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Process Control System PCS 7 Advanced Process Functions Engineering Manual

System Manual

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07/2016

A5E38719921-AA

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Siemens AG
Division Process Industries and Drives
Postfach 48 48
90026 NÜRNBERG
GERMANY

A5E38719921-AA
℗ 08/2016 Subject to change

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Preface

Purpose of the manual

This document supports you in performing engineering with the Advanced Process Functions (APF) software in the SIMATIC PCS 7 environment.

For information on installing and commissioning, refer to the manual "Advanced Process Functions (APF) Installation and Configuration".

Core content

The following core issues are covered in this document:

- How is AS-OS communication configured?
- How is the APF engineering tool operated?
- How are the APF modules configured?

Validity

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

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APF Engineering at a glance

2

Introduction

In this manual, you can find information on the possibilities for configuring with APF (Advanced Process Functions).

Configuration steps

APF Engineering involves the following basic steps:

1. Setting up the AS-OS communication
   - Setting up the communication on the AS
     - Setting up an S7 connection
     - Configuring the User Archive Read Manager
     - Configuring the User Archive Write Manager
   - Setting up the communication on the OS
     - Creating tags in WinCC
     - Declaring the WinCC tags in the raw data trigger
     - Adapting the global script actions
2. General settings in the APF engineering tool
3. Configuring the APF components with the APF engineering tool
   - Material management
   - Storage location management
   - Parameter management
   - Archive management

Requirements

The following requirements must be met for configuring with APF:

- SIMATIC PCS 7 has been installed without errors.
- APF has been installed without errors.
- The master data library must be in the same directory as the multiproject.
- All relevant steps from the PCS 7 Basic Engineering have been performed, and the PCS 7 OS has been compiled and downloaded.

- The APF configuration is complete.
- The APF Integrator has been run after completing the APF configuration.

Note

For information on installing and configuring APF, refer to the manual "Advanced Process Functions (APF) Installation and Configuration".

The process pictures may be available in different versions. For example, the material lot editor (.pdl picture) available by default as FB_MAT_LOT_ED (recommended for resolution 1280x1024), is also additionally available as FB_MAT_LOT_ED-1920 optimized for 1920x1080 resolution and an improved form.

In this manual, the process picture name is used without a suffixed number for both versions.

The inserted screen representations correspond to the PDL pictures with a resolution of 1280 and generally also apply for the PDL pictures in higher resolution and improved display.

Configuring AS-OS communication 3

3.1 Setting up an S7 connection

Introduction

An S7 connection must be set up for data exchange between the AS and OS. An important step here is the assignment of the local ID. You need this when assigning the communication block parameters on the AS.

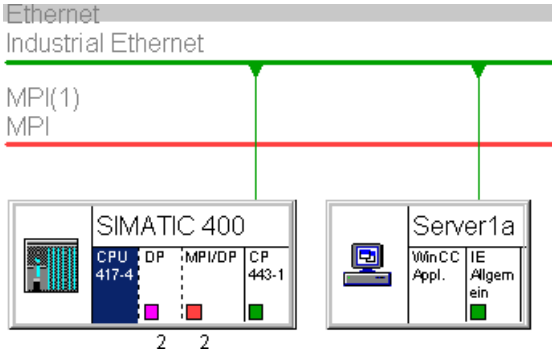
Requirement

- The multiproject configured for APF is open in SIMATIC Manager.
  For information on this, refer to the manual "Advanced Process Functions (APF) Installation and Configuration".

Procedure

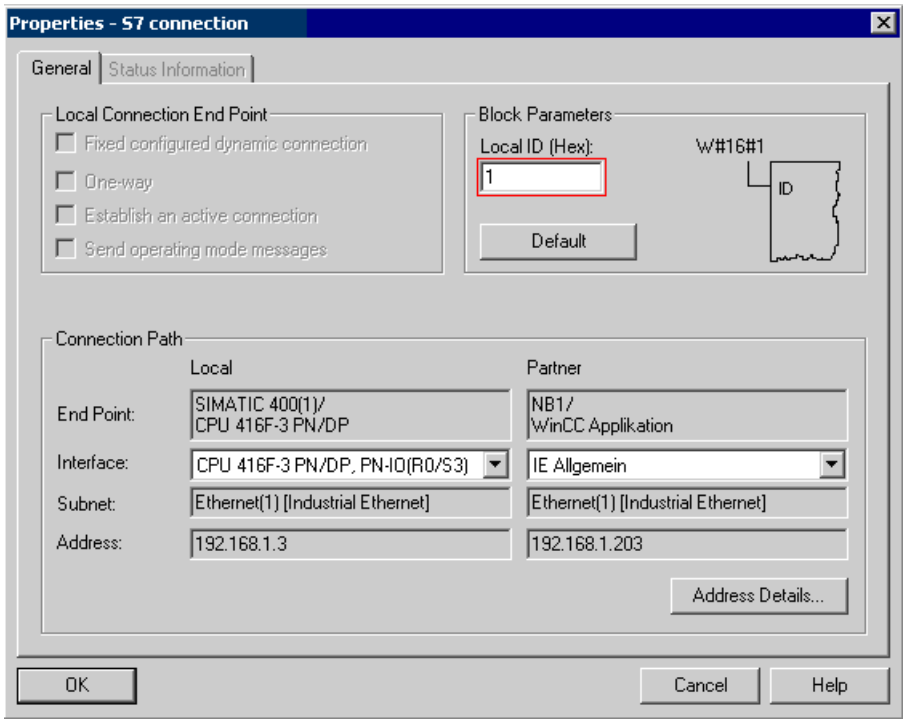
To create an S7 connection, follow these steps:

1. Open the network view (NetPro) in SIMATIC Manager.
2. Select the CPU of the SIMATIC station.
   The connection table is displayed in the lower part of the NetPro window.



3. Insert an S7 connection via the shortcut menu.
4. Activate the "Show properties before inserting" check box.

5. Specify a local ID in the "Properties - S7 Connection" dialog.



Note

The local ID is needed for configuring the communication blocks of the User Archive Read Manager and User Archive Write Manager.

6. Click "OK".
   The connection is created and displayed in the connection table of the NetPro window.
7. If you want to configure a redundant connection to the OS, create a second connection using the same procedure.

3.2 User Archive Read Manager

The User Archive Read Manager consists of the "FB_UA_RM" function block and executes the following functions:

- Reading one or more data records from the OS user archive to a data block on request
- Transferring read data to the requesting block
- Monitoring communication (generation of alarms)

No picture objects are required for the User Archive Read Manager. Execution of the User Archive Read Manager is triggered via the interconnected APF modules.

3.2.1 Function block "FB_UA_RM"

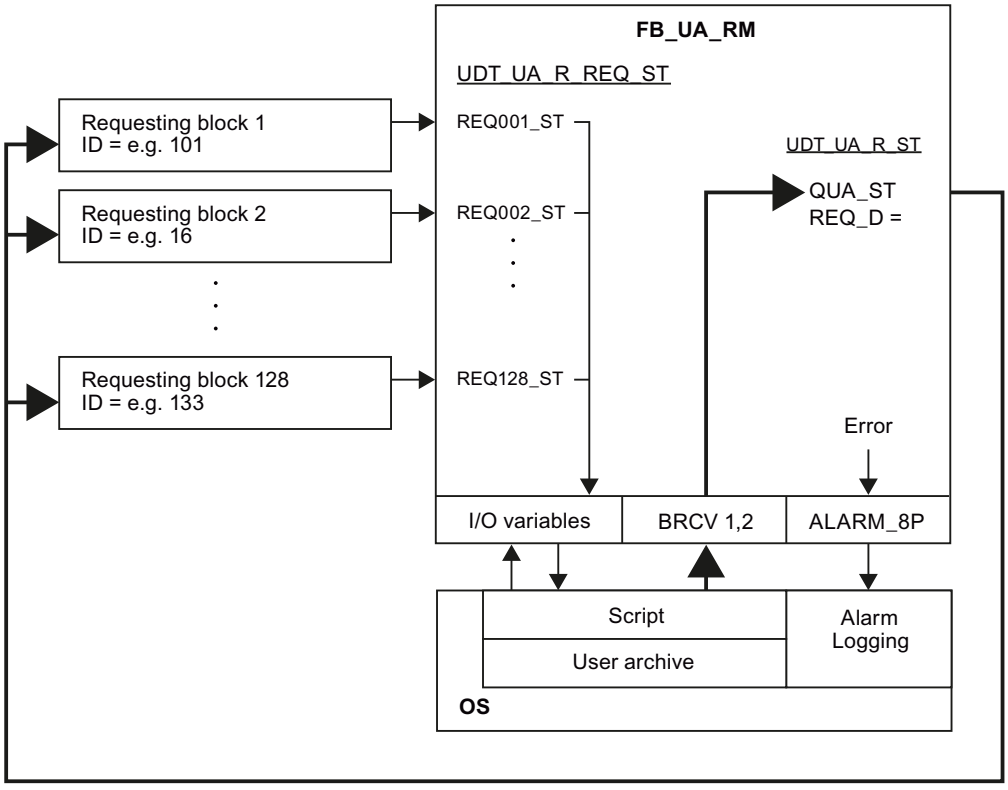
Upon request, the "FB_UA_RM" function block reads data from an OS user archive via the "BRCV" communication block (SFB13). It transfers the read data to the requesting block in the AS.

Communication between the requesting block and the "FB_UA_RM" function block occurs at the AS level using the "UDT_UA_R_REQ_ST" (request) and "UDT_UA_R_ST" (feedback) structures.

The "FB_UA_RM" block can manage a maximum of 128 requests. Each request occupies a separate structure input (UDT_UA_R_REQ_ST). The requesting block transfers its uniquely identifying ID (REQ_ID) to the structure.

The read data are made available at an output structure (UDT_UA_R_ST) and identified with the REQ_ID associated with the job. As a result, the requesting block is able to recognize that the data belong to its read request.

OS tags are used to coordinate the data communication between the AS and OS. Appropriate scripts associated with the function block and its functionalities are triggered for operator control at the OS level.



3.2.2 Configuring the "FB_UA_RM" function block

To configure the "FB_UA_RM" function block, follow these steps:

1. Create a new hierarchy folder in the PH.
2. Create a new CFC in the hierarchy folder, and open it in the CFC Editor.
3. Insert the "FB_UA_RM" function block from the master data library into the CFC.

   Note

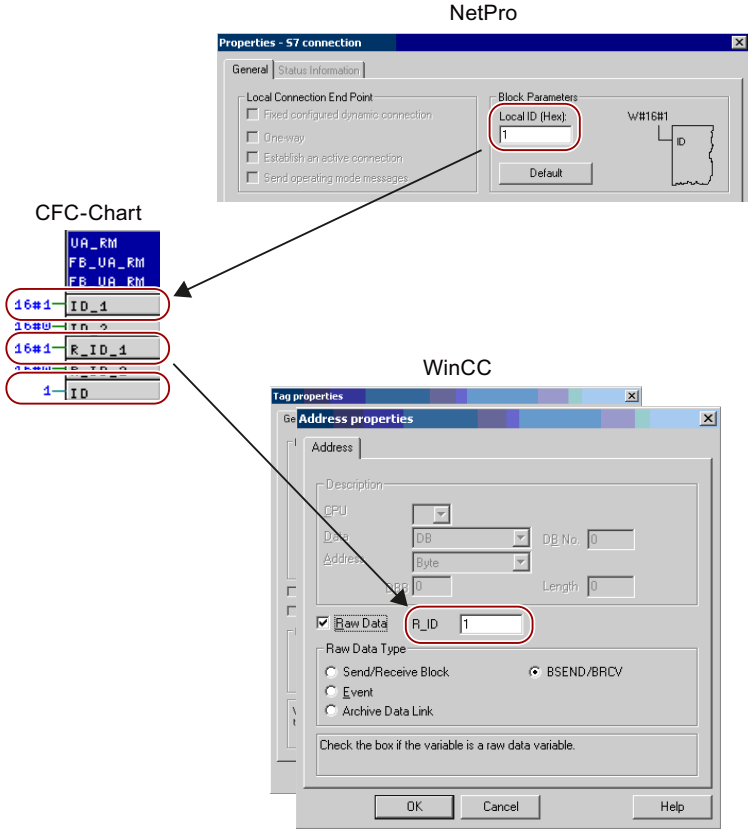
   An "FB_UA_RM" block should run in a faster OB than the requesting blocks.

4. Rename the function block "UA_RM".

   Note

   The name "UA_RM" is specified by the APF system and must not be changed here or in subsequent configuring steps. If you want to use several "FB_UA_RM" function blocks, you must configure them in different CFCs.

5. Configure the inputs and outputs of the function block.
   - For the "ID_1" input, enter the value of the local ID you specified for the configured S7 connection.
   - Enter a unique value for the "R_ID_1" input, and keep track of it. You need this value when configuring the OS tags.
   - At the "ID" input, specify a unique ID for the block. Recommendation: "ID" = "R_ID_1".



   - Configure the other input and output parameters of the function block.

Note

You can find a detailed description of the input and output parameters in the block description of the "FB_UA_RM" function block.

6. Compile the CFCs and download them to the AS.
7. Compile the OS.

Note

if you subsequently change the values for ID_1 / ID_2, you must perform one of the following procedures:

- Perform a complete restart of the CPU (preferred)
- Re-instantiate the affected "FB_UA_RM" blocks in the CFC (= new data block), that means rewire from the old instances, delete the old ones, rename the new ones, then perform an AS delta compile and download and an OS delta compile and download.

Therefore, the definition of ID_1 and ID_2 should be well thought out.

3.3 User Archive Write Manager

The User Archive Write Manager consists of the "FB_UA_WM" function block and executes the following functions:

- Writing one or more data records from an AS data block to an OS user archive on request.
- Monitoring communication (generation of alarms)

No picture objects are required for the User Archive Write Manager. Execution of the User Archive Write Manager is triggered via the interconnected APF modules.

Note

An RM/WM module should run in a OB faster than the requesting blocks.

3.3.1 Function block "FB_UA_WM"

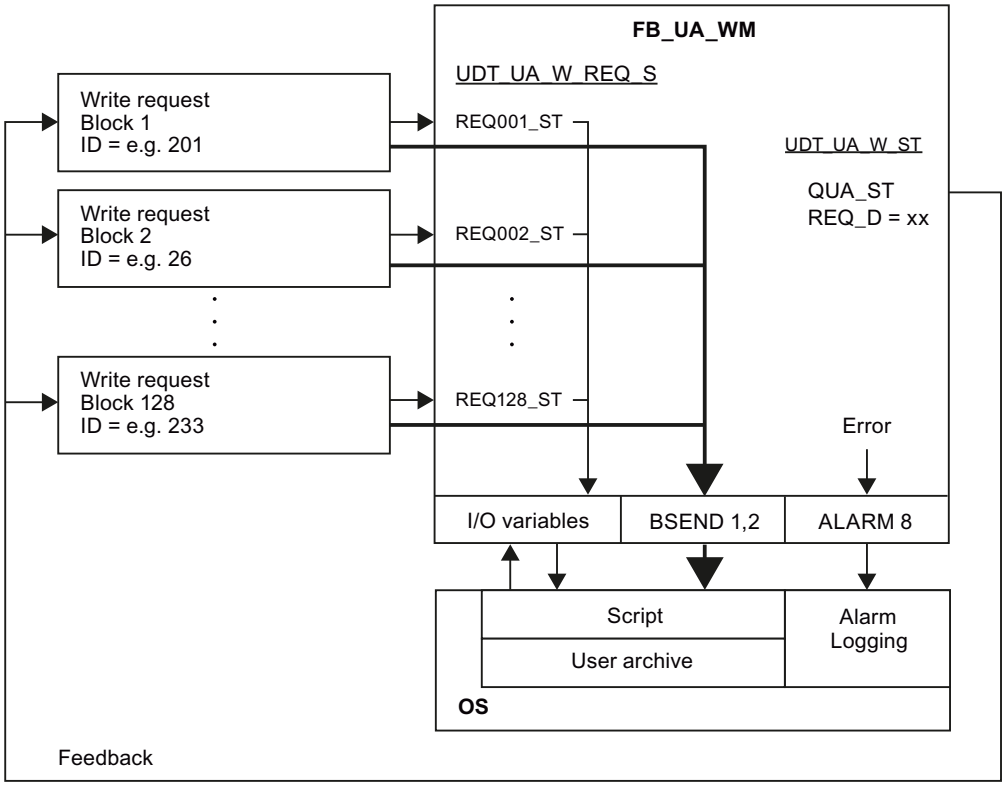
Upon request, the "FB_UA_WM" function block writes data to an OS user archive via the "BSEND" communication block (SFB12).

The data to be written are copied from a requesting block. Communication between the requesting block and the "FB_UA_WM" function block occurs at the AS level using the "UDT_UA_W_REQ_ST" (request) and "UDT_UA_W_ST" (feedback) structures.

The "FB_UA_WM" function block can manage a maximum of 128 requests. Each request occupies a separate structure input (UDT_UA_W_REQ_ST) in the block. The requesting block transfers its uniquely identifying ID (REQ_ID) to the structure.

The feedback in response to a write request is stored in a structure output (UDT_UA_W_ST) and identified with the REQ_ID associated with the job. As a result, the requesting block is able to detect that the feedback data belong to its write request.

OS tags are used to coordinate the data communication between the AS and OS. Appropriate scripts associated with the "FB_UA_WM" function block and its functionalities are triggered for operator control at the OS level.



3.3.2 Configuring the "FB_UA_WM" function block

To configure the "FB_UA_WM" function block, follow these steps:

1. Create a new hierarchy folder in the PH.
2. Create a new CFC in the hierarchy folder, and open it in the CFC Editor.
3. Insert the "FB_UA_WM" function block from the master data library into the CFC.

   Note

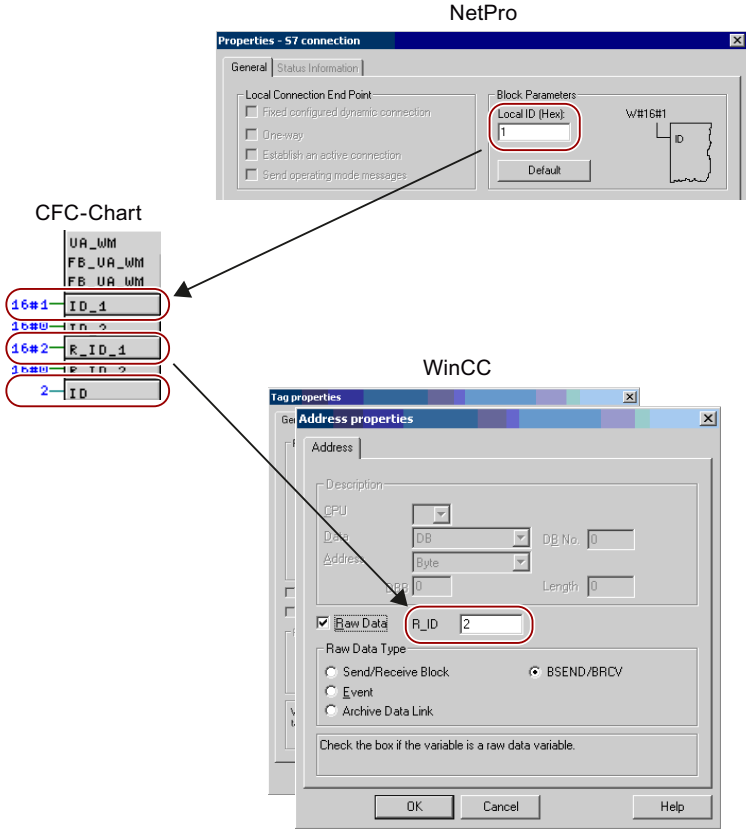
   An "FB_UA_WM" block OB should run in a faster OB than the requesting blocks.

4. Rename the function block "UA_WM".

   Note

   The name "UA_WM" is specified by the APF system and must not be changed here or in subsequent configuring steps. If you want to use several "FB_UA_WM" function blocks, you must configure them in different CFCs.

5. Configure the inputs and outputs of the function block.
   - For the "ID_1" input, enter the value of the local ID you specified for the configured S7 connection.
   - Enter a unique value for the "R_ID_1" input, and keep track of it. You need this value when configuring the OS tags in a later configuring step.
   - At the "ID" input, specify a unique ID for the block. Recommendation: "ID" = "R_ID_1".



   - Configure the other input and output parameters of the function block.

Note

You can find a detailed description of the input and output parameters in the block description of "FB_UA_WM".

6. Compile the CFCs and download them to the AS.
7. Compile the OS.

Note

if you subsequently change the values for ID_1 / ID_2, you must perform one of the following procedures:

- Perform a complete restart of the CPU (preferred)
- Re-instantiate the affected "FB_UA_WM" blocks in the CFC (= new data block), that means rewire from the old instances, delete the old ones, rename the new ones, then perform an AS delta compile and download and an OS delta compile and download.

Therefore, the definition of ID_1 and ID_2 should be well thought out.

3.4 Creating raw data tags in WinCC

Introduction

Tags are created in the WinCC Tag Management to configure a connection to the communication blocks of the User Archive Read Manager (FB_UA_RM) and the User Archive Write Manager (FB_UA_WM).

Each configured "FB_UA_RM" and "FB_UA_WM" block requires one tag.

Requirement

- WinCC Explorer is open.

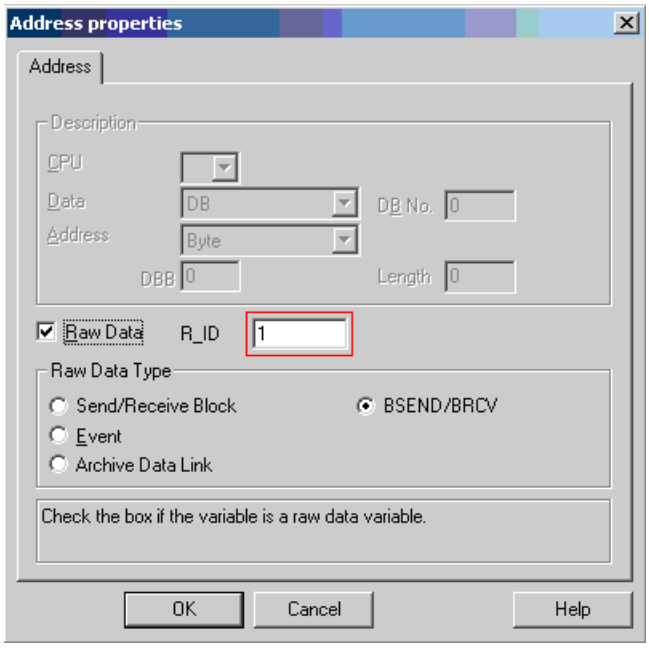
User Archive Read Manager

To create the tags for data exchange with the "FB_UA_RM" block, follow these steps:

1. Open the configured communication connection in the WinCC Explorer Tag Management (you can find it with the S7 program name under "Named Connections"). See section Setting up an S7 connection (Page 13).
2. Enter a new tag at the end of the tag list.
3. Enter the tag name according to the following pattern:
   – *Name of CFC/UA_RM_DATA*

   The "Name of CFC" prefix refers to the name of the CFC in which the "FB_UA_RM" function block is configured and to which a connection must be established.
   The name "UA_RM_DATA" is specified by the APF system and must also not be changed here or in subsequent configuring steps.
   Example:
   If the CFC is called "FB_UA_RM", the tag name is: FB_UA_RM/UA_RM_DATA.
4. In the "data type" column, select the entry "raw data type".
5. Click the "...." button in the "Address" column. The "Address Properties" dialog opens.
6. Select the "Raw data" check box.

7. In the "R_ID" field, enter the value that you have configured for the "R_ID1" input parameter of the associated "FB_UA_RM" function block.



8. Select the "BSEND/BRCV" option.
9. Close the dialog box by clicking "OK".

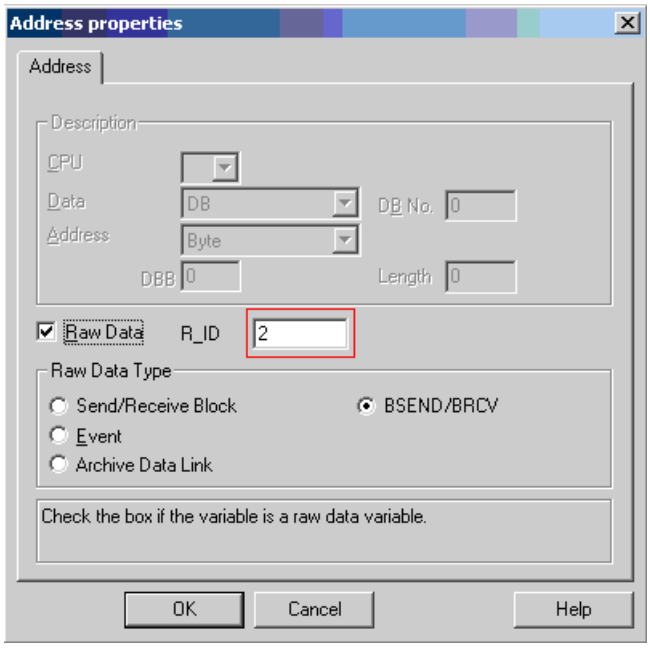
User Archive Write Manager

To create the tags for data exchange with the "FB_UA_WM" block, follow these steps:

1. Open the configured communication connection in the WinCC Explorer Tag Management (you can find it with the S7 program name under "Named Connections"). See section Setting up an S7 connection (Page 13).
2. Enter a new tag at the end of the tag list.
3. Enter the tag name according to the following pattern:
   – *Name of CFC/UA_WM_DATA*

   The "Name of CFC" prefix refers to the name of the CFC in which the "FB_UA_WM" function block is configured and to which a connection must be established.
   The name "UA_WM_DATA" is specified by the APF system and must also not be changed here or in subsequent configuring steps.
   Example:
   If the CFC is called "FB_UA_WM", the tag name is: FB_UA_WM/UA_WM_DATA.
4. In the "data type" column, select the entry "raw data type".
5. Click the "...." button in the "Address" column. The "Address Properties" dialog opens.
6. Select the "Raw data" check box.

7. In the "R_ID" field, enter the value that you have configured for the "R_ID1" input parameter of the associated "FB_UA_WM" function block.



8. Select the "BSEND/BRCV" option.
9. Close the dialog box by clicking "OK".

3.5 Registering WinCC tags in the WinCC Data Manager

Introduction

All tags that are configured in WinCC for data exchange between the "FB_UA_RM" and "FB_UA_WM" blocks and the OS must be registered in the WinCC Data Manager. For this, the tags must be entered as a trigger in the "FB_RawDataTrigger.pas" action.

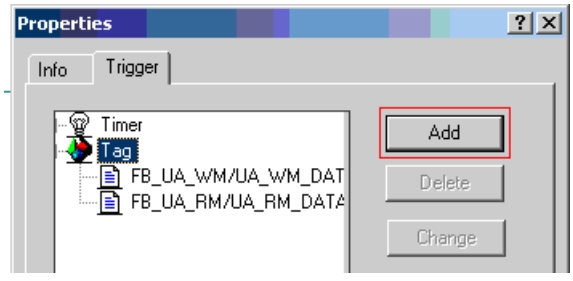
Requirement

- WinCC Explorer is open.

Procedure

To enter a tag as a trigger, follow these steps:

1. Open the "FB_RawDataTrigger.pas" action in the Global Script Editor.
2. Click the button in the toolbar.
   The "Properties" dialog box opens.
3. Open the "Trigger" tab.
4. Select the "Tag" entry and click the "Add" button.

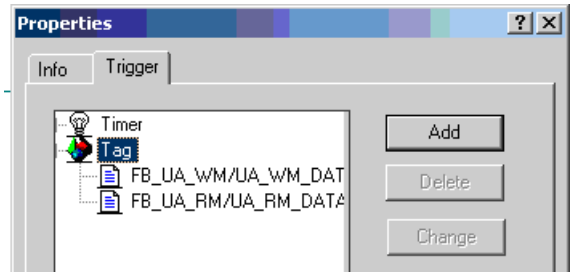


   The "Add trigger" dialog box opens.

5. Use the button in the "Tag name" area to insert the tags that you configured for the "FB_UA_RM" and "FB_UA_WM" blocks. See section Creating raw data tags in WinCC (Page 23).
6. Click "OK".

Example

In the following example, the multiproject contains one "FB_UA_RM" block and one "FB_UA_WM" block. The blocks are configured in CFCs of the same name. The associated WinCC tags are entered as triggers:



3.6 Adapting WinCC actions

Introduction

Scripts are triggered using WinCC actions for data exchange between the AS and OS. Based on an APF template, one C-action must be created for each configured "FB_UA_RM" and "FB_UA_WM" function block.

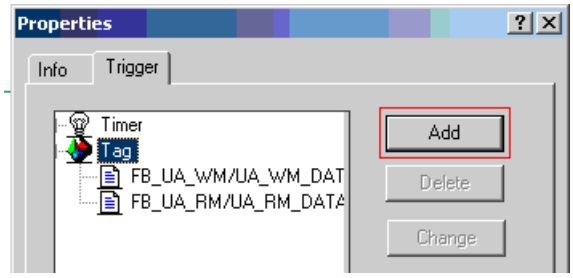
Requirement

- WinCC Explorer is open.

User Archive Read Manager

To adapt the C-action for the User Archive Read Manager, follow these steps:

1. Open the "FB_ReadRecordTrigger0.pas" template file in the Global Script Editor and save it under a different name, e.g., "FB_ReadRecordTrigger1.pas".
2. Insert a new trigger tag.

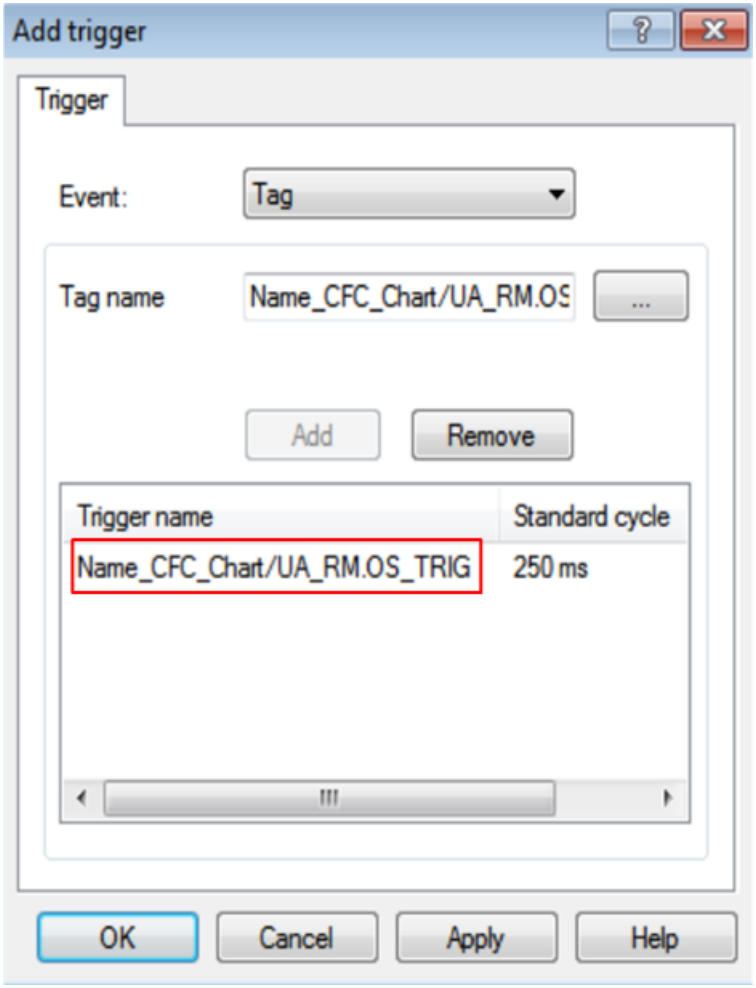


3. Enter a value in the "Tag name" field according to the following pattern:
   – *Name_CFC_chart/UA_RM.OS_TRIG*

   The "Name_CFC_chart" prefix refers to the CFC in which the "FB_UA_RM" function block is configured as a communication partner.
   See Function block "FB_UA_RM" (Page 15) for more information.
   The name "/UA_RM.OS_TRIG" is specified by the APF system and must also not be changed here or in subsequent configuring steps.

   Note

   If naming is set up for the folders of the plant hierarchy, the hierarchy path must also be entered:
   - *Names of folders in hierarchy path/Name_CFC_chart/UA_RM.OS_TRIG*



4. Adapt the update of the standard cycle.
5. Click "OK" to add the trigger tag.

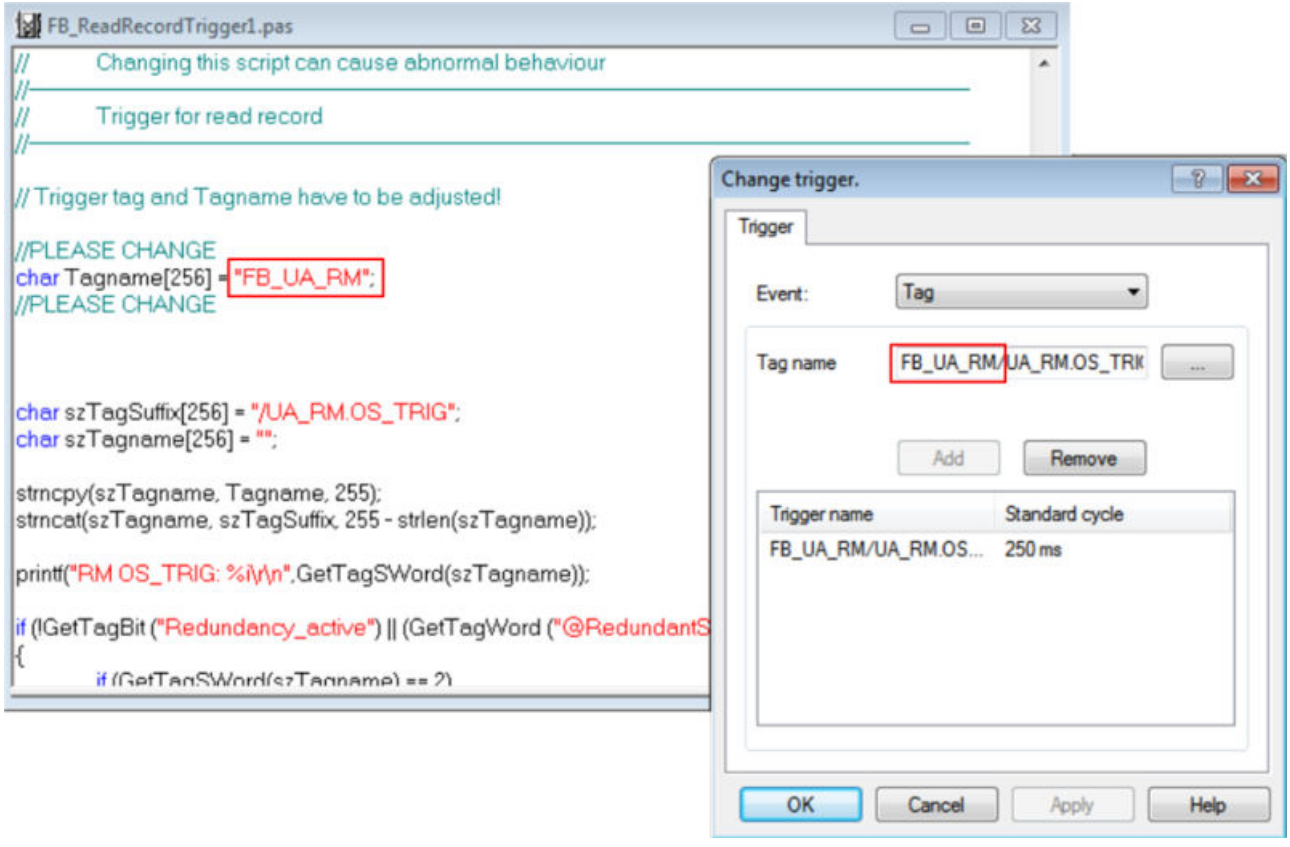
6. Adapt the action script accordingly for the created trigger tag.

```
FB_ReadRecordTrigger1.pas
//          Changing this script can cause abnormal behaviour
//
//          Trigger for read record
//

// Trigger tag and Tagname have to be adjusted!

//PLEASE CHANGE
char Tagname[256] = "Name of CFC Chart"
//PLEASE CHANGE


char szTagSuffix[256] = "/UA_RM.OS_TRIG";
char szTagname[256] = "";

strncpy(szTagname, Tagname, 255);
strncat(szTagname, szTagSuffix, 255 - strlen(szTagname));

printf("RM OS_TRIG: %i\r\n",GetTagSWord(szTagname));
```

7. Save and close the action.

Example

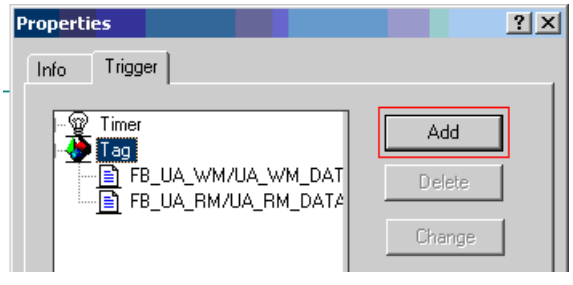
In the following example, the "FB_UA_RM" block is located in the CFC named "FB_UA_RM". The block name in the CFC is always the same (UA_RM). The name of the trigger tag consists of the CFC name "FB_UA_RM" plus the suffix "/UA_RM.OS_TRIG" (FB_UA_RM/UA_RM.OS_TRIG).



User Archive Write Manager

To adapt the C-action for the User Archive Write Manager, follow these steps:

1. Open the "FB_WriteRecordTrigger0.pas" template file in the Global Script Editor and save it under a different name, e.g., "FB_WriteRecordTrigger1.pas".
2. Insert a new trigger tag.



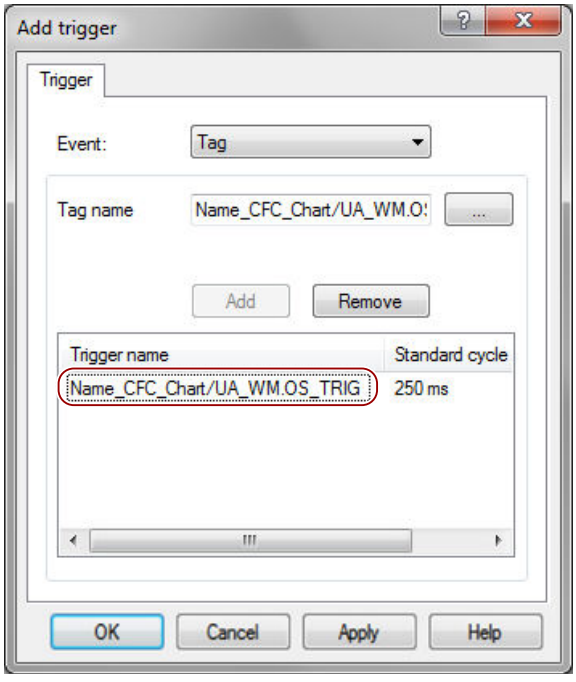
3. Enter a value in the "Tag name" field according to the following pattern:
   – *Name_CFC_chart/UA_WM.OS_TRIG*

   The "Name_CFC_chart" prefix refers to the CFC in which the "FB_UA_WM" function block is configured as a communication partner.
   See Function block "FB_UA_WM" (Page 19) for more information.
   The name "/UA_WM.OS_TRIG" is specified by the APF system and must also not be changed here or in subsequent configuring steps.

   Note

   If the naming is set up for the folders of the plant hierarchy, the hierarchy path must also be entered:

   - *Names of folders in hierarchy path/Name_CFC_chart/UA_WM.OS_TRIG*



4. Adapt the update of the standard cycle.
5. Click "OK" to add the trigger tag.

6. Adapt the action script accordingly for the created trigger tag.

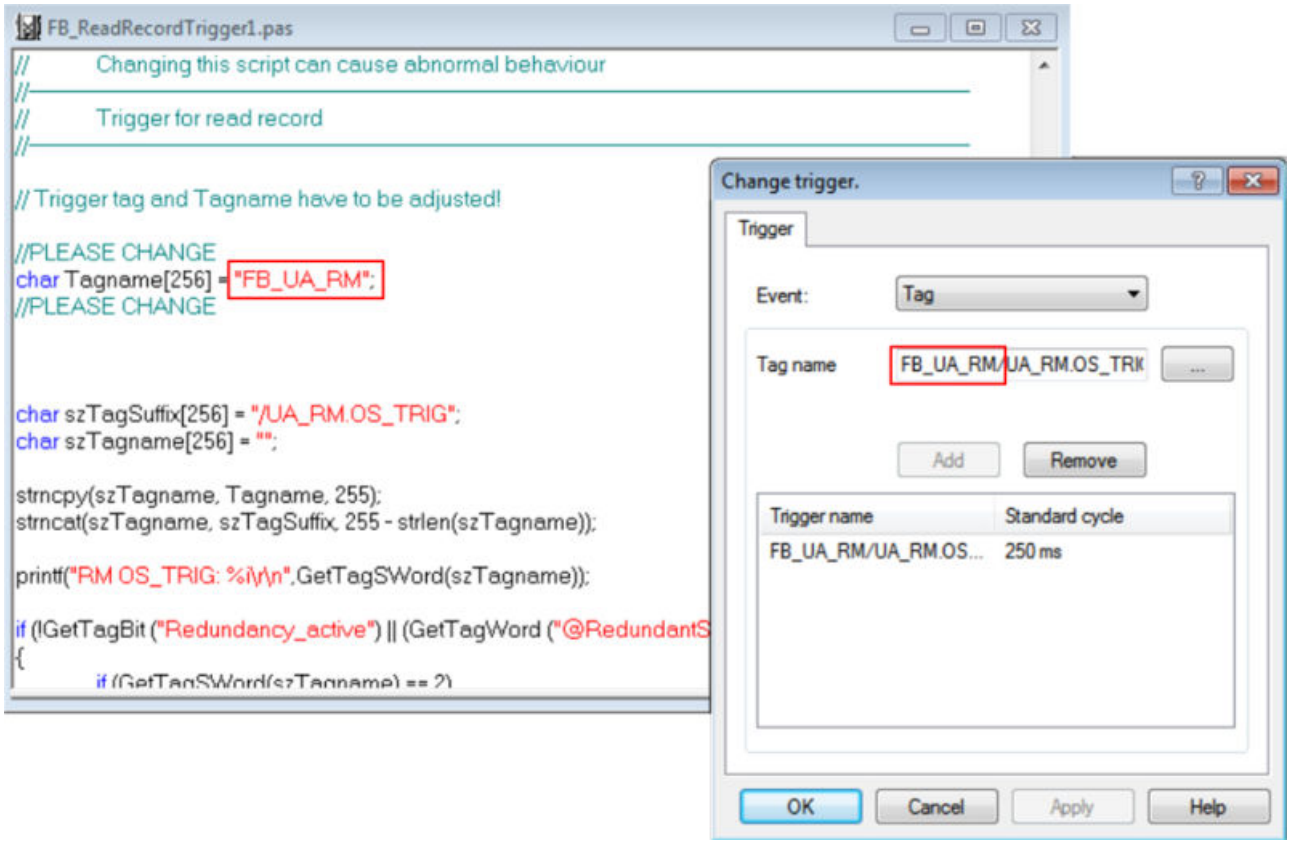
```
FB_WriteRecordTrigger1
//          Changing this script can cause abnormal behaviour
//----------------------------------------------------------------
//          Trigger for writing record
//----------------------------------------------------------------

// Trigger tag and Tagname have to be adjusted!

//PLEASE CHANGE
char Tagname[256] = "Name_CFC_Chart";
//PLEASE CHANGE


int iOS_TRIG;

char szTagSuffix[256] = "/UA_WM.OS_TRIG";
char szTagname[256] = "";

strncpy(szTagname, Tagname, 255);
strncat(szTagname, szTagSuffix, 255 - strlen(szTagname));

iOS_TRIG = GetTagSWordWait(szTagname);
printf("WM OS_TRIG: %i\r\n",iOS_TRIG);
```

7. Save and close the action.

Example

In the following example, the "FB_UA_WM" block is located in the CFC named "FB_UA_WM". The block name in the CFC is always the same (UA_WM). The name of the trigger tags consists of the CFC

chart name "FB_UA_WM" plus the suffix "/UA_WM.OS_TRIG" (FB_UA_WM/UA_WM.OS_TRIG).


FB_ReadRecordTrigger1.pas
// Changing this script can cause abnormal behaviour
// Trigger for read record
// Trigger tag and Tagname have to be adjusted!
//PLEASE CHANGE
char Tagname[256] = "FB_UA_RM";
//PLEASE CHANGE
char szTagSuffix[256] = "/UA_RM.OS_TRIG";
char szTagname[256] = "";
strncpy(szTagname, Tagname, 255);
strncat(szTagname, szTagSuffix, 255 - strlen(szTagname));
printf("RM OS_TRIG: %i\r\n",GetTagSWord(szTagname));
if (!GetTagBit ("Redundancy_active") || (GetTagWord ("@RedundantS
{
Change trigger.
Trigger
Event:
Tag
Tag name
FB_UA_RM/UA_RM.OS_TRI
Add
Remove
Trigger name
Standard cycle
FB_UA_RM/UA_RM.OS...
250 ms
OK
Cancel
Apply
Help

3.7 Checking redundancy tag in WinCC

Introduction

To run two OS servers in a redundant configuration, an internal WinCC tag (Redundancy_active) that is created automatically by the engineering tool is used. This tag is also required in non-redundant systems. The description below is only for checking the tag.

Requirement

- WinCC Explorer is open.

Procedure

Check the internal WinCC tag (internal tags) "Redundancy_active" to ensure they are present and have the correct start value.

Note

Start value:

- Redundancy_active = 0 → Redundancy not active
- Redundancy_active = 1 → Redundancy active

APF Engineering Tool 4

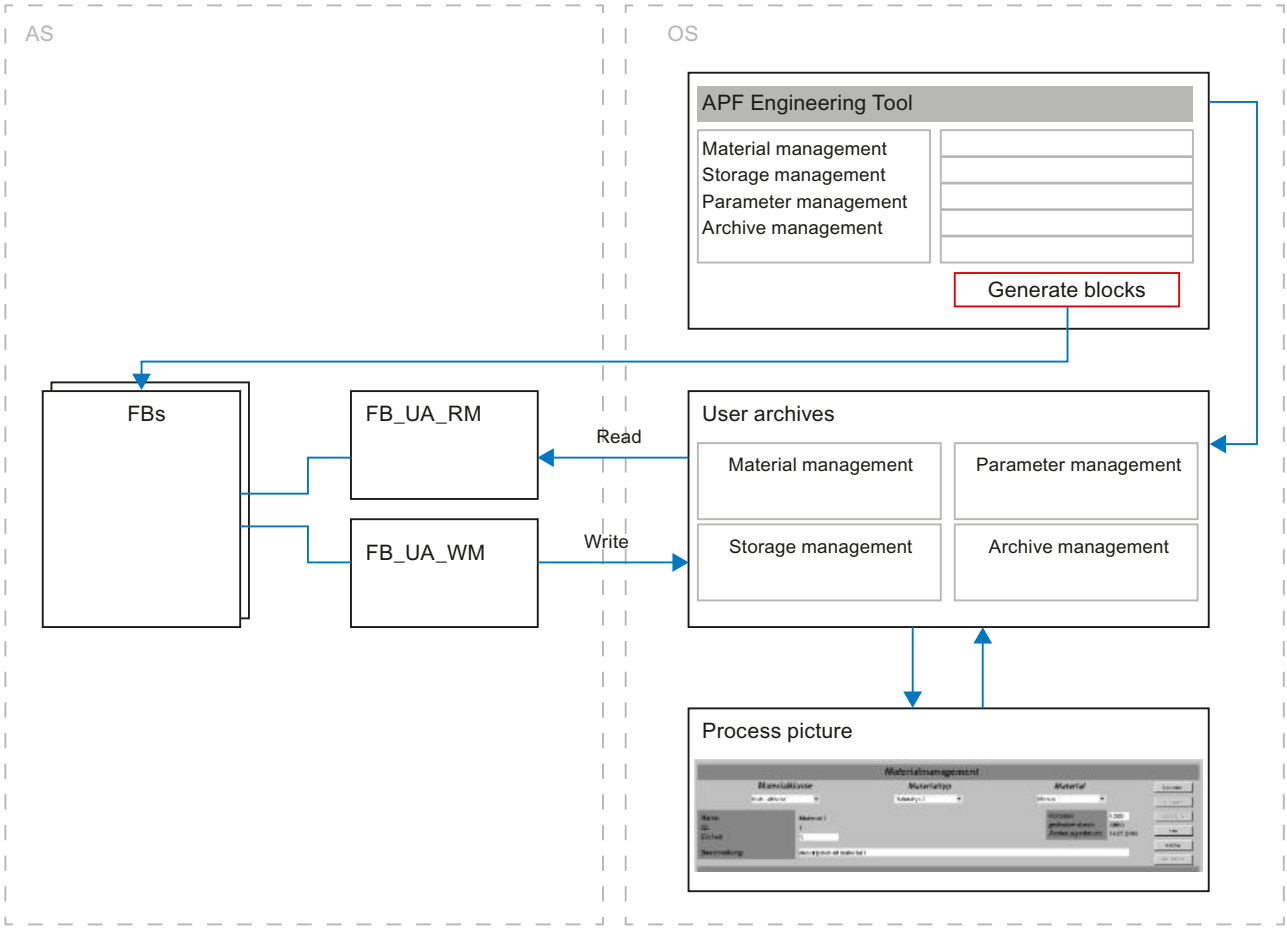
4.1 Introduction

With the help of the APF engineering tool, you can configure the following APF modules:

- Material management
- Storage management
- Parameter management
- Archive management

You specify the data for the individual APF modules on a project-specific basis in the engineering tool and generate user archives in which the data are saved. To enable access from the AS to the user archives, you generate AS function blocks based on the data contained in the APF engineering tool and interconnect these function blocks with the function blocks of the User Archive Read Manager and User Archive Write Manager (FB_UA_RM and FB_UA_WM). Upon request, the data are written to or read from the user archives.

During process control, you use pre-configured picture objects (process pictures and faceplates) that are contained in the APF software package to perform operator control and monitoring of the data configured using the APF engineering tool.



Note

Following configuration with the APF engineering tool or in the case of configuration changes, the APF Integrator must be run. For more information, refer to the section "Running the APF Integrator (Page 121)".

4.2 Opening the APF engineering tool

Introduction

Following successful APF installation, the APF engineering tool is available in WinCC Explorer under the entry "APF engineering tools" and can be run from there.

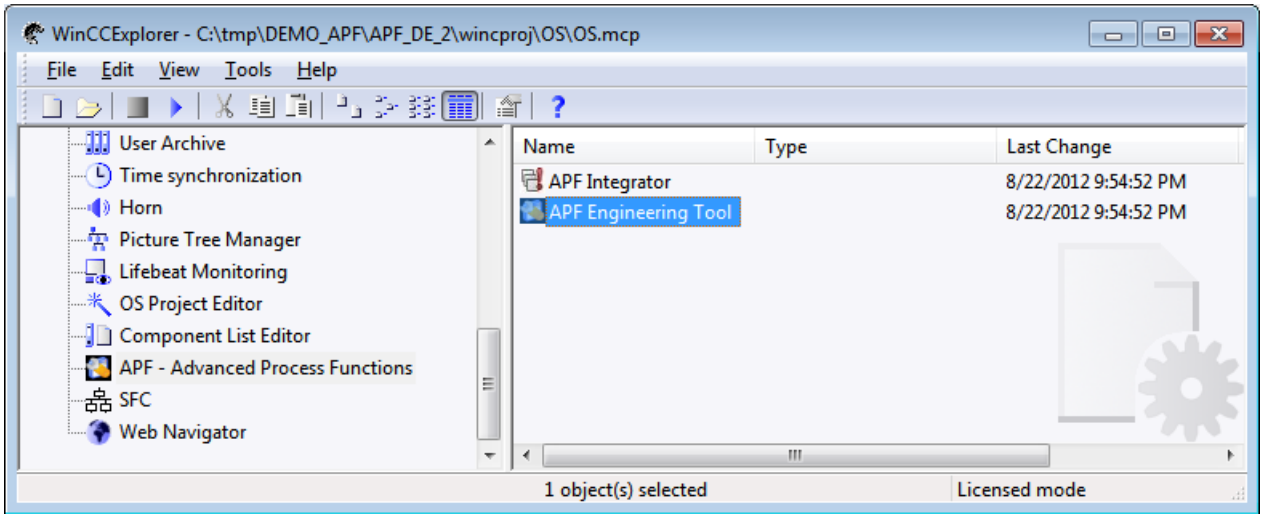
Requirement

- WinCC Explorer is open.

Procedure

To open the APF engineering tool, follow these steps:

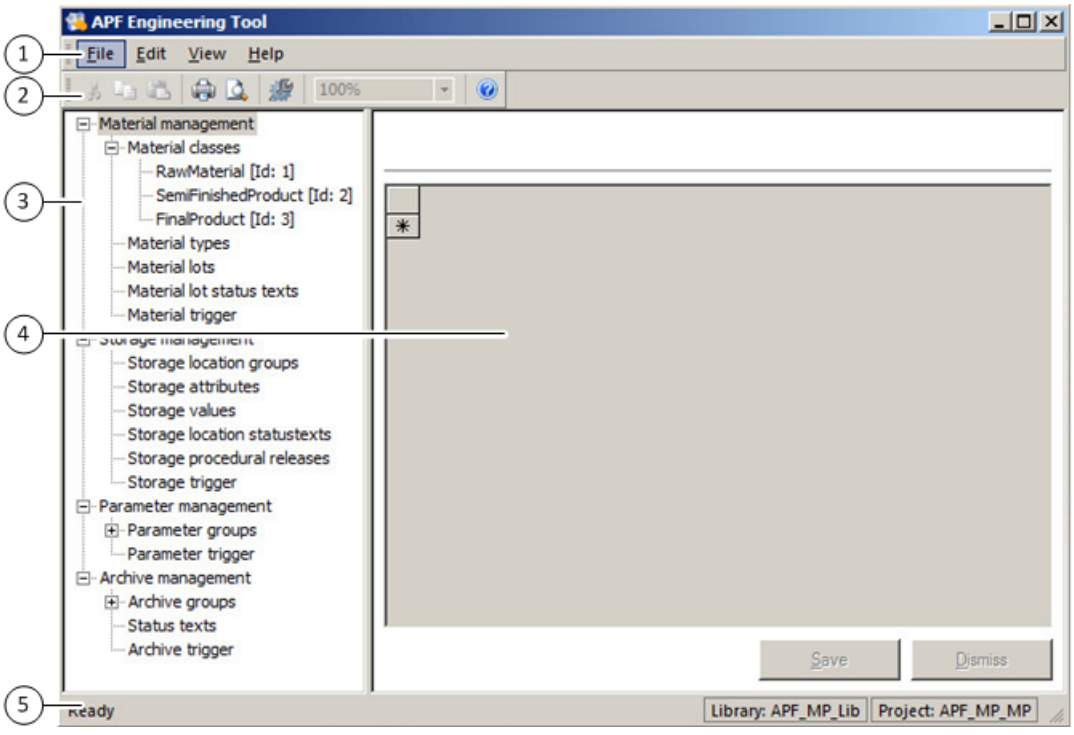
1. Click the "APF engineering tools" entry in the navigation area of WinCC Explorer.
   The APF applications are displayed on the right in WinCC Explorer.



2. Double-click the "APF engineering tool" application.
   The APF engineering tool opens.

4.3 Layout of the user interface

The following figure shows the layout of the user interface of the APF engineering tool:



① Menu bar:
You can find all the commands needed to operate the APF engineering tool in the menu bar.

② Toolbar:
The toolbar provides you with buttons for frequently used commands.

③ Navigation area:
The navigation area gives you access to the individual APF modules and their data.

④ Workspace:
The objects that you open for editing purposes are displayed within the working area. The working area has a table structure. Each data record occupies one row.

⑤ Status bar:
General project information is displayed in this area.

Menu bar

- "File" menu
  The following table shows the commands that are grouped in the "File" menu:

Command	Explanation
Settings	This command opens the "Settings" dialog where you can make general project settings as well as specific settings for the APF modules.
Print Preview	Displays a print preview of the current working area

Command	Explanation
Print	Prints the current working area
Printer Setup	Opens a dialog where you set up the printer
Close	Closes the APF engineering tool

- "Edit" menu
  The following table shows the commands that are grouped in the "Edit" menu:

Command	Explanation
Undo	Undoes the last action
Cut	Cuts a data record
Copy	Copies a data record
Paste	Pastes a copied data record
New	Inserts a new data record
Delete	Deletes a data record
Delete row	Deletes a row in the working area

- "View" menu
  The following table shows the commands that are grouped in the "View" menu:

Command	Explanation
Toolbars and docking windows	Displays and hides the toolbars and docking windows in the user interface
Status Bar	Displays and hides the status bar

- "Help" menu
  The following table shows the commands that are grouped in the "Help" menu:

Command	Explanation
Keyboard assignment	You can use this command to specify the keyboard operation.
Info about APF engineering tool ..	You can use this menu to access information about the installed version of the APF engineering tool.

Toolbar

The following table shows the commands that are displayed in the toolbar in its default setting:

Icon/Button	Explanation
	Cuts a data record
	Copies a data record
	Pastes a copied data record
	Prints the current working area
	Displays a print preview of the current working area
	Opens the "Settings" dialog
100%	Zooms the view of the working area in/out

Icon/Button	Explanation
	Calls information about the installed version of the APF engineering tool
	You can use this button to customize the display of buttons in the toolbar.

Reset Textlib IDs

The "Reset Textlib IDs" button, which is available in some dialogs, has the following effect:

- The Textlib ID of the current view is deleted.
- After saving, new entries are created in the text library.
- These then need to be filled with text using WinCC resources.

This function supports the import of a text library from another project, if the IDs overlap.

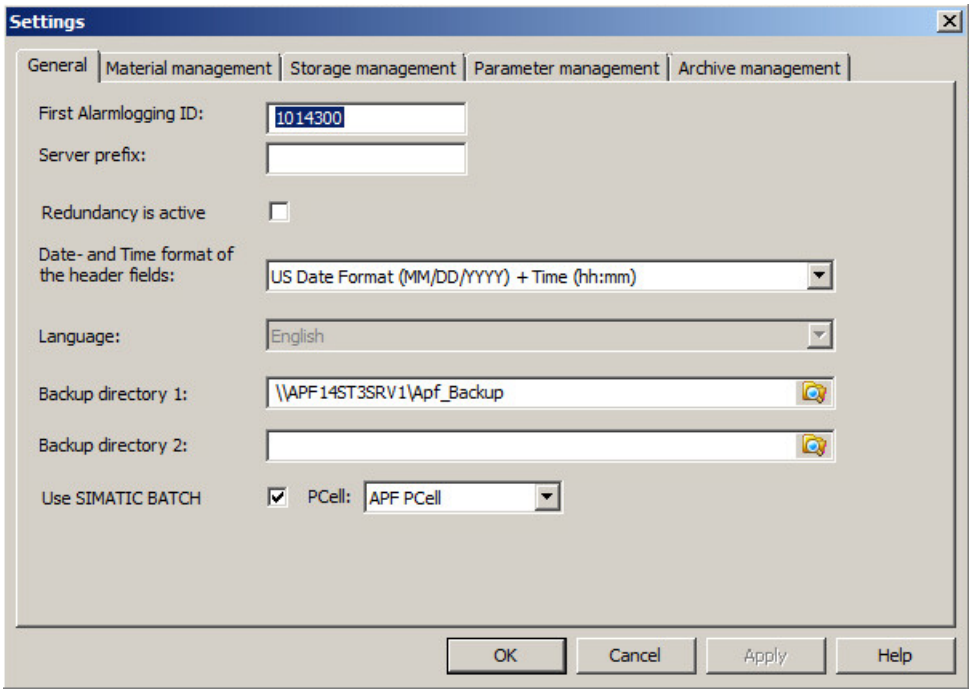
4.4 "Settings" dialog

The "Settings" dialog is opened via the "File" menu or the toolbar button. Available settings there include:

- Display of user archives of the individual APF modules
- Setting the numbering of APF message texts in Alarm Logging
- Setting the date and time format

"General" tab

You can make general project settings in the "General" tab.



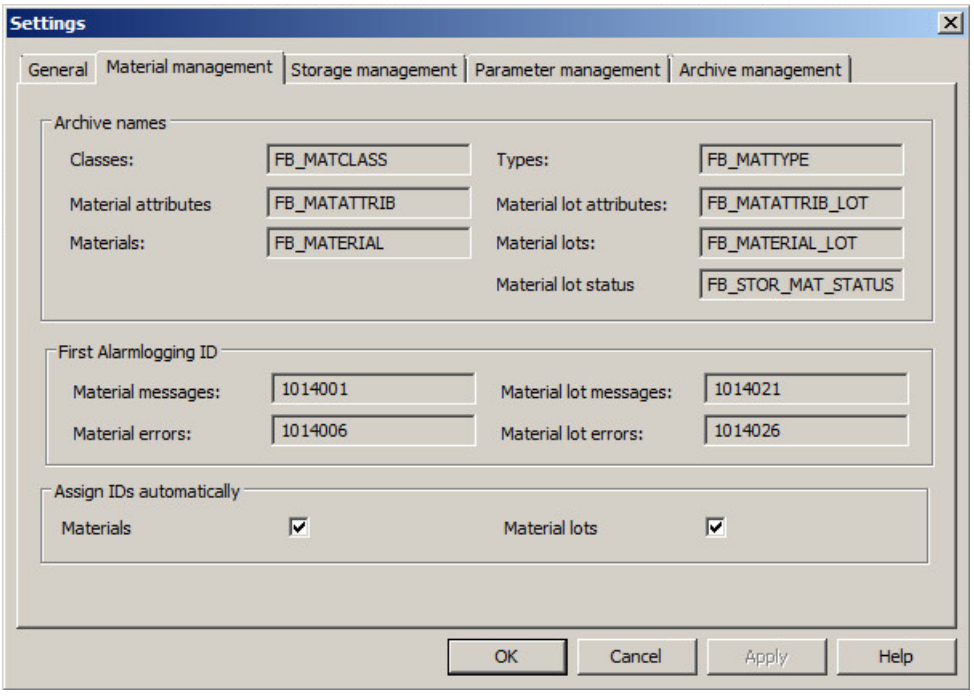
The "General" tab consists of the following areas:

Area	Explanation
First Alarm Logging ID	First message number for module-independent APF messages (Messages_General_de.txt) See the "Advanced Process Functions (APF) Installation and Configuration" document.
Server prefix	Symbolic name of OS server project with the suffix "::". (Example: "OSServerProject::")
Redundancy is active	Yes/No check box
Date and time format of header fields	Format in which the time and date are displayed.
Language	Language of the APF engineering tool (cannot be set; derived from WinCC Explorer language setting)

Area	Explanation
Backup directory 1	First backup directory path for APF user archive data backups
Backup directory 2	Second backup directory path for APF user archive data backups (optional)
SIMATIC BATCH	If used, set the check mark and select the PCell

"Material management" tab

In the "Material management" tab, you can find information and settings for the "Material management" APF module.



The "Material management" tab consists of the following areas:

- Archive names
  This area shows the pre-assigned user archives in which the material management data are saved.

Area	User archive	Explanation
Class archive	FB_MATCLASS	Definition of the material classes
Type archive	FB_MATTYPE	Definition of the material types
Material attribute archive	FB_MATATTRIB	Definition of the material attributes
Material archive	FB_MATERIAL	Archiving of the materials and their values for the attributes
Material lot archive	FB_MATERIAL_LOT	Archiving of the material lots
Material lot attribute archive	FB_MATLOTATTRIB	Definition of the material lot attributes
Material status archive	FB_MAT_STATUS	Definition of the material status texts

  The names of the user archives are pre-assigned and cannot be edited.

- Display of each first alarm logging ID for
  - Material messages
  - Material error messages
  - Material lot messages
  - Material lot error messages

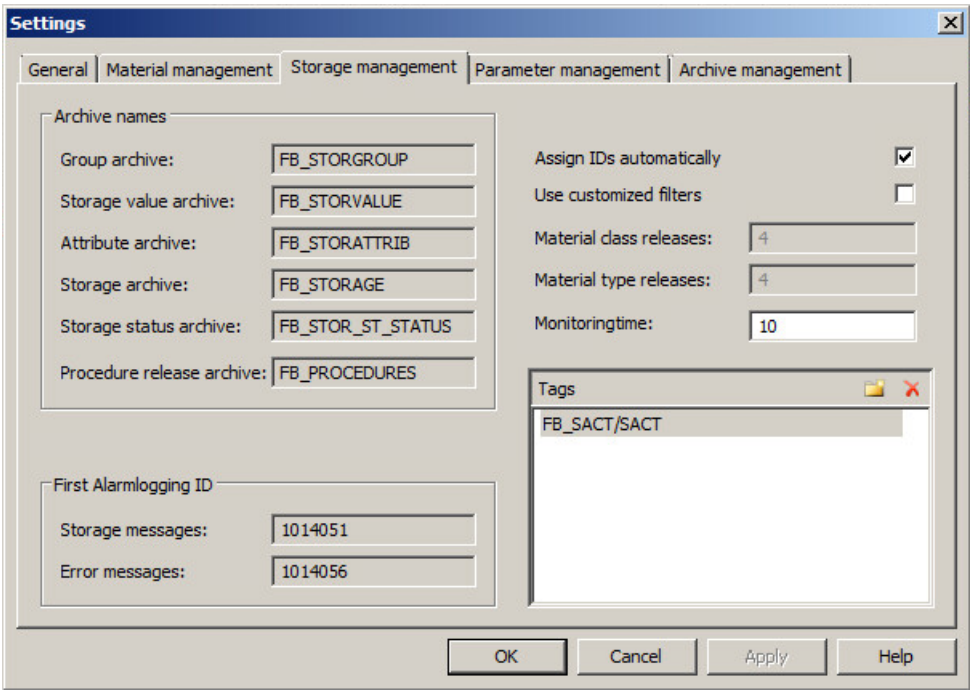
  Note

  For information on importing APF messages in Alarm Logging, refer to "Advanced Process Functions (APF) Installation and Configuration".

- Assign IDs automatically
  You can use these check boxes to specify whether the IDs for materials or material lots are assigned manually or automatically when new data records are created.

"Storage management" tab

In the "Storage management" tab, you can find information and settings for the "Storage management" APF module.



The "Storage management" tab consists of the following areas:

- Archive names
  This area shows the pre-assigned user archives in which the storage management data are saved.

Area	User archive	Explanation
Group archive	FB_STORGROUP	Definition of the storage location groups
Actual value archive	FB_STORVALUE	Definition of the actual storage location values
Attribute archive	FB_STORATTRIB	Definition of the storage location parameters
Storage location archive	FB_STORAGE	Archiving of the storage locations
Storage location status archive	FB_STOR_ST_STATUS	Definition of storage location status texts
Procedure archive	FB_PROCEDURES	Definition of the procedure releases

  The names of the user archives are pre-assigned and cannot be edited.

- Display of each first alarm logging ID for
  - Storage location messages
  - Error messages

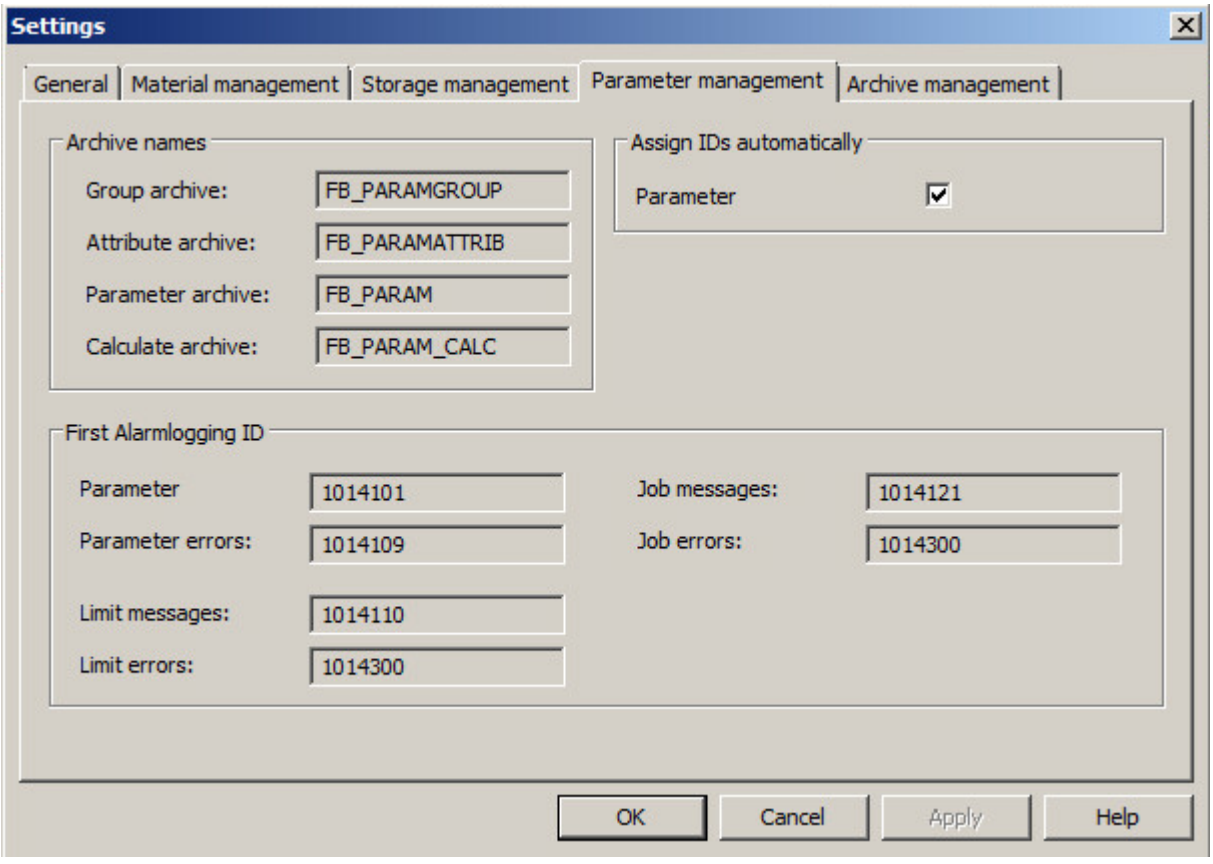
  Note

  For information on importing APF messages in Alarm Logging, refer to "Advanced Process Functions (APF) Installation and Configuration".

- Assign IDs automatically
  You can use this check box to specify whether the IDs for storage locations are assigned manually or automatically when new storage location data records are created.
- Material class releases
  In this area you can see the quantity (0-4) of material class releases.
- Material type releases
  In this area you can see the number of material type releases.
- Monitoring time
  In this field you can enter the monitoring time in increments of 2 seconds. The monitoring time is started in the process picture via the “Actual values” button. If positive feedback from all affected "FB_SACT" blocks does not arrive within this monitoring time, the user is notified that not all displayed storage locations could be updated.
- Tags
  In this area you can enter the tags of the "FB_SACT" blocks for each automation system.

"Parameter management" tab

In the "Parameter management" tab, you can find information and settings for the "Parameter management" APF module.



The "Parameter management" tab consists of the following areas:

- Archive names
  This area shows the pre-assigned user archives in which the parameter management data are saved.

Area	User archive	Explanation
Group archive	FB_PARAMGROUP	Definition of the parameter groups
Attribute archive	FB_PARAMATTRIB	Definition of the parameters and their properties (attributes)
Parameter archive	FB_PARAM	Archiving of the parameter sets and their values
Calculation archive	FB_PARAM_CALC	Buffering of newly calculated parameter sets

  The names of the user archives are pre-assigned and cannot be edited.

- Display of each first alarm logging ID for
  - Parameter messages
  - Parameter errors
  - Limit messages
  - Limit errors
  - Job messages
  - Job errors

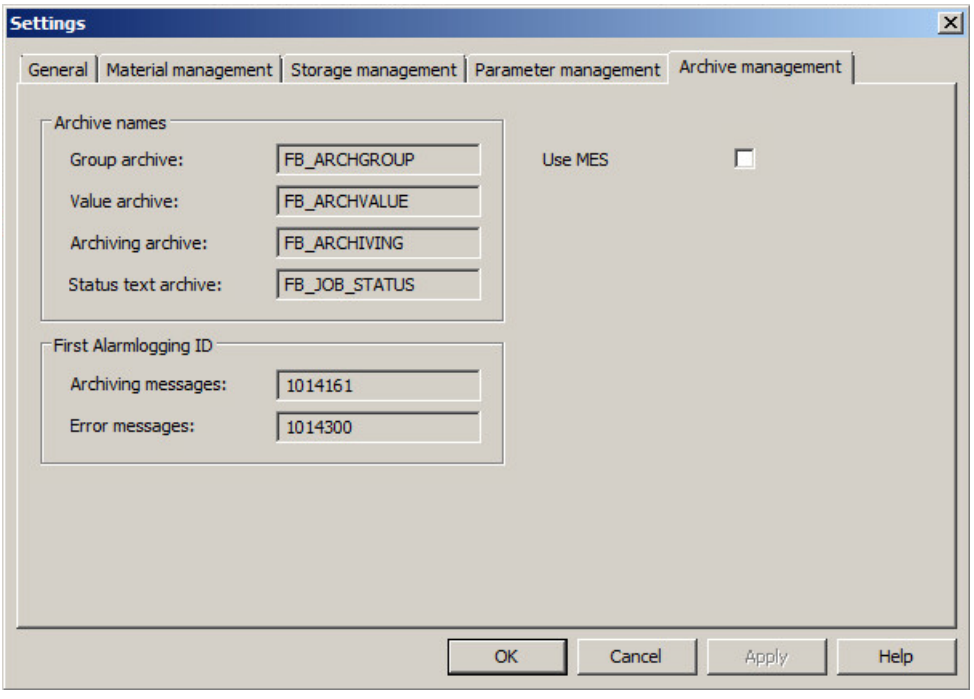
  Note

  For information on importing APF messages in Alarm Logging, refer to "Advanced Process Functions (APF) Installation and Configuration".

- Assign IDs automatically
  You can use this check box to specify whether the IDs for parameter sets are assigned manually or automatically when new parameter data records are created.

"Archive management" tab

In the "Archive management" tab, you can find information and settings for the "Archive management" APF module.



The "Archive management" tab consists of the following areas:

- Archive names
  This area shows the pre-assigned user archives in which the archive management data are saved.

Area	User archive	Explanation
Group archive	FB_ARCHGROUP	Definition of the archive groups
Value archive	FB_ARCHVALUE	Definition of the archive values
Archiving archive	FB_ARCHIVING	Archiving of the archive data records

  The names of the user archives are pre-assigned and cannot be edited.

- Display of each first alarm logging ID for
  - Archiving messages
  - Error messages

  Note

  For information on importing APF messages in Alarm Logging, refer to "Advanced Process Functions (APF) Installation and Configuration".

- Use MES
  You can use this check box to specify whether an MES is used.

4.5 Data formats

Enumerations

All modules that access user archives can operate with the S7 data type "enumeration". Enumerations must be created in SIMATIC Manager for this. You do this in the project folder under "Global declarations". For details on configuring and working with multilingual enumerations, refer to the SIMATIC Manager help. It is important to note that enumeration values cannot contain more than 15 characters. Unlike in SIMATIC Manager, 16-character values are not permitted.

If an enumeration has been generated in SIMATIC Manager, you must ensure when creating a user archive that the name of the enumeration is entered in the "ENUM_MAT" column for that archive. The available enumerations are provided in a selection list.

You can also find the name of the enumeration in the "Object name" column of the "Enumerations" folder in SIMATIC Manager. A maximum of 87 values can be displayed in the OS when all 1 – 87 numbers are used (no spaces). If numbers with multiple digits are used, the number of possible values is reduced accordingly.

For example, if the enumeration numbers are always 3-digit, a maximum of 64 values can be used.

Note

Never use the value "0" for enumerations.

Materials

With certain modules such as those for material lot management and parameter management, you can create individual parameters/attributes of the "Material" type.

This enables you to select a specific material from those listed in a pull-down menu. You can only use this function if the material master data management function already exists in the project or has been configured with the engineering tool. The class and type for the "Material" attribute must be specified. This is done in the engineering tool when you create the relevant "Material" attribute.

The class and type of the material must be entered in the "Enum_Mat" column. The first three digits represent the material class and the second three specify the material type. For example, 003002 corresponds to material class 3 and material type 2. The leading zeros must always be included, which means the figure must always have six digits.

The available combinations of material class and type can be accessed from a selection list.

Enum_Mat = XXX000 displays all materials of class XXX regardless of type.

Date format

In S7, only the years 1990 to 2089 are specified in the "DATE_AND_TIME" data type because the year is represented by two digits only. All inputs and outputs of a block that are to represent date/time are based on the S7 "DATE_AND_TIME" data type. It consists of two double words that are used separately as two inputs/outputs in the blocks of the APF Toolbox; the same name is assigned to both but the name of the second double word ends in "B" (e.g., DATE1 and DATE1B). To convert to the "DATE_AND_TIME" data type, the two double words can be used together in direct sequence.

The two double words are structured as follows:

Double word	Bytes	Explanation
1	0	Year
1	1	Month
1	2	Day
1	3	Hour
2	4	Minute
2	5	Second
2	6	The two most significant digits for milliseconds
2	7 (4 MSB)	The least significant digit for milliseconds
2	7 (4LSB)	Day of the week (1=Sunday, 2 = Monday, etc.)

MSB = 4 most significant bits

LSB = 4 least significant bits

Refer to the PCS 7 Help on the "DATE_AND_TIME" data type for more detailed information.

4.6 Block versioning

Objective

The sections below describe how the engineering tool, depending on the defined parameters and attributes

- Generates function blocks with corresponding inputs/outputs.
- Generates the user archive with corresponding column names.

This means there may be inconsistencies when changing parameters and attributes if the workflow is not followed correctly. In order to prevent this, the APFs include the version-checking mechanisms described below.

Block version

On generating a block, the Engineering Tool issues a "Generation version" (starting with 1) and writes it in the block (input/output `GEN_AS`) and additionally in the file FB_Numbers.ini. When making changes using the Engineering Tool (e.g. changes to attributes) and regenerating the block, the number of the generation version will increase. The file thus includes the current generation version for all of the generated blocks. When downloading, the file FP_Numbers.ini is transferred to the OS.

Checking by Read / Writemanager FB_UA_RM / FB_UA_WM

If a block transmits a block to FB_UA_RM / FB_UA_WM, it also writes its generation version (`GEN_AS`) in the telegram.
The scripts called by FB_UA_RM / FB_UA_WM read the target generation version from the FB_Numbers.ini file and compare it with the generation version from the read/write requirement. If the versions are not the same, the read-write jobs will not be executed. FB_UA_RM / FB_UA_WM returns the target generation version to the requesting block.

Check at the requesting block

Using the function `FB_CHECK` , the requesting block compares its own version `GEN_AS` with the returned version. In the case of an error, the error output `QERR_VER` is set and a message is generated.

The block itself is not blocked.

The error output will be reset if a request is able to be successfully executed. The output `QRELEASED` of the requesting bloick is statically set to TRUE and will be switched invisibly for the CFC. The output `QGR_ERR` contains `QERR_VER`, but for reasons of compatibility only one extended edge will be linked in by `QERR_VER` .

Note

This change in behavior of the blocks compared to previous APF versions may have repurcussions on wired user blocks to `QRELEASED` and `QERR_VER`.

Material management 5

5.1 Overview

The "Material management" APF module is used to implement automation tasks such as the following:

- Material master data management
- Material lot data management

User archives

You can find information on the material management user archives in the "Material management" tab of the "Settings" dialog.

Process pictures

During process control, you use the following picture objects (process pictures and faceplates) to perform operator control and monitoring of the data configured using the APF engineering tool:

Picture objects	Explanation
FB_MAT_ED.PDL	Picture for operator control and monitoring of the material master data
@FB_MAT_ED_WINDOW.PDL	Faceplate for operator control and monitoring of material attributes
FB_MAT_LOT_ED.PDL	Picture for operator control and monitoring of the material lot data
@FB_MAT_LOT_ED_WINDOW.PDL	Faceplate for operator control and monitoring of the free parameters of the data records

Note

You can find information on the transfer of APF pictures to the PH in the section "Transferring APF process pictures to the plant hierarchy (Page 123)".

AS function blocks

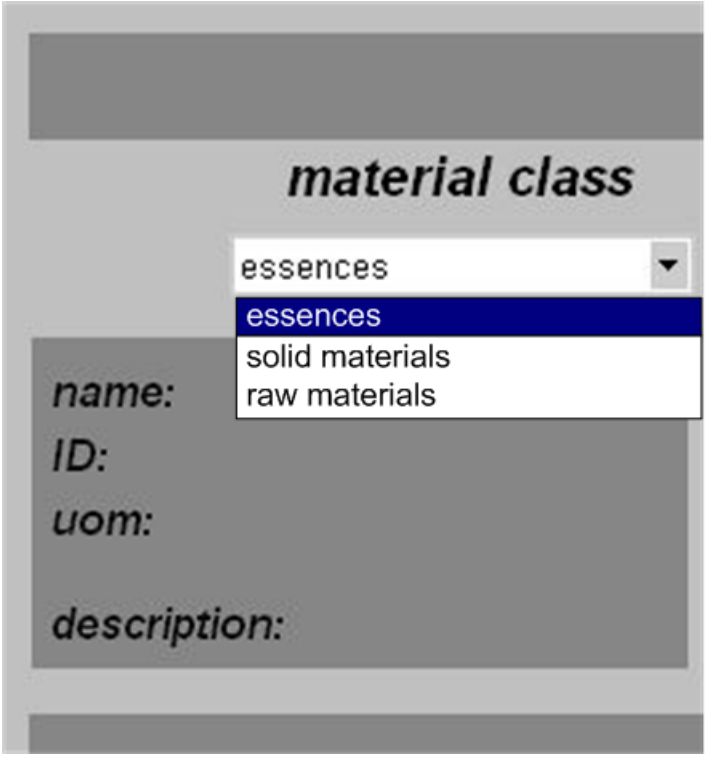
To generate the function blocks for the material management, the following blocks are used as templates.

Function block (FB)	Number	Function
FB_XXXMA	FB1777	• Provision of the material master data in the user archive via the User Archive Read Manager in the AS • Transfer of the material master data in the AS to the user archive via the User Archive Write Manager
FB_MLOT	FB1778	• Provision of the material lot data in the user archive via the User Archive Read Manager in the AS • Transfer of the material lot data in the AS to the user archive via the User Archive Write Manager

5.2 Material classes

You can use the APF engineering tool to define material classes and generate a function block of type "FB_XXXMA" for each material class. The material classes are saved in the "FB_MATCLASS" user archive.

The material classes are displayed in a selection list in the process picture.



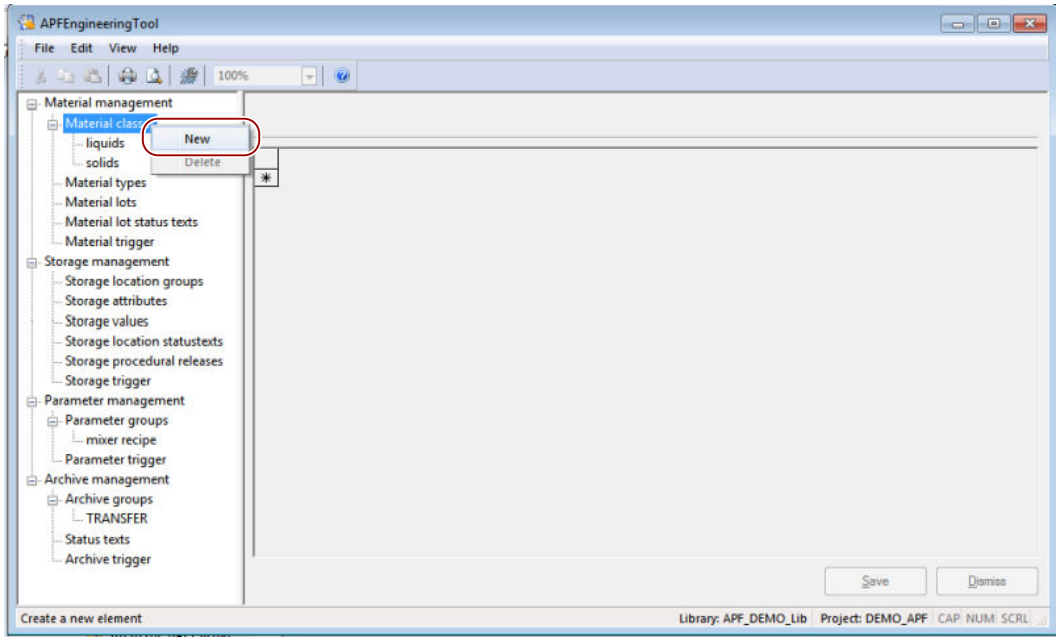
5.2.1 Creating and editing material classes

Creating material classes

To create a material class, follow these steps:

1. Open the material management in the navigation area of the APF engineering tool.
2. Select the "Material classes" group.

3. Select the "New" command in the shortcut menu.



The "Add material class" dialog opens.

4. Enter a name for the material class and click the "OK" button.
The material class is created with default properties and displayed in the navigation area.

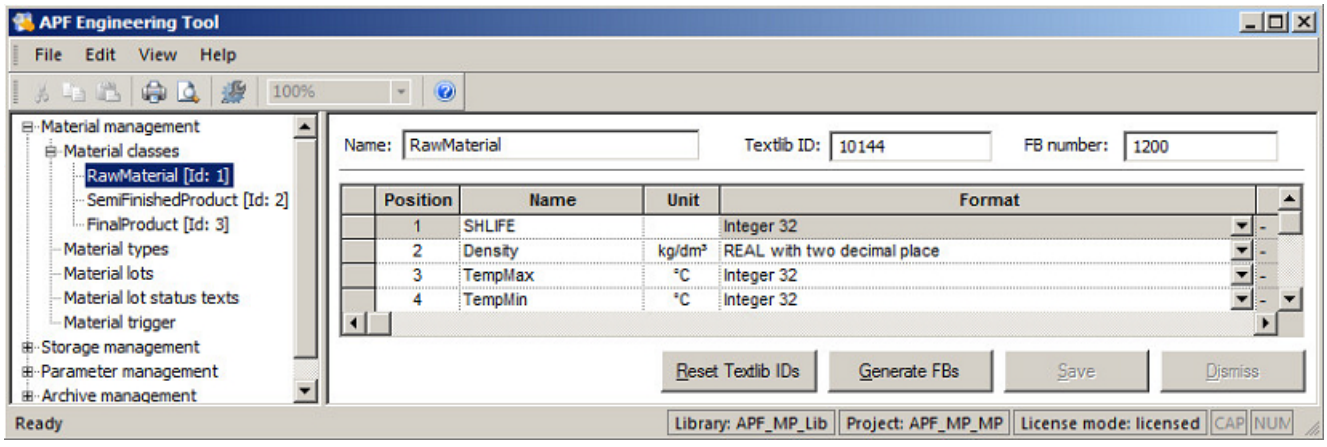
Editing material classes

In the working area of the APF engineering tool, you can edit the following properties of the material classes:

Area	Explanation
Name	Name of material class
Textlib ID	ID for multilingual management in the text library (non-editable; assigned automatically)
FB number	Number of the function block that is generated for the material class. Block numbers FB1775-1795 are reserved for APF blocks and must not be overwritten.

To edit the properties of a material class, follow these steps:

1. Select the required material class in the navigation area.
   The properties of the selected material class are displayed in the working area.
2. Define the properties of the material class in the working area of the engineering tool.



3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting material classes

Deletion is not possible, in order to guarantee data consistency.

5.2.2 Creating and editing attributes

You can define up to 100 attributes (material properties) for each material class. An output is created for each attribute when the "FB_XXXMA" function block is generated. The attribute data are saved in the "FB_MATTATTRIB_XXX" user archives.

The attributes are displayed and can be assigned with values in the process picture.

material management

material class	material type
liquids	raw material

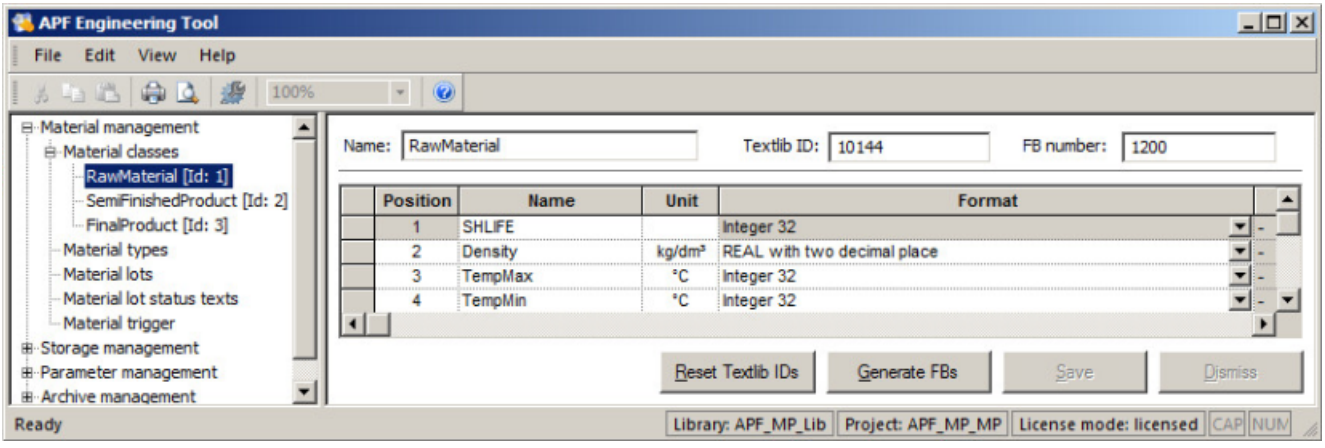
name:	green water
ID:	2
uom:	kg
description:	green water

shelf life	+100	-
specific gravity	+1000.00	kg/m³
brix	+0.00	°Brix
max. storage temperature	+40.00	°C
min. storage temperature	+5.00	°C

Adding new attributes to a material class

To add an attribute to a material class, follow these steps:

1. Select the required material class in the navigation area of the APF engineering tool. All attributes of the selected material class are displayed in the working area.



2. Click in the last row of the working area and specify the following properties:

Column	Explanation
Pos	Position in the visualization order.
Name	Name of the attribute
UoM	Unit of the attribute
Format	Format of the attribute
Enum_Mat	Name/coding of an enumeration The "ENUM_MAT" field can only be selected if you have set "ENUMERATION" as the format of the attribute. You can create enumerations in SIMATIC Manager under "Global Declarations".
Low limit	Lower operator control limit for numerical values
High limit	Upper operator control limit for numerical values
TXTLIB	ID for multilingual management in the text library (non-editable; assigned automatically)
FCT_ IO_BLOCK_NAME	Name of the output in the AS block
Visible	You can use the "Visible" check box to specify whether the attribute is displayed in the process picture.

3. Click the "Save" button.

Editing attributes

To change the properties of the attributes, follow the steps below:

1. Select the required material class in the navigation area of the APF engineering tool. All attributes of the selected material class are displayed in the working area.
2. Click in the row of the attribute to be edited and make the required changes.

3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting attributes

To delete an attribute, follow these steps:

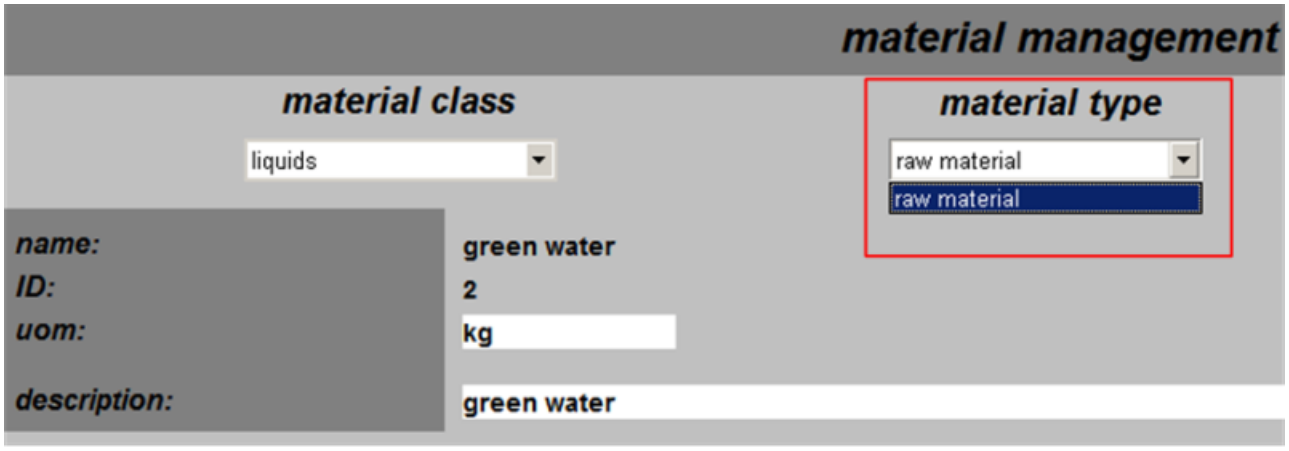
1. Select the row of the attribute.
2. Select the "Delete row" command in the "Edit" menu.

The attribute is removed from the working area.

5.3 Material types

You can assign up to ten material types to each material class. The material types are saved in the "FB_MATTYPE_XXX" user archives.

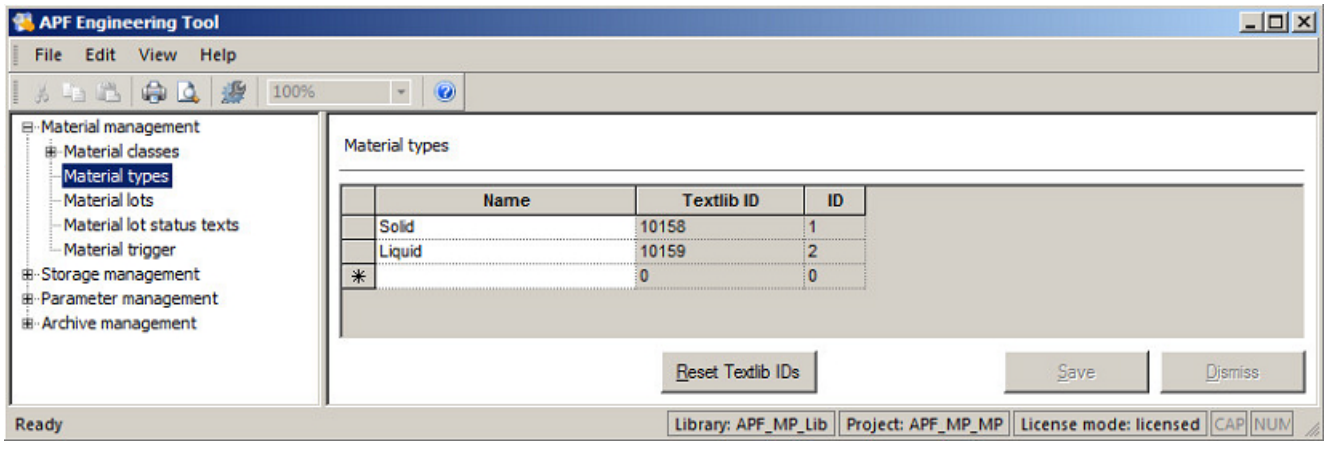
The material types are displayed in a selection list in the process picture.



Creating material types

To create a material type, follow these steps:

1. Open the material management in the navigation area of the APF engineering tool.
2. Select the "Material types" group.
   All defined material types are displayed in the working area.



3. Click in the last row of the table in the working area and specify the following properties:

Column	Explanation
Name	Name of the material type
TXTLIB	ID for multilingual management in the text library (non-editable; assigned automatically)

4. Click the "Save" button.
   The material type is created.

Editing material types

To edit the properties of a material type, follow these steps:

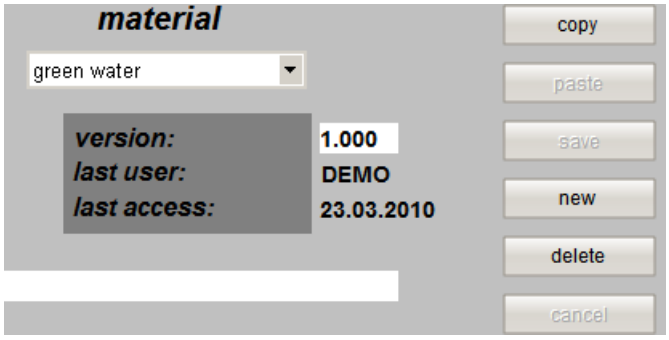
1. Select the "Material types" group in the navigation area of the APF engineering tool. All defined material types are displayed in a table in the working area.
2. Click in the row of the material type to be edited and make the required changes.
3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting material types

It is not possible to delete, in order to ensure the consistency of data.

5.4 Materials

You create the materials in Runtime using the "FB_MAT_ED.PDL" process picture. Each material is assigned to a material class and a material type and defined by the values that are specified for the individual attributes of the material class. The created materials are saved in the "FB_MATERIAL_XXX" user archives.



5.5 Material triggers

You can configure triggers for data backup operations. These start the backup of user archive data at defined intervals.

The following triggers are used for backing up the configuration data of the material management.

Trigger	Function
FB_MMBackupTriggerEN.pas	Triggers backup of the configured material master data
FB_MLBackupTriggerEN.pas	Triggers backup of the configured material lot master data
FB_MAT_STATUS_BackupTriggerEN.pas	Triggers backup of the material lot status texts

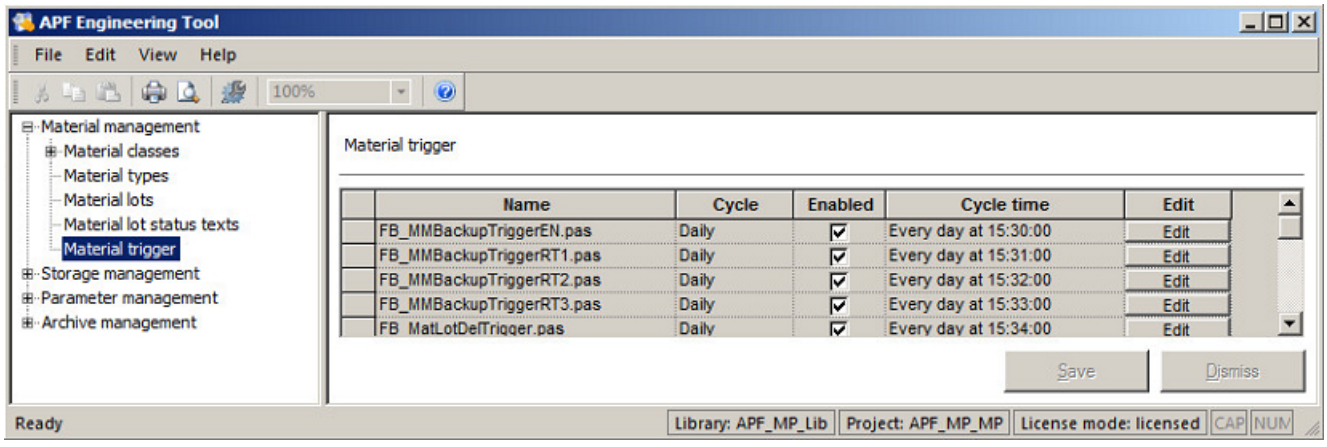
The following triggers are used for creating a backup of the Runtime data of the material management.

Trigger	Function
FB_MMBackupTriggerRTx.pas	Triggers backup of the data of a material class that are written to the user archives during runtime. For each material class, a trigger is created and numbered consecutively.
FB_MLBackupTriggerRTx.pas	Triggers backup of the material lot data that are written to the user archives during runtime.

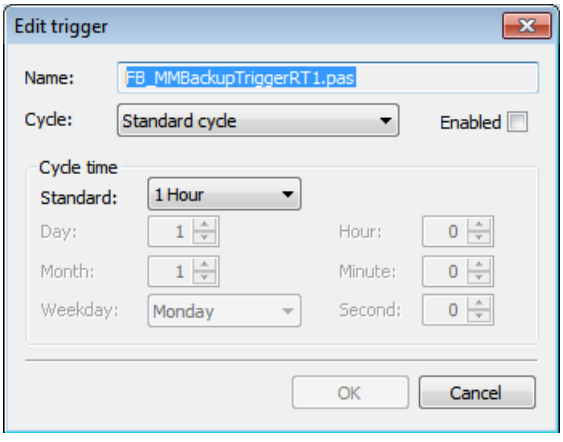
Configuring a trigger

To configure a trigger with the APF engineering tool, follow these steps:

1. Select the "Material trigger" group in the navigation area of the APF engineering tool. The triggers are displayed in the working area.



2. Click the "Edit" button in the row of the required trigger. The "Edit trigger" dialog opens.



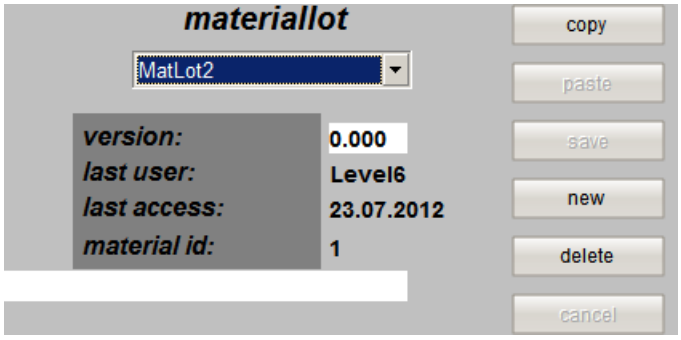
3. Configure the following properties of the trigger:

Area/check box	Explanation
Name	Name of the trigger (non-editable)
Cycle	Intervals for executing the actions in runtime: Standard cycle Hourly Daily Weekly Monthly Annually
Enabled	Activation of the trigger
Cycle time	Timing of the execution (depending on the cycle setting)

4. Click "OK".
5. The "Edit trigger" dialog closes.
6. Click the "Save" button in the working area of the APF engineering tool to apply the changes.
7. Click the "Dismiss" button in the working area of the APF engineering tool to discard the changes.

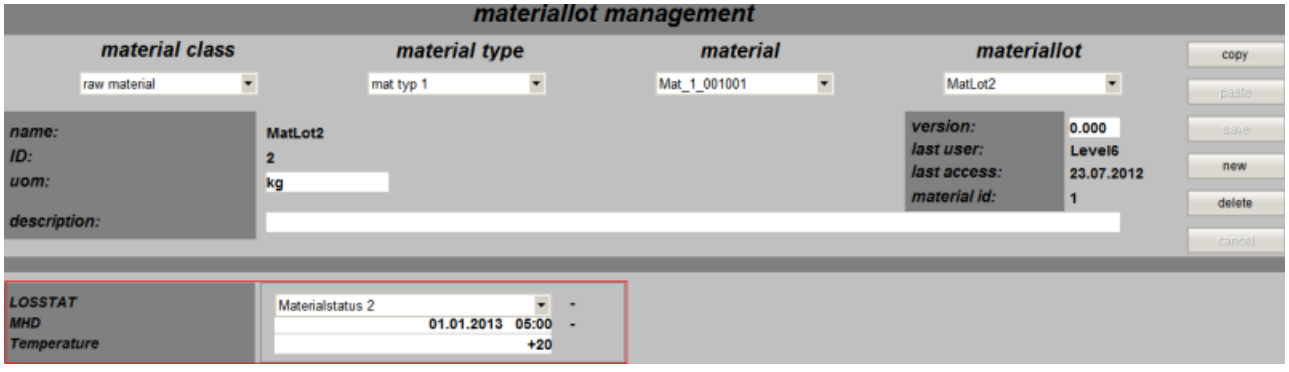
5.6 Material lots

You create and edit the material lots in Runtime using the "FB_MAT_LOT_ED.PDL" process picture. Each material lot is assigned to a material class, a material type, and a material. The created material lots are saved in the "FB_MATERIAL_LOT" user archive.



You can use the APF engineering tool to define up to 100 material lot attributes and generate a function block of type "FB_MLOT". An output is created for each attribute when the function block is generated. The attribute data are saved in the "FB_MATTATTRIB_LOT" user archive.

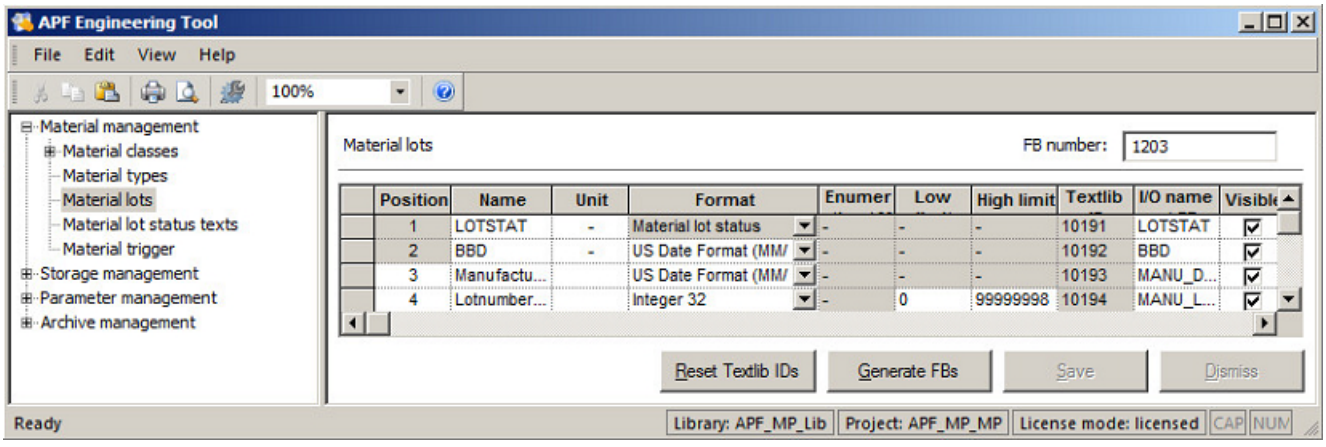
The material lot attributes can be displayed and assigned with values in the process picture.



Adding attributes

To add an attribute, follow these steps:

1. Select the "Material lots" group in the navigation area of the APF engineering tool.
   All defined attributes are displayed in the working area.



2. Specify the number of the function block that is generated for the material lot management.

   Note

   Block numbers FB1775-1795 are reserved for APF blocks and must not be overwritten.

3. Click on the last row in the working area and specify the following properties:

Column	Explanation
Pos	Position in the visualization order
Name	Name of the attribute
UoM	Unit of the attribute
Format	Format of the attribute
Enum_Mat	Name/coding of an enumeration The "ENUM_MAT" field can only be selected if you have set "ENUMERATION" as the format of the attribute. You can create enumerations in SIMATIC Manager under "Global Declarations".
Low limit	Lower operator control limit for numerical values
High limit	Upper operator control limit for numerical values
TXTLIB	ID for multilingual management in the text library (non-editable; assigned automatically)
FCT_IO_BLOCK_NAME	Name of the output in the AS function block
Visible	You can use the "Visible" check box to specify whether the attribute is displayed in the process picture.

4. Click the "Save" button.

Editing attributes

To edit the attributes, follow these steps:

1. Select the "Material lots" group in the navigation area of the APF engineering tool. All defined attributes of the material lots are displayed in the working area.
2. Click in the row of the attribute to be edited and make the required changes.
3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting attributes

To delete an attribute, follow these steps:

1. Select the row of the attribute to be deleted.
2. Select the "Delete row" command in the "Edit" menu.

The attribute is removed from the working area.

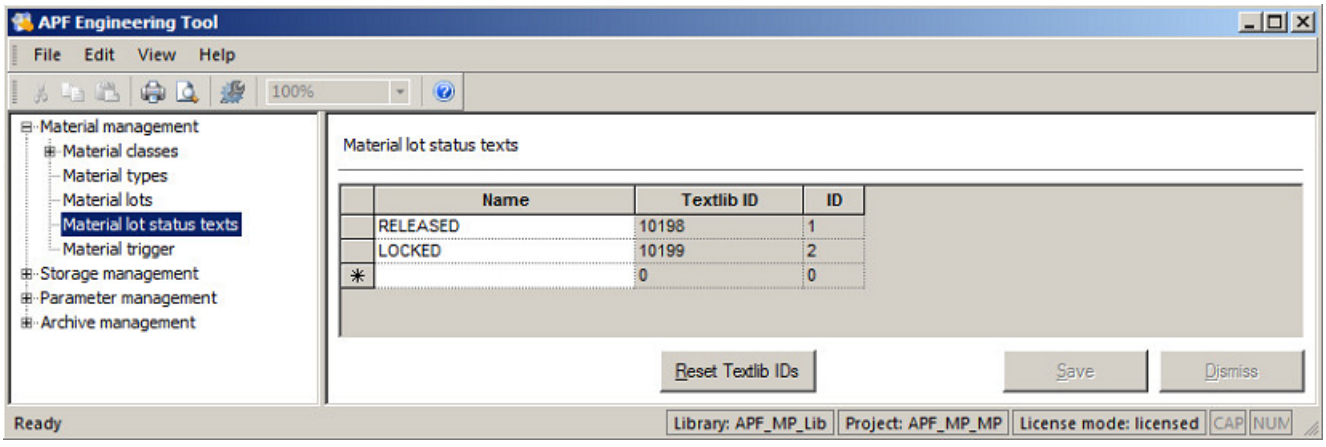
5.7 Material lot status texts

With the help of the APF engineering tool, you can define various states for the material lots. The status texts are displayed in a selection list in the process picture.

Creating status texts

To define a status text, follow these steps:

1. Select the "Material lot status texts" group in the navigation area of the APF engineering tool.
   All defined status texts are displayed in the working area.



2. Click on the last row in the working area and specify the following properties:

Column	Explanation
Name	Status text
TXTLIB	ID for multilingual management in the text library (non-editable; assigned automatically)

3. Click the "Save" button.

Editing status texts

To edit a status text, follow these steps:

1. Select the "Material lot status texts" group in the navigation area of the APF engineering tool.
   All defined status texts are displayed in the working area.
2. Click in the row of the status text to be edited and make the required changes.
3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting status texts

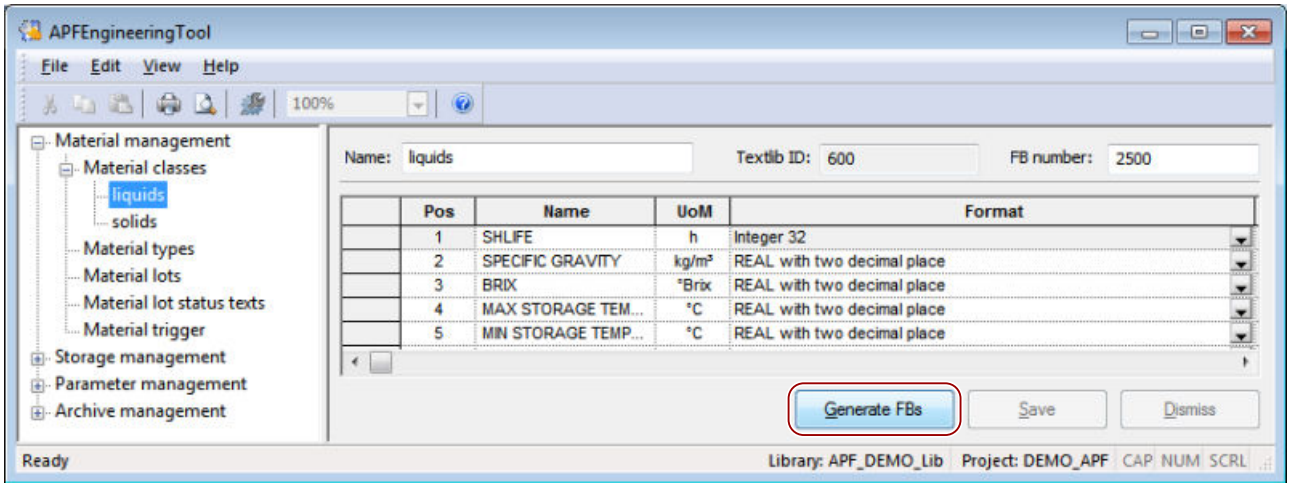
To delete a status, follow these steps:

1. Select the row of the status text to be deleted.
2. Select the "Delete row" command in the "Edit" menu.

The status text is removed.

5.8 Generating AS function blocks

Following configuration of the material classes and material lots, you can generate function blocks using the "Generate blocks" button of the APF engineering tool.



Material classes

A function block of type "FB_XXXMA" is generated for each created material class and stored in the master data library.

For information on the "FB_XXXMA" block and its parameter assignment, refer to the description of the "FB_XXXMA" function block.

Material lots

A function block of type "FB_MLOT" is generated for the material lot management and stored in the master data library.

For information on the "FB_MLOT" function block and its parameter assignment, refer to the description of the "FB_MLOT" function block.

Storage management 6

6.1 Overview

The "Storage management" APF module is used to implement automation tasks such as the following:

- Coordination of the storage locations
- Comparison of target and actual values of the storage locations
- Posting and clearing materials and material lots (including partial quantities)
- Inventory
- Fast finding of storage locations based on various selection criteria

User archives

You can find information on the storage location management user archives in the "Storage management" tab of the "Settings" dialog.

Process pictures

During process control, you use the following picture objects (process pictures and faceplates) to perform operator control and monitoring of the data configured using the APF engineering tool:

Picture objects	Explanation
FB_STOR.PDL	Overview picture of all storage locations
FB_STOR_ED.PDL	Picture for operator control and monitoring of the storage location parameters
@FB_STOR_ED_WINDOW.PDL	Faceplate for operator control and monitoring of the attribute and actual value parameters of the storage locations
@PG_FB_MAT_ADJ.PDL	Faceplate for manual correction posting of material lots in the storage locations
@PG_FB_MAT_IN.PDL	Faceplate for manual posting of materials / material lots to the storage locations
@PG_FB_MAT_OUT.PDL	Faceplate for manual clearing of materials / material lots from the storage locations
@PG_FB_MAT_IO.PDL	Faceplate for manually posting and clearing materials / material lots from one storage location to another
@PG_FB_MAT_CONV.PDL	Faceplate for converting materials / material lots in a storage location
@PG_FB_ST_SEARCH.PDL	Faceplate for searching storage locations based on various selection criteria
@PG_FB_MAT_SEARCH.PDL	Faceplate for searching materials / material lots in the storage locations based on various selection criteria

Picture objects	Explanation
@FB_Account.PDL	Faceplate for two-step posting of materials / material lots in the storage locations
@FB_ShowMatLots.PDL	Faceplate for displaying material lots during the material search
@FB_32BitsRel.PDL	Faceplate for displaying procedural releases in the "FB_STOR.PDL" picture
@PG_FB_STLOC.PDL	Faceplate for searching and selecting storage locations based on various selection criteria
@PG_FB_STMAT.PDL	Faceplate for searching and selecting materials and material lots based on various selection criteria

Note

You can find information on the transfer of APF pictures to the PH in the section "Transferring APF process pictures to the plant hierarchy (Page 123)".

AS function blocks

To generate the function blocks for the storage location management, the APF engineering tool uses the "FB_STOR" function block (FB1781) as a template. Based on this template, the APF engineering tool generates the following function blocks:

Function block (FB)	Number	Function
FB_STORI	Specified by the "FB Number (I)" field of the APF engineering tool	Provides the storage location parameters (attributes) in the "FB_STORATTR" user archive in the AS and transfers the actual values in the AS to the "FB_STORVALUE" user archive Format of format-related numerical values: INTEGER (32)
FB_STORR	Specified by the "FB Number (R)" field of the APF engineering tool	Provides the storage location parameters (attributes) in the "FB_STORATTR" user archive in the AS and transfers the actual values in the AS to the "FB_STORVALUE" user archive Format of format-related numerical values: REAL

For the storage location management, the following functions blocks can also be configured:

Function block (FB)	Number	Function
FB_STLOC	FB1779	Performs search of storage locations for a material from the AS
FB_STMAT	FB1780	Performs search of materials in storage locations from the AS

Function block (FB)	Number	Function
FT_ST_AC	FB1782	Performs posting and clearing processes of materials / material lots from the AS
FB_SACT	FB1783	Performs fast update of up to ten actual values for up to 25 "FB_STOR" blocks The "FB_SACT" function block is adapted to the "FB_STOR.pdl" overview picture and can update all 25 storage locations displayed in the picture, along with their parameters, to the current AS status in a single update operation.

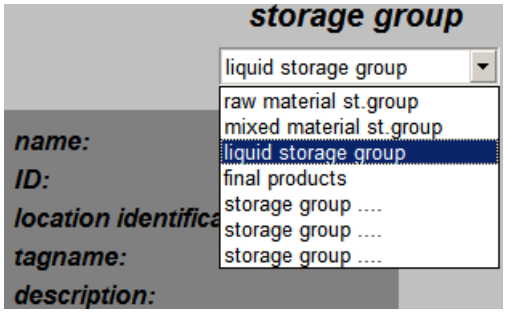
Note

For information on the function blocks and their parameter assignment, refer to the corresponding block descriptions.

6.2 Storage location groups

With the help of the APF engineering tool, you can define up to 30 storage location groups. The storage location groups are saved in the "FB_STORGROUP" user archive.

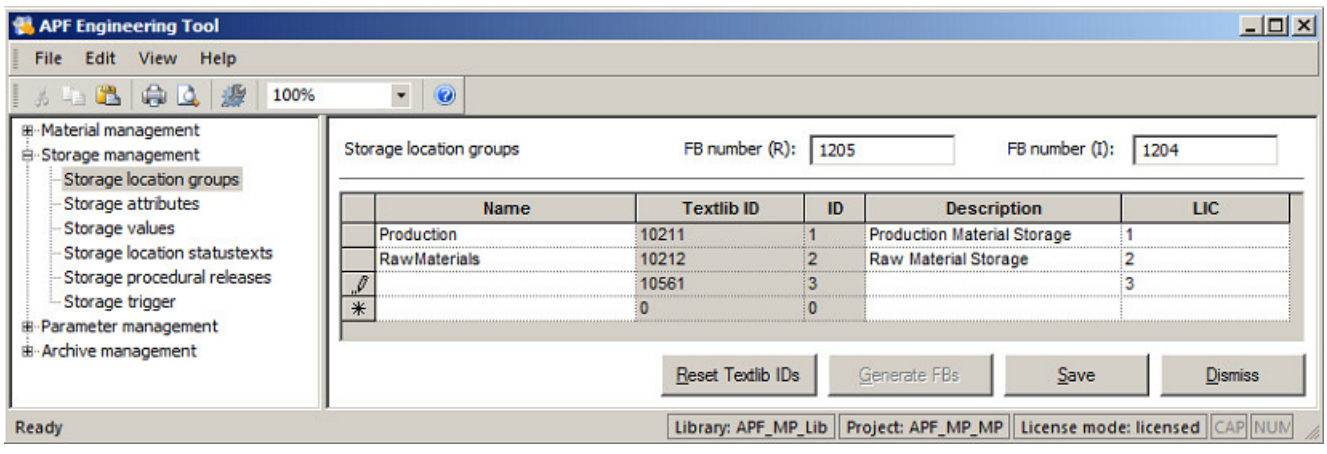
The storage location groups are displayed in a selection list in the process picture.



Creating storage location groups

To create a storage location group, follow these steps:

1. Open the storage location management in the navigation area of the APF engineering tool.
2. Select the "Storage location groups" group.
   All defined storage location groups are displayed in the working area.
3. Enter the numbers of the function blocks to be generated in the "FB Number (R)" and "FB Number (I)" fields.



Note

Block numbers FB1775-1795 are reserved for APF blocks and must not be overwritten.

4. Click in the empty row of the table in the working area and specify the following properties:

Column	Explanation
Name	Name of the storage location group
TXTLIB	ID for multilingual management in the text library (non-editable; assigned automatically)
Description	Description of the storage location group
LIC	Location identifier of the storage location group

5. Click the "Save" button.

The storage location group is created.

Editing storage location groups

To edit the properties of a storage location group, follow these steps:

1. Select the "Storage location groups" group in the navigation area of the APF engineering tool.
   All defined storage location groups are displayed in a table in the working area.
2. Click in the row of the storage location group to be edited and make the required changes.
3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting storage location groups

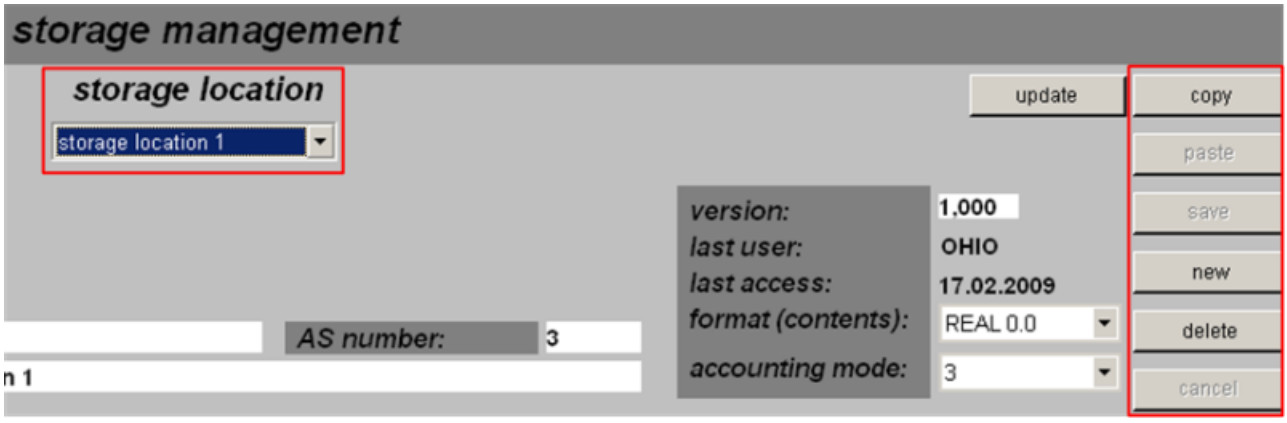
To delete a storage location group, follow these steps:

1. Select the "Storage location groups" group in the navigation area of the APF engineering tool.
2. Select the row of the storage location group to be deleted in the working area.
3. Select the "Delete row" command in the "Edit" menu.

The storage location group is removed.

6.3 Storage locations

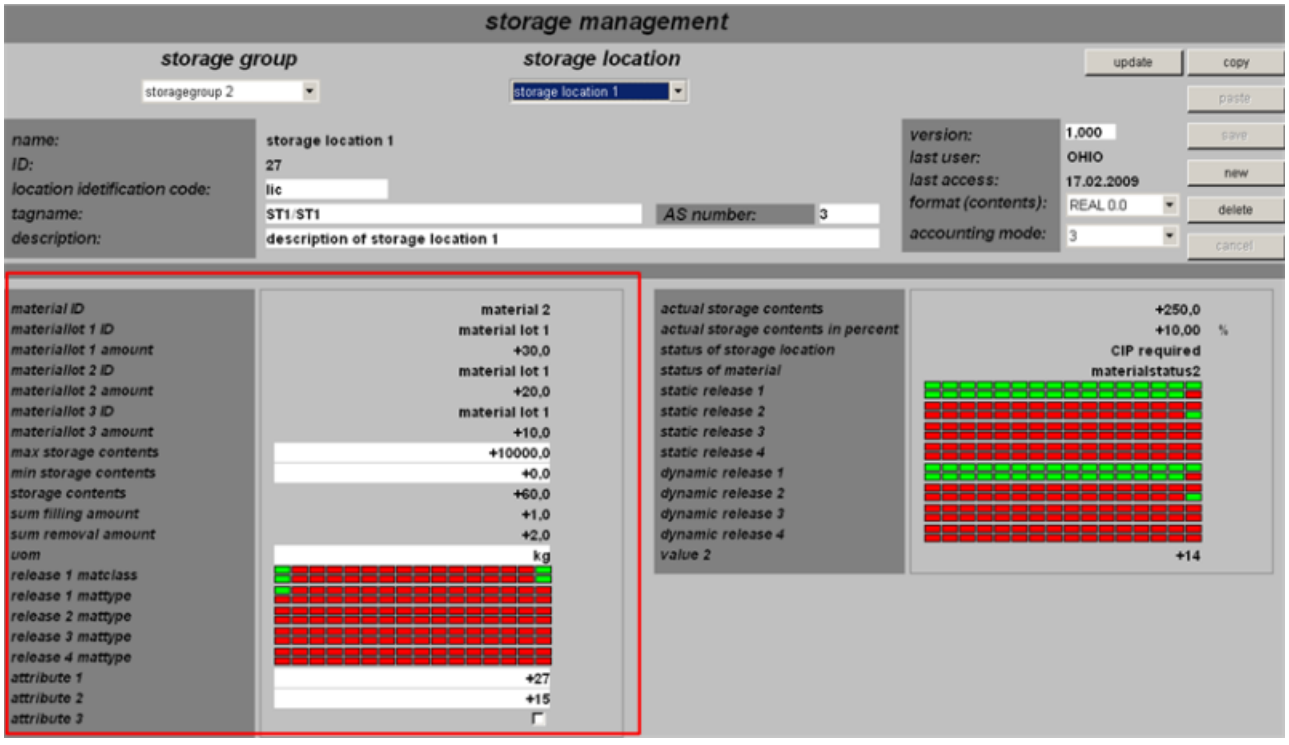
You create and edit the storage locations in Runtime using the "FB_STOR_ED.PDL" process picture. Each storage location is assigned to a storage location group. The created storage locations are stored in the "FB_STORAGE" user archive.



6.4 Storage attributes

With the help of the APF engineering tool, you can define up to 50 storage attributes. An output is created for each attribute when the function blocks are generated for the storage management. The attribute data are saved in the "FB_STORATTRIB" user archive.

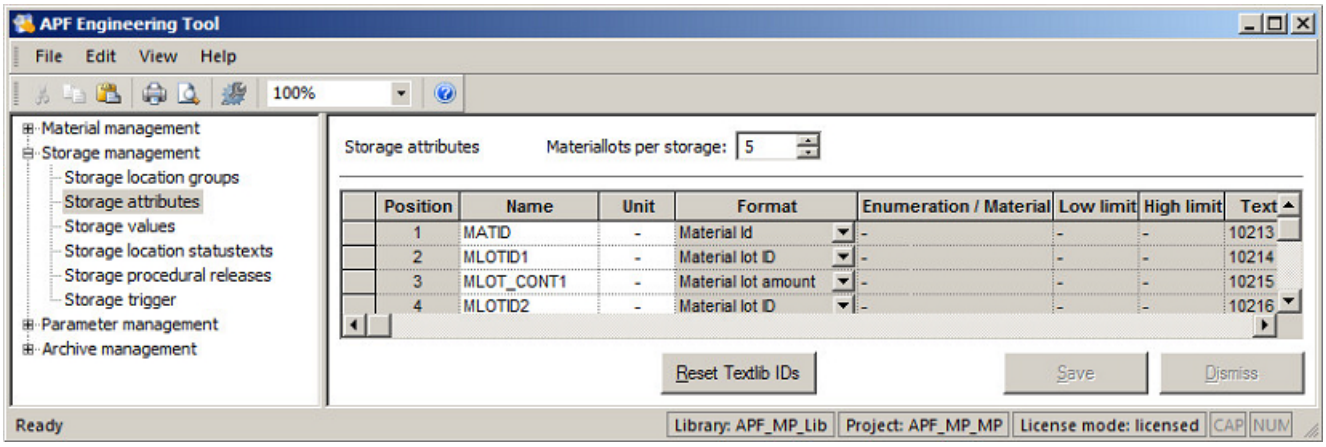
The storage location attributes are displayed and can be assigned with values for each selected storage location in the process picture.



Creating attributes

To create an attribute, follow these steps:

1. Select the "Storage attributes" group in the navigation area of the APF engineering tool.
2. Specify the number of material lots permitted per storage location.
   If this setting is subsequently modified, the corresponding function blocks must be created again.



3. Click on the last row in the working area and specify the following properties:

Column	Explanation
Pos	Position in the visualization order
Name	Name of the attribute
UoM	Unit of the attribute
Format	Format of the attribute
Enum_Mat	Name/coding of an enumeration The "ENUM_MAT" field can only be selected if you have set "ENUMERATION" or "Material" as the format of the attribute. You can create enumerations in SIMATIC Manager under "Global Declarations".
Low limit	Lower operator control limit for numerical values
High limit	Upper operator control limit for numerical values
TXTLIB	ID for multilingual management in the text library (non-editable; assigned automatically)
FCT_IO_BLOCK_NAME	Name of the output in the AS function block
Visible	You can use the "Visible" check box to specify whether the attribute is displayed in the process picture.
Overview	Position of column in the "FB_STOR" overview picture
Width	Width of column in the “FB_STOR” overview picture in pixels

4. Click the "Save" button.

Editing attributes

To edit the attributes, follow these steps:

1. Select the "Storage attributes" group in the navigation area of the APF engineering tool. All defined attributes are displayed in the working area.
2. Click in the row of the attribute to be edited and make the required changes.
3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting attributes

To delete an attribute, follow these steps:

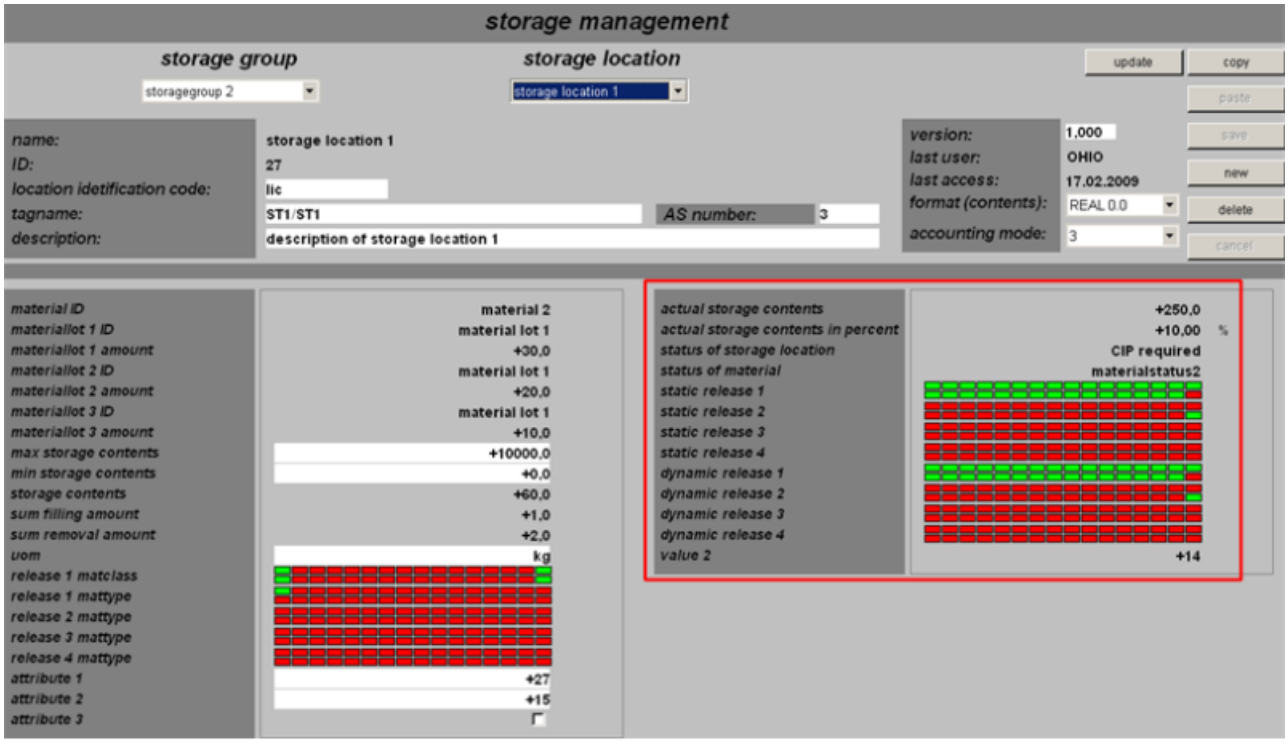
1. Select the row of the attribute to be deleted.
2. Select the "Delete row" command in the "Edit" menu.

The attribute is removed.

6.5 Storage values

With the help of the APF engineering tool, you can define up to 50 storage values. An input is created for each actual value when the function blocks are generated for the storage management. The actual values are saved in the "FB_STORVALUE" user archive.

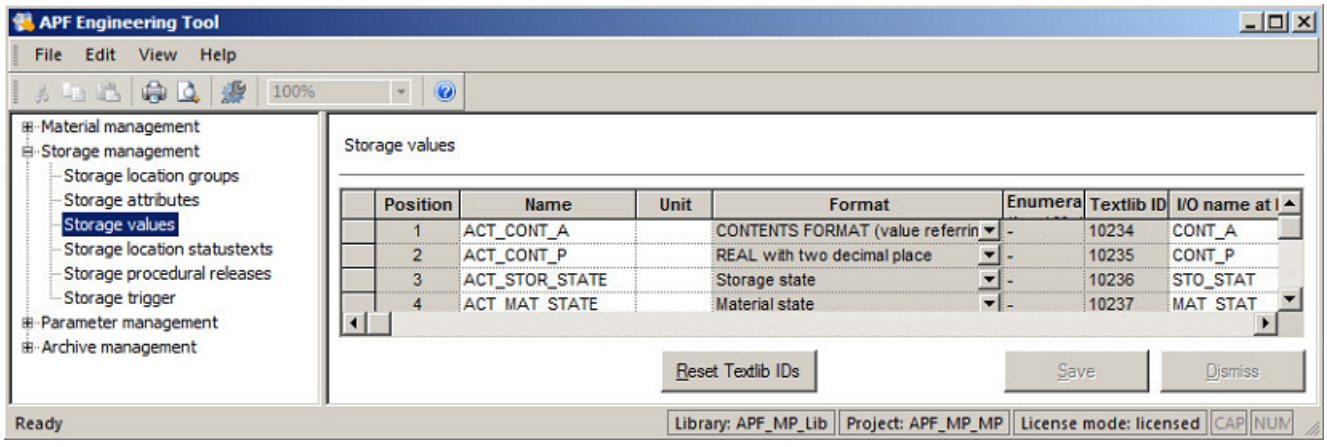
The actual values are called and displayed in the process picture, depending on the selected storage location.



Creating actual values

To define an actual value, follow these steps:

1. Select the "Storage values" group in the navigation area of the APF engineering tool. All defined values are displayed in the working area..



2. Click on the last row in the working area and specify the following properties:

Column	Explanation
Pos	Position in the visualization order
Name	Name of the actual value
UoM	Unit of the actual value
Format	Format of the actual value
Enum_Mat	Name/coding of an enumeration The "ENUM_MAT" field can only be selected if you have set "ENUMERATION" or "Material" as the format of the attribute. You can create enumerations in SIMATIC Manager under "Global Declarations".
TXTLIB	ID for multilingual management in the text library (non-editable; assigned automatically)
FCT_BLOCK_IO_NAME	Name of the input in the AS function block
Visible	You can use the "Visible" check box to specify whether the value is displayed in the process picture.
Overview	Position of column in the "FB_STOR" overview picture

3. Click the "Save" button.

Editing actual values

To edit defined actual values, follow these steps:

1. Select the "Storage values" group in the navigation area of the APF engineering tool. All defined values are displayed in the working area..
2. Click in the row of the value to be edited and make the required changes.
3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting actual values

To delete an actual value, follow these steps:

1. Select the row of the value to be deleted.
2. Select the "Delete row" command in the "Edit" menu.
3. The value is removed from the working area.

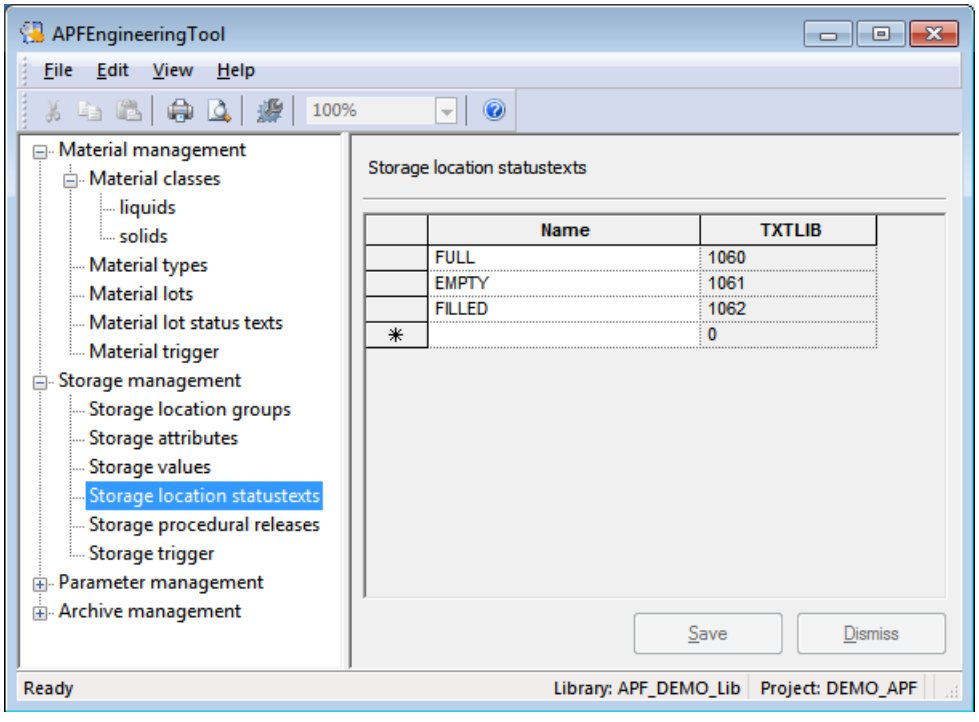
6.6 Storage location status texts

With the help of the APF engineering tool, you can define various status texts for the storage locations. The status texts are displayed in the process picture and used for the storage location and material searches.

Creating status texts

To define status texts for the storage locations, follow these steps:

1. Select the "Storage location status texts" group in the navigation area of the APF engineering tool.
   All defined status texts are displayed in the working area.



2. Click on the last row in the working area and specify the following properties:

Column	Explanation
Name	Status text
TXTLIB	ID for multilingual management in the text library (non-editable; assigned automatically)

3. Click the "Save" button.

Editing status texts

To edit a status, follow these steps:

1. Select the "Storage location status texts" group in the navigation area of the APF engineering tool.
   All defined status texts are displayed in the working area.
2. Click in the row of the status to be edited and make the required changes.
3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting status texts

To delete a status, follow these steps:

1. Select the row of the status text to be deleted.
2. Select the "Delete row" command in the "Edit" menu.

The status text is removed.

6.7 Storage procedural releases

With the help of the APF engineering tool, you can define up to 128 procedural releases. These are saved in the "FB_PROCEDURES" user archive.

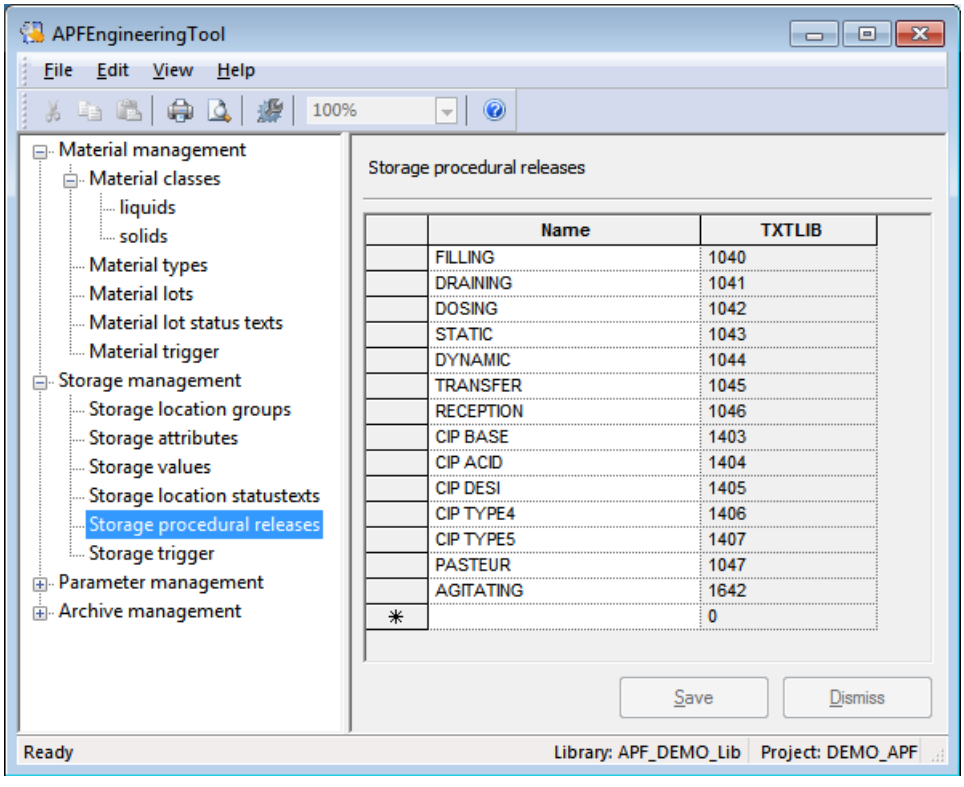
The representation of the release fields in the process picture corresponds to a 32-bit integer value:

Each release occupies one single bit in the 32-bit integer value.

Creating procedural releases

To define a procedural release, follow these steps:

1. Select the "Storage procedural releases" group in the navigation area of the APF engineering tool.
   All defined procedural releases are displayed in the working area.



2. Click on the last row in the working area and specify the following properties:

Column	Explanation
Name	Name of the procedural release
TXTLIB	ID for multilingual management in the text library (non-editable; assigned automatically)

3. Click the "Save" button.

Editing procedural releases

To edit a procedural release, follow these steps:

1. Select the "Storage procedural releases" group in the navigation area of the APF engineering tool.
   All defined procedural releases are displayed in the working area.
2. Click in the row of the procedural release to be edited and make the required changes.
3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting procedural releases

To delete a procedural release, follow these steps:

1. Select the row of the procedural release to be deleted in the working area.
2. Select the "Delete row" command in the "Edit" menu.

The procedural release is removed.

6.8 Storage trigger

You can configure triggers for data backup operations. These start the backup of user archive data at defined intervals.

The following triggers are used for backing up the configuration data of the storage management.

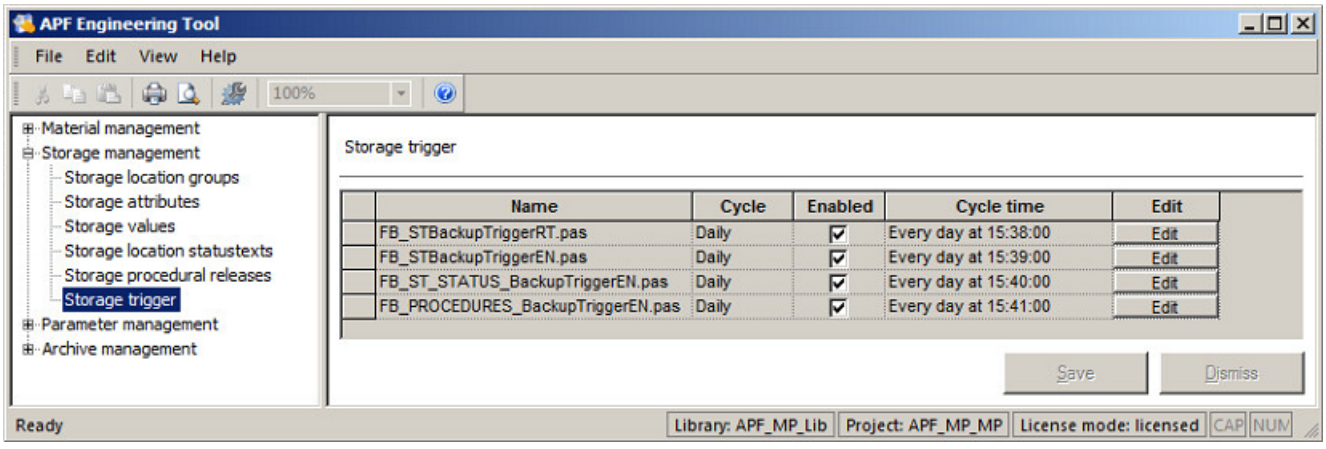
Trigger	Function
FB_STBackupTriggerEN.pas	Triggers backup of the configured storage location data.
FB_PROCEDURES_BackupTriggerEN.pas	Triggers backup of the configured procedural releases.
FB_ST_STATUS_BackupTriggerEN.pas	Triggers backup of the status texts.

The "FB_STBackupTriggerRT.pas" trigger is used for backing up the runtime data of the storage management.

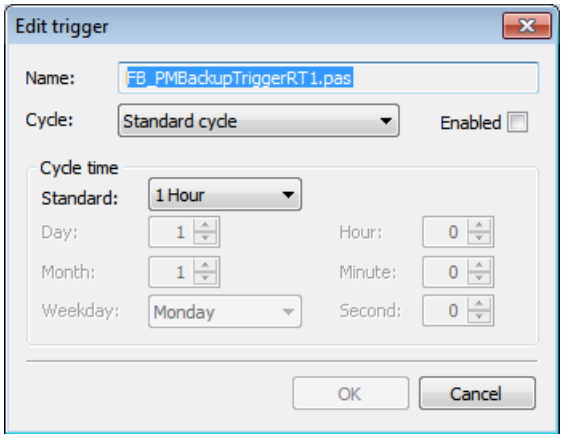
Configuring a trigger

To configure a trigger with the APF engineering tool, follow these steps:

1. Select the "Storage trigger" group in the navigation area of the APF engineering tool.
   The storage triggers are displayed in the working area.



2. Click the "Edit" button in the row of the required trigger.
   The "Edit trigger" dialog opens.



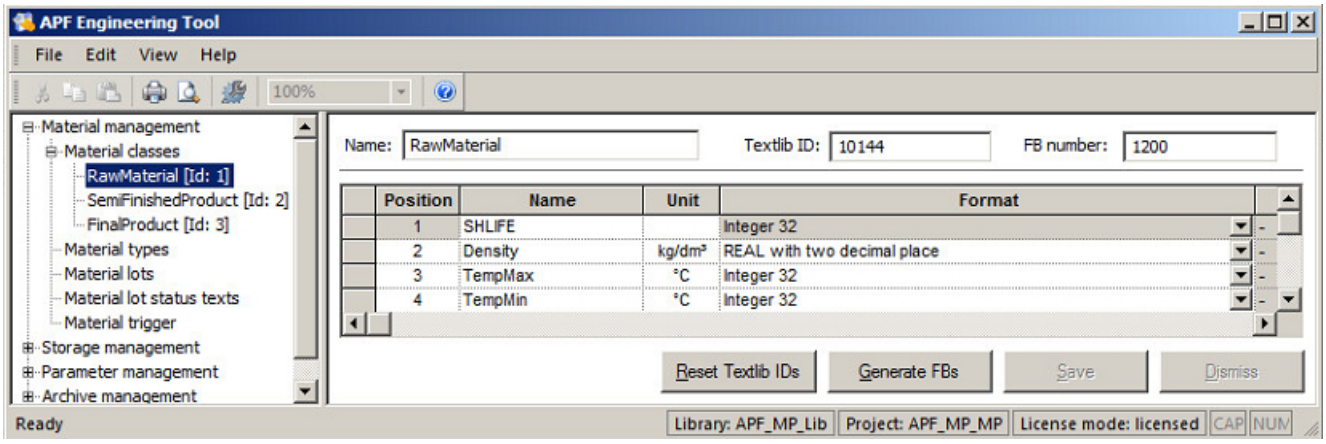
3. Configure the following properties of the trigger:

Area/check box	Explanation
Name	Name of the trigger (non-editable)
Cycle	Intervals for executing the actions in runtime: Standard cycle Hourly Daily Weekly Monthly Annually
Enabled	Activation of the trigger
Cycle time	Timing for executing the trigger (depending on the cycle setting)

4. Click "OK".
5. The "Edit trigger" dialog closes.
6. Click the "Save" button in the working area of the APF engineering tool to apply the changes.
7. Click the "Dismiss" button in the working area of the APF engineering tool to discard the changes.

6.9 Generating an AS function block

Following configuration of the storage management, you can generate the "FB_STORI" and "FB_STORR" function blocks using the "Generate FBs" button of the APF engineering tool.



6.10 FB_SACT function block restrictions

This block is used for updating the storage location overview screen "FB_STOR.pdl". The maximum volume of data that can be sent using raw data via the BSEND function block may be reached with this block (16230 bytes). You must therefore make sure that the user-defined columns can be displayed on the "FB_STOR.pdl" overview screen. Because 25 rows (storage locations) are displayed on the screen, each column needs 25 times the memory space in the AS function block "FB_SACT". The following table shows the memory space required for each of the various formats that can be shown on the screen. The sum of the memory space required by the maximum of ten columns must not exceed 16230 bytes.

Integer value	Format	Memory requirements
0	INTEGER 32	25 * 4 bytes = 100 bytes
1	REAL without decimal places	25 * 4 bytes = 100 bytes
2	REAL with 1 decimal place	25 * 4 bytes = 100 bytes
3	REAL with 2 decimal places	25 * 4 bytes = 100 bytes
4	REAL with 3 decimal places	25 * 4 bytes = 100 bytes
5	REAL with 4 decimal places	25 * 4 bytes = 100 bytes
10	STRING 8 characters	25 * 10 bytes = 250 bytes
11	STRING 16 characters	25 * 18 bytes = 450 bytes
12	STRING 32 characters	25 * 34 bytes = 850 bytes
13	STRING 64 characters	25 * 66 bytes = 1650 bytes
14	STRING 128 characters	25 * 130 bytes = 3200 bytes
15	STRING 14 characters (for PLM Dairy Library)	25 * 16 bytes = 400 bytes
20xx	DATE	25 * 8 bytes = 200 bytes
21xx	TIME	25 * 8 bytes = 200 bytes
22xx	DATE AND TIME	25 * 8 bytes = 200 bytes
30	BOOL	25 * 2 bytes = 50 bytes
40	ENUMERATION	25 * 4 bytes = 100 bytes
50	MATERIAL	25 * 4 bytes = 100 bytes
51	MATERIAL (release check) X	25 * 4 bytes = 100 bytes
52	MATERIAL LOT (release check) X	25 * 4 bytes = 100 bytes
53	MATERIAL LOT CONTENTS FORMAT X	25 * 4 bytes = 100 bytes
54	CONTENTS FORMAT (format-related value, cannot be modified)	25 * 4 bytes = 100 bytes
60	32BITS (material releases) X	25 * 4 bytes = 100 bytes
61	32BITS (material type releases) X	25 * 4 bytes = 100 bytes
70	CONTENTS FORMAT (format-related value, can be modified)	25 * 4 bytes = 100 bytes

Parameter management 7

7.1 Overview

The "Parameter management" APF module is used to implement automation tasks such as the following:

- Creating and managing parameter set data and their properties
- Specifying of limits and parameter set releases
- Normalizing/recalculating attribute values of the parameter sets

User archives

You can find information on the user archives of parameter management in the "Parameter management" tab of the "Settings" dialog.

Process pictures

During process control, you use the following picture objects (process pictures and faceplates) to perform operator control and monitoring of the data configured using the APF engineering tool:

Picture objects	Explanation
FB_PARAM_ED.PDL	Picture for operator control and monitoring of the parameter set data
@FB_PARAM_ED_WINDOW.PDL	Faceplate for operator control and monitoring of the attributes of the parameter sets
@PG_FB_000PA.PDL @PG_FB_000PA_OVERVIEW.PDL @PG_FB_000PA_STANDARD.PDL @PG_FB_000PA_VIEWLIST.PDL	Faceplate for displaying a parameter set loaded in the block
@FB_PARAM_WINDOW.PDL	Faceplate for operator control and monitoring of attribute limits of a parameter set loaded in the block.
FB_PARAM_ED_LIMITS.PDL	Picture for operator control and monitoring of the parameter assignment of the limits of a parameter group
@FB_PARAM_ED_LIMITS_WINDOW.PDL	Faceplate for operator control and monitoring of the attribute limits of a parameter set

Note

You can find information on the transfer of APF pictures to the PH in the section "Transferring APF process pictures to the plant hierarchy (Page 123)".

AS function blocks

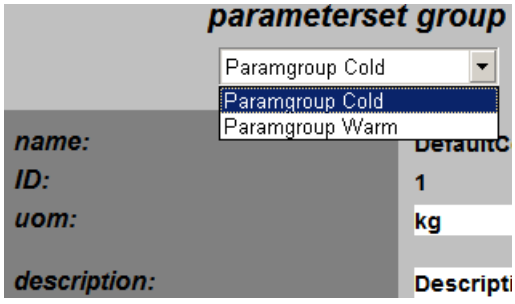
To generate the function blocks for the parameter management, the APF engineering tool uses the "FB_XXXPA" function block (FB1784) as a template. The functions of this function block include the following:

- Provision of the parameter set data in the user archive via the User Archive Read Manager in the AS
- Normalization of the parameter set data
- Transfer of the parameter set data in the AS to the user archive via the User Archive Write Manager

7.2 Parameter groups

With the help of the APF engineering tool, you can define parameter groups. A function block of type "FB_XXXPA" is generated for each parameter group. The parameter groups are saved in the "FB_PARAMGROUP" user archive.

The parameter groups are displayed in a selection list in the process picture.



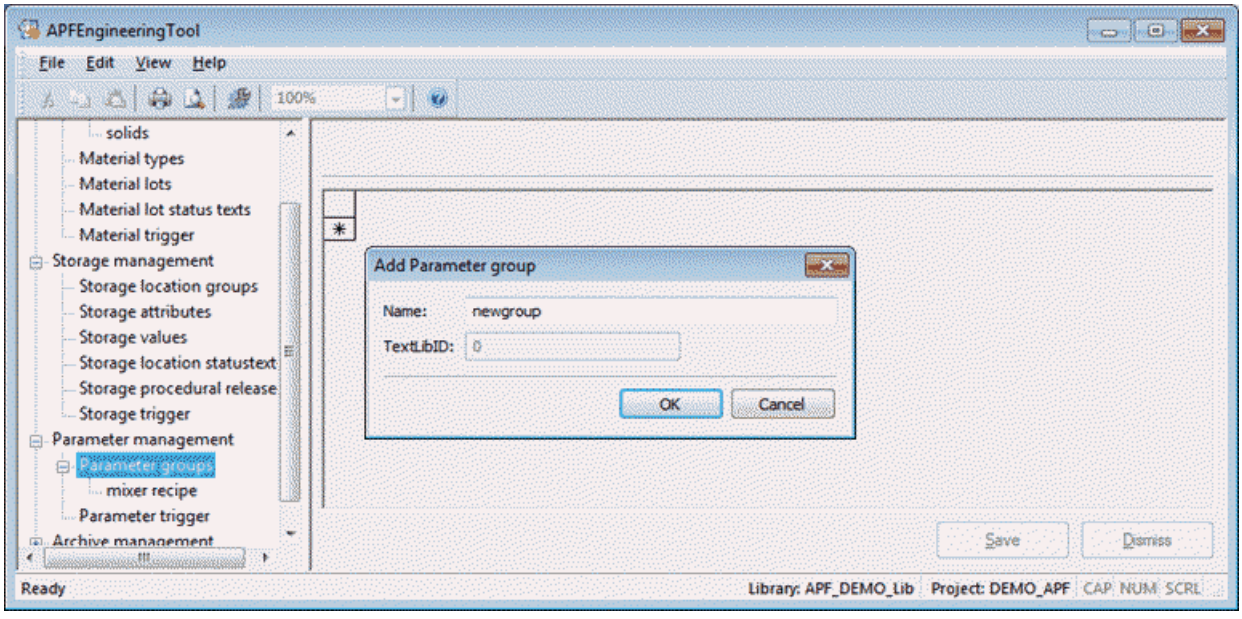
7.2.1 Creating and editing parameter groups

Creating parameter groups

To create a parameter group, follow these steps:

1. Open the parameter management in the navigation area of the APF engineering tool.
2. Select the "Parameter groups" group.

3. Select the "New" command in the shortcut menu.
   The "Add Parameter group" dialog opens.



4. Enter a name for the parameter group and click the "OK" button.
   The parameter group is created with default properties and displayed in the navigation area.

Editing a parameter group

In the working area of the APF engineering tool, you can edit the following properties of the parameter groups:

Area	Explanation
Name	Name of the parameter group
Description	Description of the parameter group
Textlib ID	ID for multilingual management in the text library (non-editable; assigned automatically)
FB number	Number of the function block that is generated for the parameter group. Block numbers FB1775-1795 are reserved for APF blocks and must not be overwritten.

To edit the properties of a parameter group, follow these steps:

1. Select the required parameter group in the navigation area.
   The properties of the selected parameter group are displayed in the working area.
2. Define the properties of the required parameter group.
3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting a parameter group

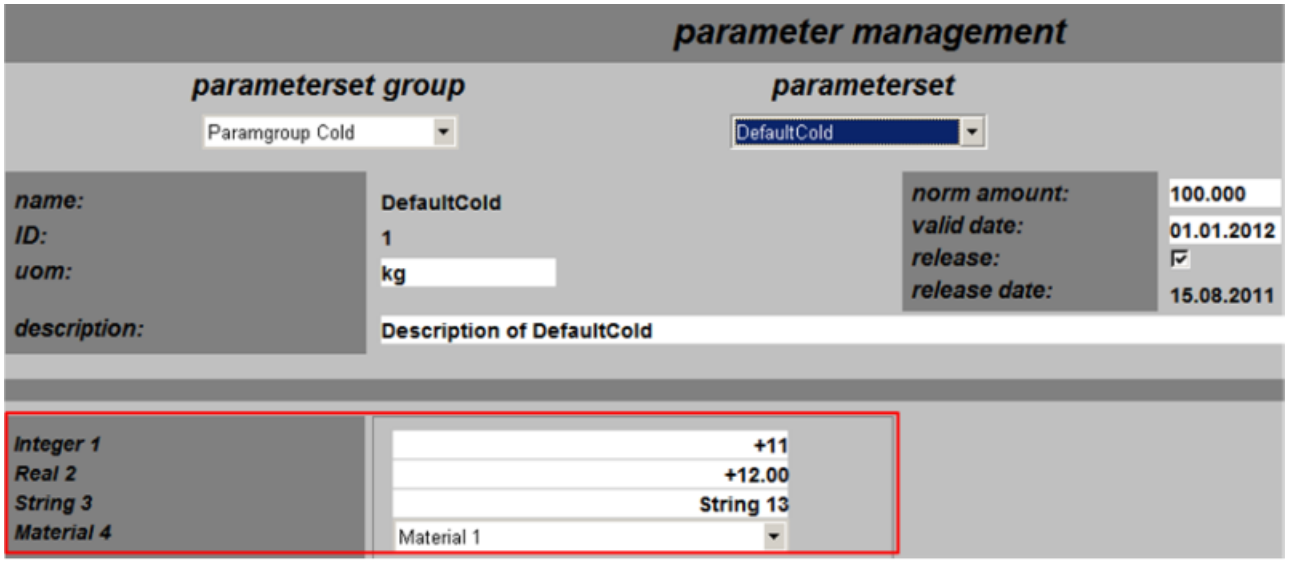
Deletion is not possible, in order to guarantee data consistency.

7.2.2 Creating and editing attributes

You can define up to 100 attributes for each parameter group. An output is created for each attribute when the corresponding function block is generated. The attribute data are saved in the "FB_PARAMATTRIB_XXX" user archives.

You can specify and edit the attribute values for each parameter set in the process pictures:

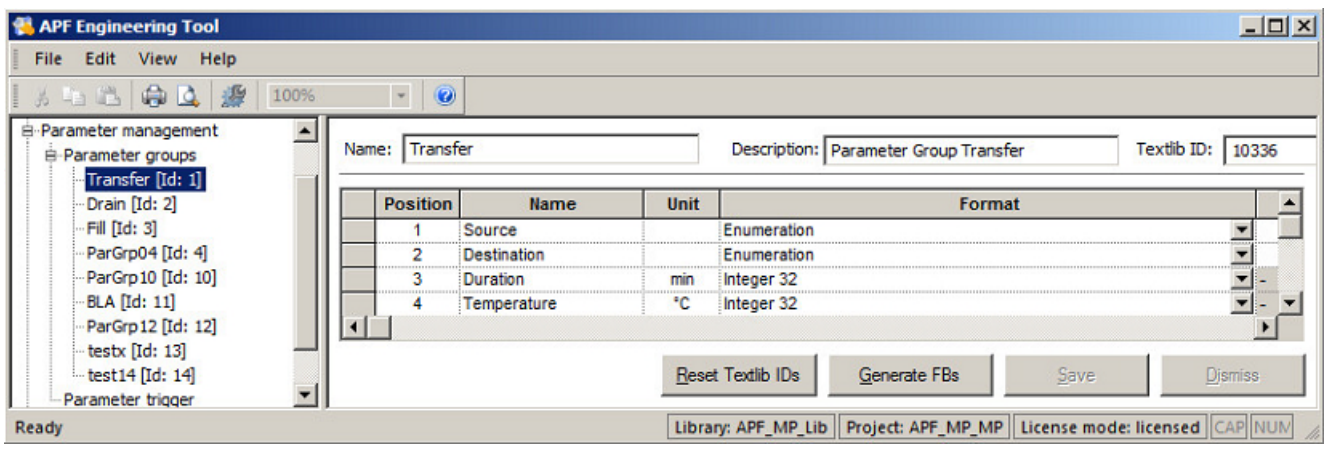
- FB_PARAM_ED.PDL



Adding new attributes to a parameter group

To add an attribute to a parameter group, follow these steps:

1. Select the required parameter group in the navigation area of the APF engineering tool. All attributes of the selected parameter group are displayed in the working area.



2. Click on the last row in the working area and specify the following properties:

Column	Explanation
Pos	Position in the visualization order
Name	Name of the attribute
UoM	Unit of the attribute
Format	Format of the attribute
Enum_Mat	Name/coding of an enumeration The "ENUM_MAT" field can only be selected if you have set "ENUMERATION" or "Material" as the format of the attribute. You can create enumerations in SIMATIC Manager under "Global Declarations".
Low limit	Lower operator control limit for numerical values
High limit	Upper operator control limit for numerical values
TEXTLIB	ID for multilingual management in the text library (non-editable; assigned automatically)
FCT_IO_BLOCK_NAME	Name of the output in the AS block
Visible	You can use the "Visible" check box to specify whether the attribute is displayed in the process picture.
Editable	You can use the "Editable" check box to specify whether the attribute can be edited in the faceplate.
Standard	You can use the "Norm" field to specify whether the attribute is normalized. The field is only editable for attributes with INTEGER or REAL format. You can find more detailed information on normalization in the section "Normalization/Recalculation (Page 103)".

1. Click the "Save" button.

Editing attributes

To edit the attributes, follow these steps:

1. Select the required parameter group in the navigation area of the APF engineering tool. All attributes of the selected parameter group are displayed in the working area.
2. Click in the row of the attribute to be edited and make the required changes.
3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting attributes

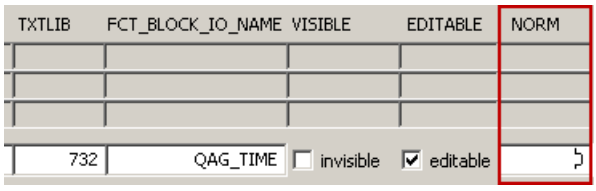
To delete an attribute, follow these steps:

1. Select the row of the attribute.
2. Select the "Delete row" command in the "Edit" menu.

The attribute is removed.

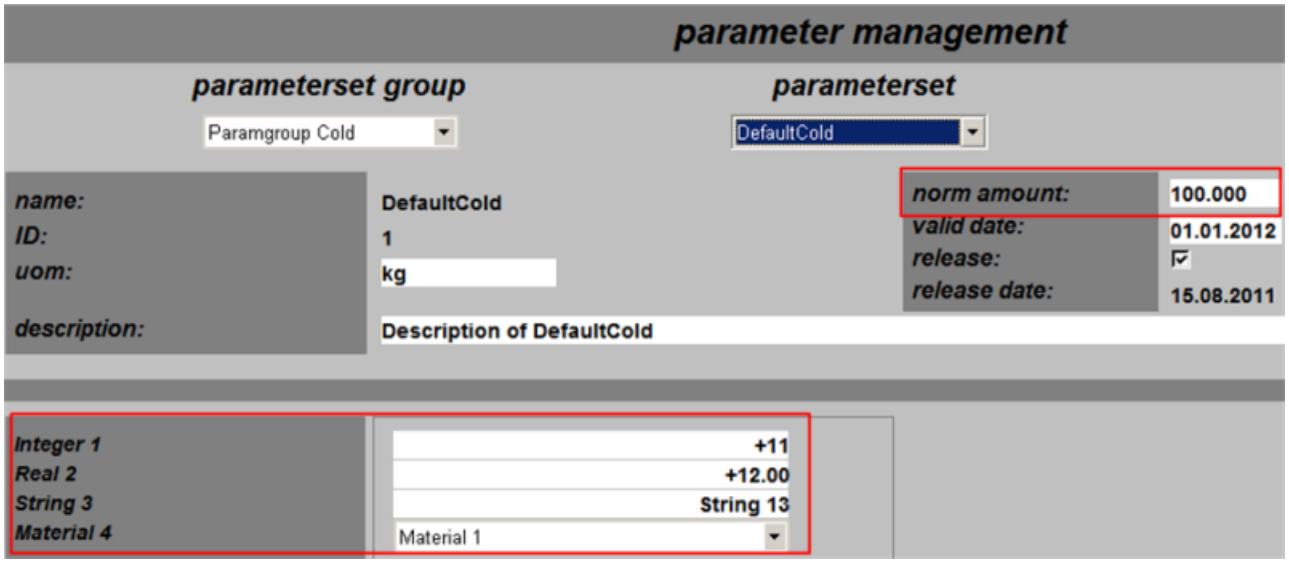
7.3 Normalization/Recalculation

With the help of the APF engineering tool, you can specify whether normalization/recalculation is performed for each attribute of a parameter group. This is specified using the "Norm" value of the attributes.



You can enter the following values in the "Norm" field:

- "Norm" = 0: No normalization/recalculation
- "Norm" = 1: Normalization/recalculation is performed according to the equations of the following functions:
  - FB_CalcValueByNormPM.fct
  - FB_ReCalcValueByNormPM.fct
    Linear normalization of the values is performed in the template.
    You specify the parameter set values that are normalized and recalculated,as well as the standard charge quantity via the process picture:



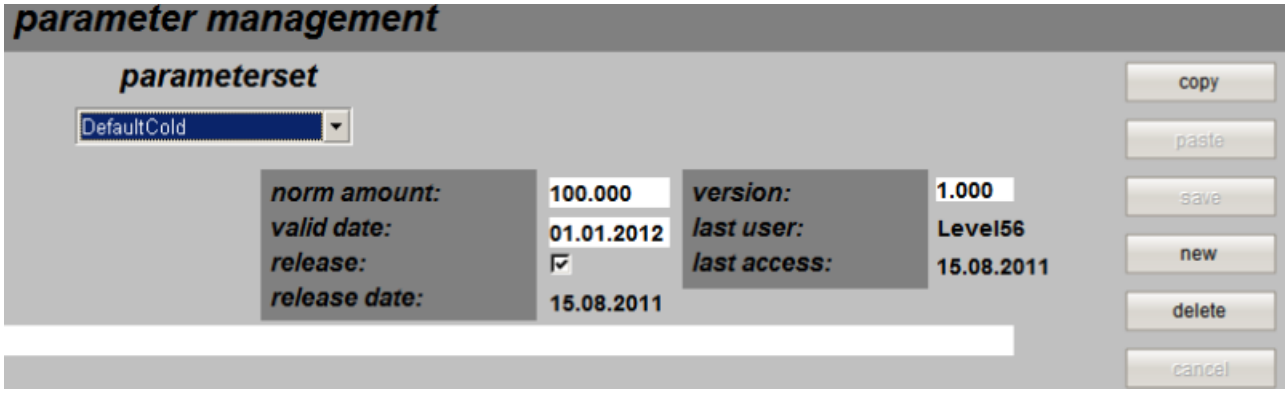
If you set the standard charge quantity to "0", the normalization/recalculation is not performed.

- "Norm" > 1: The normalization/recalculation is performed according to user-defined equations. The "FB_CalcValueByNormPM.fct" and "FB_ReCalcValueByNormPM.fct" functions must be extended appropriately for this.

The equations for "Norm" = 0 / 1 must not be changed.

7.4 Parameter sets

You create the parameter sets in Runtime using the "FB_PARAM_ED.PDL" process picture. Each parameter set is assigned to a parameter group and is defined by the values that are specified for the individual attributes of the parameter group. The created parameter sets are stored in the "FB_PARAM_XXX" user archives.



7.5 Parameter trigger

You can configure triggers for data backup operations. These start the backup of user archive data at defined intervals.

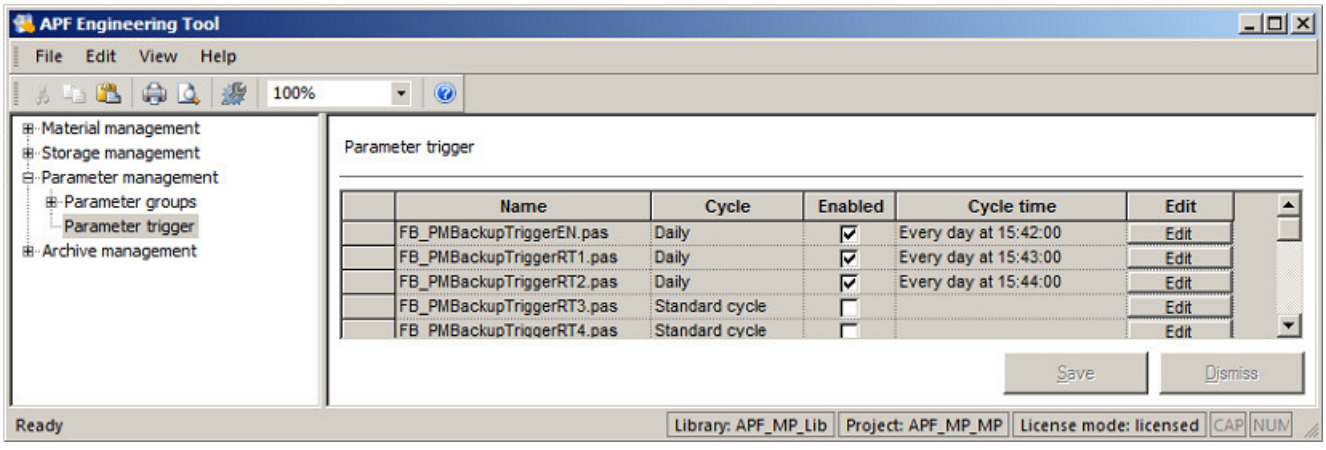
The following triggers are used for backing up the data of the parameter management.

Trigger	Function
FB_PMBackupTriggerEN.pas	Triggers backup of the configured parameter data.
FB_PMBackupTriggerRTx.pas	Triggers a backup of the runtime data. For each parameter group, a trigger is created automatically and numbered consecutively.

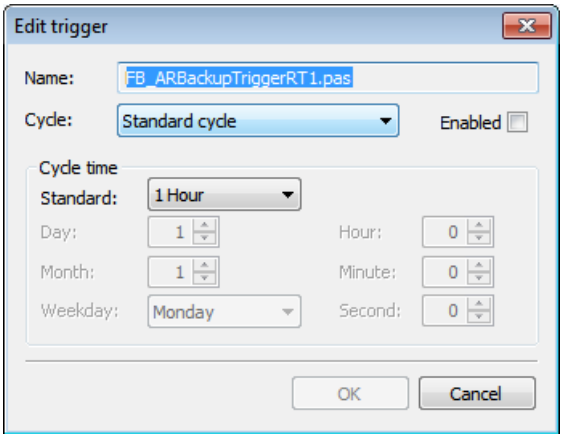
Configuring a trigger

To configure a trigger with the APF engineering tool, follow these steps:

1. Select the "Parameter trigger" group in the navigation area of the APF engineering tool. The parameter triggers are displayed in the working area.



2. Click the "Edit" button in the row of the required trigger. The "Edit trigger" dialog opens.



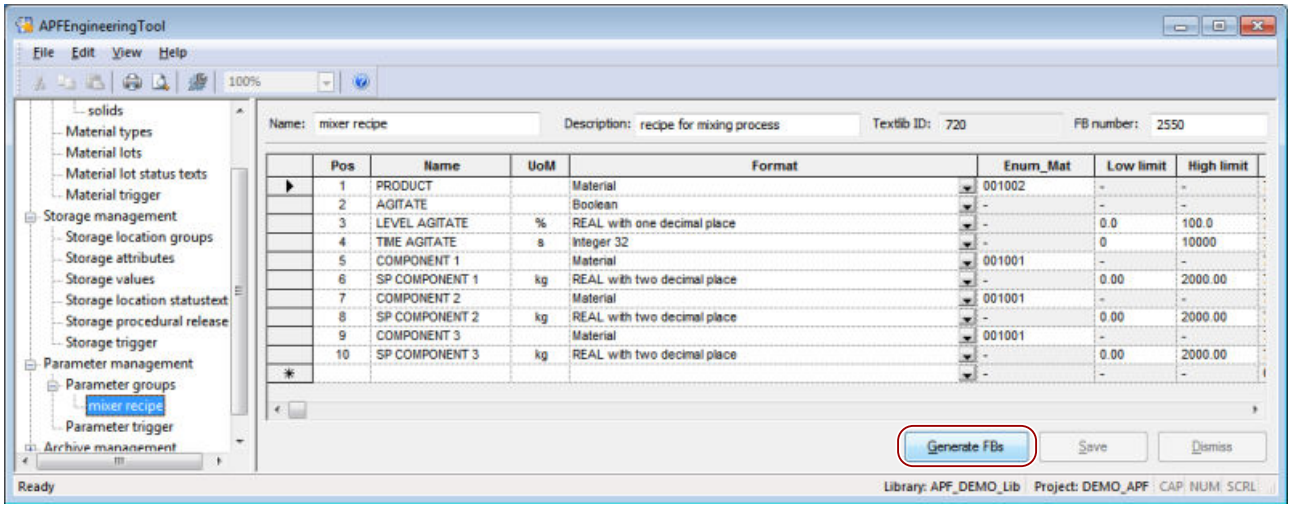
3. Configure the trigger using the following settings:

Area/check box	Explanation
Name	Name of the trigger (non-editable)
Cycle	Intervals for executing the actions in runtime: Standard cycle Hourly Daily Weekly Monthly Annually
Enabled	Activation of the trigger
Cycle time	Timing for executing the actions (depending on the cycle setting)

4. Click "OK".
5. The "Edit trigger" dialog closes.
6. Click the "Save" button in the working area of the APF engineering tool to apply the changes.
7. Click the "Dismiss" button in the working area of the APF engineering tool to discard the changes.

7.6 Generating AS function blocks

Following configuration of the parameter groups and their attributes, you can generate the corresponding function blocks using the "Generate FBs" button of the APF engineering tool.



A function block of type "FB_XXXPA" is generated for each created parameter group and stored in the master data library.

For information on the "FB_XXXPA" block and its parameter assignment, refer to the description of the "FB_XXXPA" function block.

Archive management 8

8.1 Overview

The "Archive management" APF module is used to implement automation tasks such as the following:

- Creating and updating of archiving data records
- One-time export and configurable deletion of archive data records for external post-processing

User archives

You can find information on the archive management user archives in the "Archive management" tab of the "Settings" dialog.

OS process pictures

The archive management is configured on the AS and controlled on the OS using WinCC scripts. No picture objects are needed for this module. Execution of the archive functions is triggered via the interconnected APF modules.

AS function blocks

To generate the function blocks for the archive management, the APF engineering tool uses the "FB_XXXA" function block (FB1793) as a template and generates the following function blocks for each created archive group:

Function block (FB)	Number	Function
FB_XXXAI	Specified by the "FB Number (I)" field of the APF engineering tool	Creates, updates, and deletes archive data records of format "INTEGER (32)" (for format-related numerical values)
FB_XXXAR	Specified by the "FB Number (R)" field of the APF engineering tool	Creates, updates, and deletes archive data records of format "REAL" (for format-related numerical values)

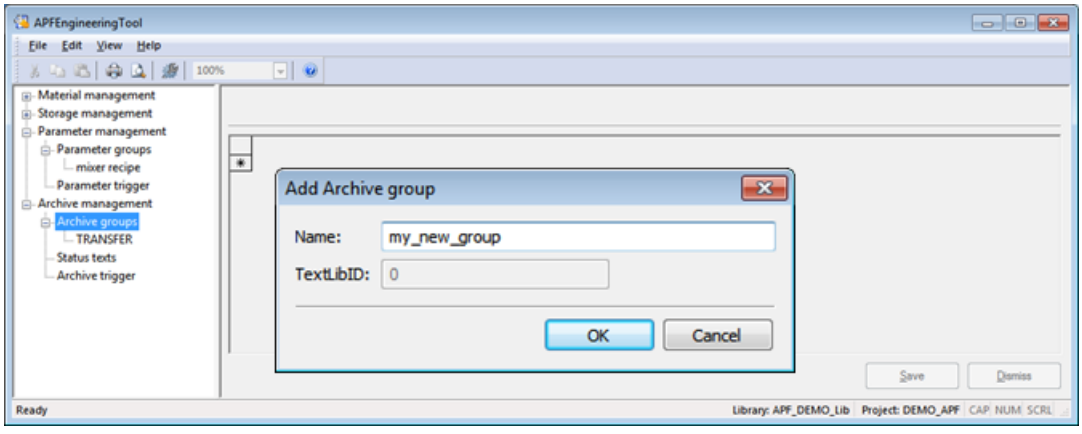
8.2 Archive groups

With the help of the APF engineering tool, you can define archive groups with different data structures. For each created archive group, the APF engineering tool generates the "FB_XXXAI" and "FB_XXXAR" function blocks.

Creating archive groups

To create an archive group, follow these steps:

1. Open the archive management in the navigation area of the APF engineering tool.
2. Select the "Archive groups" group.
3. Select the "New" command in the shortcut menu.
   The "Add Archive group" dialog box opens.



4. Enter a name for the archive group and click the "OK" button.
   The archive group is created with default properties and displayed in the navigation area.

Editing an archive group

In the working area of the APF engineering tool, you can edit the following properties of the archive groups:

Field	Explanation
Name	Name of the archive group
Description	Description of the archive group
Textlib ID	ID for multilingual management in the text library (non-editable; assigned automatically)
FB number (I)	Number of the function block that is generated for the archive data records in format "INTEGER (32)". Block numbers FB1775-1795 are reserved for APF blocks and must not be overwritten.
FB number (R)	Number of the function block that is generated for the archive data records in format "REAL". Block numbers FB1775-1795 are reserved for APF blocks and must not be overwritten.

Field	Explanation
Reserve	The minimum number of data records (free capacity) in the archive below which the system starts to delete data records.
No. DS to delete	Number of archive data records to be deleted Example: • High limit = 10000 • Reserve = 100 • No. DS to delete = 200 At least 200 data records are deleted as soon as the number of data records reaches or exceeds 9900. After deletion, there are still 9700 data records in the archive.
Type	You can create archive groups of the following types: Batch related: Predefined batch-related values are assigned automatically in the archive group. Editing of these values is restricted. The remaining values can be freely defined by the user. Freely definable: All values of the archive group can be freely defined.
Export method	You can select one of the following methods for exporting the archive data records: Data export with deleting and MES Data export with deleting without MES Data export without deleting with MES Data export without deleting without MES Data management as circular archive Deleting of data with maximum archive size
Export path 1	First path for data export
Export path 2	Second path for data export (optional)

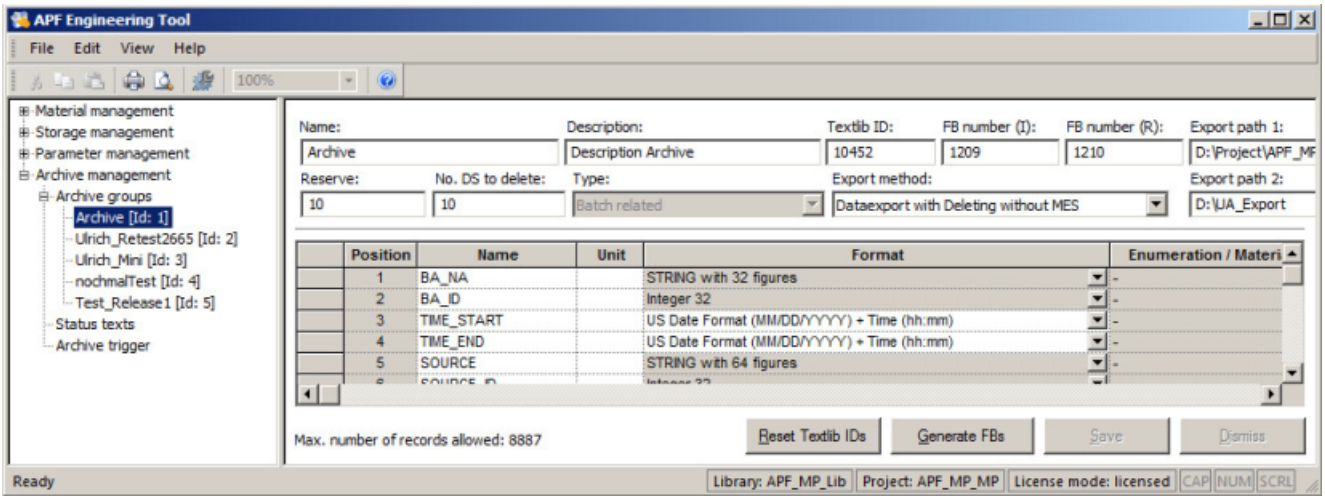
Note

Export = one-time export of selected data records to an external CSV file and deletion of these data records using a specified export method

Backup = complete backup of all data records in a user archive in an external CSV file

To edit the properties of an archive group, follow these steps:

1. Select the required archive group in the navigation area.
   The properties of the selected archive group are displayed in the working area.



2. Edit the properties of the archive group.
3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting archive groups

Deletion is not possible, in order to guarantee data consistency.

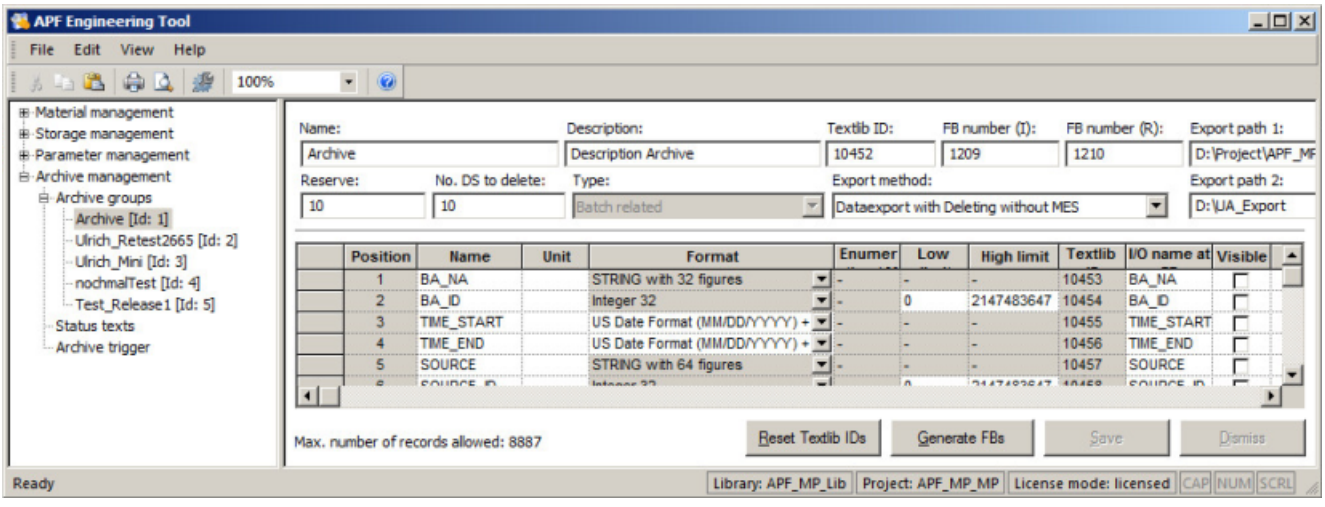
8.3 Archive values

You can assign up to 100 values to each archive group. For batch-related archiving, 25 default values are created automatically.

Creating archive values

To create values for an archive group, follow these steps:

1. Select the required archive group in the navigation area of the APF engineering tool. All defined values of the selected archive group are displayed in the working area.



2. Specify the following properties:

Column	Explanation
Pos	Position
Name	Name of the value
UoM	Unit of the value
Format	Format of the value
Enum_Mat	Name/coding of an enumeration The "ENUM_MAT" field can only be selected if you have set "ENUMERATION" or "Material" as the format of the attribute. With "Archive enumeration", you can specify the name. You can create enumerations in SIMATIC Manager under "Global Declarations".
Low limit	Upper operator control limit for numerical values
High limit	Lower operator control limit for numerical values
TXTLIB	ID for multilingual management in the text library (non-editable; assigned automatically)
FCT_IO_BLOCK_NAME	Name of the input in the AS function block
Visible	You can use the "Visible" check box to specify whether the value is displayed in the process picture.
Description	Description of the value

3. Click the "Save" button.

Editing archive values

To edit created values, follow these steps:

1. Select the required archive group in the navigation area of the APF engineering tool. All defined values of the selected archive group are displayed in the working area.
2. Click in the row of the value to be edited and make the required changes.
3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting archive values

To delete a value, follow these steps:

1. Select the row of the value to be deleted.
2. Select the "Delete row" command in the "Edit" menu.

The value is deleted.

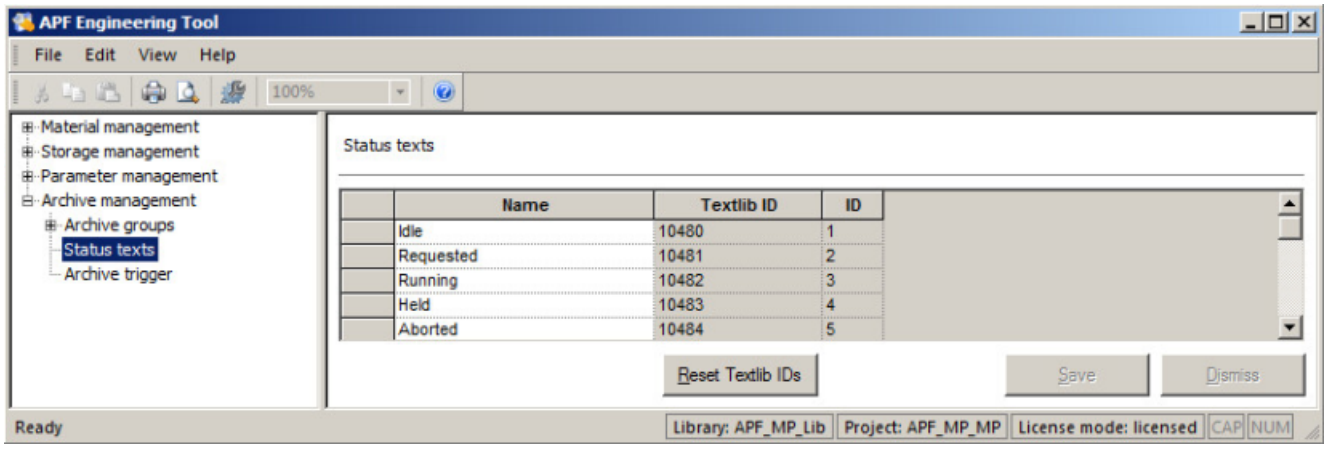
8.4 Archive job status texts

In the "Status texts" group in the navigation area of the APF engineering tool, you can define various status texts for the archive jobs.

Creating status texts

To create a status text, follow these steps:

1. Select the "Status texts" group in the navigation area of the APF engineering tool.
   All defined status texts are displayed in the working area.



2. Click on the last row in the working area and specify the following properties:

Column	Explanation
Name	Status text
TXTLIB	ID for multilingual management in the text library (non-editable; assigned automatically)

3. Click the "Save" button.

Editing status texts

To edit a status text, follow these steps:

1. Select the "Status texts" group in the navigation area of the APF engineering tool.
   All defined status texts are displayed in the working area.
2. Click in the row of the status text to be edited and make the required changes.
3. Click the "Save" button to save the changes.
4. Click the "Dismiss" button to discard the changes.

Deleting status texts

To delete a status text, follow these steps:

1. Select the row of the status text.
2. Select the "Delete row" command in the "Edit" menu.

The status text is removed from the working area.

8.5 Archive trigger

You can configure triggers for the export and backup operations. These start the backup of user archive data at defined intervals.

The following triggers are used for backing up the configuration data of the archive management.

Trigger	Function
FB_ARBackupTriggerEN.pas	Triggers backup of the configuration data.
FB_JOB_STATUS_BackupTriggerEN.pas	Triggers backup of the job status texts.
FB_DeleteMarkedRecordsTrigger.pas	When using MES, triggers the deletion of records read.

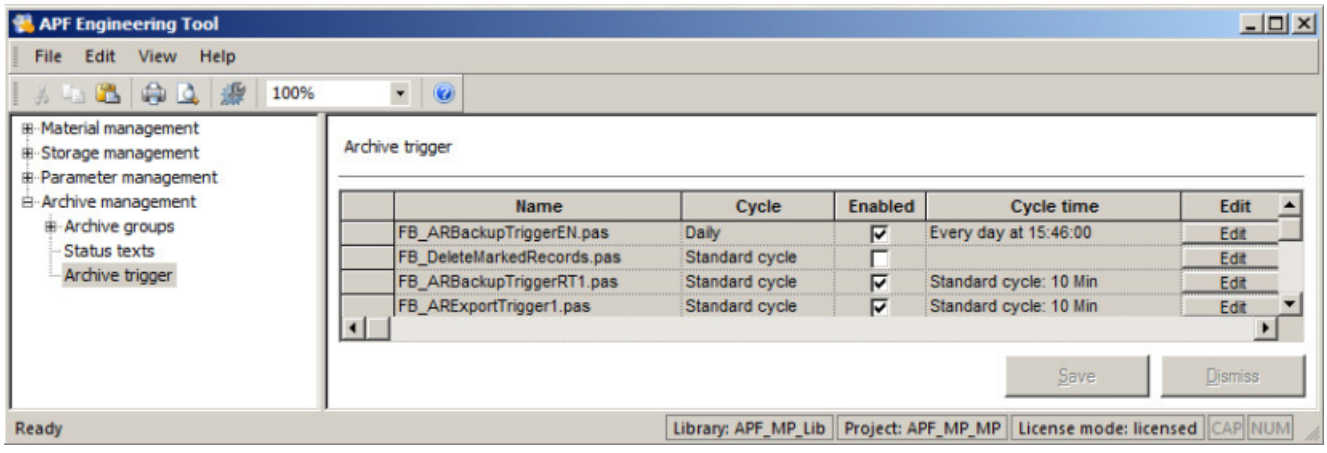
For each created archive group, the following triggers are automatically created and consecutively numbered:

Trigger	Function
FB_ARBackupTriggerRTX.pas	Triggers backup of the runtime data.
FB_ARExportTriggerX.pas	Triggers export of the data according to the specified method.

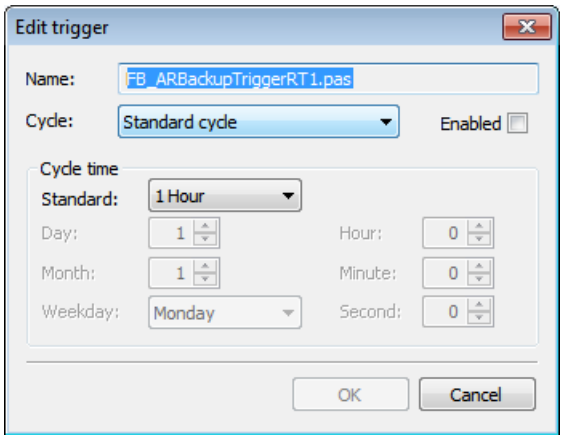
Configuring a trigger

To configure a trigger, follow these steps:

1. Select the "Archive trigger" group in the navigation area of the APF engineering tool.
   The archive triggers are displayed in the working area.



2. Click the "Edit" button in the row of the required trigger.
   The "Edit trigger" dialog opens.



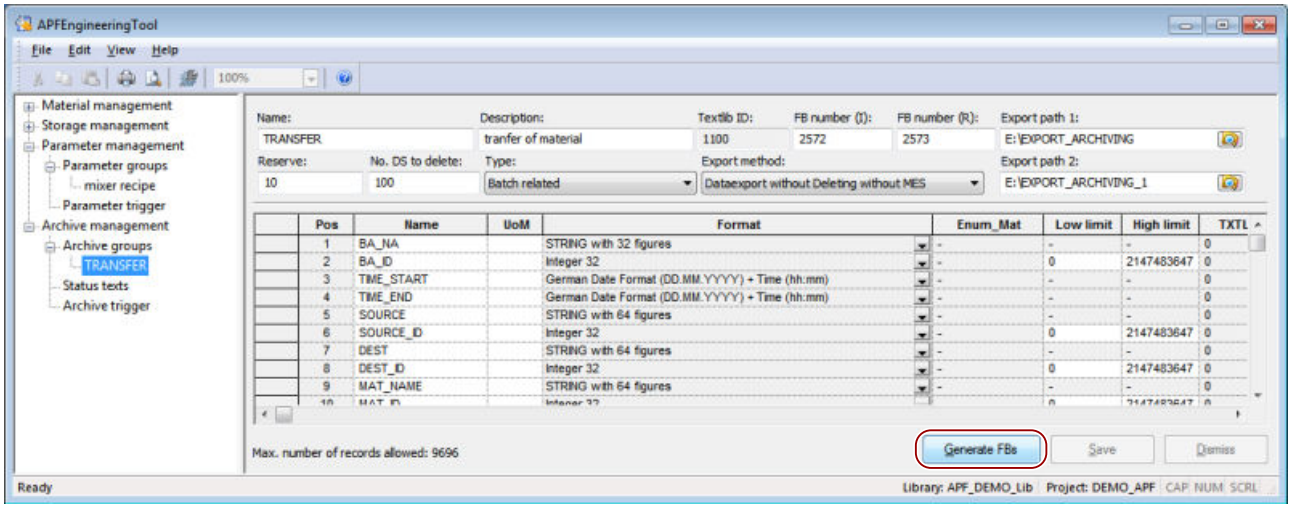
3. Configure the trigger using the following settings:

Area/check box	Explanation
Name	Name of the trigger (non-editable)
Cycle	Intervals for executing the actions in runtime: Standard cycle Hourly Daily Weekly Monthly Annually
Enabled	Activation of the trigger
Cycle time	Timing for executing the actions (depending on the cycle setting)

4. Click "OK".
5. The "Edit trigger" dialog closes.
6. Click the "Save" button in the working area of the APF engineering tool to apply the changes.
7. Click the "Dismiss" button in the working area of the APF engineering tool to discard the changes.

8.6 Generating AS function blocks

Following configuration of the archive groups and their values, you can generate the associated function blocks using the "Generate FBs" button of the APF engineering tool.



Additional steps for configuring 9

9.1 Running the APF Integrator

Following configuration with the APF engineering tool, the APF Integrator must be run in all OS projects to transfer the configured data to the entire project level.

Note

The file FB_Configuration.ini is transferred automatically from the Engineering Tool. Thus it is not imperative that the APF Integrator is run in the case of changes that do not exclusively affect the .ini file.

Exception: On first creating a material class, parameter group, or archive group, the Integrator must be run because only then will the relevant images be copied into the project.

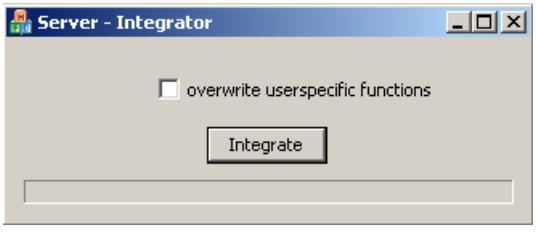
Requirement

- WinCC Explorer is open.

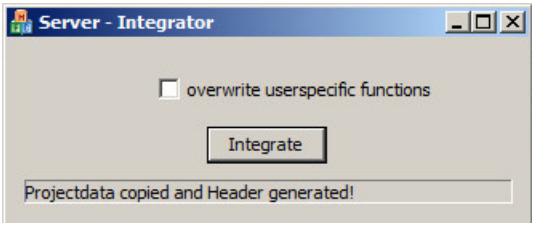
Procedure

To run the APF Integrator, follow these steps:

1. Select the "APF engineering tools" object in the navigation area of WinCC Explorer.
2. Select the "Integrator" command in the shortcut menu.
   The "Server - Integrator" dialog opens.



3. Click the "Integrate" button.
4. Close the "Server - Integrator" dialog after the APF Integrator has been run successfully.



Note

If the "Overwrite user-specific functions" check box is selected, the following functions are overwritten in the FB_UA_USER_SPECIFIC subfolder:

- FB_ReCalcValueByNormPM.fct
- FB_GetFilterAndSortValues.fct
- FB_ConvertUOM.fct
- FB_CalcValueByNormPM.fct

9.2 Transferring APF process pictures to the plant hierarchy

Preconfigured WinCC objects (process pictures and faceplates) are available for operator control and monitoring of the APF modules on the OS. To assign the process pictures to the corresponding hierarchy folders of the PH, these folders must be imported into the component view of SIMATIC Manager.

The picture objects for the individual APF modules can only be transferred once the modules have been configured with the APF engineering tool.

Requirement

- The component view of SIMATIC Manager is open.

Procedure

To assign the APF process pictures to the plant hierarchy, follow these steps:

1. Select the OS in the component view of your multiproject.
2. Select the "Import WinCC objects" command in the shortcut menu.
   The process pictures are imported and displayed in the component view.
3. Select the process pictures and move them from the component view into the required hierarchy folder of the PH using a drag-and-drop operation while simultaneously pressing the <Shift> key.

Note

The process pictures may be available in different versions. For example, the material lot editor (.pdl picture) available by default as FB_MAT_LOT_ED (recommended for resolution 1280x1024), is also additionally available as FB_MAT_LOT_ED-1920 optimized for 1920x1080 resolution and an improved form. Please use the pictures that best match the resolution selected in the "WinCC Explorer OS Project Editor".

An advantage of the new material editor in high resolution (FB_MAT_ED-1920) is the built-in function for convenient material search.

9.3 Automatically transferring changes of user archives

Objective

Changes to groups, classes, parameters, and attributes made with the engineering tool usually produce new or modified tables, table columns, and contents in user archives. This initially only happens on the engineering station (ES). To avoid the manual export and import of user archives and archive contents, APF has a function for automatic transfer to the OS.

Handling changes

The engineering tool detects changes that affect the user archives. It then automatically exports the metadata archives to the <Project directory>\Library\APF\Metadata folder when function blocks are saved or generated.

When the OS is loaded, the metadata are automatically transferred and entered in the FB_MetaDataReloaded user archive for monitoring.

Applying changes

On the OS, the APFEngineeringDataLoader.exe program searches for new metadata files and integrates them into the existing user archives after a backup. The engineering tool enters the APFEngineeringDataLoader.exe program in the OS startup list.

Note

Following changes to the user archives, manual adjustments may be required before you can re-load older data backed up using mechanisms such as the "…BackupTrigger…" from user archives.

Deleting data in the case of changes

Changes made through the engineering tool may lead to structural changes in tables. Data that already exist in the affected tables are therefore deleted from the engineering tool. This will occur in the case of the following, amongst others:

- New attribute (new column in the user archive)
- Change in data type (e.g. REAL to STRING)
- Delete attribute (column in user archive is deleted)

Data will not be deleted in the case of the following, amongst others:

- Change in field size (e.g. STRING 8 to STRING 16)
- Change in attribute name

9.4 Change to the archive structure, manual data transfer

9.4.1 General information

The automatic metadata synchronization described above does not always result in obtaining the available runtime data. The engineering tool generates a corresponding warning in these cases.

In some cases, changes to existing user archives may affect the structure of the corresponding runtime archive, the content of the corresponding configuration archive and the interface of the relevant AS function block. Changes which may have this effect include adding parameters / attributes. No automatic process is currently available to deal with this. The following steps must therefore be performed manually.

Note

To avoid this type of change, it is advisable to create a number of invisible reserve parameters / attributes in advance which can then be made visible and used where necessary. This avoids the need for a complete AS download and prevents a structure change in the runtime archive.

The examples below are based on a parameter being added to parameter set group 1. Archives FB_PARAM_001 and FB_PARAMATTRIB_001 are affected accordingly. The following table shows the relationships for all other archives:

Module	Runtime archives (structure change)	Configuration archive (content change)	AS blocks (interface change)
Material management	FB_MATERIAL_xxx	FB_MATATTRIB_xxx	FB_xxxMA
Material lot management	FB_MATERIAL_LOT	FB_MATATTRIB_LOT	FB_MLOT
Storage location management	FB_STORAGE	FB_STORATTRIB / FB_STORVALUE	FB_STORI / FB_STORR
Parameter management	FB_PARAM_xxx	FB_PARAMATTRIB_xxx	FB_xxxPA
Archive management	FB_ARCHIVING_xxx	FB_ARCHVALUE_xxx	FB_xxxAI / FB_xxxAR

xxx represents the respective material class / parameter set group / archiving group to which changes are being made. In the special case of storage location management, the configuration archive for attribute changes is FB_STORATTRIB and the configuration archive for value changes FB_STORVALUE.

To perform such a change without loss of process data, the following procedure should be followed. A distinction is made between a single-user station and server/client architecture.

9.4.2 Single-user station

Requirements

- No read or write access is being performed to the archive to be changed.
- No changes have yet been made

Note

We recommend that you do not perform this procedure in runtime. Changes cannot be downloaded in runtime because an interface change is required at the AS function block. If runtime is not active, you can also be sure that there is no read or write access to the archive to be changed.

Procedure

1. Creating a backup of the multiproject
2. Export and save the content of the runtime archive FB_PARAM_001 using the user archive editor (menu, "Runtime data" -> "Export")
3. Implement change in the engineering tool.

   Note

   The function block must be recompiled after a parameter is added. This results in a structure change at runtime archive FB_PARAM_001 and the loss of the content. The content of the configuration archive FB_PARAMATTRIB_001 is also changed, as is the interface of the FB_001PA function block. You therefore need to perform a complete download of the AS.

4. Run the APF Integrator in all OS projects
5. Adapt the exported content from step 2 to the new archive structure (a new column has been added and this column has now also to be added to the CSV file). This can be done using MS Excel or a similar program.
6. Import the adapted CSV file to the runtime archive FB_PARAM_001 using the user archive editor (menu, "Runtime data" -> "Import")
7. Replace the modified AS function block FB_001PA in the multiproject
8. Compile and download AS
9. Compile the OS server project

9.4.3 Multi-user system (server / client)

Requirements

- No read or write access is being performed to the archive to be changed.
- No changes have yet been made

Note

We recommend that you do not perform this procedure in runtime. Changes cannot be downloaded in runtime because an interface change is required at the AS function block. If runtime is not active, you can also be sure that there is no read or write access to the archive to be changed.

Procedure

1. Creating a backup of the multiproject
2. Export and save the content of the runtime archive FB_PARAM_001 using the user archive editor (menu, "Runtime data" -> "Export")
3. Implement change in the engineering tool.

   Note

   The function block must be recompiled after a parameter is added. This results in a structure change at runtime archive FB_PARAM_001. The content of the configuration archive FB_PARAMATTRIB_001 is also changed, as is the interface of the FB_001PA function block. You therefore need to perform a complete download of the AS.

4. Run the APF Integrator in all OS projects
5. Export and save the modified content of the configuration archive FB_PARAMATTRIB_001 on the ES using the user archive editor (menu, "Runtime data" -> "Export")
6. Delete the content of the configuration archive FB_PARAMATTRIB_001 on the OS server using the user archive editor (activate runtime mode under "Edit" -> "Runtime data", select archive FB_PARAMATTRIB_001, and select and delete all rows)
7. Import the CSV file from step 5 to the configuration archive FB_PARAMATTRIB_001 using the user archive editor (menu, "Runtime data" -> "Import") on the OS server
8. Use the user archive editor to delete the complete FB_PARAM_001 runtime archive from the OS server (content saved in step 2).
9. Replace the modified AS function block FB_001PA in the multiproject
10. Compile and download AS
11. Compile the OS server project
12. Download OS server: The runtime archive FB_PARAM_001 deleted in step 7 is created again with the new structure in the OS project and on the OS server.

13. Adapt the exported content from step 2 to the new archive structure (a new column has been added and this column has now also to be added to the CSV file). This can be done using MS Excel or a similar program.
14. Import the adapted CSV file to the runtime archive FB_PARAM_001 using the user archive editor (menu, "Runtime data" -> "Import")

Note

Steps 2, 6, 7, 8 and 14 are performed directly on the OS server. All other steps are performed on the ES.

9.5 General information on the engineering tool

Following a structural change (for example, adding a new attribute), you should also promptly regenerate and use the block after saving. Otherwise, problems may occur due to non-matching data structures between block users archive and editor dialog.

Spaces either within or at the end of the IO name (connection name of the attribute at the block) are not allowed.

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10.1 Troubleshooting procedure

Ini file

One of the greatest sources of errors in the configuration phase is the inconsistent use of the ini file (FB_Configuration.ini). This file must be identical on each OS computer in the project. Problems can arise if some of the OS project computers are operating with a modified ini file, while others are still using an old ini file which has not been adapted to the project. In order to prevent this, the engineering tool automatically copies the ini file to the project directory.

One frequent cause of errors is the ServerPrefix entry in the ini file. It can be adapted using the engineering tool. The symbolic computer name of the OS server project must end in "::". If you can access the APF user archive in runtime using an APF faceplate on an operable OS server, but not on an OS client, the most likely reason is the wrong ServerPrefix entry in the ini file (or the wrong ini file on the OS client, in which the ServerPrefix entry is also wrong).

Text library

APF uses the text library of the OS server for multilingual management of configuration data, for example, the name of material classes. If the text library is exported during the engineering phase to simplify processing (for example, in MS Excel), you must be careful not to trigger OS compilation or open any OS project editors between exporting and importing the text library. If you do, this can cause problems because the text library might then contain entries in the wrong places.

Messages

Runtime errors are output as messages. If messages are not output or the message row is empty, check alarm logging to see whether the messages have been imported and are also available in the relevant runtime language.

User archive data

You need to distinguish between runtime data and configuration data in the user archive. In the engineering phase, a number of different archives are created and content generated using the engineering tool. This content and the archive structure are referred to as "configuration data" as they are generated on the ES during the engineering phase. If a data record (material, parameter set, etc.) is then created on an OS client or OS server during project runtime, this data record will only be available on the OS server (pair). This content can be referred to as "runtime data" because it is created in OS runtime.

This means there are two types of archives. They are listed in the table below:

Archive name	Type	Explanation
FB_MATCLASS	Configuration	List of all material classes
FB_MATTYPE_xxx	Configuration	List of material types of material class xxx
FB_MATATTRIB_xxx	Configuration	Structure of material class xxx
FB_MATERIAL_xxx	Runtime	Storage location for materials of material class xxx
FB_MATATTRIB_LOT	Configuration	Structure of the material lot table
FB_MATERIAL_LOT	Runtime	Storage location for material lots
FB_STORGROUP	Configuration	List of all storage location groups
FB_STORATTRIB	Configuration	Structure of the storage attributes
FB_STORVALUE	Configuration	Structure of the storage values
FB_STORAGE	Runtime	Storage for storage locations
FB_PARAMGROUP	Configuration	List of all parameter set groups
FB_PARAMATTRRIB_xxx	Configuration	Structure of parameter set group xxx
FB_PARAM_xxx	Runtime	Storage location for parameter sets of the parameter set group xxx
FB_PARAM_CALC_xxx	Runtime	Storage location for recalculations of parameter sets of parameter set group xxx
FB_ARCHGROUP	Configuration	List of all archiving groups
FB_ARCHVALUE_xxx	Configuration	Structure of archiving group xxx
FB_ARCHIVING_xxx	Runtime	Storage location for archiving data records of archiving group xxx
FB_PROCEDURES	Configuration	Storage location for procedures
FB_STOR_ST_STATUS	Configuration	Storage location for storage location status
FB_STOR_MAT_STATUS	Configuration	Storage location for material status

To summarize:

- Runtime archives are written during runtime.
- Configuration archives are written during the engineering phase on the ES.

To avoid the loss of runtime archives, their content is not copied with server downloads. Archive content is only copied the first time a server is downloaded (no existing OS folder in the target location). This may mean that subsequent changes to archives during the engineering phase are not applied to the server upon download.

Remedy:

1. If existing runtime databases can be overwritten in the engineering phase and no APF runtime archives have yet been filled: Delete target folder and download entire server / servers.
2. Export user archive content on the ES and import content on the server.

User archive structure

The structure (number and format of columns) of a runtime archive consists of a fixed columns component (e.g., name and ID) and a variable component. The variable column component depends on the configuration with the relevant engineering tool. For every attribute / parameter generated, a column in the correct format (integer, string, etc.) is created in the runtime archive and a row in the corresponding configuration archive (FB_yyyATTRIB_xxx or FB_yyyVALUE_xxx). For example, the runtime archive FB_MATERIAL_001, which contains materials of materials class 1, is firmly assigned to configuration archive FB_MATATTRIB_001, which saves more detailed information (row by row) on the corresponding column in the runtime archive.

This detailed information is used during runtime by the APF OS pictures and during AS / OS communication with FB_UA_RM or FB_UA_WM.

The AS function block is also created using the configuration archive.

If these two archives do not match, problems may occur during runtime. We therefore strongly advise you not to manipulate attributes manually. Attributes should only be modified using the corresponding engineering tool, which correctly adapts both of the archives affected.

Typical error messages / errors in this procedure are as follows:

- Length errors reading a data record from the AS function block indicate that the structure of the runtime archive does not correspond to the AS function block or does not correspond to the configuration archive.
- When data appear in the wrong position on the runtime screen or are saved at the wrong position in the runtime archive, this is also an indication that the runtime archive, block and corresponding configuration archive are not consistent.

10.2 Useful information on error diagnostics

AS function blocks

All APF AS function blocks have error outputs for precise diagnostics. Many blocks also have an output that provides error codes for more detailed analysis. You can find more detailed information in the block descriptions or the online help for the relevant AS function block.

Log files

Various log files are available to help you diagnose problems using APF.

Engineering tool

The engineering tool log files can be accessed at <Program Files path>\SIEMENS\WINCC \diagnose\APF_Engineering_##.txt.

Integrator

The APF Integrator log file can be accessed at <Program Files Path>\SIEMENS\WINCC \diagnose\logfile_integrator.txt

Runtime data

There are two versions of log files for runtime processes. Both files are located in the standard WinCC diagnostics directory (<WinCC installation directory>\Diagnostics) on each computer.

- APF_OS_Diag.log: This log file contains all errors which have occurred during write or read access to the user archive and which only affect the OS. This file is stored on each OS computer (OS client and OS server).
- APF_OS_AS_Diag.log: This log file contains all errors which have occurred during AS / OS communication with FB_UA_RM or FB_UA_WM. This log file is therefore only available on the OS server (or on both OS servers of a redundant OS server pair).

The log files differ from computer to computer and are not synchronized. This enables more exact error diagnostics and also helps to establish the computer on which the error was caused.

Downloading the OS project to the computer does not overwrite the log files. They therefore remain on the relevant computers for the duration of a project.

Outputs in the C console

The OS section of the APF is based on C functions that provide useful information for diagnostics in the C output window (apdiag). But because this type of troubleshooting is extremely complex, you should only use it if you are unable to find the source of the error by other means.

Activating / deactivating diagnostic messages

You can enable and disable a number of different diagnostic levels on the APF_Debug.pdl diagnostic screen:

- bDebugModul01: Enables/disables outputs in the C console
- bDebugModul02: Enables/disables diagnostics in the APF_OS_AS_Diag.log logfile
- bDebugModul03: Enables/disables diagnostics in the APF_OS_Diag.log logfile
- bDebugModul04: Enables/disables diagnostics via OS process control messages with error codes
- bDebugModul05: Not used
- bDebugModul06: Not used
- bDebugModul07: Not used
- bDebugModul08: Not used
- bDebugModul09: Not used
- bDebugModul10: Not used