ENGEL Model Based Definition (MBD)

3D viewing with the Adobe Acrobat Reader application

1. Fundamentals

Model Based Definition (MBD) is a concept intensively promoted by CAD provider to improve the process consistency in the CAD-CAM-CAQ environment. The MBD approach is based on optimal data utilization for each process step, due to the availability of all product manufacturing information (e.g., geometry, dimensional tolerances, geometric tolerances, surface finish, process specifications, etc.) which are provided directly on the 3D model.

The previous practice of presenting all these product manufacturing information in a 2D drawing is not suitable for a digital process because the drawing, with some exceptions, is not machine-readable. Due to this paradigm shift, the technical product documentation is currently amid a major upheaval. Instead of using a medium like paper or PDF, from now on all necessary product information will be viewed by interacting with the 3D model.

2. Viewing

A 3D viewer is required to interact with a 3D model. The viewer is selected based on the data format of the 3D model. ENGEL provides two different data formats for viewing 3D models.

- PDF-E (vulgo 3D-PDF)
  - Corresponding standard ISO 24517
  - Recommended 3D viewers
    - Adobe Acrobat Reader 2020
    - Adobe Acrobat Reader DC
    - Adobe Acrobat Pro
- JT
  - Corresponding standard ISO 24517
  - Recommended 3D viewers
    - Teamcenter Visualization 13.1
    - JT2Go
    - Xcelerator Share

The PDF-E data format (vulgo 3D-PDF) is used at ENGEL exclusively for communication with external suppliers.

The JT data format is for the internal use at ENGEL. Due to the significantly better interaction with the 3D model, the JT data format is the preferred viewing data format internally at ENGEL.

It is also planned to provide the JT format to our external suppliers soon.

3. 3D-Viewing with Adobe Acrobat Reader

The PDF document format has virtually become a standard format for cross-company document exchange. The uncomplicated operation and consistent provision of document content have contributed significantly to this.

The further development of the PDF format for visualization of 3D content enables the integration of 3D Models

out of the CAD-system into a PDF-E document (vulgo 3D-PDF). Therefore PDF-E-compliant viewers, such as the Adobe Acrobat Reader, have been upgraded to universal 3D viewers.

4. Necessary default settings in Adobe Acrobat Reader

Unfortunately, most installations of Adobe Acrobat Reader are configured in such a way that a PDF-E document (vulgo 3D-PDF) does not work properly straight away. In almost all cases, this is due to incorrect entries in the preferences.

4.1 Adobe Acrobat Reader – Preferences

In the *Multimedia & 3D* category, the preferences *Enable playback of multimedia and 3D content* must be activated. Certain settings must also be observed in the *Extended security* category.

The default preferences for Adobe Acrobat Reader can be called up either via the menu bar or via the keyboard shortcut Ctrl + K.

Adobe Acrobat Reader - Preferences	

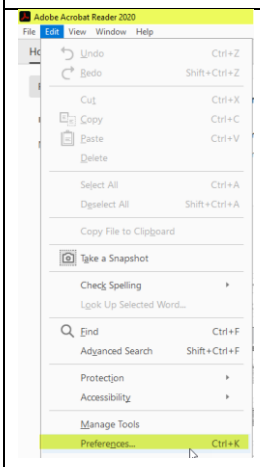
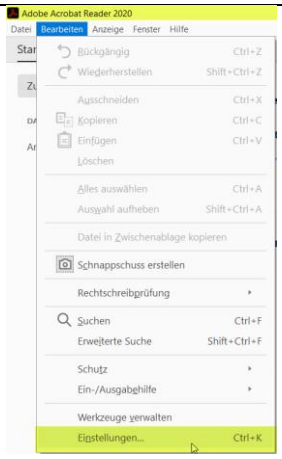

	

Figure 1: Preferences - GUI English	*Bild 2: Preferences - GUI German*

For a smooth display of the 3D content be aware of following categories of preferences.

- Category – Multimedia & 3D
- Category – Security (extended)

4.1.1. Default settings – Category – Multimedia & 3D

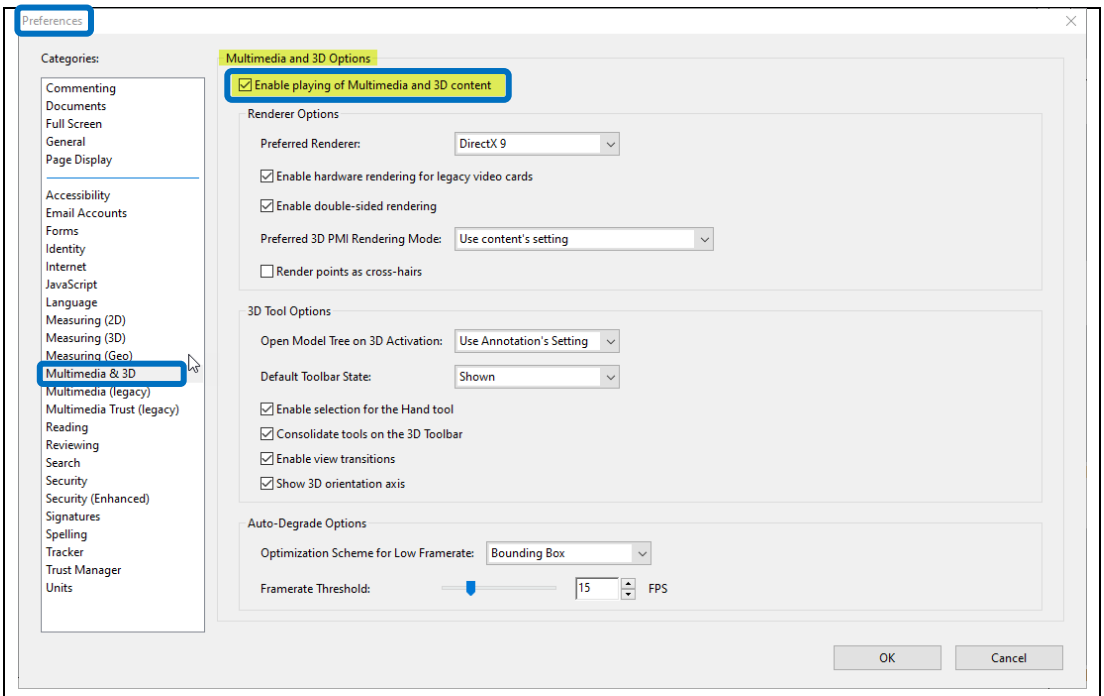


Bild 3: 3D-Voreinstellungen - GUI Englisch

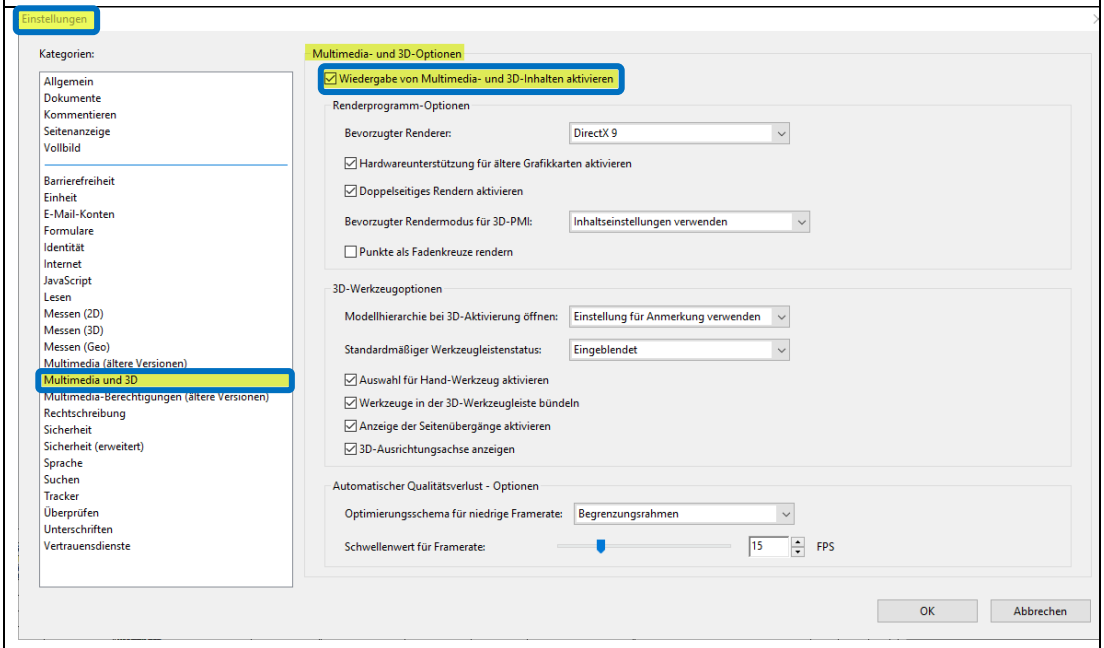


Figure 4: 3D-Preferences - GUI German

4.1.2. Default settings – Category – Security (extended)

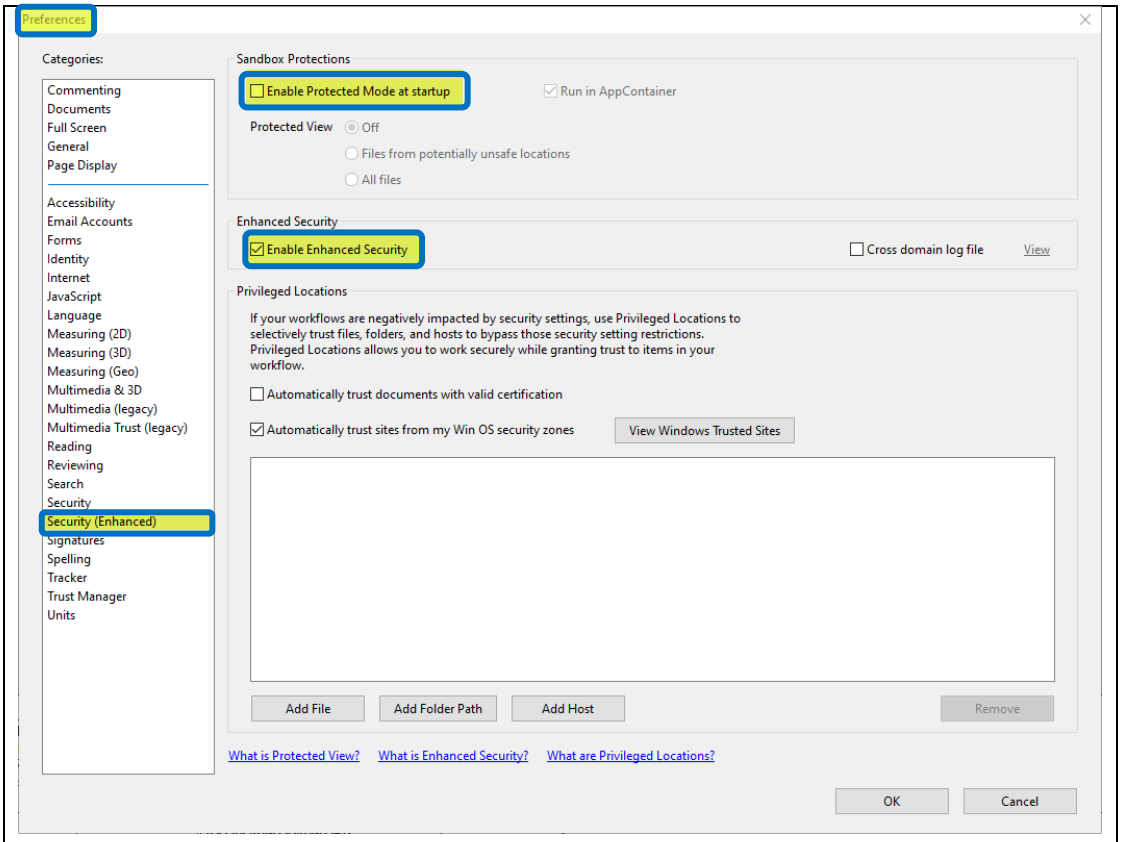


Figure 5: Extended Security Preferences - GUI English

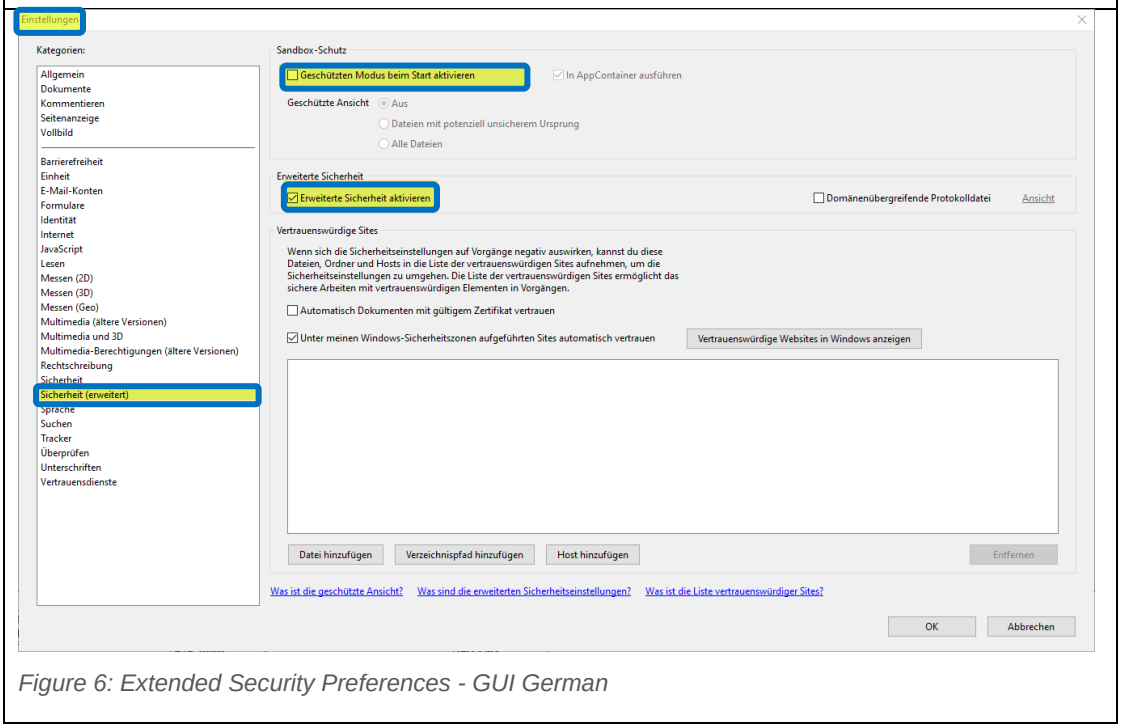


Figure 6: Extended Security Preferences - GUI German

Deselecting Protected Mode in Adobe Acrobat Reader also enables the use of a 3D mouse.

Adobe Acrobat Reader - ..\AppData\Local\Adobe\Acrobat – Setting files

It may be necessary to change the directory. An indication of this is the error message shown, which may appear when opening a PDF-E document. Therefore you have to change the local ..\AppData\Local\Adobe\Acrobat directory of the respective WINDOWS user account.

Figure 7: Error message - GUI English

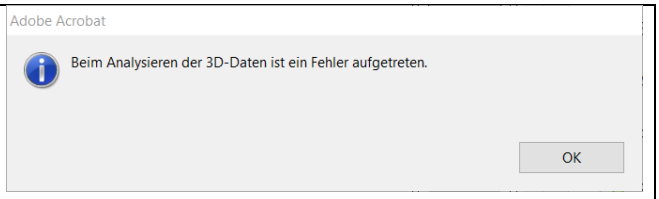


Figure 8: Error message - GUI German

Depending on which Adobe Acrobat products are in use, the directories assigned to these applications for the so-called application setting files must then be renamed. This is necessary because one or other of the custom settings stored in them are obviously responsible for this error.

These directories are located in the directory tree below the respective WINDOWS user directory (e.g. C:\Users\UserName). This directory tree contains the ..\AppData\Local directory tree in which the respective setting files for the applications installed in WINDOWS are stored.

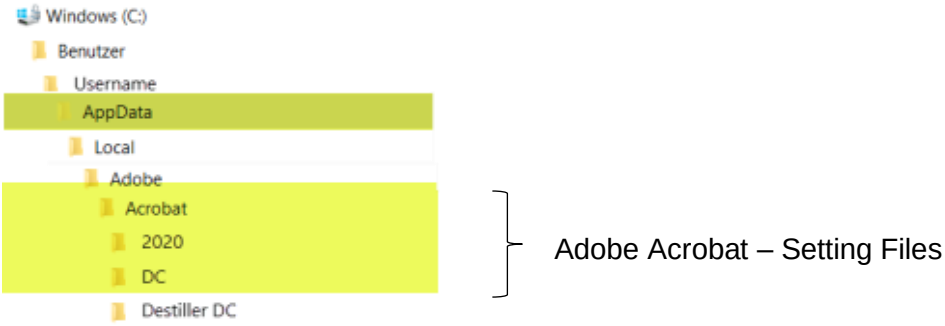


Figure 9: AppData-Directory tree in WINDOWS

There is a separate directory for each installed Adobe Acrobat product. All directories that are considered for working with PDF-E documents need be renamed.

Adobe Acrobat Produkt	***Directory path – setting files***
Adobe Acrobat Reader 2020	*C:\Benutzer\UserName\AppData\Local\Adobe\Acrobat\2020*
Adobe Acrobat Reader DC	*C:\Benutzer\UserName\AppData\Local\Adobe\Acrobat\DC*

Table 1: Directory paths of typical Adobe Acrobat products

Renaming the directories cause that all application settings stored in them become inaccessible, this also means that the application settings stored in them become ineffective, which are responsible for the error message when opening the PDF-E document. How the directories are renamed is not decisive. It is important that they can no longer be found by the corresponding Acrobat application as a result of the renaming.

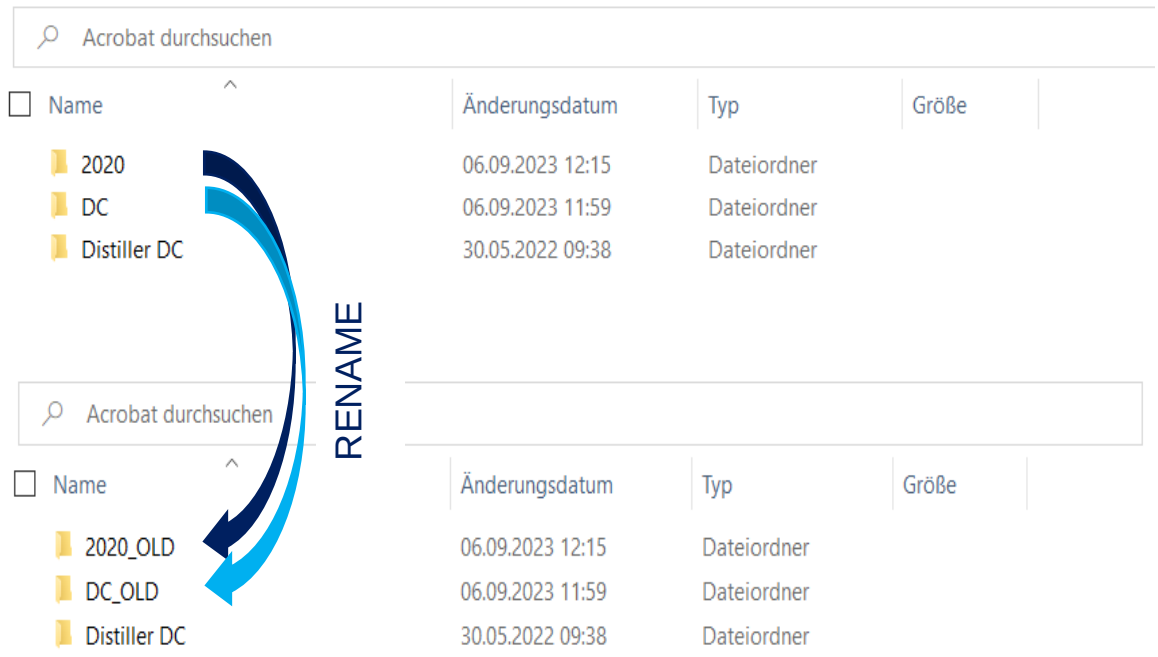
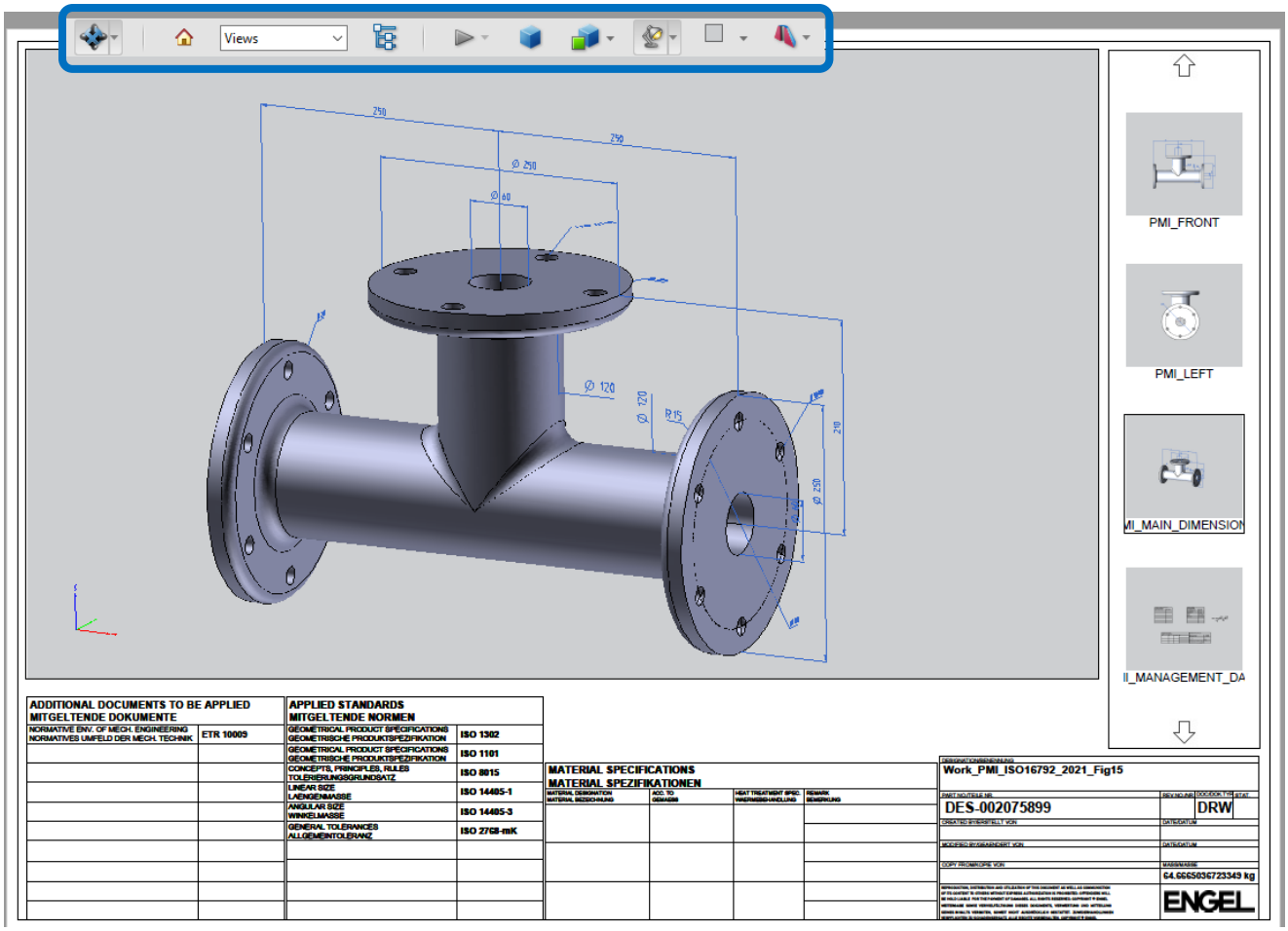


Figure 10: Renaming relevant setting files directories

Adobe is aware of this problem, see the entry in the Adobe Support	Fehlermeldung "Beim Analysieren der 3D-Daten ist ein Fehler aufgetreten".

5. Recommended GUI settings – Viewing Adobe Acrobat Reader

Adobe Acrobat Reader offers a special toolbar in connection with the display of PDF-E documents, which enables quick access to commands with the focus on the representation of 3D models.



To ensure permanent availability of the toolbar, a few preferences are required. More details about the toolbar are explained in section 6.

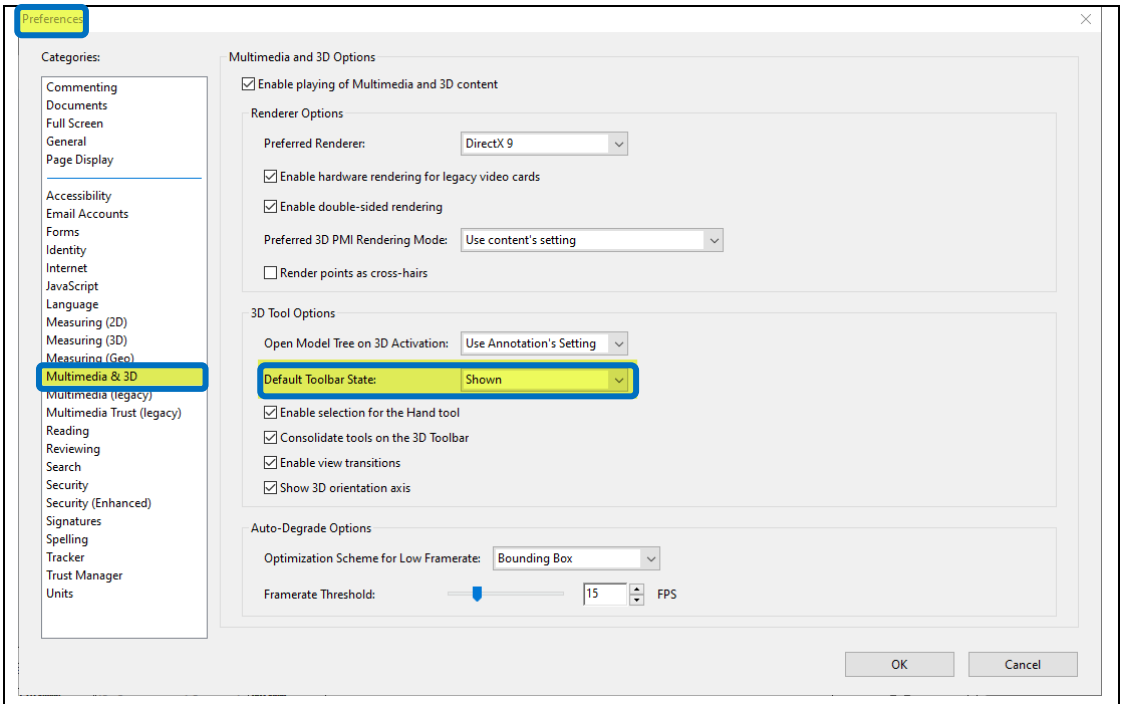


Figure 11: Permanently display of the 3D toolbar – GUI English

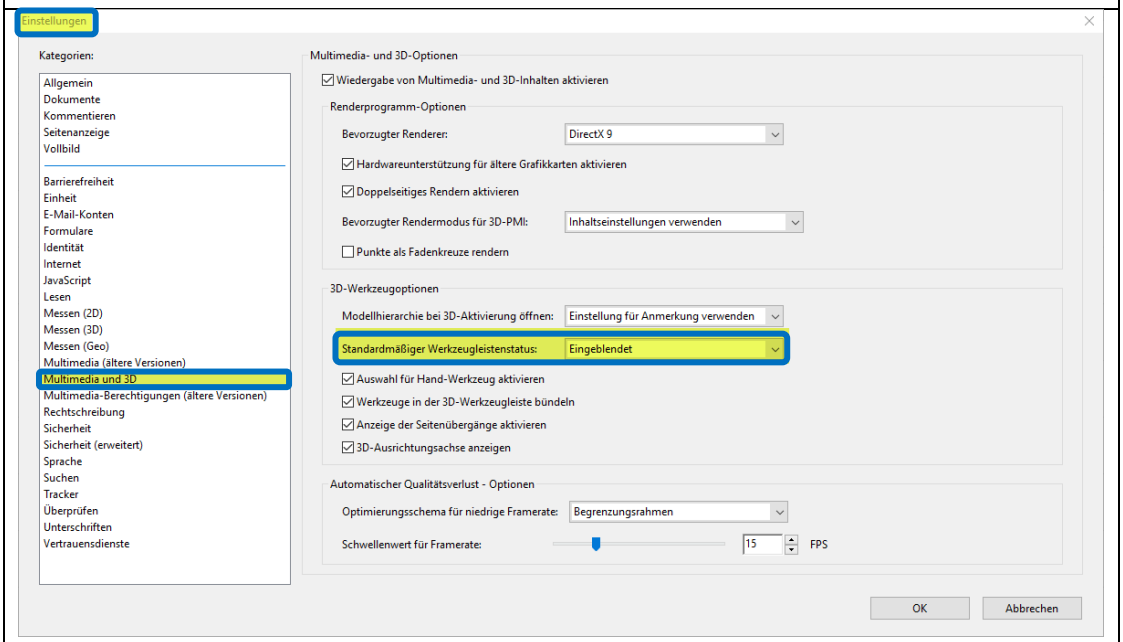


Figure 12: Permanently display of the 3D toolbar – GUI German

6. Commands in the 3D toolbar

6.1. Manipulation of the 3D model

This button offers basic commands for manipulation of the 3D model (e.g. rotating, moving, zooming,…). Some of these functions can also be carried out using the computer mouse.

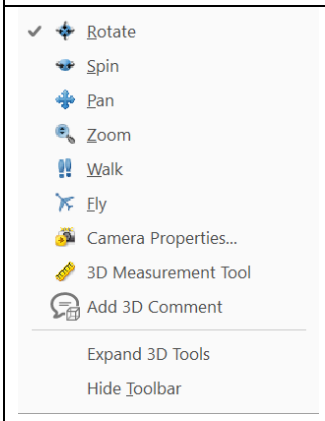
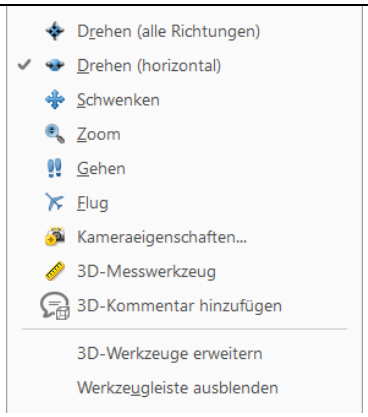


Bild 13: 3D-Manipulation - GUI Englisch



6.2. Standard View

This allows you to return to the so-called “default view”. The current orientation and position of the 3D model (model view) can be reset to the view which is marked as the default view.

6.3. Ansichten

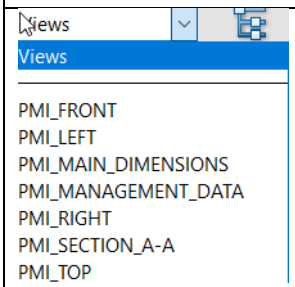


Bild 14: Modellansichten - GUI Englisch

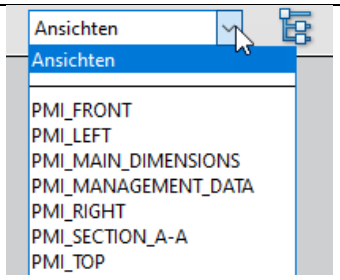
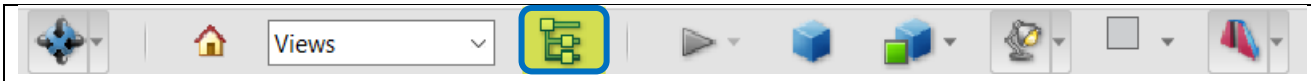


Bild 15: Modellansichten - GUI Deutsch

6.4. Switch ON/OFF model hierarchy



Access to the model hierarchy provides additional options for showing or hiding PMI objects, isolating them, …

Common PMI objects are:

- Dimension
- Geometric tolerances
- Surface roughness
- …

The model hierarchy also offers further options for handling the model views.

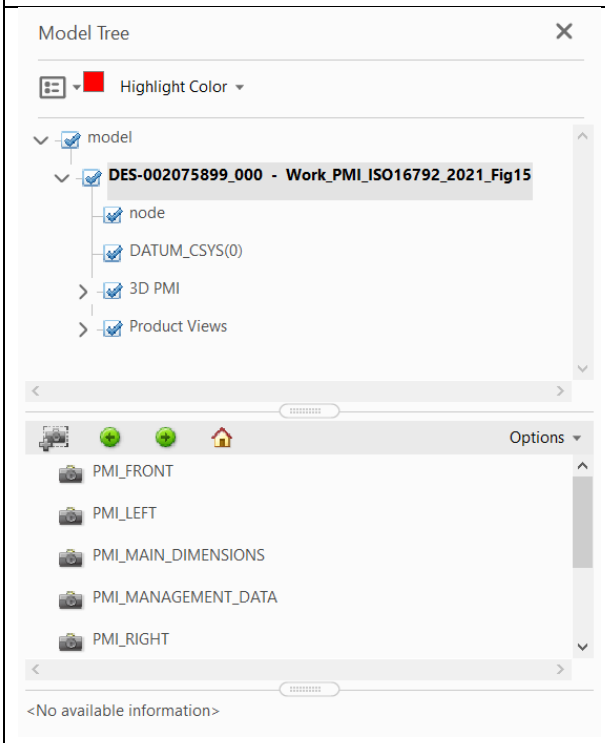


Bild 16: Dialogfenster Modelhierarchie - GUI Englisch

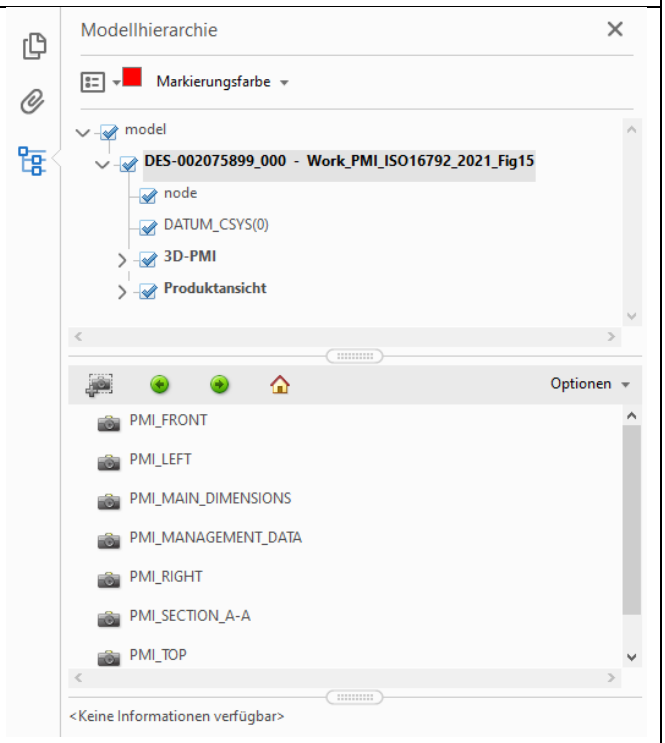


Bild 17: Dialogfenster Modellhierarchie - GUI Deutsch

6.5. Play Animation

If additional animations are also provided in the 3D-model, these can be called up in a targeted manner.

6.6. Perspective projection

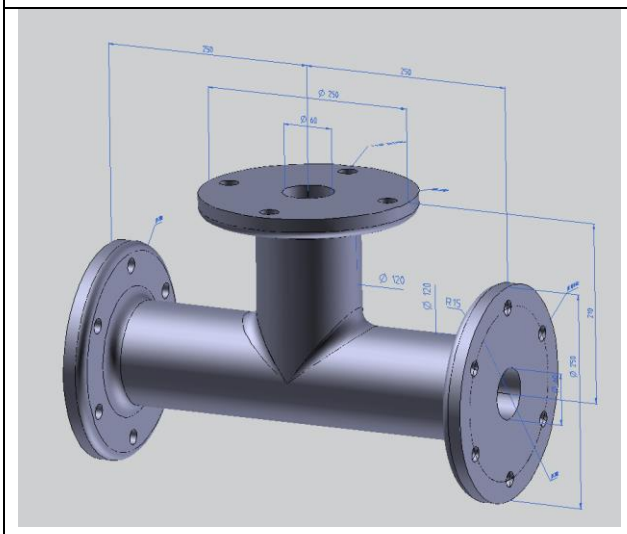


Figure 18: 3D-Representation without perspective projection

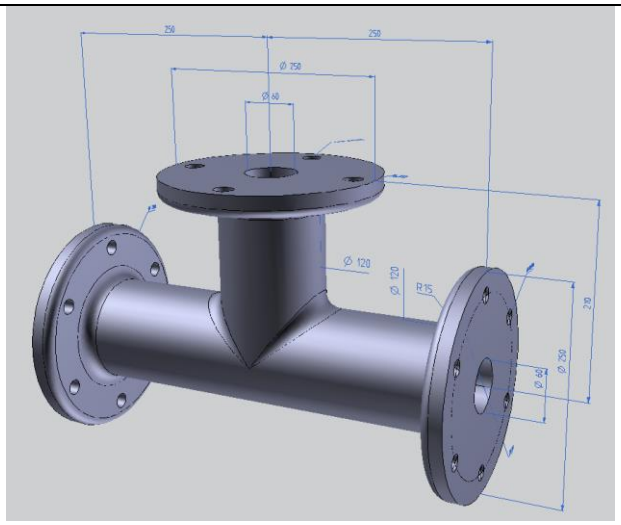


Figure 19: 3D-Representation with perspective projection

6.7. Model render mode

The model render mode can be used to visualize the model in a better way.

- Wireframe
- Shaded with light edges – render mode (*Shaded image)*
- Shaded with dark edges – render mode *(Solid Outline)*
- Illustration
- Transparency
- …

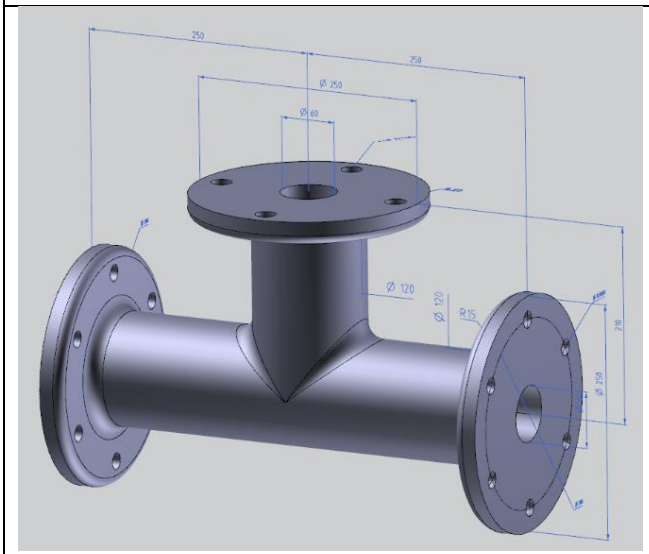


Figure 20: Shaded dark

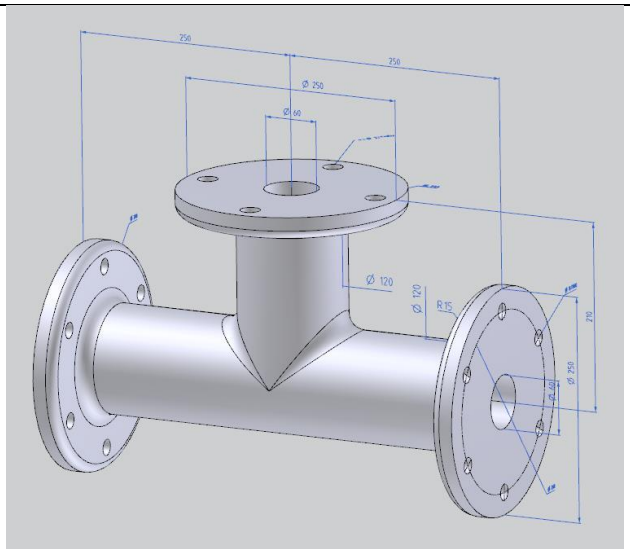


Figure 21: Shaded bright

The use of shaded representations is preferable. The combination of outline solid with cad-optimized lighting has proven to be ideal.

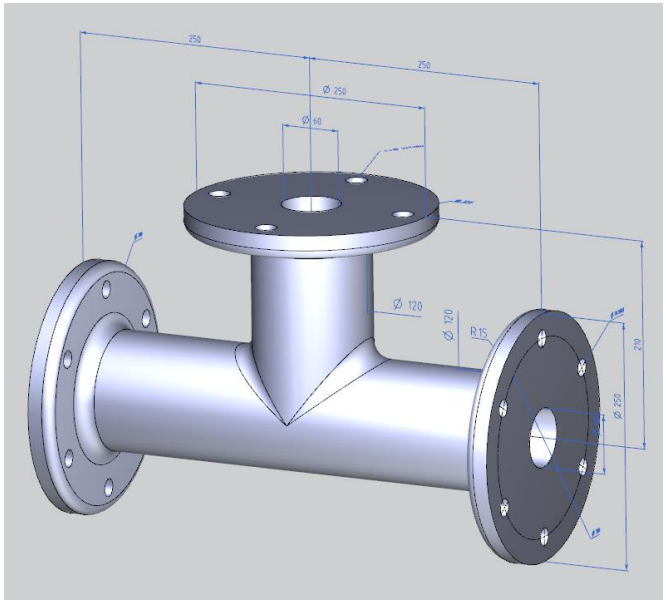
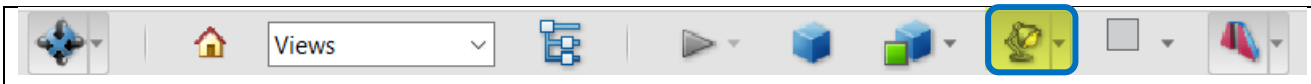


Figure 22: Render mode – Outline solid in combination of cad-optimized lighting

6.8. Activate additional lighting



If a shaded render mode is used, the lighting setting ca be changed. The end result changes greatly depending on the lighting.

Typical lighting settings are:

- White lighting
- CAD-optimized lighting
- Daylighting

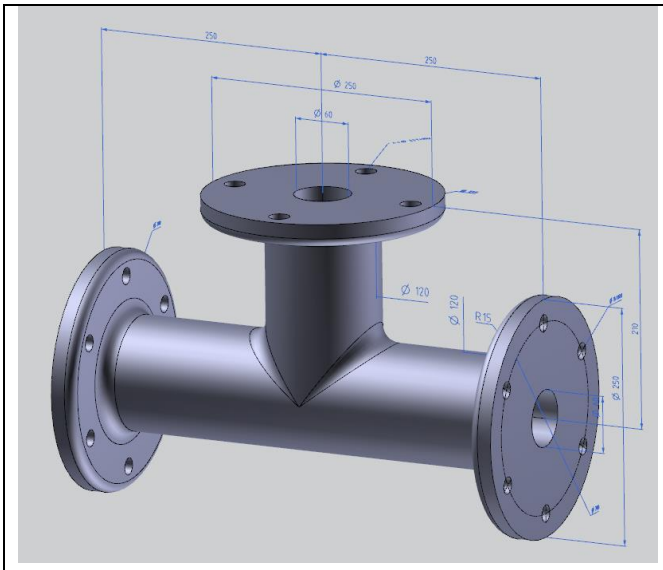


Figure 23: Shaded dark – White lighting

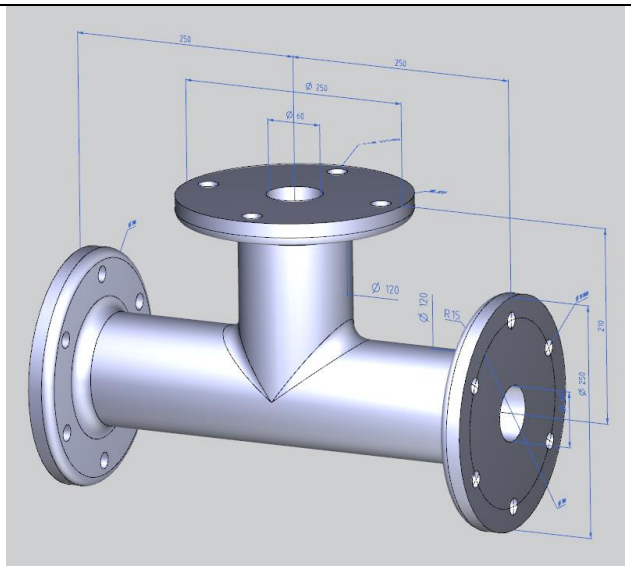


Figure 24: Shaded dark – CAD-optimized lighting

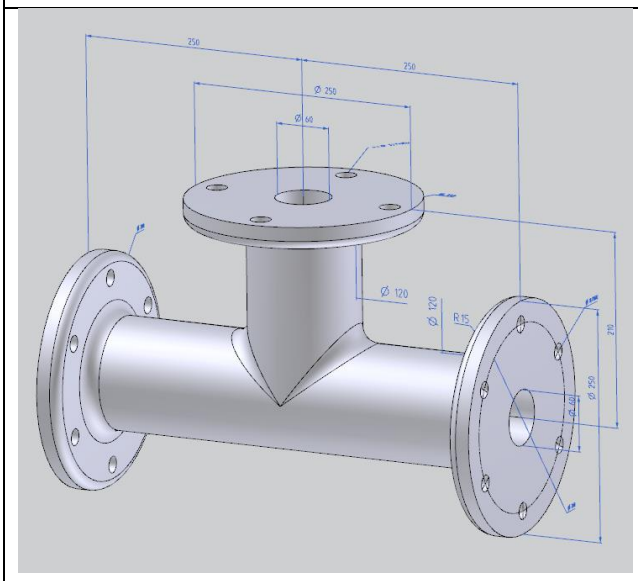


Figure 25: Shaded bright – White lightning

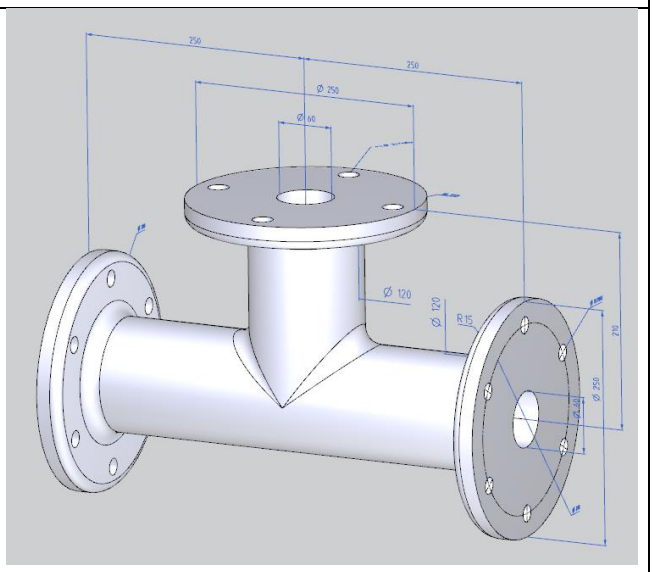
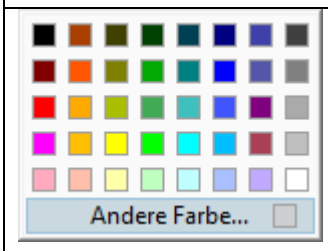


Figure 26: Shaded bright – CAD-optimized lighting

The combination of Shaded dark with cad-optimized lighting has proven to be ideal.

6.9. Background color



There is a free choice of the Background color. The aim is to achieve a high contrast between the dimensions and the 3D model.

6.10. Show/Hide cross section

The cross section can also be used. There is a free choice of cutting planes.

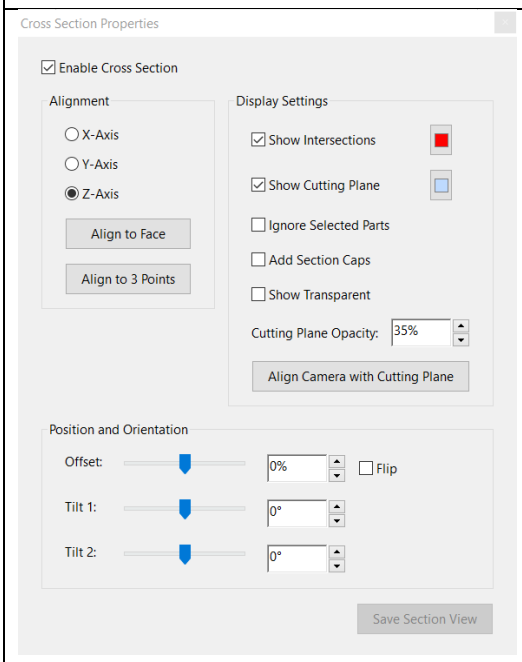


Figure 27: Cross-section dialog box - GUI English

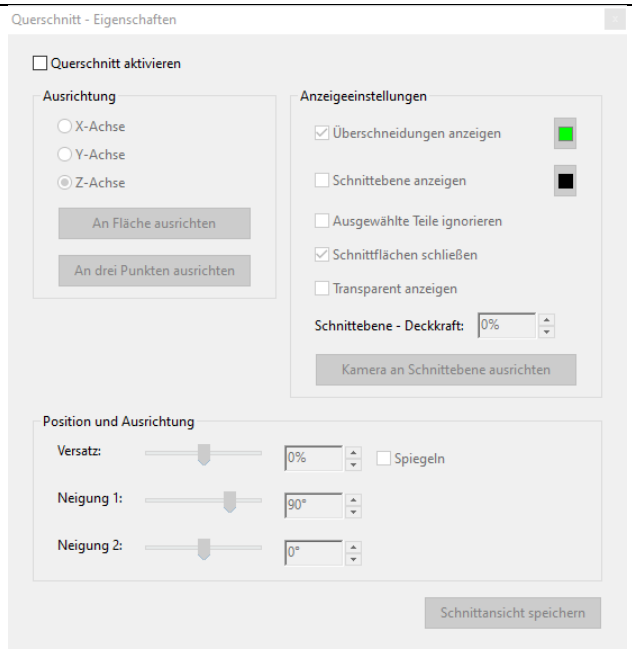


Figure 28: Cross-section dialog box – GUI German

7. Cross-references

Instructions and practical tips on working with 3D models with the use of the Adobe Acrobat Reader can be found on the Internet.

Quelle	URL
Adobe Acrobat User Guide	Interaktives Arbeiten mit 3D-Modellen