Manage Routings

Explanation on beas Routing Master Data

Boyum Solutions IT A/S

Beas Tutorial

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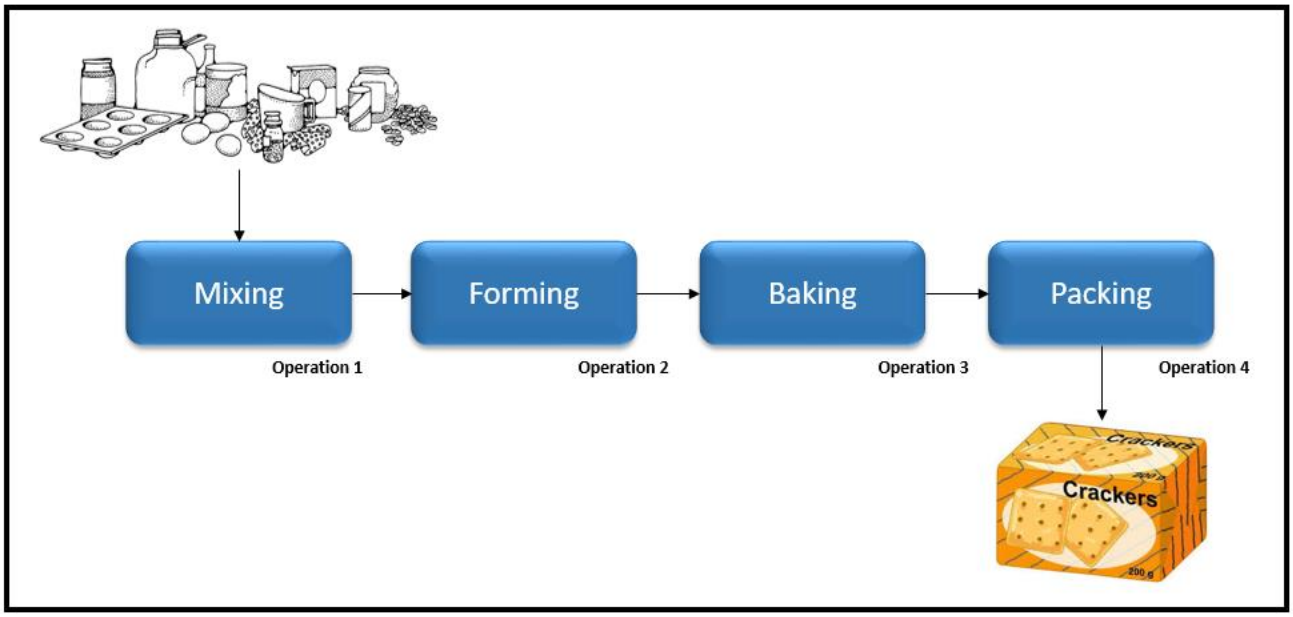
1. INTRODUCTION

Routings or operations are steps or tasks used to manufacture a product, which can be carried out on internal work centers or by contracting external providers. Typically, a routing is made up of a series of operations, also called routing steps or routing positions.

In beas, inside an item's routing, we will find the following information:

- A list of all the internal or external tasks required to manufacture it
- The standard, alternative, and parallel resources:
    - Labor
    - Machine
    - Tools
- The quality control inspection plans linked to the tasks or operations
- The setup and production time required for each operation
- Details about the work centers at which they are carried

Routings determine the lead times for manufactured items and through beas' scheduling functions, determine the start and end dates for production. Also, routing production time and the resources' cost rates determine the conversion costs associated with a manufactured item.



IMPORTANT: In **discrete manufacturing**, the production of easily distinguishable items, routings normally have their times calculated for each unit of finished product, and quality controls are generally done after the receipt of the subassemblies or the finished product.

IMPORTANT: In **process manufacturing**, the production of goods that are typically produced in bulk quantities, as opposed to discrete and countable units (normally associated with formulas and manufacturing recipes), routings normally have their times calculated for batches of finished product. And quality controls are generally done for the production operations directly, which can include sampling by production time (for example, taking one sample to inspect at every 30 minutes of process).

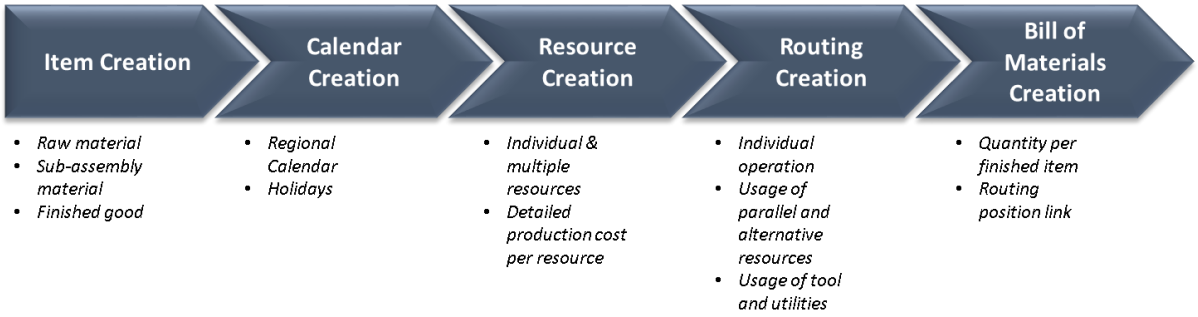
In this document, the user will learn how to set up and manage routings in beas. The user will learn about the operation steps to go through a production process, the resources (labor, machines, and tools) to be used, and the time required for completing the task.

In combination with labor and machine production times and rates, this operation data defines planning and standard cost information.

A routing is used as a source for creating a production order. Additionally, it is possible to assign material to the routings, to determine the specific step of the production process in which they have to be consumed.

2. PROCESS

To navigate through routing master data, it is essential to follow the correct flow of the process: "**Building an Item Structure**" For more information, please refer to the *Item Structure* tutorial.



So far, we have answered the first question:

1. "What are we producing?" – answered in the *Item Master Data* Tutorial
2. "When are we producing?" – answered in the *Calendar Master Data* Tutorial
3. "Where are we producing?" – answered in the *Resources Master Data* Tutorial.

Routings will help us answer the fourth question regarding the manufacturing process which is:

"How are we producing?"

This question involves two concepts:

- Routings are where we define standard production times, parallel or alternative resources
- Bill of materials is where we define the recipe or the list of component parts to produce the finished good or sub-assembly. This last concept will be detailed in another tutorial.

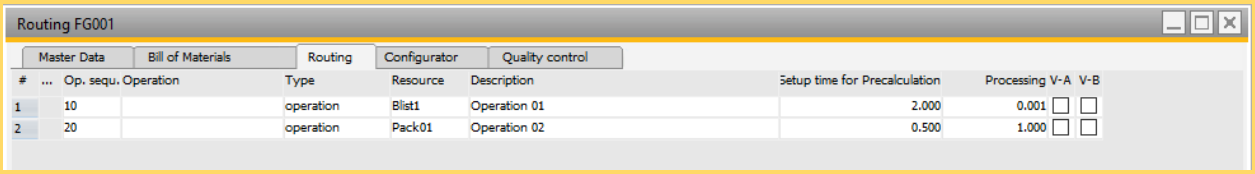
In order to create a routing, a resource must exist.

In this section, we navigate through the most relevant fields when creating a routing in beas. In the Field Guide section, we include all fields available in the routing master data.

PATH: Inventory > Item structure > Double click the item the user wants to include in the routing > Go to the *Routing* Tab > Click on *New* (for new routing) or *Edit* (for existing routing). This will be detailed later in this document.

TIP: At the Routing tab, the user can view relevant information to the routing position related to the item master data selected. It is also possible to:

- Check the current routing for the item
- Add new routing positions
- Change existing positions
- Delete positions
- Change the positions' sorting and numbers

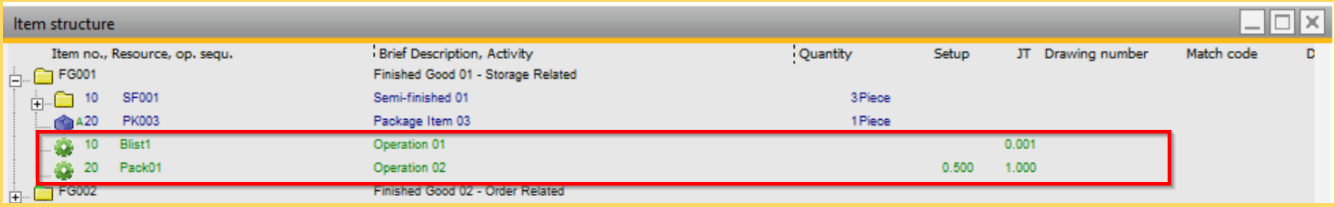


It is possible to view more information from the Routing screen; the user can activate more columns in the *Window settings*. To access the window setting, just right click on an empty part of the window and select *Window Settings*.

PATH: Inventory > Item Structure > Right click and select *routing:edit* (for existing routing) or select *operation:New* (for new routing)

TIP: If the user only wants to display the item structure with the routings linked to the item, the user may only expand the item. In this screen, it is possible to view:

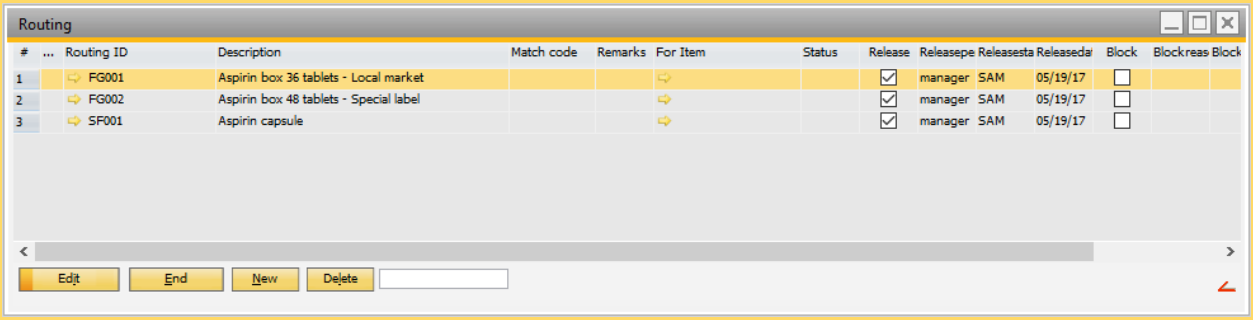
- Planned production times
- Resources.
- Parallel or alternative resources linked to the routing



ALTERNATIVE PATH: Inventory > Routing > Click on *New* to create a new routing (this is mostly used for version control). For more information, please refer to *Version Control:Setup* and *Version Control:Usage* tutorials.

TIP: This will open the Routing master data. In this window, it is possible to:

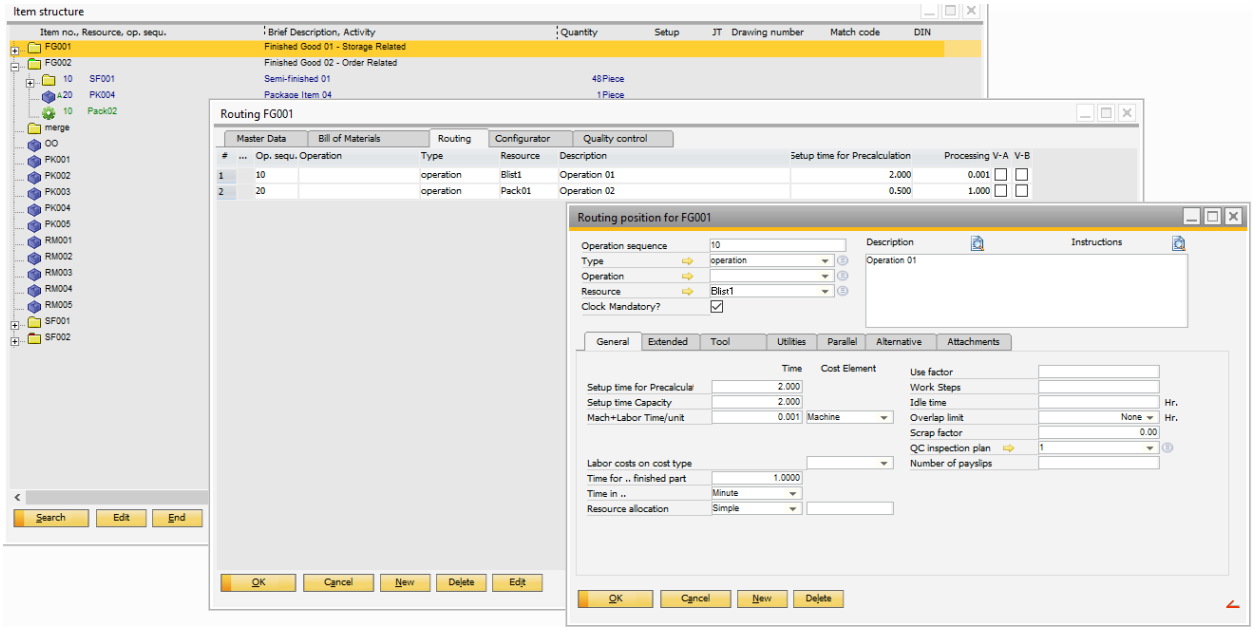
- Edit existing routings
- Create new routings (which is particularly useful when working with version control)
- Delete routings



The new screen displays all relevant information about routing, divided in tabs: General, Extended, Tool, Utilities, Parallel, Alternative, Attachments and External Operation (when an external resource is selected in the *Resource* field).

Routing positions describe individual process steps, which are carried out during production.

In the item master data, *Routing* tab, the user can add new routing positions by clicking on the button *New*, or right clicking in the empty part of the routing tab and selecting *New*. Beas will create a new routing line with either option.



Routing lines will be created empty. To fill this line, the user can select an Operation code at the *Operation* column. This information comes from the Operation Catalog. For more information about Operation Catalog, please refer to *Special Cases*.

If there are no operations created by the Operation Catalog, a resource must be selected at the *Resource* column. Operations from the Operation Catalog, and resources can be selected by right clicking on the corresponding fields, and selecting the desired values from the list. The user must select, either a resource or an operation, otherwise beas will display an error.

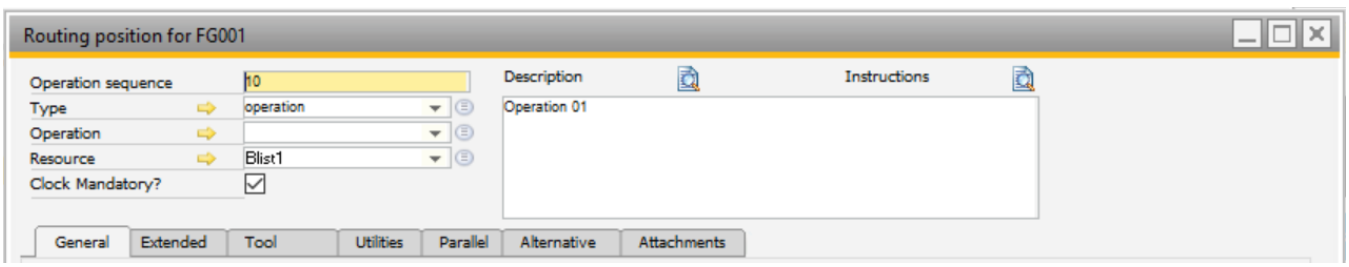
Beas will fill some fields automatically but also, the user can edit the fields directly at the routing line or edit the routing position in a new window. This new window will appear by:

- Double clicking the position line
- Selecting the line and clicking on the *Edit* button
- Right clicking the line and selecting *Edit*.

TIP: In the routing's position window, there are many other fields that are not available for direct editing in the routing line. In the routing line, only the most relevant fields are shown. It may be also changed via *Windows Settings* functionality.

2.1. Header

In the Header area of the screen the user can find general information of the routing:



Operation Sequence: Field used to set the position number. This field is counted in increments of 10, by default. The field is alphanumeric with 20 digits. This can be defined in the Configuration Wizard. For more information about this setting, please go to the Configuration Wizard at the end of this document.

TIP: In pre-calculation, routing and production, the user can edit the alphanumeric and the numeric position number.

The *Operation sequence* field can be changed via script. This function is only available if the Variant Generator was activated in the Configuration Wizard. For more information, please refer to *beas Script* tutorial.

IMPORTANT: If beas is updated to beas 9.1 PL: 08 from an older version, the field Position Text (POS_TEXT) and Sorting ID (SORT_ID) will be automatically filled with the values from Position ID (POS_ID) field, that is now an internal field.

Type: Field used to define the type of the routing position to be created. Beas has, by default, some types already created. In here, it can be defined if it is a machine, external operation, operation and so on. For more information about operation types, please refer to the *Operation Types* tutorial.

Operation: Field used to select the operation from the *Operation Catalog* definition. By selecting one operation, the rest of the fields are filled automatically from the *Operation Catalog* selected.

Resource: Field used to define the resource (work station, personnel group, machine or machinery group, external operation or labor) that will be assigned to perform this operation. This field is considered mandatory. There is an option to include a resource by default. For more information about this setting, please go to the Configuration Wizard at the end of this document.

Clock Mandatory?: Field used to set the operation where time receipts are mandatory. It is mandatory to have an operation checked as *Clock Mandatory?* when using automatic finished product receipts.

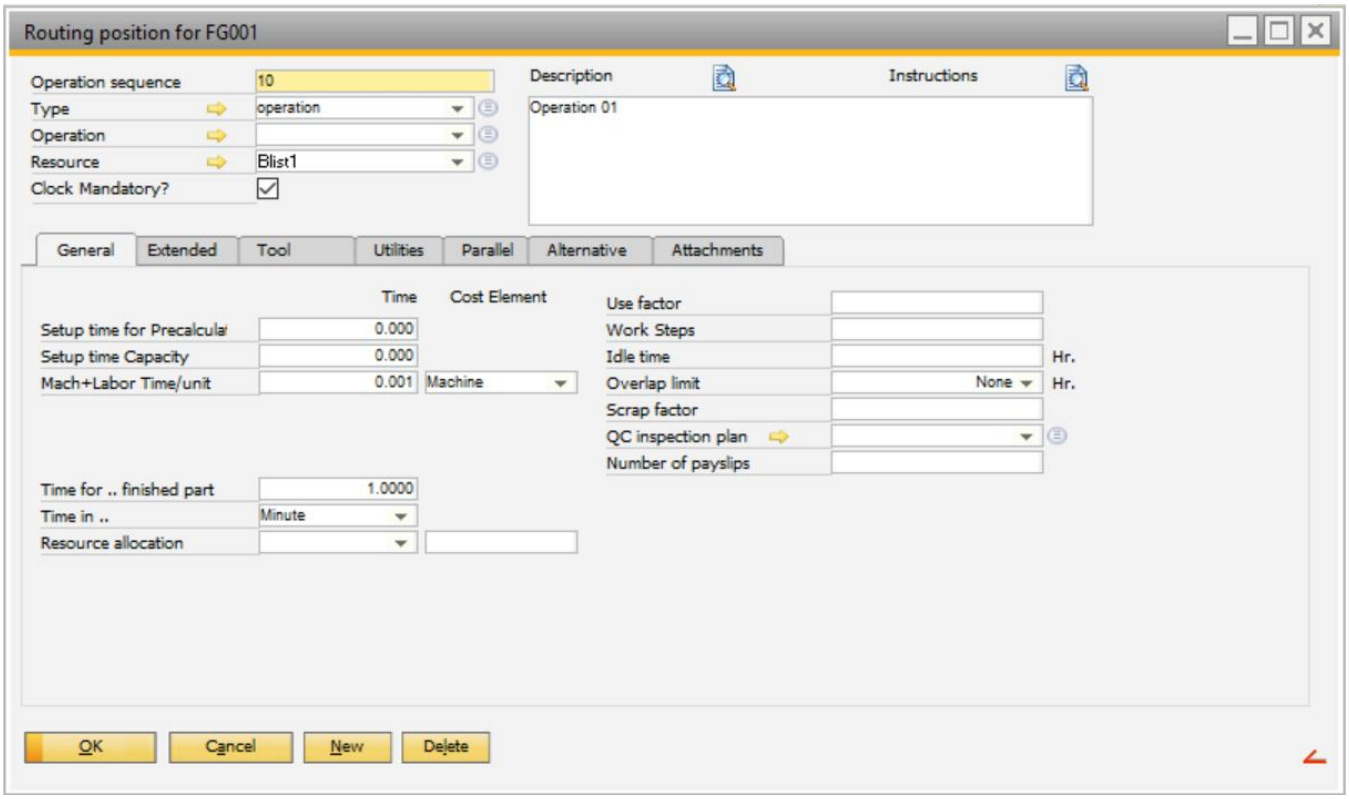
IMPORTANT: If the last routing position is not mandatory for time receipts and beas is configured to receive the finished products after reporting the last operation, beas will receive it after reporting the last operation with *Clock Mandatory?* set as active.

Example:
Pos. 10 – Not reportable
Pos. 20 – Reportable
Pos. 30 – Reportable
Pos. 40 – Not reportable
First operation is position 20 and position 30 is the last position. With the other positions, a report is possible, but not mandatory. Therefore, these are not taken into account for defining the last operation.

Description: Field used to include a description of the activity. It can have several lines (max. 16,000 characters). By clicking in the icon with a document and magnifying glass, an external editor screen is displayed.

2.2. General Tab

The following tab includes fields related to the manufacturing process:



It is possible to set the standard times for each *Time Type* activated for the selected *Resource*. For more information *Time Type*, please refer to *Resources* tutorial. If the *Resource* has only one *Time Type* activated, three fields for standard times will be active:

Setup Time For Calculation: Field used to set the time, in hours or minutes, required to make the resource ready for production, which is taken into consideration for production costing analysis and recalculation. The designation or the name of this field can be changed in the Configuration Wizard. For more information about this setting, please go to the Configuration Wizard at the end of the document.

Setup time is calculated per lot size

Example: Lot size 10, setup time=5 minutes, calculated: 19 pieces
Result: total setup time 10 minutes

If a sub-assembly has its own calculation lot size, it will be taken into account.

If a work order is created automatically, for example via order recommendation report or sales order to work order, a work order position per item/lot size is created. The setup time indicated here refers to the lot size in item master.

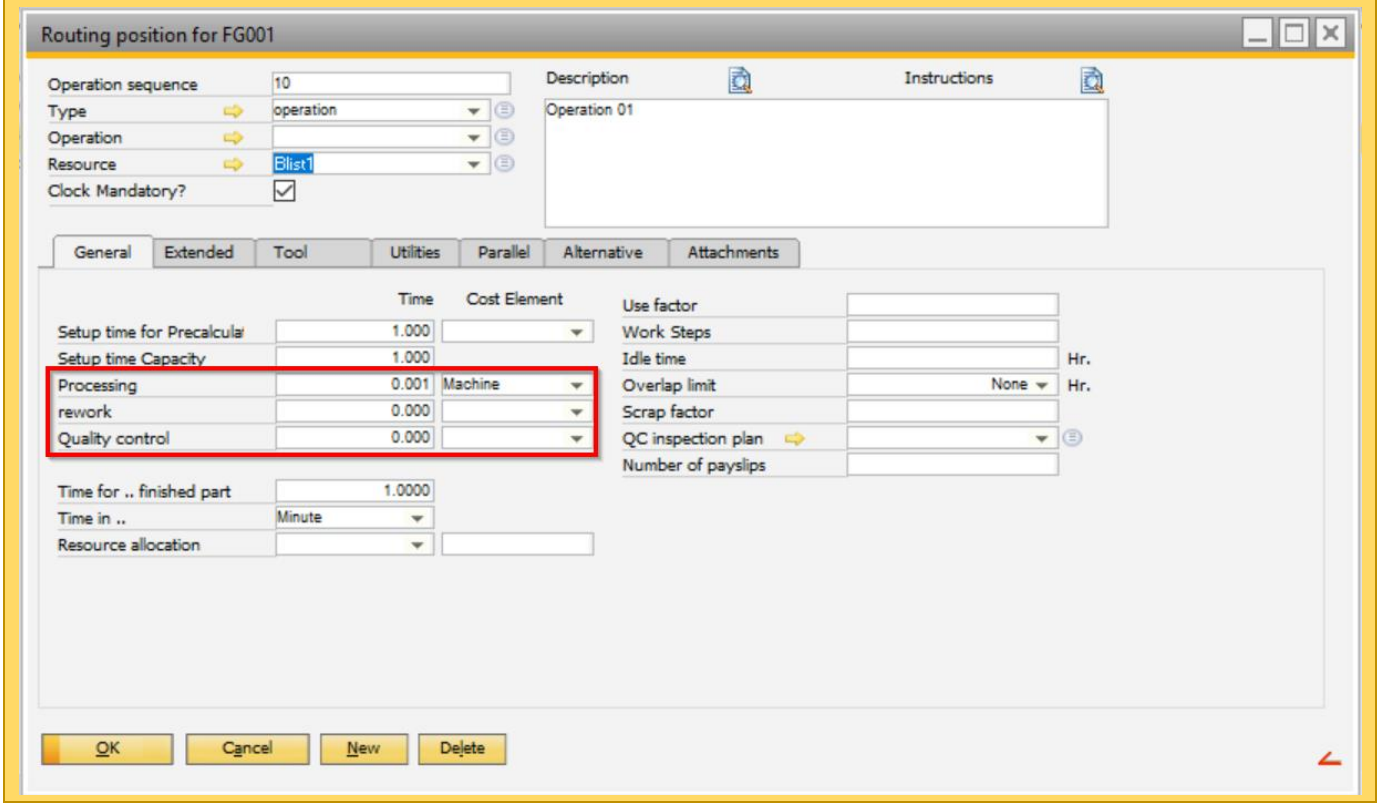
IMPORTANT: If in the resource, the field *Extend to cost elements* was set to 2 or more, then the setup time can be reported separately via FDC and evaluated separately in calculation. Enter the cost element, to which the costs will be posted.

Setup Time Capacity: Field used to set the setup time, valid only for capacity planning and throughput time calculation. This will be automatically filled with the information of the field *Setup Time For Calculation*. This setting has an effect on Calculation Target Time.

Mach+Labor time/unit: Field used to set the time the Resource takes to produce the items. This is the actual processing time per unit produced in the routing position. The designation or the name of this field can be changed in the Configuration Wizard. For more information about this setting, please go to the Configuration Wizard at the end of this document.

This field works together with the fields *Times in..* (hour/minute) and *Times For.. finished parts.* All 3 define the specific time it will take to produce a specific quantity of items.

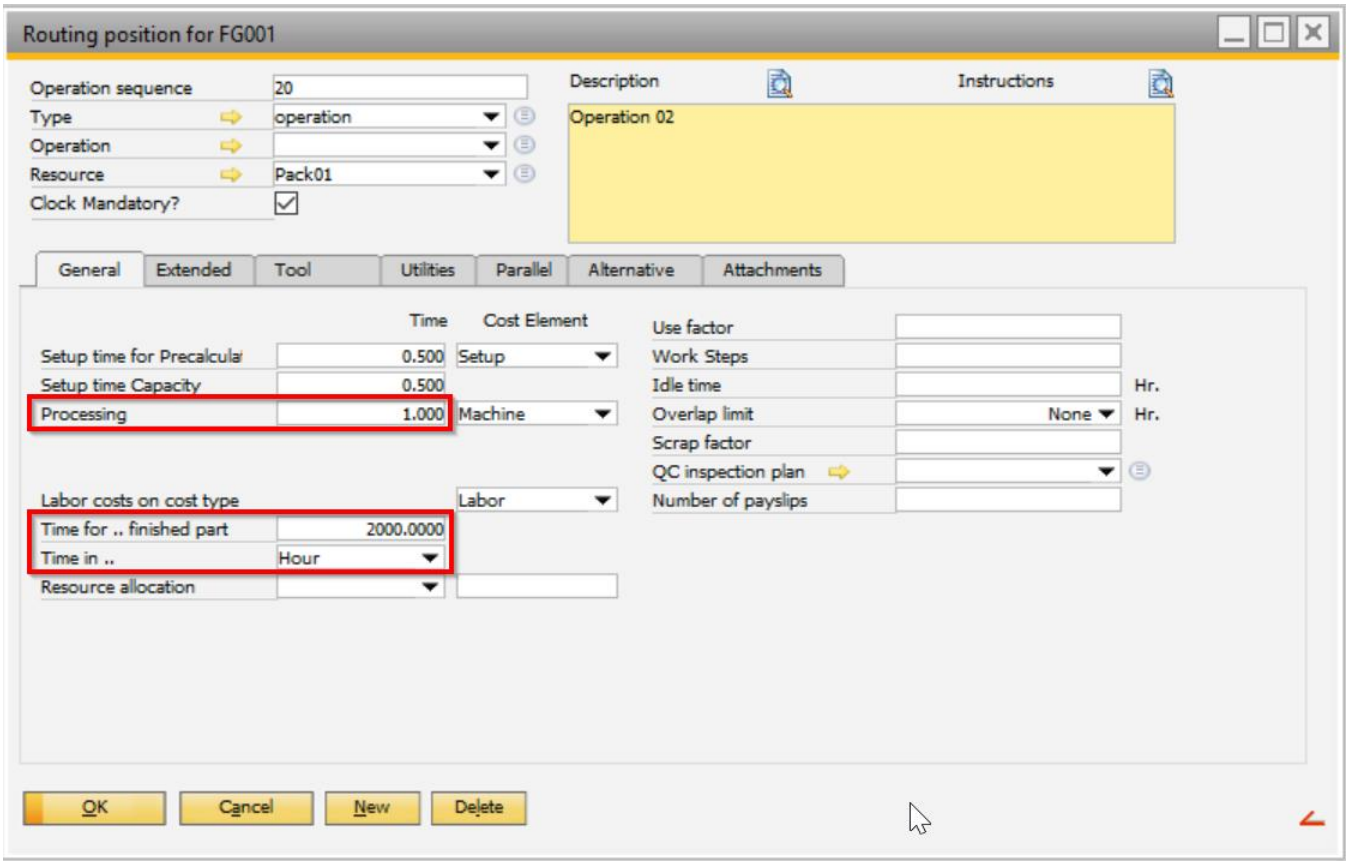
IMPORTANT: If in the resource, the field *Expand to Cost Elements* was set to 2 or more, this will expand also the fields to include time in the routing according to the titles of the time types like:



Cost Element: Field used to set a cost element to be included in the respective account every time a report is done. For more information, please refer to *Cost Element* tutorial.

Time for .. finished part: Field used to set the quantity that will be produced during the time defined in the *Mach+Labor time/unit* field. This field will help the user to understand the proportion of time per quantity produced. It is possible to set a standard value for this field in the Configuration Wizard. For more information about this setting, please go to the Configuration Wizard at the end of this document.

> Example: Production time 0.0005 hours per piece. To make it more readable, the user can enter 1 hour per 2,000 pieces.



If it is a fixed time, enter 0 in *Quantity per* field, that means this time is needed only once per lot size. This has the same effect as for setup time.

Example: Lot size 10

Production 50 pieces

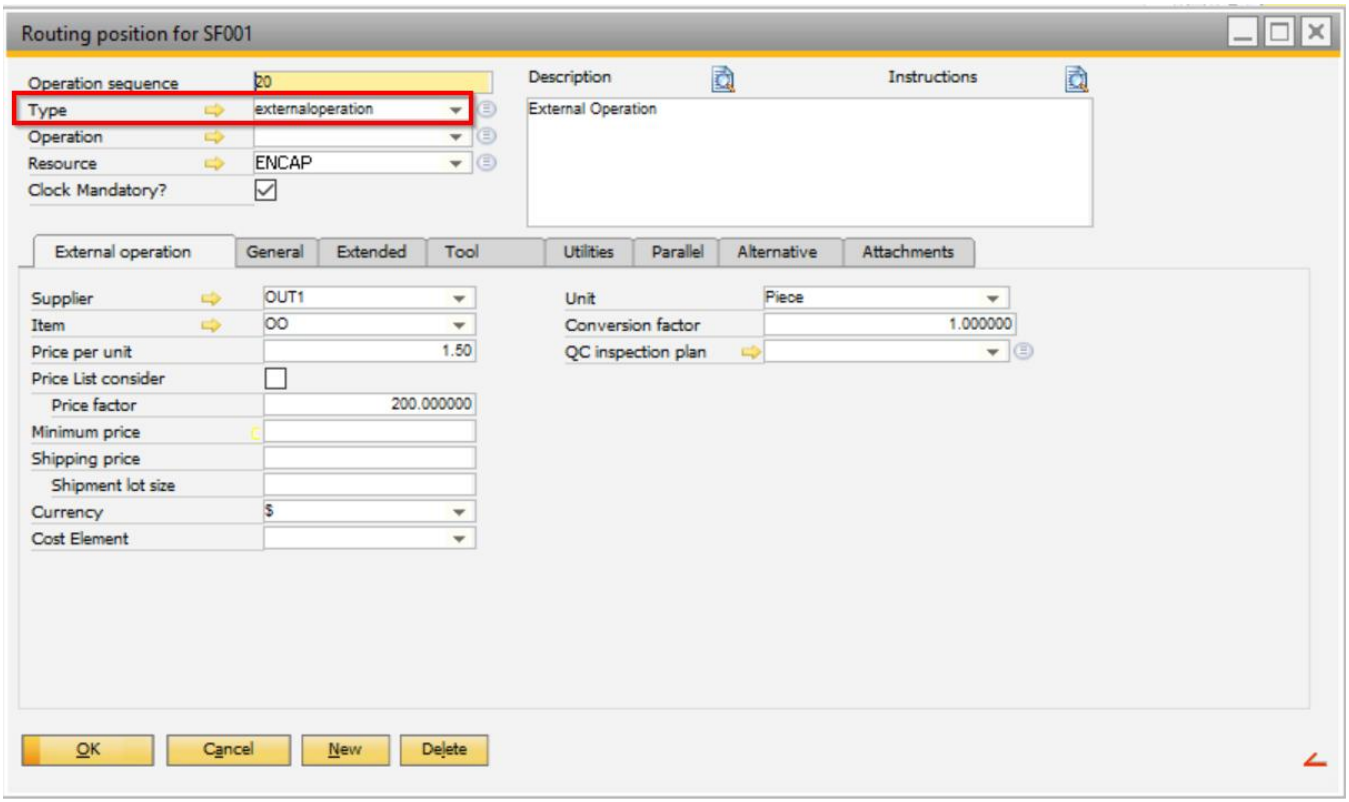
Time = 2 Minutes per 0

Total time: 5 lot sizes x 2 minutes (per lot size) = 10 minutes

Time in ..: Field used to set the unit of time (hours or minutes) for the specific time information given for setup and production processes. It is possible to set a standard value for this field in the Configuration Wizard. For more information about this setting, please go to the Configuration Wizard at the end of this document.

2.3. External Operation Tab

This tab is only visible if an external operation is set in the *Operation Type* field on the *Header*. For more information, please refer to *External Operation: Setup* tutorial.



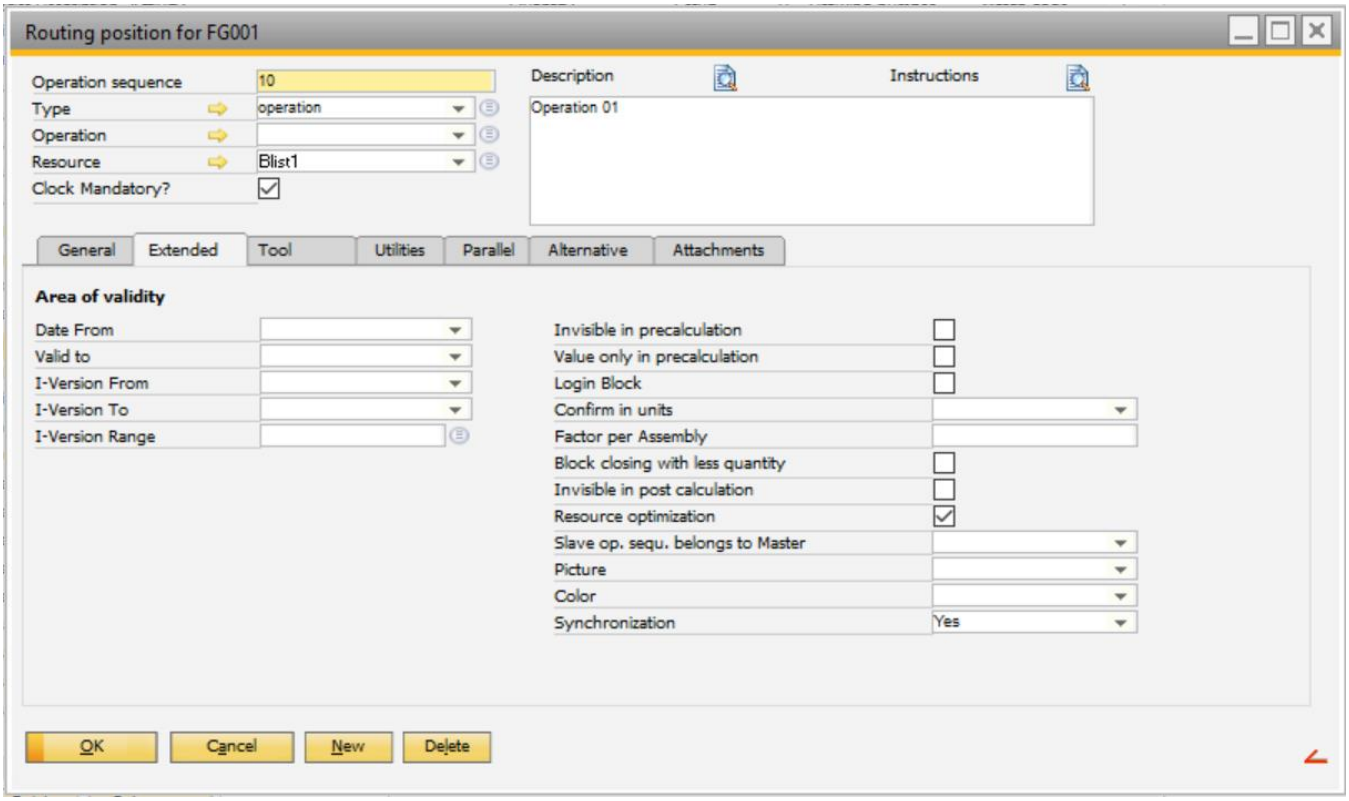
Supplier: Field used to assign the supplier linked to this external operation.

Item: Field used to assign a non-warehouse item to manage all external operation transactions like purchase orders.

Price per unit: Field used to set the price for purchase orders.

2.4. Extended Tab

In this tab, beas allows the user to insert additional information used in production processes.



Date From: Field used to define the start date of validity of the I-Versions. For more information, please refer to *Version Control:Setup* and *Version Control:Usage* tutorials.

Valid to: Field used to define the end date of validity of the I-Versions. For more information, please refer to *Version Control:Setup* and *Version Control:Usage* tutorials.

I-Version From: Field used to select the first *I-Version* to be taken into account in a range. For more information, please refer to *Version Control:Setup* and *Version Control:Usage* tutorials.

I-Version To: Field used to select the last *I-Versions* to be taken into account in a range. For more information, please refer to *Version Control:Setup* and *Version Control:Usage* tutorials.

I-Version Range: Field used to select the specific *I-Versions* to be taken into account. For more information, please refer to *Version Control:Setup* and *Version Control:Usage* tutorials.

Invisible in precalculation: Field used to select when the operation needs to be included in the work order, but not valued or displayed in the precalculation.

Value only in precalculation: Field used to consider this operation in the precalculation function, but not to transfer this routing position to the work order when it is created.

Login block: Field used to block the creation of time receipts for this operation and also not to reserve the resource's capacity.

Confirm in units: Field used to confirm a different *Unit of Measure,* like when the item is manufactured in kilograms, but is processed in liters in certain routing positions.

Factor per assembly: Field used to specify a conversion factor in case another *Unit of Measure* has been defined in the field *Confirm in Units*.

Block closing with less quantity: Field used to allow the closing of the routing position with a time receipt if one of these two conditions is met:

1) The complete planned quantity is reported

2) At least the same amount from the previous routing position, with *Clock Mandatory* set as active, is confirmed and the previous routing position is closed

Invisible in post calculation: Field used to not consider the operation in the *Post Calculation* function for planned and actual costs calculation.

Resource optimization: Field used to automatically select the resource from the group that produces the item faster. If inactive, the resource should be manually changed from the *Directly Scheduled* group to the specific resource before or during the creation of the time receipt. The resource is only automatically selected during APS calculation. For more information about *Directly Scheduled Groups*, please refer to *Resources* tutorial.

IMPORTANT: This option can only be changed if the APS has been licensed.

Slave op. sequ. Belongs to master: Field used to link two operations and create time receipts automatically for the operation linked (slave) when the main operation receives its time receipt. This can be due to the need to automate the process of creating time receipts, or because two or more operations are done together. Beas allows the user to determine how this operation should receive its time receipt when a time receipt is created for the master operation with a parameter in the Configuration Wizard. For more information about this setting, please go to the Configuration Wizard at the end of this document.

IMPORTANT: The smallest unit of a time receipt is the minute. Due to conversion, rounding differences may occur. Parallel operations are not considered for slave operations.

Picture: Field used to define an icon for the routing.

Color: Field used to set a color font for the routing.

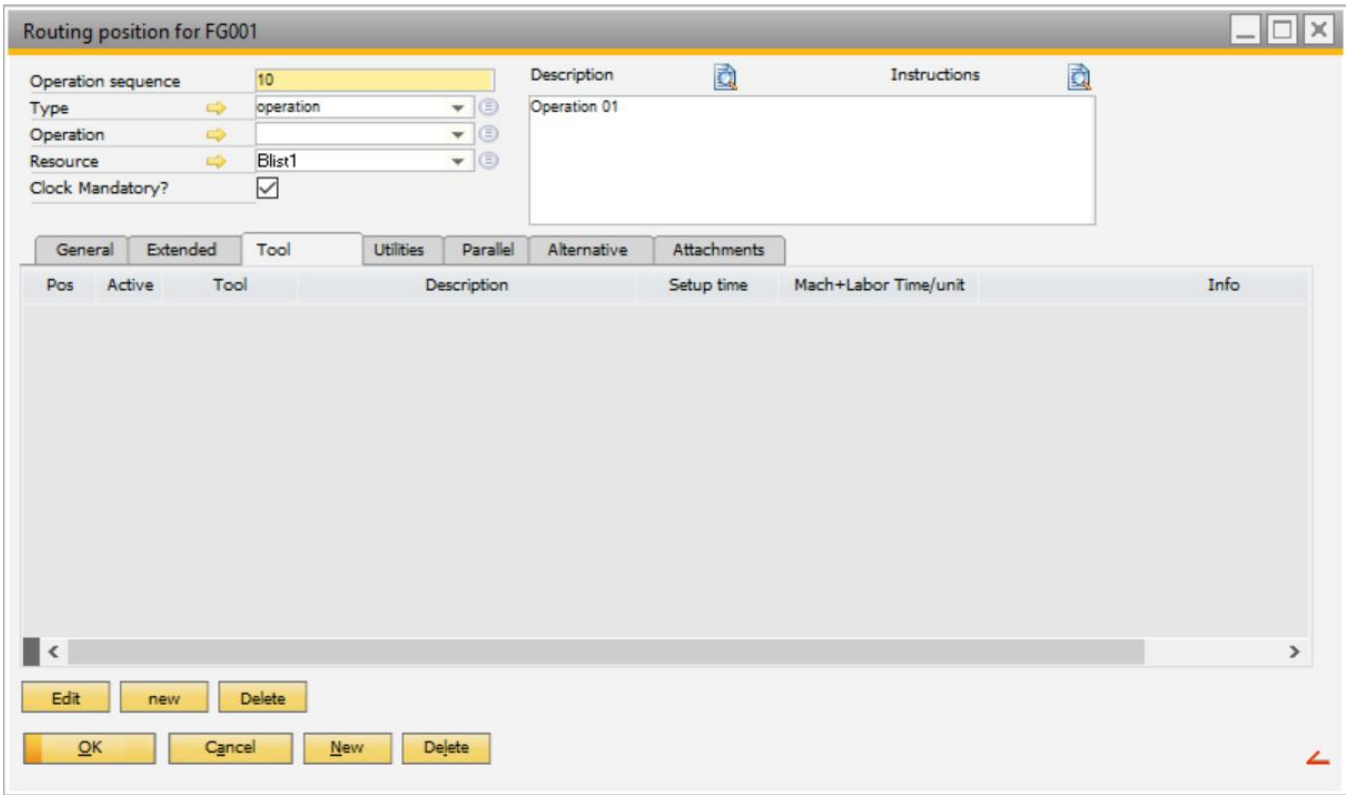
Synchronization: Field used to link, if this routing master data requires an automatic update from *Data Integration Hub* functionality. The user can specify the type of synchronization that is needed:

- *Yes* – which makes *Data Integration Hub* delete and recreate this position when importing routing positions for the related item
- *Not Delete* – which prevents *Data Integration Hub* from deleting this position, but not from updating this position's data
- *No* – which prevents *Data Integrations Hub* from deleting or updating this position

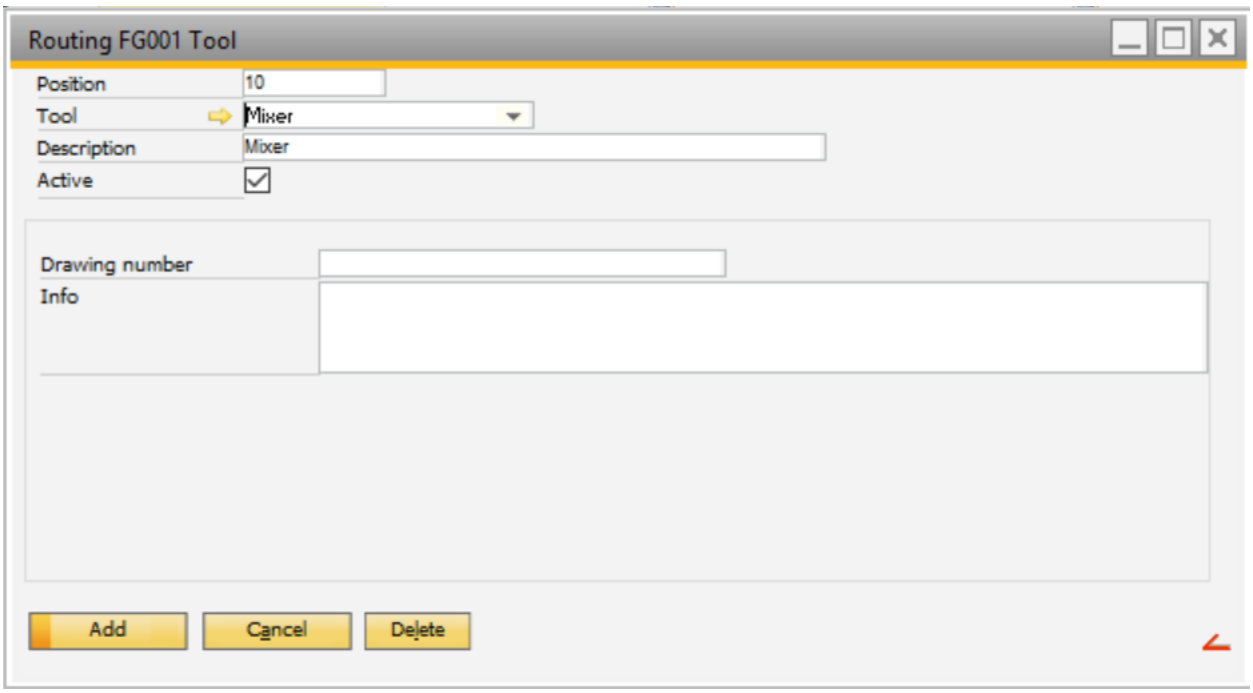
TIP: The recommended setting for *Synchronization* is the standard option, "Yes".

2.5. Tool Tab

In this tab, beas allows the user to insert tools that will be used to perform the operation. For more information about tools, please refer to *Tools* tutorial.



In this screen, beas displays a list of all tools assigned to this routing. The user can insert, edit and delete tools. To assign a tool, click on *New*. A new screen will open.



Position: Field used to sort the tool lists from the routing. It is a consecutive number, but not a primary key.

Tool: Field used to assign the tool to perform this operation. This field is mandatory.

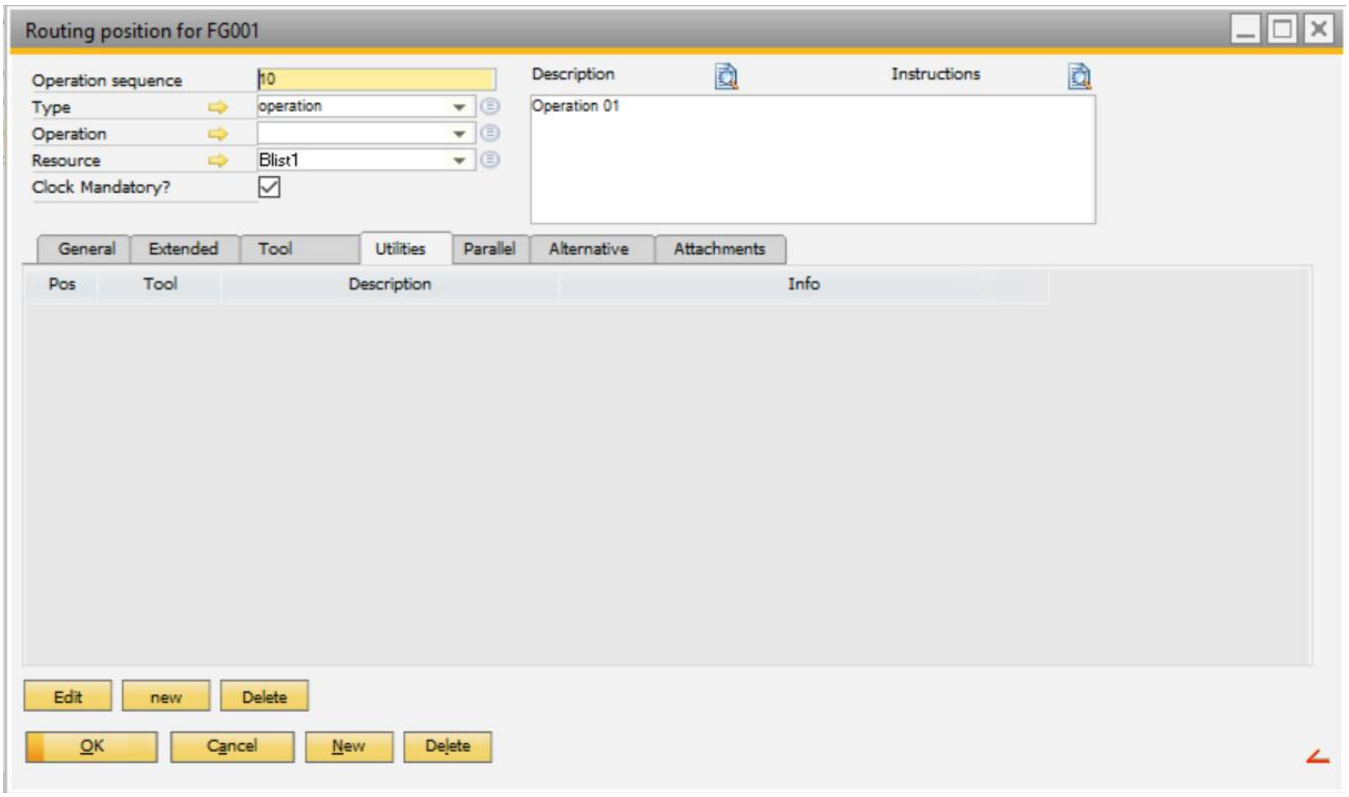
Description: Field used to display the tool description. This field cannot be changed because it automatically comes from the chosen tool.

Active: Field used to set the tool as active in the routing.

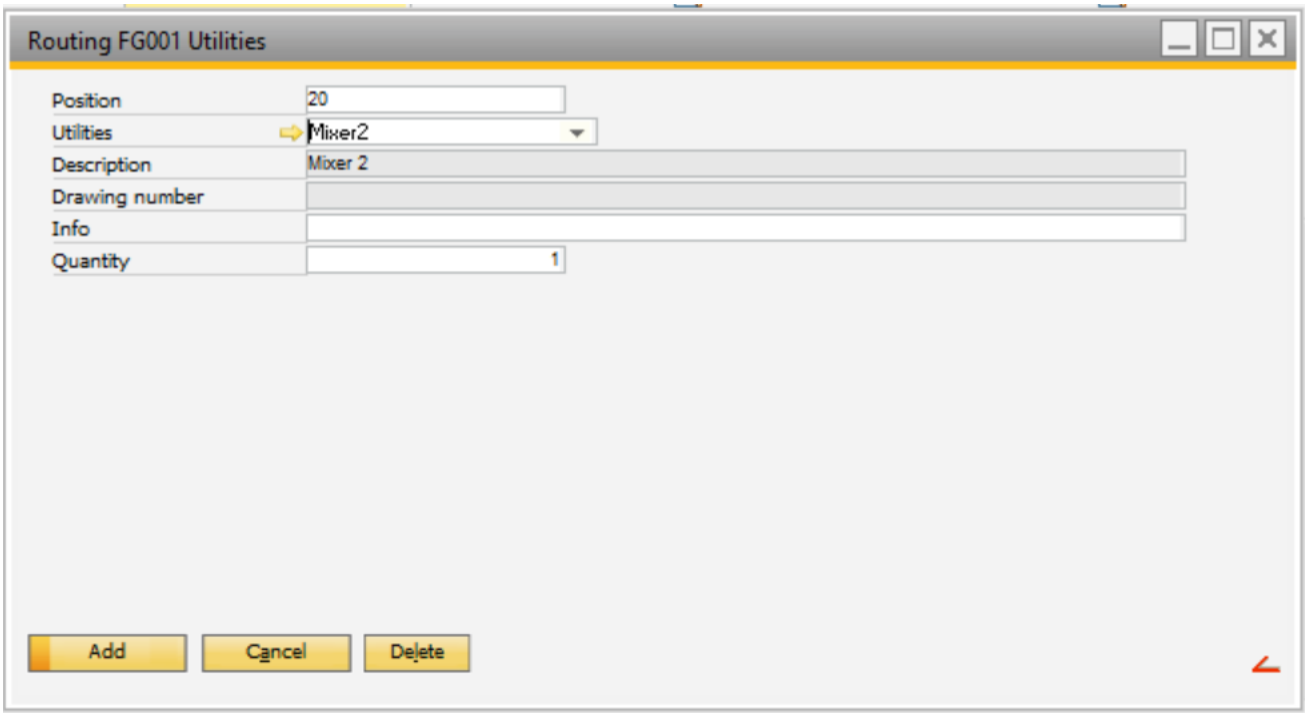
IMPORTANT: Tools that define throughput time cannot be simultaneously active for the routing position. Only one can be active at each time, but the active tool can be switched directly in work orders. This information is copied to the operation. Therefore, the user will have to check one tool as "Active", and all other tools should have "Active" unchecked.

2.6. Utilities Tab

In this tab, beas allows the user to insert utilities that will be used to perform the operation. For more information about utilities, please refer to *Tools* tutorial.



In this screen, beas displays a list of all utilities assigned to this routing. The user can insert, edit and delete utilities. To assign a utility, click on *New*. A new screen will open.



Position: Field used to sort the utilities list from the routing. It is a consecutive number, but not a primary key.

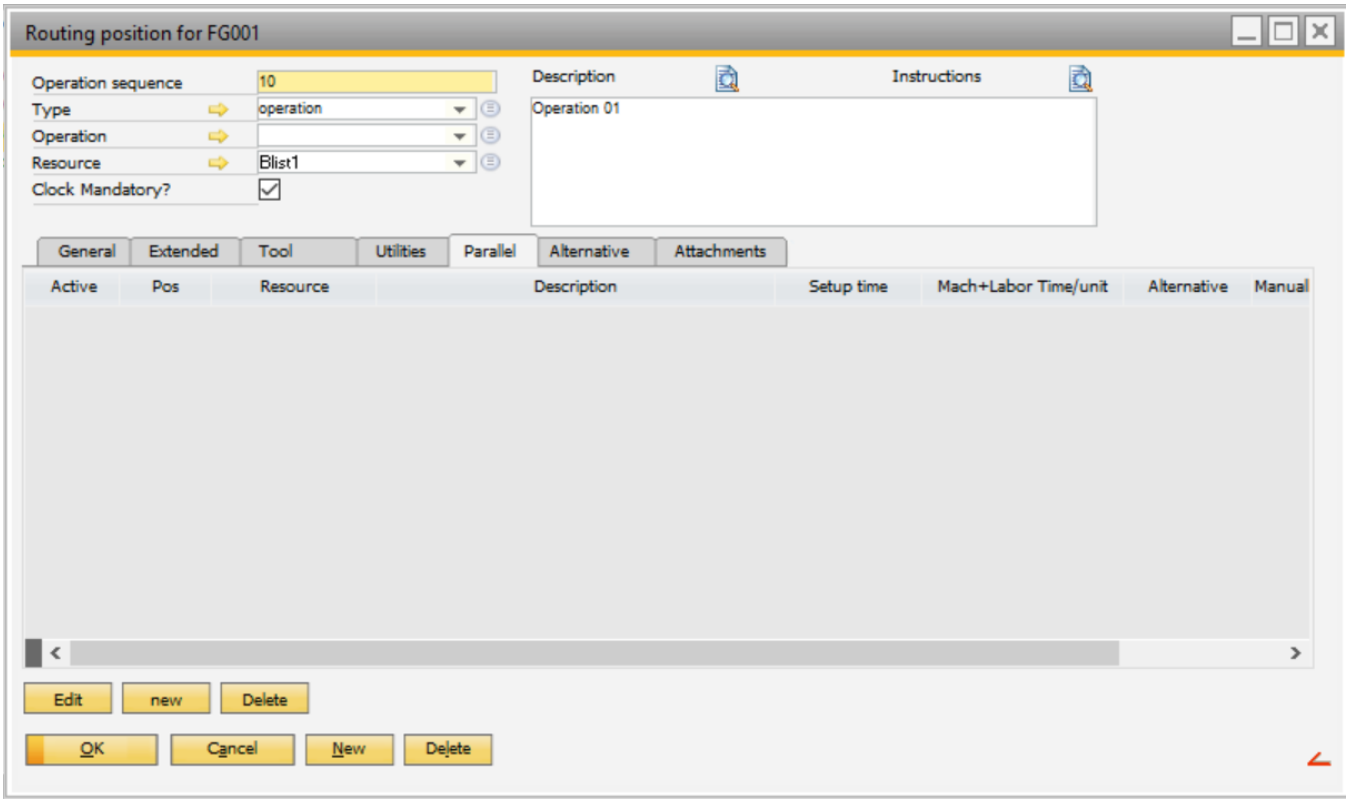
Utilities: Field used to assign the utilities to perform this operation. This field is mandatory.

Description: Field used to display the utilities description. This field cannot be changed because it automatically comes from the chosen utilities.

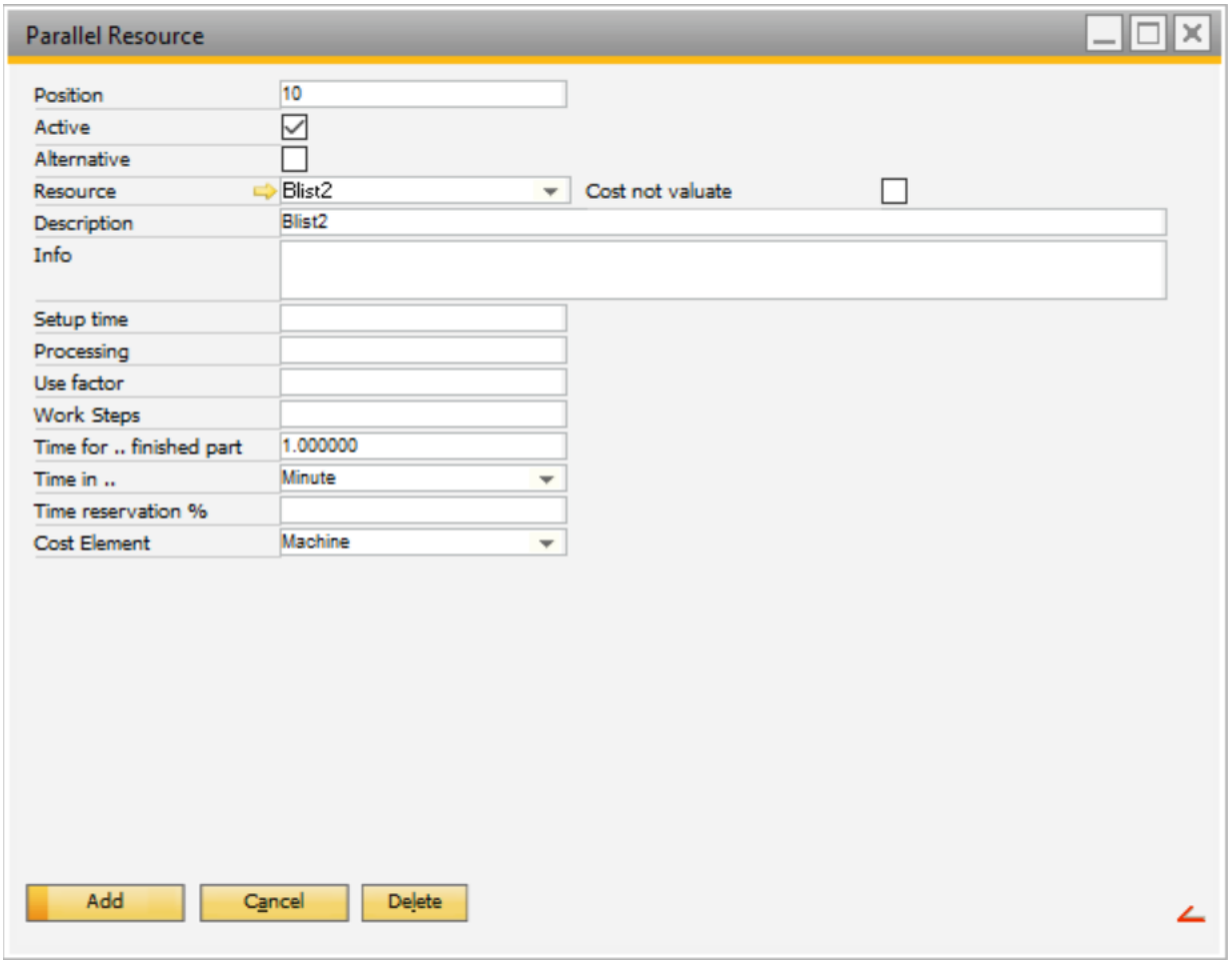
Quantity: Field used to specify the number of utilities needed to perform the operation. This field is only informative and will have no influence on the routing position.

2.7. Parallel Tab

In this tab, beas allows the user to insert parallel resources that will be used to perform the operation.



In this screen, beas displays a list of all resources that will be used in parallel with the main resource assigned in the *Header*. The user can insert, edit and delete resources. To assign a parallel resource, click on *New*. A new screen will open.



Position: Field used to sort the parallel resource list from the routing. It is a consecutive number, but not a primary key.

Active: Field used to set the parallel resource as active in the routing.

IMPORTANT: Only one parallel resource can be activated which defines the throughput time per routing. This information is copied to the operation. Therefore, the user will have to check one parallel resource as "Active", and all other resources should have "Active" unchecked.

Resource: Field used to select the parallel resource from existing resources.

IMPORTANT: No external resources or resources with extended cost rates, for example personnel costs, are allowed.

Description: Field used to display the resource description. This field cannot be changed because it automatically comes from the chosen resource.

Setup Time: Field used to set the setup time for the parallel resource. For more information, please refer to *Setup Time Capacity* field, from *General* tab.

Processing Time: Field used to set the time the tool takes to produce the items. This is the actual processing time per unit produced in the routing position. For more information, please refer to *Mach+Labor Time/Unit* field, from *General* tab.

IMPORTANT: Secondary processing times cannot be specified here.

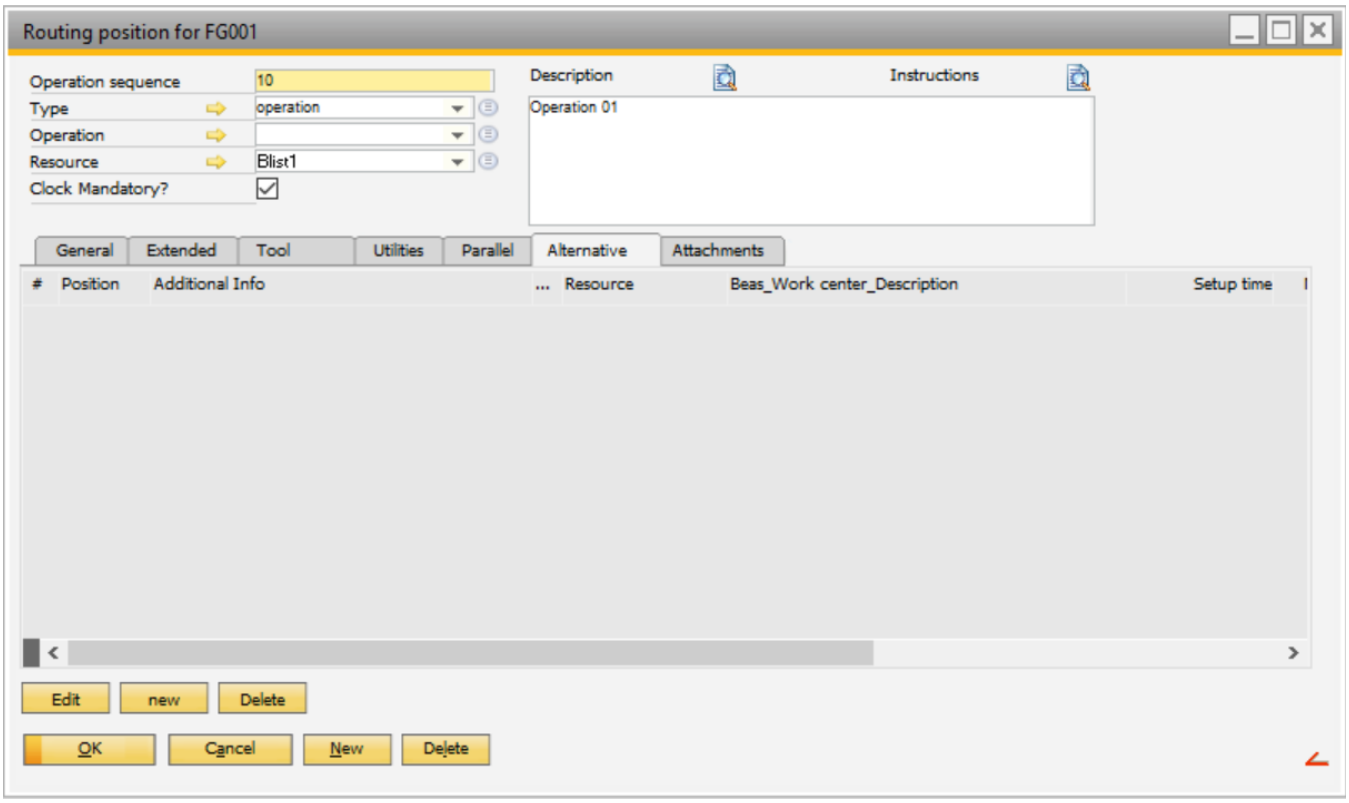
Time For .. Finished Part: Field used to set the quantity that will be produced during the time defined in the *Processing Time* field. This field will help the user to understand the proportion of time per quantity produced. For more information, please refer to *Time For .. Finished Part* field, from *General* tab.

Time In ..: Field used to set the unit of time (hours or minutes) for the specific time information given for setup and production processes. For more information, please refer to *Time In ..* field, from *General* tab.

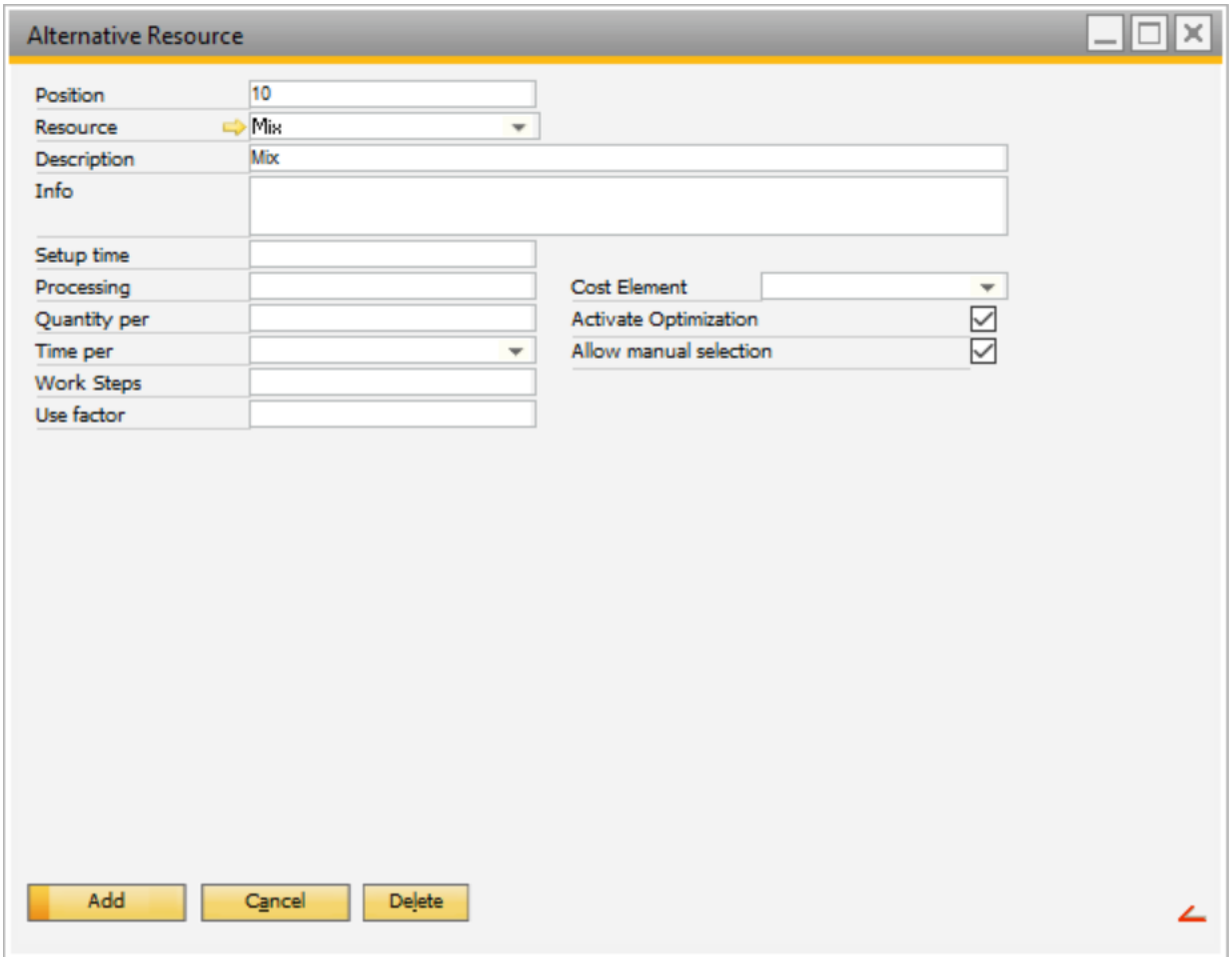
2.8. Alternative Tab

In this tab, beas allows the user to insert alternative resources that will be used to perform the operation. In some cases, different resources can be used alternately for the same operation, like a set of cutting machines with different performance, or extraction tank with different capacities.

IMPORTANT: Alternative resources are not supported in Pre-Calculation.



In this screen, beas displays a list of all resources that will be used as alternative if the main resource, assigned in the *Header*, is not available for production. The user can insert, edit and delete resources. To assign an alternative resource, click on *New*. A new screen will open.



Position: Field used to sort the parallel resource list from the routing. It is a consecutive number, but not a primary key.

Resource: Field used to select the parallel resource from existing resources. The alternative resource can be selected manually in the APS - graphic view and production structure display. For more information, please refer to *APS* tutorial.

Description: Field used to display the resource description. This field cannot be changed because it automatically comes from the chosen resource.

Setup Time: Field used to set the setup time for the alternative resource. For more information, please refer to *Setup Time Capacity* field, from *General* tab.

Processing Time: Field used to set the time the resource takes to produce the items. This is the actual processing time per unit produced in the routing position. For more information, please refer to *Mach+Labor Time/Unit* field, from *General* tab.

IMPORTANT: Secondary processing times cannot be specified here.

Quantity Per: Field used to set the quantity that will be produced during the time defined in the *Processing Time* field. This field will help the user to understand the proportion of time per quantity produced. For more information, please refer to *Time For .. Finished Part* field, from *General* tab.

Time Per: Field used to set the unit of time (hours or minutes) for the specific time information given for setup and production processes. For more information, please refer to *Time In ..* field, from *General* tab.

Activate Optimization: Field used to define if beas should automatically select the most adequate resource among the main and alternative resources, in the APS calculation. For more information, please refer to *APS* tutorial.

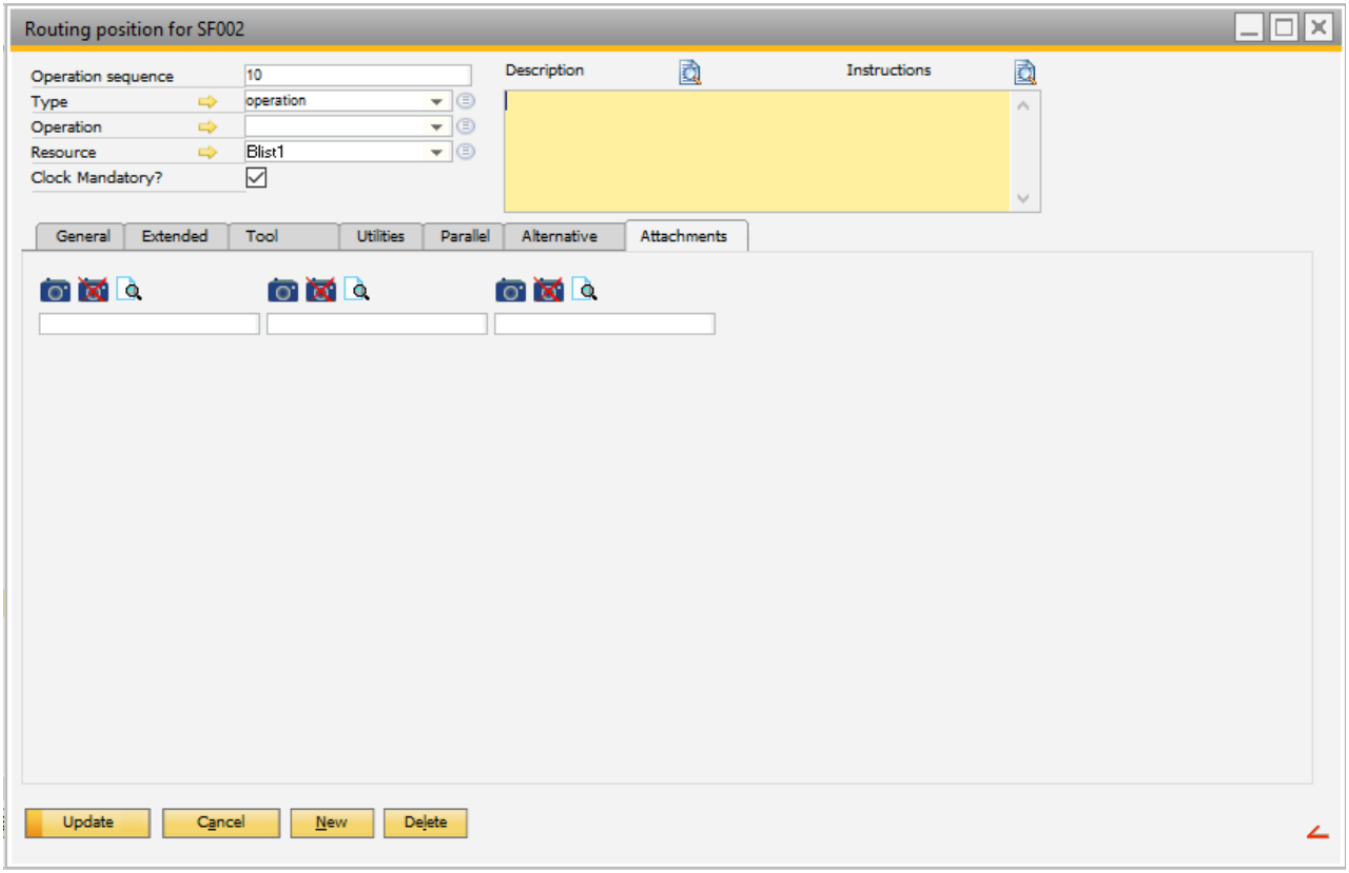
Allow Manual Selection: Field used to manually select the desired alternative resource. If disabled, only the scheduling functions will be able to change the resource and a message will be displayed if the user attempt to manually select a resource: "*(aktivaplatz440)Resource cannot be selected when flag "allow manual change" is off*".

IMPORTANT: A change is only possible if a change has been allowed according to the work order position. For more information, please refer to *Work Order: Overview* tutorial.

2.9. Attachments Tab

The Attachments tab is used to attach images and documents to the resources.

Only three files can be attached, one file per field. Right next to each field, there are three buttons:



- The camera button enables the user to select a picture or document to attach
- The camera marked with an "X" button removes the attachment
- The document with a magnifying glass opens the attachment

All attachments included in this tab will be available in the FDC Terminal. For more information about the FDC Terminal, please refer to Terminal tutorial.

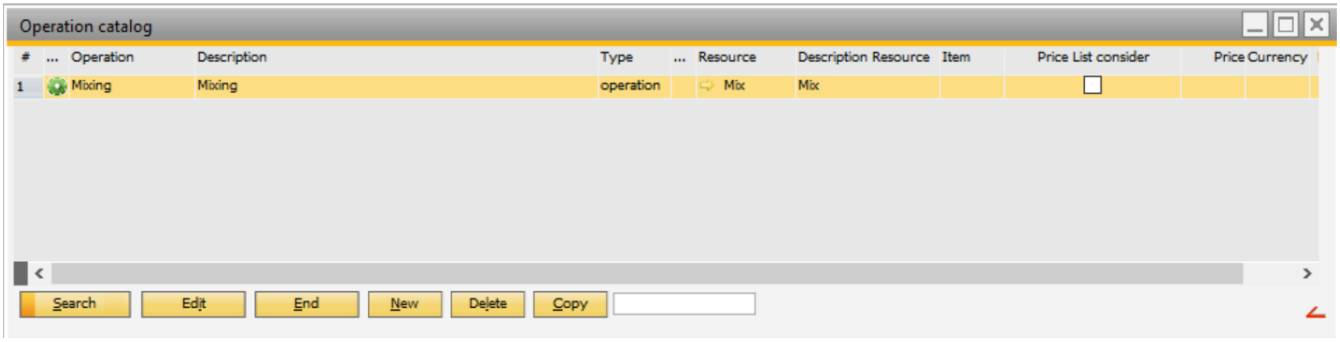
3. SPECIAL CASES

There is a function that allows the user to create standard operations and then assign them as routings in different items. This helps the user to reduce the routing creation one by one on every item.

This function is called Operation Catalog. The main purpose is to create one operation from scratch, defining setup and production times and other relevant information within the operation. Then, assign it to one or more items. If there are values to be changed per item, beas allows the user to change those particular values in the specific item without changing them in the other items.

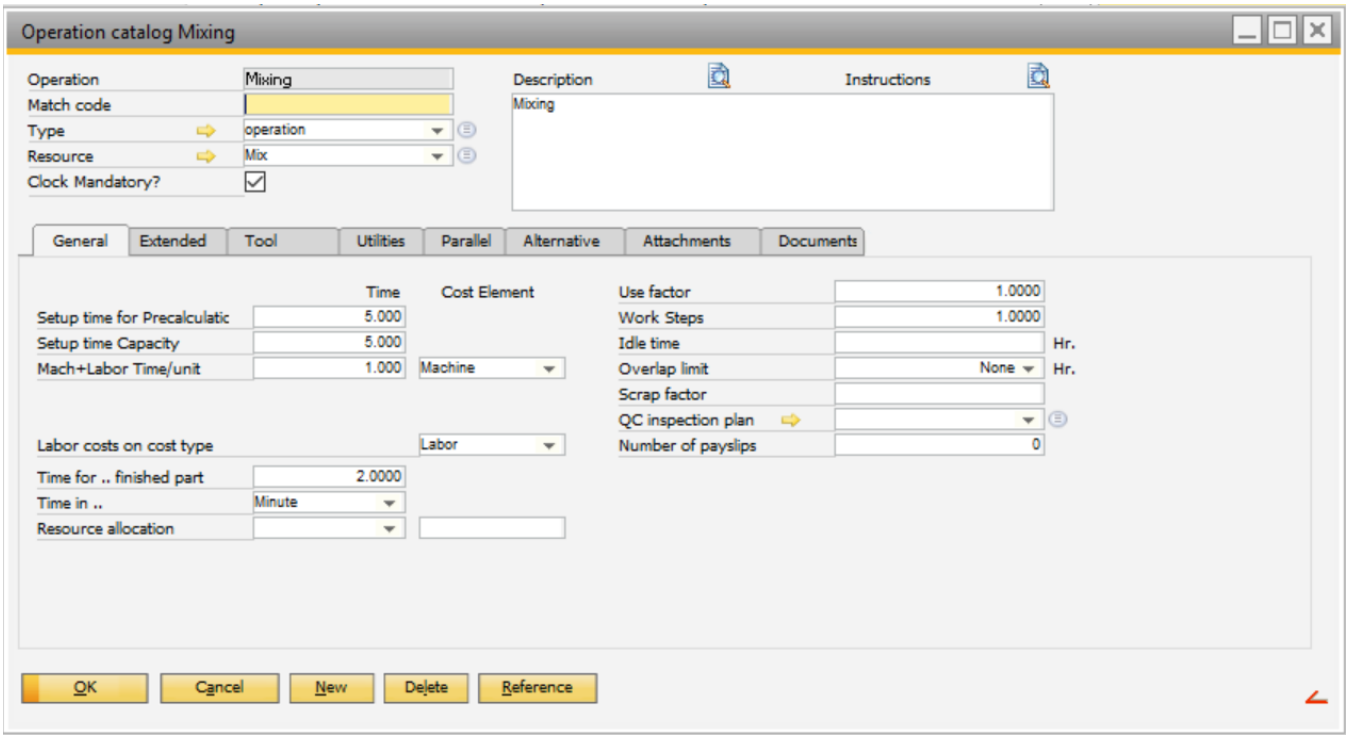
IMPORTANT: If there is an operation created in the *Operation Catalog* already assigned to different items, and the user wants to change a value in the *Operation Catalog*, those changes will not affect the routings already assigned to the items. These will ONLY affect the routings that will be assigned to items in future, after the changes were made.

PATH: Administration > Setup > Production > Operation Catalog



In the Operation Catalog screen, beas displays a list of existing Operation Catalogs. Also, beas allows the user to manage the operation within the catalog like: create, edit, delete, copy and search operations.

The operation catalog detailed screen is the well-known routing screen:



There are only a few differences in the following fields:

Operation sequence: In operation catalog, there are no position numbers, only a catalog ID.

Resource: the resource is optional in the operation catalog.

The rest of the fields behave the same as the routing fields.

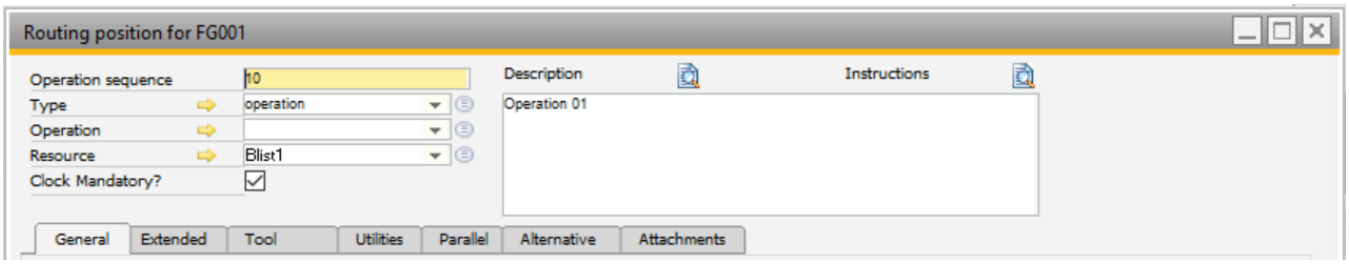
IMPORTANT: When the operation from the Operation Catalog is assigned to the routing, all fields will be populated by the information from the operation in the *Operation Catalog*.

4. FIELD GUIDE

All fields, relevant from part 3 and the rest of the fields on the master data or function, here, we should describe the ones not relevant to the standard process with all the main information. This makes the handling easier and more useful for the online documentation.

4.1. Header

In the Header area of the screen the user can find general information about the routing:



Operation Sequence: Field used to set the position number. This field is counted in increments of 10, by default. The field is alphanumeric with 20 digits. For more information about this field, please refer to *Operation Sequence*.

Type: Field used to define the type of routing position to be created. For more information about this field, please refer to *Type*.

Operation: Field used to select the operation from the *Operation Catalog* definition. By selecting one operation, the rest of the fields are automatically filled from the selected *operation catalog*.

Resource: Field used to define the resource (work station, personnel group, machine or machinery group, external operation or labor) that will be assigned to perform this operation. For more information about this field, please refer to *Resource.*

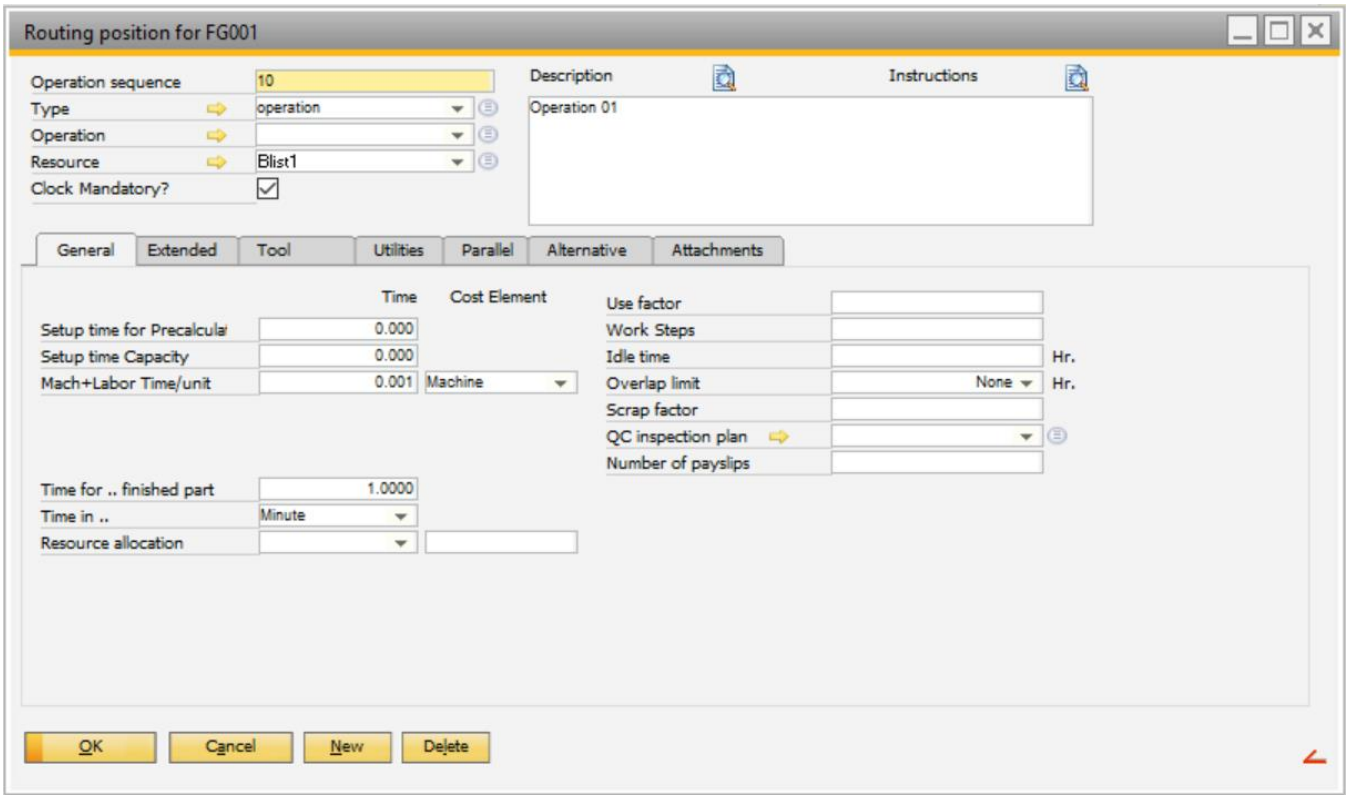
Clock Mandatory?: Field used to set the operation where time receipts are mandatory. For more information about this field, please refer to *Clock Mandatory?.*

Description: Field used to include a description of the activity. It can have several lines (max. 16,000 characters). By clicking on the icon of a document and magnifying glass, a new screen is displayed.

Instructions: Field used to include further instructions concerning the activity. It can have several lines (max. 16,000 characters). By clicking on the icon of a document and magnifying glass, a new screen is displayed. There is an option to change the field format. For more information about this setting, please go to the Configuration Wizard at the end of the document.

4.2. General Tab

The following tab includes fields related to the manufacturing process:



It is possible to set the standard times for each *Time Type* activated for the selected *Resource*. For more information about *Time Type*, please refer to the *Resources* tutorial. If the *Resource* has only one *Time Type* activated, the first three fields for standard times will become active:

Setup Time For Calculation: Field used to set the time, in hours or minutes, required to make the resource ready for production, which is taken into consideration during production cost analysis and recalculation. For more information about this field, please refer to *Setup Time for Calculation*.

Setup Time Capacity: Field used to set the setup time, valid only for capacity planning and throughput time calculation. For more information about this field, please refer to *Setup Time Capacity*.

Mach+Labor time/unit: Field used to set the time the resource takes to produce the items. For more information about this field, please refer to *Mach+Labor time/unit*.

Cost Element: Field used to set a cost element for each time reported to be included in the respective account. For more information, please refer to *Cost Element* tutorial.

Time for .. finished part: Field used to set the quantity that will be produced during the time defined in the *Mach+Labor time/unit* field. For more information about this field, please refer to *Time for..Finished Part*.

Time in ..: Field used to set the unit of time (hours or minutes) for the specific time information given for setup and production processes. For more information about this field, please refer to *Time in...*

Resource allocation: Field used to limit the use of resources in the current routing. There are different ways in which an operation can consume resources. Since resources can be groups of machines or people, it is possible for example, to limit the amount of machines or employees that this operation can use, or determine that the

operation can only use resources up to a certain amount of their total capacity. Beas allows the user to define these limits by:

- *Quantity* – Here, it can be specified the number of machines or employees that this operation can use, which will be used up to 100% of their capacity
- *Percent* – Here, it can be specified the percentage that beas will use from the resource's capacity (lesser or greater than 100%), but beas will always use all the machines or employees available
- *Simple* – Here, beas will always use one machine or employee from the resource, up to the percentage that the user can define.

IMPORTANT: If nothing is selected in the *Resource Allocation* field, beas will consider it like "Percent" and the value of "100", allowing beas to use all machines or employees available up to 100% of their capacity.

Use factor: Field used to split the production time among more finished goods.

> Example: In the production of injected plastic parts, the production times are normally calculated for the injection cycles: like 30 minutes (*Mach+Labor Time/Unit*) for 10 injection cycles (*Time For .. Finished Part*). However, at the end of each injection cycle, several pieces are produced according to the number of cavities in the mold. This means that the time for each injection cycle should be divided by the number of produced parts, and this is what the *Use Factor* field does.

Work Steps: Field used as a multiplication factor for the production times. It should be used when the production operation needs to be repeated to manufacture a product.

> Example: There is an operation to tighten screws (using a screwing machine as tool). When the operator needs 2 minutes to tighten each screw (*Processing Time* as 2 and *Quantity Per* as 1), and 10 screws are needed (*Work Steps* as 10). If the field *Work Steps* is used, beas will always multiply the production time for the required repetitions.

Idle Time: Field used to set a time during which the production process has to be stopped before going to the next operation, like when the product has to cool down or dry. This time is always expressed in hours and does not consume the resource's capacity.

Overlap limit: Field used to synchronize parallel operations. When this operation is executed in parallel with the next operation, the value "Parallel" can be selected for this field and both operations will be scheduled to end at the same time. For more information, please refer to *APS* tutorial.

Scrap factor: Field used to set the percentage of the production time that is normally wasted with bad pieces during the execution of the operation, and therefore increase its total time.

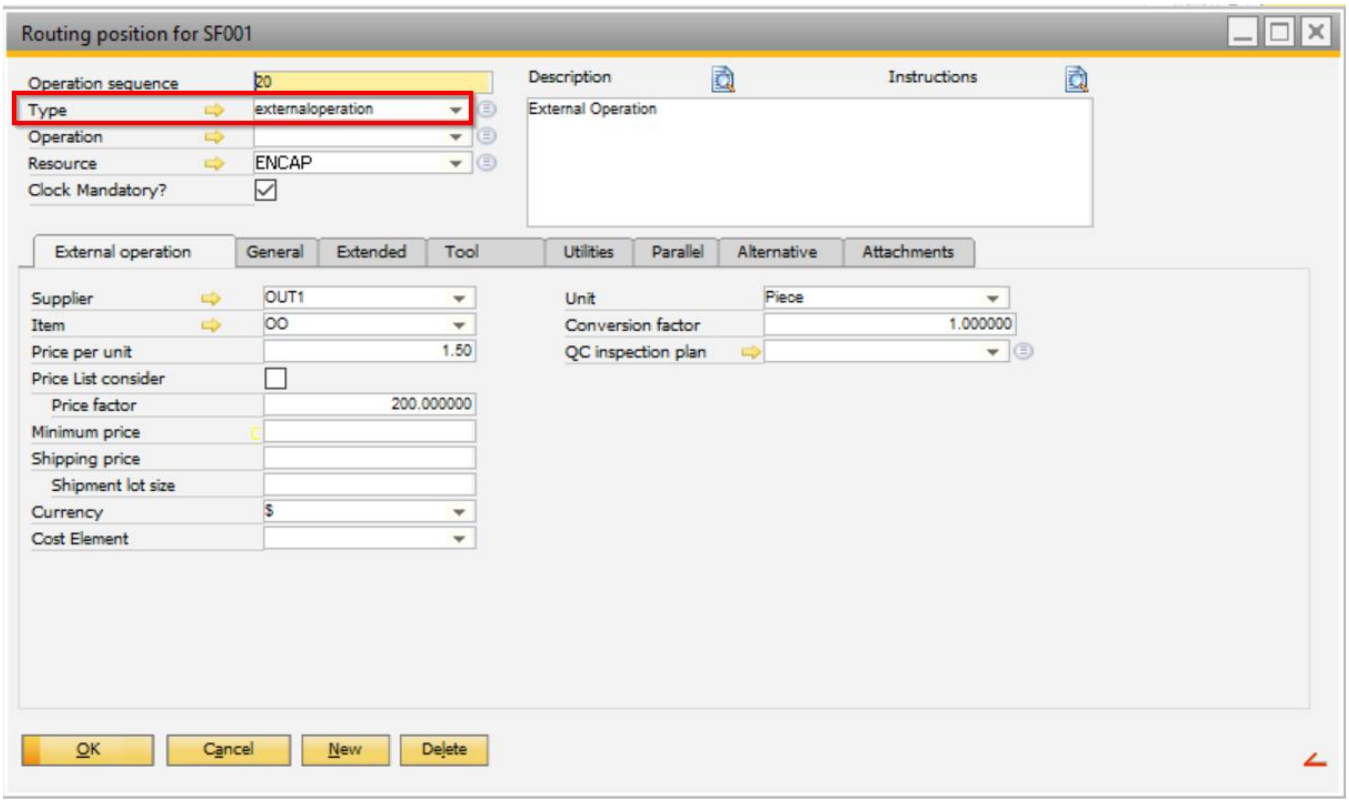
> Example, if 5% of the finished products are normally considered as scrap and need to be redone, beas will automatically increase the production time by 5% if the value "5" is filled in *Scrap Factor*.

QC Inspection Plan: Field used to define if this operation has to be inspected by the quality control team when producing the item or performing the task. For more information, please refer to *Quality Control:Create a QC Plan* tutorial.

Number of payslips: Field used to set a number for payslip printouts. This is only for information. This will not have any effect on other beas processes.

4.3. External Operation Tab

This tab is only visible if an external operation is set in the *Operation Type* field in the *Header*. For more information, please refer to *External Operation: Setup* tutorial.



Supplier: Field used to assign the supplier linked to this external operation.

Item: Field used to assign a non-warehouse item to manage all external operation transactions like purchase orders.

Price per unit: Field used to set the price for purchase orders.

Price list consider: Field used to allow beas to consider existing price lists.

Price factor: Field used to include a factor to be used according to the price per unit defined.

IMPORTANT: If *Price List Considered* is enabled, *Price Factor* is hidden, as prices in price list are always stored per warehouse unit of the service item.

Minimum price: Field used to set a minimum price for the purchase order. If the total unit price is below the minimum price, the value specified here is used.

Example: 10€ per 1000 units, minimum 30€

For 1000 units 30€ is calculated (minimum price)

For 10000 units 300€ is calculated (unit price higher than minimum price)

Shipping price: Field used to set the transportation price to be included in the total price.

Shipment lot size: Field used to set the lot size that can be shipped.

Example:10€ per 1000 units, minimum price 30€, transport price 100€, lot size 5000
1000 units are 30€ + 100€ transport price = 130€
For 10000 units: 300€ + 200€ (transport price x 2 lots) = 500€

Currency: Field used to define the currency in which the amounts are expressed. If no currency is set, local currency is used.

Cost element: Field used to change the account in which the standard costs from the external operation will be booked. For more information, please refer to *Work Order: Accounting* tutorial.

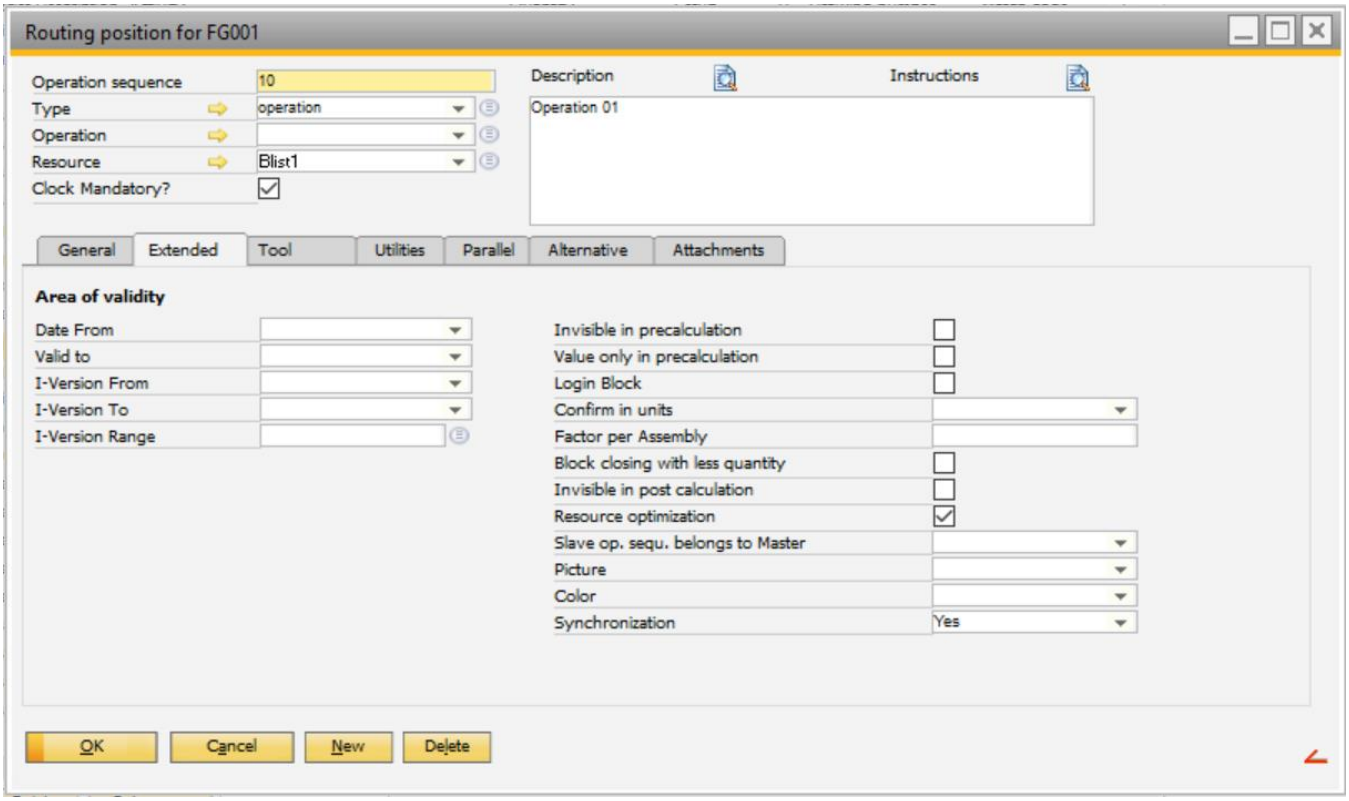
Unit: Field used to set the unit for which the purchase is registered.

Conversion factor: Field used to define the conversion factor between the time receipt unit and the consumption unit.

QC Inspection Plan: Field used to define if this external operation has to be inspected by the quality control team when producing the item or performing the task. For more information, please refer to *Quality Control:Create a QC Plan* tutorial.

4.4. Extended Tab

In this tab, beas allows the user to insert additional information used in production processes.



Date From: Field used to define the start date of validity of the *I-Versions*. For more information, please refer to *Version Control:Setup* and *Version Control:Usage* tutorials.

Valid to: Field used to define the start date of validity of the *I-Versions*. For more information, please refer to *Version Control:Setup* and *Version Control:Usage* tutorials.

I-Version From: Field used to select the first *I-Version* to be taken into account in a range. For more information, please refer to *Version Control:Setup* and *Version Control:Usage* tutorials.

I-Version To: Field used to select the last *I-Version* to be taken into account in a range. For more information, please refer to *Version Control:Setup* and *Version Control:Usage* tutorials.

I-Version Range: Field used to select the specific *I-Versions* to be taken into account. For more information, please refer to *Version Control:Setup* and *Version Control:Usage* tutorials.

Invisible in precalculation: Field used to select when the operation needs to be included in the work order, but not valued or displayed in the precalculation.

Value only in precalculation: Field used to consider this operation in the precalculation function, but not to transfer this routing position to the work order when it is created.

Login block: Field used to block the creation of time receipts for this operation and also not to reserve the resource's capacity.

Confirm in units: Field used to confirm a different *Unit of Measure,* like when the item is manufactured in Kilograms, but is processed in Liters in certain routing positions.

Factor per assembly: Field used to specify a conversion factor in case another *Unit of Measure* has been defined in the field *Confirm in Units*.

Block closing with less quantity: Field used to allow the closing of the routing position with a time receipt if one of these two conditions is met:

1) The complete planned quantity is reported

2) At least the same amount from the previous routing position, with *Clock Mandatory* set as active, is confirmed and the previous routing position is closed

Invisible in post calculation: Field used to not consider the operation in the *Post Calculation* function for planned and actual costs calculation.

Resource optimization: Field used to automatically select the resource from the group that produces the item faster. If inactive, the resource should be manually changed from the *Directly Scheduled* group to the specific resource before or during the creation of the time receipt. The resource is only automatically selected during APS calculation. For more information about *Directly Scheduled Groups*, please refer to *Resources* tutorial.

IMPORTANT: This option can only be changed if the APS has been licensed.

Slave op. sequ. Belongs to master: Field used to link two operations and create time receipts automatically for the operation linked (slave) when the main operation receives its time receipt. This can be due to the need to automate the process of creating time receipts, or because two or more operations are done together. Beas allows the user to determine how this operation should receive its time receipt when a time receipt is created for the master operation with a parameter in the Configuration Wizard. For more information about this setting, please go to the Configuration Wizard at the end of this document.

IMPORTANT: The smallest unit of a time receipt is the minute. Due to conversion, rounding differences may occur. Parallel operations are not considered for slave operations.

Picture: Field used to define an icon for the routing.

Color: Field used to set a color font for the routing.

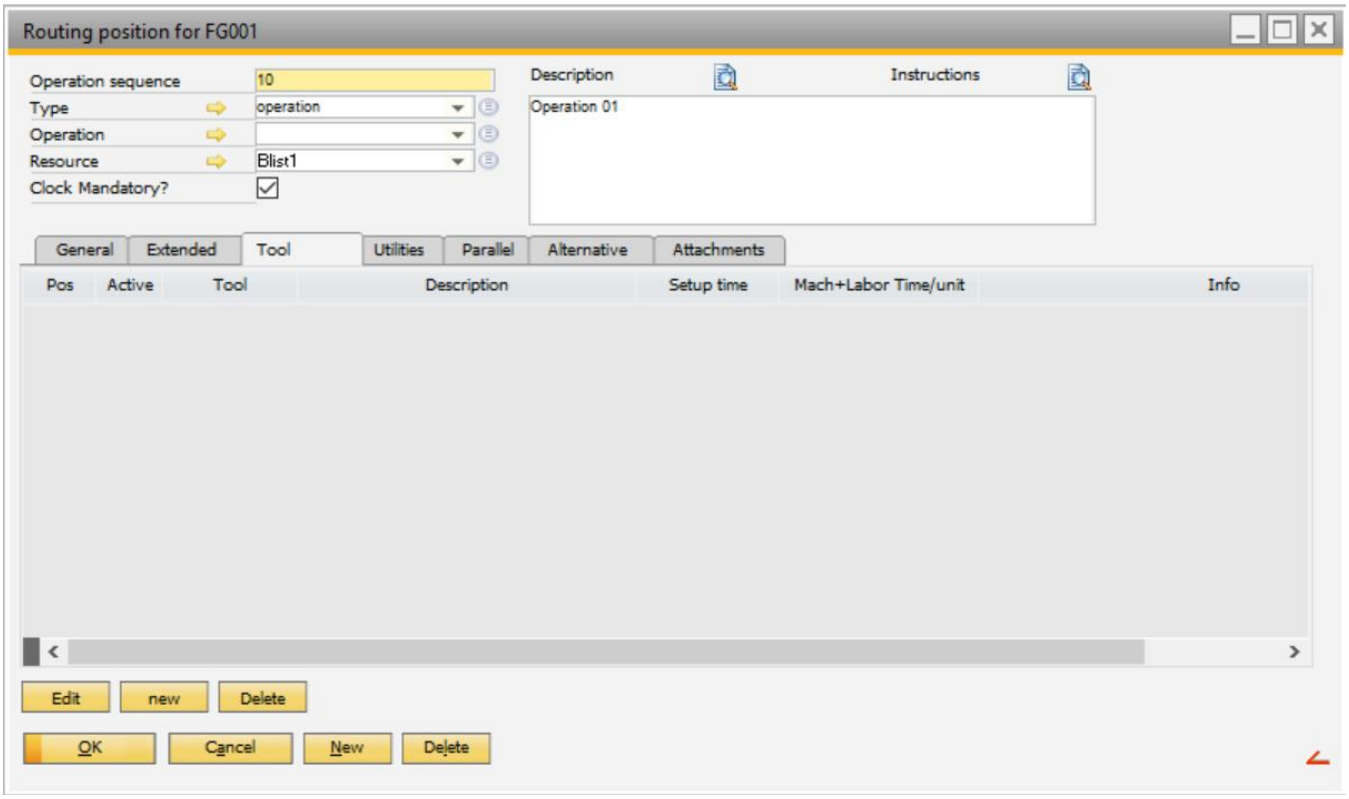
Synchronization: Field used to link if this routing master data requires an automatic update from *Data Integration Hub* functionality. The user can specify the type of synchronization needed:

- *Yes* – which makes *Data Integration Hub* delete and recreate this position when importing routing positions for the related item
- *Not Delete* – which prevents *Data Integration Hub* from deleting this position, but not from updating this position's data
- *No* – which prevents *Data Integrations Hub* from deleting or updating this position

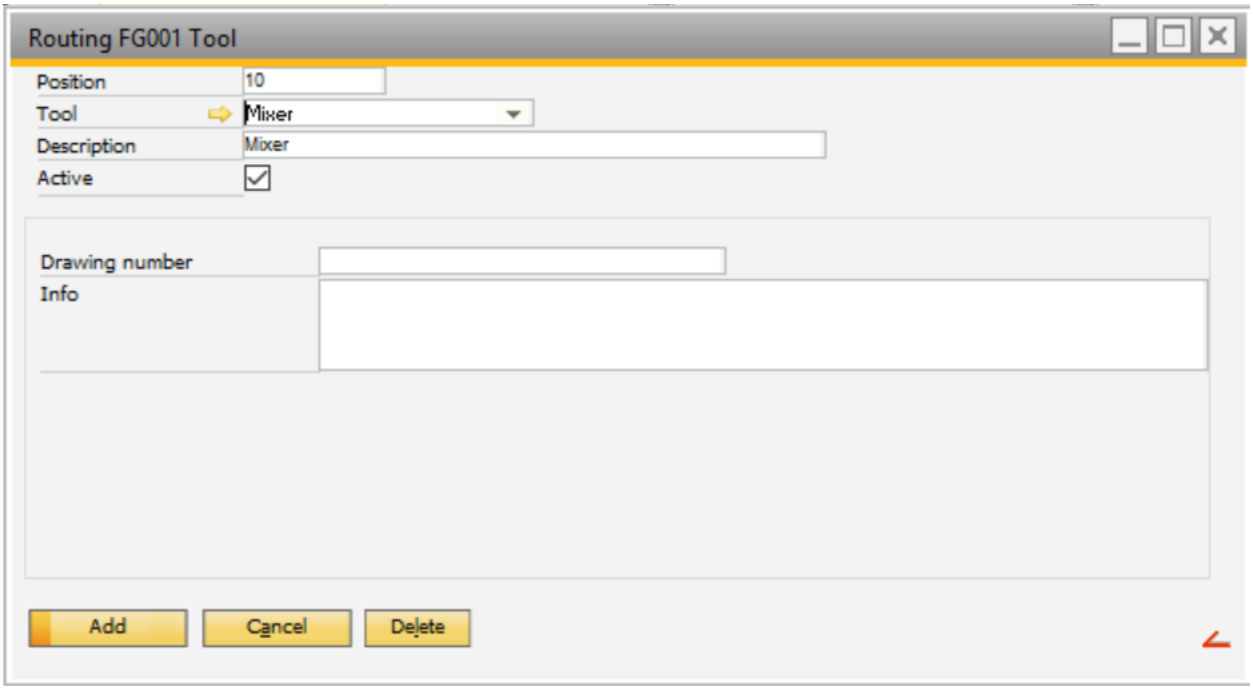
TIP: The recommended setting for *Synchronization* is the standard option, "Yes".

4.5. Tool Tab

In this tab, beas allows the user to insert tools that will be used to perform the operation. For more information about tools, please refer to *Tools* tutorial.



In this screen, beas displays a list of all tools assigned to this routing. The user can insert, edit and delete tools. To assign a tool, click on *New*. A new screen will open.



Position: Field used to sort the tool lists from the routing. It is a consecutive number, but not a primary key.

Tool: Field used to assign the tool to perform this operation. This field is mandatory.

Description: Field used to display the tool description. This field cannot be changed because it automatically comes from the chosen tool.

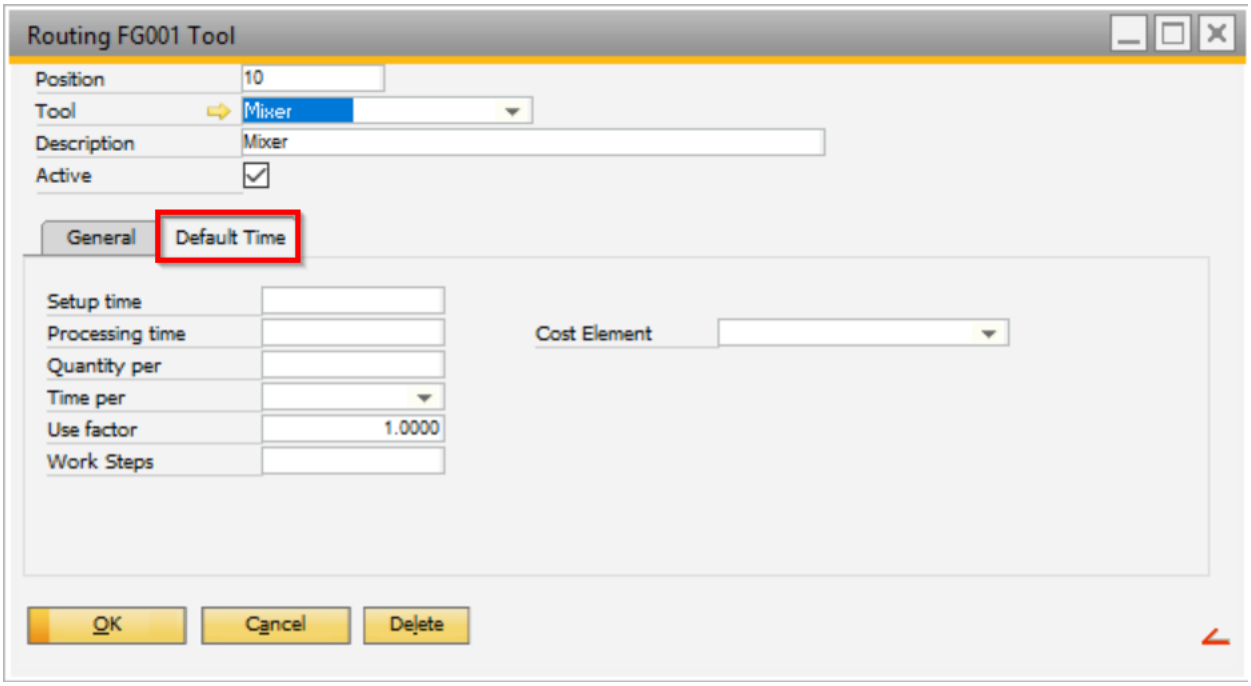
Active: Field used to set the tool as active in the routing. For more information, please refer to *Active.*

Drawing number: Field used to add the technical drawing number. This field cannot be changed because it automatically comes from the chosen tool.

Info: Field used to include extra information about the tool.

If the *Defines Lead Time* field is active for the tool, a new tab appears in the *tool* screen.

IMPORTANT: Work step and use factor are only used if they are greater than zero.



Setup Time: Field used to set the setup time to start using the tool.

IMPORTANT: This will replace the operation's setup time when this tool is used.

Processing Time: Field used to set the time the tool takes to produce the items. This is the actual processing time per unit produced in the routing position. For more information, please refer to *Mach+Labor Time/Unit* field.

IMPORTANT: Secondary processing times cannot be specified here.

Quantity Per: Field used to set the quantity that will be produced during the time defined in the *Processing Time* field. This field will help the user to understand the proportion of time per quantity produced. For more information, please refer to *Time For .. Finished Part* field.

Time Per: Field used to set the unit of time (hours or minutes) for the specific time information given for setup and production processes. For more information, please refer to *Time In ..* field.

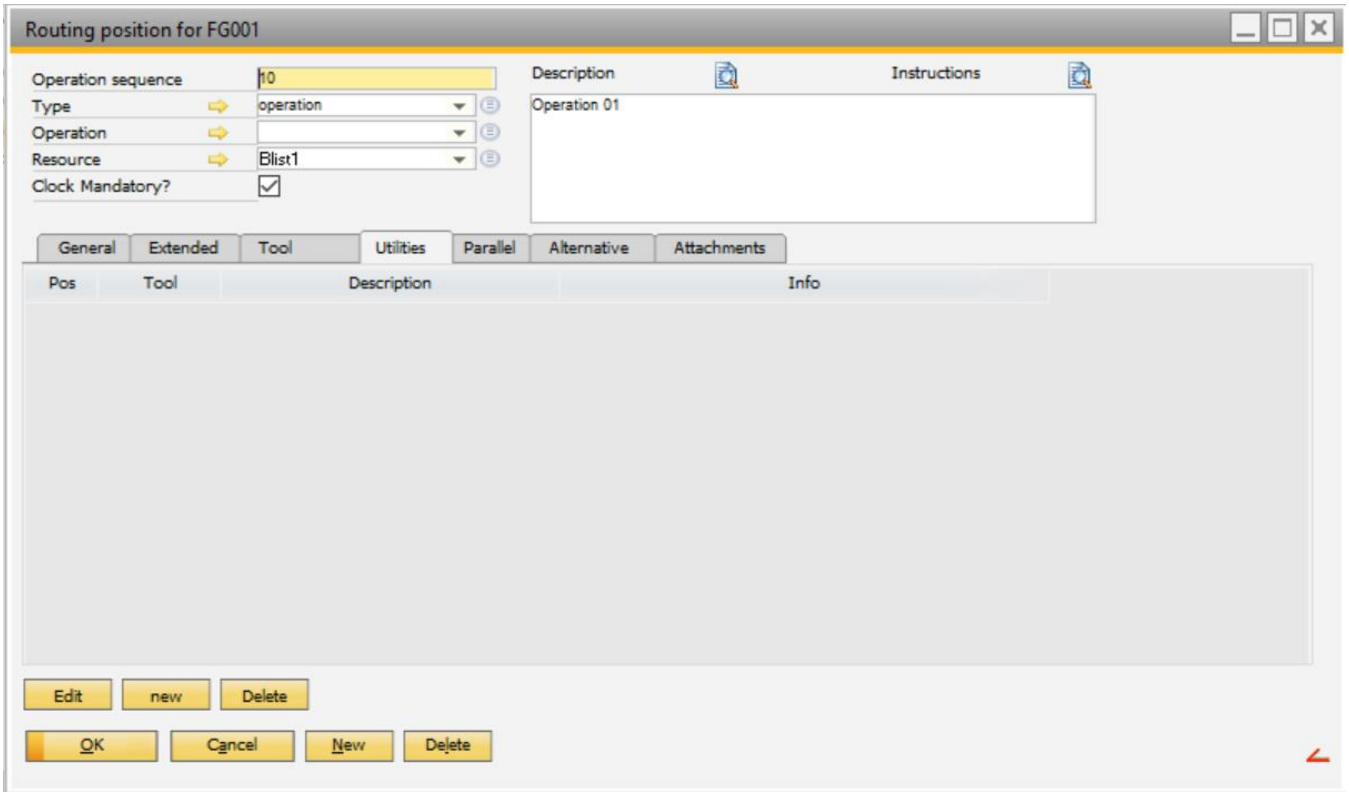
Use Factor: Field used to split the production time amongst more finished goods. For more information, please refer to *Use Factor* field.

Work Steps: Field used as a multiplication factor for the production times. For more information, please refer to *Work Steps* field.

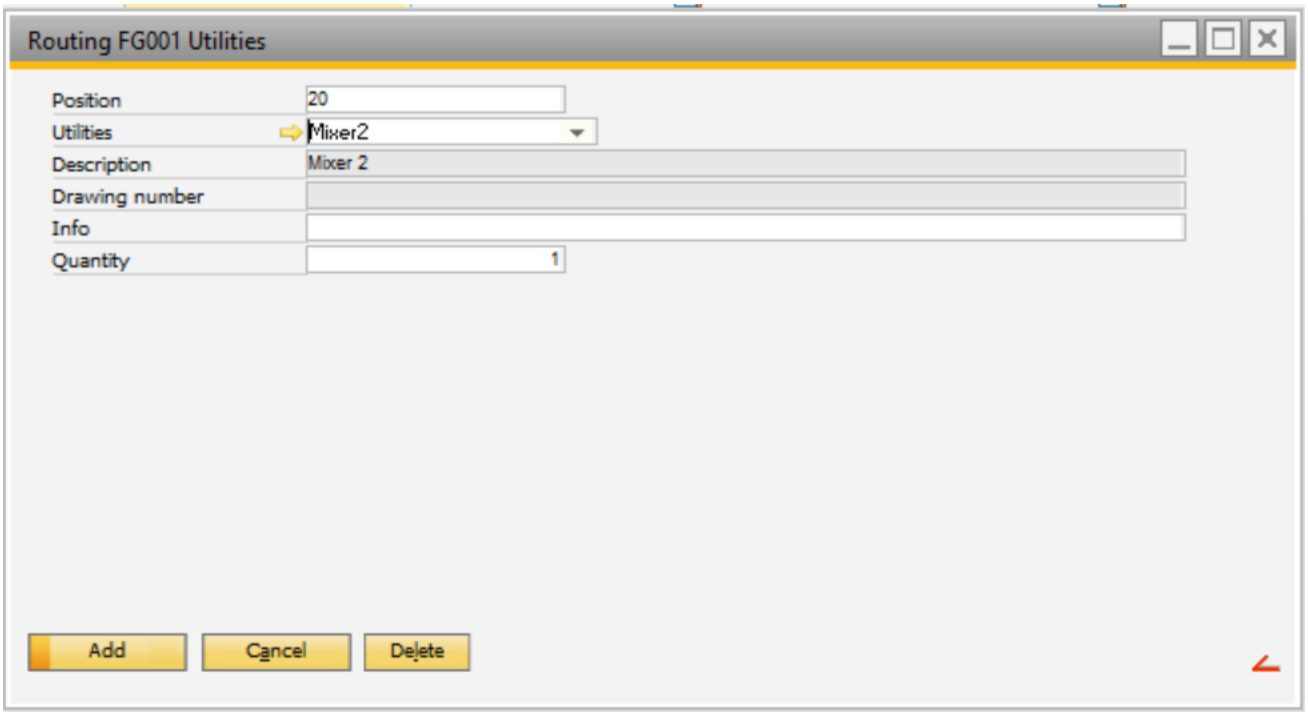
Cost Element: Field used to change the account in which the standard costs from the usage of this tool will be booked. For more information, please refer to *Work Order: Accounting* tutorial.

4.6. Utilities Tab

In this tab, beas allows the user to insert utilities that will be used to perform the operation. For more information about utilities, please refer to *Tools* tutorial.



In this screen, beas displays a list of all utilities assigned to this routing. The user can insert, edit and delete utilities. To assign a utility, click on *New*. A new screen will open.



Position: Field used to sort the utilities list from the routing. It is a consecutive number, but not a primary key.

Utilities: Field used to assign the utilities to perform this operation. This field is mandatory.

Description: Field used to display the utilities description. This field cannot be changed because it automatically comes from the chosen utilities.

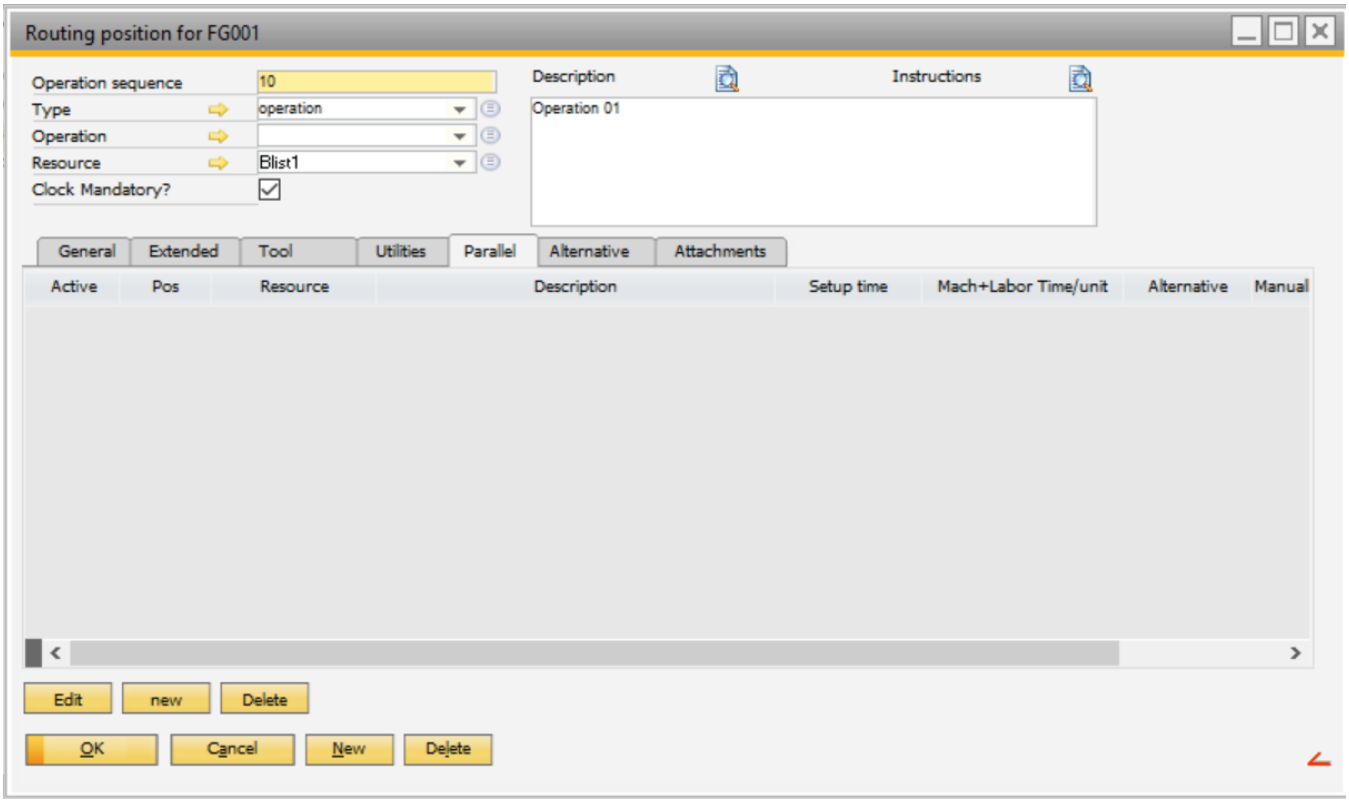
Drawing number: Field used to add the technical drawing number. This field cannot be changed because it automatically comes from the chosen utilities.

Info: Field used to include extra information about the utilities.

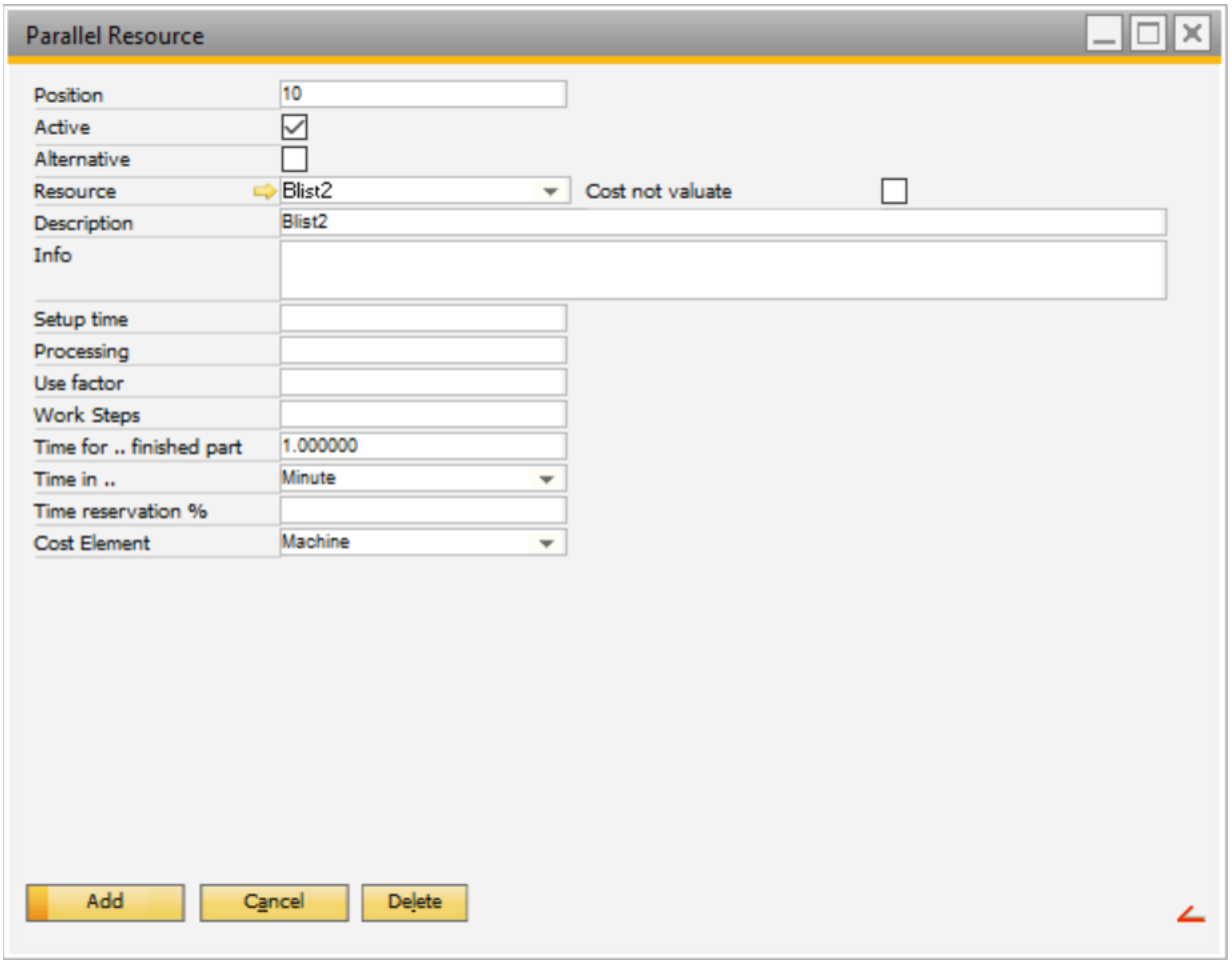
Quantity: Field used to specify the number of utilities needed to perform the operation. This field is only informative and will have no influence on the routing position.

4.7. Parallel Tab

In this tab, beas allows the user to insert parallel resources that will be used to perform the operation.



In this screen, beas displays a list of all resources that will be used in parallel with the main resource assigned in the *Header*. The user can insert, edit and delete resources. To assign a parallel resource, click on *New*. A new screen will open.



Position: Field used to sort the parallel resource list from the routing. It is a consecutive number, but not a primary key.

Active: Field used to set the parallel resource as active in the routing. For more information, please refer to *Active*.

Alternative: Field used to set if this parallel resource can also be alternative to other parallel resources for the same operation.

Resource: Field used to select the parallel resource from existing resources. For more information, please refer to *Resource.*

Cost not valuate: Field used to set if the cost of this resource should not be considered to value the item, at pre- and post-calculation. Costs created with time receipts are also not taken into account. By default, this option is disabled. Use this option if it is already included the costs with the main resource.

Description: Field used to display the resource description. This field cannot be changed because it automatically comes from the chosen resource.

Info: Field used to include extra information about the parallel resource.

Setup Time: Field used to set the setup time for the parallel resource. For more information, please refer to *Setup Time Capacity* field, from *General* tab.

Processing Time: Field used to set the time the tool takes to produce the items. This is the actual processing time per unit produced in the routing position. For more information, please refer to *Mach+Labor Time/Unit* field, from *General* tab.

Use Factor: Field used to split the production time amongst more finished goods. For more information, please refer to *Use Factor* field, from *General* tab.

Work Steps: Field used as a multiplication factor for the production times. For more information, please refer to *Work Steps* field, from *General* tab.

Time For .. Finished Part: Field used to set the quantity that will be produced during the time defined in the *Processing Time* field. This field will help the user to understand the proportion of time per quantity produced. For more information, please refer to *Time For .. Finished Part* field, from *General* tab.

Time In ..: Field used to set the unit of time (hours or minutes) for the specific time information given for setup and production processes. For more information, please refer to *Time In ..* field, from *General* tab.

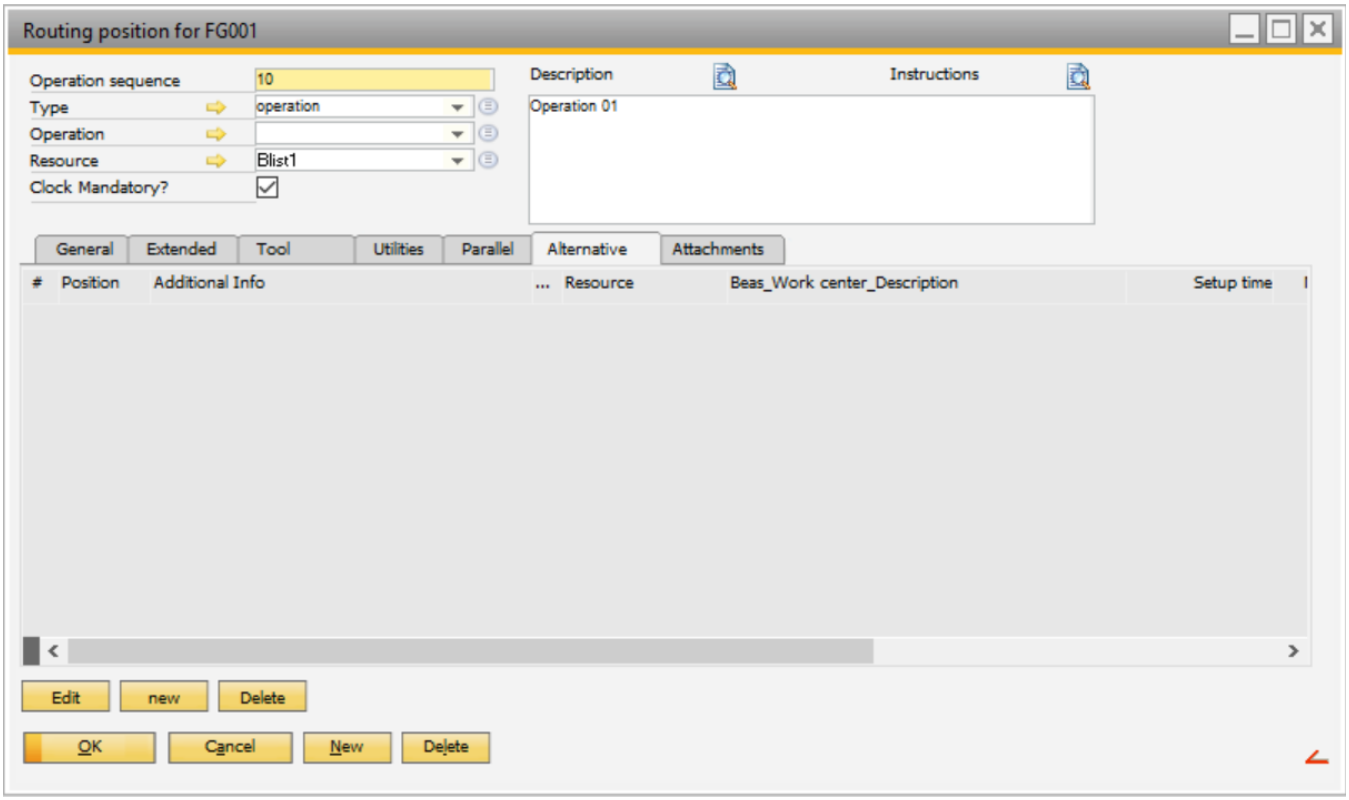
Time Reservation %: Field used to set production times when the parallel resource does not have setup or production times defined for it.

> Example: If the user knows that the parallel resource should work during 30% of the main resource time, the user can enter the value "30" in the *Time Reservation* field, and beas will calculate the times for the parallel resource automatically.

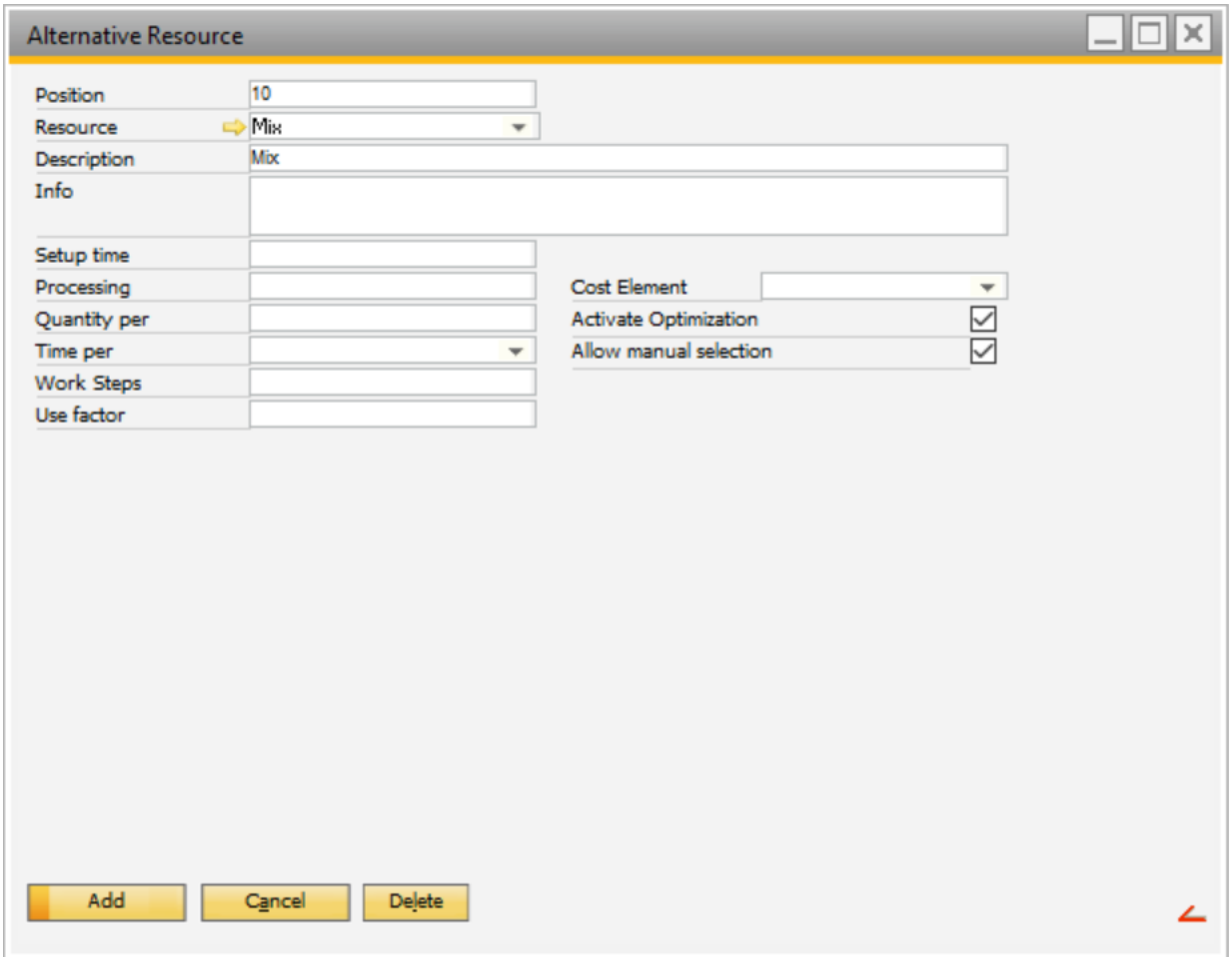
Cost Element: Field used to change the account in which the standard costs from the parallel resource will be booked. For more information, please refer to *Work Order: Accounting* tutorial.

4.8. Alternative Tab

In this tab, beas allows the user to insert alternative resources that will be used to perform the operation. In some cases, different resources can be used alternatively for the same operation, like a set of cutting machines with different performance, or extraction tank with different capacities. For more information, please refer to *Alternative Tab.*



In this screen, beas displays a list of all resources that will be used as alternative, if the main resource assigned in the *Header* is not available for production. The user can insert, edit and delete resources. To assign an alternative resource, click on *New*. A new screen will open.



Position: Field used to sort the parallel resource list from the routing. It is a consecutive number, but not a primary key.

Resource: Field used to select the parallel resource from existing resources. For more information, please refer to *Resource.*

Description: Field used to display the resource description. This field cannot be changed because it automatically comes from the chosen resource.

Info: Field used to include extra information about the parallel resource.

Setup Time: Field used to set the setup time for the alternative resource. For more information, please refer to *Setup Time Capacity* field, from *General* tab.

Processing Time: Field used to set the time the resource takes to produce the items. This is the actual processing time per unit produced in the routing position. For more information, please refer to *Mach+Labor Time/Unit* field, from *General* tab.

Quantity Per: Field used to set the quantity that will be produced during the time defined in the *Processing Time* field. For more information, please refer to *Time For .. Finished Part* field, from *General* tab.

Time Per: Field used to set the unit of time (hours or minutes) for the specific time information given for setup and production processes. For more information, please refer to *Time In ..* field, from *General* tab.

Work Steps: Field used as a multiplication factor for the production times. For more information, please refer to *Work Steps* field, from *General* tab.

Use Factor: Field used to split the production time amongst more finished goods. For more information, please refer to *Use Factor* field, from *General* tab.

Cost Element: Field used to change the account in which the standard costs from the parallel resource will be booked. For more information, please refer to *Work Order: Accounting* tutorial.

Activate Optimization: Field used to define if beas should automatically select the most adequate resource, amongst the main and alternative resources in the APS calculation. For more information, please refer to *APS* tutorial.

Allow Manual Selection: Field used to manually select the desired alternative resource. For more information, please refer to *Allow Manual Selection*.

4.9. Attachments Tab

The Attachments tab is used to attach images and documents to the resources. For more information, please refer to *Attachment Tab.*

5. CONFIGURATION WIZARD

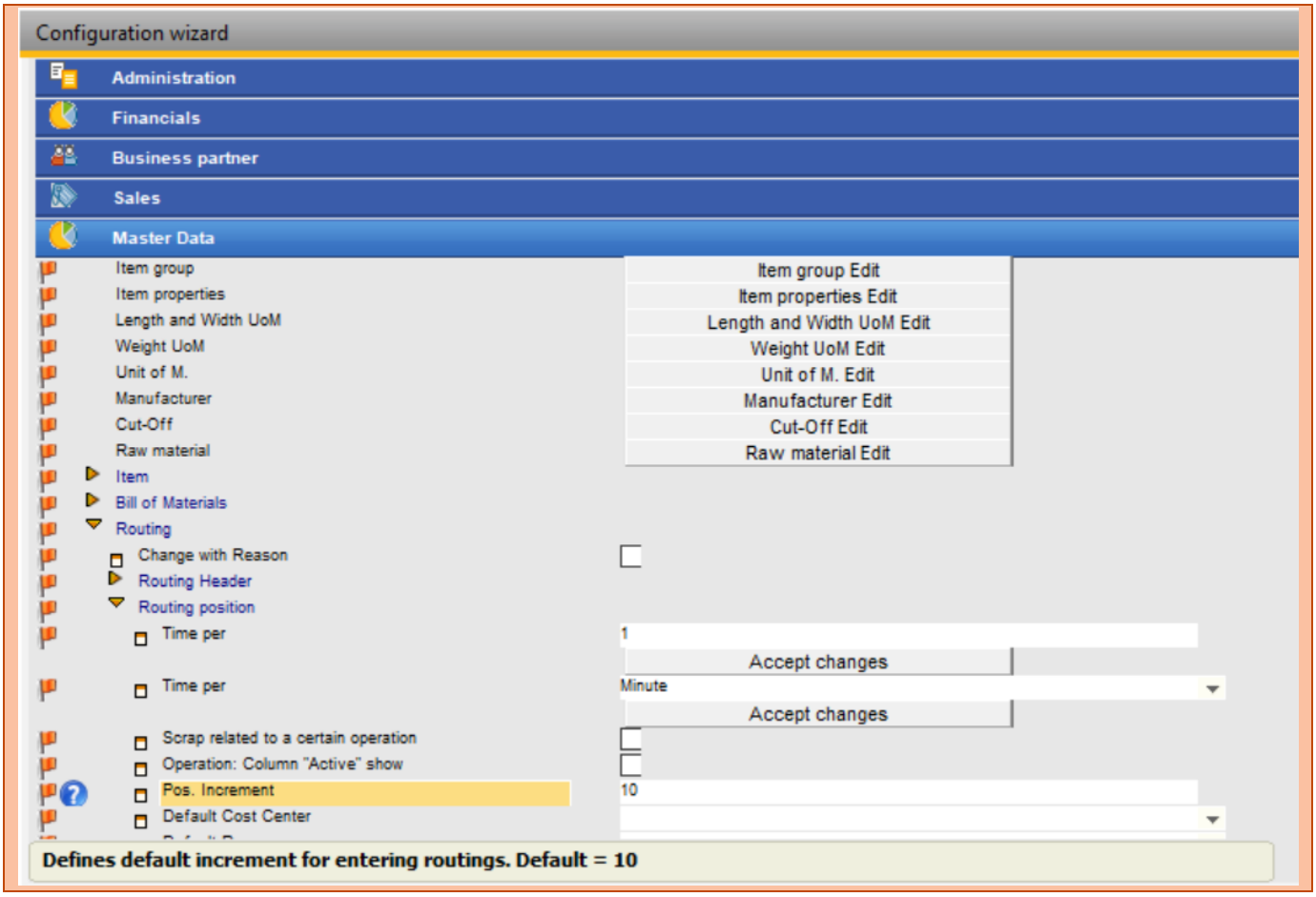
Includes each Configuration Wizard setup and special parameters that involve fields or business scenarios from the lesson.

5.1. Header

Operation sequence

Configuration Wizard: When routings are created, the position numbers are generated automatically. The increments are entered in this parameter. By default, it is 10.

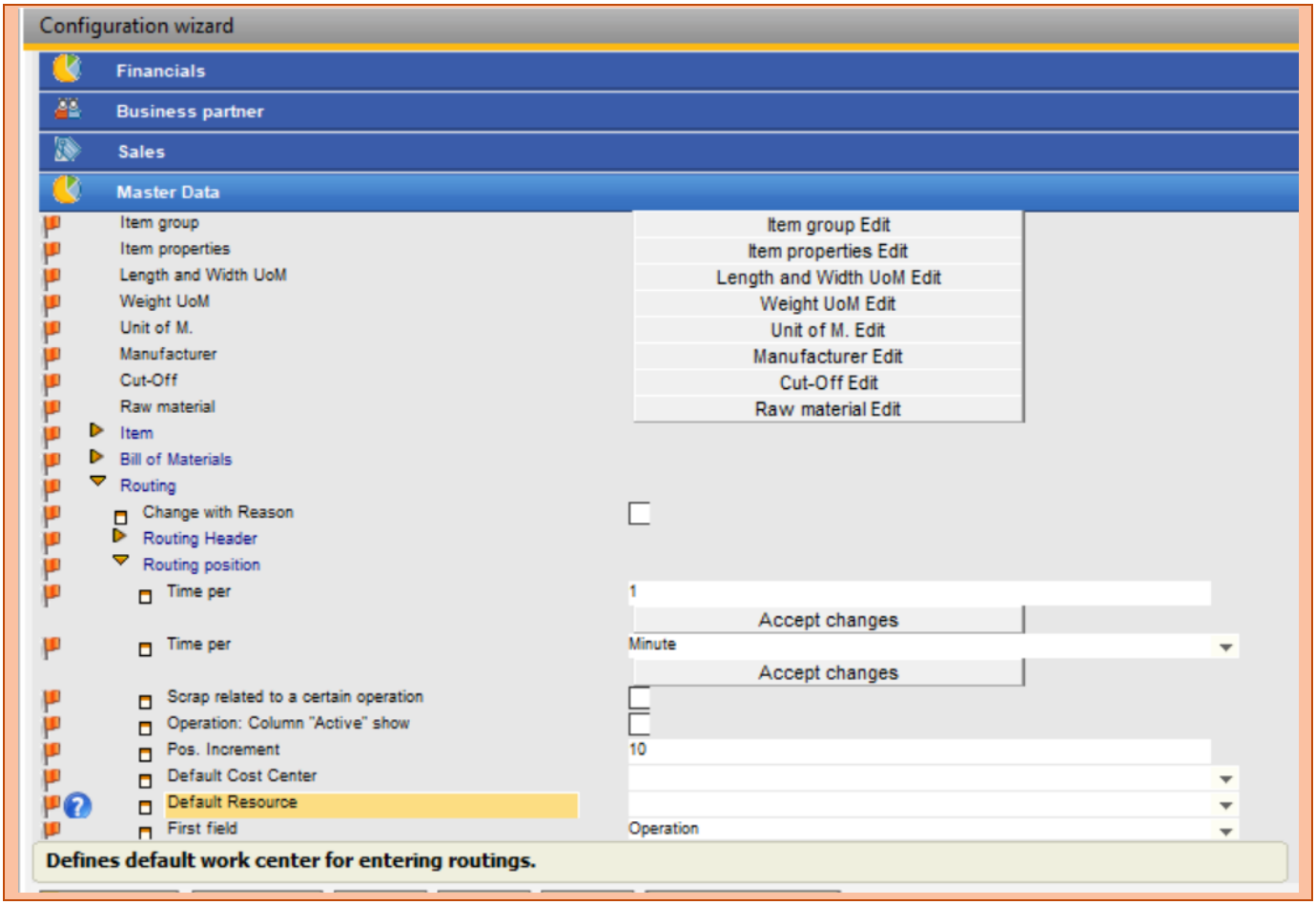
PATH: Master Data > Routing > Pos. Increment



Resource

Configuration Wizard: When routings are created, one resource can be assigned by default.

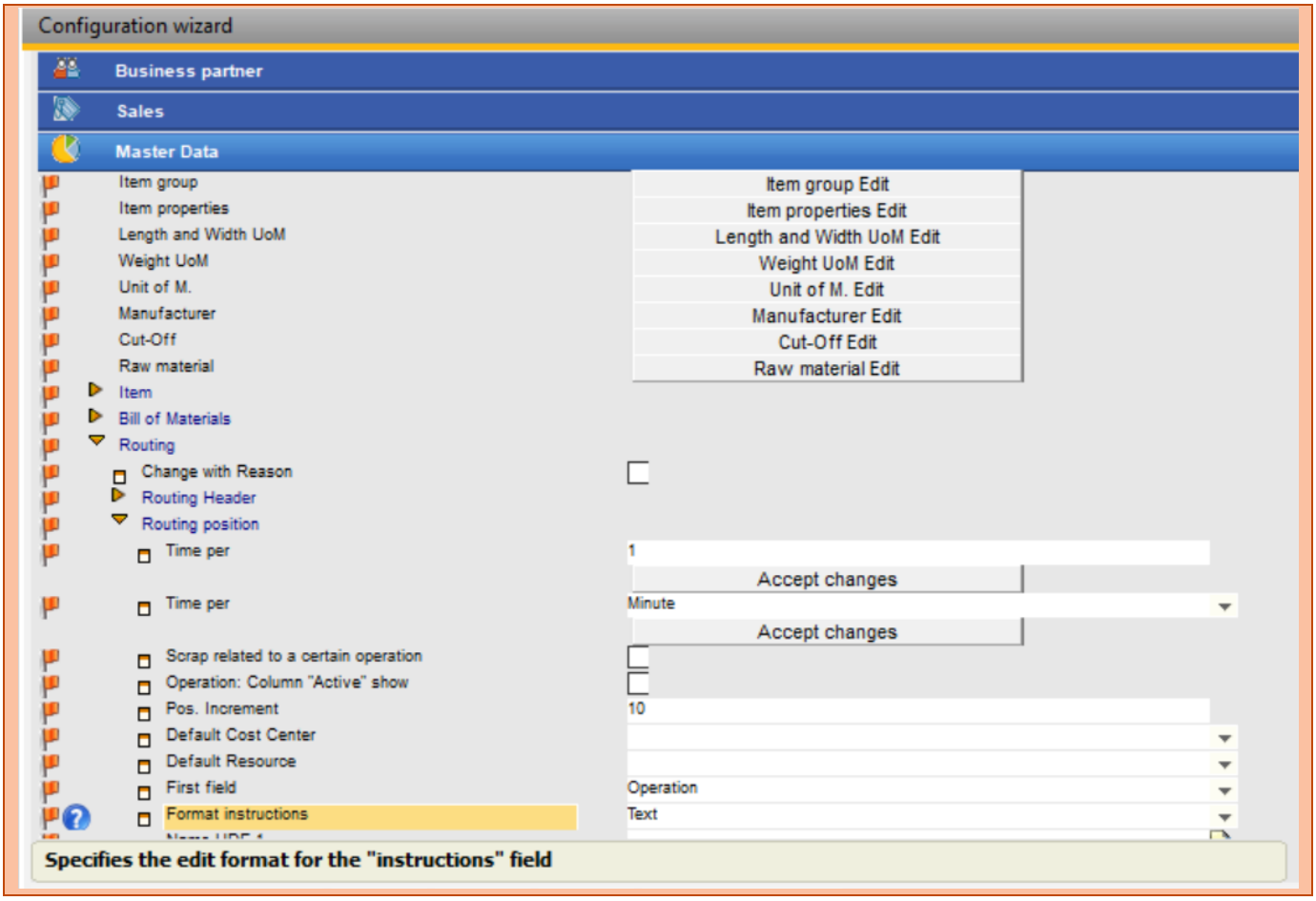
PATH: Master Data > Routing > Default Resource



Instructions

Configuration Wizard: When routings are created, this option allows the user to specify the editing format for the instruction field.

PATH: Master Data > Routing > Format instructions

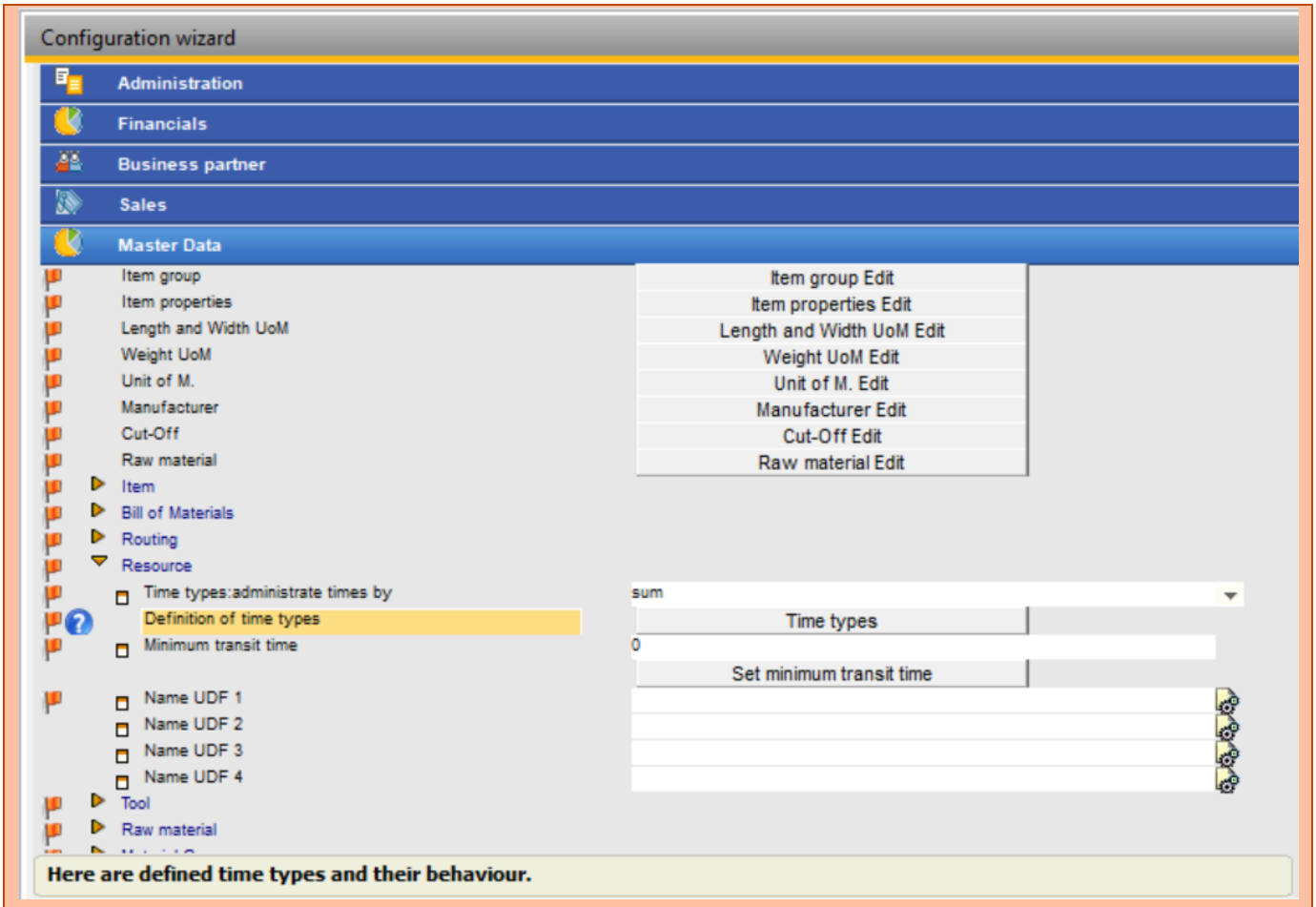


5.2. General Tab

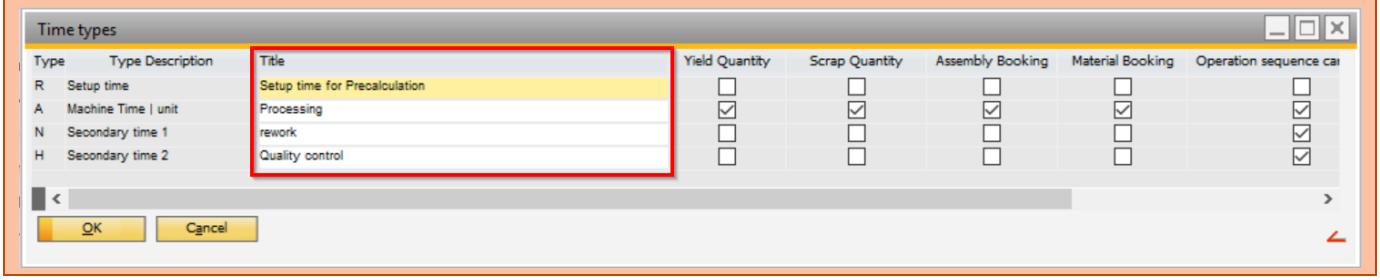
Time Types Designation

Configuration Wizard: The title or designation for the time types appearing in the routing as *Setup time for Calculation* and *Mach+Labor time/unit* can be edited in the Time Types setup.

PATH: Master Data > Routing > Routing Position > Pos. Increment



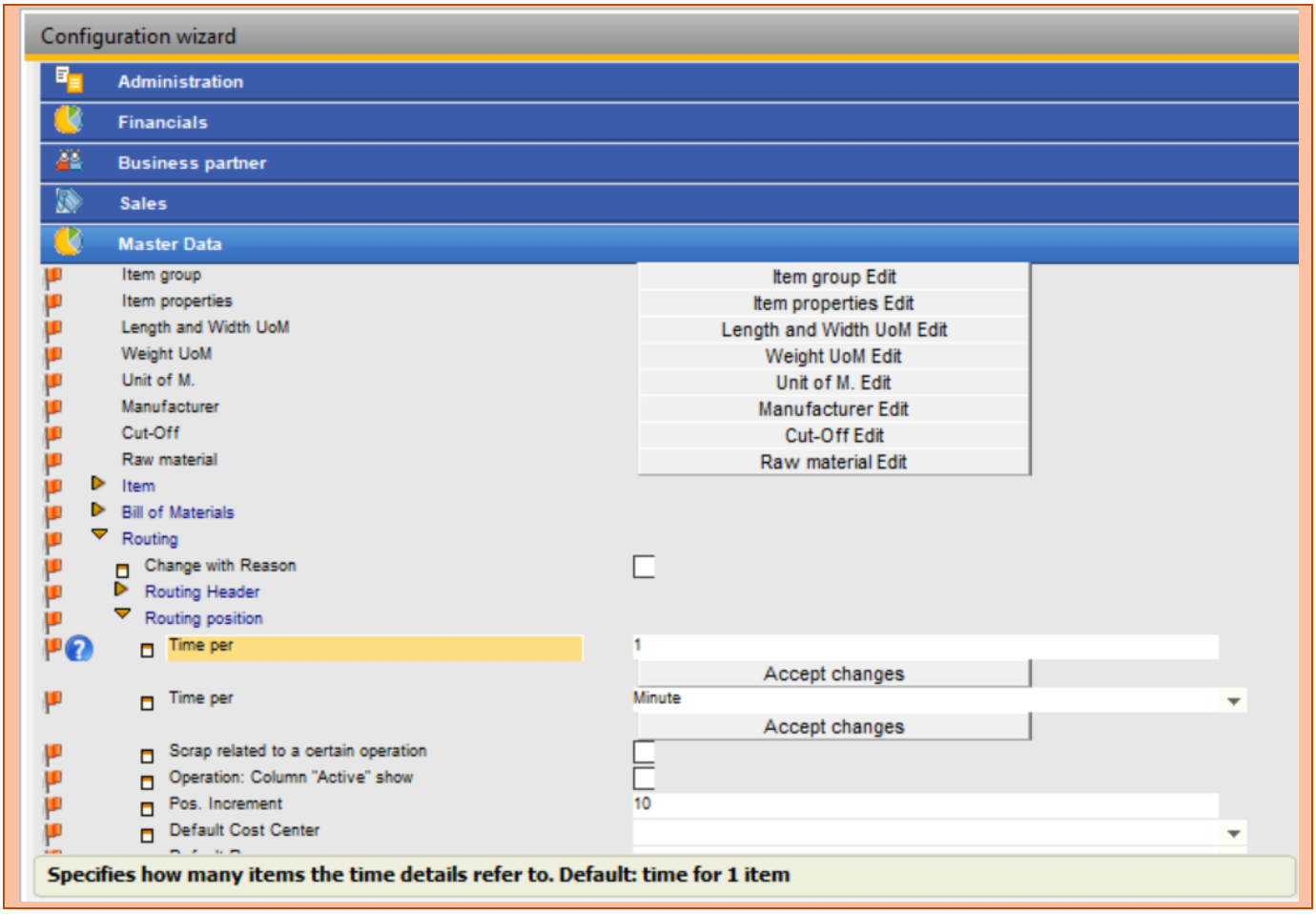
Click on Time Types, and a new screen will be displayed. In the column *Title*, the user can edit the name.



Time For .. Finished Part

Configuration Wizard: Beas allows the user to set this value by default.

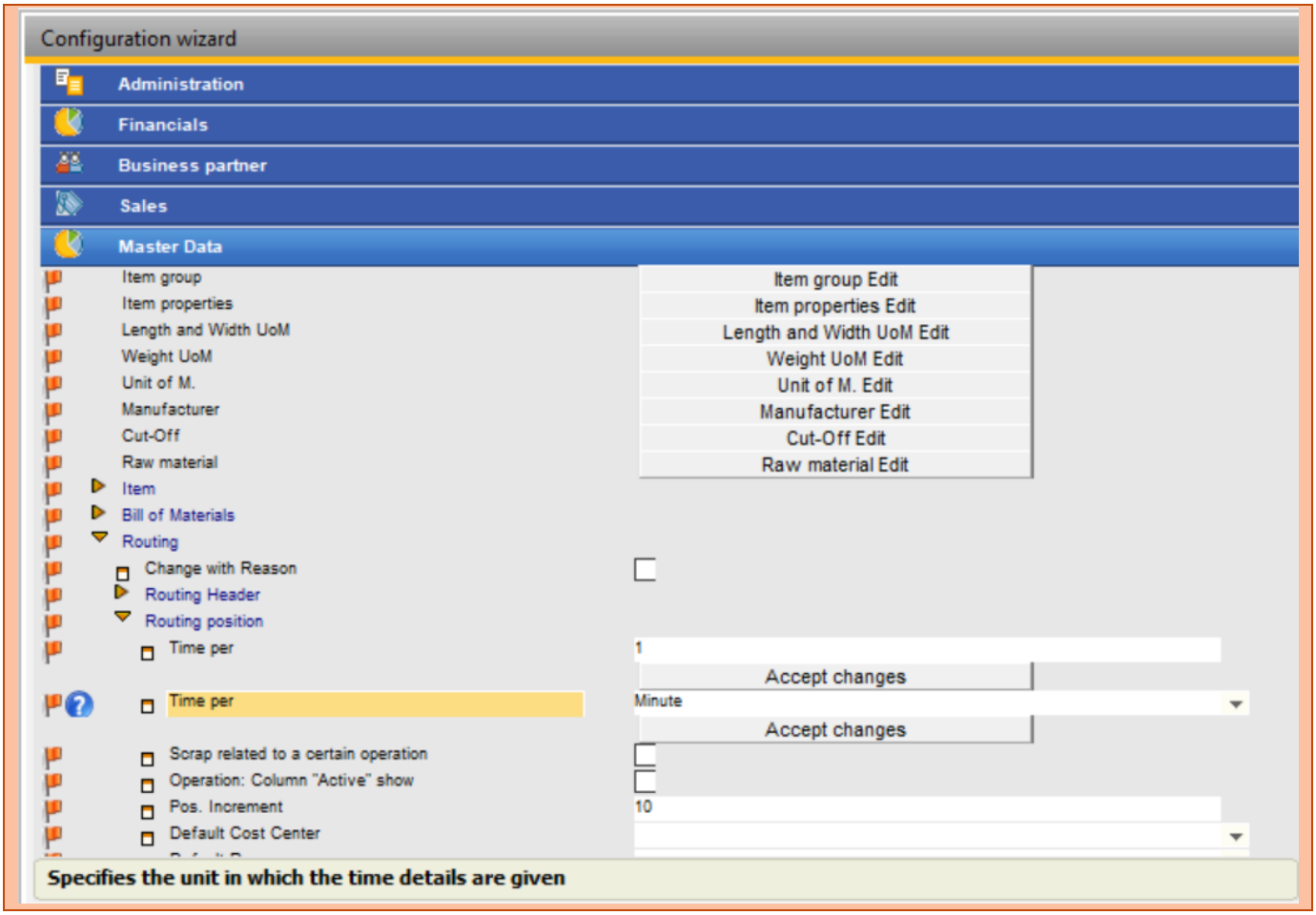
PATH: Master Data > Routing > Routing Position > Time per (first parameter)



Time in..

Configuration Wizard: Beas allows the user to set this value by default.

PATH: Master Data > Routing > Routing Position > Time per (second parameter)



5.3. Extended Tab

Slave op. sequ. Belongs to master

Configuration Wizard: There are three types of distribution of time for master slave:

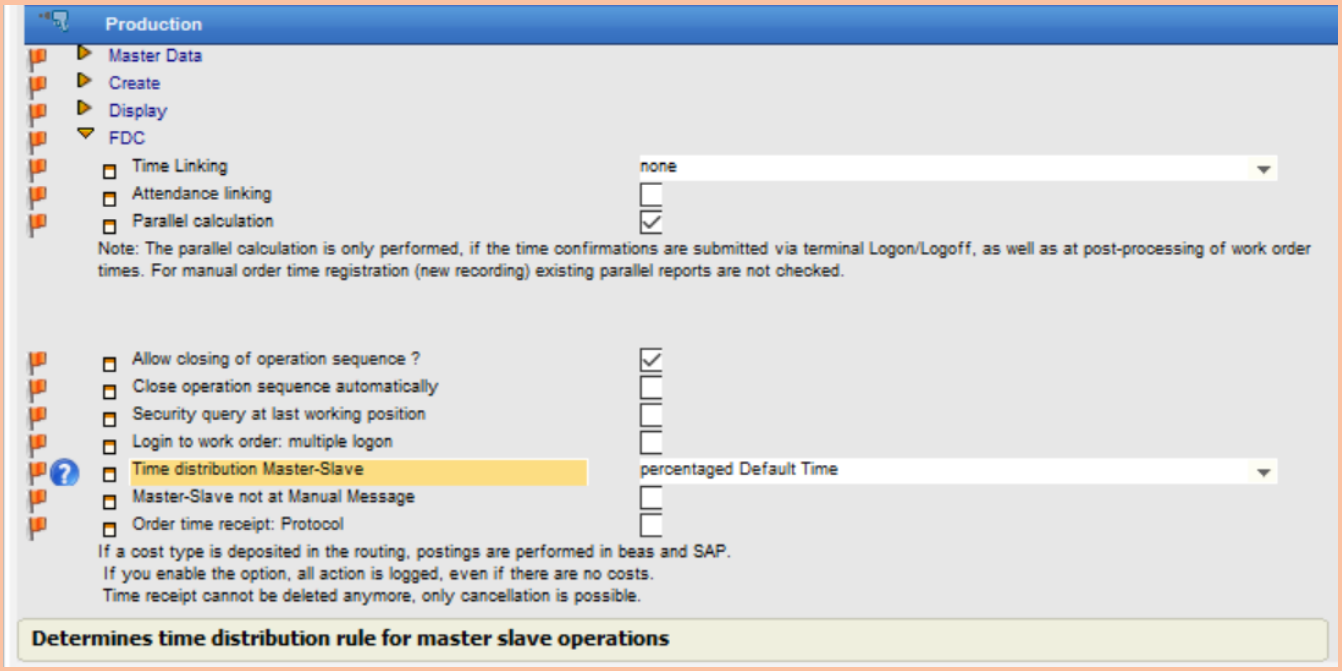
- *Default Percentage* – The complete time is distributed in operations. Each operation receives a percentage part of the default time.

  Example: Slave pos. 10 = 60 min
  Slave pos. 20 = 120 min
  Slave pos. 30 = 20 min
  Perceptual ratio : Pos 10 30% ; Pos 20 60%; Pos 30 10%
  When calculating the planned time, the reported quantity is used as reference. For this reason, a quantity needs to be entered.
  With time receipts for Pos 30 (master-operation) of 10 minutes 2 time receipts are created.
  Pos. 10 30% of 10 minutes = 3 minutes
  Pos. 20 60% of 10 minutes = 6 minutes
  Pos. 30 10% of 10 minutes = 1 minute
  Total = 10 Minutes

To work properly, this function requires a plan time and posted quantities. With plan time zero or without a quantity the user will get incorrect results. If no quantity was reported, the new reported quantity is posted to the master only. If a quantity had been posted before, the results will be the percentage of zero, thus no distribution.

- *No Distribution* – Each operation gets the same time. Default time is not considered.

  Example: In the upper example with time receipt on Pos 30 with 10 Minutes, the following time receipts would be created:
  Pos. 10 10 Minutes; pos. 20 10 Minutes; pos. 30 10 Minutes
  Total: 30 Minutes. This concept is used in production lines

- *Planned Time* – Reported time for master operation, planned time for slave operation. Planned time is calculated: ((job time * planned quantity) + setup time) / planned quantity * reported quantity

PATH: Production > FDC > Time distribution master-slave