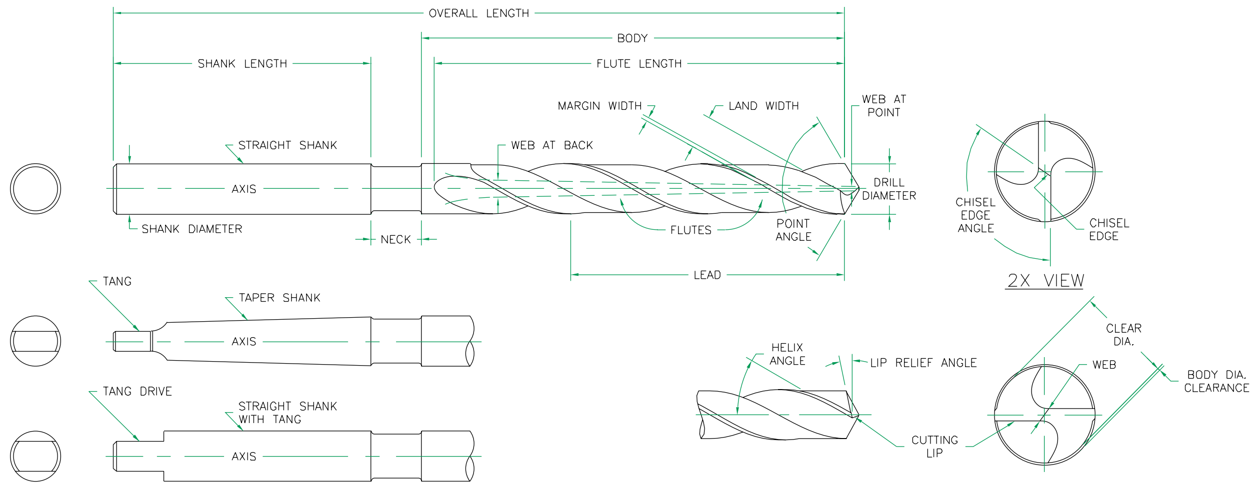
# TECHNICAL

## DRILL DICTIONARY




**Axis**—The imaginary straight line which forms the longitudinal center line of a drill.

**Backtaper**—A slight decrease in diameter from front to back in the body of a drill.

**Body**—The portion of a drill extending from the shank or neck to the outer corners of the cutting lips.

**Body Clearance Diameter**— The portion of the land that has been cut away so it will not bind against the walls of the hole.

**Chisel Edge**—The edge at the end of the web that connects the cutting lips.

**Chisel Edge Angle**—The included angle between the chisel edge and cutting lip, as viewed from the end of a drill.

**Clearance Diameter**—The diameter over the cut away portion of the drill lands.

**Dia**—Drill Diameter

**Drill**—A rotary end cutting tool having one or more cutting lips, and having one or more helical or straight flutes for the passage of chips and the admission of a cutting fluid.

**Drill Diameter**—The diameter over the margins of a drill measured at the point.

**Feed**—Feed rates for drilling are governed by the drill diameter, machinability of materials and depth of hole. Small drills, harder materials, and deeper holes require additional considerations in selecting the proper feed rate.

**Flute Length**—The length from the outer corners of the cutting lips to the extreme back of the flutes. Includes the sweep of the tool used to generate the flutes and therefore does not indicate the usable length of flutes.

**Flutes**—Helical or straight grooves cut or formed in the body of a drill to provide cutting lips, permit removal of chips, and allow cutting fluid to reach the cutting lips.

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

**IPM**—Inches Per Minute

**IPR**—Inches Per Revolution

**Land**—The peripheral portion of the body between adjacent flutes.

**Land Width**—The distance between the leading edge and heel of the land; measured at a right angle to the leading edge.

**Lead**—The axial advance of a leading edge of the land in one turn around the circumference.

**Lip Relief Angle**—The axial relief angle at the outer corner of the lip; measured by projection to a plane tangent to the periphery at the outer corner of the lip.

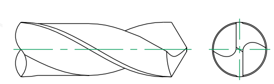
**Lips**—The cutting edges of a two flute drill extending from the chisel edge to the periphery.

**Margin**—The cylindrical portion of the land, which is not cut away, to provide clearance.

**Neck**—The section of reduced diameter between the body and the shank of a drill.

**Overall Length**—The length from the extreme end of the shank to the outer corners of the cutting lip. It does not include the conical shank end often used on straight shank drills, nor the conical cutting point used on both straight and taper shank drills.

**Point**—The cutting end of a drill, made up of the ends of the lands and the web. In form, it resembles a cone, but departs from a true cone to furnish clearance behind the cutting lips. *Conventional*— Conventional Points with 118° included point angles are the most commonly used because they provide satisfactory results in a wide variety of materials. A possible limitation is that the straight chisel edge contributes to walking at the drill point, often making it necessary to spot the hole for improved accuracy.



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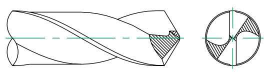
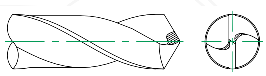
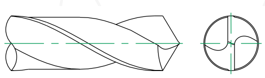
*Split*—Split-Points (commonly called Crankshaft Points) were originally developed for use on drills designed for deep oil holes in automotive crankshafts. Since its inception, the split-point has gained widespread use and is applied to both 118° and 135° included point angles. Its main advantages are the ability to reduce thrust and eliminate walking at the drill point. This is a distinct advantage when the drill is used in a portable drill or in drilling applications where bushings cannot be used. The split-point also has two positive rake cutting edges extending to the center of the drill, which can assist as a chipbreaker to produce small chips which can readily be ejected.



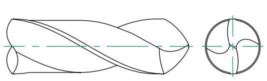
*Notched*—Notched Points were developed for drilling tough alloys. Commonly incorporated on heavy web drills, which allow the point to withstand the higher thrust loads required in drilling these materials. As with the split-point, the Notched Point contains two additional positive rake cutting edges extending toward the center of the drill. These secondary cutting lips, which extend no further than half the original cutting lip, can assist in chip control and reduce the torque required in drilling tough materials. Notched Points can be incorporated on both 118° and 135° included point angles, making them suitable for drilling a wide variety of materials.



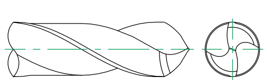
*Helical*—Helical Points change the flat blunt chisel to a "S" contour with a radiused crown effect which has its highest point at the center of the drill axis. This crown contour creates a continuous cutting edge from margin to margin across the web. The advantage is its self-centering ability which allows the chisel to cut and enables the drill to cut closer to actual drill diameter. Helical Points are not available under 1/16" diameter.



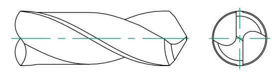
*Racon®*—Racon® Points provide a continuously varying point angle, with the lips and margins blending together to form a smooth curve. Because the lips cut on a long, curved cutting edge, there is less load per unit area and therefore less heat generated during the cut. Like the Double Angle Point, the outer periphery of the cutting lip is protected to reduced margin wear. Breakthrough burrs can be eliminated and tool life can be increased when drilling abrasive materials. Its limitation is that it must be used through a guide bushing because it is not self-centering.



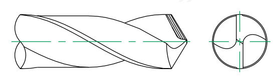
*Bickford™* —Bickford™ Points are a combination of the Helical and Racon® Point. They combine the self-centering feature of the Helical Point with the long life and burr-free breakthrough and higher feed capacity of the Racon® Point. These features make the Bickford™ an excellent selection for producing accurate holes on N/C machines without the need for prior spot drilling.



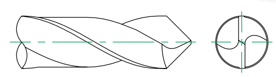
*Double Angle*—Double Angle Points were initially developed for drilling medium and hard cast irons as well as other very abrasive materials. Their purpose was to reduce corner wear at the outer periphery of the cutting lip. The point is generated by first grinding a larger included angle, and then a smaller included angle on the corner. This provides the effect of a chamfer, which not only reduces wear, but improves hole size, acts as a chipbreaker, and reduces chipping corners of the lips when drilling hard materials. This point can be used to reduce breakthrough burr in soft materials. The length of the corner angle should be 1/3 the original cutting lip length.



*Reduced Rake (Dub Lip)*—
Reduced Rake Points are generated by flattening or dubbing both cutting lips from the outer periphery to the chisel. This reduces the effective axial rake to 0–5, positive which translates to a plowing rather than shearing action. This reduction in shearing is an effective method of preventing the drill from grabbing in low tensile strength materials such as brass, bronze, and plastics. Reducing the rake also strengthens the cutting lip and can assist in breaking chips.



*Low Angle* —Low Angle Points generally have an included angle of 60° or 90°. This reduces the effective rake at the outer periphery of the cutting lip, which reduces cracking when drilling plastics and grabbing on breakthrough in low tensile non-ferrous materials. The Low Angle Point is commonly incorporated on low helix drills, commonly used for these materials.



**Point Angle**—The included angle between the cutting lips projected upon a plane parallel to the drill axis and parallel to the two cutting lips.

**Relative Lip Height**—The difference in indicator reading between the cutting lips of a drill. Measured at a right angle to the cutting lip at a specific distance from the axis of the tool.

**RPM**—Revolutions Per Minute

**SFM**—Surface Feet Per Minute

**Shank**—The part of a drill by which it is held and driven.

**Speed**—The speed of a drill is determined by the rate which the outer periphery of the tool rotates in relation to material being cut. In general, the SFM at which a drill will operate is within a range based upon the workpiece material, its condition, hardness, and depth of hole. The deeper the hole, the greater tendency there is for more heat to be generated, due to length of drill engagement, as well as chip compaction. Thus, speed reduction is often recommended to minimize the amount of heat being
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generated. By increasing the SFM, fewer holes will result. Therefore, it is usually advisable to start the drilling process at a slower SFM and then increase to the maximum.

**Surface Treatment**—Surface treatments for high speed steel tools function to condition them, so in certain applications they will out-perform tools that have not been treated. Surface treatments do not, however, alter the functional structure of the tool itself.

*Oxide*—This treatment is applied to finished tools and produces a thin black iron oxide surface coating. It also provides additional tempering and stress relieving. This coating reduces galling and chip welding and also increases the ability of the tool to retain lubricants. Recommended in iron and steel drilling applications. It should not be used in non-ferrous metals such as aluminum because it increases the loading tendencies of the tool.

*Nitride*—This treatment produces a hard case which is highly resistant to abrasion. It also retards the tendency of softer materials to cling or load on tools. Generally recommended for tools that are used for ferrous, non-ferrous, and non-metallic materials which are abrasive and have loading characteristics. Traditionally the surface treatment is only located on the drill's margins with the inception of performance coatings Nitriding is not as often recognized for any future benefit.

*Nitride and Oxide*—Combines the advantages of the lubricity of oxide with the abrasion resistance of nitriding. Recommended for abrasive ferrous applications. Not recommended for soft materials such as aluminum, magnesium or similar non-ferrous applications.

*Chrome Plating*—This treatment deposits an extremely thin layer of chromium on the surface of tools. It reduces the coefficient of friction, and resists chip weld and abrasion. Recommended for non-ferrous and non-metallic materials.

*TiN-Titanium Nitride*—An excellent general purpose coating for protecting a wide variety of cutting tools from wear generated from heat dissipation. TiN is a good Iron- based materials. Tin coated tools are easily recognizable by their bright gold color.

*TiCN-Titanium Carbo Nitride*–TiCN has a higher hardness value than TiN which provides excellent heat resistance for more abrasive materials. The lower oxidation temperature limits the use of TiCN to workpiece materials where moderate temperatures are generated at the cutting edge. Tools coated with TiCN have a platinum/blue sheen.

*TiALN-Titanium Aluminum Nitride*–TiALN performs very satisfactorily in materials that generate high cutting temperatures during machining. The key to its success is the addition of Aluminum to TiN, which increases its hot hardness capability and oxidation stability. When this coating is exposed to high cutting temperatures, TiALN forms a hard aluminum oxide layer that has low thermal conductivity. This layer acts as an insulator to the heat and rejects more heat into the chip. Tools coated with TiALN have a purple sheen.

**Tang**—The flattened end of a taper shank, intended to fit into a driving slot in a socket.

**Tang Drive**—Two opposite parallel driving flats on the extreme end of a straight shank.

**Taper Shank**— Drills having conical shanks suitable for direct fitting into tapered holes in machine spindles, driving sleeves, or sockets. Tapered shanks generally have a tang.

**TD**—Tool diameter

**Web**—The central portion of the body that joins the lands. The extreme end of the web forms the chisel edge on a two flute drill.

**Web Thickness**—The thickness of the web at the point, unless another specific location is indicated.