

OMC

BatchControl Component

Recipe Editor

User Manual

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Symbol Definition	
	WARNING: Indicates information that a potentially hazardous situation which, if not avoided, could result in serious injury or death.
	RISK OF ELECTRICAL SHOCK: Indicates information that Potential shock hazard where HAZARDOUS LIVE voltages greater than 30V RMS, 42.4V peak, or 60V DC may be accessible.
	ESD HAZARD: Indicates information that Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices.
	ATTENTION: Identifies information that requires special consideration.
	TIP: Identifies advice or hints for the user.

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BatchControl Recipe Editor

Section 1 Overview

OMC BatchControl component is generally used in the fine chemical, pharmaceutical industry and to manage the recipes uniformly and in batches, in order to make the management of the process faster and more convenient.

BatchControl component consists of configuration management software, recipe editor software monitoring operational client and more. This manual mainly describes the functions and usages of the configuration software.

Section 2 Work Flow

The recipe editing software (Recipe Editor) is used for recipe management. It is usually installed on the engineer station of the control system. The process engineer is responsible for configuring the recipe and routine maintenance of the configuration.

The job flow chart for recipe configuration is shown below.

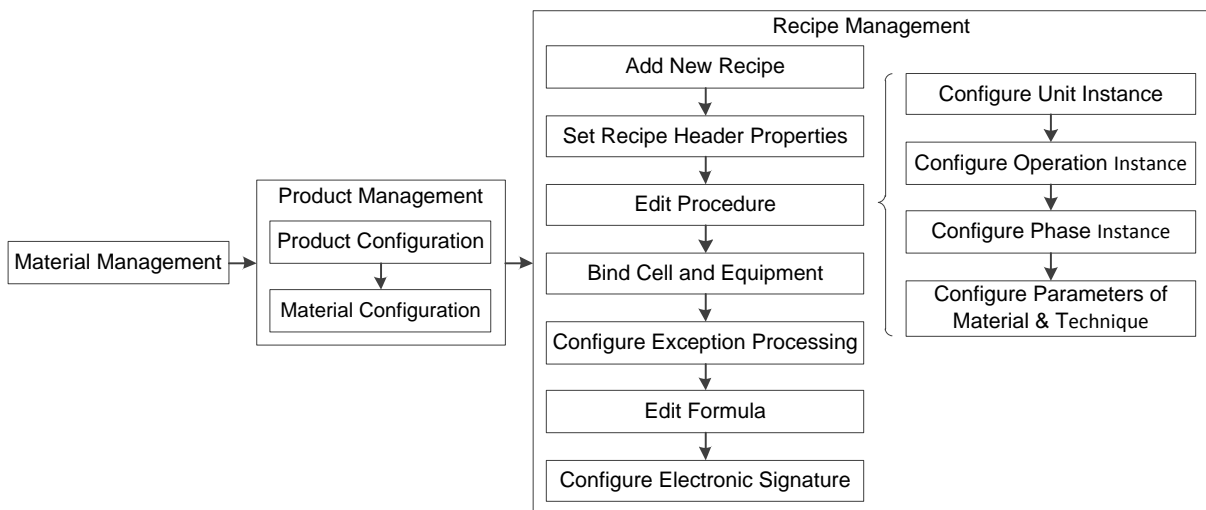


Figure 2-1 The Workflow

Section 3 Open the Software

Tip:



Before logging in, please synchronize the monitoring user accounts in the BatchControl configuration management software. For details, please refer to the section User Access Management in *BatchControl Configuration Management Software User Manual*.

1. In the configuration management software of High-performanceHMI component, right-click the operation domain and select "Open From Configuration Server" to open the HMI configuration software.
2. In the HMI configuration software, select "Operation Domain > Recipe Editor" in the left, double-click the node to open the login box of BatchControl Recipe Editor.
3. Select the area, enter the user name and password and click "Login" to enter the recipe management page of the recipe editing software. As shown in Figure 3-1, the recipe editing software consists of four tabs: Material management, used to define basic material information; product management, used to define product material BOM (Bill of Materials); library management, used to manage OP program templates; recipe management, used to define main recipe property.

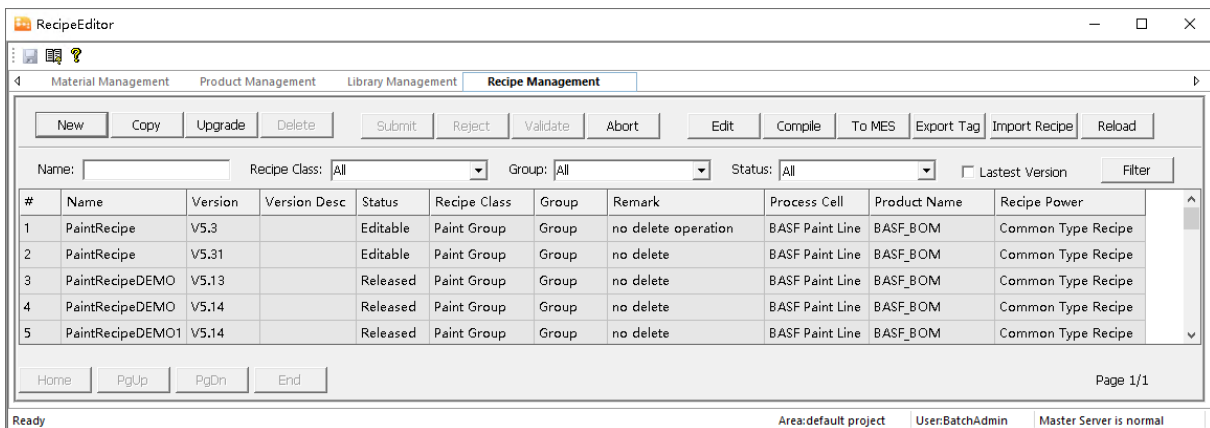


Figure 3-1 Recipe Editor Interface (Recipe Management Interface)

Tips:



- After any configuration in the Recipe Editor Software, you can click  at the left upper corner to save the modified parameters.

-
- The formula editing software only displays the formula categories that belong to the current project and the user has the right to view.
 - The project opened in the recipe editing software is locked. When other users log in to the project, they can view but not modify.
 - Without authorization, you have 2-hour trial time of the software and can add 5 master recipes at most.
-



Attention:

When the formula editing software exits abnormally, the current project is locked. If you need to unlock it, please log in to the project again using the same account on the same computer, or contact the engineers of SUPCON to unlock it for you.

Section 4 Material Management

In the material management, the properties of the material can be configured and the tags of the material can also be set. After configuring which material to use and its amount in the recipe, the amount value will be loaded to the corresponding tag to this material.

4.1 Material Configuration

Click the “Material Management” page above to enter the material management configuration interface, as shown in Figure 4-1, through the button above, you can New-add, Copy, Delete and Reload the material information, and up to 1,000 kinds of material can be added.

#	Name	Code	Group	EU	Batch Tag	Location	Inventory	Package	Property
1	Material Acid	A001	Default Group	kg			1000	0	
2	Material Anhydride	B001	Default Group	kg			1000	0	
3	Material Anhydride	B002	Default Group	kg			1000	0	
4	Material Alcohol	B003	Default Group	kg			1000	0	
5	Material Alkene	C001	Default Group	kg			1000	0	
6	Material Solvent	C002	Default Group	kg			1000	0	

Figure 4-1 Material management

The parameters in the material management are described as follows:

- **Name:** A material name is used when you want to select one of the material. The name can be repetitive, but cannot exceed 200 characters.
- **Code:** This is a unique ID of the material. It cannot be null or repetitive and cannot exceed 32 characters.
- **Group:** select from the drop-down menu. You can add a new material group and enter a name when creating a new kind of material. The length cannot exceed 32 characters.
- **EU:** Set the measuring unit of the material.
- **Batch Tag:** Set the batch number corresponding to the material name. Enter tags in the pop-up dialog box after double clicking it. You can delete the tag by the right-click menu.
- **Location:** set the location where to store the material. The length cannot exceed 32 characters.
- **Inventory:** set the original storage amount of the material. The range is 0-999999.
- **Package:** set the standard package specification of one package of material. Double click the item to modify it. The range is 0-999999.

- Property: you can set the physical state to the raw materials by selecting from the drop-down menu. The options are gas, liquid and solid.

**Tips:**

- The tag is read and obtained from the monitoring platform, but the tag deletion and modification of the monitoring platform don't influence the existed tags. It only checks the tag's effectiveness when the batch is generated.
- If the set value of "Package" is 0, the barcode cannot be generated in the "To Scale" interface.

Table 4-1 Button list of the recipe management

Button	Description	Remark
New	Create a new item of material information. For parameter description, please refer to this section.	One configuration supports up to 1,000 items of material information.
Copy	Take the existed material as the template and create a new item of material. It is allowed to modify the property.	-
Delete	Delete the selected material information.	<ul style="list-style-type: none"> ● The material information the recipe used cannot be deleted. ● Select multiple material information and click this button, you can delete these information in batches.
Import	Select the .CSV file and import the material information recorded in the file into the system.	For details, see the section Material Table Import/Export.
Export	Select the storage path and enter the file name and then the material information would be exported as .CVS file.	For details, see the section Material Table Import/Export.
Reload	Update the material information such as updating the material information in MES system to this software.	-
To Scale	It will update the raw material data of BatchControl component to the raw material table of the external equipments (such as intelligent scale).	Please refer to <i>BatchControl Monitoring Software User Manual</i> for the function of "scan the QR code to confirm".
Filter	Filter the displayed material information as per the configured filtering conditions.	-

4.2 Material Table Import/Export

In order to improve the efficiency of raw material configuration, you can use the "export" and "import" buttons to quickly configure similar raw material information.

1. Click the "Export" button above and the "Save As" interface will pop up. The current material information will be saved as .csv file.
2. As shown in the figure below, after modifying the material information in batch in the .csv file and click "Import" button to re-import the information in the system.

**Attention:**

The parameter such as “sequence number”, “Name” cannot be modified arbitrarily, otherwise it may cause failure.

#	Name	Code	Group	EU	Batch Tag	Location	Inventory	Package	Property
1	Material	A001	Default	Gkg			1000	0	
2	Material	B001	Default	Gkg			1000	0	
3	Material	B002	Default	Gkg			1000	0	
4	Material	B003	Default	Gkg			1000	0	
5	Material	C001	Default	Gkg			1000	0	
6	Material	C002	Default	Gkg			1000	0	

Figure 4-2 Material table

Section 5 Product Management

Through the “Product Management” page, you can define the BOM of product raw materials. In general, the BOM of product raw materials in the BatchControl component is obtained from the MES system, and can also be added manually.

Click the “Product Management” tab above to enter the product management configuration interface, as shown in the following figure. All product information is displayed on the left, an item of product information is selected, and the input and output materials related to the product are displayed on the right. By entering keywords, you can filter the displayed information in terms of Product Name, Product Code, or Version.

The screenshot shows the Product Management interface. At the top, there are buttons for 'New', 'Copy', and 'Delete'. Below these are input fields for 'Product Name', 'Product Code', and 'Version', followed by a 'Filter' button. The main area is divided into two tables. The left table lists products, and the right table shows the input and output materials for the selected product.

#	Product Name	Product Code	Version	Normal Size	EU
1	Production	202004131536	V1.0	100	

Input Material		Output Material			
#	Mat Name	Mat Code	Mat Mark	Mat Amount	EU
1	Material Acid	A001	Mark01	0	kg
2	Material Anhydh	B001	Mark03	0	kg

Figure 5-1 Product Management

5.1 Product Configuration

You can add, edit and delete information to the product information in the “Product Management” interface. The description is as follows.

5.1.1 Add Product Information

You can add a new item of product information by following these steps:

- 1) Click the “New” button above to bring up the “New Product” dialog box, as shown below.

The screenshot shows the 'New Product' dialog box. It has a title bar with a close button. The dialog contains four input fields: 'Name', 'Code', 'Version', and 'Normal Size'. The 'Normal Size' field is pre-filled with '100.0'. At the bottom, there are 'OK' and 'Cancel' buttons.

Figure 5-2 “Add Products” Dialog Box

- 2) According to the following instructions, the basic information of the product can be edited.

- Name: Enter product name in the text box. The name cannot exceed 200 characters.
- Code: the code information of products. Version number and code cannot be the same at the same time. Also, it cannot be empty.
- Version: the version information of products. Version number and code cannot be the same at the same time. Also, it cannot be empty. It is not allowed to use Chinese or special characters. The length cannot exceed 32 characters.
- Normal Size: the standard production of products. The input value has to be the float number. The default number is 100. It cannot be 0.

3) Click the “OK” to save the changes.

5.1.2 Copy Product Information

Taking the existed product information as sample, you can fast add product information by “Copy” function. The steps are as follows:

- 1) Taking one item of product information as sample and click “Copy” button on the top.
- 2) The “Copy product” dialog will pop up where you can edit the added newly product information.
- 3) Click “OK”.

The product information got by copy function would be with the materials associated with the sample. You can edit it in the right interface. Please refer to the section Material Configuration for description.

5.1.3 Edit Product Information

Select one item of product information in the product list, and double click the cell to modify its information.

5.1.4 Delete Product Information

Select the information you want to delete and click “Delete” on the top. Click “OK” in the double check box, and then the deletion is completed.

5.2 Material Configuration

After configuring the product information, you can associate the input materials and output materials used in the recipe with the product. The steps are as follows:

- Add materials:
 - 1) Select an item of product information and select the “Input Material” or “Output Material” tab in the right interface.
 - 2) In the material list, right-click and select the “New” command from the right-click

menu.

- 3) In the pop-up “Select Material” window, click to select the material, and click “OK” when finished. (Hold down Shift to select multiple consecutively, hold down Ctrl to select multiple non-continuously.)
- 4) The newly added materials would be displayed in the material list. Click the cell after selecting materials where you can modify material mark and feeding quantity. Material identification is used to distinguish different phases of the same material. The feeding amount is the set value of the material.
- 5) After completing the configuration, click the button in the upper left corner of the recipe editor software to save the modification.



Tip:

Only the material groups that the current user has the right to view are displayed in the material selection interface.

- Delete material:

Select an item of material information and select the “Delete” command in the right-click menu.

Section 6 Library Management

Objects such as programs and data commonly used in recipes can be managed through the OP template configuration function. In the process configuration of the recipe, you can call the same OP program template when editing the same program unit to complete the configuration of the main program efficiently and quickly.

In the upper tab, click the “Library Management” node, and the configured OP program is displayed on the lower right side, as shown in Figure 6-1.

#	Name	Group	Status	OP Class	Remark
1	OP1	G1	Edit	ET-OP	
2	OP11	G1	Validate	ET-OP	

Figure 6-1 “Library Management” interface

6.1 Generate Templates

On the “Library Management” interface, you can new, edit, delete, copy, validate, abort, reload configuration, and query OP templates. The steps for creating a new OP program template are as follows. Other operation steps are similar to the “Recipe Management” interface. Please refer to the description of “Recipe Management”.

- 1) In the interface shown in Figure 6-1, click the “New” button, and the “New Operation Template” dialog box will pop up, as shown in the following figure.

Figure 6-2 New operation template

- 2) Set the OP template name, OP class grouping and remarks, click “OK” after completing

the settings, the newly created OP template will be displayed in the list of the interface shown in Figure 6-1.

- 3) Select an OP template in the list, click the “Edit” button above, and edit the program of the OP template in the newly opened tab. The operation steps are similar to the procedure configuration in the section Procedure, please refer to the description of the section Procedure
- 4) After completing the program configuration of the OP template, click the “Enable” button above.

6.2 Use Templates

After the OP template takes effect, you can use the OP template to create an OP program during program configuration on the “Procedure” interface, see the description of the section Procedure.

Section 7 Recipe Management

The main interface of recipe manager is shown in Figure 3-1, which is used to manage the recipes used in production, including new construction, submission, and examination.

For parameter description, see the section Configure Recipe . The buttons at the top of the page are described as follows:

Table 7-1 The list of the recipe management buttons

Button	Description	Remark
New	Add a new recipe. For detailed description, please refer to the section Add a New Recipe.	-
Copy	Take the existed recipe as the template and create a new template and allow them to modify the property parameters.	The recipe class cannot be modified.
Upgrade	Update by the recipe of the released status, getting a new recipe and it is allowed to modify property parameters.	The recipe name and the recipe class cannot be modified.
Delete	Delete the recipe in the list	The recipe waiting for examination and the released recipe are not allowed to delete.
Submit	After configuring the parameters of the newly added or the updated recipe, the recipe is in an "editable" status. At the time, you can submit it and waiting for being validated.	-
Reject	If the recipe information waiting for examination is error, click "reject" to make the recipe go back to the editable status.	-
Validate	If the recipe information waiting for examination is error, click "Validate" to make the recipe go into the released status.	BatchControl configuration management software can configure whether or not this step needs electronic signature verification.
Abort	After clicking it, you can discard the released recipe.	-
Edit	After clicking it, you can enter the configuration interface of the recipe details. For the detailed information, please refer to the section Configure Recipe Properties.	-
Compile	Check whether or not the recipe workflow (master recipe) is correct. If there is an error, the software will display an error message box. You can copy the information from it to troubleshoot issues in the associated system or software.	If the control system tag is used instead of the concatenated tag of the BatchControl configuration management software, when checking the recipe, it will also check whether the invalid or duplicate tag is referenced in the recipe
To MES	Update the recipe information to the corresponding MES system	-
Export Tag	Click it, select one storage path and enter the file name. Then the tag information would be exported as .CVS file.	-
Import Recipe	Click the button to import the database file to import the edited recipes. For the detailed information, please refer to. the section Recipe Management.	
Reload	Update the information in MES system and BatchControl configuration management software to the recipe editor software.	-

Button	Description	Remark
Filter	Filter the displayed recipe as per the configured filter condition (recipe name, recipe class, grouping, status and only displaying the newest version) and filter the displayed recipes.	-

7.1 Add a New Recipe

Click “New” button and the “New Recipe” dialog box will pop up as shown in the figure below. For the description of the property parameters, please refer to the section Configure Recipe Properties.

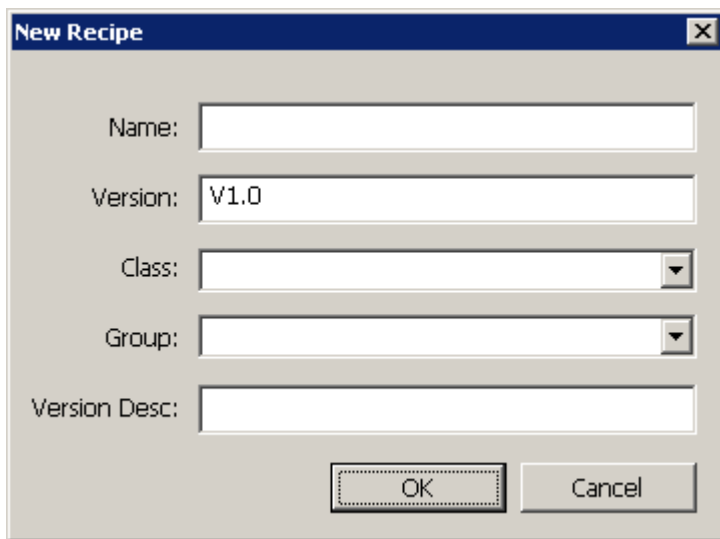


Figure 7-1 Add a New Recipe



Attention:

To ensure the uniqueness of recipes in the Batch database, please avoid using deleted recipe information. If you need to refer to existing recipes to create new ones, please copy or upgrade the recipe.

7.2 Delete a Recipe

Select the recipe and click the “Delete” button above; in the delete confirmation dialog, select “OK” to delete this recipe and select “Cancel” to cancel this operation.

7.3 Import Recipes

When the Batch server is running, you can use the "Import Recipe" function to reuse the recipe

data of other Batch databases in the current database to avoid restarting the Batch server and affecting the normal production process on site. In addition, you can copy the current database, modify the recipes being produced in the copy, and then re-import them into the current database to modify recipes without downtime.

7.3.1 Preconditions

Prepare the batch database file (suffix .FBD) that contains the needed recipe data.

For illustrative purposes, the database that needs to be imported is called the source database, and the current database of the recipes to be imported is called the destination database. Then, the source database file should meet the following requirements:

- 1) The Batch database version corresponding to the source database and the destination database should be the same. (Upgrading the database file does not meet this requirement.)
- 2) The configuration data configured in BatchControl configuration management software should be exactly the same in the source and destination databases.
- 3) The recipe to be imported and the recipe of the destination database cannot be duplicated, that is, the recipe name and version of the two cannot be repeated at the same time, and should meet the configuration requirements of recipe properties.
- 4) Before importing recipes, please make sure that the recipes to be imported have taken effect. If not, edit, submit, or review the recipe through Recipe Editor software to finally leave the recipe status at Released.

7.3.2 Import Steps

1. On the Recipe Management page, click the Import Recipe button at the top right.
2. Select the source database file (.FBD file) in the pop-up dialog box, click "Open" to pop up the recipe selection interface.
3. In the recipe selection interface, select the recipe to be imported, tick the "Import" column, and click "OK".

7.3.3 Using Imported Recipes

After the import is successful, the recipe appears in the recipe list with a status of Editable.

Submit and validate recipes in Recipe Editor software to bring them to the "Released" state. Click the Save button in the upper left corner of the software interface to save the changes to the recipe server. Then, you can use the recipe in BatchControl Management software during the monitoring period.

7.4 Configure Recipe Properties

In the "Recipe Management" page, you can view or modify the basic properties, including Name,

Version, Version desc, Status, Recipe Class, Group, Remark, Process Cell, Product Name, and Recipe Power.

#	Name	Version	Version Desc	Status	Recipe Class	Group	Remark	Process Cell	Product Name	Recipe Power
1	BASF17	V5.0		Released	Workshop A Recipe	Demonstration		1# Line (A)		Common Type Rec
2	TestRecipe	V2.0		Released	Workshop A Recipe	Demonstration		1# Line (A)	Production	Common Type Rec
3	TestRecipe	V1.0		Editable	Workshop A Recipe	HOME		1# Line (A)	Production	Common Type Rec
4	BASF17	V1.0		Editable	Workshop A Recipe	HOME		1# Line (A)		Common Type Rec

Figure 7-2 Recipe Basic Properties

- Name: Recipe name shall be configured when a new recipe is created and cannot be modified. The recipe name and version cannot be repeated at the same time. They are not allowed to be empty. Chinese or special characters are not allowed, and the length is no more than 32 characters.
- Version: Recipe version information shall be configured when a new recipe is created and cannot be modified. The recipe name and version cannot be repeated at the same time. It cannot be empty. Chinese or special characters are also not allowed, and the length is no more than 32 characters.
- Version Desc: You can edit the remark information of the recipe version.
- Status: the newly added recipe status is “editable” and the status transition of recipe is shown in the figure below.

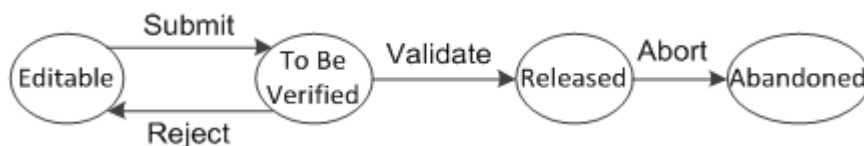


Figure 7-3 Status transition of recipe

Note: only recipes in active state can create batch.

- Recipe Class: Recipe class of the recipe shall be selected when a new recipe is created and cannot be modified. The recipe class is configured in the BatchControl configuration management software. Please see the section “Recipe Class” of *BatchControl Configuration Management Software User Manual*.
- Group: Recipe grouping. When creating a new recipe, you can select an existing group or enter a grouping name to create a new one. The length cannot exceed 32 characters.
- Remark, Product Name and Recipe Power: the information on the recipe details page. For details, please refer to the section Recipe Header.
- Process Cell: There may be multiple backup equipments, indicating that the master recipe can be used in these equipments. For details, please refer to the section Equipment Requirements.


7.4.1 Recipe Header

The “Recipe Header” page is used to define the basic information of the recipe, such as the product, remarks, maximum output / minimum output / standard output associated with the recipe.

Header	Formula	Procedure	Equipment Requirements	Recipe Parameter	Other Information
<div> <div> Name: <input type="text" value="PaintRecipe"/> </div> <div> Product Name: <input type="text" value="BASF_BOM"/> ... </div> </div>					
<div> <div> Remark: <input type="text" value="no delete operation"/> </div> <div> Product Version: <input type="text"/> </div> </div>					
<div> <div> Version: <input type="text" value="V5.3"/> </div> <div> EU: <input type="text" value=""/> </div> </div>					
<div> <div> Version Description: <input type="text"/> </div> <div> Product Maximum: <input type="text" value="0"/> </div> </div>					
<div> <div> Recipe Power: <input type="text" value="Common Type Recipe"/> </div> <div> Product Minimum: <input type="text" value="0"/> </div> </div>					
<div> <div> Status: <input type="text" value="Editable"/> </div> <div> Product Normal: <input type="text" value="600"/> </div> </div>					
<div> <div> Modify Time: <input type="text" value="2023-05-05 09:48:02"/> </div> <div> Modifier: <input type="text" value="BatchAdmin"/> </div> </div>					
<div> <div> Create Time: <input type="text" value="2022-10-12 15:31:02"/> </div> <div> Creator: <input type="text" value="admin"/> </div> </div>					
<div> <div> Approval Time: <input type="text"/> </div> <div> Approver: <input type="text"/> </div> </div>					

Figure 7-4 Recipe Details Page (Editable Status)

After the new recipe is created, the recipe name and version are not allowed to be modified. The remaining parameters can be modified in the “Header” tab, as explained below:

- **Remark:** You can edit the remark information of the recipe. The length cannot exceed 255 characters.
- **Version Description:** You can edit the remark information of the recipe in the area of version. The length cannot exceed 255 characters.
- **Recipe Power:** Configure the recipe type. The privilege corresponding to the recipe type is the operation privilege of the recipe. “Common Type Recipe”, “Top-secret recipe” or custom recipe type is optional. The recipe type is set in the “Basic Configuration” and the recipe permissions are set in “User Authorization”. For details, see the *BatchControl Configuration Management Software User Manual*.
- **Product Name and Version:** Product and version information produced as per the recipe. Click  to bring up the product selection interface, you can also input product name manually. After selecting the product, you only need to select the required raw material information from the list of raw materials of the selected product when editing the Phase instance; if product has not been selected, all the raw material information will be listed for editing when the Phase instance is being edited. Optional products are configured at the “Product Management” node, as described in the chapter the section Product Management.
- **EU:** The unit of product quantity, which is selected in the drop-down menu. You can also input the unit manually.
- **Product Maximum / Product Minimum/ Product Normal:** enter product quantity

parameters in the text box. It cannot be empty, and the Product Minimum \leq Product Normal \leq Product Maximum. If both the Product Maximum and Product Minimum are set to 0, the Product Normal is the set value. The Product Normal is not limited by the Product Maximum or the Product Minimum. Otherwise, the system will test if or not the standard product is between the Product Minimum and the Product Maximum when recipe is tested.

Under normal circumstances, the minimum output \leq standard output \leq maximum output must be met. If both the maximum output and the minimum output are set to 0, the standard output is not limited by the interval.

- If products are selected in the recipe, the standard product set in the product management will be updated to the recipe.
- Modify Time and modifier: The modification time of the recipe and the modification person are automatically generated when the recipe is being modified and saved.
- Create Time and creator: The creation time and creator of the recipe are automatically generated when the recipe is being created.
- Approval time and approver: The examination time of the recipe and the examiner are automatically generated when the recipe is being examined.

7.4.2 Formula

Although the parameters under the same recipe are fixed, the values of the parameters may be different. Therefore, it is necessary to save multiple parameter combinations of different values. by the "Formula" function. At the same time, in the formula table, the setting amount of all input parameters under the formula can be changed uniformly for convenient operation.

Select the "Formula" tab on the recipe details page and switch to the formula list page, as shown below. You can set the formula to the formula shall be used by the recipe by checking a formula in the Default column.

#	Default	Name	Remark
1	<input checked="" type="checkbox"/>	Basic Formula	
2	<input type="checkbox"/>	222	

#	△	Parameter Name	Parameter Type	Data Type	Min	Value	Max	EU
0		Rec_MixReq01	Input Parameter	Real	0	<50>	0	
1		Rec_MixTime01	Input Parameter	Real	0	<20>	0	
2		Rec_FeedAcid01	Input Parameter	Real	0	<100>	0	
3		Rec_FeedAnhy01	Input Parameter	Real	0	<100>	0	
4		Rec_FeedAlc01	Input Parameter	Real	0	<100>	0	
5		Rec_FeedEster01	Input Parameter	Real	0	<100>	0	

Figure 7-5 "Formula Page" in Formula Details

Add Formula

There is a base formula by default in each recipe, and the remaining custom formulas are created by the base formula. You can create a new formula by following these steps:

- 1) Right-click in the formula list and select "Add" in the right-click menu to bring up the "New

Formula” dialog box, as shown below

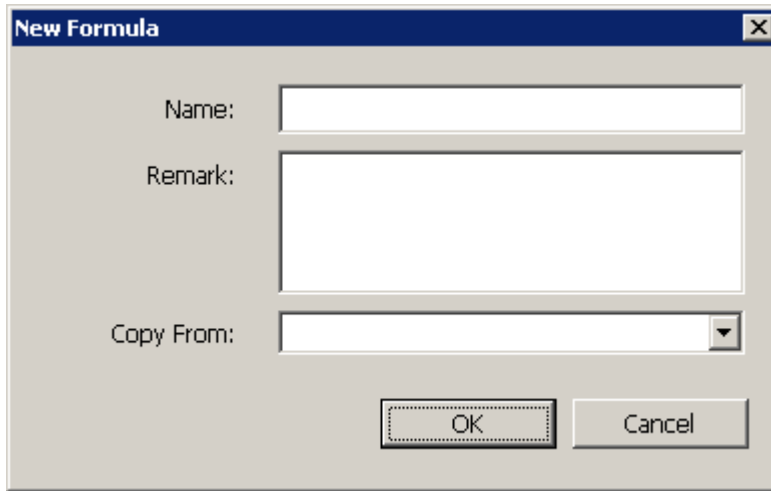
The image shows a 'New Formula' dialog box with a title bar containing a close button. Inside the dialog, there are three input fields: 'Name:' with a single-line text box, 'Remark:' with a multi-line text box, and 'Copy From:' with a drop-down menu. At the bottom right, there are two buttons: 'OK' and 'Cancel'.

Figure 7-6 Add New Formula Dialog Box

- 2) Configure the basic parameters of the formula according to the following instructions.
 - Name: enter it in the text box. The formula name cannot be repeated, it cannot be empty, it doesn't support special characters and the length cannot exceed 32 characters.
 - Remark: The comment information of the formula is entered in the text box. The remark of basic formula is not editable.
 - Copy From: select from the drop-down menu. If an existing custom formula is selected, the newly created formula will copy the set value of the selected formula; if not selected, the newly created formula will copy the set value of the base formula.
- 3) After completing the configuration, click “OK”.

Modify the Set Value

After you selecting a formula in the formula list, the parameters and settings under the formula are displayed on the right. The parameters included in the formula are the parameters added into the Recipe layer in the master recipe. Please see the description in the section Procedure.

The setting value of the parameter is displayed in the format of “<value>”. Double-click the cell to change the value. If the parameter of the base formula is modified, the new set value will be updated to the parameters of the Procedure page; if the parameter value of the custom formula is modified, the set value will only display the value.

The modified custom value can be restored to the default setting as follows:

- 1) Select the parameter in the parameter list that needs to restore.
- 2) Right-click and select “Use Base Value” from the right-click menu.

7.4.3 Procedure

A master recipe consists of several Unit instances, an Operation instance, and several instances of the Phase class. This section mainly describes how to configure the master recipe, Unit instance, Operation instance and Phase instance.

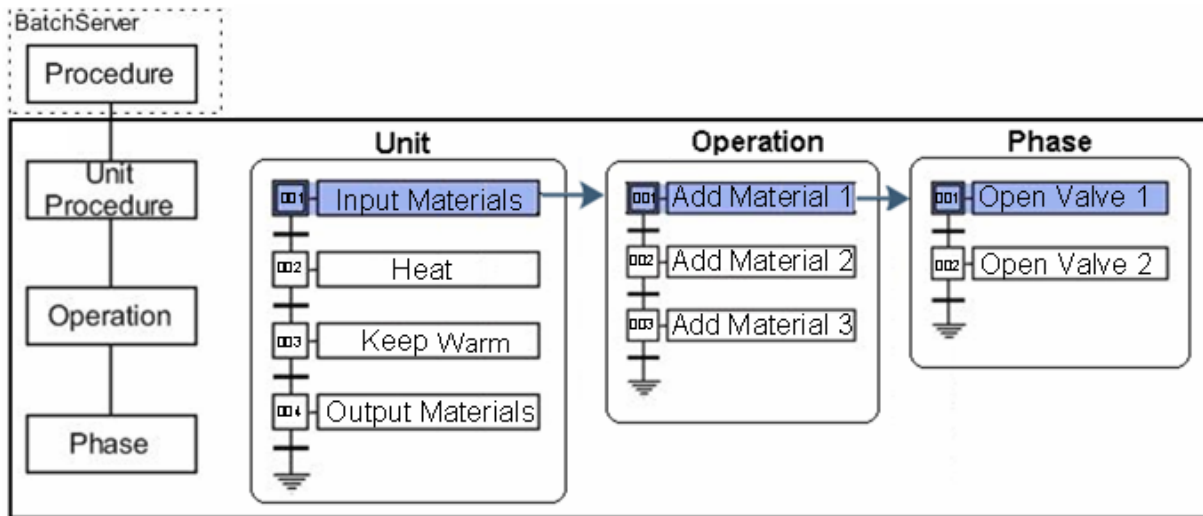


Figure 7-7 Program model diagram

This section mainly describes the master recipe, Unit instance, Operation instance and Phase instance.

Recipe Procedure

Select "Procedure" page in the recipe details page and switch to the procedure page as shown in Figure 7-8. The tree directory on the left shows the instance details of the current master recipe, and the right side contains two tabs which are master recipe Procedure SFC and Unit Procedure list. The tab of master recipe program SFC displays Procedure SFC interface and Unit Procedure of the master Recipe layer.

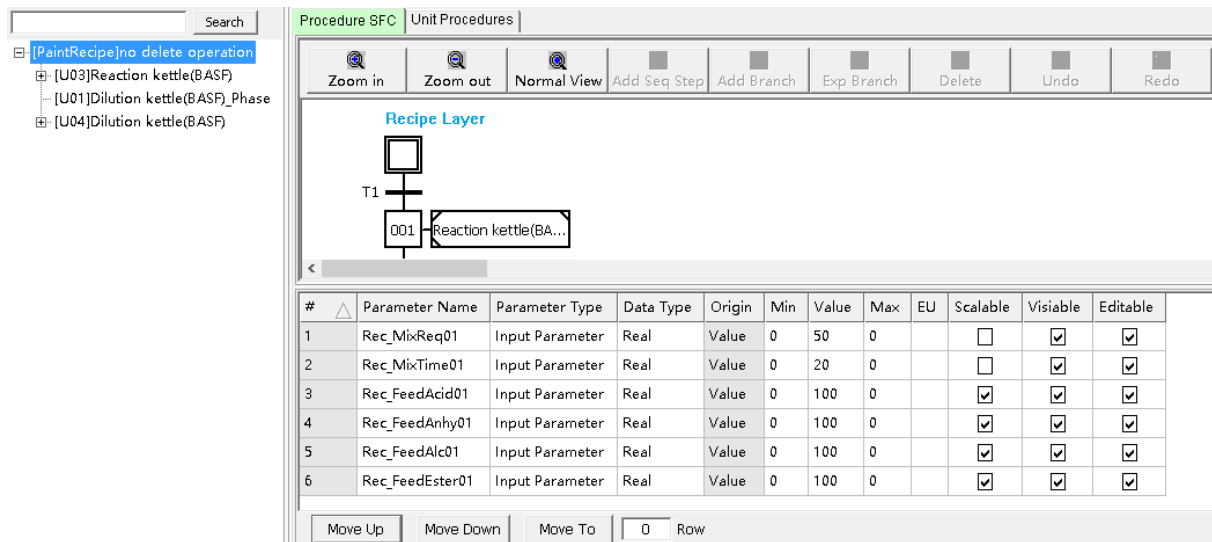
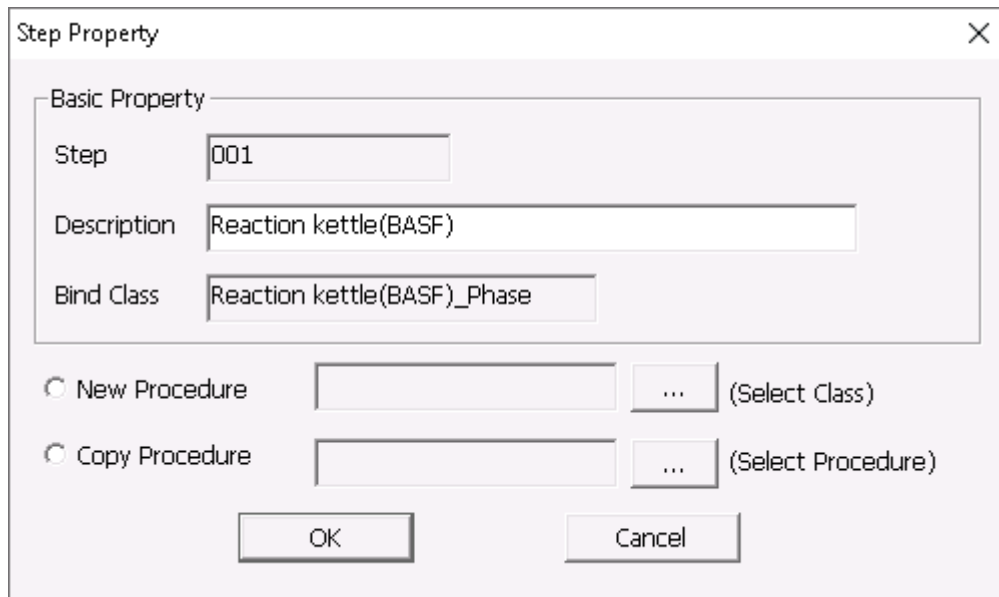


Figure 7-8 Recipe Editor Interface

- 1) Select the start step in the “Procedure SFC” tab, click “Add Seq Step” or “Add Branch” to add a step or branch. For SFC programming, please refer to the section SFC Program Instruction.
- 2) Double-click the newly added step to open the interface as shown in Figure 7-9, and set the basic properties of the step. The step is the Unit instance. Adding steps is to increase the Unit instance.
 - Step: it is the serial number of the step. The system automatically recognizes it and it cannot be changed.
 - Description: The description of the step, which can be customized.
 - Bind Class: according to the settings of “New Procedure” or “Copy Procedure”, it displays the referenced Unit class by the step.
 - New Procedure: the created step is a new instance. The class referenced by this real instance can be selected in the drop-down box.
 - Copy Procedure: select one real instance as the sample to make it as the same as the real instance. In the step property of the real instance, the referenced program class is the same as the sample instance which cannot be modified. The description is the name of the sample instance that can be modified. The Operation instance, Phase instance and the sample instance are the same.



The 'Step Property' dialog box contains the following fields and controls:

- Basic Property** (grouped box):
 - Step**: Text field with value '001'.
 - Description**: Text field with value 'Reaction kettle(BASF)'.
 - Bind Class**: Text field with value 'Reaction kettle(BASF)_Phase'.
- New Procedure**: Radio button, followed by an empty text field, an ellipsis button (...), and the text '(Select Class)'.
- Copy Procedure**: Radio button, followed by an empty text field, an ellipsis button (...), and the text '(Select Procedure)'.
- Buttons**: 'OK' and 'Cancel' buttons at the bottom.

Figure 7-9 Step Property


- 3) Right click in the parameter list and the right-click menu is shown below.



Figure 7-10 The right-click menu of parameter list

- **Add:** A new row of parameters will be added after you select this option. Do configuration as per the table below.

Table 7-2 Configuration Illustration of the Recipe Parameters

Parameter Items	Parameter Illustration
Parameter Name	The name of the parameters. Input in the cell. The recipe parameter name cannot be empty, cannot be repeated, and the length cannot exceed 32 characters.
Parameter Type	For the classification of parameters, select "Input Parameters" or "Output Parameters" from the drop-down menu.
Data Type	The data type of the parameters. It can be set as values (Real) or character string.
Origin	<p>The source of the parameter values.</p> <ul style="list-style-type: none"> ● Value: If the setting source is a input value, you need to set the default value of the parameter and enter the value in the "Value" column cell. When the maximum and minimum values are not both equal to 0, the rule should be conformed to is $\text{minimum value} \leq \text{value} \leq \text{maximum value}$. ● Defer: defer the parameters of the previous level, and use the value of this parameter as the set value. After selecting Defer, you need to click the "Value" column cell and in the drop-down menu select parameters of the last layer as the current layer's parameters. ● Expression: Set the value of the expression as the parameter value. After selecting Expression, click the button  to the right of "Value" column cell, edit and save it in the pop-up expression editing box. Please refer to description below the table for the usage of the expression editor. <p>Note: For the parameters in Recipe layer, the origin is the input value by default and cannot be modified.</p>

Parameter Items	Parameter Illustration
Max/Min	It is the range of parameters. You can enter the maximum and minimum values in the cell. <ul style="list-style-type: none"> When the maximum and minimum values are both zero, the default value is the set value. The set value will not be limited. When the maximum and minimum values are not both equal to 0, the rule should be conformed to is minimum value \leq default value \leq maximum value.
Value	The default value of parameters. According to different origin types, you can set in different ways. Refer to the description in the "Origin Type".
EU	The unit of the tag parameters. You can choose in the drop-down menu. You can also input it manually.
Scalable	Enable it when the origin type is Value. Ticking it means enabling it, otherwise means disabling. Scalable value=plan product/standard product \times 100%.
Visible	If it is checked, the software will display parameters; if it is not checked, parameters are not displayed. This setting will influence the displayed parameters in the two interfaces below: <ul style="list-style-type: none"> As the formula configuration shown in Figure 7-5, only "visible" checked parameters are displayed In the order dispatching interface in the monitoring software, only "visible" checked parameters are displayed as a new batch is created.
Editable	Only when "visible" is checked, can this button take into effect. When this button is checked, it means it is editable and it isn't allowed to be edited when it was not checked. If "Editable" is checked, parameters' values can be modified when a new batch is created in the order dispatching interface in the monitoring software.

Expression editor is shown in Figure 7-11. You can select nodes in the tree directory and parameter type and double click parameters in the middle area. You can also enter the Input Parameter, Output Parameter, Equipment Parameter or operating states into the current recipe.

The commonly used fields in expressions and their meanings are shown in the following table. The length is limited to 4096 characters. You can also input the function operators by the virtual keyboard on the right and click "Compile" to examine the syntax after the configuration is completed.

Table 7-3 Meanings of expression fields

Fields	Meanings	Examples
.ST	Input parameter	PARAM("[U03.OP02].TAG01.ST")
.FB	Output parameter	PARAM("[U03.OP02.P06].TAG001.FB")
MatSTval, MatFBVal	Input and output parameters of material parameter	PARAM("[U03.OP02.P06].MatSTVal")
\$(STATUS.running status)	Running status of procedure	STATUS("[U03.OP02.P06]") = \$(STATUS.IDLE)
EQUIP.BINDED	Equipment status: bound	PARAM("[U03].EquipStatus") = \$(EQUIP.BINDED)
EQUIP.UNBINDED	Equipment status: Unbound	PARAM("[U03].EquipStatus") = \$(EQUIP.UNBINDED)
EquipMarker	Equipment status: equipment marker	PARAM("[U03].EquipMarker")

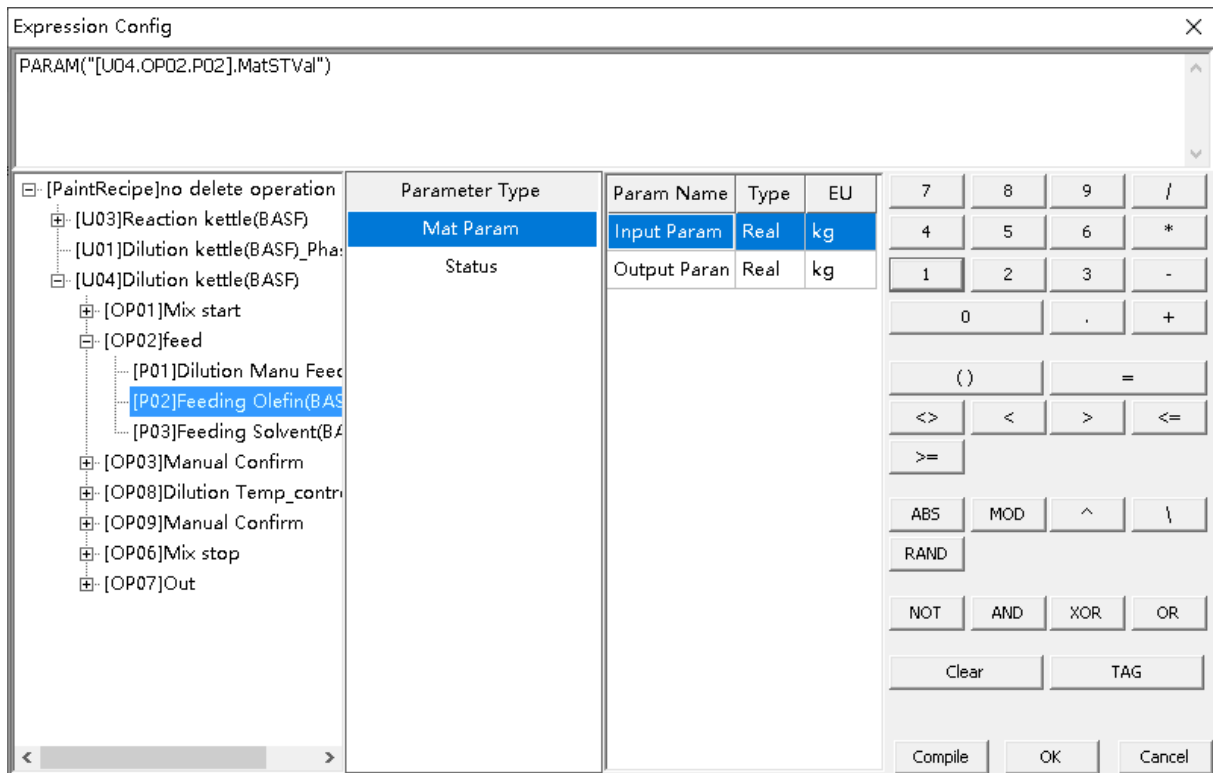


Figure 7-11 Expression Editor

**Attention:**

If Phase program (marked as Phase2)'s parameter type is expression and it concludes another Phase program (marked as Phase1)'s feedback parameters. Only when Phase1 is completed, Phase2 can obtain Phase1's feedback value and continue calculation.

- Delete: delete the selected variable information.
- Adjust parameter display order: Select the parameters in the list, and click the "Move Up" and "Move Down" buttons below to adjust the order of the parameters line by line. If there are many parameters, after selecting a line, enter the target row serial number at the "X row" below, and then click the "Move to" button, the parameter will be directly moved to the specified line, and the original parameters of the specified line will be automatically moved down.
(There are similar buttons below the Unit parameter list and the Operation parameter list, the description will not be repeated later.)

4) Click in the Unit Procedures to open the interface shown in the figure below.

Procedure SFC		Unit Procedures	
#	Name	Remark	Unit Class
1	U01	Reaction kettle	Pre-mixing kettle
2	U02	Dilution kettle	Reaction kettle

Figure 7-12 Unit Program List

Fill in the table parameters according to the table below,.

Parameter Item	Instruction	Operating Method
Name	Set the Unit instance name	<ul style="list-style-type: none"> Click to select it, and then click to edit it. Cannot be empty or be repeated. Chinese and special characters are not allowed. The length cannot exceed 32 characters.
Unit Class	If referenced, the referenced program class is displayed.	Not editable.
Remark	The remark information of Unit instance is the property description of a step when it is being added.	Not editable.

Unit Procedure

In the interface shown in Figure 7-8, click the name of the Unit instance. The interface on the right is as follows. On this interface, you need to configure the Unit instance.

Parameter Type	Data Type	Origin	Min	Value	Max	EU	Scalable
Input Parameter	Real	Defer	0	Recipe_Lipid Sum	0		<input type="checkbox"/>
Input Parameter	Real	Defer	0	Recipe_Alcohol Sum	0		<input type="checkbox"/>

Figure 7-13 Unit Instance Configuration Interface

- 1) Select the start step in the “Unit Procedure SFC” page and click “Add Seq Step” or “Add Branch” to add a new step or branch.
- 2) Double-click the step in the Unit Procedure SFC to bring up the step attribute setting interface as shown in Figure 7-9. Set the step attribute. The step at this time is the

Operation instance. Adding the step is to increase the Operation instance. If you choose to edit the class and to edit the SFC, please refer to the section SFC Program Instruction.

- Step: the sequence number of the step, which is automatically recognized by the system and cannot be changed.
- Description: The description of the step, which can be customized.
- Bind class: According to the setting result of “New instance” or “Copy instance”, the Operation class referenced in this step is displayed.
- New procedure: The created step is to create a new instance, in the drop-down box, you can select the Operation class referenced by the instance.
- Copy procedure: Select a program instance as a sample in the drop-down box to create a new instance of the same. In the step property of the new instance, the referenced program class is the same as the sample instance and cannot be modified; the description is the sample instance remark, which can be modified; the Operation instance, Phase instance and the sample instance under the new instance are the same.
- Template procedure: Select a valid OP template as a sample in the drop-down box to create a new instance of the same. In the step property of the new instance, the referenced program class is the same as that of the template program, described as template program remarks, which can be modified.

Figure 7-14 Step property

- 3) Right click in the parameter list and select “New”, edit Unit parameter. For details, please refer to Table 7-2
- 4) On the interface shown in Figure 7-13, click the Operation Procedures. The right interface is shown in Figure 7-15.

Unit Procedure SFC		Operation Procedures	
#	Name	Remark	Operation Class
1	OP01	Reaction Kettle Operation	Reaction Kettle Operation

Figure 7-15 Operation List

Fill in with the parameters as per the table below:

Parameter	Description	Operation Description
Name	Operation instance name under the recipe	<ul style="list-style-type: none"> Click to select, and then click to edit. Cannot be empty or be repeated. Chinese and special characters are not allowed. The length cannot exceed 32 characters.
Operation Class	Configuring an Operation equipment instance	Not editable
Remark	Remarks of the Operation instance, that is, the description content when adding the step attribute	Not editable.

Operation Procedure

In the instance tree on the left side of the interface shown in Figure 7-8, select the Operation instance name. The right interface is shown below. Start setting up the Operation instance in this interface.

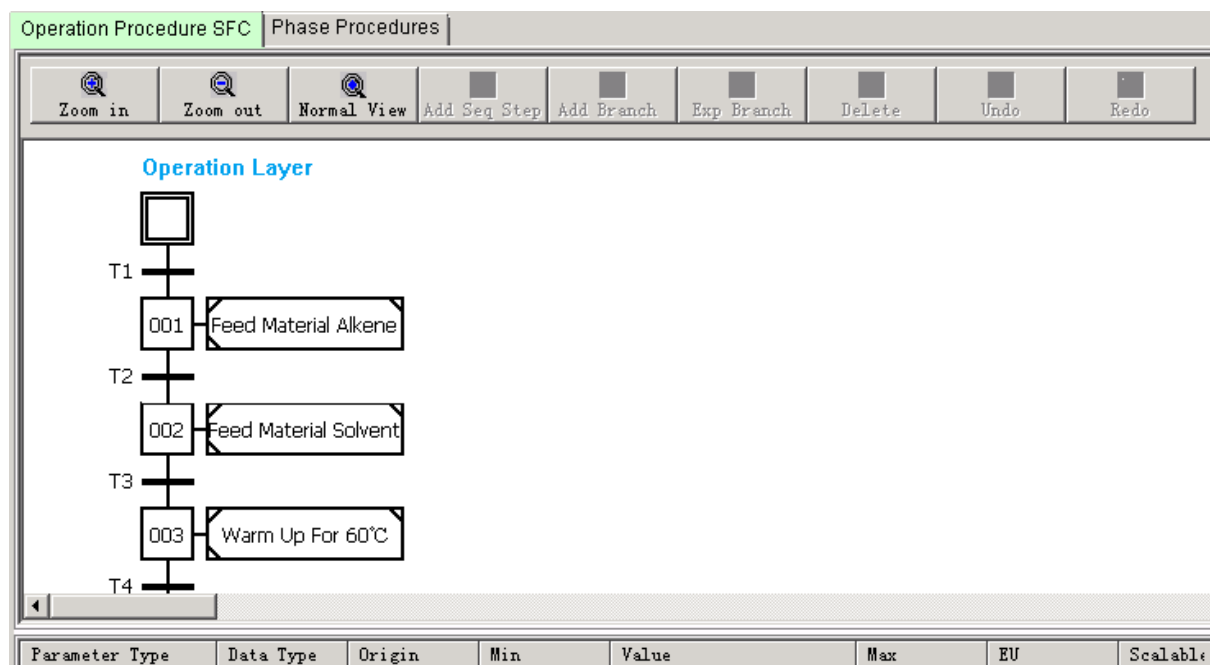


Figure 7-16 Operation Instance Configuration Interface

- 1) Select the start step in the Operation Procedure SFC tab, and click “Add Seq Step” or “Add Branch” to add a new step or branch.

- 2) Double click the newly added step, the interface shown in Figure 7-17. will pop up, and you can set the step properties. The step at this time is the Phase instance, and increasing step is to increase the Phase instance. The Phase instance must reference the existing Phase class. Please select it in the drop-down box and click “OK” to finish.

Figure 7-17 Step Property

- 3) Right click in the parameter list and select “New” and edit the Operation parameters. For details, please refer to Table 7-2.
- 4) Click “Phase Procedures” sheet as shown in the figure below where you can view and modify the Phase real instance information in SFC page.

Operation Procedure SFC: Phase Procedures												
#	Phase Procedure	Remark	Phase Class	Phase Class Continuous	Phase Continuous Status	Signature	Aborted Release	Completed Release	Held Release	Paused Release	Stopped Release	Scan Code
1	P01		Phase Class 001	Phase Class 001	<input type="checkbox"/>	No Signature	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2	P02		Phase Class 002	Phase Class 002	<input type="checkbox"/>	No Signature						<input type="checkbox"/>

Figure 7-18 Phase Program List

Set parameters as per the parameters in the table below:

Parameter	Description	Operation Description
Name	The name of the Phase instance under the recipe	<ul style="list-style-type: none"> After selecting it, you can edit it. Cannot be empty or be repeated. Chinese and special characters are not allowed. The length cannot exceed 32 characters.
Phase Class	Referenced Phase class name	Not editable
Remark	Remarks of the Phase instance, that is, the description content when adding the step attribute.	Not editable

Parameter	Description	Operation Description
Phase Class Continuous	The continuous status of the Phase class (only automatic step has this setting)	"Continuous mark" setting is only set as the initial status of "Phase class continuous" in Phase property in BatchControl configuration management software.
Phase Continuous Status	<p>If the continuous Phase enters the Running state and the ready tag is 1, the system will start or stop the continuous operation of the associated equipment according to the phase continuous status setting, while the system is executing the Operation procedure SFC. The continuous status of Phase step is "ON" or "OFF" displayed in the procedure.</p> <p>If the status is set to "Start", the associated equipment will be started and run continuously until any of the following conditions are met:</p> <ul style="list-style-type: none"> ● In subsequent instances, there is a case where the Phase continuous status associated with the equipment is set as "Stop". ● The execution of the Unit instance to which the Phase belongs is completed. ● The batch to which the Phase belongs enters Completed, Stopped or Aborted state. 	Select "Phase class continuous" and click the cell in this column. Select "ON" or "OFF" by the drop-down menu.
Signature	<p>If it is a manual interactive step, you can configure whether the Phase step operation of the monitoring period requires electronic signature verification.</p> <ul style="list-style-type: none"> ● No signature: Any user can do this operation. ● Operation signature: This operation can only be performed after the operator's signature is done. ● Verification signature: This operation can only be performed after the signature of the operator and the verifier 1 are both done. ● Verification 2 signature: This operation can only be performed after the signatures of the operator, the verifier 1 and the verifier 2 are all done. 	Only the manual interactive step can be edited. After selecting it and clicking the cell, select from the drop-down menu.
Aborted/ Complete/ Held/ Paused/ Stopped/ Release	Whether to allow the user to switch the occupancy of the control mode from Batch to DCS and debug on the Phase panel when the Phase instance is in the static state (Aborted, Complete, Held, Paused, Stopped).	Click the check box to select or unselect it.
Scan Code	<p>Manual confirmation (MANU-CONFIRM) or manual inspection (INAV-REQUEST) Phase needs to be set, to set whether the device code needs to be scanned before configuring the confirmation information:</p> <ul style="list-style-type: none"> ● Check: On mobile devices, you need to scan the device code before you confirm the interactive message. ● Unchecked: No need to scan, you can directly confirm the interactive message 	Only manual confirmation or manual please check the step can be edited, click to check or uncheck

Phase Procedure

In the instance directory tree on the left side of the interface shown in Figure 7-8, select the Phase instance name.

- If the operation step type associated with the Phase instance is Pipeline feeding/Pipeline feeding and batching or interactive steps - raw material verification/autoclave loading verification/tank loading verification/dump truck verification, the right interface is shown in the figure below.



Tip:

In the SFC page of the Operation program, right-click the Phase program and select the "Jump to Parameter" command, you can also open the interface shown in Figure 7-19.

On this interface, the raw materials, setting tags and feedback tags corresponding to the Phase instance can be configured. You can also modify the material type, Origin, Value, Scalable, Confidentiality, Input or Output Parameter as shown in the figure below.

Phase Procedure										
#	Mat Name	Mat Code	Mat Type	Origin	Min	Value	Max	EU	Scalable	Confidentiality
1	Ester	B004	Input Material	Value	0	0	0	kPa	<input type="checkbox"/>	No

#	Parameter Name	Parameter Type	Origin	Data Type	Min	Value	Max	Group	Remark	EU	Scalable	Reference unit equipment Parameter
1	IN001	Input Parameter	Value	Real	0	0	0	Default			<input type="checkbox"/>	
2	T001	Output Parameter	Value	Time								

Figure 7-19 Phase Program (auto step- feeding step)

- Double-click the cell or right-click the "Select Material" command. In the pop-up dialog box, you can select the material, of which the bound Phase class's material's number background color is blue. For the description of the maximum value, minimum value and the setting value, please refer to the section Recipe Header. For the material type, confidential parameter, Origin Type and Linear scalable parameter settings, see Table 7-2.
Note: if Phase class is already associated with the raw materials, you can only modify the set values in the configuration software.
- Confidentiality: Set whether or not the parameters related to the raw materials are confidential parameters. The confidential parameters and raw material information without access are hidden (displayed as ***) and the non-confidential parameters will be displayed as engineering values as per the user's recipe operation authority. Operation method: select and click it to edit, and select "Yes" or "No" in the drop-down menu. The description of the user recipe operation authority, please refer to *BatchControl Configuration Management Software User Manual*.
- If the operation step associated with the Phase instance is the automatic step-non-feeding step, then the interface is similar to Figure 7-19. You can set tag information by the right-click menu.
- If the operation step type associated with the Phase instance is the interactive

step-artificially feeding step/artificially feeding material step, then the interface is similar to that in Figure 7-19. You only need to set material parameters, setting tags, feedback tags and the setting values of the Phase class and tag information.

- If the operation step type associated with the Phase instance is interactive step-artificial confirmation step/ artificially checking step, you can add the text prompt information displayed during the operating period of the Phase instance or modify the value of the setting parameter, and bind associated equipment parameters as shown in Figure 7-20.

#	Parameter Name	Parameter Type	Origin	Min	Value	Max	EU	Scalable	Reference unit equipment Parameter
1	Temperature	Output Parameter	Value	0	0	0		<input type="checkbox"/>	Temperature
2	Pressure	Output Parameter	Value	0	0	0		<input type="checkbox"/>	Pressure

Figure 7-20 Phase Program (Interactive step- confirmation step)

- Select a Phase node in the navigation tree on the left, and through the right-click menu “Tag Information” command, you can view the command tag, feedback tag and other tag parameters in the pop-up dialog box, and set the tag value to the default or Is empty.

So far, a recipe configuration is completed.

7.4.4 Equipment Requirements

After configuring the Process Cell (Cell) in the configuration software and configuring the Unit equipment, you can associate the standby equipment with the recipe in the recipe details page, indicating that the master recipe is available for use in these equipments.

On the recipe details page, select the Equipment Requirements tab and switch to the equipment page as shown below. The process group member list is displayed on the left. After a message is selected, the Unit Equipment configured in the process Cell is displayed on the right side.

Select	Select All		#	Unit Equipment	Unit Equip Class	Bindable	Marker	Purpose	Remark
<input type="checkbox"/>	Clear All	Line1	1	Dilution R1002(BASF)	Dilution kettle	<input checked="" type="checkbox"/>	1		
<input type="checkbox"/>		BASF Paint Line2	2	Dilution R2002(BASF)	Dilution kettle	<input checked="" type="checkbox"/>	2		
<input checked="" type="checkbox"/>		BASF Paint Line Test	3	Reactor R1001(BASF)	Reaction kettle	<input checked="" type="checkbox"/>	0		
<input checked="" type="checkbox"/>		BASF Paint Line Test1	4	Reactor R2001(BASF)	Reaction kettle	<input checked="" type="checkbox"/>	0		
<input type="checkbox"/>		BASF Resin Line3							

Figure 7-21 “Equipment Requirements” Page in the Recipe Details

Operation Steps

1. Bind a process cell. Supports single binding or batch binding operations.
 - Single binding: In the list on the left, check the process cells that need to associate with.

- Batch binding: Right-click the "Select" item in the header and select the "Select All" or "Clear All" command to select all equipments at once or cancel all equipments.
- 2. After you select the process cell, the software adds all the Unit devices under the process cell to the list of bindable devices by default. Select the bound process cell on the left, and check the selection box of "Bindable" column on the right to filter the Unit device twice.

Operation Result

When binding Unit device to a batch on the dispatching interface, or modifying the Unit device in the IDLE batch logic on the process management interface, or selecting the Unit device used by the batch after startup, only the Unit devices with "Bindable" column checked in Figure 7-21 will be displayed in the list of bindable devices. The unchecked devices will not be displayed.

If the device binding method for the batch is set to "Auto" or "First Available" in dispatching interface, the software will also follow this rule when automatically binding devices.

7.4.5 Recipe Parameter

On the recipe details page, select the Recipe Parameter tab and switch to the recipe parameter interface. The software summarizes and displays the material parameters and process parameters used in the recipe.

- As shown in Figure 7-22, "Material Parameter" summarizes the material parameters used in the recipe, and displays the material parameters and corresponding procedure steps in different group tab. Here you can modify the minimum, maximum and setting value. For the description of value, please refer to Table 7-2.
- As shown in Figure 7-23, "Process Parameter" summarizes the parameter that needs to be monitored in the batch production processes. These parameters are the monitoring parameters added in the master recipe procedure/Unit procedure/Operation procedure list of the process, and are displayed on separate tabs of different material groups. Here you can modify the minimum, maximum, setting value and remark information of the parameter. For the description of value, please refer to Table 7-2. The length of the remark information cannot exceed 255 bytes.

Backup and batch modification: Right-click in the data list and select the "Export" command, you can export the parameters in the current page as a CSV file. The default archive path is "D:/BatchData/" and you can edit it when exporting the file; After modifying the value of the Phase parameter, you can import the modification into the list through the "Import" command. The background color of the modified value is displayed in red, and the modification can take effect after saving.

Material Parameter Process Parameter											
'Group'											
#	Unit Procedure	Operation Procedure	Phase Procedure	Parameter Name	Data Type	Origin	Min	Value	Max	EU	Scalable
1	[U03]Reaction kettle(BASF)	[OP02]Reaction liquid(BASF)	[P06]Add_Anhydride 10kg	Anhydride	Real	Value	0	10	0	kg	<input type="checkbox"/>
2	[U03]Reaction kettle(BASF)	[OP02]Reaction liquid(BASF)	[P09]Feeding_Ester phase	Ester	Real	Value	0	0	0	kPa	<input type="checkbox"/>
3	[U03]Reaction kettle(BASF)	[OP02]Reaction liquid(BASF)	[P15]Add_Alcohol 11kg	Alcohol	Real	Value	0	11	0		<input type="checkbox"/>
4	[U03]Reaction kettle(BASF)	[OP02]Reaction liquid(BASF)	[P07]Add_Anhydride 20kg	Anhydride	Real	Value	0	20	0	kg	<input type="checkbox"/>
5	[U03]Reaction kettle(BASF)	[OP02]Reaction liquid(BASF)	[P01]Add_Anhydride	Anhydride	Real	Value	0	50	0	atm	<input type="checkbox"/>
6	[U03]Reaction kettle(BASF)	[OP02]Reaction liquid(BASF)	[P16]Add_Alcohol 22kg	Alcohol	Real	Value	0	22	0		<input type="checkbox"/>
7	[U03]Reaction kettle(BASF)	[OP02]Reaction liquid(BASF)	[P17]Add_Alcohol	Alcohol	Real	Value	0	22	0		<input type="checkbox"/>
8	[U03]Reaction kettle(BASF)	[OP02]Reaction liquid(BASF)	[P10]Add_Acid(Command0)	Acid	Real	Value	0	5	0	kg	<input type="checkbox"/>
9	[U03]Reaction kettle(BASF)	[OP02]Reaction liquid(BASF)	[P03]Add_Acid(Command1)	Acid	Real	Value	0	15	0	kg	<input type="checkbox"/>
10	[U03]Reaction kettle(BASF)	[OP02]Reaction liquid(BASF)	[P11]Add_Acid	Acid	Real	Value	0	15	0	kg	<input type="checkbox"/>

Figure 7-22 Material parameter list

Material Parameter Process Parameter												
Default Group												
#	Unit Procedure	Operation Procedure	Phase Procedure	Parameter Name	Data Type	Origin	Min	Value	Max	EU	Scalable	Remark
1	[U03]Reaction kettle(BASF)	[OP02]Reaction liquid(BASF)	[P09]Feeding_Ester phase	IN001	Real	Value	0	0	0		<input type="checkbox"/>	

Figure 7-23 Process parameter list

7.4.6 Other Information

During the monitoring period, when the batch operation fails, the Unit procedure is held. Through the configuration of the recipe details interface, you can only hold the Batch, Unit or Operation with fault, and the held batch is selected by default. The steps are as follows:

- 1) Select the “Other Information” tab on the recipe details page and switch to the page as shown below.

#	Procedure Hold
1	[PaintRecipeDEMO1].[U03]
2	[PaintRecipeDEMO1].[U03].[OP01]

Figure 7-24 “Other Information” Tab in Details Page

- 2) Right-click in the list and select the “Add” button in the right-click menu to bring up the “Please select recipe procedure” dialog box.
- 3) Select Unit, Operation in the dialog box and click the “OK” button.

Section 8 SFC Program Instruction

The SFC programming interface in BatchControl is shown in the following figure, which appears in the Unit instance or the Operation instance under the master recipe, or in the master recipe. The page will display which layer this program belongs to, such as “Operation Layer” in the figure below, which means this program belongs to the Operation program.

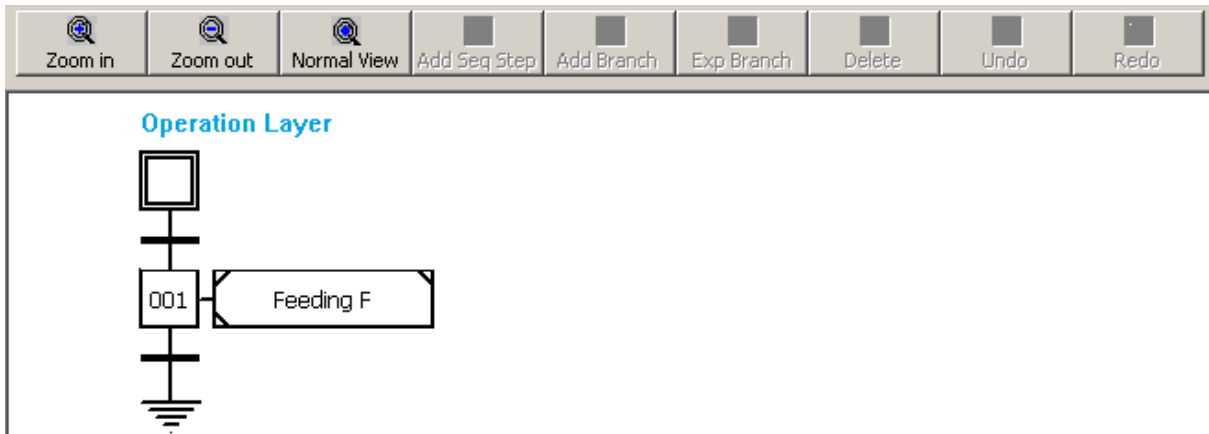


Figure 8-1 SFC programming basics

8.1 Interface Instruction

The toolbar function in the above figure is as follows:

Tool	Description	Instructions
Zoom in	Zoom in to display the current sequence function chart	Click the toolbar button
Zoom out	Zoom out to display the current sequence function chart	Click the toolbar button
Normal view	Restore the current picture to normal size	Click the toolbar button
Add Sep Step	Add one step sequence	Enable when a sequence step or conversion is selected, then click the toolbar button
Add Branch	Add a branch	Enable when a sequential step or transition is selected, and then click the toolbar button. Add a branch to the selected branch after the step, and add the branch to the parallel branch after the conversion.
Exp Branch	Extend a branch	Enable when a branch is selected, then click the toolbar button
Delete	Delete a sequential step or branch	Enable when selecting a sequential step or branch, then click the toolbar button
Undo	Undo the previous step, which can cancel multiple operations from the back to the front.	After you have enabled the sequential function chart, you can click the toolbar button.
Redo	Redo the undone operation, and then redo the undone operation from the back to the front.	It can be enabled after undoing. At this time, click the toolbar button.

The right-click menu of the sequence control function is as follows:

Menu	Description	Instructions
Jump to Previous Level	Jump to the previous program, valid in the main recipe and its program examples	Right click on the SFC program editing interface and click on the menu
Jump to Next Level	Jump to the next level of the program, valid in the main recipe and its program examples	Right click on the SFC program editing interface and click on the menu

8.2 Programming Basics

Program Structure

An introduction to the SFC program is shown in Figure 8-2.

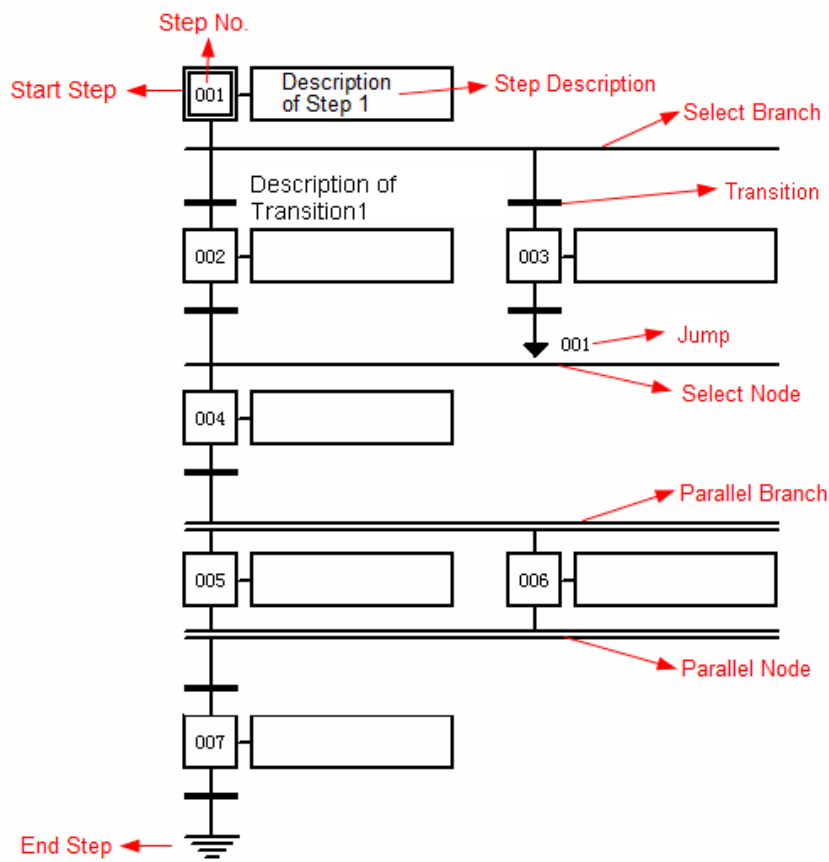


Figure 8-2 SFC program

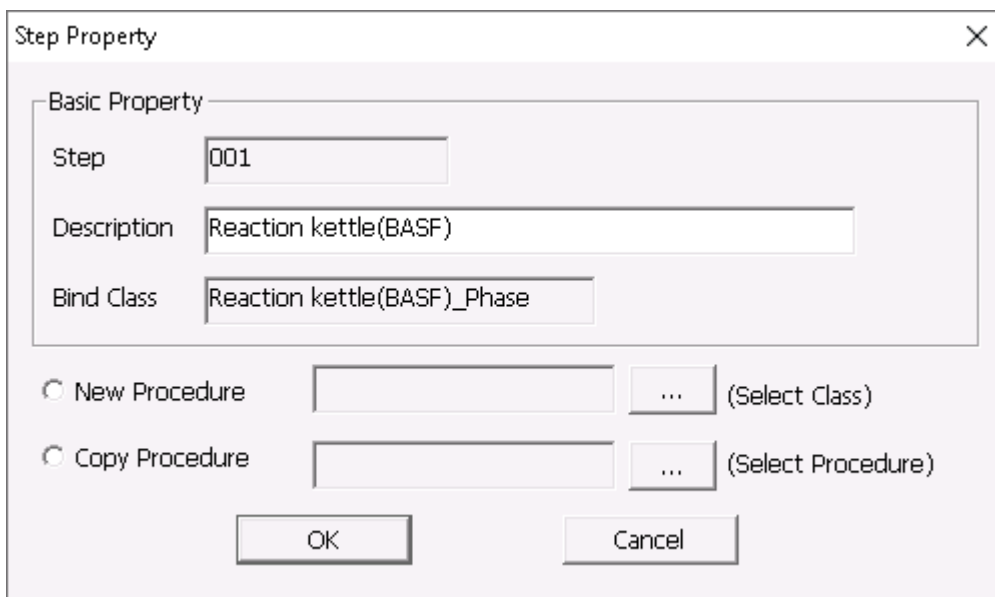
Programming Rule

- Supports sequential, parallel, select, loop, and jump structures.
 - Sequence structure: Start from the beginning step, meet the conditions and then proceed to the next step in order until the end step exits the program.

- Parallel structure: A structure containing parallel branches. When the current transition condition is satisfied, all the branches under the parallel branch start running at the same time. When all the branches finish running and the transition conditions are met, the parallel branch runs.
 - Select structure: A structure containing selected branches, which are executed along the branch that first satisfies the condition in the selection branch, and other branches will not be executed. When there are more than two selection branches satisfying the condition at the same time, the leftmost branch is executed first.
 - Jump structure: When the pre-transition condition of the jump is satisfied, the program logic jumps directly to the target step and continues from that step.
 - Loop structure: When the pre-transition condition of the jump is satisfied, the program logic jumps to the target step that has been executed to form a logical loop.
- When the conversion condition is logic “true”, the program goes to the next step; if it is logical “false”, then each conversion cycle needs to scan to this conversion.
 - When the conversion condition is not met, the currently active step will be executed in each scan cycle until the current activation step fails and the next step is activated.
 - There are only one initial step and one termination step in each custom SFC, and up to 128 steps are supported.
 - Up to 16 branches can be supported in each selection structure or parallel structure, and the maximum number of output pins can be set to 32.

Step Operation

Double-click the step to bring up the Step Property setting dialog.



The image shows a 'Step Property' dialog box with a close button (X) in the top right corner. It contains a 'Basic Property' section with three text input fields: 'Step' (containing '001'), 'Description' (containing 'Reaction kettle(BASF)'), and 'Bind Class' (containing 'Reaction kettle(BASF)_Phase'). Below this section are two radio button options: 'New Procedure' and 'Copy Procedure'. Each option has an empty text input field followed by a button with three dots and a label in parentheses: '(Select Class)' for 'New Procedure' and '(Select Procedure)' for 'Copy Procedure'. At the bottom of the dialog are 'OK' and 'Cancel' buttons.

Figure 8-3 Step property setting box

Set the description of the step in the above interface, and select the referenced program class in

the drop-down box of the referenced program class.

Table 8-1 Color and status correspondence table of monitoring period

Status	Wait for running	Running	After running
Color	Green flashing	Green	Grey

Conversion Property

Double-click the conversion to bring up the Transition Property setting dialog shown in Figure 8-4.

Transition Property

Basic Property

Name: T2

Description:

Transition Condition (Reach Condition Execute)

Select Unit/Op/Phase Procedure and Status

Expression Determines, Example: Tag("A1.VALUE") > 10

True

Is Jump

Target Step 1



Clear Transition OK Cancel

Figure 8-4 Conversion property settings

In the above interface, you can set the following parameters:

- Description: Set the description of the conversion.
- Transition conditions:

Set the conversion conditions and goes into the next program when the condition is met, The conversion condition has two types:

- Determine as per the program and the running conditions: click , select one program in the dialog box that pops up and select one running condition in the drop-down menu. (Note: If the running status is not set, the default is "Completed".)
- Determine as per the tag expression: click  then the expression editor dialog box in Figure 7-11 will pop up. Manually enter tags, batch parameters (shall cite

quotation mark in the English format) and use =, <, >, or logic and (and), logic or (or) and so forth as well as fill in the determination condition. If the conversion condition is empty, it means unconditional conversion, and the next step is automatically executed.

Example:

- 1) If the conversion condition is that the value of the tag T1 is greater than 1, and the condition is satisfied, the judgment condition is Tag ("T1") >1.
 - 2) If it is a digital value, and 1 and 0 respectively represents ON and OFF. For example, Tag("YDI.VALUE") = 1.
 - 3) Unconditional conversion (satisfied): No conversion conditions are set, that is, the conversion conditions are always met.
- Conditional jump: After checked, the jump target can be set. When the transition condition is met, it will automatically jump to the set jump target step, otherwise it will be executed sequentially. You can set a conditional jump by selecting the transition in the branch (except for the leftmost transition).
 - Clear conditions: clear the set conversion conditions and descriptions, and select "unconditional conversion".

Section 9 Appendix: Indicator List in Configuration Period

Table 9-1 Indicator List in Configuration Period

Period	Parameter Items		Description
Configuration Period	Material kinds		≤2,000
	Master recipe	Number of recipes	≤1,000
		Number of master recipes	≤20,000
		Unit program (each master recipe)	≤100
		Operation program (each Unit program)	≤64
		Phase program (each Operation program)	≤128

Section 10 Revision

Table 10-1 Retrofit list of the version

Document Version	Applicable Product Version	Remarks
V1.0 (20230407)	OMC BatchControl V4.10.02.00	The first edition.
V1.1 (20230828)	OMC BatchControl V5.10.00.00	<ul style="list-style-type: none">● Add the description about importing recipes and how to adjust parameters order.● Add field meanings table of the expression description. Add description of Recipe Parameter in the recipe attributes.● Supplement the description of basic information, such as materials, products, recipes and procedures.