How To Drill With Diamond Tools

Drilling Techniques and Tips for Using Diamond Drills

Drilling with any diamond drills is part science, part art, and some practice once you understand the basics:

1. **Selecting the Right Drill.**
2. **The Equipment You Will Need.**
3. **The Importance of Coolant.**
4. **Drilling Speed and Pressure.**

Safety First!

- It is extremely important to wear proper eye protection. We highly recommend that you wear safety goggles rather than safety glasses.
- **DO NOT** wear loose clothing or any accessories (long necklaces, bracelets, shirts with long fringes, and similar) that might get caught in a power tool.
- Diamond tools require coolant, water being the most common, and electricity; so extreme care must be taken. Make sure machines are powered by a properly grounded and tested outlet. Under NO circumstances should you override the grounding system or modify the plug.
- Read and understand the proper set-up and operation of your machinery.
- Set up so you are drilling on a sturdy, level work surface at a comfortable height on which to work.

Selecting the Right Drill

Drilling a satisfactory hole in any material requires choosing the correct type of drill bit for the material and size of hole.

- **Diamond:** Used for drilling in stone, glass, tile, ceramic, and similar mineral materials. The diamond can be electroplated, sintered, or brazed to the base metal depending on its intended use and desired cost vs life. They may be available in different grits corresponding to the coarseness or fineness of the diamond used. Diamond bits are not recommended for steel or other ferrous metals.
- **Carbide Drills:** Tungsten carbide and other carbides are mostly found as either solid carbide or carbide tipped drills. They are suitable for drilling iron, steel and other ferrous alloys as well as metals, masonry, tile, and glass.
- **Twist Drills:** Are used to drill holes in wood, metal, plastics, and similar materials.

The Equipment You Will Need

You will want a drill of a size that will properly hold and secure the bit while in use. For smaller drills such as wire drills, something like the FlexShaft is perfectly suited. You can also use a moto-type tool. For smaller drills, up to about 1/2" diameter, a hand held drill will work or you can opt for a drill press. For drills, especially core type, 1/2" and larger and when drilling in thick materials, a drill press is highly recommended as it is very difficult to properly control the drill and material.

The Importance of Coolant

The surefire way to destroy a diamond drill is to run it dry or without adequate coolant. Coolant is required to cool the drill and flush out the debris (called swarf) generated during drilling. Water is the most frequently used coolant. It provides excellent performance at a minimal cost and is a true organic coolant. It doesn't leave an oily or greasy residue on the material. There are additives, like Inland DiamondCoolant, you can add to the water to help increase the lubricity and protect your diamond tool investment. Occasionally mineral oil or other oils are also used but can be messy to clean up.

- The amount of coolant used should increase with the hardness of the material being drilled. Sparks or a dry, crumbly residue while drilling indicates insufficient coolant is reaching the drilling area.

- Adequate coolant increases the diamond drill efficiency and reduces heat buildup, thereby reducing the chance of heat cracking the drilled material.
- Adequate coolant will help flush away swarf and insure proper lubrication of the drill. Using an up and down motion while drilling keeps fresh coolant flowing into the drilling area.

Diamond Drilling Set-ups

There are several different methods you can use to maintain proper coolant flow while drilling:

1. **Cake Pan Method:** Use an old cake pan and place a couple sheets of cardboard in the bottom to act as a drilling board or back stop and prevent you from drilling through the tray bottom. Place your material on top of the cardboard and fill the tray with water just to cover the piece. This method is suitable for small to medium size pieces that can safely be held in place by hand during drilling.
2. **Clay Dam Method:** If the material is too large to fit or hold in place you can build a dam from modeling clay around where the hole will be drilled and fill the dam with coolant. Don't forget to think about where that liquid will go when you have drilled through!
3. **Other Options:** You can supply coolant via a squeeze bottle or similar set up while drilling being careful to keep water away from your electrical equipment.

Drilling Speed and Pressure

Drilling speeds are affected by the hardness and abrasiveness of the material, the size of the drill, and the amount of pressure and coolant used. The speeds listed below are suggested guidelines but only experience will help you develop the right drilling speed and pressure for your application.

General Guidelines

- A general rule of thumb for diamond drills is the harder the material, the faster the drill speed.
- Set the torque to #1 (if you can) on your hand drill. That way, if it "sticks" the motor spins but not the drill. This can save you from cracking or breaking through inappropriately.
- Beginners should start with low pressure and extra coolant to prevent damage to the diamond while learning.
- Use light pressure and let the diamond do the work. Unlike twist drills, diamond tools require only light to moderate pressure for optimum results. Allow the bit to drill at its own speed. Too much pressure can fracture the material and prematurely wear the diamond.
- Use an up and down motion when drilling to allow coolant to circulate in the hole and flush out swarf and allow fresh water / coolant to penetrate the hole. This is especially important when drilling through thick materials.
- When drilling completely through an object, really lighten up the pressure as the drill is about to break through the bottom so that you don't chip out the back side as it emerges.

Drilling Speed Chart

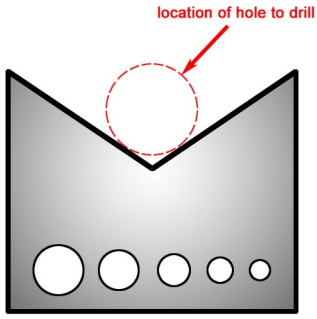
WIRE DRILLS	CORE DRILLS AND SIMILAR BY OUTSIDE DIAMETER			
.75 – 2.5 mm	1/8 to 1/2 inch	5/8 to 1-1/2 inch	1-3/4 to 2-3/4 inch	3 to 4 inch
30,000 TO 18,000 rpm	2,400-1,000 rpm	1,250 – 1,000 rpm	1,100 – 850 rpm	850 to 200 rpm

General Tips for Better Drilling

- If a white powder forms as you drill, stop, remove the drill, clean and add more water/coolant**. NEVER USE DIAMOND DRILLS TO DRILL STONE, GLASS AND SIMILAR MATERIALS DRY!**
- Use drilling boards or a back stop of expendable material whenever possible to protect work surfaces and drills.
- For optimum results, bring the drill down at a right angle to the hole and keep it perpendicular through the entire drilling process.
- Use a light pressure while drilling until you become familiar with your drills cutting speed. The weight of the drill itself should provide sufficient cutting pressure. You want to allow the diamond to do the cutting! Too much pressure can fracture the material and prematurely wear the diamond.

- In addition to using the #1 torque setting (if you have the option) of the drill, You can prevent "walking" when starting a hole by:

Make a Drilling Template



1. Make a template by either drilling a pilot hole in a piece of 1/8" plastic, 1/8" pressed wood or cardboard, or by cutting a "V" in the edge. A hole template works best, however, the "V" template is easier to make and can be used with many sizes of core drill bits. For repetitive drilling, a plastic (like Plexiglas) template will hold up the longest to water and wear.
2. The template is held on the surface of the material being drilled, with the pilot hole or "V" above the target hole area and will hold the drill bit in place as it starts.
3. A few revolutions of the drill will create a shallow hole, or groove if using a core drill, that will now hold the drill in place and the template can be removed if desired.

Make a Temporary Drilling Foothold

1. Mark the center of the hole using an easy to see indelible pen.
2. Layer several pieces of clear tape over the mark until you build up a "pad". If needed, re-mark the hole location on the tape if the original mark becomes obscured through the layers.
3. The layered tape pieces will give the bit a place to bite into as you start the hole and are easy to remove.
4. Similarly you can use a piece of masking or duct tape over the area and then mark the hole location but this may not be precise enough for some applications.
5. Use a glass or stone scribe to create a small round divot or scratch where you want to drill to give the bit a place to bite as you start drilling the hole.

Make a Pilot Hole

1. Drill a pilot hole using a much smaller bit first. This will allow you to center the tip of bit for the larger hole and then accurately drill your final size hole.
2. This method works best for wire and twist type drills and is not suited for core type drills.

Tips Just for Core Drills

- If you are using small (less than ½" diameter) core drills a hand drill, start drilling with core drill held at a 45° angle to the material. As drilling proceeds and the drill begins to bite into the material, then slowly bring it up until it is at a right angle to the material.
- Frequently remove the core drill from the hole during drilling to flush out the ground material and allow fresh water / coolant to penetrate hole. Also rinse accumulated material from core drill itself.
- You must remove any slugs from the inside diameter of the core. Remove by pushing a nail or stout piece of wire through the hole provided in the side of the core drill or on larger drills, through the back of the core.

This free how to is courtesy of

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