



Consumer's Guide to Ocutech[®] Bioptic Telescopes

Part 1 of 3

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OCUTECH[®] *Sight Enhancement Technology*



Understanding Telescopic Low Vision Aids

Consumers often ask “Which Ocutech bioptic telescope is right for me?”

My first answer is that it’s your low vision specialist’s job to help guide you to make that decision—you can’t reliably choose it by yourself as there are too many variables that need to be considered. And you’ll need your low vision specialist to demonstrate, prescribe, and fit the bioptic, as well as support you as you learn to use it.

With that being said, it certainly makes sense for you to know what your low vision specialist is thinking about when you are evaluated, and what information they collect through your history, needs, goals, and testing that will drive their recommendation.

First of all, what are bioptic telescopes?

Bioptic telescopes are eyeglasses that have a miniature telescope attached that magnify the image seen by the user. The telescopes are usually (though not always) mounted toward the top of the eyeglass frame, which allows the user to look

through their regular eyeglass prescription (the carrier lenses) and then be able to dip their head down slightly to look into the telescope eyepiece to see the magnified image. In much the same way that Ben Franklin invented bifocal eyeglasses so he wouldn’t have to constantly switch between his distance and near eyeglasses, a bioptic is more convenient than having to stop what you are doing, pick up another device, and aim and focus it. If you’re doing other things with your hands it’s even less convenient. It’s called a ‘bioptic’ because the name ‘bifocal’ was already taken!

There are two types of bioptic telescope optical designs—Galilean and Keplerian.

Galilean telescopes are smaller and lighter weight and are great at 1.7x and 2.2x powers, but their fields of view become very narrow at powers of 3x and higher. So, when prescribing powers of 3x and higher, Keplerian telescopes, which have a more complicated optical design which includes both lenses and prisms, will provide much wider fields of view that users prefer.

All bioptic telescopes can be used both for distance and near seeing distances. Galilean telescopes are available as manual focusable or fixed

focus devices that use ‘reading caps’ to be focused at near distances. Keplerian telescopes are available as both manual focus and autofocus versions.

What are we trying to accomplish when prescribing a bioptic telescope?

1. Get you the visual acuity you need to see more clearly!

Well, the obvious answer is to get you to see what you want to see. So, the first goal is to provide adequate visual acuity through the telescope. As practitioners, we know that our patients can see just about everything they need to see with visual acuity of 20/40. In fact all states will allow individuals to drive with no restrictions if their acuity is no worse than 20/40 with regular eyeglasses or contacts if needed. In the classroom, studies have shown that students can see everything they need to see with acuity of 20/40, and lastly most newspaper print is legible with 20/50 visual acuity.

So, once we know what your best-corrected visual acuity is (with eyeglasses or contacts if they are helpful), we can start to determine what power telescope is likely to provide 20/40 vision through the device.

Below is a chart that can help determine a starting point for telescope power selection.

For Best-Corrected Visual Acuity up to: (With regular glasses or contacts if helpful)			Start with telescope power
Snellen Measure	Metric Measure	Decimal Measure	
20/60	6/18	0.32	1.7x
20/80	6/24	0.25	2.2x
20/125	6/40	0.16	3.0x
20/160	6/48	0.125	4.0x
20/200	6/60	0.10	5.0x
20/240 - 20/300	6/72 - 6/90	0.08 - 0.067	5.5x or 6.0x

Usually visual acuity gain from telescope magnification is geometric—a two power telescope will give you a two-times improvement in acuity. However as visual acuity worsens, especially beyond 20/200 and more frequently with wet macular degeneration, diabetes, and glaucoma, the acuity gain may not always be geometric. You may require more magnification than expected to achieve the visual acuity you seek. And if 6x magnification doesn’t achieve your goal, it’s unlikely you’ll be successful with a bioptic telescope.

Why not prescribe for better visual acuity than 20/40?

To achieve better visual acuity through the telescope a higher magnification power must be used. The higher the power, the narrower the field of view, the greater the image motion due to head movement, and the dimmer the magnified image will be (all telescopes reduce retinal illumination and contrast- and the stronger the power, the greater this effect).

So, once adequate visual acuity is achieved when looking through the telescope, the primary goal users have is to gain the widest field of view possible, which allows you to more easily find what you are looking for and obviously to see more at one time. As a result it usually makes sense to use the lowest power telescope that will provide adequate visual acuity so as to achieve the widest field of view

possible. Low vision specialists have found that users do most well when fields of view through the telescope are at least 10 degrees in diameter.

Here's a chart that shows the fields of view of bioptic telescopes. The decision point comes at 3x—at powers lower than 3x only Galilean versions are manufactured. At 3x and higher both Galilean and Keplerian versions are available. As you can see, Keplerian telescopes have wider fields of view than Galilean designs especially as telescope powers increase. Ocutech only manufactures Keplerian telescopes at 3x and higher as they are sharper and the fields of view are much wider.

Power	Galilean (degrees)	Keplerian (degrees)
1.7x	18-22	n/a
2.2x	11-18	n/a
3.0x	8-10	12.5-15
4.0x	6	12.5
5.0x	5	10.5
6.0x	4	9.6

Fields of View of Telescopes in different powers and designs

2. Help you do the things you want to do!

We can organize our thinking about what you want to do by defining the distances at which you want to do them—distance, midrange, or near? Bioptics can support all of these distances.

- ? Do you want a bioptic solely to obtain or keep your driver's license and nothing else?
- ? Do you want to be able to watch TV without sitting right in front of it and blocking everyone else?
- ? Do you want to see friends and family in social settings and at different distances?
- ? Do you want to see the board in the classroom, see the teacher and classmates?

- ? Do you want to see the pulpit in Church, Synagogue, or Mosque?
- ? Do you want to see details in movies, maybe the pins when bowling?
- ? Do you want to shop and be able to see aisle signs, displays, and packages on store shelves?
- ? Do you want to visit museums and see the displays on the walls and in cabinets?
- ? Do you want to look at computer screens or read music on a stand at normal distances?
- ? Do you want to play cards, board games or do other tabletop activities?

You get the idea!

These are just some of the many activities you might seek to improve at different distances.

Telescopes, of course, magnify the image size making it easier to see what you're looking at. It's like moving closer without having to move closer. When looking at someone from across the room, they'll look twice as close with a 2x telescope, 3 times as close with a 3x, etc. But the benefit for seeing at distance with a telescope is that it will let you see that much further away—twice as far with a 2x, 3 times as far with a 3x, etc.!



When you need magnification to see at near, hand magnifiers or strong reading glasses require that you get very close to the material you want to see, sometimes only inches away. This can be inconvenient and certainly fatiguing and uncomfortable. Looking at computer screens, table top activities such as cards and board games and dexterity tasks, and music on music stands for instance all require that we have a further working distance than what hand magnifiers and strong reading glasses can provide. And often times we want our hands to be free (for playing music or typing on a computer keyboard for example).

Seeing at different distances

Bioptic telescopes can be focused to allow you to see a magnified image at any distance you may require. Galilean telescopes are available as either manually focusable or set for near by using 'reading caps.' All Keplerian telescopes are manually focusable and one offers autofocusing.

When looking through a telescope, you may still see clearly for some distance in front of and behind the point at which you have focused. This is called the depth of field. The stronger the telescope power and the closer you are looking the shallower the depth of field will be. This can become a challenge for extended near vision activities, as it will require that you either maintain a very fixed posture or refocus the device.

So focusing is an important feature that makes the bioptic helpful for the range of things you may be interested to do. If you expect to want to look at a lot of different distances a focusable version is obviously preferable. If you choose a fixed focus telescope you'll need to have near-focus caps for each distance you want to work. If you only need them for one specific distance that would be fine, however, it's rather inconvenient to having to change reading caps frequently for different distances, or alternatively to keep a fixed working distance and posture for all near activities.

Below is a chart that gives you the working distance ranges for different common power reading caps for non-focusable Galilean telescopes.

Reading Cap Power	Activity Working Distance	
	<i>inches</i>	<i>cm</i>
+1	40	100
+1.5	26	67
+2	20	50
+3	13	33
+4	10	25

If you need your hands free (for music or typing perhaps), or if you have to continually look at different distances, or if you don't have the dexterity to manually focus a bioptic, an autofocus bioptic is ideal. It provides the closest to natural telescopic vision because wherever you look the image will be clear virtually immediately. All you have to do is look—there will be no manipulation of the device or postural constraints required.

Alternatively, if you seek vision help solely for distance vision (20 feet or 6m) or further away, there's no need for autofocus, as bioptics generally don't need to be focused when you are looking that far away.

Stay Tuned for Part 2 as we explore Bioptics for one eye or both eyes? The 'Nuts and Bolts' of Ocutech's Galilean Bioptics

I hope this discussion has been helpful.

I invite you to visit the Ocutech website (www.ocutech.com) for more information on Ocutech products, general information and helpful videos.

And as always, we invite your questions, suggestions and feedback.

Contact Ocutech today should you have any questions regarding our low vision aids.

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