100mm Binoculars – What Can You See

by Ed Zarenski

Not all binoculars are created equal. There are wide-field binoculars and there are high power binoculars. Some have fine sharpness of image and some not so sharp. Some show slight flares in the image, some show a little astigmatism, some show a slightly bloated image in one or both sides of the binocular. Some are more difficult than others to bring to a fine pinpoint focus. Even with some of these deficiencies present in various of the binoculars used in this comparison, these results, achieved over a long period of months of use, will show some very good performance can be achieved. Some have better coatings and contrast and certainly all are not equal in mechanical functions or quality of components. But, what is most noticed is this; regardless of what slight imperfections appear in the image, there is a dramatic increase in what can be seen with larger binoculars.

There is no question a higher quality binocular will step up the ladder when compared to its closest companion sizes. But that can take you only so far. This does not mean to indicate the largest binoculars are the best binoculars. Nor is it intended to mean the best binocular in the middle sizes is the equal of the largest. In many ways, largest may not always be best, and this can sometimes be experienced when attempting wide field view observations that might require 4° to 6° just to encompass the whole view. This type of wide-field view cannot be obtained with a 2.5° Tfov 22x100mm or 25x100mm binocular.

While this report discusses some of the relevant aspects of binoculars, such as quality of coatings and size of field of view, mostly it concentrates on a comparison of the visual capabilities of the optics of several 100mm binoculars as compared to each other and as compared to several other well-known models of other sizes. Hopefully, this will provide the reader with useful information about the performance that can be expected from some of these 100mm binoculars and how that might compare to some other select binoculars.

Binoculars included in this report:
Primary comparison is the Celestron Skymaster 25x100 and Oberwerk Giant 22x100.
Also used for many comparisons are Oberwerk BT100 and Oberwerk Standard 20x80.
Among other binoculars used for performance indications are references to Fujinon FMT-SX 16x70, Oberwerk 15x70 and Nikon SE 12x50.

Clear Skies, and if not CloudyNights
Edz
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Oberwerk Giant 22x100 vs Celestron Skymaster 25x100
As far as the ability to see, 22x100s and 25x100s are a step above every 20x80 or smaller binoculars I've ever used. Literally, they see more. They see fainter objects and image scale is larger. The Pleiades fills the field of view with over 200 stars. Fainter deep sky objects are seen and closer doubles are split. Objects like the double cluster are simply stunning. But don't expect they are performing to the full potential of a 100mm binocular. They are not. I have highlighted some test data that will show quality smaller binoculars perform to a higher level relative to their size. While the Celestron cannot reach a fine pinpoint image, the Oberwerk has an optical alignment issue and both of these have some chromatic aberration, still these two 100mm binoculars see more than either my 20x80 or my 16x70 binoculars. The Celestron, a waterproof sealed binocular, seemed to always show fainter extended objects easier. The Oberwerk have a slightly wider field of view and seemed to have better sharpness across the field and better on-axis resolution. For an equal size 100mm comparison, if you were able to spend one night out doing side-by-sides with a higher quality binocular like the Oberwerk BT100 you would easily observe some of the higher performance abilities the BT provides. But then, the Oberwerk 22x100 at $395 and the Celestron 25x100 at $349 cost less than the Fujinon 16x70 and only about 25% of the BT100.

Oberwerk Standard 20x80
Compared to my previous 20x80s, the Oberwerk 20x80 Standards have a far sharper image much further out from center, have very little CA, see deeper in magnitude, have excellent coatings that show almost no reflections, and see fainter diffuse objects. The 20x80 Standards weigh less, have much better eye relief than most binocs and for me the

right diopter adjustment has plenty of room for adjustment. The 20x80s have a sharper field of view than both of these 100mm binoculars above.

The sample of 20x80 Standards that I used had a spiked flare around bright stars. This was not present in some other samples. The spikes were not seen on stars mag 5-6 or fainter. Even with the spikes present in the image on bright stars, these are the results I achieved. Other than that, these were the best 20x80s I've ever used. However, I still see significantly more with Oberwerk 22x100s and even more again with Celestron 25x100s. Coatings were very good in both 100s, but I think the 20x80s coatings were better.

Oberwerk BT100 Binocular Telescope

The BT100 is a different animal altogether than any other 5# to 12# binocular in the 80mm to 100mm range. The BT100, at 26# (12kg), is heavier than my largest telescope, a 1200mm f8 6" refractor. The BT100 cannot be picked up while mounted on its tripod. You must first set out the custom tripod then attach the BT100s. You would not move it while mounted. You must first take the binocs off the tripod. The BT100 is a straight thru viewing binocular. The standard tripod, a specially modified heavy-duty wood surveyor's tripod results in the need to sit in a chair under the binocs to view at any altitude. Actually, I’ve found for most altitudes this can be very comfortable.

Even though this BT100 shows a bit of astigmatism in one barrel, the views are simply stunning. It comes standard with two sets of WA eyepieces, a 24.5mm = 2.5° Tfov at 25x and a 10mm = 1° Tfov at 62x. My favorite eyepieces in the BT100 so far are 26mm and 20mm Televue plossls.

Mounting Considerations for 100mm Binoculars

If you've never seen or held or looked thru a pair of 100mm binoculars like the Oberwerk 22x100 or the Celestron 25x100, when you first do get the chance, you will find these are dramatically different than anything else smaller you've used. These are big, real big. And they show it. They require a substantial mount, not just any tripod but a heavy-duty tripod with a heavy-duty head. These binocs weigh about 9-10#. Most light or basic parallelogram mounts groan under the weight.

The best mount I have used for both of these binoculars is a sturdy Bogen 3246 tripod with a heavy duty Bogen 501 head. That combination setup will easily hold either of these 100mm binoculars. I use it to hold all of my center post design binocs 8# -10#. Purchased based on a CN recommendation, it’s the heaviest duty tripod I own. It has smooth fluid motion and the elevator crank is great. It’s pretty tall, not as tall as the Bogen 3211/3130 (my 3246 is an older model, the newer model is taller). With 22x100s mounted to the 3246/501 combo, elevator shaft fully extended and with binoculars pointed at an altitude of 60°, the eyepieces are 68” above the ground. I can stand comfortably behind the eyepieces to view. I'm 6'1" and maybe need to scrunch down 3 –

4 inches when looking at zenith. The 3211/3130 legs/head combination is not up to the load of these big 100mm binoculars. The 3211/3130 is about $150 value. The 3246/501 is about $350.

The mounting post on the Celestron 25x100 is a polished chrome post without base plate. I found it difficult to keep it tightened against tripod mounting plate. In addition it deforms the rubber on the tripod mount plate. If at least the bottom of this post was roughened and not polished, the contact surface would hold better.

The Oberwerk 22x100 has a black metal base plate which screws onto the bottom of the mount post. This makes a 1.5" diameter bottom contact area with the tripod mounting plate. It spreads out the area of connection to the tripod plate, eliminates the punching deformation of the rubber on the quick release shoe and it never once got loose.

You could get away with mounting the 20x80 Standards on a $150 tripod setup. The 20x80s mount with a standard binocular L bracket. The Bogen 3211/3130 combination works fine. They are easily within the limits of light or basic parallelogram mounts. I've had my 20x80s mounted on a Virgo Skymount parallelogram and a UA Unimount Light Basic. All three of these setups handled this 20x80 binocular and a Fujinon 16x70 with ease.

The BT100 mounts to a custom tripod mount. Any consideration to use a different mount for these would require expenditure in the range of $500 for a suitable mount.

Plan on a range of $300-$350 for a suitable tripod/head mount for the 22x100s or 25x100s. If you are looking for a parallelogram mount, it’s probably best to direct your search to something similar to the heavy-duty models such as the UA Unimount ($429) mounted to a heavy-duty tripod or a surveyor’s tripod (~$150).

Inter-Pupilary Distance & Eye Relief

The Celestron 25x100 has an inter-pupilary distance (IPD) range from 56.5mm to 74mm. That’s quite a wide range. Not too many binoculars get down smaller than 57mm. Eye relief is measured at 15mm, but there is a 6mm recess to the lens, so effective usable eye relief is only 9mm. That’s very short. When used with my glasses on, I have to look around a little to see the very edges of the field. This deeply recessed eye lens is very similar to that found on the Fujinon 16x70, one that also requires I look around to see the entire field of view inside. With these two binoculars, looking straight into the eyepiece while wearing glasses cuts off about 10-15% of the field of view, but tilting the head slightly allows seeing to either edge.

The Oberwerk 22x100 has an IPD that goes down to 60mm+/- to 70+. Eye relief measures 12mm and with the rubber eyecups removed 11mm is usable. These binoculars have a shaped eyecup that snaps on over the eyepieces. It cannot be used with glasses.

I’ve cut some cheap pliable rubber eye guards and put them over the eyepiece housing so I can use these with my glasses. I can see the entire field of view this way. Since the snap-on eye guards have a plug that acts as the eye lens cap, without those snap-ons in place I have no eye lens caps.

The Oberwerk 20x80 Standard has 17mm eye relief, a very comfortable binocular to use with eyecups up or down. The IPD has a range from 59mm to 72mm. The entire field is visible with or without glasses.

The BT100 eye relief is dependant on the eyepieces you select to use for your viewing. It uses any 1.25” format eyepieces. The WA eyepieces supplied have enough eye relief to use glasses but in the low powered eyepieces field cutoff is slight. The BT100 has non-rotating helical focusers that adjust the IPD from 58mm to 80mm, and can reach 58mm even with fairly wide-bodied eyepieces.

Collimation and Exit Pupils

This pair of Celestron 25x100s is out of collimation by 1 arc minute. That doesn’t seem like much but at 25x, some may find it annoying. Most of the time I don’t see it, but I had a difficult time focusing on Jupiter and I thought this might be part of the problem. There are probably prism screws under the leatherette vinyl covering, but I did not cut holes in the cover too look for the screws.

The Oberwerk 22x100 arrived slightly out of collimation. The error was only 2 arcminutes. Again, I’ll say this is a small amount, but I am highly sensitive to this. The prism adjustment screws are readily accessible on the outside of the 22x100 body. This was an easy adjustment and took only about a minute to merge the images.

The exit pupils in this Oberwerk 22x100 are not round, they are cat’s eyes. That tells me there is something askew in the optical alignment. However, I was not about to undertake any attempt to set this right. Attempting to reset exit pupils to a fully round appearance will knock the entire optical path out of conditional alignment. I know because I’ve tried this before. It then becomes an even greater task to get everything back in alignment and get the exit pupils as close to round as possible.

Considering that the exit pupils are not round, there is light loss. The percent loss is not an easy calculation as it would be necessary to take into consideration the percent illumination within the portion of the exit pupil that is not seen. Suffice it to say, since the outer edges of the exit pupil are not fully illuminated, then the percent light loss may be less than the percent of the area of the pupil lost.

The Oberwerk Standards are nearly perfectly collimated and never moved throughout use. The BT100 is slightly out of collimation, more noticeable at high magnifications but not at 25x to 36x.

Differences Noted in the Coatings.

Both the Celestron Skymaster 25x100 and the Oberwerk Giant 22x100 have objective coatings that appear purple/green with very little reflection off the objective lens. Looking at reflected light inside the Oberwerk 22x100 shows a green reflection off the prism face towards the objective. The same prism face in the Celestron 25x100 shows a light blue reflection. The coatings on the Oberwerk eyepieces appear greenish. The eye lens and prism coatings on the Celestron 25x100 appear like they might be single coated MgF.

The 20x80 Oberwerk Standard has a fine coating on the objective that produces almost no reflection with full daylight. The coatings on this 20x80 binocular seem to reflect so little light, they appear better than the Oberwerk 15x70/'03 and maybe should be considered nearer to the Fujinon 16x70. The coatings on the Oberwerk BT100, judged by the amount of reflections coming off of them and the difficulty of seeing any detail in those reflections, appear to be one of the finest coatings I have seen.

One way to tell, comparatively, how much light gets through the coatings is to look for how much light is being reflected back off the coatings. You really can't tell much by looking at just one binocular. You need to see a range of binoculars to see different amounts of reflection.

Here’s how I compare the coatings on binoculars. Standing with my face in full sunlight and looking into the binoculars objectives as a mirror, I look for my reflection and try to see how much detail I can pick out in light reflected off my face. I look for reflection of my sunlit face and the outline and color of my dark hair. I look for clear facial features, eyes, nose or ears. Then standing in the shade but still with bright outdoor light on my face, again I use the binocular objective like a mirror, and I look for all the same facial features reflected in the coatings.

Now I must tell you I hold the Fujinon FMT-SX in the highest regard. The 10x70 and the 16x70 are the same binocular with a different eyepiece. For a long time, I have felt they have the best coatings of any binocular I own. But, when I first picked up a pair of Nikon 12x50 SE I was startled when I looked at the coatings. At first glance, you can't see any light reflected off the coatings. Keep in mind the Fujinon FMT-SX and the Nikon SE are the best of all the binoculars I own. Probably right in with those is the Oberwerk BT100.

Without a doubt the Nikon 12x50SE reflects LESS light off the objective lens than the Fujinon FMT-SX. It's hard to see any reflected light coming off the Nikon 12x50 SE. It’s very difficult to see the entire outline of my head. No facial light, no features visible, just a faint dark outline of my head.

The Nikon SE, Fujinon FMT-SX, Oberwerk BT100 and Oberwerk Standard reflect less than the Celestron 25x100 and the Oberwerk 22x100. These two have objective coatings probably closer to the Oberwerk 15x70/'03. Keep in mind the Celestron appear to have single coated prisms and eye lens.

All these binoculars reflect a slightly different color back to you, varying from a purplish-blue to blue/green/purple to yellowish-green to just green and plain blue. If coatings are applied to the proper thickness, color is not an indication of the quality, only a result of the chemical composition of the coatings. However multicoatings that are applied too thick can appear green. Blue reflections probably indicate single coated MgF surfaces. White reflections indicate a lack of coating.

The more light you can see reflected in the coatings, the less light gets through the lens. What you want is coatings that reflect the least amount of light.

Field of View

In the 22x100 to 25x100 range, binocs actually measure 2.8° down to less than 2.5°. None that I know of reach 3.0°.

I have not found the need to use any sort of finder on any binocular with a filed of view down to about 2°. Viewing thru the binocs seems easier to me than viewing thru a finder.

FOV is not as much an issue for me when I jump to higher powered binocular viewing in the 20x to 25x range. Sure the fov gets smaller, but the image scale gets a lot bigger and objects are easier to see. Since I don't seem to have much problem finding things, maybe that's what makes it a non-issue for me.

The Celestron Skymaster 25x100 binocular is advertised as 3.0°. It measures 2.45°.
The Oberwerk 22x100 is advertised as 2.8°. It actually measures Tfov at 2.7°.
They are still stamped on the prism housing as 3.5°, an artifact I presume left over from the fact that these binoculars use the older 20x80 Deluxe housing. Both are still larger Tfov than the Pentax 20x60 (2.2°).

The BT100 is an f6.2 binocular. It comes standard with two sets of wide WA eyepieces, a 24.5mm = 2.5° Tfov at 25x and a 10mm = 1° Tfov at 62x. Both eyepieces have an apparent fov of 62°. I use various plossl eyepieces that give a somewhat narrower field of view. 26mm TV plossls gives 24x with a 2.2° Tfov. A recent addition of a pair of Meade 13.8mm SWAs with about 65° Afov, gives 45x with a 1.44° field of view.

The Oberwerk 20x80 Standard is advertised as 3.5°. It measures 3.2°.
The Fujinon FMT-SX 16x70 is advertised as 4.0° and measures 4.05°
The Oberwerk 15x70 is advertised as 4.3°. It measures 4.3°
Handheld, I find my favorite Tfov is about 5-6°. Mounted, my favorites for field of view

are Oberwerk 15x70s at 4.3° and Fujinon 16x70s at 4.0°.

Sharpness Across the Field of View

We know what the edge sharpness test seems to show. Not surprising, but some of the best binoculars show significantly better sharpness towards the outer edges of the field of view. The Fujinon FMT-SX 16x70, the Nikon SE 12x50, Pentax PCF WP 16x60 and the Oberwerk Standard 20x80 display excellent sharpness across the field. The Oberwerk BT100 at f6.2, with 20mm TV plossls at 31x is sharp right up to the very edges of the field stop. You can put a 7" double right up to the edge of the field stop and still observe the two components cleanly separated.

A binocular with a sharper image still sees fainter stars further out in the view. One with a less sharp image spreads the star images out over such a large area that it has already lost the faint stars from view by the time the sharpness has become only fair and has lost many more than just the faint stars at the point where sharpness is poor.

In the Celestron 25x100 sharpness of image is still good at 70% out from center, but then it drops off pretty quickly beyond 70%. By 80% out it gets rather poor. The Celestron has a problem with one side of the binoc that won't allow it to reach pinpoint focus as well as the other side.

The Celestron 25x100, when observing a 14" double, was very clear at 50%, still good at 60% but poor at 70%, all the way around. Doubles of 21” and 22” could still be seen at 70-75% out from center. A 29” double was the limit at 80% out.

In my sample of the Oberwerk 22x100, an unusual result is found. The best image sharpness is not centered in the lens. In order to see it, sharpness needs to be tested across the lens at various hour lines on a clock. Then it becomes obvious. Along one hour line, sharpness is OK to 70%, poor by 80%. But on the opposite side, it's sharp to only 40-50% and poor by 60%. Testing other hour lines shows the sharp central point is off-axis.

The other side of the binocular is mirror image. That tells me the optical axis of these binocular barrels is out of alignment in these 22x100s. The images are merged, but the optical axis of the two barrels does not center the optimum light in the middle of the exit pupil.

In the Oberwerk 22x100 the 14” double, on one side was good to 60-70% and poor at 80, but on the opposite side of the same barrel was good to only 40% out and poor by 50-60% out. The 21” double was seen out to 70%. Best with a 22” double was 70-75% out, less on the poor side. The 29” double could be seen at 80% out.

In the Pentax 16x60, the same 22” double can be seen as two components within 10% of the edge.

In the Fujinon 16x70, Mizar, at 14.4”, can be seen at 60% out from center and a 22” double can be seen at 80% out. A faint mag 7.0-7.2 double at 16.7” can be seen at 50% out. Another faint double Struve485 in NGC1502 7.0-7.1 at 18” is seen out to 65-70%. The BD components of the Trapezium, 19.2” are still seen at 70% out from center. A 36” double can be seen out within 10% of the edge.

The Nikon 12x50 SE can see 14.2” out to 50% and can see 22” at 70% out handheld. Faint mag7 Struve2690 at 16.7” is seen out to 45%. Faint mag 7 Struve485 at 18” is out to 60-65%. Alberio at 34” is still seen at 80% out.

In the Oberwerk 20x80 Standards, the 14” double is resolved perfectly at 60% out from center and can be seen out to nearly 70%. The 22” double can be seen to 80%.

In the BT100 with a 26mm TV plossl at 24x, the 14” double can be put right on the edge of the field stop and still be seen as two. At 25x with the standard 24.5mm wide-angle eyepiece supplied with the BT100, a 7.4” double can be seen out to 60-70% before it becomes distorted.

This method of checking doubles with various binoculars at points along the radius allows us to determine the loss of sharpness by referring to the apparent resolution at the points measured. For this, the magnification comes into play. The separation of the double multiplied by the magnification gives apparent separation as seen at that magnification thru that binocular. It should be easily understood even a fairly close double will get easier with higher magnification. However, a considerable degree of sharpness is still required to see close doubles split. Therefore, various doubles are used to test sharpness and a lower apparent separation # is better.

Based on the above, the sharpness as measured by apparent resolution (in arcseconds) of various binoculars is given. When comparing one binocular to another, at any given % out from center, lower is better.

Oberwerk BT100-26TV, 170 at 50-60%, 330 at 98% out from center.
Oberwerk BT100-24.5 WA, 190 at 60-70% out from center.
Oberwerk BT100-20pl and 17pl, faint mag 8 double, 205 on-axis, 240 at 50%.
Celestron 25x100, 350 at 60-65%, 530 at 70%, 550 at 75% and 725 at 80% from center.
Oberwerk 22x100A, 310 at 60-65%, 460 at 70%, 480 at 75%, 640 at 80% from center.
Oberwerk 22x100B, 310 at 40-50%, 480 at 50-55% and 660 at 60% out from center.
Oberwerk 20x80, 280 at 70% and 440 at 80% out from center.
Fujinon 16x70, 230 at 60%, 310 at 70% and 350 at 80% out from center.
Fujinon 16x70, faint mag 7 doubles, 270 at 50%, 290 at 70%.
Oberwerk 15x70, 210 at 50% and 330 at 60% out from center.
Oberwerk 15x70, faint mag 7 double, 270 at 40-45% out from center.
Pentax 16x60, 350 at 80-90% out from center.

Nikon 12x50 SE, 170 at 50%, braced 260 at 70%
Nikon 12x50 SE, faint mag 7 doubles, 200 at 45% and 220 at 60-65% out from center.

List of Stars for Testing Sharpness and Resolution

You can try observing some of these doubles with your binoculars to find out how yours compare to some of those listed here with on-axis resolution and field sharpness.

95 Her, 5.0-5.1/6.3”, 5° ssw of 100Her, split with BT100 at 25x
Stf 232 Tri, 7.9-7.8/6.6”, 2h15m +31n, near 6 Tri, split at 31x in a BT, faint, difficult.
Stf 953 Mon, 7.2-7.7/7.1”, 6h40m +9n, 1° s of o.c. 2264, elong. with 20x80 and 16x70
11 Mon, beta, 4.7-5.2/7.3”, C=6.1/10”, BC=2.8”, seen as A-BC = 4.7-4.8/7.3”
Stf 1121 Pup, 7.0-7.5/7.4”, 7h38m –24s, easily separated at 25x, in o.c. M47,
5 Ari, Mesartim, 4.8-4.8/7.8" PA 000, split at 22x100, better at 31x in BT
41 Ori, theta 1, Trapezium ABCD, A-B= 8.7”, A-C=12.9”, C-D=13.3”, B-D=19.2”
12 Del, gamma 4.5-5.5/9.6", elongated pointed in 12x50 SE, split in 16x70
Stf 1245 Cnc, 6.0-7.2/10.3”, 8h25m +7d30m, just north of Hydra’s head
Stf 954 Mon, 7.1-9.6/12.8”, 6h40m +9.5n, 1/2° n of Stf 953, split in 25x100
17 Boo, kappa, 4.6-6.6/13.4”, 2.0 mag difference this close makes it difficult
Stf 2470, Lyra 6.6-8.6/13.4", 19h10m +34.6n, seen in 16x70
100 Herc, 5.9-6.0/14.2", nearly even mag 6 double, easily resolved even in 12x50.
79 UMa, Mizar, 2.3-4.0/14.4", difficult due to bright primary
Stf 2474, Lyra 6.7-8.8/16.2", 19h10m +34.5n, cleanly separated with 15x70
Stf 2690 Del, 7.0-7.2/16.7", 20h35m +11.5n, fainter but easy, clearly separated in 12x50.
Stf 485 Cam, 7.0-7.1/18”, 4h05m +61n, easy, in o.c. 1502, also faint but easy in 12x50.
61Oph, 6.0-6.5/21” easily resolved at 15x
63 Ser, Alya, 4.5-5.0/22", easily resolved, seen as two 70% out in 12x50 SE.
7 Her, kappa, 5.3-6.5/28.4”, near triangle of Serpens.
Stf 855, Ori, 6.0-7.0/29” and C=8.9/118”, 6h15m +2.5n, about 4° sw of 8 Mon.
48 Cnc, iota, 4.2-6.6/31”, beautiful colored double
6 Cyg, Alberio 3.1-5.1/34", seen at 80% out from center in 12x50,color shows well.
16 Cyg, 6.0-6.1/39”, easy even double within 1° of 6826, Blinking Planetary.
24 Dra, nu, 4.9-4.9/62", easily visibly separated.

Double Star Observations – On-Axis Resolution

How close a double you can split with a binocular is a good measure of that binocular resolution. Of course, binoculars won’t allow reaching the resolution limits of the aperture due to the low magnification, so it’s as much a measure of your own acuity, the ability of your eyes to separate close objects. But, if the same observer performs the same type of observation thru all the instruments then you have a relative measurement. It may vary slightly for someone else with a different acuity, but they would get similar relative measurements of resolution with the same group of instruments.

Some binoculars focus to a finer pinpoint than others. And obviously, magnification provides a greater ability to split doubles. Generally, binoculars with higher magnification allow seeing closer doubles, but sometimes the binocular with a finer image will exceed the limits of one with a higher magnification. What this also means is you get to see a lot more resolution in dense clusters because binoculars with the ability to see that closer double will separate more stars in a cluster. This allows you to define that word resolved. With the Oberwerk 22x100, stars like Mizar resolve easily. Regular difficult double star targets become regularly viewed objects. Doubles like Gamma Delphinus at 9.6" are resolved. Challenges are doubles in the 7" and 8" range. Mesartim at 7.8", although not always split, became a favorite test.

In Celestron 25x100s, 7.1" and 7.4" doubles are clearly separated. Mesartim at 7.8" is a successful target. Gamma Delphinus at 9.6" becomes an easy target. The Trapezium, with closest components at 8.7”, provides none of the difficulty associated with 20x80s. I clearly separated the double Struve 953 in Mon at 7.2-7.7/7.1”, just below the Christmas Tree cluster. I split this one "easily" in the BT100. I've seen it elongated but not split with the 20x80 Standards.

Doubles, when resolved in the 16x70s, were more sharply defined than any other binocular, smaller or larger. But the higher powered 22x and 25x binoculars, even though they do not resolve to as fine a point, are capable of so much closer separations, they get to see closer doubles, which also means they are seeing more stars resolved in dense clusters.

I woke up early one morning and Aries was high in the southern sky, so I gave Mesartim a try. These Celestron 25x100 do not reach a perfect pinpoint focus on one side and that hampered the view somewhat. I was easily able to see the two components, but they were not clearly separated. The position angle was evident and there were two distinct bright components, but I could not see any solid space between them. I would say they were deeply notched.

The apparent separation of Mesartim with the Celestron is 7.8x25= 195 arcseconds. They should have been able to split to this apparent separation easily. The Fujinon 16x70 shows clean splits down to apparent separations under 160 arcseconds. I did see a fainter mag 7 double at 7.1” split with the 25x100s for an apparent separation of 178 arcseconds. So, why was I able to see 7.1” split, but not see 7.8” split in the 25x100s. Maybe because Mesartim, 7.8” has components both of magnitude 4.8, pretty bright. Struve 953, the 7.1” double has components of mags 7.2 and 7.7, quite a bit fainter. The fainter double causes much less brilliance in the image and the finer points are much easier to see. Once stars get much fainter than that it begins to get more difficult due to lack of light.

I tried Mesartim again, this time with the Oberwerk 22x100. This time I saw a clean split, difficult, but clean. I saw two nice little points with the tiniest of black space between them. So, for me the best I could do with the 22x100s was 7.8” for an apparent separation of 7.8x22 = 172 arcseconds. With the 25x100s I got 7.1” for an apparent separation of 7.1x25 = 178 arcseconds. Eventually, I did split Mesartim with the 25x100s.

I tried Mesartim with the 20x80 Oberwerk Standards, but these also have a problem bringing things to a pinpoint focus. With the 20x80s, I could not focus out the flared rays of the two stars and this caused too much interference in the image. I was just able to see the elongation of the pair. It would be pushing it, but I think a better sample of the 20x80s might be able to do it.

With Oberwerk BT100s, along with Mesartim at 7.8”, other successfully split doubles were Struve 953 Mon 7.2-7.7/7.1” at 24x = 170 arcseconds, Struve 232 Tri 8.0-8.0/6.6” at 31x for 204 arcseconds, and 95 Herc 5.0-5.1/6.3” at 25x = 158 arcseconds. I have no eyepiece combinations for the BT between 31x and 25x.

With the Fujinon 16x70, on numerous occasions I have seen Gamma Delphinus 9.6” split at 16x for an apparent separation of 154 arcseconds. To date, I believe this is the best resolution I have recorded with any binocular.

With the Nikon 12x50 SE, the best I’ve tried was 100 Herc at 14.2” x 12 = 170 arcseconds. I’m expecting much better out of this binocular and I’ve picked some targets from the list above for additional testing. I tried Struve2470 in Lyra, but with a difference of 2.0 magnitudes between components, this is a very difficult double. Best chances would be a more even double at about 13”, perhaps the A-C components of the Trapezium.

Limiting Magnitude

Limiting magnitude gives you an indication of how deep you will see into the many faint stars within open clusters. The deeper limiting magnitude will see more faint stars.
Assuming equal quality lenses and coatings:
Every 10% increase in magnification provides about 0.1 magnitude gain.
Every 10% difference in the area of the aperture provides only 0.03 magnitude gain.

In mag 4.7 skies the Fujinon 16x70 can see mag 10.7 stars.
In mag 5.0 skies the Oberwerk Standard 20x80 can see mag 10.9 stars.

A selection of observations, all at mag 5.4, with the number of stars visible in M45

15x70/’03 Oberwerk	128 stars to mag 10.84
16x70 Fujinon FMT-SX	133 stars to 10.84
20x80 Oberwerk Standard	184 stars to mag 10.96
25x100 Oberwerk BT100	209 stars to mag 11.18 w/24.5 WA Ober
36x100 Oberwerk BT100	229 stars to mag 11.68 w/17 Sirius plossl

Under my best skies ranging from mag 5.4 to 5.8;
12x50 Nikon SE see stars to a limit of mag 10.8,
16x70 Fujinon FMT-SX see stars to a limit of mag 11.0,
20x80 Oberwerk Standard see stars to a limit of mag 11.2,
22x100 Oberwerk is capable of seeing stars as faint as 11.8,
25x100 Celestron could reach nearly to stars at mag 12.0.

Both the 100mm binoculars lost about a half magnitude in the viewable area beyond 50% out from center. In most binoculars, the loss grows to about a full magnitude or more as you move out closer towards the edge in the field of view.

The following observations are taken on a field of stars in M44 west area. First observation was viewed entirely within the center 50% of the field of view. Second observation is exact same field, but viewed entirely using the outer 50% of the field of view. Note the drop-off in the number of stars seen. This illustrates the loss of magnitude and hence faint stars in the outer area of the field of view.

15x70 Oberwerk - 20 stars seen but only 18 when viewed in outer 50%
16x70 Fujinon - 23 stars seen, but only 21 in outer 50%
25x100 Celestron - 28 stars seen, but only 23 in outer 50%
25x100 Oberwerk BT100 - 32 stars seen, but only 28 in outer 50% (w/24.5WA Ober ep.)

Two recent observations show a similar result and show the magnitude loss exists to some degree even in two of the finest binoculars. On the same field and on the same night in mag 5.4 skies;
Fujinon 16x70 sees mag 10.87 out to 50-60%, 10.64 at 80% out and 10.37 at 90% out.
Nikon SE 12x50 sees 10.64 out to 50-60% out, 10.37 at 80% out and 10.2 at 90% out.

The loss of edge magnitude cannot be offset. The better the instrument, the more you will see towards the edges. Loss of sharpness will contribute to additional loss of limiting magnitude at the edges, but these are two different things going on. Loss of magnitude can be noticed more easily over the sharp view area. Illumination of the exit pupil gives an indication of magnitude loss in the outer edges of the field of view.

Illumination of the Exit Pupil

The illumination of the exit pupil may give an indication of the light drop-off in the outer portions of the field of view. Along with the loss of sharpness across the field identified above, this is responsible for the loss of magnitude observed in the outer field of view.

The illumination is recorded by moving a laser light across a scaled flat glass surface placed over the objective end. The exit pupil, enlarged and projected on a white card, will be seen to vary in width according to the position of the laser light on the objective.

As the light is moved from the center towards the edge of the objective, measurements are recorded for the width of the exit pupil.

Significant readings are the position of the laser on the objective at the point at which the exit pupil first drops below 100% full size, the position at which the exit pupil has only 50% the full diameter and the size of the exit pupil when the laser it at the extreme edge of the objective. For comparative purposes, I have listed the 70% position readings here. I chose 70% out from center of objective because that represents at which one half the area of the objective lies within the line and one half the area outside the line.

Celestron Skymaster 25x100
Light entering at 70% out on objective radius fully illuminates only the central 40% diameter of the exit pupil.
The central 20% of the exit pupil receives no light at all from the outer edge of the objective.

Oberwerk Giant 22x100
Light is off-center in both objectives. Light from the center of the objective does not produce the maximum exit pupil.
Light at 70% out on the objective radius, on one side of center, illuminates 80% of the exit pupil. On the opposite side of center, no point in the exit pupil is fully illuminated and the central 20% diameter of the exit pupil gets no light at all. On average, the central 40% of the exit pupil receives no light at all from the outer edge of the objective.

As a comparison
Fujinon FMT-SX 16x70
Light entering at 70% out on the radius of the objective lens illuminates the central 52% of the diameter of the exit pupil.
The central 20% of the exit pupil receives no light at all from the outer edge of the objective.

Oberwerk BT100 with stock 24.5mm eyepiece at 25x
Light entering at 70% out on the radius of the objective lens illuminates the central 40% of the diameter of the exit pupil.
The central 10% of the exit pupil receives no light at all from the outer edge of the objective.

Oberwerk BT100 with 26mm TV plossl eyepieces at 24x
Light entering at 70% out on the radius of the objective lens illuminates the central 64% of the diameter of the exit pupil.
Light entering at 100% out, at the very edge of the field stop illuminates the central 10% of the diameter of the exit pupil.

What Can Be Seen
The combination of magnification and aperture is so overwhelming in the 100mm binoculars, even the 16x70 Fujinon is no match for a 22x100 or 25x100 binocular. Fainter galaxies seem to be easy pickings for these 100mm binoculars. While M66 is seen bright, and M65 is difficult in the 16x70s, both are readily seen in the 25x100s. In addition, NGC 3628, the companion to M65/M66, not seen by me in any smaller binocular, was visible several times in the 25x100. M105 and its companion NGC 3384 make a nice pair. M96 is seen, but M95 remains difficult.

Keep in mind, you will not see as much handheld as you will with mounted binoculars. It is very difficult even with the best 70mm binoculars to see stars beyond mag 10 when handheld. Seeing stars at mag 10 requires a completely quieted binocular on a stable mount, viewing without touching the eyepieces. A binocular used for scanning, with slight minor shake eliminates most stars over mag 9.0 from view. Absolute steadiness and some persistence is required to see mag 10.2 and 10.3. This translates to how much can be seen in star fields, open clusters and dense clusters. Deeper magnitude means more stars seen. A steady binocular means more resolution in clusters.

M101 was found instantly in the 25x100, it was seen equally well in the 22x100, but on the same night it was only suspected in the 16x70s. M57 is an obvious torus at 25x.

In the area just south of M11, oc M26 is seen easy in the 16x70 Fujinon, but nearby gc 6712 and oc 6664 are not seen at all. In 20x80 Oberwerk Standards, 6712 is seen and in 6664 only 3 or 4 stars can be glimpsed. In both the 22x100s and 25x100s, 6712 is seen readily and 8-10 stars can be counted directly in 6664.

On M17, the nebula was by far the best in the 25x100s. In the 20x80s, M17 was seen but not with the same size and brightness. In all smaller 16x70 binoculars, M17 appeared smaller with much less prominence.

Some few objects are so huge that they will not fit into the small field of view of these high powered binoculars. The Hyades is too large. Even the Pleiades is just a little too large to be viewed in context, but the amazing depth provided by the 22x100 and 25x100 binocs allows seeing about 200 stars in this cluster.

Comet NEAT was near the same fov as M44, just about 3° below it. In the Oberwerk 22x100, it was just out of the fov with M44. In Celestron 25x100s, the field was too narrow to capture both at once, but NEAT looked better. The 22x and 25x gave a much better view than the Fujinon 16x70 because the magnification allowed seeing distinction between the core and the halo. At 25x, even the core had size to it. There was a distinct core with a fairly large halo, maybe 20 arcmin. In the 25x100, it appeared to me there was a slight stubby fan-tail pointing out to the left/upper left.

In the 22x100s, NGC 6934 in Delphinus was an obvious globular cluster. It was just seen in 16x70s. The 22x100 caught glimpses of another globular in Delphinus, NGC 7006. NGC 7006 was not seen in any binocular smaller than 22x100.

When you view faint clusters in 25x100s you see stars that just were not there in any smaller binocular. Star counts on clusters like IC4665 in Ophiuchus show 51* in the 25x100, 50* in the 22x100, but only 40* in the 16x70. The BT100 at 36x sees 60 stars in the same field.

On another night, nearby IC4756 was observed in the BT100 with 20Tvplossl at 31x. Surrounded by about 8 bright stars, sprinkled with faint stars counted over 100 stars at 31x100, with moonlight in the sky. In 20x80s, this cluster looks somewhat sparse because the faintest stars are not even visible.

Oberwerk 22x100s and Celestron 25x100s make M12, a globular cluster, look like it is on the verge of resolution in the outer edges, where the Fujinon 16x70s could not resolve M12 at all. The Oberwerk BT100, using a 17mm Orion Sirius plossl at 36x did in fact provide some resolution in the outer edges of M12.

This is a comparison of observations made on an area with controlled boundaries around M45, The Pleiades. All observations were not made on the same night, but these are all in mag 5.4 skies and under the same controlled conditions.

16x60 Pentax PCF V WP see 141 stars to a limit of mag 10.84
15x70/’03 Oberwerk see 139 stars to a limit of mag 10.84
16x70 Fujinon FMT-SX see 156 stars to a limit of mag 10.94
20x80 Oberwerk Standard see 184 stars to a limit of mag 11.18

Best views yet with the BT100 were with the Televue 26mm plossl 2.0°fov and with Televue 20mm plossl 1.5°fov eyepieces. View is quite a bit narrower than the stock WA 2.5°fov eyepieces, but you can literally put objects right out to the edge of the field stop and still see a near perfect view with almost no distortion present.

Magnifications I use the most often in the BT100 are 24x, 31x and 36x. Each step up increases the number of stars that can be seen and none of the fixed power 100mm binoculars can equal the performance of the BT100. The BT100 can see stars to mag 12.0 easier and more directly than any of the other 100mm binoculars.

The best low power views I had in the BT100 were with the 26mm at 24x. The only instrument I've ever own/used that was able to see a portion of the Merope nebula is the Oberwerk BT100 binocular telescope with a pair of 26mm TV plossls at 24x with a 4.2mm exit pupil and a 2.2° fov. Using the stock 25x WA eyepiece, I saw slight definition to the Rosette nebula.

I’ve seen M78 easily in the BT100. One morning, at about 5:15 AM the viewing was still very good so I thought I’d try for M1 and M78 with the Fujinon 16x70. I didn’t have my charts out with me so I lined up the 16x70s on the top of Orion’s belt stars and swung left. I knew M78 was in the vicinity. Took about 20 seconds to find it. Actually it appeared pretty bright. Moving off to search around the area and coming back, it was found instantly the second time. Unlike the graininess of the clusters, it appears as just a faint smudge. Then I gave M1 a try. M1 was much easier than M78. It was brighter and has a bright star nearby as a guidepost. It was found instantly first try. It's larger than M78, but still just a faint smudge.

I wondered if my sky conditions were just so good that it allowed me to find these two objects that quickly. The Fujinon 16x70 when mounted do make it pretty easy to see faint objects. So I grabbed my Nikon 12x50 SE and gave it a shot. I was easily able to re-acquire M1 in the 12x50s handheld. M78 took a little more time. I needed to search around for a while, but passing over it several times showed it in the movement. Even handheld in 12x50s, these two objects proved attainable. It has been mentioned before, these are both visible in 10x50s. I’ve never tried them with 10x50s, but I’m sure it would take some pretty dark skies to get M1 and M78 in10x50s, especially M78.

Chromatic Aberration

Chromatic Aberration (CA) occurs because all wavelengths of light come to focus at a slightly different focal length. In faster focal ratio instruments it can be more pronounced. To get a feel for the magnitude of the focus differential between the centered yellow focal length and the blue and red wavelengths focal length, in a 22x100 binocular, approx 460mm focal length, if corrected to 1/1000 F, the difference in focal length between the blue and red is 0.46mm. The Oberwerk 22x100 moves the eyepiece assembly 1mm in or out with a 60° turn of the center focus dial. So the 0.46mm difference in the red/blue and yellow focal lengths is about a 30° turn of the focus dial. If corrected to 1/2000 F, the turn would be 15° of the focus dial.

In a good corrected doublet, the size of the blue/red CA blur can be 3x the size of the Airy disk. That is, for a 100mm lens with an Airy disk radius of 138/100 = 1.38 arcseconds, the blue blur or red blur may have a radius of 1.38 x 3 = 4.1 arcseconds. For faster (shorter focal length) binoculars, this blur size will increase. Since it can be considered that any point of light on an extended object (like Jupiter) forms an Airy disk, you may now see why it is at the edge borders of bright objects that we see the colored band of CA.

In the Oberwerk 22x100, Jupiter on-axis has very little CA, off-axis has moderate blue to one side. CA on the moon was a thin band and it was easy to move my eye placement to make it go away.

In the Celestron 25x100, Saturn produced no CA at all. None Seen in Venus on-axis, but blue and sometimes a purple or green was seen off-axis. Very little CA is seen on Jupiter out to about 50-60% from center. Beyond that, Jupiter produces blue CA on the inside edge and yellow/green on the outer edge. Ca on the moon was green towards the outer edge.

With Jupiter at the very edge of the FOV in the 22x100s, CA is a pronounced red/ purple on the side towards the center of the lens. At the edge of the 25x100s, Jupiter produces a blue CA on the side towards center.

Simply moving your head from side-to-side and looking into the exit pupil at a different angle can produce a different color CA around these bright objects.

As a comparison, the CA in the long focal length 20x80 Standards is very well suppressed. I saw no CA on axis and almost none when viewing Jupiter at 80% out from center of field. The f6.2 Oberwerk BT100 produced a CA free view of 5/8 phase Venus and a slight thin blue CA ring entirely around Jupiter, but only when Jupiter was about 70-80% out from center of view. Fujinon 16x70s show blue CA around Jupiter when it is placed about 60% out from center.

Optical and mechanical deficiencies

I had some problems with the Celestron 25x100, that the left eyepiece would not achieve a pinpoint star focus, overall the view was pretty good, but the finest point star image thru the left eye was noticeably enlarged. This indicates some problem. Had these been a purchase, I would have sent them back as defective. I thought the exterior construction around the prism housings was a bit chintzy, not what I would have expected in a $300 binocular. The center mounting post was simply too short. I could not mount these binoculars on any tripod without the bottom of the barrels rubbing against the top of the tripod mount plate. If I were a person with a very narrow inter-pupilary distance, I would not have been able to achieve anything less than about 60mm with the currently supplied mounting post. There is no way to take that post off the binocular and replace it.

The Oberwerk 22x100 uses the body from the older model 20x80 Deluxe. Instead of dew shields screwed onto the front end, the extension is now part of the binocular body and the objective lens is moved out about 3” further. The 22x100, just like the old discontinued 20x80 Deluxe has a right diopter adjustment that seems set incorrectly at the factory. I use my corrective glasses with all my binoculars. Therefore, with many binoculars, the right eye diopter is set on or near zero. With the 22x100, it is almost at the very end of the minus diopter range. Like the older 20x80 deluxe, I could not use these binoculars without my glasses if I wanted to.

The illumination of the exit pupil test on the Oberwerk 22x100s shows an unusual result for this sample. This off-center illumination is, in my opinion, a substantial reason to consider this sample unacceptable. However, at this time I know of possibly only a handful of people beside myself who would ever perform such a test to find this anomaly.

The off center illumination in the 22x100 coincides exactly with the non-symmetrical sharpness test. The side of the lens that shows the least sharp image is the same area that shows the least illuminated exit pupil.

These 20x80 Oberwerk Standards have a pronounced flare in the image of bright objects. It produces radial points around bright objects. A mag 1 star appears with 40-50 spikes flared around the point image. Stars of 5^{th} or 6^{th} magnitude are not bright enough to show the flare in the image. So while this caused a great deal of interference in the image of bright objects, it seemed to contribute no interference on faint objects.

This BT100 has a bit of astigmatism in one barrel. It is more pronounced with some eyepieces than with others. It is very difficult to focus the image in this barrel to get as fine a pinpoint to match the nice image in the other barrel. The out-of-focus diffraction image in the affected barrel is decidedly oblong horizontally one side of focus and vertically the other side of focus. A small cross appears at the point of image focus. It appears to be less noticeable at lower magnification, I assume simply because the image is smaller.

What comes after 25x100?

The next step is not necessarily a larger aperture beyond 100mm. There are even larger fixed power binoculars but another option is a variable power binocular. You would be surprised how much more can be seen with just a little more magnification. Interchangeable eyepieces provide that variable magnification. There are a variety of binoculars on the market in the 80mm to 120mm range that fit this bill. The one I am using is the Oberwerk BT100.

The BT100 is a different animal altogether than any other 5# to 12# binocular in the 80mm to 100mm range. The BT100, at 26# (12kg), is heavier than my largest telescope, a 4 foot long 6" refractor. The BT100 cannot be picked up while mounted on its tripod. You must first set out the tripod then attach the BT100s. You would not move it while mounted. You must first take the binocs off the tripod.

The views are simply stunning. It does come standard with two sets of WA eyepieces, a 24.5mm = 2.5°Tfov at 25x and a 10mm = 1°Tfov at 62x. Both eyepieces have an apparent fov of 62°. My binocular shows a bit of difficulty with the 62x eyepieces. The supplied WA eyepieces are fine, especially the 25x pair, for wide field easy observing. For detailed work I have been using various plossl eyepieces that give a somewhat narrower field of view. My favorite eyepieces in this instrument are:
26mm TV plossls for a 4.2mm exit pupil that give 24x with a 2.2° Tfov;
20mm TV plossls for a 3.2mm exit pupil that give 31x with a 1.67° Tfov;

17mm Orion Sirius plossls with a 2.7mm exit pupil puts up a great 36x with a 1.44° Tfov. A recent addition of a pair of Meade 13.8mm SWAs will give me an exit pupil of 2.2mm at 45x with a 1.44° field of view. Also I have used a pair of 12.5mm UO orthos that gave a 2mm exit pupil at 50x, but with only a 53 arcminute field of view. However, the depth of magnitude seen in clusters was absolutely stunning.

Oberwerk 22x100s and Celestron 25x100s make M12, a globular cluster, look like it is on the verge of resolution in the outer edges, where the Fujinon 16x70s could not resolve M12 at all. The Oberwerk BT100, using a 17mm Orion Sirius plossl at 36x did in fact provide some resolution in the outer edges of M12.

One of the best high-powered views ever in the BT100 was with a 12.5mm ortho at 50x when I resolved some 30 to 40 stars in the very dense open cluster M11. The best low power views I’ve had were with the 26mm TV plossls that allowed seeing the Merope and Rosette nebulae.

These fixed power 100mm binoculars provide about a 2.5° field of view at low power. The BT provides 2.5° at low power 24x to 25x and would provide a 1° field of view at about 62x. Highly corrected wide field eyepieces can be used to get a wider field of view at a substantial cost above initial investment. Most people are using fixed binoculars and prefer the wider field of view.

25x100 will not allow you to resolve globulars, but 25x100 with a 2.5° fov and a 4mm exit pupil will show you many faint nebulae, galaxies and clusters.

More power is not always the answer to see an object. These binoculars provide exit pupils ranging from 5mm (30mm ep in BT100 = 20x and 5mm e.p.) to 4mm at fixed low power and a BT can be used at the same low powers or at higher power, generally with exit pupils about 1mm or larger.

Are These 100mm Binoculars Worth It?

Keep in mind a binocular allows you to see with both eyes. A 100mm binocular has two 100mm apertures with a combined area of aperture equal to a 141mm telescope. Binocular summation allows brain to process information from the eyes giving an end result that is greater than what would be seen with one eye in one of those apertures. Depending on the type of objects observed, that summation ranges from 1.2x for light gathering to 1.4x for contrast beyond what is seen in a single 100mm aperture.

I really do agree whole-heartedly that a larger glass won't completely compensate for a mediocre design. However, I've put three different pair of 100mm binoculars up against the 16x70 Fujinons and Oberwerk 20x80s. The fact is, even with each of the 100mm binoculars with some optical deficiencies, the Fujinons could not see as much as any of the 100mm binoculars. 22x100, 25x100 and variable power BT100s see so much more than the 16x70 Fujinons that in some cases it's like seeing it small in the 16x70s and then finally adding enough magnification to really see it.

22x100 or 25x100 will not allow you to resolve globulars, but 25x100 with a 2.5° fov and a 4mm exit pupil will show you many faint nebulae, galaxies and clusters. 25x100s show nearby companion NGC galaxy to M95/M96 and to M65/M66, where the 16x70s do not (in my mag 5.4 skies. I suspect if skies were mag 6, the 16x70s would show the NGCs). 22x100s and 25x100s made M12 look like it was on the verge of resolution in the outer edges, where the Fujinons could not. The BT100 at 36x did in fact provide some resolution in the outer edges of M12. Finding M9 and the fainter NGC globular (in the same fov to the northeast) was easy in the 22x100 and 25x100s, not so easy in the 16x70s, but it was still seen.

The number of fainter stars seen in open clusters with both of the 100mm binoculars is greater than the number seen with the 16x70s or 20x80s. Using BT100s with 36x eyepieces, the number of stars seen and the faintest magnitude reached increases dramatically even over both of the other 100mm binoculars.

Of course everything needs to be taken into context. I have no doubt the Fujinon 16x70 reaches the finest pinpoint sharpness and resolution. I haven't found a binocular to beat it. Maybe the 12x50 Nikon SE is in the same category. None of these fixed power 80mm or 100mm binoculars bring stars to as crisply defined focus as the Fujinons. The contrast in the Fujinons may be closely equaled, but not beaten.

But, when it comes to how much can be seen, in just about every side-by-side viewing session, the larger binoculars saw more, and easily, not just barely. The 16x70s have a finer view, but the 22x100s and 25x100s will see more. If there are no serious optical deficiencies present that take away too much from the observation, then even if you didn't add aperture for most objects adding magnification allows you to see more.

Will I ever get rid of my 16x70 Fujinons in exchange for a 22x100 or 25x100. Not a chance. I haven't found another binocular that equals the quality of the Fujinons. But there is room on my equipment shelf for a 100mm binocular that sees more than my Fujinon. A good sample of either one of these would make a nice choice.

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