

ADVANCED MACHINING

BETP 3584

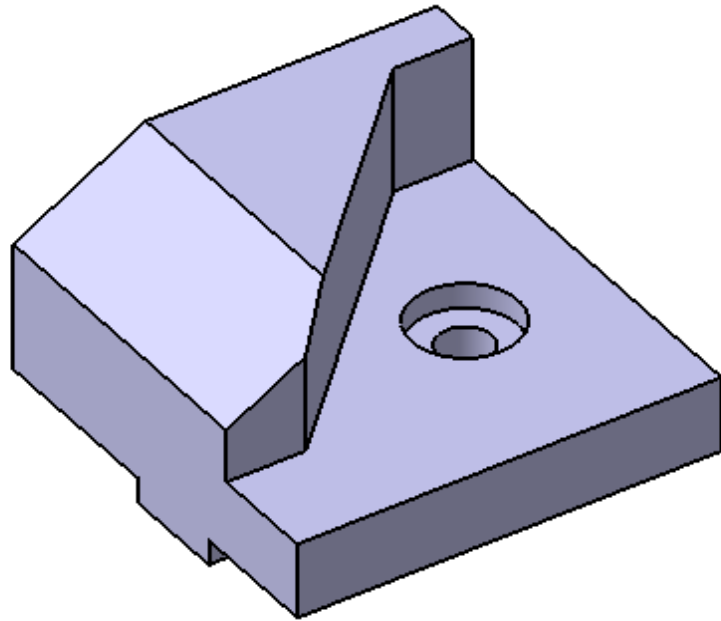
MULTIPLE HOLES DRILLING OPERATION

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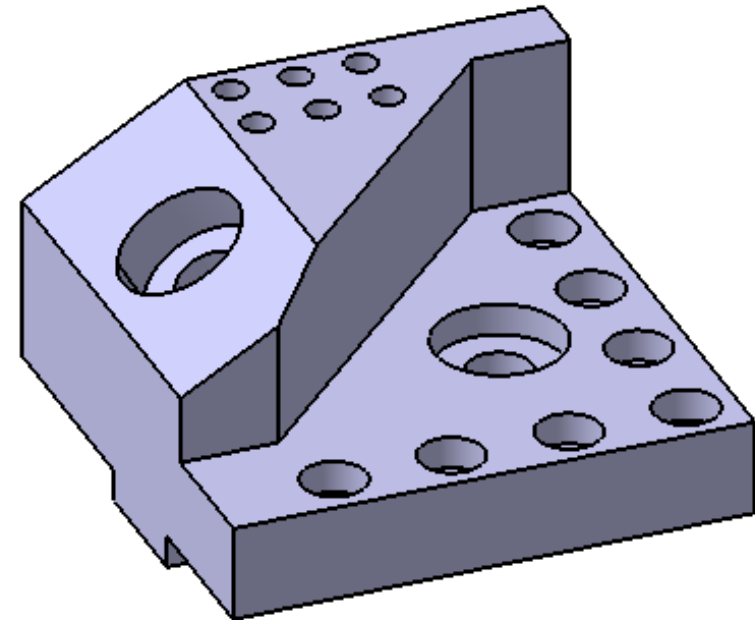
Multiple Holes Drilling Operation

- ❑ Multiple Holes Drilling Operation is actually an advancement from normal Drilling Operations with specific Machining Patterns defined.
- ❑ Despite performing Drilling Operation by one hole to another, with Machining Patterns Drilling Operations holes are can now be more easier and faster to be picked and selected.
- ❑ Furthermore, with an advanced function called “Find Feature Through Faces” which automatically find respected holes at any given hole’s specification.

Multiple Holes Creation – Part Design

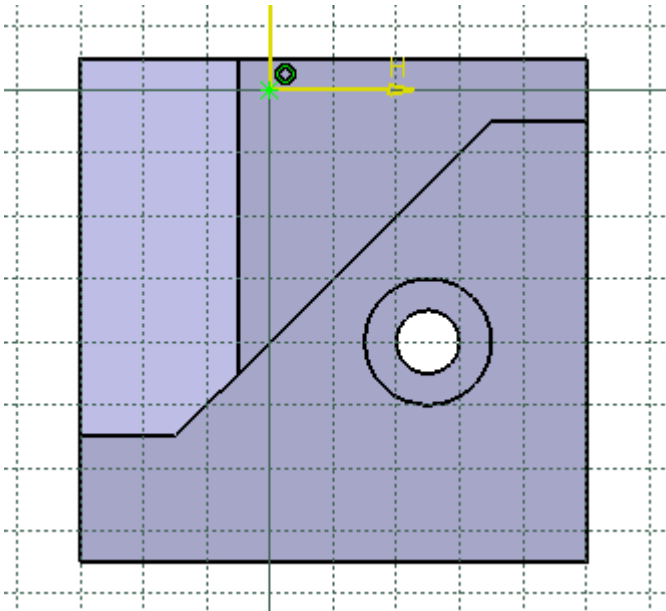


Original CAD Model

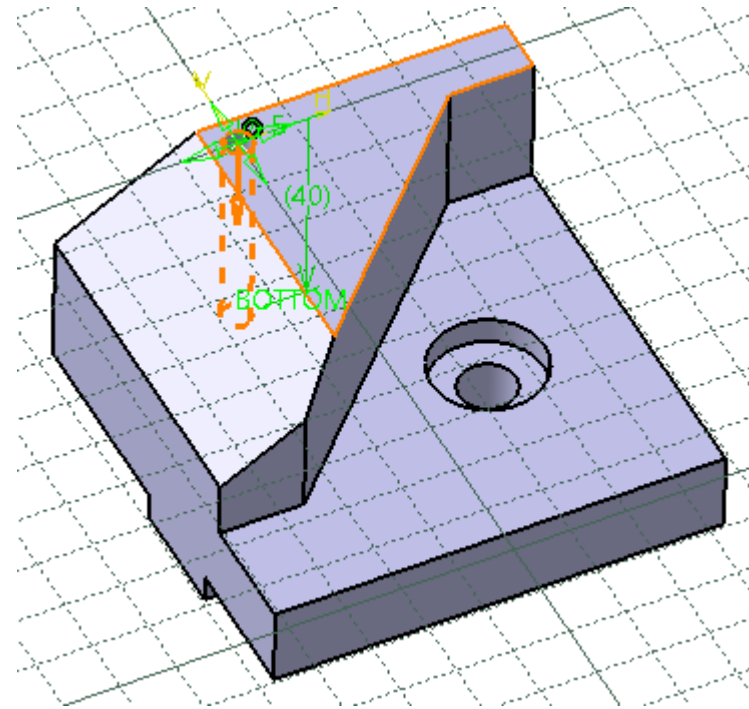


Multiple Holes Modified CAD Model

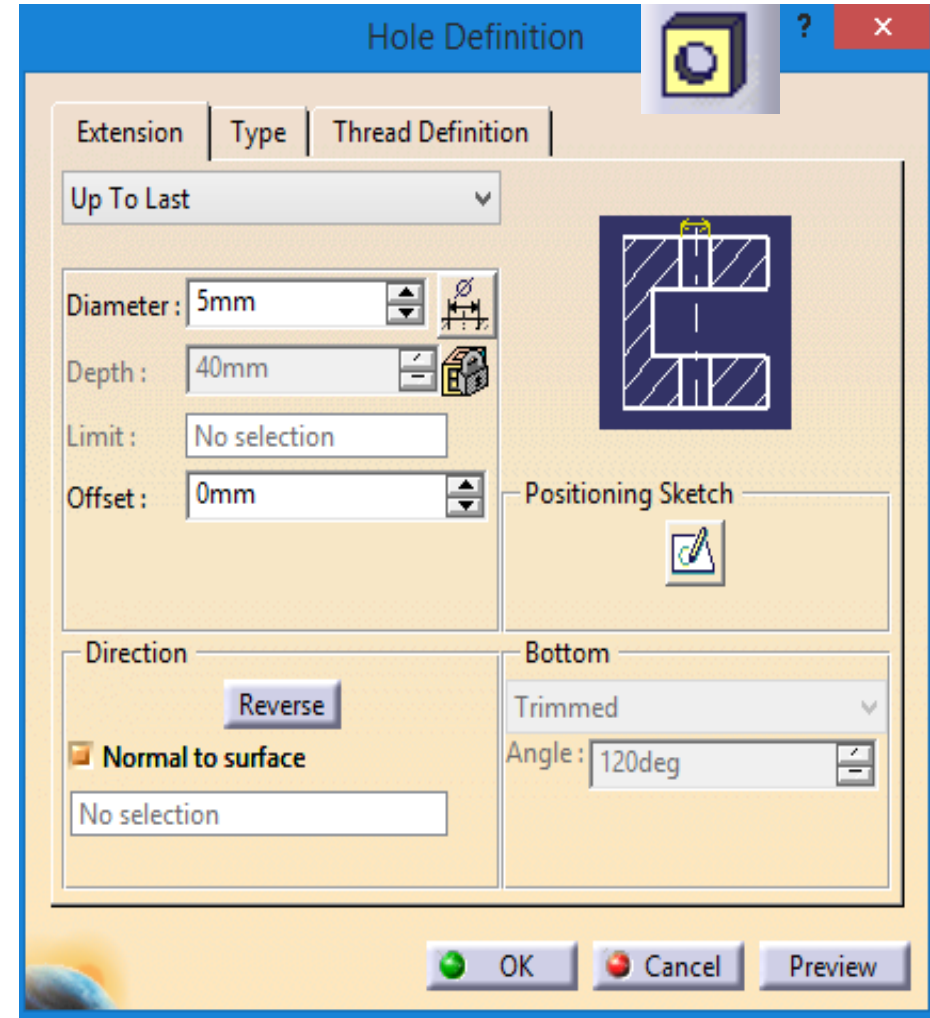
Multiple Holes Creation – Part Design



Create one (1) point on the top surface in **SKETCH** workbench

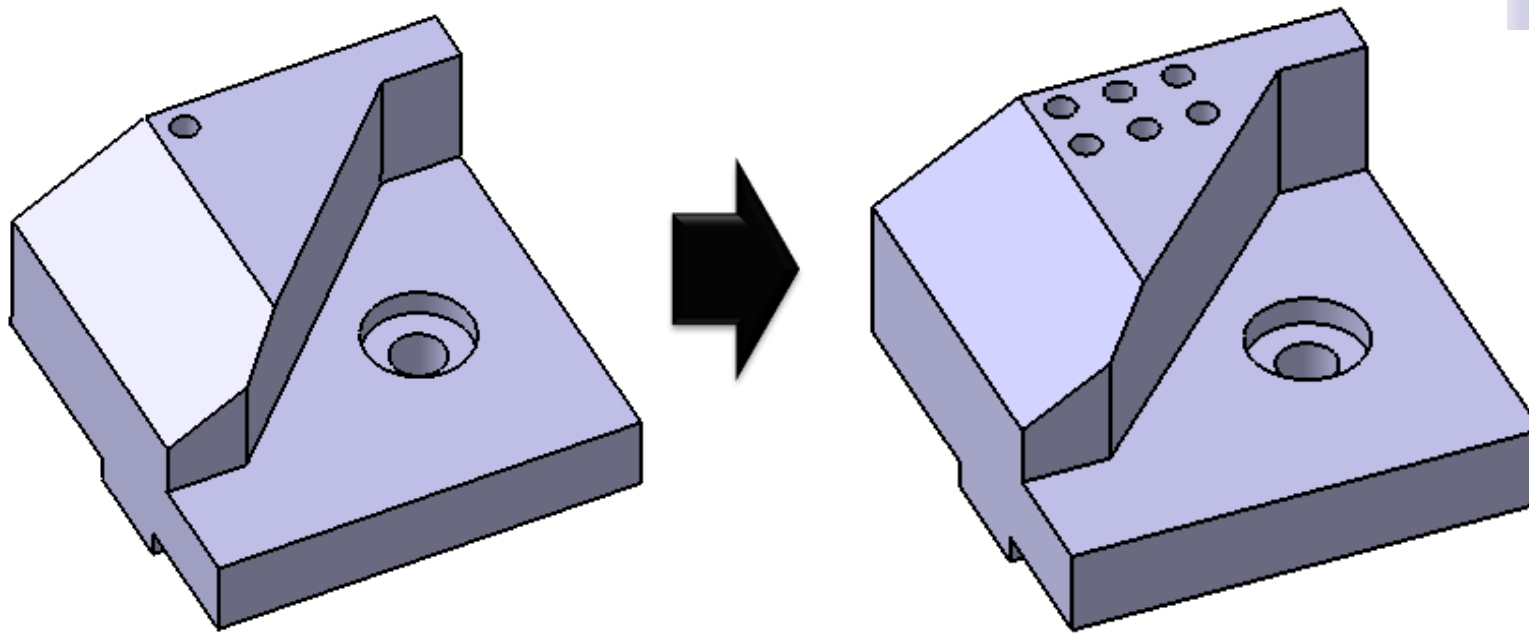


Use **HOLE DEFINITION** to create first hole with reference to the point created

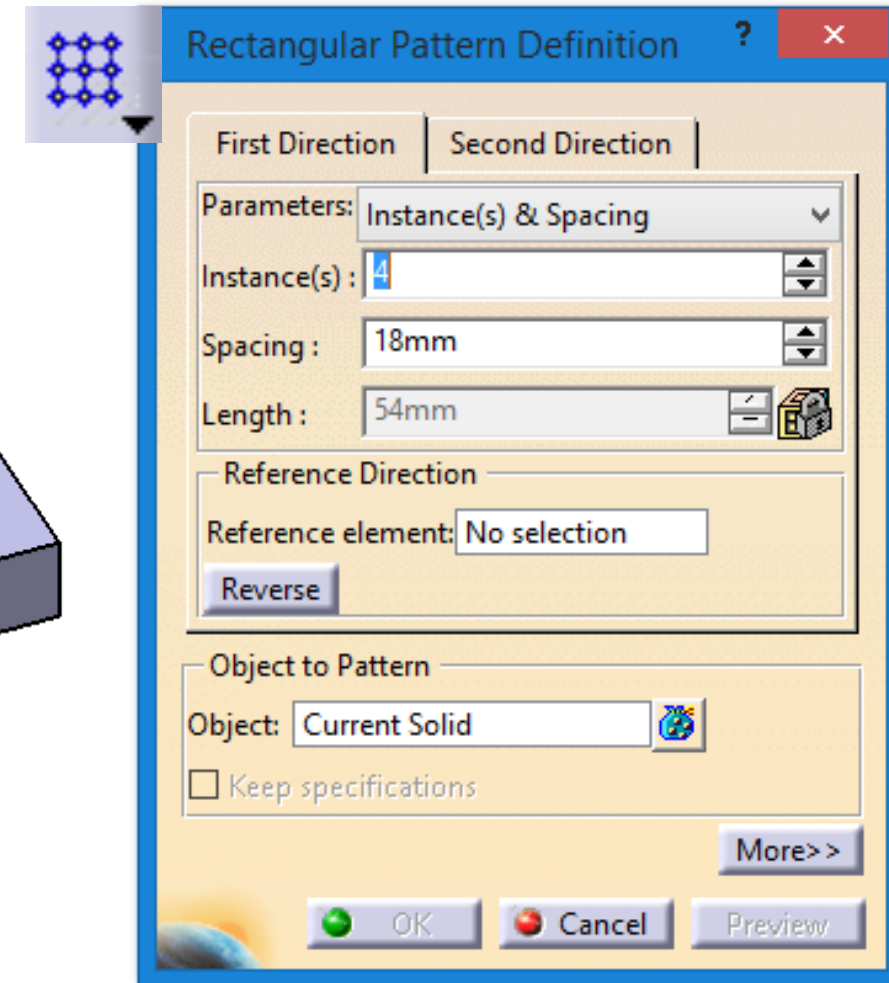


Hole Specifications / Types

Multiple Holes Creation – Part Design

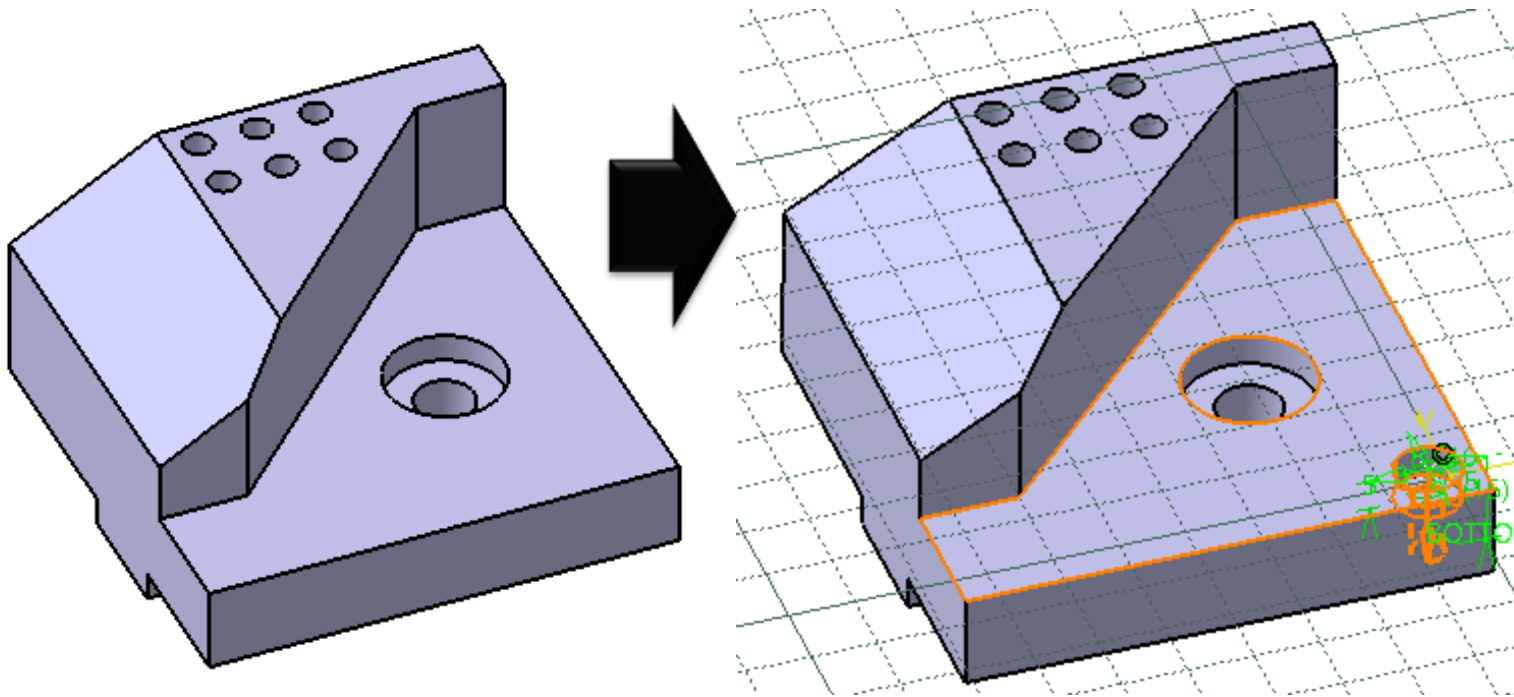


Select the created hole to create multiple holes. Use **RECTANGULAR PATTERN DEFINITION**.

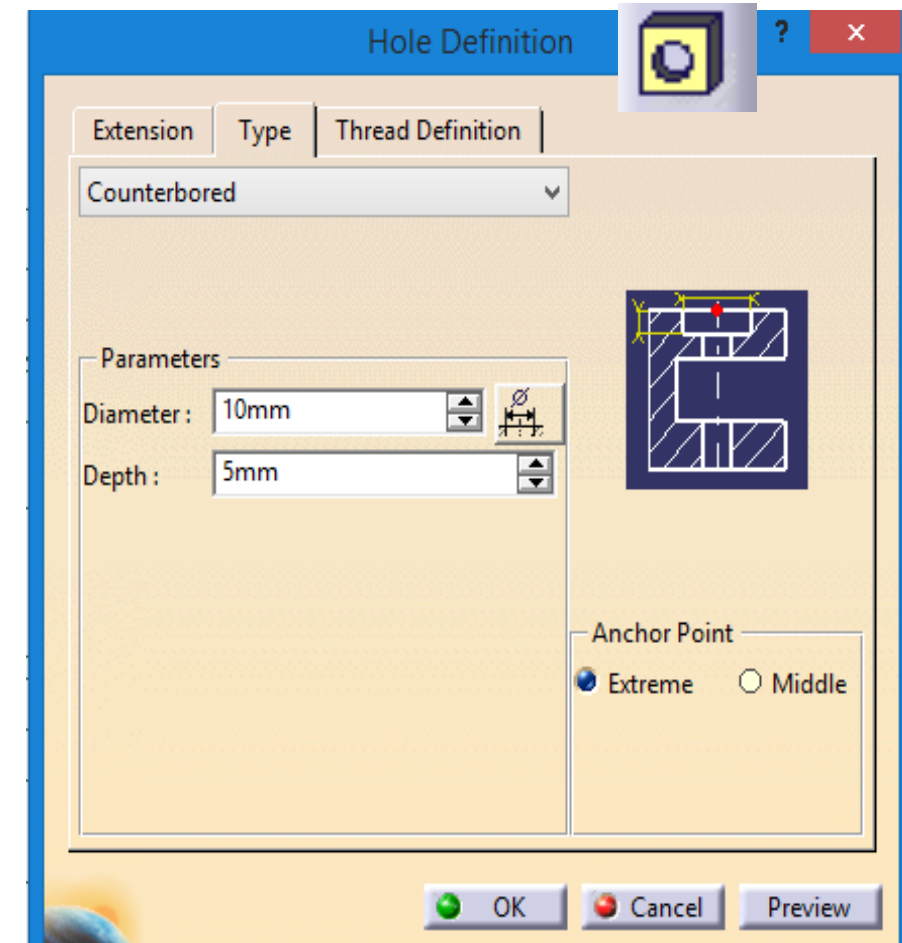


Pattern specification can be defined as shown above

Multiple Holes Creation – Part Design

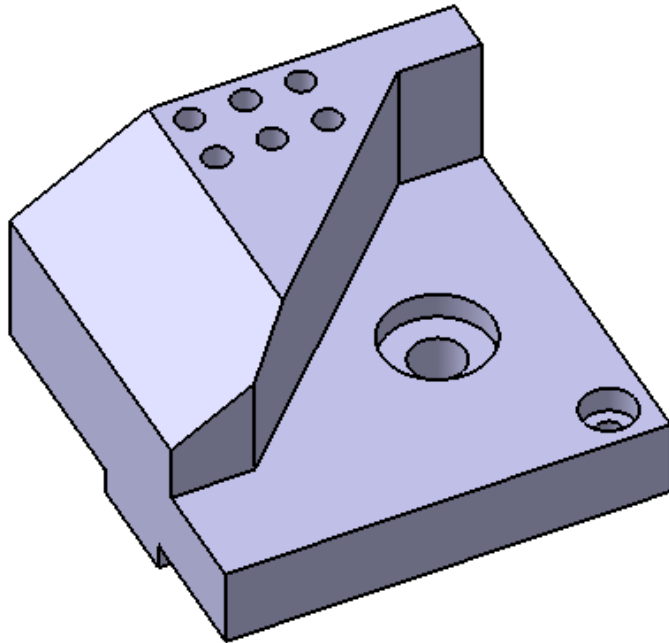


Create another hole with different specification – **Counterbored**

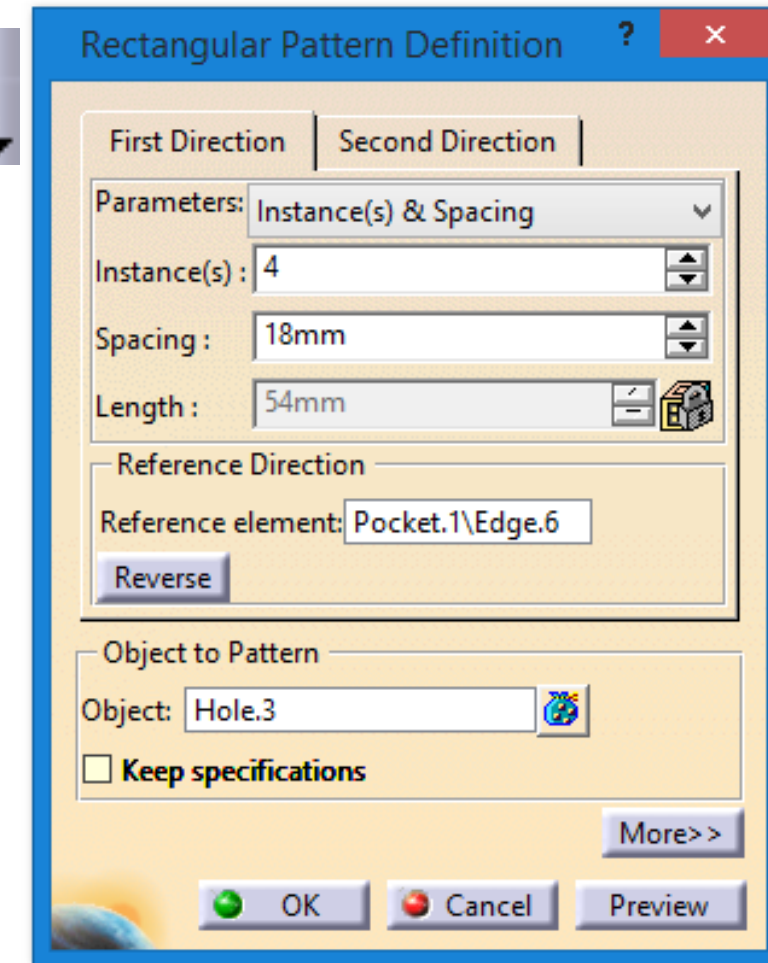
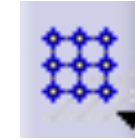
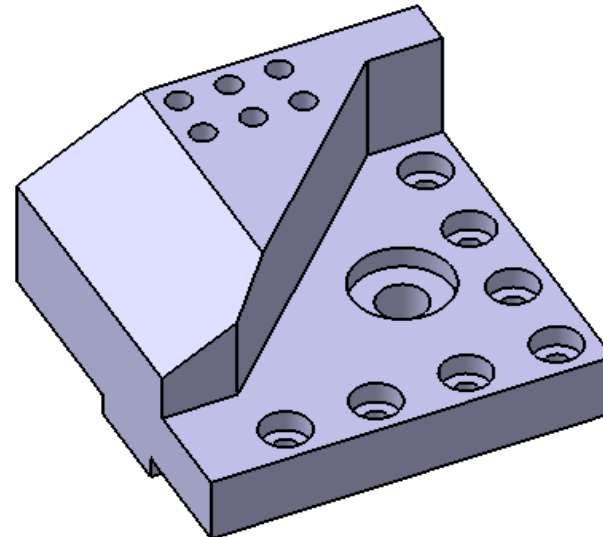
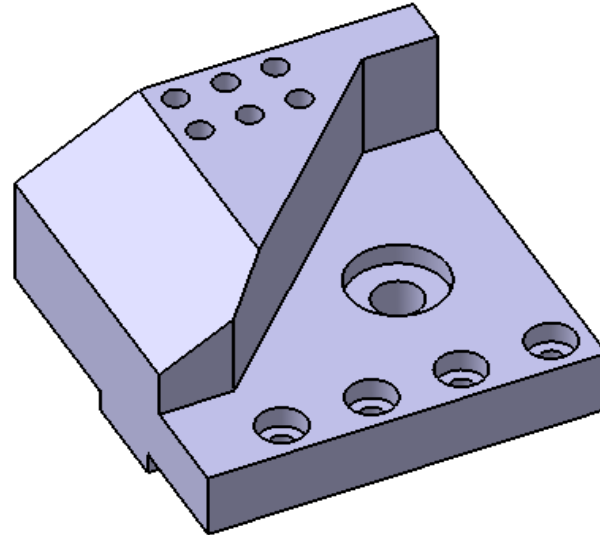


Counterbored Hole Specification

Multiple Holes Creation – Part Design

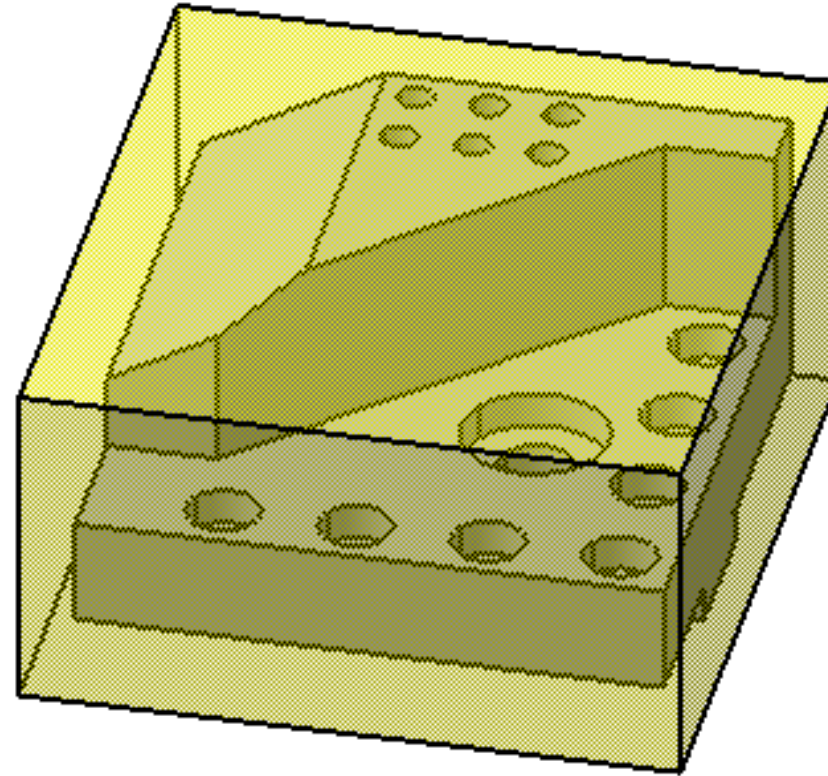


Create **Multiple COUNTERBORED Holes** using the same definition with different approach



Pattern Specification with Second Direction defined

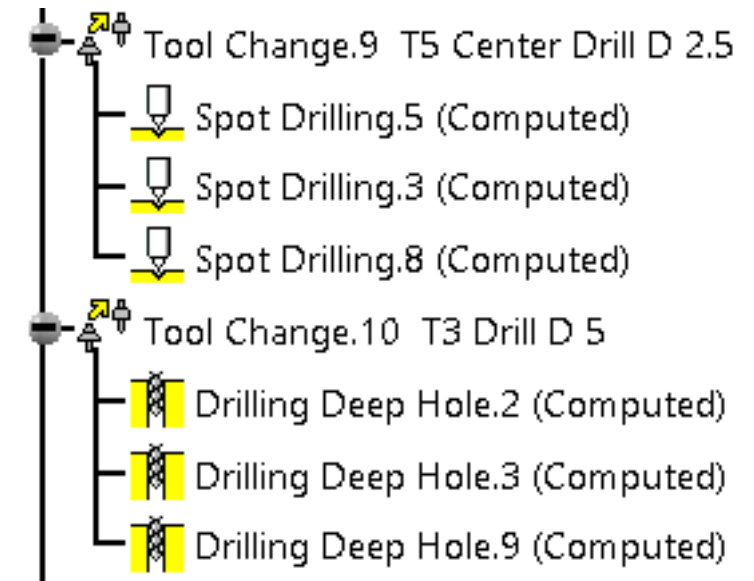
Multiple Holes Creation – Part Design



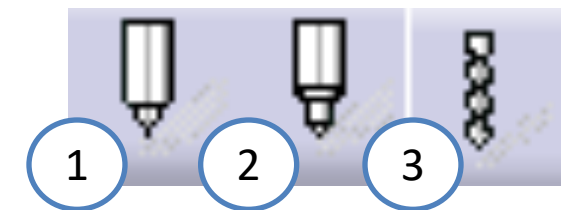
Multiple Holes CAD Model ready for machining programming – Drilling Process

Multiple Holes Machining Process - Drilling

- Standard of **Drilling Process** always begin with **Spot Drill / Center Drill**.
- The use of Spot or Center Drill is **to prepare such a mark or also known as Pilot Hole**.
- **Tip / slip of cutting tool** which can cause of broken tool could also be avoided with the present of this Pilot Hole.
- Once the Pilot Hole ready then the actual diameter of desired hole's size can start to do the machining process.



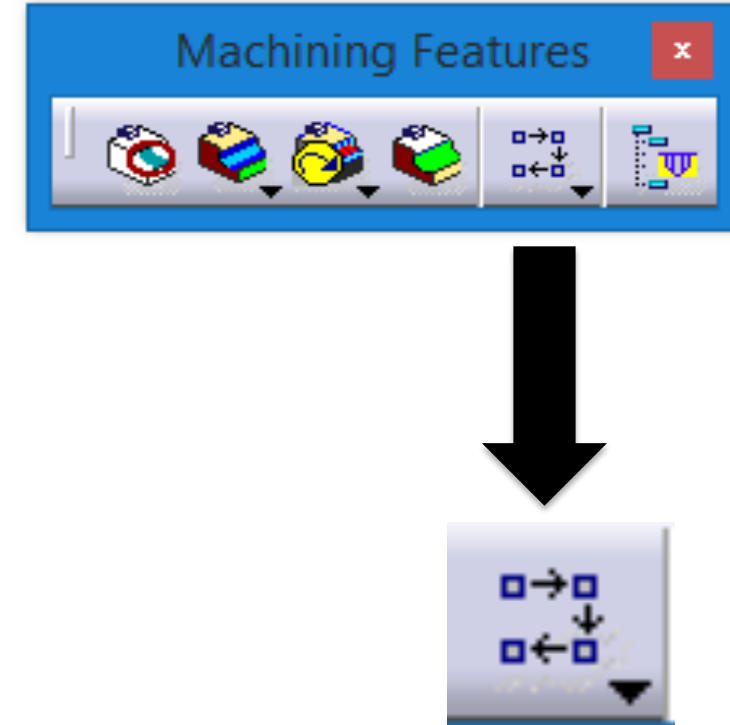
Specification TREE shows **Cutting Tools for Drilling Process** created & inserted



1. Spot Drill 2. Center Drill 3. Drill

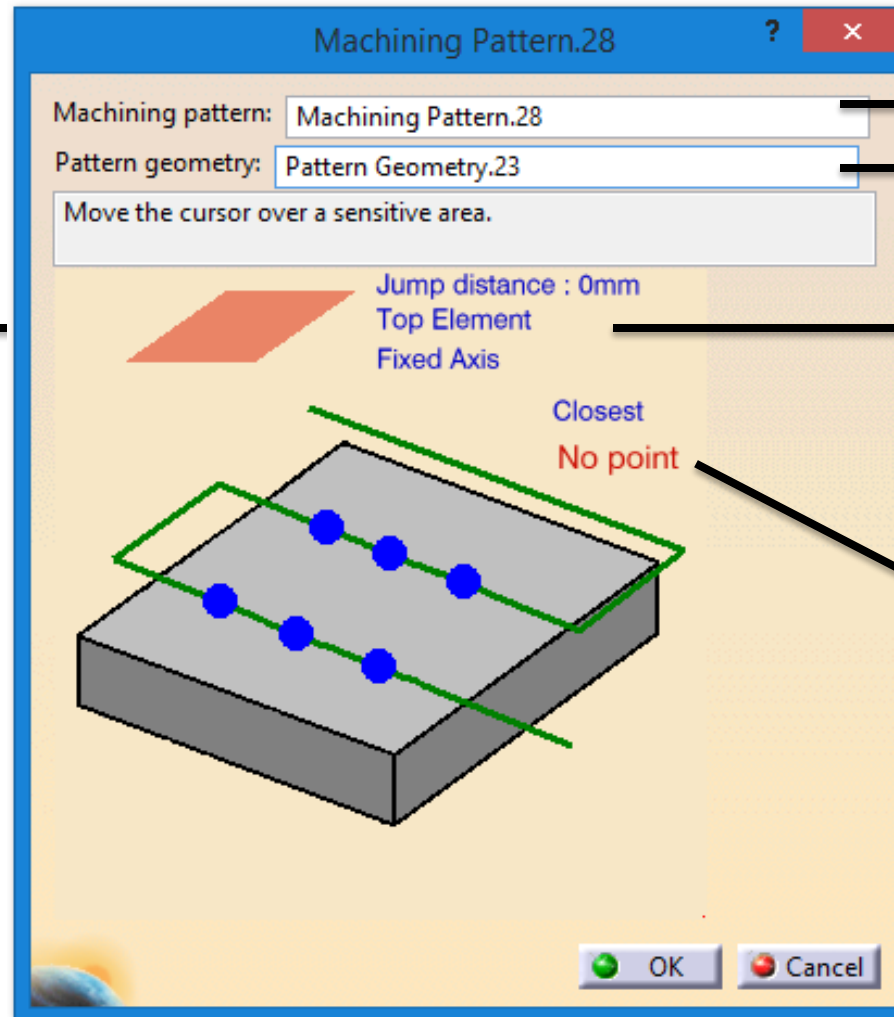
Multiple Holes Machining Process - Drilling

- ☐ The **FASTEST way** to machine / drill Multiple Holes profiles is using **MACHINING PATTERN**
- ☐ **MACHINING PATTERN** can be found in **Machining Features**
- ☐ Prepare **TYPES of PATTERN** first according to the size / variety of holes' specification
- ☐ Once **TYPES of PATTERN** prepared and renamed then **all the created patterns** could be **called back** in any **Drilling Process Definition**



Multiple Holes Machining Process - Drilling

Selection of **Top Surface** to be the reference surface

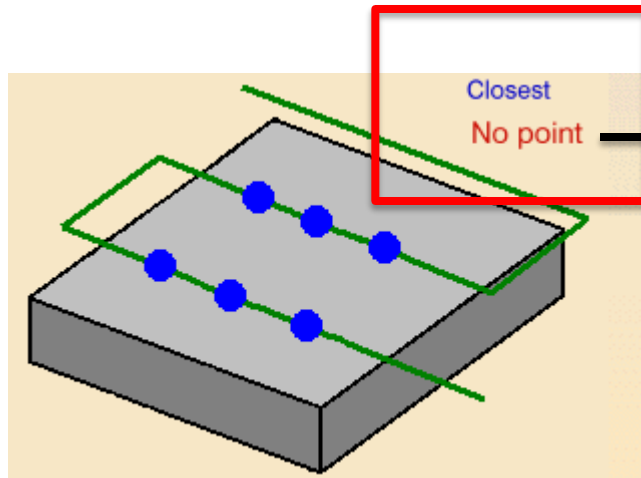


Machining Pattern and **Pattern Geometry** need to be renamed accordingly

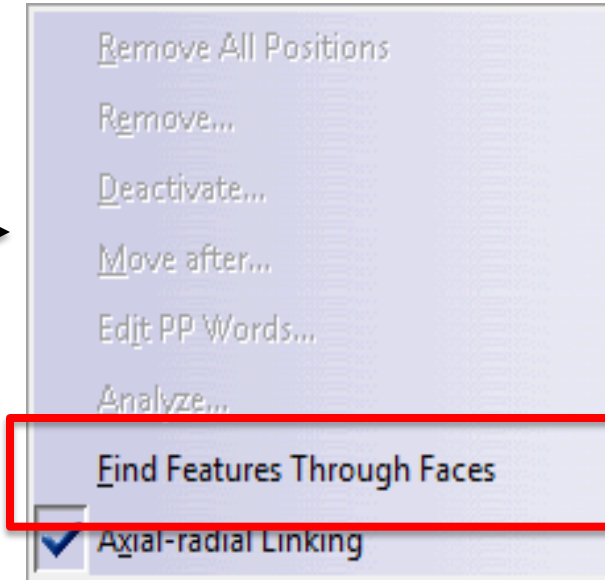
Jump distance : retract motion from one hole to another hole
Top Element : Reference surface
Fixed Axis: For perpendicular to the reference surface

Number of holes selected
 *** Shall be explained further in the next slide

Multiple Holes Machining Process - Drilling



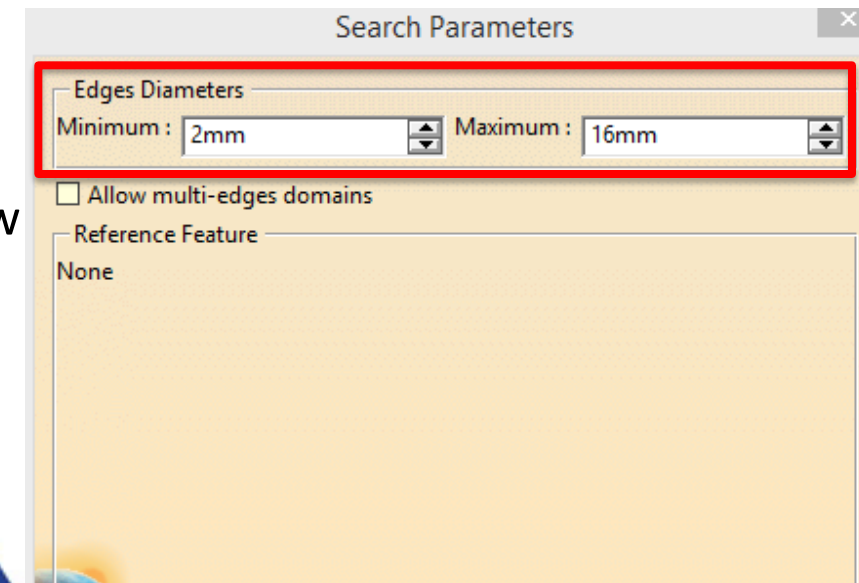
RIGHT CLICK – NO
POINT to see
options given.



Select **Find Features Through Faces**

Flexibility given by CATIA V5 in searching number of holes based on specification defined by user.

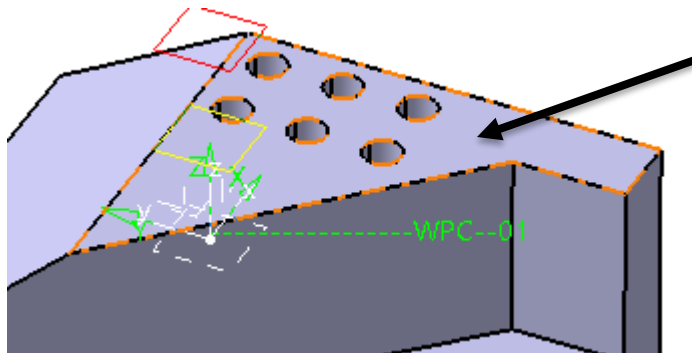
Search Parameter window will pop-up.
Enter **Minimum & Maximum Hole's Diameter**



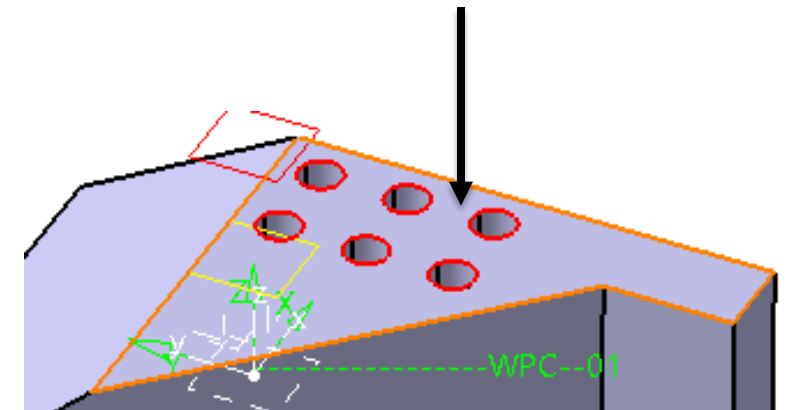
Multiple Holes Machining Process - Drilling



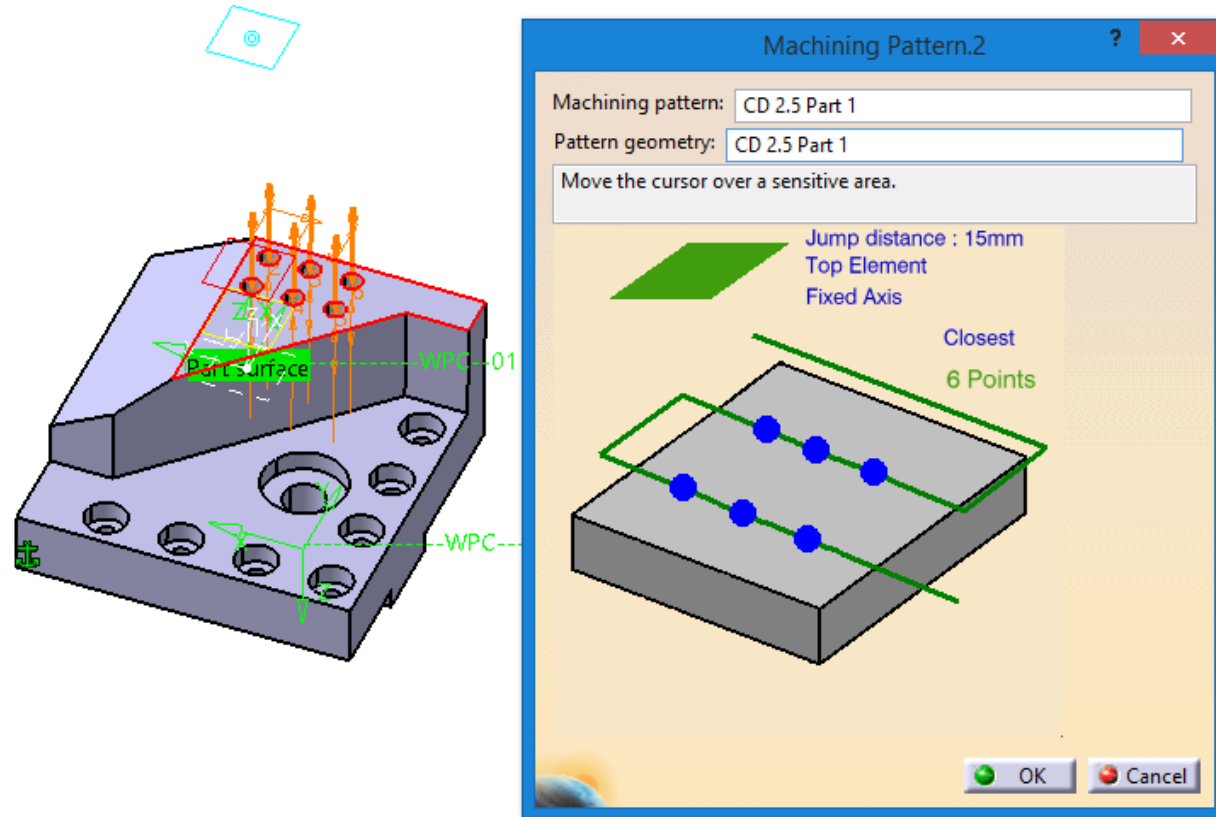
Select **Top Surface** to activate the **BINOCULAR** for searching the desired range of holes specification



Click the **BINOCULAR** and CATIA V5 will search the holes with defined range of diameter highlighted in **RED color**

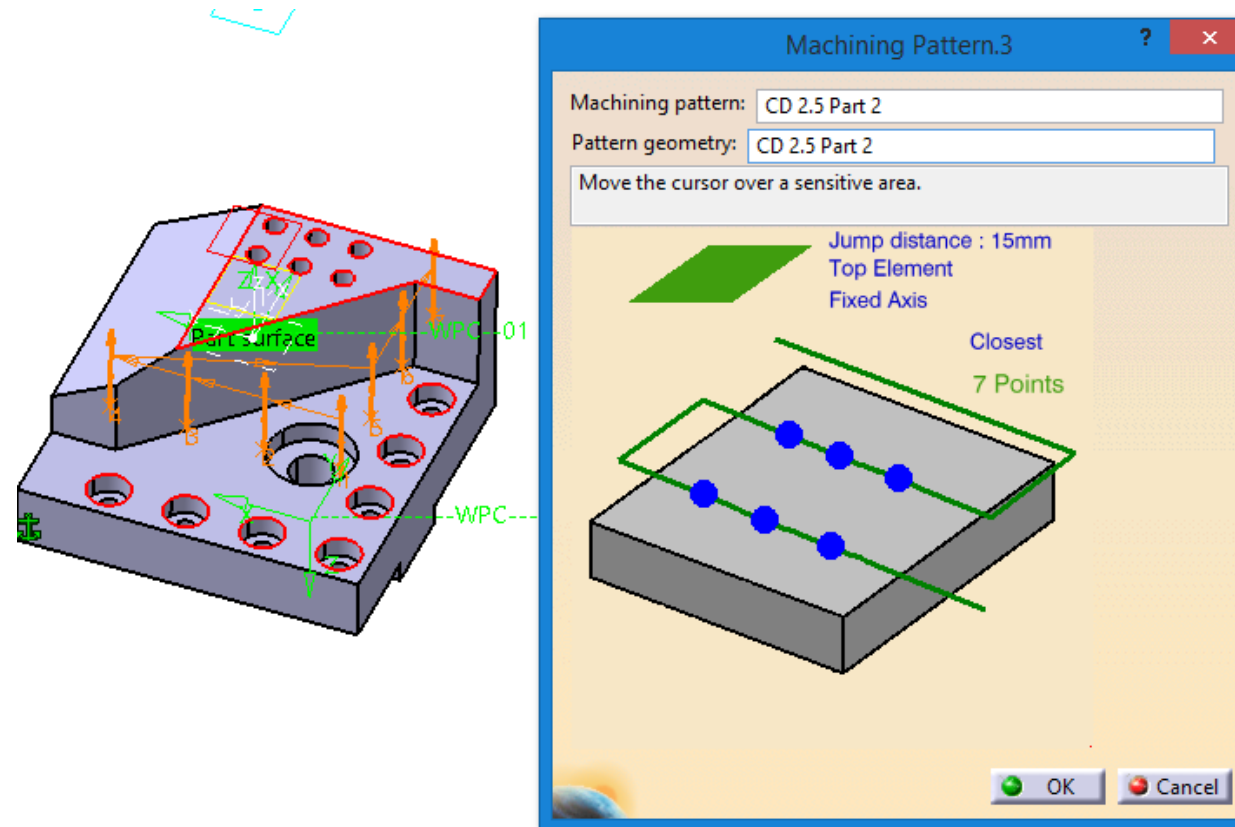


Multiple Holes Machining Process - Drilling



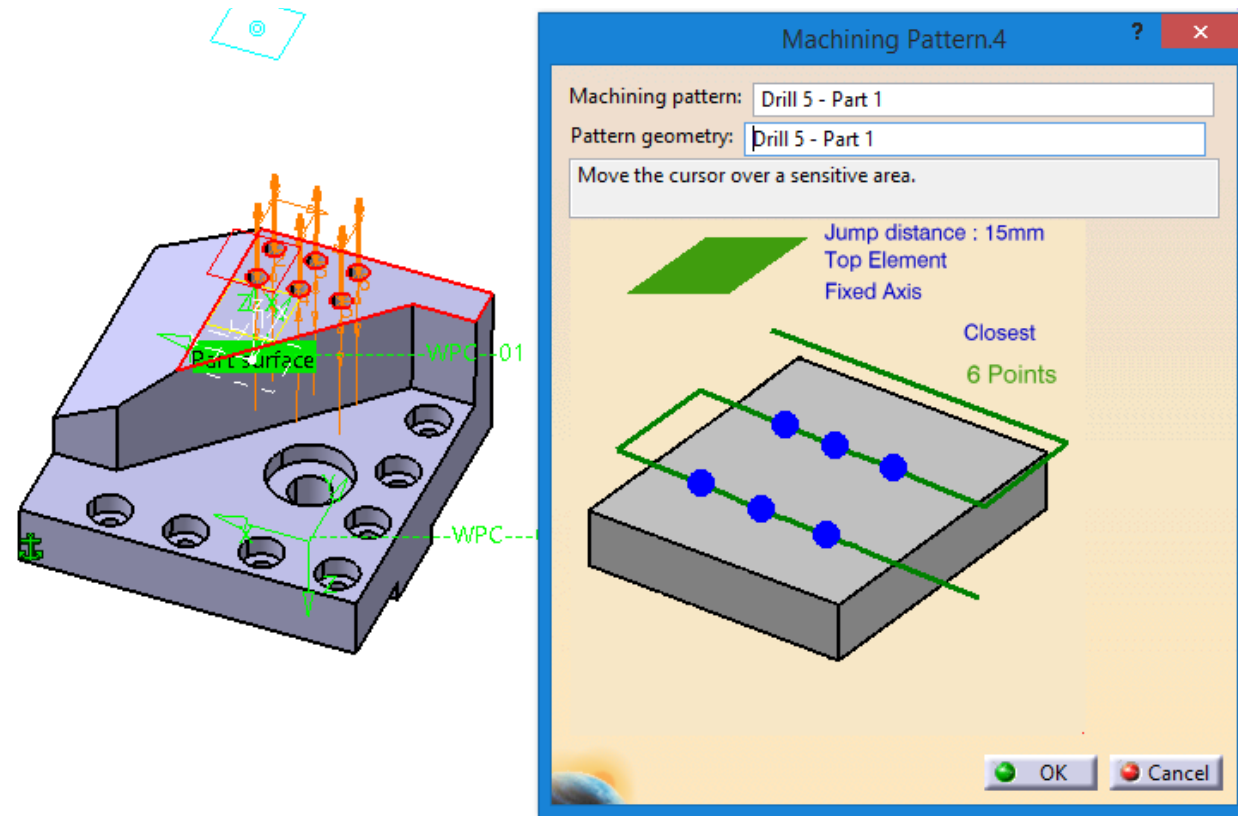
Multiple Holes PATTERNS ready for machining programming –
Center Drilling Process

Multiple Holes Machining Process - Drilling



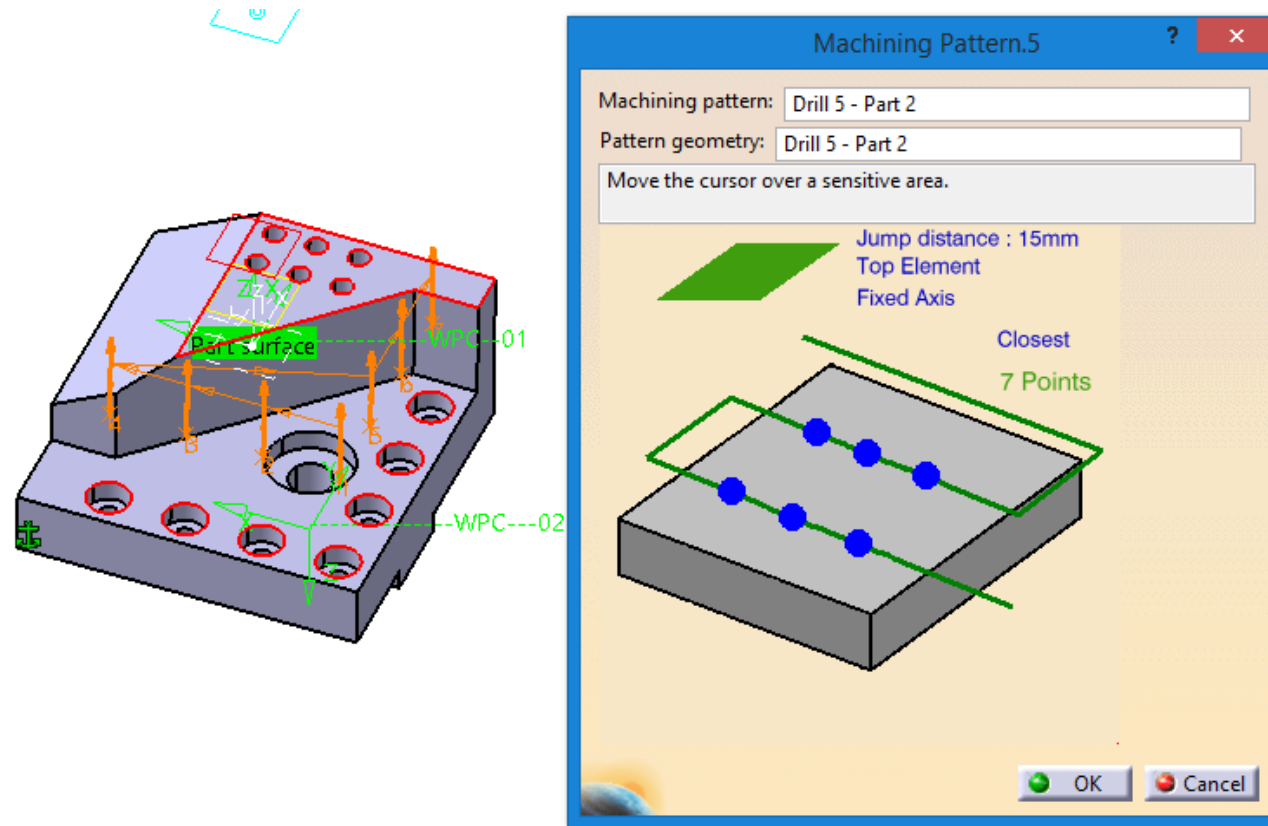
Multiple Holes PATTERNS ready for machining programming –
Center Drilling Process

Multiple Holes Machining Process - Drilling



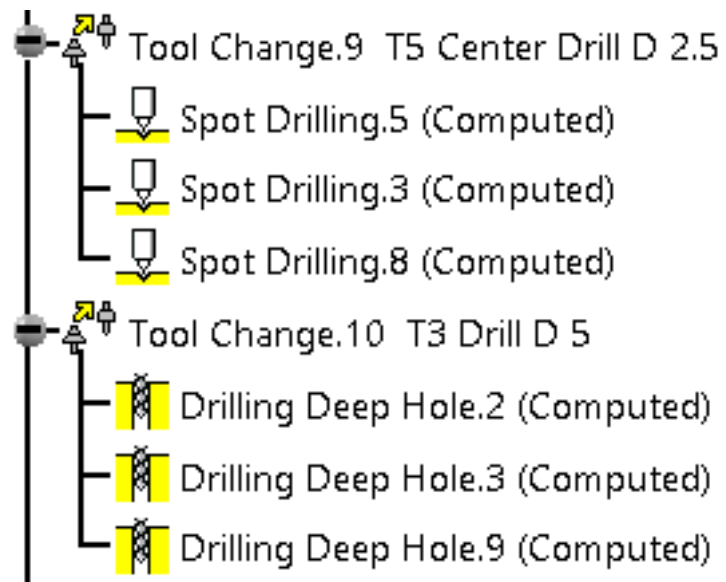
**Multiple Holes PATTERNS ready for machining programming –
Drilling D-5mm Process**

Multiple Holes Machining Process - Drilling

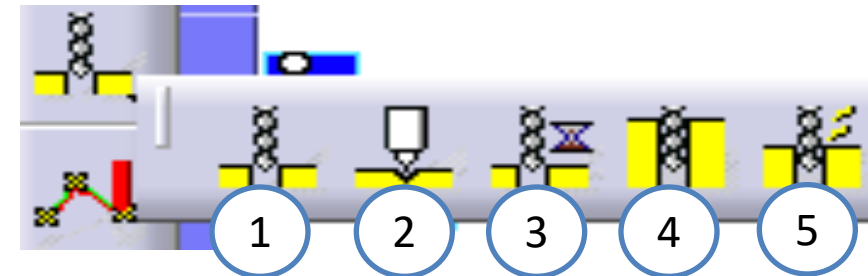


Multiple Holes PATTERNS ready for machining programming –
Drilling D-5mm Process

Multiple Holes Machining Process - Drilling

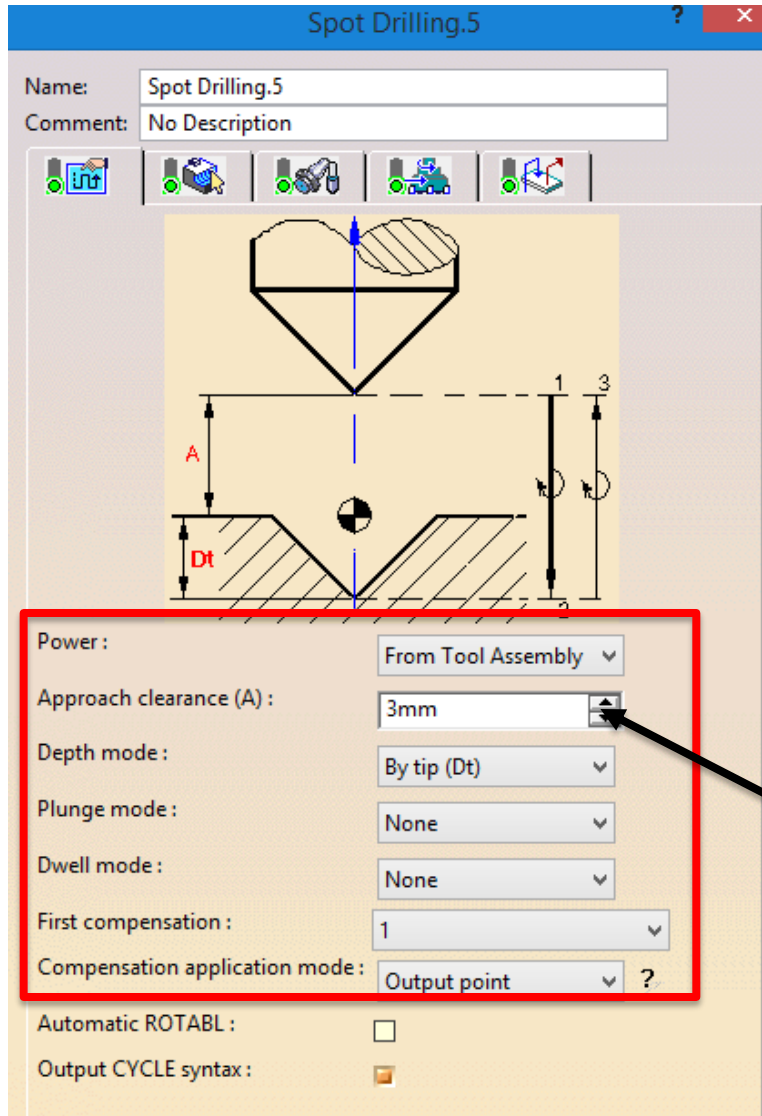


Specification TREE shows created & inserted
Cutting Tools for Drilling Process



1. Drilling Process (G82)
2. Center Drill / Spot Drill (G81)
3. Drilling Dwell Delay
4. Drilling Deep Hole (G83)
5. Drilling Break Chips

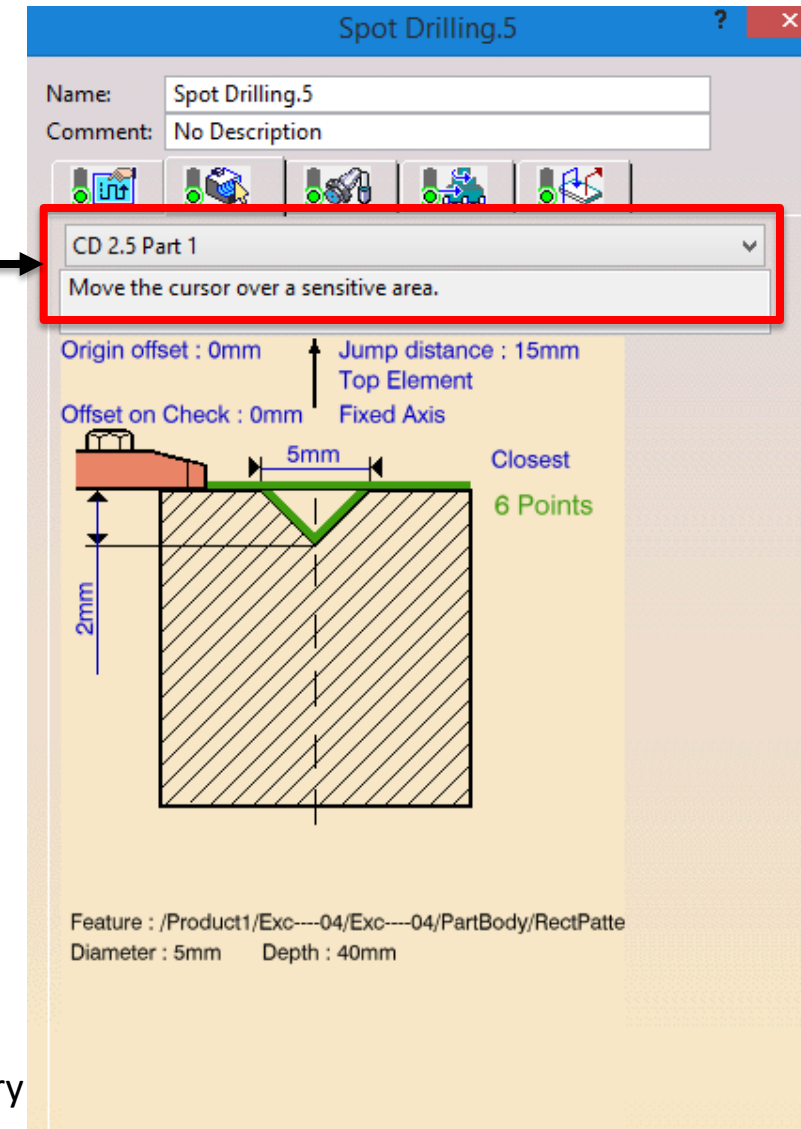
Multiple Holes Machining Process - Drilling



Approach Clearance:
Distance before tip of cutting tool reach the workpiece

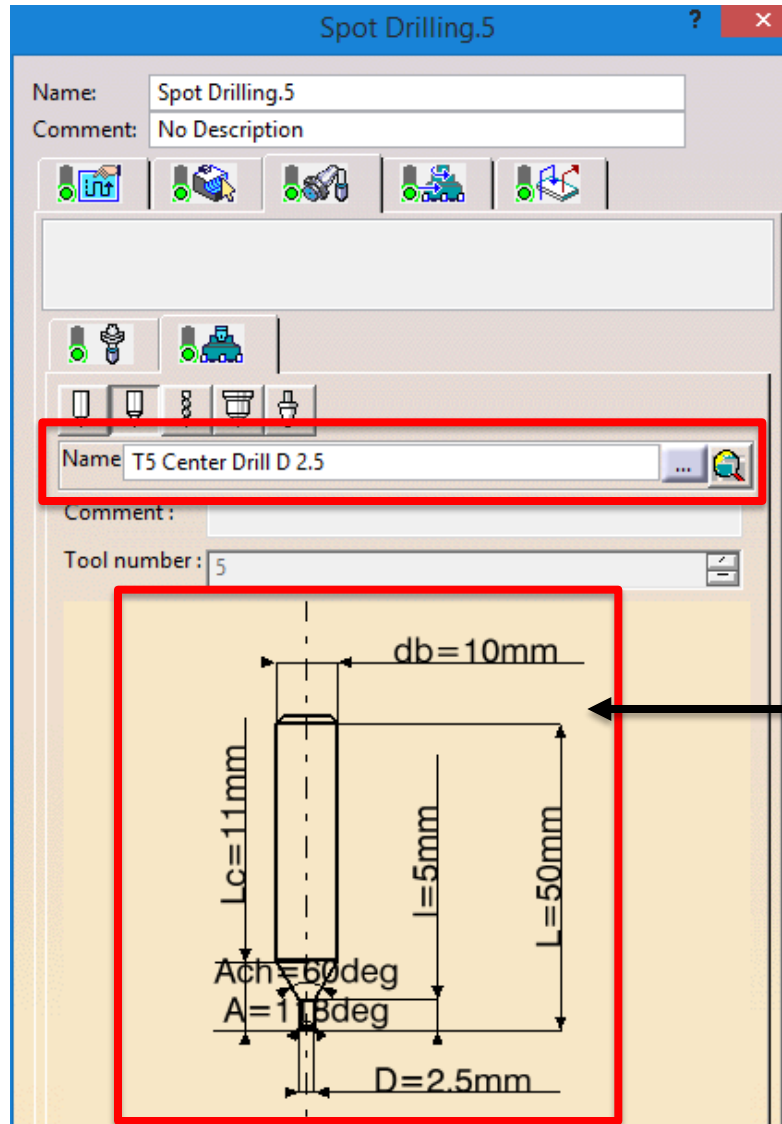
Pg.1: Machining Strategy

Change to the Created Pattern.
All details defined whilst creating the pattern will be called back together



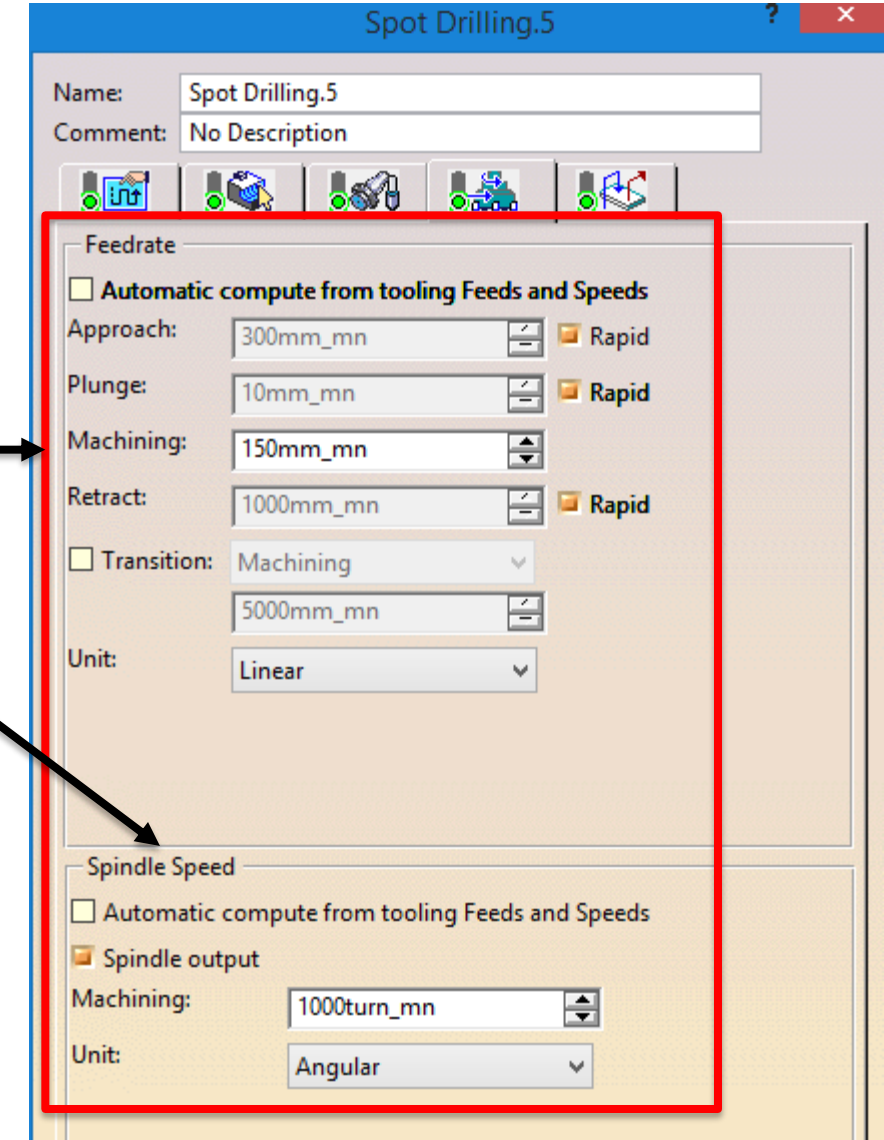
Pg.2: Geometry

Multiple Holes Machining Process - Drilling



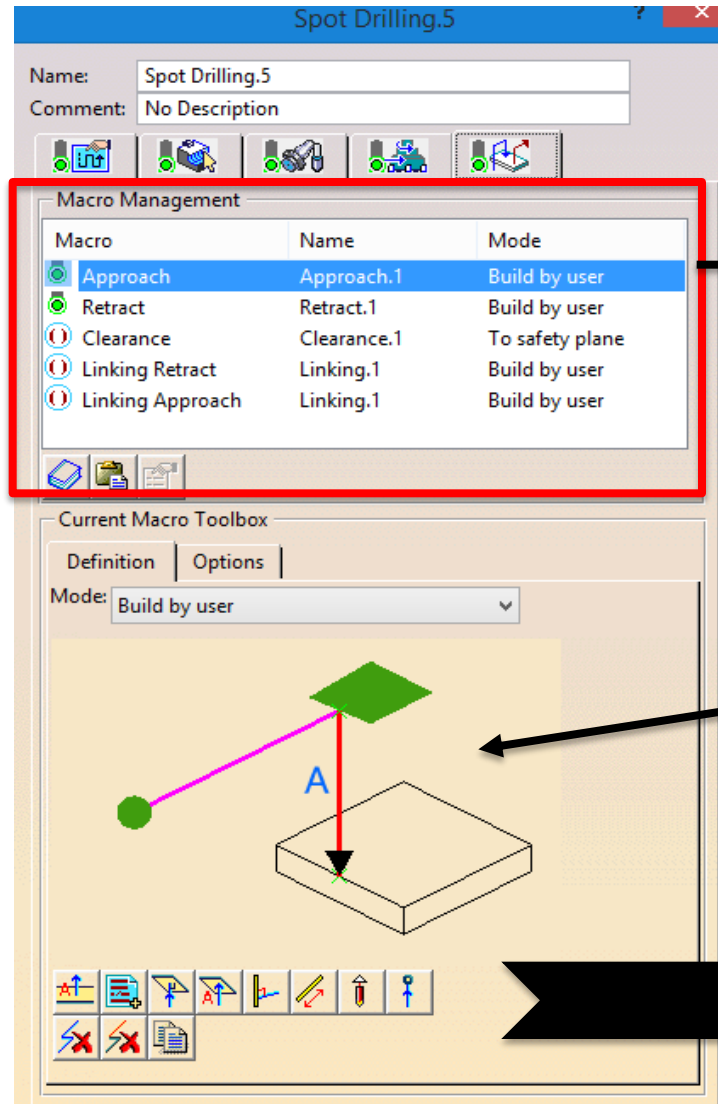
Pg.3: Cutting Tool Details

Define Machining
Parameters
Feed Rate
Spindle Speed



Pg.4: Machining Parameters

Multiple Holes Machining Process - Drilling



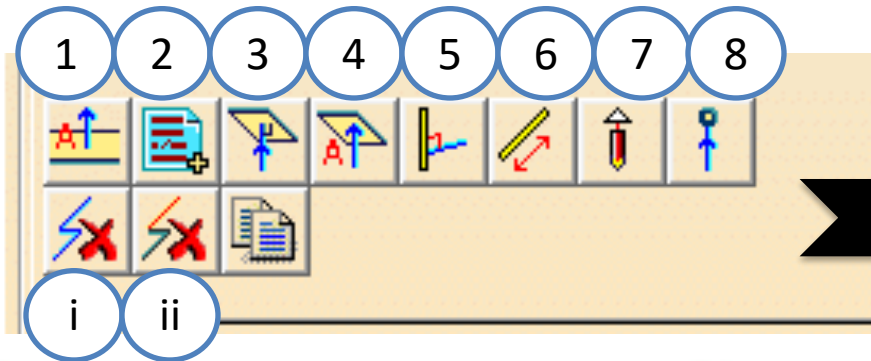
Pg.5: MACRO Settings

Activate
Save

Right Click to **ACTIVATE** any desired Macro motion

For **DRILLING Process** only
Approach and **Retract** Macro need to be activated

Macro motion involve usually **Axial Motion UP** and **Motion to Point** as shown



Macros Definition:

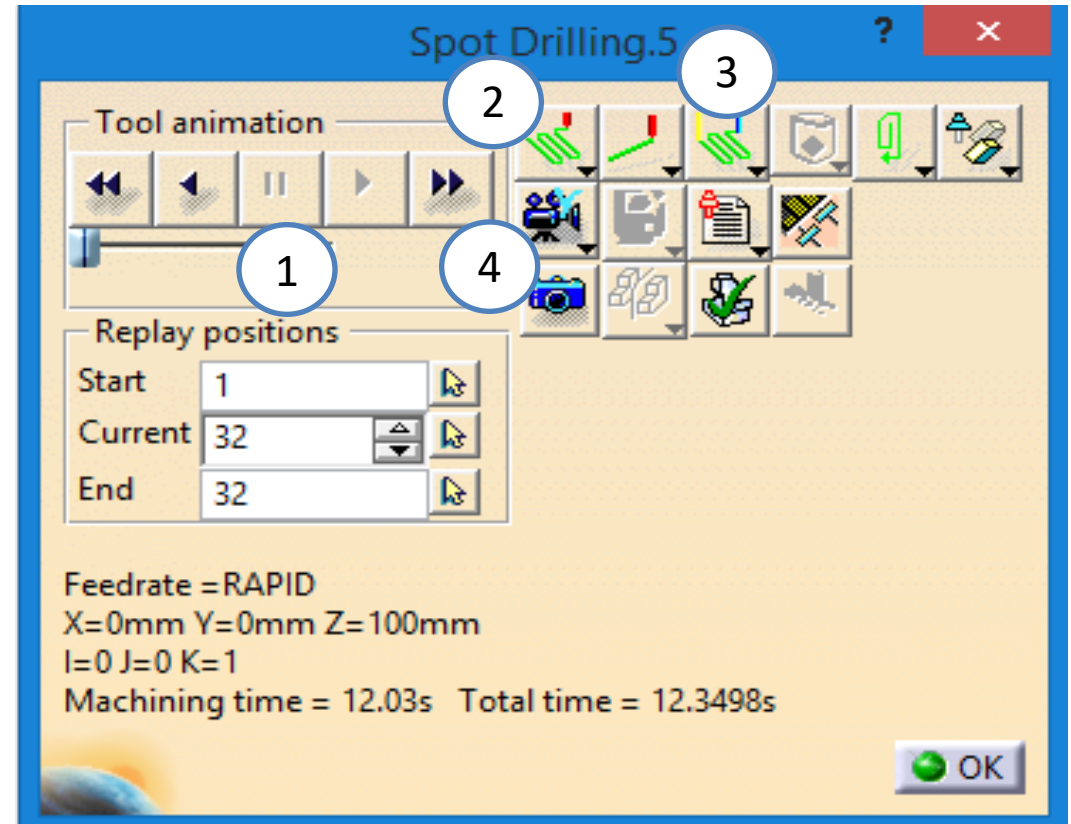
1. Axial Motion
2. Add PP word
3. Perpendicular Motion
4. Axial Motion UP
5. Motion to LINE
6. Distance along LINE
7. Tool Axis
8. Motion to POINT

- i. Delete respected macro
- ii. Delete ALL macros

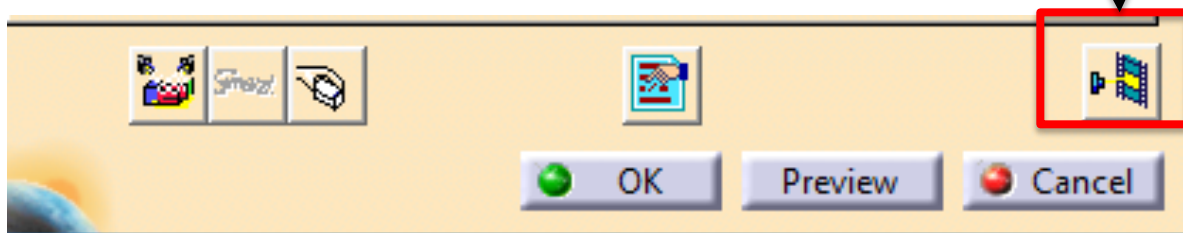
Multiple Holes Machining Process - Drilling

Simulation Editor will pop-up straight away once the **TOOL PATH** calculation done.

Once **ALL FIVE (5) Pages / Tab** settings **done**, click **Tool Path Reply** button to **view the simulation**. CATIA will calculate the **TOOL PATH** referring to all settings defined by user.



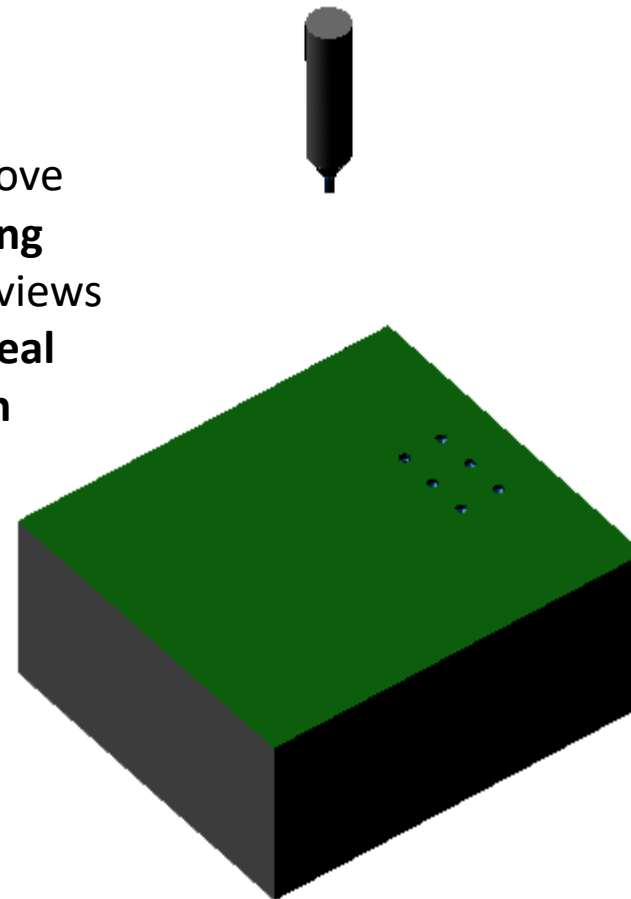
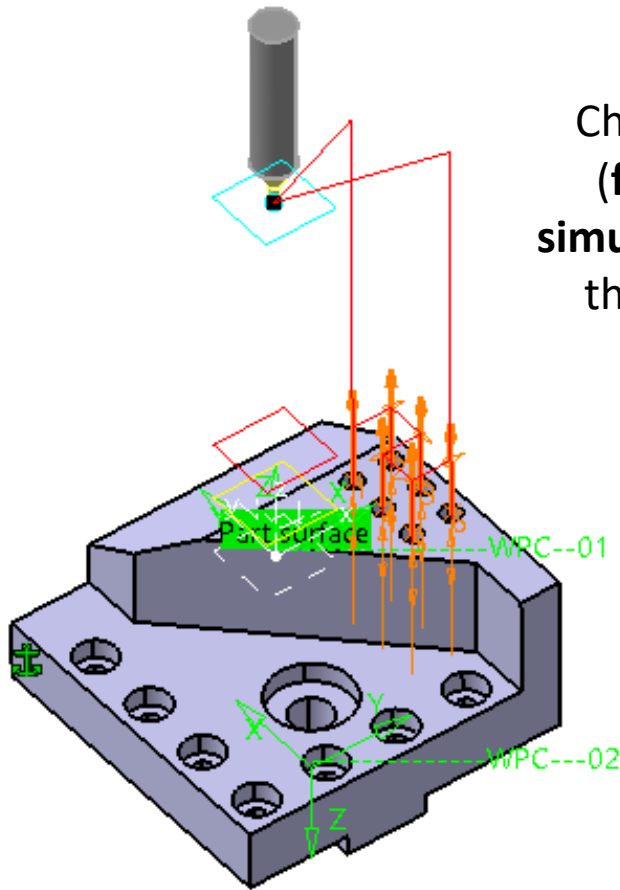
1. Toggles for play/rewind/forward of TOOL PATH simulation
2. Continuous motion of TOOL PATH
3. Visualization of feed rates
4. Full video of cutting simulation



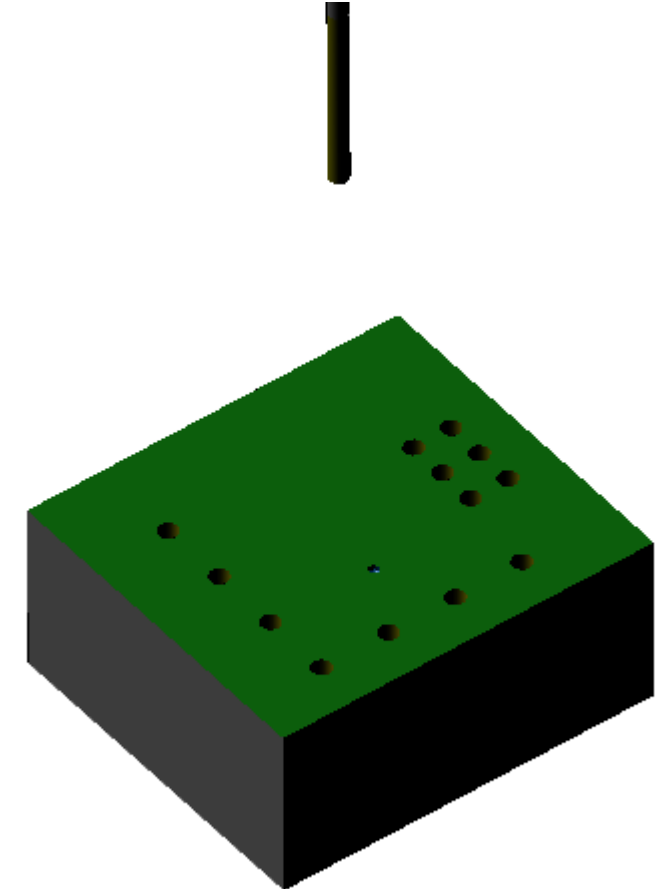
Multiple Holes Machining Process - Drilling



Choose the icon above
(full video of cutting
simulation) user can views
the simulation of real
cutting condition



Center Drill D 3.5 cutting
simulation – end result



Drill D 5.0 cutting simulation
– end result

Multiple Holes Machining Process - Drilling

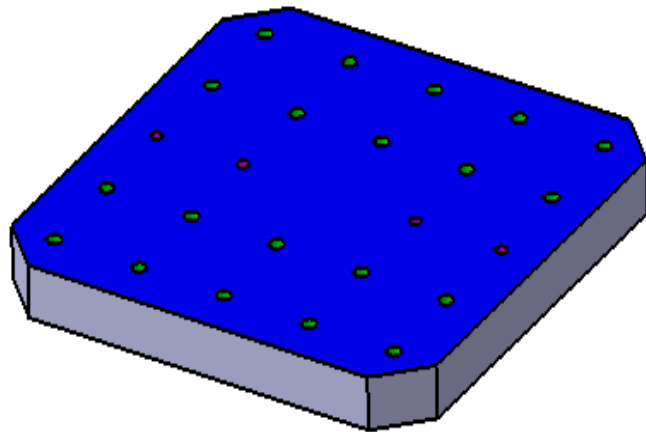


Ultimately, performing **Drilling processes** for **Multiple Holes** although with various holes' specification is much more easier and faster by using **Machining Pattern method**

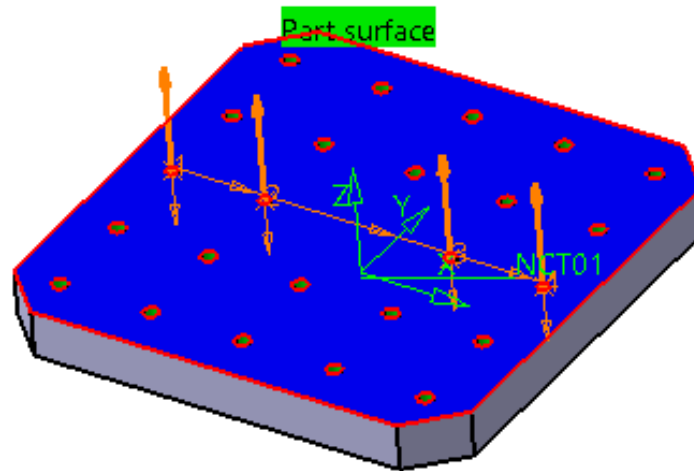
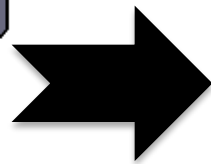


Multiple Holes Machining Process - Drilling

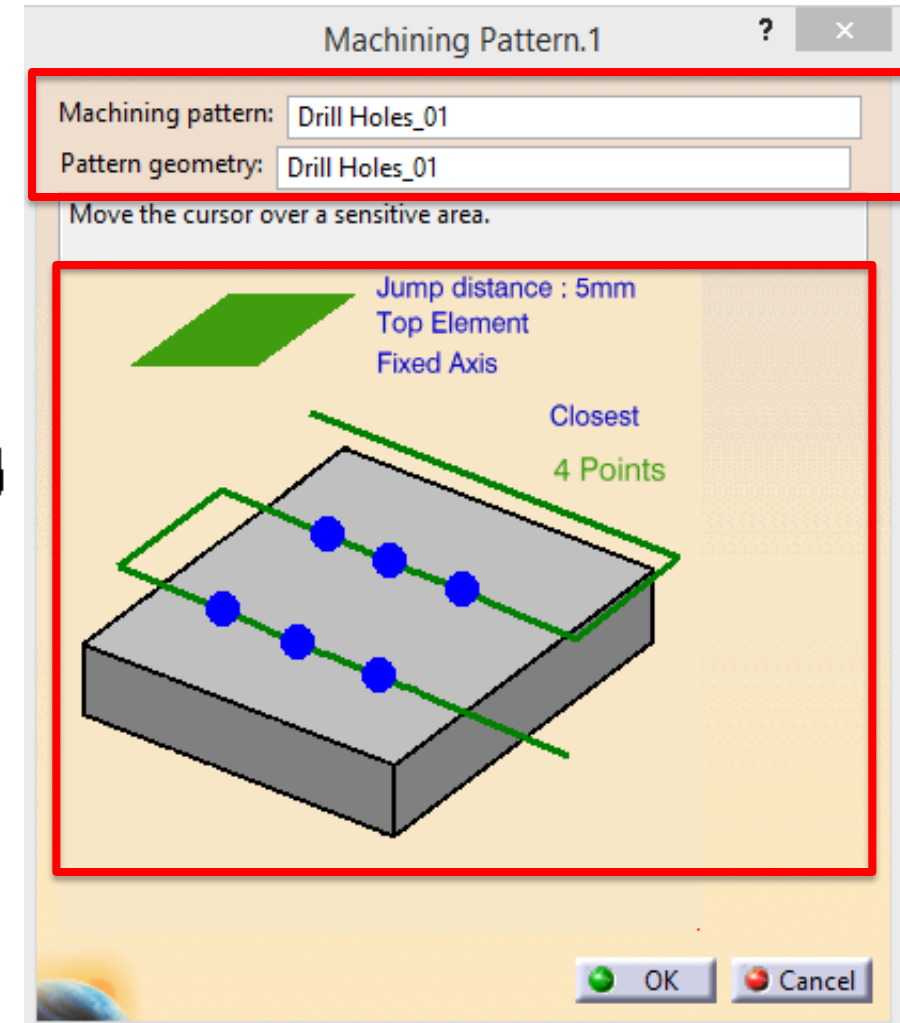
**Exercise 1 : Machine
Table – VRX 630
Size: 500mm x 500mm**



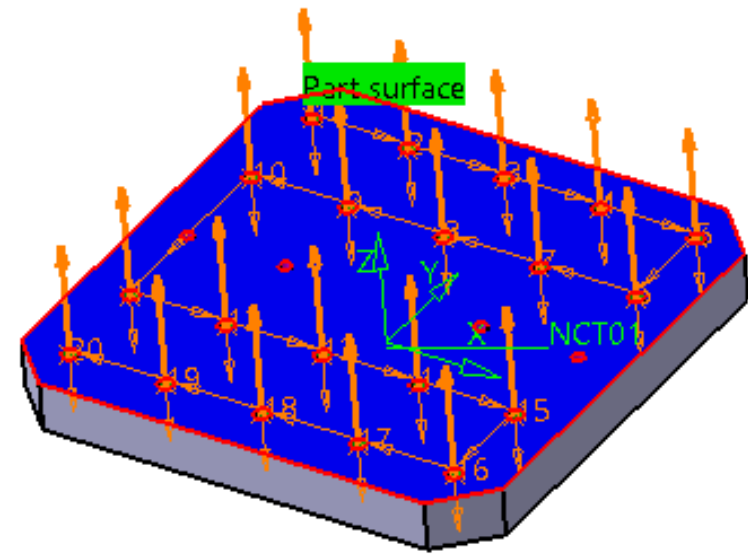
Given CAD Model



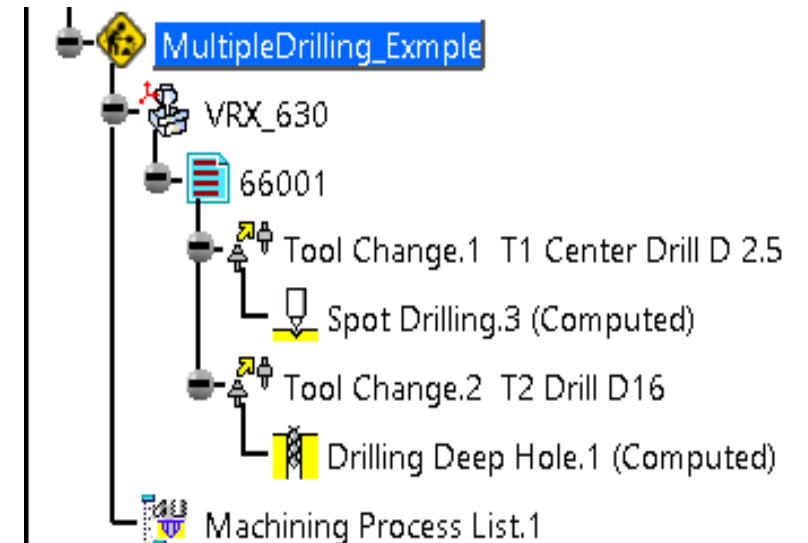
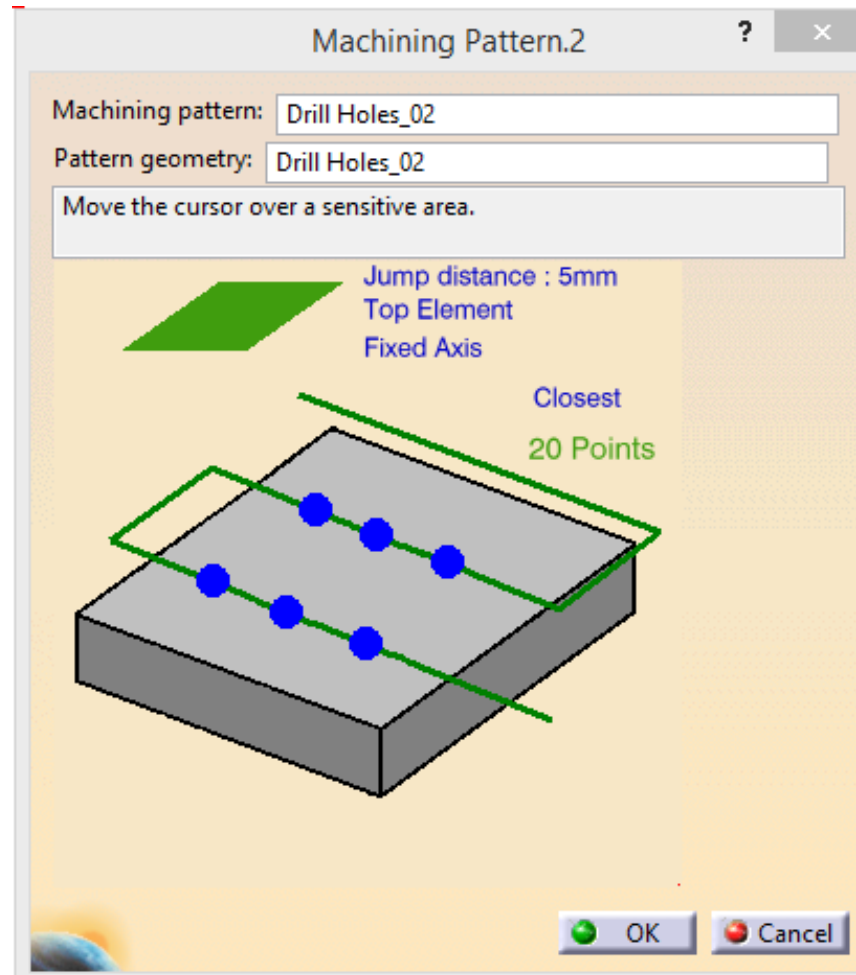
Machining Patter 1 –
For central holes



Multiple Holes Machining Process - Drilling

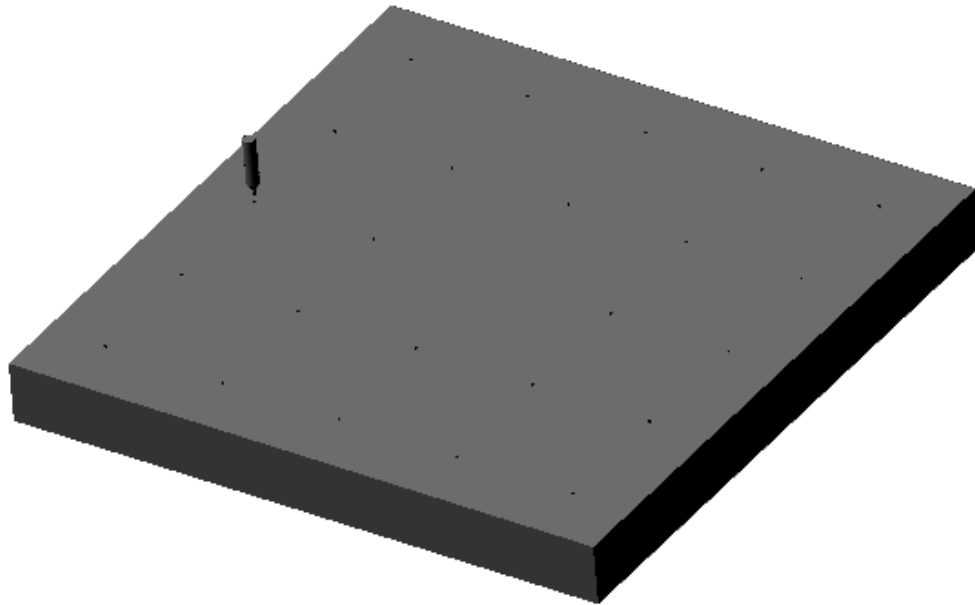


Machining Pattern 2 – The rest of the holes (20 Holes)

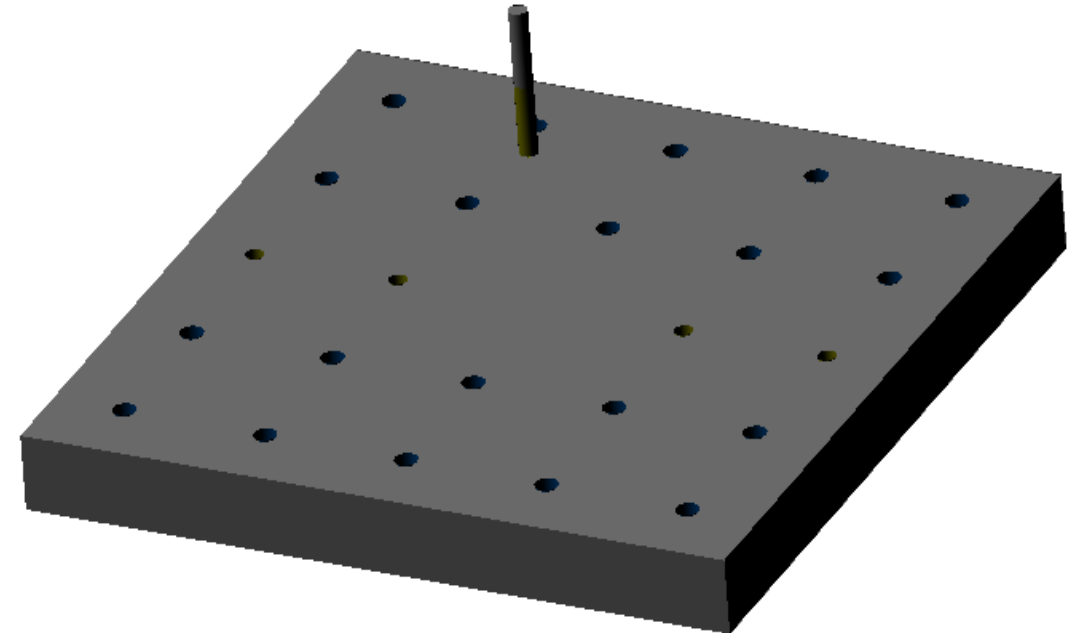


Specification TREE shows created & inserted **Cutting Tools for Drilling Process**

Multiple Holes Machining Process - Drilling



Center Drill D 2.5 cutting
simulation – end result

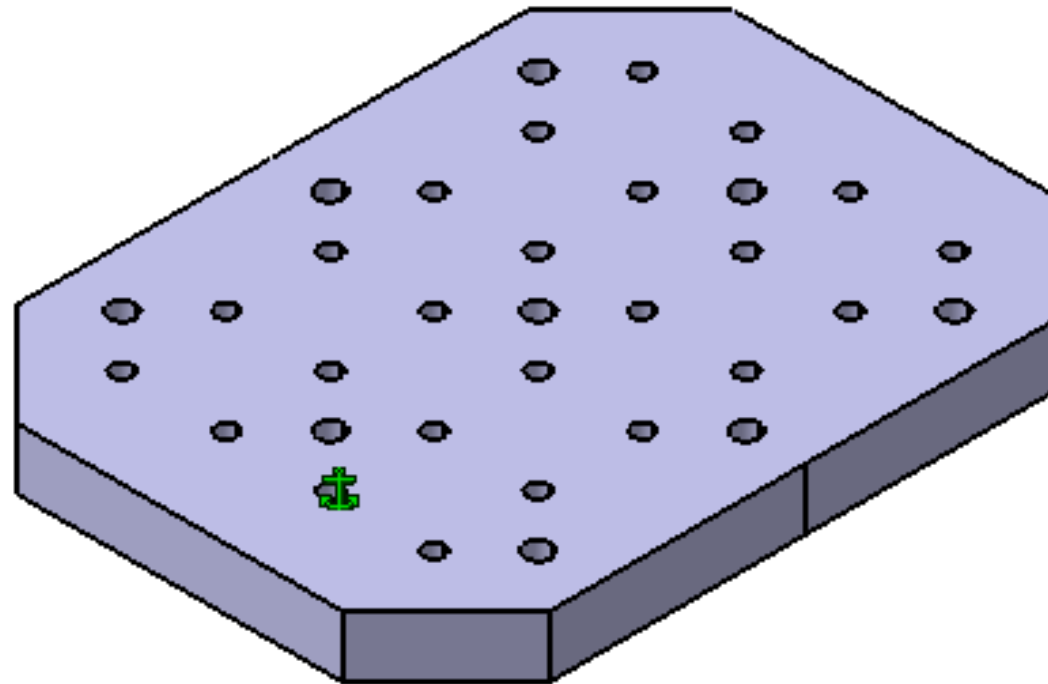


Drill D 16.0& D12.7
simulation – end result

Multiple Holes Machining Process - Drilling

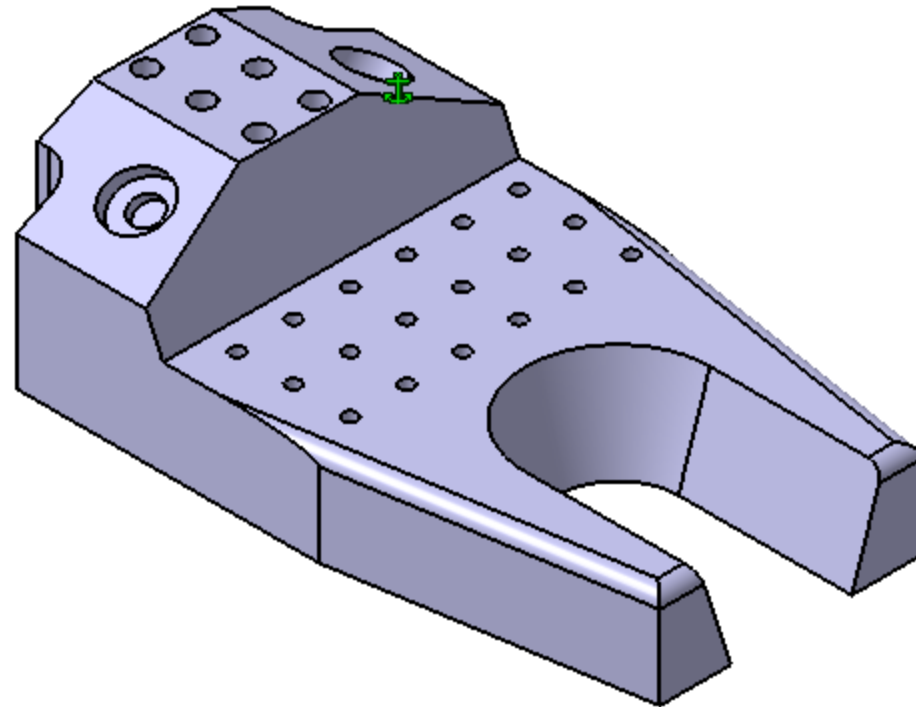
Exercise 2 : Base Plate

Size: 350mm x 260mm



Multiple Holes Machining Process - Drilling

Exercise 3 : Finger Guide
Size: 113mm x 63mm



Multiple Holes Machining Process - Drilling

ALL THE BEST

THANK YOU