 3D viewer Provided the maximum BOM is assigned to a 3D model, the selected variant is displayed on a 3D viewer.

If it exists, a list of the instantiated assemblies is displayed in the lower area. Various operations are available for any selected assembly.

Product structure Graphic depiction of the product structure, see *Product Structure* (page 26).

Usage structure Graphic depiction of the usage structure, see *Usage Structure* (page 11).

Information Detailed information on the assembly, see *Pop-up menu of the part* (page 9).

Status change Change the status of the assembly, see *Pop-up menu of the part* (page 9).

Workflow/New Create a new ad hoc workflow *Pop-up menu of the part* (page 9).

Workflow/New from template Create a new workflow from a template *Pop-up menu of the part* (page 9).

Display part in the 3D viewer If the assembly is assigned to a suitable 3D model, the assembly will be displayed in the 3D viewer, *Pop-up menu of the part* (page 9).

Tip: You can operate the user interface with the keyboard as an alternative to the mouse, as long as you have clicked in the window. The following keyboard shortcuts are available:

Keyboard shortcut	Meaning
`Tab`	• Move focus (forward)
`Shift + Tab`	• Move focus (backwards)
`Left`	• Collapse tree element
`Right`	• Navigate right in table
`Up`	• Navigate up in table or list
`Down`	• Navigate down in table, list or dropdown
`Alt + Down`	• Open a focused dropdown
`Enter`	• Activate a focused button • Confirm the modal dialog
`Esc`	• Cancel a selection in the dropdown • Cancel the modal dialog
`Space bar`	• Toggle a check box • Collapse or expand structure • Select a table column

7.6 Maximum BOMs

The possibility of filtering maximum BOMs based on selected variants is a key aspect of variant management.

7.6.1 Selection Conditions

Filtering a maximum BOM using a selected variant requires that corresponding selection conditions are initially defined for the variable items of the maximum BOM. The system then checks the property evaluations of the selected variant when filtering the maximum BOM. If these property evaluations meet one of the selection conditions of the BOM item, the BOM item is taken over in the filtered product structure. BOM items that do not depend on any selection conditions are taken over in every filtered structure.

The simplest selection condition consists of just evaluating a property. This leads to an equation of the type <*Property*> = <*Value*>. In order to create a selection condition such as this, use Drag&Drop to drag the property

value to the BOM item. You can then add additional property evaluations to the selection condition. This requires that you drag another property value to the existing selection condition. All of the property evaluations that depend on a selection condition are semantically linked using `AND`.

7.6.2 Alternatives and Options

BOM items of a maximum BOM to which selection conditions are assigned are semantically split into *alternatives* and *options*.

An *alternative* means that two or more BOM items have the same value for the *Position* attribute.

An *Option* means that there is no shared value for the *Position* attribute.

Alternatives and options can easily be distinguished visually by their icons.

7.6.3 Filtering Maximum BOMs

Once you have defined selection conditions, you can filter the maximum BOM using a variant.

Filtering using a saved variant

You can filter maximum BOMs using a saved variant. Use the *Filtered product structure* menu item in the pop-up menu of the variant or the corresponding operation in the Variant Editor to do this. Alternatively, you can select a variant for filtering in the product structure of the part for the maximum BOM. Use the *Configuration* button to do this; the button is located in the upper area of the product structure.

If you have highlighted a specific view (see *Working with views* (page 59) in this regard) for evaluating the maximum BOMs, in principle you are only allowed to filter using variants of that view. However, the system also allows you to filter by a product variant as long as it can be displayed on a unique variant of the highlighted view. This is specifically the case if a unique variant mapping is saved in the system or if a unique variant mapping can be derived from the defined constraints.

Filtering using a virtual variant

You can also filter maximum BOMs using an unsaved variant, i.e. a purely virtual variant. Use the *Show product structure* (page 61) operation of the Variant Editor to do this.

If you have highlighted a specific view for evaluating maximum BOMs, the same information as for saved variants applies: Filtering a maximum BOM requires that you select a variant of the highlighted view.

If you have accessed the Variant Editor in view mode or in the combined view using the view highlighted for evaluation, the selected view variant is used for filtering. If you access the Variant Editor at the product level, the system attempts to map the selected variant to a view variant. If a unique mapping cannot be found, the Variant Editor generates a corresponding error message.

7.7 Modular Design

CONTACT Virtual Product supports the use of products in other products as modules. This allows products and their variability model to be reused and the variability of multi-tiered product structures to be modeled.

Using a product as a module within another product requires the definition of a corresponding interface. The interface is defined using all of the properties that can be used by the parent products for filtering the module BOM. You can define a property such as this by activating the *Interface property* check box in the data sheet for the property.

Note: Interface properties are intended to be taken over from the property catalog. This is required for synchronizing the properties of the parent product.

7.7.1 Using Modules

In order to use a product X as a module within another product Y, drag product X to the *Modules* folder in the overview for product Y. Alternatively, you can also assign product X on the *Modules* tab of the data sheet for product Y.

Note:

- Product X needs to have been approved beforehand; this means it has to have the *Released* status.
- The interface properties of product X are automatically applied to product Y during the assignment process.

7.7.2 Filtering Maximum BOMs

Once you have assigned one or more different products to a product as modules, you can take over the maximum BOM of the assigned modules as components in your maximum BOM. The system can then evaluate the selection conditions in the modules using the interface properties in the parent product. This allows you to filter the maximum BOMs of the modules using a variant of the parent product.

Note: Keep in mind that you can only filter the maximum BOM of a module using the interface properties. The selection conditions that apply to other properties are ignored.

7.8 Instantiating parts

Variant management makes it possible to filter maximum BOMs based on selected variants. Often it is also desired to create a *concrete instance* of such a filter. For this purpose, the variant management offers the ability to instantiate corresponding parts into one product variant. The parts generated automatically in this way are assigned both to the product and to the source variant, i.e. the parts' context is visible.

Parts instantiated in such a way receive no saved BOM by default, as this is can be generated and used dynamically at all times by filtering the maximum BOM using the source variant assigned to that part.

In order to instantiate a new part from a variant, choose the operation *Instantiate part* from the context menu of a saved variant or in the *Variant Editor* (page 61) or the *Variant matrix* (page 63).

Optionally, you can permanently instantiate the BOM of a variant with a saved BOM by selecting *Persistently instantiate BOM*.

In this case, all variable sub-assemblies must also be instantiated. Furthermore, you can choose to re-use an existing type for every sub-assembly group.

Selecting this option and confirming the dialog opens a window to support this step.

The window displays a list of all new sub-assembly groups to be instantiated and a preview of the instantiated product structure.

In this list, you can select for any variable assembly whether a new copy should be instantiated or an existing part with valid properties should be used. A sidebar showing the property evaluations for the variant can be displayed on the left.

A preview of the product structure of the part instantiated from the maximum BOM is displayed on the right. This visualizes the decisions made in the list. Additionally, any items selected in the list are also highlighted in the product structure for your convenience.

If you select the *Instantiate now* button using the mouse or keyboard, the parts will be persistently instantiated according to the settings in the list and the newly instantiated part for the maximum BOM is displayed as a product structure.

Tip: You can operate the user interface with the keyboard as an alternative to the mouse, as long as you have clicked in the window. The following keyboard shortcuts are available:

Keyboard shortcut	Meaning
`Tab`	• Move focus (forward)
`Shift + Tab`	• Move focus (backwards)
`Left`	• Collapse tree element • Collapse or expand sidebar • Navigate left in table
`Right`	• Expand tree element • Collapse or expand sidebar • Navigate right in table
`Up`	• Navigate up in tree, table or dropdown
`Down`	• Navigate down in tree, table of dropdown
`Alt + Down`	• Open a focused dropdown
`Enter`	• Select a part in the dropdown or • Enable closing button
`Esc`	• Cancel selection in dropdown
`Space bar`	• Select a table row

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