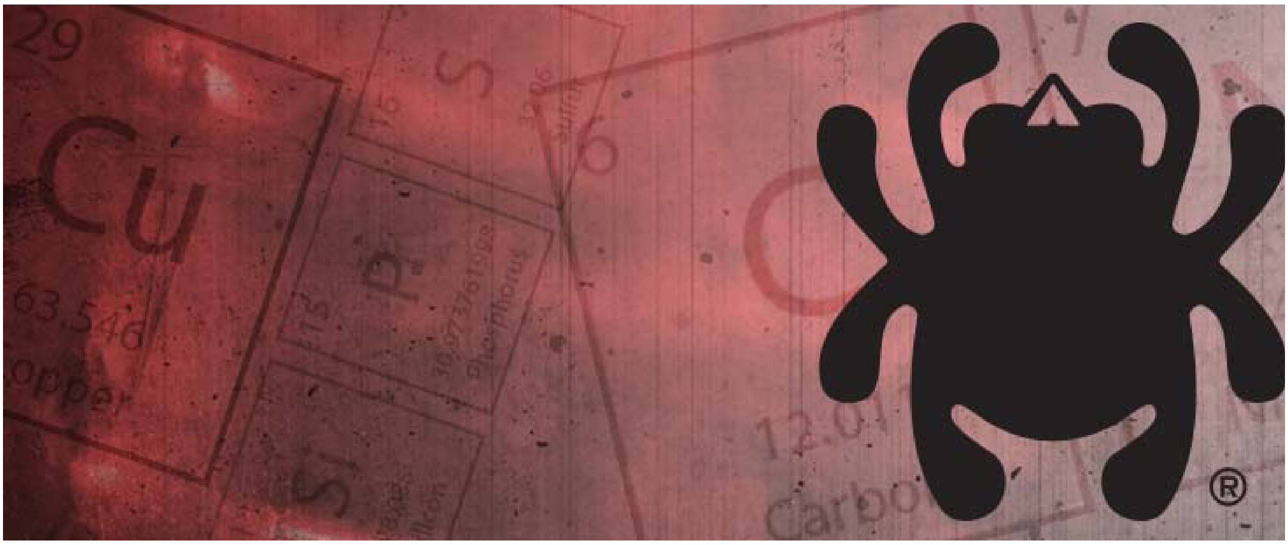
Spyderco

Steel Elements



Carbon (C)

• Increases edge retention and raises tensile strength.

• Increases hardness and improves resistance to wear and abrasion.

Chromium (Cr)

• Increases hardness, tensile strength, and toughness.

• Provides resistance to wear and corrosion.

Cobalt (Co)

• Increases strength and hardness, and permits quenching in higher temperatures.

• Intensifies the individual effects of other elements in more complex steels.

Copper (Cu)

• Increases corrosion resistance.

Manganese (Mn)

• Increases hardenability, wear resistance, and tensile strength.

• Deoxidizes and degasifies to remove oxygen from molten metal.

• In larger quantities, increases hardness and brittleness.

Molybdenum (Mo)

• Increases strength, hardness, hardenability, and toughness.

• Improves machinability and resistance to corrosion.

Nickel (Ni)

• Adds strength and toughness.

Niobium (Nb)

• aka columbium. Improves strength and toughness.

• Provides corrosion resistance.

• Improves grain refinement and precipitation hardening

Nitrogen (N)

• Used in place of carbon for the steel matrix. The Nitrogen atom will function in a similar manner to the carbon atom but offers unusual advantages in corrosion resistance.

Phosphorus (P)

• Improves strength, machinability, and hardness.

• Creates brittleness in high concentrations.

Silicon (Si)

• Increases strength.

• Deoxidizes and degasifies to remove oxygen from molten metal.

Sulfur (S)

• Improves machinability when added in minute quantities.

Tungsten (W)

• Adds strength, toughness, and improves hardenability.

Vanadium (V)

• Increases strength, wear resistance, and increases toughness.

Steel Production

The world of steel is as fluid as molten metal. It is ever-evolving. Steel as a matter of opinion is very subjective as it relates to knives and knife knuts. There is no clear-cut answer as to which is the best steel. We have different requirements and preferences. Our hope is this guide will help you understand the world of steel a bit better and perhaps assist you in better defining what your own preferences are and why. A word of caution, this information is not intended to be all-inclusive, nor could it ever be.

We at Spyderco, just like all other people, gravitate towards superior products. We are committed to using the best materials available at the time. As the world of steel evolves, so do our products. There are over 3000 different types of steel, each having its own positive and negative attributes. In order to determine your own preferences, it is perhaps best to first understand the history of steel and how it is made.

Although an exact date of discovery is not known, man has been forging steel for as long as he's been working iron. Ironworkers learned to make steel by heating wrought iron and charcoal (a source of carbon) in clay boxes for a period of several days. By this process, the iron absorbed enough carbon to become a true steel.

Iron by itself is a relatively soft metal, it does not hold a good edge. However, if you add Carbon it hardens the iron, making steel. Steel has proven to be ideal for making edged weapons.

At a very simplified level, making steel is like baking a cake. You follow a precise recipe to achieve the type of cake (steel) that you desire. You begin with flour (iron) and from there you add various ingredients (elements). These additional ingredients will determine what type of cake (steel) you end up with. Once you have added all of the additional ingredients (elements) you are left with a batter that is ready to bake (heat treat). Baking (heat treating) is just as much a part of the "recipe" as the ingredients (elements). If not done properly, several properties can suffer. Once baked, you have a new – completely different – finished product. Your cake will forever be a cake, it can never go back to being batter. Of course, steel can be re-melted to a molten state, but that simply is the beginning of becoming a new type of steel.

Steel is an alloy of iron and carbon; just as bronze is an alloy of copper and tin. Historically, steels have been prepared by mixing the molten materials. Alloying elements are melted and dissolved into molten iron to make a steel. The molten steel is cast into an ingot, which is then rolled out (while it is still hot) and shaped much like you would roll out cookie dough. As the steel begins to slowly cool below the critical temperature, things start to happen inside the steel. At these elevated temperatures, alloying elements are able to move around in the steel, or diff use. Different elements diff use at different rates, (typically the larger the atom, the slower it diff uses). If the alloying contents are too high for some elements to assimilate with, the excess will separate or segregate out of the steel and form inclusions or possibly combine with another element to form large undesirable carbides. These diffusional processes are also controlled by the austenite grain size of the steel – grains are little packets of specifically oriented crystals. Grain boundaries act as barriers to diffusion, the smaller the grains, the more boundaries, and the slower the steel. This limits the performance capabilities of the steel both in corrosion resistance and in wear resistant carbide formation.

More recently, Powder Metallurgy has become the chosen method of preparation. The difference in the processing of a powdered metal allows for steel chemistries not possible with traditional steelmaking practices. The process starts out the same as wrought steels – alloying elements are added and dissolved into molten iron. Then comes the main difference. The molten steel is atomized (misted into microscopic droplets) into liquid nitrogen where the steel is instantly frozen, leaving no time for diffusional processes. The chemistry of the resulting powder is identical to that in the molten vat. Additionally, there are no inclusions or large carbides that form. The austenite grain size is the size of the powder at the very largest, which is small. The powder is then cleaned and sorted by size and then the remaining ideal powder is sintered in a hot isostatic press to solidify the steel. Sintering is heating the steel to a temperature just below its melting point, and then pressing it together at high pressures to solidify or remove the voids between powder spheres. This allows for drastic changes in the steel chemistry namely in carbon and vanadium. A larger volume of the highly wear resistant vanadium carbides form upon heat-treating. Since Vanadium has a greater propensity to interact with carbon and form carbides than it does with Chromium, most of the excess carbon is utilized in the formation of vanadium carbides. These leave the Chromium free to help keep the steel corrosion resistant. The result is a premium steel product with properties of exceptional wear-resistance and good corrosion-resistance.

Heat treating the steel to its critical temperature allows the carbon atoms to enter into the crystalline molecules of the iron which have expanded due to the heating. Quenching the steel at this point causes the molecules to contract, trapping the carbon atoms inside. More specifically, the process of hardening steel by heat treatment consists of heating steel to a temperature at which austenite is formed. Austenite has the property of dissolving all the free carbon present in the steel. Quenching is then used to "freeze" the austenite changing it to martensite. These treatments set up large internal strains in the steel; these are relieved by tempering (further heating the steel at lower temperatures). Tempering the steel decreases the hardness, strength, and brittleness. It, however, increases the ductility and toughness. Steels are classified accordingly with the elements used in production. These classifications are Carbon Steels, Alloy Steels, High-Strength Low-Alloy Steels, Stainless Steels, Tool Steels and Exotic Steels (non-steel).

Properties of Steel

Alloy

A material that is dissolved in another metal in a solid solution; a material that results when two or more elements combine in a solid solution.

Alloy Steels

Have a specifi ed composition, containing certain percentages of vanadium, molybdenum, or other elements, as well as larger amounts of manganese, silicon, and copper than do regular carbon steels.

Austenetized

The basic steel structure state in which an alloying is uniformly dissolved into iron.

Carbon Steels

Contain varying amounts of carbon and not more than 1.65% of manganese and .60% of copper. There are 3 types of Carbon Steels, Low (.3% or less), Medium (.4-.7%) and High (.8% and up). High carbon is commonly used for knives.

Corrosion Resistance

The ability of a material to resist deterioration as a result of a reaction to its environment. Provided by the elements Chromium (Cr), Copper (Cu), Molybdenum (Mo) and Nitrogen (N).

Critical Temperature

The temperature at which steel changes its structure to austenite in preparation for hardening.

Ductility

The ability of a material to be stretched or drawn, plastically deform appreciably before fracturing. Provided by the element Manganese (Mn).

Edge Retention

The ability of a material to resist abrasion and wear. Provided by the elements Carbon (C), Chromium (Cr), Manganese (Mn), Nitrogen (N) and Vanadium (V).

Exotic Steels

Are generally accepted as steel, but by defi nition are not steel. Examples of Exotic Steels include H1, ZDP-189, Talonite and Titanium. There is an old proverb, ?There was never a good knife made of bad steel.? This statement, just like steel itself, is completely subjective as it relates to knives and knife knuts. We hope this information provides you with a foundation to make your own determinations where steel is concerned.

Grit

The physical size of the austenite grains during austenizing. The actual size can vary due to thermal, time and forging considerations.

Hardenability

The ability of a steel to be hardened by a heat treating process. Provided by the elements Manganese (Mn), Molybdenum (Mo) and Tungsten (W).

Hardness

The resistance of a steel to deformation or penetration analogous to strength.

Heat Treating

Heating and cooling metal to prescribed temperature and the limits for the purpose of changing the properties and behavior of the metal.

High-Strength Low-alloy Steels

Known as HSLA steels are relatively new. They cost less than do regular Alloy Steels because they contain only small amounts of the expensive alloying elements. They have been specially processed, however, to have much more strength than Carbon Steels of the same weight.

Impact Strength

The ability of a material to resist cracking due to a sudden force.

Martensite

A very hard and brittle steel with a distorted body centered tetragon crystal structure.

Precipitation

The separation of a substance that was previously dissolved in another substance.

Quenching

Soaking of steel that has reached a high temperature (above the recrysallization phase) in a medium of air, liquid, oil or water to rapidly cool it. Quenching steel creates martensite.

Rockwell Test

A measurement of steel hardness based on the depth of penetration of a small diamond cone pressed into the steel under a constant load.Stainless

Steels

Contain a minimum of 12% Chromium. The Chromium provides a much higher degree of rust resistance than Carbon Steels. Various sources site differing minimum amounts of Chromium required to deem a steel as stainless (10-13%). It is important to note, that the amount of Chromium needed can be dependent upon the other elements used in the steel.

Tempering

Reheating to a lower temperature after quenching for the purpose of slightly softening the steel, precipitating carbides, stress relieving.

Tensile Strength

Indicated by the force at which a material breaks due to stretching.

Tool Steels

Contain Tungsten, Molybdenum and other alloying elements that give them extra strength, hardness and resistance to wear.

Toughness

The ability of a material to resist shock or impact.

Yield Strength

The point at which a steel becomes permanently deformed; the point at which the linear relationship of stress to strain changes on a Stress/Strain curve.

Why the Round Hole?

One of the most common questions we get from people new to Spyderco knives is "Why the Round Hole?" The Round Hole allows the blade of a folding knife to be swiftly and easily opened with only one hand. This revolutionary feature was granted a U.S. utility patent in 1981 and literally helped define the form of the modern folding knife. Unlike thumb studs, disks, and other one-hand-opening attachments, the hole offers a larger surface area for greater reliability and does not interfere with the cutting action of the blade. An iconic symbol of our brand, the Trademark Round Hole™ also serves as a user-friendly alternative to a traditional nail nick in our two-hand-opening folders and a proud expression of our brand identity in our fixed-blade knives.

Why the Clip?

Spyderco was the first company to equip a folding knife with a pocket clip. This revolutionary feature was introduced on our very first folding knife design in 1981 and allows a folding knife to be carried at the top of the pocket where it is easily accessible and does not interfere with access to other items in the pocket. This brilliantly simple idea inspired our entire line of CLIP-IT® knives and also helped define the form of the modern folding knife. Although it is now commonplace on most brands of folding knives, it all started with Spyderco.

Blade Grinds

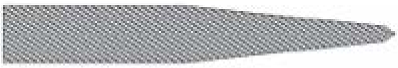
CENTERLINE GRIND

A blade grind resembling that of a double-edged knife in which the top and bottom bevels meet in the center of the blade's width. Only the bottom edge is sharpened and the spine of the knife is left unsharpened to create a swedge.

FALSE EDGE

A sharpened secondary edge on the spine of a blade near the point. If unsharpened, it is called a swedge.

FLAT SABER GRIND



A blade ground with flat bevels that extend from the centerline of the blade to the cutting edge. This grind maintains full thickness through a larger portion of the blade for increased strength.

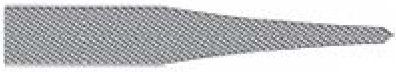
FULL-FLAT GRIND

A blade ground with flat bevels that extend from the spine all the way to the cutting edge. This grind reduces drag during cutting and decreases overall weight.

HAMAGURI

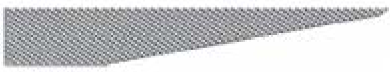
Japanese for "clam" or "clamshell," it describes a blade ground with convex radiused bevels. Also called an Appleseed or Moran grind, it is often produced by grinding on a slack grinding belt.

HOLLOW GRIND



A blade with bevels that are ground with a concave radius. The bevels may extend the full width of the blade (full hollow grind) or only a portion of its width.

SINGLE-BEVEL GRIND

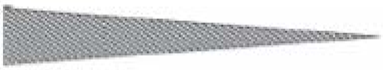


Also called a chisel grind, this describes a blade that is beveled on only one side. It may be flat or hollow ground.

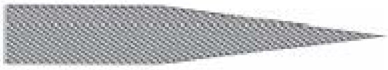
SWEDGE

An unsharpened bevel on the spine of a blade near the point. If it were sharpened it would be considered a false edge. A swedge reduces blade weight, enhances balance, and improves penetration.

ZERO GRIND

A grind similar to a full-flat grind but without the secondary  bevel at the cutting edge. The plane of the bevel continues to create the cutting edge.

ZERO SABER GRIND

(Scandinavian or “Scandi” grind) Similar to a flat-ground  saber, but without a secondary bevel at the cutting edge. The plane of the bevel continues to create the cutting edge.

Blade Shapes

Assist Blade

(Patented blunt tip) A hollow-ground blade with a blunt tip designed to prevent accidental punctures. Designed for cutting webbing, rope, seatbelts, or clothing.

Bowie Shaped Blade

Named after the legendary Colonel James Bowie, this term has come to describe any number of variations of a blade with a primary cutting edge with a curved "belly" and a clipped point. The clip may be sharpened or unsharpened or may be straight or concave.

Double-Edged Blade

A blade with sharpened edges on both the primary edge and the spine or a symmetrical blade with two sharpened edges, like a dagger.

Drop Point Blade

A design popularized by the hunting knives of the late Bob Loveless. The spine of the blade follows a subtle convex arc to the point.

Hawkbill Blade

A sharply curved blade sharpened on the concave side. Designed for cutting with a pulling stroke, it is commonly used by commercial fishermen for cutting line, webbing and netting.

Leaf Shaped Blade

A blade shape developed and refined by Spyderco. It is similar to a spearpoint, but not completely symmetrical, and has a more acute point and typically no swedge.

Modified Clip Point Blade

A blade ground on the spine in an angled or sweeping line downward to meet the point.

Reverse "S" Blade

A blade shape resembling a backwards letter "S" with the tip curving downward and the widest portion of the blade curved in a convex arc.

Sheepfoot Blade

A blade with a blunt rounded tip and a straight cutting edge. The lack of a traditional point reduces the chances of accidental punctures around livestock, inflatable watercraft and during emergency cutting.

Spear Point Blade

A symmetrical blade with an equal amount of curve on the spine and the cutting edge. The grind line of the primary bevel and the point both lie on the blade's centerline. Spearpoint blades often feature swedges or false edges on the back of the blade.

Wharncliffe Blade

A blade shape in which the point of the knife tapers downward from the spine to meet a straight cutting edge at the tip.

Clips

DEEP POCKET CLIP

A knife clip designed to mount close to the end of the handle so very little of the knife remains exposed when it is clipped in the pocket.

INTEGRAL POCKET CLIP

A pocket clip molded as an integral part of the handle rather than a separate component attached with screws. This style of clip was used on early Spyderco models.

METAL CLIP

The most commonly used clip on Spyderco knives, metal clips can be made of stainless steel or titanium. They vary in shape, size, and finish to complement specific knife designs. They may be attached to the handle with screws or barrel bolts and often may be adjusted to provide multiple carry options.

SHACKLE CLIP

A spring-loaded barrel clip with a release pin positioned near the Spyderco Round Hole letting you unhook and open the folder in one motion without needing to rotate the knife in hand. It snaps through a loop for attachment to a PFD, spray skirt, harness, buoyancy equipment or carabineer. Found on the C30BK2 Remote Release2.

WIRE CLIP

A clip made from formed heat-treated wire that is attached with a screw or barrel bolt. Some wire clips are designed for deep-pocket carry, while others position the knife higher and closer to the pocket’s edge.

Edge Grinds

PLAINEDGE

A sharpened knife blade with no serrations or teeth sometimes referred to as a “smooth blade”.

SPYDEREDGE

Spyderco’s two-step serration patterns consisting of one large and two small serrations. The pattern increases the cutting edge’s surface area by up to 24%.

COMBINATIONEDGE

A blade that is partially PlainEdge and partially SpyderEdge at the cutting edge.

TRAINER

A non-sharpened blade that is identical in weight and proportion to its live counterpart and used for training and practice purposes. Spyderco trainers are red handled denoting they are non-sharpened.

Handle/Scale Materials

ALMITE

A coating used on aluminum handles, similar to anodizing. It resists scratching and marring and can be tinted to any color.

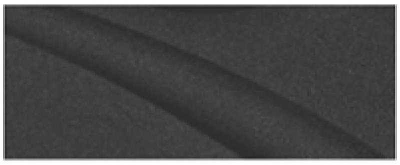
ANODIZED ALUMINUM

Subjecting aluminum to electrolytic action, coating the aluminum with a protective and decorative film.

CARBON FIBER

Graphic fibers (the size of a human hair) woven together then fused with epoxy resin. Lightweight with a high level of tensile strength it is three dimensional in appearance and costly to manufacture.

FRN (FIBERGLASS REINFORCED NYLON)



A nylon polymer mixed with glass fiber then injection molded into formed and textured lightweight high-strength knife handles.

BI_DIRECTIONAL TEXTURING

Patented texture pattern molded into FRN handles with forward and backward graduating steps radiating outward from the center of the handle. It provides resistance to slipping in the hand.

VOLCANO GRIP

Our trademarked waffle texture found on several of our FRN handled knife models. It is a continuous pattern of small squares providing tactile resistance to slipping while gripped in the hand.

G-10

An epoxy filled woven glass fiber that is rigid, impervious to temperature changes and chemicals and can be tinted into different colors.

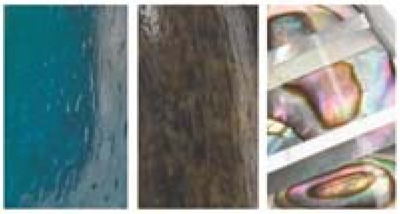
KRATON

A rubbery thermoplastic polymer used as flexible inlays on knife handles enhancing grip.

MICARTA

Composite of linen or paper fabric that is impregnated with epoxy resin then formed into lightweight, durable and visually appealing handles. It can be polished or bead blasted to change its appearance and texture.

NATURAL MATERIALS



Natural materials such as jigged bone, leather, mother of pearl, abalone, stabilized woods and stone that are used in making and embellishing handles.

PEEL PLY CARBON FIBER

A carbon fiber filled, epoxy resin lay-up that has textured material placed on the surface to protect the material during manufacturing. After manufacture the material is removed and it leaves a grippy texture in the epoxy making a non-slip handle material.

STAINLESS STEEL

Steel containing a minimum of 12.5% chromium, making the steel resistant (not stain proof) to corrosion. The chromium oxide (CrO) creates a barrier to oxygen and moisture inhibiting rust formation.

TITANIUM

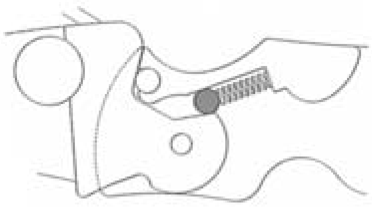
A non-ferrous metal used in knife manufacturing for its high tensile strength, light weight and corrosion resistance. Often used for clips (Salt Series), handles and liners.

Locking Mechanisms

BACK LOCK

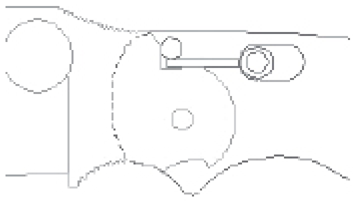
A locking system positioned on the back of the handle that uses a rocker arm that pivots in the center. A lug on one end of the arm engages a notch in the blade's tang to lock the blade open.

BALL BEARING LOCK



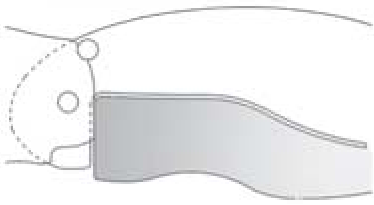
A patented compressive lock that wedges a ball bearing between a fixed anvil and the blade tang. The mechanism also serves as a detent to hold the blade in the closed position.

BOLT ACTION LOCK



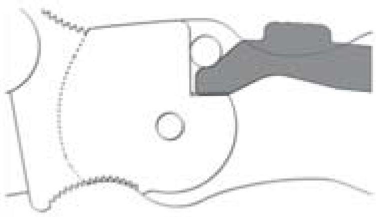
A locking mechanism designed by Blackie Collins that consists of a spring-loaded bolt that engages on a ramp on the tang of the blade to lock the blade open.

CHRIS REEVE INTEGRAL LOCK (R.I.L.)



Developed by custom knifemaker Chris Reeve, the R.I.L. is similar to the Walker LinerLock, but uses a lock bar that is integral to one of the handle scales.

COMPRESSION LOCK

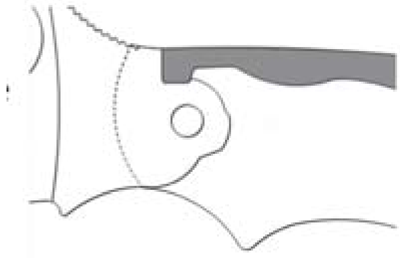


A lock mechanism that uses a leaf-like spring from a split liner in the handle to wedge laterally between a ramp on the blade tang and the stop pin (or anvil pin). Developed and patented by Spyderco, it provides extreme lock strength and ease of use.

FRICTION FOLDER

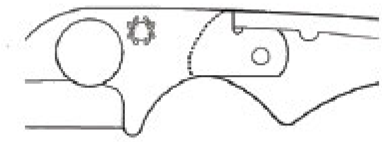
A type of nonlocking folding knife in which the blade features a tab or lever extending from the tang. In the open position, this tab rests against the back of the handle and is held in place by the hand to stabilize the blade during use.

NOTCH JOINT



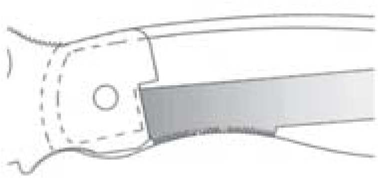
A non-locking joint in which the blade is held open by spring pressure against a notch in the tang.

SLIP JOINT



A non-locking mechanism in which the blade is held open by spring pressure on a flat section on the back of the blade's tang.

WALKER LINERLOCK



A locking system developed by custom knifemaker Michael Walker that uses a leaf-like spring split from the liner to wedge laterally against a ramped surface on the tang of the blade.

Counterfeit Statement

When Spyderco sold its first knife more than 30 years ago, we revolutionized the concept of the modern folding knife and literally set a new standard in cutting tools. In doing so, we also immediately became one of the most imitated products in history.

At Spyderco, we have been defending our company and our reputation against poor quality knockoffs of our products for decades. Through diligent policing of the marketplace, close cooperation with U.S. and international customs authorities, and aggressive legal action, we have successfully defended the honor and integrity of our brand many times.

Today's marketplace is flooded with an increasing number of counterfeit and "look-alike" knives that are being illegally represented and sold as genuine Spyderco products. In some cases, these knives bear only a passing resemblance to our real products, but are illegally marked with our brand logo. In other cases, these imitations are frighteningly accurate reproductions of our knives made with substandard blade steel and other materials. Differentiating them from authentic, genuine Spyderco products has become increasingly difficult.

In response to this serious issue, Spyderco has redoubled its efforts to combat the manufacture, importation, and sale of counterfeit knives. Our in-house legal experts have testified in front of the U.S. Congress on this issue and continue to cooperate closely with federal and international authorities to stem the flow of illicit copy knives and punish those responsible to the fullest extent of the law.

Spyderco has worked very hard for more than three decades to earn a reputation for producing reliable, high-performance cutting tools and accessories. We deserve that hard-earned reputation and will work just as hard to protect it, our integrity, and the integrity of our products. Please support us in our efforts with your commitment to purchase only genuine Spyderco products.

COUNTERFEIT KNIVES AND WARRANTY REPAIR

Spyderco's warranty policy is fair and simple: We warrant that all of our products are free from defects in materials and workmanship. We do that because they are our products and we take full responsibility for their quality.

Logically, if we did not make something, we cannot accept any responsibility for its quality. It's that simple.

If you return a knife to us and we determine that it is not a genuine Spyderco product, we will inform you of that fact and return it to you at your expense. Under no circumstances will we perform any service or repairs—no matter how minor—on any counterfeit, knockoff, or other non-Spyderco product.

What can you do to support Spyderco's efforts and protect yourself against the risk of receiving a counterfeit knife?

The answer is a lot. Here are some suggestions:

- Do your homework and become thoroughly familiar with our products before you buy. The more you understand the quality and features of our genuine products, the easier it will be for you to spot and avoid fakes.
- Remember that if something looks too good to be true, it probably is. Spyderco makes premium-quality knives from premium-quality materials and price our products appropriately. If you see a Spyderco knife being sold for a ridiculously low price, it's probably not a genuine product.
- Buy your knives exclusively from Spyderco directly or from reputable dealers who sell only genuine, name-brand knives. You may pay a little more, but the service and peace of mind you will have are well worth it. And, in the unlikely event your knife requires service, you can return it to us with the confidence that we will stand behind it.

- One of Spyderco's most powerful weapons against counterfeit knives is our devoted community of fans. Those who have used real Spyderco knives swear by them and help us police the marketplace for counterfeits. They also help other Spyderco fans avoid being cheated.