Combination Machines

Five-function machines are heavy duty and save space, but are they worth the price?

BY ASA CHRISTIANA

1. TABLESAW
A large-capacity sliding table running next to the blade sets this saw apart from American-style cabinet saws.

Less space, better machines

Space savings aren't the only benefit of European combination machines. Each of the five individual tools will represent an upgrade for most small shops.

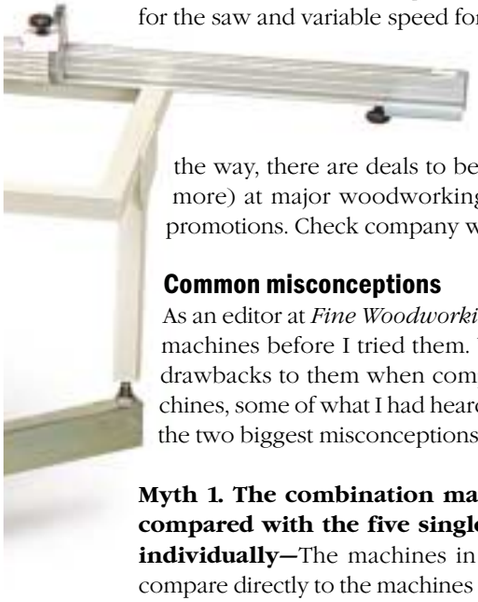
2. JOINTER
A 12- or 16-in. jointer will mill a flat face on most of the lumber a furniture maker encounters.

3. PLANER
Combination machines also include a heavy-duty 12- or 16-in. planer.

Most American woodworkers know very little about European-style combination machines—except for their high price tags relative to other small-shop equipment. It has been 22 years since the last review of these machines in *Fine Woodworking*, so this article also provides a general introduction to them. I have defined combination machines as five-function, three-motor, heavy-duty units. The smaller multipurpose machines such as the Shopsmith are a breed unto themselves. All of the machines covered include a sliding tablesaw, a shaper, a planer-jointer and an add-on horizontal mortiser with a sliding table.

Six brands—Felder, Hammer, Knapp, MiniMax, Robland and Rojek—are currently imported into North America, with a multitude of models and configurations.

To keep the price tags as low as possible and to be sure I was comparing similar machines, I ordered the 12-in. planer-jointer units, as opposed to the 16-in. size that most brands also offer, and a sliding table stroke that could handle a 48-in.-wide panel. I opted for the bolt-on mortising unit but passed on the scoring blade for the saw and variable speed for the shaper, among many other options. As outfitted, these machines range in price from $6,000 to $15,000, with four of them priced under $9,000. By the way, there are deals to be had on all of these (10% off or more) at major woodworking shows and through in-house promotions. Check company web sites.



Common misconceptions

As an editor at *Fine Woodworking*, I had heard a lot about these machines before I tried them. While there certainly are a few drawbacks to them when compared with single-function machines, some of what I had heard turned out to be false. Here are the two biggest misconceptions, in my opinion:

Myth 1. The combination machines are expensive when compared with the five single-function machines bought individually—The machines in a combination machine don't compare directly to the machines in most shops. Most small shops I know don't have a sliding tablesaw, a 12- or 16-in.-wide jointer or a sliding horizontal mortiser. And many don't have a shaper, not to mention one with a sliding table. If you do the math, most of these combo machines are actually less expensive than five single-function machines of the same quality and capacity.

A real-world shop test. *To try out each function as well as the changeovers from one to the other, Christiana made a frame-and-panel door on each machine.*

The fact is that this combination of machines would represent an upgrade to most small shops. The sliding tables—which run right next to the sawblade and offer long strokes and accurate crosscut fence systems—are more comparable to an industrial sliding table such as a Martin than they are to the add-on sliders available for American-style saws. A sliding tablesaw can make precise joinery cuts and crosscuts on solid or panel stock without the need for auxiliary sleds, jigs or work supports. Also, it can make a long, straight-line rip on rough lumber. These sliding tables also work with the nearby shaper spindles for operations like tenoning.

You also get a shaper with 3 hp (or more). Yes, shaper cutters are more expensive, but they accommodate custom knives and can take a much bigger bite than router bits can. The panel-raising cutter I used to test these shapers was able to take at least half of the cut in a single pass, while leaving a smooth finish and little-to-no breakout at the end of the panel. Shapers also feature precise height adjustment. Once woodworkers go to a shaper, they usually find it difficult to go back to a router table.

Myth 2. Slow conversions are a deal-breaker—The only necessary conversions are from saw to shaper and from jointer to planer. The saw-to-shaper conversion involves fastening the shaper fence to the table, so it takes a bit longer, but it's not an operation you will have to do often, because shapers typically get less use than tablesaws, planers and jointers. The planer-to-jointer conversion involves raising the tables, cranking up the planer bed to the needed height (it must be lowered for jointing to allow the dust hood to be flipped) and then flipping the dust hood and

4. SHAPER
Absent from many shops, this heavy-duty tool can do many things a router table can't, and do them faster.

5. MORTISER
A horizontal mortiser can make accurate, identical mortises quickly and easily.

Photos: Kelly J. Dunton

MACHINES UNDER $9,000

The Hammer, while overall a nicely made machine in its price range, arrived with two major problems. For starters, there was severe vibration in the saw unit, resulting in very rough cuts. A company spokesman said this was due to a defective motor, so I tried another machine. I got much better rip and crosscut results, but the quality still was rough. The other problem was damage to the steel tracks in the sliding mortising table, which resulted in a bumpy ride. Hammer sent a new table that moved smoothly. There were smaller assembly problems that needed attention, too: a loose height-adjustment support block on the saw unit and an internal dust hose fastened in the wrong position.

The Hammer also has a few design problems. The rip fence, which pivots to become the jointer fence, flexes under pressure and has three closely spaced clamp levers, which were annoying to deal with. The splitter also has too much flex, due to its placement on a long, weak arm. The mortising table doesn't travel quite high enough to center a bit in ¾-in.-thick stock, but this can be remedied by inserting a scrap spacer between the workpiece and the table. Unlike the Rojek and MiniMax, the Hammer does not offer reverse rotation on its shaper spindle, which would allow cutters to be flipped for safer orientation of certain workpieces. Also, using the five jack bolts underneath, I was unable to get the sliding table level throughout its stroke with the central saw table.

HAMMER C3-31 COMFORT

Source: Made in Austria, distributed by Hammer USA (800) 700-0071 www.hammerusa.com

Price of model tested: $8,790, with mortiser option

Weight: 1,200 lbs.

Minimum width: 43 in.

The pivoting rip/jointer fence is a problem. *The closely spaced clamp handles are hard to tell apart, and they get in each other's way. Also, the fence has significant flex.*

The crosscut fence excels at miters. *There are many positive stops (holes) for common angles.*

hose. But once I got the hang of it, this process took only about 30 seconds on most of these models. And, as many users have pointed out to me, you can organize your workflow—a benefit in itself—to reduce the overall amount of changeovers. I found the planer-to-jointer conversion to be a bit annoying at times, but I would make the tradeoff if space were a big consideration in my shop.

If you want these five core woodworking functions in one space-saving unit, one of these combination machines may be for you. However, size and weight may be deal-breakers for your shop. You need a floor that can support a 1-ton machine and a doorway wide enough to get the machine through. Check the minimum width for each. All machines are available with a single- or three-phase motor.

Watch it on the web

For more on combination machines, go to www.finewoodworking.com.

What to expect when ordering a machine

Unless a manufacturer has the exact model and setup you want sitting in a stateside warehouse, you will have to wait at least a

This is the latest version of MiniMax's combination machine. In many ways—fit and finish, ease of tune-up and adjustment, quietness, American-style jointer guard, Tersa cutterhead for easy planer-jointer blade changes, among others—this was the most refined design in its price range. Its lightweight (but strong) shaper fence assembly was easy to take on and off the machine. Like the Rojek, the MiniMax accepts a full dado head and offers a router option, but top speed on the latter is only 9,000 rpm—not enough for most bits. Other than routing, the MiniMax handled each of its tasks well.

However, like the others in its group, the MiniMax has a few manufacturing wrinkles to iron out. The jointer tables sagged 0.010 in. away from each other over the entire length—tolerable maybe, but too much for my liking. However, it would not be difficult to insert shims in the table supports to bring them level. In fact, I noticed that the factory already had inserted a few. Also, the extruded-aluminum jointer fence had a 0.008-in. bulge in it from top to bottom, enough to leave jointed edges just slightly off square.

This machine had almost as quick a planer-jointer conversion as the Knapp, due to a similar dust-collection design, but a few details slowed it down. Still, it was a quick changeover.

The MiniMax has the shortest outrigger travel, a drawback because it does not allow very wide cuts when the crosscut fence is in its normal, forward position.

MINIMAX CU300 SMART

Source: Made by SCMI in Italy, distributed by MiniMax USA
(866) 975-9663
www.minimax-usa.com

Price of model tested: $7,495, with scoring blade and mortiser standard

Weight: 1,260 lbs.

Minimum width: 42 in.

Quickest planer-jointer conversion in its group. *As on the Knapp (p. 59), the planer dust hood is smaller, meaning the planer bed does not have to move as far during the changeover. However, the rip and jointer fences have to be moved or removed.*

month—maybe two—to get your machine. Then plan on two days to unpack the machine, clean off the oil-and-wax protectant, put on the various attachments and tune up the machine for use. I found the manuals to be weak, so expect to do some head-scratching and trial-and-error to figure out assembly and tune-up. However, there is U.S.-based technical support for each of these machines; call the companies' toll-free numbers.

Felder and Hammer offer a company installation for $400 extra. A factory technician will spend the better part of a day at your shop assembling, tuning up and demonstrating your new machine. This is a worthwhile investment, especially considering the overall price tag, and more than 90% of Felder buyers choose this option, according to the company. Laguna also offers this service for its Knapp machine. You cover the cost of a technician's airfare and pay an hourly rate.

The testing procedure

With the help of John White, *Fine Woodworking*'s shop manager, I first uncrated and cleaned each machine and its many parts. Then I assembled and tuned up each one. The sliding table must

The NX-31 is an updated version of the X-31, which was the first combination machine on the U.S. market. The NX-31 had a lower cost than the other combo machines in its price range, but it also was significantly lower in quality, accuracy and efficiency than the others.

The sliding table dipped as much as 1/16 in. at the front of its stroke, rising near the blade, and there was a noticeable bumping of the bearings as the table slid. The aluminum extrusion that makes up the sliding table had a 0.007.-in. dip along its center. Also, the crosscut extension table would not go on flat. The cast-iron center saw table also dipped 0.007 in. to 0.008 in. in some places. The saw's arbor and trunnion assembly is lighter and less solid than most of the others, so it could be flexed by hand, which explains the amount of vibration and rougher quality of cut.

The jointer fence also was a problem: Its extrusion was cupped 1/32 in. at the ends but bulged 1/64 in. near the center, more than enough to affect squareness of cut.

There were a number of significant design problems on this machine. One example: On the crosscut fence, there is no stop at 90° (although one could be fabricated by the user). Also, the machine required much more assembly than any other machine I looked at, and wiring access was difficult. The machine is rated for a 12-in. blade, but the 12-in. diameter caused the splitter to sit so high that it couldn't drop below the surface of the table (a clear saw-table surface is necessary when using the shaper). The machine accepts a dado head but doesn't provide a throat plate to fit one, as the others do. Laguna doesn't recommend the Robland's router spindle, which mounts directly on the shaper spindle, limiting it to 6,000 rpm and keeping the collet ½ in. above the tabletop at its lowest point. Last, the height adjustment on the tablesaw was very stiff and difficult to move, especially at the bottom of its range.

ROBLAND NX-31

Source: Made in Belgium, imported by Laguna Tools
(800) 234-1976
www.lagunatools.com

Price of model tested: $5,995

Weight: 1,500 lbs.

Minimum width: 47 in.

The sliding table is sloppy in its travel. *After being adjusted level with the central saw table, the sliding table's height changes at the blade and shaper spindle by as much as 1/16 in. as it is pushed forward and backward, which reduces the accuracy of saw and shaper cuts.*

be level with the main saw table and parallel with the blade. The crosscut table that rides on the slider and the outrigger support also needs to be adjusted level, as do the detachable auxiliary infeed/outfeed tables that come with most machines. Last, I bolted on the mortising unit and adjusted it level with its chuck, which is attached to the end of the planer-jointer cutterhead.

Next, I ran through the general functions of each machine, but to try them in a real-world situation, I also made a frame-and-raised-panel door using each one, switching between functions as I milled stock, cut joinery and shaped a wide ogee profile on the panel.

Many features in common

The quality and accuracy among the machines I looked at varied. But these European machines have a lot in common. All use a selector switch to divert power to various functions, ensuring that only one can be running at a time. Each comes with a motor that's at least 3 hp, with more horsepower as an option. Dust collection is integral, with fittings around the machine and hoses inside.

The sliding tables lock for ripping cuts and have crosscut extension tables to support large stock. Four or five jackscrews make the sliding-table assemblies easily adjustable for level and square.

Each of the saws has a curved European-style riving knife (a type

The Rojek has more mass than the others in its group, which is always good. The size and weight of the machine more than likely helped the planer-jointer, saw and shaper make smooth cuts with less vibration. The Rojek comes with a four-knife cutterhead, and the machine has a thick, strong base and a solid rip fence that rides on thick rails. It also has the longest outrigger travel, which means I didn't have to move the crosscut table to the back of the sliding table to use the saw's entire stroke. The crosscut table, which is loosened with one knob, slid easily to various positions along the table. The saw accepts a dado head.

While in the past the Rojek line had not included a tilting shaper spindle, as most of the other machines do (a popular option because it creates many potential profiles for a single cutter), Tech Mark said a tilt option will be available early this year. Like the MiniMax, the Rojek offers a quick-change router spindle, but the speed tops out at 10,000 rpm.

While the Rojek is the most heavy-duty machine in its group, there are a few crude areas in its design. For one, there is no easy way to adjust the level of the crosscut extension table where it attaches to the sliding table short of grinding or filing its bearing surfaces. On the machine I tested, this table sat 0.011 in. high at one end of the slider, and level at the other—not a deal-breaker, but troublesome. You'd want to pick a spot along the sliding table to locate the crosscut table for your most accurate cuts. The planer-jointer design has a few drawbacks. The jointer fence must come off to allow the tables to be lifted for planing, and the planer bed must be cranked down to the 8-in. mark (100 cranks) to allow the dust hood to be reversed for jointing, giving this machine the slowest changeover time. Also, the bar that supports the rip fence sticks out in front of the planer, not in the way of boards being fed but awkward for the user.

ROJEK KPS 300A

Source: Made in the Czech Republic, imported by Tech Mark
(501) 945-9393
www.tech-mark.com

Price of model tested: $8,274, including optional mortising unit, with scoring blade standard

Weight: 1,500 lbs.

Minimum width: 34 in.

The planer design is problematic. *The support bar for the saw's rip fence remains between the user and the planer, and the jointing tables open outward, making the user go farther to reach a board.*

The shaper is almost dust free. *The Rojek is the only machine in its price group to offer a dust port under the table as well as in the fence/hood assembly.*

of splitter). The splitter hugs the blade closely and moves up and down and tilts sideways with it, which means it can stay on the saw more often than not, preventing kickback.

The combination machines come with options for longer or shorter sliding tables and strokes, with large and small crosscut extension tables (with or without outrigger support arms). There are options for tilting and variable-speed shapers, scoring blades and 16-in. planer-jointers, among others. Also, most companies offer their saw-shapers and planer-jointers as separate machines, which are popular options. By the way, on most of these machines you should consider purchasing the smaller crosscut table with no outrigger, unless you cut large panel stock all the time. The outrigger got in the way when I was standing on the left side of the machine using the shaper or changing sawblades.

Each machine has a shaper hood outfitted for dust collection, with a tall, sturdy fence, and adjustable hold-downs and an outfeed fence. All machines accept a router spindle, but most don't offer spindle speeds that are high enough for efficient routing. Four of the six saw units accept a dado head.

With the exception of the MiniMax, all of the machines have a European-style cutterhead guard on the jointer, which I found to be an annoyance. Because the guard stays in place I was forced

MACHINES OVER $10,000

Both the Knapp and the Felder machines arrived from the factory within close tolerances in every way. Tune-up was easy, with each bolt and setscrew offering positive adjustment. Machines built as solidly as these two should stay aligned for years.

Felder offers more combinations of features and capacities than any other manufacturer: up to 10-hp motors (three-phase), digital readouts, a wide range of saw strokes and cross-cut capacities, two types of scoring systems, variable speed and more. Felder also makes the Hammer line of combination machines, offered at a lower price.

While the Knapp machine is heavier, the Felder sports a few more refinements of design. It was clear that every detail—from shipping to woodworking—had been considered carefully. Just a few highlights: All of the height dials and scales on the machine can be reset to zero at any point. The Felder sliding table locks in two positions: one for ripping, and the other for shaping. The saw's internal dust hose has a flange that can be adjusted to hug a 10-in. blade as closely as a 12-in. one. The router and shaper spindles can be changed out quickly. This is the only machine of the bunch with the shaper fence assembly pegged into holes in the table, so the assembly can be removed to use the saw and then returned to the previous setting. This machine's base (and that of the Hammer) has gaps built in to accept a pallet jack for mobility.

Performance was a delight. All of the functions delivered clean, precise, almost dustless cuts, and none of the motors even threatened to bog down. The mortising unit was the best among these machines, with ergonomic clamping handles and a screw-driven hold-down (as opposed to a cam). It also was the easiest unit to attach and detach from the main machine, and its stops were the easiest to set and use.

However, the Felder doesn't accept a dado head, so dadoing must be done using the router spindle and the sliding table, which takes longer. Also, the router spindle turns only at 15,000 rpm, which is too slow for small bits. However, if you opt for the variable-speed shaper, the router spindle will run at 19,000 rpm.

The 45-in.-long jointer/rip fence is a slight drawback. It had more flex than the Knapp rip fence, and when it was mounted on the jointer it came up too short on the outfeed side for my liking.

FELDER CF 731 PRO

Source: Made in Austria, distributed by Felder USA
(800) 572-0061
www.felder-usa.com

Price of model tested: $13,389, with optional mortiser, single-phase power and router spindle

Weight: 2,000 lbs.

Minimum width: 31 in.

Bells and whistles. *Many thoughtful features, like magnified scales and accurate dials that read in 0.001-in. increments, make the Felder a pleasure to use.*

to reposition my hands as I pushed a board over the cutterhead. For face-jointing, I ended up sliding the guard completely out of the way—not the safest situation. The MiniMax, however, is outfitted with an American-style guard, which pivots out of the way as needed. Finally, all of the units offer some means for mobility.

Head-to-head comparison

Combination machines range widely in price, performance and overall brawniness. There basically are two high-end machines—Knapp and Felder—in the $10,000 to $20,000-plus range, depending on options. Both are from Austria, and I found them to be engineered and manufactured with very few compromises.

Then there is another tier of four combination machines at $6,000 to $9,000. While most in this group are at least as accurate and well-built as the cabinet saws and other equipment many of us have, they can't compete with the Knapp and Felder. In general, tune-up is a bit more difficult and there is less mass throughout, which results in more vibration and slightly rougher cuts; and there are cruder stops, dials and scales, which reduce efficiency somewhat. Accuracy is slightly diminished but still within acceptable limits

The Knapp is an industrial machine, built to withstand a lifetime of abuse in European cabinet shops. The planer-jointer can be unbolted and used as a separate machine, a nice touch. Also, the Knapp has the most cast iron in its massive arbor and spindle assemblies. It takes up to a 14-in. blade (the others accommodate 12 in.), and a tilting shaper spindle is standard (an option on other machines). It has separate fences dedicated to ripping and jointing. The Knapp router spindle is the only one that turns at the ideal speed for routing: 23,000 rpm. It also accommodates a full dado head, giving you two options for dadoing.

Its switches were heavy-duty and conveniently mounted, and the ripping and jointing fences were the most rigid. The height adjustments of the saw, shaper and planer bed were the smoothest and most solid of any machine tested. Although it didn't need much tuning, this machine was the most easily tuned up and adjusted for flat and square. Also, all of the dust-collection ports are on the same side of the machine—the back.

The wide sliding table was by far the most massive and smooth. It was deadly accurate throughout its stroke, with positive fence stops built in at common angles. The round bearings run against round bars for point-to-point contact designed to resist fouling by dust.

I preferred the Knapp's standard crosscut extension table over any of the others. It requires no outrigger to support it. It is lightweight aluminum but dead-flat and rigid enough to support large panels.

The only design flaw I encountered was that the cam-driven hold-down on the sliding table pushed the stock forward when it was engaged. While these hold-downs are not necessary for most operations, they increase the accuracy of miter and joinery cuts on the saw, and tenoning on the shaper.

KNAPP KOMBI 410 PROFIT

Source: Made in Austria, imported by Laguna Tools (800) 234-1976 www.lagunatools.com

Price of model tested: $15,150

Weight: 2,200 lbs.

Minimum width: 35 in.

Knapp has its own bells and whistles. *It shares many of the Felder's niceties, and its switches are the most accessible.*

Best planer-jointer changeover. *As on the Felder, the jointer tables lift in one piece, but the Knapp's cleverly designed dust-collection ports mean the planer bed has to be moved only to the 4-in. mark for jointing operations.*

on most. And each of these midrange machines has its own unique drawbacks; if you are interested in this group of machines, the question is which issues are significant for you and your work.

If I had the money and if space were an overriding consideration in my shop, I'd be ecstatic with either the Felder or the Knapp. In terms of design, the Felder has a few more refinements than the Knapp. But the Knapp has its own advantages, such as its mass and complete lack of vibration, its dado capacity, its more substantial fences and its ability to be broken apart into separate machines: saw-shaper and planer-jointer. However, it's more expensive.

On a budget, and again with space as a major consideration, I'd go with the MiniMax because of its overall performance and small footprint. It accepts a dado head and comes standard with a mortiser and a scoring blade. The Rojek ran a very close second. It has more mass and solidity, but it's a little rougher in its design and sports a higher price tag. Note: The Rojek can break down into halves temporarily and fit through a smaller doorway than the MiniMax. □

Asa Christiana is a senior editor. John White, Fine Woodworking's *shop manager, also contributed to this article.*