

## How to use ZW3D Turning Module

ZW3D is all-in-one software that specializes in 3D CAD/CAM (computer-aided design and manufacturing). It offers integrated modules for performing mold designs, sheet metal layouts, and 2- thru 5-axis milling functions.

In particular, the turning module integrated into ZW3D 2012 permits actions such as turn drilling, facing, rough turning, finish turning, turn grooving, and threading cycles, as well as part-off. See figure 1. These functions are highly tuned to help you extend your design capabilities, and thereby increase profits.

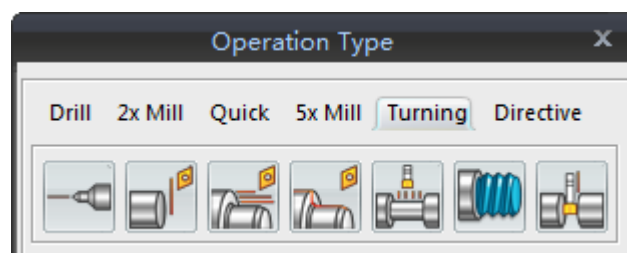


Figure 1: Turning operations available in ZW3D 2012

To see how the turning module works, let's walk through a simple example and give you a brief demonstration of this new product.

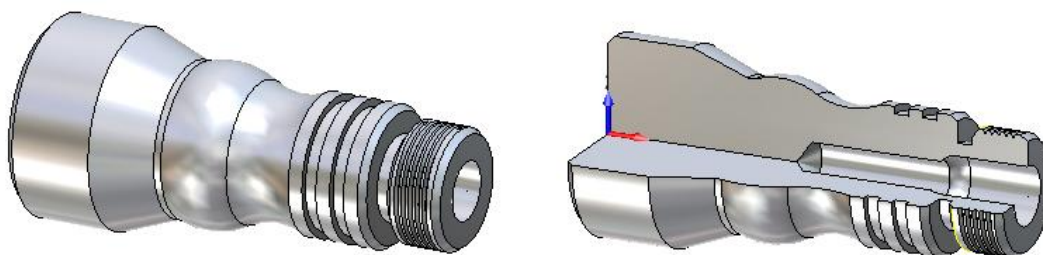
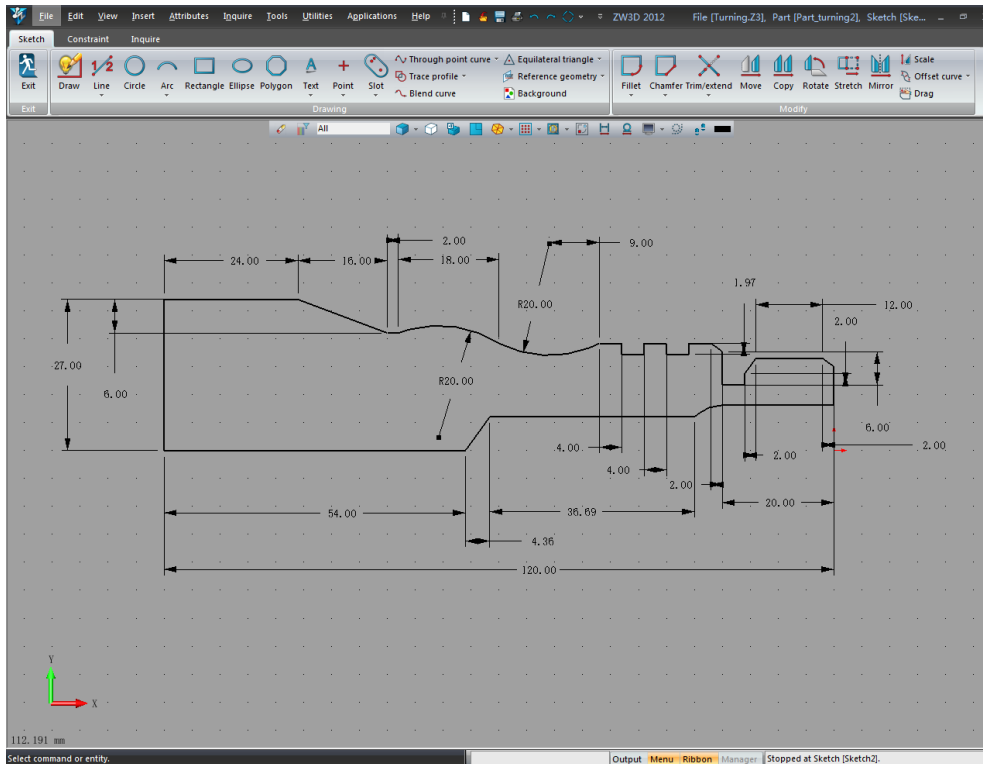


Figure 2: Example part to be turned

### 1. Part Design

The first step is to design the part according to the requirements of your customers, or else to import the geometry from another design system into ZW3D's CAD module. For this tutorial, we will work with the threaded part shown in figure 2. We begin by creating and dimensioning the drawing in the Sketch module, as shown in figure 3.



*Figure 3: Sketching the part to be turned*

## 2. Turning Module

After completing the design, we right-click in the graphic area, and then select the **CAM Plan** item from the context menu, as shown in figure 4. ZW3D jumps into the CAM Plan environment for turning programming. The turning module is integrated in ZW3D's CAM Plan module, just like the milling module.

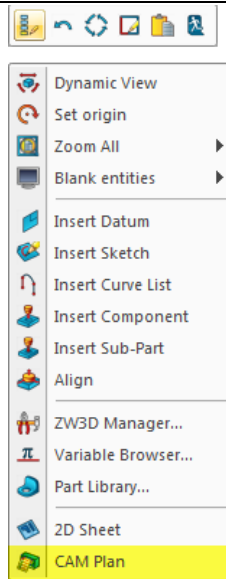


Figure 4: Copying the 2D design to the CAM Plan environment

### 3. Stock Creation

The obvious stock shape best used for the turning of this tutorial is a cylinder. ZW3D 2012 adds a new function named ‘Cylinder Stock’ that lets us quickly create our cylinder stock directly (figure 5). Just select the 2D profile, and the smallest cylinder stock that fits the profile is created. Options are available to you to change the diameter and height of the stock, when necessary.

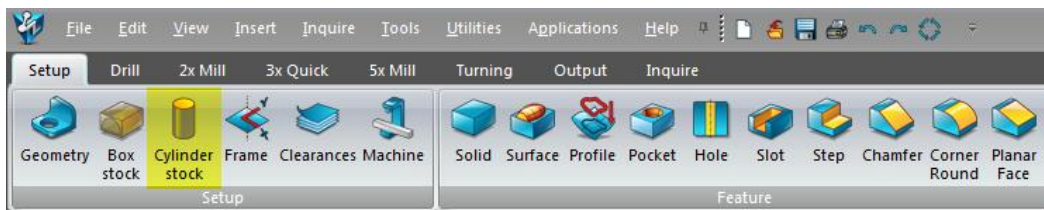


Figure 5: Selecting cylinder stock

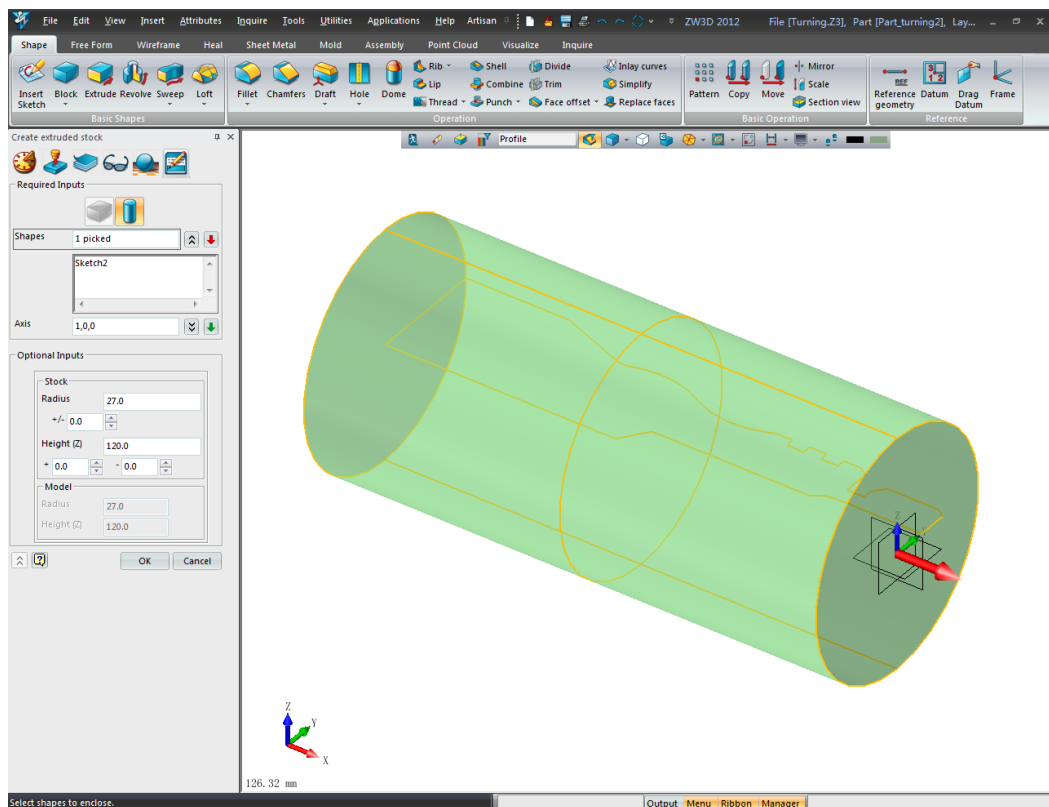


Figure 6: Cylinder stock with 2D turning profile

#### 4. Generating Operations

The process of generating turning operations is similar for all types of CNC operations. Here, we use the facing operation as our example, and thereby show the details.

##### 1) Creating Facing Operations

Operations are created by simply clicking the **Operation** icon in the setup tree, and then selecting the type of operation you require from the popup menu. See figure 7.

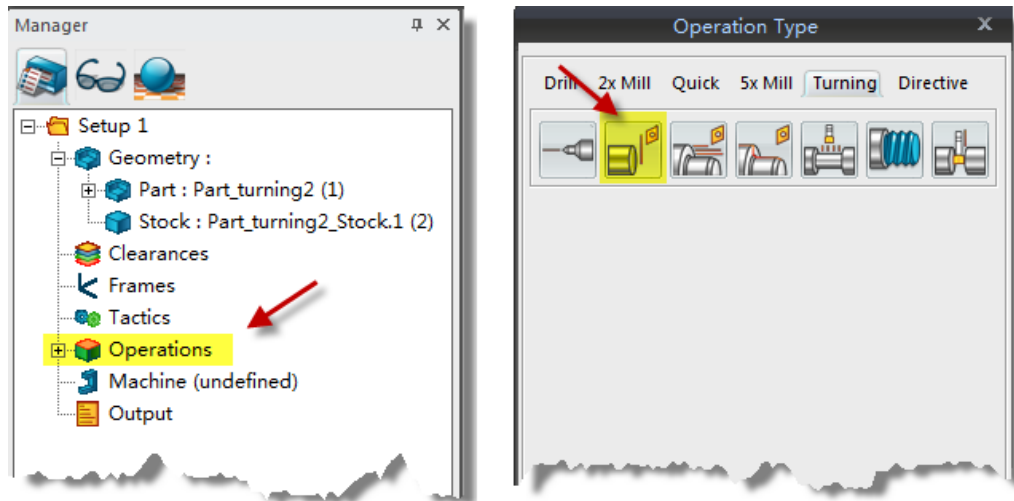


Figure 7: Choosing the type of operation

- i. Select the appropriate cutting tool from the tool library by clicking on **Tool** item. Notice the Tool library form that pops up (figure 8).

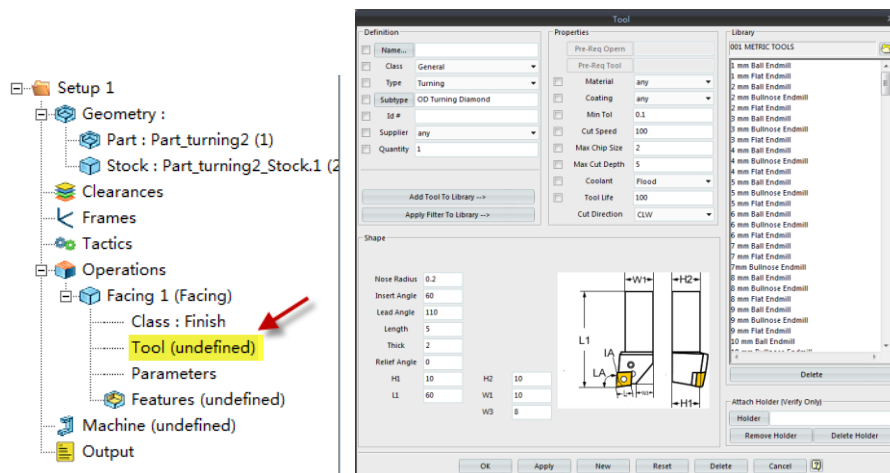
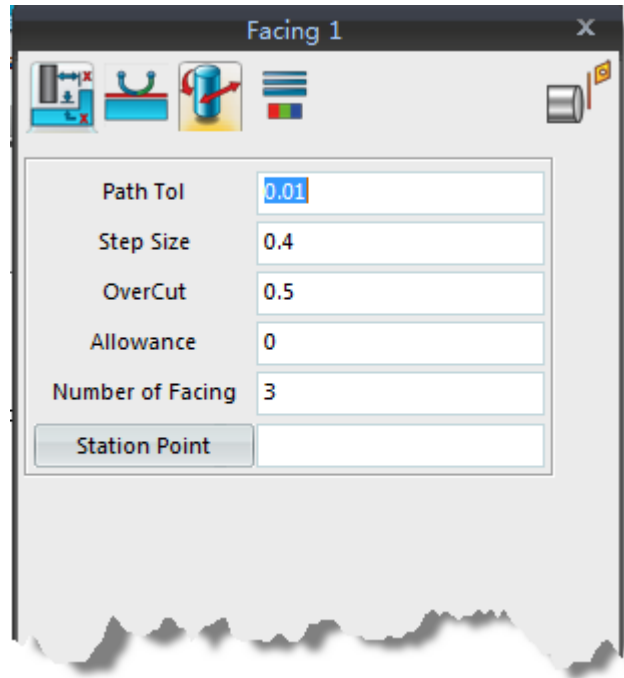


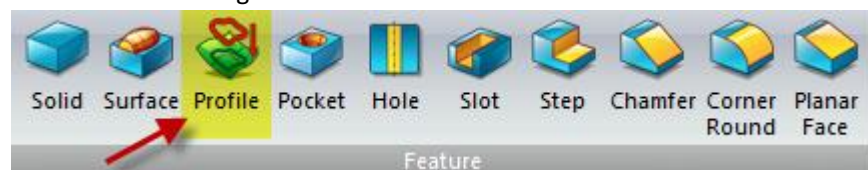
Figure 8: Choosing the tool

- ii. Set the parameters according to your machining requirements, such as the stock and cutter information, cutter length, and machine situation. See figure 9.



*Figure 9: Setting up the machining parameters*

Create, and then add the new machining feature to the current operation. From the **Feature** toolbar, choose **Profile**. See figure 10.



*Figure 10: Choosing Profile from the Feature toolbar*

Specify the following parameters; see figure 11:

**Input type** = Profile

**Profile** = Chose the profile form the graphic area.

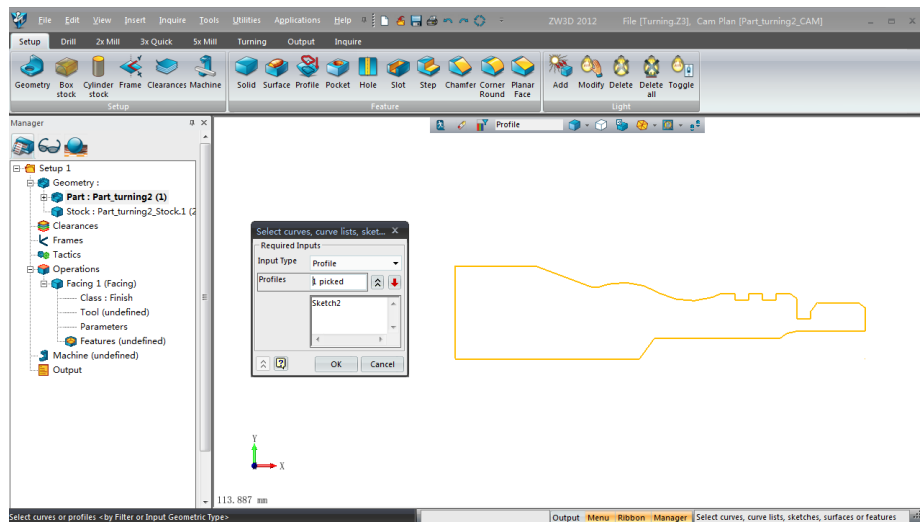


Figure 11: Setting the profile parameters

Add the profile feature to the operation, as shown in figure 12. Follow these steps: (1) under **Operations | Facing**, select **Features**, and then (2) choose the **Profile** feature.

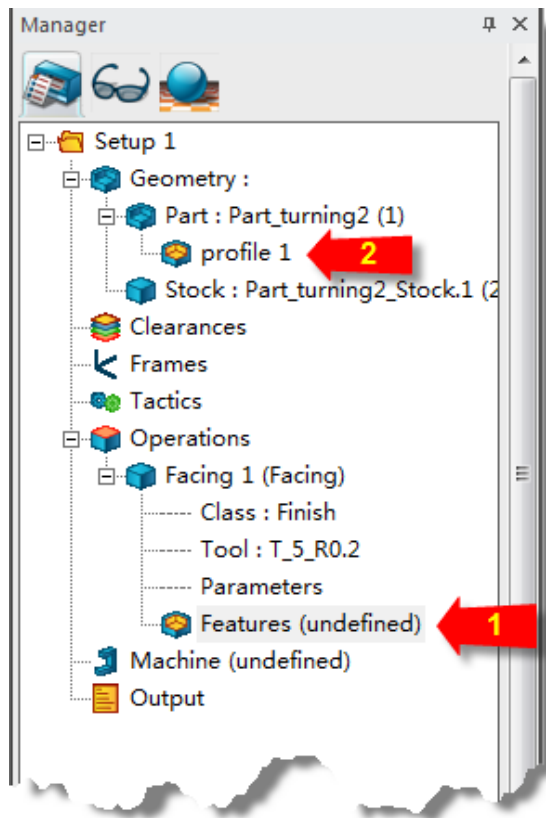


Figure 12: Choosing Features and Profiles

iii. Calculating Tool Paths

The face of the part is recognized automatically by ZW3D, and so tool paths are created on it, as shown in figure 13.

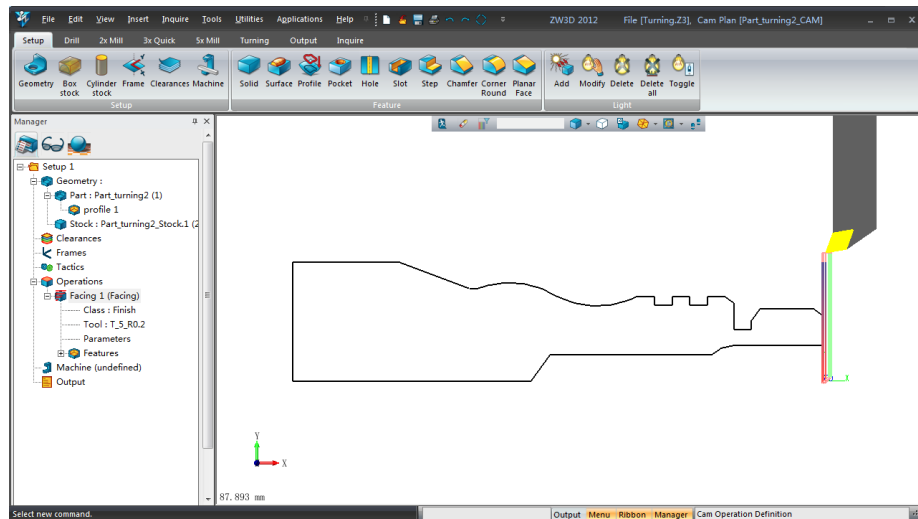


Figure 13: Creating the tool path

- 2) Use the same method to create and add other strategies to the part, and then set the parameters for each operation.
  - i. Turn Drill Operation

The Turn Drill operation offers a number of drilling types, which you define in the Cutting Parameters menu. Examples include Center, Drill, Peck Drill, and Ream. See figures 14 and 15.

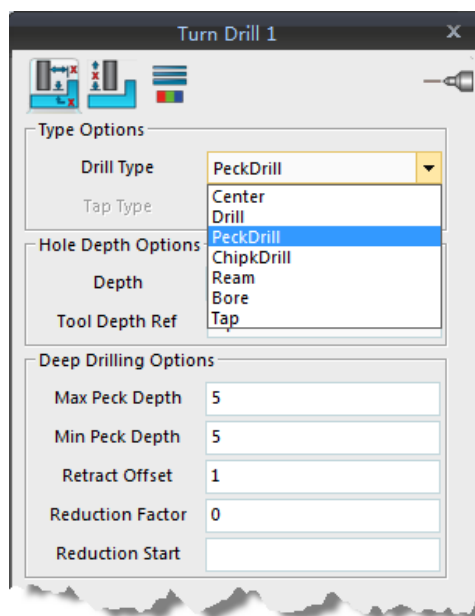




Figure 14: Setting drill parameters

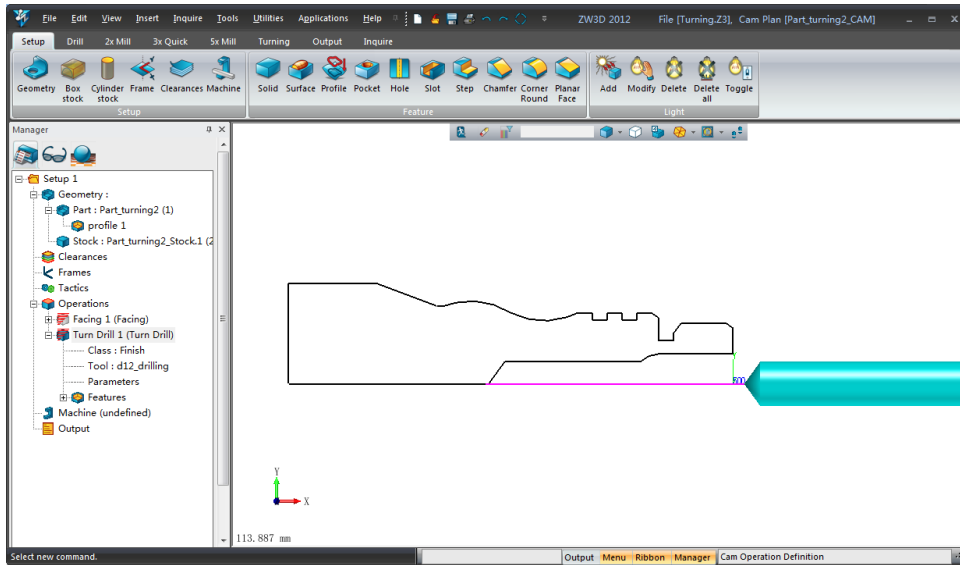


Figure 15: Generating the drill path

ii. Rough Turning

While setting up rough turning, choose the correct cutting direction: OD means ZW3D will create tool paths for the outside diameter, while ID is for the inside diameter.

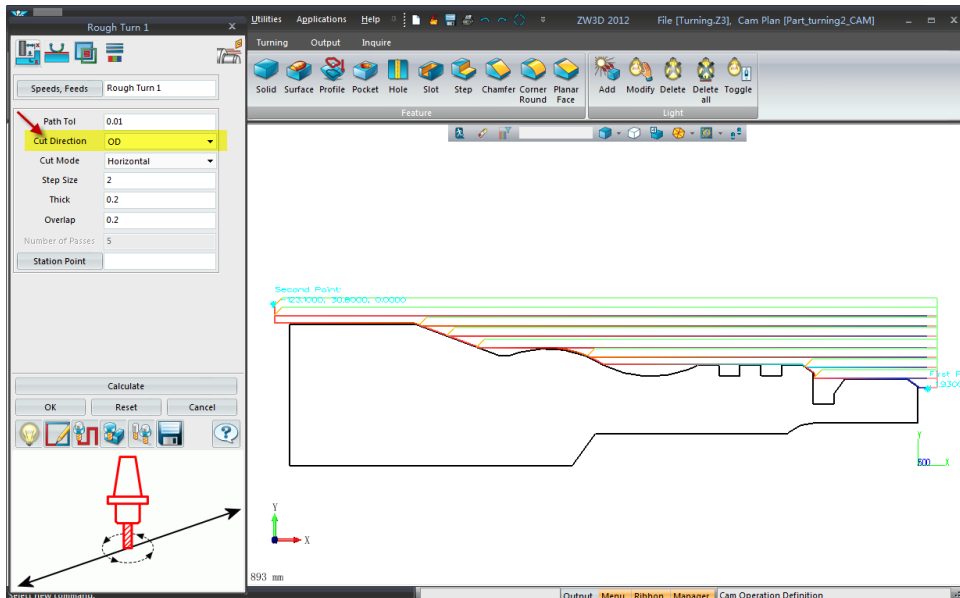


Figure 16: Roughing with outside diameter

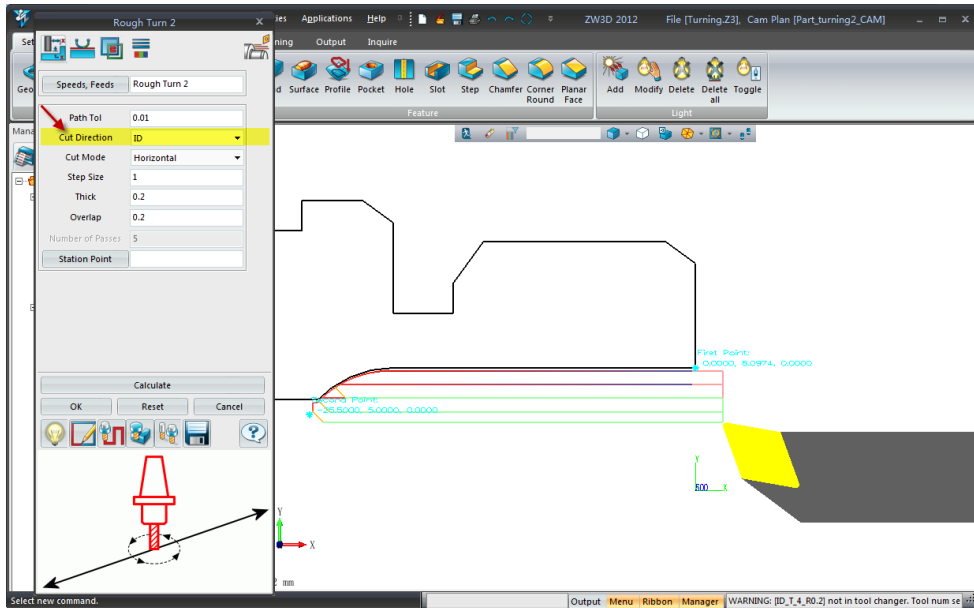


Figure 17: Roughing with inside diameter

iii. Turn Groove

After finishing the Turn Rough operation, there are still several grooves to add, as shown in figure 18. These cannot be cut with a Turn Rough operation.

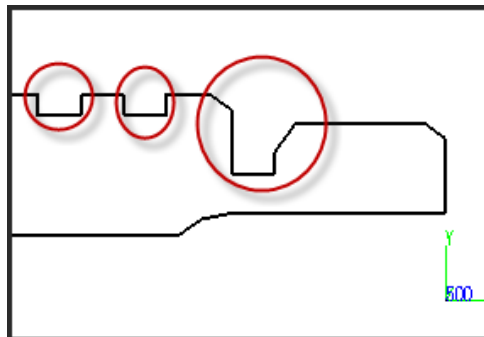


Figure 18: Grooves in the design

Instead, we use the Turn Groove operation with a grooving cutter to cut the allowance in these areas.

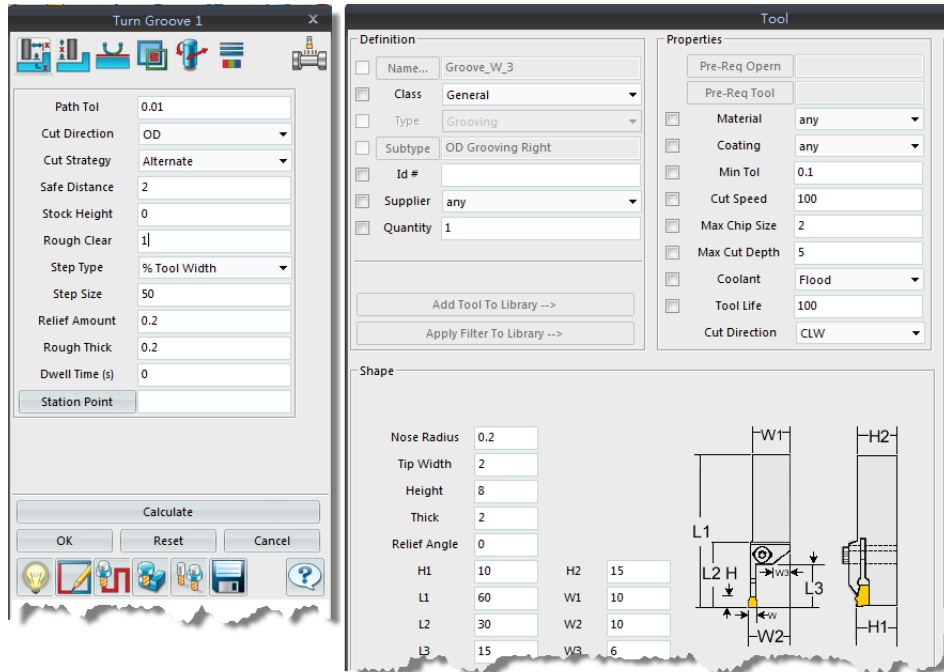


Figure 19: Setting parameters for the grooving operation

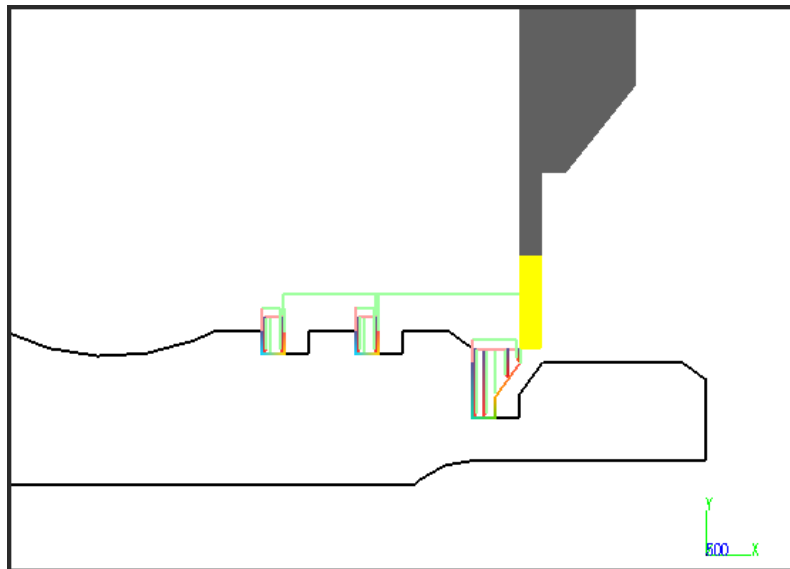


Figure 20: Simulating the grooving operation

iv. Turn Finish

The Turn Finish operation is similar to the Turn Rough one, except that it generates just one path around the part. See figure 21.

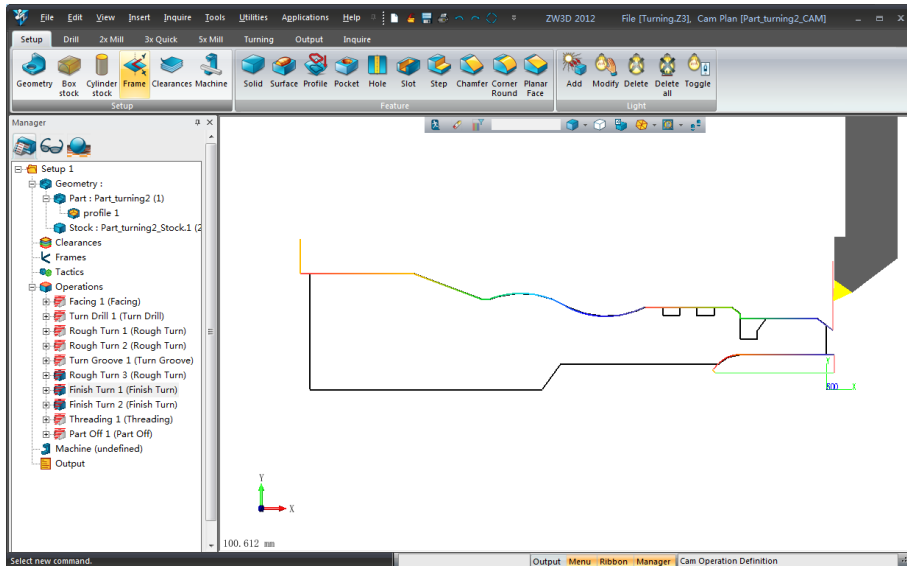


Figure 21: The finishing operation

v. Threading

The Threading operation cut threads into the stock. To add them, go to the **Cutting Parameters** tab, and then select the **Position** icon. ZW3D asks you to select a point in the drawing. As seen in figure 22, the entire straight red line is recognized as the machining area. The tool paths will be generated along this line. See figure 23.

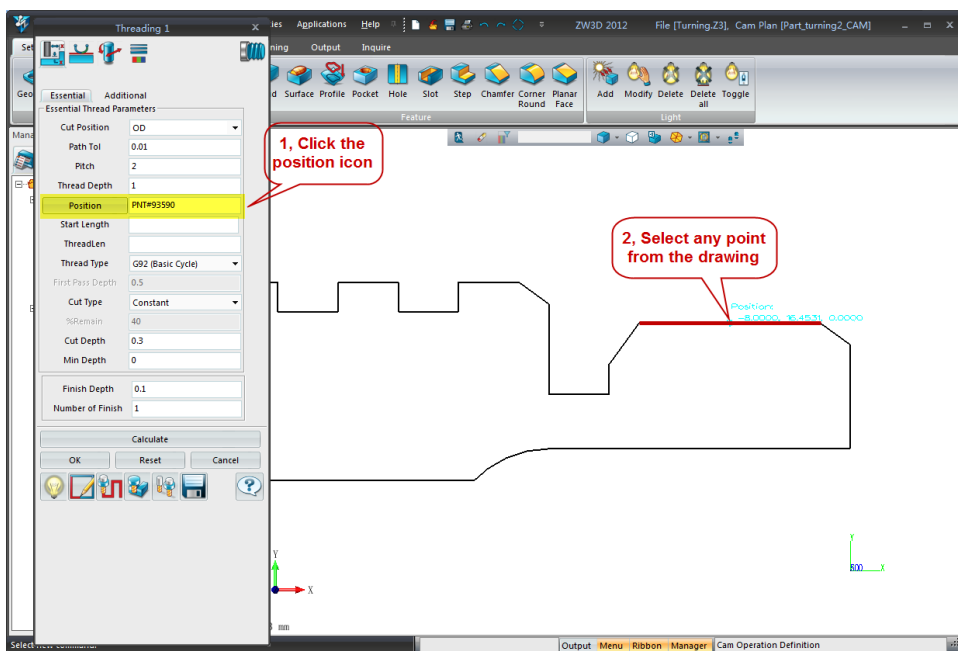


Figure 22: Adding threading

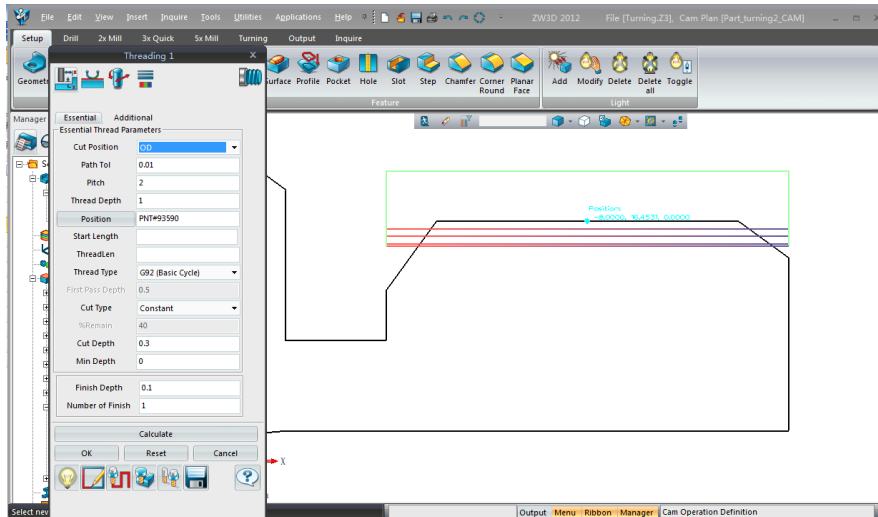


Figure 23: Threading path generated

There are additional options for helping you create threading tool paths, such as those based on requirements of the number of spring passes and the thread direction. See figure 24.

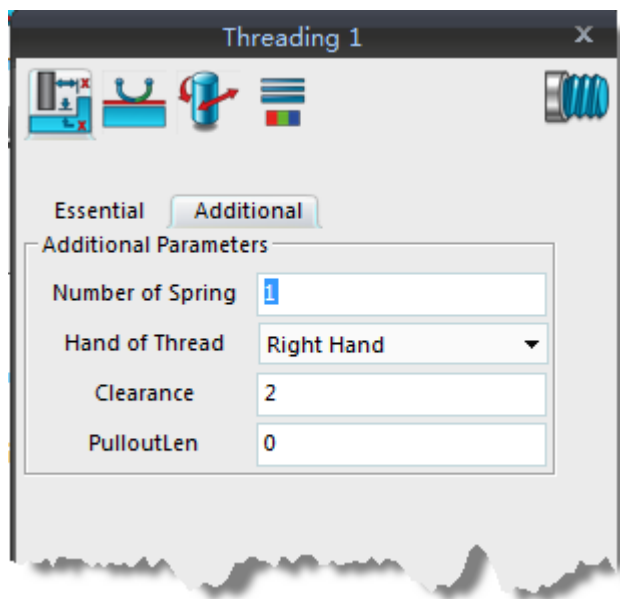


Figure 24: Parameters for threads

vi. Part Off

The last step is to cut the part off from the stock. Using the Part Off operation, we define the Cutoff Point. Following the illustration shown in figure 25, click the **Cut-Off-Point** button, and then pick an end point from the part. ZW3D detects the end of the part automatically, and then calculates the tool path.

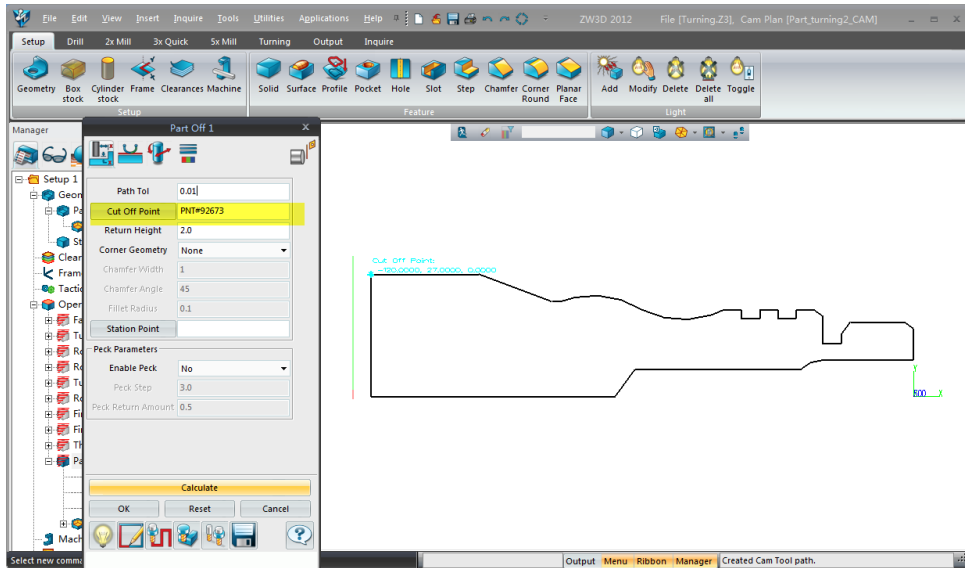


Figure 25: Locating the cutoff point

In this operation, you are able to add chamfers and fillets freely, even if the original design doesn't have them. See figure 26.

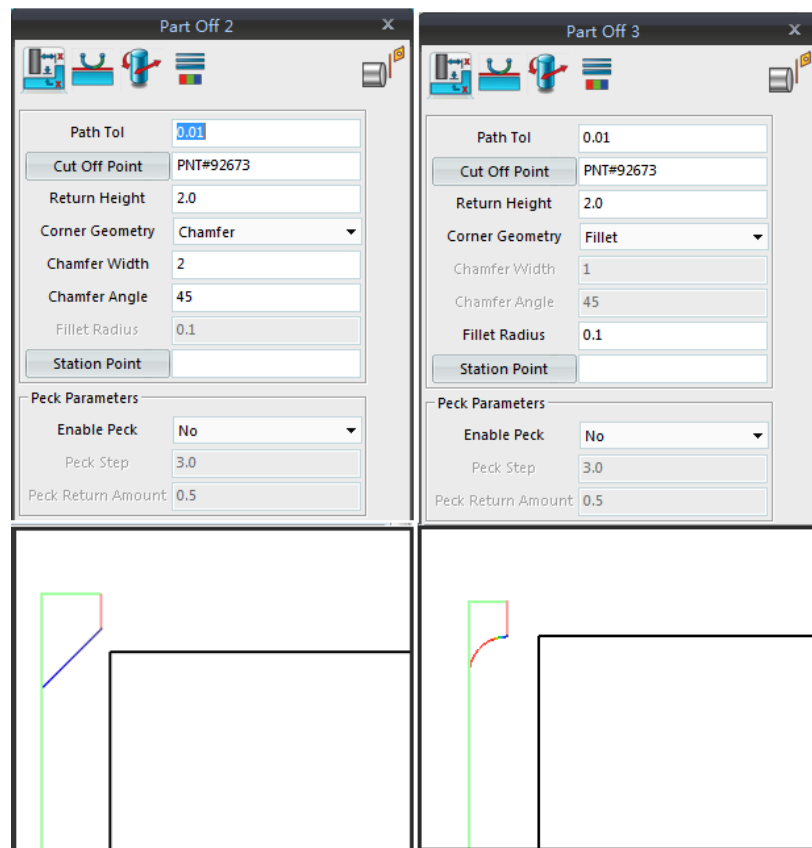


Figure 26: Adding chamfers and fillets

## 5. Simulation

To ensure that each tool path is correct, a solid verification function is included in ZW3D, as shown in figure 27.

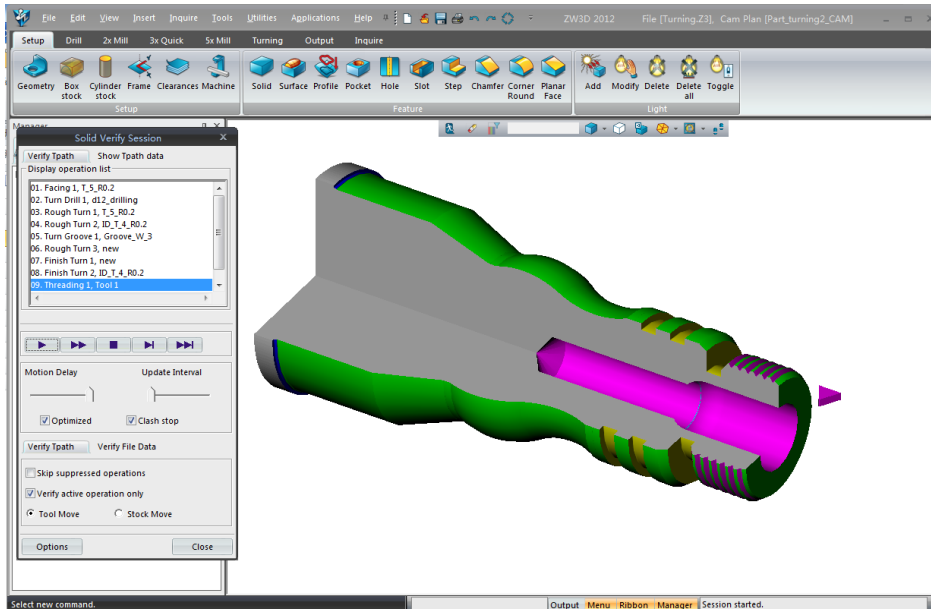


Figure 27: Solid verification

## 6. Outputting the NC File

Finally, we output the G and M codes, and then send them to the machine tool to machine the part.

```
C:\Users\Administrator\AppData\Roaming\ZW3D 2012 Eng\output\P0001.nc
%
O1000
N1 (PROGRAMMED BY ADMINISTRATOR)
N2 (TOOL 0 IS T_5_R0.2.)
N3 (SHAPE PARAMETERS)
N4 T0000
N5 S1000 M03
N6 M08
N7 S1000
N8 (OPERATION - FACING 1)
N9 (TACTIC - FACING 1)
N10 (PLAN - )
N11 (FILE - TURNING.Z3)
N12 G98 G00 X58.0 Z.8
N13 G01 X54.0 Z.8 F250.0
N14 X-1.0 Z.8
N15 X1.828 Z2.214 F50.0
N16 X58.0 Z2.214 F250.0
N17 X58.0 Z.4 F50.0
N18 X54.0 Z.4
N19 X-1.0 Z.4 F250.0
N20 X1.828 Z1.814 F50.0
N21 X58.0 Z1.814 F250.0
N22 X58.0 F50.0
N23 X54.0
N24 X-1.0 F250.0
N25 X1.828 Z1.414 F50.0
N26 X58.0 Z1.414 F250.0
N27 T0000
N28 M09
N29 (TOOL 0 IS D12_DRILLING.)
N30 (SHAPE PARAMETERS)
N31 T0000
N32 S1000 M03
N33 M08
N34 S1000
```

File number 1 / 1    Display    Edit    ZW3D Edit    Dismiss

Figure 28: NC output from ZW3D