

Visible-Beam Rotary Lasers



Look for an accurate instrument with safety sensors and a detector for outdoor work

Shopping for a rotary laser is no easy matter: There are many contenders on the market, in a wide range of prices, each promising accuracy and quick setup.

by Gary Katz

I wanted to find a rotary laser with a strong beam, one I could see easily indoors for finish work like wainscoting, cabinets, and casing. I also wanted a beam that would be visible outdoors, for occasional foundation work, decks, exterior trim, and siding. Obviously, I wanted a tool that is dead-nuts accurate — or as close to it as I could find — for as great a working range as possible. Finally, I set out to find a tool that felt affordable for the use I would give it. I don't do professional site work or

surveying, so I wasn't about to spend what the most sophisticated electronic instruments cost.

Rotating lasers differ from point-to-point lasers for the simple reason that there's more than one axis that requires careful leveling. Point-to-point lasers must maintain a level position in only one direction, for which most manufacturers have adopted a sophisticated but motorless pendulum. But rotary lasers must be leveled in two directions (or axes), so a pendulum won't do the whole job. The fully automatic self-leveling rotary lasers rely on microcomputerization and servo motors to level the tool. When you switch on one of these tools, you immediately see flashing lights and hear whirring motors. Once the lights blink off or in some cases

Figure 1. The best detectors have a beeping tone that changes to a steady tone when the beam is on the mark.



glow steadily, the laser has leveled itself and is ready to go. I also looked at instruments that require an initial manual leveling before commencing automatic operation, as well as some lasers that rely on fully manual leveling.

Visible vs. Invisible Beams

Although I wanted a beam I could use for exterior work, I found that rotating lasers are nearly invisible outdoors. In fact, many of them are dim even indoors, because the faster the laser spins, the weaker the “dot” becomes. Most of the lasers I reviewed are capable of casting a single bright dot (the LMH and the LM500 will not cast a single dot) — just like a point-to-point instrument (see “Self-Leveling Lasers,” 8/01). Those bright dots are visible outdoors up to 30 or 40 feet, which can be useful if you use a remote control to move the dot.

Detectors. If you aim to use your new instrument outdoors, be sure to purchase a tool that comes with a detector. (Forget about the red glasses; they’re more likely to be lost or discarded.) Detectors come in many shapes and sizes, but they all work the same way; the detector for one tool will work with any other tool. Some detectors have a clear LCD display that increases the visibility of the laser beam as it passes over the panel. After using all the detectors, I found the best were equipped with a beeping tone and a flashing LED arrow, both of which told me to move the detector up or down until it sounded a steady tone (see Figure 1). Some of the less expensive detectors have only a series of lights and a beeping tone. A fine notch located at the back of every detector makes it easy to transfer a level line to a wall or measuring rod.

Interior work. Inside, I tested all the lasers in a brightly lit white-walled room and judged their visibility subjectively. Though many of the lasers I



Figure 2. With some tools, you can deactivate the sensor, allowing you to project an inclined layout line.

tested share the same laser beam specifications, the light they produced was dramatically different. The visibility of a laser beam depends on both the power of the instrument, which is measured in milliwatts (mw), and the wavelength of the laser diode, which is expressed in nano-meters (nm). While higher power means a brighter beam (naturally, safety reasons limit the power of these devices), a lower wavelength enhances the beam’s visibility because the human eye is more sensitive to shorter wavelengths: A 635-nm laser will appear more than two times brighter than a 650-nm laser. Most of the lasers I tested had ratings ranging from 635nm to 670nm, a wide spread.

Accuracy

I used my transit to test accuracy. I shot bench marks at 8, 20, 75, and 150 feet, then checked the precision of those marks by shooting them again from a second location. At 150 feet, my transit was off 1/8 inch, no matter how perfectly I tried to adjust the bubbles. I’m sure it’s time to have my transit recalibrated, but I had the same problem with each of the manually leveling rotary lasers; in fact, the error was far greater with some instruments.

I’ve always known that spirit levels aren’t perfect because they all depend on the human eye for fine adjustment. Obviously, the same holds true for rotary lasers that depend entirely on manually adjusted spirit levels. However, I was able to shoot a perfect bench mark at 150 feet using several of the automatic and manually self-leveling instruments, which exemplifies the old cost vs. quality issue: Dependable accuracy comes with a higher price.

Sensors and warnings. Self-leveling lasers have sensors to detect any disturbance that might change the line of the laser or exceed the self-leveling ability of the instrument. In such an event, warning lights

flash and in some tools an audible beep sounds, then the instrument shuts off and must be reactivated. This allows the operator to check that the line is still in the right position before continuing work.

While using the tools in the field for this review, I was uncomfortable working with instruments that didn't have sensors and warning systems. It's just too easy to make a large error using an instrument without a sensor. Each time I used one of the manual-leveling lasers on my job, I double-checked the line accuracy using my point-to-point laser.

Several tools also have sensors that can be deactivated, so the instrument can cast inclined lines without automatically shutting down. The inclined line might be useful for laying out stairs, simple handrails, or slopes for drainage (Figure 2, previous page).

Modes: Scanning, Rotation & Dot

Most of the rotary lasers I reviewed have three modes of operation, with different controls for each mode. I found that speed control of the rotary movement was essential, especially indoors, where slower speed increased visibility. The scanning mode is also useful, especially in conjunction with a remote control. Though some manufacturers refer to it as a "line" or "chalk-line" mode, scanning simply means controlling the laser beam so that it doesn't rotate 360 degrees, but travels back and forth over the same 40-, 60-, 80-, or 180-degree line (Figure 3). In the scanning mode, many rotary laser lines are highly visible indoors, even in bright rooms and over long distances. And used in conjunction with a remote control, the scanning mode is perfect for laying out almost all interior work. I didn't find the dot mode especially useful compared to the scanning mode. Of course, outdoors I always used a detector and set the lasers at high speed on full rotation mode, according to the instructions of several manufacturers.

Remote controls. I hadn't thought that a remote



Figure 3. Using scanning or "chalk-line" mode makes the beam more visible, even in bright light.

control would be useful with a rotary laser — after all, if the thing is spinning and casting a continuous line, who'd need a remote control? But continuous lines cast by rotary lasers are dim, which means the scanning mode is often necessary even indoors, especially in brightly lit rooms or over long distances (without a detector). I quickly learned to depend on a remote control so that I wouldn't have to walk back and forth to the instrument to move the location of the line. In addition, most remote controls are able to change the mode from scanning to rotating, as well as the speed of rotation and the length of the scanning line. All the self-leveling lasers came with a remote control, while only a few of the manual-leveling lasers did.

Vertical & Horizontal Work

All of the tools tested were capable of shooting vertical and horizontal lines, though each instrument relies on a slightly different vertical setup. Some rotary lasers have vertical supports built into their housing, so they'll sit securely in both vertical and horizontal positions; others include an accessory foot (Figure 4). For tripod work, most



Figure 4. Some lasers use an accessory foot for vertical work (left); the Stabila LAR (right) pivots between horizontal and vertical orientations.

instruments must be mounted on a bracket, which is supplied with the tool. The Stabila LAR has built-in hinges, so it can be operated in both modes without any brackets.

Calibration

Tools that require job-site calibration can be dangerous. I once had a two-foot spirit level with adjustable vials. After installing a houseful of out-of-level head jamba on one job, I threw that level away and swore that in the future I'd buy only levels that were fixed — calibrated at the factory. But then, in-field calibration can be better than downtime due to factory maintenance. I couldn't work with the tools in this review long enough to determine the durability of factory-maintained instruments. However, I did recalibrate the instruments that required it. Transportation of those instruments often meant recalibration, making them much less dependable as factory-calibrated tools. In fact, the instructions on one instrument warned that the calibration must be checked at every use and advised users to shoot bench marks at each job site for future reference. I assumed that those bench marks would initially have to be shot with another instrument — at least that's what I did.

Batteries

Though they may not seem like a big deal, batteries can be both a hassle and a responsibility: I'm tired of discarding D cells and AAA batteries. Though many of the lasers were equipped with throwaway batteries, an equal number came with some type of rechargeable system. No doubt the best was the SLR-01, which came with both an internal rechargeable pack and an external long-lasting rechargeable pack.



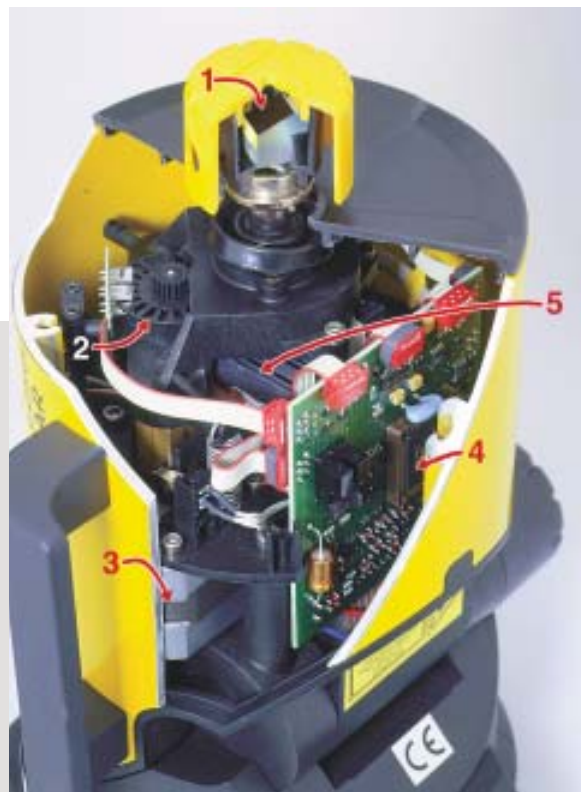
Figure 5. Case sizes vary dramatically — something to consider if space is at a premium in your truck or van.

Case Size

Though the issue of case size may not be important to some users, it is to me (Figure 5). Many rotary lasers are packed in protective cases that demand an annoyingly huge amount of storage space. I'm reluctant to devote valuable storage space in my van to a tool I don't use often, yet I never know when I might be needing my rotary laser, so I want to have it with

Inside an Automatic Rotary Level

Auto self-leveling rotating lasers are crammed with microtechnology, including: 1) a rotating laser prism; 2) a rotation and scan controller; 3) a stepping motor, which levels the laser; 4) a microchip controller that determines the number of steps (measured movements) required for leveling; and 5) inclination sensors (one per axis), which detect changes in the position of the laser and relay information to the microchip controller.



me. For this review, I divided the cases into simple categories of large, medium, and compact. I found that some of the compact cases would even fit under the passenger seat of my van.

Auto Self-Leveling Lasers

Automatically self-leveling lasers have all the bells and whistles. But buyers will need to decide if the additional cost is money well spent. Though these “automated” tools are designed for job-site work — with all its pitfalls and vibrations — and the circuitry and technology inside these instruments is impressive, I’m concerned about long-term durability and downtime maintenance, especially with all the moving parts.

LaserMark LMH

The LMH comes with a good detector and four D-batteries in a medium-sized case. The instrument is entirely self-leveling, though if it is moved, no beep or warning sounds. Instead, the laser shuts off, re-levels itself, then comes back on — sometimes at a different elevation. If the anti-drift system is engaged (by the press of a button), the laser will not come back on automatically. Instead, the on/off buttons will flash until the laser is reset, at which time the operator can check that the instrument is set at the same elevation. This sensor is very sensitive and detects even a slight movement, yet I noticed that the line still goes somewhat out of level before the sensor activates the shutoff.

The beam is extremely dim indoors and requires a detector. In addition, the beam spins at only one speed and lacks a scan-line-dot capability. The kit does not include a remote control. The LMH can be recalibrated in the field (instructions are included in the kit), runs on four D-cell batteries, and comes in a medium-sized case. Unlike most other rotary lasers, this instrument cannot be used in a vertical position to shoot plumb lines.



LaserMark LMH

Accuracy: Good at 20 ft., $\frac{3}{16}$ in. off at 75 ft., $\frac{5}{16}$ in. off at 150 ft.

List price: \$1,095 includes detector, medium-sized case, four D batteries.

LaserMark 400

Similar in size to the LMH, the LaserMark 400 series boasts many improvements. Powered by four D-cell batteries or an optional NiCad pack, the LM 400 is CST/Berger’s latest and most innovative tool. Fully self-leveling, the instrument is designed with an intelligently engineered LCD display. There are four models in the LM400 series, and the differences are plain: The 400-1 shoots only a single horizontal beam, while the 400-2 shoots dual beams — one plumb and one level. The mode button on both brings up one of the four operation modes: single-dot, point-to-point, sweep, and rotation (the point-to-point and sweep modes are nearly identical in operation though they vary in setup). The two select switches allow the operator to vary sweep size, line and dot location, and rotary speed. At high speed, the rotary beam is visible in a brightly lit room at 20 feet, though slower speeds are suggested for interior rotation work. This tool is also designed for fully automatic self-leveling in the vertical mode.



LaserMark 400

The high-end LM 400-3 and 4 have the added ability to shoot sloped grades. Simply enter the percentage of inclination — up to 10% positive and negative — into the on-board display, and the tool will do the rest, even for a dual-axis drainage slope. The 400-3 is a single-beam tool, while the 400-4 shoots both plumb and level lines. The LCD display in all four models also provides for on-site calibration, a process that is entirely electronic. An optional detector and remote control are available for this laser.

Accuracy: Right on up to 75 ft., $\frac{1}{8}$ off at 150 ft.

List prices with case: \$995 for the 400-1, \$1,295 for the 400-2, \$1,695 for the 400-3, \$1,895 for the 400-4.

Levelite LiteHouse 3

This upper-end instrument comes in a medium-sized case with a remote control, detector, wall and tripod mounts, and a rod holder. Fully automatic and self-leveling, this tool flashes and will shut off if it’s bumped out of level more than $\frac{1}{4}$ inch at 100 feet. The laser beam is dim indoors, even at 20 feet in a dimly lit white-walled room, although at slow speeds the beam is visible. The speed of rotation is adjustable



Levelite LiteHouse 3

in four steps. In addition, the beam will cast a chalk line (scanning mode) and a single dot, all controlled remotely. This tool runs on rechargeable NiCad batteries and must be calibrated at the factory.

Accuracy: Right on up to 150 ft.

List price: \$1,125 includes medium-sized case, remote control, detector, wall and tripod mounts, rod holder.

Levelite SLR-01 Pro Pack

Definitely a standout among rotary lasers, this tool is entirely automatic and self-leveling up to 3.5 degrees, though it does require rough manual leveling in the vertical mode (it has dual vials with easy-to-operate adjustment knobs). Included in the well-designed compact case are a remote control, detector with rod clamp, interior rechargeable battery pack, long-lasting exterior NiMH battery pack, and a charger. A mounting plate for horizontal work is also included. The instrument is equipped with a locking switch, which ensures that the delicate instrumentation will not be damaged during transport. For extra safety, the tool beeps (even when it's switched off!) if it's moved without the lock-switch in the locked position.

If knocked or bumped, the instrument beeps and stops — though the line remains level until the max-



Levelite SLR-01 Pro Pack

imum “tilt” position is reached. The beam has good visibility indoors, even at high speed, though like all rotary lasers, the slower it spins, the brighter the beam. Speed adjustment and dot location can be remotely controlled, as well as two scanning modes. The instrument must be calibrated by the factory.

Accuracy: Right on at 150 ft.

List price: \$700 includes compact case, remote control, detector with rod clamp, battery pack, mount plate for horizontal work.

Stabila LAR

The Stabila fully automatic self-leveling laser is a marvel of engineering — just listen to the small leveling motors hum and wind when the instrument is switched on. But the beam is nearly invisible indoors on high speed in a bright room at 20 feet. On slow speed, the beam is barely visible. No beep sounds if the tool is bumped or moved out of level, but the



Stabila LAR

beam shuts down until the operator reactivates the self-leveling function. The self-leveling mode can be shut off and the laser used to strike angles and inclines. Four speeds of rotation are available, and three line types, as well as a dot. Switching from horizontal to vertical work is easily accomplished by swiveling the instrument on the built-in hinge, while self-leveling remains automatic.

Accuracy: Right on at 150 ft.

List price: \$1,715 includes remote control, detector, rod bracket, mount bracket, three D batteries.

Manual Self-Leveling Lasers

Though the description sounds contradictory, it's the best way to separate fully self-leveling lasers from partially self-leveling lasers. While testing the tools in this review, my first inclination was to lay full praise on automatic self-leveling instruments. But after working in the field with all the lasers, I found those that require initial manual leveling but maintain a level position through the use of an internal pendulum well adapted to the terrors of

both a rough job site and a low-balance checking account. Most manual self-leveling lasers also include sensors.

LaserMark 500

Though this laser is described as “automatic,” it must first be leveled manually — at least within an acceptable range of tolerance. It’s equipped with two spirit vials; however, unlike fully manual lasers, once this instrument is up and running, a sensitive sensor will shut the laser off, without a beep, if it’s bumped out of level. Once bumped or knocked out of level, the instrument resets automatically.



This tool comes with a medium-sized case and includes a detector and rod holder, though no remote control. The laser is dim indoors even at slow speed and has only a two-speed rotation control and no scan mode. It’s powered by three D cells, though an optional NiCad battery pack is available. Unlike most rotary lasers, the LM 500 cannot shoot a vertical or plumb line.

Accuracy: Right on at 20 feet, 1/4 in. off at 75 feet, 1/2 in. off at 150 feet.

List price: \$1,065 includes detector, medium-sized case, rod holder.

Pro-Shot L5

This instrument is also described as “auto-leveling” but first must be leveled manually. The single round vial on this laser was difficult to use, but fortunately the bubble doesn’t have to be perfectly centered for the self-leveling mechanism to operate. Still, the instrument is sensitive — even the slight movement of raising my elevator tripod tripped the built-in sensor, at which point a yellow light flashed and the beam shut off.

The laser beam is one of the brightest, easily visible indoors at 30 feet, and almost as far outdoors. Calibration can be done in the field, which can be troublesome: The manufacturer recommends that bench marks be shot and used on every job to check



the instrument before use. Once set up, the L5 has good controls, including speed, scanning, and a single dot. Brackets for horizontal and vertical setup are included, though no remote control or detector comes with the unit. The R-6 detector is available and runs approximately \$150. The L5 is powered by rechargeable NiCad batteries and comes in a medium-sized case.

Accuracy: Good at 20 feet, 1/8 in. off at 75 ft., 3/8 in. off at 150 feet.

List price: \$499 includes vertical and horizontal brackets, medium-sized case.

Manual-Leveling Lasers

Manually leveling rotating lasers can’t be compared to automatic self-leveling lasers — that would be like comparing apples to artichokes. But the price difference is dramatic, so many builders will consider these tools in spite of some serious shortfalls.

These tools rely on bubble vials, either single or dual, for leveling. Not only it is difficult to center a bubble in a single, round vial, but dependable accuracy is hard to achieve when you can’t look directly down on the vial with the laser in an elevated position. Dual-vial instruments are easier to set up and to check during use, though the tools vary in dependability. Some vials were easier to adjust than others, and several had poor adjustment sensitivity: A slight rotation of the adjustment knob caused an overadjustment in the bubble location, meaning that even cautious setup relied a little too much on guesswork.

In addition, the bubbles on manually leveled lasers must be checked frequently. A strong wind can knock out the alignment, as can raising and lowering the height of the elevator tripod.

Few manually leveled lasers are equipped with sensors, so it’s easy to make errors. Personally, I found lasers without sensors and warning devices too dangerous for job-site use.

DeWalt DW 073K & DW 071K

Because the two DeWalt lasers include substantial stands, the instruments and cases are among the largest available. Both stands allow quick conversion between vertical and horizontal work. Like most accessory bases, the DeWalt stands can be mounted on a wall, but unlike other stands, the DW 073 has a unique rack-and-pinion gearing system



DeWalt DW 073K



DeWalt DW 071K

for adjusting and fine-tuning the height of the laser beam — ideal for ceiling, cabinet, and any other work requiring a constant horizontal line. The DeWalt lasers both shoot highly visible beams that are bright even at high speeds, with excellent visibility up to 30 feet in a bright white-walled room, and up to 20 feet outdoors. Neither instrument has a scan or chalk-line feature, though both have variable-speed control over beam rotation. These tools are factory calibrated for accuracy.

Both lasers are manually leveled with a two-vial system, and both are equipped with a bump indicator, which turns the instrument off in the event of a severe disturbance; however, even the manufacturer warns that the bump indicators are not out-of-level sensors, so be warned — errors are easy to make with these instruments.

The DW 073 is packed in the largest case, which would be difficult for full-time storage in a truck, van, or even a trailer. The instrument comes with a target, detector, and rod holder, though no remote control. It's powered by a DeWalt 18-volt battery and comes with a charger. The DW 071 is powered by three D-cell alkaline batteries. This unit is smaller than the 073 and comes with a large detached bracket and a slightly smaller case. The laser operates identically to the DW 073, though it does not include a detector.

Accuracy: DW 073 is right on at 20 ft., $\frac{1}{8}$ in. off at 75 ft., $\frac{1}{4}$ in. off at 150 ft.; DW 071 is $\frac{1}{8}$ in. off at 20 ft., $\frac{1}{4}$ in. off at 75 ft., $\frac{7}{16}$ in. off at 150 ft.

List prices: \$399 for the 073K includes stand, case, target card, battery pack, charger; \$299 for the 071K includes case with target card and batteries.

Levelite LiteHouse 4

The vials on this instrument offer the best example of the problem with adjustment sensitivity: I found if the bubbles were off by $\frac{1}{8}$ of a bubble, the line could be off by as much as $\frac{1}{4}$ inch in 16 feet — allowing for an unacceptable degree of error, particularly since this instrument has no auto-shutoff or warning sensor when bumped or otherwise moved.

The laser will continue to rotate and cast its dim continuous beam even at a 45-degree angle. Red glasses (supplied with all the lasers) help a little to see this low-powered laser, but I was horrified at how easily the

beam could be nudged $\frac{1}{2}$ inch off my pre-shot bench marks. The instrument has a scan mode and speed control for both scanning and rotational use. This laser is powered by two D cells, is packaged in a compact soft case, and comes with an attached mount for tripod or floor work, but no wall bracket, detector, or remote control.

Accuracy: $\frac{1}{4}$ in. off at 20 ft. (inconsistent results due to sensitivity of bubble vials), $\frac{1}{2}$ in. off at 75 ft., up to 1 in. off at 150 ft.

List price: \$250 includes mount for tripod, soft case.



Levelite LiteHouse 4

LaserMark LM30 and LM30X

These new LaserMark devices, manufactured by CST/Berger, have several improvements. The two instruments are identical except for a few addi-

LaserMark LM30



tional features on the X model. Both tools are adjusted manually, with dual spirit vials. The on/off switch also controls the scan mode, dot mode, and rotary speed. The instrument is dim indoors on fast rotation but visible in a brightly lit room at 20 feet on slow rotation. The sweep mode is even more visible, but

no remote control is available for the LM30.

An optional remote control is available for the LM30X, and that model is also upgraded with an out-of-level shutoff device. Both instruments operate on four C-cell batteries, are shipped in a medium-sized case, and must be calibrated in the field.

Accuracy: Right on at 20 ft., 1/8 in. off at 75 ft., 3/8 in. off at 150 ft.

List prices with medium-sized case: \$245 for the LM30, \$415 for the LM30X.

Pro-Shot L3

Similar to but less expensive than the L5, this laser is leveled entirely by two knobs and vials. The beam is highly visible indoors and even dimly visible up to 30 feet outdoors. No remote control or detector is included with the L3, though the optional R-6 detector also works with this tool. Scan mode and

Pro-Shot L3



speed control are good, and an optional bracket is available for vertical use. As with many manually leveling lasers, there is no shutoff sensor, and the line can be bumped out of level easily and dramatically. Power is supplied by D-cell batteries.

Accuracy after in-the-field calibration: On at 20 ft., 1/4 in. off at 75 ft., 1/2 in. off at 150 ft.

List price: \$299 with case.

Stabila LMR

The LMR is the same instrument as the LeveLite LiteHouse 4. Leveling is accomplished through two vials, but the beam is barely visible indoors at rotational speed, and dependability is hampered by the instrument's sensitivity — even cranking my elevator tripod one turn threw the line off level more than 1/4 inch in 20 feet (same with the LeveLite LiteHouse 4). The three-step scan-line mode is good, as is the three-speed control.

The Stabila package comes with an inexpensive detector, target, folding-rule bracket, and folding rule, as well as a tripod adapter. An optional larger

Stabila LMR



target and accessory wall bracket with a quick release are also available.

Accuracy: 1/8 in. off at 20 ft., 1/4 in. off at 75 ft., 1/2 in. off at 150 ft.

List price: \$398 includes detector, target, folding-rule bracket, tripod adapter.

What I Bought

I didn't just test these lasers, I used them; my other crew members used them extensively, too. We've been working on a Victorian reproduction for over eight months, so we had ample opportunity to try out these tools while dialing in corner trim, siding, exterior newel posts, and wainscoting in nearly every room of the house. After considerable testing and job-site use, all of us found that the LeveLite SLR-01 ProPack was the real gem. It may be pricier than a few of the manual rotating lasers, but in my opinion, you get what you pay for. The SLR-01 is auto self-leveling, has an excellent sensor, and includes a lock-down system for transportation. The ProPack kit comes with a rechargeable battery as well as a battery pack for longer use, a remote control, and a detector; and the whole thing fits underneath the seat of my van. [↗](#)

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Rotary Laser Manufacturers

CST/Berger (Laser Mark)

888/753-8358

www.cst-berger.com

DeWalt

800/433-9258

www.dewalt.com

Laserjamb

888/443-3750

www.laserjamb.com

Levelite

800/453-8354

www.levelite.com

Pro Shot

800/238-0685

www.proshotlaser.com

Stabila

800/869-7460

www.stabila.com

Toolz

800/984-0404

www.robotoolz.com