CADdoctor® EX 4.0

Translate and Harness the Power of 3D Data
Elysium’s cutting edge technology brings unprecedented value to 3D data processing. Adopted and highly praised by the Renault F1 Team, the Elysium geometry interoperability technology condensed in CADdoctor provides highly reliable data translation and advanced 3D processing features that meet the complex requirements of this championship racing team.

Knowing that the smallest error hidden in 3D data can be a major impediment to its data requirements, Renault F1 has confidently chosen Elysium as its primary provider for 3D data products.

**PDQ Evaluation** – The most important requirement for PDQ (Product Data Quality) validation is the manner in which the data is compared with existing CAD data and algorithms to accurately check each element of the validation criteria. Elysium’s ability to maximize 3D data by providing practical and highly reliable PDQ validation features is far beyond routine quality validation.

Validating a mathematical representation of a ridge line in a solid model could vary depending on the original CAD system in which it was created. When validating edges such as short curves or a self-intersection of a loop containing free edges, it is important to devise ways to accommodate characteristics to ensure the validation baseline is identical in all CAD systems.

Our expertise in processing CAD data through every stage of data translation is the result of experience gained through years of PDQ validation.

**Highly Accurate Healing** – When poorly defined data is found through the PDQ validation process, the best solution is redefining within the original CAD system. But this isn’t always practical because the same error could persist. A healing process which simultaneously heals and redefines the geometry is the key to maximizing 3D data.

Healing requires an extremely high degree of geometry interoperability. For example, within a precision-level 0.001mm CAD system, closing a gap with a 0.002mm element is sufficient. But healing an element in a precision-level 0.01mm system would result in a poor quality “tiny element” which would not be usable.

Elysium Healing closes gaps by extending the adjacent surfaces for repair which require a precision level of 0.001mm. It will never create an element less than 0.01mm, and will always produce accuracy for leveraging 3D data with a wide variety of tools.

**Geometry Optimization** – Revising a CAE model or adding mold elements is often required to successfully leverage 3D data. This requires distinct operations within various CAD systems, prohibiting reliance on the feature tree. So the editing operation needs to proceed using geometry only.

Elysium’s geometry optimization provides advanced features in order to support 3D data editing for maximum utilization. For example, for the most frequently used detection and removal of fillets, free-form fillet is supported. However, full arc form, or “analytical form”, isn’t required.

Elysium’s unique approximation operation, called arc determination, together with an algorithm which determines continuity with periphery elements, recognizes fillet areas with extreme accuracy. This includes gradually changed fillets and corner fillets between fillets.

When removing fillets, “angle” is often created inadvertently by extending the face adjacent to the fillet. But if the adjacent face is missing due to continued fillets without clearance, Elysium’s advanced technology can regenerate the missing faces based on boundary line information.

**Fail Safe Self-Diagnosis** – The Elysium Healing Process constantly adheres to the highest levels of precision, and will fix edges and surfaces only within a permissible precision range. Designed to avoid unintended deformation, there are rare cases where a slight swell or distortion may occur on the surface through healing, even when executed within the precision range.

In a case where swell or distortion is detected, our healing supports post self-diagnosis, automatically switching to a different repair method, healing and diagnosing until the appropriate result is generated. This highly reliable process is accomplished as a result of our proprietary fail-safe technology. If the self-diagnosis reveals a poor quality element or interference, the simplification will not be executed, ensuring no obstacle in leveraging 3D data.

**Vendor Partnerships** – Elysium maintains contracts with all major CAD Vendors to assure our customers that we can handle any CAD data. We are fully versed on the data structure and API (Application Programming Interface), allowing us to provide high quality 3D data so that we can quickly support the latest releases of upgraded CAD software.
CADdoctor provides the ultimate solution to 3D data translation and transformation with its unmatched levels of precision and reliability. Features that support data translation between different CAD systems are essential to maximizing 3D data. In addition to geometry optimization features for analysis, systems design, and reverse engineering are all essential to prototyping and mold design.

CADdoctor EX4.0, with translation and transformation integrated together, allows CAD data, polygon data and point cloud data to be tied together effectively so that the range of data integration is much greater. CADdoctor provides complete support for 3D data utilization in various areas such as medical, computer graphics and plant engineering in addition to the complete manufacturing phases from design, analysis, prototyping, process planning and fabrication.

Translation

Data Input-Output
CADdoctor is a comprehensive tool that maximizes 3D data interconversion, validation, healing and optimization. It supports CAD data, polygon data and point cloud data, and its input-output feature supports both general and specific formats, assuring you the flexibility to support any customer with data in any format.

Validation & Healing
CADdoctor EX4.0 measures up to user expectations and is extremely versatile as an STL healing tool for the creation of CAD models and RP (Rapid Prototyping) output, and as a reverse engineering tool that generates CAD data from point cloud data. It is equipped with highly reliable validation and superb healing to repair defects found through validation of CAD data, polygon data, and point cloud data in their original formats.

The optional Manufacturing Check feature validates manufacturability of a mold and its formability on CADdoctor and allows efficient quality validation in any given area.

Optimization (Edit Feature)
CADdoctor provides various Optimization features to edit CAD and polygon data to optimal 3D data in accordance with the intended final use. The following data optimization features are available as options:

- Feature Detection and Removal – automatically detects features such as fillets and holes
- Envelope Solid – removes fillings, leaving the envelope
- Broad Deformation – deforms geometry directly
- Polygon Option – wrapping and trim weight features to thin out a polygon

Interconversion of CAD, Polygon, and Point Cloud Data
CADdoctor is unique in that it provides an environment to interconvert freely between CAD data, polygon data, and point cloud data: Tessellation converts CAD data to polygon, Reverse Engineering converts polygon to CAD data, and Polygon Generation generates polygon from point cloud data.

This unique feature allows the user to operate on polygon data if something cannot be handled in CAD data and vice-versa, providing versatility to use the most appropriate 3D data operation depending on the current situation.

For example, when generating a CAE model or repairing STL data for RP output, instead of going through the pain of loading and repairing STL data, with CADdoctor it is now possible to select the most appropriate approach like input in CAD data, validate, heal, generate high quality CAD data, then generate polygon data using the Tessellation feature and finally, output high quality STL.

Tools available for different domains can be linked, as well. For example, if a fixture needed to be designed with only lightweight polygon data for DMU (Digital Mock Up), that data could be converted to a CAD solid model and then loaded to a mid-range CAD system to be designed.

This unique combination of transformation with translation demonstrates how CADdoctor can provide you with a single solution to 3D data operation, instead of using multiple tools or through time-intensive manual operations.
The CAD Data Validation and Healing Process

Importing CAD Data
Import the CAD data to perform translation or PDQ validation to CADdoctor. The standard version of CADdoctor supports IGES input-output and STL output. Various other input-output options can be added.

Select CAD to Convert and Validate
The representation of CAD data, its precision level and its validation criteria are different in each CAD system. To successfully translate data requires much more than the simple translation between formats. Validating errors like tiny elements, tiny segments in the elements and large gaps between the elements might be affected after the translation process.

CADdoctor has the benefit of many years’ experience in data translation, and includes the accumulation of original validation criteria. By selecting which CAD system to convert to, the correct validation criteria will automatically accommodate the target system. Validation based on PDQ guidelines in SASIG/VDA/JAMA/JAPIA is also supported.

Visual Representation of Errors
The Check Panel lists the number of errors detected by each validation category in 3 levels based on a pre-established degree of tolerance. By clicking on the validation category item, the error becomes highlighted in the model, making it easy to find. It can be enlarged for further analysis by clicking on the magnifying glass icon. By clicking the TV monitor icon, other elements related to the error can be enlarged, as well. These rich error visualization tools allow the user to understand the errors accurately and provide invaluable information for determining the best methods for adequately fixing them.

Automatic Healing
Most validation processes reveal errors to some degree, and by clicking the Heal icon in CADdoctor, Elysisum Automatic Healing repairs the data sufficiently. This feature of CADdoctor heals errors through sophisticated geometry treatments, like fine tuning the location and form of a face and edge. However the healing will never exceed the precision level of the original CAD, ensuring consistency with the original data.

The interactive Healing Advisor will also support easy healing of extreme or composite errors which can’t be fixed automatically. It doesn’t require the complicated operation of a CAD system, and healing can be accomplished by clicking just one icon.

Exporting Healed Data
Once the healing process is complete, translation can be completed by saving the data in the format of the target CAD system or another intermediate format.

Geometry Verification
With Automatic Healing, the healing and fail-safe features achieve extremely high quality while simultaneously preserving the precision of the original CAD. By using Geometry Verification, the original and healed geometry can be compared through a difference map for thorough inspection of changes in geometry, element formation of face and edge, and face continuity.

Exporting Polygon Data
The Remesh feature evens and trims uneven polygons without changing their geometry and granularity. Polygon size can be assigned arbitrarily, and polygon data can be edited and optimized by way of these 3 features: the Smoothing feature smooths polygons with a convex-concave, the Polygon Simplification feature trim weights the polygon data significantly while maintaining the physical appearance, and the Wrapping feature extracts the exterior form and creates a closed polygon.

Exporting Polygon Data
After healing and optimizing the polygon data, the process can be completed by output in STL, VRML, or OBJ format as in the import process. And with the Reverse Engineering option, the polygon can be converted to CAD data.
For development of CAE models and mold design, the Geometry Simplification Option supports development of a light-weight model by automatically omitting the detailed geometry without relying on the feature tree. Feature Detection and Removal are the most frequently used functions.

**Feature Detection**

Feature Detection determines features such as fillets, holes, boss and rib, and steps from the geometry in the 3D data and detects the drawing area. Detection from CAD data in any format is possible since the characteristics are captured only from the geometry, without relying on the feature tree.

Just as in PDQ Validation, each feature can be highlighted and zoomed into, allowing for easy checking of omissions or superfluous detection. In either case, the target element can be repaired easily by clicking.

**Feature Removal**

Feature Removal allows all or some detected features to be removed by simply clicking. With Feature Removal, adjacent faces will be extended and the area will appear natural, with no trace of the removed feature. The form of the feature can be preserved and the face can be partitioned for setting analysis conditions. Depending upon areas adjacent to a removed feature, if abnormalities like interference between faces are created after removal, the feature can be restored, preventing the creation of inadequate data.

**Fillet Removal**

A series of fillets can be detected including fillets with radii that are non-constant, a gradually changing fillet with varied radii, or corner fillets that have multiple fillets colliding. Also, either concave or convex fillets can be selectively detected.

The detected fillets can be automatically removed collectively resulting in the intersections of the underlying surfaces. In the case of a continuous fillet whose trimmed surfaces were removed in creating the fillet, the trimmed surfaces can be recreated by extrapolation from the existing auxiliary surfaces. In addition, the intersection curve of the fillet can be highlighted and edited to change the geometry after removing the fillet. This might be required when creating a draft angle needed for a plastic mold.

**Holes**

CADDoctor has three features which allow detection and removal of either round or generic holes. Round Hole Auto-Detect and Removal refers to the diameter of the round hole as the threshold while the Generic Hole Auto-Detect and Removal feature refers to the width as the threshold. Manual Hole Detect and Removal supports detection and removal of any opening on a face which you select.

Round holes can be detected by setting upper and lower limit thresholds, just like in the fillet feature. Holes do not have to be cylindrical; as long as the cross section is circular complex holes that are wending can also be automatically detected. Openings that cross over multiple faces can also be detected. Both the round hole and generic hole detect features can automatically and distinctly detect through holes that have more than two openings and blind holes that only have one opening, which allows sorting holes automatically by type.

The CAD Data Validation and Healing Process

The CAD Data Validation and Healing Process is a powerful tool for CAD data validation and healing. It allows you to detect and remove various features such as fillets, holes, boss and rib, and steps from the geometry. The process is based on CAD data in any format, allowing for easy checking of omissions or superfluous detection. Feature Detection and Removal are the most frequently used functions.

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The holes can be filled by either extending the adjacent faces not leaving any form, or by filling with another face and leaving the form. In developing flow path for fluid analysis, geometry of the inner void can be extracted. A Cap can be automatically generated on the opening and can be extracted as a solid model.
Reverse Engineering
Maximize 3D data with the Reverse Engineering Option

Automated Creation of CAD Data from Point Cloud and Polygon Data

With the Reverse Engineering Option, CAD data can be created from polygon data imported directly or generated from point cloud data by Polygon Extension. Adequate CAD data can be created automatically by just clicking a button.

Automated Segment Creation
Prior to creating CAD data from polygon data, a surface is segmented. For the segmentation, the geometry of the polygon data is captured, fillets are automatically detected, and the range of each segment is determined automatically to approximate the surface composed in a CAD model. Planar, cylindrical, and conic surfaces for analysis representation are recognized automatically allowing segmentation based on surface type. Surfaces can be color-coded by type at each segment, allowing verification prior to creating CAD data.

Healing Segments
Segmentation is automatic, but there are cases where the segmentation alone may not be adequate due to unevenness from noise or where the density of a polygon is low and lacking data. Areas like this can be edited to achieve accurate segmentation. Editing is easy with operations like picking the segment to be merged or assigning parting line with a rubber band. Surface type can be easily switched just like when repairing an area.

Also, if the original CAD data is present, the edge from the original CAD data can be copied to polygon and used as parting line for segmentation.

Referencing Original CAD Data
In a situation where original CAD data is available for prototyping in an in-house design, an edge from the original CAD data can be copied to polygon and used as parting line for segmentation. When copying the edges from the original CAD data and aligning them with the polygon data, optimal positioning can be automatically offset by specifying 3 corresponding points. The 3 points don’t have to be precise; since specifying approximate location will result in an automated offset, ensuring accurate registration between the polygon data and CAD data.

Automatic Surfacing and Creation of CAD Data
Once the segmentation is complete, CAD data can be generated from a NURBS surface. With CADdoctor, surfacing is also possible on trim surface surrounded with complex edges, creating CAD data with simple surface based on segmentation. Also, after batch surface generation, minor amendments can be made without re-executing the process, since partial segments can be repaired or surface types switched. This results in reduced time spent on repairs.

Fitting CAD Data to Polygon Data
Product design in 3D CAD data can be transformed to be consistent with actual polygon data by using a coordinate measuring machine. The original CAD data is maximized by creating master data, which is easy to re-edit in a CAD system.

Data Import and Registration
Polygon data loaded from a coordinate measuring machine will have different positioning and orientation than original CAD data, requiring registration to reconcile the two. The Best Fit feature produces automatic registration to the optimal position by selecting approximately 3 corresponding points.

Detecting Target Face for Deformation
When deforming actual CAD data, CADdoctor recognizes the difference between the CAD data and polygon data, since the polygon data from a coordinate measurement machine contains noise which creates subtle differences from the actual geometry. By setting the tolerance to minimize this difference, the target for deformation will create faces larger than the tolerance, and faces smaller than the tolerance will be excluded from the target.

Also, when detecting the target face, if the difference is due to noise and is local, the face will be excluded from the deformation target even if the tolerance is larger than set, ensuring that inadequate deformation isn’t executed. Faces detected automatically as targets for deformation can be excluded manually.

Fitting CAD Data
The target face for deformation is deformed consistent with the polygon. However, if the face is deformed simply to the nearest point of the polygon data, an area of the feature may be out of alignment, creating distortion, and a fillet’s boundary line may be disrupted affecting the adjacent planar surface. The Fit feature in CADdoctor determines the transformation orientation with respect to curvature change of both the CAD and polygon data and will maintain the correct position of the boundary line between a fillet and an adjacent surface, ensuring that continuity between faces is maintained when deforming.

In cases where multiple noise, irregular form and smoothness would make it impossible to ensure consistency between deformed CAD and polygon data, smoothness is a higher priority, ensuring geometry isn’t distorted after deformation.

Evaluating Data Created
The difference between the polygon data and CAD data that has been created from point cloud and polygon data, or fit to polygon data using Reverse Engineering Option can be visually compared with the Difference Map which indicates differences based on distance. If the polygon and CAD data were created based on imported point cloud, the difference between point cloud and CAD data can also be compared. The range of the Difference Map can be changed freely to preserve minute differences, thus ensuring effective CAD data validation.

CAD Data Output
CAD data created or fitted using the Reverse Engineering feature can be output in various CAD formats with CADdoctor’s powerful data translation feature.
Geometry Deformation
Simplify Changes for Mold Requirements

Broad Deformation

Broad Deformation executes flexible deformation by directly assigning the range to deform, the distance the elements can move, and the passing point after deformation.

Assigning Deformation Target and Specifying Deformation

In Broad Deformation, the initial step is to assign the range within which the deformation will take place on a specific target. Specifying the deformation method is the next step and there are 3 ways to specify this. One is by specifying the orientation and distance the random elements can move. Another is to specify which elements the geometry should pass after deformation. The third is to specify an element within the deformation target and that element at the destination.

Checking the Deformation Results and Retry

After determining which method will be used, deformation into a smooth surface will proceed based on the assigned distance, passing elements, and matching elements while maintaining tangential continuity of the boundary line part in the target area. Geometry can be compared to verify whether the deformation was completed as intended. The deformation specification is stored, allowing changes to the specification and retain in case deformation wasn’t completed as intended.

Move Face

Move Face executes deformation while taking into consideration the tolerance required in mold design by offsetting or shifting a specific area surrounded by parallel fillets. The offset and parallel shift is executed without changing the fillet radius. Move face can be executed by first selecting the face area to offset or shift, whereby the surrounding fillets are recognized. By executing the transformation, the selected area is offset or shifts parallel. Radii of the surrounding fillets is maintained while the face within the area or adjacent to it is extended or contracted. If there’s a fillet within the transformation target area, selection can be made in advance whether to automatically change the fillet radius following the offset, or to maintain the fillet radius by adjusting the size of the adjacent faces.

Other Geometry Transformation Features

Bending Deformation

This feature produces smooth bending which is required for anticipating spring back in molds. A dedicated dialog box supports bend profiling, for bending the tip and base sharply, or spontaneously.

Overbend Rotate

Overbend Rotate accommodates rotation of the deformation target smoothly by assigning the target, reference axis, deformation range, and angle.

Flange Deformation

The Flange Deformation feature is for deforming a flange in anticipation of spring back. The rotational deformation is executed by distance or angle in an arc around the base of the flange.

Move Flange

Move Flange parallel shifts the flange consistent to the extend direction of its face. Detailed deformation requirements allow assignment of value to multiple points and variable radius.

Check Results Report Generation

Results from the manufacturing check can be output in xml format which can be viewed on web browsers. They can also be shared with other departments and partners who don’t have CADdoctor to prompt design changes. The report includes the entire image, pointing out locations in the model and includes enlarged details for each of the issues detected, ensuring that those who receive the report easily understand the issue. Finally, CAD data that has been color-coded by area and sorted based on draft-direction such as cavity, core, undercut, and straight areas are automatically detected. The parts detected as undercut are sorted as slide, and by assigning the slide direction, draft angle against the slide direction is also checked.

Manufacturing Check
Reduce Development Rework and Mold Cost

Assigning Draft Direction

Using Manufacturing Check, the effect on plastic mold formability and mold construction can be verified. By assigning the draft direction of the mold during preparation for the checking process, cavity, core, undercut, and straight areas are automatically detected. The parts detected as undercut are sorted as slide, and by assigning the slide direction, draft angle against the slide direction is also checked.

Manufacturing Check

Assigning Draft Direction

After assigning the draft direction, checking is run on 10 items in 3 categories. The first category is Product Formability to check possible product quality issues such as inadequate thickness. The second is Mold Construction which includes features such as an undercut, which may increase complexity to the mold construction, leading to increased cost. The final category is Mold Formability to check sharp edges, deep trenches, and small bumps which can’t be formed in a mold. By setting tolerance based on company standards, any item that doesn’t meet the standards can be detected. Issues found in each category are highlighted and can be enlarged and checked, as in the FDO Validation feature.
Building a 3D Data Distribution and Usage System

Elysium also supports building large scale 3D data translation and usage systems that run across multiple divisions and to external partners. ASFALIS can be implemented as a base system and can deploy CADdoctor where an interactive operation such as Healing Advisor is required.

Progression to ASFALIS

ASFALIS from Elysium is for large scale 3D data processing and automated operation. It supports batch processing of massive 3D data, automation of analysis and DMU model development, and a 3D data translation and distribution system involving many users and divisions. At the core of ASFALIS is Elysium’s original intermediate file called ENF (Elysium Neutral File) consisting of component software which provides various features such as 3D data translation and optimization operation. The component software is linked together with ELYSIUM CANVAS™ included in the ASFALIS Controller.

Every component can be controlled using CANVAS Script supported in ELYSIUM CANVAS which, in addition to sending processes, recognizes specified conditional judgments and repeat operations. This allows finely-tuned processing from simple tasks such as one-to-one data translation and batch translation, to more complex operations like changes in an automatic healing method based on PDO validation, changes in the geometry optimization procedure based on volume and material, and changes in assembly configuration during translation.

ASFALIS can be used easily with its standard menu in ASFALIS Controller independent of CANVAS Script. This is achieved by combining ELYSIUM CANVAS using CANVAS Script from an external system, an original 3D data translation and processing system can be built.

With ASFALIS, data translation and geometry optimization can be handled as in CADdoctor. So in the case of increased data, an increase in an user, or if process procedures become complicated, migrating to ASFALIS from CADdoctor would result in automation and improvements in processing capacity. Migration isn’t the only solution but by having ASFALIS and CADdoctor work together, CADdoctor can be automatically activated in case visual confirmation or manual operation is needed during ASFALIS automated operation.

Furthermore, ASFALIS supports various 3D operations which CADdoctor doesn’t, such as translation of 3D annotation, translation and edit of attributes, change in assembly configuration, and assembly interference check.

ASFALIS Transforms CADdoctor into a Comprehensive Product Data System
Implementation Consulting for Product Life Cycle Coordination

Consulting Flow

1. Understanding 3D Data Flow
   - We create a 3D data distribution map based on interviews with our customers.
   - The map shows all the divisions that created and used 3D data, the CAD/CAE systems, CAD/CAE/Mesh used, distribution routes of the 3D data, and data format.

2. Defining the Target
   - Based on the 3D data distribution map, we compile requirements around 3D data translation and geometry optimization at each or between those divisions. When not enough, we define a target for every division. We can improve communication by developing a reference through geometry optimization.

3. Understanding Manufacturing Check
   - Prior to starting analysis of the 3D data, we clarify the kind of information required by the target division. If attributes and annotations are required in addition to geometry, we clarify each individual item. This includes clarifying geometry optimization requirements.

4. Preparing Test Data for Each Tool
   - We perform test data to formulate PDO criteria and validate optimization settings for automated healing. The test data includes various parts, mainly those that have issues like failures in translation. If attributes and annotations required translation, test data will include such information as well.

5-1. Formulating PDO Criteria
   - We use the test data to validate PDO criteria and validate optimization settings for automated healing. The test data includes various parts, mainly those that have issues like failures in translation. If attributes and annotations required translation, test data will include such information as well.

5-2. Customizing Automatic Healing
   - We select optimal settings for automated healing based on issues found when formulating PDO criteria, ensuring reliability. In cases of extremely low quality, 10+ data, automatic healing can’t provide a solution. Those instances may require the Healing Advisor to establish procedures.

5-3. Mapping Attributes and Annotation
   - If attributes and annotations require translation, we create a mapping table called the translation specification. If the specification doesn’t correspond with the target CAD system, attributes and annotations need to be translated accordingly.

5-4. Formulating Optimization Procedures
   - We formulate geometry optimization procedures for developing a CAD model by geometry simplification. The ASFALIS component’s automatic optimization and CADdoctor’s implemented as an in-stream operation is required to provide instructions on the edit target.

6. System Design
   - The tools required for developing the CAD model are determined after confirm what CAD system and tools are in use and formulating PDO validation criteria. The process must be completed depending on the user size and usage frequency. After establishing the system model, we’ll be conducted with the IT division and system engineers.

7. Running the Pilot System
   - Once the system configuration and settings are determined, the pilot system is built and tested run by selected divisions and users before going live.

8. Adjusting PDO Criteria and Customizing Automatic Healing
   - We analyze various issues during the pilot operation and adjust PDO validation criteria and tolerance. After automatic healing procedures are established, we conduct the system and revise necessary adjustments for operation, prepare and run for wider use.
## CADdoctor®EX 4.0 Supported CAD

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Input &amp; Output Format</th>
<th>Version</th>
<th>Target CAD for Flavoring</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>CADdoctor/Standard Package</td>
<td>Input : IGES</td>
<td>V5.3</td>
<td>· CATIA V4 · CATIA V5 · I-DEAS · NX · Pro/ENGINEER · SolidWorks · CADCEUS/CADMEISTER · Autodesk Inventor · TOPsolid · OneSpace Modeling/Cocreate Modeling · Solid Edge · Others</td>
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<td>CATIA P2 ASD required</td>
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<td>CATIA V5</td>
<td>R6-R19</td>
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<td>· One Space Modeling/ Cocreate Modeling · Autodesk Inventor · Mechanical Desktop</td>
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*Plug-In* options require each corresponding CAD system. *Add-On* options don’t require each CAD system.

## Requirements

<table>
<thead>
<tr>
<th>Requirements</th>
<th>32bit</th>
<th>64bit</th>
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<tbody>
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<td>Execution Environment</td>
<td>Windows 2000, XP Professional, Vista capable IBM PC/AT compatible machine</td>
<td>Windows XP Professional (x64), Vista (x64) capable IBM PC/AT compatible machine</td>
</tr>
<tr>
<td>CPU</td>
<td>Windows 2000, XP Professional, Vista capable CPU</td>
<td>Windows XP Professional (x64), Vista (x64) capable CPU</td>
</tr>
<tr>
<td>Memory</td>
<td>1GB or more</td>
<td>1GB or more</td>
</tr>
<tr>
<td>OS</td>
<td>Windows 2000, Windows XP Professional, Windows Vista</td>
<td>Windows XP Professional (x64), Windows Vista (x64)</td>
</tr>
<tr>
<td>Disk device</td>
<td>Hard Disk (200MB or more + data area + swap area; CATIA V5 Interop Add-On requires at least 500MB), CD-ROM drive</td>
<td>Hard Disk (500MB or more + data area + swap area; CATIA V5 Interop Add-On requires at least 1GB), CD-ROM drive</td>
</tr>
<tr>
<td>Display</td>
<td>1280x1024 dot or more, high color (65,536 colors), Open GL video card compliant with double buffering</td>
<td>1280x1024 dot or more, high color (65,536 colors), Open GL video card compliant with double buffering</td>
</tr>
</tbody>
</table>

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