

# Getting the Most from Festool Sanders

Text and photos by Jerry Work

It is always fun to watch visitors who come into my small gallery and studio as they approach the fine furniture I design and hand craft. Unlike those who stand back to look at flat art or sculpture, when looking at furniture most people move quickly to a piece and invariably move their hands across the surface while they take in the piece with their eyes from up close. They might pause to ask if it is OK to touch the pieces first, but once they know they can, the tactile urge takes over.

At some point the question is always asked, “what kind of finish do you use?” It does not make any difference if it is a flat oil based finish or a highly polished mirror-like finish, they seem to think the silky tactile feel is somehow accomplished by the application of a magic elixir.

While the choice of finish material is important to achieving the desired overall look and feel, the far more important factor is how the raw wood was prepared before the application of the finish material. And, that is what this manual is all about.



I thought long and hard about how best to organize this discussion. The sanders are the machines which move the abrasive in a defined manner. The abrasives themselves do all the cutting and shaping. However, in the process of cutting and shaping they also produce a great deal of dust which can be quite harmful for the operator.

Festool wisely developed these three systems to work together: the sander, the abrasives and the dust collection components. Used together these not only make the sanders more efficient and productive for the user but also greatly reduce the dangerous airborne particulate matter, making the work far safer and healthier and the tools more pleasant to use day in and day out.

Finally, to make matters a bit more potentially confusing, as we come to understand these different systems, there are at least three major standards by which the "grit" on the sanding media are measured. So what is called 1000 grit by one standard is called 800 by another and 500 by still another "standard!"

All of these are important to getting the most from Festool sanders so I decided to organize this manual by first talking about the differences between the three grit "standards," then talking about the dust collection systems and how they work together with the sanders, then talking about the differences between the several different kinds of grit media supplied by Festool, and then, finally, talking about the sanders themselves.

So, let's go.....

## Three Different Grit “Standards”

In building fine furniture more than 50% of one’s time goes into sanding, final assembly, buffing and polishing. The sanding part alone can take more than twice the amount of time that it took to machine all the component parts of the piece. Yet, sanding processes, tools and materials are seldom as carefully chosen as are the machines that cut the wood components in the first place.

Sanding, after all, is just using some kind of hard material to abrade the surface fibers of the wood, shearing them off to leave a smooth feel to the surface. Simple to say, but hard to do well. As you abrade the surface you also scratch the surface. If those scratch marks are large enough, they will detract from, not add to the appearance of the final product.

So, the trick is to learn how to use smaller and smaller particles of the hard material to remove the larger scratches and leave smaller and smaller scratches until they no longer are visible and to do so in such a way that the entire surface of the finished piece is uniformly treated, corners

and all.

Initially, this work was done laboriously by hand by scooping up naturally occurring small rock particles (sand) and rubbing them over the surface with animal skins or cloth. Later, means were found to adhere the sand to a paper or cloth backing and what we today call “sandpaper” was born. That is where it started, but far from where it ended.

What we call “sandpaper” today rarely is either really sand in the way we normally think of sand nor is it necessarily paper. The abrasive particles can be anything from natural materials like garnet and diamonds that have been carefully processed to be as even in particle size as possible to manmade materials like aluminum oxide or silicone carbide engineered with a very high uniformity in particle size.

The backing material can be various kinds of paper derivatives or various kinds of cloth materials or manmade screens or

combinations of all three.

There may also be other materials added to the abrasive surface like soaps and waxes (called “stearates”) to help prevent loading of the paper with small particles of wood fibers and the resins that naturally occur in the wood.

GRIT COMPARISON CHART

| MICRON | US CAMI | FEPA 'P' (Festool) | JAPAN JIS |
|--------|---------|--------------------|-----------|
| 500    | 36      | 36                 | 36        |
| 430    | 40      |                    |           |
| 410    |         | 40                 |           |
| 350    | 50      |                    | 40        |
| 320    |         | 50                 |           |
| 300    |         |                    | 50        |
| 270    | 60      |                    |           |
| 260    |         | 60                 |           |
| 250    |         |                    | 60        |
| 210    |         |                    | 70        |
| 197    |         | 80                 |           |
| 192    | 80      |                    |           |
| 177    |         |                    | 80        |
| 156    |         | 100                |           |
| 149    |         |                    | 90        |
| 140    | 100     |                    |           |
| 127    |         | 120                | 100       |
| 116    | 120     |                    |           |
| 97     |         | 150                | 120       |
| 93     | 150     |                    |           |
| 78     | 180     | 180                | 150       |
| 66     | 220     | 220                | 180       |
| 60     |         | 240                | 240       |
| 52     | 240     | 280                | 280       |
| 46     |         | 320                | 320       |
| 42     | 280     |                    |           |
| 40     |         | 360                | 360       |
| 35     | 320     | 400                | 400       |
| 30     |         | 500                |           |
| 28     | 360     |                    | 500       |
| 25     |         | 600                | 600       |
| 21     | 400     | 800                | 700       |
| 18     | 500     | 1000               | 800       |
| 15     | 600     | 1200               | 1000      |
| 13     | 800     | 1500               | 1200      |
| 10     | 1000    | 2000               | 1500      |
| 8      | 1200    | 2500               | 2000      |
| 7      |         |                    | 2500      |
| 6      |         |                    | 3000      |

To add to the confusion surrounding “sandpaper,” there are three different “standards” applied to describing the size of the abrasive particles. The US grades are called “CAMI,” the European grades including the Festool sanding media are identified as “FEPA” and in Japan the grades are identified as “JIS.”

The table on the previous page lists how these different size grades relate one to another with the actual size of the particles measured in microns. In coarser grades they are quite close, but as you move to the finer grades the differences become greater.

It is not as important to know these differences as it is to recognize how the abrading materials you are using have been graded. This is important because in order to achieve a desired very smooth final finish you need to progressively “sand” the finish with finer and finer grits before you apply the finish and often afterwards as well. You don’t want to be inadvertently jumping back and forth between grading standards or you could be moving from a finer to a coarser grit without realizing it.

## Dust Control With Festool Sanders

All Festool sanders feature built-in dust ports to which a vacuum or dust collector can be attached. These dust ports lead to pads which have a series of holes cut in them. The Festool sandpapers have matching holes cut in them so the vast majority of the sanding dust is pulled through the holes and out through the dust port into the vacuum or dust collector without spilling out into the open air, and therefore into the operator’s lungs.



Festool sanders which use round abrasives feature a unique pattern of eight smaller holes around the outside edge of the pad and paper plus one larger hole in the center of the pad and paper.

Here is a picture of a typical Festool round sanding material in the 150mm diameter size. The photo shows the back of the material which has printed on it the type (which we will discuss in a moment) and grade (P180 in this case.) All Festool sanders and supplied sanding media use a hook-and-loop style of fastening which means you can remove and reattach the sanding material repeatedly and quickly.

For the sanders which use the round media, vacuum is drawn through the dust collector port which is routed to the outer eight holes. The center hole aligns with specially designed **air inlet ports** in the backing plates. This allows air to be drawn **in** through the center hole and then pulled **out** to outer holes bringing with this air stream most of the sanding particles. As a result Festool sanders are



Note the 9 hole pattern on the pads on these two Festool Rotex sanders

very efficient in collecting sanding dust at the point it is created.

## Festool Dust Extractors

Festool supplied dust collectors (they use the term “extractor”) like the CT 22 model shown below are very efficient vacuums designed to work as a system



with all of the Festool sanders and cutting tools. Combined with the 9 hole vent pattern in the round pad sanders, and the variety of hole patterns in the other sanders, this potent team keeps the air around the sanding area much cleaner and safer for the person operating the sander.

Since human safety is such an important topic with respect to sanding, let's take a few moments to look in more detail at how the Festool sanders and dust collectors work together.

First, the Festool dust collectors come in several sizes. The smallest is called the CT Mini while the larger units are called CT xx where xx refers to the collection capacity of the internal bag. A CT 22 has



a 22 liter (5.8 gallon) capacity, A CT 33 has a 33 liter (8.7 gallon) capacity and so on.

The CT Mini pictured above has a 10 liter (2.6 gallon) capacity and hose/cord storage built into the top of the unit. As with all the other Festool dust collectors, it can



utilize hoses of different diameters for different tasks. It comes with a 27mm (~1”) hose but larger diameter hoses can also be connected if need be.

Unlike the other Festool dust collectors, the CT Mini opens

by releasing catches on the sides of the unit and then lifting the whole top assembly off of the base section as is shown in the bottom photo on the previous page.

The bag snaps into the bottom assembly and a cone shaped section in the upper assembly engages the bag opening (which is sealed by a soft lip running all around the bag opening) when the two assemblies are brought together.

Air is sucked in through the hose port and into the bag trapping most of the airborne particulates. The now largely cleaned air that passes through the disposable bag is further scrubbed by replaceable automotive type air cleaner elements (shown in brown in the upper assembly in the bottom photo on the previous page) before being returned to the room.

Suction is 99 CFM with up to 80" of static water lift so performance is impressive even for such a small unit.



The CT 22 and larger units are different. First, the top hinges open rather than lifting off. The disposable bags fit into a chamber tightly connecting to the incoming air hose tube shown in the photos above and to the left.

An "O" ring seals the bag chamber to the top when the top is closed. As with the CT Mini, the air coming through the disposable bag is quite clean. But unlike the CT Mini which uses automotive style air cleaner elements, on the CT 22 and larger units, before the air is returned to the room, it passes through dual **HEPA** filters shown in white in the photo on the next page. These remove 99.97% of all particulate down to 0.3 microns in size so that the air coming back into the room where you are operating the sander is 99.99% dust-free.



This is why the designed interaction between the dust collection built into each sander and the dust extraction system itself is so important to discuss before we move on to the sanders themselves.

HEPA (High Efficiency Particulate Air) filters were developed by the U.S. Atomic Energy Commission to remove radioactive dust from industrial exhaust. These type filters are now



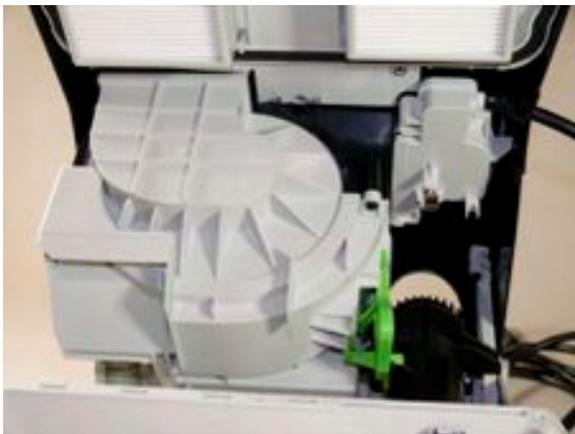
from the room is used to cool the motor which is never in the path of the incoming dirty air. That means a longer service life and little down time.

The green tabs shown on the inside of the back wheels in the picture to the left operate wheel locks to keep the unit steady when you want it fixed in position.

The front wheels are casters for easy rolling around.

As the size increases on the CT 22 and larger units the motor assembly remains the same,

but the lower chamber holding the bag



the primary filtration systems used in the most sensitive manufacturing and health-care environments.

They are a most welcome addition to my studio and will be to your studio or shop as well!

Another important feature of the Festool dust collectors is the sealed motor chamber shown above. Only clean air drawn



gets taller. A CT 22 is shown in front of a CT 33 in the photo on the previous page. Notice how the white lower section is taller on the CT 33 than on the CT 22. They draw 134 CFM and pull an impressive 90" of static water lift (23000Pa) while generating only a 72dB noise level.

I can't leave the discussion about the Festool dust collectors without commenting on the boom arm shown mounted on the CT 33 on the previous page and to the right. This highly useful device keeps the vacuum hose and the power cord up off the floor and out of your way no matter which Festool product you might be using.

When I first heard about the boom arm I must admit that I thought it was just one of those 'nice to have but certainly not critical' items. From the minute I first used one, I changed that position 180 degrees. It simply alters for the better how well the already very good dust collection system works in a shop or

studio setting.

As you can see, bottom left, for years I kept a Festool dust collector under my primary sanding station with all the various Festool sanders close at hand. Yes, I



After the boom arm

was always stumbling over the hose and the sea of cords shown in the photo below but, it was so much better than anything I had used before, I guess I just ignored the mess and instead enjoyed the dramatic improvement in productivity brought on by the tight integration of the sanders and the dust extractors.

However, as soon as the boom arm mounted on the Festool DC moved to the far side on one end of the sanding station, everything changed for the better. As the photo above clearly shows, the sanding station now is free of the hose/cord clutter on the floor. The power strip into which all the sanders



Before the boom arm

were plugged is gone, replaced by the one power cord that is right beside the vacuum hose. All the sanders are still in the same place and right at hand, it is just that now the hose and cord are both up off the floor and out of my way.

The boom arm mounts easily to the back of any of the CT 22 or larger dust collectors. It swivels through a wide arc so there is good work surface coverage. You can mount stabilizing out-riggers (supplied) if you wish but I don't find them necessary the way I use the unit. I can't say enough good about the boom arm.

I won't cover here the several other neat features of the Festool dust collectors like the 20 amp power cords, the self-locking stacking storage for the boxes the sanders and other Festool products come in (called "Systainers,") but instead will direct you to the Festool catalog and web site for more details.



on the tool.

Many of the sanders also come with handy "mini bags" which attach directly to these ports when you are working in areas not easily reached by the dust collector hose. The photos here show both the round and the oval port configurations. Notice the "O" ring seal at the bottom of the port fitting. A nice touch.



**"O" ring seal**

Festool vacuum hoses have soft rubber ends that can easily mold to either the round or the oval shape, and the green versions of those hoses are anti-static so they don't build up dust on the outside as normal vacuum hoses do.

Ok, now we know something about the three different grit sizing "standards" (remember Festool supplied grits all use the European FEPA

All the Festool products with built-in dust collection have either round or oval ports

standard,) and we have covered the very important topic of user health via the dust collection ports built into every Festool sander working in conjunction with the HEPA filtered Festool dust collectors, so it is now time to move to the topic of the sanding media itself.

## Festool Supplied Sanding Media

Festool supplies an extensive line of sanding media for each of its sanders. These different sanders utilize seven different shapes and sizes of pads so there are seven different shapes for the Festool supplied sanding media as shown here.



The round shapes are 150mm, 125mm or 115mm in diameter. The triangular shapes are 100mm x 150mm or 93mm x 93mm while the rectangular shapes are either 80mm x 133mm or 115mm x 228mm. These equate to 6", 5", 4 1/2" round, 4" x 6" or 3 11/16" triangular, and 3 5/32" x 5 1/4" or 4 1/2" x 9" rectangular.

For each of these shapes several different types of media are available. Each is given a name which can be a bit intimidating at first. In the catalog and on the web site an icon is used to identify the most common use for each media type. For our purposes I think the following simple explanation will help clear things up.

For bare wood the recommended type is called **RUBIN**. For bare wood, paint, varnish or filler materials either **CRISTAL** or **BRILLIANT** can be used with success. Cristal is a much more open grit paper

while Brilliant media is more densely populated. This means that for any given grit size, there will be fewer actual granules of grit per surface area on the Cristal paper than on the Brilliant paper. As a result, the Cristal paper will cut more aggressively and load up less than the Brilliant, but the Brilliant will leave a finer surface at any given grit level than will the Cristal.

For really heavy duty work where tearing of the media could be an issue, the recommended media is called **SAPHIR**. For cleaning and mild sanding a scouring pad type material called **VLIES** is supplied. For solid surface (manmade countertop materials) and automotive work where paper loading can be a major issue, a steared media called **TITAN** is available.

**PLATIN** is a special purpose mesh on foam media designed for fine sanding of metal or surfaces to be polished.

The ones I use the most in my furniture making are Brilliant, Rubin and Cristal and I use them on bare wood interchangeably. On finished surfaces that I want to flatten before applying additional top coats or before final polishing, I use Brilliant. I also find lots of uses for the scouring pad type material called Vlies. It will brighten and clean metals, clean up plastics without burning, clean rust off my cast iron tool tables without changing the surface itself, and scrub sinks and floors clean when I gunk them up with finish or glues.

There is no right or wrong here. Any media can be used for any task, it is just that each is optimized for the task indicated.

Let's look at each in a bit more detail.

**Brilliant** is a paper based material of differing weights to which high-strength aluminum oxide has been bonded by a synthetic resin compound. It uses antistatic agents to reduce loading of the abrasives as you sand. It is ideal for both sanding of bare woods and for sanding paints and varnishes (sanding the finish itself). Since the backing is thinner than Rubin or Saphir, it will follow minor contours somewhat better. It is also less expensive which makes it an all-around good choice for most furniture making applications.



**Cristal** is an open coat material similar to Brilliant but with fewer grit particles per unit of surface area than Brilliant or Rubin. It is especially good for rapid stock removal and for taking off old finishes without undue damage to the underlying surface. It is my first choice if the wood surface is damaged and in need of flattening before finish sanding can begin or where I am intending to shape the wood before final finishing. It cuts very quickly and does not load up even on resinous woods like Bloodwood, Jatoba, Teak, Cocobolo, Rosewoods and other exotics. It does leave a more noticeable grit marking than either Brilliant or Rubin but those grit marks can be quickly taken out by starting with Brilliant or Rubin several grit levels coarser than the last Cristal grit used.

**Rubin** uses a heavier weight paper to which another form of aluminum oxide

has been bonded, also by a synthetic resin compound. It uses special filling materials to prevent premature clogging with sanding dust or wood fibers. It tends to last longer than Brilliant and is somewhat more expensive. It is also a good all-around choice for most furniture making applications and does an especially good job on bare wood.

**Saphir** is a cloth based aluminum oxide designed for rapid stock removal on wood, metal, or man-made materials. It is most commonly used with rotary action sanders.



The heavy cloth type backing can take more heat and abuse than the paper backed materials used on Brilliant, Cristal and Rubin. While it can take more heat, be careful as it is very aggressive and can remove a lot of stock very quickly. In the process a lot of heat can be generated. Use a light touch and the results are very impressive.

**Titan** has a water resistant backing material and is designed for smoothing solid surface (manmade) countertop materials or automotive finishes.

**Vlies** is more like a scouring pad and is designed for smoothing finished surfaces or for removing rust, paints or pollutants from just about any surface. It uses both



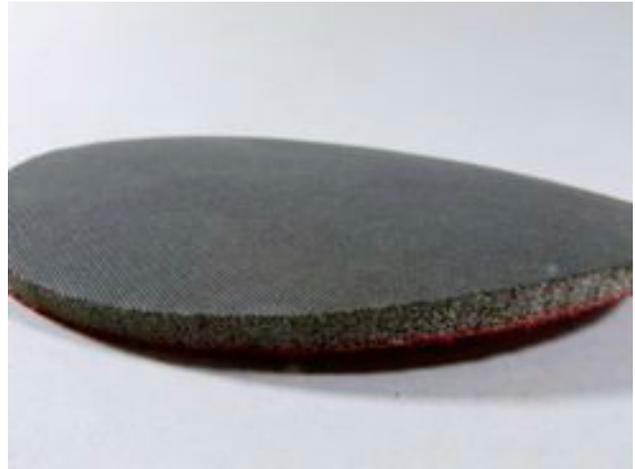
aluminum oxide and silicon carbide particles embedded in a synthetic fiber mat allowing it to easily follow surface contours and to reach into surface imperfections. It does a great job of cleaning most anything and in coarser grits can be quite aggressive.

**Platin** is a mesh material impregnated with silicon carbide abrasives on a foam layer which I use either as a final step on polished surfaces or for the final flattening steps just before the use of rubbing or buffing compounds. They are available in “grits” up to 4000 so produce a really nice fine surface on their own.



The view above is of the working surface of Festool's Platin while the photo above right shows the foam layer (this photo of another manufacturer's similar product).

When Platin is followed by rubbing or buffing compounds an extreme high gloss can easily be achieved. Try this on highly figured woods like big leaf maple that have been finished by quality clear water based conversion varnish and people will just have to touch the surface to make sure it is flat. It looks so three dimensional they will swear there are peaks



and valleys a bit like a topographical map rather than a flat surface.

If Platin is used as the final step you will get a very flat surface which will refract light well but which has less surface sheen than is achieved by following with rubbing or buffing compounds so the surface will reflect a bit less light.

For some “real” magic on bare hardwood, especially resinous exotics like bloodwood or rosewood, sand to around 800 grit and then use Platin working up to 4000 grit. The surface of the unfinished wood will take on a gloss and patina of its own that simply cannot be matched by any finish I know of. A bit of wax will maintain that patina, but it is an easily marked surface unsuited for any wear and is not at all water resistant.

There are a number of other abrasive materials available from other manufacturers that can also be useful but some may present a bit of a downside as well.

One, sold by Mirka, is called “Abranet”. It is an open silicon carbide mesh. Without the interface pad also sold by Mirka, the use of Abranet may prematurely wear the hook and loop elements on the Festool

pads, so be careful when using abrasive materials supplied by others.

## Why so many different kinds of sanding materials?

Offering an array of different engineered abrasives came about naturally for Festool. While they first became known in Germany for the development of a portable chain saw in the 1920's (photo right), they really made their mark shortly after WWII with the development of the first powered orbital hand sander (lower photo right.)



This tool so improved the efficiency of the German furniture makers that, according to a story in the January 2005 issue of "Handy" magazine, those artisans would travel for miles by bicycle to pay their deposits knowing they would wait weeks just to receive one.

(These photos are from the Handy magazine article which can be found on the Festool web site, [www.festoolusa.com](http://www.festoolusa.com).)

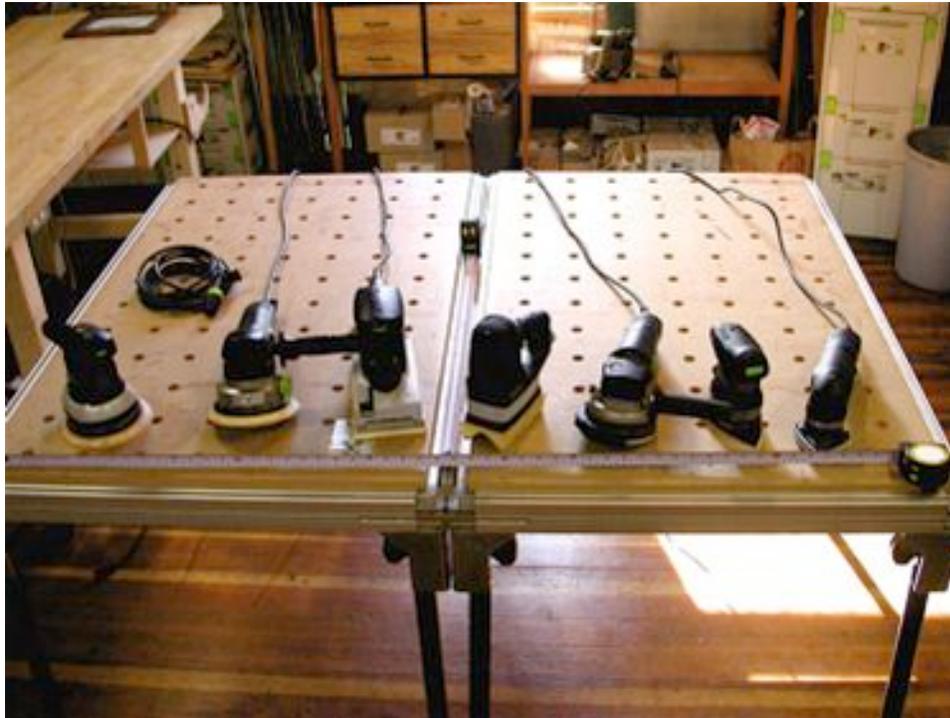
Since that time Festool has refined and expanded the art and science of power hand sanding. Along the way they have introduced numerous machines for moving the abrasive particles across the surface of the wood, added all these different kinds of abrasive materials, and designed integrated dust collection creating whole "systems" optimized for this task.



Our next task is to look at the sanders themselves.

## Let's start by understanding how the different kinds of sanding machines do their job.

We are going to look at nine different Festool sanders covering the range of different ways of moving the abrasive.



The seven shown in this photo sitting atop two Festool Multi Function Tables (model 1080) joined together are from my studio and are in use daily. I did clean them up a bit for these photos, but they show the marks and scuffs from continuous use.

Festool has also introduced an upgraded version of the dual mode sander shown second from the left above (called the "Rotex" sander), also shown in the picture to the right. We will cover the differences between

the "old" and the "new" Rotex as we discuss that sander. The 150mm (6") pad diameter Rotex (the two shown on the left in the bottom photo) is now also joined by a 125mm (5") pad diameter unit (shown right most of the trio).

To help you judge relative size, each sander we talk about will be shown with the same collection of different sizes and shapes of media and they will also be shown with me holding each. Hopefully, these two visual cues will put the different sizes into better perspective.

Each different kind of sander is designed to



move the abrasive in a different pattern or to have a different abrasive form factor to reach different shapes of surfaces.

RS 400 (not pictured), **DS 400** (second from the right) and **RS 2** (third from the left) use an orbital



There are basically three different ways the abrasive can be moved by a machine sander: **linearly in a fore-aft motion, in a circle in a rotary motion, or back and forth in an arc.** Festool uses the first two motions but not the arc motion.

If these motions are combined or the pivot point is also moved at the same time, the motion becomes much more complex. If the pivot point rotates and the pad is free to move independently but not forced to move in a defined path, then the motion is called "**random orbit**".

We will discuss each of the different Festool sanders in terms of how they move the abrasive from the pure rotary sander to the various random orbit units.

**RAS 115** uses a pure rotary motion (third from the right in the picture).

**LS 130** uses a pure linear back and forth motion (center one pictured).

motion.

**DX 93 Deltex** (right most pictured) uses a tight rotary motion.

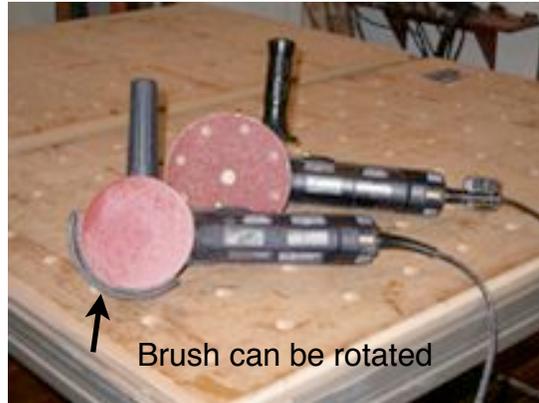
**ETS 150/3** (left most), 150/5 (not shown), and ETS 125 (not shown) use a random orbit motion.

**RO 150 Rotex** (second from the left) and RO 125 (not pictured) can be switched between a random orbit motion and a rotary motion with a rotating pivot point.

Let's start with the **RAS 115.04 E** sander. It is a *pure rotary* sander with a circular pad 115mm (about 4 1/2") in diameter. Some might liken it to an angle grinder. The abrasive material is affixed to the pad by a hook and loop system that allows the material to be removed and replaced without damage.



You can see from the photo above right (RAS 115 in foreground) that there are no holes around the perimeter of the pad as in the other Festool sanders like the RO 150 behind it. Instead, there is a space between the pad and the base of the machine through which particles are drawn out through the built in vacuum port at the rear of the machine. There is a brush about one third of the circumference of the pad (at the bottom of the pad in the photo) that can be rotated to any position around the outside of the pad to help direct these cut particles into the vacuum port. The handle on the side of the machine is rotated to move the position of the brush. The speed of rotation can be varied from 1500 to 4000 RPM.



This is a VERY aggressive machine capable of removing a lot of material in a hurry. This much abrasive action generates a lot of heat. It takes a light touch to prevent digging the pad too far into the work piece and to prevent overheating of the pad or the work piece.

I find it ideal for rough shaping wood such as carving a chair seat for example. In furniture designs where I want to instill an Oriental feel, I often will curve the undersides of top or shelf components, a process I refer to as "boating." The curves are more abrupt (have a smaller radius) at the outer edges and become softer (have longer radii) towards the center. Such complex curves can be roughed out easily and quickly with the RAS sander and then finished with one of the less aggressive sanders we will discuss later on.



The RAS sander is also very handy for removing paints, rust or surface contaminants as long as you keep in mind just how much heat doing so can generate. You don't want to burn the work piece nor do you want to burn and ruin the pad.

The Vlies scouring pads shown in use with the RAS 115 to the right are especially useful for this as they tend to dissipate the heat better than regular abrasive sheets do and leave far fewer deep scratch marks than coarse abrasive sheets will.

In this photo I am cleaning the floor of my finish room which, as you might imagine, gets quite gunked up from time to time. The RAS 115 with Vlies scouring pads is just the ticket.

The small (115mm) diameter pad helps get into nooks and crannies that larger grinder style units cannot such as under the toe kick on the cabinets that are present in my finish room.

My suggestion is to practice a bit with this machine before starting in on an important work piece. Use a slower speed and a lighter touch until you get the feel of how aggressive it is with a given abrasive material. Once you develop a feel for it, you will find it in your hands often.

Dust extraction, while very good, is not as complete as with the other Festool sanders which employ the nine hole system we discussed earlier where air is drawn through the center hole and out through the eight outer holes and into the attached dust collector. As mentioned above, the RAS 115 instead uses a space between the sanding material and the body of the unit to draw the sanding grit out through the vacuum port. The brushes that can be rotated around the outside perimeter of this space are what help to direct the sanding grit into the vacuum port.



The **LS 130 EQ** is a *pure linear* sander. It moves the pad fore and aft in a 4mm (5/32") stroke. There is no rotary or side to side action. This allows the efficient



sanding of edges and profiles that would not be possible by

any other means. Sanders which move the pad in any direction other than purely linearly will create a flat spot on any linear curved surface like a stair handrail. With the LS sander you can easily do rebates (rabbets), edges, or profiles that otherwise would require laborious hand sanding.

Many different pads are available to fit flat profiles, both concave and convex radiuses of different sizes, and various angles. The standard profile pads are shown here along with the sander itself. There even is a kit (shown to the right of the sander) which will allow you to create a custom profile. A block of foam with dust extraction holes already formed into the block is included along with glue and a hook and loop surface. Temporarily glue the hook and loop to the profile with the included contact cement. Fit a piece of sand paper to carve the backer block to the shape of your custom profile. Now glue on the hook and loop surface to the profiled backer block and you are ready to sand to exactly that shape. Slick!

Each of these pads has holes in it to allow the extraction of sanding dust via an



attached vacuum through a port designed into the machine itself.

Finally, a scraping knife (shown in the



center of this photo) is offered as an accessory. Since the motion of the LS 130 is purely fore and aft you can use this to scrape off wallpaper, carpet, and other glued on materials far more easily than you could do by hand.

Next are the **orbital** sanders.

These move the pad in an orbit around a fixed pivot point. The **DS 400 EQ** (pictured) is a very small and lightweight



sander that employs a triangular shaped pad that moves in a 2mm (5/64") orbit. Its companion is the **RS 400 EQ** (not pic-



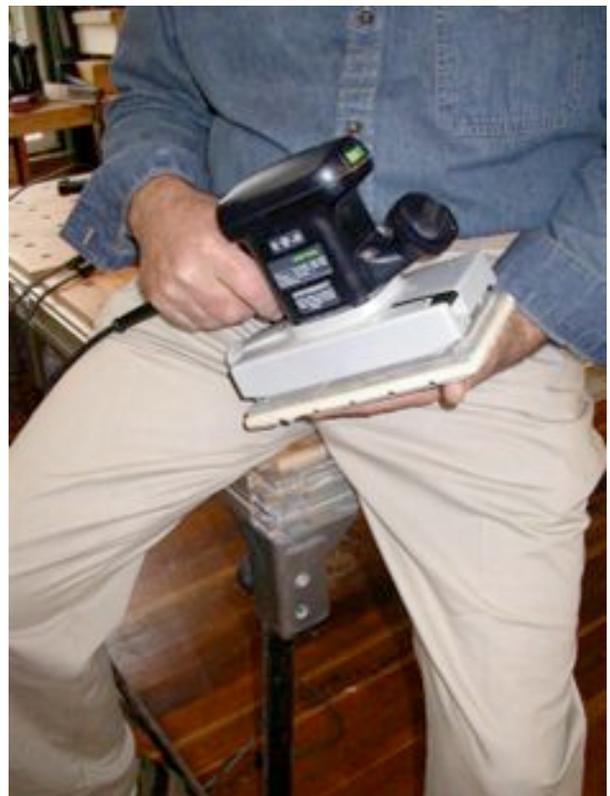
tured) which has the same small size and orbit but with a rectangular pad.

Both are so much smaller than most of the other Festool sanders that they are ideal for getting into corners or areas like the inside of the box pictured above where the RS 2 E (on the left) and the ETS 150 3 (on the right) simply won't fit.

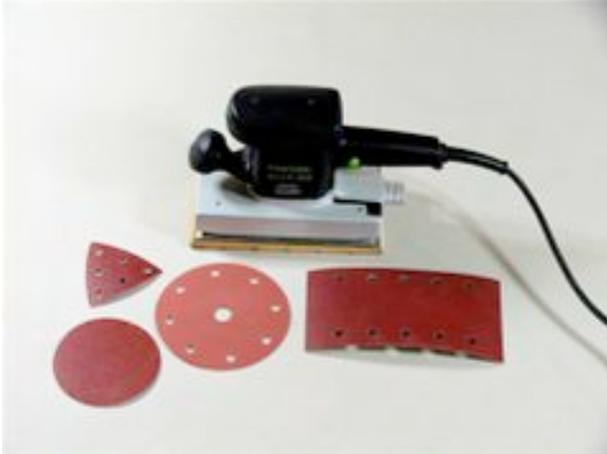
While pure orbital sanders from other manufacturers often will leave very noticeable circular scratch patterns, the small diameter orbit on these two leaves a nearly imperceptible scratch pattern with all but the largest grits. They are not in use every day in my studio like the other Festool sanders are, but when the small size or tight corner ability is needed, they are really handy.



The other pure rotary sander, the **RS 2 E** (pictured below) is another story. It is a big, powerful work horse that is in my hands virtually every day. It has a bit



larger orbit (2.5mm), has a much larger pad (115mm x 228mm or 4 1/2" x 9"), and at 5.5 pounds is twice as heavy as the DS and RS 400 sanders.



That big flat sanding pad (the right most media pictured above) simply cannot be beat for smoothing out large surfaces. It is not an overly aggressive sander compared to the RAS 115 we discussed earlier or the RO 150 we will be discussing shortly, but you can use it all day long with no tingling of the hands. Since it produces a really flat surface, there is no

worry about dips or gouges showing up after the final finish is applied.

The weight works very much in your favor. All you need to do is guide it across the surface. No downward pressure is needed and none is desirable. Just glide it along nearly vibration free and enjoy how the surface begins to develop a natural patina even before you apply any finish at all. I often stop just to admire the natural beauty of the wood itself once I have worked up to the finer grits.



As pictured here you can see how the large flat surface is ideal for rail, style and panel components where a tip of the sander could well leave an undesirable depression along an edge.

The RS sander is also the champion in my book for sanding edges and breaking sharp edges. I particularly like the way it handles end grain. The pure orbital action seems to me to cut the end grain fibers more cleanly than any of the other sanders. You can also get right up into corners on pan-

els that are not raised flush with the surrounding rail and style components.

stand shown both in process and completed) without it.

You can get either hook and loop pads or pads with a clamp on each end to mechanically hold the abrasive material. A hole punch is available if you prefer to use your own abrasive sheet goods instead of buying the pre-punched sanding materials.



If you get the impression that I like this sander a lot, you are correct. I use it every day and can't imagine making fine furniture (such as the Brazilian Cherry and Black Walnut plasma TV



The **DX 93 E “Deltex”** sander is a specialty sander with a number of tricks up its small “sleeves.” It rotates in a short orbit to prevent the scratches that I found



common with other brands of arc swing detail sanders. Those other brands simply move the pad in a fixed arc which exacerbates scratch marks since, unless



you constantly move the machine, the same sanding grit passes the surface of the work piece at the same location repeatedly leaving often hard to remove deep scratches. The DX sander does not do this

and the results even in tight corners are outstanding.

The pad at 93mm x 93mm (left in the photo to the right) is quite a bit smaller than the 100mm x 150mm pad on the DS 400 (right) we discussed earlier. Also, the form factor is flatter so you can maneuver the DX into even smaller areas than you can with the DS sander.

It is gear driven so it can drive even coarse abrasives easily, but where I find it really shines is in doing careful detail restoration sanding. This was required by my son, Alex, for the fragile pieces on this folding lap table made a half century ago by Tubbs, the Wallingford, VT, snow shoe company. Turn down the speed, put on a fine abrasive, and the DX becomes a very precise sanding tool that won't tear up details that you want to preserve.

While the DS 93 is featured by Festool as



“... designed for strong abrasion through reduction gearing ..... ideal for stripping off old, thick and stubborn coatings,” I find it also is one of the gentlest and most easily controlled of all the Festool sanders when the speed is turned down. I don't make scale models, but, if I did, this would be the first sander for which I'd reach.



Both hard and soft pads are available. Festool materials are offered in Brilliant, Rubin or Saphir (shown right) up to 400 grit.

I often hand cut much finer grits from other size materials and use them on the DX 93 when I want very fine finishes in very tight corners. With no holes in my hand cut abrasives the dust collection is not good so I have to be careful to frequently wipe away the residual sanding



dust. Dust collection with the Festool supplied materials which do have the proper holes is excellent.

The photo on the right shows the relative sizes of the DX 93 (right) and the DX 400 (left). The tape measures may help you visualize the absolute size of each.



This brings us to the best known of the Festool sanders, the random orbit machines and the highly regarded Rotex units.



Random orbit machines *rotate a pivot point while allowing the attached but not mechanically driven pad to move*



*in a random motion.* This produces very fine finishes with little or no scratching so long as you keep the pad flat on the work surface. Tip the pad to get more aggressive stock removal and scratches are sure to be the result.

In the Festool lineup three random orbit sanders are offered: two 150mm (six inch) pad size units and a 125mm (five inch) pad size unit. The **ETS 150 EQ** units are available with either a 3mm orbit for fine sanding (shown here on the left and below) and a 5mm orbit (not pictured) for more aggressive, but still very fine, stock removal. The **ETS 125** (not pictured) has a 2.5mm orbit.

All three feature the Festool unique “Jet-stream” system for dust removal and control. As we discussed in the beginning of this manual, the machines draw air through a hole in the center of the abrasive material then out through eight holes around the outer perimeter of the pad through a port designed into the sanders themselves. This system is so effective that even after a day of sanding I seldom need to clean off my sanding center nor do I find a need for ceiling mounted ambient air dust cleaners. I only wear a



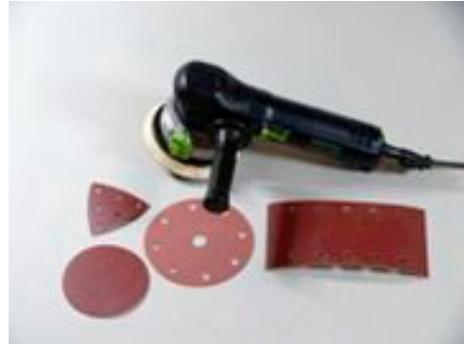
mask when dealing with woods that I know cause an allergic reaction.

I can't even begin to remember how many random orbit sanders I wore out and threw away before I began buying Festool sanders when they first became available in the US. No matter what brand I tried, I always found myself limited in how long I could sand by vibration induced tingling in my hands and by the cloud of dust thrown off. I also was always irritated by having to replace the hook and loop pads every few months.

Not so with the Festool units. The vibration is so minimal that I never even think about the length of time I have been sanding and seldom, if ever, feel that dreaded tingling sensation in my hands.

In all the time I have used Festool sanders, I have only replaced pads on two of them: once on a Rotex unit that I simply wore out since it was in use so much, and the other time on the RAS when I first got it and did not realize just how much heat could be generated by that aggressive unit ("pilot error" on my part, not a design issue with the machine.)

Now let's look at what I call the "great synthesizer" of the Festool sanders, the dual mode **Rotex** sander, buffer, polisher unit shown here. The previous version is shown in the top photo and the newer, replacement version is shown left along side the previous version in the lower photo.



These have the form factor of angle grinders but that is where any comparison stops. The Rotex units, whether the



150mm (6") pad unit or the 125mm (5") unit (both shown here for size comparison), feature a switch selectable sanding



action. The green switch on the top makes the mode change. In one mode they act just like the ETS random orbit units. Switch modes on the RO 150 or the RO 125 and things get very different. The second mode on both machines is a hybrid between the gear driven pure rotary motion of the RAS 115 and the pure random orbit motion of the ETS units.

The gear driven pad turns in a rotary motion while the pivot point orbits to minimize burning and scratching. In this mode (what Festool calls "rotary/random" mode) these units are capable of removing stock at a very rapid rate. Put on a coarse grit and I would call it very, very rapid stock removal, enough so that with the 150mm pad it can be a handful to control until you get the hang of it.

What is slick is how you can do rapid stock removal with one grit and then without even switching grits change to

the random orbit mode and smooth out the relatively rough surface left by the rotary mode all the while gathering up all that sanding dust through the unit and off into the bag of the vacuum rather than sending it into the air and into your lungs.

Remove the sanding hook and loop pad and put on a polishing/buffing pad and the RO units turn into one of the finest variable speed polishers I have ever used.

To buff out a build finish to a mirror-like surface takes only the Festool felt pads and a couple of grits of an automotive polishing compound. With rotary motion speed control from 240 to 560 RPMs and eccentric motion control from 2000 to 5600 orbits per minute you don't have to worry about burning a sensitive finish or knocking off the edges unless you simply "screw up."

Practice a bit and you can replicate a guitar or piano gloss like the top of this coffee table done in highly figured Oregon



big leaf maple. Truly amazing results and all from one very versatile machine.

No question about it, the Rotex machines, along with the big flat pad RS2E, are my favorite Festool sanders, hands down. I use the others for special purposes, but day in and day out it is either the Rotex or the big flat pad RS2E that is in my hands most of the time.

I use the Rotex with papers of all kinds up to 1200 grit, with mesh backed screens up to 4000 grit and with felt pads and several different grits of polishing compounds. I also use it for applying waxes when I want a soft "hand" on a piece.



That is what I am doing in this picture. Here the design of this very modern kitchen with solid wood countertops called for a South African Bloodwood stove vent hood over the top of the commercial gas range. The vent hood goes

all the way to the 14 foot ceiling. The vent hood was constructed of plywood and then covered with 5mm thick veneers of the Bloodwood. After the final sanding (with the RO 150 and Festool CT22 dust collector,) wax was used as the final finish to produce the soft patina look I was after.

Notice how easy the RO 150 is to control even with one hand. With both hands on the RO 150 it is really easy to manage allowing you to balance even in difficult locations such as on a ladder without having to hang on for dear life.

One wax I really like is a combination of beeswax and hard carnuba wax in a toluene base that can be somewhat difficult to apply evenly. Put a 6" micro fiber pad (available from [surbuf.com](http://surbuf.com)) on the hook and loop surface of the RO 150 polishing pad and waxing becomes as easy and fast as polishing.

Before I take a piece to a show or put it into a gallery where I know it will be "lovingly" handled frequently, I like to put on three coats of this wax since fingerprints from one day can simply be wiped off before the show opens the next.

When I did this by hand on large pieces it was a significant task. Now it is a "no brainer" that I can do at the last minute, thanks to the RO machines.

The **RO 150 E** has a 5mm stroke identical to the ETS 150/5 and, in random orbit mode, sands just the same and hence just as well. The smaller RO 125 uses a 3.6mm stroke and performs in random orbit mode much the same but a bit more aggressively than the ETS 125 with it's 2.5mm orbit.

# Conclusion

In this manual we have looked at nine different Festool sanders which run the gamut from pure rotary, to pure linear, to pure orbit, to combinations of all of these. The different kinds of sanders allow you to select the optimum abrasive motion for the work you are doing and the result you want to achieve.

The question I get all the time is, "Which should I buy"? I think the best way to parse that question is the following:

If you are only able to buy one Festool sander, and you do general woodworking and furniture making, my recommendation is to start with the **RO 150** or RO 125 Rotex sander. These are the all-around work horse sanders that, with the right abrasive materials, can take you from aggressive sanding and shaping in the rotary mode through fine finish sanding in the random orbit mode. Switch to felt pads and rubbing compounds to impart a mirror-like shine to your finish or to apply waxes easily. The one I use the most is the RO 150 as I like the 150 mm (6") sanding surface. The smaller 125 mm RO 125 works just as well, only covers less ground. Some like the lighter weight of the RO 125, but I do not find the RO 150 either heavy or clumsy.

The RO 150 uses a 5mm stroke while the RO 125 uses a 3.6 mm stroke which can result in a slightly smoother finish with the same grit abrasive.

Need to sand large flat surfaces? The choice is simple - use the **RS 2**. The 2.5mm stroke and pure rotary motion coupled with the large (4.5" x 9") rectangular pad produces an exceptionally

smooth flat surface. It is ideal for panels, edges or any flat component. It is so smooth you can sand all day if you need to without the dreaded tingle in the hands, wrists or arms. Dust collection is really good when coupled with any of the Festool vacuums.

If one is doing model work or trying to reach small recesses my choice would be the **DX 93 Deltex** sander. The small triangular pad reaches where most other pad shapes will not. At high speeds such as the maximum 9,500 RPM its 2.5mm sanding stroke produces very rapid stock removal but obviously only over small surface areas as the pad is only 93mm x 93mm. Slow it down to the low speed of 5,000 RPMs and use a fine grit to produce very smooth, very controlled sanding on small or fragile components.

Is rapid stock removal or rapid cleaning of gunk or rust the objective? Go for the **RAS 115**. Put on Saphir, Cristal or Rubin abrasives and shape just about anything. Switch to Vlies pads for cleaning, gunk and rust removal.

Do you need to sand profiles or odd edge surfaces? If so, there is no substitute for the **LS 130** pure linear sander with all of the available profile shape pads. Add the profiling kit and you can easily custom shape a backer pad to fit nearly any profile.

More and more I am asked to make solid wood countertops like the ones shown on the next page. To make them properly (so they will never warp,) I like to place sliding dovetails every 150 to 300mm along the bottom side. This allows the solid wood top to expand and contract with normal seasonal changes in humidity while holding the top from warping over



time. A lip covers the ends of these sliding dovetail stringers. The top is attached to the cabinet by screwing into the stringers.

Most of my customers prefer a soft rounded edge like is shown here which I like to cut with a Festool 491-015 round-over bearing guided router bit. To finish sand that curved edge I use a 491-197 pad on the LS 130. While the round-over bit has a 9.5mm radius and the pad is a 10mm radius, the results are very good indeed.

As we discussed earlier, a really nice feature is the ability to make your own custom profile using the 490 780 kit. With it, you are limited only by the overall size of the pad (80 x 195mm). If the edge profile is bigger than that, you can use two or more kits to make custom profiles for different parts of the edge profile. I can't tell you how much hand sanding time this gem saves.

In general, random orbit sanders will likely be the ones you use the most often in the most different applications with the exception of the RS 2 which will see use daily if you build furniture which has large flat surfaces.

If furniture making is what you do and you can bring yourself to invest in three Festool sanders, the combination of the RO 150 Rotex, ETS 150/3, and RS 2 shown below is really hard to beat. The RO 150 (previous version pictured foreground left) will do the fast stock removal and shaping operations as well as the sanding up to the middle grit range. Then switch to the ETS (rear) for the finer grits and the RS (right) for the flat panels and your work



will take on a whole new smoothness. If polishing and buffing fits the look you are after, put felt pads or a sheepskin pad on the RO 150 and let rubbing compounds and waxes work their magic. You will be floored by the mirror-like surface you can create. Then, when your needs, interests, and pocket book allow, add one or

more of the specialty sanders shown here.



If you are like me, before long all the great Festool sanders will be in use in your shop or studio on a daily basis.

**Enjoy!**

## A Closing Note On Continuous Improvement Engineering

Earlier we saw a few pictures of the “new” and “previous” versions of the Rotex sanders. I want to comment a bit more on the differences as it reflects well the Festool focus on continuous improvement engineering.

There certainly was nothing “wrong” with the previous Rotex sander. I can’t even guess how many hours I used that machine before the new version became available. It was, and the new one remains, the best sander I have ever



used.

So, what did they improve?

The new version (left) is a bit shorter, easier to control and has a more powerful motor (720 vs 500 watts). Notice in the photo at the top of the next column how the new version balances flat on its pad



while the longer body of the older version caused it to tip backwards.

The dust port is now removable to make tasks like polishing which don’t require the dust port a bit easier. The removable dust port (shown in the photo above) also acts as a hand guard to keep you from banging your knuckles on the work surface during aggressive sanding operations.

Pads change with a quick quarter-turn twist lock instead of via removal of the machine

screw fastener used on the previous model.

Notice that the new model features the very handy removable cord that is being introduced across the Festool line with each upgraded model. A quick quarter-turn removes or attaches the power cord so it is not in your way when the machine is not in use.



On the previous version changing from rotary to random orbit mode required lifting the lock and twisting a shaft, the green mechanism shown in this photo. Simple enough but a bit fussy. On the

thumb naturally falls. The previous model had the on-off switch on the side where you had to consciously look or feel for it.

Finally, there is now a slick snap on guard that prevents the Rotex pad from impacting the work piece - very much appreciated if you have ever scarred a work piece by inad-



new version the same change is accomplished by simply moving the green rectangular button on the front top of the unit. Faster and far handier. The other green button shown is the on-off switch positioned to be on top right where your

vertently hitting some part of it with the edge of the pad. Ouch!

So this new version of the already very good Rotex is a nice piece of continuous improvement engineering that adds useful new features, improves power, and makes the unit a bit smaller and easier to handle with none of the good stuff from the previous unit compromised. Bravo Festool!

## About the author.



Jerry Work designs and hand crafts fine furniture in the 1907 Masonic Temple building in historic Kerby, Oregon. Unless otherwise noted, all of the photos used in this manual were taken in his studio and gallery. Located on the Redwood Highway (US 199) 26 miles SE of Grants Pass, OR, where visitors are always welcome.

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