Saw Blades: Technical Information

Glossary Of Terms

Anti-Kickback Limiter – (L)
The projection at the back of the tooth shoulder that limits the maximum tooth bite to the safe amount for the blade design.

ATB – Alternate Top Bevel
Tooth configuration where the top bevel alternates from right to left. Top bevel can range from 10 degrees to 40 degrees. Used for crosscutting hardwoods and softwoods and general-purpose cutting.

Bore
Arbor hole diameter

Brazing
The method used to attach the carbide tips to the blade body. Both the blade and the body are heated above the melting point of the brazing compound, which then flows, by capillary action into the joint, forming a bond between the parts.

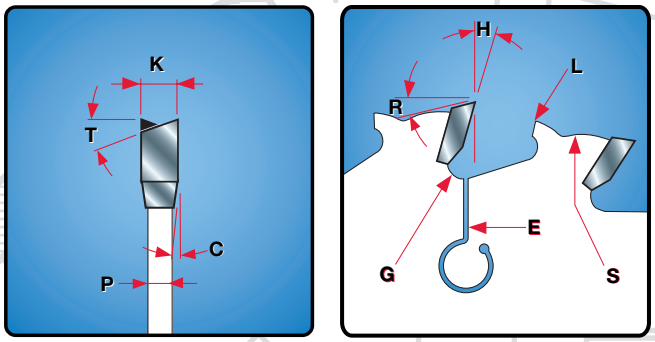
COMB – Combination Grind
A mixture of ATB and Flat Top tooth design where each group of 5 teeth are led by a flat-topped raker tooth and followed by top bevel teeth alternating from left to right. Multi-purpose use.

Expansion Slots – (E)
Slots that are cut into the radius of the blade body controlling the expansion of the blade that may occur due to heat and centrifugal force.

FLAT – Flat Top Grind
Teeth are ground flat on top with 0 degrees of top bevel angle. Durable and long lasting, this blade is used for ripping or general purpose.

Gullet – (G)
The area cut out in the blade body in front of each tooth. The gullet is designed for chip removal. The higher the ratio of teeth to blade size the smaller the chip size, and therefore the smaller the gullet.

Hook Angle – (H)
The angle that the face of the tooth makes with a line projecting radially from the center of the bore coming into contact with the tooth. Hook Angle ranges from 25 degrees to –7 degrees.



Kerf – (K)
The width of cut a saw blade makes under ideal conditions.

Plate – (P)
The thickness of the saw blade body.

Radial Side Clearance – (C)
The clearance angle on the side of the tooth.

Relief Angle – (R)
The angle made by the top of the tooth away from the cutting edge to a line tangent to the blade circumference.

Shoulder – (S)
The part of the blade body directly behind each tooth, which provides support for the tooth.

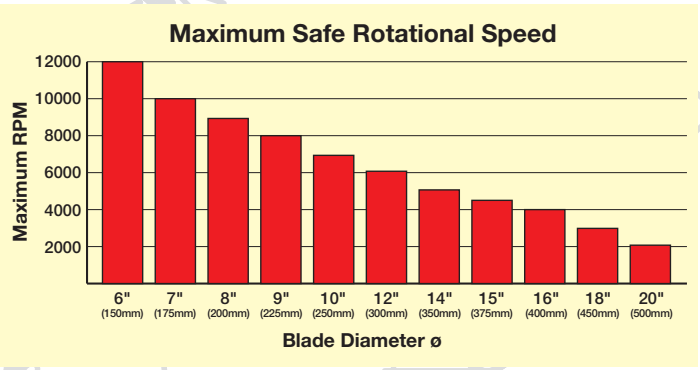
TCG – Triple Chip Grind
Tooth grind where one flat-topped tooth is followed by a trapezoidal tooth that is slightly higher. The higher tooth pre-cuts the material narrower than the final kerf, helping to eliminate chipping in brittle materials, such as chipboard and laminates.

Tensioning Ring
The area in the blade that is pre-tensioned for maximum flatness over a broad temperature range, and operational speed. The tensioning ring can be seen on most blades as a faint ring approximately 3/4 the diameter of the blade.

Top Bevel Angle – (T)
Angle that the top of the tooth makes from side to side.

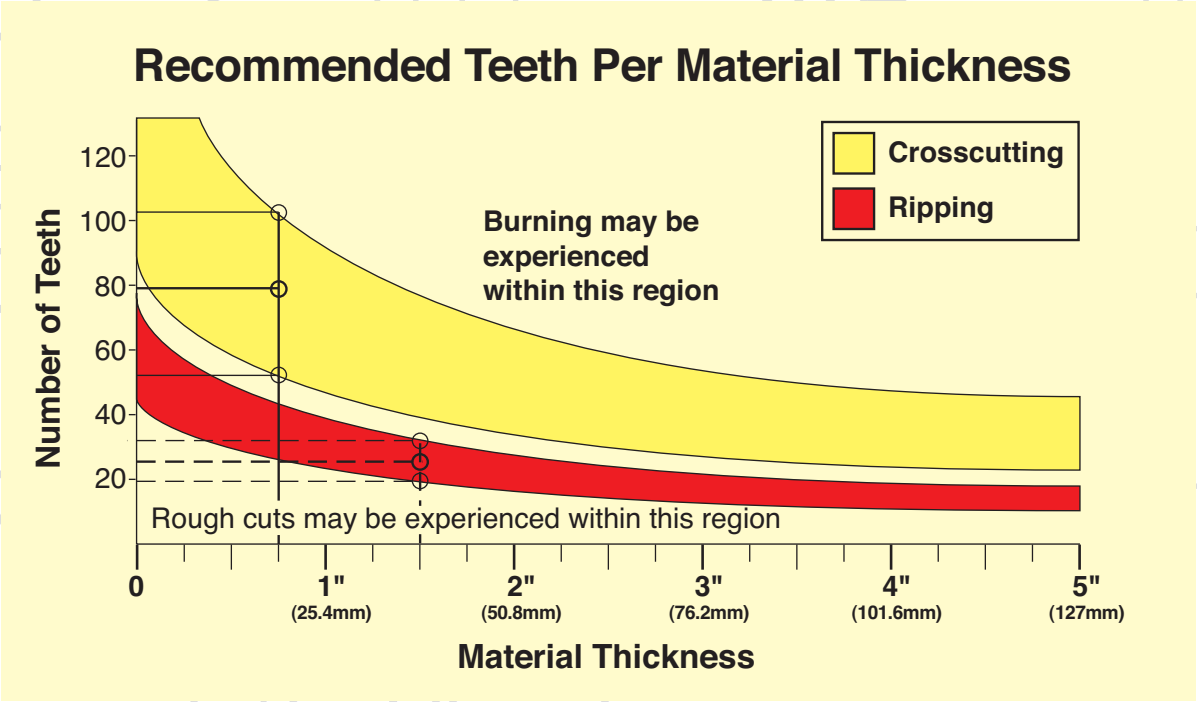
Equivalency Table
For Industrial Saw Blade Sizes

mm	Inches	mm	Inches
150	6	235	9-1/2
160	6-1/2	250	10
170	7	300	12
184	7-1/2	350	14
200	8	400	16
210	8-1/2	450	18
220	9	500	20



Saw Blades: Technical Information

Valuable Information: The correct number of teeth is more important than the highest number of teeth. See chart below.



How To Use This Chart

1. Find the material thickness you will be cutting on the bottom scale.

2. Extend a vertical line up into the shaded area that matches the cut that you will be making (ripping or crosscutting).

3. Extend horizontal lines from the points that the vertical lines enter and exit the shaded area. These two lines represent the maximum and minimum number of teeth that should be used to make the cut.

4. Extend a horizontal line centered between the first two horizontal lines.
THIS LINE REPRESENTS THE IDEAL NUMBER OF TEETH THAT SHOULD BE USED TO MAKE THE CUT.

EXAMPLE 1:
How many teeth should be used to crosscut a 3/4" thick board?
The heavy solid line is extended vertically into the light yellow crosscut region. The two light solid lines are extended horizontally from where the vertical line crosses the boundaries of the crosscut region. The heavy solid line is drawn horizontally, from the middle of the crosscut region. The chart shows that the blade to use to crosscut a 3/4" thick board should have between 56 and 104 teeth. Ideally, an 80-tooth blade should be used. You then select the blade closest to the ideal number of teeth.

EXAMPLE 2:
How many teeth should be used to rip a 1-1/2" thick board?
The heavy dashed line is extended vertically into the orange ripping region. The two light dashed lines are extended horizontally from where the vertical line crosses the boundaries of the ripping region. The heavy dashed line is drawn horizontally from the middle of the ripping region. The chart shows that the blade to use to rip a 1-1/2" thick board should have between 20 and 32 teeth. Ideally, a 26-tooth blade should be used. You then select a blade closest to the ideal number of teeth, which in this case would be a 24-tooth blade.

Freud—Leaders In Carbide Technology

About Freud's TiCo™ Hi-Density Carbide

TiCo™ Hi-Density Carbide is a new specially formulated, highly compact Titanium Cobalt Carbide engineered and manufactured by Freud to maximize performance on all Freud cutting tools.

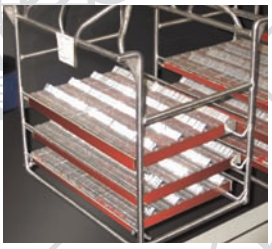
Designed in Freud research and development laboratories, Freud's TiCo™ Hi-Density Carbide is scientifically developed using the following elements (as well as proprietary elements), to produce a supreme product:

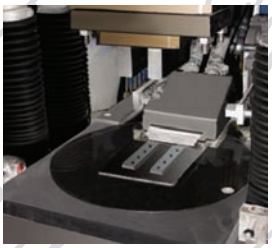
- TiC=Titanium Carbide is known for its high strength, excellent wear resistance, resistance to corrosion, and high melting/boiling points (heat resistance).
- Co=Cobalt also known for its density, hardness, and corrosion resistance; but it's also a very impact resistant element.
- W=Tungsten is an extremely dense and durable hard metal.

This new carbide is much smaller and more densely packed than other carbides on the market today, enabling the carbide teeth on Freud's blades, bits and cutters to last up to four times longer than standard products. Carbide size is extremely important when it comes to sharpness as well as the rate at which an edge wears. The larger the carbide grain, the faster an edge will wear. While standard carbides measure as large as 5 microns, and an advanced micrograin carbide can measure at 1 micron, Freud's TiCo™ Hi-Density Carbide is miniscule in comparison at .8 microns, with a laminate blend as small as .4 microns.

Freud Hi-Density Carbide Blends:

- **Non-Ferrous Blend**
- **Ripping Blend**
- **General Purpose Blend**
- **Combination Blend**
- **Crosscutting Blend**
- **Panel Sizing Blend**
- **Laminated Panel Blend**





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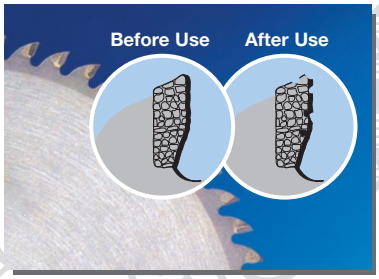
TiCo™ Hi-Density Carbide
Freud's premium quality TiCo™ Hi-Density Carbide allows for a sharper edge that gives a better finish with a dramatically longer cutting life. And since the grains are much smaller and more dense there is not as dramatic a loss to the cutting edge, so wear occurs much more slowly.

Competitors



Standard Grade Carbide
Large grain carbide cannot be sharpened to such tight tolerances and as a result leave a rougher finish. Plus, the cutting edge wears much more quickly due to larger pieces of material eroding away with use. In fact, after just a few cuts with standard carbides, life and finish begin to suffer.

Using precise mixtures of cobalt (for impact resistance), titanium (for its anti-corrosive properties), tungsten (for its hardness), and a number of proprietary elements, Freud creates over 20 different blends of TiCo™ Hi-Density Carbide designed specifically for each cutting application to maximize blade life and material finish. Other carbide that is purchased "off-the-shelf" is usually non-specific and therefore will not maintain the proper tooth geometry or sharp edge. Freud-made carbides are designed to produce the best finish and life for their particular purpose.

Freud's industrial carbide blends range from highly impact-resistant for durability in ripping to extremely hard for maintaining a sharp edge in laminate cutting. For example a TiCo™ Hi-Density Ripping Carbide contains a moderate amount of cobalt allowing the carbide to withstand the impact demands when ripping, while a TiCo™ Hi-Density Laminate Carbide is a sub micrograin, dense carbide formulation that is half the size of Freud's other TiCo™ blends. At 0.4 microns, this carbide which contains a maximum amount of tungsten is the hardest of all which allows the edge to stay sharpest in laminate, melamine and solid surface cutting applications

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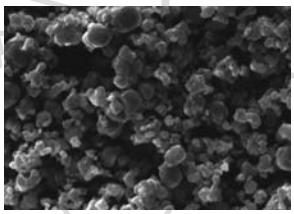
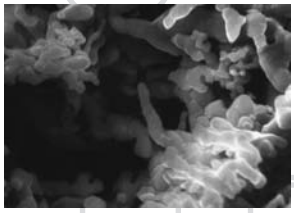
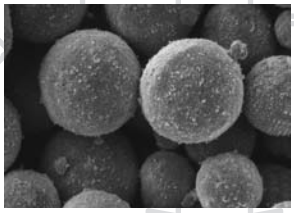
Freud—Leaders In Carbide Technology



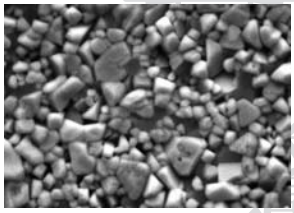
Tungsten Carbide (WC)
Tungsten Carbide is a combination of Tungsten and Carbon in powder form. This powder is created by a process of carburization in a Hydrogen furnace to create very fine particle sizes in the 2 to 0.2 µm range.



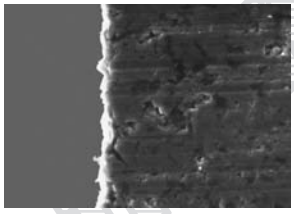
Cobalt (Co)
Cobalt is used as the binder that holds the different carbide powders together. It also provides the bonding surface for the brazing process. Freud uses only Cobalt from a special process which yields a certain grain structure required for a strong bond.



Atomized Carbide Powder
Atomized Carbide powder is a mixture of Tungsten Carbide, Cobalt and other carbides, which was mixed with wax and alcohol to form a homogeneous mixture then atomized in Nitrogen atmosphere. The spherical shape makes the mixture flow evenly into the presses yielding a higher quality carbide. The average size of the spheres are approximately 150 µm.

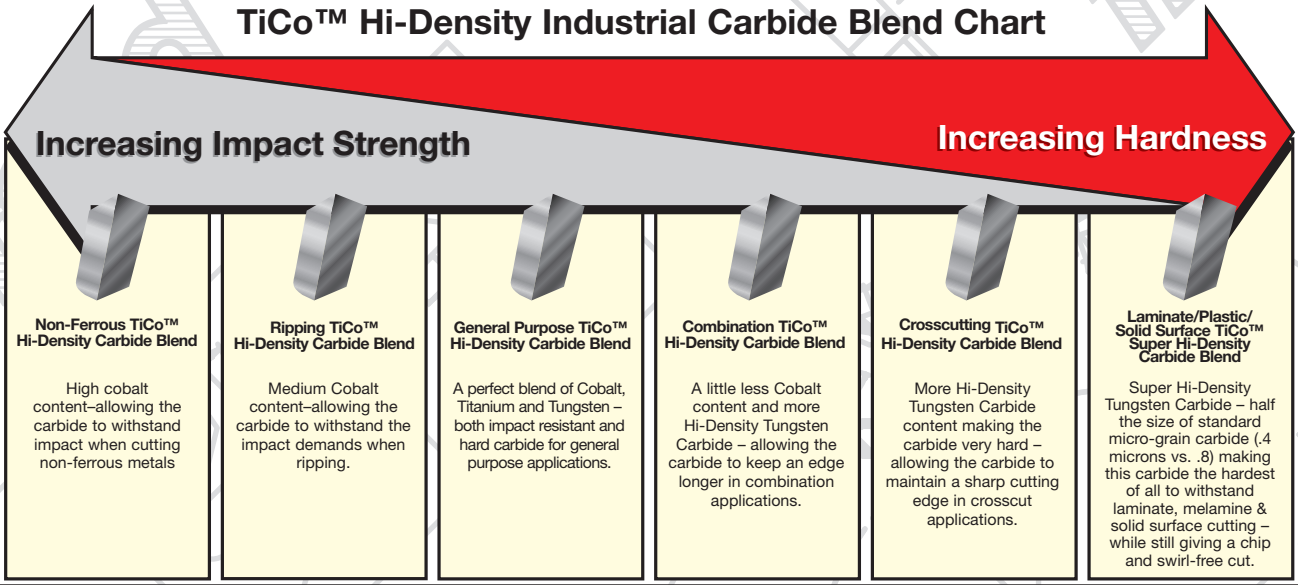


Crystalline Structure
This is an image of the crystalline structure of the carbide after sintering in a vacuum furnace. The light colored crystals are the Tungsten Carbide, notice how fine and even the grain sizes are one to another. The dark zones are the Cobalt binder.



Magnified Cutting Edge
The Tungsten Carbide crystals can be seen after grinding. Freud's finer grain mixture allows for a sharper edge which will resist wear better and last longer because as particles break off there is less rounding of the cutting edge.

TiCo™ Hi-Density Industrial Carbide Blend Chart



All of these technological advancements add up to:

- **Sharper Edge—Flawless Finish**
- **Controlled Wear—Stays Sharper 4X Longer**
- **Precise Formulation—Maximum Performance**
- **More sharpenings—More cut for the money**
- **Extra Long Life—More cut for the money**

Freud—Leaders In Coating Technology

All Freud blades feature industry-first protective coatings to shield the blades from extreme heat, build-up and corrosion.

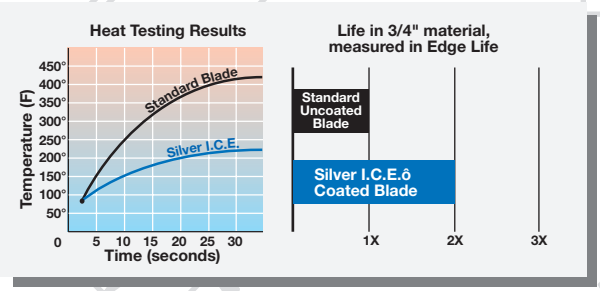
About Freud's Silver I.C.E.™ (Industrial Cooling Element) Coating

Silver I.C.E.™ Coating - a revolutionary new coating that resists corrosion and resin or "pitch" build-up and resists heat up to 2 times longer than standard polished blades.

Blades featuring **Silver I.C.E.™** Coating resist corrosion and build-up, and have 2 times more heat resistance and life than polished blades.

Silver I.C.E™ Coating protects the blade from heat stress that can cause rapid loss of tension, which in turn causes blade warp, over heating and poor cut quality. Additionally, this coating reduces the possibility for pitch build-up, which further reduces the heat element responsible for drag on the motor. Less drag means longer tool life and longer blade life. Less pitch also means less down time for blade cleaning.

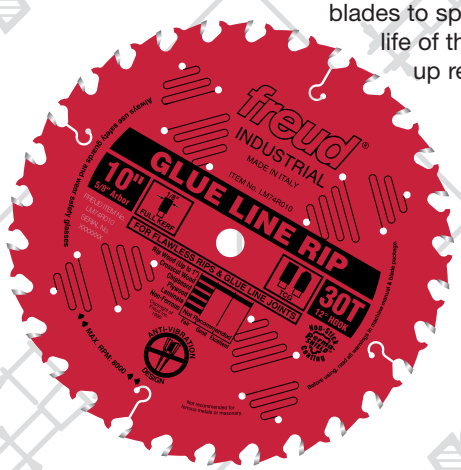
Silver ICE Coating Testing Versus Standard Uncoated Blades



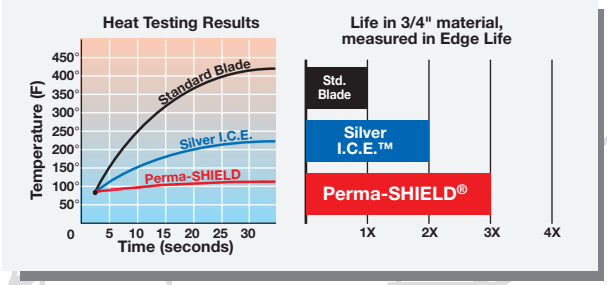
About Freud's Perma-SHIELD® Coating

Perma-SHIELD® - a state of the art formulation produces a coating that is superior to any today, and will withstand the toughest woodworking applications. Combine **Perma-SHIELD®** Industrial Coating System with the other features Freud has pioneered, on a full range of products, and you have a superior wood cutting tool that will answer the needs of all woodworkers.

Perma-SHIELD® - coating virtually eliminates heat generated from friction. The non-stick coating envelops the blade plate and cutting edge in a protective layer resulting in complete thermal insulation in even the harshest conditions. Blades coated with **Perma-SHIELD®** resist binding in large volume cutting, which reduces blade warp. This lubricating feature allows the blades to spin freely and reduce stress on the motor and saw carriage, in turn prolonging the life of the machine. Like Silver I.C.E., **Perma-SHIELD®** eliminates pitch and debris build-up reducing down time for cleaning.



Perma-SHIELD® & Silver ICE Coating Testing Versus Standard Uncoated Blades



Freud—Leaders In Coating Technology

Coated Blades Reduce Blade Drag

Freud's coatings significantly reduce blade drag keeping the blade cool, improving the quality of cut, and extending the life of the blade.

Standard Uncoated Saw Blades

A non-coated saw blade produces more drag and develops more heat. This heat distorts most saw blades, compromising its cut quality and reducing its cutting life.

Prevents Corrosion

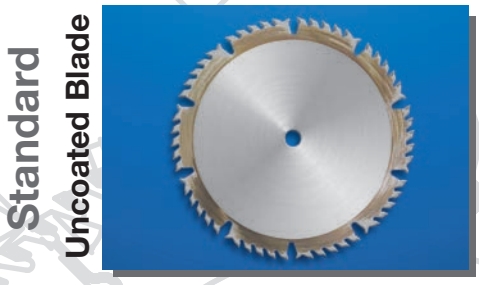
Freud coatings protect the blade from humidity and corrosion, therefore improving feed rate and extending the life of the blade.

Open to Corrosion

A non-coated saw blade is more susceptible to corrosion, therefore increasing blade drag, reducing blade life, and causing more strain on the saw's motor.

Reduces Pitch Build-up

Freud's coatings reduces pitch build up; maintaining the quality of cut and reducing blade clean up time.



Pitch Build-up

A non-coated saw blade is receptive to pitch build up; altering the blade's cutting performance with life and finish.

Freud—Leader In Manufacturing & Engineering

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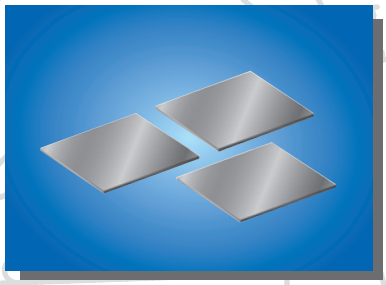
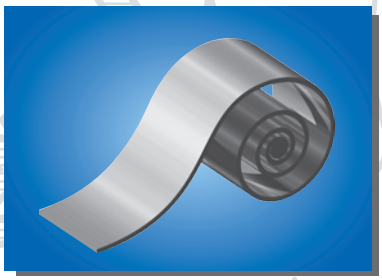


Premium Anti-Fatigue Steel

Pre-Hardened and pre-flattened steel (46 to 48 Rc) – recognized as the world's highest quality steel – ensures precision manufacturing and performance longevity, even under heavy load.

Competitors



Average Soft Rolled Steel

Rolled, soft steel (30 Rc) cannot maintain precision manufacturing tolerances and is therefore unable to remain stable and precise under load.

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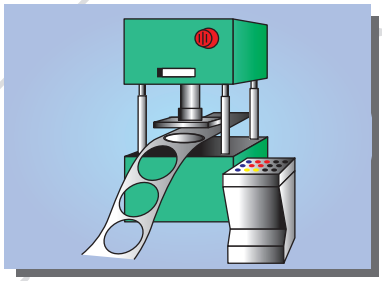
High Performance Laser Cut

Revolutionary high-tech lasers cut each Freud saw blade, ensuring a precise blade body time after time. These lasers are so powerful, Freud is able to utilize a high strength steel (46 to 48 Rc) for the blade bodies, so they will remain flat and true, even after years of use.

Competitors



Stamped Die Cut Blades

Most other manufacturers are forced to use a softer metal (30 Rc) because the 'stamp' or die is also made of steel. This punching process cuts 2/3 of the way through the material; the remaining 1/3 is stretched until it tears. This process creates stresses in the blade that often lead to blade flexing and 'wandering' within the cut.

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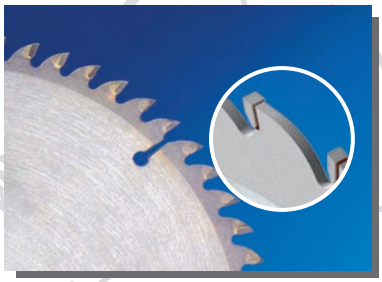
Safety Feature: Kickback Reducing Design

New shoulder design for added safety, reduces the effects of dangerous kickbacks and make the saw blades good at cutting wood with loose knots & nails, and are superb at cutting even the poorest quality chipboard.

Competitors



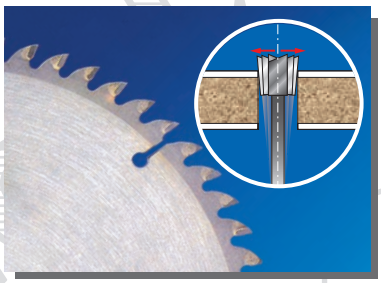
No Safety Feature

Saw blades without anti-kickback system gives no safety benefit at all to the user and may also damage the blade and the workpiece itself.

Freud—Leader In Manufacturing & Engineering

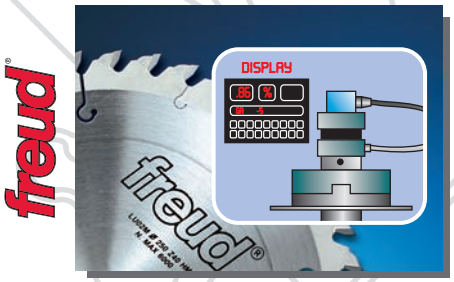
Anti-Vibration Technology

Freud's anti-vibration design stabilizes the blade to reduce chatter for a flawless finish and long life. This feature also produces a low noise saw blade.



No Anti-Vibration

Saw blades without anti-vibration vent technology can move sidways in the cut producing chattering and noise, resulting in poor cut quality.

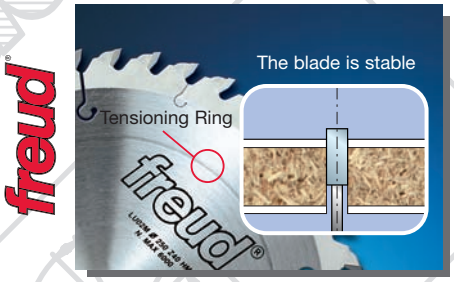


Balancing

All Freud blades are precision balanced to ensure vibration-free cuts. Blades are balanced on computer-controlled equipment that determines exactly where material needs to be removed. Once material is removed, the blade is rechecked to ensure that it is perfectly balanced.

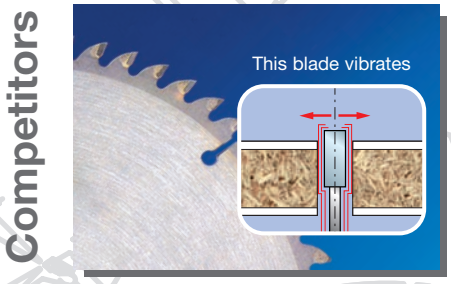
Imperfectly Balanced Saw Blades

A non-balanced blade has different weights in various parts of its body which evokes vibration during rotation and an unbalanced blade can also chatter and create unnecessary rework costing quality, time, and money.



Tensioning Ring

Pretensioning balances the centrifugal and thermal forces the blade endures while cutting and ensures that the blade stays truer under load. Freud's exclusive computer-controlled equipment pretensions the blades, leaving a faint ring near the outside diameter of the blades.



Non-Tensioned Blade

Some manufactures do not tension their blades. Saw blades that are not properly tensioned cannot handle changes in temperature and stresses endured in standard cutting applications. A non-tensioned blade can lead to an unstable cut causing premature wear of carbide teeth, poor cutting finish and a reduction in the cutting life of a saw blade.

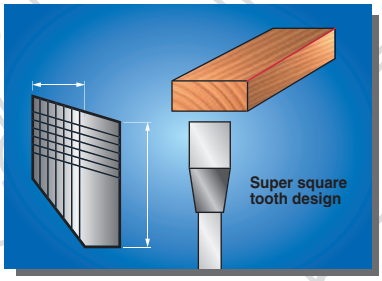
Freud—Leader In Manufacturing & Engineering

Expansion Slots Reduce Noise

The Freud designed laser cut expansion slots are unique in design to dissipate blade stress over a greater area and produce a quieter operation.

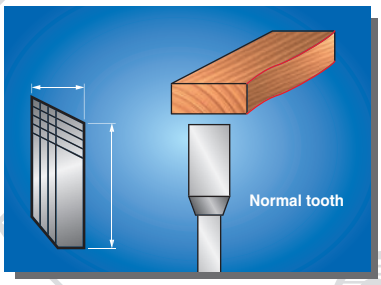
High Noise with Die Cut Expansion Slots

Other designs are not as effective at reducing stress. Punched holes can lead to cracking and high noise.



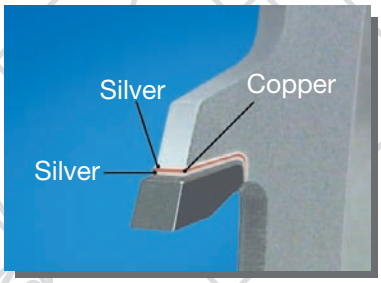
Super Square Tooth Design

The super square tooth cuts more precisely than a normal tooth and with a higher number of sharpenings, lasting longer than standard teeth.



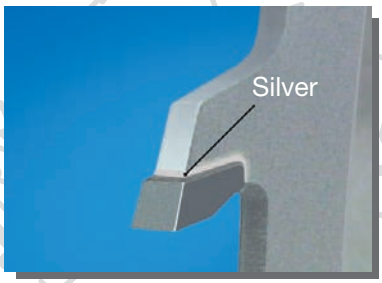
Normal Tooth

The larger cutting surface of a traditional tooth compromises the cutting quality because the tool tends to follow the work pieces grain.



Tri-Metal Brazing

Freud's innovative Tri-Metal Brazing process bonds the carbide tips to the steel blade body. This method consists of copper alloy sandwiched between layers of silver alloy. The copper allows for flexibility and impact resistance to protect the carbide tips and steel shoulders when cutting knots, laminates, hardwoods, etc.



Standard Brazing

Other manufacturers only use silver alloy, which does not allow for expansion during operation. This causes the bond to develop stresses, leading to cracks in the carbide and failed joints.