

Baader Clicklock™ 2" Dielectric Mirror Diagonal

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Second only to eyepieces, a new diagonal tends to be high on a new scope owners list of "must haves". Most new telescopes ship with a sub-par diagonal, both optically and mechanically. Plastic housings, low-quality mirrors, a single set screw with no protection from marring the shiny barrels of your new eyepieces - it is soon obvious that a replacement is in order.

Baader Clicklock Diagonal at a Glance

Format: 2" diagonal

Mirror Type: 1/10 wave dielectric

Approximate Street Price: \$259

Weight: 17.5 ounce (495g)

Manufactured by: Baader Planetarium

www.baader-planetarium.de

Distributed in USA by: Alpine Astro

www.alpineastro.com

Many popular eyepieces today sport a 2" barrel, so sales of 2" diagonals outnumber 1.25" diagonals by far. Of course, most 2" eyepieces are fairly heavy and many are quite expensive so you'll want that new diagonal to hold your prize oculars firmly without leaving so much as a scratch on the barrel. The Baader Clicklock diagonal employs a unique twist-lock eyepiece holder that grasps an eyepiece so firmly you could actually carry most telescopes by the eyepiece (not that I would recommend it!). A simple twist and the eyepiece is firmly locked or quickly released. No more fumbling with thumbscrews.

Baader Planetarium has a long history of designing and manufacturing dielectric mirror diagonals. They were the first to bring a dielectric diagonal to market. The Maxbright was introduced to North America when Baader licensed the name to Astro-Physics and starting providing the mirrors for AP's diagonals. Some years later, AP switched manufacturers for their dielectric diagonals; Baader in the meantime developed new coating processes to address a dielectric mirror's primary weakness - the dielectric coating process stresses the mirror substrate leading to optical deformity. The 1/10 wavefront error specification stated in other manufacturer's marketing material is *before coating*, even for those premium quartz mirrors. After the reflective dielectric coatings are added, only the center of the mirror remains flat - the closer you get to the edge, the worse the optical performance. In fact, one prominent equipment manufacturer recommends you only purchase 2"

dielectric diagonals so that the sweet spot covers wider fields of view. For most eyepieces you will

Pluses

- Excellent optical performance
- Clicklock™ eyepiece clamp is quick, simple to use and holds your eyepieces like a (gentle) vise
- Fully-machined premium housing

Minuses

- A bit too heavy for some lightweight scopes/mounts, but then this quality of diagonal would be overkill on such equipment

never see the difference, but for high quality wide field eyepieces in a short to medium focal length telescope, the distortion is noticeable.

Enter Baader's dielectric diagonals. The Baader Maxbright diagonal utilizes a dielectric coating process with an equal number of layers on *both* sides of the mirror substrate. This results in 1/10 wavelength performance after coating. The Clicklock diagonal reviewed in this article uses a new proprietary coating process which Baader is currently keeping secret. The result is on par with the premium Maxbright process, but at a much lower cost.

Out of the Box

The Clicklock diagonal is a solid piece of gear weighing in at just over 1 pound. The distinctive machined aluminum body features a two layer airbrush paint in an off-white color and accented with a red stripe and the Baader Planetarium logo on both sides. The barrel and eyepiece clamp are both a semi-gloss black. The barrel is threaded for 2" filters and includes baffling grooves and evenly applied flat black paint to reduce internal reflections. The entire assembly is a fine piece of equipment.

The dielectric mirror is scratchproof and should last a lifetime of cleaning with reasonable care. The mirror is oversized to ensure full illumination of the widest field 2" eyepieces. Further along those lines, the barrel and eyepiece clamp have no restrictions impeding the light path.

The Clicklock diagonal gets its name from the unique eyepiece holder shown in Figure 1. The brass compression ring (no marks on your eyepiece barrels) hides a unique locking system which securely holds any 2" eyepiece with just a simple twist of the barrel with the knurled rubber ring. The finger lever (that is not a thumbscrew) makes this motion yet easier, even with gloved hands. Additionally, you can feel several click stops which get closer together as you turn the clamp into the locked position. This works nicely in the dark providing positive feedback to identify the clamp is fully engaged.



Figure 1

In discussing the clamp with Baader, they stressed the fact that disassembly of the clamp or removal of the brass compression ring will void the warranty. In fact, it was emphasized that if you remove the brass compression ring, you will not be able to return the clamp to useable service. This should not be an issue (except for the incessantly curious among us) as the clamp requires no lubrication or maintenance.

It always surprises me just how much thought goes into even the most subtle detail when Baader designs a product. Considering that individuals might prefer the finger lever to be at a different orientation, Baader made it possible to rotate to clamp by loosening six recessed set screws, turning the clamp and retightening the set screws. For example, those who are left-handed may prefer to orient the lever to the left.

A cosmetic point should be made here. An excess of thread lock compound was used on a set screw located on back side of the rotating ring. An attempt was made to wipe it off but there was still a lot left. This did not affect performance in any way and could be remedied by the owner.

Mounting

Attaching a refractor-style diagonal to the rear of an SCT scope is usually accomplished with a 2" visual back or adapter. Figure 2 shows the Clicklock diagonal mounted on the NexStar 11 GPS using Baader's new 2" Clicklock adapter (part number 2956233). You might notice that this looks a lot like the eyepiece holder sticking up from the top of the diagonal. In fact they are the same part though this adapter is connected to a 3.25" threaded ring designed for 11" and larger SCT scopes. This adapter provides a true 2" aperture. You must first remove the stock reducer ring and then screw the adapter ring directly onto the rear cell. A similar Clicklock



Figure 2



Figure 3

adapter is available for 8" and 9.25" SCTs - Baader part number 2956220. Baader makes additional 2" Clicklock adapters for the visual back of Zeiss, Astro-Physics, TEC, Takahashi and Pentax scopes. Contact Baader or Alpine Astro for more details.

An added advantage of the Baader Clicklock diagonal is that it can be mounted directly to the rear cell of an SCT as shown in Figure 3. With the NexStar 5/8/5i/8i this is a must as these models do not include a sliding dovetail mount and thus most 2" diagonals will not clear the base. Even the new NexStar SE benefits from the added clearance as it is not necessary to push the optical tube so far forward which will result in a heavily misbalanced scope when a dew shield is in use.

Any 8" or smaller SCT will actually benefit from this direct mount method. A 2" diagonal always increases the total focal length necessary to reach the focal plane of the eyepiece. Depending on the design of the diagonal this could result in a focal ratio of $f/10.5$ or even higher. The optics were designed to function at $f/10$ - any deviation from this introduces subtle optical aberration. Mounting the diagonal directly on the back of the rear cell keeps the focal ratio as close as possible to $f/10$. However, I wouldn't recommend this on 10" and larger SCTs as it requires the use of the manufacturer's reducer ring on the rear cell, restricting the rear aperture to about 1.5" - in this case use a full 2" aperture adapter like part number 2956233 discussed above.

The direct mounting method requires that you remove the front barrel as shown in Figure 4. A large locking ring (Figure 5 - also available from Baader) is used to orient the diagonal and prevent it from rotating upside down, potentially dropping an eyepiece in the process.



Figure 4

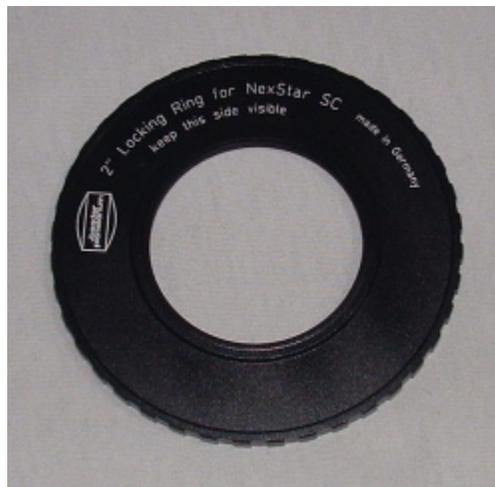


Figure 5

Optical Performance

Optically, this diagonal is as perfect as my eyes can perceive. Collimation was spot-on, as one should expect from a precision machined diagonal such as this. When comparing a variety of eyepieces placed both in the diagonal and directly in the scope (no diagonal), there was no perceptible difference in either my 11" SCT or my 4" refractor. Stars were sharp to the edge in both cases and there was no difference in light levels. There is not much more you can say about a diagonal - it should be optically invisible and this one is.

A Unique 1.25" Adapter

And what about the use of 1.25" eyepieces or web cams? Figure 6 shows one of Baader's 2" to 1.25" adapters - the *Pushfix 2" to 1.25" Reducer*. Though not included with the Clicklock diagonal, I thought I would mention it here.

There are three methods for using this adapter. First is a traditional thumbscrew (protruding to the left) which presses against a bronze compression ring. With most diagonals, including the Clicklock, this is not the best method. In order to reduce the height of the adapter to a mere 1mm (useful in some refractors



Figure 6

with minimal in-focus travel), Baader located this thumbscrew down on the barrel area. This arrangement was designed to work with other Baader 2" eyepiece holders with a special slot for the thumbscrew.

The two other methods call for removing the thumbscrew entirely. The first of these methods is intended to convert a 1.25" eyepiece to 2" barrel size semi-permanently. In Figure 6, you will see two holes in the front of the barrel. The top opening holds a set screw which tightens against the bronze lock ring using an included hex wrench. In this manner you can attach the Pushfix to a 1.25" eyepiece and use it in a 2" eyepiece holder or diagonal. To complete the eyepiece's transition to this larger format, the Pushfix is threaded for 2" filters.

A second method uses a set of three nylon setscrews which are evenly spaced around the bottom of half of the Pushfix barrel. The lower hole in the front of the barrel in Figure 6 houses one of those nylon setscrews. With a little trial and error you can adjust the three nylon screws to allow an eyepiece to be pushed into the adapter and pulled out with just enough force to keep it in place.

Conclusion

If you felt the Maxbright diagonal was too expensive but you still want a premium diagonal, the Clicklock is just what you've been waiting for. The Clicklock is a clear step above the competition in optical performance and loaded with unique and useful features, yet competitively priced.

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