

2-Axis Diamond Turning Machine

Diamond Tool Setting and Handling Instructions – Insert type

Operation

1. Once it is decided a diamond-tool needs changing, note the lathe number and the tool life.
2. Remove the used diamond-tool from lathe and immediately re-pack into its Sleigh and tube. Make a note of the cutting height (this will be used later).
3. Clean the toolholder carefully, using a stiff brush and/or air blast, ensuring all debris is removed from the socket.
4. Take the new diamond-tool to be fitted and remove it from it's packing. This can easily be done by gently squeezing the tube parallel to the diamond-tool Sleigh. The Sleigh will then gently slide out of the tube.
5. Whilst keeping the diamond-tool in the Sleigh, remove the fixing screw. Insert the 'handling bat' (see photo) into the screw hole and carefully position the diamond-tool into it's toolholder.
6. Whilst holding the diamond-tool in position by the back, remove the 'handling bat' and secure the diamond-tool into position with its fixing screw (see photo).
7. Note the information on the packing tube label.
8. Take the cutting height of the new diamond-tool and compare it with the cutting height of the used diamond-tool (see operation 2). The difference between the two is the amount you have to adjust the toolholder (see note B).
9. Using the DTI (dial test indicator) on the toolholder, adjust to the required new position. This will get the new diamond-tool approximately into the correct cutting-height position. However, it will still require fine adjustment to get the cutting edge exactly on centre (this will be done later operation 12).
10. Fit the tool-set probe to the machine. Ensure the calibration pin and the sapphire probe are both clean (they can be cleaned with a tissue and acetone) and calibrate the tool-set probe.

Comments

Send this information to Contour so it can be added to the tool Data-Base

For any tool that is fitted to the machine, always keep tool-packing Sleigh and tube with the machine.

Periodically check the toolholder condition. They do require replacement when the socket is showing signs of wear. Check the fixing screw also as this can wear.

Do not insert an Allen key other hard object into the tube/Sleigh to force it out, you can damage the cutting edge.

Take great care not to touch the diamond.

Take care not to touch the diamond, particularly with the Allen key.

This information will be used in conjunction with the used diamond-tool information (see operation 2) to initially set the cutting height.

Example: If the used diamond-tool has a cutting height of 3.150mm, and the new tool is 3.039mm then you will need to raise the toolholder by 0.111mm. Ensure the tool-post moves in the correct direction.

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11. Position the probe to the diamond-tool and calibrate the diamond-tool. Reduce the probing of the diamond-tool to the minimum number possible. This probing action can damage the diamond-tool cutting edge (See note C).

As the diamond-tool is approximately on the correct cutting-height the probe will be less likely to damage the tool and will probe more accurately.

12. Fine adjustment for cutting height.
Cut a test convex sphere (see note C) and inspect it under a microscope for correct height. If the height is incorrect you will see the following (see diagram D1).
Diamond-tool too high: Cone shaped centre pip.
Diamond-tool too low: Cylindrical shaped centre pip.

Keep the cutting of the test convex sphere to a minimum. To avoid unnecessary wear to the cutting-edge of the diamond-tool.

13. Measure the centre pip on a microscope and adjust the tool-post by half this measurement. Lower the tool-post if you get a cone shaped centre pip and raise the tool-post if you get a cylindrical shaped centre pip.

14. Cut another test convex sphere and inspect. Repeat this process until the diamond-tool is at the correct height.

If this process is done correctly then you should be able to set the diamond-tool cutting height within two or three passes. This avoids unnecessary tool wear.

15. Once you are satisfied that the tool is set on centre correctly, you can measure the final test convex sphere you have cut for absolute radius size and for true sphericity.

Notes:

- A. Always keep the packing (tube and Sleigh) with the lathe the tool is being used on.
- B. For all the machines, put stickers on the toolholders showing the direction to turn adjusting screws for up and down movement, to adjust the cutting height of the diamond-tool.
- C. To avoid putting too much wear into the apex of the diamond-tool whilst tool-height setting, it would be better to cut a steep convex sphere instead of a flat. This will spread the wear over a greater area of the diamond-tool cutting edge. Also, because you are cutting a CONVEX sphere, if you accidentally allow the diamond-tool to cut past the spindle ϕ the edge will be in free air and therefore less likely to cause damage (see diagram D2). It will also allow, at a later stage, to test for absolute radius size and sphericity.
- D. Ensure the diamond-tool isn't being probed too many times. This is a time when the cutting edge can (and will) get damaged. Always ensure the probe is clean and in good condition. We have seen cutting edge damage due to this operation (see photo). However, we also understand this operation has to be carried out – so take care.
- E. Conical controlled-waviness diamond-tools have a RED mark to the back of the insert.
Cylindrical controlled waviness diamond-tools have a YELLOW mark to the back of the insert.
Non-controlled waviness diamond-tools have NO mark to the back of the insert.
- F. Diamond-tools will occasionally require cleaning (due to plastic and/or wax build up). Always use a clean tissue soaked in acetone or alcohol. First gently hold the soaked tissue against the edge. Then, using a clean soaked tissue, gently wipe around the edge (NOT up or down). Always use a clean soaked tissue for each operation and NEVER use the same tissue for more than one tool (see diagram D3).

Diagram D1: showing how a diamond-tool above ϕ will damage the cutting edge vs. diamond-tool below ϕ if done carefully won't damage the edge.

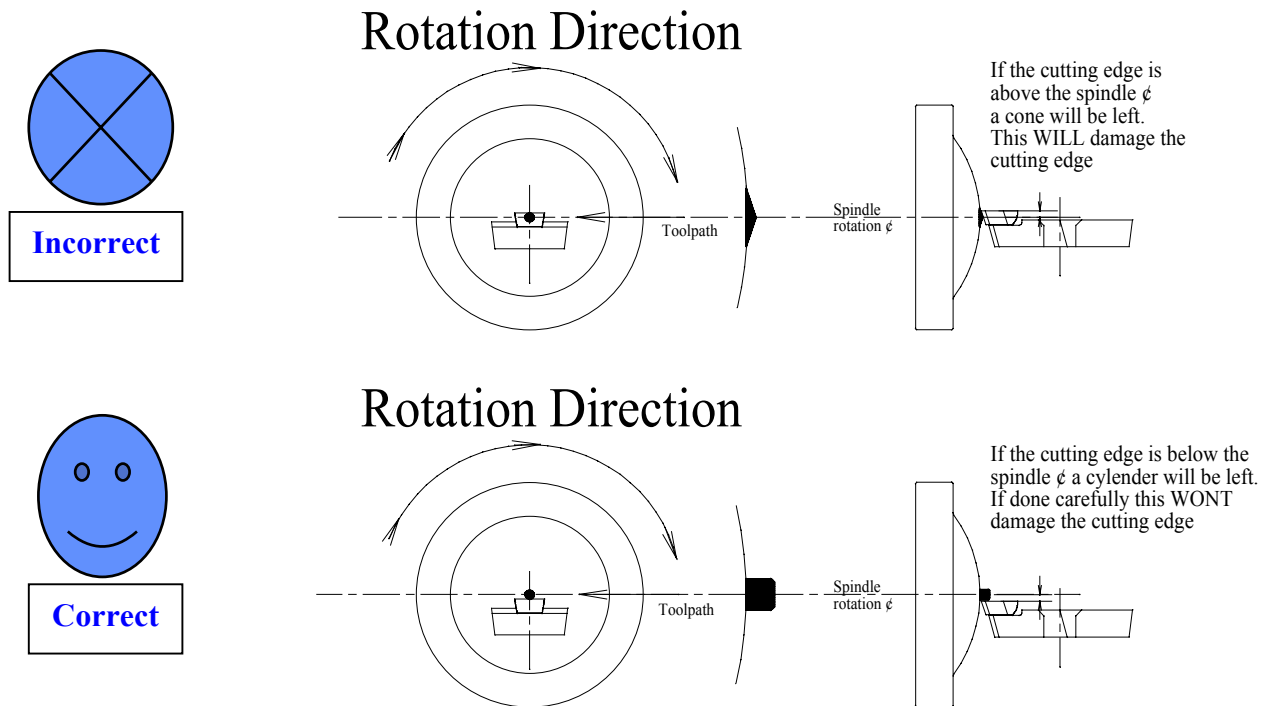
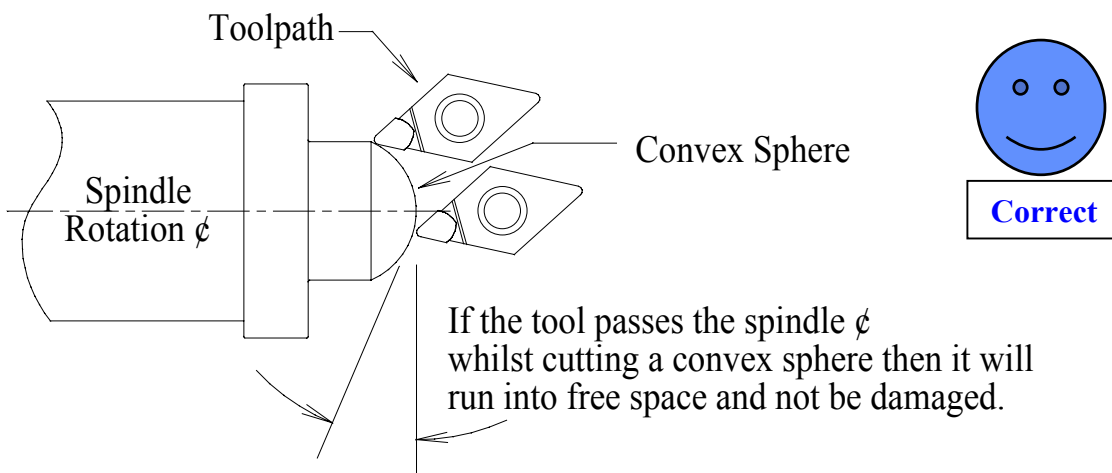
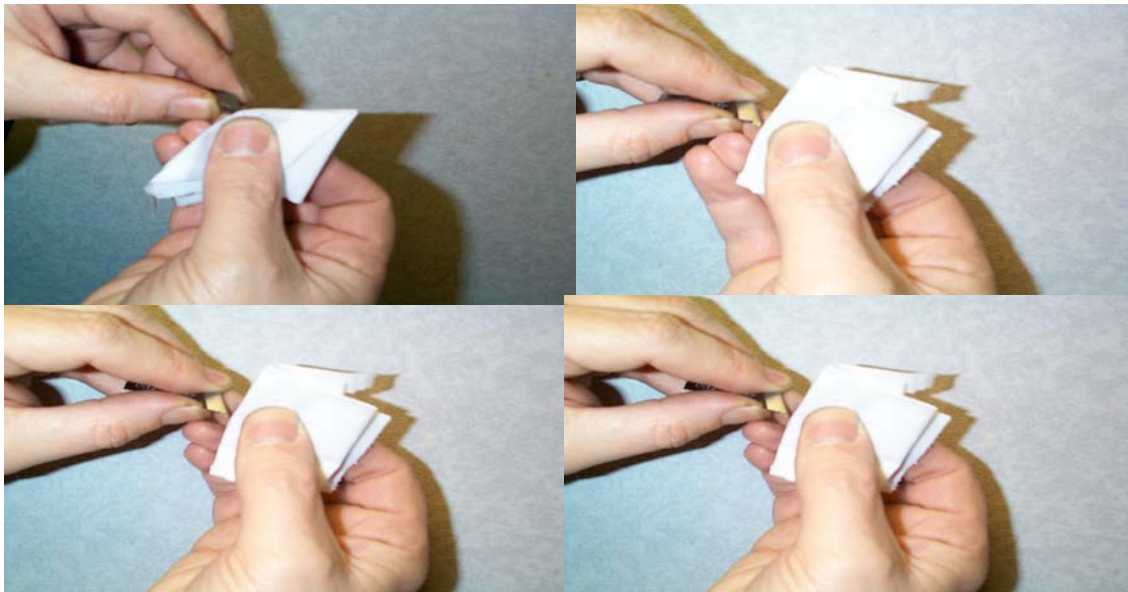
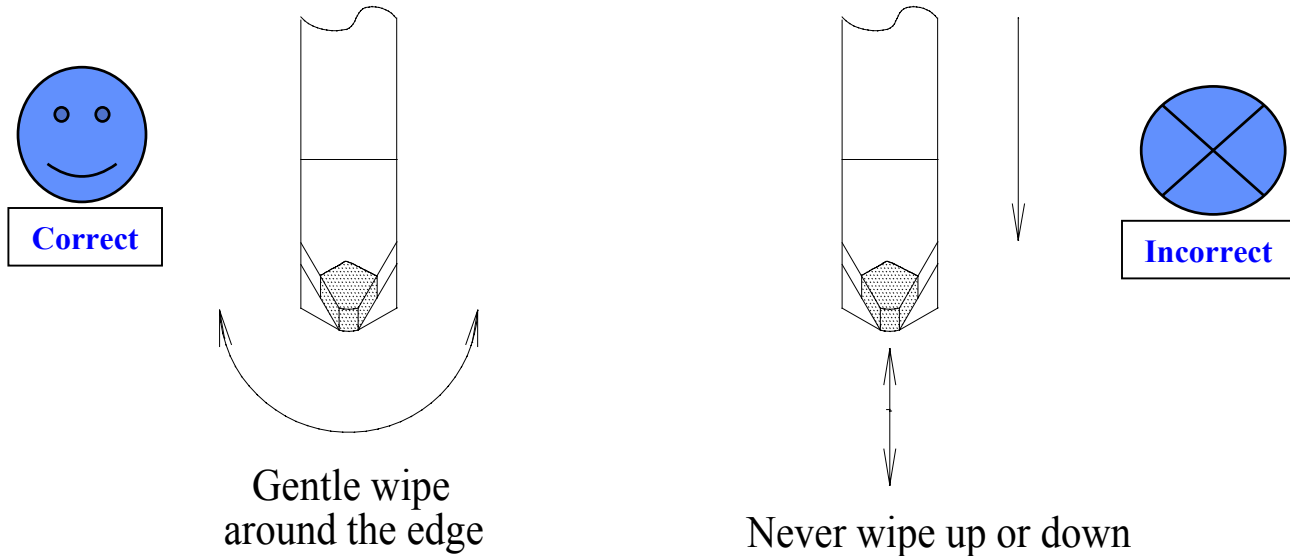


Diagram D2: showing how if a convex sphere is used for test cutting and the diamond-tool passes the spindle rotation ϕ (if done carefully) won't damage the edge.



D3: Cleaning a Diamond-tool

Contour ensures all diamond-tools are clean when they are supplied. Only clean when necessary; they can get damaged. To clean plastics off, ALWAYS use a clean tissue and spirits (acetone or alcohol). First soak the tissue in the spirits and hold against the cutting edge for a few seconds. This will 'melt' the debris. Then take another clean tissue soaked in spirits and carefully wipe around the edge. Never wipe up, down or off the edge.



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Always make use of the information supplied on the packing tube.
Radius size. Cutting Height.

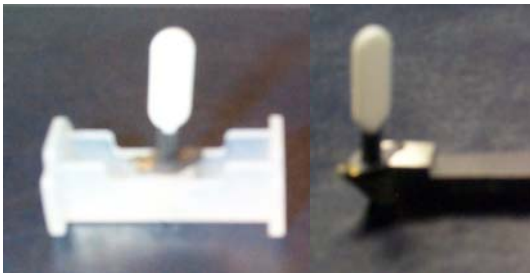
Always keep the diamond-tool safe in its packing other than when it is being used in the lathe.

Always keep the packing tube and Sleigh, of the diamond-tool currently in being used, with the lathe. This makes the information readily available and allows you to re-pack the used tool in its correct container.

Always use the 'handling bat' to move the diamond-tool.
NEVER handle it by touching the diamond.



Take care when removing the retaining screw.
Do not touch the diamond



Always use the 'Handling Bat' to move the diamond-tool.



Hold only the rear of the diamond-tool when securing the screw.
Do **NOT** touch the diamond.

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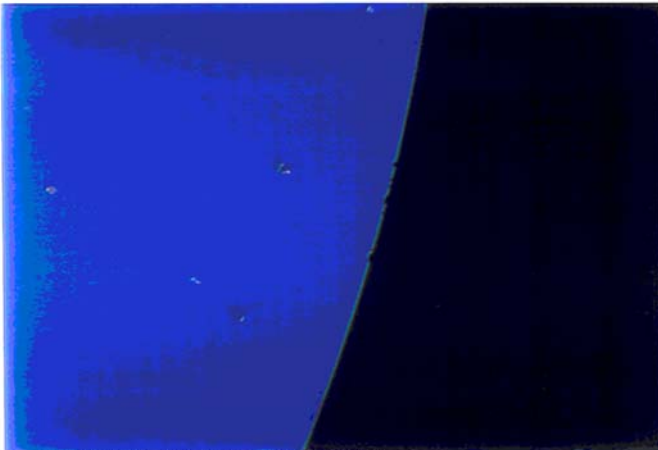
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Top view of cutting edge
Showing damage caused by probing

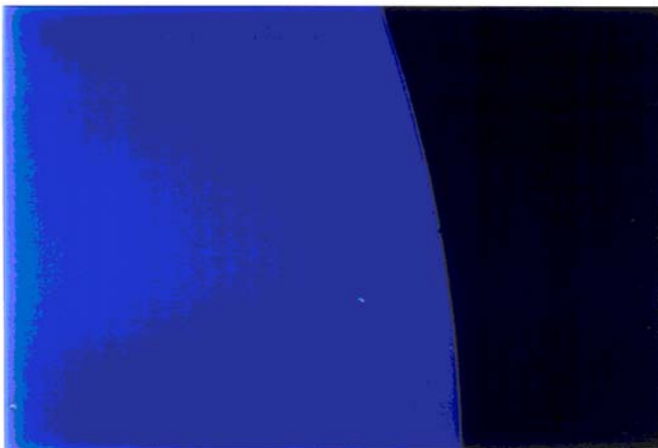
CONTOUR FINE TOOLING TOOL#: V12367 MAGN: 359X.

Photos below are of two tools that were set up by a technician. The tools were only set to position in the machine, then immediately removed. This was to allow us to see if they were damaged during set-up.



Top View (on rake angle), Magnification 900x
Cutting edge is damaged – large chipping

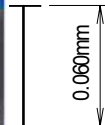
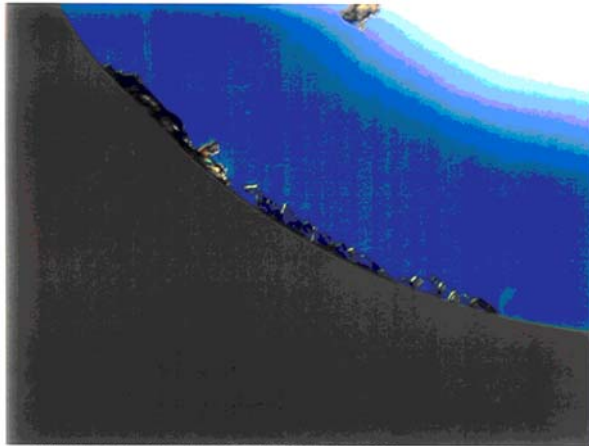
CONTOUR FINE TOOLING TOOL#: V12362 MAGN: 900X.



Top View (on rake angle), Magnification 900x
Cutting edge is damaged – small chipping

CONTOUR FINE TOOLING TOOL#: 59218 MAGN: 900X.

Natural diamond-tool sent to Contour with a complaint about tool-life and surface finish. Cutting edge has been damaged during tool set-up.



Both photos are top view (rake angle)
Showing the damage to cutting edge

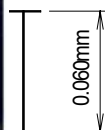
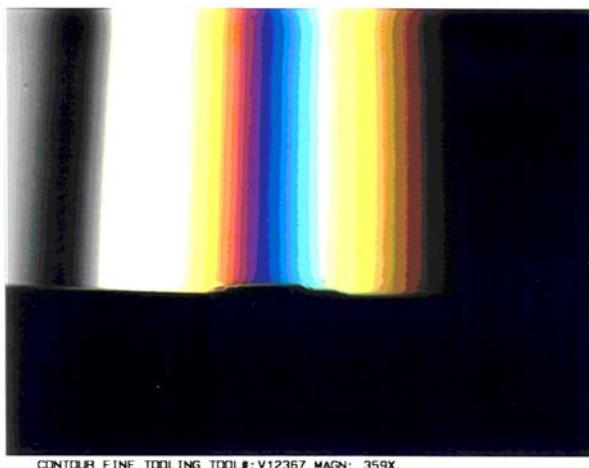


Photo of the front view (radius)
Showing the depth of damage to cutting edge