Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

<table>
<thead>
<tr>
<th>Alert</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DANGER</strong></td>
<td>indicates that death or severe personal injury will result if proper precautions are not taken.</td>
</tr>
<tr>
<td><strong>WARNING</strong></td>
<td>indicates that death or severe personal injury may result if proper precautions are not taken.</td>
</tr>
<tr>
<td><strong>CAUTION</strong></td>
<td>indicates that minor personal injury can result if proper precautions are not taken.</td>
</tr>
<tr>
<td><strong>NOTICE</strong></td>
<td>indicates that property damage can result if proper precautions are not taken.</td>
</tr>
</tbody>
</table>

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

Qualified Personnel

The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

<table>
<thead>
<tr>
<th>Alert</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WARNING</strong></td>
<td>Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.</td>
</tr>
</tbody>
</table>

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.
Preface

Purpose of the manual

This document contains reference information for engineering and operation of the Advanced Process Functions (APF) together with SIMATIC BATCH. You can find additional information on APF in the following manuals:

- Advanced Process Functions (APF) Function Manual
- Advanced Process Functions Installation and Configuration
- Advanced Process Functions Operating Manual

Also refer to the SIMATIC BATCH manuals.

Core content

The Advanced Process Functions (APF) provide functions for material master data management. Integration with SIMATIC BATCH allows the automatic synchronization and shared use of materials in APF and SIMATIC BATCH. The APFs provide a dialog that allows easy recording of data for orders and batches. Data are transferred to SIMATIC BATCH and the batches are created there. All other steps are carried out in the SIMATIC BATCH.

APF provides a freely programmable interface in the form of WinCC global scripts which can be used for automatic creation, releasing and starting of batches in SIMATIC BATCH. All relevant batch header data (basic recipe or formula, order or batch name, batch size, start mode and start time, unit assignment) as well as the batch parameters (process parameters, input material and output material) are transferred in the process.

The following core issues are covered in this document:

- Amendment to the Installation / Configuration Manual:
  - Installation of the APF for shared operation with SIMATIC BATCH
- Amendment to the Engineering Manual:
  - Activation of the APF integration with SIMATIC BATCH
  - Configuration of the "Order Creation" dialog
  - Runtime-Interface and WinCC Script for automatically creating, releasing and starting of batches in SIMATIC BATCH
• Amendment to the Operating Manual:
  – Synchronization of the material master data between APF and SIMATIC BATCH
  – "Order Creation" dialog

• Amendment to the Function Manual:
  – "Order Creation" interface

Validity

This documentation is valid for V2.1 of the APF software package.
Table of contents

Preface..................................................................................................................................................3
1 Security information..............................................................................................................................7
2 Amendment to the Installation and Configuration Manual.................................................................9
3 Amendment on Engineering Manual....................................................................................................11
   3.1 Integration....................................................................................................................................12
   3.2 Configuration of the "Order Creation" dialog.............................................................................13
   3.3 Runtime interface to SIMATIC BATCH......................................................................................19
4 Amendment to the Operating Manual..................................................................................................25
   4.1 Material management .................................................................................................................26
   4.2 "Order Creation" dialog..............................................................................................................29
5 Amendment to the Function Manual....................................................................................................33
   5.1 "Order Creation" interface............................................................................................................33
   5.2 Formula Split Mode......................................................................................................................38
Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens’ products and solutions only form one element of such a concept.

Customer is responsible to prevent unauthorized access to its plants, systems, machines and networks. Systems, machines and components should only be connected to the enterprise network or the internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place.

Additionally, Siemens’ guidance on appropriate security measures should be taken into account. For more information about industrial security, please visit: http://www.siemens.com/industrialsecurity

Siemens’ products and solutions undergo continuous development to make them more secure. Siemens strongly recommends to apply product updates as soon as available and to always use the latest product versions. Use of product versions that are no longer supported, and failure to apply latest updates may increase customer’s exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under: http://www.siemens.com/industrialsecurity
Security information
Amendment to the Installation and Configuration Manual

Please read the "Advanced Process Functions Installation and Configuration" manual before you read this section. The following only describes relevant changes that result when you use APF together with SIMATIC BATCH.

Server

The BATCH server must be installed on the APF OS server.

OS setup on all clients

When you use SIMATIC BATCH integration, the APF OS setup must be installed on all APF clients. (It is the same setup as for the OS servers. No additional APF licenses are required for the APF clients.)

For installation and license terms of SIMATIC BATCH refer to the corresponding SIMATIC BATCH manuals.

Note

Ensure that the APF OS setup is performed on the client when you operate APF with BATCH. Otherwise, for example, the APF Material Editor may be affected due to lack of communication partners.

User rights

Please assign at least the "Process controlling" rights for the "Order Creation" dialog.
Amendment on Engineering Manual

Please read the "Advanced Process Functions Engineering Manual" before you read this section. The following only describes the relevant changes that result when you use APF together with SIMATIC BATCH.
3.1 Integration

The integration of APF with SIMATIC BATCH is configured using the "Einstellungen – Allgemein" / "Settings - General" dialog of the APF engineering tool:

The release of APF integration using SIMATIC BATCH occurs through the option box "Use SIMATIC BATCH" / "SIMATIC BATCH will be used". This option box can only be activated if a SIMATIC BATCH process cell (installation) is configured in a PCS 7 project.

The name of the process cell (plant) in the Plant Hierarchy (PH) is specified with the PCS 7 project configuration where it is automatically determined. If you change the name of the process cell in the PCS 7 project, you must update the APF Engineering settings in the "Settings - General" dialog.

Run the APF Integrator once you have applied the settings.

Note

Ensure that the BATCH server is started when you operate APF with BATCH. Otherwise, for example, the APF Material Editor may be affected due to lack of communication partners.
3.2 Configuration of the "Order Creation" dialog

The "Order Creation" dialog offers numerous possible settings to tailor the dialog to customer-specific requirements. These settings are specified during the engineering phase directly at the dialog control @FB_OrderCreation.pdl using WinCC Graphics Designer or through a user-specific script.

**Note**

If configuration changes are required, it is recommended to make a copy of @FB_OrderCreation.pdl.

Possible settings are described below:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FormulaCategoryMode</td>
<td>Options:</td>
</tr>
<tr>
<td></td>
<td>• enabled: The operator must select a formula category before he/she can select the relevant formula.</td>
</tr>
<tr>
<td></td>
<td>• disabled (default): The operator can select the recipe or formula without previously selecting a formula category.</td>
</tr>
<tr>
<td>FormulaCategoryOperation</td>
<td>Options:</td>
</tr>
<tr>
<td></td>
<td>• enabled (default): The operator can select a formula category.</td>
</tr>
<tr>
<td></td>
<td>• disabled: The operator is not authorized to select a formula category.</td>
</tr>
<tr>
<td>FormulaCategoryFilter</td>
<td>• Filter for selectable formula category names. Formula categories are displayed when their name starts with FormulaCategoryFilter.</td>
</tr>
<tr>
<td></td>
<td>• No default</td>
</tr>
<tr>
<td></td>
<td>• Can be set in Graphics Designer or in script.</td>
</tr>
<tr>
<td></td>
<td>• If only one formula category matches the filter, this will be selected automatically.</td>
</tr>
<tr>
<td>RecipeOperation</td>
<td>Options:</td>
</tr>
<tr>
<td></td>
<td>• enabled (default): The operator can select a formula / recipe.</td>
</tr>
<tr>
<td></td>
<td>• disabled: The operator is not authorized to select a formula / recipe.</td>
</tr>
</tbody>
</table>
### 3.2 Configuration of the “Order Creation” dialog

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RecipeFilter (In/Out)</td>
<td>• Filter for selectable formula or recipe names. Formulas or recipes are displayed when their name starts with RecipeFilter. &lt;br&gt;• No default &lt;br&gt;• Can be set in Graphics Designer or in script. &lt;br&gt;• If only one formula or recipe matches the filter, this will be selected automatically.</td>
</tr>
<tr>
<td>OrderCategoryMode</td>
<td>Options: &lt;br&gt;• SelectExisting (select existing) &lt;br&gt;• UserInput (manual input) &lt;br&gt;• FormulaCategoryName (formula category name) &lt;br&gt;• FormulaOrRecipeName (formula / recipe name) (default) &lt;br&gt;• ProductCode (product code)</td>
</tr>
<tr>
<td>OrderCategoryOperation</td>
<td>Valid when OrderCatMode = SelectExisting or manual input &lt;br&gt;Options: &lt;br&gt;• enabled (default): The operator can select/edit the order category. &lt;br&gt;• disabled: The operator is not authorized to select/edit the order category.</td>
</tr>
<tr>
<td>OrderCategoryFilter</td>
<td>• Valid when OrderCatMode = SelectExisting &lt;br&gt;• Filter for selectable order category names. Order categories are displayed when their name starts with OrderCategoryFilter. &lt;br&gt;• No default &lt;br&gt;• Can be set in Graphics Designer or in script. &lt;br&gt;• If only one order category matches the filter, this will be selected automatically.</td>
</tr>
<tr>
<td>OrderCategoryPreselection</td>
<td>• Valid when OrderCatMode = manual input &lt;br&gt;• Start value of OrderCategory input field &lt;br&gt;• No default &lt;br&gt;• Can be set in Graphics Designer or in script.</td>
</tr>
<tr>
<td>OrderNameCalculationMode</td>
<td>Options: &lt;br&gt;• UserInput (manual input) &lt;br&gt;• DateTimeAndUserInput (date + time + manual input) &lt;br&gt;• ProductCodeAndUserInput (product code + manual input) &lt;br&gt;• ProductCodeAndDateTime (product code + date + time)</td>
</tr>
<tr>
<td>OrderNameOperation</td>
<td>Options: &lt;br&gt;• enabled (default): The operator can enter or overwrite order names. &lt;br&gt;• disabled: The operator is not authorized to enter or overwrite order names.</td>
</tr>
<tr>
<td>OrderNamePreselection</td>
<td>• Valid when OrderNameMode includes manual input &lt;br&gt;• Start value of the manual input part &lt;br&gt;• No default &lt;br&gt;• Can be set in Graphics Designer or in script.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>OrderSizePreselection</td>
<td>• Start value of OrderSize field</td>
</tr>
<tr>
<td></td>
<td>• Default is 0</td>
</tr>
<tr>
<td></td>
<td>• Can be set in Graphics Designer or in script.</td>
</tr>
</tbody>
</table>
| OrderSizeOperation          | Options:<br>  
|                             | • enabled (default):<br> The operator can select the order size.            |
|                             | • disabled:<br> The operator is not authorized to select the order size.    |
|                             | The order size is calculated using the batch sizes.                        |
| OrderSplitModePreselection  | Start value of selection of order split mode.                             |
|                             | Options:<br>  
|                             | • Evenly (default)<br> MaxSizeWithRemain (maximum size + remainder) (default) |
|                             | • MaxSizeWithOverProd (maximum size rounded up)                            |
|                             | • MaxSizeWithUnderProd (maximum size rounded down)                         |
|                             | More information on the calculation principles for this mode can be found in Amendment to Function Manual under Formula Split Mode. Can be set in Graphics Designer or in script. |
| OrderSplitModeOperation     | Options:<br>  
|                             | • enabled (default):<br> The operator can select the order split mode.     |
|                             | • disabled:<br> The operator is not authorized to select the order split mode. |
| BatchLimitsOperation        | Options:<br>  
|                             | • enabled:<br> The operator can overwrite the minimum and maximum batch size. |
|                             | • disabled:<br> The operator is not authorized to overwrite minimum and maximum batch sizes. |
| MinBatchSizePreselection    | • Start value of the Minimum Batch Size field                              |
|                             | • Default is 0                                                              |
|                             | • Can be set in Graphics Designer or in script.                            |
| MaxBatchSizePreselection    | • Start value of the Maximum Batch Size field                              |
|                             | • Default is 0                                                              |
|                             | • Can be set in Graphics Designer or in script.                            |
### 3.2 Configuration of the “Order Creation” dialog

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BatchesSizeOperation</strong></td>
<td>Options:</td>
</tr>
<tr>
<td></td>
<td>• enabled: The operator can change the batch, including the remainder batch size.</td>
</tr>
<tr>
<td></td>
<td>• disabled: The operator is not authorized to change the batch, including the remainder batch size. These are then calculated automatically.</td>
</tr>
<tr>
<td><strong>OrderCreationModeOperation</strong></td>
<td>Options:</td>
</tr>
<tr>
<td></td>
<td>• enabled (default): The operator can select the order creation mode.</td>
</tr>
<tr>
<td></td>
<td>• disabled: The operator is not authorized to select the order creation mode.</td>
</tr>
<tr>
<td><strong>OrderCreationModePreselection</strong></td>
<td>Options:</td>
</tr>
<tr>
<td></td>
<td>• Created (all batches are created)</td>
</tr>
<tr>
<td></td>
<td>• Released (all batches are created and released)</td>
</tr>
<tr>
<td></td>
<td>• FirstStarted (all batches are created, released and the first batch started)</td>
</tr>
<tr>
<td></td>
<td>• AllStarted (all batches are created, released and started) (default)</td>
</tr>
<tr>
<td></td>
<td>• FirstStartedAtTime (all batches are created, released and the first batch started in a time-controlled manner)</td>
</tr>
<tr>
<td></td>
<td>• AllStartedAtTime (all batches are created, released and started in a time-controlled manner)</td>
</tr>
<tr>
<td></td>
<td>• StartedChained (all batches are created, released and started in a chain)</td>
</tr>
<tr>
<td></td>
<td>Can be set in Graphics Designer or in script.</td>
</tr>
<tr>
<td><strong>OrderStartTimeOperation</strong></td>
<td>Options:</td>
</tr>
<tr>
<td></td>
<td>• enabled (default): The operator can select the start time of the order.</td>
</tr>
<tr>
<td></td>
<td>• disabled: The operator is not authorized to select the start time of the order.</td>
</tr>
<tr>
<td><strong>OrderStartTimePreselection</strong></td>
<td>Start time of the order (the first batch of the order)</td>
</tr>
<tr>
<td></td>
<td>Can be set using script.</td>
</tr>
</tbody>
</table>

Note:
• If BatchLimitsOperation is enabled, the recipe limits are checked against the Min and MaxSizePreselection setting of the Order Creation dialog when a recipe is selected for the first time. When a new recipe is selected, the recipe limits are checked against the entries in the Order Creation dialog.
• If BatchLimitsOperation is disabled, the recipe limits are checked against the Min and MaxSizePreselection setting of the Order Creation dialog each time a recipe is selected.
### 3.2 Configuration of the “Order Creation” dialog

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BatchesWaitingTimeOperation</strong></td>
<td>Options:&lt;br&gt;● enabled (default):&lt;br&gt;  The operator can select the waiting time of the batch.&lt;br&gt;● disabled:&lt;br&gt;  The operator is not authorized to select the waiting time of the batch.</td>
</tr>
<tr>
<td><strong>BatchesWaitingTimePreselection</strong></td>
<td>Waiting time after which the next batch is started.&lt;br&gt;Can be set in Graphics Designer or in script.</td>
</tr>
<tr>
<td><strong>BatchListNameOperation</strong></td>
<td>Options:&lt;br&gt;● enabled (default):&lt;br&gt;  The operator can overwrite the individual batch names.&lt;br&gt;● disabled:&lt;br&gt;  The operator is not authorized to overwrite the individual batch names.</td>
</tr>
<tr>
<td><strong>BatchListSizeOperation</strong></td>
<td>Options:&lt;br&gt;● enabled (default):&lt;br&gt;  The operator can overwrite the individual batch sizes.&lt;br&gt;● disabled:&lt;br&gt;  The operator is not authorized to overwrite the individual batch sizes.</td>
</tr>
<tr>
<td><strong>BatchListCreationModeOperation</strong></td>
<td>Options:&lt;br&gt;● enabled (default):&lt;br&gt;  The operator can overwrite the individual creation modes.&lt;br&gt;● disabled:&lt;br&gt;  The operator is not authorized to overwrite the individual batch creation modes.</td>
</tr>
<tr>
<td><strong>BatchListStartTimeOperation</strong></td>
<td>Options:&lt;br&gt;● enabled (default):&lt;br&gt;  The operator can overwrite the individual batch start times.&lt;br&gt;● disabled:&lt;br&gt;  The operator is not authorized to overwrite the individual batch start times.</td>
</tr>
<tr>
<td><strong>BatchListCustomColumn1Type</strong></td>
<td>Type of the first user-defined column in the batch list&lt;br&gt;Options:&lt;br&gt;● none (default): No user-defined column is displayed.&lt;br&gt;● Integer: One column with numerical content is displayed.&lt;br&gt;● Real: One column with floating-point content is displayed.&lt;br&gt;● String: One column with text content is displayed.&lt;br&gt;● Enumeration: One column with a combined box as content is displayed.&lt;br&gt;  → Not supported at present</td>
</tr>
<tr>
<td><strong>BatchListCustomColumn1Caption</strong></td>
<td>Valid when BatchListCustomColumn1Type is not &quot;none&quot;&lt;br&gt;Heading of column, if visible (default: Custom1)</td>
</tr>
<tr>
<td><strong>BatchListCustomColumn1Operation</strong></td>
<td>Options:&lt;br&gt;● enabled (default):&lt;br&gt;  The operator can change the values in the user-defined column.&lt;br&gt;● disabled:&lt;br&gt;  The operator is not authorized to change the values in the user-defined column.</td>
</tr>
<tr>
<td><strong>BatchListCustomColumn1Min</strong></td>
<td>Valid when BatchListCustomColumn1Type = Integer or Real&lt;br&gt;Minimum input value for the user-defined column (default: 0)</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>BatchListCustomColumn1Max</td>
<td>Valid when BatchListCustomColumn1Type = Integer or Real Maximum input value for the user-defined column (default: 0)</td>
</tr>
<tr>
<td>BatchListCustomColumn1MaxChar</td>
<td>Valid when BatchListCustomColumn1Type = String Maximum number of characters for entry in the user-defined column (default: 0)</td>
</tr>
<tr>
<td>BatchListCustomColumn1Enumeration</td>
<td>→ Not supported at present List of alternatives separated by</td>
</tr>
<tr>
<td>BatchListCustomColumn2Type</td>
<td>Type of the second user-defined column in the batch list Options: • none (default): No user-defined column is displayed.</td>
</tr>
<tr>
<td></td>
<td>• Integer: One column with numerical content is displayed.</td>
</tr>
<tr>
<td></td>
<td>• Real: One column with floating-point content is displayed.</td>
</tr>
<tr>
<td></td>
<td>• String: One column with text content is displayed.</td>
</tr>
<tr>
<td></td>
<td>• Enumeration: One column with a combined box as content is displayed.</td>
</tr>
<tr>
<td></td>
<td>→ Not supported at present</td>
</tr>
<tr>
<td>BatchListCustomColumn2Caption</td>
<td>Valid when BatchListCustomColumn2Type is not &quot;none&quot; Heading of column, if visible (default: Custom2)</td>
</tr>
<tr>
<td>BatchListCustomColumn2Operation</td>
<td>Options: • enabled (default): The operator can change the values in the use-defined column.</td>
</tr>
<tr>
<td></td>
<td>• disabled: The operator is not authorized to change the values in the user-defined column.</td>
</tr>
<tr>
<td>BatchListCustomColumn2Min</td>
<td>Valid when BatchListCustomColumn2Type = Integer or Real Minimum input value for the user-defined column (default: 0)</td>
</tr>
<tr>
<td>BatchListCustomColumn2Max</td>
<td>Valid when BatchListCustomColumn2Type = Integer or Real Maximum input value for the user-defined column (default: 0)</td>
</tr>
<tr>
<td>BatchListCustomColumn2MaxChar</td>
<td>Valid when BatchListCustomColumn2Type = String Maximum number of characters for entry in the user-defined column (default: 0)</td>
</tr>
<tr>
<td>BatchListCustomColumn2Enumeration</td>
<td>→ Not supported at present List of alternatives separated by</td>
</tr>
</tbody>
</table>
3.3 Runtime interface to SIMATIC BATCH

With the Runtime interface to SIMATIC BATCH you can do the following in APF:

- Create orders and batches
- Release and start batches
- Set batch header parameters: order and batch names, recipes or formula for the batch, batch size, batch start mode and start time
- Allocate units
- Set batch parameters: process values, input and output materials

**Note**

A Batch ID cannot be transferred.

---

Opening the Runtime interface to SIMATIC BATCH

You can open the Runtime interface to SIMATIC BATCH with the Global Script Template FB_BMBatchCreation.tpl under <...SIEMENS\WINCC\bin\Engineering\tool\Konfig\PAS>. You need to copy the template to the <OSProject>\<SERVERNAME>\PAS directory to use this functionality in the PCS 7 OS project. Then change the extension from .tpl to .pas. To use the script in a specific project, you need to adapt it in the Global Script editor. The script includes sections with the comment "//TODO" for this purpose.

To activate the script, you need to add a cyclic trigger (for example, 10 or 20 seconds cycle time). We recommend you also add all employed tags as tag triggers.

The Global Script consists of two sections. In the first section, an action is prepared and triggered in SIMATIC BATCH. Because these actions are mostly asynchronous, the return values must be determined and checked in a later call of the Global Script; this is the job of the second part of the script.

**Note**

**Use the SIMATIC BATCH OS Controls**

The main applications for this Global Script are automatic background actions without user interaction, for example, based on trigger events from the production process. We recommend you use of SIMATIC BATCH OS Controls for user operations of SIMATIC BATCH in the context of PCS 7 OS.

---

**NOTICE**

*This script cannot run without adaptation.*

The project engineer / customer has to make these adaptations. This script cannot be used without adaptations.
3.3 Runtime interface to SIMATIC BATCH

Global Script flow diagram
3.3 Runtime interface to SIMATIC BATCH

Advanced Process Functions SIMATIC BATCH Integration
Function Manual, 07/2016, A5E38719543-AA
User-defined APF functions

The Global Script uses three "User-defined APF functions":

- **FB_Batch_GetOrderCatName():** Determine the name of the order category (can be adapted by the user, returns "Order Category" as default).
- **FB_Batch_GetOrderName():** Determine the name of the order (can be adapted by the user, returns "Order" as default).
- **FB_Batch_GetBatchName():** Determine the name of the batch (can be adapted by the user, returns "Batch_YYYYMMDD_hhmmss" as default).

These scripts are available under <Projectfunctions>\apf fb ua_user_specific. You can adapt the scripts with the Global Script editor.

Reference

Additional information on the topic Performance data of the SIMATIC BATCH interface (for example, creating, releasing, starting batches) is available in the SIMATIC BATCH Manual, section 3.7.

Sections of the Global Script template with TODO

```plaintext
// TODO insert condition for Batch Creation
...
// TODO: Set Command type
// Choose one of the following commands:
// BMS_SBIF_BATCH_COMMAND_CREATE = 1,  // Create the batch only
// BMS_SBIF_BATCH_COMMAND_RELEASE= 2,  // Create and release
// the batch
// BMS_SBIF_BATCH_COMMAND_START = 3  // Create, release and
// start according start mode
...
// TODO: If Command is set to BMS_SBIF_BATCH_COMMAND_START then set
// start modes
// Choose one of the following start modes:
// BMS_SBIF_BATCH_STARTMODE_MANUAL = 0,  // The batch will be
// started by the operator
// BMS_SBIF_BATCH_STARTMODE_INSTANT= 1,  // The batch will be
// started immediately
// BMS_SBIF BATCH_STARTMODE_TIME_ABS= 2,  // The batch will be
// started at a given time
// BMS_SBIF BATCH_STARTMODE_TIME_REL= 3   // The batch will be
// started after a given waiting time
...
// TODO: If start mode is set to BMS_SBIF BATCH_STARTMODE_TIME_ABS
// then set the start time
// Set the absolute start time based on local time
...
// TODO: If start mode is set to BMS_SBIF BATCH_STARTMODE_TIME_REL
// then set the waiting time
// Set the waiting duration in days, hours, minutes and seconds
```
// TODO: Set Recipe Name and Version
...
// TODO: Set Batch Size
...
// TODO: Use parameter by setting the name
...
// TODO: If parameter name is set then set parameter type:
// BMS_SBIF_PARAMETER_TYPE_INT=0:              //Set integer value
// at BatchData.Parameters[iParameterIndex].iValue
// BMS_SBIF_PARAMETER_TYPE_DOUBLE=1:           //Set real value at
// BatchData.Parameters[iParameterIndex].dblValue
// BMS_SBIF_PARAMETER_TYPE_STRING=2:           //Set string at
// BatchData.Parameters[iParameterIndex].szValue
// BMS_SBIF_PARAMETER_TYPE_INPUT_MATERIAL=3:   //Set amount at
// BatchData.Parameters[iParameterIndex].dblValue and material name at
// BatchData.Parameters[iParameterIndex].szMaterial
// BMS_SBIF_PARAMETER_TYPE_OUTPUT_MATERIAL= 4: //Set amount at
// BatchData.Parameters[iParameterIndex].dblValue and material name at
// BatchData.Parameters[iParameterIndex].szMaterial
...
// TODO: Set parameter value depending on type
...
// TODO: Use allocation by setting the RUP name
...
// TODO: If RUP Name is set then set unit name
...
// TODO: Reset trigger
...

3.3 Runtime interface to SIMATIC BATCH
Amendment to the Operating Manual

Please read the "Material Management" section in the "Advanced Process Functions Operating Manual" before you read this section. The following only describes relevant changes that result when you use APF together with SIMATIC BATCH.
4.1 Material management

Overview

- A material in APF as well as SIMATIC BATCH (in SIMATIC BATCH: a material) is identified by 2 unique codes: <Material Name> and <Material ID>. These two codes are then identical in both systems.
- If you are using APF together with SIMATIC BATCH, APF becomes the material master. You may only generate, edit and delete materials using APF material management and not SIMATIC BATCH.
- The data is transferred to SIMATIC BATCH as described below. Only a subset of the APF material model is represented in SIMATIC BATCH.
- The use of materials in SIMATIC BATCH (in recipes, batches, phases, SFCs, etc.) is not influenced by APF. You can continue working with it as usual.

Representation of APF materials in SIMATIC BATCH

- The material is represented with its class, type, name, ID and description in SIMATIC BATCH.
- The material name in SIMATIC BATCH corresponds to the material name in APF.
- The material code in SIMATIC BATCH corresponds to the material ID in APF.
- The material description in SIMATIC BATCH corresponds to <description> in APF.
- Because the material description is language-neutral in SIMATIC BATCH, the names of the class and the type are transferred in the APF standard language.
- The materials transferred to SIMATIC BATCH are defined there as "input material" as well as "output material".
- Class-specific attributes are not transferred to SIMATIC BATCH.

Synchronizing material data

This function lets you transfer APF materials to SIMATIC BATCH in form of a group transfer as well as an individual transfer.

When the check box "Use SIMATIC BATCH" is selected in the Engineering tool, a new button "synchronize material data" is displayed in the APF material management dialog. Once the Batch PCell is connected to the runtime, this button is released (this can take a few seconds during the first initialization).

In order to transfer the materials to SIMATIC BATCH, click on the button "synchronize material data" / "Materialdaten synchronizieren". The materials in the SIMATIC-BATCH structure tree will then be filed under Material class name\Type name\Material name.
The transfer of materials depends on the selection of the material class, type and material:

- If no class is selected, all materials of all classes are transferred.
- If a class is selected, all materials of this class are transferred.
- If a class and a type is selected, all materials of this class of this type are transferred.
- If an individual material is selected, this material is transferred.

The following message is displayed during the material transfer:

- English: "Please wait while synchronizing materials…"
- German: "Bitte warten während Materialien synchronisiert werden…"

You will be notified if a material cannot be transferred to SIMATIC BATCH:

- English: "Unable to transfer materials to SIMATIC BATCH!"
- German: "Materialien konnten nicht nach SIMATIC BATCH übertragen werden!"

Example: Another material with different code but identical name already exists in SIMATIC BATCH.

Creating material

You can use this function to create and save an individual material in APF and SIMATIC BATCH.

When the check box "Use SIMATIC BATCH" is selected in the Engineering Tool, the selected material is saved in APF and transferred to SIMATIC BATCH by pressing the "Save" button in the APF material management dialog.

Deleting material

You can use this function to delete an individual material in APF as well as SIMATIC BATCH.

Before a material is deleted in APF, there is a check to see if it can also be deleted in SIMATIC BATCH. If this is not the case, the material cannot be deleted from APF or SIMATIC BATCH.

Example: A material is still being used in a recipe in SIMATIC BATCH.

The operator is notified when a material is deleted:

- English: "Please wait while deleting materials…"
- German: "Bitte warten während das Material gelöscht wird…"

The operator is notified if a material cannot be transferred to SIMATIC BATCH:

- English: "Unable to transfer materials to SIMATIC BATCH!"
- German: "Materialien konnten nicht nach SIMATIC BATCH übertragen werden!"

The following message is displayed while the material is being deleted:

- English: "Please wait while deleting materials…"
- German: "Bitte warten während das Material gelöscht wird…"
If a material cannot be deleted in SIMATIC BATCH, the following message is displayed:

- English: "Unable to delete material in SIMATIC BATCH! Deleting not possible"
- German: "Material konnte in SIMATIC BATCH nicht gelöscht werden! Löschen nicht möglich"

**Other**

Any modification of a material in APF is logged with date / time, user = "APF", action, etc. in SIMATIC BATCH (see Audit Trail / Log in SIMATIC BATCH material dialog).
"Order Creation" dialog
The "Order Creation" dialog provides you with the following functions:
- The acquisition of order data
- The acquisition of batch data
- Transferring the data to SIMATIC BATCH

In the engineering phase, the dialog can be tailored specifically to the user in many different ways. Dependent on this, some input fields can be used in various ways.

For example:
The first field of the interface can either be called "Recipe" or "Formula Category". For this reason, the following description will only be given as an example.

The possible parametrization can be found in the chapter "Amendments to the Engineering Manual" under "Configuration of the "Order Creation" dialog".

Note
This dialog is used exclusively for entering data for new orders / batches. It is not possible to manage orders / batches that already exist.

Layout of the user interface
The following figure shows an example of the operator interface of the dialog:
The operator interface is divided into the following areas:

- Top left and top center: Details about the order
- Top right: Details about the batch
- Center area: List of the batches calculated in the dialog
- Low range: Round button "Create order" - Transfer to SIMATIC BATCH

The acquisition of order data

The order data include the following, amongst others:

- Formula category
- Recipe / formula selection combined box
- Recipe quantity text box
- Order category
- Order name (The combination of order category + order name cannot already exist in SIMATIC BATCH)
- Order quantity
- Split mode (order split mode)
  More information on the calculation principles for this mode can be found in Amendment to the Function Manual under Split Mode formulas.

The acquisition/calculation of batch data

Depending on the configuration and the order split mode, the batch data are calculated automatically.

- Minimum batch size
- Maximum batch size
- Number of batches
- Batch size
- Remaining quantity
• Creation mode (order creation mode) specifies the types of generation and/or start of batches.

• Batch list with following columns:
  – Symbol of creation mode
  – Sequential number
  – Batch name
  – Batch size
  – UOM (unit of measurement)
  – Creation mode
  – Start time
  – 2 additional columns can be configured specific to the user

Total line at the end of the list

**Note**
In the case of manual input in the batch list, you can only exit the field after a correct input.

**Transferring the data to SIMATIC BATCH**

**Note**
Check the data displayed on the operator interface!

Data transfers cannot be undone. You can still make later changes directly in SIMATIC BATCH.

Click on the "Create order" button in the lower area of the dialog. The recorded data will now be transferred to SIMATIC BATCH. The order and the batches will be created here.
Amendment to the Operating Manual

4.2 "Order Creation" dialog
5.1 "Order Creation" interface

If you want to access the user-specific scripts on this dialog, WinCC-Dialog provides the following properties and events:

Properties

- **PCellName (In)**
  - Name of the PCell to connect to
- **FormulaCategory (Out)**
  - Name of the formula category which is selected/calculated.
- **Recipe (Out)**
  - Name and Version of the formula or recipe which is selected.
- **RecipeName (Out)**
  - Name of the formula or recipe which is selected.
- **RecipeVersion (Out)**
  - Version of the formula or recipe which is selected.
- **ProductName (Out)**
  - Name or the product which is associated with the selected Recipe
  - Will be updated if Recipe has changed
- **ProductCode (Out)**
  - Code or the product which is associated with the selected Recipe
  - Will be updated if Recipe has changed
- **MinRecipeSize (Out)**
  - Minimum amount of selected recipe
  - Will be updated if Recipe has changed
- **MaxRecipeSize (Out)**
  - Maximum amount of selected recipe
  - Will be updated if Recipe has changed
- **UOM (Out)**
  - Unit of measurement which is associated with the selected recipe
  - Will be updated if Recipe has changed
• OrderCategory (Out)
  – Name of the order category which is selected.

• OrderName (Out)
  – Name of the order which is to be created.

• OrderNameAvailable (Out)
  – Indicates whether the selected order name already exists in SIMATIC BATCH or not.

• OrderDescription (Out)
  – Description of the order which is to be created.

• OrderSize (Out)
  – Selected amount of the order

• OrderSplitMode (Out)
  – Selected order split mode

• MinBatchSize (Out)
  – Selected minimum batch size

• MaxBatchSize (Out)
  – Selected maximum batch size

• NumberOfBatches (Out)
  – Selected number of batches

• BatchesSize (Out)
  – Selected size of batches

• RemainingBatchSize (Out)
  – Selected size of the remaining batch

• OrderCreationMode (Out)
  – Selected order Creation Mode

• OrderStartTime (Out)
  – Selected Order Start Time

• BatchesWaitingTime (Out)
  – Selected Batches Waiting time

• SelectedBatch (In)
  – Sets the index in the batch list for getting or setting batch data with subsequent
    "SelectedBatch ..." properties.

Note
This is independent from operator selection!

– Restricted to 1 to Number of batches
– Defaulted to 1
• SelectedBatchName (In/Out)
  – Name of the selected batch
• SelectedBatchSize (In/Out)
  – Size of the selected batch
• SelectedBatchCreationMode (In/Out)
  – Creation mode of the selected batch
• SelectedBatchStartTime (In/Out)
  – Start time of the selected batch
• SelectedBatchCustomColumn1Value (In/Out)
  – Value of the 1st Custom Column of the selected batch formatted as string
• SelectedBatchCustomColumn1Enumeration (In/Out)
  – Valid if BatchListCustomColumn1Type = Enum
  – |-Separated list of alternatives which are selectable within the custom column combo box of the selected batch
• SelectedBatchCustomColumn2Value (In/Out)
  – Value of the 2nd Custom Column of the selected batch formatted as string
• SelectedBatchCustomColumn2Enumeration (In/Out)
  – Valid if BatchListCustomColumn2Type = Enum
  – |-Separated list of alternatives which are selectable within the custom column combo box of the selected batch

Events

• FormulaCategoryChanged
  – Raised if the FormulaCategory has changed
  – Includes the new formula category name
• RecipeChanged
  – Raised if the RecipeName or RecipeVersion have changed
  – Includes the new recipe or formula name, version, product name, product code, min and max amount and unit of measurement
• OrderCategoryChanged
  – Raised if the OrderCategory has changed
  – Includes the new order category name
• OrderNameChanged
  – Raised if the OrderName has been changed
  – Includes the new order name and the availability of the order name
• OrderDescriptionChanged
  – Raised if the SelectedOrderComment has been changed
  – Includes the new order comment

• OrderSizeChanged
  – Raised if the OrderSize has been changed
  – Includes the new order size

• OrderSplitModeChanged
  – Raised if the OrderSplitMode has changed
  – Includes the new split mode

• BatchLimitsChanged
  – Raised if the MinBatchSize or MaxBatchSize have changed
  – Includes the minimum and maximum batch size.

• BatchesChanged
  – Raised if NumberOfBatches, BatchesSize or RemainingBatchSize has changed
  – Includes the new size and number of batches and the remaining size of batches

• OrderCreationModeChanged
  – Raised if SelectedOrderCreationMode, OrderStartTime or BatchesWaitingTime have changed
  – Includes the new creation mode, order start time and waiting time for the following batch

• BatchNameChanged
  – Raised if a batch name has changed
  – Includes index and new name of the batch

• BatchSizeChanged
  – Raised if the size of a batch has changed
  – Includes index and new size of the batch

• BatchCreationModeChanged
  – Raised if the creation mode or start time of a batch have changed
  – Includes index, new creation mode and start time of the batch

• BatchCustomValue1Changed
  – Raised if the value within the first custom column of a batch has changed
  – Includes new custom value 1 of the batch

• BatchCustomEnum1Changed
  – Raised if the selected value within the first custom column of a batch has changed
  – Includes index and new custom value 1 of the batch
• BatchCustomValue2Changed
  – Raised if the value within the second custom column of a batch has changed
  – Includes index and new custom value 2 of the batch

• BatchCustomEnum2Changed
  – Raised if the selected value within the second custom column of a batch has changed
  – Includes index and new custom value 2 of the batch
5.2 Formula Split Mode

Evenly

Split the order amount in batches of equal size.

From SB:
Configuration/Operator Input:
Constraint:

\[
Q_{\text{RecipeMin}} \leq Q_{\text{BatchMin}} \leq Q_{\text{BatchMax}} \leq Q_{\text{RecipeMax}}
\]

Input Option a
Operator Input:
Constraint
Calculate
Number of Batches
Batch Size
Actual Production

\[
Q_{\text{Order}} \leq Q_{\text{Order}} \leq 100 \times Q_{\text{BatchMax}}
\]

\[
N = \frac{Q_{\text{Order}}}{Q_{\text{Batch}}} \quad \text{(rounded up)}
\]

\[
Q_{\text{Batch}} = \max (Q_{\text{Order}} / N, Q_{\text{BatchMin}})
\]

\[
Q_{\text{Prod}} = N \times Q_{\text{Batch}}
\]

Input Option b
Operator Input:
Constraint
Calculate
Batch Size
Actual Production

\[
1 \leq N \leq 100
\]

\[
Q_{\text{Batch}} = \min (\max (Q_{\text{Order}} / N, Q_{\text{BatchMin}}), Q_{\text{BatchMax}})
\]

\[
Q_{\text{Prod}} = N \times Q_{\text{Batch}}
\]

Input Option c
Operator Input:
Constraint
Calculate

\[
1 \leq N \leq 100
\]

\[
Q_{\text{Order}}
\]
Order Size  
Q
Order = N * Q
Batch

Actual Production  
Q
Prod = Q
Order

MaxSizeWithRemain

Split the order amount in batches of maximum size plus one batch with the remaining amount.

From SB:
Q
RecipeMin ≤ Q
RecipeMax

Configuration/Operator Input:
Q
BatchMin ≤ Q
BatchMax

Constraint:
Q
RecipeMin ≤ Q
BatchMin ≤ Q
BatchMax ≤ Q
RecipeMax

Input Option a

Operator Input:
Q
Order

Constraint
Q
BatchMin ≤ Q
Order ≤ 100 * Q
BatchMax

Batch Size
Q
Batch = Q
BatchMax

Calculate
N, Q
BatchRemain, Q
BeforeLast

Number of Batches
N = Q
Order / Q
Batch (rounded down)

Remaining Batch
Q
BatchRemain = Q
Order - N * Q
BatchMax

Before last Batch
if Q
BatchRemain < Q
BatchMin then
Q
BeforeLast = Q
Batch - Q
BatchMin + Q
BatchRemain
Q
BatchRemain = Q
BatchMin
else
Q
BeforeLast = Q
Batch

Actual Production
Q
Prod = Q
Order

Input Option b

Operator Input:
Q
Order, Q
Batch

Constraint
Q
BatchMin ≤ Q
Batch ≤ Q
BatchMax
Q
BatchMin ≤ Q
Order ≤ 100 * Q
BatchMax

Calculate
N, Q
BatchRemain

Number of Batches
N = Q
Order / Q
Batch (rounded down)
5.2 Formula Split Mode

Remaining Batch
Q_{BatchRemain} = \max(Q_{Order} - N \cdot Q_{Batch}, Q_{BatchMin})

Actual Production
Q_{Prod} = N \cdot Q_{Batch} + Q_{BatchRemain}

Input Option c
Operator Input:
N, Q_{Batch}, Q_{BatchRemain}

Constraint
Q_{BatchMin} \leq Q_{Batch} \leq Q_{BatchMax}
Q_{BatchMin} \leq Q_{BatchRemain} \leq Q_{BatchMax}
1 \leq N \leq 100

Calculate
Order Size
Q_{Order} = N \cdot Q_{Batch} + Q_{BatchRemain}

Actual Production
Q_{Prod} = Q_{Order}

MaxSizeWithOverProd

Split the order amount in batches of same size and allow overproduction.

From SB:
Q_{RecipeMin}, Q_{RecipeMax}
Q_{BatchMin}, Q_{BatchMax}

Configuration/Operator Input:
Constraint:
Q_{RecipeMin} \leq Q_{BatchMin} \leq Q_{BatchMax} \leq Q_{RecipeMax}
Q_{Order} \geq Q_{RecipeMin}

Input Option a
Operator Input:
Q_{Order}, Q_{Batch}

Constraint
Q_{BatchMin} \leq Q_{Order} \leq 100 \cdot Q_{BatchMax}
Q_{Batch} = Q_{BatchMax}

Calculate
Number of Batches
N = Q_{Order} / Q_{BatchMax} (rounded up)

Actual Production
Q_{Prod} = Q_{BatchMax} \cdot N

Input Option b
Operator Input:
Q_{Order}, Q_{Batch}
Constraint

\[ Q_{\text{BatchMin}} \leq Q_{\text{Batch}} \leq Q_{\text{BatchMax}} \]
\[ Q_{\text{BatchMin}} \leq Q_{\text{Order}} \leq 100 \times Q_{\text{BatchMax}} \]

Calculate

\[ N = \frac{Q_{\text{Order}}}{Q_{\text{Batch}}} \text{ (rounded up)} \]

Actual Production

\[ Q_{\text{Prod}} = Q_{\text{Batch}} \times N \]

MaxSizeWithUnderProd

Split the order amount in Batches of same size and allow underproduction.

From SB:

Configuration/Operator Input:

Constraint:

\[ Q_{\text{RecipeMin}} \leq Q_{\text{BatchMin}} \leq Q_{\text{BatchMax}} \leq Q_{\text{RecipeMax}} \]

Input Option a

Operator Input:

\[ Q_{\text{Order}} \]

Constraint

\[ Q_{\text{BatchMin}} \leq Q_{\text{Batch}} \leq Q_{\text{BatchMax}} \]
\[ Q_{\text{BatchMin}} \leq Q_{\text{Order}} \leq 100 \times Q_{\text{BatchMax}} \]

Calculate

\[ N = \left\lfloor \frac{Q_{\text{Order}}}{Q_{\text{Batch}}} \right\rfloor \]

Number of Batches

\[ N = \frac{Q_{\text{Order}}}{Q_{\text{Batch}}} \text{ (rounded down)} \]

Actual Production

\[ Q_{\text{Prod}} = Q_{\text{Batch}} \times N \]

*1) In case \( Q_{\text{Order}} < Q_{\text{BatchMax}} \to one \text{ Batch with } Q_{\text{BatchMax}} \text{ will be added to the batch list.}*

*2) In case \( Q_{\text{Order}} < Q_{\text{Batch}} \to one \text{ Batch with } Q_{\text{Batch}} \text{ will be added to the batch list.}
Amendment to the Function Manual

5.2 Formula Split Mode