

Testing Two Askar Astrographs

We examine two of the latest offerings from a brand specializing in optics for astrophotographers.

Askar FMA230

U.S. Price: \$629

Askar FRA500/5.6 APO

U.S. Price: \$1,999

askarlens.com

What We Like

Sharp optics

Excellent fittings

Compact, modular design in the FMA230

What We Don't Like

Some off-axis aberrations in the FMA230

Slight chromatic aberration in the FRA500

Adding filters can be difficult

THESE DAYS, we're blessed with an abundance of quality telescopes for astrophotography, with new brands such as Askar continually offering tempting choices. I tested two of Askar's latest instruments, one from each of their two main series. The compact FMA230 resembles a short telephoto lens, while the larger FRA500/5.6 is more like a conventional telescope in both size and style.

Both units are intended primarily for imaging, thus their designation as *astrographs*. However, they can also be used for observing when fitted with the included visual backs, which accept 2-inch accessories. Using samples sent on loan from Askar in China, I tested each model both by eye and by camera.

The Astrophotographic Pair

Both astrographs feature three-element objective lenses that include two low-dispersion ED glass elements intended to reduce chromatic aberrations. The scopes differ in their rear flattener lenses.

Unlike most telescopes, these astrographs follow the photographic naming convention, in which camera lenses are referred to by their focal length rather than aperture — the FMA230's name comes from its 230-mm effective focal length. However, its 50-mm-diameter objective lens actually has a focal length of 275 mm, making it an f/5.5 instrument, as per the label on the tube. The included four-element 0.84× reducer/flattener lens, required for photography, takes the instrument down to its eponymous focal length of 230 mm at f/4.6 — relatively fast for an astrograph, though a bit slow for a 200-mm-class telephoto lens.

The 230-mm model I tested is the newest in the FMA series (as of early 2022), which includes the even smaller FMA135 and FMA180. The trio of FMAs come with brackets cut with the Arca-Swiss standard used with many tripod heads. As such, all of the FMA series are advertised as being usable for daytime subjects. But the lack of a diaphragm



▲ The FMA230 is 25 cm (10 inches) long when fully assembled for imaging and weighs just 1.6 kg (3.5 lbs).

► The FMA230 provides a field 8.8° by 5.9° wide on a full-frame sensor. This portrait of central Auriga is a stack of seven 4-minute exposures with a filter-modified Canon Ra camera at ISO 800, at the small astrograph's f/4.6 focal ratio.



and their fine helical focusing, while superb for astrophotography, make them less than ideal for most terrestrial targets, except perhaps for those at a fixed distance like a bird feeder or nest. I found the closest focus point for the FMA230 to be 15 meters (50 feet).

The larger FRA500's name refers to the 500-mm focal length of its main lens, though astronomers are more likely to think of it as the 90-mm aperture telescope it really is. The instrument is a Petzval design that includes a pair of lenses (a front three-element and a rear doublet) to achieve the stated $f/5.6$ focal ratio.

An optional 0.7 $\times$ reducer lens takes the FRA500 to $f/3.9$ and 350-mm focal length. However, at the time of my testing in early 2022, this accessory reducer was undergoing design changes, and a sample unit was not available to us.

At the time of testing, the FRA500 was the newest in a family of FRA astrographs. The FRA400 has a 72-mm lens, while the FRA600 has a 108-mm lens, both at $f/5.6$ with a quintuplet design like the mid-sized FRA500. An even newer 60-mm $f/5$ FRA300 has since been announced.

The FMA230 Mechanics

The little FMA230 has a solidly built, black-metal tube that can be separated into several components for air travel



▲ All the FMA230's parts can unscrew from each other. The metal dew cap extends 50 mm (2 inches) and is threaded to accept 58-mm photographic filters.

or inspection at airport security. The modular design reminds me of the Japanese Borg brand of astrographs.

The scope includes red anodized tube rings and mounting plates. While fashionable and attractive, I find such finishes are easily scratched. In particular, the dovetail plates soon become marked by the clamps and set screws of some mounts. The FMA230 includes an 18-cm-long (7-inch), Vixen-style standard dovetail for attaching it to a mount or star tracker.

The aforementioned helical focuser's motion proved smooth and precise, though in the sub-freezing temperatures of a Canadian winter night, the lubrication stiffens, making the focuser control difficult to turn. I also found that the focuser's tiny lock screw is impossible to adjust with gloves on.

The tube components are well black-

ened inside, though in some test images I did notice an odd flare, likely produced by a bright star just outside of the camera frame.

The rear adapter ring on the reducer has 48-mm threads on the camera side to accept large-aperture T-rings for DSLR and mirrorless cameras, or the nosepiece tubes of cooled CMOS cameras. The adapter ring separates from the reducer to reveal a recessed, threaded well on the telescope side that accepts standard 48-mm filters. However, as with any such recessed filter wells, screwing filters in and out is fiddly, with fingers inevitably touching the filter. Changing filters also requires removing the camera.

There is no rear camera-angle adjuster as such. Rotating the camera is a matter of loosening the four bolts on the felt-lined tube rings and rotating



▲ Without camera adapters, the FRA500 is 38 cm (15 inches) long with its dew shield retracted and weighs 5.4 kg (11.9 lb).

► The larger FRA500 astrograph presents a 4° by 2.7° field with full-frame sensors, perfect for many targets along the Milky Way such as these nebulae in Auriga. This is a stack of ten 6-minute exposures at $f/5.6$, with a stock Canon R6 camera at ISO 800.



the entire tube, camera and all. With such a small tube, that works just fine.

Optical Performance

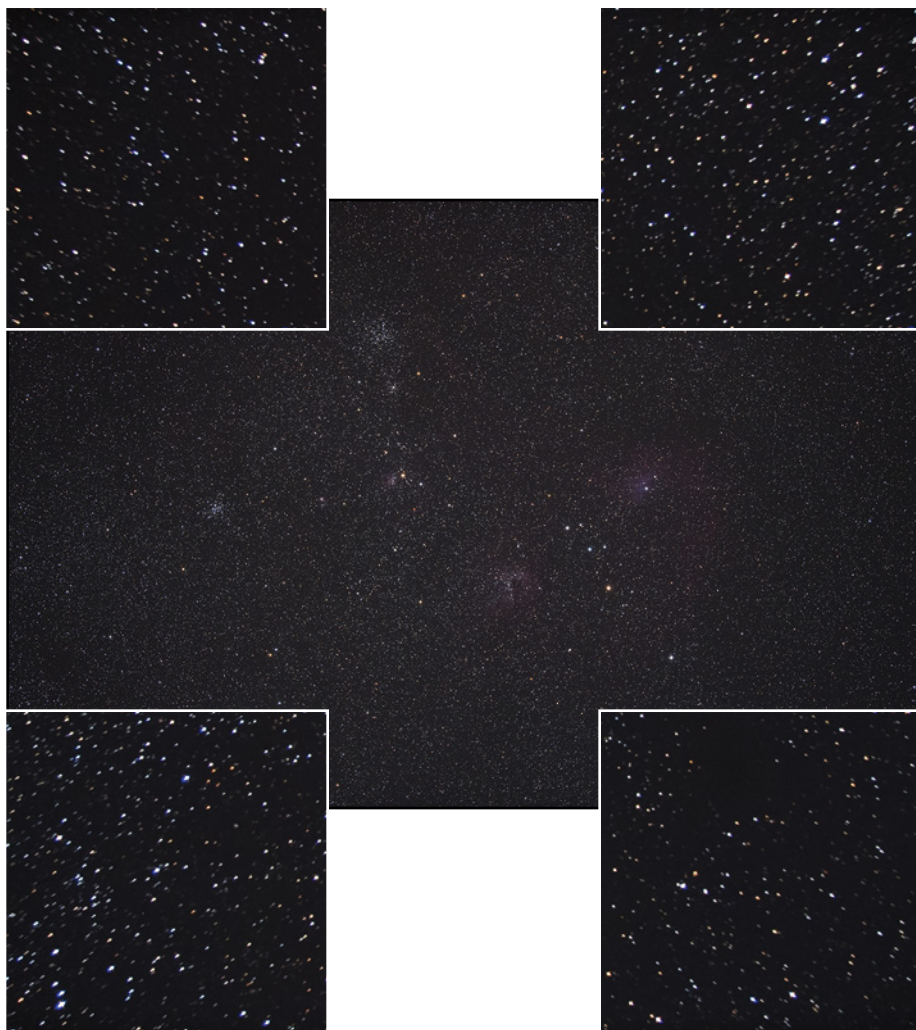
Unlike some astrographs that require special star diagonals or that can't accept an eyepiece at all, both instruments can be converted to visual use quite easily with the supplied visual backs. I performed a high-power star test on each instrument, which can reveal aberrations that might go unnoticed in undersampled images.

When used visually, eyepieces reached focus on the FMA230 using a standard 1¼-inch prism star diagonal. Achieving focus with premium 1¼-inch mirror diagonals (which often

have longer bodies), or with any 2-inch diagonal, requires removing the small extension tube that goes between the focuser and main tube, as the instructions advise. This worked well, and the little scope filled the field of even a massive Tele Vue 41-mm Panoptic eyepiece — an incongruous combination, but one that worked, yielding a whopping 10° field of view!

The more typical combination of a 1¼-inch-barrel 24-mm eyepiece (with a 68° apparent field) yields 11× and a 6° true field, similar to 10×50 binoculars. Testing the optics at 80× with a 3.5-mm eyepiece, bright stars showed textbook perfect Airy disks with no astigmatism, and just a tiny trace of spherical and

▼ In the FMA230 paired with a full-frame (36 × 24-mm) sensor, star images begin to elongate with astigmatism and lateral chromatic aberration beyond about a 32-mm imaging circle and are noticeably elongated at the extreme corners.



FMA230



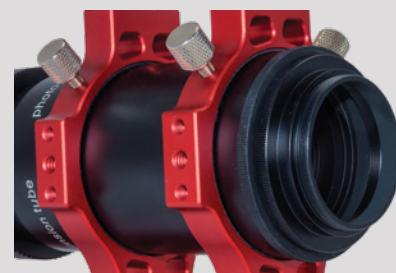
▲ The front triplet lens is fully multi-coated. While the tube interior is ribbed, it has minimum baffling, as the rear aperture is almost the same size as the front.



▲ The focuser shifts the objective over a range of 19 mm. A scale marked in roughly 1/10 mm increments aids in resetting to a previous focus point.



▲ The removable top bracket serves as a handle and is machined with a 12-cm (4.7-inch) long Synta standard channel for finderscopes and guidescopes.



▲ The two rings have 1/4-20 sockets on either side, as well as two M5 metric threaded holes, for bolting on other accessories. The rear cell has an M48 male thread.

chromatic aberrations in the extra-focal diffraction patterns. This is a sharp little telescope.

As expected based on the visual evaluation, photographically the FMA230 proved tack-sharp on axis. While the FMA230 fills a full-frame camera sensor, the stars at the corners of the field turn into tiny colored streaks at the pixel-peeping level. As with other lenses, colored halos from the lateral chromatic aberration evident at the corners can be corrected in processing by “defringing” using software filters such as those found in *Adobe Photoshop’s Camera Raw* or techniques to do the same in *PixInsight*. I saw no sign of tilted optics or skewed mechanical con-

nections in either astrograph — stars looked the same at each edge and in every corner.

The 92-mm FRA500

Turning my attention to the FRA500, the conical camera adapter rings included with the bigger astrograph are Askar’s unique solution to offering several thread sizes and spacings. Together, they provide the optimum 55-mm back focus required for a DSLR camera.

However, in a previous experience with this set of rings I found they could bind and seize onto the focuser. When that occurred, their conical shape made them extremely difficult to grip in order to remove them. As a pre-emptive

▼ The integrated field flattener in the FRA500 did its job very well. Stars are sharp to the corners, with the only niggling flaw being the slight blue halos that were most obvious toward the corners. This minor flaw is easily correctable in post processing.



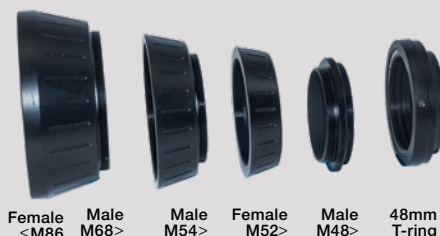
FRA500



▲ The front triplet lens is fully multi-coated. The tube interior is well blackened and ribbed, with a single baffle at the sub-diameter flattener lens halfway down the tube.



▲ The focuser’s motion is smooth and has a 10:1 fine-focus knob. The focuser is lockable, while the bottom includes bolt holes to accept a motor drive.



▲ The adapters offer M68, M54, and M52 threads, while the final ring has an M48 thread for attaching a camera or T-ring adapter. The final ring also accepts 2-inch (48-mm) filters in its filter well.



▲ The focuser has a standard shoe that accepts quick-release finderscopes. The tube rings each have five M6-thread sockets on either side. This photo shows the 2-inch visual back in place.

measure, I applied a film of light grease to the threads of the FRA500's set, avoiding any issues with binding during my testing.

Like the FMA230, the FRA500 includes tube rings and a dovetail mounting plate. The top handle on the rings is slotted to accommodate other accessories, such as a small guide-scope. The bottom plate is a 4-inch-wide Losmandy-style plate. Those wanting to pair this scope on a mount that accepts only the narrower Vixen-style dovetail bars will need to replace this piece.

Orienting your camera with this instrument is a bit different than the FMA230 since the focuser itself doesn't rotate, and turning the entire tube to reorient the focuser requires an Allen key to loosen the tube rings, which is an inconvenience. Instead, the focuser has a locking camera-angle adjuster that turned smoothly and did not shift focus when rotated. So, framing a camera was easy, though there are no angle markings on the rotator for making precise turns, which would be helpful when shooting mosaics.

Although each Askar instrument came with a signed inspection certificate, my FRA500 arrived with some minor cosmetic blemishes. But, overall, the unit is well-made.

FRA500 Optics

The focuser of the bigger FRA500 offers an M86 male thread, which accommodates either the conical camera adapter set or the included 2-inch visual back. All the eyepieces I tested reached focus with a 2-inch star diagonal. Under high-magnification testing, stars in focus showed a nearly perfect Airy disk and clean first diffraction ring, with no astigmatism, even on cold winter nights when optics can be pinched by contracting lens cells.

In focus, bright stars were colorless, with no blue or magenta halos of chromatic aberration. Extra-focal diffraction patterns showed a touch of asymmetry either side of focus, indicating slight spherical aberration. The diffraction pattern had a mild magenta rim inside focus and a cyan rim outside



▲ The FMA230 (left) comes in a gift box but does not include a carrying case, though it is small enough to slip into a typical camera bag. The FRA500 (right) comes with a foam-fitted aluminum case that holds the scope (with rings attached) and space for the camera adapters.

of focus from residual longitudinal chromatic aberration. Ditto on crater rims and the limb of the Moon — they were colorless in focus but showed the same slight tints when just out of focus.

I compared the FRA500 to a Sharpstar 94EDPH, a similar-sized telescope from Askar's companion brand. In star tests, images in the two telescopes looked identical, and both scopes cleanly resolved close double stars such as Castor, with generous dark sky between the component suns.

Photographically, star images in the Askar 500 appeared sharp right across images produced by a full-frame sensor, though stars at the extreme corners were elongated ever so slightly. This is field-flatness performance as good as I've seen in the many apo/flattener combinations I've tested over the years.

Recommendations

The little FMA230 is suitable for framing wide Milky Way star fields and dark dust lanes, and even small constellations. While a 200-mm telephoto camera lens can provide a similar field of view, most will need to be stopped down to f/4 or f/5.6 to approach the image quality of the FMA230. And a camera lens won't have the ease of image rotation and mounting features offered by astrographs like these Askar models. At about \$630 from U.S. suppliers, the FMA230 is also less expensive than most 200-mm telephoto lenses, though of course the FMA lacks features such as auto-focus and aperture diaphragms.

The small astrograph's size and light weight make it ideal for overseas trips to exotic locations, while its short focal length is a good match for a star tracker mount — a compact and portable combination.

Out of the box, the bigger FRA500 is a superb visual and photographic instrument. The optional f/3.9 reducer should provide the attractive choice of an even wider field and faster speed when needed, but not having a sample of the reducer for testing, I can't say how well that combination works. However, the FRA500's native f/5.6 speed is fast enough for most imaging purposes with the aid of a guidescope and autoguider, and it will work well mated to a small equatorial mount for a lightweight observing rig to take to dark skies.

The similar telescope in the Sharpstar line, the 94EDPH, also works very well (I know, I own one!), and it costs about \$200 less than the \$2,000 for the FRA500, once you factor in the \$300 for the required EDPH reducer. But the FRA500 offers the flexibility of being able to work photographically at two focal lengths and fields of views, though by adding its extra cost f/3.9 reducer.

We are certainly spoiled for choice these days, and this pair of Askars are fine options for anyone looking for a wide-field astrograph. Or two!

■ **ALAN DYER** is coauthor with Terence Dickinson of the new fourth edition of *The Backyard Astronomer's Guide*, described at BackyardAstronomy.com.