

SAW BLADES 101

Making smooth, safe cuts with your table saw, radial-arm saw, chop saw or sliding compound mitre saw depends on having the right blade for the tool and for the type of cut you want to make.

There's no shortage of quality options, and the sheer volume of available blades could bewilder even an experienced woodworker. That's why we've put together this article. Its part glossary and part guide, with important basic information to help you make the right selection for your shop.

How do I choose the right saw blade?

A good way to narrow your options and focus your search is to answer a few key questions:

In what type of saw will the blade be used? Table saw? Compound mitre saw? Sliding compound mitre saw? Radial-arm saw?

Some blades are designed to be used in particular saws, so you'll want to be sure to get the right blade for the tool. Using the wrong type of blade for the saw is likely to produce poor results and might in some cases be dangerous.

What materials will the blade be used to cut?

If you need to cut a wide range of materials, that will affect your choice. If you cut a lot of a single type of material – melamine, for example – that specialization also might affect your choice.

What types of cuts will the blade be used to make?

Will it be used exclusively for crosscutting (cutting across the woodgrain)? Will it be used only for ripping (cutting with the grain)? Will it need to produce good results in all types of cuts?

Related to that, are you looking to build a collection of specialized blades, or do you want one blade that can make all kinds of cuts?

Are you willing to change the blade every time you switch from one cut to another?

How powerful is the saw on which the blade will be used, and what size blade does the manufacturer recommend?

Is it a 3 hp cabinet table saw or a portable job-site saw? Is it a 10" saw or 12"?

Answering these questions will go a long way toward clarifying your best options. Understanding a little about the anatomy of a saw blade can help further narrow your search. **Saw Blade Essentials**

many saw blades are designed to provide their best results in a particular cutting operation. You can get specialized blades for ripping lumber, crosscutting lumber, cutting veneered plywood and panels, cutting laminates and plastics, cutting melamine and cutting non-ferrous metals. There also are general purpose and combination blades, which are designed to work well in two or more types of cuts. (Combination blades are designed to crosscut and rip. General-purpose blades are designed to make all types of cuts, including in plywood, laminated wood and melamine.)

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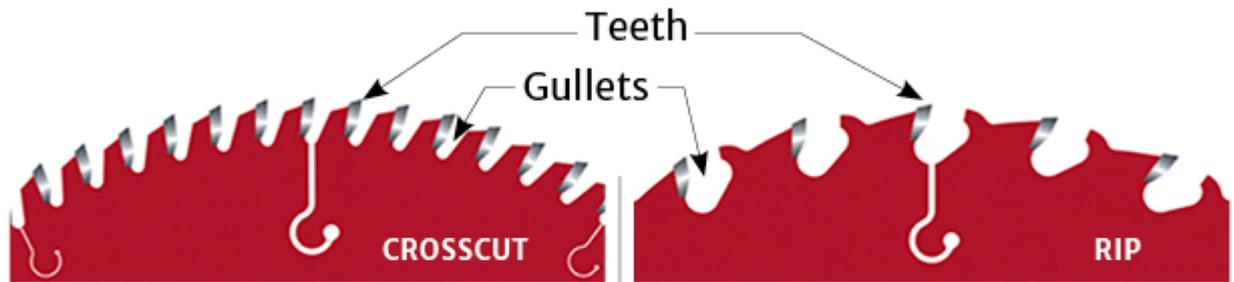
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Number of Teeth

In general, blades with more teeth yield a smoother cut, and blades with fewer teeth remove material faster. A 10" blade designed for ripping lumber, for example, usually has as few as 24 teeth and is designed to quickly remove material along the length of the grain. A rip blade isn't designed to yield a mirror-smooth cut, but a good rip blade will move through hardwood with little effort and leave a clean cut with minimal scoring.

A crosscut blade, on the other hand, is designed to produce a smooth cut across the grain of the wood, without splintering or tearing. This type of blade will usually have 60 to 80 teeth, and the higher tooth count means that each tooth has to remove less material. A crosscut blade makes many more individual cuts as it moves through the stock than a ripping blade and, as a result, requires a slower feed rate. The result is a cleaner cut on edges and a smoother cut surface. With a top-quality crosscut blade, the cut surface will appear polished.

Crosscut blades need more teeth than rip blades



- More teeth yield smoother cut across woodgrain
- Smaller gullets prevent too-fast feed rate

- Fewer teeth required when cutting with woodgrain
- Larger gullets allow faster stock removal

Gullet

The gullet is the space in front of each tooth to allow for chip removal. In a ripping operation, the feed rate is faster and the chip size is bigger, so the gullet needs to be deep enough for the large amount of material it has to handle. In a crosscutting blade, the chips are smaller and fewer per tooth, so the gullet is much smaller. The gullets on some crosscutting blades also are purposely sized small to inhibit a too-fast feed rate, which can be a problem especially on radial-arm and sliding mitre saws. The gullets of a combination blade are designed to handle both ripping and crosscutting. The large gullets between the groups of teeth help clear out the larger amounts of material generated in ripping. The smaller gullets between the grouped teeth inhibit a too-fast feed rate in crosscutting.

Tooth Configuration

The shape of the saw blade tooth and the way the teeth are grouped also affect the way the blade cuts. The configuration of the teeth on a saw blade has a lot to do with whether the blade will work best for ripping, crosscutting or laminates.

 **Flat-Top (FT):** Flat-top teeth are used on blades for ripping hard and soft woods. Because wood is much less likely to chip and splinter when it is being cut with the grain, a rip blade is designed to quickly and efficiently remove material. The flat-top tooth is the most efficient design for cutting and raking material out of the cut.

 **Alternate Top Bevel (ATB):** This means that the blade teeth alternate between a right- and left-hand bevels. This configuration yields a smoother cut when crosscutting natural woods and veneered plywood. The alternating

bevelled teeth form a knife-like edge on either side of the blade and make a cleaner cut than flat-top teeth.

 **Combination Tooth (Comb.):** Combination blades are designed to do both crosscutting and ripping. The teeth are arranged in groups of five – four ATB teeth and one FT – with a large gullet between the groups.

 **Triple Chip Grind (TCG):** The TCG configuration excels at cutting hard materials such as laminates, MDF and plastics. Teeth alternate between a flat "raking" tooth and a higher "trapeze" tooth. The TCG configuration is also used for non-ferrous metal cutting blades.

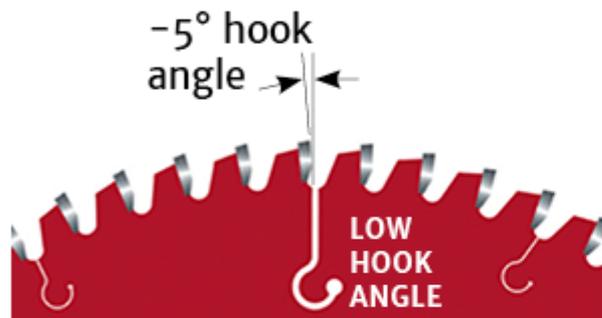
 **High Alternate Top Bevel (Hi-ATB):** The Hi-ATB configuration is used for extra-fine crosscutting and to cut materials surfaced with melamine, which is prone to chipping. The high bevel angle increases the knife-like action at the edge of the blade.

Hook Angle

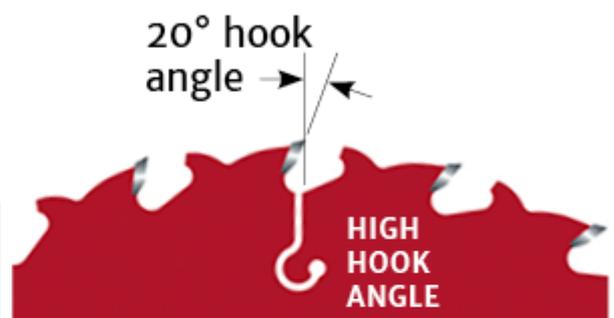
On most saw blades, the faces of the teeth are tipped forward or backward, rather than being perfectly in line with the centre of the blade. This is called "hook angle." On a blade with a positive hook angle, the teeth are tipped forward, toward the direction of the blade's rotation. A negative hook angle means that teeth tip away from the direction of rotation, and a 0° hook angle means that the teeth are in line with the centre of the blade.

Hook angle has an important effect on blade operation. A blade with high positive hook angle (say, 20°) will yield a very aggressive cut and a fast feed rate. A low or negative hook angle will slow the feed rate and will also inhibit the blade's tendency to "climb" the material being cut. A blade for ripping lumber on a table saw will generally have a high hook angle, where an aggressive, fast cut is usually what you want. Radial-arm saws and sliding compound mitre saws, on the other hand, require a blade with a very low or negative hook angle to inhibit overly fast feed rate, binding and the blade's tendency to "climb" the material.

What you need to know about hook angle



- Low (or negative) hook angle prevents overly fast feed rate and prevents blade from “climbing” stock being cut
- Good choice for sliding miter and radial-arm saws



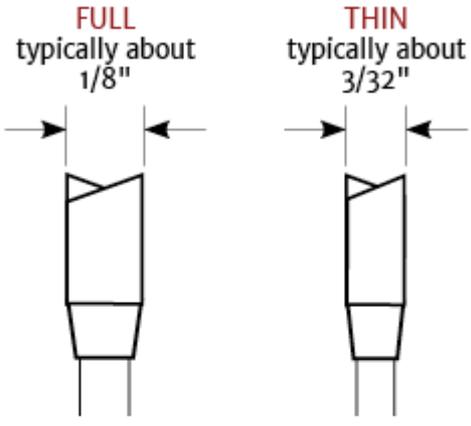
- High hook angle provides an aggressive cut and allows a faster feed rate
- High hook angle is common on rip blades for use on a table saw

Kerf Width

**Full kerf or thin?
How powerful
is your saw?**

FULL
typically about
1/8"

THIN
typically about
3/32"



- Because they take a wider bite and remove more material, full-kerf blades work best for saws with at least 3hp motors
- Thin-kerf blades won't bog down saws under 3hp. That means there will be less heat buildup, less burning and less wear on your saw. Thin-kerf blades also waste less material.

The width of the "kerf" – the slot the blade cuts in the material – is another important consideration. Many blade types are available in both full-kerf and thin-kerf varieties. Full-kerf blades typically cut a 1/8" slot and are intended for use on saws powered by 3 hp (or greater) motors.

Thin-kerf saw blades – blades with a kerf thickness of less than 1/8" – were developed for use on portable and contractor model table saws with motors of less than 3 hp. Because a thin-kerf blade has to remove less material than a full-kerf blade, it requires less power to operate and allows lower-powered saws to cut material at an appropriate feed rate without the risk of bogging down during

the cut. (Bogging down causes excessive friction; as a result, the blade heats up and can become distorted or burn the cut surface.)

A potential trade-off for the thinner kerf is the fact that the blade plate is thinner and therefore might be expected to vibrate more than a thicker, more rigid plate. However, technological advances in blade design have generated thin-kerf blades that rival the best industrial-quality full-kerf saw blades. Vibration-dampening systems, like the one used with Freud thin-kerf blades, compensate for the slight loss of stability and make thin-kerf blades the optimum choice for lower-powered saws.

Teeth quality

the teeth on most high-quality saw blades are thick carbide tips that have been fused (or brazed) to the steel blade plate. How long the blade will stay sharp, how cleanly it will cut and how many re-sharpening it will take all depend on the quality of the cutting tips. On some of the best blades, the carbide is formulated specifically for the application of the blade, and a tri-metal brazing process is used to attach the carbide cutters to the blade plate. This process, in which a layer of copper alloy is sandwiched between layers of silver alloy, provides extra flexibility and impact resistance. At a minimum, look for a blade with C3 grade micro-grain carbide teeth, which are thick enough to allow a number of re-sharpening.

Comparing general purpose and combo blades

Teeth: Hi-ATB	Teeth: 4 ATB + 1 flat
 <p>GENERAL PURPOSE</p>	 <p>COMBINATION</p>
<ul style="list-style-type: none">• Designed to provide exceptional results in all cut types and materials• Shearing action of Hi-ATB teeth yields ultrasmooth cuts• Aggressive hook angle and slightly larger gullets	<ul style="list-style-type: none">• Designed for both crosscutting and ripping• Grouped tooth configuration: 4 alternate top bevel (ATB) plus 1 flat top• Small gullets between teeth, large gullet between groups

BUYING A MITRE SAW BLADE

Aside from getting the correct size blade, the main consideration when choosing a crosscut blade for your mitre saw is whether the saw is a stationary or sliding mitre saw. On sliding mitre saws, regular crosscut blades can tend to take a deeper bite and "climb" the material, posing a possible danger. To reduce "climbing," manufacturers designed blades with teeth set at a negative hook angle that won't bite so aggressively. If you're using a sliding mitre saw, these sliding mitre saw blades are your best – and safest – bet.

BUYING A TABLE SAW BLADE

In choosing the best blade for your table saw, you'll have several important considerations:

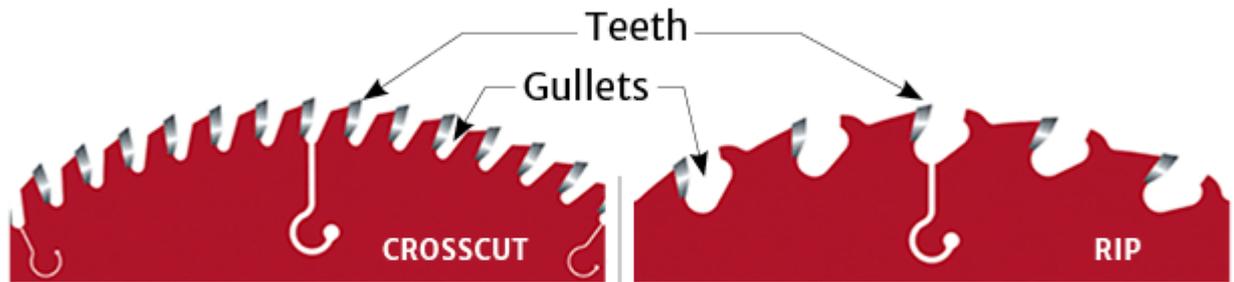
What size blade does your saw require?

Most table saws use 10" blades, but some take smaller blades, and some take larger. Though not generally recommended, you can use a smaller blade than your saw is designed to handle (with the obvious loss in depth of cut). Never try to use a larger blade.

What kind of cuts will the blade need to make?

Primarily rip cuts (with the grain) or crosscuts (across the grain)? Because it's easier to remove material with the grain, ripping blades typically have fewer teeth, and they're set at a more aggressive hook angle and separated by larger gullets to cut and clear wood chips as quickly as possible. The teeth themselves are flat-topped or shaped with triple-chip-grind geometry, both of which are well-suited to cutting with the grain. Because it's harder to get a clean edge when cutting across the grain, crosscut blades have more teeth, which generally are set at a slightly less aggressive hook angle and feature a knife-like alternating-top-bevel geometry that allows them to slice across the wood's fibres. If you're working in a shop with table saws dedicated to each type of cutting operation (or if you don't mind switching out blades on a single saw), specialized blades might be the right choice for you.

Crosscut blades need more teeth than rip blades



- More teeth yield smoother cut across woodgrain
- Smaller gullets prevent too-fast feed rate

- Fewer teeth required when cutting with woodgrain
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But if you need the blade to handle both types of cut with more or less equal frequency and you don't want to have to switch the blades each time (or buy two blades to begin with), you'll want to check out a combination or general purpose blade. These blades balance the number of teeth, hook angle and tooth shape to give you the best results in a variety of cuts. Freud's Premier Fusion general purpose blades, for example, promise excellent results in all kinds of cuts.

Comparing general purpose and combo blades

Teeth: Hi-ATB



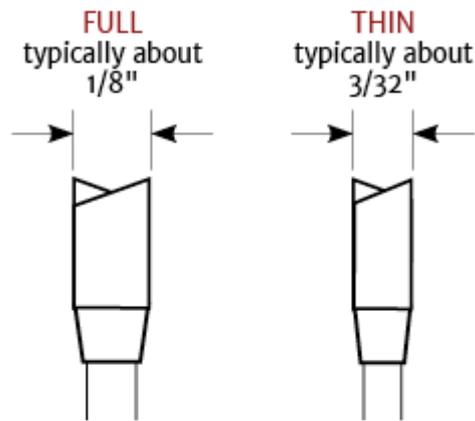
- Designed to provide exceptional results in all cut types and materials
- Shearing action of Hi-ATB teeth yields ultrasmooth cuts
- Aggressive hook angle and slightly larger gullets

Teeth: 4 ATB + 1 flat



- Designed for both crosscutting and ripping
- Grouped tooth configuration: 4 alternate top bevel (ATB) plus 1 flat top
- Small gullets between teeth, large gullet between groups

Full kerf or thin? How powerful is your saw?



- Because they take a wider bite and remove more material, full-kerf blades work best for saws with at least 3hp motors
- Thin-kerf blades won't bog down saws under 3hp. That means there will be less heat buildup, less burning and less wear on your saw. Thin-kerf blades also waste less material.

What kinds of material will the blade need to cut?

Some manufacturers have developed blades designed specifically for certain materials that are prone to splintering or chipping when cut with a regular blade. Freud, for example, offers blades designed to deliver excellent cuts in plywood and melamine- and laminate-coated materials. These blades feature a high tooth count, less aggressive hook angles and tooth shapes that score the material to avoid chip-out. If you cut a lot of these materials, a specialty blade might be a good idea for you.

Finally, how powerful is your saw?

Many blades are available in full-kerf and thin-kerf varieties. Although they can be used in any table saw, thin-kerf blades were developed specifically for use on portable and contractor-style table saws with 1-1/2hp or smaller motors. These saws can bog down with full-kerf blades, resulting in heat build-up and decreased cut quality. Thin-kerf blades are narrower and remove less material, and, as a result, they require less power. So if your saw's motor is less than 3hp – or you want your lumber to go as far as it possibly can – give thin-kerf blades a serious look.

Choosing circular saw blades

Most saw blades are designed to work best in certain types of cutting operations, such as ripping or crosscutting lumber or cutting veneered plywood or melamine. What a blade does best is determined by the number of teeth, the type of gullet (the space between the teeth for clearing chips), the tooth configuration and the hook angle (angle of the teeth).

Crosscut: These blades have more teeth (typically 60 to 80) set at a moderately aggressive angle with shallower gullets. Usually they're configured with an alternate top bevel (ATB) – meaning that the teeth alternate between a right- and left-hand bevel, forming a knife-like edge on either side of the blade – or a triple-chip grind (TCG), in which flat-top teeth alternate with higher teeth chamfered on both sides. They excel at making smooth, splinter-free cuts across the grain of solid wood.

Rip: These blades have fewer teeth (24 to 30) set at a more aggressive angle with deeper gullets to allow for faster stock removal. They often also come in ATB or TCG configuration, and they excel at cutting with the grain.

Combination: As the name suggests, these blades are designed to work well for both ripping and crosscutting. They typically have 50 teeth set at a moderately aggressive angle that are arranged in groups of five: one flat-top tooth and four ATB teeth, with smaller gullets within the groups and a larger gullet between the groups. A good choice for woodworkers who want to be able to perform a variety of cutting operations without having to change blades.

General purpose: These blades are designed to deliver great results in most applications, including cutting solid wood, plywood, laminated wood and melamine. They typically have 40 teeth set at a moderate to aggressive angle with either an ATB configuration or a HiATB configuration (in which the angle of the bevels is steeper). The number of teeth and the depth of the gullets combine to provide both adequate stock removal and clean cuts. Another good choice for woodworkers who want to be able to perform a variety of cutting operations without having to change blades.

Cut-off: These blades are designed specifically for crosscutting with mitre saws and radial arm saws. They have a high tooth count and ATB or HiATB configuration. Specific blades are available for sliding compound mitre saws/radial arm saws and stationary mitre saws.

Specialty blades: These blades are designed for cutting specific materials, such as veneered plywood, plastics and laminates, melamine and non-ferrous metals.