

REVIEWED

ASKAR FMA180

The four-in-one telescope

At a glance: Askar FMA180

Aperture: 40mm
Focal length: 220mm (objective); 179mm (with reducer, measured)
Focal ratio: f/5.5 (objective); f/4.5 (with reducer)
Objective type: triplet dual-ED air-spaced apochromat
Reducer type: triplet, air-spaced
Image circle (with reducer): 38mm diameter (12.1-degree field, photographic mode)
Overall length: 145mm (photographic mode, with reducer); 160mm (observation mode, no diagonal)
Weight: 395 grams
Back-end adaptor: M42 x 0.75 (photographic mode); 1.25-inch adaptor (observation mode)
In the box: 40mm f/5.5 FMA180 optical tube, helical focuser, f/4.5 reducer, a pair of tube rings, a finderscope bracket, a Swiss-Arca mounting plate, a 1.25-inch adaptor, Extension Tubes 1 and 2, and an Allen key.

Price:

£351

Supplier:

365astronomy.com



■ The FMA180, shown here with the supplied f/4.5 focal reducer and corrector equipped for DSLR imaging on a full-frame Canon 5D, is ideally suited to small camera tracking mounts such as the Sky-Watcher Star Adventurer. All images: Ade Ashford.

Is it a travel-scope, a finder, a guider, an astrograph – or all four? Ade Ashford investigates the diminutive yet extremely versatile Askar FMA180.

Any keen deep-sky astrophotographer who uses a refractor in conjunction with a full-frame camera (DSLR or CMOS) usually employs a focal reducer–corrector to widen and flatten the field of view and reduce exposure times. However, it's difficult to achieve focal lengths shorter than about 250mm with conventional instruments and speeds faster than about f/4.5 without introducing unwanted aberrations. For

focal lengths less than about 200mm, the traditional choice is a prime camera lens – usually at an exorbitant price. Even then, prime camera lenses are only optimised for astrophotography and, with few exceptions, you can't use them with an eyepiece without resorting to bespoke adaptors. Now all that is about to change: let me introduce the Askar FMA180.

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Founded in October 2019, Askar is a new player in the quality optics market, but it has something of a pedigree. A subsidiary of Jiaxing Ruixing Optical Instrument Co., Ltd. in Zhejiang Province, China, that has been trading for 20 years, Askar comes from the same stable as SharpStar Optics, two of whose products we reviewed in the December 2019 and May 2020 issues of *Astronomy Now*.

First impressions

The FMA180's build feels robust yet finely engineered, possessing a reassuring heft in the hand, yet at 400 grams it doesn't feel unduly massive for a modest camera tracking mount. The black anodised components with red accents have a finely textured satin finish and the white lettering on the objective lens cell and reducer is not merely printed on, but engraved onto their barrels. Attention to small details lends the FMA180 an air of quality that bears up under closer inspection. For instance, the screw-on objective lens and end caps are not made of plastic but machined from anodised metal with finely milled edges that can be gripped even with gloves on.

The optical tube is pre-configured for imaging at f/4.5 straight out of the box, and consists of the following four units threaded together: the 40mm, f/5.5 FMA180 objective lens cell; a focuser; an f/4.5 reducer; and a Reducer Connection Adaptor (RCA) terminating in a male T-thread (M42 x 0.75). More on these individual components later, so pay attention to the acronyms!

Also in the box are two T-threaded Extension Tubes (ET1 is 54.5mm long and ET2 is 74.5mm in length), a 1.25-inch adaptor for user-supplied eyepieces and visual accessories, a Multifunction Finderscope Bracket, and an Allen key.

Optical design

The 40mm aperture, f/5.5 (natively 220mm focal length) objective is a fully multicoated air-spaced triplet with a rather novel design, inasmuch as the outer and inner elements are both made of extra-low-dispersion 'ED' glass. Parent company Jiaxing Ruixing Optical Instrument Co., Ltd. prefers not to enter into discussions about the ED glass(es) that they use, but one or both could be Chinese-made H-FK95N with similar optical properties to the very desirable FPL-53 manufactured by Ohara in Japan. However, any triplet objective made with two low-dispersion glass elements is likely to have superior colour correction.

As is typical of all short-focal-ratio objective lenses – triplet or otherwise – there is inevitable some field curvature at the focal plane, which



▲ The FMA180 comes with two T-mount extension tubes, named ET1 (middle, 54.5mm long) and ET2 (right, 74.5mm), plus a 1.25-inch adaptor (left).

▼ The 40mm aperture, f/5.5 objective is a fully multicoated, air-spaced triplet possessing two extra-low-dispersion 'ED' glass elements for exquisite colour correction. The objective's screw-on metal dust cap has a M48 x 0.75 thread, so two-inch filters screw directly into the front of the lens.

is especially frustrating to imagers using large format CCD/CMOS cameras or full-frame DSLRs, since the focus varies over the sensor. To cure the field curvature, the supplied 0.81x Reducer (f/5.5 to f/4.5) also doubles as a field flattener across an unobstructed field limited only by the internal diameter of the male T-thread on the end of the RCA, which is 38mm.

An image circle of 38mm at the f/4.5 focal length of 180mm equates to a fully illuminated field of 12.1 degrees. Note, therefore, that the FMA180 very slightly vignettes full-frame DSLRs that require a 43mm imaging circle. To maintain the colour correction of the triplet objective, the reducer is also a multicoated air-spaced triplet. Hence, we can rightly call the FMA180 a sextuplet system which, on paper at least if the computer ray-traced spot diagrams are anything to go by, delivers an impressive on- and off-axis performance right across the imaging circle.

As stated above, the FMA180 is delivered pre-configured for f/4.5 imaging. The back focus from the start of the male M42 x 0.75 thread on the rear

of the RCA to the focal plane is 55mm, so all that DSLR users need to buy is an



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Askar have given a lot of thought to how best the FMA180's travelscope, finder, guider and astrograph capabilities are implemented

▲ The Multifunction Finderscope Bracket (MFB) has two felt-lined and red anodised tube rings secured by brass thumbscrews, a removable 70mm-long Swiss-Arca mounting plate on a stem that terminates with a standard dovetail, and a 1/4-20 thread ensuring that the FMA180 is easily mounted on photo tripod and ball-head mounts.

flexibility is also down to the Multifunction Finderscope Bracket (MFB). The rear sections of the FMA180 are all 45mm in diameter and designed to be a sliding fit within the MFB's two felt-lined and red anodised tube rings, secured by two pairs of brass thumbscrews that engage non-marring compression rings. Thus the FMA180 is easily rotated within the tube rings to compose an image or select a better viewing position when used visually as a finderscope or spotting-scope.

The tube rings attach to a 70mm-long Swiss-Arca mounting plate via four Allen bolts on a stem that terminates with a standard dovetail designed to fit most finder shoes found on telescope tubes. From the base of the finder dovetail to the top of the Swiss-Arca mounting plate is 60mm. The base of the finder dovetail is equipped with a standard 1/4-20 photo tripod thread, as is the centre of the Swiss-Arca plate once the stem is removed, so the FMA180 is easily mounted on telescope tubes or to most photo tripod and ball-head mounts. The centre thread of the Swiss-Arca plate makes it easy to attach the FMA180 to a tripod ball-head, or the dovetail L-bracket of a Sky-Watcher Star Adventurer or a similar camera-tracking mount.

Focuser

For compactness, the FMA180 employs a helical focusing mechanism that is just 25mm long when retracted. This is smoothly actuated by a 62mm-diameter knurled collar over a focusing range of 15.5mm, without any backlash or slop. The barrel of the focuser has 17 labelled divisions, each clearly subdivided a further ten times. Since it is easy to set the focuser against an engraved marker to a precision of half a subdivision, it's possible to routinely and repeatedly set the focus to an accuracy of one-twentieth of a millimetre – that's quite impressive!

FMA180 and filters

We have already seen that the FMA180 has adequate back focus to accommodate a filter-wheel behind the reducer for CCD/CMOS users, but what about those with a DSLR? If you have an APS-C or full-frame camera, then you may already have clip filters for the camera body, but there is an option for using standard filters. Fortunately, the 40mm objective's screw-on metal dust cap has a M48 x 0.75 thread, so two-inch light

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pollution, broadband or narrowband filters screw straight into the front of the lens. This does mean that the filter is exposed to dew, so a dew heater is called for. However, note that M48 extension tubes also screw into the front of the FMA180's lens cell, so if you have a stackable two-inch filter with a female M48 thread in the front, then you can use an M48 extension tube as a makeshift dew shield.

Optical tests: photographic

It's somewhat unfortunate that this FMA180 review coincided with the height of summer and twilight all night at my latitude. However, I was still able to obtain some meaningful data in deep nautical twilight. I used the FMA180 as configured out of the box at f/4.5 with a T-ring appropriate for my full-frame Canon 5D. I removed the finder stem from the MFB and attached the Swiss-Arca mounting plate directly to a ball-head mount connected to a Star Adventurer Mini on a photo tripod.

Forty-five-second exposures at ISO 800 of the constellation Lyra immediately revealed an impressive level of colour correction across the entire field, with the merest suspicion of vignetting and star elongation in the extreme upper left and right corners. Vega, also near the upper right of the frame, showed no trace of flare, halo or false colours – it was pure white, just as it should be. Plate solving the image revealed a true field of 11.43 x 7.63 degrees, hence the measured focal length was 179mm, just a millimetre shorter than the specification.

Optical tests: visual

When using the FMA180 in what Askar like to call its 'observation mode', the reducer is unscrewed and the 40mm triplet objective is used at its native f/5.5 focal ratio, hence a focal length of 220mm. There are two ways to use the instrument visually. If you wish to use the FMA180 with a 1.25-inch star diagonal and eyepiece, then you must first screw ET1 into the back of the helical focuser, followed by the 1.25-inch eyepiece adaptor.

Alternatively, if you prefer straight-through viewing, then both ET1 and ET2 need threading into the back of the focuser, followed by the 1.25-inch eyepiece adaptor.

Mediocre nocturnal seeing conditions prevented me from performing a critical evaluation of the FMA180 on real stars during the period that I had the instrument to review, so I used the next best thing: the specular reflection from a ball bearing in sunlight viewed from a distance of around 100 metres. A TMB 3.2mm Planetary II eyepiece used in a straight-through configuration delivered a magnification of 69x, with a true field of 50 arcminutes and an exit pupil of almost 0.6mm. The focusing range was about five metres to infinity, lending the FMA180 to terrestrial applications in addition to astronomy.

With a quality zoom eyepiece, it makes for a fabulous nature spotter.

Vega's impressive colour correction and lack of spurious rays or flares when captured photographically via the FMA180's six glass elements prepared me for a better than average visual performance for the 40mm f/5.5 triplet

▲ This image of Messier 13 is a live stack of 47 five-second images (235 seconds cumulative exposure) captured with a ZWO ASI385MC CMOS camera and AS180 Pro at the f/4.5 (179mm focal length, measured) focus of the FMA180. Even a small 7.3mm x 4.1mm sensor like this yields a field of 2.3 x 1.3 degrees.

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objective, especially given its two extra-low-dispersion 'ED' glass elements, but I was still pleasantly surprised. The colour correction is extraordinarily good. So much so that one has to look hard for any false colour unless the subject is very bright indeed. The centre of the diffraction pattern had the palest orange hue when defocused about five waves extra-focally, which transferred to the outermost diffraction ring when viewing the same distance intra-focally.

Final thoughts

My impressions of the FMA180 were overwhelmingly positive, so any niggles are thankfully minor. The MFB and Swiss-Arca mounting plate ensures compatibility with a wide range of photo tripod ball heads and telescope finder brackets, but I would like to have seen a short Vixen-style dovetail for use with small equatorial mounts; an inexpensive

TS Optics 120mm-long Vixen dovetail with a slotted hole and 1/4-20 screw (PSFotoDel) rectifies that deficiency. The 1.25-inch eyepiece adaptor uses three small thumbscrews for securing visual accessories, but these thumbscrews could potentially mar eyepiece barrels – a compression ring adaptor would be far better.

Askar have succeeded admirably in their design brief, creating a highly configurable, very versatile and compact imaging/visual instrument in the form of the FMA180. It's lightweight and relatively inexpensive, which means it's stiff competition for the likes of William Optics' RedCat 51. The optical performance for its price is outstanding too.

Ade Ashford has travelled the globe writing about astronomy and telescopes, serving on the staff of astronomy magazines on both sides of the Atlantic. His first *Astronomy Now* review appeared a quarter of a century ago.

▼ The FMA180, seen equipped for visual use in a straight-through configuration at f/5.5. Note that the 1.25-inch eyepiece is not included, and has to be supplied by the user.



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