KNEW CONCEPTS

A Cut Above

The Way of the Saw

Understanding Saw Blades Will Make Sawing Easier

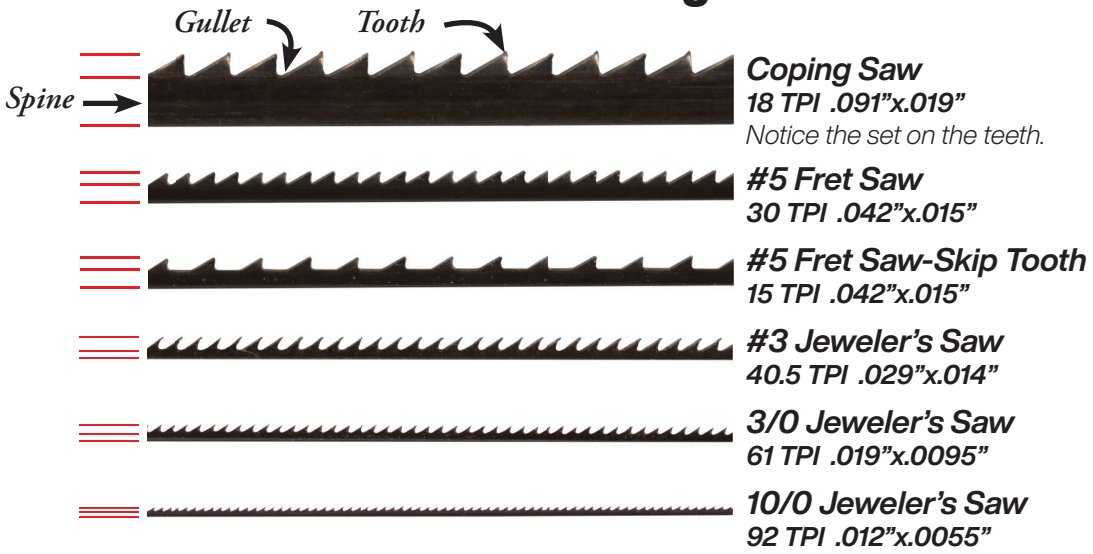
V1.1

In order to get the best performance out of your Knew Concepts saw, you must first understand the Way of the Saw. This is not some mystical discipline; it is simply that you must take a moment to understand your new saw.

What is a saw? If you look in our box, you probably think that the saw is the big red thing with the handle. Not a bad guess, but wrong. That's the saw **frame**. The saw itself is the little teeny bit of wire with the teeth on it. **Everything** else—all of it—is just there to guide the teeth on the front of that tiny little wire. Those teeth do the cutting, and they are the part that it is critical to understand.

You must also understand what you're trying to do. Knew Concepts saws have a variety of different uses: cutting gold and silver for jewelry, steel or plastic for jewelry dies, wooden dovetails or marquetry, and wax cutting, among others. Each of those uses will require a slightly different choice of blades. To make the correct choice, it is important to understand how blades are made, and why you want one type or another. That is the way of the saw.

Saw Blades—Magnified



The saw blades were all photographed together. Their sizes relative to each other are correct. The red lines give a sense of the ratio of tooth depth to spine depth. Notice that the wood blades have much more spine, relative to the depth of their teeth than the jeweler's blades do.

Fret saws and jeweler's saws are the same tool by different names and can load either jeweler's blades, or fret saw blades. The blades are the same length, but their designs are different.

Jewelers' saw blades are designed to be very maneuverable. They're able to turn 90 degrees within their own kerf. The reason they can do this is that they have a very shallow spine. There isn't much material between the bottoms of the gullets between their teeth and the back of the blade. Which means that they can turn on (or in) a dime, but they are very easy to break. The ratio of thickness to width of most jeweler's

blades is roughly 1 to 2. Fret blades are closer to 1 to 3. The critical difference is that their teeth are much deeper relative to that proportion, which is what lets them turn so fast. Their teeth are also very small, and very close together, which lets them cut thin metal easily, but means that they cut thicker things very slowly. Coarser jeweler's blades will cut thin-ish (for wood) pieces reasonably quickly while retaining the deeper teeth that make them maneuverable.

Blade Size	Blade Thickness	Blade Depth	Teeth Per Inch	Recommended min. thickness (B&S Gauge)	Drill size for piercing
8	.0197"	.0440"	28.0	12	#55
7	.0189"	.0400"	30.5	12	#57
6	.0173"	.0370"	33.0	14	#58
5	.0158"	.0331"	35.5	16	#65
4	.0150"	.0307"	38.0	16-18	#67
3	.0140"	.0290"	40.5	16-18	#68
2	.0134"	.0276"	43.0	16-18	#70
1	.0120"	.0240"	51.0	18-20	#71
1/0 (0)	.0110"	.0220"	53.5	18-22	#73
2/0 (00)	.0103"	.0204"	56.0	20-22	#75
3/0 (000)	.0095"	.0190"	61.0	22	#76
4/0 (0000)	.0086"	.0175"	66.0	22	#77
5/0 (Etc.)	.0080"	.0157"	71.0	22-24	#78
6/0	.0070"	.0140"	76.0	24	#79
7/0	.0067"	.0130"	84.0	24-26	#80
8/0	.0063"	.0126"	89.0	26	#80
10/0	.0055"	.0120"	92.0	26+	#80

Jeweler's Saw Blades larger than 8 are uncommon, and there is no 9/0.

Jewelers' blades are sized on a scale which ranges from #18 to 10/0, with zero in the middle. The scale starts at #18 as the largest blade, and counts down to zero, which is also called 1/0, then keeps going below zero by listing the blades as 2/0 (00), 3/0 (000) etc., all the way down to 10/0, or "Ten Aught". 10/0 blades are only .005" thick, or roughly twice as thick as a human hair, while #18 blades look almost like coping saw blades. Most jewelers use a range from #2 down to 6/0.

Woodworkers' blades, (or "fret saw" blades) are proportioned a little differently; they have a deeper spine and shallower teeth, which means that they can't turn a corner as quickly as jeweler's blades can. They also have coarser teeth, and a different cutting edge angle, which means that they don't like to cut metal. One style of fret blade is known as "skip tooth", which means that every other tooth is missing, so that the blade will clear itself of sawdust more easily. Skip tooth blades are especially good for wax and plastic cutting for silhouette/matrix dies and wax models, where buildup of sticky sawdust is a particular problem.

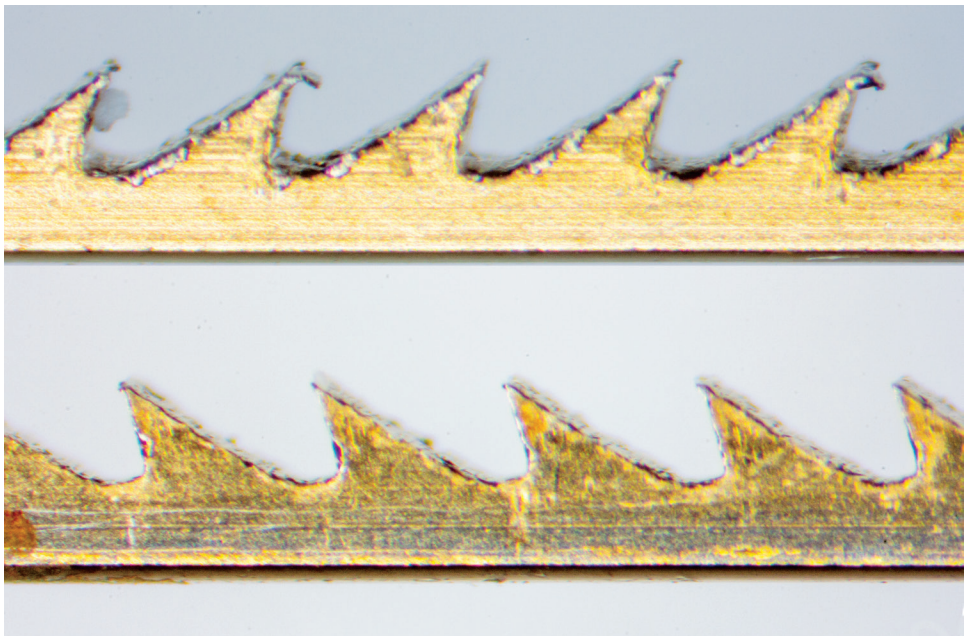
The cross section of a fretsaw blade is more rectangular than the jeweler's blade. On a blade that is 0.015" thick, the blade is .042" deep--a ratio of about 1 to 3; a jeweler's blade of the same thickness would only be about 0.030" or twice the thickness. This makes fret saw blades slightly harder to turn than jewelers' saw blades, as well as harder to break. On the other hand, they cut straight much more easily. This is an acceptable trade-off for most woodwork outside of marquetry. (Marquetry blades look like jewelers' blades with coarse teeth: similar thin spines.)

Coping saws use deeper, longer blades that have cross pins in the end. They have much thicker spines, so they don't turn as quickly as jeweler's or fret blades do, but they can cut much more quickly, and are nearly impossible to break. They're also an inch longer than fret blades, so there's no way to make a fret saw load a coping blade. It just won't fit.

Now to Get "Set"

Larger saw blades, such as coping saws, have what is known as 'set' to the teeth. Every other tooth is bent slightly to one side or the other. This causes them to cut a groove that is wider than the saw blade itself, which keeps the saw blade from getting pinched in the cut, and allows them to turn if they need to.

Fret saw blades, and jewelers' saw blades are far too small to have their teeth set. Instead, they rely on the fact that they really don't have much of a spine for the cut to bind up on in the first place. They also use the miniscule burrs on the side of the blade that are created when the saw blades are manufactured. These little burrs cause the same wider cut as set teeth would. Unfortunately, they wear off eventually. The speed at which they wear is a function of how hard the material being cut is. For instance, blades will wear out surprisingly quickly when cutting steel. If your design has a lot of straight lines, you may not care much, but if you have a lot of turns, you will notice that the first few turns on a new blade are easy, but they get progressively harder from there. For cutting steel dies, 'worn out' isn't a function of how sharp the teeth of the saw are, but how much microscopic burr you have left on the sides. If it gets to be hard to turn a corner, change the blade. This is also why you notice that new blades have a hard time sliding their way to the 'front' of the cut made by the previous blade: they have fresh burrs on their sides, and the old blade didn't. So the new blade is ever-so-slightly wider than the old one. To get a new blade to the front of the cut—any cut—it's best to slowly saw as you move forward, which will widen the cut enough to get the blade through without doing too much damage to the burrs. The same applies for backing out of a cut if you need to: keep sawing while moving backwards.



Microscope photograph of both sides of a normal #1 jeweler's blade. Note that the little burrs are only on the top image, which will become the right side of the blade as used.

All blades have these microscopic burrs, and in general, they're quite useful, but they are also the origin of the fact that most jewelers blades track slightly to the left as they cut. If you look at them under a microscope, the burrs are all on the right side of the blade. Blades tend to cut at a slight angle away from the burrs, thus leading to the well known tendency of most jeweler's blades to cut a smidge to the left. Some people like to drag new blades between a pair of diamond hones to remove the burrs, which stops this behavior, but at the price of reducing the ability to make sharp turns. The best defense is simply to be aware of the problem. The finer the blade, the more effect it has. 6/0 blades notice it far more than #6's do. Also, jeweler's blade notice this effect more than fret blades do, because they are finer.

The Rule Of Threes

Illustration of the 3 tooth problem. The green block is thick enough not to grab. The red one is too thin, and jumps into the gullet between the teeth. So the next tooth suddenly slams into the material much more deeply than the previous tooth..

When selecting the blade to cut any material, from .25mm gold sheet, to a pine 2x4, it is good to keep the Rule of Three in mind: make sure that the blade you use has at least three teeth per the thickness of whatever you're trying to cut. For most woodwork, this isn't an issue, as the pieces are so thick. For metalwork, or when using skip tooth blades, it can matter a lot.

The reason you want at least three teeth in your material at all times, is so that you never end up with a situation where the bottom tooth exits the material before the top tooth enters. In that situation, the blade will jump forward until the material hits the bottom of the gullet between the teeth. Then when the top tooth does finally reach the top of the material, it's suddenly dug in much deeper than it should have been, which usually breaks the blade, or certainly causes it to stop dead. That's why starting a cut with the blade laid down almost parallel to the top face of the metal works: the teeth hit the surface of the metal before they grab on the corner, and sort of slide into the cut, keeping them from grabbing on the corner until it's gone. Once the cut is established, then you can stand the saw up vertically, and cut normally.

Having more than three teeth in the material won't cause any trouble at all, so it's always better to go with finer blades—within reason. Finer blades will cut more slowly, so try for the fewest teeth per material thickness you can get away with, as long as you're sure that you've got more than three. This becomes more critical as the material gets thinner, or when using skip-toothed blades, which can have very long distances between any three teeth.

Marching in Place

The easiest way to turn a jewelers' saw, or fret saw is to slowly turn the work piece as you cut along the curve of your pattern. This will work great for soft curves, but for hard corners, it's best to do what's known as 'marching in place'.

Saw up to the corner as you normally would, then stop moving the work at all. Keep sawing, but don't try to go anywhere. While you're marching in place, slowly rotate the work piece to the required angle for the new cut direction. Once you have rotated about 45 degrees, you can start gently pulling back, so that the material is pushing against the smooth rear of the blade. This will keep it in place for the rest of the turn.

This works best with jeweler's blades and their thin spines. Essentially what's going on is that you're pivoting around the spine, and letting the teeth on the front of the blade cut their own path sideways through the material until they get lined up with the new direction. This only works because jewelers' saw spines are so thin. Fret saw blades, or coping saw blades have thicker spines, and can't pull that trick.

To turn a corner with a fretsaw blade, you need to keep moving forward slightly, and saw around the curve. This means that all fretsaw corners will be slightly radiused.

For the ultimate in sharp corners, it is best to cut up to the corner, and then either pull back and cut around the form going the other direction, so you end up coming into the corner from the other side, and there is no turn at all, or to pull back a bit and cut a 'loop' that gets you over to the other side of the corner, so you can cut into the corner from the other direction, and generate a sharp corner in that fashion. Once the corner's cleared out, finish cutting the main shape as you normally would.