ProDrill Feature creation on Solids and Wire-frame Models
ProDrill V5 - (METRIC)

In addition to feature recognition from surface or Solid models, ProDrill offers machinists a powerful, fast and easy to use tool to create and insert complex drill forms/processes.

Create drill forms using Mastercam Solids and/or using the reference 2D geometry created in Mastercam or any another CAD system (e.g. AutoCAD). Chamfers, tooltip angle, reaming, tapping, etc are all taken into consideration in this powerful design tool. The created geometry has all the associated toolpath operations as defined in the ProDrill form library tables!

On Solids, you can easily create the drill forms geometry and operations of all your drill forms with a couple of clicks for single or multiple solids (up to 8 solids supported).

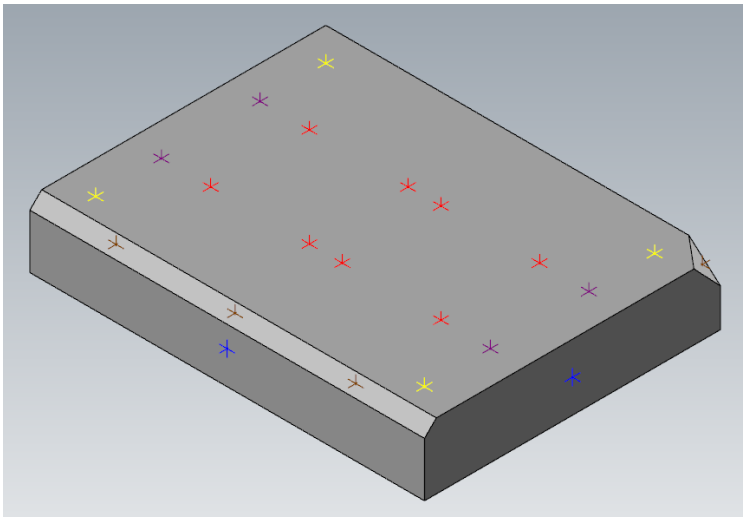
On wireframe/2D drawings, you can create 3D surface forms of the desired drill forms. Surfaces are created for visualization of the forms/features that have been inserted.

THIS IS TRUE FEATURE BASED CAD/CAM! All the features (including reaming and tapping) are inserted into the file for fast and perfect processing by ProDrill.

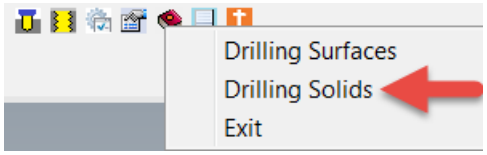
Creating Solid Drill Forms using ProDrill
Creating Surface Drill Forms using ProDrill

Drilling on Solids

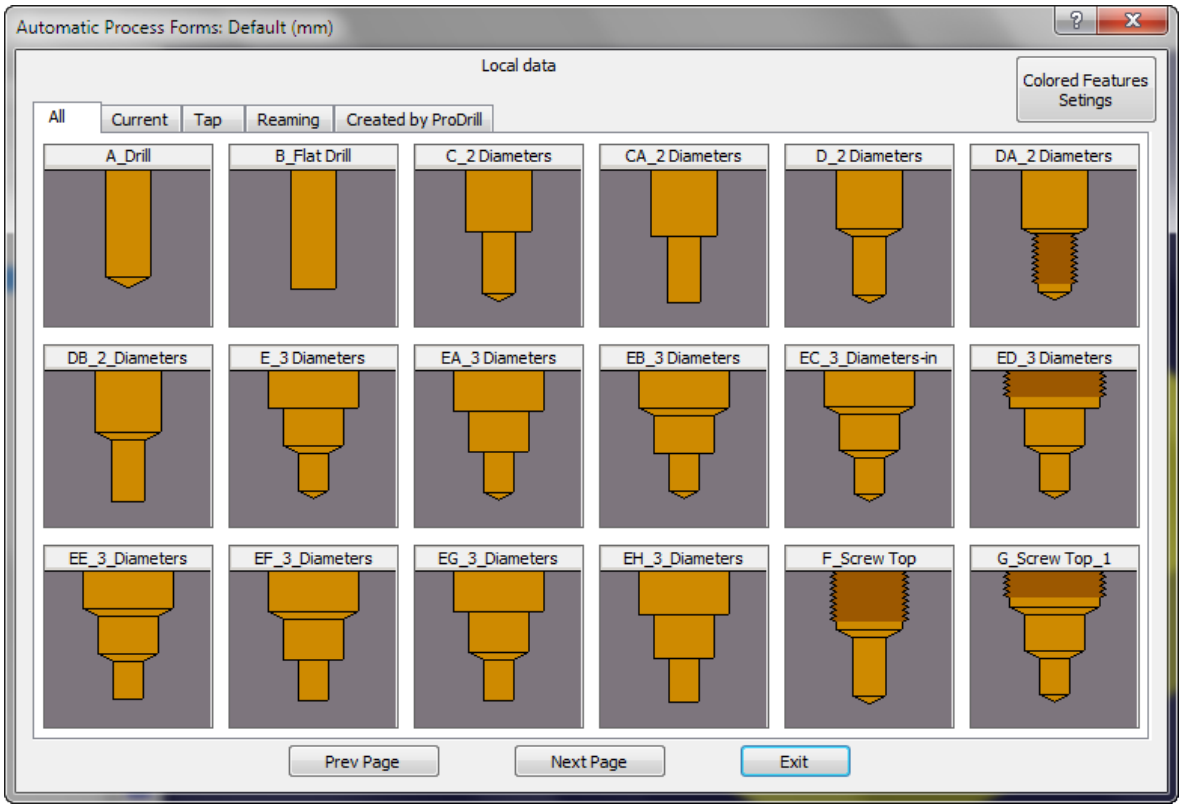
To try the drill form design tool, load the **PART7_DESIGN.MCAM** file. This is a Solid form created using Mastercam Solids. Several points of varying colors are also created to assist you in creating the different drill forms. You can also use the Auto Cursor function of Mastercam to select points based on reference geometry.



We will create a few different drill forms on this part including some inclined plane drills.

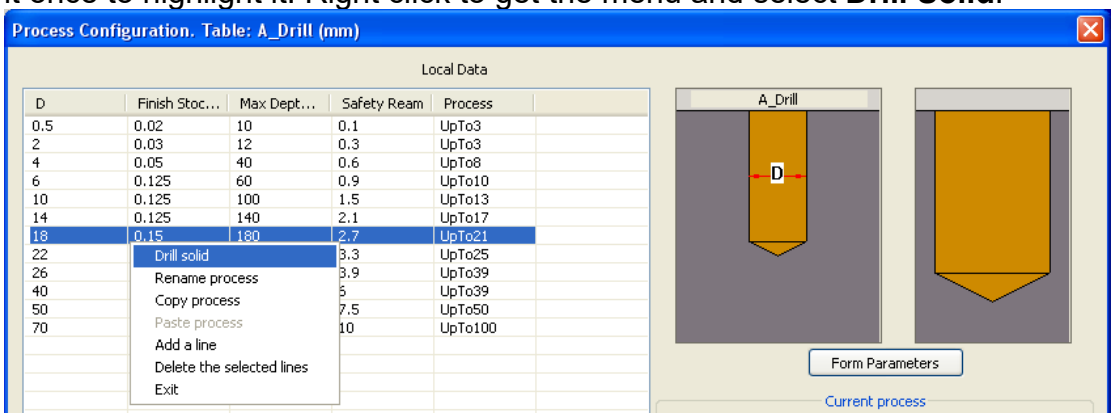


Click on **Drilling Solids**. The ProDrill Automatic Process Forms library is presented:

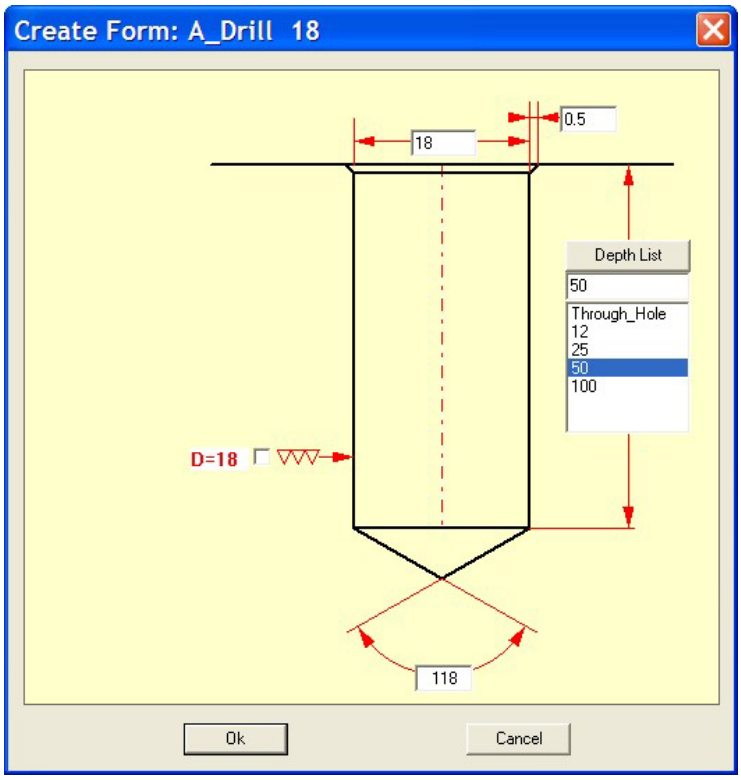


Select the ***A_Drill*** Form.

You will be presented with the table list. Select the **18mm** form by ***clicking*** on it once to highlight it. Right click to get the menu and select **Drill Solid**.



Selecting **Drill Solid** will now present the following dialog:



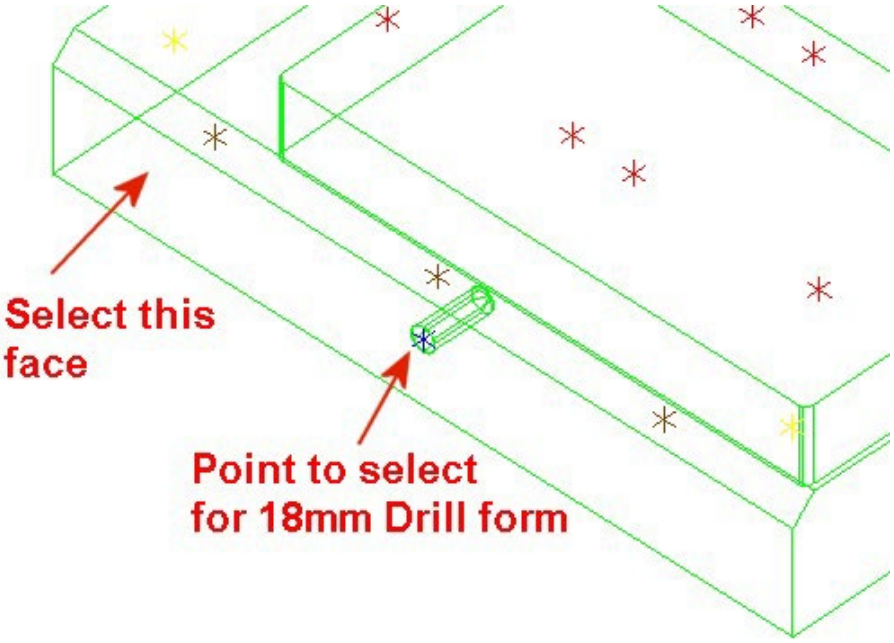
Change the values to the above settings and click on OK

You will be presented with the following menu. Since there is only 1 Solid, it is automatically selected. You need to select the points at this stage. The Mastercam selection toolbar is presented:

Since you can use existing points to select geometry and the AutoCursor function of Mastercam, the following message is displayed:

Select the point/s to drill.
To toggle selection: Pick again over a point
Can use R-Click Autocursor option.
Click on [Return] when done

We will first select the plane on which the drill form will be created. Click on **Planes**, **Planes by solid face** and select the **Front** face on which the point will be created. Select the blue point and click on the **Enter** key to create the drill form. ProDrill will create the drill form on the Solid as shown below.

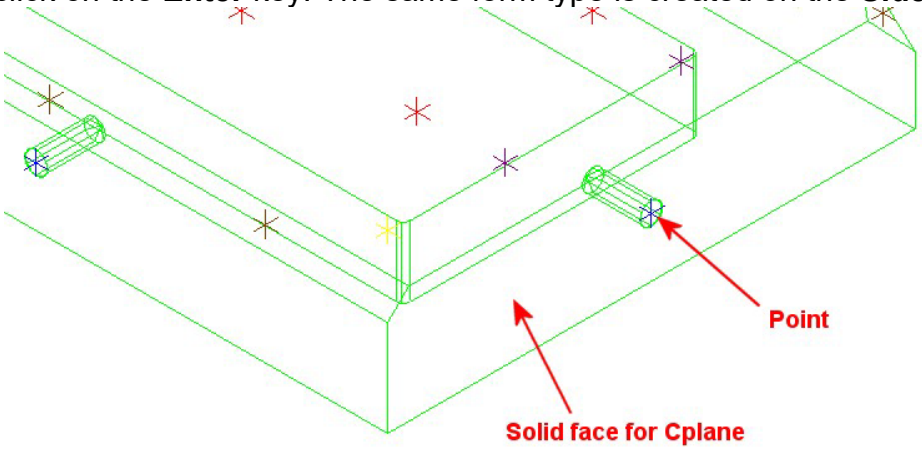


Notice that the form created has a 0.5mm chamfer at the start of the drill form and has a 118 drill tip form.

Within a few seconds, you have created the drill form with the required drilling operations to machine it!

We will create some more forms on this part. Click on **Create Forms – Solids**, select the same form and measurement. The drill form parameters will be the same as the previous settings.

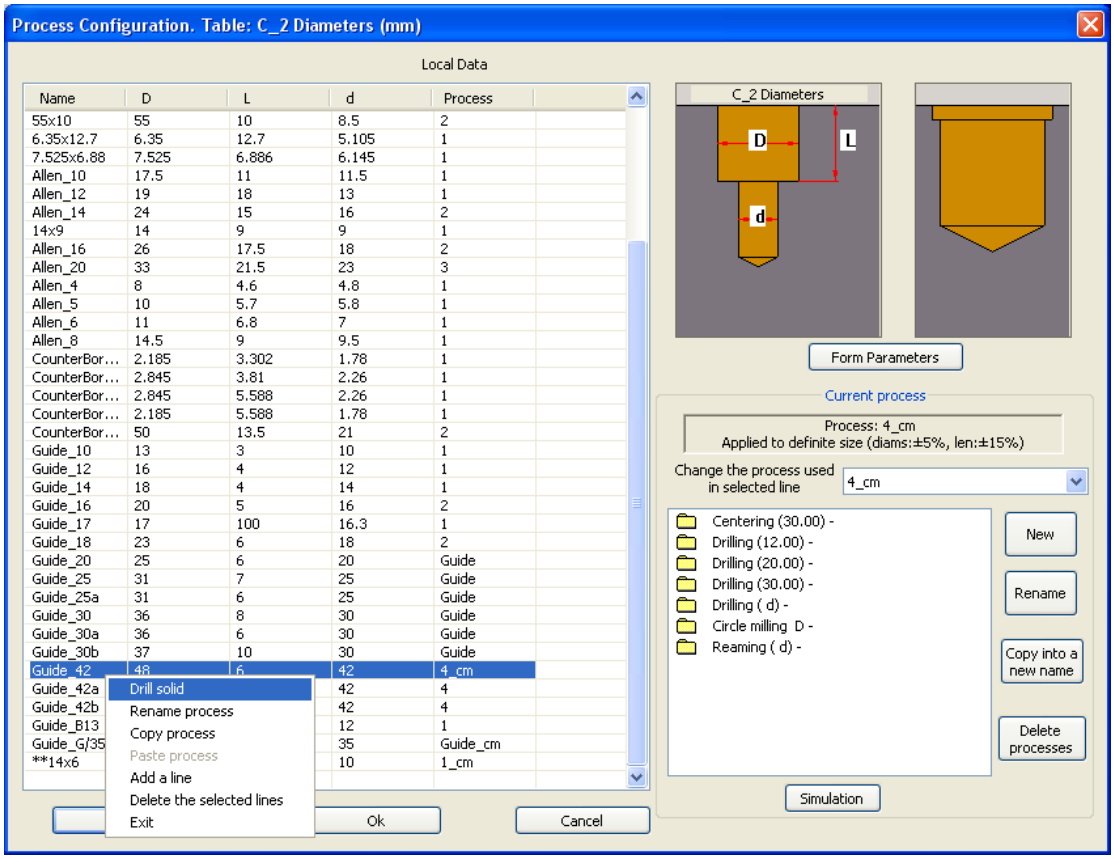
In this case, all you need to do is to set the new **Plane** first by selecting the **Solid Face** on which the form will be created and then to select the blue point and click on the **Enter** key. The same form type is created on the **Side** plane.



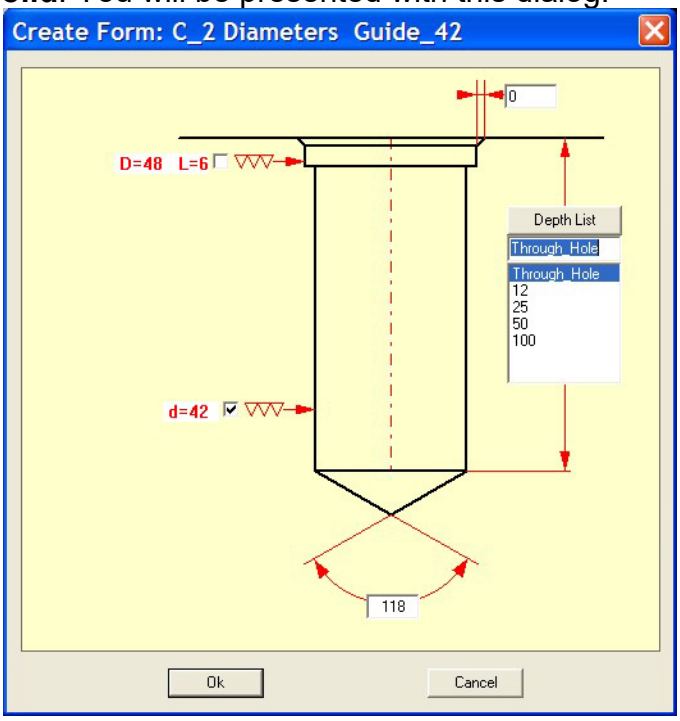
You can then proceed to create the same forms on the other 2 planes that are opposite the Front and Side using the same method described as above (not essential to complete exercise). After you have inserted the forms on the other sides we will proceed to insert other forms on the Top plane.

We will now create some forms on the **Top** plane.

Click on **Create Forms - Solids**, select the ***C2_Diameters*** and then select the **Guide_42** form.



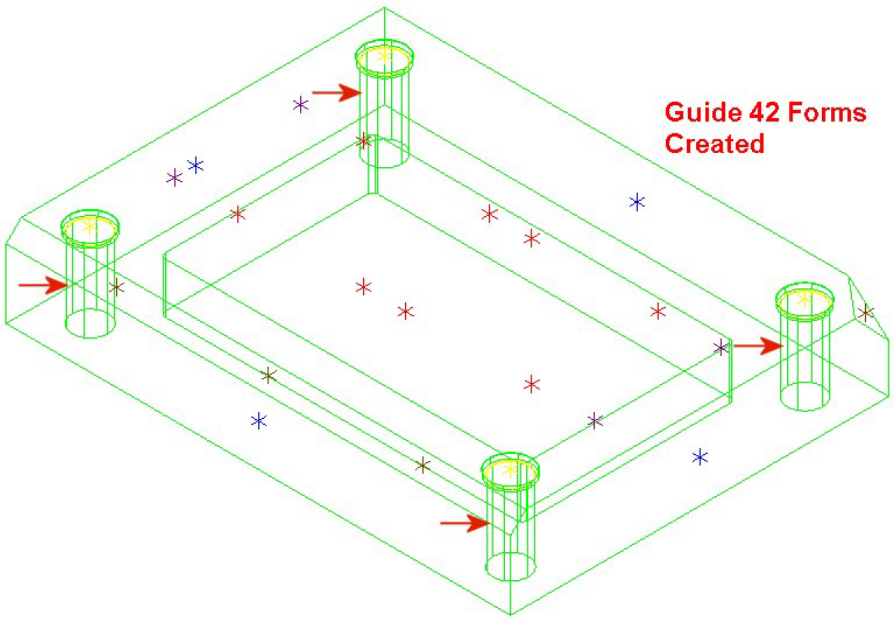
Click on **Drill Solid**. You will be presented with this dialog:



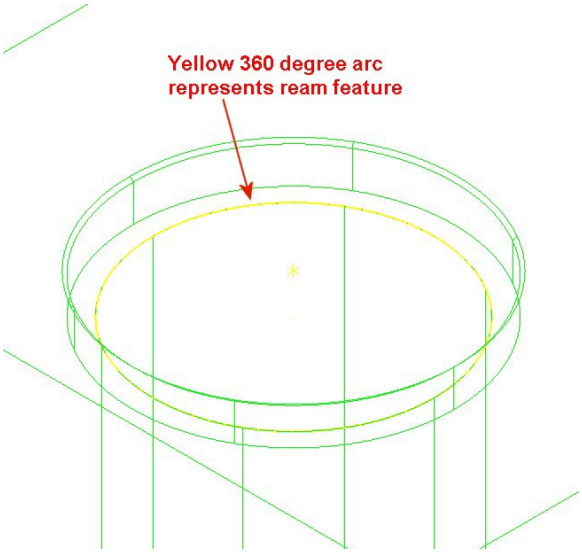
Since this will be a through hole for the Guide pins, we need we need to check the box 

to indicate that the hole will be reamed. Click on 

Click on **Plane**, **Solid Face** and select the **Top** face.
Click on **the 4 yellow points**. Click on **Enter**. The forms will be created and the following will be the result.

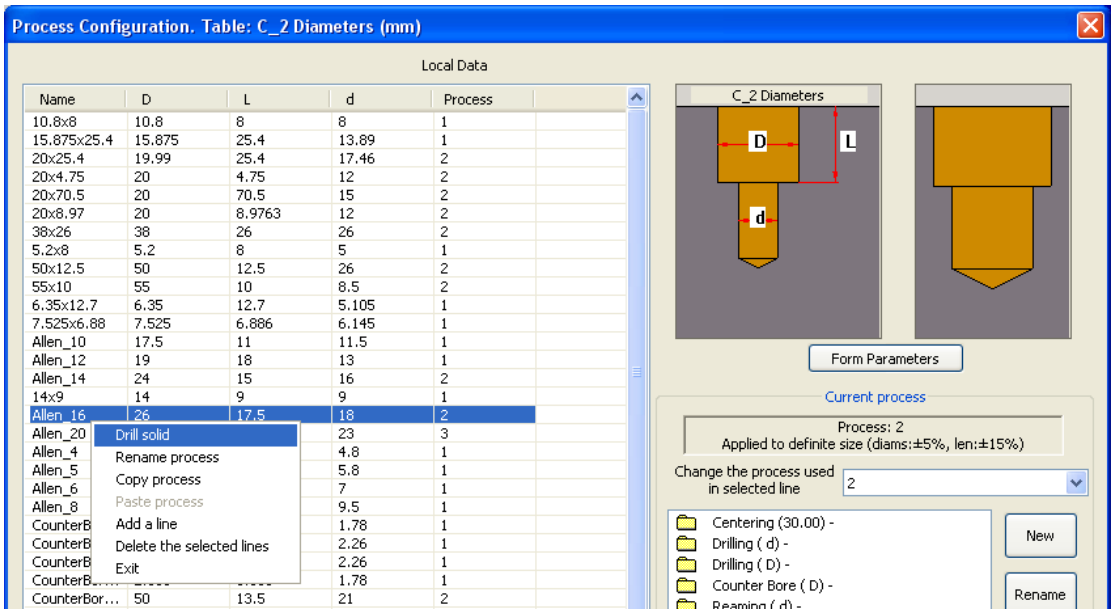


Taking a closer look at the drill form, you will notice that at the top of the smaller cylinder / through hole, a yellow arc is created. This represents the cylinder that will be reamed.

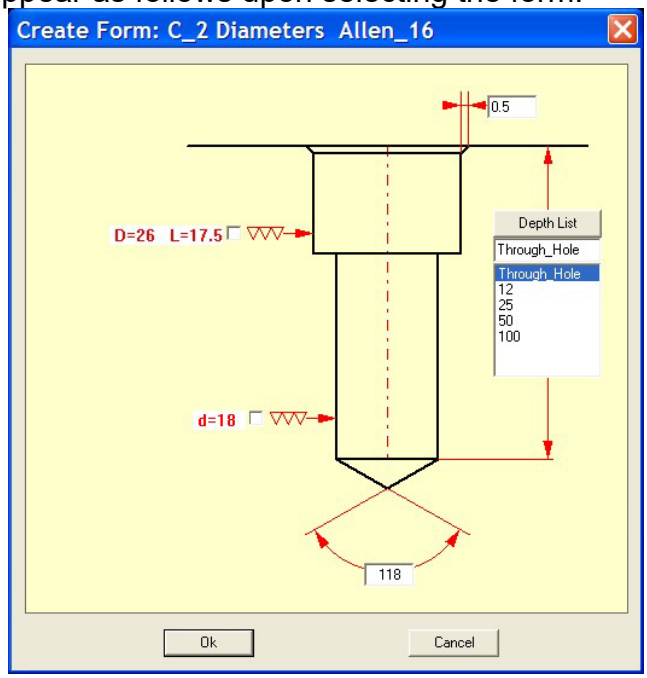


We shall now create some Allen 16 screws for the red points on the top plane.

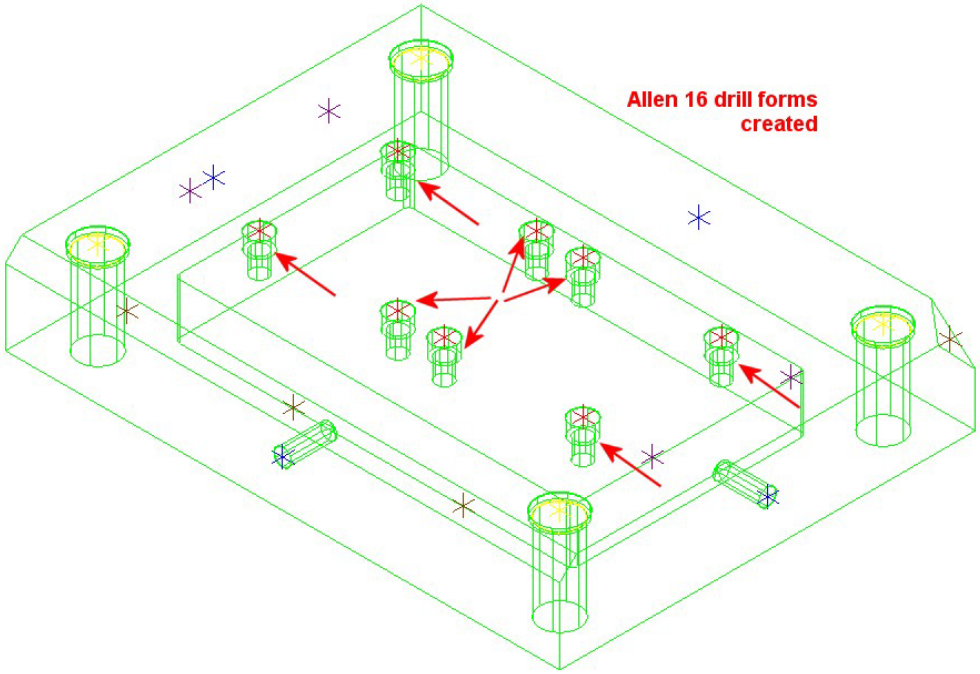
The Allen screws are also located in the same *C2_Diameters* table. Click on **Create Forms - Solids**. Select the **C2_Diameters**, **Allen_16** diameter, right click and select **Drill Solid**.



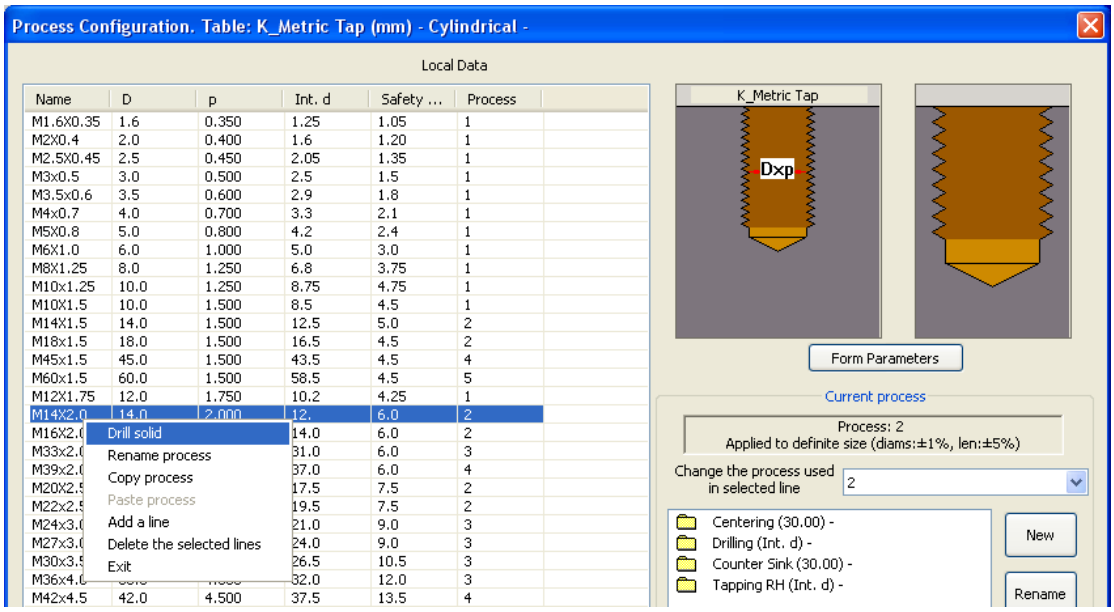
The dialog will appear as follows upon selecting the form.



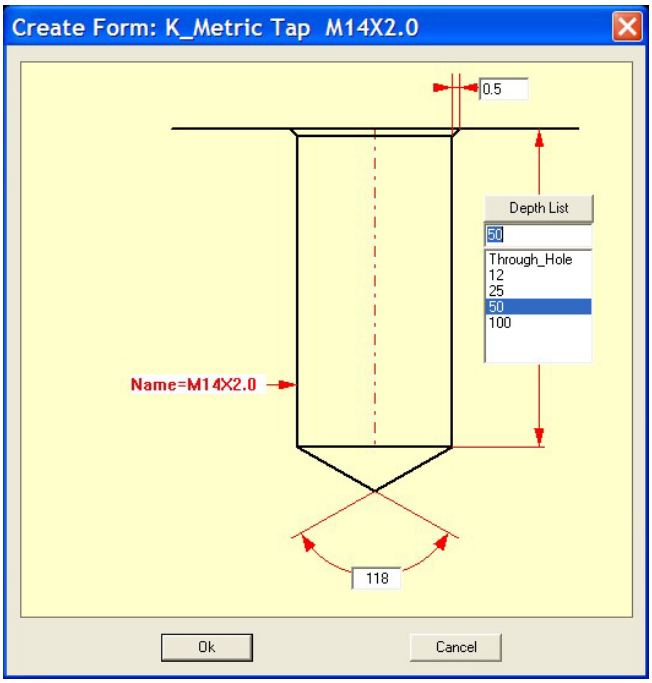
Change the settings as shown above. Disable the reaming of this drill form for the cylinders. Click on OK. Click on the **8 red** points (Mastercam color 12). Click on **Enter**. The following will be the result.



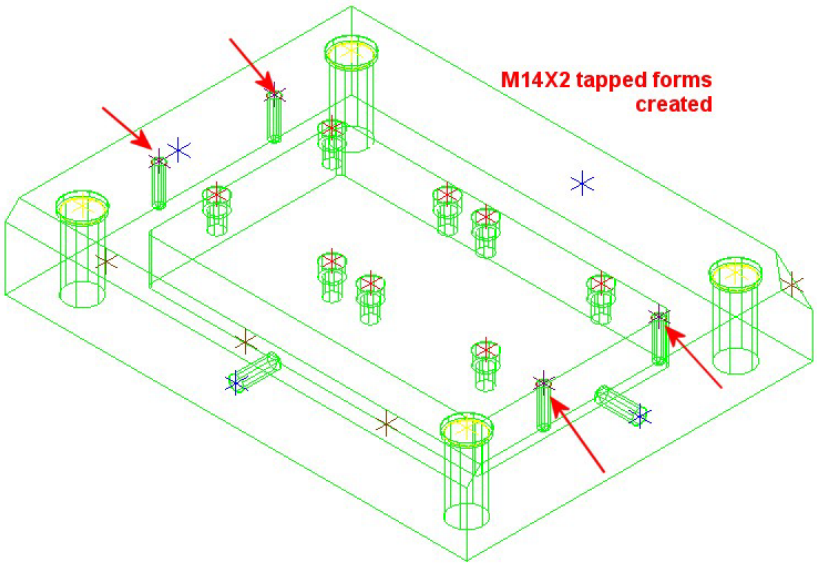
We will now create some tapped holes on the **Top** plane. Click on **Create Forms - Solids**, ***K_Metric Tap***, select the **M14X2.0**, right click and select **Drill Solid**.



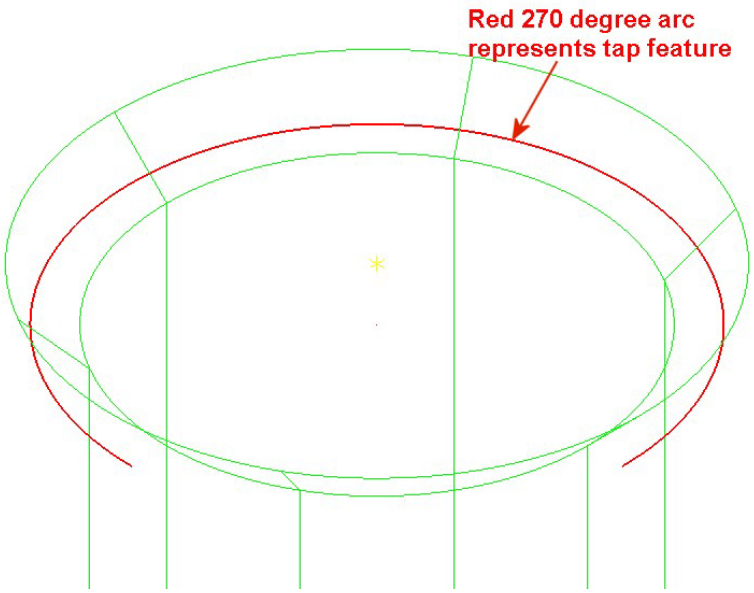
The following dialog will be presented.



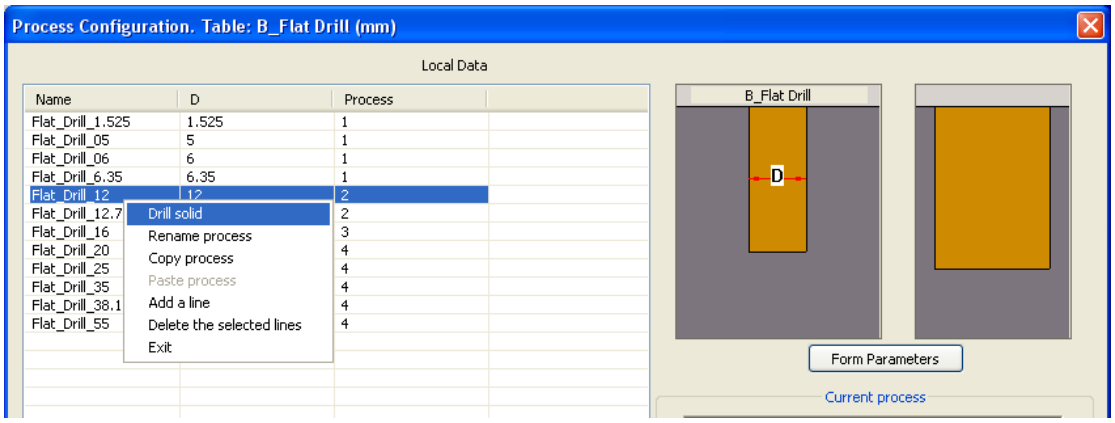
Use the identical above settings then click on **OK**. Select the 4 purple points (color 5 of Mastercam). Click on **Enter**. The tapped forms will be created.



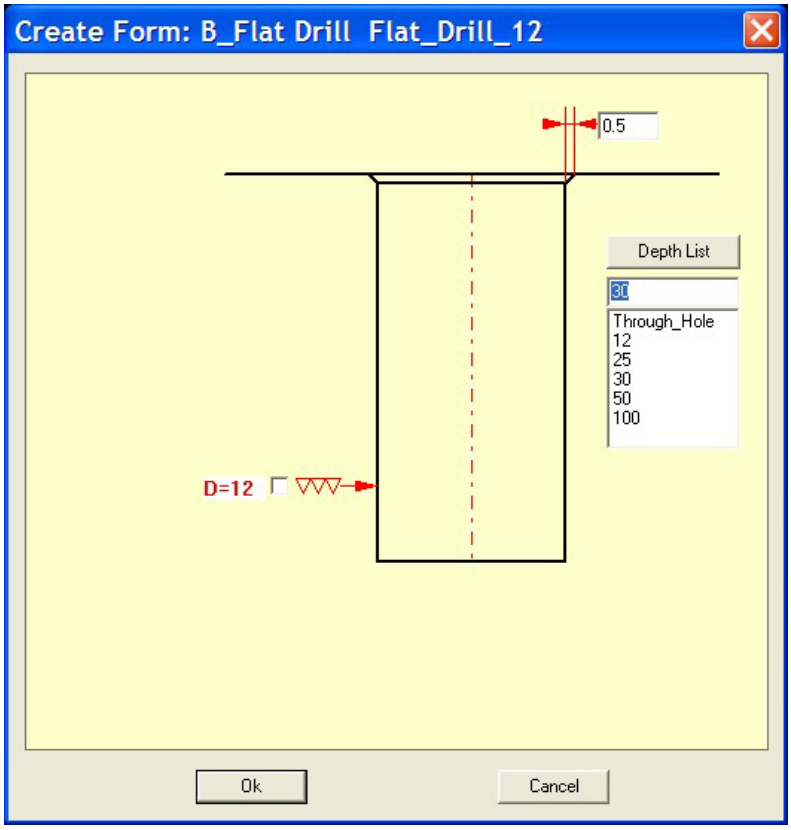
Zooming in to a form will show that there is a red arc that is 270 degrees that represents the tapped hole.



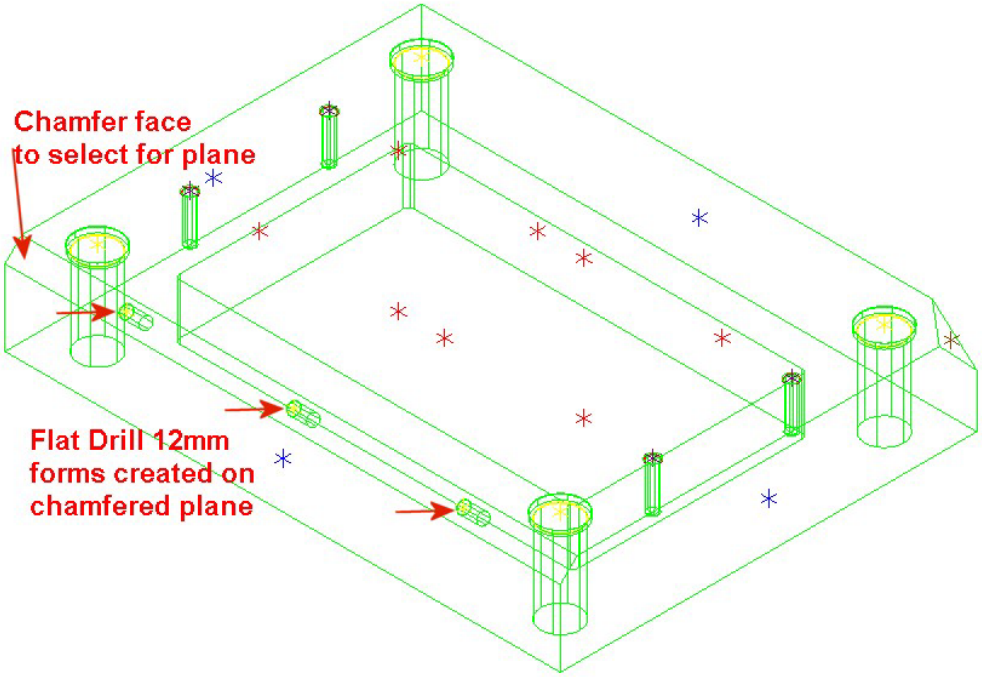
We will now create some forms on non-standard planes. Click on **Create Forms - Solids**, ***B_Flat_Drill*** and select the **Flat_Drill_12mm** form, right click and select **Drill Solid**.



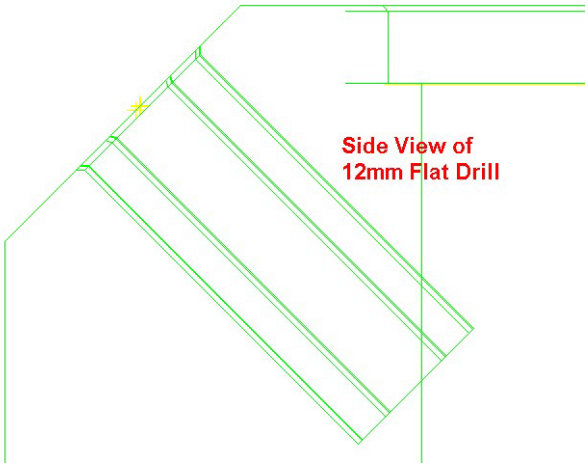
Set the total depth to **30 mm** for this form in the following dialog.



Click on **Plane**, **Plane by solid face** and select the angled plane in the front as shown below. Select the 3 brown points Mastercam color 6). Click on **Enter**. The Flat Drill forms are created on this plane.

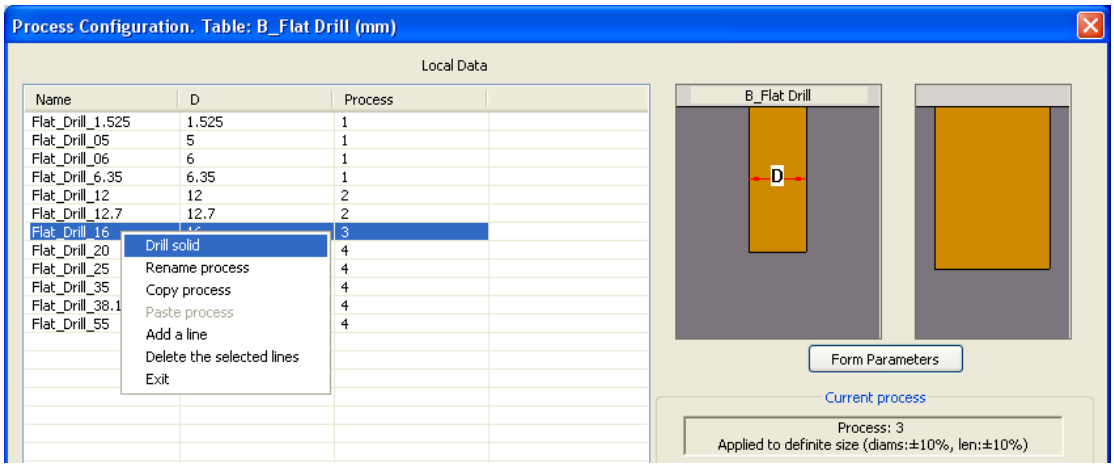


A closer look at the form in Isometric view and then Side View.

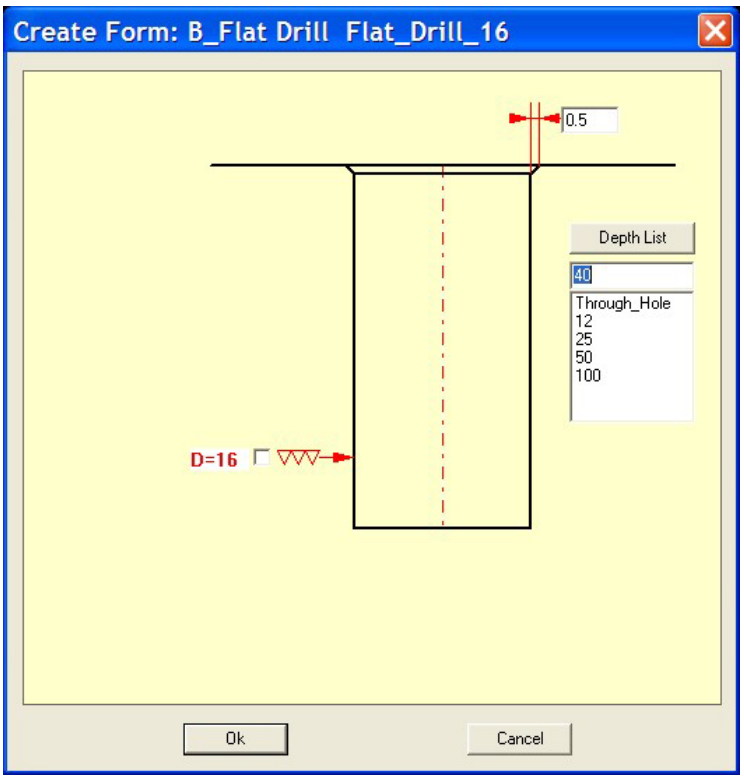


We have one more form to create on another plane. Another flat drill of diameter 16mm.

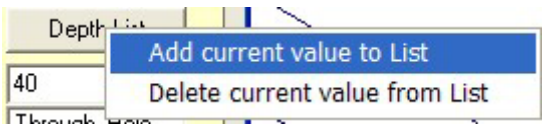
Click on **Create Forms - Solids** and select the **Flat_Drill_16** form.



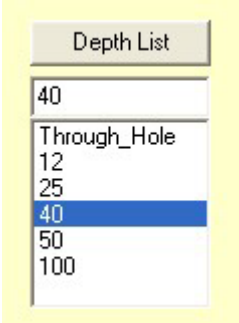
Set the dialog settings as shown with total depth set to **40mm**



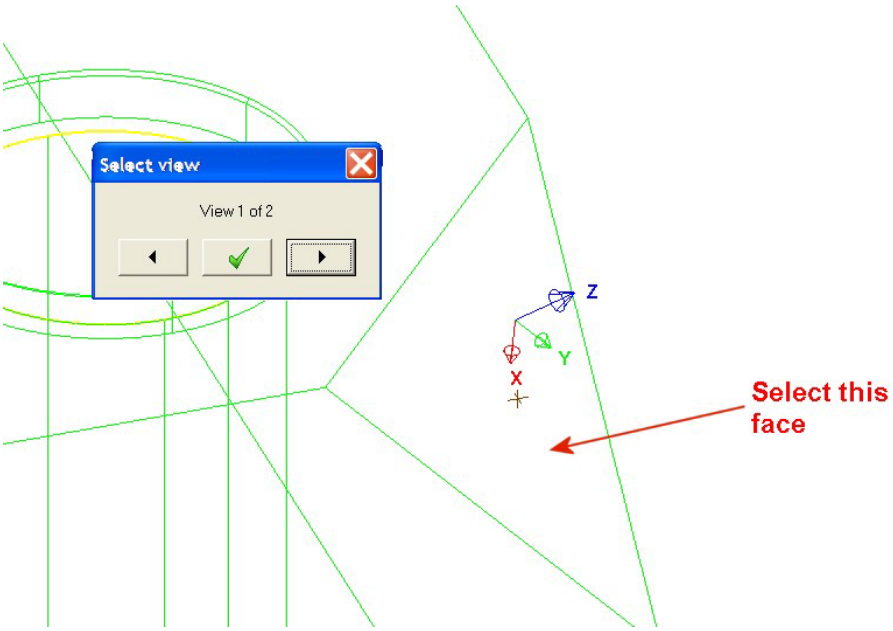
We can also add this depth to the Depth List. To add the new depth of 40mm to the list so that it is presented to us the next time, click on Depth List. The following options are presented:



Highlight and click on the "***Add current value to List***". The 40mm will be added to the depth list. The result will be as follows:

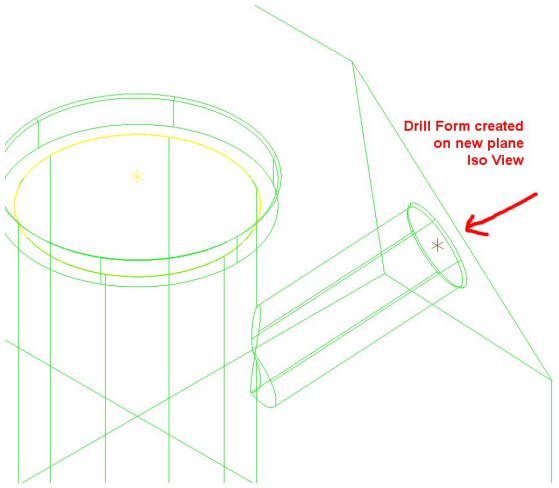


Click on **OK**. Click on **Planes** and select the following **Solid Face** as shown below.

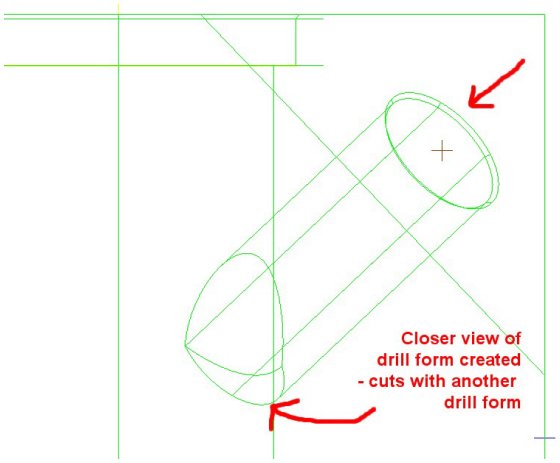


Once the new plane is set, select the brown point on the face as the **point** for drilling. Click on **Enter**.

The following form will be created.



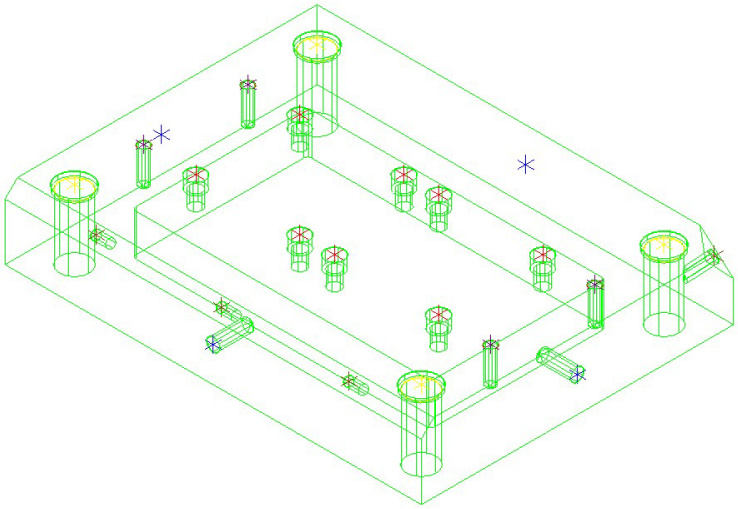
You will notice that this form depth is too long and will cut with the other Guide 42 form.



We are done creating Solid Drill Forms.

In a fraction of the time normally involved, we have created the forms we need and assigned the appropriate drilling operations to them!

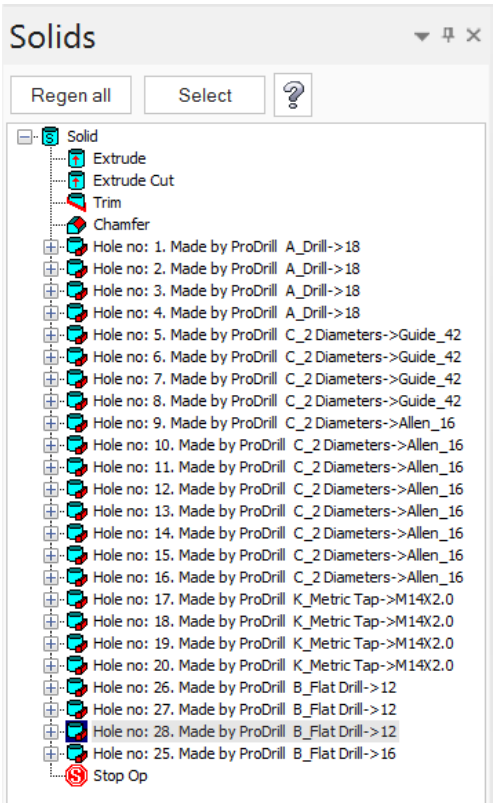
Think about the time and money you save doing this simple part. ProDrill's ROI on investment is incredibly rapid.



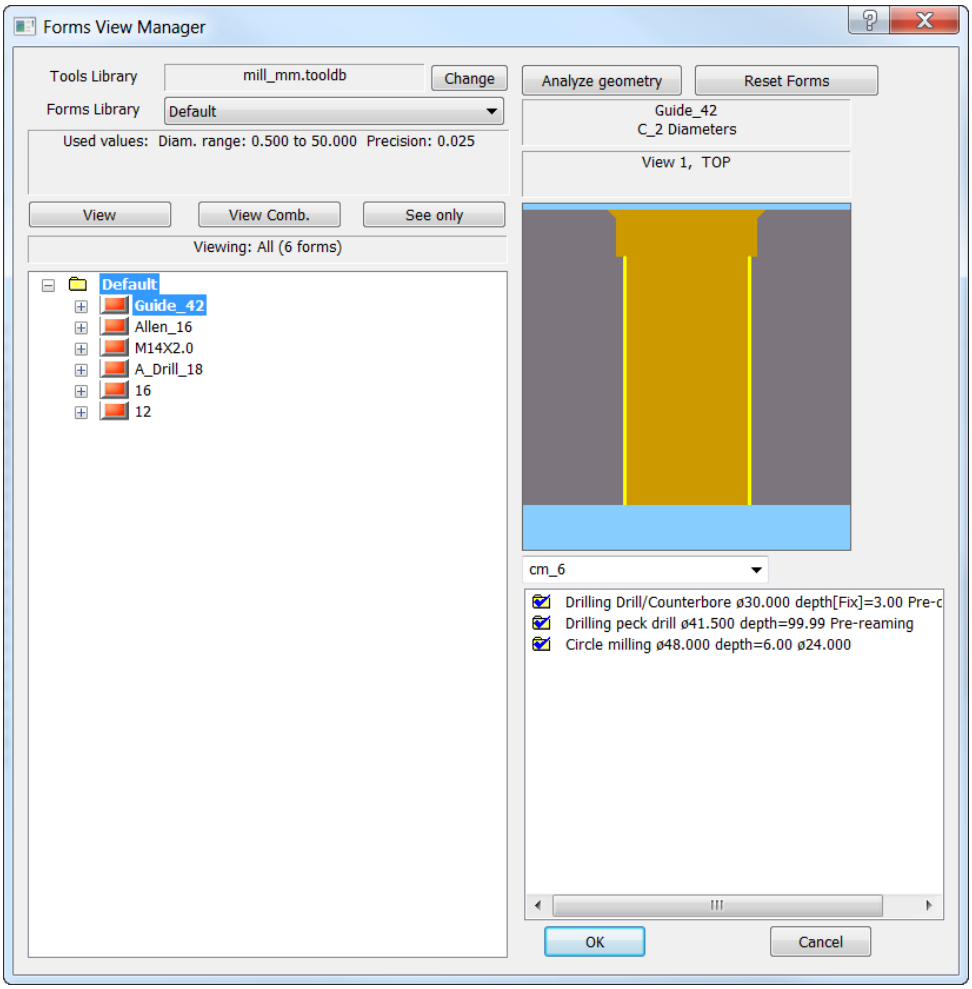
If you need to delete any form, go to the Mastercam Solids Manager and delete the cut and then the Solid form from the Solids Manager.

Solids Manager.

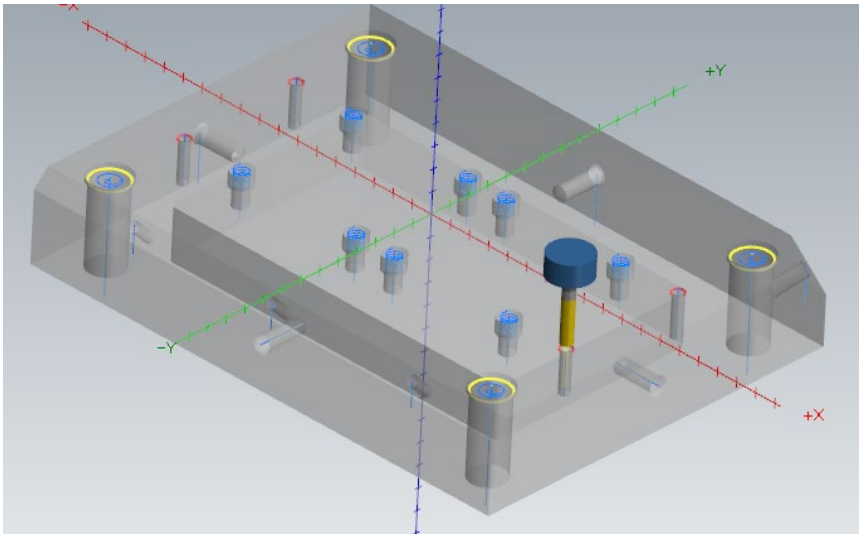
You will be presented with a list of all the forms created. You can highlight any of them and delete the cut first, then the Solid (which is moved to the bottom of the list). PLEASE NOTE THAT THE USER CANNOT EDIT ANY OF THE DRILL FORMS CREATED USING PRODRILL.



You can now process all the Drill Forms using ProDrill. Click on **Forms View** icon to process the part. All the Forms are recognized. When you apply drilling processes to them, the following is the result:

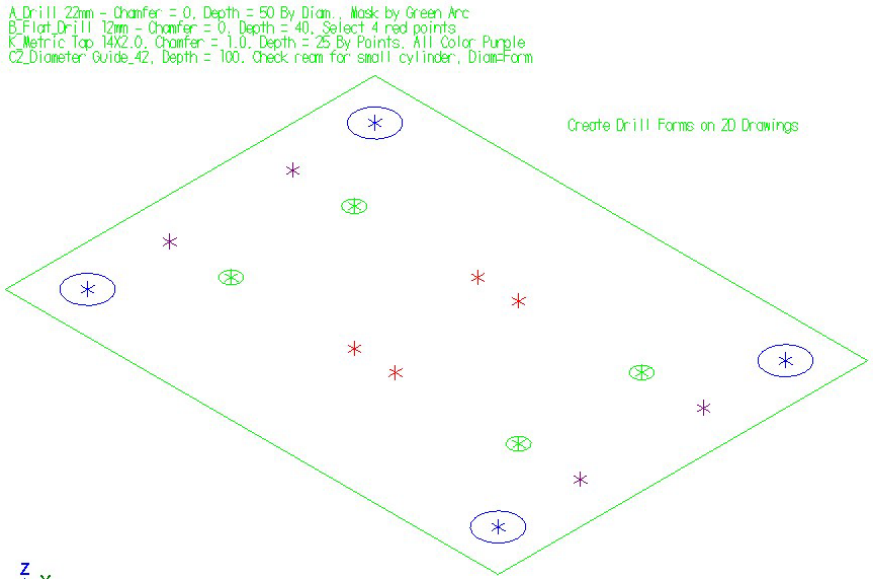


Notice that the holes that need to be tapped or reamed are all automatically recognized. At this point the toolpath can be generated for all the operations and you can backplot the toolpath or verify it to make sure it is exactly what you wanted.

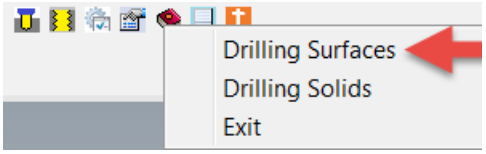


Drilling on Wireframe models

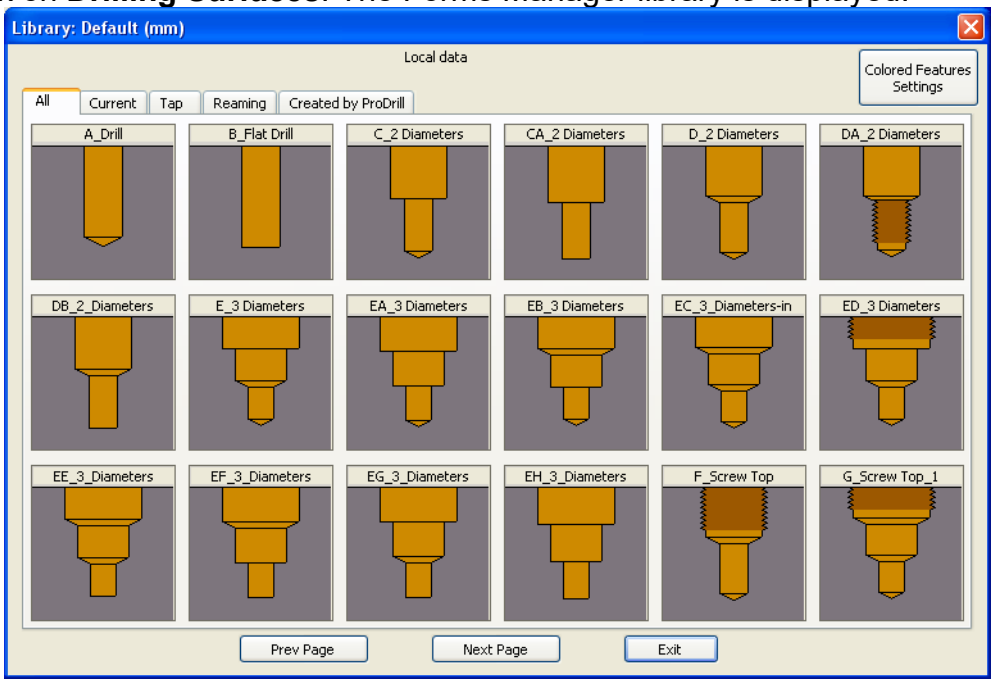
To try the drill form design tool, load the **PART_2D_DESIGN_MM.MCAM** file. This is a simple 2D drawing. Several points of varying colors are created to assist you in creating the different drill forms.



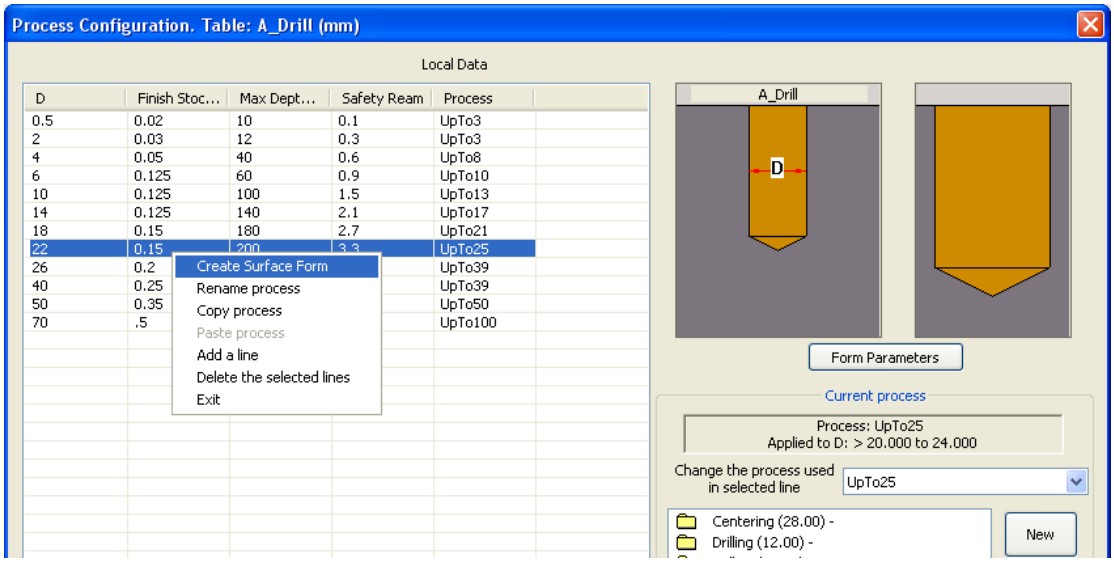
We will create a few different drill forms on this drawing. ProDrill feature creation will work in all possible tool planes.



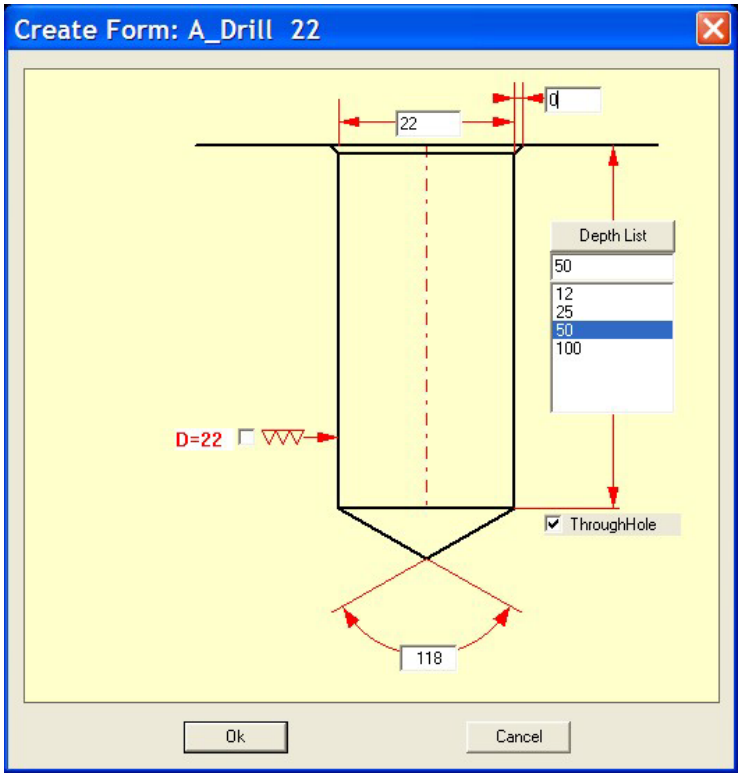
Click on **Drilling Surfaces**. The Forms Manager library is displayed:



Select the ***A_Drill*** Form. You will be presented with the table list. Select the **22** mm form, right click and select **Create Surface Form**.



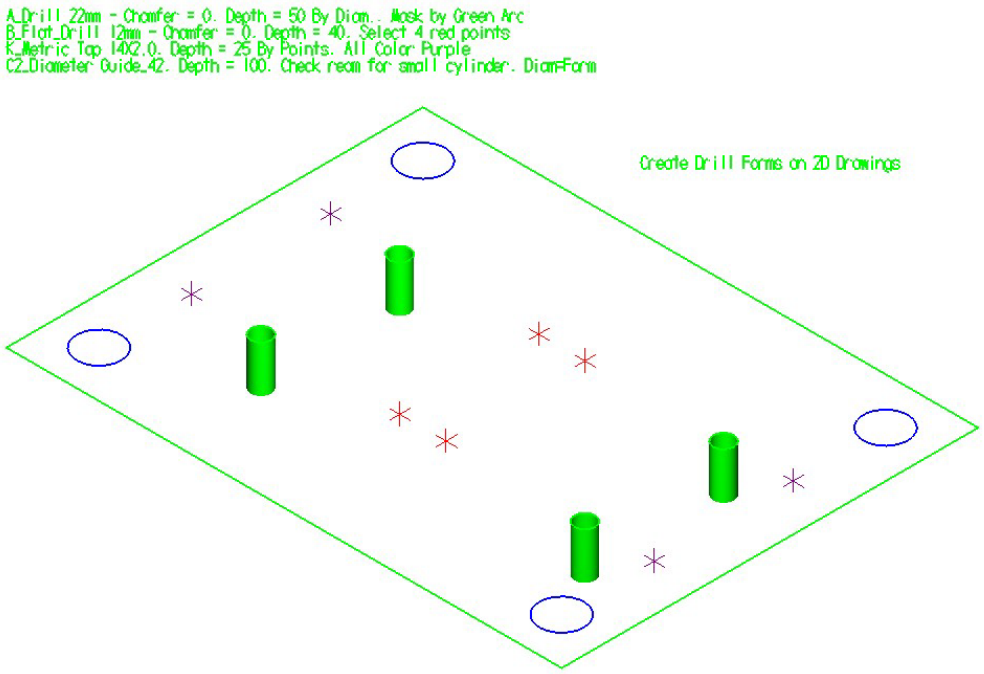
The following dialog is presented to enter the form parameters:



Set the values as shown above and click on OK. You are prompted to select the points:

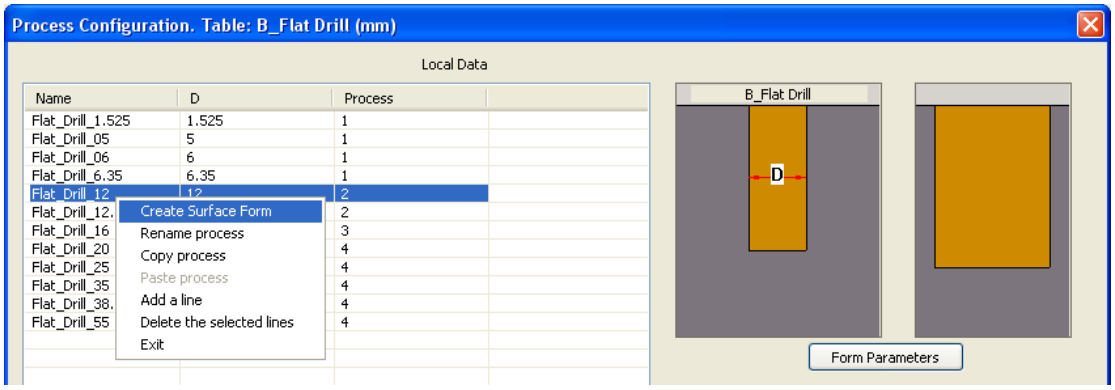
Select the point/s to drill. Click on [Return] when done

With this simple part we can easily select the center points of the green arcs one by one. If you select the 4 green arcs and click on **Enter**, the following drill forms are created (displayed with Mastercam shading turned on):

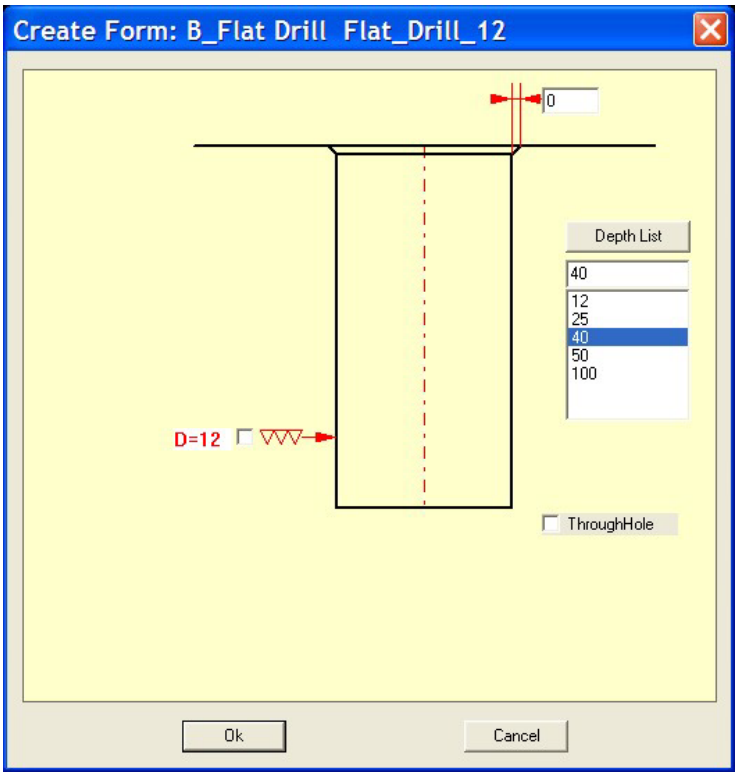


We will now create the other forms mentioned in the Mastercam note in the drawing.

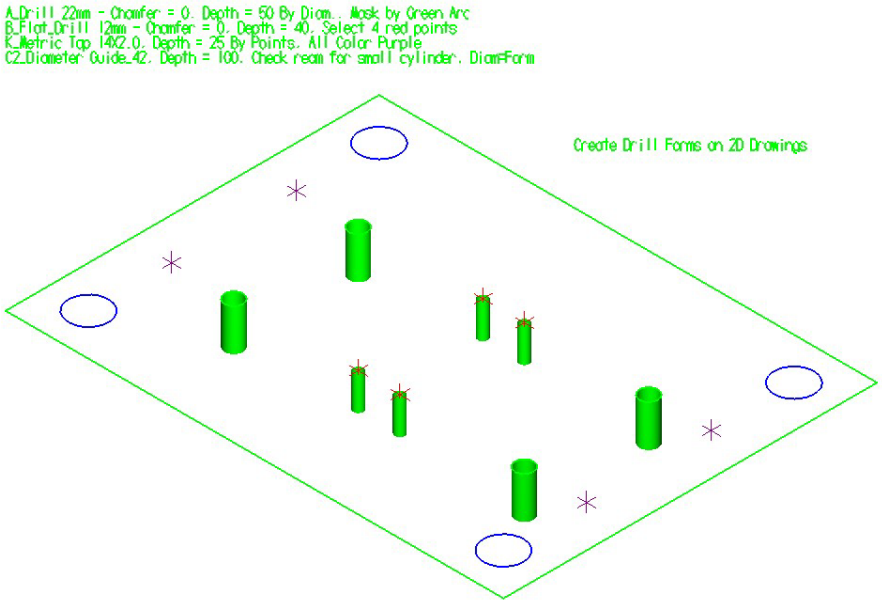
Click on **Create Forms - Surfaces**. Select the ***B_Flat_Drill*** form. Select the **Flat_Drill_12** measurement form, right click and select ***Create Surface Form***.



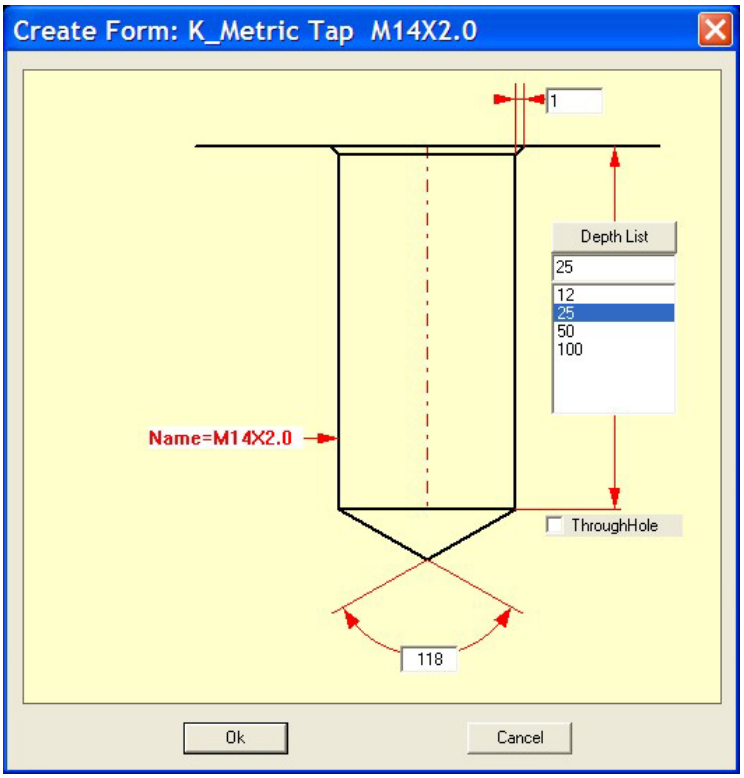
The form parameters dialog is presented. Set the depth to **40mm**.



Set the parameters as displayed above and click on OK. The selection menu is once again presented. Select the 4 red points manually and click on **Enter** to create the forms. The following will be result of the creation of the Flat Drills. If you look at the bottom of the forms, you will see a flat surface created to indicate that it is a blind hole.

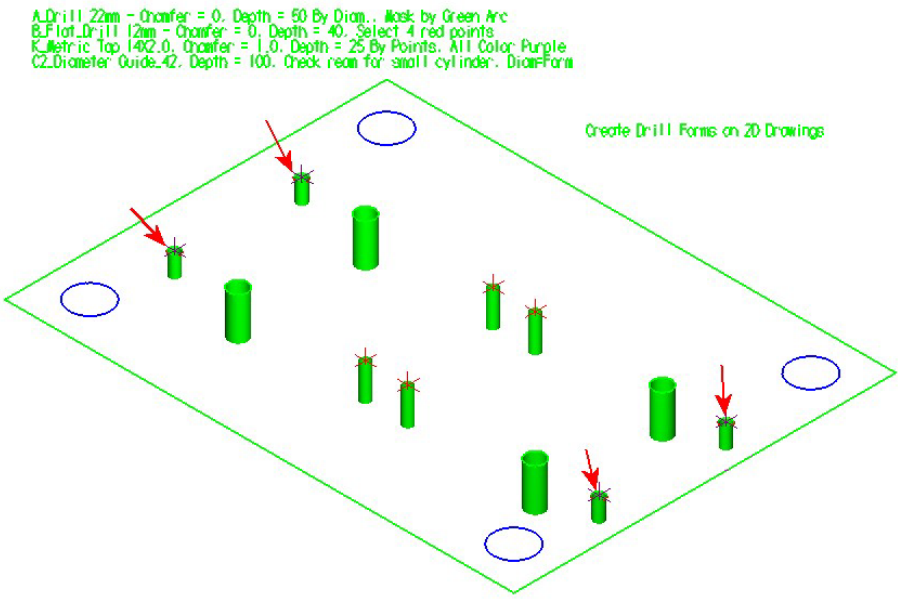


Click on **Create Forms - Surfaces**, select the tab for the ***Tap*** and click on ***K_Metric Tap***. Right click on the **M14X2.0** form and click on "***Create Surface Form***". The form creation parameters dialog is presented:

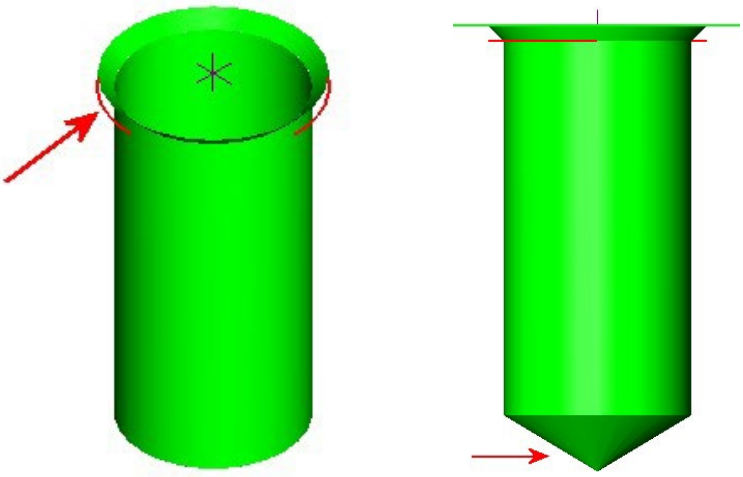


Set the parameters as shown above. Notice that we are creating a 1mm chamfer and creating it as a blind hole (**ThroughHole** unchecked). Click on OK.

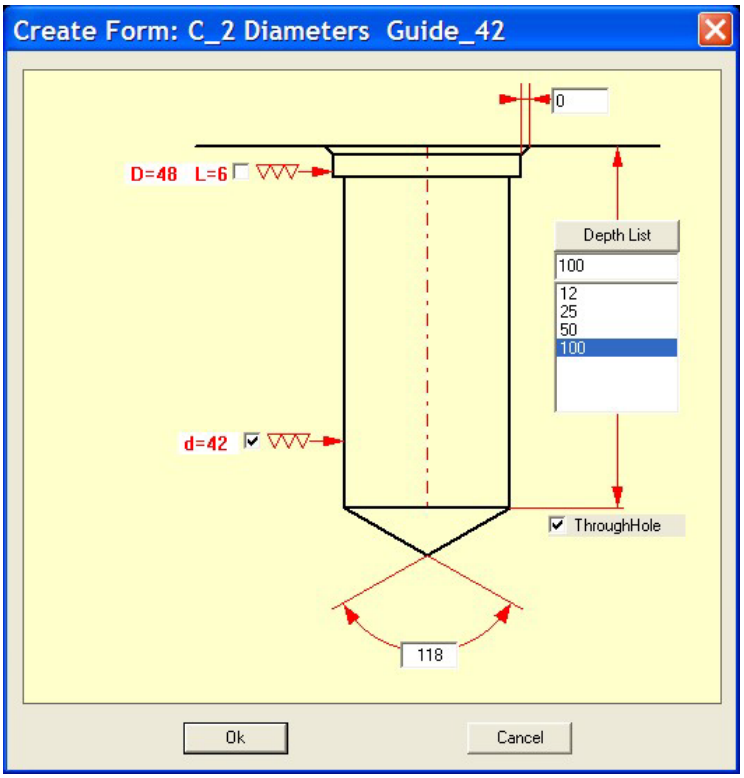
Select the 4 purple points. The following will be the result of the Tap forms creation (indicated by red arrows).



To indicate a Tap form, ProDrill also creates a 270 degree red arc on top of the cylinder to be tapped. Notice that the arc is created below the chamfer. The image on the right shows that the tap form ends in a tooltip (angle used in the Forms Parameters).

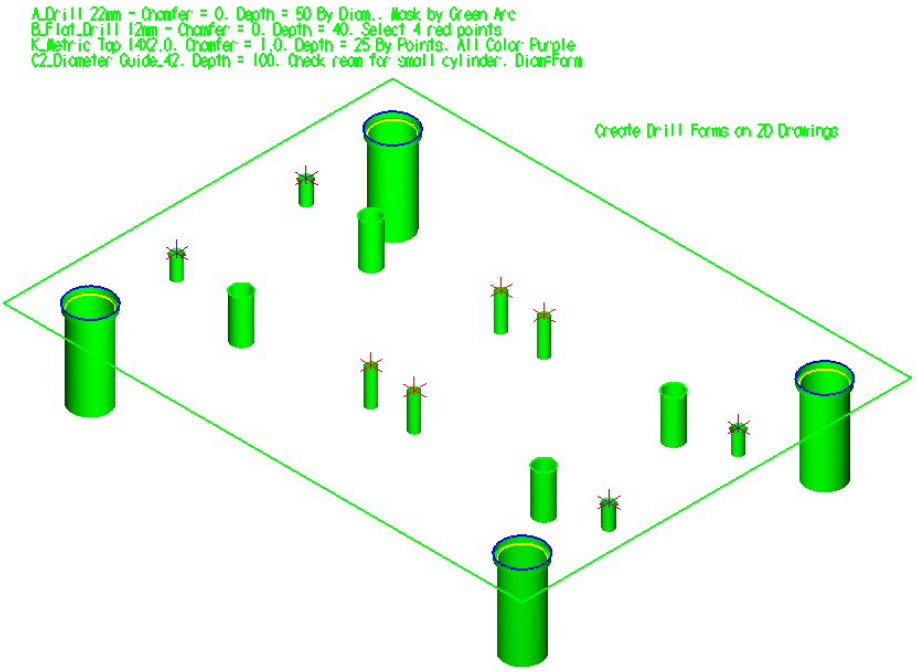


We will now create the final form for this drawing. Click on **Create Forms - Surfaces**, **C_2 Diameters**, select the **Guide_42** measurement, right click and select the "**Create Surface Form**". The following dialog is presented:

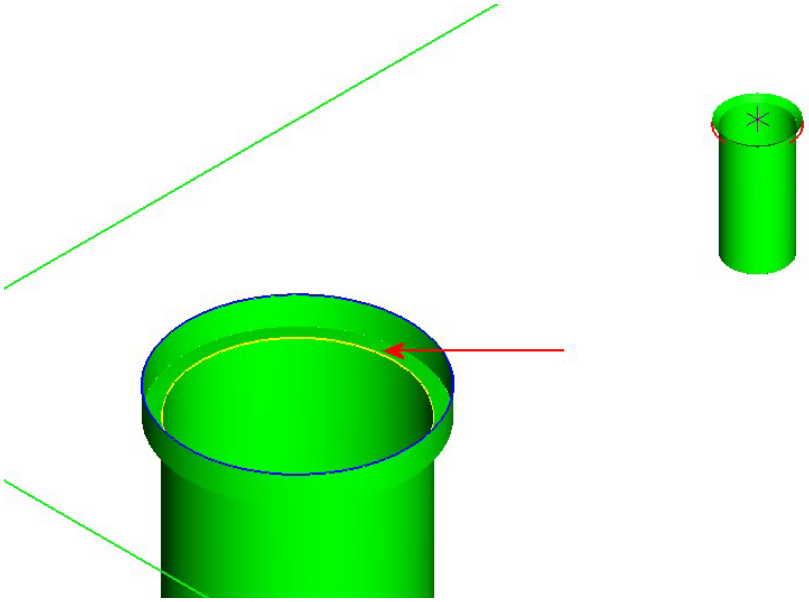


Set the parameters as shown above. Notice that the 42mm diameter is checked  – indicating that it should be reamed. Click on

OK. You are returned to the selection menu. Select **the 4 blue arcs**. Click on **Enter**. The 4 forms will be created.



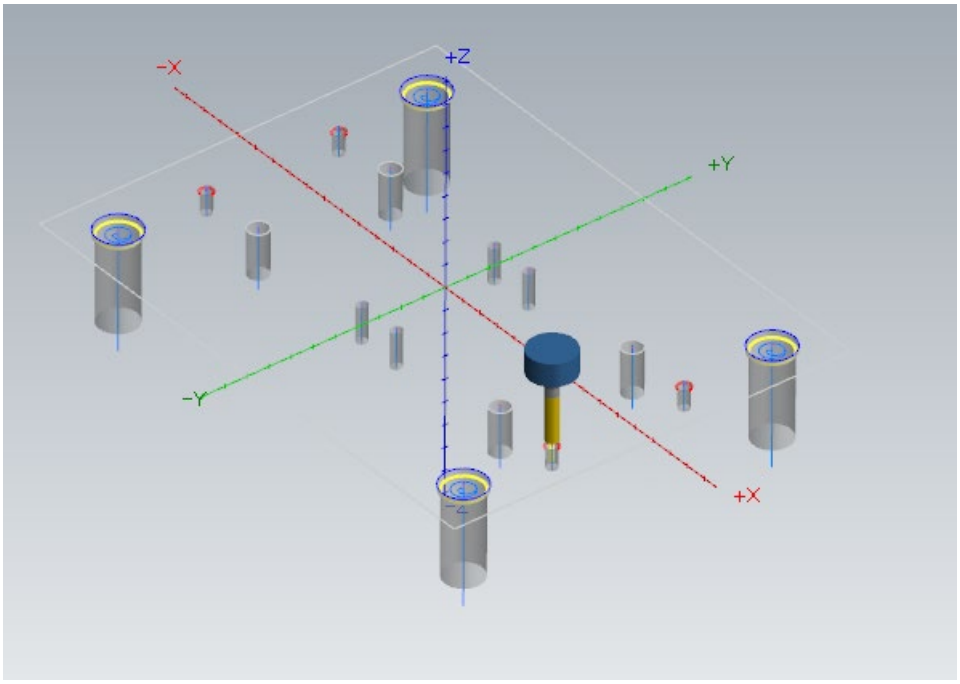
If you zoom close to one of the guide forms created, you will notice that a yellow arc is created on top of the 42mm diameter. This indicates that this form will be reamed.



Within a few minutes, you have created drill forms and assigned machining features on a 2D drawing!

Save the geometry as a new file if you desire. You can process the part in the same manner as the previous part in ProDrill V4.

Once the toolpaths are created, click on **Backplot** and verify the toolpaths generated.



You have created drilling forms on a 2D drawing, processed the part and generated toolpaths for the same in a manner of minutes!

Using the surface form creation tool, you can easily convert 2D Drawings into 3D drawings with all relevant drilling forms created with all necessary drilling operations.

This concludes the Drill Form creation guide.

Revisions:

ProDrill V5 – February 13, 2019 (minor edits)
ProDrill V5 – February 15, 2019 (minor edits, update part names)