DRILLING
• Drills are used to make holes in a variety of operations from maintenance & repair to high volume precision hole-making.
• Many factors influence the selection process when choosing a drill, including drill style, performance level, tool and workpiece material and drill point angle.
• Coatings or surface treatments provide improved tool performance and increase in tool life.

DRILL STYLES
• Straight Shank: Shank diameter matches the cutting diameter. These are the most common drills and are effective on both ferrous and non-ferrous materials. Jobbers length and screw machine length are widely used.

SPECIALTY STRAIGHT SHANK DRILLS
• Parabolic: Used for deep hole drilling and reduce the need for pecking.
• Slow Spiral: Used for long chipping materials like aluminum and copper.
• Fast Spiral: Used on softer materials where chip evacuation is important.
• Half Round: Used in deep hole drilling on soft materials like brass and rubber.
• Straight Flute: Used on hard materials.
• Core: Used to enlarge existing holes and are also available in taper Shank.

SHANK OPTIONS
Non-cutting end that is held by a machine tool accessory to drive or hold the drill bit.
• Straight Shank: Most usual style for modern drill bits. Shank size is always made the same diameter as the drill bit.
• Reduced Straight Shank: Drill Shank diameter is smaller than the drill bit size (cutting diameter). They can drill holes that are larger than the capacity of the drill chuck. Larger cutting diameters than straight Shank’s drill diameters, so that drill chucks can be used to drill large holes.
• Taper (Morse Taper): Allows the bit to be mounted directly into the spindle of a drill, lathe tailstock, or (with the use of adapters) into the spindle of milling machines. Has very accurate centering.
• SDS: Has the advantage of a simple spring-loaded chuck, so that bits can be chucked with a simple and quick hand action. Further, the Shank and chuck are uniquely suited to hammer drilling in stone and concrete.

LENGTHS
In general, the shorter the drill, the better the performance. The shortest length provides the best rigidity thus creating truer holes.
• Stub Length: Short length drill bits or screw machine drill bits are shorter in flute and overall length than jobbers length drills. Reduces deflection and breakage and gives maximum rigidity and accuracy. For hand and machine drilling.
• Jobbers Length: Jobbers length drills are the most common type of drill. The length of the flutes is either four or five times the diameter of the drill. For general purpose or heavy duty drilling.
• Taper Length: Longer flute and overall length than jobbers drill. For drilling deep holes.
• Long Length: For drilling deep and hard to reach spots.
• Extra Long/Aircraft Length: For drilling extra deep and hard to reach spots.

OTHER HOLE MAKING TOOLS
• Annular Cutters: Also called a core drill, core cutter, broach cutter, trepanning drill hole saw, or cup-type cutter is a hollow cutting tool, with multiple cutting edges used to make drill holes in ferrous and non-ferrous metals. It cuts an annular groove at the periphery of the hole and leaves a solid core or slug at the hole center. It can also be used as a substitute for slower, more expensive and less efficient twist drills and hole saws. The function of annular cutters is similar to a hole saw, but differs in geometry and material. Annular cutters are faster, easier and are more accurate than the conventional twist drills or drill bits.
• Hole Saws: Also known as a hole cutter, is a saw blade of annular shape, whose annular kerf creates a hole in the workpiece without having to cut up the core material. It is used in a drill. Hole saws typically have a pilot drill bit at their center to keep the saw teeth from walking.
**HOLE MAKING SOLUTIONS**

**FUNDAMENTALS OF DRILLS**

**DRILL POINT ANGLES**

Selection of drill point angles affect tool performance. Flat points, (larger point angles) offer better cutting action & more aggressive angles create torque. Sharper points (smaller point angles) are better for soft, non-ferrous materials.

- 118°: General purpose
- 130°: For soft non-ferrous materials
- 134°: For mild steel
- 135°: For hard metal
- 140°: For hard materials and high performance
- 150°: For hard materials and high performance

**PERFORMANCE LEVELS**

Combination of the drill geometry, tool material and coating helps drive the level of performance.

**COST**

- **Economy**: used for short run jobs and provides the lowest price point option.
- **General Purpose**: generally preferred for the machining of non-ferrous and non-metallic materials and alloys.
- **Deep Hole**: for general purpose and heavy duty drilling operations.
- **High Performance**: meets the tough demands of production level manufacturing. Longer life and recommended for increased speeds and feeds when drilling aluminum, cast iron and other easy to machine materials.
- **Heavy Duty**: for drilling a wide variety of ferrous materials including steel, cast steel, cast iron, stainless steels and other alloyed or non-alloyed ferrous metals.

**NUMBER OF FLUTES**

The sum of the cutting edges that impact the workpiece material. Flutes provide a path for the removal of chips and carry cutting fluid to the front of the cutting tool.

- **0 Flute**: For use in soft materials including brass, copper, hard rubber and fiber that frequently clog the standard helical flutes with chips.
- **2 Flutes**: The conventional type of drill used for originating holes. Excellent for non-ferrous metals.
- **3 Flutes**: Drill commonly used for enlarging and finishing.
- **4 Flutes**: Used interchangeably with 3 flute drills. They are of similar construction except for the number of flutes.

**TOOL MATERIAL**

Choice of tool material is driven by the workpiece material, number of holes desired along with the life of the drill.

- **High Speed Steel**: economical choice for general applications in most materials including steel, cast iron and forgings. Provides good tool life and efficiency.
- **Cobalt**: M35, M42, better than high speed steel, they hold their hardness at much higher temperatures and are well suited for harder to machine materials and stainless steels.
- **Solid Carbide**: resists wear better than both high speed steel and cobalt steel. Has a better degree of accuracy for drilling very hard materials such as stainless steel, titanium alloys and nickel alloys.
- **Carbide Tipped**: same benefits as solid carbide for a fraction of the cost.

**FINISH/COATING**

Coating or surface treatments have a direct effect on tool performance and tool life. They also build a barrier between the drill and workpiece.

- **AG Coated**: TiAlN Multilayer Coating – Outstanding thermal and chemical resistance properties increases the stability of the cutting edges & improved chip flow.
- **AITIN**: Aluminum Titanium Nitride Coating – Ideal for high temperature cutting operations in titanium and nickel alloys, stainless steel, steels and cast iron. It creates a hard aluminum oxide layer as temperature increases, insulating the tool and transferring heat into the cutting chips.
- **Black & Bronze Oxide Coated**: Reduces friction & allows higher speeds.
- **Bright**: Surface is untreated. Use for general purpose drilling of most metals, wood and plastic.
- **Bronze Oxide Coated**: Reduces friction & allows for higher speeds. Known appearance color for cobalt.
- **SG Coated**: Silicone Multilayer Coating – Use for high performance drilling of carbon steels, stainless steels, aluminum and high-temp alloys.
- **Steam/Black Oxide**: An inexpensive black coating. A black oxide coating provides heat resistance and lubricity, as well as corrosion resistance. These result in a longer life than possible for the typical uncoated high speed steel bits. For drilling of ferrous metals such as steel, stainless steel and cast iron.
- **TAIN Coated**: Super Life Titanium Aluminum Nitride – Dark Violet/Black - considered superior to TiCN and can extend tool life five or more times. More stable at higher temperatures than TiN or TiCN. Increases machining speeds by 75% to 100%.
- **TIN Coated**: Long Life Titanium Nitride - Bright Gold - is a very hard ceramic material, and when used to coat a high-speed steel bit can extend the cutting life by three or more times. Increases machining speeds by 25% to 30%.
- **TICN Coated**: Extra-Life Titanium Carbonitride – Violet/Blue-Gray - superior to TiN and more wear resistant; increases machining speeds by 35% to 50%.
**GUIDE TO DRILL ICONS**

**Number Of Flutes:**
The sum of the cutting edges that impact the workpiece material. Flutes provide a path for the removal of chips & carry cutting fluid to the front of the cutting tool.

**Coolant:**
Holes in the drill to allow coolant to flow directly to the machined location to reduce heat and flush away chips.

**Cutting Direction:**
Clockwise or counterclockwise turning options for the cutting tool. The rotation of the machine is supported by the same direction of the cutting tool. Right hand (clockwise) is the most common. Left hand (counterclockwise).

**Drill Point Angle:**
Selection of drill point angle affects tool performance. Flat points offer better cutting action and more aggressive angles create torque.

**Drill Point Style:**
Helps to remove the cutting force in different grades of materials.

**Finish/Coating:**
Coatings or surface treatments have a direct effect on tool performance and tool life. They also build a barrier between the drill and the workpiece.

**Helix Angle:**
The angle made by the leading edge of the land with a plane containing the axis of the drill.

**Length:**
In general, the shorter the drill the better performance. The shortest length provides the best rigidity, thus creating truer holes.

**Performance Levels:**
Combination of the drill geometry, tool material and coating help drive the level of performance.

**Shank:**
Non-cutting end that is held by a machine tool accessory to drive or hold the drill bit.

**Tool Material:**
Choice of tool material is driven by the workpiece material, number of holes desired along with the life of the drill.

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**HOLEMAKING SOLUTIONS GUIDE**

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<tr>
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<th>Drill Style</th>
<th>Tool Material</th>
</tr>
</thead>
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<td>.0156” To .2598”</td>
<td>Micro Drills</td>
<td>Cobalt Solid Carbide</td>
</tr>
<tr>
<td>1/64” To 3/4”</td>
<td>Jobbers &amp; Screw Machine</td>
<td>H.S.S. Cobalt Solid Carbide</td>
</tr>
<tr>
<td>33/64” To 2”</td>
<td>Silver &amp; Deming</td>
<td>H.S.S. Cobalt Carbide Tipped</td>
</tr>
<tr>
<td>.001” To 1”</td>
<td>Masonry</td>
<td>Carbide Tipped Solid Carbide</td>
</tr>
<tr>
<td>1mm To 3/8”</td>
<td>Flat Bottom</td>
<td>H.S.S. Cobalt</td>
</tr>
<tr>
<td>.0125” To 1-3/4”</td>
<td>Taper Length</td>
<td>H.S.S. Cobalt Carbide Tipped</td>
</tr>
<tr>
<td>.0449” To 1/2”</td>
<td>Aircraft</td>
<td>Carbide Tipped Carbide Tipped</td>
</tr>
<tr>
<td>1/8” To 4”</td>
<td>Taper Shank</td>
<td>H.S.S. Bi-Metal Carbide Tipped</td>
</tr>
<tr>
<td>3/16” To 6”</td>
<td>Hole Saws</td>
<td>H.S.S. Cobalt Carbide Tipped</td>
</tr>
<tr>
<td>1/4” To 4”</td>
<td>Annular Cutters</td>
<td>Carbide Inserts Steel Bodies</td>
</tr>
<tr>
<td>.454” To 2-3/8”</td>
<td>Indexable Drilling</td>
<td>H.S.S. Cobalt</td>
</tr>
<tr>
<td>7/16” To 6”</td>
<td>Spade Drills</td>
<td>H.S.S.</td>
</tr>
<tr>
<td>20mm To 300mm</td>
<td>Holes Making Systems</td>
<td>-</td>
</tr>
</tbody>
</table>

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*We Are A Full Line Distributor Of Over 800 Trusted Brands*
## Technical Information for King Drill

### Workpiece | Grade | vc | Feed (aspect ratio=2D, 3D, 4D) | Feed (ipr depending on drill Dia. (Inch))
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>ISO</td>
<td>Workpiece</td>
<td>Hardness(HB)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carbon steel</td>
<td>80~180</td>
<td>LD</td>
<td>Central Point</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>PD</td>
<td>Central Point</td>
</tr>
<tr>
<td></td>
<td>High carbon</td>
<td>180~280</td>
<td>PD</td>
<td>Central Point</td>
</tr>
<tr>
<td></td>
<td>Low alloy steel</td>
<td>140~260</td>
<td>PD</td>
<td>Central Point</td>
</tr>
<tr>
<td></td>
<td>Low pre-hardened</td>
<td>200~400</td>
<td>PD</td>
<td>Central Point</td>
</tr>
<tr>
<td></td>
<td>Low alloy steel</td>
<td>50~260</td>
<td>PD</td>
<td>Central Point</td>
</tr>
<tr>
<td></td>
<td>High pre-hardened steel</td>
<td>220~450</td>
<td>PD</td>
<td>Central Point</td>
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<tr>
<td></td>
<td>Austenite series</td>
<td>135~275</td>
<td>PD</td>
<td>Central Point</td>
</tr>
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<td></td>
<td>Ferrite series</td>
<td>135~275</td>
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<td>Central Point</td>
</tr>
<tr>
<td></td>
<td>Martensite series</td>
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<td>PD</td>
<td>Central Point</td>
</tr>
<tr>
<td></td>
<td>Gray cast iron</td>
<td>150~230</td>
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<td>Central Point</td>
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<tr>
<td></td>
<td>Ductile cast iron</td>
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<td>Central Point</td>
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<tr>
<td></td>
<td>Heat resistant alloy</td>
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<td>PD</td>
<td>PCS300</td>
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<td></td>
<td>Heat resistant alloy</td>
<td>130~400</td>
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<td>PCS300</td>
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<td></td>
<td>Heat resistant alloy</td>
<td>130~400</td>
<td>PD</td>
<td>PCS300</td>
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<tr>
<td></td>
<td>High hardened steel</td>
<td>400~</td>
<td>PD</td>
<td>PCS300</td>
</tr>
</tbody>
</table>

* In case of 3D, reduce 30~40% of cutting condition from the above.

* In interrupted machining part, reduce 30~50% of feed from the above machining around interrupted part.

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### Range of Adjusting Machining Diameter in the Lathe:

- In machining in the lathe, the King Drill can extend and reduce the machining diameter with moving to the x axis. Please refer to the table showing the range of adjusting drilling diameter below.

- The more the drilling diameter is extended or reduced, the more the drill loses drilling balance. In this case, reduce the feed or cutting speed in machining.

- Reducing the machining diameter excessively could damage the holder.