UNLIMITED CAD PERFORMANCE **DEVELOPED BY ISD**

HiCAD

Version 2023

Performance Optimisation

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isdgroup.com

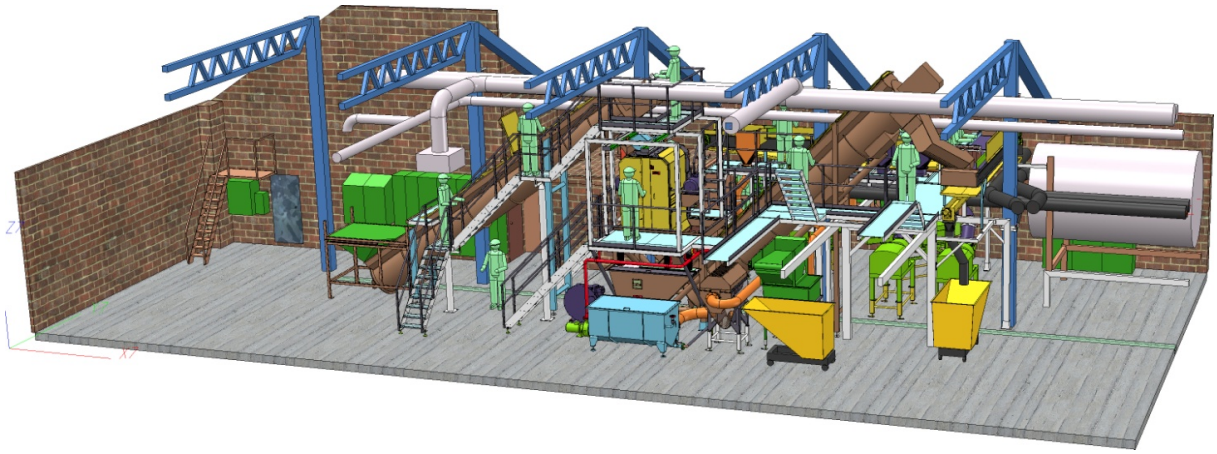
THE WORLD OF CAD AND PDM SOLUTIONS

Contents

Preface

HiCAD enables a fast, flexible and convenient processing even of very large CAD models consisting of several thousands of parts.

The following tips will help you keep your orientation in complex models, and process large assemblies rapidly and effortlessly.



CAD drawing of a cutting plant, consisting of 14.843 parts and 130.353 surfaces (Tummers Machinebouw, NL)

What are "large" assemblies?

Whether an assembly can be called a “large” assembly does not just depend on the number of parts of which it consists, but on a combination of different factors, namely:

- The number of parts,
- The complexity of the individual parts,
- The number of solid parts / surface parts

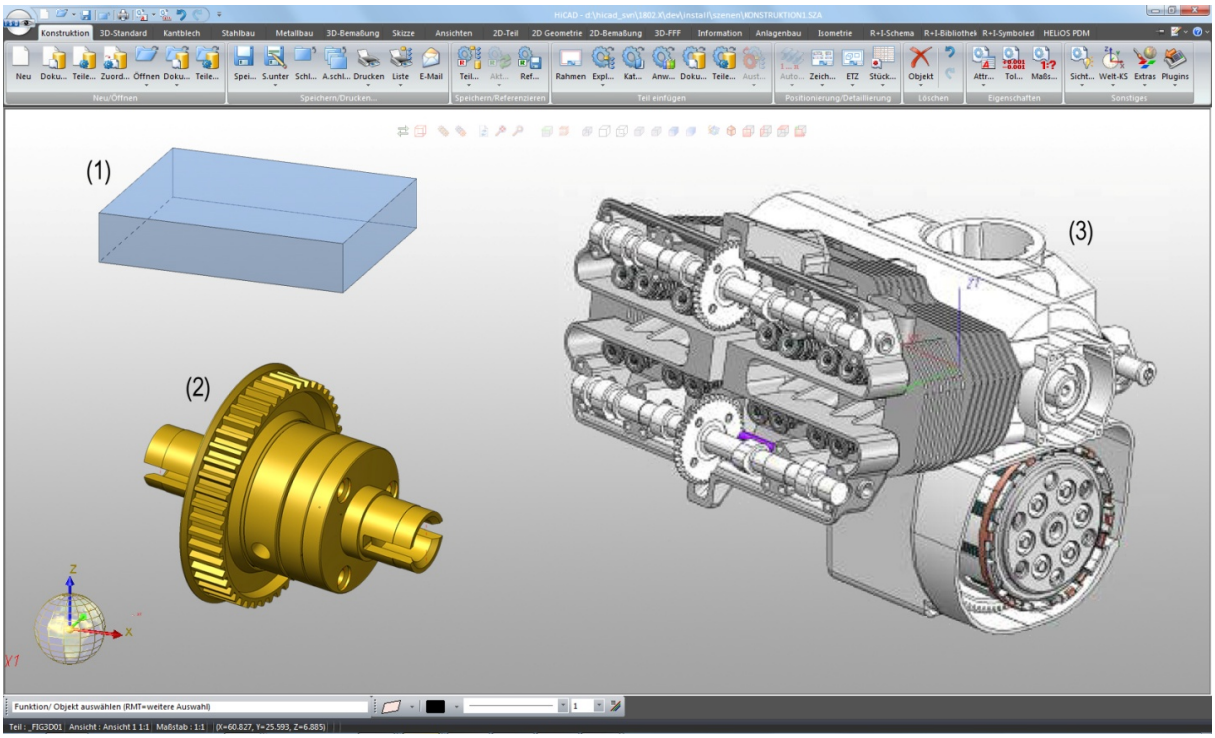
In practice, assemblies are not infrequently imported via various interfaces. Such imported models often have more surfaces than necessary.

What is a "Part"?

A "Part" can be a simple 3-D object such as a cuboid, but also a more complex part with a larger number of surfaces. And the more surfaces a part has, the larger will be assembly to which it belongs.

Examples

- (1) 6 surfaces (1 part)
- (2) 560 surfaces (1 part), 560/6 ≈ 93 parts
- (3) 24.711 surfaces in an imported assembly

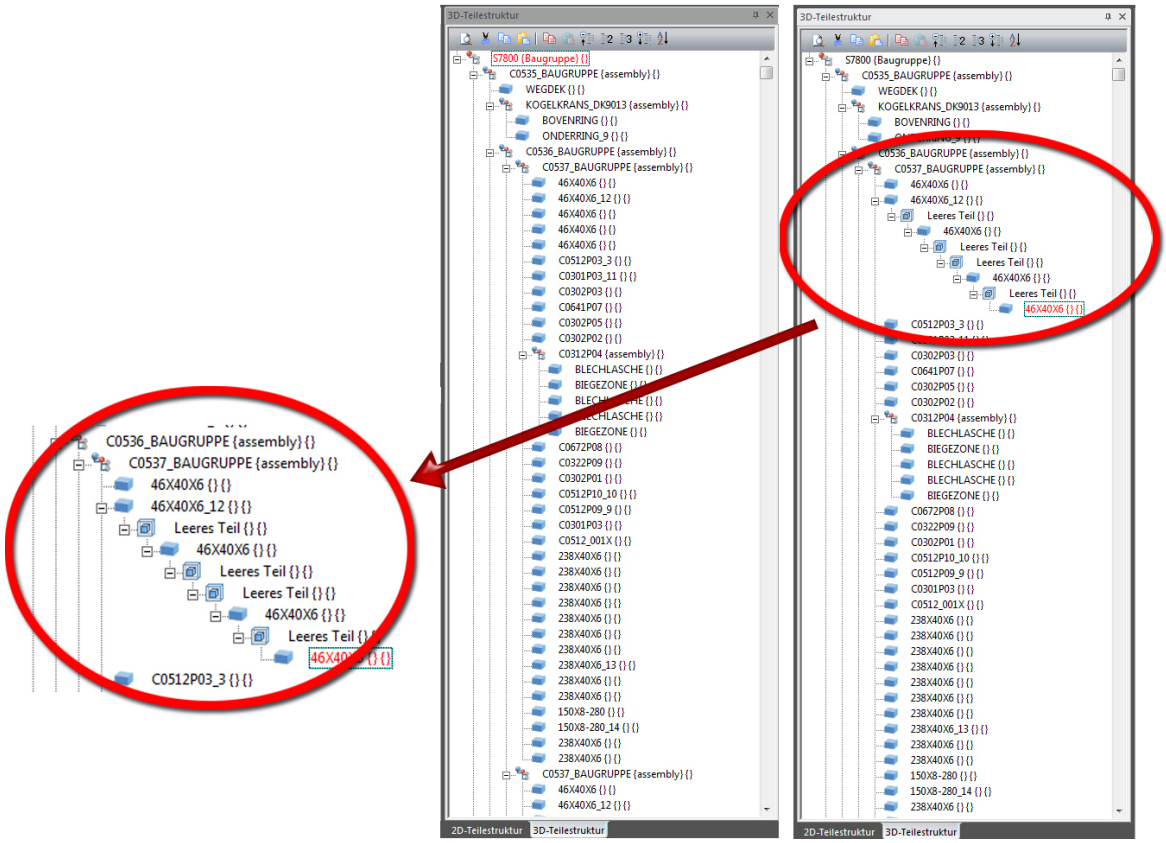


Using clear assembly structures

A clear and logical structuring of the elements in your CAD drawing is essential, particularly in large and com-plex drawings. In HiCAD, this structuring is enabled by the subdivision of your CAD drawing into assemblies, main parts and sub-parts. This part-oriented data structure allows the creation of models the structures of which correspond exactly to those of “real” products.

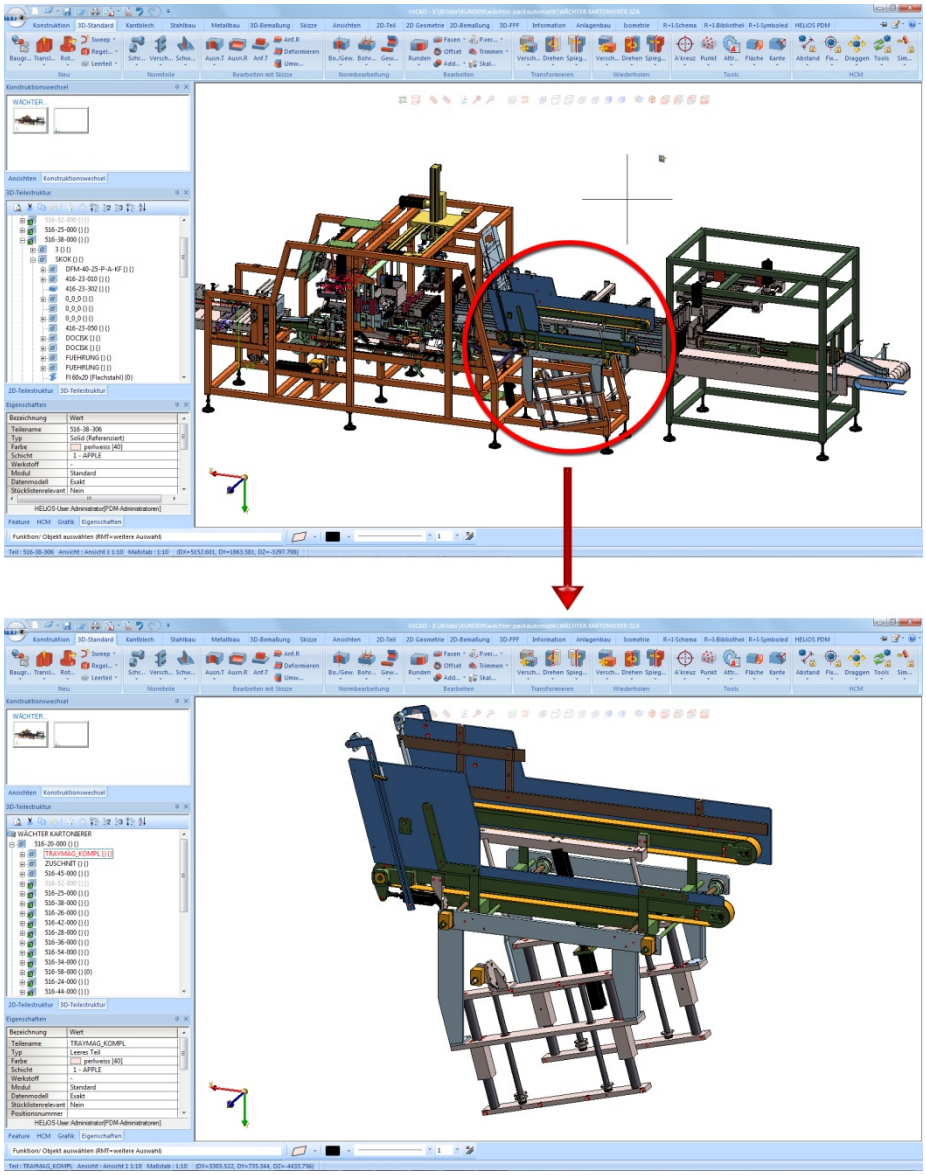
For a convenient processing of large assemblies while maintaining a clear overview you should always make sure that you are working with clear and logical assembly structures.

- Clear structures enable an easy hiding and showing of sub-assemblies.
- Assemblies can be selected very easily.
- Parts can be easily moved within the structure.
- Please avoid “dummy parts” within assemblies.



Using referenced parts

Referenced parts can be used across several projects and throughout all departments of a company, and can be modified and managed much more efficiently and conveniently from an engineer's point of view. You should therefore preferably save your sub-assemblies as referenced parts. If you work on a sub-assembly, just open the referenced assembly in a separate drawing and edit it there. Your main assembly will be updated automati-cally.



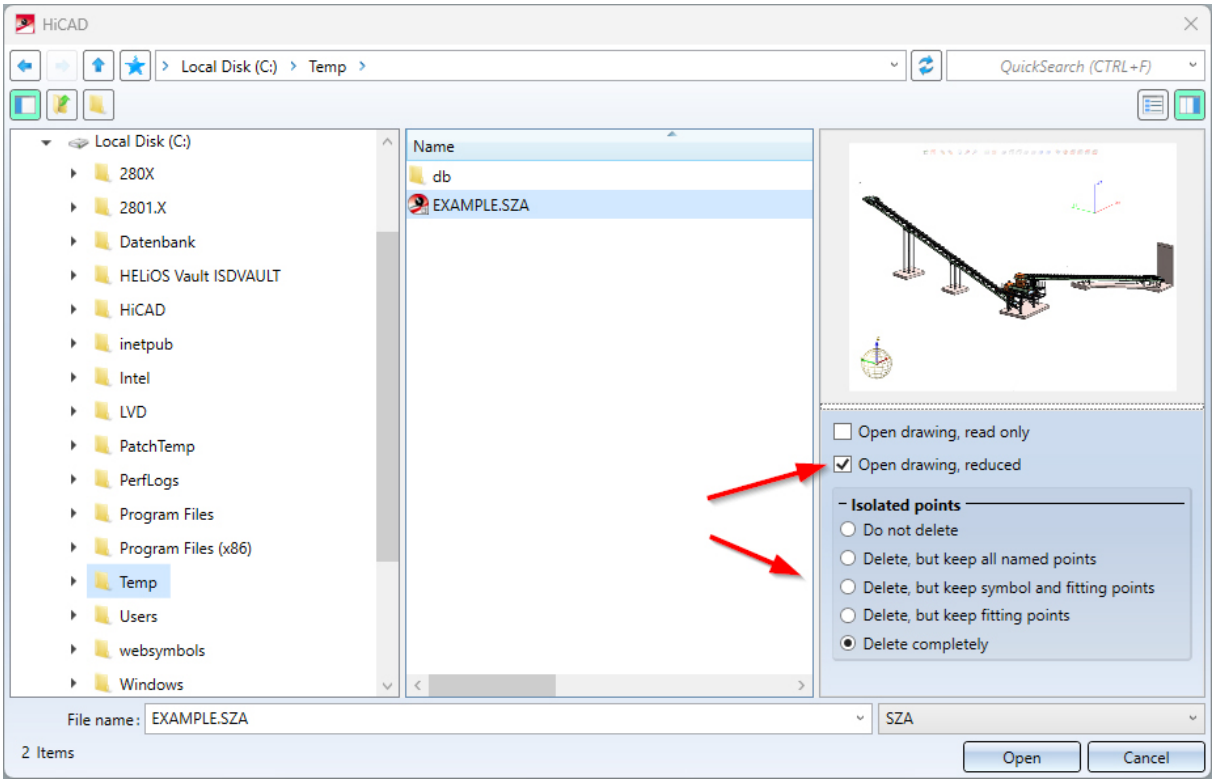
Cartoner, Wächter Packautomatik GmbH&Co. KG

	HiCAD function
	Reference part, Save, Detail drawing Available via **Drawing > Save/Reference** or via context menu for 3-D parts/assemblies (right-click)

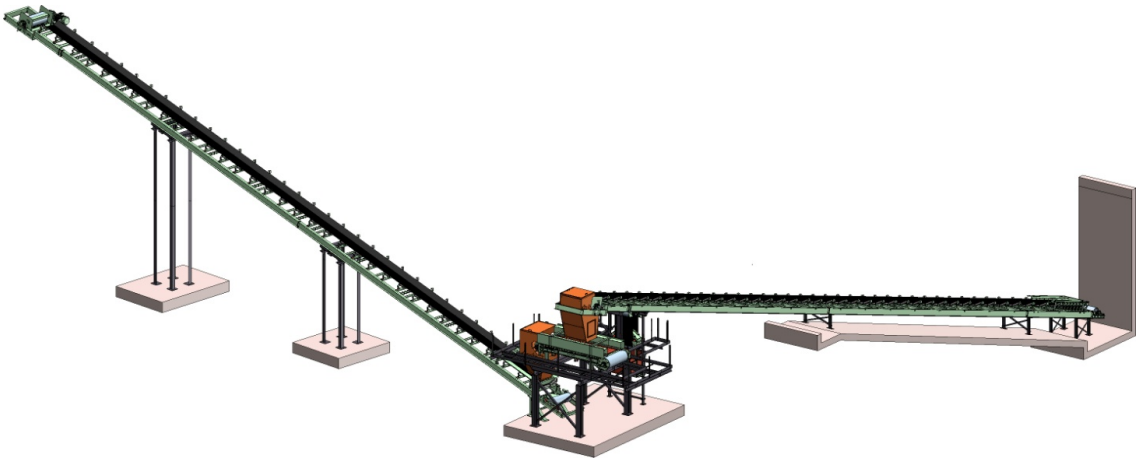
Reduced opening of drawings

HiCAD offers the **Open drawing, reduced** option to enable a faster assembling. If you activate this option, referenced 3-D parts/assemblies will be displayed as “reduced” elements, i.e. only the corresponding polygon model will be loaded, which reduces the amount of data. As a result, less memory will be required for large models, which in turn increases the overall performance.

- All referenced 3-D parts will be displayed in exact representation; solid and feature data, however, will not be loaded
- Ideally suited for layout plans or large amounts of copies
- The reduced representation of parts or assemblies can be removed at any time, whenever their processing is required.
- The reduced representation can be applied immediately, i.e. when opening the drawing file, but also subsequently for individual parts or assemblies.



Benchmark:



CAD drawing by the AZI Anlagenbau AG, Switzerland

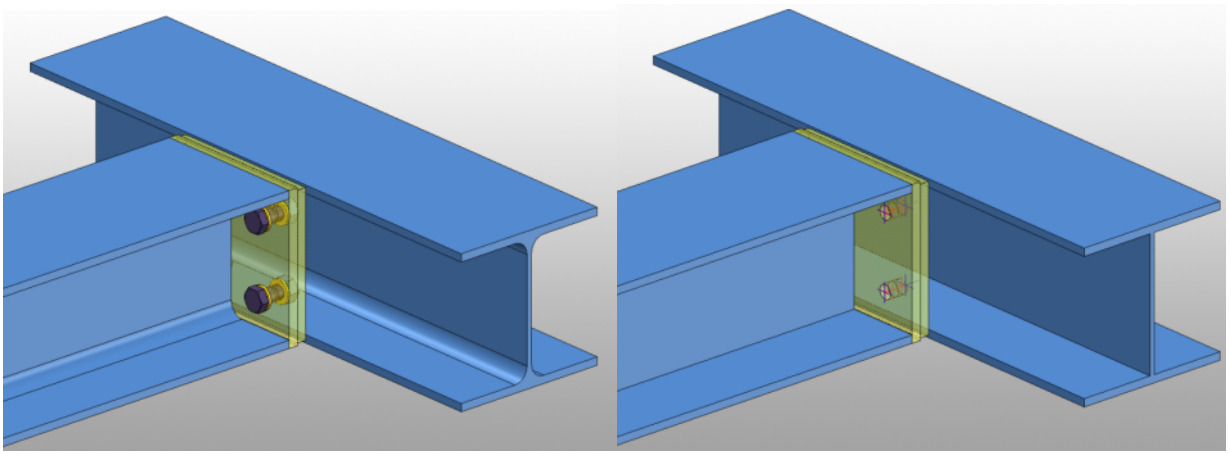
Measured time	Normal (min:sec)	Reduced (min:sec)
Loading of assembly	0:23	0:02
Add part + Save assembly	0:11	0:04
Copy complete assembly 5 times	6:57	1:24

Specifications of system used for testing	
Notebook	Dell Precision M6400 (Nov 2009)
Processor	Intel Core2 Duo T9600 @ 2.80 Ghz
RAM	8,00 GB
Graphics card	NVIDIA Quadro FX2700M
Hard disk	250GB Serial ATA (7200RPM)
Operating system	Windows 7 professional 64 bit

	HiCAD functions
	**Open drawing,**  **Open drawing, reduced** Drawing > New/Open > Open
	**Part reduction, Change representation** (changes the representation of parts/assemblies) 3-D Standard > Tools > Attr.
	**Remove part reduction** (removes the reduced representation) 3-D Standard > Tools > Attr.

Exact and simplified display of standard parts

Beams, profiles, standard parts, standard processings and boltings can be displayed either exact or simplified. In large drawings containing very many beams, profiles etc. you can select the simplified display to achieve a performance increase.



Left: Exact display = 252 surfaces; Right: Simplified display = 48 surfaces

You can switch between exact and simplified display at any time.

HiCAD functions

- The display type for standard parts / standard processings / boltings can directly be selected during their insertion; for Steel Engineering beams it has to be selected via the Settings (Steel Engineering > Further functions > Settings).
- The display type can be changed subsequently via the **Change representation** function in the context menu (right-click).

Working with imported parts

When working with parts that have been imported via STEP, Iges etc., please note the following:

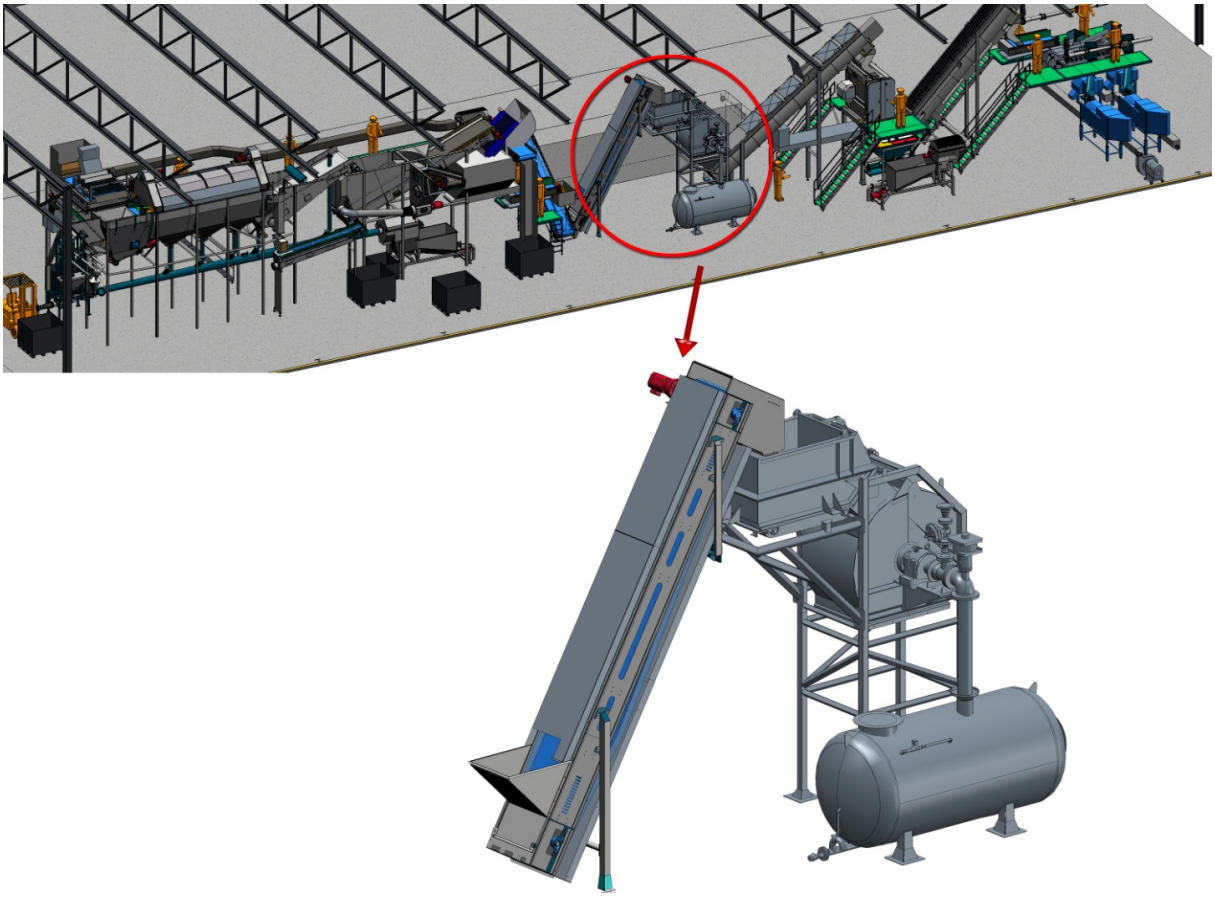
- Always optimize imported parts, i.e. when opening the files, always activate the **AutoOptimize** checkbox.
- Always check whether the imported parts are intact. If required, correct faulty surfaces and/or parts.
- If larger numbers of a faulty part can be found in an assembly, you should re-model the part in HiCAD.

Using list views

HiCAD offers the option to define part lists, and then only display the parts contained in these lists in the drawing. Such views are called **List views** in HiCAD.

The use of list views offers the following advantages:

- The enable a particularly clear visualisation of assemblies
- The smaller quality of parts allows a faster (re)calculation of views.

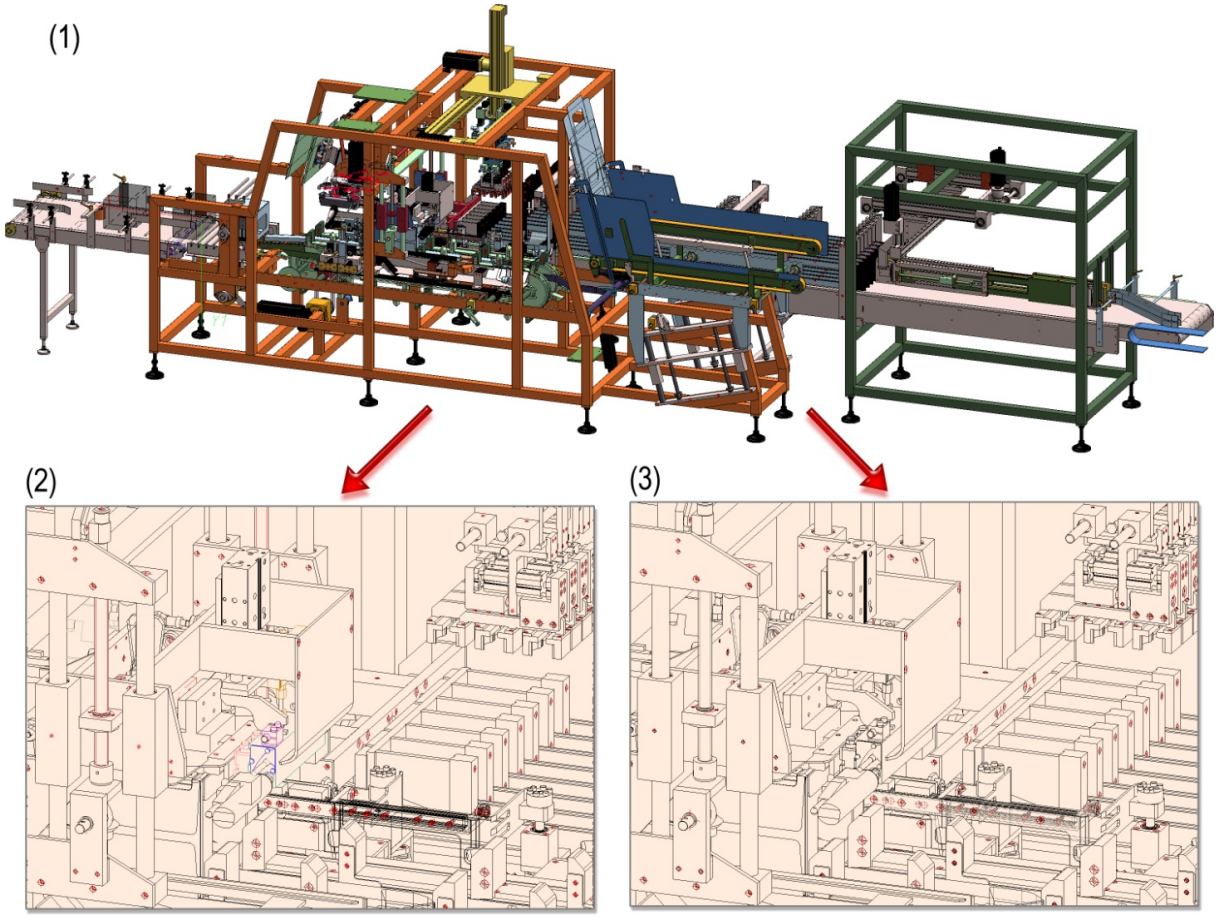


List views allow an isolated viewing of selected parts (CAD drawing by Tummers Machinebouw, The Netherlands)

	**HiCAD functions**
	Views > New > Standard List view ☑

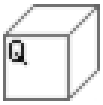
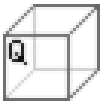
Working with Quick Hidden Line representation

Hidden Line calculations can be very time-consuming in large drawings. To accelerate the process, you can select the representation types **Quick Hidden Line** and **Quick Hidden Grey**, which are very similar to the “real” Hidden Line representation.



(1) Shaded 3-D model, (2) Hidden Line 24 sec., (3) Quick Hidden Line <1 sec.

(Cartoner, Wächter Packautomatik GmbH&Co. KG)

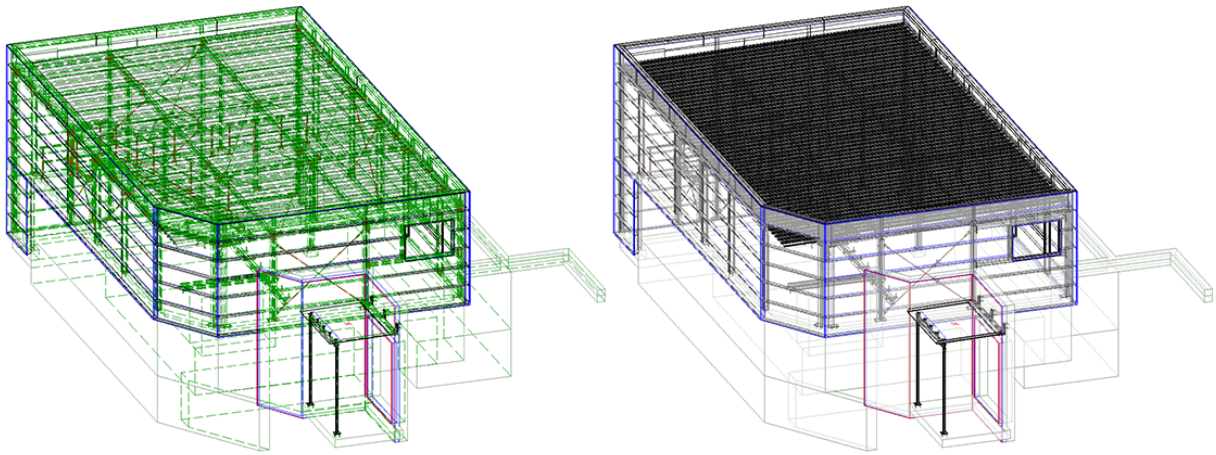
	HiCAD functions
	Views > Representation Quick Hidden Line Displays the edges in the surface colour and hides covered edges
	Quick Hidden Grey Displays the edges in the surface colour and covered edges in grey

Alternatively, you can also use the **AutoQuickView** option for views. In order to reduce waiting times, HiCAD 2020 SP1 offers the possibility to temporarily use the corresponding Quick HiddenLine representation - the so-called QuickView - instead of the exact HiddenLine calculation for views with long calculation times. This considerably increases performance when editing and updating views. Situations in which this mode is very useful include

- the opening of model drawings with updating of referenced parts or
- switching from the model view to a sheet area with many views.

The table below shows which QuickView belongs to which exact representation:

Exact representation	Associated QuickView
HiddenLine	Quick HiddenLine
HiddenLine dashed	Quick HiddenGrey
Shaded with HiddenLine	Shaded with edges
Glass model	Wireframe (not separately selectable)



Left: Exact representation - HiddenLine dashed; Right: QuickView - Quick HiddenGrey

(Image: Metallbau Wilhelmer Projekt GmbH, Kolbnitz, Austria)

An exact representation shown in its corresponding QuickView is still considered an exact representation. This means that no information is lost in **Automatic QuickView** mode. This mode is only used to improve performance if updating a view would lead to considerable wait times.

Advantages and disadvantages

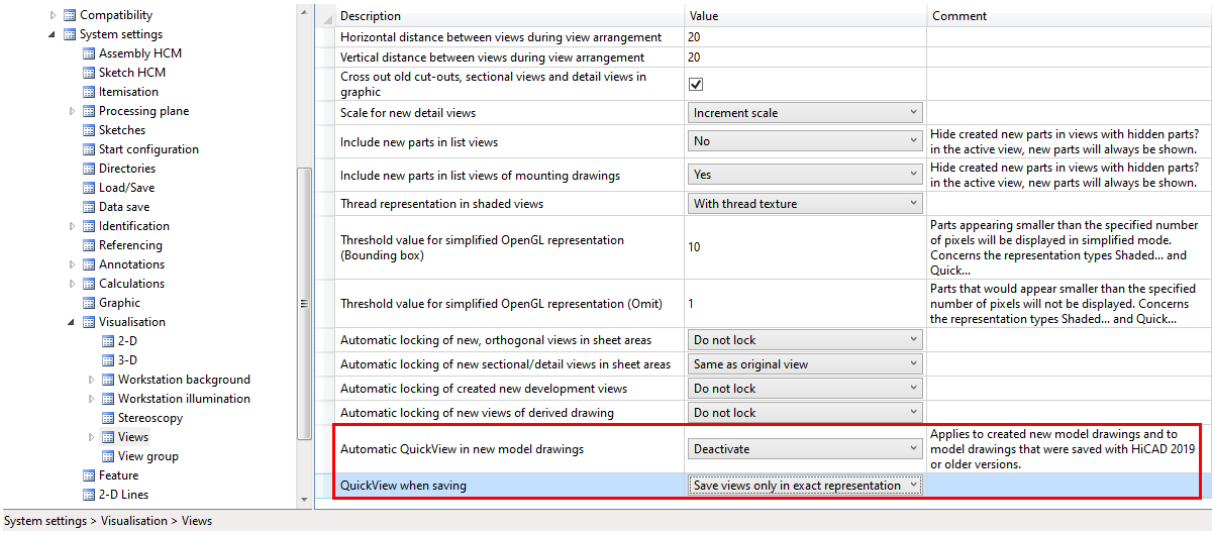
The advantages and disadvantages of the AutoQuickView depend on the specific situation. The advantages only outweigh the disadvantages if the waiting times for the exact display are high/considerable.

The following disadvantages should be noted:

- In practice, it is often necessary to switch to the Glass model in order to edit rear edges. This is not possible in the QuickView. This means that you must first reactivate the exact representation and then switch to the Glass model.
- Lines, hatching, and axes are not always displayed correctly in the QuickView.
- Also, it may not be possible to snap points as in the exact representation.

The QuickView can be activated model drawing-dependent, i.e. you can switch the mode on or off depending on the requirements or size of the model drawing. This can be done either automatically or manually. In addi-tion, you can define how the system should proceed when saving if the model drawing contains QuickViews.

The parameters are available in the Configuration Editor at **System settings > Visualization > Views**.



Detailed information on the AutoQuickView can be found in the Online-Help.

Configuration Editor

System settings > Visualisation > Views > AutoQuickview in new model drawings

Enable AutoQuickView

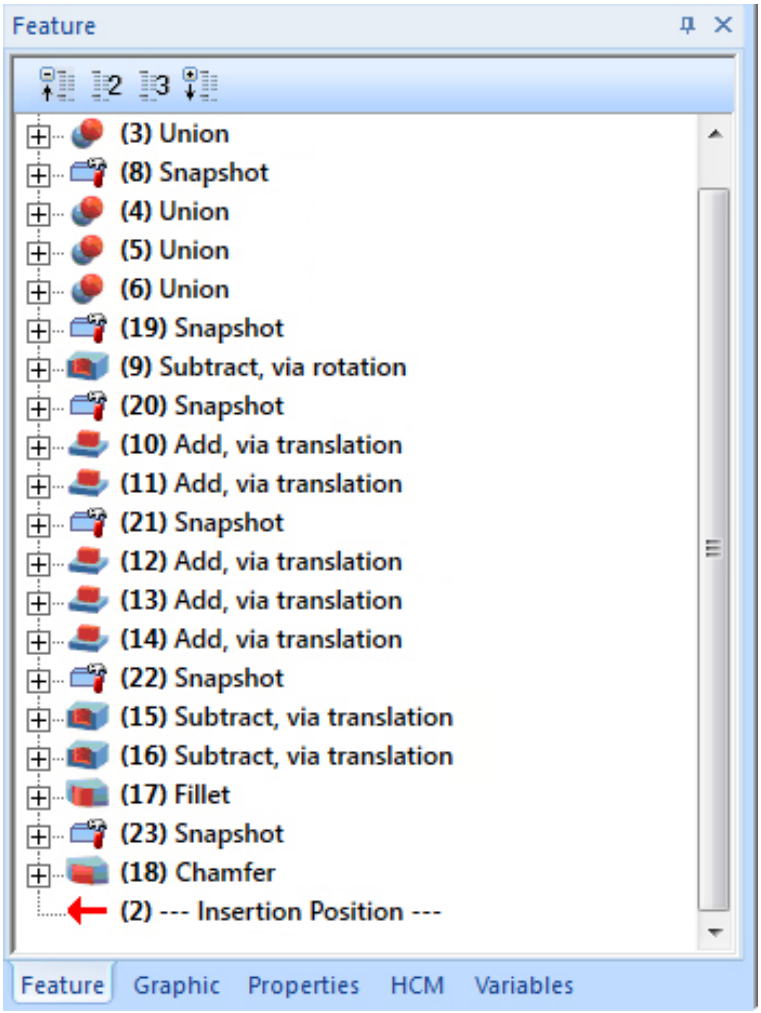
Hide hidden (i.e. covered) parts

When working with the “real” Hidden Line representation, you can hide parts that are covered by other parts in the drawing and would therefore not be visible in the active view anyway. These parts will not be considered for further processings and recalculations of the view. This can speed up processing times significantly, especially in large, complex drawings.

	HiCAD function
	Views > Parts > Hide Hide hidden parts

Snapshots in long feature logs

You can speed up the recalculation process in very long feature logs by the insertion of so-called “snapshots”. Recalculations will then only be performed starting from the last snapshot above the changed feature step. In this way, a time-consuming recalculation of the entire feature log can be avoided.



Feature log with "Snapshots"

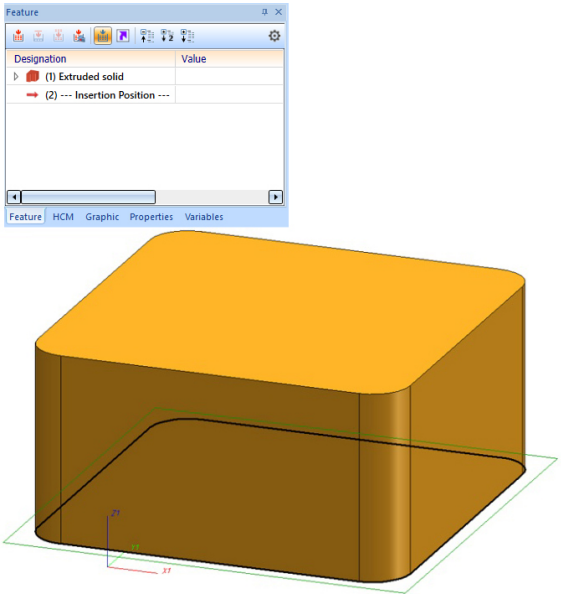
HiCAD function

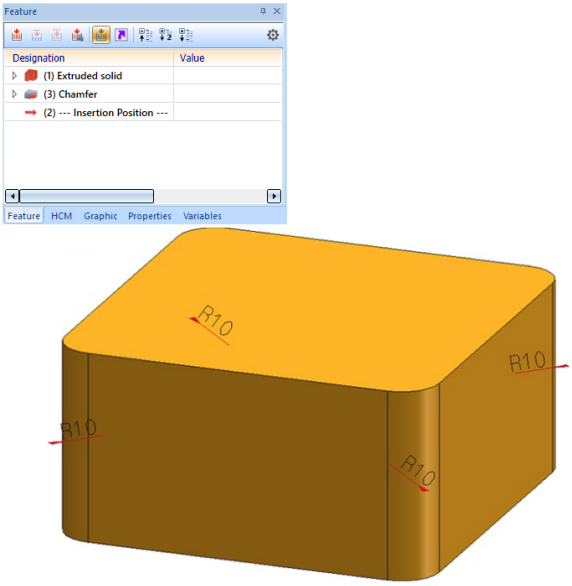
- Right-click the feature above which you want to insert the snapshot.
- Select the **Insert snapshot** function in the context menu.

Using Sketches instead of Features

When working with extruded or revolved parts you should always try to place all design details such as bores, radii, chamfers etc. within one Sketch if possible. In this way you reduce the number of feature steps and in-crease the performance.

For example, it is much more convenient to create a sketch of a rectangle with filleted corners first and then derive an extruded solid from it than to draw the rectangle without filleted corners first, then derive the extruded solid, and fillet the corners afterwards.





HiCAD functions

- Various function on the **Sketch** tab
- Context menu functions of a Feature (right-click feature)

Correct usage of Features

- Mirror parts
  A convenient way of creating parts with symmetrical shapes is to initially draw only one quarter of the part, and then mirror the part twice.
- Avoid unnecessary features, and adjust the original feature instead.
  - Example 1:
    Deleting a "Bore" feature is generally better than closing the bore with another feature.
  - Example 2:
    Changing the length of a sketch is generally better than moving surfaces with further features.

Freeze views

Besides the hiding of views you have the option to “freeze” views. In contrast to hidden views, frozen views will remain visible on the screen, but cannot be edited. Please note that 3-D parts, 3-D texts or 3-D dimensioning cannot be identified (i.e. selected via mouse click) in frozen views!

A frozen view cannot be updated until it is “unfrozen” again.

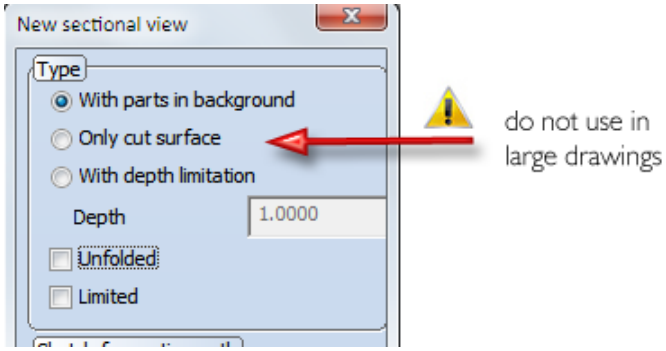
The **Freeze views** option is useful if you have several views on one sheet, but to work in only one view.

	HiCAD functions
	Views > View Functions > Freeze (individual views)
	Views > View Functions > FreezeAll (except active view)
	Views > View Functions > FreezeHL (all Hidden Line views)

Working with sectional views

When working with sectional views in large drawings, most notably in facade engineering, you should deactivate the **Only cut surface** option. The other options are less time-consuming.

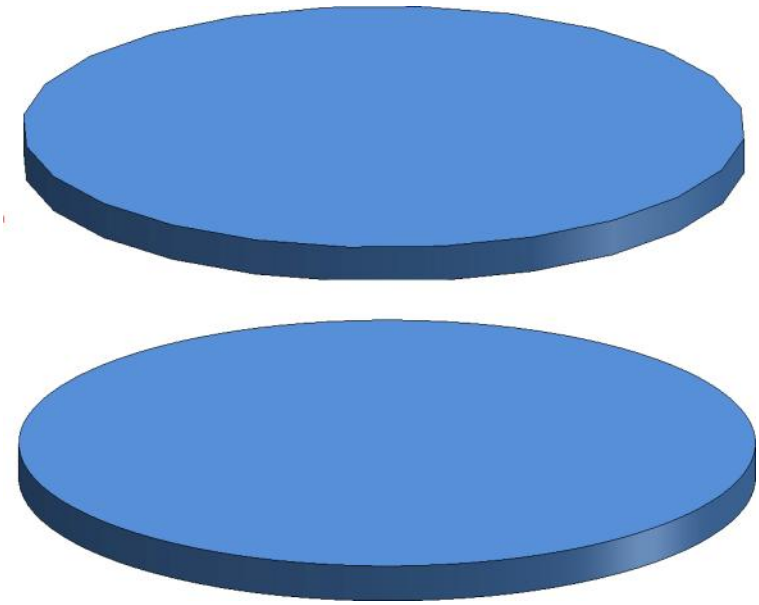
	HiCAD functions
	
	**Views > New > New detail view** Displays details of the drawing, enlarged in a new view.
	**Views > New > Process > Change sectional view** Enables a subsequent modification of sectional views.



Working with surface approximations

The surface approximation determines the quality of the screen representation of filleted surfaces. The higher the value for the surface approximation, the "cleaner" and more precise will the shading look. Please note however that the file size will also increase. If the chosen value is too high, this may result in a loss of perfor-mance, especially for large drawings.

We recommend the setting **Via distance tolerance, with maximum/minimum number** to obtain a good rep-resentation combined with a high performance.



Top: Low surface approximation value; Bottom: Higher value

	HiCAD function
	**Drawing > Properties > Attr…** **Surface approximation** or in the context menu of the drawing (right-click drawing surface)

The pre-setting for polyhedron approximation can be changed in the Configuration Editor at **Model-ling > Part creation > Polyhedron approximation**.

For large drawings the following settings are recommended:

Description	Value	Comment
Polyhedron approximation mode	Via distance tolerance with minimum number	
Number of division points per quadrant	4	min = 2; max = 100
Polyhedron approximation accuracy	2	min = 10*tol

Threshold values for simplified OpenGL

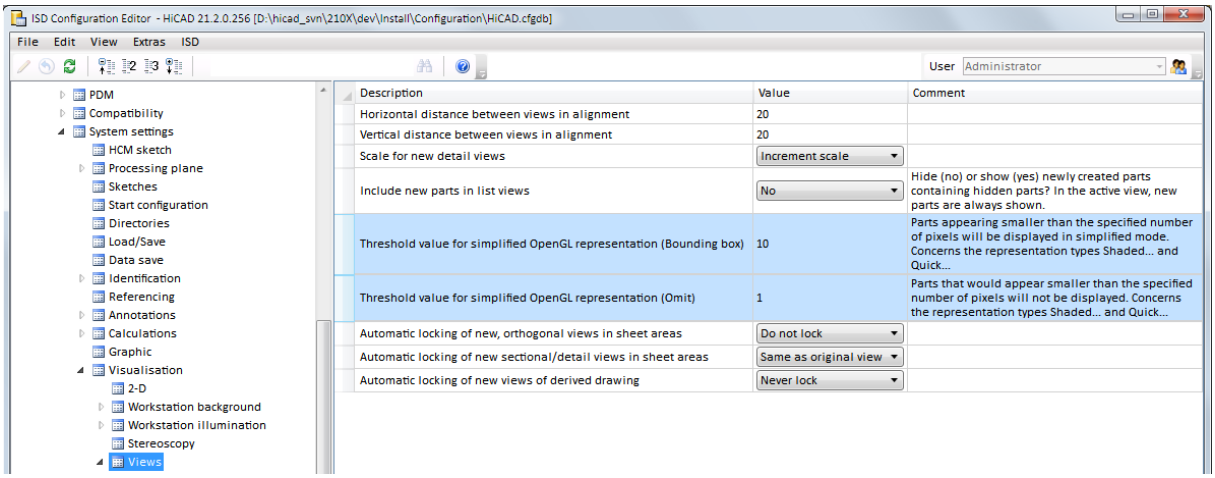
A higher Threshold value for simplified OpenGL representation, too, can help increase the performance. The setting for threshold values enables the automatic simplification of parts starting from a particular size:

- Parts that are smaller than 1 pixel are automatically hidden on the screen.
- Parts that are smaller than 10 pixels are represented as cuboids on the screen.

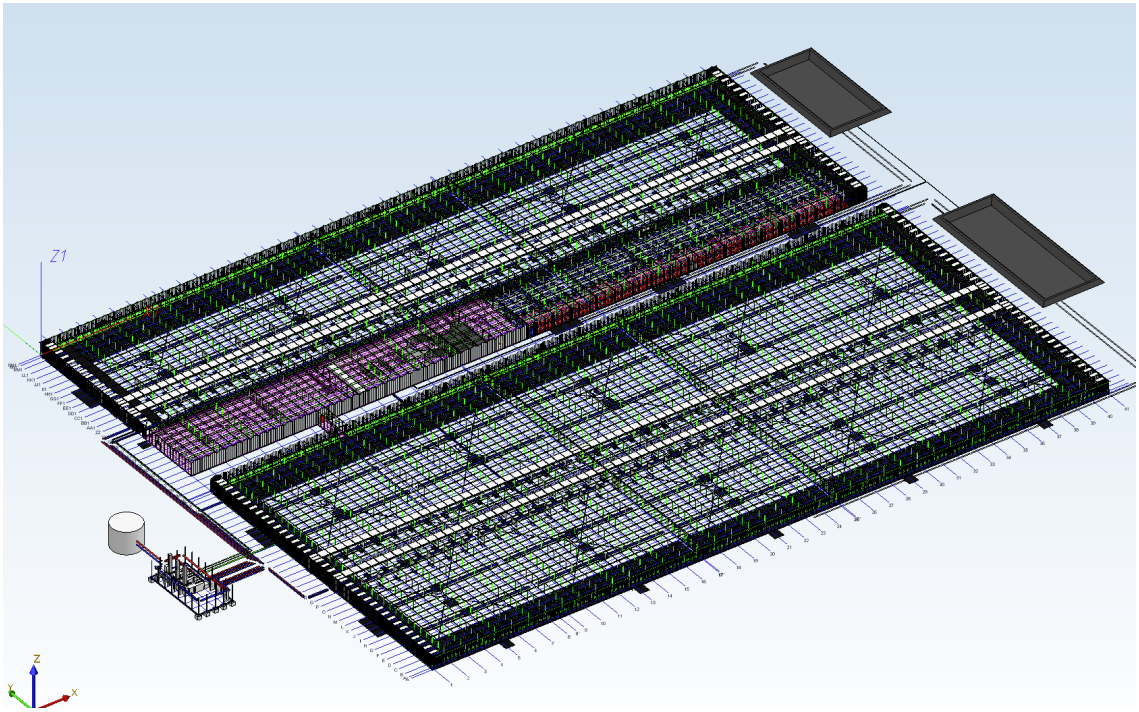
This setting can be adjusted to the individual requirements of the user.

The pixel size for this dynamic changing of the representation can be modified in the **Configuration Editor**, at **System settings > Visualisation > Views**. You use the parameters

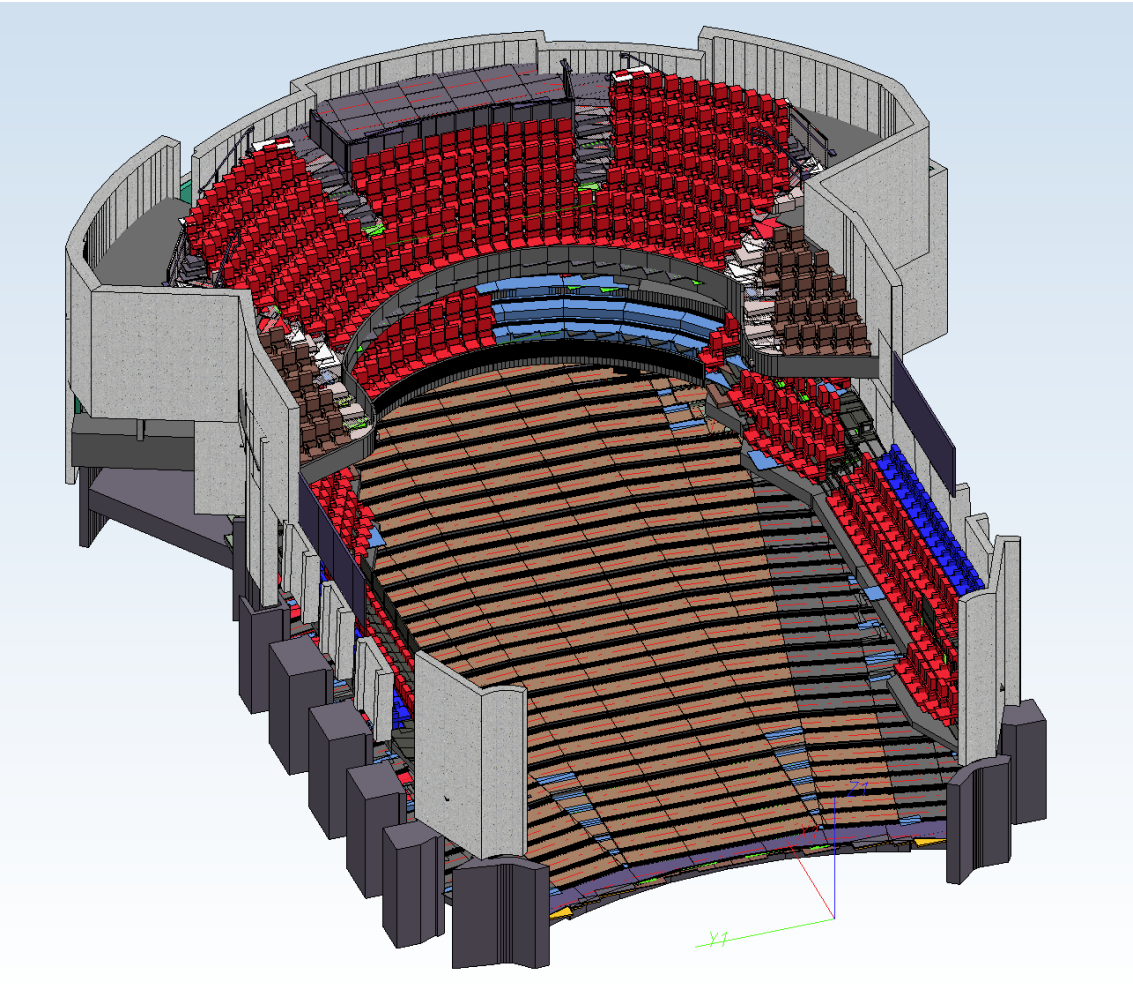
- Threshold value for simplified OpenGL representation (Bounding box) and
- Threshold value for simplified OpenGL representation (Omit)



In a test the following two model drawings were inspected:



Model drawing consisting of approx. 350.000 parts (Image: Certhon Build B.V., Poeldijk, The Netherlands)



Model drawing consisting of approx. 60.000 parts (Image: CAD Planung Arnold Matei, Mannheim, Germany)

The test was carried out with the following equipment:

- Version: HiCAD 2019 SP2 Patch 0
- CPU: Intel® Core™ i7-8750H CPU @ 2.20GHz, Intel64 Family 6 Model 158 Stepping 10
- Graphic card: NVIDIA Quadro P3200 (Quadro P3200, 4 GB VRAM)

The entire model drawings were rotated with the middle mouse button in the **Shaded with edges** mode. The table shown below shows the measured frame rates for different threshold values set in the Configuration Editor:

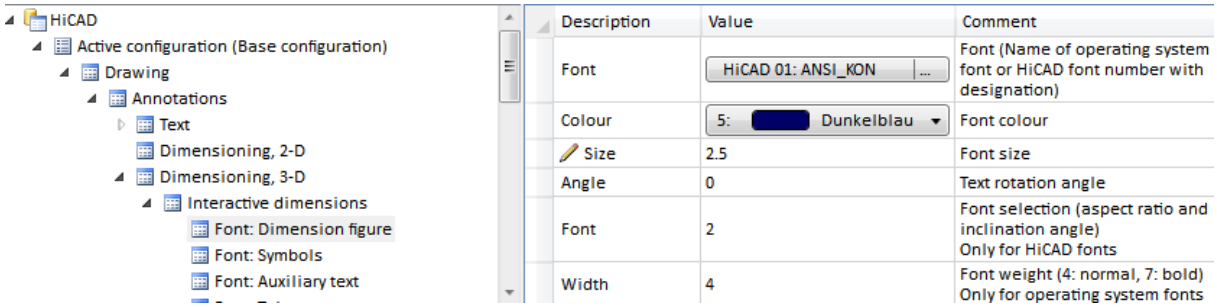
Threshold value for simplified OpenGL rep-resentation (Omit)	Threshold value for simplified OpenGL representation (Bounding box).	Framerate Matei drawing	Framerate Certhon drawing
0	0	13	3
1	10	28	8
10	10	30	12
1	50	44	12.5
10	50	55	17

Changing of text fonts

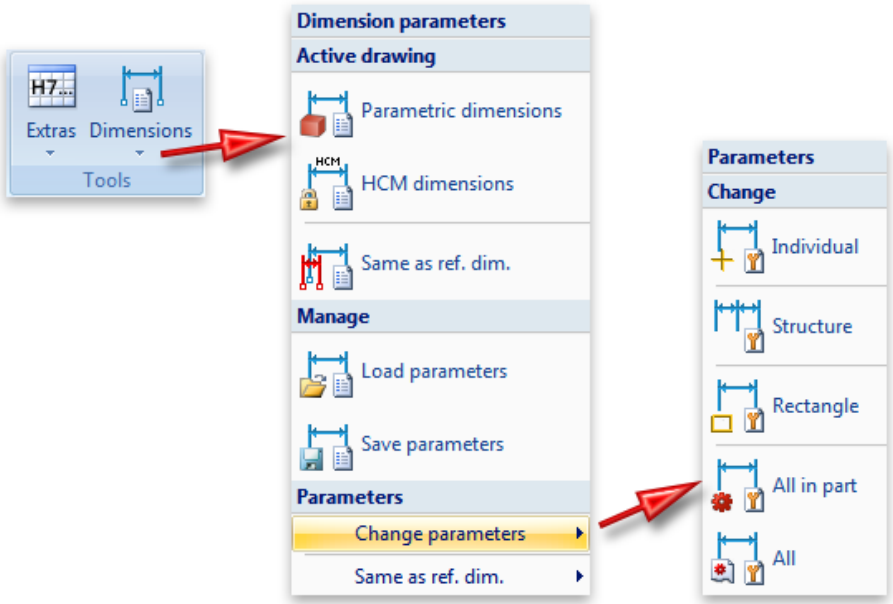
Normally, model drawings contain many texts. These can be “normal” texts, dimensions, annotations and BOMs. Here, too, changing the text font can lead to a significantly increased performance. For instance, changing TrueType Fonts to a HiCAD font during zooming or moving in Sheet areas can increase the perfor-mance by a factor of up to 10. The font for texts, annotations and dimensions can be pre-set in the Configuration Editor at **Drawing > Annotations**.

Configuration Editor

Drawing > Annotations > …. > Font … > Font
HiCAD …



In HiCAD the font for texts, annotations and dimensions can also be changed subsequently – either via the cor-responding functions of the **3-D Dimensioning + Text** Ribbon (the same applies to 2-D), or via the context menu, e.g.



For BOMs the font is defined in the BOM template.

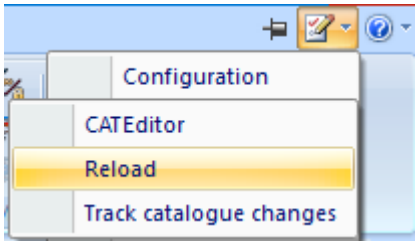
HiCAD 2019 SP2 offers a significantly increased performance for the drawing of texts, which will probably make the workaround solution described here superfluous for higher versions.

Track catalogue changes

The up-to-dateness check of catalogues in HiCAD can significantly impair performance in some situations. The function **Track catalogue changes** (**Settings > Catalogue**) can be used to define how catalogue changes are to be handled in HiCAD.

If the switch is active, the catalogues are regularly checked for up-to-dateness during a HiCAD session. However, this up-to-dateness check can significantly impair performance in some situations.

By default, the switch is deactivated, i.e. the catalogues are loaded in HiCAD only once, when HiCAD is started. After that, the system no longer automatically checks whether more up-to-date data is available. In order to update the catalogues after changes, the function **Reload** is available.

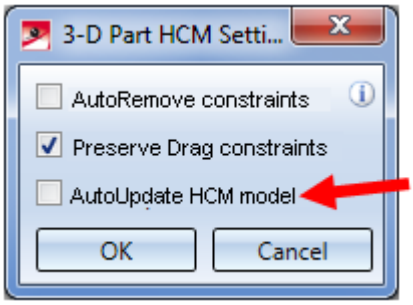


	HiCAD functions
	Settings > Catalogue > Track catalogue changes Settings > Catalogue > Reload

HCM Settings

Automatic updating of Part HCM models after applying changes to the 3-D drawing may take a prolonged time for larger models.

In such cases you can increase the performance by deactivating the **AutoUpdate HCM** model checkbox.



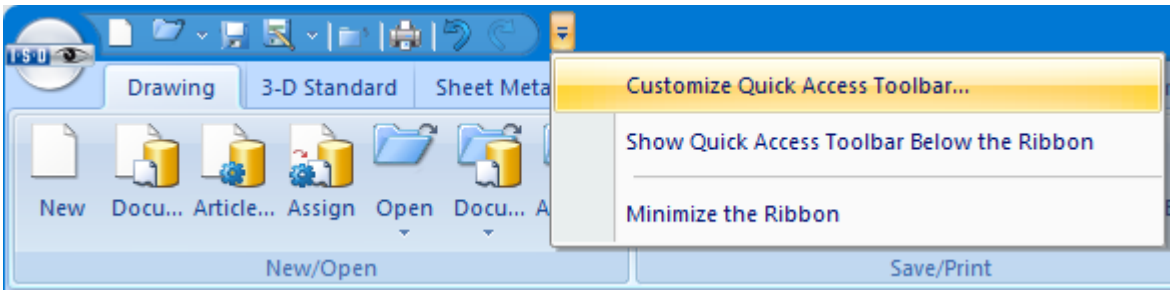
3-D Parts - HCM Settings

3-D Standard > HCM > Tools > Settings > AutoUpdate HCM model: NO

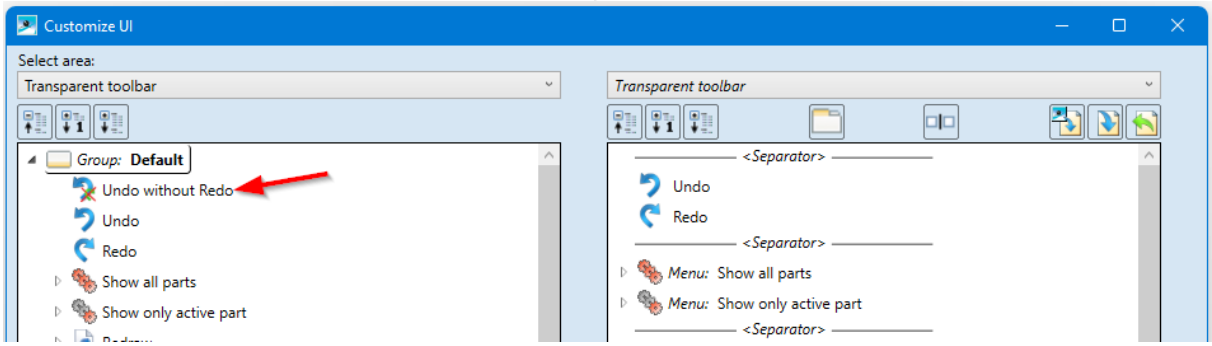
Undo without Redo

When the Undo function is called, a Redo backup is created, which can lead to longer waiting times for large drawings. For such cases, HiCAD offers the option (from HiCAD 2019 SP2, Patch 1) of an Undo without Redo. However, you will not find this functionality in the standard user interface. To be able to use the function, you have to customise the transparent toolbar as follows:

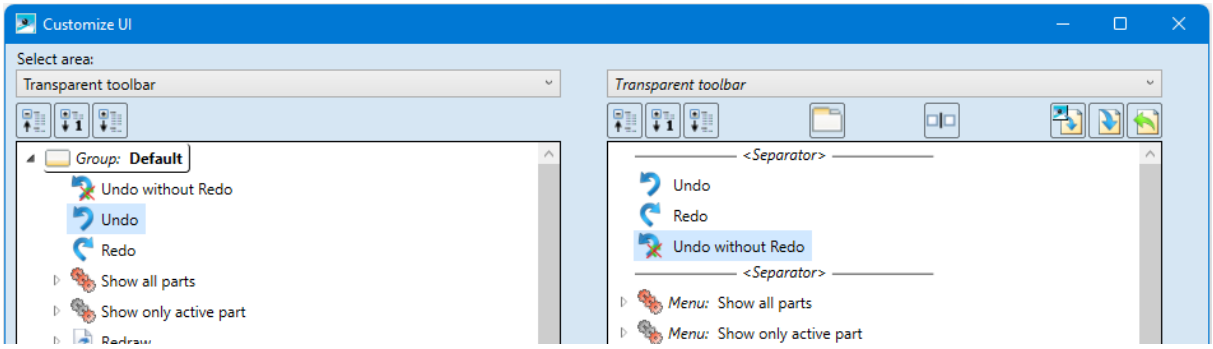
1. Select Customize QuickAccess Toolbar.



2. In the **Customize UI** dialogue window, select the **Transparent toolbar** entry both on the left and the right pane



3. Then select the function **Undo without Redo** on the left, transfer it to the right-hand pane with the  button, and move it to the desired position using the  and  buttons, e.g.:



4. Exit the **Customize UI** dialogue window with **OK**.

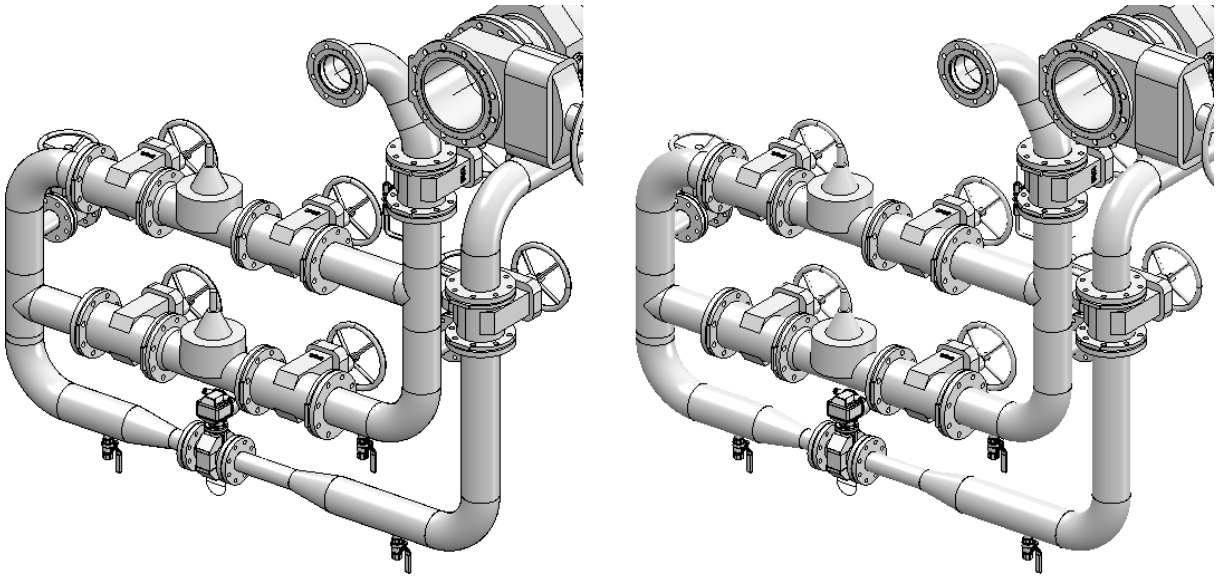
The function is now available in the transparent toolbar.

When using this function, please note that no Redo is possible afterwards!

Shaded without highlighted edges

With the function **Shaded without highlighted edges** (as of HiCAD 2022) the parts of the active view are shaded and all visible edges are displayed with the exception of highlighted edges. Highlighted edges are theoretical edges that occur where there is no clear edge due to a fillet.

This type of representation can be useful to improve performance when working in the model view of large drawings. In particular, zooming with the mouse wheel can be accelerated in this way.



Left: Shaded with edges Right: Shaded without highlighted edges

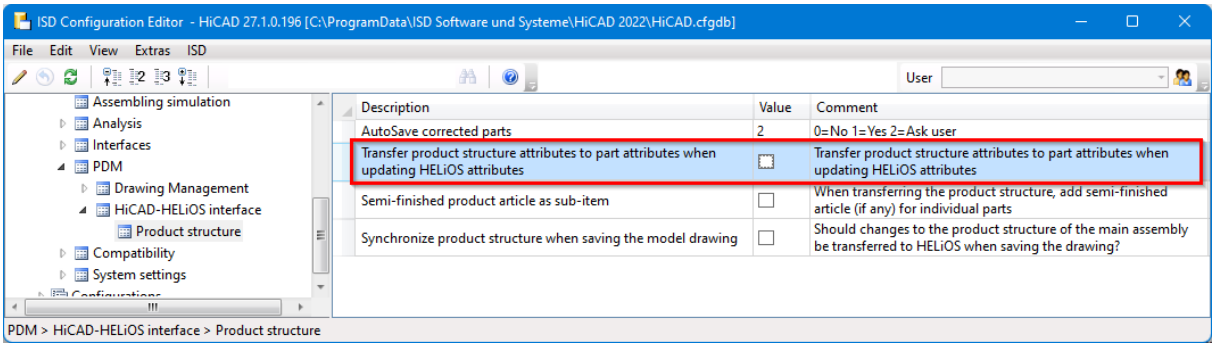
	HiCAD function
	Views > Representation > Shaded, without highlighted edges

You will also find the function

- in the context menu for views and
- on the transparent toolbar.

Transfer product structure attributes to part attributes

The transfer of product structure attributes to part attributes leads to greatly increased waiting times in case of large assemblies when opening the associated drawings. If you work with large drawings, you should not activate the option **Transfer product structure attributes to part attributes when updating HELiOS** attributes in the Configuration Editor.

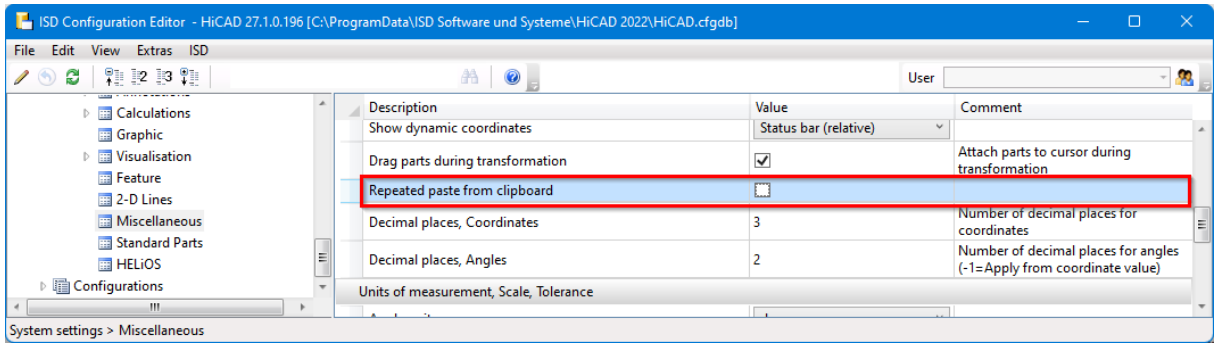


Configuration Editor

PDM > HiCAD-HELiOS interface > Product structure > Transfer product structure attrinutes to part attributes when updating HELiOS attributes

Paste from clipboard

To speed up pasting large assemblies from the clipboard, it is recommended to deactivate the **Repeated paste from clipboard** setting.

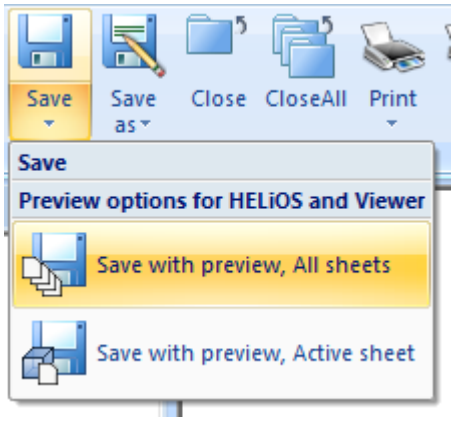


Configuration Editor

System settings > Miscellaneous > Repeated paste from clipboard

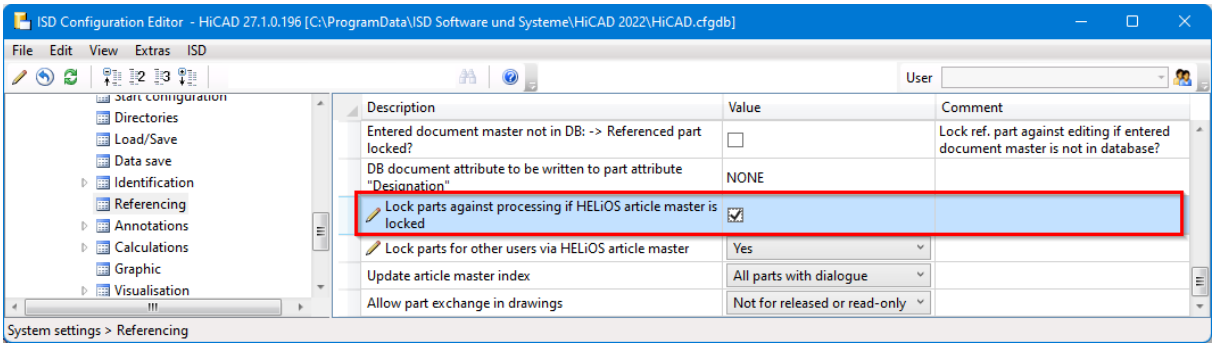
Preview for HELiOS and Viewer

With the function **Save with preview, All sheets**  , when saving the model drawing, all sheets are also saved for display in HELiOS and in the HiCAD Viewer. This means that the views of all sheets are displayed both in HELiOS and in the HiCAD Viewer. This can significantly increase the waiting time when saving, especially if there are several sheet areas.



Lock via article master

The setting **Lock parts against processing if HELiOS article master** is locked should only be used with Steel Engineering Drawing Management or if it is essential for your design process. Activating the setting causes waiting times at various points because the query of the processing right takes significantly longer.

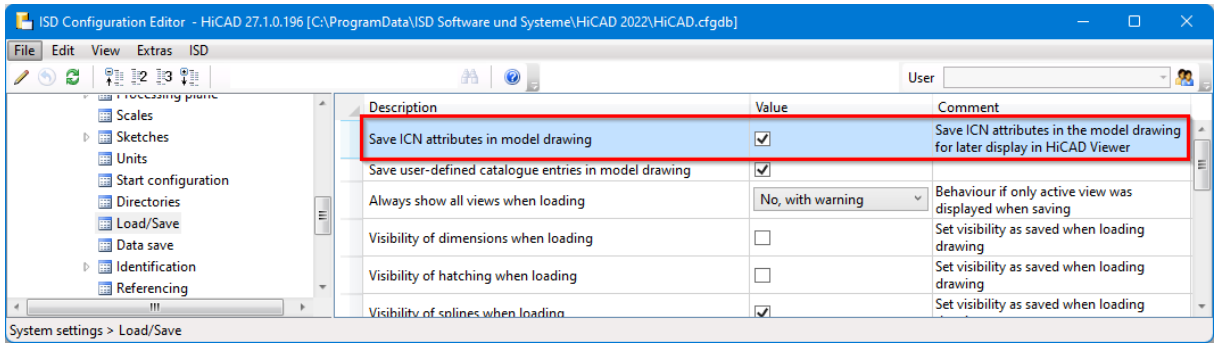


Configuration Editor

System settings > Referencing > Lock parts against processing if HELiOS article master is locked

Save ICN attributes in model drawing

You should only activate the setting **Save ICN attributes in model drawing** if you actually use the HiCAD Viewer in your workflow. Activating the setting causes additional waiting times when saving model drawings.

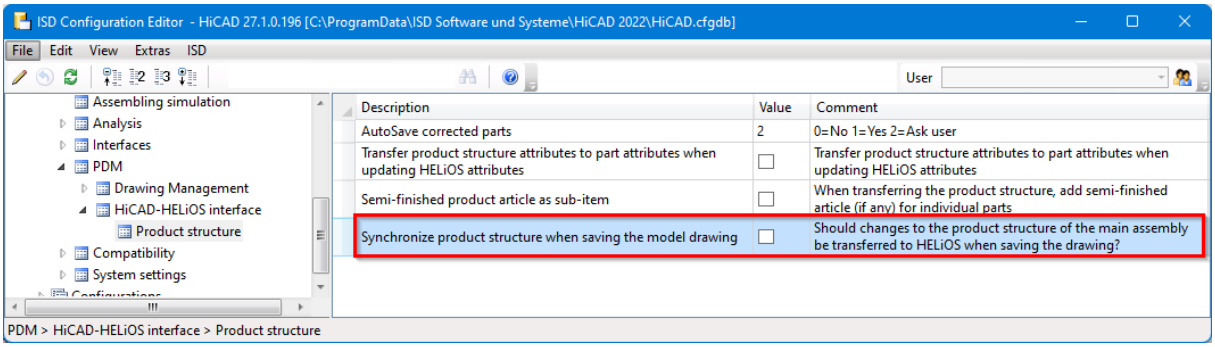


Configuration Editor

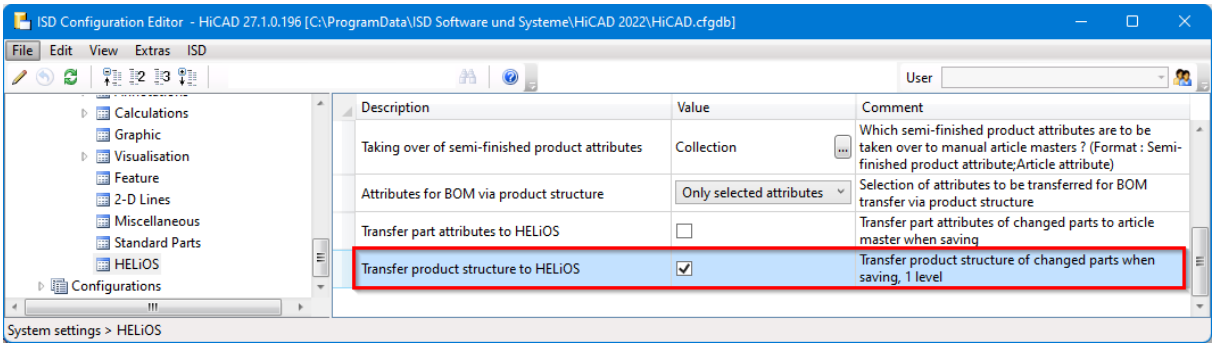
System settings > Load/Save > Save ICN attributes in model drawing

Product structure transfer

Activating the option **Synchronize product structure** when saving the model drawing ensures that the product structures of all assemblies of a model drawing are automatically transferred to HELiOS. This can lead to considerable additional waiting times when saving. Therefore, it is recommended to deactivate this option.



Use the option **Transfer product structure to HELiOS** instead. This will only transfer the product structures of actually modified and saved assemblies.

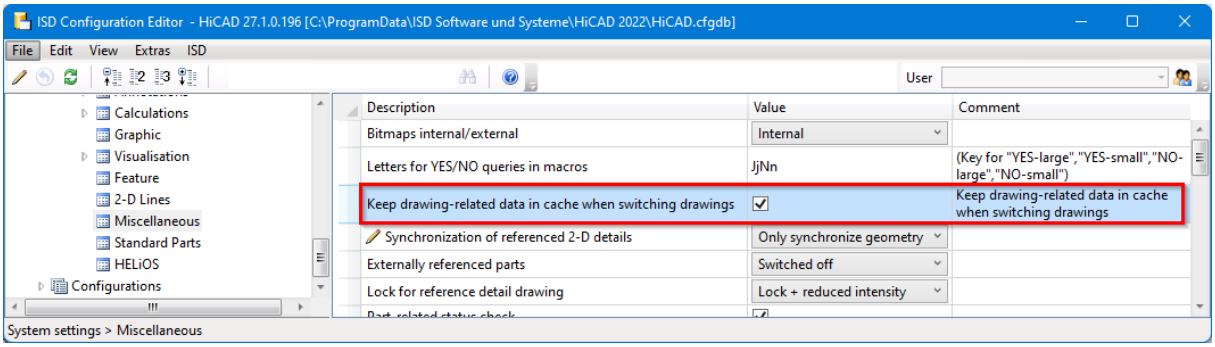


Configuration Editor

- PDM > HiCAD-HELiOS interface > Product structure > Synchronize product structure when saving the model drawing
- System settings > HELiOS > Transfer product structure to HELiOS

Switch drawing

Make sure that the option **Keep drawing-related data in cache when switching drawings** is activated in the Configuration Editor. This keeps a lot of data in the working memory when switching drawings, so that the switching process is noticeably speeded up.

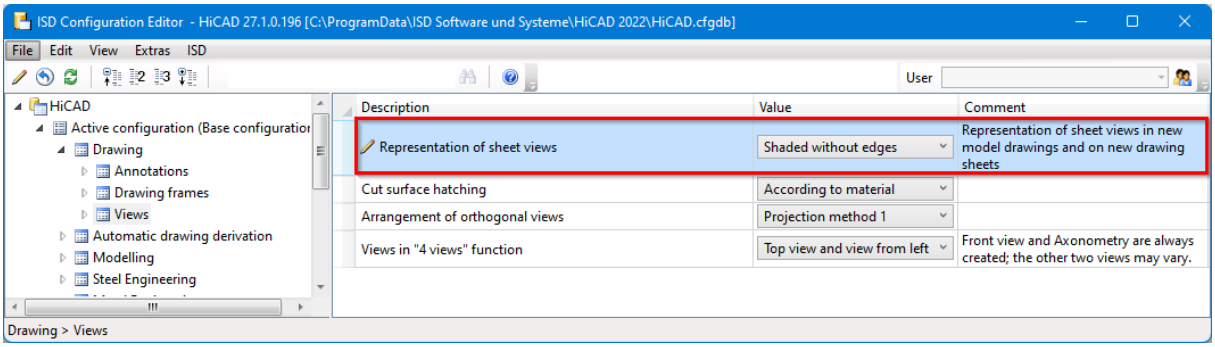


Configuration Editor

System settings > Miscellaneous > Keep drawing-related data in cache when switching drawings

Representation of sheet views

The setting **Representation of sheet views** can be changed to **Shaded without edges**, for example, so that no HiddenLine calculation causes waiting times when switching to the sheet area of a new drawing for the first time.



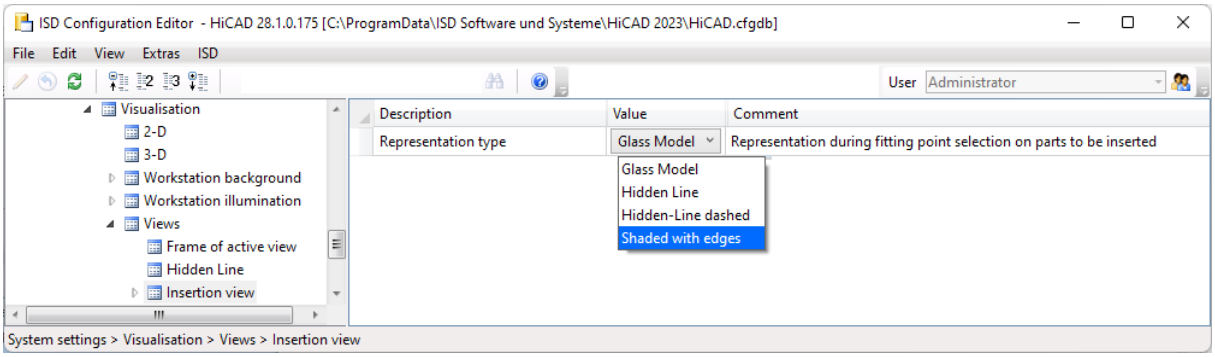
Configuration Editor

Drawing > Views > Representation of sheet views

Representation type of insertion view

If parts are inserted into the model drawing where it is necessary to specify a fitting point on the part in order to place the part in the drawing, HiCAD will display an enlarged preview of the part in order to determine this point. This happens with most functions under Drawing > Insert Part.

The setting from the configuration management under **System settings > Visualisation > Views > Insertion view** is used as the display type for the preview (insertion view).



When inserting large assemblies, it can be useful for performance reasons to select the display type **Shaded with edges**. This will avoid time-consuming Hidden Line calculations.

Configuration Editor

System settings > Visualisation > Views > Insertion view

Still too slow?

If you still have performance problems despite observing the aforementioned tips, go through the checklist below:

Checklist

- Test HiCAD locally, without network.
- Test HiCAD without any additional plugins or other, simultaneously started software.
- Do you use the latest HiCAD version / Service Pack?
- Please always make sure that you update to the latest version.
- Check your hardware:
- Is the RAM of your computer sufficient?
- Is there enough free disk space?
- Does your computer have a 64 Bit processor?
- Which graphics card / which graphics card driver do you use?

  The recommended hadrware equipment can be found on the ISD website at Support > System Requirements.
- Which anti-virus software do you use?

Random Access Memory (RAM)

The Random Access Memory (RAM) of your computer has a decisive impact on the performance of HiCAD.

If the RAM is insufficient, Windows will switch to the virtual memory of your hard disk. Transfer rates and access times of hard disk memories are very slow compared with RAM modules.

If your computer reaches the limit of its RAM, the system will become unstable.

To achieve an optimal performance for very large drawings, the system used should have a significantly larger RAM than it would usually the case when working with HiCAD. The hard disk accessing operations buffer memory, UNDO and Switch drawing can then be performed up to 4 times faster.

The recommended hadrware equipment can be found on the ISD website at Support > System Requirements.

Graphics card

- Please do not use gaming cards for your CAD system!
- Always use the recommended driver for your graphics card. You will find a list recommended graphics cards on the ISD website, at Support > System Requirements.
- Check whether your graphics card is HiCAD-capable (fully OpenGL 4.3-capable with 128 MB RAM).

Anti-virus software

Exclude HiCAD from the scanning by your anti-virus software.

Depending on the type of your anti-virus software you can:

- Exclude your HiCAD application from the virus scan,
- Exclude your HiCAD installation directory from the virus scan,
- Exclude the directory for your CAD drawings from the virus scan,
- Exclude the HiCAD catalogue (if located on a server) from the virus scan.

HiCAD

UNLIMITED CAD PERFORMANCE **DEVELOPED BY ISD**

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