



# Infor LN Manufacturing User Guide for Product Configuration

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## About this Guide

This document describes the processes that are available to configure complex items in LN. Setup and handling information is provided for both the PCM Configurator and the Product Configuration (PCF).

### Document summary

### How to read this document

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## Chapter 1: Introduction Product Configuration

### How to configure product variants and generate product structures

The procedure to configure product variants and generate product variant structures is composed of a number of separate steps.

The product variant configuration process differs dependent on the module it is initiated from:

- Product Configuration (PCF) in Manufacturing
- Sales Control in Order Management
- Project Control (PCS) in Manufacturing
- Budgeting in Project
- Project Planning and Requirements (PSS) in Project

If you initiate a product variant from Product Configuration, you must define a product variant code before you start the configuration process. The product variant has the **Standard Variant** reference type.

In the other modules, LN generates a product variant code so you can start the configuration immediately. The product variant has one of the following reference types: **Sales Quotation, Sales Order, Budget, Project (PCS), Standard Variant, OR Project**.

#### The configuration process

The configuration process section consists of the following subsections:

- To configure a product variant
- To select an option value
- To validate an option value
- To validate an option set
- To validate a product variant

#### To configure a product variant

- 1 Open the **Product Variants (tipcf5501m000)** session, and start the details session.
- 2 Determine the generic item for which you want to configure a product variant.
- 3 Start the configuration process from the **Product Variants (tipcf5501m000)** details session.
- 4 LN reads the generic configuration structure and searches for the *option set* for the top of the product structure.

- 5 If the option set is found, the set is displayed in the **Product Configurator (tipcf5120m000)** session; go to step 6. If the option set is not found, nothing is displayed in the **Product Configurator (tipcf5120m000)** session; go to step 10.
- 6 LN reads the first option set of the generic item. Refer to subsection To read option sets.
- 7 Click the **Option** field of a product feature. Double click '.' to display the valid options. The options are displayed in the Options by Product Feature and Configurable Item (tipcf1110m000) session. Select the desired option value. Refer to subsection To select an option value.
- 8 LN validates the selected *option* value. Refer to subsection To validate an option value.
- 9 Repeat steps 7 and 8 for each new feature. After you selected a option for each product feature, LN validates the entire option set. Refer to subsection To validate an option set.
- 10 Click the next group button to prompt LN to search for the next (lower level) option set for the item.
- 11 LN searches for the next option set and performs the constraint section **Validation** for the components of the generic bill of material.
- 12 LN checks if another option set is available on this level. If Yes, go to step 5. If No, go to step 13.
- 13 LN validates the product variant. Refer to subsection To validate a product variant.

#### To read option sets

- 1 LN reads the product features of the generic item and searches for the first product feature (the first option set) of the generic item in the top of the structure.
- 2 LN checks if a product constraint is linked to the product feature. If Yes, go to step 3. If No, go to step 7.
- 3 LN reads the product constraint and performs the **Before Input** constraint section.
- 4 LN checks if the input or display of option values is allowed. If Yes, go to step 5. If No, go to step 6.
- 5 LN checks if there are any additional features for which steps 2 through 4 must be performed. If Yes, go to step 8. If No, go to step 7.
- 6 If the input of an option value is not allowed, LN initializes the option with the value defined in the **Before Input** constraint section, and continues the procedure from step 8. If input and display are not allowed for any of the options, LN disables the option field. Such option sets are called invisible option sets. Invisible option sets are option sets in which the input or display of an option value is not allowed for any product feature. These invisible option sets are automatically initialized and subsequently validated by the product configurator.
- 7 Select the option values. Option values are discussed further in the To select an option value subsection.
- 8 LN searches for the next product feature of the first option set.

#### To select an option value

- 1 Double click the Option field of the product feature for which you want to select an option value.
- 2 LN checks if a product constraint is linked to that product feature. If Yes, go to step 3. If No, go to step 5.
- 3 LN reads the product constraint and performs the **Before Input** constraint section.
- 4 LN checks if the input or display of option values is allowed. If Yes, go to step 5. If No, go to step 6.
- 5 Zoom to the allowed options. Click '.' to display all valid features in the **Options by Product Feature and Configurable Item (tipcf1110m000)** session. To compose the list of allowed options, LN carries out the **Validation** constraint section of the relevant constraints for each available option. Go to step 7.
- 6 If the input of an option value is not allowed, LN initializes the option with the value defined in the **Before Input** constraint section. Continue the procedure from step 9.
- 7 Select the option value.
- 8 LN validates the option value selected. Refer to subsection To validate an option value.

- 9 Check whether another product feature is present for which options must be selected. If Yes, go to step 1. If No, go to step 10.
- 10 LN validates the option set. Refer to subsection To validate an option set.

### To validate an option value

The option value is only validated if:

- The input of an option value is allowed for the product feature.
  - The option value is not empty.
- 1 LN checks if the options are selective (that is, a set of option values of which you can select one), or whether you must type a value yourself. If selective, go to step 2. If not selective, go to step 3.
  - 2 If a product feature has selective options, LN checks if the selected option value is part of a set assigned to the feature. Then LN checks if the selection date falls within the validity period of the option.
  - 3 If the product feature has no selective options, LN checks if the entered option value falls within the option value domain.
  - 4 LN reads the product constraint and performs the constraint section **Validation**, which determines whether the selected option value is allowed.
  - 5 LN checks if the selected option value is allowed. If Yes, go to step 6. If No, go to step 7.
  - 6 Double click the Option field of the next product feature.
  - 7 If you entered a value that is not allowed, you can call the constraint expression involved.
  - 8 You can record an extensive description or explanatory text that relates to the product variant option by selecting the record in the **Options by Product Feature and Configurable Item (tipcf1110m000)** session, and click Text.

### To validate an option set

Option set validation occurs for each product feature of the product variant option set. LN performs this step before searching for another option set and before terminating the configuration process.

- 1 LN reads the first product feature of the option set.
- 2 LN reads the product constraint and carries out the **Before Input** constraint section.
- 3 LN checks if the input or display of option values is allowed. If Yes, go to step 4. If No, go to step 5.
- 4 LN checks if the options are selective. If Yes, go to step 7. If No, go to step 8.
- 5 If the input of an option value is not allowed, LN initializes the option with the value defined in the **Before Input** constraint section.
- 6 LN performs the **Parameter Substitution** constraint section. You can give the option a fixed value in this constraint section. This value may or may not be calculated with a formula.
- 7 If the product feature has selective options, LN checks if the option value selected is part of a set assigned to the product feature. Then, LN checks if the selection date falls within the validity period of the option.
- 8 If the product feature has no selective options, LN checks if the option selected falls within the option value domain.
- 9 LN reads the product constraint and performs the **Validation** constraint section, which determines whether the option value selected is allowed.
- 10 LN checks if the option value selected is allowed. If Yes, go to step 11. If No, go to step 12.
- 11 LN reads the next product feature of the option set.
- 12 If you have selected an option value that is not allowed, you can correct the option value.



### To validate a product variant

The product variant is only validated if you have selected an allowed option value for each product feature of each option set.

**Note:** You can validate a range of product variants in the Validate Product Variants (tipcf5200m000) session.

### The generation process

After you configured a product variant, you can continue to generate the product variant using the following sessions:

- **Generate (Project) Structure for Product Variant (tipcs2220m000)** session.
- **Generate (Budget PCS) Structure for Sales Quotations (tdsls1201m100)** session.
- **Generate (Project PCS) Structure for Sales Orders (tdsls4244m000)** session.

The generation process is explained in the following subsections:

- To generate a product variant structure
- To generate item data
- To generate a variant routing
- To generate a purchase/sales price

### To generate a product variant structure

- 1 Select the product variant for which you want to generate the product variant structure.
- 2 Click Generate to start the process.
- 3 LN reads the generic product structure and searches for the first item in the top of the structure.
- 4 LN reads the product constraint linked to the bill of material component and performs the **Validation** constraint section.
- 5 LN determines whether the item is part of the generic product structure. If Yes, go to step 6. If No, go to step 7.
- 6 LN reads the item type of the item. If the type is Generic, go to step 8. If it is another item type, go to step 7.
- 7 LN searches for next item on this level.
- 8 LN searches for the product variant and reads the selected features and options.
- 9 LN includes the item in the variant structure.
- 10 LN generates the product variant structure on the basis of the features and options selected. The following are generated consecutively: product variant item data, purchase/sales price, bill of material, and routing. Refer to the subsections below for more information.
- 11 LN checks if the item is a generic, purchased, or manufactured item. If the item is Manufactured, go to step 7. If the item is Purchased, go to step 12.
- 12 LN continues the search for the next item on the next lower level. The procedure is resumed from step 4.
- 13 LN generates the item data, the purchase and sales data, the bill of material and the routing of the product variant.

### To generate item data

- 1 LN reads the first line of the generic item data.

- 2 LN reads the product constraint and performs the constraint section **Validation**.
- 3 LN determines if the item data element can be included in the variant structure. If Yes, go to step 4. If No, go to step 5.
- 4 LN includes the data element in the product variant structure.
- 5 LN reads the next line of the item data.
- 6 LN reads the first component of the generic bill of material.
- 7 LN reads the product constraint and performs the constraint section **Validation**.
- 8 LN determines if the component may or may not be included in the variant structure. If Yes, go to step 4. If No, go to step 5.
- 9 LN performs the constraint section **Parameter Substitution**. Using the formulas of this constraint section, LN calculates the length, width, number of units, and net quantity of a bill of material component.
- 10 LN includes the bill of material component in the product variant structure.
- 11 LN reads the next component.

#### To generate a variant routing

- 1 LN reads the first operation of the variant routing.
- 2 LN reads the product constraint and performs the constraint section **Validation**.
- 3 LN determines if the operation can be included in the variant structure. If Yes, go to step 4. If No, go to step 5.
- 4 LN performs the constraint section **Parameter Substitution**. Using the formulas of this constraint section, LN calculates the setup time and the run time for the operation.
- 5 LN includes the operation in the product variant structure.
- 6 LN reads the next operation.

#### To generate a purchase/sales price

- 1 LN reads the first line of the generic price list.
- 2 LN reads the product constraint and performs the constraint section **Validation**.
- 3 LN determines if the price list line can be included in the price structure of the product variant. If Yes, go to step 4. If No, go to step 5.
- 4 LN performs the constraint section **Parameter Substitution**. Using the formulas of this constraint section, LN calculates the purchase/sales price or the surcharge/discount percentage.
- 5 LN includes the price list line in the purchase/sales price structure of the product variant.
- 6 LN reads the next price list line.

To configure product variants that contain purchased configurable items

You can configure *product variants* that contain purchased *configurable items*. You can use a *configurable item* to create a item structure that can hold a configurable purchased sub-assembly. The purchased sub-assembly is issued at the assembly line like other assembly parts.

For more information on procuring purchased *configurable items* in Assembly Control module, refer to

- Procuring configured items in Assembly Control - Master Data Setup
- Procuring configured items in Assembly Control - BOM setup
- Product variants - Purchased configurable items

## Product configuration scenarios

### Configuration of parameters for various scenarios

You can configure items either in the Product Configurator (PCF) or the *CPQ Configurator*. You can select a combination of the Product Configuration and the CPQ configurator parameters in the Implemented Software Components (tccom0100s000) session possible scenarios:

Parameter Setting	Scenario	Description	
<ul style="list-style-type: none"> <li>Product Configurator (PCF) selected</li> <li>CPQ Configurator Integration selected</li> </ul>	1	If both parameters are selected it is possible to customize items using both Product Configurator (PCF) and the <i>CPQ Configurator</i> . In case the item is configured using CPQ, the BOM and routing can be configured using the PCF or CPQ.	This scenario is recommended if PCF is already in use, and you want to convert the configurations in use to the CPQ configurator.
Only CPQ Configurator Integration selected	2	<i>CPQ Configurator</i> is responsible for the configuration of the <i>item</i> , the <i>bill of material (BOM)</i> , and <i>routing</i> .	In this scenario, the Product Configurator (PCF) functionality is disabled.
Only Product Configurator (PCF) selected	3	PCF is responsible for the configuration of the item, the bill of material and routing.	With this scenario the <i>CPQ Configurator</i> does not have to be integrated. All CPQ related functions are disabled and the fields/check boxes are hidden.
Neither parameter is selected	4	No configuration engine is implemented.	

### BOM and routing for configured items

You can maintain the *bill of material (BOM)* and *routing* for configured items using various methods, depending on the supply source:

- Generic BOM and routing for configured items with supply source: **Job Shop**  
Generic BOM and routing are not required in the *CPQ Configurator*. In this situation, both BOM and routing are generated in LN.  
If you generate the customized BOM and routing in *CPQ Configurator*, the BOM is defined to the level of the standard manufactured or purchased components. The BOM related to the standard manufactured, and purchased components is always maintained in LN.  
The same applies to the routing for the CPQ configured items.
- Generic BOM and Routing for configured items with supply source: **Assembly**  
A generic BOM is required, but no generic routing is used.

**Note:** If item configuration is performed in *CPQ Configurator* without the (generic) assembly BOM and the related information, LN maintains the data.

### Generation of customized BOMs and routings in CPQ

The Generate (Project) Structure for Product Variant (tipcs2220m000) and Generate (Project PCS) Structure for Sales Orders (tdsls4244m000) sessions can be used in combination with CPQ Configurator to trigger the retrieval of the variant structures from CPQ and the regeneration, based on the variant structure obtained from CPQ, of custom item codes and project structures.

**Note:**

If the variant is generated in PCF, validation is performed using the Validate Product Variants (tipcf5200m000) session.

If the variant is generated in the CPQ configurator, the CPQ configurator status translates into a validation of status in LN.

### Generation of customized item codes in PCM

If you use PCF, the custom item codes are generated from the Generic Item - Settings for Data Generation (tipcf3101m000) session. This is not possible for items configured with the CPQ configurator.

**Note:** If all the items are configured in the CPQ Configurator, the Generic Item - Settings for Data Generation (tipcf3101m000) is disabled.

The CPQ configurator allows for the redaction of configuration (items, BOM and Routing) specific documents, images and (data) files (such as pdf, docx, CAD, SVC, image, test). These documents can be used in LN for further processing.

If both configurators are active, an error message is displayed if a duplicate configuration registers during import of the data from the CPQ configurator into LN.

## Generating Product Variant Structures

The structure of a product variant for a selected configured item is defined by specifying the relations between the item and the *engineering modules* that are used to create the item. Generic sub-items can also have related sub-items and/or engineering modules. The sub-level of the engineering modules is specified using the *flattened assembly parts*, defined in the Assembly BOM and Operations (tiapl2520m000) session.

The product variant structure is created:

- When the *product variant* is specified and saved based on the relation between the main item and the generic sub items.
- When you run the current session, the product variant structure is created, based on the relation between the main item or generic items and the engineering modules.

The Generate Product Variant Structures (tiapl3210m000) only creates product variant structures if the following conditions are met:

- Your current *company* is defined as the *master company* in the **Assembly Planning Parameters (tiapl0500m000)** session.
- The External Product Variant Structure check box is cleared in the **Assembly Planning Parameters (tiapl0500m000)** session.

- The Planned Offline Date of the product variant, specified in the **Product Variants (Assembly) (tiapl3500m000)** session, is within the *time fence* that is specified in the **Assembly Planning Parameters (tiapl0500m000)** session.
- The Product Variant Structure generated check box on the product variant, in the **Product Variants (Assembly) (tiapl3500m000)** session, is cleared.
- The To Be Deleted check box in the **Product Variants (Assembly) (tiapl3500m000)** session, is cleared.
- The Assembly Line field, in the **Product Variants (Assembly) (tiapl3500m000)** session has the **Assembly Line Structure Status** set to **Actualized**. The **Assembly Line Structure Status** is displayed in the **Assembly Lines (tiasl1530m000)** session.

The *bill of material (BOM)* relations to the engineering modules are copied from the item's template, which is specified in the **Generic Assembly Bill of Material (Assembly) (tiapl2510m000)** session. The information that is retrieved from the *generic BOM* is selected, based on the *effectivity unit* of the product variant, and the effective and expiry dates. The date range is evaluated against the **Configuration Date**, specified in the details of the **Product Variants (Assembly) (tiapl3500m000)** session.

If the product variant structures are generated, a completion report is created, and the Product Variant Structure generated check box on the product variant is selected, specified in the details of the **Product Variants (Assembly) (tiapl3500m000)** session.

You can also generate product variant structures for *configurable items*. You can use a *configurable item* to create an item structure that contains a configurable purchased sub-assembly.

For more information on procuring purchased *configurable items* in Assembly Control, refer to

- Procuring configured items in Assembly Control - Master Data Setup
- Procuring configured items in Assembly Control - BOM setup
- Product variants - Purchased configurable items

*Generic items* can be configured using a *contract deliverable*. The product variant resulting from the configuration is stored on contract deliverable for possible reuse. The generic item linked to a contract deliverable can be modified to a customized item before the deliverable status is set to **Active**.

To configure a customized item, the Customizable field must be set to **Yes** with With PCS set to **No**.

The Inherit Project Peg and Mandatory Project Peg check boxes are available for generic items in the **Items (tcibd0501m000)** session if:

- The Default Supply Source is **Job Shop**
- The Customized field is set to **Yes** and the With PCS set to **No**

## Purging Product Variants

Product variants are only deleted if the following conditions are met:

- Your current *company* is defined as *master company* in the **Assembly Planning Parameters (tiapl0500m000)** session.
- The To Be Deleted check box on the product variant is selected, which is displayed in the details of the **Product Variants (Assembly) (tiapl3500m000)** session.

- No references to a corresponding sales order exist, which is the case when the sales order is deleted, or when the product variant originates from a pseudo order. If no references to a sales order exist, the **Reference Order**, **Reference Position**, and **Alternative Sales Quotation** fields are empty (value 0). These fields are displayed in the details of the **Product Variants (Assembly) (tiapl3500m000)** session.

**Note:**

In addition to the product variants, the following data is also deleted:

- *Product variant structures*
- Links between the product variants and the assembly lines, which are displayed in the **Product Variant - Assembly Lines (tiapl3520m000)** session.

Click Make Job to add the current session to a job to run the session in batch mode.

## Product variants - Purchased configurable items

This topic explains the following functionality that pertains to purchased configurable items:

- Compare any configured item of the variant.
- Define product variant purchase price structure.

### Compare variants

You can compare two product variants to check the following:

- The inventory of a configured purchased subassembly.
- The possibility of using inventory of a matching configuration rather than order a new configured item.

**Note:** You can consider two configured items as interchangeable if all the options are the same.

You can compare the following configured items of a product variant:

- The configured end item
- Any configurable child

To compare the configured items of a product variant, you can use the Option List ID. The *configurable items* are compared at the option set level. Two configured items that are created by a variant are considered as interchangeable if they have the same Option List ID.

The Option List ID is used for the following types of transactions:

- Manufactured assembly item transactions
- Purchased configured item transactions
- Inventory transactions

### Variant numbers and Option list IDs

The matching of demand and supply of purchased configurable items is based on the Option List ID.

The matching of the demand and supply of a manufactured assembly end item is based on the product variant. Example the demand for the manufactured assembly end item is generated when a product variant is created for a new sales order. The Option List ID for this variant matches with a redundant variant which is in stock. An assembly order is created to meet this demand is created as the variant numbers differ.

The variants numbers and Option List IDs are used in the following processes:

- Create assembly planning ( **Calculate Assembly Part Requirements (tiapl2221m000)**)
- Generate assembly orders
- Generate warehouse outbound advice.

### Product variant purchase price structure

You can set up the purchase price for a configured item. The purchase price depends on the options of a configured item. You can calculate the purchase price of a variant during the configuration process. You can do so, after you calculate the sales price. If you update the variant, you are prompted to re-calculate the sales price.

To re-calculate the sales price, the configuration date is used as the reference date for price list validation. You can set the configuration date in the **Sales Parameters (tdsls0500m000)** session in the Sales package. The **Configuration Date (PCS)** can be:

- **Order Date**
- **System Date**
- **Delivery Date**

To calculate the purchase price for a set of variants, you can use the **Calculate Product Variant Purchase Price Structure (tipcf5235m000)**

To calculate the purchase price for the current variant, you can use the following sessions:

- **Product Variants (tipcf5501m000)**
- **Product Variant Purchase Price Structure (tipcf5535m000)**

The purchase price for the schedule is retrieved from the **Generic Price Lists (tipcf4101m000)** session and is based on the value selected in the **Purchase Price Date Type** field in the **Pricing Parameters (tdpcg0100m000)** session. Allowed values

- **Order Date**
- **System Date**
- **Delivery Date**

**Important:** The purchase price structure is used for analysis only.

**Note:** Since different dates are used as reference date for sales price/purchase price calculation, the price on the schedule can differ from the price displayed in the variant data.

## Chapter 2: PCF

### Product Configuration (PCF)

In a traditional production control system, the product structure generally consists of:

- Item data, such as delivery time and standard cost.
- Data that relates to the structure of items, such as bills of material.
- Data about operations, such as routings.

This system may be adequate for companies that produce a limited number of products. However, if a large number of variants of the finished products are produced, they are usually only assembled or manufactured when the customer's order has been received. In such cases, the traditional information system may encounter problems with the quantity, complexity, and manageability of the product data, and the need for timely availability of the information.

Almost any company that assembles to order deals with product variants, which makes it impossible to define the product structure for all the versions of all finished products in advance. The answer to this problem is configuration management. This can be translated into a well conceived, modular, product design with proper validation and design support functions provided by the information system to enhance the level of logistical control.

In the Product Configuration (PCF) module, a product model is created that defines all the *features* of the product model. You can define the desired product variant if you select the options of the features. The translation of your requirements into the product structure of the variant is controlled by a set of decision rules and *constraints*. These constraints indicate the components and operations that are or are not used in a specific version.

#### Performance aspects

The settings in this session could affect system performance and database growth. For more information, refer to PCF without PCS.

### Configurator

This topic describes in short the working of Product Configuration in LN.

The competitive power of a company is determined by the speed with which customer requirements are met. A business must be capable to deliver a customer specific product within the delivery time of a standard product.



In a traditional production control system, the product structure generally consists of:

- Item data, such as delivery time and standard cost.
- Data relating to the structure of items, such as bills of material.
- Data about operations, such as routings.

Product data defined like this may be adequate for companies producing only one or just a few products. However, if a large number of variants of the finished product is produced, assembling or manufacturing of a product is usually only started when the customer's order has been received. In such cases, the traditional information system may run into problems with respect to quantity, complexity, and manageability of the product data. Also the timely availability of the information can be problematic.

Almost every company that assembles to-order deals with product variants. In that case, you cannot define the product structures for all versions of all finished products in advance. The answer to this problem is configuration management. Configuration management must be translated into a well thought-out, modular, product design with proper validation and decision support functions provided by the information system to enhance the level of logistic control. LN offers such an application, Product Configuration.

### To set up product configuration

Before setting up product configuration in LN, you must define items of the **Generic** type in the Item Base Data module, the so-called *generic items*.

A generic item can have various *features* linked to it. The product features are the basis for a procedure to define the product specifications. For every feature you can define various *options*, which reflect the choices you can make with regard to a specific feature. For example, for a feature COLOR, you could define the options red, yellow, and blue. By using *constraints*, certain selections can be excluded or made mandatory. A combination of options chosen for a generic item, reflects a *product variant*. You can view, define and maintain configuration data for a generic item in one single session: Configurable Item - Structure (tipcf3100m100).

Multi-language support enables you to define the characteristic features of a product in several languages. For each feature you can define one or more options in several languages. You can state whether options can be freely selected or are bound to a specific domain.

You can define purchase and selling prices for each generic item. On the basis of the selling prices stated for the generic item, LN calculates the selling prices of the product variants. Purchase prices come in when generic items are purchased, for instance as part of a generic subassembly or finished product.

Refer to How to define a product model

### To use the product configurator in LN

When product configuration is set up, you can configure a product for a customer by selecting an option for every feature of the product. The translation of customer requirements results into a *product variant*. The process can be controlled by a set of decision rules, the *constraints*. The constraints indicate which components and operations can or cannot be used in a specific version.

The product configurator can be triggered from several places in LN, as indicated in the table below. Dependent on where a product variant is configured, the product variant receives a reference type, which can be viewed in the **Product Variants (tipcf5501m000)** session.

Configurator triggered where?	Session where configurator is triggered	Reference type
In Product Configuration, Manufacturing	• <b>Product Variants (tipcf5501m000)</b>	<b>Standard Variant</b>
In Project Control, Manufacturing	• <b>Generate (Project) Structure for Product Variant (tipcs2220m000)</b>	<b>Project (PCS) or Budget</b> , dependent on whether the product variant applies to a project or budget.
On a sales quotation line, Sales	• <b>Sales Quotations Overview (tdsls1500m000)</b>	<b>Sales Quotation</b>
On a sales order line, Sales	• <b>Sales Orders (tdsls4100m000)</b>	<b>Sales Order</b>
In Planning, Project	• <b>Element Budget (Material) (tpptc1510m000)</b> • <b>Activity Budget (Material) (tpptc2110m000)</b>	<b>Project</b>
In Requirements Planning, Project	• <b>Planned PRP Warehouse Order (tpss6115m000)</b>	<b>Project</b>
In Estimating, Project	• <b>Estimate Lines (tpest2100m000)</b>	<b>Project</b>
In Project Definition, Project	• <b>Project Deliverables (tpdm7100m000)</b>	<b>Project</b>

For more information, refer to

- How to use a product model in a sales quotation
- How to use a product model in a sales order

### To generate a (project) structure

After product variants are created, a product structure must be based product variant. A generic product structure is generated in the following sessions, dependent on where the product variant is configured:

- **Generate (Budget PCS) Structure for Sales Quotations (tdsls1201m100)**
- **Generate (Project PCS) Structure for Sales Orders (tdsls4244m000)**
- **Generate (Project) Structure for Product Variant (tipcs2220m000)**

The structure generally consists of data about:

- Product features
- Product options
- Product constraints
- Generic item data
- Generic bill of material
- Generic routing

If the **Customized** field in **Items (tcibd0501m000)** session for the generic item on which the product variant is based is set to **Yes**, a PCS project must created to generate the project structure. If the if the **Customized** field is set to **No**, a project is not required.

## How to test the product model

You can carry out the following steps to check whether the selected options when configuring a generic item result in a product variant with the correct product structure, routing, and item data.

### 1 Product Configurator

You can start the Product Configurator (tipcf5120m000) session from the Project Control module, the Sales Control module, or the **Product Variants (tipcf5101s000)** session. The product configurator is used to define which *features* and *options* are chosen by the customer.

**Note** If you start the **Product Configurator (tipcf5120m000)** session from the **Product Variants (tipcf5101s000)** session, you cannot generate a *product variant* structure.

### 2 If applicable, define projects

If the **Customizable** field for the generic item in the **Item Defaults (tcibd0502m000)** session is **Yes**, you are using Project Control for Product Configuration. Define a project in the Projects (tipcs2101m000) session that is used in the product structure of the product variant.

If the **Customizable** field for the generic item in the **Item Defaults (tcibd0502m000)** session is **No**, standard items are generated instead of customized items, which means that items are configured without PCS projects. Consequently, you do not need to define projects.

### 3 Generate project structure for product variant

You can use the Generate (Project) Structure for Product Variant (tipcs2220m000) session, the **Generate (Project PCS) Structure for Sales Orders (tdsls4244m000)** session, or the **Generate (Budget PCS) Structure for Sales Quotations (tdsls1201m100)** session to generate the product variant structure.

If the **Customizable** field for the generic item in the **Item Defaults (tcibd0502m000)** session is **Yes**, you must enter the project defined in step 2 in the **Generate (Project) Structure for Product Variant (tipcs2220m000)** session as the project for which a product variant structure must be generated.

If the **Customizable** field for the generic item in the **Item Defaults (tcibd0502m000)** session is **No**, no project is required, and you can leave the field empty.

### 4 Generic BOMs and generic routing

Check the Generic Bill of Material (tipcf3110m000) session and the Generic Routing (tipcf3120m000) session to check if the selected options result in a product variant with the correct product structure, routing, and item data.

## Configurator example

### Example

A kitchen manufacturer defines a generic product that is the basis for configuring different kitchen units to a customer order:

In principle, the generic model consists of:

- Lower cabinet unit.
- Worktop.

The product features of the generic product's components are presented in the tables below. Note that if **Select Option** is Yes, you can choose between various predefined options. If **Select Option** is No, you must enter a value yourself for the product feature.

SeqNo	Product Feature	Description	Select. Options	Feature Options	
Item Code : 4 Kitchen Unit					
10	kitbrand	Brand of Kitchen	yes	sie	Siebert
				iki	Interkitchen
20	colour	Colour	yes	gre	Grey
				bla	Black
30	matttype	Material Type	yes	woo	Wood
				syn	Synthetic
40	numcabin	No.of Cabinets	no		
45	height	Height	yes	80	cm
				90	cm
				100	cm
50	depth	Depth	no		
60	typehand	Handle	yes	lux	luxe
				std	standard
70	worktop	Worktop	yes	yes	worktop
				no	no top
SeqNo	Product Feature	Description	Select. Options	Feature Options	
Item Code : 7 Lower Cabinet Unit					
10	cabnumb	Cabinet Number	yes	1	
				2	
				3	
40	height	Height	no		
50	width	Width	no		
60	depth	Depth	no		

SeqNo	Product Feature	Description	Select. Options	Feature Options	
70	rotat	Turning Direction	yes	lef	Left
				rig	Right

SeqNo	Product Feature	Description	Select. Options	Feature Options	
Item Code : 9 Worktop					
10	topbrand	Brand of Worktop	yes	alt	Altus
				wil	Wilder
20	length	Length	no		
30	depth	Depth	no		
40	finish	Finish of Sink	yes	mou	Mounted
				sun	Sunken

All feasible variants can be composed using the above options. However, you can link a *constraint* to a certain product feature, if, for example, not all options are possible for a given part.

### Example

If the brand of the kitchen is Interkitchen, as a constraint you can define that the material type must be Wood.

## Chapter 3: PCF Costs

### How ERP calculates the product variant cost structure

A product variant cost structure is calculated for each *option set*. This calculation is based on the generic sales price list defined for the generic item linked to the *option set*, or based on the chosen product variant options for the relevant option set. During this process, product variant options are automatically inherited from higher levels in the generic product structure.

The final sales price for a *product variant* is determined based on the various sales price components in the *sales price structure* for the product variant.

#### Option set quantity

For each *option set*, the required quantity is determined by LN based on the generic product structure and the chosen options for product features. The generated sales prices in the sales price structure of the option set are then multiplied by the required quantity for the option set.

#### Product variant options

If no sales price structure is defined for the first option set of the product variant (option set 0), or if the sales price of the first option set is 0 and the configured product is a *phantom* item, LN automatically generates a sales price plan for the standard components on the first bill of material level of the configured product variant structure. A discount percentage is also determined for the generic components based on the first bill of material level of the sales price information.

### How to test the price list

The test for the price list is used to determine if the selected options result in the correct sales price. You can perform the test if the *generic price list* is defined.

To perform the test, the following actions must be executed:

- In the Product Variants (tipcf5501m000) session, a valid product variant must be generated.
- In the Calculate Product Variant Sales Price Structure (tipcf5230m000) session, the sales price for the product variant must be calculated.
- In the Product Variant Sales Price Structure (tipcf5530m000) session, the sales price structure can be displayed.

**Note:** Use the Print Sales Price Structure by Product Variant (tipcf5430m000) session to print the sales price structure. In the report, the total sales price is distributed over the different lines as defined in the generic price list.

## How to use a product model in a sales quotation

If the customer wants a *sales quotation* for a product that must be configured, you can use the product configurator to define the *product variant* from a sales quotation.

- 1 Open a sales quotation, or create a new one in the **Sales Quotations Overview (tdsls1500m000)** session. Create a new quotation line for the generic item in the **Sales Quotation Lines (tdsls1501m000)** session.  
Open a sales quotation, or create a new one in the **Sales Quotations Overview (tdsls1500m000)** session. Create a new quotation line for the generic item in the **Sales Quotation Lines (tdsls1501m000)** session.
- 2 Zoom on the quotation line to the generic item that you want to configure. If you enter a generic item on the sales quotation line, the Product Configurator (tipcf5120m000) session can be started from which you can select the *options* and *features* desired by the customer. When you configure the product variant, the sales price is calculated and written to the quotation line. Save the product variant.  
Zoom on the quotation line to the generic item that you want to configure. If you enter a generic item on the sales quotation line, the Product Configurator (tipcf5120m000) session can be started from which you can select the *options* and *features* desired by the customer. When you configure the product variant, the sales price is calculated and written to the quotation line. Save the product variant.
- 3 If information about the sales price must be provided to the customer, the Print Sales Price Structure by Product Variant (tipcf5430m000) session can produce a report that shows the different price list lines.  
If information about the sales price must be provided to the customer, the Print Sales Price Structure by Product Variant (tipcf5430m000) session can produce a report that shows the different price list lines.
- 4 Select the quotation line, and click **Generate Budget Structure** from the *appropriate* menu to run the **Generate (Budget PCS) Structure for Sales Quotations (tdsls1201m100)** session. Before or after the generation of the product variant structure, print the quotation in the Print Sales Quotations (tdsls1401m000) session.  
Select the quotation line, and click **Generate Budget Structure** from the *appropriate* menu to run the **Generate (Budget PCS) Structure for Sales Quotations (tdsls1201m100)** session. Before or after the generation of the product variant structure, print the quotation in the Print Sales Quotations (tdsls1401m000) session.
- 5 If the quotation order is converted into a sales order, you must copy the budget to a project if the **Customizable** check box is selected for the generic item in the **Items (tcibd0501m000)** session. Note that copying a budget to a project is not necessary if the generic item does not need to be customized.  
If the quotation order is converted into a sales order, you must copy the budget to a project if the **Customizable** check box is selected for the generic item in the **Items (tcibd0501m000)** session. Note that copying a budget to a project is not necessary if the generic item does not need to be customized.  
If the generic item is customizable, to copy the budget to a project:
  - a Select the quotation line in the **Sales Quotation Lines (tdsls1501m000)** session.

- b Click **Process** on the *appropriate* menu. The **Sales Quotation Results (tdsls1101s100)** session is started.
  - c Zoom on the **Project** field, and select Copy Project.
  - d In the **Copy Project (tipcs2210m000)** session, select **Single Project** in the **Target Project Type** field, and click **Copy**.
- 6 To convert the sales quotation into a sales order, select the quotation in the **Sales Quotations Overview (tdsls1500m000)** session, and click **Process Sales Quotations** on the *appropriate* menu.  
To convert the sales quotation into a sales order, select the quotation in the **Sales Quotations Overview (tdsls1500m000)** session, and click **Process Sales Quotations** on the *appropriate* menu.

## How to use a product model in a sales order

If the customer orders a product that must be assembled to order, a *product model* can be used to define the *product variant*.

Take the following steps:

- 1 Open a sales order, or create a new one in the **Sales Orders (tdsls4100m000)** session.  
Open a sales order, or create a new one in the **Sales Orders (tdsls4100m000)** session.
- 2 Create a new sales order line in the **Sales Order Lines (tdsls4101m000)** session.  
Create a new sales order line in the **Sales Order Lines (tdsls4101m000)** session.
- 3 Select on the sales order line the generic standard item that you want to configure. If you enter a generic item on the sales order line, the Product Configurator (tipcf5120m000) session can be started from which you can select the *options* and *features* desired by the customer. When you configure the product variant, the sales price is calculated and written to the order line. Save the product variant.  
Select on the sales order line the generic standard item that you want to configure. If you enter a generic item on the sales order line, the Product Configurator (tipcf5120m000) session can be started from which you can select the *options* and *features* desired by the customer. When you configure the product variant, the sales price is calculated and written to the order line. Save the product variant.  
You can configure *product variants* that contain purchased *configurable items*. You can use a *configurable item* to create a item structure that can hold a configurable purchased sub-assembly. The purchased sub-assembly is issued at the assembly line like other assembly parts.  
For more information on procuring purchased *configurable items* in Assembly Control module, refer to
  - Procuring configured items in Assembly Control - Master Data Setup
  - Procuring configured items in Assembly Control - BOM setup
  - Product variants - Purchased configurable items
- 4 If information about the sales price must be provided to the customer, the Print Sales Price Structure by Product Variant (tipcf5430m000) session can produce a report that shows the different price list lines.  
If information about the sales price must be provided to the customer, the Print Sales Price Structure by Product Variant (tipcf5430m000) session can produce a report that shows the different price list lines.



- 5 Select the appropriate sales order line, and run the Generate (Project PCS) Structure for Sales Orders (tdsls4244m000) session to generate a product variant structure for the product variant on the sales order. A product structure is created with the configured item at the top level of the product structure. If the generic item is customizable, a project must be defined for the configured item. If the generic item is not a customizable item, a project is not present.

Select the appropriate sales order line, and run the Generate (Project PCS) Structure for Sales Orders (tdsls4244m000) session to generate a product variant structure for the product variant on the sales order. A product structure is created with the configured item at the top level of the product structure. If the generic item is customizable, a project must be defined for the configured item. If the generic item is not a customizable item, a project is not present.

Before or after the generation of the product variant structure, print the sales order in the Print Sales Order Acknowledgements/RMAs (tdsls4401m000) session.

## Multiple sales order lines with identical product configurations

If you enter a *generic item* on a *sales order line*, you must configure the item to determine the *product variant*. If you configure the generic item, LN generates an item code and product variant for the configured item.

### Selling generic items

Depending on the parameter settings described below, LN can handle this in the following ways:

- Each sales order line gets a different item code, even if the product configuration is identical.
- If multiple lines in a sales order have the same generic item in the same product configuration, all sales order lines reuse the same generated item code with the same *product variant identification code*.

### Reuse item codes of a product configuration

To allow reuse of item codes, in the **Product Configuration Parameters (tipcf0100m000)** session, select the Allow reuse of Configurations check box.

If you enter a generic item on a sales order line with the same product options as you used in an earlier sales order line, LN reuses the configured item and product variant.

**Important:** In the **Generic Item - Settings for Data Generation (tipcf3101m000)** session, make sure that two items with different *options* cannot result in the same item code. If that happens during item configuration, LN ends the configuration process with an error message.

### Generate (project) structure for sales orders

When you generate the project structure in the Generate (Project PCS) Structure for Sales Orders (tdsls4244m000) session, you must select the Create a Project (PCS) per Sales Order check box.

## How to calculate a discount percentage on the basis of the sales price

A discount percentage for a sales price is calculated by LN for each standard manufactured or purchased part on the first bill of material (BOM) level of the product structure.

The sales price and discount percentage are also determined based on the sales price information recorded for this standard item in the Sales Control module and the Tables module in the form of sales contracts, sales price lists, or a recommended sales price per item.

### Configured items

For a component of a product variant, a sales price line is generated for option set 0. The sales price line contains the quantity needed, the unit of the component, the item code and the sales price. If a discount percentage is applicable, it is shown in the **Discount %** field. The net sales amount for the component is shown in the **Amount** field.

A discount percentage is determined for each generic component on the first BOM level of the configured product variant structure, based on the sales price information for this generic item defined in sales contracts or sales price lists. If a discount percentage is defined, an additional sales price line is automatically generated for the generic component in which the discount percentage and the discount amount is recorded.

If the language of the customer is the same as the home language, an extra text line is generated with the item description, the customer dependent item text, the sales text, or the general text for the item. If the language of the customer deviates from the home language, the previously mentioned text is linked to the sales price line of the component.

## Chapter 4: CPQ Configurator

### CPQ Configurator setup

The *CPQ Configurator* is an interactive configurator that is integrated with LN. The configuration information required to handle the manufacturing process is stored in LN.

To set up the *CPQ Configurator*, complete the following steps:

- 1** Implemented Software Components (tccom0100s000)  
To enable the interactive configurator functionality, select the Infor Configurator (CPQ) check box.
- 2** CPQ Configurator Profiles (tipcf0120m000)  
Specify the profile used for the CPQ configurator. The profile defines the language and the view of the model of the configurator.
- 3** CPQ Configurator User Profiles (tipcf0125m000)
  - Specify the default user profile as part of the user profile. The user profile overrides the profile defined in the CPQ Configurator Settings (tipcf0111m000) session.
  - Before starting sales order configuration LN checks for the confirmation of the user. When you start the *CPQ Configurator*, by default the profile defined in the user profile or Item settings is executed. The authorized user can override the default profile, by selecting a different profile from the list of profiles defined in the **CPQ Configurator Profiles (tipcf0120m000)** session. You can use either the defaulted, or manually changed profile to start the CPQ configurator.
- 4** CPQ Configurator Settings (tipcf0111m000)  
To enable the CPQ configurator settings for the company, item group or the item, select the Configured by CPQ Configurator check box. You can define the Specific Settings such as, Currency, Application URL and Profile. It is very important that the settings defined in LN are in sync with the settings of the *CPQ Configurator*.

To configure an item using the CPQ Configurator Integration, complete the following steps:

- 1** Sales Order Lines (tdsls4101m000)  
Create a sales order line, select the configurable item and confirm the configuration of the product. The *CPQ Configurator* starts in new web user interface page and the options defined for the model in the configurator are displayed.  
Apart from the sales order lines in the Sales package, the product variant can configured using below sessions:
  - Sales Quotation Lines (tdsls1501m000)
  - Product Variants (tipcf5501m000)
  - Product Variant (tipcf5600m000)
  - Element Budget (Material) (tpptc1510m000)

- Activity Budget (Material) (tpptc2110m000)
- Estimate Lines (tpest2100m000).
- Planned PRP Warehouse Orders (tppss6815m000)

## 2 CPQ configurator Web UI

You can view product features, options, images of options and the final images of models as defined in the *CPQ Configurator* during and after configuration.

- You can select the required options to configure the end product. The final price of the item is calculated once you have finished configuration.
- When you save the data and close the configurator, a product variant is created.

If the features and options you have selected are not available in LN, they are created after configuration is finished.

**Note** that options and features that are selected are created in LN. Options that are created in *CPQ Configurator*, but not selected for the item modeled are not integrated.

## 3 Product Variants (tipcf5501m000)

Review the status of the product variant in the CPQ Status field. Review the CPQ Configurator Variant field, the check box must be checked for the variants created using the CPQ configurator.

### **Note:**

The sales price and quantity is calculated by the *CPQ Configurator*.

The product variant created in the *CPQ Configurator* and the features, options, option sets (PCF levels) of the product variant are stored in LN. You can configure, reconfigure, modify or delete the product variant. After the product variant is created, you can continue with the standard sales and manufacturing process if required.

## Chapter 5: Miscellaneous

### Linking Product Features by Generic Item

The product independent features and options defined in an earlier stage, are now made product dependent. When you link features to generic items, you can also link valid *constraints*. Recording product features and options forms the basis for configuring product variants for the generic product in question. Product features and options serve as technical descriptions of a specific product variant derived from a generic product.

When you configure a product variant, the product features linked to each generic item in this session can be further specified with the options that you recorded in the Options by Product Feature and Configurable Item (tipcf1110m000) session. In principle, all options are possible if the **Select Option** check box is cleared in the **Product Features by Configurable Item (tipcf1101m000)** session. Constraints help you include or exclude any options or combination of options needed in certain conditions.

Select the configurable item for which you want to define product features and determine the appropriate product feature for each sequence number. For this purpose, use product independent features that are recorded in the Product Feature (tipcf0150m000) session. After you link a product feature to a generic item, LN automatically copies the general data of the product feature, such as the description of the product feature, the options and the language dependent descriptions, as well as the texts for product features and options, to the generic item. You can then change this data.

After you select a product feature, you can define the validity period for the product feature and specify which constraint applies. You can also choose from any current standard option that is defined earlier for this product feature in the Options by Product Feature (tipcf0160m000) session. You can also add extra options or delete existing ones. Explanatory text can be entered with the text manager for the product features and options.

Product features and options are automatically adopted by the lower levels in the configuration structure from the higher levels. As a result, you need not record these features on each level in the configuration structure unless you actually want to maintain these options at lower levels in the configuration structure.

On the *appropriate* menu, click **Options by Product Feature** to maintain options by product feature in the **Options by Product Feature and Configurable Item (tipcf1110m000)** session. You can copy the product feature data to an existing feature within the same item. Options that belong to the product feature, language dependent descriptions for the feature, options, and option texts are also copied.

**Note:**

- Click the Text Manager button to record a detailed description for each product feature. You can view the text in the Product Configurator (tipcf5120m000) session and the text can be printed on external (sales) documents.

- If you change the descriptions of features and options in this session, the descriptions of configured *product variants* are also changed. For example, if you change the descriptions and print a sales order acknowledgement / RMA for a configured product variant, the changed descriptions occur.

## Defining Answers and Follow - up Questions

Answers with associated follow-up questions are a special answer type used in the classification process. This answer type enables you to set up a staged question structure. After the selection of an answer, another question is asked. Answers that are followed by a question are especially useful in situations where a single question is not sufficient.

For each answer group you can define the answers and associated return values. The return value is always one character.

Asking questions continues until there is no follow-up question left, or if there is no more room in the classification code associated with the aspect. If no follow-up question has been defined for an answer, the classification process continues with the next aspect.

You cannot modify answers and follow-up questions for a specific answer group as long as there are still items in LN that have been classified with that answer group. If you try to modify an answer or follow-up question, LN displays the following message: **Feature already used in classification process**.

If you press ENTER the following question appears: **Mark previously classified items for recoding?**

If you select **yes**, the **Mark Classified Items for Recoding (tigrt0203m000)** session starts.

**Note:** You can only define answers and follow-up questions for answer groups of the **Answer & Follow-up** answer type.

## Constraint editor

### Syntax of constraint expressions

The constraint expressions syntax is a subset of the LN Tools syntax. You can make constraint expressions with the following basic instructions.

Arithmetic operators:

- \* (multiplication)
- / (division)
- + (addition)
- - (subtraction)
- \ (remainder after division)
- & (linking alphanumeric arrays)

Logical operators:

- or
- and
- not

Relational operators:

- = (equal to)
- > (greater than)
- >= (greater than or equal to)
- <> (not equal to)
- < (less than)
- <= (less than or equal to)

### Domain expressions

A is {a1,a2,a3-a4,..} means: (A=a1 or A=a2 or A >= a3 and A <= a4 and so on).

The domain expression syntax is an abbreviated notation for logical expressions regarding the domain of a variable.

### Priority in expressions

Arithmetic operators have a higher priority than relational operations.

Relational operations have a higher priority than logical operators.

The priority sequence for arithmetic operators : \* / \ + -

The priority sequence for logical operators : not, and, or

Round brackets '('') can be used to change the priority sequence for arithmetic and logical operators.

---

#### Example

$3 + 4 * 5 = 23$

$(3 + 4) * 5 = 35$

### Boolean expressions

Boolean expressions can have the value true or false (1 or 0). This can be applied in constraints, especially conditional expressions.

---

#### Example

If not e then ' means:

If e = false then'

or If e = 0 then'

### If-then-else constructions

Extensive if-then-else constructions can be used in constraints. Nesting of statements is allowed.

An if-then-else construction is always closed with an endif statement. The else statement is not mandatory. If, else and endif statements always start on a new line. (Conditional) expressions can be divided over several lines. A validation constraint may be defined without if-then-else statements; this constraint must start with c:.

A constraint can be provided with comments using the | sign. During the configuration process, you can generate messages using the variable message (up to 80x25 lines of text).

#### Example

```
If expression1
then expression2
else expression3
endif
```

### Constraint variables

Both global and local variables can be used in constraint expressions. Global variables are product features and user-defined constraint variables that are declared as global. The variables predefined by the product configurator, such as input, display, length, width, and so on, are local ones. Global variables retain their value throughout the configuration process unless their values are changed.

A constraint variable can have the following type declarations:

- string (alphanumeric) (for example: string machine global)
- long (integers) (for example: long i)
- double (fractions) (for example: double j)

The user-defined constraint variables must always be declared at the top of the constraint. All local variables are initialized before execution of the constraint: alphanumeric variables are cleared and numeric variables are given the value zero. The global variables input and validating are initialized with the value true.

### Use of constraint variables

Product features must be provided with opening and closing square brackets ([.....]) in constraint expressions. The remaining variables can directly be used in expressions. Alphanumeric variables (string arrays) can be indexed according to the notation: (startposition[:length]).

#### Example

```
[color] = "red"
validating = true
```

The values of variables can be alphanumeric or numeric. Alphanumeric values must be written in quotation marks ("...."). Numeric values can directly be entered. The decimal sign is a point ('.').



**Example**

```
machine(1;2) = "A5"
```

```
volume = 28.673
```

The constants true/false can be used for boolean expressions.

**Arithmetic functions**

- `round(X,Y,Z)`: produces rounded value of X; Y is number of decimals and Z is rounding method (0 = down, 1 = normal, 2 = up)
- `val(A)`: produces numeric value of string A (`val("8.7") = 8.7`)
- `abs(X)`: calculates absolute value of X (`abs(-10.3) = 10.3`)
- `int(X)`: produces integer value of X (`int(11.6) = 11`)
- `pow(X,Y)`: raises X to the power of Y (`pow(10,2) = 100`)
- `sqrt(X)`: produces square root of X (`sqrt(16) = 4`)
- `min(X,Y)`: produces smallest value of X and Y (`min(6,10) = 6`)
- `max(X,Y)`: produces largest value of X and Y (`max(6,10) = 10`)
- `pi`: constant with value PI (3.1415926...)

**Goniometric functions**

- `sin(X)`, `cos(X)`, `tan(X)`: produces sine, cosine, or tangent of X (radials)
- `asin(X)`, `acos(X)`, `atan(X)`: produces arc sine, cosine, or tangent of X
- `hsin(X)`, `hcos(X)`, `htan(X)`: produces hyperbolic sine, cosine, or tangent of X

**Logarithmic functions**

- `exp(X)`: raises e to the power of X
- `log(X)`: produces natural logarithm of X on the basis of e
- `log10(X)`: produces logarithmic value of X on the basis of powers of 10

**String functions**

- `edit(X,Y)`: formats numeric value X according to format Y (`edit(10.3,"ZZZ9V.99") = " 10.30"`)
- `str(X)`: puts numeric value in string (`str(10.3) = "10.3"`)
- `len(X)`: produces length of string X (`len("abc") = 3`)
- `strip(X)`: deletes spaces after last character (`strip("A ") "A"`)
- `pos(X,Y)`: produces position of string Y in string X from left
- `rpos(X,Y)`: produces position of string Y in string X from right

**Date functions**

- `date()`: produces the number of days between day 0 and current date
- `date(y,m,d)`: produces the number of days between day 0 and entered date

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**Example**

date(1995,06,01) = 728445

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