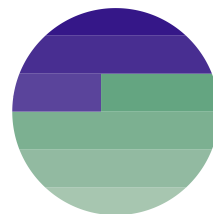


Siemens PLM Software

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thinkstep

User Guide

Integrated Material Management

Siemens PLM Software



On behalf of thinkstep AG and its subsidiaries

Document written by [IMM Core Team]

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List of Acronyms

CAD	Computer-aided Design (for instance NX)
DB	Database
GUI	Graphical User Interface
IMM	Integrated Material Management
LOV	List of Values
PDM	Product Data Management (for instance Teamcenter)
TC	Teamcenter
UI	User Interface



Introduction

The **I**ntegrated **M**aterial **M**anagement (**IMM**) is a fully integrated framework that provides interactive and user-friendly interfaces as well as a bunch of functionalities that allows handling and managing the materials information and relation context both from Teamcenter and NX.

This solution is a backbone for all Material Information. IMM can manage materials, properties, substances with a single point of access. IMM allows Teamcenter and CAD objects integration. It also designs products for compliance and sustainability.

IMM has a specific Unit Management system that can be well adapted to each client specification. IMM is very flexible with his import/export facilities.

This user guide document will go through the different features and capabilities of **IMM**.



1. IMM user interface

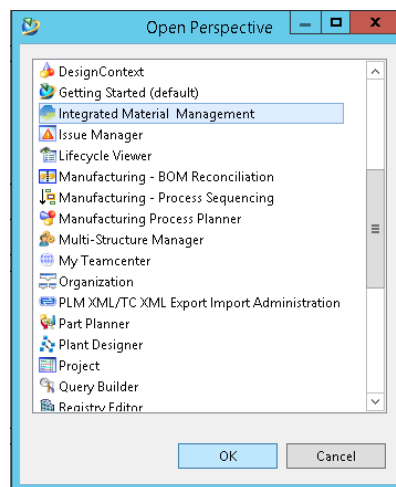
1.1. Access IMM application in Teamcenter RAC

1. To Start the IMM application in Teamcenter, select **Integrated Material Management**:

- ✓ Either from the **Navigation bar**:



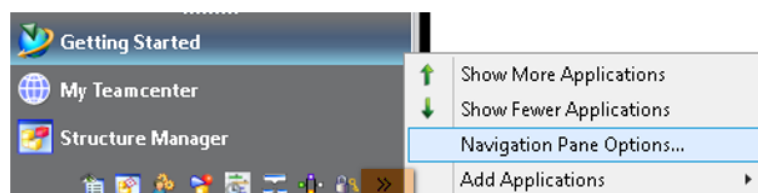
- ✓ Or from the dialog **Open Perspective** that pops up by selecting the menu item **Window→Open Perspective→Other:**



- ✓ Or select any material or material revision then **Double click** it or press right mouse button then select **Send To→Integrated Material Management**

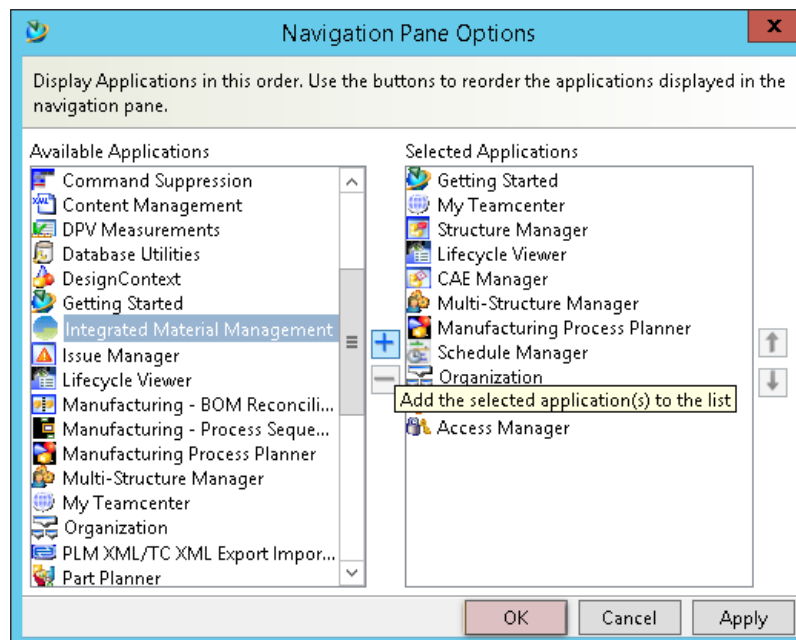


2. If the IMM application is not available in the Navigation bar it can be added via the menu item **Navigation Pane Options...**



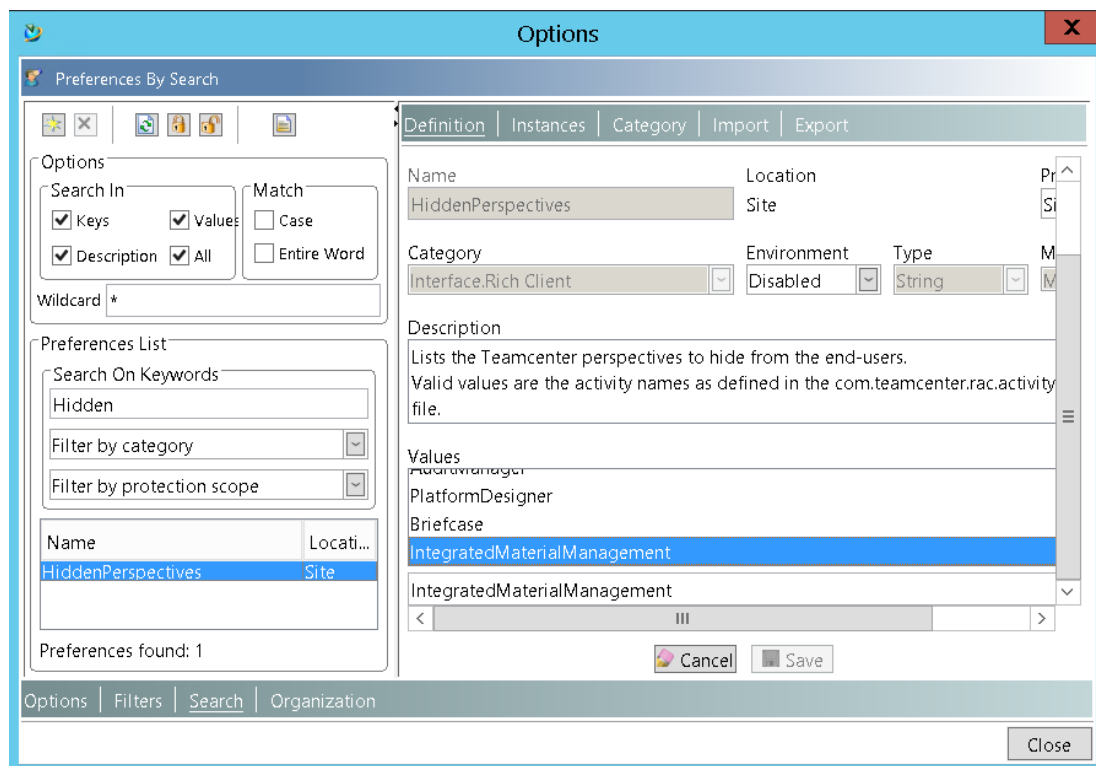


3. From the **Navigation Pane Options** dialog, select **Integrated Material Management** and add it to the right application list. It can then be moved up or down in position by using the arrows on the right-hand side.



1.2. Hide the IMM application in Teamcenter RAC

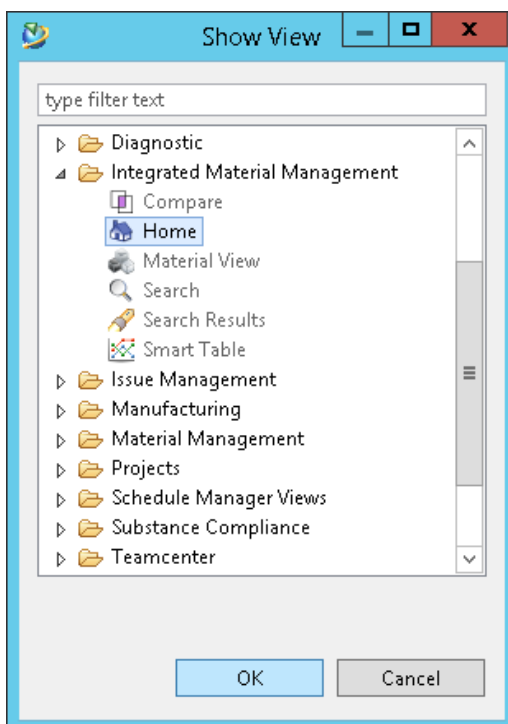
The IMM application in Teamcenter RAC could be hidden for some groups or roles, by adding the value **IntegratedMaterialManagement** to the preference **HiddenPerspectives**.



1.3. Access IMM Views

1. The IMM application has different views that help managing materials. If one of these views is closed, it can be made visible again through the menu **Window→Show View→Other...**, by selecting the needed view from the **Integrated Material Management** section.

Note: IMM Views can also be displayed in the other Teamcenter perspective like **My Teamcenter**.



1.4. Set user roles

Changing roles for IMM is performed through from the IMM application, the same way as in **My Teamcenter** application through the menu **Edit→User Settings**.

The roles that are allowed to **create**, **import** and **manage** materials in IMM are listed by the administrator in the Teamcenter preference **MATERIALMGMT_material_creator_roles**.

One of the basic roles is **Material Analyst**, this role is needed to **create/import** new materials, manage and **release** them.

Notes:

- ✓ If extra Teamcenter **Display Rules** or Access Control Lists (**ACL**) are defined for IMM objects, they **apply** even if the role is set to the preference.
- ✓ **Only** the administrator (for instance Material Analyst) should configure the site **session unit objects**.



2. Searching Materials in IMM

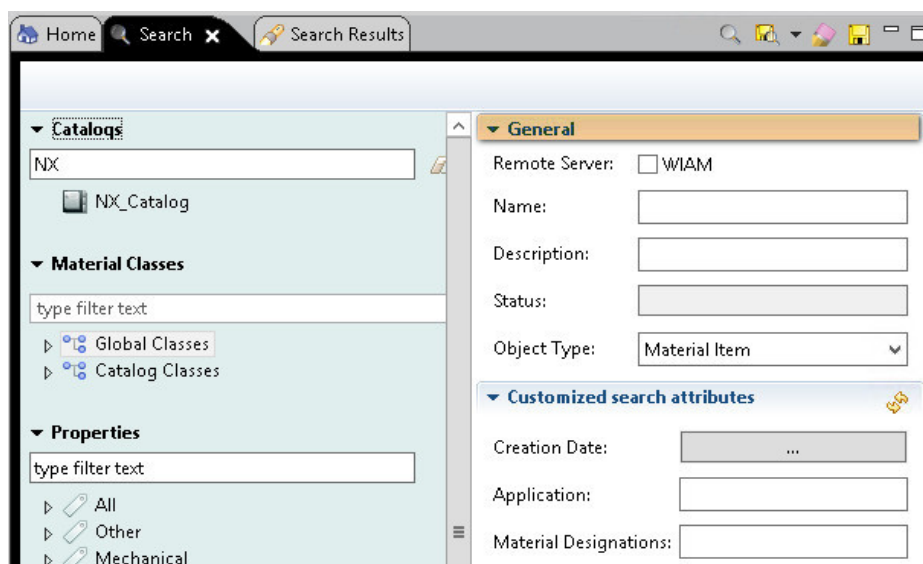
2.1. Material Search Overview

IMM provides a complete interactive search functionality that allows to filter and narrow down the search for materials based on a variety of search criteria:

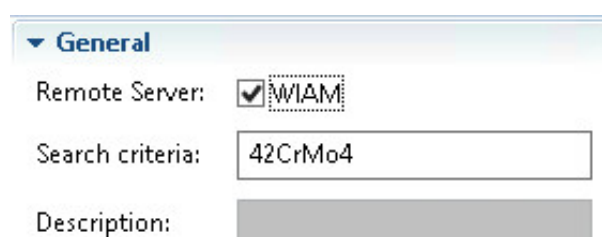
1. The **Search View** provides 2 vertical panels where it is possible to **drag** any criteria object, from the left panel and **drop** it to the right one. For instance, **Catalog**, Material **Class**, **Substance** or Material **Parameter**.
2. Dragging any object from the left and dropping it to the right panel will create a specific section.
3. All section trees in the left side panel has a filter by name capability.
4. The right panel of the **Search view** has some default search attributes (**TC properties** which are persistent on the material revision) like Name, Description and Status put in one default section called **General** section.

Note: To differentiate between a material property & TC property refer to **Material Properties** chapter

5. To search based on more material revision persistent TC properties, the search view provides also an extra dynamic section called Customized search attributes.

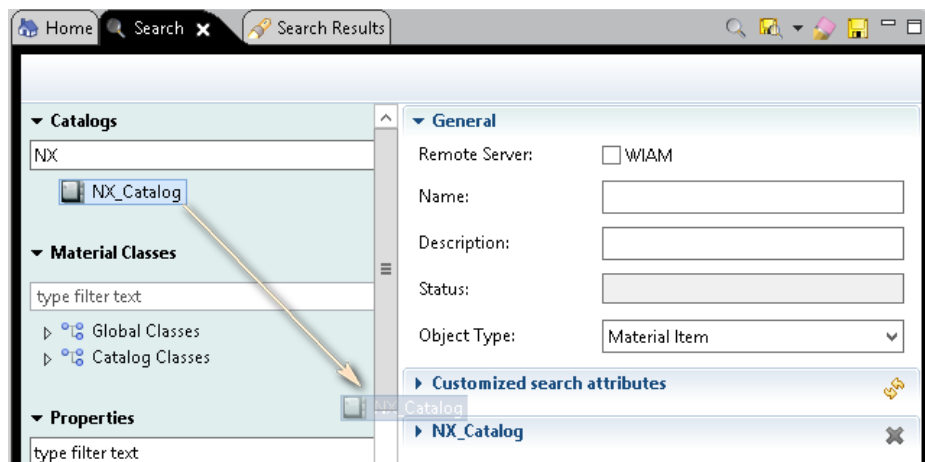


6. If the WIAM feature is activated (refer to **WIAM Materials** section for more details) the first general search option in the right side panel will be a checkbox to distinguish between the Search in **Teamcenter Database** or in **WIAM server data source**

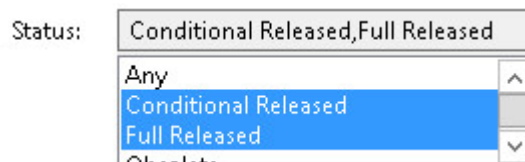


2.2. Main Search Criteria

1. If the WIAM checkbox is **checked** refer to **WIAM Materials** section.
2. If the WIAM checkbox is **unchecked** the Search will be executed exclusively in **TC database**.
3. If the **Name** is empty or has less than **3** characters, without considering the wildcards "*", then the **Catalog** is **mandatory** as search criteria. In this case one Catalog must be dragged **prior** to any other additional search criteria.
4. **Selecting** a catalog in the left panel will automatically **update** the **Catalog Classes** tree as well as the **Properties** tree/section with the objects related to that Catalog.
5. To search for materials based on a **catalog**, **drag** the selected catalog, for example **NX_Catalog**, from the left panel and drop it on the right search parameter area.

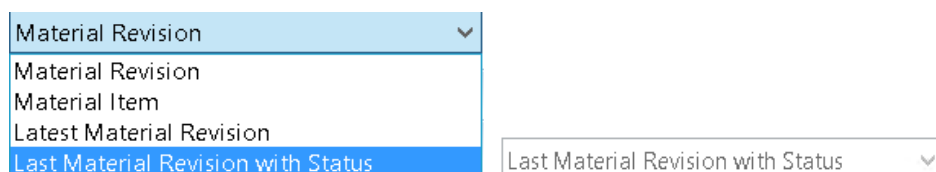


6. Trying to drag and drop a different Catalog will clear all the search criteria and reset it to the new dropped Catalog, a message dialog will pop up for confirmation.
7. The **Status** will shrink the search, according to the **release status** of the materials revisions, multiple release statuses could be selected at a time by keeping the Keyboard **Ctrl** key pressed while selecting.





8. If the list is enabled, in order to search based either on **Material item**, **Material Revision**, **Latest Material Revision** or **Last Material Revision with Status** level, select the level needed from the combo box **Object Type**.

If the list is disabled, the search will be based only on **Last Material Revision with Status**.



Note: The enablement of the search level is dependent on the group full name, whether it is available in the preference **IMM_MATERIAL_SEARCH_ALL_TYPES_GROUPS** or not.

9. To **execute** the search, press the magnifying glass  button.
10. To **clear** all search criteria including the added sections, press the eraser  button.



2.3. Customized Search Attributes

In addition to the default **General** section, IMM gives the ability to search based on Material revision persistent Teamcenter attributes (**No runtime properties**) of type **Date**, **String**, **Integer**, **Double** or **Boolean**. The attribute could be also attached to a classic **LOV** of those types or any tag **objects**.


Customized search attributes

Creation Date:

Application:

Material Designations:

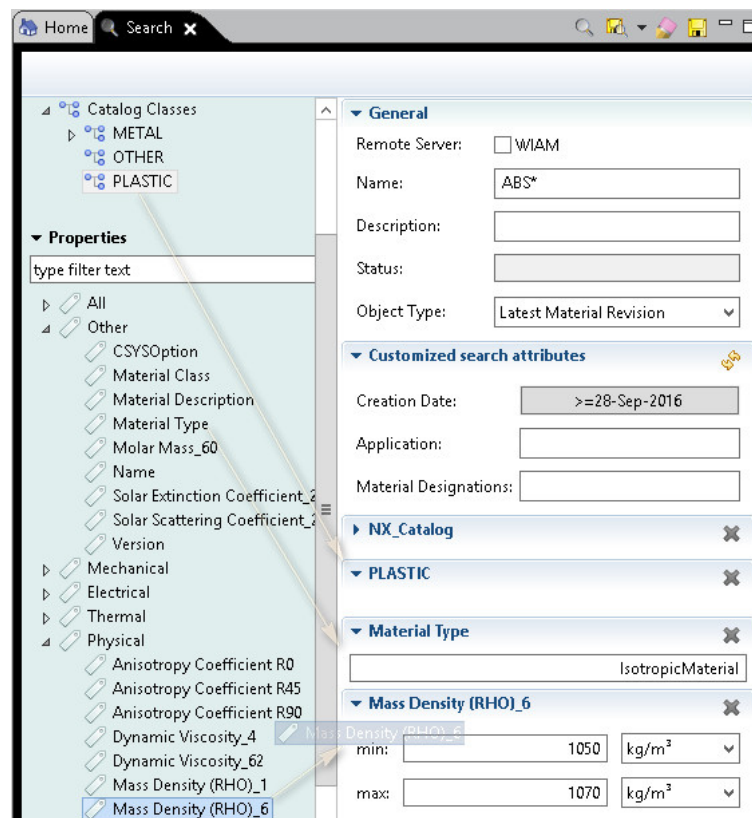
The customized search attributes are maintained through the Teamcenter preference **IMM_SEARCH_MATREV_CUSTOM_ATTR** which has **user** protection scope. For **site** and **group** scopes only, the administrator can edit this preference. For more details on how to handle the custom search preference refer to the IMM_Admin_Guide in Teamcenter Preference chapter.

If the preference is modified for any scope, no Teamcenter restart is needed, instead press the **reload** button  on top-right of the section to update the list of customized search attributes.

2.4. Search by Material Class

1. To search for materials based on **Catalog Classes**, drag **first** the owning **Catalog** then the **Material class** to the right panel.
2. To search for materials based on **Global Classes**, which are catalog independent, select and drag a **global material class** to the right panel (see screenshot below).
3. Multiple material classes could be selected for search.

Note: To see the difference between **Catalog Class** and **Global Class** refer to Material Class section.



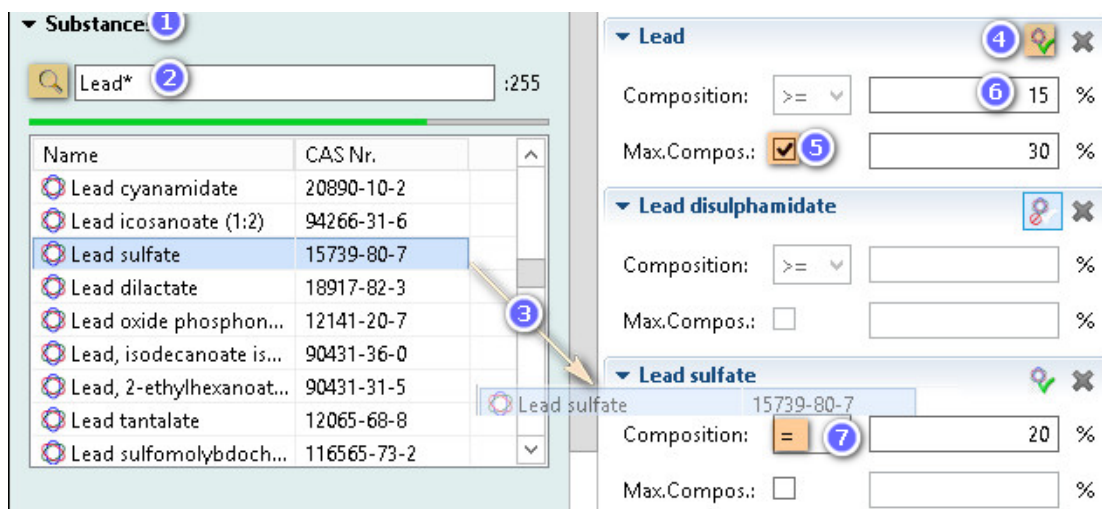




2.5. Search by Property


1. To search for materials based on specific property descriptor, drag **first** the owning **Catalog** then the desired property descriptors, for example **Mass density**, to the right side search panel.
2. If the property is of type **string** the section will have only one Text entry (see previous screenshot).
3. If the property is of type **double/float** the corresponding Section will be created with 2 entries Min/Max as well as the corresponding Units (see previous screenshot).
4. Multiple property descriptors could be selected for search, but **No** search based on Smart **Table** properties is possible.
5. The IMM search engine will find out all Materials revisions that have properties which property descriptors are selected as search criteria and with the required values (see previous screenshot).

2.6. Search by Substance

1. To search for materials based on specific Substances, go to **Substances** section in left panel of the **Search View**.
2. Search for the desired substances by **Name** or **CAS** number. The * wildcard is allowed.
3. If the substances are found, **drag** the needed substance and **drop** it to the right panel.



4. Each dragged and dropped substance will have a search section where to decide about the kind of search, composition value or composition range. Each section has a toggle button that could be used like follow:
 - ✓ By default the toggle button is green  this allows to search for all materials that has this substance with the given values.
 - ✓ If the toggle button is pressed, its icon turns to red sign  and all section fields are disabled. This allows to search for all materials that have substances **but** or **except** this substance.

5. If the toggle button is not pressed  the section fields are enabled. This gives the ability to search:

- ✓ Based only on **Composition** value with **equal**, **greater** or **smaller than** operators.
- ✓ Based on the range **Composition** and **Max Composition** range, for that the checkbox highlighted by nb 5 in the screenshot above should be selected to activate the Max Composition field.

Notes:

- ✓ For performance reason IMM does not fetch the substances at IMM startup.
- ✓ Multiple substances could be selected for search, an AND operation is applied.
- ✓ The Substances are not dependent from any Catalog.
- ✓ Searching for materials based on substances will neglect/ignore the materials that have no substance attached during search operation.

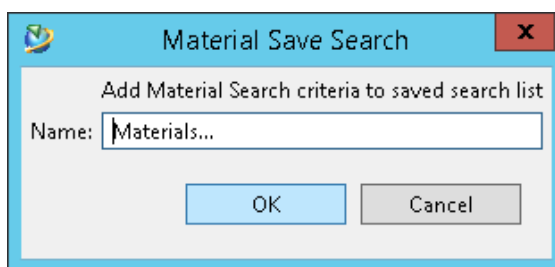
2.7. Saved Search

In order to save time of configuration and facilitate the search feature, IMM gives the ability to save the search criteria of the right panel of the search view like follow:

1. After configuring the search criteria by drag and drop of the required objects and entering the search values, press the **Save** button on IMM Search View toolbar



2. A dialog will pop up to enter a name for the set of search criteria. Pressing **OK** will persist the new saved search in a preference for future calls.



3. To call the saved search criteria again select the drop down menu on the IMM Search View toolbar all **site** and **user** saved searches will be displayed, each in as menu item.

If both **site** and **user** saved searches exist, the site items will be displayed first then the user ones. The drop down menu will be splitted by a **separator** between the site and user items.



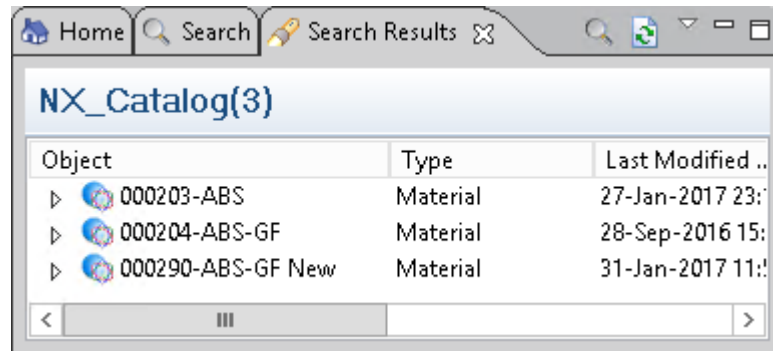
Notes:

- ✓ Every saved search will be added in one row to the string array **user** preference **IMM_SAVED_SEARCH_LIST**. If the current user has role **DBA** or group **dba** then the saved search will be added to the **site** preference with the same name.
- ✓ Re-calling a saved search will set the search panel with same saved criteria (sections, values and units).
- ✓ The admin can configure the saved searches also by modifying manually the **site** preference **IMM_SAVED_SEARCH_LIST**.

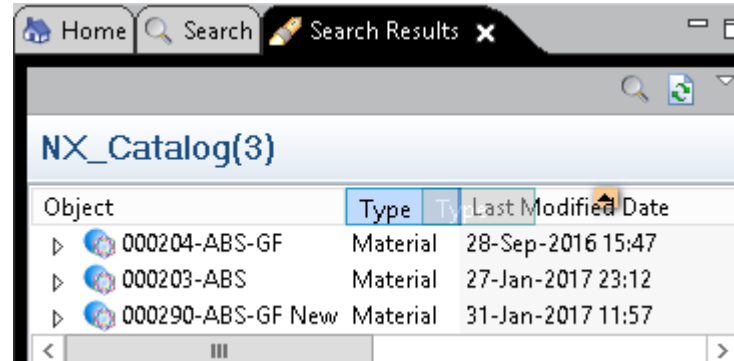


2.8. Search Results view details

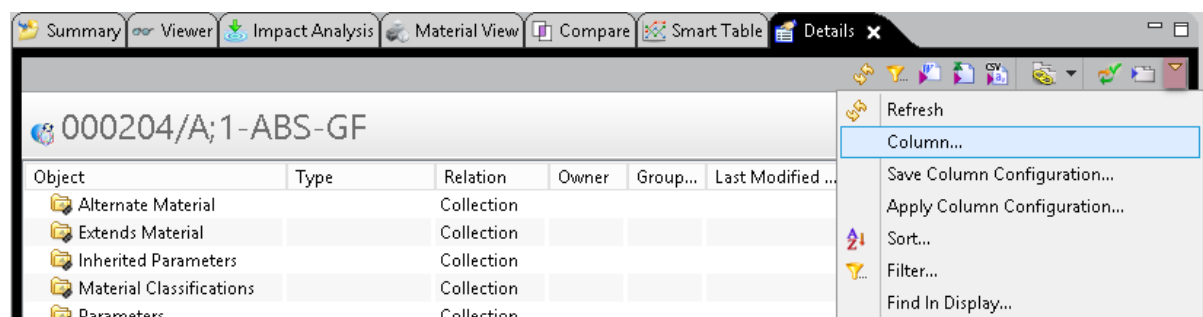
The results of any performed search will be displayed in **Search Results** view. Below are some details:



1. The number next to the catalog name is the **number** of materials or material revisions found under the Catalog according to the search criteria.
2. To perform the same **search again** (last executed search) from the same view press the magnifying glass. It is useful, for example, after a new import process **into** the same catalog.
3. To force refresh the objects after any data manipulation press the **Refresh** button.
4. To **reorder** the **columns**, **drag** the column to the required position.
5. To **sort** the **rows** in **ascendant/descendant** way, press on the desired column header.

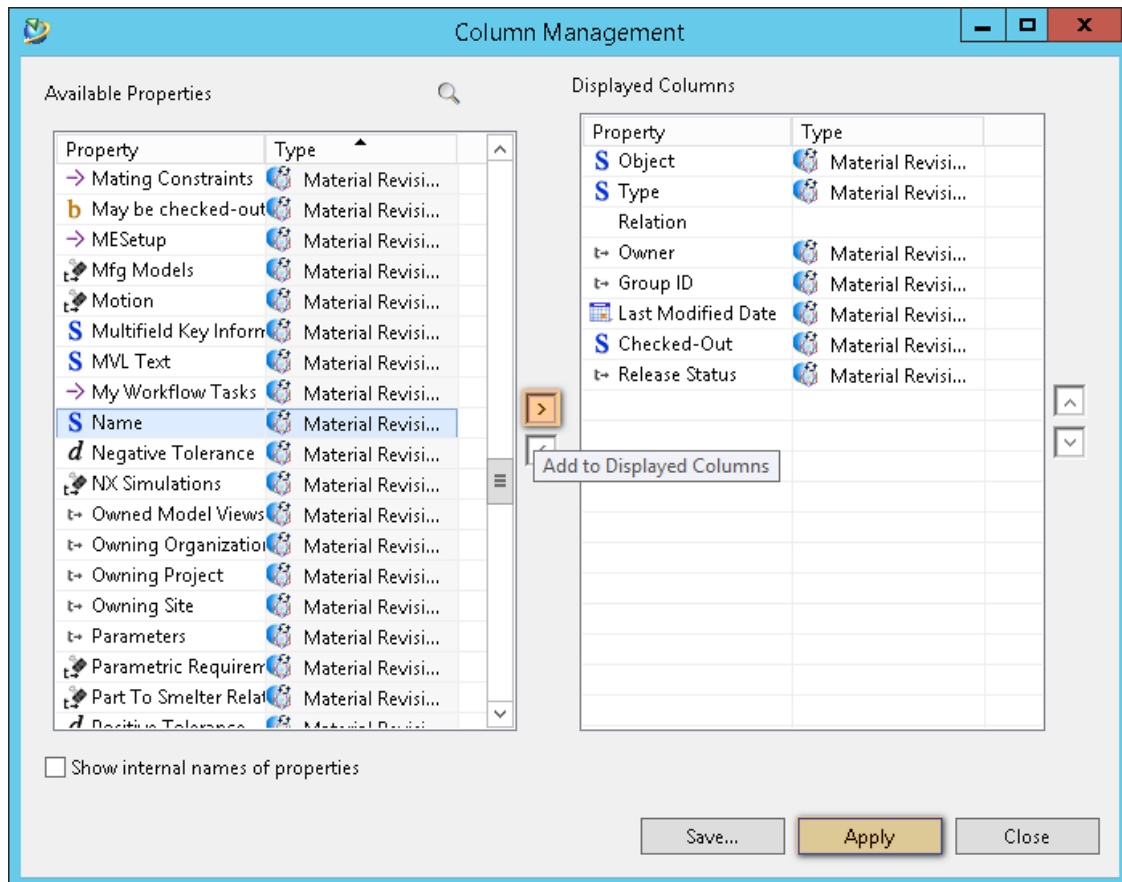


6. The displayed columns in the **Search Results** view are not fixed, they can be configured same way like for Teamcenter Home view. This can be performed like depicted in the picture below by following these steps:
 - ✓ Select a material or material revision depending of the needs.
 - ✓ Press the drop-down menu on the top-right corner of **Details** view and select menu item **Column....**





- ✓ From the **Properties** list on the left side of the **Column Management** dialog, select and move the required properties to the left side **Displayed Columns** list.



- ✓ Finally press apply and refresh the **Search Result** view.



3. Material Catalogs

3.1. Material Catalog definition

1. A Catalog is a collection of Materials organized, for instance, according to:
 - ✓ Material family type (Metals, Plastics, Ceramic or Composites...)
 - ✓ List of Materials used by a Plant or Business Unit
 - ✓ Material providers or organization...
2. A Catalog has also a list of unique Property Descriptors called also Meta Parameters those later are needed to create Material Properties.
3. A Catalog could also contain a specific list of Material classes.
4. A Material has a back-pointer to the Catalogs to which it belongs.
5. To create a Material, a Smart Table Descriptor or a Property Descriptor, **select a Catalog first**.

3.2. Create a material Catalog

To create a material catalog:

1. From IMM perspective select **File→New→Material Catalog**
2. If the **New Material Catalog** first wizard page appears, select **Material Catalog** and press **Next**
3. In the **New Material Catalog** second wizard page, fill the required fields and press **finish**.

The screenshot shows a software window titled "New Material Catalog". Inside, there's a section labeled "Material Catalog Data" which contains a "Material Catalog" icon and a "General" tab. Under the "General" tab, there are three input fields: "Description:" (empty), "ID:" (empty) with an "Assign" button, and "Name:" (filled with "Company Standards"). At the bottom of the window, there are four buttons: "< Back", "Next >", "Finish", and "Close".

4. The newly created Catalog should be listed in IMM Home View. If not refresh the view.



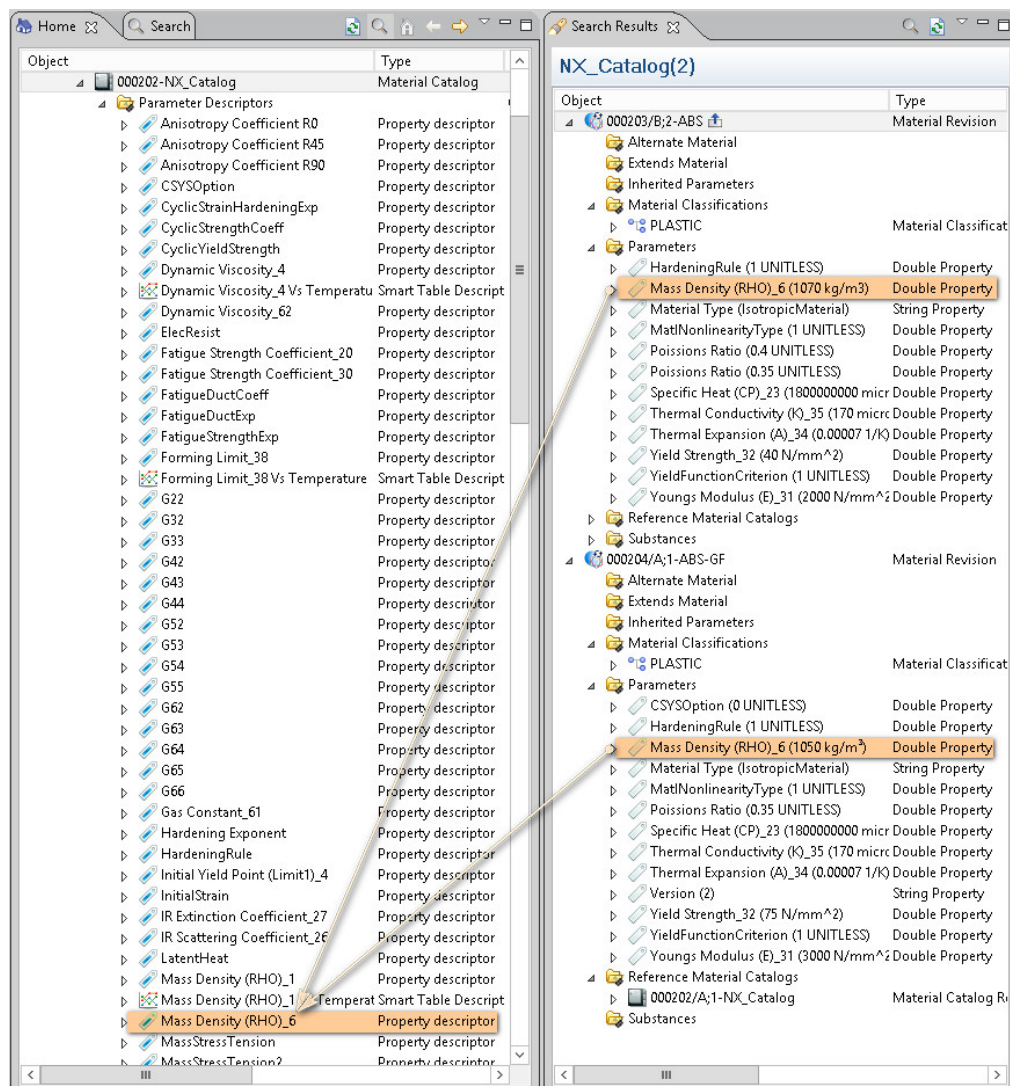
4. Property Descriptors

4.1. Property Descriptor definition

A **Property Descriptor** called also **Meta Parameter** is the **definition** object of a **Material Property** which carries the Value.

For example, one **Material Property** called “Mass Density” has a **value** 0,002794 and refers to the **Property Descriptor** “Mass Density” that has **unit** kg/m³ and **description** “Mass Density (RHO)”.

1. A Property Descriptor is unique inside one Catalog.
2. One **Property Descriptor** is referenced by multiple **Material Properties** of **Material revisions** belonging to the same **Catalog**.



3. There are single **property descriptors**, for String or double values, as well as **table descriptors**, for table values.



4.2. Create single Property Descriptor

To create a Property Descriptor for string or double values:

1. Select one **Material Catalog** in IMM application
2. Select menu item **File→New→Property Descriptor**
3. Define the Property Descriptor via the **Create new Property Descriptor** dialog box.

Notes:

- The **Name** is the display name of the property descriptor that could be localized whereas the **Real Name** is the fixed name used for mapping the descriptor with the names supported by CAD systems for instance NX.
 - On selecting a **Dimension**, the corresponding base **Unit** is selected automatically.
4. Press **OK**, the newly created property descriptor will be visible under the selected **Catalog**.

4.3. Create Table Descriptor

The Table Descriptor is called also **Smart Table Descriptor**, the table values created based on such descriptors have more capabilities and features than simple table values. Smart Tables could contain more than one **Curve**.

To create a **Table Property Descriptor** for a table property:

1. Select one **Material Catalog** in IMM application.
2. Select menu item **File→New→Smart Table Descriptor**.
3. Define the **Table Property Descriptor** via the **Create new Table Property Descriptor** dialog.

Note:

- The **Name** of the Table is composed from **Y** and **X axes names**, it is the display name of the table descriptor whereas the **Real Name** for a table is a fixed name for the **Y axis** used for mapping the descriptor with the names supported by CAD systems.
- On selecting a **Dimension** for **X** and **Y axes**, the corresponding base **Units** are selected automatically.



5. Managing Materials in Teamcenter

A material is a composition of one or many **substances** that constitute any raw component or manufactured product. The material is also defined by a set of **properties/characteristics** such as Dimensions, Density, Dynamic viscosity, Thermal conductivity, Material Type or even its unit price... Materials could be classified into different **catalogs** and **classes**...

This Chapter describes how to handle materials in **Teamcenter**. To know how to handle materials in **NX** refer to **Managing Materials in NX** chapter.

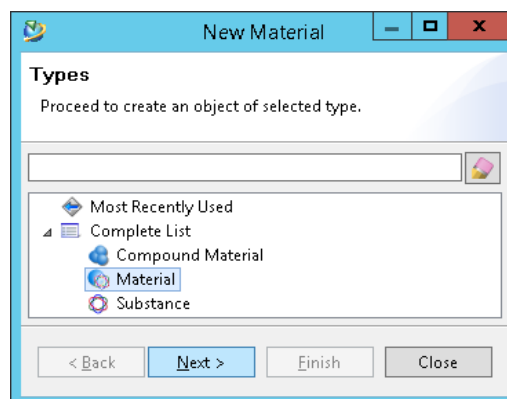
5.1. Create a Material

Materials can be created manually or imported and in both cases from the IMM File menu.

For importing Materials refer to **Import** chapter.

To create a material:

1. Select one **Material Catalog**
2. Go to **File→New→ Material**.
3. In **New Material** first wizard page select the required material type and press **Next**.



4. In the next page of the **New Material** create wizard, fill the required attributes and press **Finish**

Note: This page displays the create input attributes, the main ones to consider in IMM are:

- ✓ The object **Name** and **Description**
- ✓ The **External Identifier** which is the unique identity of the material in its original data source for instance, WIAM, GRANTA, IMDS.... This attribute of the material in Teamcenter is a key information that insures the unicity of the material and prevents the same material item to be duplicated in Teamcenter.

Note: if the **External Identifier** is not specified IMM will not be able to prevent the creation of the same material more than once.

- ✓ To see the definition of the remaining attributes, refer to the GTAC Material Management documentation.

5. The newly created material is displayed in the **Recently Created materials** folder in **Home** view.



5.2. Save As a Material

1. Search for the required material to copy
2. Select the material or material revision and go to **File → Save As**
 - ✓ If the **Material Revision** is selected, in the **Save Material Revision As** first wizard page, enter a **name** and click **Next** to define the Attached Objects or directly press **Finish**, the other attributes and pages are optional.

Note: The **External Identifier** will be empty.

- ✓ If the **Material item** is selected, the **Save Material As** wizard is different from the previous one. In the first page, enter the required information and press **Finish**.

Note: The **name** is mandatory, but the other attributes and pages are optional. The **External Identifier** could not be same as the **original Material**.

3. The newly created material revision has a copy of the original material revision parameters.

5.3. Revise a Material

4. Search for the required **material revision** to revise
5. Select the **revision** and go to **File → Revise**
6. In the **Revise** wizard page, check the auto-filled information from the original revision, change the description if required and press **Finish** enter a **name** and click **Finish**.



7. Same as **Save As** the **new revision** has a copy of the original material revision parameters.

Notes: each material has its own parameter list; the parameters are unique for each material revision. The parameters are referencing the revision. The list of parameters is not persistent on the revision.

5.4. Define an Alternate Material for a Material

If a material could not be used for some reason, for instance it is not available or is made prohibited by law in a country, **alternate materials** should be defined and be used instead.

To define an Alternate material for an original material:

1. Search the **material revision** that could replace or be used instead of the **original material**.
2. Select the **material revision** and **copy** it with menu item **Edit→Copy** or click right-mouse-button and from the pop-up menu select **Copy**.
3. Go to the target **original material** and expand it.
4. Select the **Alternate Material** pseudo-folder and **paste** the copied material revision with menu item **Edit→Paste** or click right-mouse-button and from the pop-up menu select **Paste**.

Note: if the **Alternate Material** pseudo folder is not displayed, add it using the menu **Edit→Options** then **General→Item Revision** tree item.

5. The pasted alternate material is assigned to the original one, based on the **relation Alternate Material**.

5.5. Copy a Material to another Catalog

The material is unique in TC database and has one main catalog to which the access is restricted, the same Material could be copy to a second catalog called reference catalog. For example, a company could have a central Material Catalog and some Business Unit (BU) Catalogs a Material could be referenced by both central and BU catalogs.

To have the same material in different catalogs:

1. Search for the required **Material** or **Material Revision** from the **source Catalog**.
2. Select and copy it with menu item **Edit→Copy** or click right-mouse-button and from the pop-up menu select **Copy**.
3. Select the **target Catalog** and paste the copied **Material** or **Material Revision** with menu item **Edit→Paste** or click right-mouse-button and from the pop-up menu select **Paste**.
4. The material revision refers to both catalogs it could be searched in both of them.

Note: The **properties/parameters** of the material revision could refer to **property descriptors** which are not existing in the target Catalog, those later will be created automatically under the **target Catalog**.



5.6. Assign Materials to a Part in Teamcenter

Materials could be assigned to a specific part either from CAD system for instance NX or Teamcenter.

To assign a material to a part in Teamcenter:

1. Search for the required **Material Revision**.
2. Select the **Material Revision** and **copy** it with menu item **Edit→Copy** or click right-mouse-button and from the pop-up menu select **Copy**.
3. Navigate to the **target part** and expand it.
4. Select the **Materials** pseudo-folder under the part or item revision and paste the copied **Material Revision** with menu item **Edit→Paste** or click right-mouse-button and from the pop-up menu select **Paste**.

Note: if the **Materials** pseudo folder is not displayed, add it using the menu **Edit→Options** then **General→Item Revision** tree item.

5. In the **Properties on Relation** dialog that pops up, enter the **Mass** value according to the selected **Unit of Measures** and fill the remaining attributes if needed. Then press **Finish**.

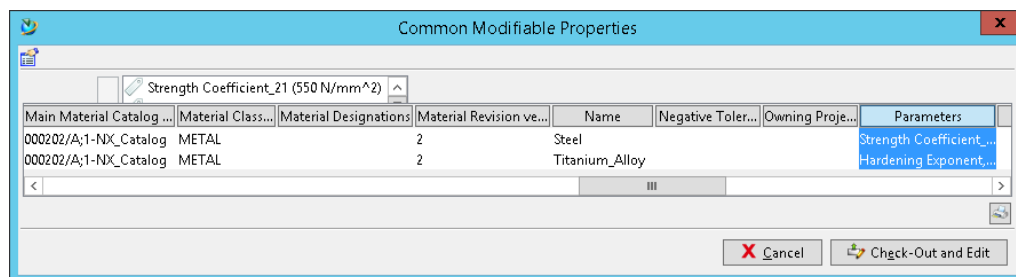
6. The pasted **Material Revision** will be related to the part or item revision with the relation called **Materials**.



5.7. Compare Materials

5.7.1. Compare material revision Teamcenter attributes

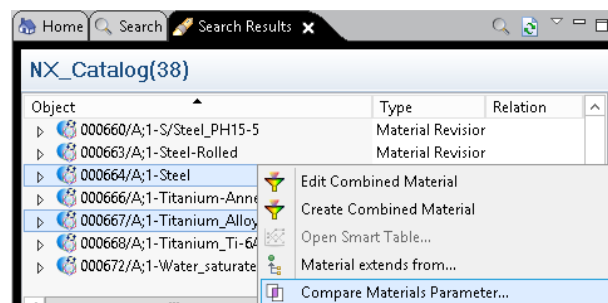
1. Select 2 **material revisions** or more.
2. Press the right mouse button and select the pop-up menu item **View Properties**
3. All selected material revision will be displayed each in a different row like follow:



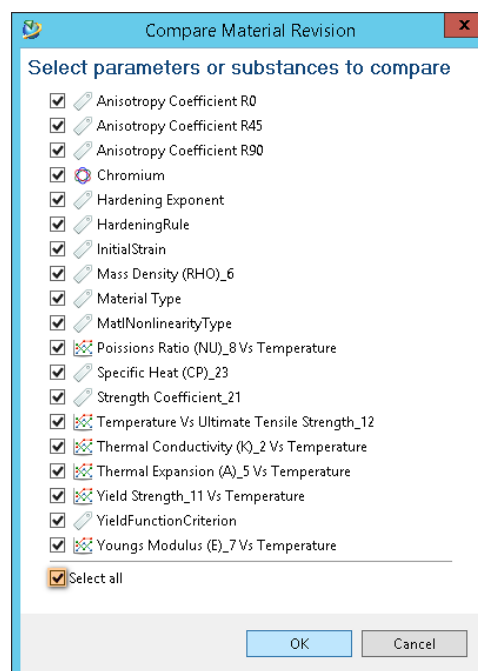
5.7.2. Compare material revision properties

To compare material properties:

1. Select 2 **material revisions** or **more**.
2. Press the right mouse button and select the pop-up menu **Compare Materials Parameter...**



3. The **Compare Material Revision** dialog will display all common **properties** and **substances**.

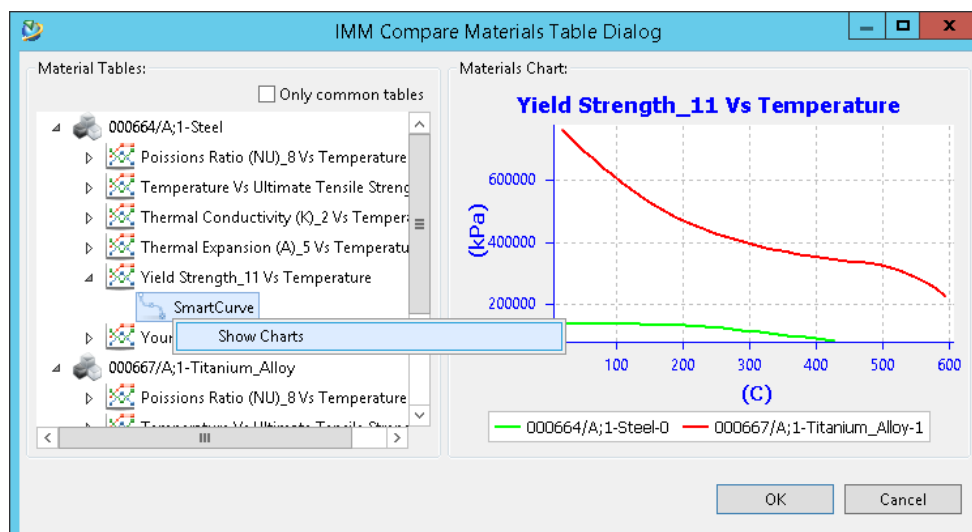




4. From **Compare Material Revision** dialog select the required properties and substances to compare and **press OK**. The **Compare** view will be brought to top and display the **differences** and **variations** like follow.

Material	Parameter	Bar	Value	Unit	Category	Description
000664/A;1-Steel	Anisotropy Coefficie...		1.3	UNITLESS	Physical	
000667/A;1-Titanium...	Anisotropy Coefficie...		1.2	UNITLESS	Physical	
000664/A;1-Steel	Anisotropy Coefficie...		1.3	UNITLESS	Physical	
000667/A;1-Titanium...	Anisotropy Coefficie...		1.25	UNITLESS	Physical	
000664/A;1-Steel	Anisotropy Coefficie...		1.3	UNITLESS	Physical	
000667/A;1-Titanium...	Anisotropy Coefficie...		1.5	UNITLESS	Physical	
000664/A;1-Steel	Chromium		12.0 to 20.0	%	Substances	
000667/A;1-Titanium...	Chromium		6.0	%	Substances	
000664/A;1-Steel	Hardening Exponent		0.2	UNITLESS	Mechanical	
000667/A;1-Titanium...	Hardening Exponent		0.26	UNITLESS	Mechanical	
000664/A;1-Steel	HardeningRule		1	UNITLESS	Mechanical	
000667/A;1-Titanium...	HardeningRule		1	UNITLESS	Mechanical	
000664/A;1-Steel	InitialStrain		0.02	mm/mm	Mechanical	
000667/A;1-Titanium...	InitialStrain		0.02	mm/mm	Mechanical	
000664/A;1-Steel	Mass Density (RHO)_6		0.000007829	kg/mm^3	Physical	
000667/A;1-Titanium...	Mass Density (RHO)_6		0.000004454	kg/mm^3	Physical	
000664/A;1-Steel	Material Type		IsotropicMaterial		Other	
000667/A;1-Titanium...	Material Type		IsotropicMaterial		Other	
000664/A;1-Steel	MatlNonlinearityType		1	UNITLESS	Mechanical	
000667/A;1-Titanium...	MatlNonlinearityType		1	UNITLESS	Mechanical	
000664/A;1-Steel	Poissons Ratio (NU)...					
000667/A;1-Titanium...	Poissons Ratio (NU)...					
000664/A;1-Steel	Specific Heat (CP)_23		434000000	microJ/k...	Thermal	
000667/A;1-Titanium...	Specific Heat (CP)_23		525000000	microJ/k...	Thermal	
000664/A;1-Steel	Strength Coefficient...		550	MPa	Mechanical	
000667/A;1-Titanium...	Strength Coefficient...		1527.923	MPa	Mechanical	
000664/A;1-Steel	Temperature Vs Ulti...					
000667/A;1-Titanium...	Temperature Vs Ulti...					
000664/A;1-Steel	Thermal Conductivit...					
000667/A;1-Titanium...	Thermal Conductivit...					

5. To compare the Smart table **curves**, press the toolbar button on the top right of the **Compare** view. Select the required curve, click right mouse button and press **Show Charts**.





6. Material Properties

Material **properties**, called also material **parameters**, are the objects that define the material, they are the measurements or metrics that help material engineers, assess a material and compare it to other materials in order to choose the one that fits the best their needs. For instance, Mass density, Dynamic viscosity, Thermal conductivity, Material Type

Note: Be careful, do not get confused between **Material properties** and **TC properties**. In IMM documentation a property is an object and is meant to be the **material parameter object**. To refer to classic Teamcenter attributes or runtime properties, **TC property** or **attribute** terms are used instead.


A **Material Property** could be a single **constant value** (string, double), a **range value** or a **table of values** which is a function of one or more independent variables, for instance the Temperature.

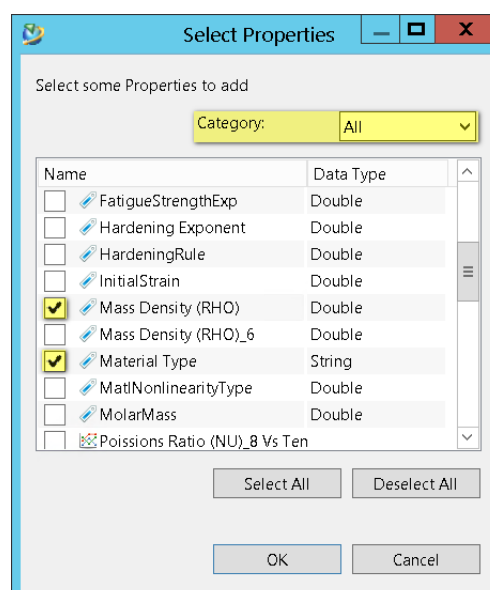
Each **Material Property** is defined by one **Property Descriptor** (already presented in **Chapter 4**) from which it inherits the name, the type, the description and the unit, or units in case of **Smart Table Material Property**. To be able to create a **Material Property**, the corresponding **Property Descriptor** must be already created.

A **Material Property** could have one or more reference properties called also reference parameters.

6.1. Create and add Properties to a Material

To create and add properties to a material:

1. Select the target **material revision**.
2. In **Material View**, press the action button **Add properties to a material** .
3. The **Select Properties** dialog box will display all the **Property Descriptors** (including Property Table Descriptors) of the **catalog** to which the **material** belongs to.
4. From the **Select Properties** dialog box, Select one or more **Property Descriptors**. User can filter the property descriptors by there category from the **Category** drop down list






- By pressing **OK**, the **Materials Properties**, defined by the selected descriptors, will be created and added to the material revision.
- The new properties are display in the **Material View** and under the pseudo-folder **Properties** of the material revision.
- To change or edit the values of type string or double, click on the cell, of the material property row and column Value, and edit the value, for example enter **7829** for a constant or enter **7800 to 7900** for a range value.

Name	Value	Unit	Category	Reference Values
InitialStrain	0.02	mm/...	Mechanical	
Mass Density (RHO)	7850	kg/m3	Physical	
Material Type	IsotropicMaterial		Other	
MatlNonlinearityType	1	UNIT...	Mechanical	
PlasticStrainRatio	1.88	UNIT...	Mechanical	
Poissions Ratio	0.3	UNIT...	Mechanical	
Specific Heat (CP)_23	434000000	micro...	Thermal	
Strength Coefficient_21	686766200	N/m2	Mechanical	
Stress-Strain (H)_37	Smart Table Value			
Thermal Conductivity (K)_35	14000	micro...	Thermal	
Thermal Expansion (A)_34	0.00002	1/C	Thermal	
Ultimate Tensile Strength_33	340000000	N/m2	Mechanical	


- Press **Enter** keyboard button, the value will be set to the property.

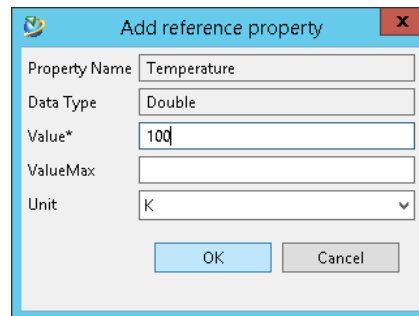
Notes:

- ✓ To edit **table values**, go to chapter **Create and add a Smart Table Properties** below.
- ✓ Before adding a property in the **Material View** check that the update input  is enabled so that the active material revision for that view is indeed the selected one.
- ✓ The properties are referencing back the material revision. The list of properties is not persistent on the material revision.

6.2. Add reference properties to a material property

To add one or more reference properties to another material property:


- In **Material View** select the target property row.
- From the toolbar, press the action  button.
- From the **Select Properties** dialog box select one or more property descriptors and press **OK**.
- From the **Add reference property** dialog enter the **values** for each reference property and press **OK**.

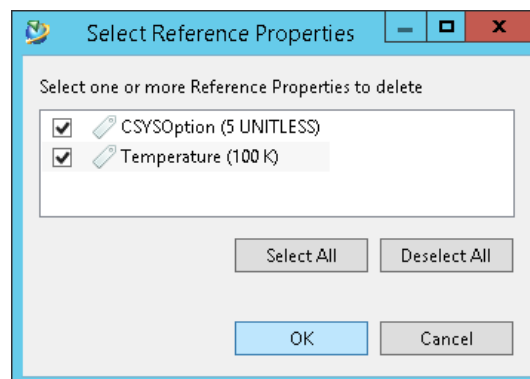


5. For each selected reference property, a new material property will be created and set as a reference value to the **target property**.

6.3. Remove reference properties from a material property

To delete one or more reference properties from a material property:

1. In **Material View** select the target single-property (double or string) row.
2. From the toolbar, press the action  button.
3. From the **Select Reference Properties** dialog box select one or more reference property to delete and press **OK**. All selected reference properties will be removed from the property.




6.4. Create and add Smart Table Properties to a Material

Smart Table properties are complex types of tables, instead of one simple X/Y table a **Smart Table** property could have one or multiple X/Y table that are called **Curves**. Each **Curve** is table of values and could have a reference property.

The name and the units, for X and Y axes, are inherited from the **Smart Table Descriptor** described in **Chapter 4**, Paragraph 4.3.

To create and add Smart Table Properties to a material:

1. Repeat the steps from **1 to 6** of previous paragraph, with a one detail in **step 4** where to select a **Smart Table Descriptor** instead of simple single-property descriptor.
2. To display or edit a Smart Table property, in **Material View** select the Smart Table row and press the action button  either from the view toolbar or from the pop-up menu.



Summary Viewer Impact Analysis Material View Compare Smart Table

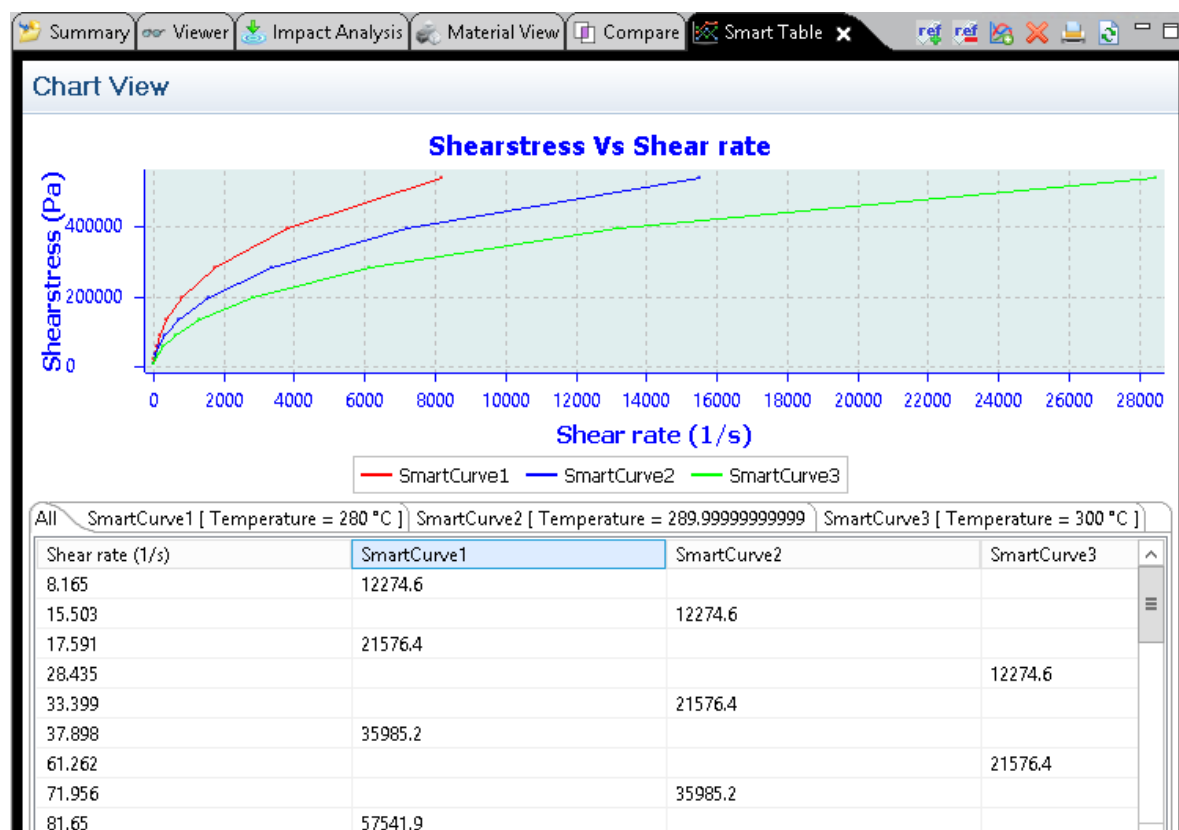
000724/A:1-Ultramid® A3X2G10[1785] (71)

All Other Mechanical Electrical Thermal Substances Physical

Name	Value	Unit	Category	Reference Values	Desc
Relative permittivity (IEC 60250)	3.6			Frequency = 1000000 Hz	Ultra
Relative permittivity (IEC 60250)	5			Frequency = 1000000 Hz	Ultra
Shearstress	Smart Table Value				Ultra
Strain at Break ISO 527-1-2	2	%			Ultra
Strain at Break ISO 527-1-2	3	%			Ultra
Stress at Break (ISO 527-1/-2)	130	Mpa			Ultra
Stress at Break (ISO 527-1/-2)	180	Mpa			Ultra
Surface resistivity (IEC 60093)	10000000000	Ohm			Mois
Temp. of deflection under load	25.0	°C			Strac

Open Smart Table
Add Property
Delete Property
Overwrite inherited property
Change Display Unit


3. The selected Smart Table property will be displayed in the **Smart Table view**.



6.5. Add a Curve to a Smart Table Property

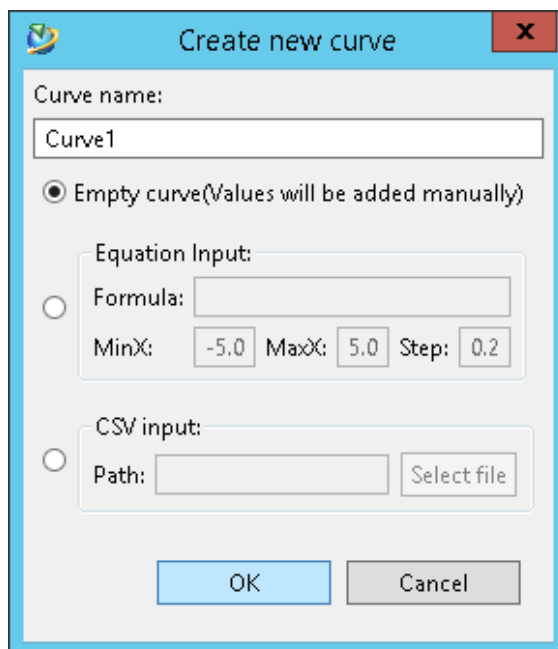
Multiple curves could be created and added to one Smart Table. The **name of each curve** should be **unique** in one Smart Table.

To create and add a new curve to a smart table:

1. In Smart Table view toolbar, press the action button New Curve .
2. The **Create new curve** dialog box, provides 3 ways to create a curve.



- ✓ Create an empty curve, to be edited manually through the corresponding tab viewer.
- ✓ Create a curve based on a **Formula** or **Math Equation**.
- ✓ Create a curve based on a CSV input.



The image shows a 'Create new curve' dialog box. It has a title bar with a blue icon and a red close button. The dialog contains a 'Curve name:' text box with 'Curve1' entered. Below it is a radio button labeled 'Empty curve (Values will be added manually)'. Underneath is an 'Equation Input' section with a radio button, a 'Formula:' text box, and three smaller text boxes for 'MinX:' (containing '-5.0'), 'MaxX:' (containing '5.0'), and 'Step:' (containing '0.2'). Below that is a 'CSV input:' section with a radio button, a 'Path:' text box, and a 'Select file' button. At the bottom are 'OK' and 'Cancel' buttons.

6.5.1. Create an empty curve

1. In **Create new curve** dialog box, give a **unique name** to the curve.
2. Select the **Empty curve** radio button and press **OK**.
3. A new curve is created and added to the Smart Table list of curves.
4. In the bottom part of the **Smart Table** view will be created and display a new tab folder containing an empty 2 columns viewer.
5. To enter the table values, click on the viewer cells and edit row by row.

6.5.2. Create a curve based on a Formula

1. In **Create new curve** dialog box, give a **unique name** to the curve.
2. Select the **Equation Input** group radio button.
3. Enter the **Formula** string, for example $\sin(x)$, $3x^2+1$, $1/x...$
4. If needed, change the values with the desired **X axis range** and **Step** then press **OK**.
5. A new curve is created and added to the Smart Table list of curves.
6. In the bottom part of the **Smart Table** view will be created and display a new tab folder containing the values of the **parsed mathematical equation**.
7. In the top part of the **Smart Table** view will be displayed the **curve chart**.
8. The **curve chart** could be **zoomed in and out** using the mouse.

Note: in this current IMM version the formula is **parsed at creation time** and all values are **stored** on the curve, for performance reasons please consider the chosen range and step, if the range is kept reasonably small and the step is kept big so the number of table values will be smaller.



6.5.3. Create a curve based on a CSV input

1. In **Create new curve** dialog box, give a **unique name** to the curve.
2. Select the **CSV Input** group radio button.
3. With **Select file** button, browser to the CSV file path and press **OK**.
4. A new curve is created and added to the Smart Table list of curves.
5. In the bottom part of the **Smart Table** view will be created and display a new tab folder containing the values of the **parsed CSV file**.
6. In the top part of the **Smart Table** view will be displayed the **curve chart**.
7. The **curve chart** could be **zoomed in and out** using the mouse.

Note: The CSV file format for table values should contain in each line X and Y double values separated by a semi column “;”. For example:

```
8.165;12274.6
17.591;21576.4
37.898;35985.2
81.65;57541.9
```

6.5.4. Add reference properties to a Curve

A Smart Table property may contain different cures which values are affected by one or more independent variables which are called and created as reference properties.


To add one or more reference properties to a curve:

1. In the bottom part of the **Smart Table view**, select the **target Curve** tab folder.
2. Repeat same **steps 2, 3 and 4** of section **6.2-Add reference properties**
3. For each selected reference property, a new material property will be created and set as a reference value to the **target curve**.

As shown in section 6.4, the curves of **Shearstress vs Shear rate** Smart Table have each a reference property called **Temperature** with respective values 280°C, 290°C and 300°C.

6.5.5. Remove reference properties from a Curve


To delete one or more reference properties from one **smart table curve**:

1. In the bottom part of the **Smart Table view**, select the **target Curve** tab folder.
2. From the toolbar, press the action button  if enabled.
3. From the **Select Reference Properties** dialog box select one or more reference property to delete and press **OK**. All selected reference properties will be removed from the curve.




6.5.6. Remove a Curve from a Smart Table

To delete a curve from a **smart table**:

1. In the bottom part of the **Smart Table view**, select the **target Curve** tab folder.
2. From the toolbar of **Smart Table view**, press the action button .

6.6. Remove a property from a Material

To remove any property (string, double property or a smart table property) from a material:

1. Select a **material revision**
2. From the **Material view**, select the **row** corresponding to the property and press the **Remove Property** action button  if enabled.

Notes:

- ✓ In 11.4 onwards, the **permission to delete**, any IMM property or inherited property, is **driven** by the **Access Delegations** (see admin guide for more details).

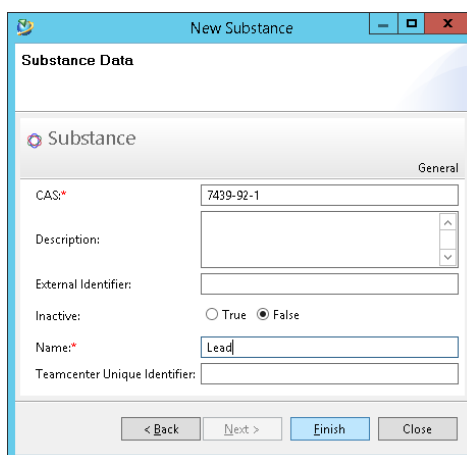
7. Substances

7.1. Create a Substance

The Substance are Catalog independent.

To create a new substance:


1. Go to menu item **File → New→Substance**.
2. Select **Substance** from the first **New Substance** wizard page.
3. In the second page of **New Substance** wizard page, fill the required fields and press **Finish**.

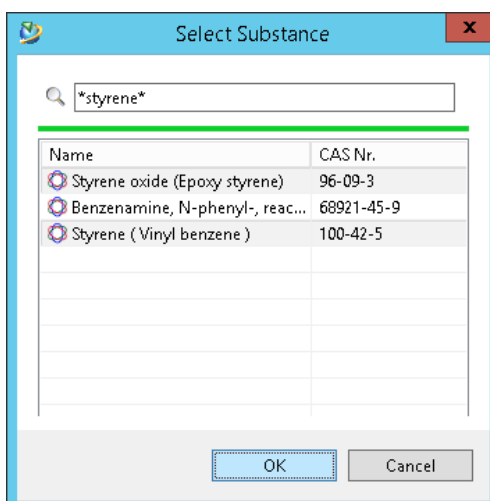


The 'New Substance' dialog box, 'Substance Data' tab, is shown. It contains the following fields and controls:

- CAS:***: Text box containing '7439-92-1'.
- Description:**: Text box with up/down arrow buttons.
- External Identifier:**: Text box.
- Inactive:**: Radio buttons for 'True' and 'False' (selected).
- Name:***: Text box containing 'Lead'.
- Teamcenter Unique Identifier:**: Text box.
- Buttons at the bottom: '< Back', 'Next >', 'Finish', and 'Close'.




7.2. Add Substances to a Material

1. Select a **material revision**
2. From the **Material View** toolbar, press the action button  **Add substances to a material**.
3. In **Select Substance** dialog enter a **name** or **CAS number** then press enter or click the search button on the top-left of the dialog.



The 'Select Substance' dialog box is shown. It contains the following elements:

- Search bar: Contains '*styrene*'.
- Table of results:

Name	CAS Nr.
 Styrene oxide (Epoxy styrene)	96-09-3
 Benzenamine, N-phenyl-, reac...	68921-45-9
 Styrene (Vinyl benzene)	100-42-5

- Buttons at the bottom: 'OK' and 'Cancel'.



4. Select the required substances and press the **OK** button.
5. A wizard form will be displayed to enter the **composition** for the first selected substance. If **more** than one substance is selected, the **Next** button will be enabled to go to the next substance form.

Enter the values for Properties on Relation

Substances
Properties on Relation page

Primary Reference: 000290/A-4-ABS-GF New
Relation Type: Substances
Secondary Reference: Styrene oxide (Epoxy styrene)
Composition (in %): 25
Is The Composition In Range: ☒ True ☐ False
Maximum Composition (in %):
To use maximum composition: ☒ True ☐ False
is confidential: ☐ True ☒ False

Apply All < Back **Next >** Finish Cancel

6. If composition is filled for all selected substances, the **Finish** button will be enabled.

Enter the values for Properties on Relation

Substances
Properties on Relation page

Primary Reference: 000290/A-4-ABS-GF New
Relation Type: Substances
Secondary Reference: Styrene (Vinyl benzene)
Composition (in %): 15
Is The Composition In Range: ☒ True ☐ False
Maximum Composition (in %):
To use maximum composition: ☒ True ☐ False
is confidential: ☐ True ☒ False

< Back Next > **Finish** Cancel

Notes: The Composition and Max Composition value limits are controlled by two preferences:

- ✓ **MATERIALMGMT_substance_composition_tolerance_lower:** default value is 0.0%.
- ✓ **MATERIALMGMT_substance_composition_tolerance_upper:** default value is 0.0000001%.

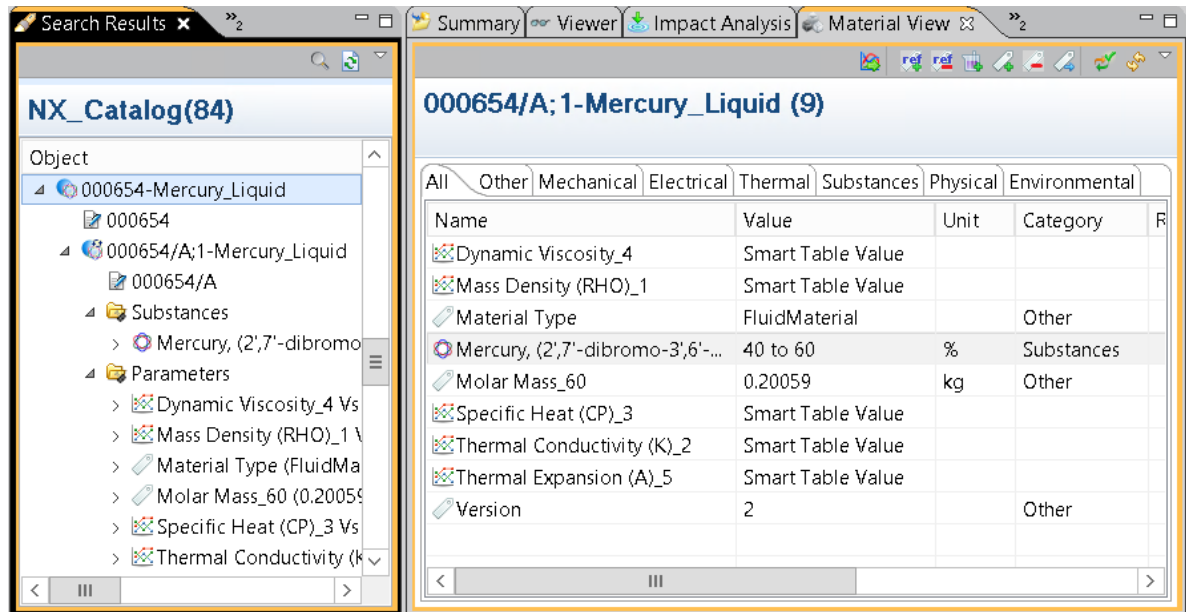
Those preferences define the value of the percentage deviation in which the substance composition of a material can be **less** or **greater** than full (100%). For example:

- ✓ If lower is set to 10% that means that the composition could not be less than 90%.
- ✓ If upper is set to 20% that means that the composition could not exceed 120%.

Those values will also be used to determine the actual composition deficit for a material.




7. Press Finish, a **relation** will be created between the material revision and **each** of the selected **substances**. A substance entry will be displayed in the Material View for each selected substance with the proper composition value.
8. To modify the composition values again, click on the cell of the substance row and column values and **edit** the value. For instance, type **25** for 25% or type **8 to 15** for a range values in percent.



7.3. Remove a Substance from a Material

To remove a substance from a material:

9. Select a **material revision**
10. From the **Material View**, select the **row** corresponding to the substance and press the **Remove Property** action button  if enabled.



8. Material Class

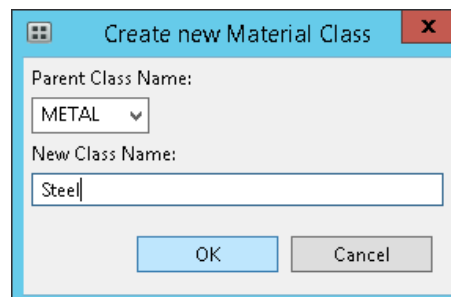
A Material Class is a light weight classification of materials, for advanced filtering and sorting of materials. For example, inside a **Catalog** specific for **Metals** we can classify Materials into sub-groups or **classes** of the same catalog. For instance: **Iron**, **Steel**, **Aluminum** and **Copper**...

8.1. Create a Material Class under a Catalog

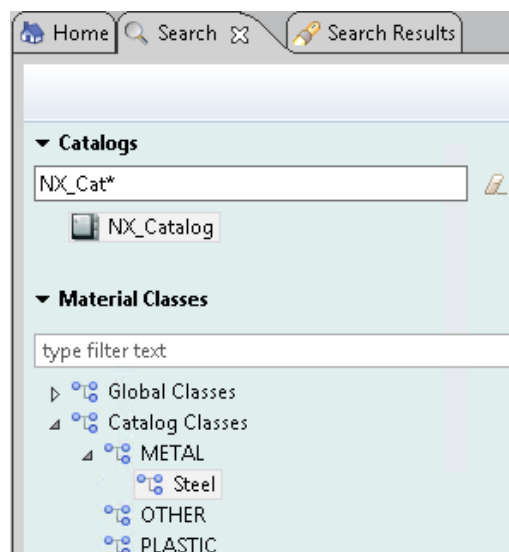
A **Material Class** can be created manually or imported and in both cases from the IMM File menu. For importing classes go to Import chapter.

To create a material class under a Catalog:

1. First, select one **Catalog**.
2. Go to menu **File → New→Material Class**.
3. In the **Create new Material Class** dialog, if the new class is a **sub-class**, select from the combo box a **Parent Class**, if not leave it empty.
4. Enter a name for the new **Material Class**.



5. The newly created class will be displayed in the **Search view** if the catalog is selected.








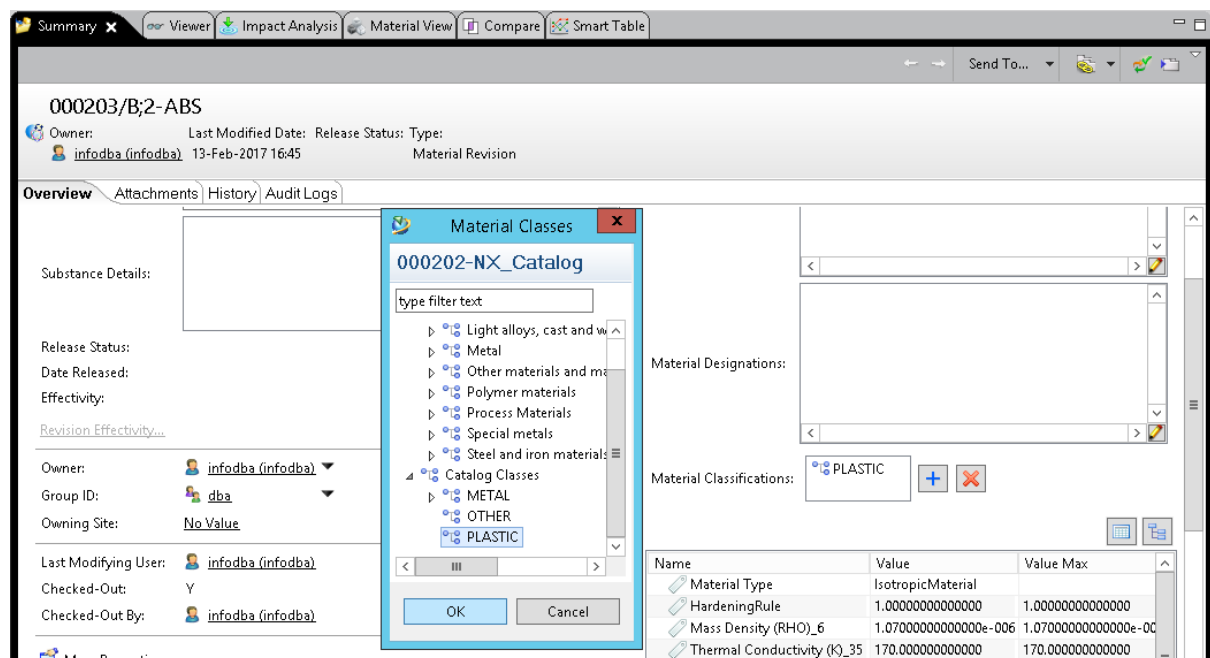
8.2. Create a global Material Class

A global Material Class is a unique and catalog independent class. To create a global material class, skip the step number 1 above and repeat the steps number 2 to 4 **without any Catalog selection**.

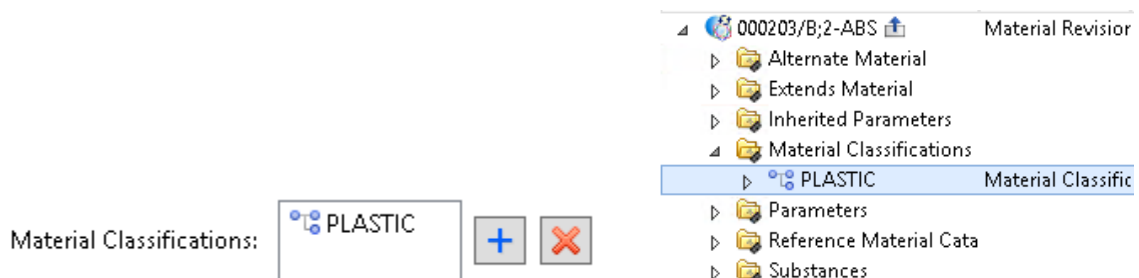
8.3. Assign a Material Class to a Material


To assign a class to a material:

1. Select a **material Revision** and go to the **Summary Page**.
2. **Check-Out** the revision, this could be done from **pop-menu** or **bottom bar** of **summary page**.
3. In **material revision** summary page, if the write access is allowed, the buttons  , in front of **Material Classes** attribute, will be **enabled**, click on the  button.
4. From **Material Classes** dialog choose **one** catalog or global class and confirm with **OK**.



5. The selected class will be added to the attribute list and is displayed under **Material Classes** pseudo folder as well.



6. To remove a class, in material revision summary page, select the class and press .



8.4. Import Classes

The Material Class import capability simplifies the creation of a whole structure of material classes.

The Material manager could prepare a simple spreadsheet, with the needed material class structure and then export it to a CSV file, pay attention to the **separator** used “;” or “,”.

The format of the spreadsheet is depicted in the following table:

Classes	German	English
C1	Klass1	Class1
C1 C1.1	Klass1.1	Class1.1
C1 C1.1 C1.1.1	Klass1.1.1	Class1.1.1
C1 C1.1 C1.1.1 C1.1.1.1	Klass1.1.1.1	Class1.1.1.1
C1 C1.1 C1.1.1 C1.1.1.2	Klass1.1.1.2	Class1.1.1.2
C1 C1.1 C1.1.2	Klass1.1.2	Class1.1.2
C1 C1.1 C1.1.3	Klass1.1.3	Class1.1.3

- ✓ This spreadsheet should be composed of 3 columns with respective headers: **Classes**, **German** and **English**.
- ✓ In each row, a different **Material Class** should be listed.
- ✓ The first column should have the internal name of the class, if it has a parent put the name of the parent before and add a pipe “|” between the 2 names.
- ✓ In the second and third columns give the **display name** of the class in German and English for **localization** purposes, if one language is not needed put the same name in both columns but do not remove the column for parsing purposes.

Note: till it is enhanced in future IMM releases, the class CSV file should be exactly like depicted above, if no German class names are available, **as a workaround**, use the same English names in the second column too.

To Import Material Classes:

1. Go to menu item **File→Import→Material Classes**.
2. Press the **Open** button to browse to the class **csv** file path to import
3. Check the **separator** used in csv “;” or “,”, default is “;”.
4. If the Classes are aimed to be **Catalog Classes**, select one **Catalog** from the **combo box**.
5. If the Classes are aimed to be **Global Classes**, **skip** the previous step. Do not select any catalog.
6. Press the **Import** button, the import process will start.
7. If the classes are imported successfully a confirmation dialog will be displayed.
8. If the Classes are imported as **Catalog Classes** they will be displayed in the **Material Classes** section of the **Search** view when the corresponding **Catalog** is **selected**.
9. If the Classes are imported as **Global Classes** they will be displayed in **Home** view under **Classes** root tree as well as in **Material Classes** section of the **Search** view.




9. Material Inheritance

To handle different completion levels of materials, IMM gives the ability to make a Material extend or derive from another Material and manage the own material properties as well as the inherited properties.

9.1. Derive from a Material

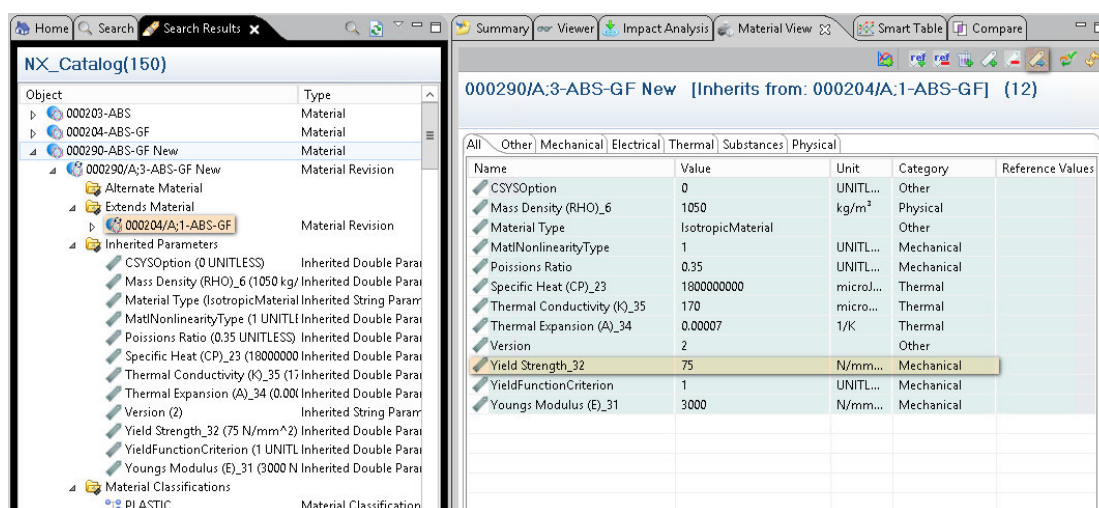
The material inheritance is handled on the Material Revision level and only one material revision could be derived at a time.

To derive from a Material, copy the material revision and choose one of the **3 ways** below:

- ✓ Select the target material revision, click right-mouse-button and in **popup menu** press  **Material extends from**.
- ✓ Check-out the target material revision, in Material Revision **Summary view**, select paste from the drop-down menu next to the **Extends Material** attribute in the **Material Inheritance** section.
- ✓ Select the pseudo-folder **Extends Material** under the target material revision and do paste.

Extending or inheriting from a Material revision will **automatically create**, through a post action handler, the corresponding **inherited property** objects for the new Material revision based on the original properties of the inherited Material revision as well as the corresponding **inherited substance relation** that will grab the composition values from the original substance relation.

The screenshot below shows an example of a new material that inherits from the ABS-GF material and the inherited properties are created.



Name	Value	Unit	Category	Reference Values
CSYSOption	0	UNITL...	Other	
Mass Density (RHO)_6	1050	kg/m³	Physical	
Material Type	IsotropicMaterial		Other	
MatlNonlinearityType	1	UNITL...	Mechanical	
Poissons Ratio	0.35	UNITL...	Mechanical	
Specific Heat (CP)_23	1800000000	micro...	Thermal	
Thermal Conductivity (K)_35	170	micro...	Thermal	
Thermal Expansion (A)_34	0.00007	1/K	Thermal	
Version	2		Other	
Yield Strength_32	75	N/mm...	Mechanical	
YieldFunctionCriterion	1	UNITL...	Mechanical	
Youngs Modulus (E)_31	3000	N/mm...	Mechanical	


Notes:

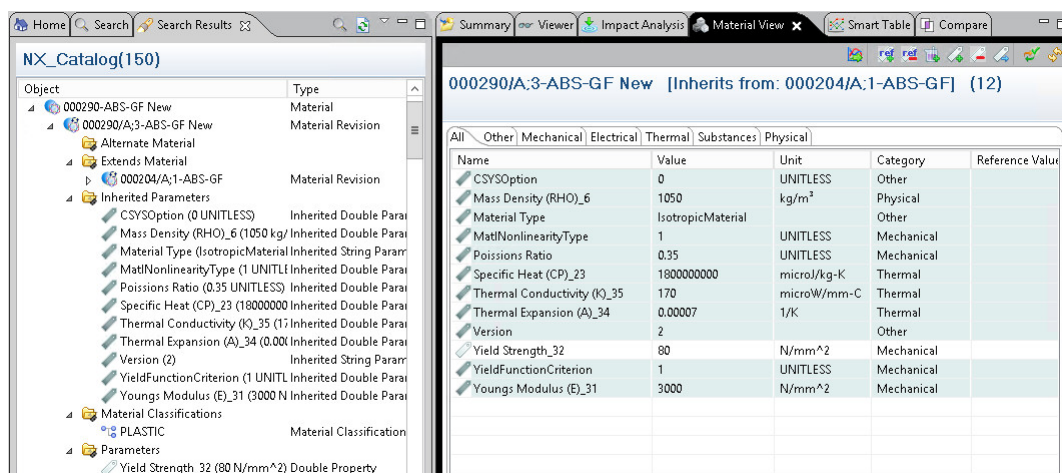
- ✓ The values of an inherited property are **not modifiable** and point to the same values of the original Material properties.
- ✓ An inherited property should and could manually **neither deleted nor added/created**.



9.2. Override inherited properties or substance relations

If the new material should have different values for one property, the inherited property should be overridden, that means that the inherited property will be removed and replaced by a standard material property object where to enter the new values. To override an inherited property:

1. Select a **material revision**
2. From the **Material View**, select the **row** corresponding to the **inherited property** or **substance** to override and press the **Overwrite inherited properties or substances** action button  like shown in the screenshot above.
3. The overwritten inherited property should be **deleted** and **replaced** by a **material property** that will receive the new values like shown below



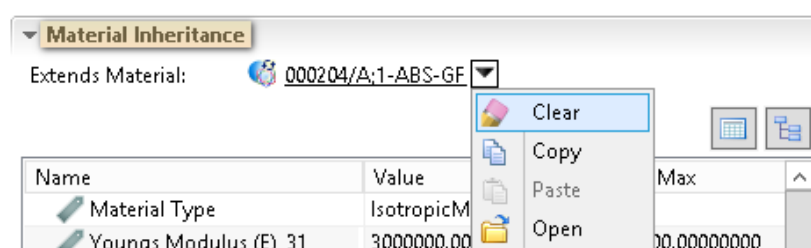
Notes:

- ✓ In some sites there are some access rules based on object types, even if the user has access right on the material it could be that the access rules in place do not allow the deletion of Inherited Property objects then the selected property will not be deleted.
- ✓ The admin should configure the **access rules** to **allow deletion** of Inherited Properties
- ✓ In 11.4 onwards, the **permission to delete**, any IMM property or inherited property, is **driven by the Access Delegations**.

9.3. Remove the derived Material

To remove a derived material:

1. Select a **Material revision**.
2. Check-out the target material revision, in Material Revision **Summary view**, select **Clear** like shown below.
3. The derived Material revision will be removed as well as all the **inherited properties**.





10. Unit Management

To be able to convert and display material properties values in different units, IMM provides the unit management. The conversion of values to different units is required for instance for display reasons or for mapping between PDM and CAD Systems such as NX and Teamcenter.

Only the **Material Manager** role, such as Material Analyst, should be **allowed** to create, import and populate units as well as configure session-unit objects.

Switching between units does not affect the original real unit saved on the property descriptor.

The unit objects could be **created manually** or **imported** in IMM and provides a flexibility for the Material Engineer to define a specific system of units.

10.1. Create a Unit Category

Unit Categories are the unit **dimensions** such as Area, Length, Temperature and Volume...

To create a Unit Category:

1. Click the menu item **File→New→Unit Category**
2. In **Unit Category** create dialog enter a **Dimension** name and press **OK**.
3. The new Unit Category will be displayed under the **Units** tree root in Home view.

10.2. Create a Base Unit

For each unit category/dimension, the most representative unit for the dimension should be the base unit. For example for dimension **Length** the SI units is **meter** with symbol **m**.

The **Base Unit** can be the most used worldwide, called SI Units, or the unit mostly used in the country or the company.

For each **Unit Category** should be created one **unique Base Unit**.

To create a Base Unit:

4. Select one **Unit Category**.
5. Click the menu item **File→New→Base Unit**.
6. In **Base Unit** create dialog enter the mandatory attributes, **name** and **symbol**, then press **OK**.
7. The new **Base Unit** will be displayed under its **Unit Category**.

10.3. Create a Derived Unit

For each **Base Unit**, numerous **Derived Units** of the same dimension could be created. For example, the dimension "Length" with base unit "meter", the derived units could be "kilometer", "millimeter", "feet", "inch" ...

The **Derived Unit** has the key mandatory values **Offset** and **Factor** used to convert values between 2 units of the same dimension with regard to the **base unit**.



For example:

- ✓ The **factor** of the derived unit **kilometer** according to the base unit **meter** is **1/1000**.
- ✓ The **offset** of Temperature derived unit **Celsius** according to the base unit **Kelvin** is **-273.15**.

To create a Derived Unit:

1. Select one **Base Unit**.
2. Click the menu item **File→New→Derived Unit**.
3. In **Derived Unit** create dialog enter the **name**, **symbol**, **Offset** and **Factor**, then press **OK**.
4. The new **Derived Unit** will be displayed under its **Base Unit**.

10.4. Create a Unit Alternate Name

The Unit Alternate name is the alias or symbol with which the unit is represented. For example the dimension Temperature could have different aliases for different derived units, for instance: **K** for **Kelvin**, **C** for **Celsius** or **F** for **Fahrenheit** but also under the same derived unit **C**, **°C** or **degC** for **Celsius**...

To create a Unit Alternate Name:

1. Select one **Derived Unit**.
2. Click the menu item **File→New→Unit Alternate Name**.
3. In **Unit Alternate Name** create dialog enter the **alias name** and press **OK**.
4. The new Unit Alternate Name will be displayed under its **Derived unit**.

Note: To be able to convert values between units of same dimension, each **Base Unit** has to have a **Derived Unit** with the **same Name** and under this later should exist **one Unit Alternate Name** with same **Symbol** of the **Base Unit**.

10.5. Create Session Units object

A “**Session Units**” object contains a list of **Session Unit Category** objects.

A **Session Unit Category** object is a set of <Dimension, UnitAlternateName>.

To create a “**Session Units**” object:

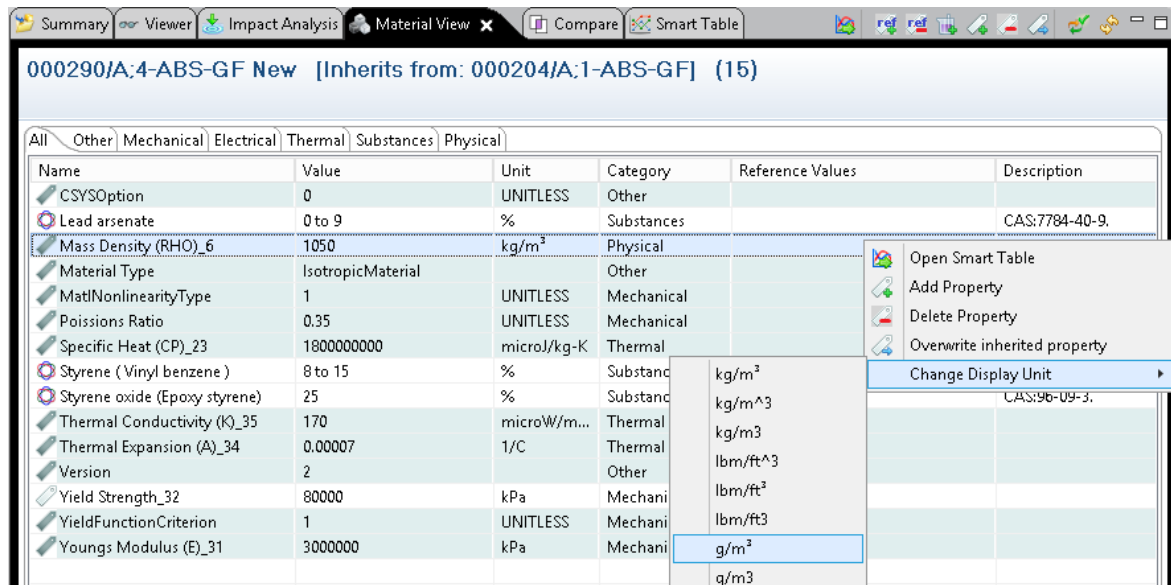
1. Click the menu item **File→New→Session Units**.
2. In **Session Units** object creation dialog, configure the Session Units, to each **dimension** set the required **unit alias name**.
3. Give a unique **Name** to the Session Units and Press **OK**.
4. The newly created **Session Units** object will be displayed under its Session Units root tree.
5. The corresponding list of **Session Unit Category** objects are also automatically created and are displayed under their **Session Units**.



10.6. Change a display unit for one material property

To display the value in a different unit for one Material property, do the following:

1. In **Material View** select a property or inherited property.
2. Click right-mouse-button, in popup menu go to sub menu **Change Display Unit** and select the target unit alias name.



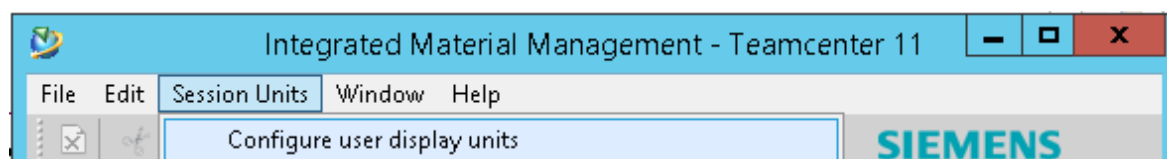
10.7. Change all display units for the Teamcenter Session

To set new display units for all material properties for a whole Teamcenter session, there are 2 ways:

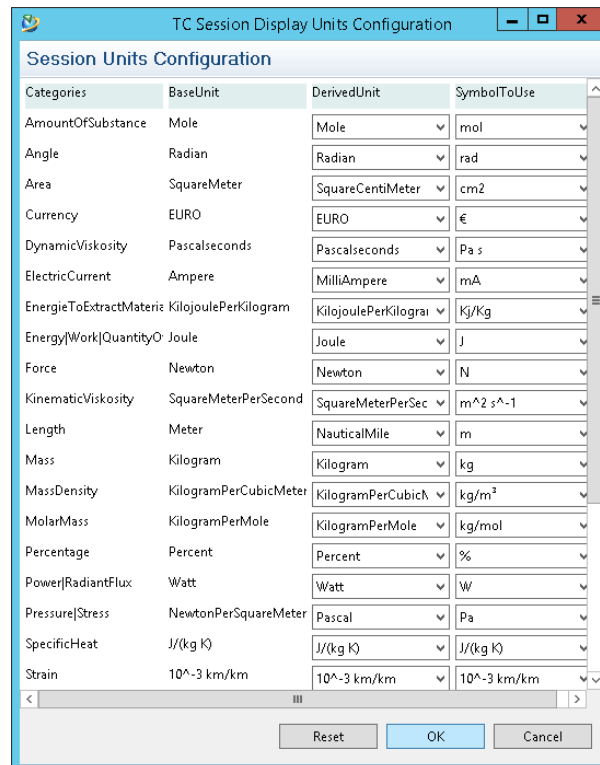
10.7.1. Configure the display units


To set complete user customized display units for any user Teamcenter session:

1. Go to menu item **Session Units→Configure user display units**



2. In **TC Session Display Units Configuration** dialog select for each **Unit Category** the required unit alias name from the column **SymbolToUse**.
3. Press **OK**, all display units in **Material View** and **Smart Table** view will be updated to the user defined units. The values will be converted properly to the new units.

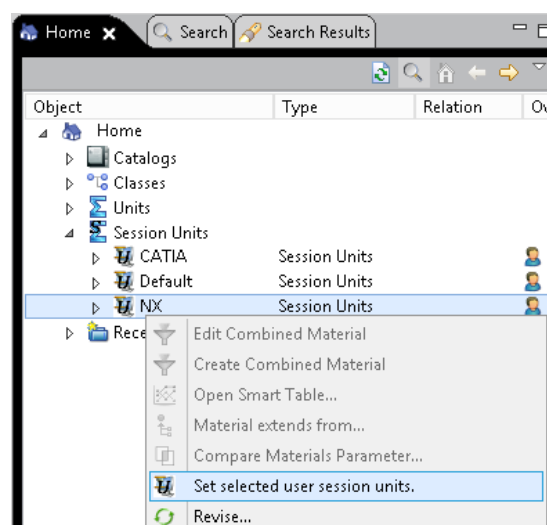



4. If the units are not set instantly, refresh the **Material view** with the top right action button .

10.7.2. Use one predefined Session Units

To display properties values in different units based on **Session Units** objects

1. Go to IMM Home view
2. Select the required **Session Units**
3. Click right-mouse-button and in popup menu press **Set selected user session units.**



1. All display units in **Material View** and **Smart Table** view will be updated. The values will be converted properly to the new units. If the units are not set instantly, refresh the **Material view** with the top right action button .



10.8. Import Units

In the install package, IMM provides hundreds of units to import, 3 different folders are available:

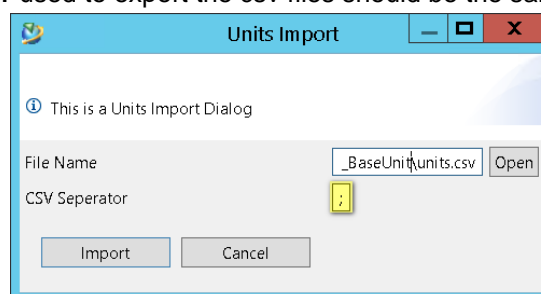
- ✓ **Metric units:** For system international base units.
- ✓ **Imperial units:** For base units used in USA.
- ✓ **Units with no special characters:** For databases which character set does not support any special characters like power 2 '2' and power 3 '3'.

Under each folder, 3 files are available:

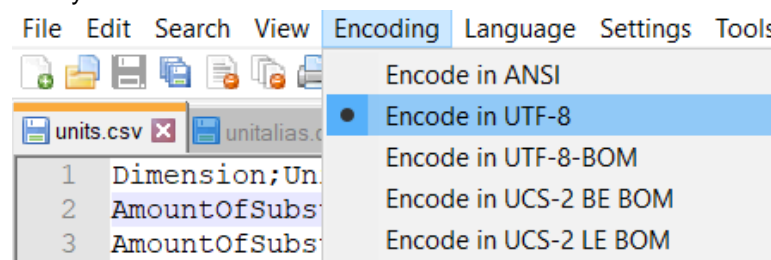
- ✓ **units.csv:** this is the **csv**, semi-column “;” separated, file to import.
- ✓ **Unitalias.csv:** this csv file has all possible unit alias names, which are unique and case sensitive, this file should exist in the same folder as the previous one, but it is **not** to be selected for import.
- ✓ **units.xlsx:** this Excel file has 2 spreadsheets and is provided to allow the Material Manager to add, remove or customize units. To add any new alias name, go to the unitalias sheet, in the **first column** put the **target/derived** unit name, in the **second** the unit alternate name. After any units.xlsx content modification, both spreadsheets should be re-exported/saved, accordingly to **units.csv** and **unitalias.csv** files described above, as “csv utf-8”.

Notes:

- Whilst great care has been taken in the compilation and preparation of the provided units, use of the data is entirely at the risk of the user. IMM cannot accept responsibility or liability for loss or damage occasioned by any person or property acting or refraining from action as a result of any material in this data.
- IMM provides accurate unit factors and offsets for value conversion between units. But, to avoid any risk of wrong data, it is **highly recommended** to double check the unit factors and offsets before import. The conversion calculation is described below.
- The **separator** used to export the csv files should be the same during import.



- After exporting the csv files as CSV UTF8 format, check that the file format is UTF-8 and not any other format. Otherwise convert the format to UTF-8 like depicted below:





- The format of this Excel file is like follow:

1	Dimension	Unit	Symbol	Target Unit	Target Symbol	Factor	Offset
181	Strain	10^-3 km/km	10^-3 km/km	10^-3 usFt/usFt	10^-3 usFt/usFt	1	0
182	ThermalConductivity	W/(m K)	W/(m K)	W/(m K)	W/(m K)	1	0
183	ThermalConductivity	W/(m K)	W/(m K)	BTU-in/hr-ft^2-°F	BTU-in/hr-ft^2-°F	6.94	0
184	ThermalConductivity	W/(m K)	W/(m K)	cal.cm/sec-cm^2-°C	cal.cm/sec-cm^2-°C	0.00239	0
185	ThermalConductivity	W/(m K)	W/(m K)	ft-lb.in./hr-ft^2-°F	ft-lb.in./hr-ft^2-°F	5400	0
186	ThermalConductivity	W/(m K)	W/(m K)	J.m/min-m^2-°C	J.m/min-m^2-°C	60.0	0
187	ThermalConductivity	W/(m K)	W/(m K)	kcal/m-hr-°C	kcal/m-hr-°C	0.860	0
188	ThermalConductivity	W/(m K)	W/(m K)	lb/s-°F	lb/s-°F	0.125	0
189	ThermalConductivity	W/(m K)	W/(m K)	lbm-in/s^3-°F	lbm-in/s^3-°F	48.2	0
190	ThermalConductivity	W/(m K)	W/(m K)	W/(m °C)	W/(m °C)	1.00	0
191	ThermalConductivity	W/(m K)	W/(m K)	μW/(m °C)	μW/(m °C)	1e6	0
192	ThermalExpansion	1/K	1/K	1/K	1/K	1	0
193	ThermalExpansion	1/K	1/K	1/°C	1/°C	1	0
194	ThermodynamicTemperature	Kelvin	K	Kelvin	K	1	0
195	ThermodynamicTemperature	Kelvin	K	Rankine	°Ra	9/5	0
196	ThermodynamicTemperature	Kelvin	K	Celsius	°C	1	-273.15
197	ThermodynamicTemperature	Kelvin	K	Fahrenheit	°F	9/5	-459.67
198	Time	Second	s	Second	s	1	0
199	Time	Second	s	Hour	hr	1/3600	0
200	Time	Second	s	Minute	min	1/60	0
201	Time	Second	s	MilliSecond	ms	1000	0
202	UNITLESS	UNITLESS	UNITLESS	UNITLESS	UNITLESS	1	0
203	Velocity	MeterPerSecond	m/s	MeterPerSecond	m/s	1	0
204	Velocity	MeterPerSecond	m/s	KilometerPerHour	km/h	3.6	0
205	Velocity	MeterPerSecond	m/s	MillimeterPerSecond	mm/s	1000	0
206	Voltage	Volt	V	Volt	V	1	0

- IMM calculates the **conversion** from one unit to another unit, from the same dimension, is based on the formulas below (the directions highlighted above by 1 and 2 is taken as an example):
 - **F1:** To convert the value X from a **derived unit** (e.g. Temperature °Ra) back to a **base unit** (e.g. Temperature K): the formula used is:

$$T(K) = [T(^{\circ}Ra) - \text{Offset}] / \text{Factor}$$
 - **F2:** To convert the value X from a **base unit** (e.g. Temperature K) to a **derived unit** (e.g. Temperature °F): the formula used is:

$$T(^{\circ}F) = [T(K) * \text{Factor}] + \text{Offset}$$
 - So, to convert the value X from one **derived unit** (e.g. Temperature °Ra) to another **derived unit** (e.g. Temperature °F): IMM applies: **F1** then **F2** above.
- The unit alias names should be unique in the database but not case sensitive we can for example have two unit-alias-names called "Kg" and "kg" but not "Kg" and "Kg" otherwise an error is thrown by IMM.

To import the IMM units:

- Start Teamcenter and open the IMM perspective
- Select the menu item **File→Import→Units**
- In **Units Import** dialog, browse using the **Open** button to the provided file **units.csv**, (**Note:** the **unitalias.csv** should exist along with the units.csv, but it is not to be selected for import).
- Check the separator to be used for import. By default, a semi-column ";" is used. If the provided unit files are re-customized and new csv files are generated the separator could change.
- Press **Import** button.
- The unit tree will be **created** or **updated**.
- If not already existing, a default **Session Units** tree will be created with base units.
- If the units are imported successfully a confirmation dialog is displayed.



11. Import Catalog of Materials

One of the core capabilities of IMM is the import of Catalogs of Materials in different formats and from various sources. Every data input for import is considered as a **collection of materials** therefore we call it a **Catalog of materials**. A Catalog could contain one or multiple materials.

An import wizard is provided to guide through all the steps of material import process.

11.1. Data formats

The main supported material data formats are MATML, VDA, legacy CSV and Excel.

11.1.1. MATML

The MatML format or the Material XML supported by IMM is based mostly on the standard MatML, with some customization for substances and persistent material **attributes**. In the **Appendix** chapter **MatML Sample format** is an extract of a MatML file that could be imported by IMM.

Note: that there is **one common Metadata** section for **all Materials**.

11.1.2. VDA

VDA is the abbreviation for "Verband Deutsche Automobilindustrie", a German organization which could be translated to "Automotive industry association". It set up a VDA standard which is a CAD data exchange format for the transfer of surface models from one CAD system to another.

The VDA format is a special XML dedicated for material. The main provider for those material could be found here <http://www.ima-dresden.de>.

The VDA XML format files could be retrieved after connecting, searching and importing materials from **WIAM** server. Searching/importing from WIAM is based on the same parser.

11.1.3. Legacy CSV

In IMM 11.4 the Excel format is introduced but the legacy CSV format is still supported. To import materials based on csv format, two related spreadsheets are required for example:

- ✓ Sample.csv.
- ✓ Sample-props.csv

The initial document is an excel file with 2 spreadsheets. After preparing the excel file it needs to be converted in two csv files. Note that the name of the csv file with properties should end with **-props**.

1. **Sample.csv:** This spreadsheet has as many columns as it has properties and substances. A minimum of three rows are required. The **first** column will always be the material **object name** and the **second** the material **class**, the **third** column has the material **description**.

Starting from the **fourth** column, the material properties and their values are listed like follow:

Material name	Material class	Material description	Property 4	Property 5	Property 6&5	Property 5 7	Substance 8
Material 1	Metal	Desc 1	Steels	873.6 to 1250	0.04&50	1;3;4 20;30;40	10
Material 2	Liquid Water	Desc 2	Fluid	150 to 600	0.01&120	1;4;7 10;30;50	20

**Notes:**

- ✓ In the 2nd column, when we have an extended material class (class and subclasses), we need to give the full path of the subclass separate by “|”. For instance, **ClassParentName | ClassName**.
 - ✓ If the value is a **range of doubles** it should look like **valueMin to valueMax**
 - ✓ If the property has reference property we use the **&** character like highlighted above
 - ✓ If a property is a **Curve/table of values** we should specify the X and Y property descriptors row numbers separated by “|”, for example: **Property 5|7**. The X and Y values should be like follow **X1;X2;X3|Y1;Y2;Y3**.
2. **Samples-props.csv**: This spreadsheet has 4 mandatory columns and a 5th optional column that could be added for CAS numbers of eventual substance entries. If the substance rows exist but has no CAS number then a Substance object will be created with wildcard string “-”. **Each row** is a different **Property Descriptor** or a **Substance** like described in the table below:

Row number	Name of Property	Type	Category	Unit	CAS Number (only for substances)
...
4	Property 4	Text	Other	UNITLESS	
5	Property 5	Number	Thermal	°C	
6	Property 6	Number	Mechanical	MPa	
7	Substance 1	Number	Substance	%	12345-67-8
8	Substance 2	Number	Substance	%	23456-78-9

Sample Property Descriptor/Substance spreadsheet**11.1.4. Excel**

To import materials via Excel, the user should follow a predefined Excel format as described below:

- ✓ The first two columns are fixed:
 - The **first** column is just a legendary one, it is used for user guidance and describes what the row value could be. It could remain empty.
 - The **second** column contains in the:
 - 1st row: optional display name for the TC property **object_name**
 - 2nd row: the mandatory TC property real name **object_name**
 - 3rd row: the expression **tc_item_attr** which is the IMM key for TC item attribute
 - 4rd, 5th and 6th rows: are not relevant for TC attributes at any column
 - Starting from the 7th row: the names of the materials to be imported

Display name	Name	...
Attribute name	object_name	
Type	tc_item_attr	...
Category	NA	...
Unit	NA	...
Description	NA	...
	Material 1	...
	Material 2	...

- ✓ The first 6 rows are dedicated for the Material data like follow:
 - 1st row: starting from 3rd column it could be:
 - Any IMM Property Descriptor **display** name if empty the real name in second row will be used as a display name also
 - Any Material or Material revision TC persistent property display name, could be left empty.
 - 2nd row: starting from 3rd column it could be:
 - Any Material or Material revision TC persistent property real name, for instance “object_desc”.
 - Any IMM Property Descriptor name for instance “Density”

- 3rd row: the IMM key defining the type of the property. The key could be like depicted in the table below:

ATTRIBUTE TYPE	DESCRIPTION
tc_item_attr	Represents a TC persistent attribute real name on Material Item
tc_item_rev_attr	Represents a TC persistent attribute real name on Material Revision
double_prop	Material double Property descriptor/parameter
string_prop	Material String Property descriptor/parameter
table_prop	Material Table Property descriptor/parameter
substance	Substance to be attached to the material
...	

- 4th row: defines the category name of the IMM properties, for instance mechanical, Thermal... for substances the value should be **Substance**, for any TC attributes this row is not relevant.
- 5th row: defines the unit of the IMM property value... for substances the unit should be %, for any TC attributes this row is not relevant.
- 6th row: defines the description of the IMM property descriptor... for substances and any TC attributes this row is not relevant.
- Starting from 7th row: each row contains the values of the properties, Teamcenter attributes and substance composition accordingly.

Note: For **more details** about the Excel format, check the comments in the IMMSampleMaterials.xlsx excel file provided in the IMM install package\Teamcenter\data to import\Catalog.

11.2. Import process

To import a **Catalog of Materials** with any specific data format:

1. Select the function **File→Import→Material Catalog**
2. In **Catalog Import** first wizard page, select from **Input Type** combo box the target format of the file to import **CSV**, **MATML** or **VDA**.
3. Press the **Open** button to browse to the file absolute path to import
4. If the materials should be imported to an already existing **Catalog** select one catalog from the **Existing Catalog Name/Id** combo box.
5. To create a complete **new Catalog**, **skip step 4**, **do not** select any existing catalog.
6. If **Next** button is activated, press it to continue.
7. From the second wizard page, select the material and substance types and if the CSV format is selected check also the csv **separator**, then press **next**.

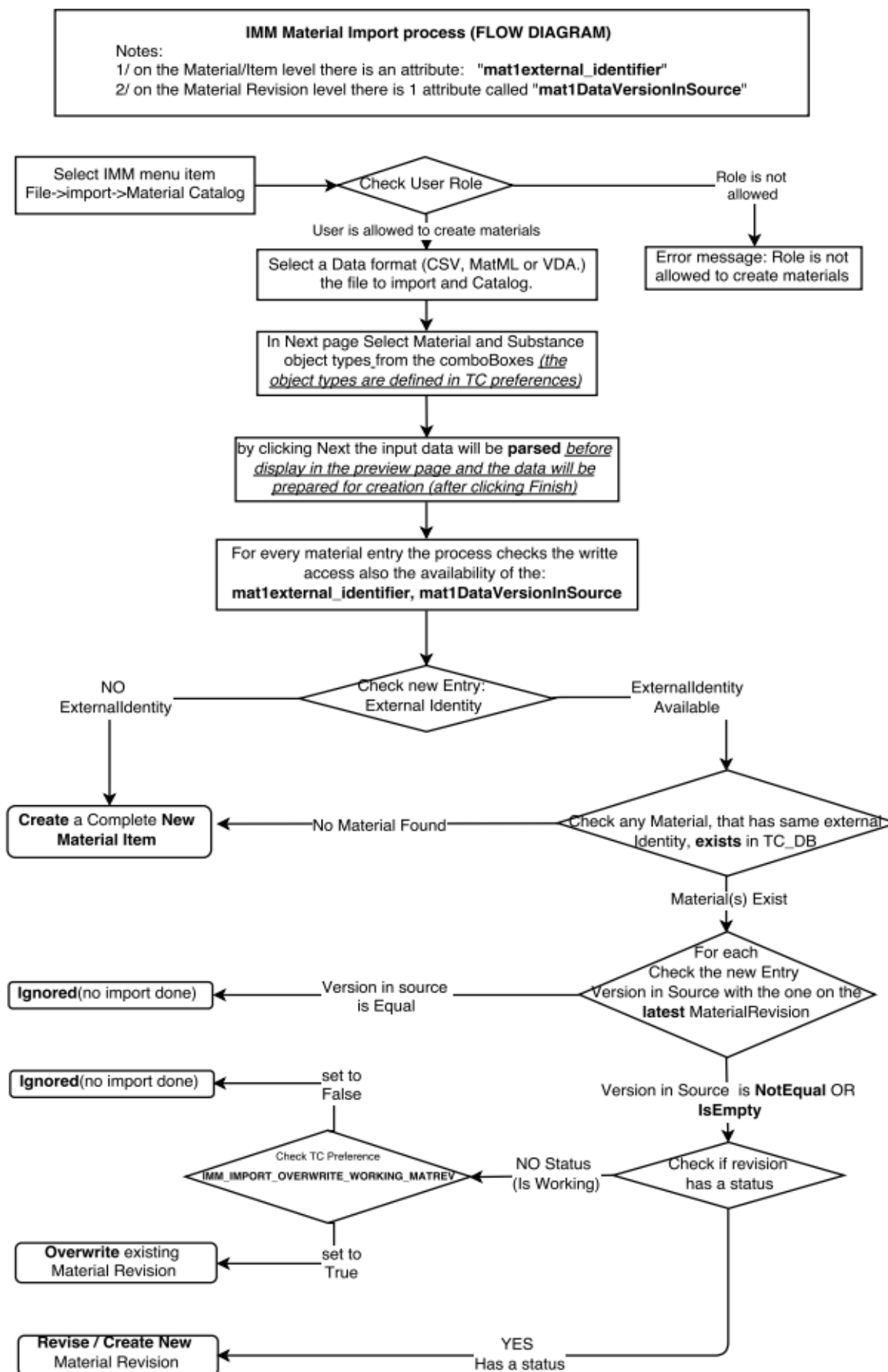
Note: The admin could add or remove, material or substance types from the preferences: **IMM_IMPORT_WIZARD_OBJECT_TYPES** and **IMM_IMPORT_WIZARD_SUBSTANCE_TYPES**.

8. At this point, the file starts to get parsed to retrieve materials.
9. In the third wizard page, if not parsing issues thrown, a viewer will display all the materials candidates for import.
10. Select the materials required and press **Finish** to start the import of materials into Teamcenter.
11. At the end of the import process a message dialog will be displayed with the result.

Note: The next 2 chapters will give more details and examples about the import process.



11.3. Import process flow diagram





11.4. Example of real import use cases

To import for example a CSV file that has 3 materials:

1. Select CSV

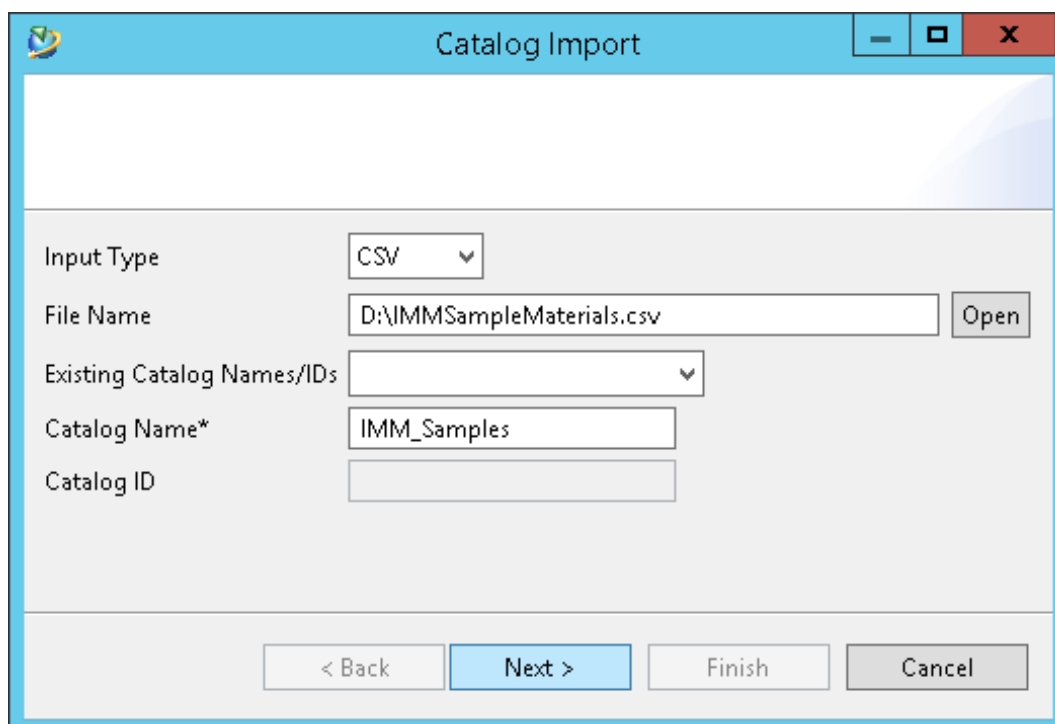
The 'Catalog Import' dialog box displays a message: 'Please provide a name for a new catalog Or Select an existing one.' The 'Input Type' dropdown is set to 'CSV'. The 'File Name' field is empty, with an 'Open' button to its right. The 'Existing Catalog Names/IDs' dropdown is empty. The 'Catalog Name*' and 'Catalog ID' fields are also empty. At the bottom, there are buttons for '< Back', 'Next >', 'Finish', and 'Cancel'.

2. Select an existing catalog and a csv file and press **Next**

The 'Catalog Import' dialog box shows the 'File Name' field populated with 'D:\IMMSampleMaterials.csv' and the 'Existing Catalog Names/IDs' dropdown set to 'NX_Catalog/000202'. The 'Catalog Name*' field is now 'NX_Catalog' and the 'Catalog ID' field is '000202'. The 'Next >' button is highlighted in blue, indicating it is the active step.



3. If a new catalog is needed, simply give a catalog, without selecting an existing one, then press **Next**.

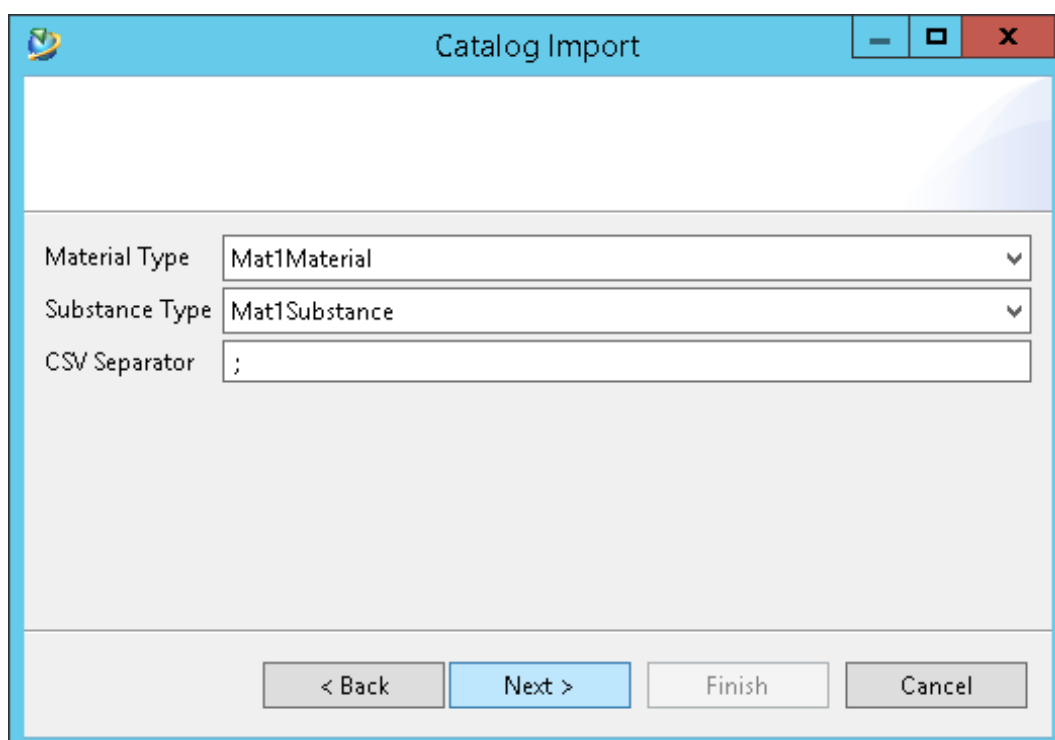


The 'Catalog Import' dialog box is shown. It has a title bar with a standard Windows icon and window controls. The main area contains the following fields:

- Input Type:** A dropdown menu set to 'CSV'.
- File Name:** A text box containing 'D:\IMMSampleMaterials.csv' and an 'Open' button to its right.
- Existing Catalog Names/IDs:** A dropdown menu.
- Catalog Name*:** A text box containing 'IMM_Samples'.
- Catalog ID:** An empty text box.

At the bottom, there are four buttons: '< Back' (disabled), 'Next >' (active/highlighted), 'Finish' (disabled), and 'Cancel' (disabled).

4. Select an available material type, check the csv separator and press **Next**.



The 'Catalog Import' dialog box is shown again, but with different settings. It has the same title bar and layout as the previous one.

- Material Type:** A dropdown menu set to 'Mat1Material'.
- Substance Type:** A dropdown menu set to 'Mat1Substance'.
- CSV Separator:** A text box containing ';'.

At the bottom, the buttons are: '< Back' (disabled), 'Next >' (active/highlighted), 'Finish' (disabled), and 'Cancel' (disabled).



5. In case of **first time** import, all materials will not be found and will be **newly imported**.

The 'Catalog Import' dialog box shows a table with the following data:

Import	IdPre...	Name	Type	Description	Item found?
<input checked="" type="checkbox"/>		Aluminum_X01	Mat1Material		
<input checked="" type="checkbox"/>		Aluminum_X02	Mat1Material		
<input checked="" type="checkbox"/>		Aluminum_X03	Mat1Material		

Buttons at the bottom: < Back, Next >, Finish, Cancel.

6. In case of **second time** import of same material file the column “**Item found?**” will display the materials already found in Teamcenter, based on the **external identifier**.

The 'Catalog Import' dialog box shows a table with the following data:

Import	IdPre...	Name	Type	Description	Item found?
<input checked="" type="checkbox"/>		Aluminum_X01	Mat1Material		[1 Items]-000726.
<input checked="" type="checkbox"/>		Aluminum_X02	Mat1Material		[1 Items]-000727.
<input checked="" type="checkbox"/>		Aluminum_X03	Mat1Material		[1 Items]-000728.

Buttons at the bottom: < Back, Next >, Finish, Cancel.

Notes: When importing materials which are already existing in Teamcenter, like depicted before in the import Process flow diagram, different use cases are possible: For instance:

- ✓ The material revision has a **Version in Source** attribute value is equal to the material version being imported: The material will be ignored.
- ✓ Else the material revision has a **Release Status**, in this case the material will be revised and the import will take place into the new revision.
- ✓ Else the material revision is in **Working State** and the logical preference called **IMM_IMPORT_OVERWRITE_WORKING_MATREV** is set to **true**, then the import will take place and the existing **material properties** will be **updated**.
- ✓ Else the material revision is in **Working State** and the logical preference called **IMM_IMPORT_OVERWRITE_WORKING_MATREV** is **false**, the material is ignored.



12. Export Materials

12.1. Export pre-requisites


IMM allows to export materials from Teamcenter to multiple file formats based on the following pre-requisites:

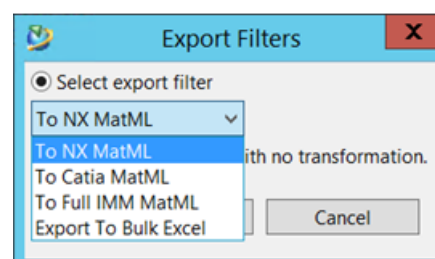
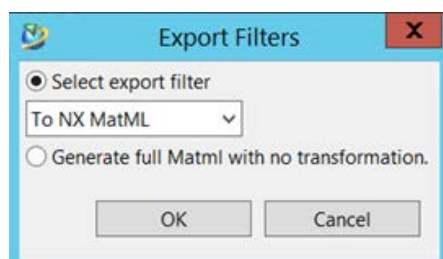
1. Transformation XSLT stylesheet files, that transforms the IMM MatML to any target format.
2. Datasets that will contain the XSLT files as named reference. For each **.xslt** file a dataset is required. Each dataset should include only one **.xslt** file.
3. **IMM_EXPORT_FILTERS** preference should be defined and set by the material manager.

For more details regarding export feature pre-requisites and preference refer to the admin guide.


12.2. Export materials to a target file format

To Export materials to one of the available target formats:

1. Select **at least one** material or a material revision.
2. Press **Export selected materials** button  from IMM toolbar, or go to menu item **File→Export→Selected materials**, to display the **Export Filters** dialog.



3. By default, the radio button **Apply transformation** is checked. In case of export with transformation is required, select one export filter from the drop down list and press **OK**.
4. If an export to a full matml, with not transformation, is needed. Select the second radio button from the bottom (the export filters list will be disabled) and press **OK**.
5. From the **Save to file** dialog select the file path, name and extension then press **Save**.
6. A file with the selected type will be generated in the given path.

Note: To Export a material to an **ANSYS** MatML file. IMM has a **deprecated** Export to ANSYS MatML feature called when pressing the toolbar button , this will be **removed** in **feature releases**. This export is based on a special hardcoded naming of the Material properties, **hence** it is **recommended** to use the new material Export, based on mapping, depicted above.



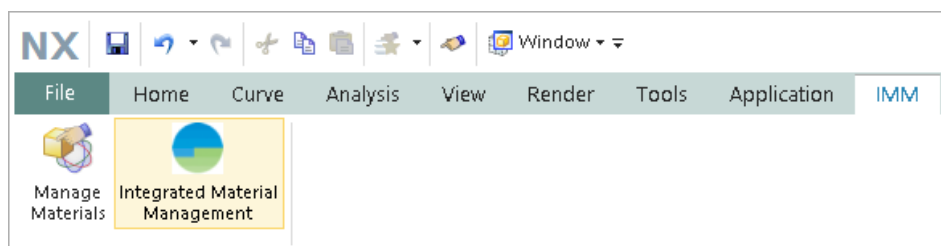
13. Managing Materials in NX

The Integrated Material Management provides a module, for NX CAD system, to allow searching and assigning materials to an NX Part more specifically a material to each solid body of an NX Part.

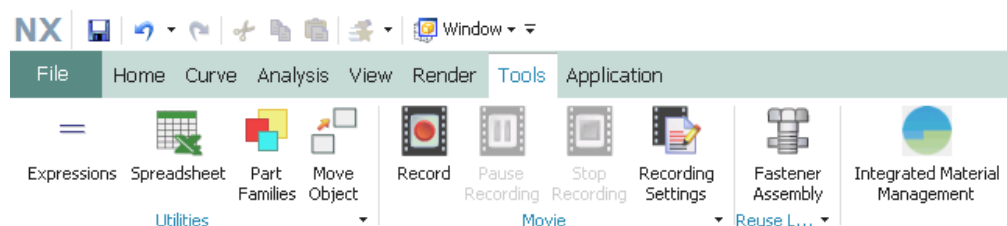
13.1. Access IMM from NX

The display of IMM UI from NX could be done either:

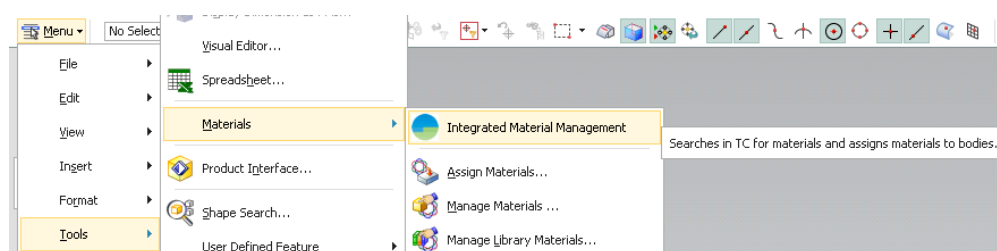
1. From **NX→IMM** ribbon, press the ribbon item **Integrated Material Management**.



2. Or From **NX→Tools** ribbon, press the toolbar item **Integrated Material Management**. If it is not found customize the toolbar and add it.



3. Or through menu **Tools→Materials→Integrated Material Management**.



13.2. Switching between new IMM NX Open UI and legacy UI

Depending on the configuration of the files, with the following extensions **.rtb .tbr .men**, under the **startup** folder of IMM extension, two different IMM UIs could be displayed and used like below:

- ✓ The **legacy IMM UI**, by modifying the startup library entry to **"MDS.NX.UI.dll"**.
- ✓ The **NX Open IMM UI** that has the NX look and feel, by keeping the default entry **"IMM.NX.UI.dll"**.



13.2.1. Legacy IMM UI

Name	Id/Rev	Material Class	Release Status	Description	Material Type
Aluminum_2014	000622/A	METAL			
Aluminum_5086	000623/A	METAL			
Aluminum_A356	000624/A	METAL			

Details Panel:

Mass Density (RHO)_6: 2794 kg/m3
Strength Coefficient_21: 826957000 N/m2
YieldFunctionCriterion: 1
MatlNonlinearityType: 1
Specific Heat (CP)_23: 8800000000 micro/kg-K
Anisotropy Coefficient R90: 2
CSYSOption: 0
Anisotropy Coefficient R0: 2
Anisotropy Coefficient R45: 2
CyclicStrainHardeningExp: 0.132
FatigueDuctCoeff: 1.418
FatigueDuctExp: -0.87
Fatigue Strength Coefficient_30: 1008000000 N/m2
CyclicStrengthCoeff: 963000000 N/m2
Version: 3
Material Type: IsotropicMaterial

Graph: Youngs Modulus (E)_7 Vs Temperature

The graph shows Young's Modulus (E) in N/m2 on the y-axis (ranging from 600,000,000,000 to 700,000,000,000) versus Temperature on the x-axis. The curve shows a gradual decrease in modulus as temperature increases, starting from approximately 700,000,000,000 N/m2 at low temperatures and ending near 600,000,000,000 N/m2 at higher temperatures.

13.2.2. IMM UI with NX Look and Feel (NX Open UI)

Type: Select Body(s)

Select Body: Select Object (1)

Search Criteria:

Material Catalog: 24-NX_Catalog

Attributes | Parameters | Material Classes

Name: AI*
Description:
Release Status: Any
Material Designations:
Applications:

Search Result:

Material Rev	Name	Material Cl...	Release St...	Description	Own...	Last modifi...
000622/A	Aluminum_2014	METAL			infod...	16-Feb-201...
000623/A	Aluminum_5086	METAL			infod...	16-Feb-201...
000624/A	Aluminum_A356	METAL			infod...	16-Feb-201...

More: Click to see all dialog options. OK Apply Cancel

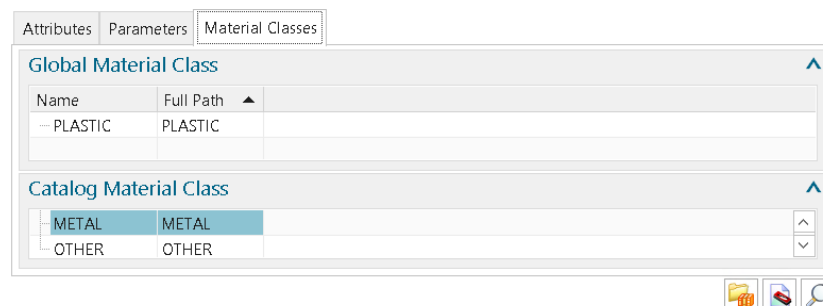


13.3. Search and display materials in NX

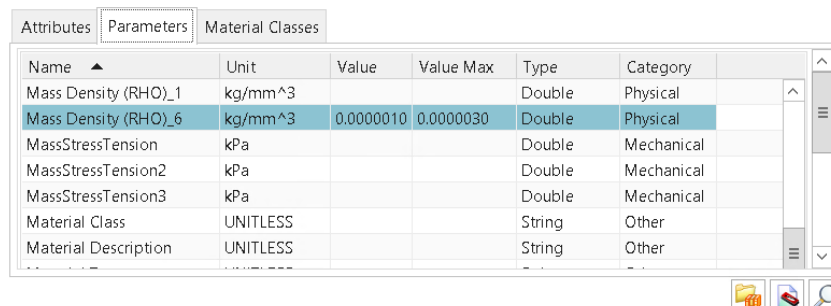
1. To filter and narrow down the search material result, configure the search criteria, in the left part of **Integrated Material Management** NX legacy UI and in the upper part of the new NX Open UI, like depicted in the screenshots above.




Note: It is possible to search for materials based on **classes** or other criteria with **no catalog** selected. However, for performance reason, there is a minimum number of characters, required for the **name**, controlled by **IMM_SEARCH_BY_NAME_MIN_NB_OF_CHARS** preference for both TC and NX. If this limitation is not required, set this preference value to **0**.

2. Select the required classes in the **Material Classes** tab to filter based on the selected global or catalog classes. If the **Catalog Material Class** group is hidden from the NX Open UI, press the arrow button ▼ highlighted in the screenshot of section 11.3.2.



3. To search based on parameter data, click once on the values columns, in front of the required parameter in the **Parameters** tab, to enter a value then select the corresponding parameter.



4. Press the **Search** button. For NX Open IMM UI, it is the magnifier glass button .
5. The material revisions found will be displayed on the left part of IMM legacy UI and in the **Search Result** section in the IMM NX Open UI.
6. To display the material revision details such as properties, substances, alternate materials...
 - ✓ For the legacy IMM UI, select one material revision from the search result list then press the **Details** button. The details will be displayed on the bottom right panel.
 - ✓ For the NX Open IMM UI, select one material revision then press the **Inspect** material button  or the material **Information** button  for a flat text presentation of the material properties.
7. To add extra columns to **Search Result** panel to display other material revision attributes check the preference **IMM_CAD_MATERIAL_VIEW_COLUMN_CONFIG**.
8. To search based on extra material revision attributes. Up to **five** extra **string** properties could be added to **Search Criteria** panel via the preference **IMM_SEARCH_MATREV_CUSTOM_ATTR**

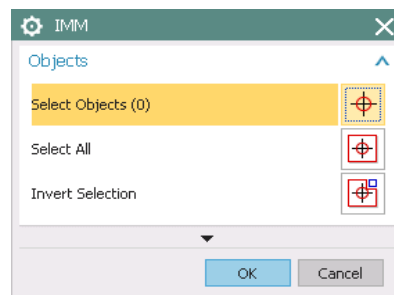
**Notes:**

- ✓ The display of values and units will be in the **Unit system** defined by the Material Manager as a mapping between Teamcenter and NX. Refer to the pre-requisites section below.
- ✓ The release status list is managed through the preference **IMM_NX_Display_Statutes**. This preference has protection scope **Group**. The administrator could add or remove statutes.

13.4. Assign a Material to a Part in NX

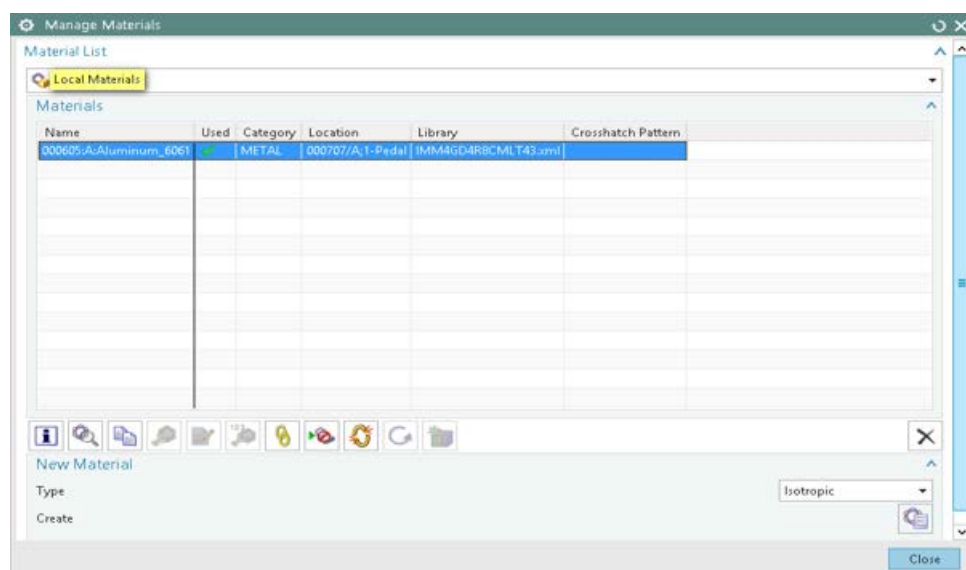
To assign a material to a part in NX:



1. Select the required **material revision** from the search result on the top right of IMM window.
2. Select the target **solid bodies**.
3. For the legacy IMM UI, press the **Assign** button. If the Part has more than one **solid body** and none is already selected, a message box will pop-up to ask to select any. Select the target solid bodies and press **OK**.

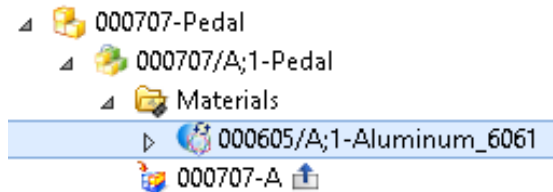



4. For the NX Open IMM UI, press **OK** button if it is enable. If no **solid body** is selected the **OK** button will be disabled.
5. If the material is assigned successfully a confirmation dialog will be displayed. A **MatML** file is generated and **attached** to the Part. To check this, go to NX ribbon **IMM** or to the menu **Tools→Materials** and select **Manage Materials**.

In NX **Manage Materials** dialog, go to **Local Materials**, the xml corresponding to the assigned material revision should exist.



6. To check its content, select the file and press the  button.
7. To effectively **create a relation** in **Teamcenter** between the **assigned** material revision and the **part**, press the **Save** button from the  toolbar.
8. If the relation creation is enabled and the Save action was successful, the **material revision** will be displayed in Teamcenter under the pseudo-folder **Materials** of the part.



9. If the materials attached to the part revision are modified in Teamcenter, user could update the materials for the part in NX by pressing **Update Materials from TC** from the IMM legacy UI and the button  from the IMM NX Open UI.

13.5. Important pre-requisites for successful material assignment

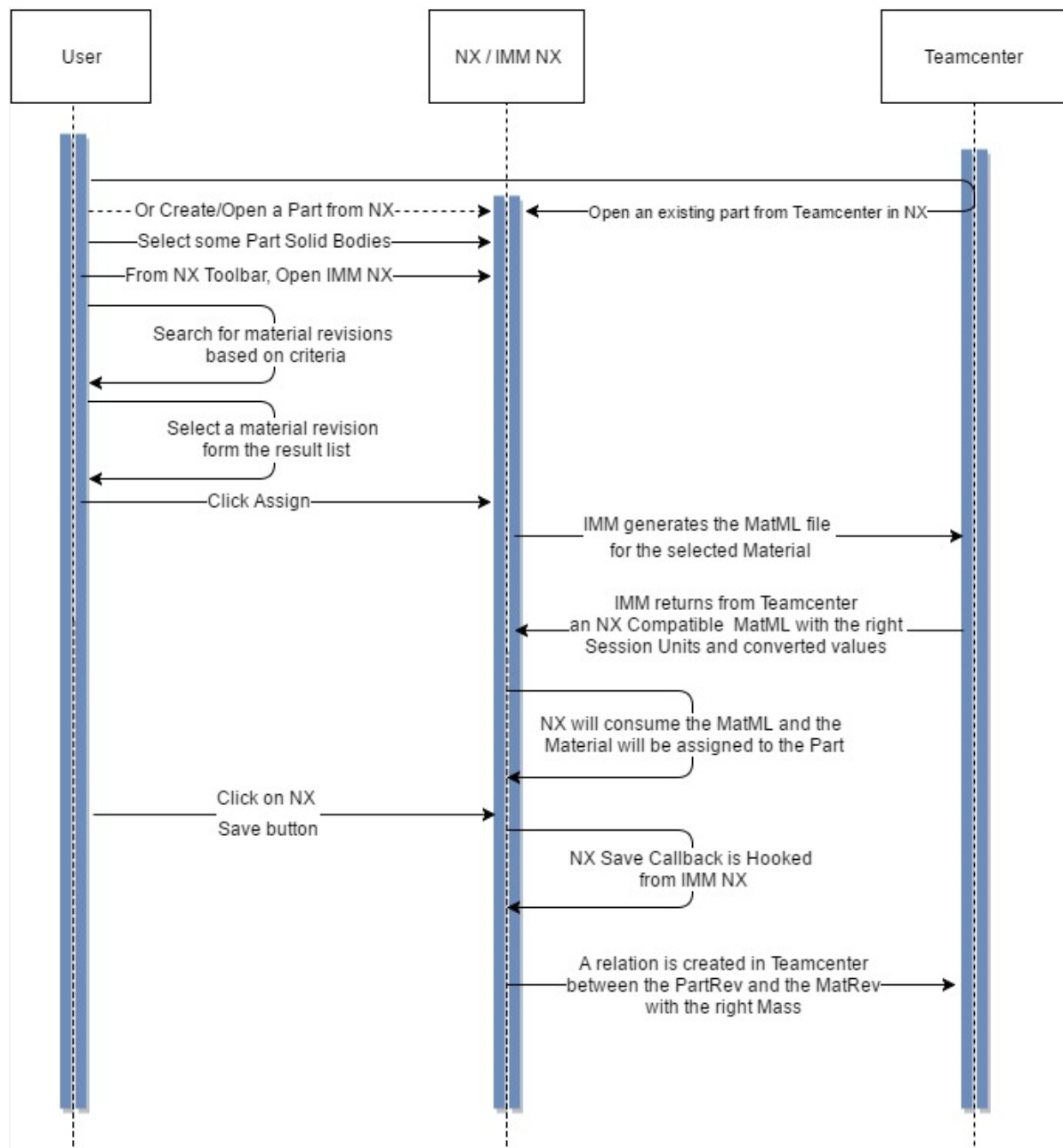
For successful material assignment, the following notes and pre-requisites are to be considered:

- ✓ It is important that the **property name mapping**, between Teamcenter and NX, has been already defined by the material manager. It is based on the XSLT mapping file.
- ✓ The Teamcenter preference **IMM_EXPORT_FILTERS** should have an entry that starts with **NXMATML;NXMATML** and points to the dataset name containing the XSLT mapping file.
- ✓ It is important that the **unit mapping**, between Teamcenter and NX, has been already defined by the material manager. The unit mapping is based on two site preferences, **IMM_NX_SESSION_UNIT_ALIASNAMES** and **IMM_NX_SESSION_UNIT_CATEGORIES**
- ✓ Only materials, assigned to solid bodies which belong to the NX **Reference Sets** defined by the preference **IMM_NX_GEOMETRY_REFERENCESSET**, will be related to the part in Teamcenter. The default Reference Set is **MODEL**. From IMM 10.1.7 and 11.2.3 onwards, multiple Reference Sets are possible, the preference can remain a single comma separated String or an array String with multiple Reference Sets name.
- ✓ The relation name is defined by a mandatory preference **IMM_NX_PrimaryMaterialRelation**.
- ✓ To enable the relation creation in Teamcenter the following preference should be set to **true**: **IMM_CREATE_REL_WITH_MATERIAL_ON_NXSAVE**



13.6. Material Assignment sequence diagram

To assign a material to a part in NX, here is sequence diagram to follow:





14. WIAM Materials

As mentioned before, IMM provides by default, the capability to search and import materials from an external material source called **WIAM**. This feature could be activated or deactivated through the logical preference **IMM_WIAM_USED**.


The communication between Teamcenter Server Process and WIAM Server Instance is based on the HTTP Protocol.

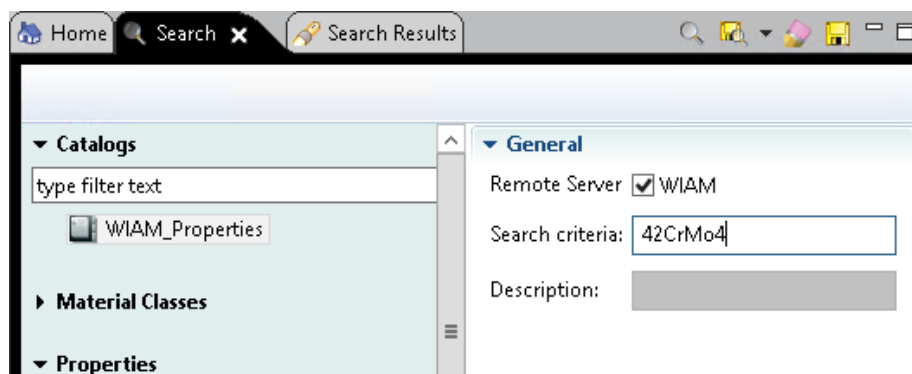
To access data from the WIAM Instance no login is needed. The returned material data is in standard VDA 231-200 XML schema format.

All related information about the path to the WIAM Server Instance and search options are configured by the Material Manager in the mandatory preferences which names are starting with **IMM_WIAM***.

14.1. Search Materials in WIAM

To Search in WIAM server:

1. In Search view tick the WIAM remote server checkbox, the Search will be **re-wired** to the **WIAM server data source**.
2. Enter the name in the search criteria then press the  button.



3. If no WIAM Catalog is available, a message dialog will ask whether to import the Property Descriptors from WIAM Server. If OK is pressed a CSV file will be transferred from WIAM server and parsed by IMM to create the Catalog and its descriptors
4. If the connection is established and no issue with the path to the server, the WIAM Search process will start.

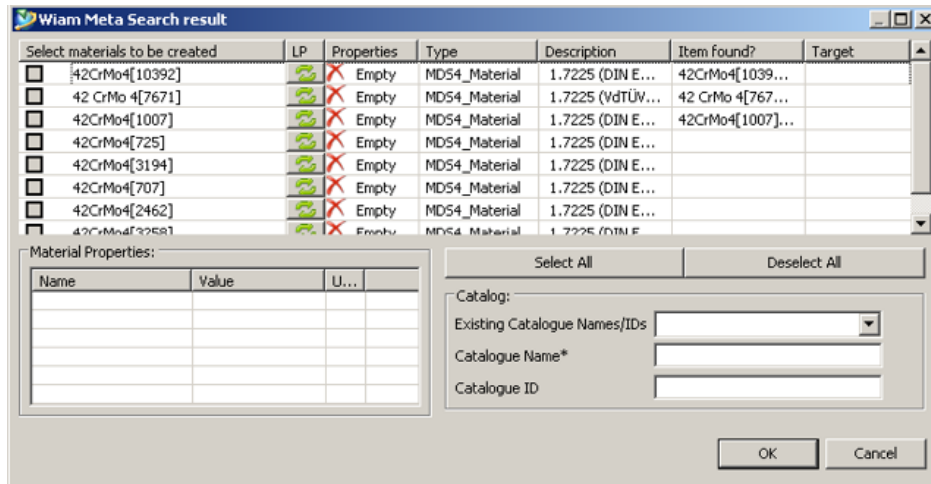
Notes:

Avoid having a short search criterion, this may take some time. The longer and more precise the name is, the shorter time the search will take.

If the **WIAM_Properties** catalog exists, property descriptors could be dragged and dropped also to the right panel of the Search view as described in the main IMM search chapter.




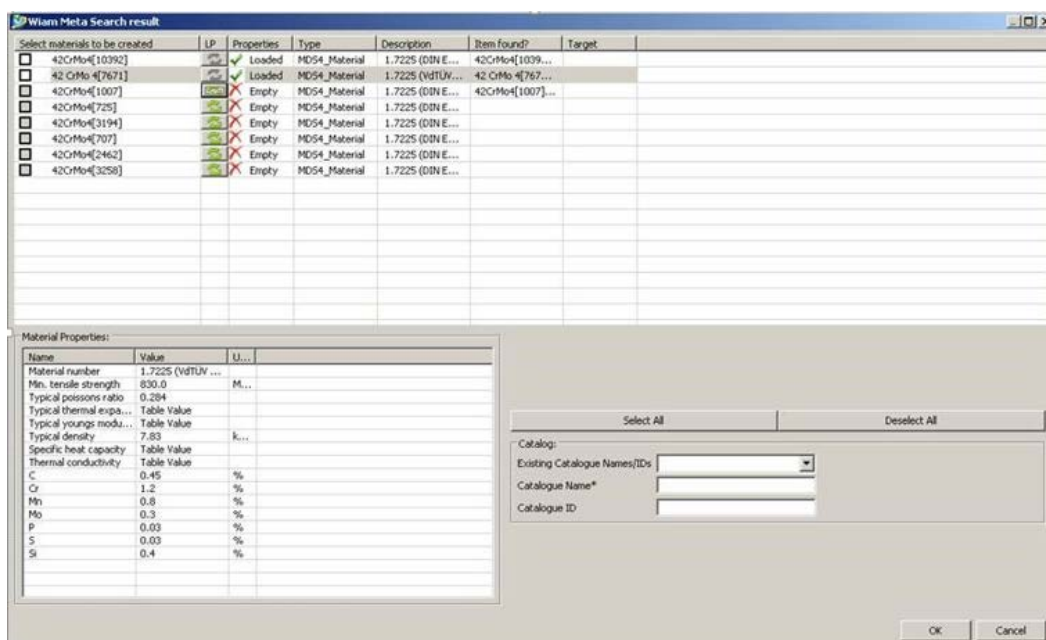
- When the search process is finished the **Wiam Meta Search result** dialog will be displayed with the found materials.
- At this stage the properties are not transferred by WIAM and no material could be selected for import like shown below.



14.2. Import Materials from WIAM

To import the found materials from WIAM:

- Press the  button to Load the properties for each required material separately. This will fetch the corresponding material properties again from the WIAM server.
- If loaded successfully, the button will be disabled and the properties will be display in the bottom left part of the dialog and the corresponding material checkbox will be enabled.
- Select the material to import but ticking the corresponding checkbox.
- Select an existing Catalog or give a name to a new catalog then press **OK**.
- This will **import** and create the materials in Teamcenter under the specified Catalog.





15. Appendix

15.1. IMM MatML Sample format

```
<?xml version="1.0" encoding="UTF-8"?>
<MatML_Doc>
  <!--Material 1-->
  <Material>
    <BulkDetails>
      <Name>Water_vapour_Gas</Name>
      <Notes>description of the material1</Notes>
      <Class><Name>Gas</Name> </Class>
      <Source source="SourceName"/>
      <TCItemAttribute name="mat1external_identifier">
        <Data>the unique external identifier for the material</Data>
      </TCItemAttribute>
      <TCItemAttribute name="persistent_material_attribute">
        <Data>persistent_material_attribute value</Data>
      </TCItemAttribute>
      <TCItemRevAttribute name="persistent_mat_rev_attribute">
        <Data>persistent_mat_rev_attribute value</Data>
      </TCItemRevAttribute>
      <PropertyData property="Material Type_1">
        <Data format="string">FluidMaterial</Data>
      </PropertyData>
      <PropertyData property="MolarMass_11">
        <Data format="exponential">1.802000e-002</Data>
      </PropertyData>
      <SubstanceData property="5001">
        <Data format="exponential">40</Data>
      </SubstanceData>
      <PropertyData property="MassDensity_7">
        <Data format="exponential">
          1.070000e+002, 1.270000e+002, 1.770000e+002, 2.270000e+002, 2.770000e+002, 3.270000e+002
        </Data>
        <Qualifier>temperature</Qualifier>
        <ParameterValue format="exponential" parameter="MassDensity_7_Y">
          <Data format="exponential">
            5.863000e-010, 5.542000e-010, 4.942000e-010, 4.405000e-010, 4.005000e-010, 3.652000e-010
          </Data>
        </ParameterValue>
      </PropertyData>
    </BulkDetails>
  </Material>
```




```
<!--Material n-->
<Material>
  ...
</Material>

<!-- Metadata -->
<Metadata>
  <ParameterDetails id="MassDensity_7_Y">
    <Name>Mass Density (RHO)</Name>
    <Units name="kg/mm^3" description="kilograms per millimeter cubed">
      <Unit><Name>kg/mm^3</Name></Unit>
    </Units>
  </ParameterDetails>
  <PropertyDetails id="MassDensity_7">
    <Name>MassDensity</Name>
    <Units name="C" description="Celsius">
      <Unit><Name>C</Name></Unit>
    </Units>
  </PropertyDetails>
  <PropertyDetails id="MolarMass_11">
    <Name>MolarMass</Name>
    <Units name="kg" description="kilograms">
      <Unit><Name>kg</Name></Unit>
    </Units>
  </PropertyDetails>
  <PropertyDetails id="Material Type_1">
<Name>Material Type</Name>
    <Units>
      <Unitless/>
    </Units>
  </PropertyDetails>
  <SubstanceDetails id="5001">
    <Name>Alkanes, C10-13, chloro</Name>
    <CasNumber>85535-84-8</CasNumber>
    <Units description="" name="%">
      <Unit><Name>%</Name></Unit>
    </Units>
  </SubstanceDetails>
</Metadata>

</MatML_Doc>
```

Note:

- ✓ The nodes highlighted in **red** are IMM specific nodes used for import and export purposes and are not default Matml schema.
- ✓ In case of a table with multiple curves refer to the detailed format below.

1. To be able to import tables with multiple curves from a MatML file the table should be like follow:

66 of 67



2. Once the MatML is imported with IMM the corresponding table will be like follow:

