DeskArtes
Expert Series 10.0

Quick Start Guide for

- 3Data Expert

- 3Data Expert Lite

- Dimensions Expert

First Edition

Ismo Mäkelä: "Expert Series 10.0: Quick Start Guide".

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Contact Address

DESKARTES OY

Olarinluoma 7

02200 Espoo

FINLAND

http://www.deskartes.com

Expert Series 10.0: Quick Start Guide

Foreword

The *Expert Series 10.0: Quick Start Guide* document provides an introduction to the basic 3D model handling: triangle model repair and model splitting with *3Data Expert, 3Data Expert Lite* and *Dimensions Expert* software products for Additive Manufacturing.

Expert Series 10.0 is a 64 bit implementation allowing you to handle huge models for Additive Manufacturing. This and the ability to connect directly to AM processes via new user defined plugins make your everyday data preparation as easy as you can imagine!

There are two simple lessons and it should not take more than 15 minutes to go through the examples. *The first lesson* fixes an erroneous STL model for 3D Printing using the Auto Repair process available with Expert Series 10 software.

The second lesson describes methods to split and combine STL parts for 3D Printing. Large parts must be split and pins have to be added to be able to attach the manufactured parts correctly with Expert Series software. The split and repaired data can be transferred directly to downstream AM processes through new plugin interface.

DeskArtes Expert Series software suite consists of several products targeted from home and DIY use to education and professional Additive Manufacturing:

- *View Expert* is entry level tool targeted for viewing, verifying, dimensioning and communicating 3D geometry information. Free View Expert allows you to input triangle models, create consistent topology, check errors, orient normals and output STL data for 3D printing without any cost.

- *3Data Expert* is professional tool for preparing 3D models for Additive Manufacturing and Simulation applications. There are several commands for manipulation of both 3D surface models and 3D faceted models. Thse commands include surface triangulation, STL verification and repair, STL offsetting, splitting, connecting, decimation, smoothing and boolean as well as STL coloring and texturing. Basic supports can be generated for both Stereolithography and metal processes.

- *Dimensions Expert* is a simple, economical and user friendly tool for STL repair and splitting for machines with a smaller build area.

- *3Data Expert Lite* adds primitive generation, boolean and 3D markup commands to Dimensions Expert functionality for connecting STL models as well as adding/engraving 3D text on STL parts.

- *Sim Expert* is a dedicated tool for preparing 3D models for Simulation applications, with triangle count reduction and triangle aspect ratio improvement functions.

- – *Design Expert* is a tool for free form conceptual design for jewelery, ceramics and conceptual design.

Lesson 1 – Fully Automatic STL fixing

Welcome to Expert Series 10.0 tutorial Lesson 1. Expert Series 10.0 is a 64 bit implementation allowing you to handle huge models for Additive Manufacturing (AM) and Simulation applications. But let's start with more simple models.

This lesson shows you how to fix an erroneous STL model for AM using the automatic tools with 3Data Expert, 3Data Expert Lite or Dimensions Expert software. Before starting the lessons please make sure you have received and installed the software evaluation license from DeskArtes. If you do not have a license yet, it is very simple to request a license. First start the program from the desktop icon:
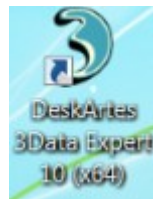

Then go to the *Program licenses* dialog through *Help > Licenses* command. There you can find the *Send license request by email* button. Press it and it will open your favorite email application to send the license request to DeskArtes.
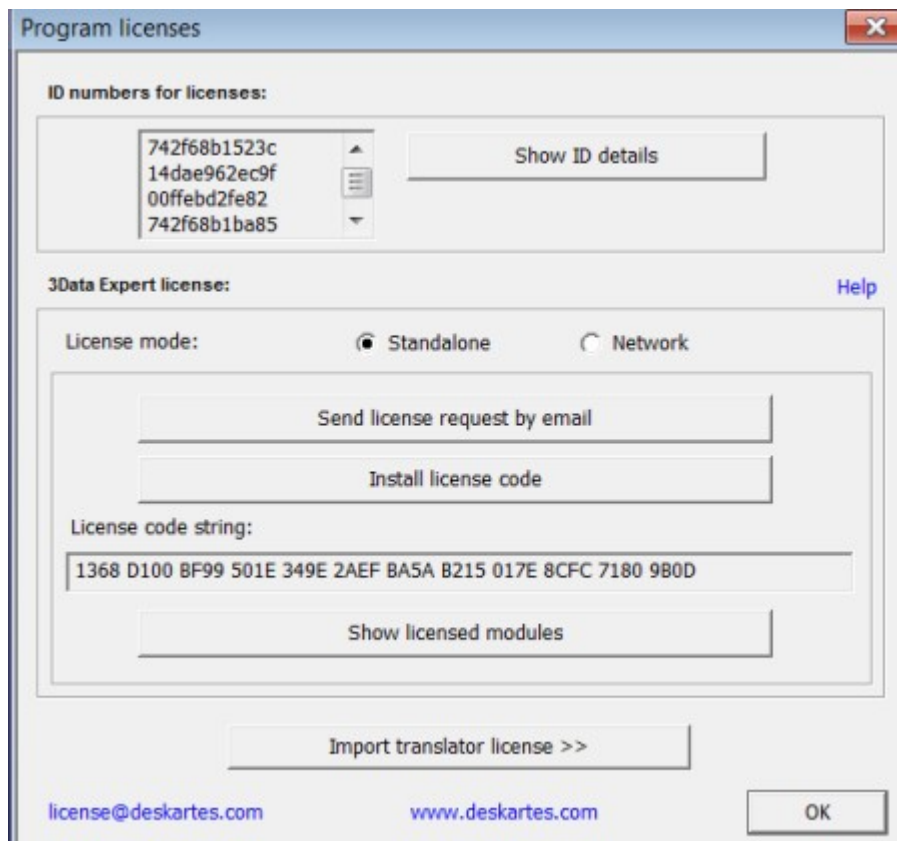
You will receive the 30-day evaluation license within 24 hours.

When the license arrives, press *Install license code button* and *Copy/Paste the license string* into the input field that appears:
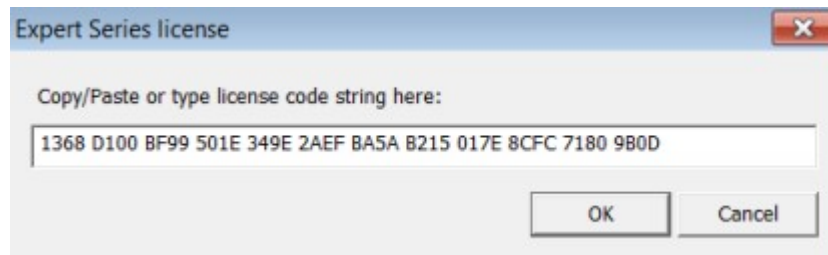

Then press *OK* as requested to accept the license. Finally, *restart* the software. Now you are ready to go ahead with the lessons!

Auto Repair process for STL files

When inputting a triangulated model into Expert Series software, an automatic analysis and repair process is started. In normal everyday use you can verify and correct most of the models using the Auto Repair process. Now we will show how the Auto Repair process works.

First open the *dino-connected.stl* file in the *Tutorials/GeomFiles* directory with the *File > Open* command. Make sure the *Files of type* is *STL*:
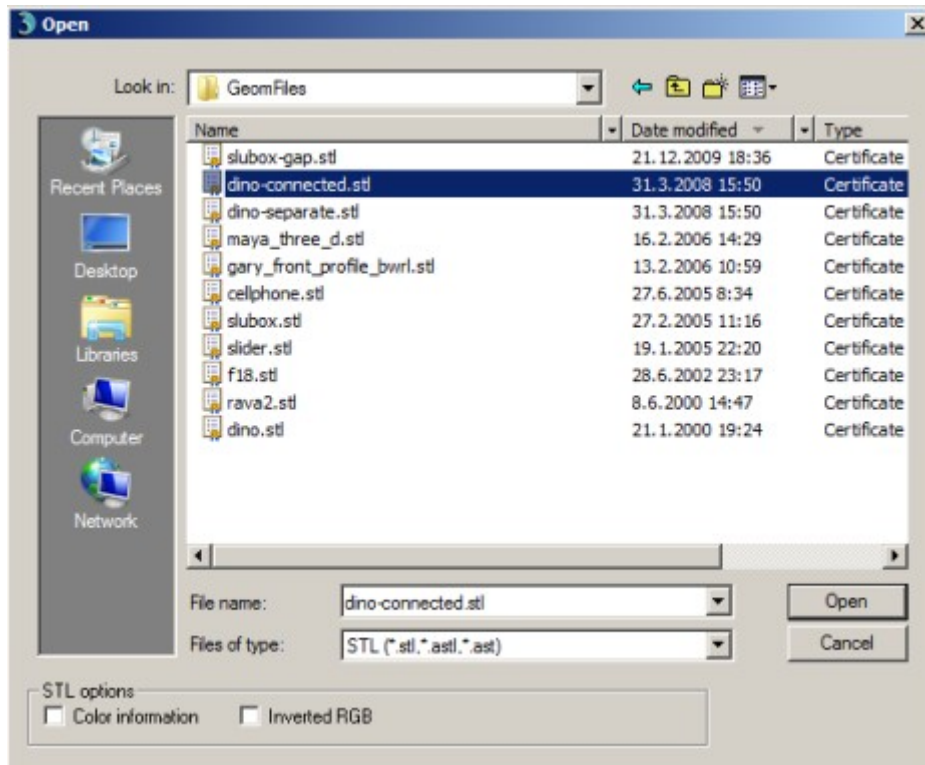
Press _Open_ to bring the model into the software. You will be prompted for the units, accept the proposed units _Millimeters_:
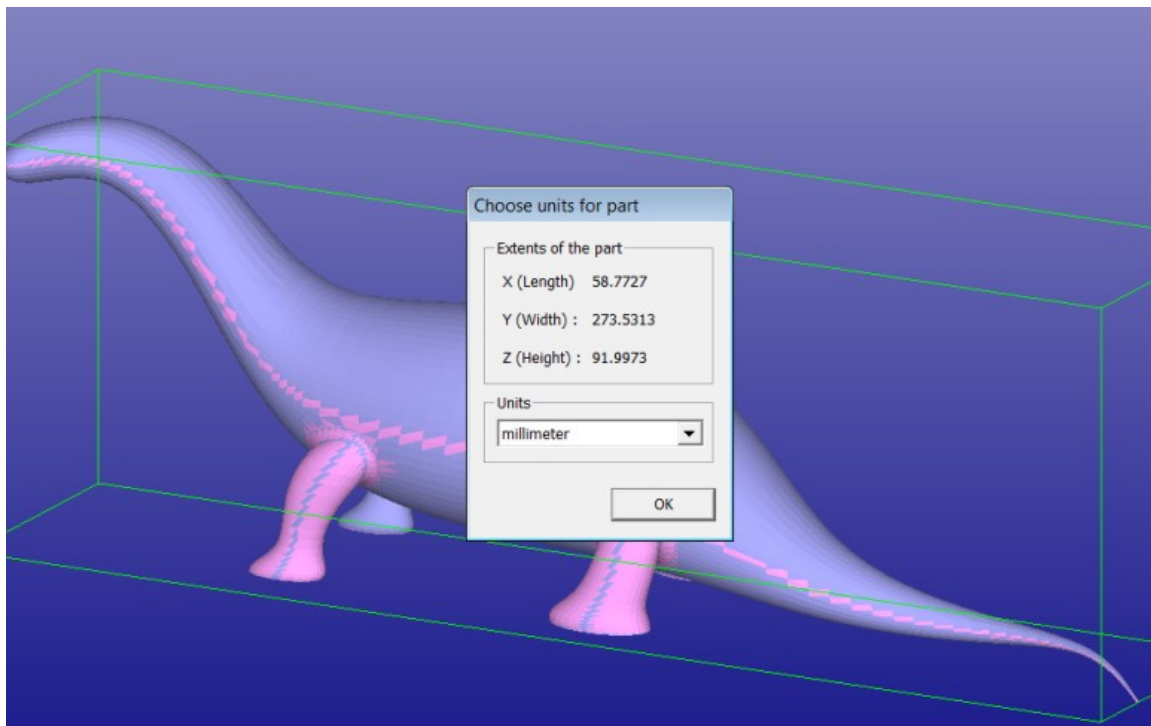
**Press OK** to continue and you will be prompted for the Operation Mode. 3Data Expert has four main operation modes: *Fix Model*, *Paint & Texture Model, Print Preparation*, and *View Model* mode. The different modes are used for specific tasks:

- *Fix Model* takes you to automatic model verification and repair, and contains shortcuts to the main tools used for repair work;

- *Paint & Texture Model* displays the tools for painting and texturing. These tools check the model for errors and set it to "what you see is what you get" display color mode (this mode is not available with Dimensions Expert or 3Data Expert Lite software products);

- *Print Preparation* shows tools for model manipulation, such as hollowing and splitting. These tools also check the model for errors;

- *View Mode* minimizes the Operation Mode window and allows you to view the model and then return back to Operation Mode selection when clicking the minimized window again.
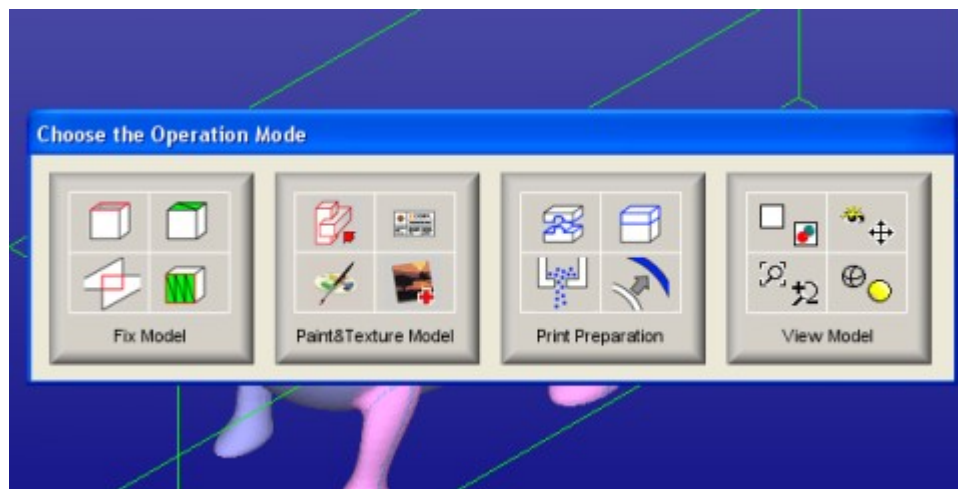
The normal way to begin repairing a model is to start with the Fix Model mode. To start fixing **press the Fix Model button** in the Operation Mode dialog now. *Expert Series* will begin automatic model verification (*Fix Model > Verify Shells* command). The screen is erased and a progress bar appears. When the analysis is ready, a *Model status* message box is displayed
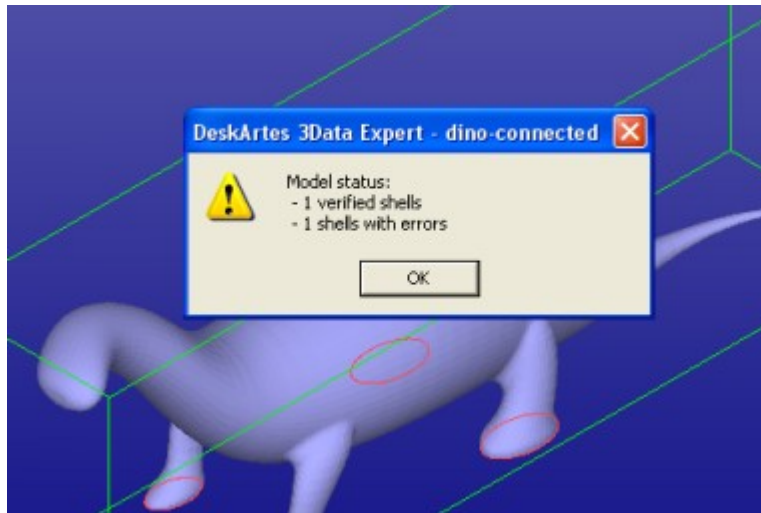
The message indicates that there is one verified shell, which also contains errors. The display shows red *Gap curves* through the surfaces. Gaps are an error type you must fix during the repair process.

Press the OK button in the *Model status* dialog. You will see the model structure in the *Model Tree* on the left-hand side of the graphics area (see the image next page). The model is divided into separate shells during verification. In this case we only get one shell (*1. dino-connected (Verified)*).

The shell has errors (i.e. gaps), which is indicated by the red icon 🔴 in the Model Tree (correct shells would have green icons) .

On the right hand side of the graphics area you will see the *Tools Window*. *Fix Model Tab* on the *Tools Window* provides shortcuts to the commands available for repair, like Repair Shells, Offset, and Fill Gaps commands. The *Help text* window at the lower part of the Tools Window also contains information for required repair actions. We will learn more about these in the Tutorials, now we will follow the Auto Repair process.
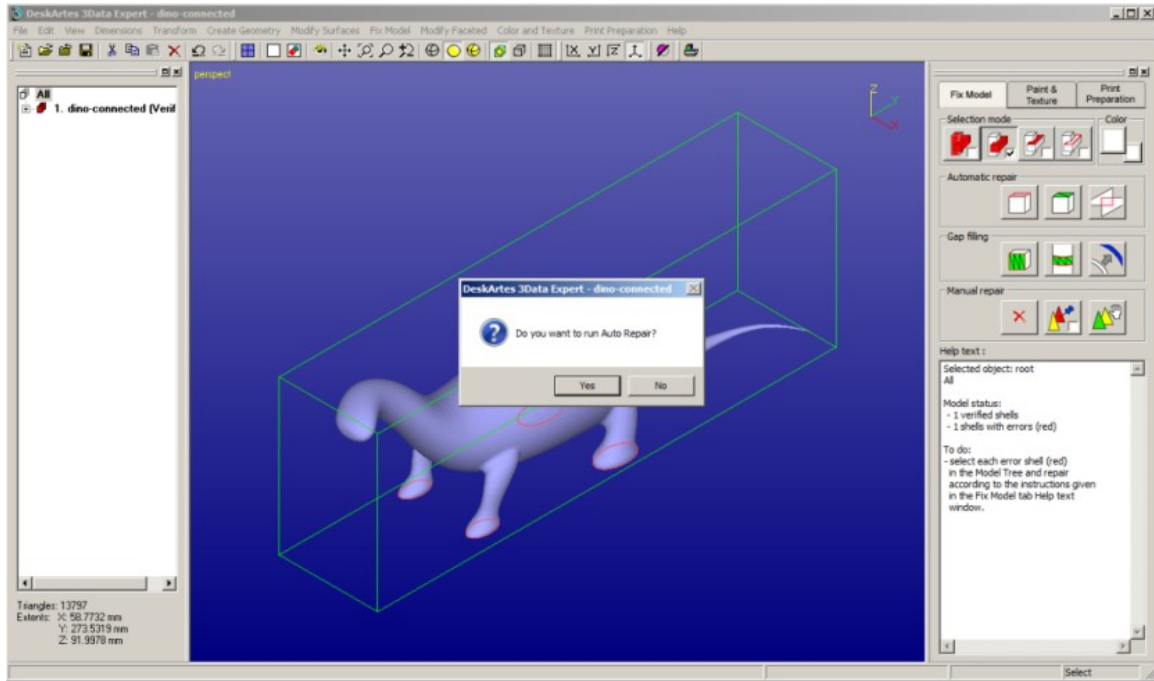
Auto Repair is the best path to follow when repairing everyday models. Auto Repair will attempt to fix all shells with errors in the Model Tree. Especially when you only have one shell, like now, you should always try Auto Repair first. **Press the Yes button** to initiate Auto Repair now.

When Auto Repair is started each shell is run through the automatic repair command (*Fix Model > Repair Shells* command) using automatically calculated parameters. For each shell, a progress bar shows the progress of the repair. After the Auto Repair process the following message is displayed:

Press OK and you will now receive the final status report:
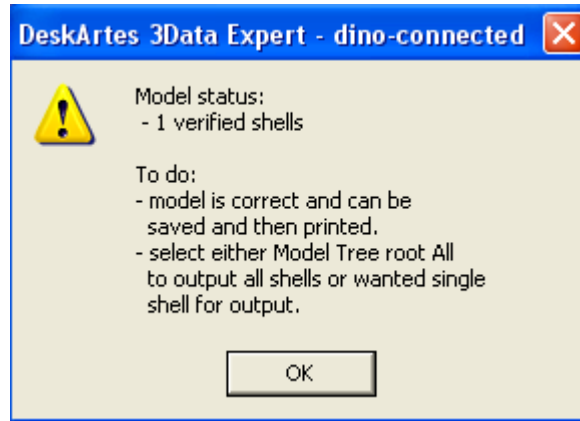
Press the OK button to close the *Model status* window, containing the final status report. A *Tip Window* with useful tips on viewing and selection mechanisms is also displayed after Auto Repair. After reading the tip you can **Close** the window:

During the Auto Repair, Expert Series fills all gaps and removes non-manifold triangles (overlapping triangles, multi-edge triangles, duplicate triangles, triangles having less than three neighbors, etc.) from the model. When you want to learn more about triangle errors, please see the "Triangle errors" page in the Online Help chapter "Handling Faceted Models". The *dino-connected.stl* model only has simple errors, like inverted triangles and gaps, which are all fully repaired during the Auto Repair process. The model is now correct and can be printed (or taken into simulation softwares), as is indicated by the status information in the Help text window below the Fix Model Tab on the right hand side of the screen.

Basic viewing commands

You have just fixed your first model with Expert Series software. Now try the following commands to become familiar with viewing operations.

Note that the commands below do not alter the model's true 3D coordinates. They only alter the eye-point location:

- *Rotate* the model on the screen by pressing the *middle mouse* (*MMB*) and moving the cursor. MMB rotation is always available. *Left mouse button* (*LMB*) rotation is available most of the time except when working with painting, texturing, curve editing, and transformations (LBM is mostly used for selecting objects as shown later).

- *Rotate* the model around a selected surface point by pressing the *right mouse button* (*RMB*) and moving the cursor. A blue cross indicating the rotation middle point appears on the part surface if the cursor is on top of the model when the *RMB* is pressed.

- *Pan* the model by dragging with the *Shift + MMB* (or *LMB* most of the time) (*Shift + MMB* means pressing the Shift key and dragging with the mouse).

- *Pan with rubberband* by dragging with *Shift + RMB*.

- *Zoom in/out* by rotating the *mouse wheel.*

- *Zoom in/out with* Ctrl + MMB (or LMB).

- *Zoom to box* with Ctrl + RMB.

- *Hide all* by pressing the ☐ icon with LMB *(or F5)*

- *Show all* by pressing the 🔴 icon with LMB *(or F6)*

- *Fit the model* by pressing the 🔍 icon with LMB *(or F7).*

The main viewing command icons reside in the *Viewing Toolbar*:

Try them out now. The tooltips provide a short description of each icon (let the cursor remain on top of the icon for a couple of seconds to see the tooltip). Please note that some icons will perform slightly different operations when pressed with *RMB* or *LMB* as seen in the tooltip image*:*
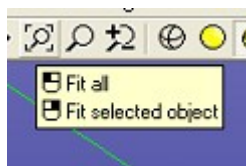
Also, the *Viewing Planes* toolbar allows you to select any projection direction as the viewing direction (try both *LMB* and *RMB* clicks):
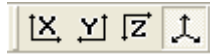
Try also Clipping functionality through the Clipping Tab to look inside the model. The Clipping Tab is opened with the 🪐 icon. The clipped area can be displayed with different ways, like with wireframe or transparent.

Clipping also enables to extract real time slice information on the model. *Real time slices* can used to visually check the model quality or be copied to the Model Tree for internal model dimensioning with the *Edit > Save Clip curves* command.
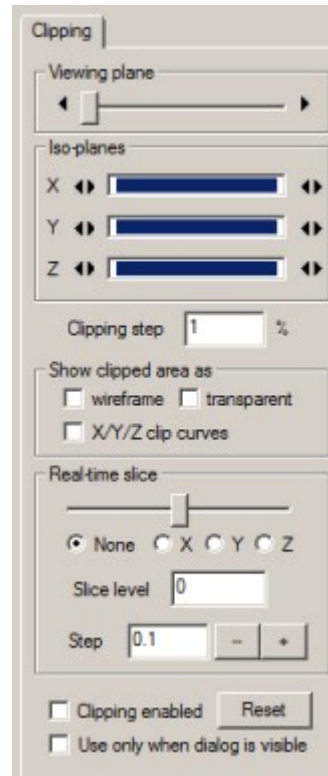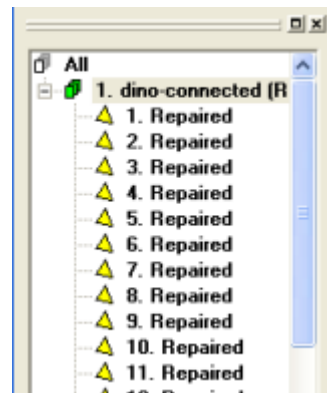
Selecting objects

On the left hand side of the Expert Series software window you can see the Model Tree tab.

This tab tells you the current contents of the program database. With this example you can see one *shell* (aka node, group) *1. dino-connected (Repaired)*. The node 1. includes the correct dino model, as indicated by the green icon with the shell. The *(Repaired)* text describes the last command run on the surfaces, which in this case is repair.

If you click the *+-icon* at the shell 1. it will open and display the separate triangle surfaces the *dino* model is made of. During the repair process the model is subdivided into separate surfaces along sharp edges. Triangle surfaces are indicated by a yellow triangle icon and the last operation name, i.e. *1. Repaired* for the first and largest area triangle surface in the model and so forth.

You can select objects at different levels either directly from the Model Tree with LBM click or graphically from the display area. For example, the surface 4 selec   the
dino   the
selec
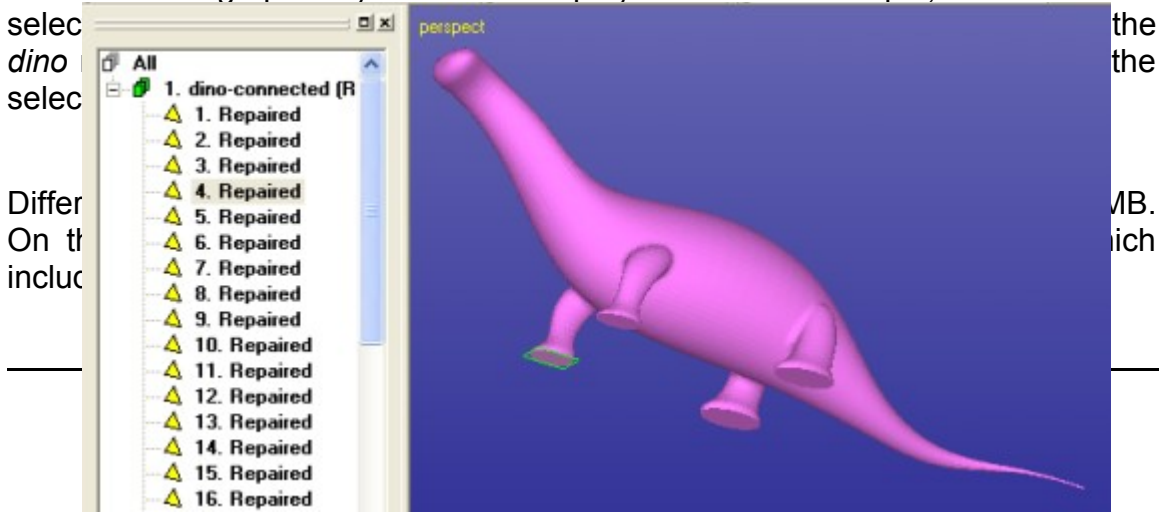
Differ   MB.
On th   ich
incluc

The *Selection mode* icons allow you to set the graphical selection level to *All, Shell, Surface* or *Gaps*. The default mode is shown in the image right and it is the *Shell* level. If you now click on the dino model on the screen with the LMB the shell *1. dino-connected (Repaired)* will be selected in the Model Tree.

Generally, the Tools Window contains handy shortcuts to the available commands in the selected Operation Mode as well as *Help text* window for the selected object or for the command in progress.
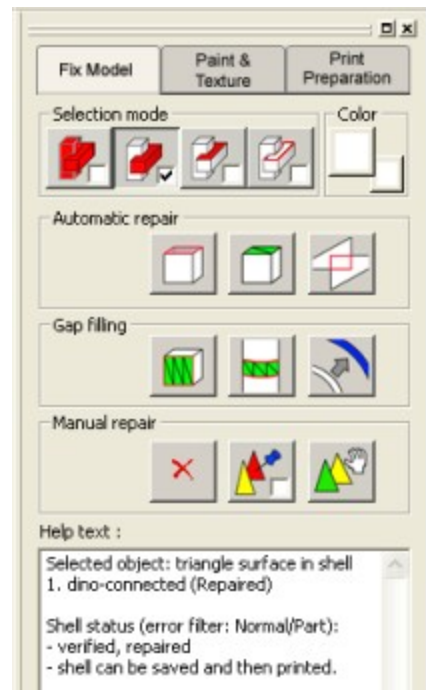
With Expert Series software you normally should select an object and then run the desired command to it, as seen in the next lesson.

Lesson 2 - Splitting and Combining STL

One of the most common tasks with 3D Printing is to split a large model into smaller pieces to fit into the build area. This lesson shows you how to split large STL models for Additive Manufacturing. Sometimes building a very tall part is more expensive than building two shorter parts simultaneously. Also, the building area may not be large enough for a very big part. Correct joining of the split parts is ensured by adding guiding pins to the models.

### Splitting the *dino* model

Start by inputting the DeskArtes geometry file *DinoOk.3de* in the *Tutorials/GeomFiles* directory. **Give the *File > Open* command.** During the input you are prompted if the previous *dino-connected* model should be stored into . *3de* (DeskArtes proprietary format) file. You should press *No* when prompted for it and continue to the file Open window. Set the correct *File of type (.3de)* and **select the *DionOk.3de* file for input.**
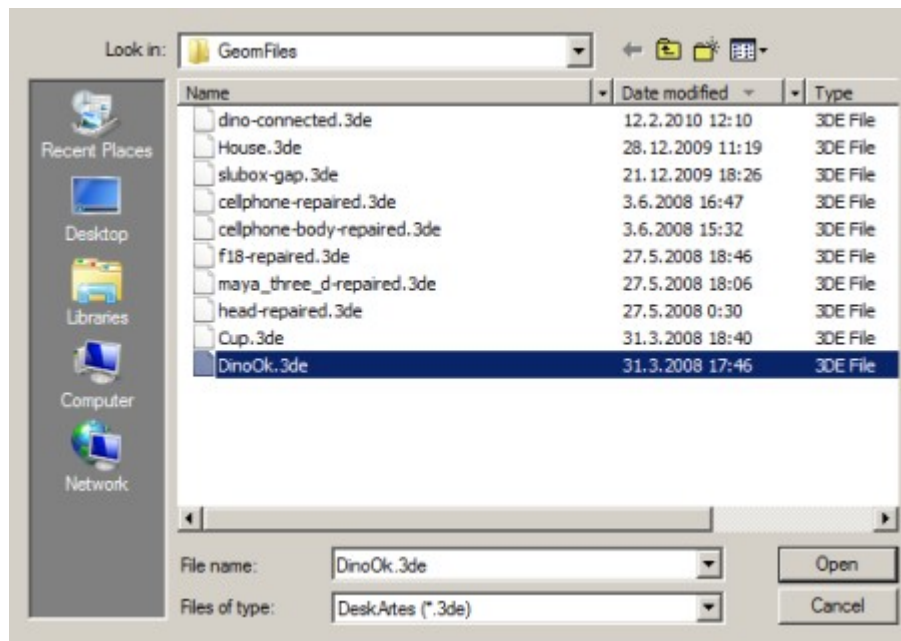
The file includes a correct triangulation for the familiar *dino* model. You should accept the proposed units and **go directly to the *Print Preparation* mode** by pressing the
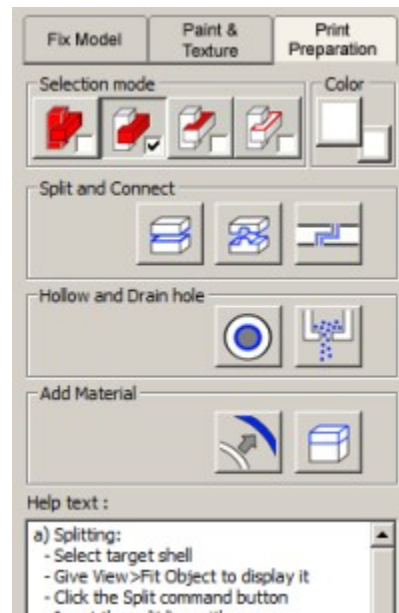
button in the Operation Mode Window. You should see the following dino model:
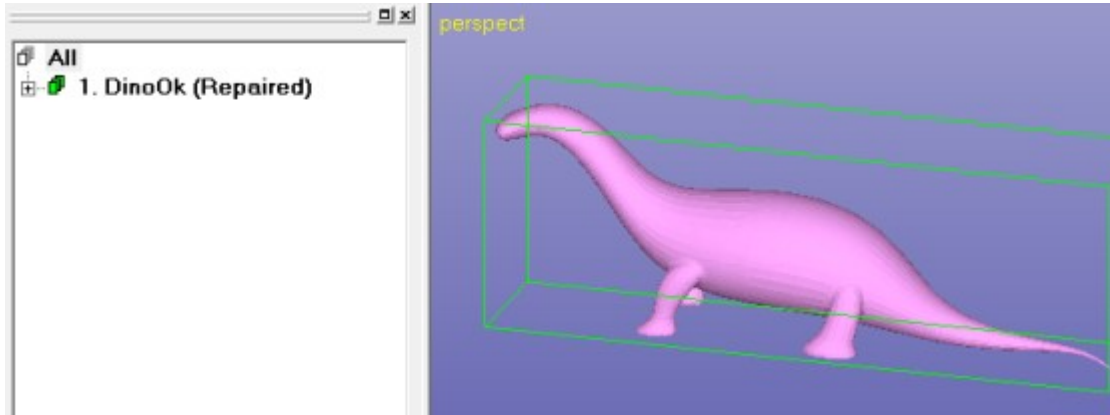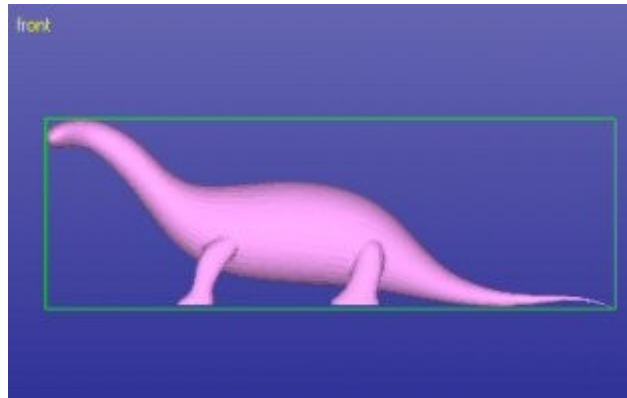

with the Print Preparation Tab on the right hand side of the screen.

The Print Preparation Tab gives shortcuts to the mostly used print preparation commands, like split, connect, add lap joint, hollow, offset and drain hole. The Help Text provides context sensitive help to the commands.

Select node *1. dino (Repaired)* by clicking it with the LBM in the Model Tree. Before the splitting we must take a correct view to the model because the splitting plane is generated by extruding a user defined split polygon away from the viewer. With 3D Printing the correct way normally is to split the model perpendicular to the z-axis to make the part lower. Thus, **take a view from the x-axis direction with** ⊠ + *LMB (or View > Ortho View > Front (+X))*.

The splitting is started with command *Print Preparation > Split* or with the command shortcut in the Print Preparation tab:


The system prompts you to take the correct view direction if no yet set:
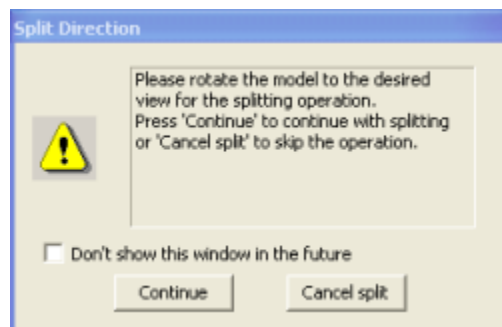
When the view is correct you can **press Continue** or Cancel to quit. You may hide this window permanently if necessary by ticking the *"Don't show this window in the future"*.

The *Split STL* parameter dialog appears. The system asks you if you wish to use a *Polyline* (*linear), Curved* split line or *Coordinate value.* We will **select Polyline** for this exercise:
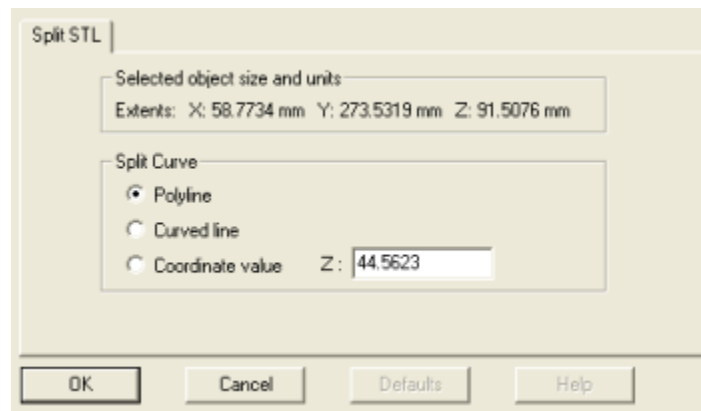
After pressing OK the system goes into the curve edit mode where you can define the shape of the splitting surface. **Press OK** now to start the curve edit mode.

In the curve edit mode you can draw the shape for the splitting surface. **Draw a horizontal line by giving two points with the LMB clearly outside of the** *dino* **model** as seen in the image below:
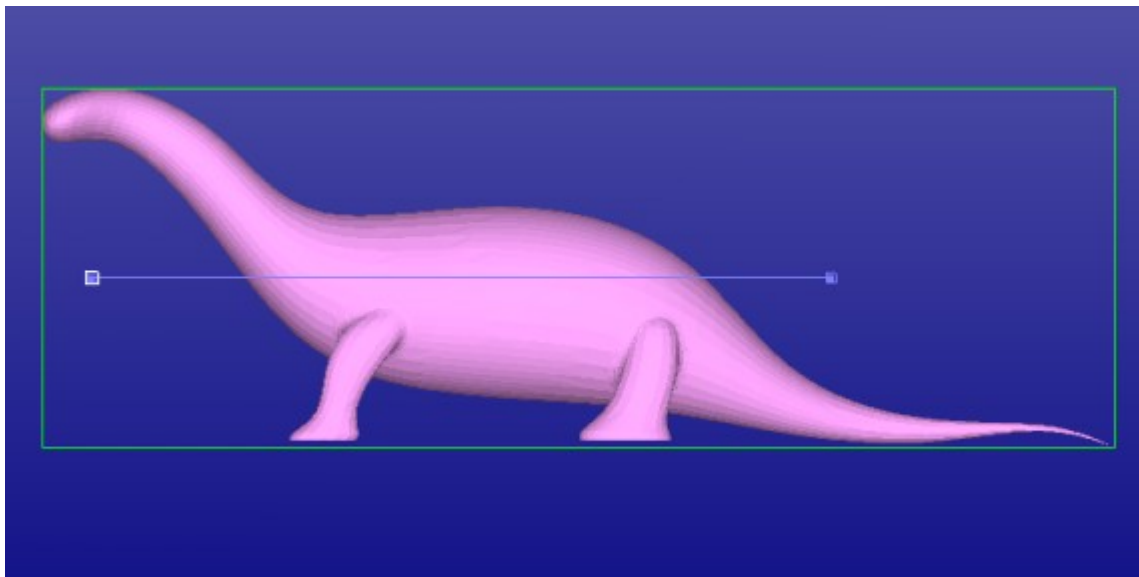
The curve editing is finished by **pressing the** *RMB* (or *ESC* key to cancel). When RMB is pressed the model is split along the plane defined with the polyline. After a while the result is available in the Model Tree. You can select the upper part with LMB click on the shell *1. a-dino (Split)* to highlight it.
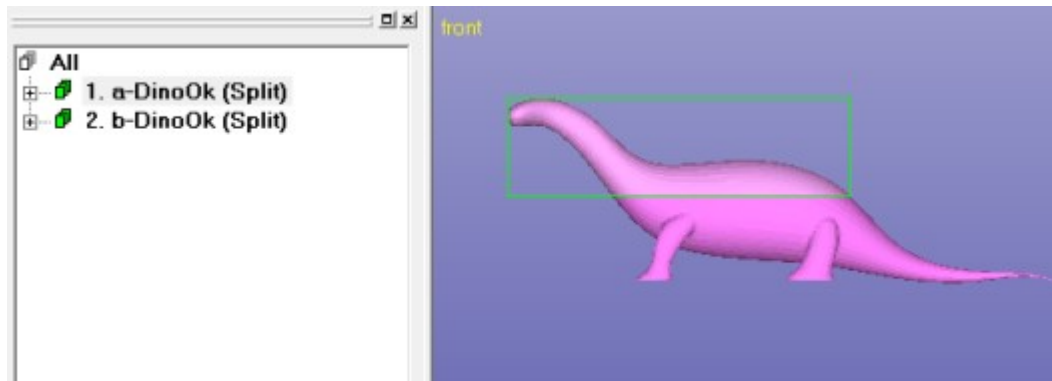
The two halves are named with *a-* and *b-* prefixes to distinguish between the shells above the split line and below the split line.

Creating the pins

The separate parts of the model could now be positioned and stored into .stl files for 3D Printing. However, the precise joining of the ready parts would be difficult or impossible. To be able to position the parts accurately we shall add pins in the models to connect them accurately together after finishing the build.

First we will locate the necessary primitives (sphere, cone, cylinder) which will connect the two parts together. For that we will need a nice view to point the pins on the model. Here we are also using the shaded+wireframe view mode available with the ⊕ icon.
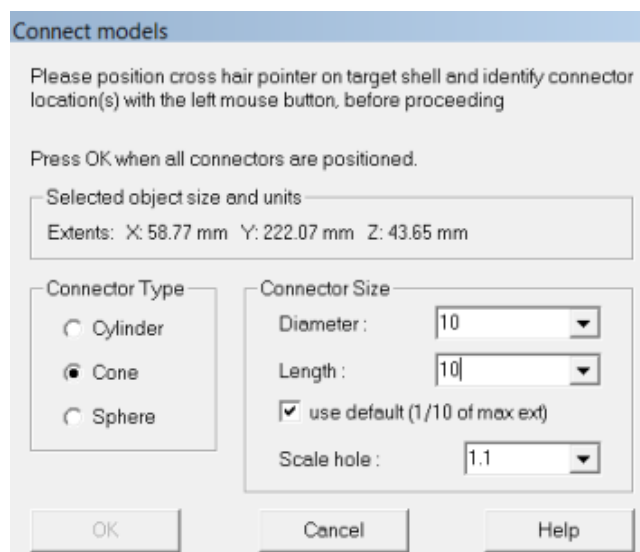
Let's start. First **rotate the model, erase the screen and display the lower part of the dino, shell *2. b-DinoOk (Split)***. Zoom in to the front end of the model to be able to accurately position the connectors with the next command.
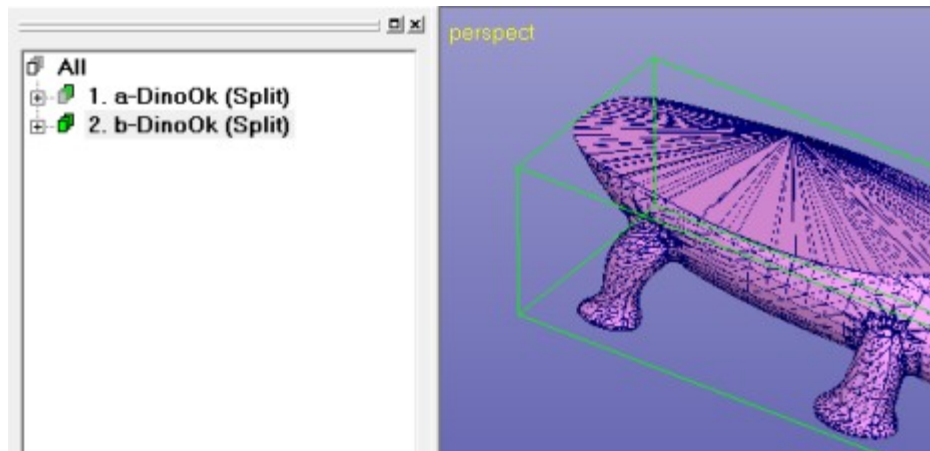
The pins are now **created with the *Print Preparation > Connect* command** or using the Print Preparation Tab shortcut

After the command is given, it is possible to give the *shape* and the *size* for the pin to be created. The software computes default values based on the model bounding box when *use default (1/10 of max ext)* is set. Now set *Diameter* and *Length* both to 10.0, as seen below:

The pins are positioned with LMB clicks on the display area on top of the dino model. Give two locations, the positions for the red conical pin location indicators should look similar to the image below when set. Note that you can use the MMB zoom and MMB rotation to change the view point when locating the connectors.

If a connector location is not correct you can remove it by clicking on the red indicator cone again. Then reposition with another LMB click on the correct location.
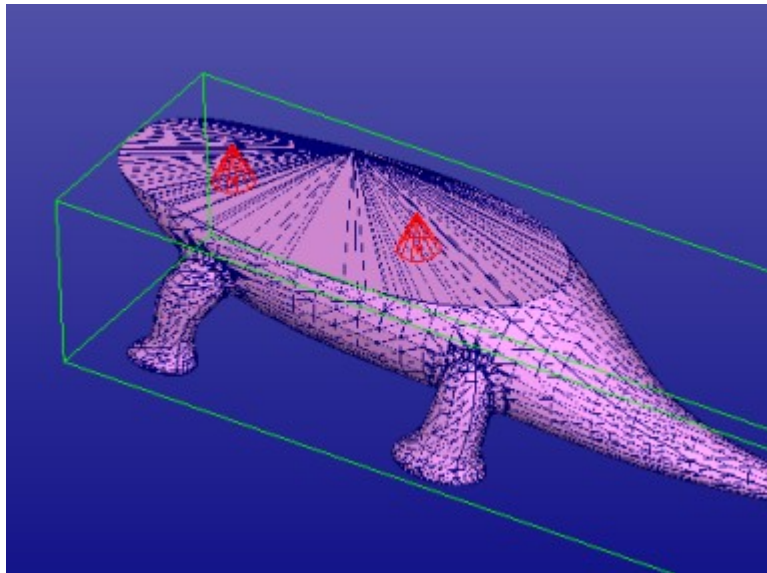
When ready **Press *OK* to generate the connectors.** After a while you will see the connectors added to the selected shell (in shaded mode again with ⬤ icon):
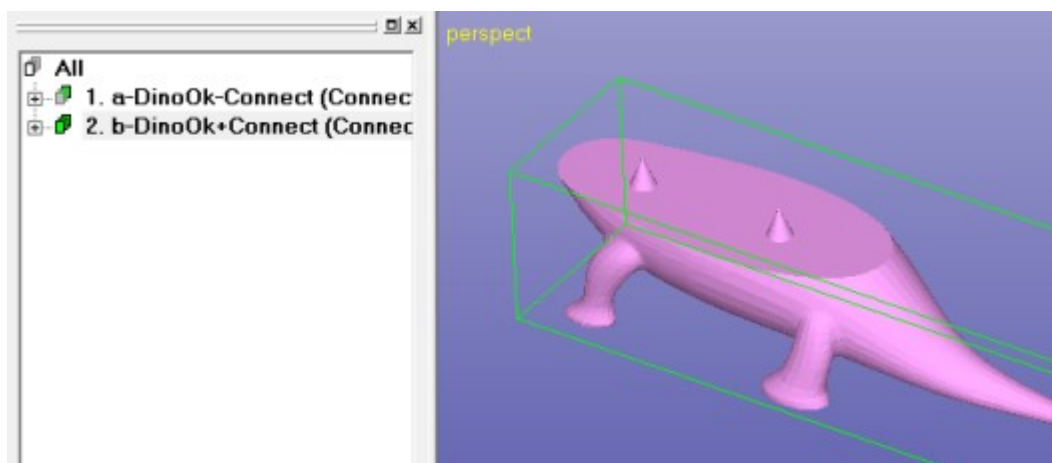
Corresponding holes are automatically created to the *a-DinoOk-connector* shell.

Transferring the result for 3D Printing

You can save both files into the same STL file by selecting the Model Tree root *All*. Anyhow, you normally wan to build and position the parts separately in the 3D Printer. For that select each shell separately and **output** it to a proper STL file **with *File > Save As* command**.

If you wish to save the two parts into one file, you should move the shells apart from each other with the Transform or Print Preparation > Move Platform menu

commands prior to outputting the model for 3D Printing. To output one file, select the Model Tree root All before the Save As command.

Also, if you wan to use the **Print Preparation menu plugins** to transfer the tow halves directly to another AM application, like some 3D Printer control software, it is good to position the halves correctly before the plugin execution.

To define and use plugins from DeskArtes software products, please see On-line Help *Menus and Commands > Print Preparation > New Plugin* page. This page explains how to create connection to 3D Systems ZPrint, Stratasys CatalystEX and Objet Studio software products, for example.

Further Reading

This *Quick Start Guide* has given you the skills to verify and repair models with moderate or few errors for 3D Printing. Also, model splitting for building with systems with smaller build areas when compared to the part size is presented. Repaired data transfer to further processes is explained.

This *Quick Start Guide* is the first in a set of tutorials covering different aspects of model repair, coloring and print preparation. The tutorials are available in the software distribution package through the *Help > Tutorial Documents* menu:

- *Expert Series 10.0: Quick Start Guide* gives a short introduction to model repair and splitting for 3D Printing with 3Data Expert, 3Data Expert Lite and Dimensions Expert products. Estimated completion time 15 minutes.

- *Expert Series 10.0: Tutorial 1 – Working with 3D Models* introduces basic viewing, measuring, automatic repair, split, connect, hollow, offset, 3D Text, Boolean, cut, reduce, surface triangulation and other model manipulation functions available for STL files. Applies to All Expert Series modules. Estimated completion time is 3 hours.

- *3Data Expert 10.0: Tutorial 2 – Working with Colors* introduces basic automatic repair and coloring for 3D Color Printer users. For 3Data Expert only. Estimated completion time is 60 minutes.

- *Expert Series 10.0: STL and VRML repair examples* document includes more advanced model repair operations with 3Data Expert. Applies to 3Data Expert module and mostly to 3Data Expert Lite, Dimensions Expert and Sim Expert modules. Estimated completion time with 3Data Expert 2 hours.

More information and other STL manipulation tools can be found in the Handling Faceted Models section of the On-line Help pages. These pages contain information on model verifying, repairing, splitting, offsetting and hollowing for Additive Manufacturing.