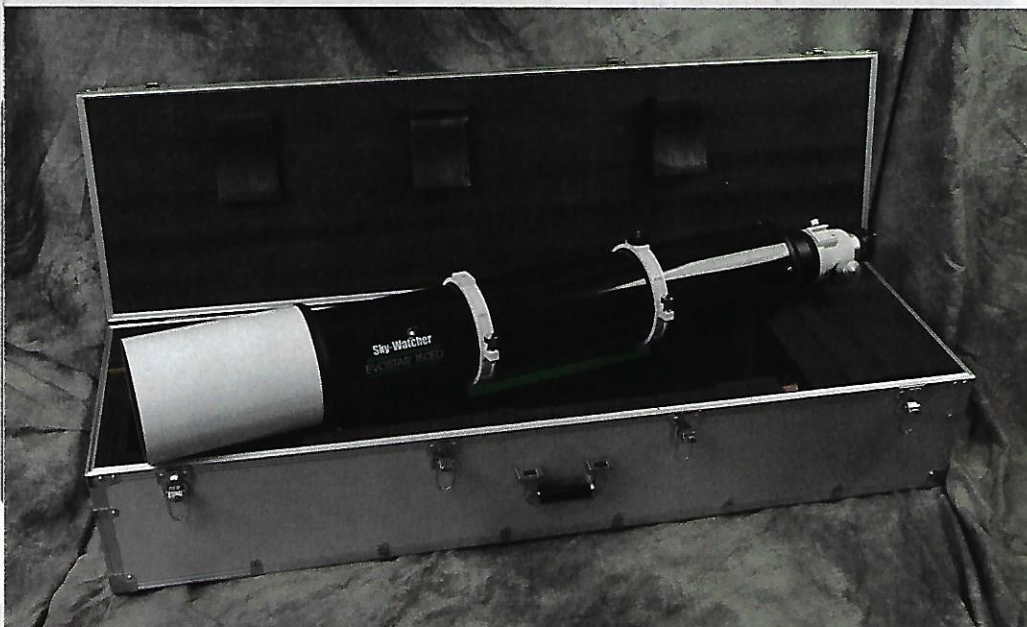


# Sky-Watcher's Evostar 150 APO Refractor

*ED glass and advanced optical coatings push this two-element objective design to its full potential.*



◀ The Sky-Watcher Evostar 150 APO Refractor is a 150-mm (5.9-inch) f/8 with a two-element objective, including one element made with ED (extra-low dispersion) glass. Fitted with typical accessories for observing, the tube assembly weighs about 20 pounds. Its rugged carrying/storage case weighs 36 pounds and holds the tube assembly with mounting rings and dovetail bar attached and has extra room for accessories.

Evostar line, featuring two-element objectives with one element made of ED (extra-low dispersion) glass. As such, these objectives produce images with far better color correction for a given focal ratio than typical two-element achromats made of traditional crown-and-flint glasses. There are currently six models in the Evostar line ranging from 72- to 150-mm aperture (read our review of the 72-mm Evostar in the February 2009 issue, page 58). There's also a 50-mm version (Evoguide) that's mainly intended as a finder- or guidescope.

The Evostars are a step down from Sky-Watcher's premier Esprit ED Triplet APO Refractors, which have three-element objectives and are aimed at observers who are also interested in high-end astrophotography. (The 150-mm Esprit is reviewed in this magazine's February 2020 issue, page 68.) But that's not to say that the Evostar scopes aren't suited for astrophotography, espe-

## Evostar 150 APO Refractor

U.S. Price: \$2,350  
skywatcherusa.com

### What We Like

- Excellent optics
- Smooth, dual-speed 2-inch focuser
- Rugged carrying/storage case
- Eyepieces, star diagonal, and finder not included (but see below)

### What We Don't Like

- Tube slips in its mounting rings
- Eyepieces, star diagonal, and finder not included (but see above)

**IT'S UNUSUAL TO JUDGE** the quality of a telescope after only a few nights under the stars, so it's really rather extraordinary to form a strong opinion after just an hour or so. But that's all it took for me to realize that the 5.9-inch f/8 Sky-Watcher Evostar 150 APO Refractor is an exceptional telescope for visual observing. And it's an opinion that grew stronger in the weeks of testing that followed.

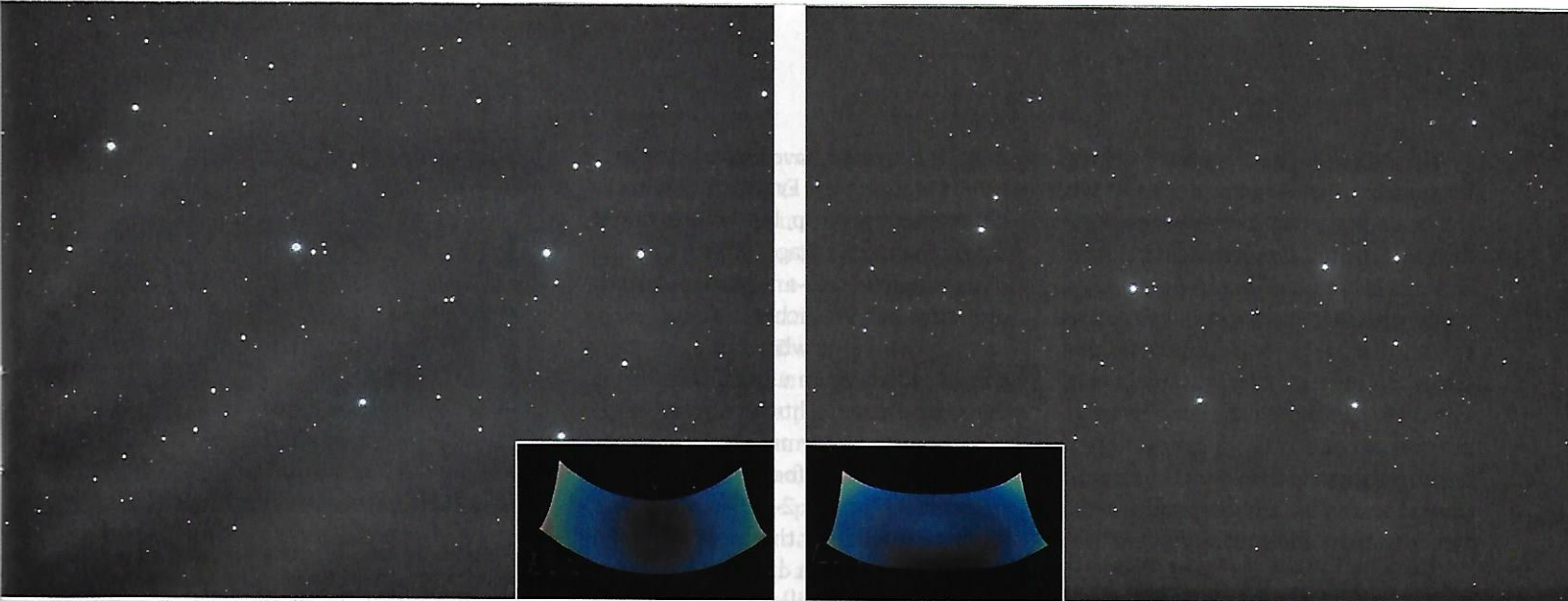
If anyone needs proof that amateur astronomy's love affair with refractors has not abated in recent years, they can simply tally up the number of refractors on the market today with apertures between 60 and 150 mm. It has to be hundreds. Among them is Sky-Watcher's

► For observers with an interest in deep-sky imaging with the telescope, there's an upgraded version called the Evostar 150DX APO Refractor, which replaces the tube rings, dovetail bar, and focuser on the standard model with the items shown here. At right is the optional f/6.2 focal reducer made specifically for the Evostar 150, which only attaches to the heavy-duty, 3.4-inch focuser.



ALL PHOTOS BY AUTHOR UNLESS OTHERWISE NOTED; SCOPE IN CASE: SEAN WALKER / S&T





▲ These 30-second exposures of the Pleiades star cluster on a hazy, moonlit evening were made with the Evostar and 2-inch focuser working at f/8 (left) and with the 3.4-inch focuser and f/6.2 focal reducer (right). Insets show analysis of the images with *CCD Inspector*, revealing that the focal reducer also flattens the scope's focal plane compared to the curved field inherent to the f/8 objective, and that it would be good for an APS-format detector.

cially in the case of the 150-mm model, which is available in two flavors.

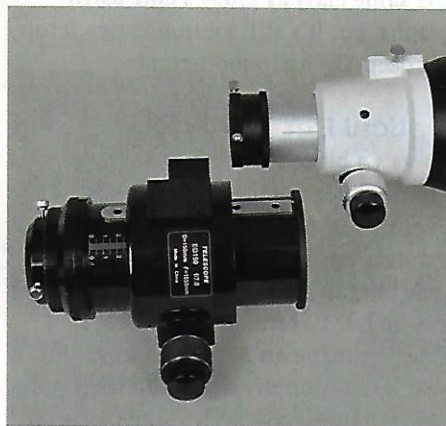
### Hardware

For this review we asked to borrow the Evostar 150 APO, which is the basic version of the two 150-mm models. It's equipped with a dual-speed 2-inch focuser, lightweight tube rings, and a Vixen-style dovetail mounting bar. The other model is the Evostar 150DX APO Refractor. It has the same objective and tube assembly but comes with the heavy-duty, dual-speed focuser found on the Esprit 150-mm scope, and it's supplied with heavier tube rings and a Losmandy-style dovetail bar. These upgrades cost an additional \$850 over the price of the basic 150-mm scope. The more-robust focuser on the DX model brings the advantage of accepting the new f/6.2 focal reducer designed specifically for the Evostar 150-mm scope. Because swapping the focusers on the main Evostar 150 tube assembly takes only minutes, Sky-Watcher sent along the upgraded items available with the DX model so that I could try them out. Let's start with the basic model.

The Evostar 150 APO is a handsome scope with its dark, metal-flake painted tube, white dew cap and focuser, and Sky-Watcher's signature green trim. With the focuser retracted its overall length is 50 inches, and it weighs 17 pounds (3.2 kg). It comes with a very

solid, metal lens cap. The supplied carrying case is also particularly noteworthy for its solid, high-quality construction. It alone weighs 36 pounds and is made for transporting as well as storing the scope. The scope is sold without a finder, star diagonal, or eyepieces. This might be a negative for a first-time scope buyer, but for observers who already own these items it helps keep the cost of the instrument down, which I found a plus. There's a dovetail base for mounting a finder on the focuser body. While not universal, this format is relatively common, and I used it to

▼ The author found the 2-inch Crayford-style focuser to be excellent for visual observing and even astrophotography with cameras as heavy as a DSLR. The robust focuser on the DX model is the same one used on Sky-Watcher's premium 150-mm Esprit refractors and is capable of handling much heavier imaging setups.



attach a finder that I commandeered from another scope.

From the standpoint of visual observing, I was very happy with the 2-inch Crayford-style focuser. It has slightly more than 5¼ inches (133 mm) of travel, and easily accommodated every eyepiece I tried with and without a 2-inch star diagonal. I was especially impressed with the light touch required to operate the fine-focus knob — something that I really appreciated when focusing at high magnifications where a heavier touch would be prone to jiggling the telescope.

▼ The optional f/6.2 focal reducer also significantly flattens the Evostar's focal plane for deep-sky astrophotography. Fitted with a 48-mm (large aperture) T-ring, the setup provides even illumination across a full-frame camera sensor with only a little vignetting in the very corners of the image. The focal reducer can be rotated to aid with framing images.



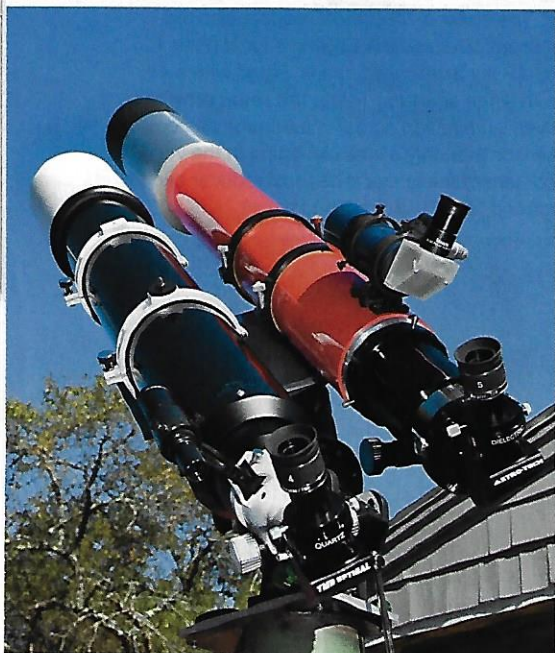


The 2-inch focuser is also very good for imaging the Moon and planets with the small planetary cameras designed to fit into 1¼-inch eyepiece holders. And while I wasn't planning to do photography with large cameras, I was pleased to find that the 2-inch focuser did not slip when my heavy DSLR camera was attached, even when the scope was pointed at the zenith. In my opinion this focuser serves well for visual observing and astrophotography with cameras up to and including DSLRs.

The only hardware issue I had with the Evostar 150 APO involves the tube rings. With their clamping knobs fully tightened, the tube sometimes slipped when the scope was pointed at high elevations. My solution was to add a couple of small cork strips around a portion of the inside of each felt-lined tube ring to add a little friction.

As mentioned above, the DX model's hardware upgrades include the heavy-duty 3.4-inch focuser. There's no question that this focuser is very nice, and

▼ As described in the text, the author mounted the Evostar scope together with his homemade 6-inch f/10 refractor assembled with a conventional achromatic objective made by A. Jaegers in the early 1970s. While both scopes were evenly matched in critical resolution tests, the Evostar consistently delivered images that were brighter and more contrasty than the 6-inch.

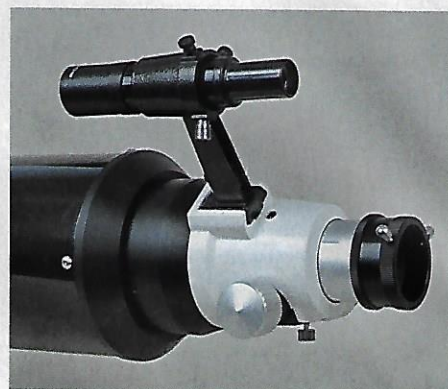


it really is a must-have upgrade if you intend to use the Evostar 150 with a heavy imaging setup, but I didn't find it a significant advantage for strictly visual observing. The rack-and-pinion-driven drawtube has 3½ inches of travel, with its midpoint being where many eyepieces come to focus when using a 2-inch star diagonal. For straight-through viewing some eyepieces may need a short extension tube. The fine-focus knob has a firmer feel than the 2-inch focuser, and there's a small lever that adds friction on the rack-and-pinion drive, which virtually guarantees it will not slip regardless of the load on the focuser. This focuser has the same style dovetail mounting base for a finder that's included on the 2-inch focuser.

The biggest optical advantage of the DX focuser is that it accepts the new Evostar f/6.2 focal reducer and makes the scope more attractive to people interested in deep-sky imaging. While it's called a focal reducer, this accessory also flattens the field quite a bit. At f/6.2, the Evostar 150 has an effective focal length of 930 mm and a field of view covering about  $2\frac{1}{4}^\circ \times 1\frac{1}{2}^\circ$  on a full-frame ( $36 \times 24$ -mm) sensor. With a 48-mm T-ring on my full-frame DSLR, there was only minimal vignetting in the corners of the frame. And though it's a somewhat subjective call, I found star images to be very good over more than 80% of the sensor's long dimension. The bottom line with the focal reducer is an imaging circle with good star images approaching 30 mm in diameter (covering a  $1.8^\circ$  field) and almost no vignetting. It may not be in the same class as today's elite astrographs, but it's still an impressive setup for deep-sky astrophotography.

### Optical Performance

There's a bit of a backstory as to why I passed judgement so quickly on the Evostar 150 APO's optical quality, and it involves another telescope. Earlier this year I began an observing project with a 6-inch f/10 refractor that I cobbled together using an A. Jaegers' objective that had sat on my workshop shelf for more than 40 years. The project was a



▲ While the Evostar 150 models are sold without a finder, there's a common-style dovetail shoe on the focusers for attaching one.

departure from my typical just-for-fun observing, which usually involves deep-sky objects and reflectors with apertures of 12 inches and up.

I gained a lot more appreciation for observers who rave about refractors and how they excel for viewing the Moon, planets, and double stars (the latter being a big part of my observing project). It also helped that our New England astronomical seeing accommodates a 6-inch scope far more often than it does a large reflector. The A. Jaegers lens proved to be very sharp and clearly capable of resolving double stars around the aperture's 0.75-arcsecond Dawes limit when the seeing permitted. Its main weakness is color fringing, which is to be expected for an f/10 crown-and-flint achromat.

Given this 6-inch scope's aperture and performance, it was an excellent benchmark for comparing to the Evostar 150 APO, and as such I mounted both scopes side by side on the same Sky-Watcher EQ8-R Pro German equatorial mount that was reviewed in last October's issue, page 66. And to help level the playing field, I selected sets of eyepieces that gave similar magnifications when paired with the respective scopes, often using the same brand and design, including eyepieces from the Burgess/TMB Planetary Series and Tele Vue's Radian family.

My first look through the Evostar 150 APO was an eye-opener. Despite its slightly smaller aperture (5.9 vs. 6 inches), it gave a view of the brilliant star





▲ Although the telescope's 10-inch-long dew shield does not retract, it can be unscrewed from the lens cell to make it easier to blow or gently brush off any dust and tree pollen from the objective. The metal lens cap fits on the dew shield and offers significant protection.

Arcturus in deepening twilight that was clearly brighter and more contrasty than the one produced by the 6-inch. The modern multi-coatings on the Evostar objective likely account for much of the difference, but the scope's three internal light baffles offered better suppression of scattered light than did the baffling I used for the 6-inch. As the night wore on, same-magnification views in both scopes always seemed brighter and more contrasty in the Evostar, and it wasn't just a subtle difference.

Indeed, the only aspect of the two scopes that was evenly matched involved resolution. During weeks of observing under varying seeing conditions and moonlight, there was never a time when one scope outperformed the other for resolving tight binary stars or lunar and planetary details.

The Evostar always came to a crisp focus even with magnifications between 500× and 600×. Only the slightest touch on the fine-focus knob was enough to show the difference between an image being in and out of focus. For a two-element objective, the Evostar's color correction is noteworthy. There is only a slight hint of color fringing around out-of-focus star images. In focus there were no noticeable color halos around bright stars. Spherical aberration was also well-corrected. Stars showed similar diffraction patterns on both sides of focus. The only exception

occurred during autumn evenings when the temperature was rapidly falling and I could sometimes detect a hint of spherical aberration in the out-of-focus images, which is not unusual for a refractor objective acclimating to temperature changes. Even so, it was never enough to degrade in-focus views.

The Moon was a particularly good target for the Evostar, especially when the seeing permitted using high magnifications. The scope produced excellent, high-contrast views along the lunar terminator without a hint of scattered light washing over the deep shadows. And while timing of the observation was as important as the telescope, on the evening of last October 24th I had one of my most memorable views of the famed Straight Wall and the top of the adjacent crater Birt catching the first rays of lunar sunrise.

During the fall, Jupiter and Saturn barely made it above the treetops as seen from my observatory, but there were times when I had decent views of both and several instances when Jupiter's moon Ganymede clearly appeared as a tiny disk rather than just a point of light. The highlight of the season was, of course, Mars, and here the Evostar did not disappoint. I was able to identify dozens of dark albedo features and the shrinking south polar cap as I followed the Red Planet on nights when the seeing was decent.

Overall, I was extremely pleased with the Evostar's optical performance.

▼ Even with the tube rings fully tightened, the telescope tended to slip when pointed to high elevations. The author solved the problem by adding several thin cork strips between the ring's felt lining and the telescope tube.



I can't speak for everyone, but it's difficult for me to imagine anyone nitpicking the views this scope is capable of producing. It is a very fine instrument for serious visual observers and delivers everything I expect from a 150-mm-aperture telescope.

### A Word about Mountings

Because of their length, refractors put more demands on a telescope mounting than instruments with compact tube assemblies. As such, it's desirable to use a mount rated for a greater weight capacity than the telescope. My observing setup with the two refractors mounted together totaled about 60 pounds, or slightly more than half of the rated capacity of the Sky-Watcher EQ8-R Pro. That might seem like overkill, but it really was a pleasure using such a solid platform with responsive slow-motion controls. A mount with twice the weight capacity of the Evostar 150 would certainly be a good choice for the scope.

If owning a high-quality, large-aperture refractor is on your bucket list, I can highly recommend the Evostar 150 APO. Its optical performance for visual observing is on par with some of the finest refractors I've ever used, including ones costing three and four times the price of the Evostar. The light touch needed to operate the 2-inch focuser's fine-focus knob is a real plus for observing at high magnifications. The focuser was also more than adequate for all kinds of astrophotography with cameras even as heavy as today's typical DSLRs. The biggest advantage that the heavy-duty focuser on the Evostar 150DX APO brings to astrophotography is its potential for using the optional f/6.2 focal reducer. While that setup is a notch below the capability of Sky-Watcher's 150-mm Esprit astrograph, it's more than enough for a lot of serious deep-sky photography. Needless to say, I'm impressed with the 150-mm Evostar refractor.

■ DENNIS DI CICCIO spends a lot of clear nights testing equipment from his backyard observatory in Boston's western suburbs.