# Swarovski ATX/STX 30-70x95 and the other X-series scopes

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*In the summer of 2012, the Austrian firm Swarovski Optik revealed their closely guarded secret. The new X-series takes the development of spotting scopes a clear step forward.*

Swarovski telescopes have been popular among Finnish birdwatchers for some 15 years now, starting with their AT/ST 80 HD with a 20-60x zoom. This unassuming grey telescope was the first truly high-class zoom telescope, offering image quality previously seen only with the best fixed-magnification eyepieces. The scope had a simple optical design and was manufactured to high precision, whereby the image remained sharp and clear all the way up to the (then) very high 60x maximum magnification.

In the years that followed, the other top players rose to the challenge and eventually took the lead from Swarovski. This was partly because although Swarovski's later A/STS and A/STM series scopes are of very high quality, they decided to stick with 65 and 80 mm objectives and a maximum magnification of 60x. This conservative design philosophy was probably chosen to allow making the scopes very compact and lightweight – which they were – but it also meant that in the ability to resolve tiny faraway detail – arguably the most important feature of a birding telescope – scopes such as the Zeiss 85 mm Diascope and Nikon Fieldscope ED 82 mm with their maximum magnification of 75x and Kowa's 88 mm/60x Prominar 883 and 884 with a 10% aperture advantage have out-performed the smaller Swarovskis. This comes from the laws of physics being such that the resolving power of an ideal (perfectly designed and made) telescope is directly proportional to the diameter of its objective lens. Thus the maximum resolution of an 80 mm scope is 10% less than that of an equally well-made 88 mm telescope, and in good viewing conditions a viewer with sharp eyes will see this difference readily at magnifications well under 60x. The size of the objective also limits the brightness and contrast of the image whenever the exit pupil of the scope is smaller than the pupil of the eye. To illustrate this point, if we take the commonly mentioned 2 mm as the smallest diameter a normal human pupil constricts to under bright light, the magnification above which a scope would have that 2 mm exit pupil or smaller is 32.5x for a 65mm scope, 40x for a 80mm scope and 47.5x for a 95 mm scope.

Increasing the magnification of a telescope brings the detail it provides up to a size your eye can resolve, and in a telescope well-enough made that its performance is limited by its objective size rather than design or manufacturing flaws, there are diminishing returns available all the way up to a

magnification about equal to its objective diameter in millimeters. This improvement from added magnification is more difficult to quantify, since it depends on several factors, one of which is the visual acuity of the viewer in question. The sharper your eyes, the less magnification you need to get all the available detail out of the image. However, even for a person with visual acuity twice as good as what is considered normal vision (normal being 20/20, Visus 1.0) – possible but exceedingly rare – none of the present birding scopes offer magnifications high enough to be redundant. Closest to showing their full resolution potential are Swarovski's 65 mm scopes at 60x and Nikon's 82 mm and Zeiss's 85 mm scopes at 75x. With their new X-series, Swarovski has taken a step to address these issues, as the largest model offered comes with a huge 95 mm objective and can reach magnifications of 70x.

## A new kind of construction

In designing the new series, Swarovski has freshly re-thought the concept of a spotting scope. Instead of offering a choice of different size scopes and a selection of eyepieces for them, Swarovski has designed a zoom eyepiece they clearly feel to be good enough to serve all users at all times. This eyepiece is integrated with a prism back (available either as a straight-through view STX or an angled view ATX version) as a module, which can be paired with three different objective modules. The resulting scopes are 25-60x65 mm, 25-60x85 mm and 30-70x95 mm. The two modules connect with a solid bayonet mount similar to those used in SLR cameras. The bayonet has a locking mechanism that only releases when a button on the prism housing is pressed, so the scope cannot accidentally come apart.

This modularity allows birders for example to first buy a compact 65 mm travel scope, and later when their appetites grow, a 95 mm objective module for viewing over large distances and in challenging light conditions. For digiscoping, Swarovski offers two interesting accessories: a hinged adapter for compact digital cameras and the TLS Apo lens which mounts on an SLR with a T-ring and is optimized for imaging through the ATX/STX eyepiece. Along with the TLS Apo comes a dedicated eyecup with a cylindrical metal exterior tube, over which the lens simply slides in place for quick transition from viewing to photography and back.

The X module eyepiece is a zoom with a 2.4x zoom ratio and a 57-71 degree subjective field of view. These numbers mean that it almost meets wide-angle standards already at its minimum magnification, and at higher magnifications it offers fields of view similar to best of the fixed magnification wide-angle eyepieces available for other birding scopes. I checked the real fields of view for different magnifications and found them to be as specified. Eyepiece eye-reliefs on the other hand are often not what they are promised to be, especially if you measure them from the plane of the eyecup rim, which pretty much limits how close to the eyelens you can place your eyeglasses or your eye. Measuring like this, I got the following eye-reliefs for different magnification settings with the 95 mm objective mounted: 16 mm at 30x, 13 mm at 40–60x and 14 mm at 70x. Although these results are not quite as good as specified, they are reasonably good for viewing with glasses on, and Swarovski also offers an extra-low-rimmed eyecup as an accessory for those who need an additional 2-3 mm of eye-relief.

Another deviation from manufacturer's specifications concerns available magnifications using the 95 mm objective module. Since the eyepiece is the same for all three scope sizes, the zoom ratio also must be identical, and while 2.4 times 25 equals 60, 2.4 times 30 equals 72, not 70. I did some measurements to determine what the real magnifications would be, and concluded that with the 65 and 85 mm objectives, the values were as specified but the 95 mm objective indeed reached about 72x magnification. Perhaps Swarovski's marketing department thought that 30-72x looks too random and preferred to round the numbers to the nearest five or ten in the spec sheets and promotion material.

Having the zoom eyepiece integrated with the prism assembly has allowed Swarovski to place the zoom control ring foremost in the module, so it is right behind the focus ring of the objective module. This enables the user to control the zoom and focus very quickly with the same hand without having to move the hand much at all. For a little while, my hand was habitually reaching to the eyepiece for zooming, but

once I got used to the new system, it started to feel very convenient, quick and natural. However, the movement of the zoom ring is rather stiffer than I would prefer, and you have to turn it quite a lot between the extremes. There has also been some variability in turning resistance between different samples of the scope I have tried. The wide helical focus ring around the objective barrel just ahead of the zoom ring turns much more lightly. It is relatively slowly geared but offers very precise focus control. To change focus from one kilometer to ten meters, I had to turn the ring about 1.2 revolutions, and to come down from 10 meter to the 95's closest focus distance of 4.6 meters I needed to turn it another 1.5 revolutions. It is very easy to find the best focus precisely, but large adjustments take some time.

These scopes are fully armored with synthetic rubber, so it is not necessary to use a protective case with them. Swarovski supplies a two-part cordura stay-on case as an accessory, but I have not tried one on the scope yet. The supplied objective cover is made of hard plastic and fastens by pressing small locking tabs like most camera objective covers. It works well enough but may fall off if knocked hard by branches in the woods. The eyepiece cover is made of semi-hard plastic, pushes on, and is tethered to the scope with an elastic band. It is otherwise nice and works well, but dangles annoyingly under the scope when it is off the eyepiece.

The best accessory of these scopes, coming with the angled view prism unit, is the world's first manufacturer-supplied aiming device that really works. This is a well-thought-out detachable and easily mounted version of the "cable-tie sight" that birders in Finland have been using since the nineties. The strap of the device is wrapped around the front of the objective, either over the pull-out lens hood or in the gap between the body and the hood, and a black rubber aiming antenna is pushed on a peg protruding from the strap. The antenna needs to be cut to the proper length depending on the size of the objective unit being used, a procedure that takes a bit of time and should be done carefully, especially since Swarovski's instructions advise cutting it rather shorter than what I would consider optimal. But once it is done, it is very accurate and fast to use, and any object whether sitting still or flying fast and far away can be captured in the view almost instantaneously and without moving your head away from the viewing position. This little and inexpensive addition to the telescope improves its usability immensely.

The X-series scopes are a bit heavier than comparable models in Swarovski's earlier TM and TS series, but are about three centimeters shorter. For the 65 mm models the weight difference is a little under 200 g and the ATX 85 weighs roughly the same as Kowa's 88 mm and Zeiss's 85 mm scopes. The ATX 95 weighs about 2.25 kilos, but is nevertheless markedly lighter and shorter than the 85 mm Nikon EDG and the Opticron ES 100, and does not feel too massive in the field.

## Image quality

Testing the scopes, I was primarily interested in the biggest model, the ATX 95, as it is the one that potentially could offer image quality unprecedented in field-worthy spotting scopes. With the 65 mm and 85 mm X-scopes, the difference to Swarovski's earlier models or their chief competitors comes mainly from the wide angle zoom now reaching up to 60x, and the ATX 85 now having an objective lens diameter that enables it to reach resolution on par with the Zeiss Diascope 85 FL and the Kowa 883/4.

Contrast in the ATX scopes is really excellent. In comparisons, the ATX 85 showed slightly better contrast than other scopes in its size class, and the 95 with its larger exit pupil is in a class of its own here. Only in the area of chromatic aberration are the ATX scopes a little bit behind the best competitors, with somewhat more color fringing visible than in the Zeiss FL and especially the Kowa 883/4, which is essentially free of this aberration. Stray light suppression, the ability to view backlit scenery and especially to view close to the sun is very hard to assess precisely, because even small differences in the angle of incident light can make a big difference in flare. In this regard, the best scope I have used has been the Nikon ED 82 A, and I would say that the ATX is not quite as good, but close. Now that I have been using the ATX 95 more, I have not encountered any situations where glare from the sun would be much of an impediment, but I feel that the Swarovski is not as immune to glare as the Nikon.

The brightness of ATX's image is absolutely top class. In measurements at an independent Dutch lab published by Dr Gijs van Ginkel, Swarovski's stated 86% total light transmission has been verified, a figure 10% better than for Kowa 883, and solidly better than in any of the other top scopes they have tested. Moreover, the color balance of these scopes is extremely neutral and colors are vivid and natural. Both the ATX 95 and 85 retain excellent color rendition all the way up to their highest magnification.

The image quality of the integrated eyepiece is indeed so fine that I can (almost) forgive the lack of alternatives. The image is very easy to view and impressively wide throughout the magnification range. Despite the wide viewing angle, image sharpness is nearly flawless all the way to the edge. Tested with resolution charts, image resolution at the very edge compared to that in the center of the field was only compromised by about 25% at the top end of the magnification range and about 40% towards the bottom end of the range. Towards the image edges, chromatic aberration becomes rather visible, but since the image is otherwise so sharp, this does not matter very much. However, in this regard the Kowa 883 with the new 25-60x wide zoom performs better, with very little color fringing evident even far off-axis. The only real reservation I have about the ATX eyepiece is that both of the bigger objective modules could easily offer even more practically usefull resolving power if it were possible to use still higher magnifications in them. The 85 would benefit from using about 75x and the 95 about 85-90x magnifications. For the 65 mm objective module, the 25-60x magnification range is about optimum. I can understand the compromises Swarovski has chosen with the zoom range, minimum/maximum magnifications, field of view and physical size, but nevertheless personally would like to see the 85 and 95 reach higher.

In resolution tests, the big objective lens of the ATX 95 showed its power: this scope has the best resolving power among all the scopes I have ever tested. This comes from the size advantage of the objective, but also from the design and manufacturing quality being high enough for the scopes to get very close to the maximum resolution allowed by their objective size. Compared indoors viewing a USAF glass slide resolution target, an ATX 95 easily surpassed the resolution of both the Kowa 883 and the Zeiss Diascope 85 FL, and the patterns that could just be resolved looked brighter and cleaner as well. I later carefully tested a near-perfect sample of the ATX 95 that has virtually no spherical aberration or astigmatism, and is also essentially perfectly collimated. Using a booster to achieve magnifications of over 120x, this unit could reach 1.23" (arcseconds for the line pair) resolution, which is a fantastic result for such a complex telescope.

In order to make the performance differences easier to quantify, I did an experiment where I determined for the ATX 95 and the Kowa 883 what was the distance from scope to target at which a chosen bar target could just barely be resolved. I used the same near-perfect sample of the ATX 95 as in the second resolution test and a Kowa which was likewise an excellent, nearly aberration-free sample, fitted with the new TE 11-WZ 25-60x zoom. With these scopes I wanted to see the effects of aperture and magnification on maximum detail recognition both separately and combined. These tests were done outdoors on a rather bright winter day with the air very stable and good light levels throughout. I first used an aperture mask for the ATX 95 that limited its objective size to 88mm like in the Kowa and matched its magnification exactly to the 60x the Kowa can reach. This "ATX 88/60x" essentially equaled the Kowa 883/60x, with measured resolving limit distances being 19.05 meters for the ATX and 18.85 for the Kowa. This amounts to a 1% difference, and can be attributed to this specific ATX having even lower overall aberrations than this particular Kowa. Unmasking the ATX to full 95mm aperture while leaving its magnification at 60x increased its resolving limit distance by about 7%. Keeping the aperture at 88mm but increasing the magnification up to 72x increased the resolving limit distance by about 8%, while removing both restrictions increased the distance to almost 22 meters or by about 16% over the distance obtained with the Kowa 883 or the "ATX 88/60x." These results show the resolving power increasing with aperture exactly as it should, but they also show that if we look at the ability to detect high-contrast detail, for this size-class scopes having magnifications in excess of 60x helps at least as much as increasing the objective size. I did a similar test comparing the ATX 95 to a Zeiss Diascope 85 FL, both set to their maximum magnifications (72x for the ATX,

75x for the Zeiss), and the result was that with the Swarovski, the target could be resolved about 10% further away. I likewise tested the ATX 25-60x85 against the Kowa 883, and found their resolution distances at 60x to be identical.

I have since used the ATX 95 extensively in everyday birding, and it has consistently kept surprising me by how much more detail and better overall views I could see in thoroughly familiar settings than I was accustomed to seeing with my excellent Nikon Fieldscope ED 82 A. The full 72x magnification gets used a lot and is very useful not only in full daylight but also close to twilight, and the absolute sharpness of the image is a joy to behold every time I put my eye to the scope.

## The best scope right now

Swarovski has succeeded in producing an absolutely marvelous telescope series. Their earlier ATM 65 HD was already the best scope in its size class, and the ATX 25-60x65 improves on it by offering a wider viewfield zoom eyepiece and the option of later upgrading it with a bigger objective module. The ATX 25-60x85 has the best contrast, brightness and color rendition among the 80–88 millimeter scopes, and thanks to its 85mm objective offers performance comparable to the Kowa 883 and the Zeiss 85, although the higher magnifications possible with the Zeiss 20-75x zoom will give it a small advantage in usable resolving power. And finally, the ATX 30-70x95 is simply the highest performing field-worthy telescope available today. When atmospheric conditions allow scopes to reach their full potential, it will show detail 10-15% smaller or further away than any of the competing 80-88 mm scopes, and in all conditions it will show what can be seen as brighter, with higher contrast and truer colors. If its size, weight or price don't go over the limit of what you can live with, my test findings and field experience with the scope certainly did not reveal any other reasons not to get one. After the tests, I sold my Nikon and bought an ATX 95, which will serve as my reference scope from now on.

**Swarovski ATX specifications**

| **Swarovski ATX specifications** | **25-60x65** | **25-60x85** | **30-70x95:** |
|---|---|---|---|
| Length (objective + eyepiece modules) | 342 mm | 374 mm | 428 mm |
| Weight (incl. eyepiece and objective covers) | 1625 g | 1960 g | 2248 g |
| Closest focusing distance | 2,1 m | 3,6 m | 4,6 m |
| Field of view | 2,37–1,30° | 2,37–1,30° | 1,98–1,09° |

- Kimmo Absetz

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