

# DIAMOND TOOL CARE & HANDLING



Single crystal diamond (Natural and Synthetic) is used to machine non-ferrous metals, plastics and infrared crystals. Being the hardest material on earth, its unique crystalline structure makes it possible to achieve near perfect cutting edges that are critical for machining optical surfaces.

Diamond is a cubic crystal, and its shear strength varies by a factor of 100 between its hardest and softest planes. So it is crucial that each diamond tool has the proper crystal orientation in order to give the longest tool life.

Although diamond is extremely hard, it is also quite brittle. Tools should be handled with extreme care, and nothing should come in contact with the edge other than the workpiece.

## TOOL CLEANING



When cleaning the tool (on or off the machine) use **isopropyl alcohol or acetone** and a lint free cloth or a Q-tip. Always wipe along the front of clearance angle along the cutting edge. Paint brushes and un-filtered compressed air can hold particles that can cause damage, so are not recommended. Never drag anything from the top of the diamond over the cutting edge, as this may cause a chip-out.

## DO

- When touching off on a part, **make certain the spindle is turning in the cutting direction.**
- Adjust air/coolant lines to **push the chips away from the tool** and part to avoid chip entanglement
- **Always wear eye protection** when working with tooling and be aware of the sharp cutting edge.
- **If a tool is not in use, it should be stored** in its specially designed K&Y packaging to protect it from damage due to bumping or dropping.



## DON'T

- When 'touching-off' a part manually, **DO NOT rotate the spindle back and forth** while incrementing either axis. This will certainly chip the cutting edge.
- **DO NOT touch the cutting edge with your finger**

# CONDITION OF A NEW K&Y DIAMOND TOOL

Your new K&Y Diamond tool is manufactured with care by highly skilled tooling engineers and technicians. Our proprietary processes combined with ultra-precision machine tools and state-of-the-art metrology assures the highest quality tools at a competitive price.

Depending on customer requirements, the peak-to-valley variation from a perfect arc (waviness) is between .01 micron and 2 microns as measured by profilometer and/or video microscope. The cutting edge is chip and defect free at 800X. If required, we can offer inspection using our scanning electron microscope up to 150,000 magnification!

## TOOL WEAR AND WHEN TO REPAIR

Diamond tool wear is most often a micro-fracturing of cutting edge. This shows up in part as increased surface roughness, varying power, or surface irregularity.

Wear rate is caused by several variables including:

- Material being cut
- Impurities
- Temperature

Cutting parameters

### 1. Coolant media and flow

Water based is generally better than oil or OMS (odorless mineral spirits) for heat removal. Oil based has more lubricity. Higher flow creates better heat transfer.

### 2. Depth of cut and Feed-rate

There is an optimum depth of cut and feed rate to get the most life out of a tool, but this needs to be balanced with the desired rate of production.

### 3. Stiffness and dampening

Keep tool overhang as short as possible. Keep fixtures small and close to the spindle.

Tools that are damaged can be repaired or 'relapped' by K&Y Diamond at a fraction of new tool cost. The relap process consists of removing a minimal amount of material from the rake face (top) until the new plane is just below the previously damaged area. After lapping, the tool is re-certified and re-labeled showing measured radius, cutting height and waviness. Typical turnaround time for this service is 1-2 business days. A tool can typically be relapped 10-20 times depending on wear depths. If tool has more severe damage that goes further down the front clearance, it may be best to "recone" the diamond. This includes polishing the front clearance angle and then lapping the top. Depending on the diamond thickness, it can be an economical alternative to buying a new tool. K&Y Diamond's technical team is available to answer any questions you may have and fulfill all of your diamond tooling needs. Please do not hesitate to contact us with any questions!

#### K&Y Diamond

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