

## CANON 10x42 L IS WP



Weight (including batteries, strap and eyepiece rainguard)	1210g
Height (including eyepiece rainguard)	185mm
Width	135mm
Interpupillary distance	56-75mm
Eye-relief	c.13mm
Closest focusing distance	c.2.6m
Field of view	6.5°
Subjective field of view	65°
Warranty	1 year

In binocular usage, the biggest factor compromising image quality is image shake. This is easy to verify by first using your binoculars hand-held or with a 'finnstick', and then placing them on a tripod and studying the same view. Binoculars with built-in stabilisation mechanisms have been in military use for decades, and for some time now there have also been consumer models available. Initially, stabilised binoculars were invariably too large and had too much magnification to be suitable for everyday birdwatching, until Canon, some ten years ago, introduced the 12x36 IS. Canon utilised a stabilising technology based on vari-angle correction prisms controlled by a microprocessor and tiny gyroscopic motion sensors, which allowed them to build binoculars of comparatively normal size, weight and usability. Since then, Fujinon and Nikon have also introduced stabilised binoculars for the consumer market. I have briefly tried both, but my impression was that their stabilisation did not work in a way that would make them suitable for birding. Meanwhile, Canon has expanded its range to include 10x30, 15x and 18x50, 12x36 Mk II and 8x25 IS binoculars, of which the three smallest models are small and light enough to be easily usable in the field. Suspicions concerning the durability of binoculars incorporating complex technology, some peculiarities of Canon's design and handling, lack of waterproofing and, last but not least, conservative attitudes and prejudices have contributed to make the stabilised Canons a rare sighting among Finnish birders.

Optically, the stabilised Canons have been of quite high quality, but in all the models listed above, the exit pupil is only 3-3.3mm. Such a small exit pupil compromises viewing comfort and low-light viewing properties, and the complex optical design also cuts light transmission down enough to make the Canons visibly less bright than the best conventional binoculars. Thus there have certainly been doubts (some of them justified) concerning the suitability of the Canons for low-light use. In addition, the way the stabiliser

works as well as the use of rather high magnifications relative to the objective diameter require that the binoculars be assembled very precisely, and in my experience there have been rather pronounced variations in image quality between different pairs, especially with the higher-magnification models.

I tested the "rain waterproof" Canon 15x50 IS UD in ALULA 4/2001, and soon after purchased a pair for myself. Five years of use have not given me reason to alter my predominantly positive assessment, and the binoculars have functioned reliably in the heat of summer and the cold of winter alike. The limits of the rainproofing were met once on a week long sailing trip, after which the binoculars started to fog up internally in cold weather until I had them serviced. Although the stabiliser is not perfect, the calming effect it has on the image and the chance to take my time to study all the details on the target are always welcome.

Canon have loaded their new 10x42 L IS binoculars with a number of features which should, at least in principle, make it much more attractive to birders than the previous models have been. Firstly, it is stated to be waterproof and fog-free. My testing protocol does not include immersion in water, but Canon gains some credibility by advising that if the binocular has been stained by salt water, you should soak it in a bucket of fresh water for an hour or two before rinsing it clean and drying it. Other changes/improvements include twistable eyecups, lockable diopter adjustment, a much-improved neoprene strap, proper rainguards, longer battery life and, most importantly, a large enough 4.2mm exit pupil and, with the "L" designation, a promise of top-quality optics.

Testing the new Canons was not as straightforward as usual, however. The first unit I tried had prominent enough optical aberrations (of the kind caused by poor assembly) in both tubes that I deemed them unsuitable for a test. The importer's demo pair, meanwhile, were damaged at a fair before we had a chance to borrow them. Finally, a fellow birder who had bought the 10x42 IS in December kindly lent me his, and a star-test showed them to have good enough manufacturing tolerances to give a reliable indication of the binoculars' potential. Quality variation, resulting in visibly differing image quality between pairs, is always a problem for testers of birding optics. Very rarely, if ever, is it possible to try out a large enough number of pairs to form even a rough idea of the magnitude of variation or the likely proportions of "good/poor" units. I have seen lamentably large variations in quality with other top brands as well, but in a stabilised binocular any aberrations are much easier to see. The test results and user impressions in the following report are based on this later and better unit, but in the paragraph where I discuss resolution, I include some results from the poorer unit which I had measured earlier so readers can draw their own conclusions and the manufacturer can get some feedback.

I had the Canons on loan for about two weeks in March 2006. I used them in the field on several days, of which one rather gray morning was spent with our test team in the Viikki reserve in Helsinki. The period included both sunny and cloudy winter weather, as well as a couple of starry nights. A few fellow birders also briefly tried the binoculars and commented upon them. Resolution tests were, as usual, done indoors to eliminate heat haze effects and to have sufficiently constant lighting. As a reference, I used a Nikon 10x42 SE porro which has served in this role for nearly a decade now, and which still has first-class optics. In addition to the Nikon, our test team used Zeiss 10x42 FL and Leica Ultravid 10x42 during the field test.

## Optical quality

Resolution: I measured the resolution of the Canons both with my eyes only and with a 3x "booster." Tripod-mounted and viewing with both eyes, I could resolve 2.8 line-pairs/mm at 10 m. Considering the steps in the target and the acuity of my eyes, this is the maximum result I can obtain with 10x binoculars. With the booster, the Canon resolved about 5.6 lp/mm through the right barrel and 5.0 through the left barrel. Thus far, the best 10x binocular resolutions I have measured with this set-up have been 6.3 lp/mm (Nikon 10x42 SE, Swarovski EL 10x42 and Zeiss 10x40 Victory & 10x42 FL). Judging by the boosted results alone, the Canon does not equal the very best, but is nevertheless better than the best measured 10x32

models. In addition to my usual measurements, I measured the resolution for the Canons and the Nikons hand-held. With the 10x42 Nikon, I could resolve 2.0 lp/mm, while with the Canon 2.24 lp/mm. There are two likely factors to explain this somewhat surprising result. First, the Canon's heavier weight makes it more stable in the hands until they get tired holding it, and secondly 10 m is short enough a distance for the wider spacing of the Nikon's objectives to compromise its performance somewhat. With the Canon hand-held and using the stabilisation, I could resolve the same 2.8 lp/mm as on a tripod, but in order to resolve the pattern I needed to wait a while for the stabilisation to settle, and even then the image did not remain optimally sharp at all times. I also looked at the effects of stabilisation with a booster on the Canon tripod-mounted. After engaging stabilisation, the image softened momentarily and the target moved off-centre, but within a couple of seconds it re-centred and full resolution was restored. Generally, my impression was that "stabilisation artefacts" compromise resolution much less with the new 10x42 Canon than with the older 15x50 model, but that Canon has not fully solved the issue yet. The resolution results for the other sample which I had measured earlier and considered to be a subpar specimen were the same 2.8 lp/mm unboosted but only 4.0 lp/mm with the booster. Although the resolution difference between the pairs does not show in the naked-eye figures due to the gradation of the test target, it was obvious as a visibly softer and lower contrast image both when viewing the test target and in the field. In the weaker sample, the stabiliser also appeared to soften the image more.

An artificial star test revealed very slight astigmatism and a bit of stray light in the best focus. Centring of optical elements was good. In the weaker pair, a star test had shown prominent flare in focus, and considerable de-centring of elements in one barrel.

After these measurements, I expected the field tests to place the Canons slightly behind the top Zeiss, Leica and Nikon models when assessed on optical merits alone, without taking the stabiliser into account. However, the opposite was true: we unanimously felt the Canon gave the sharpest image. Considering the boosted test results, the reason must be some kind of aggregate effect of sharpness, contrast, colour rendition, and the relative lack of chromatic aberration. Whatever the cause, the Canons certainly gave the impression of having superior sharpness. Of the binoculars we pitted against the Canon, the Nikons have been tested many times over and are a good pair while the Zeiss and Leica were borrowed from a shop and visually evaluated with a test target but not specifically tested for aberrations.

Chromatic aberration: Canon corrects chromatic aberration by using two UD elements in each barrel. In the middle of the field, for instance when viewing birds flying against a bright sky or darkish objects against bright white snow, there is very little colour fringing in the Canon. Among top binoculars, only the Zeiss FL series can equal it. Moving towards the edges of the field-of-view, colour fringes widen rather quickly, but even then they remain narrower than usual – noticeably narrower than in the Nikon SE, which in turn beats all roof-prism binoculars save the Zeiss in this respect. When the stabilisation is on, however, chromatic aberration increases occasionally, and what there is is much easier to notice than in normal hand-held viewing. Contrast: The Canon has superb contrast, and even in this elite group did the best job of showing subtle brightness and colour gradations. Brightness: I compared light transmission by looking at the objectives of two binoculars side-by-side, their eyepieces pointing towards an evenly illuminated snowscape. In this test, the Canons were not quite the equal of the reference trio, but the difference was not very pronounced. A similar comparison between the 15x50 and 10x42 Canons showed a much greater difference in the 10x's favour. In the field, though, the Canon seemed brighter than the references. I also did a comparison between the Nikons and the Canons in deep dusk (dark enough for almost all colours to be invisible). In these conditions, the Nikons looked brighter by a barely perceptible margin. With the Canons using stabilisation, however, I could easily read text half as large as with the Nikons. This did not surprise me much, as I have repeatedly witnessed the benefits of stabilisation in low light when comparing the 15x50 IS with top binoculars. In spite of having a small exit pupil, the 15x50 has consistently shown considerably more detail (and more easily) than even the best of the 8-10x42 binoculars. Colour rendition: The Canons have very good colours. There is a slight yellow bias, which is somewhat more pronounced than

in the Zeiss FLs, but a sunny snowscape still looked natural through it. Colours are vivid and bright, and in the field our testers thought the Canons showed subtle colour hues better than the other binoculars. Flare and backlight properties: The Canons were very good in this regard as well. There were occasional slight reflections in the image, but they did not interfere with the image. I directly compared the Canons to the Nikons at sunset by looking at scenery details on either side of and just below the setting sun. At certain angles, both showed very narrow colour arches in the image, but the Canons were markedly better at maintaining image contrast especially with the sun just barely outside the view. On the other hand, Canon's miserable eyecups allow plenty of stray light to enter from the side. Such light is most detrimental when it enters from the front and gets to bounce back and forth between the eye and the eyepiece lens, though, and since the eye cups are very wide, they do a reasonable job at blocking light from these angles. Image quality near the edge of field in the Canons is better than in any binoculars I have ever used. The field-flattener lenses work so well that the same focus setting gives the sharpest image both at the centre and the edge. Towards the edges chromatic aberration increases markedly and astigmatism somewhat, but even at the very edge I could still resolve 1.2-2 lp/mm, or about half of the centerfield resolution. With many top binoculars edge resolution is so poor that normal resolution testing is not even feasible. There is some pincushion distortion, but very little of the usual change of magnification from the centre to the edge. All in all, I am tempted to say that the Canons are the first binocular for which the advertising cliché "sharp to the edge" is no longer a sorry joke. The Canons also have a pleasantly wide "sweet spot," or area of good sharpness around the centre. Ease of viewing: As far as the optics of the Canons' go, there was nothing to complain about. The best image is quickly found and is peaceful and coherent. A testament to this was that most of the people who tried the Canons praised something about their image quality within seconds of first putting them up to their eyes. The shortcomings which become apparent have to do with its external properties. It is heavy, the focus knob is too far back considering the centre of gravity, the stabilisation button is small, has indistinct operation and is almost impossible to find by touch with gloves on, and the eyecups are so poorly designed that they are literally painful (if I were to buy these binoculars, I would immediately take them to a shoemaker and have the sharp edges rounded).

### Technical properties and usability

Size, weight and accessories: The Canons feel pretty massive. The length is rather normal, however, as is width, but the body is 85mm thick. For their specifications, Canon has managed to squeeze the weight down to 1,030g. Since you are not likely to use binoculars without their strap, eyepiece rainguards and, with IS binoculars, rechargeable batteries, I weighed the Canon with these and got a weight of 1,210g. For comparison, the Zeiss 10x42 FL with their strap and guards (also including the objective covers) weighs 860g. This is a substantial weight difference. Fortunately, Canon's strap has improved, and the 5cm wide contoured and padded neoprene strap does what can be done to help carry the weight. The eyepiece rainguard (finally included with Canons) is in the loosely fitting school which I prefer. Also provided is a push-on objective cover. This is a one-piece slab, which can be snapped onto the eyepiece cover for storage while the binocular is being used. This seems like a handy idea, but in practice it is pretty cumbersome and adds even more weight. The owner of the test sample had left it at home, so its weight is not included above.

Field of view is 6.5° giving a subjective field of 65°. This is a good wide-angle field for a 10x. Most top models have a slightly narrower field, although some have as much as 69°. Close focus and focus wheel action: The Canons focused down to 2.6 metres. Focusing is rather slow as focusing from 10 m to infinity takes a 190° turn of the wheel. Precise focusing is easy, but large focus adjustments take some time. The focus action is smooth and easy, but occasionally the image twitched a bit while focusing as if the focus rails were not always keeping the lenses precisely aligned. In the -5 C° weather we had during the test period, the focus did not stiffen up noticeably. The depth of field also appeared to be very good. Use with glasses and diopter adjustment: Eye-relief measured from the plane of the eyecup rim was 13mm. Canon specifies

16mm for the 10x42, and this is probably accurate if measured from the surface of the eye lens. My “reference” spectacle wearer got a full view with the Canon, but the eye relief is not sufficient for everyone. With a different eyecup design or by removing the eyecup rubbers one would get a couple of extra mm of effective eye-relief. The eyecups twist out 11mm, but it is hard to imagine anyone wishing to do so. Since the Canon eyecups are huge (44mm diameter) and have a sharp edge, they do not fit the average eye-sockets. Eyecup comfort is heavily dependent on individual facial anatomy, but I do not understand whom Canon has designed these eyecups for. With many binoculars I have wished for eyecups that would extend further out, but with this model I ended up keeping them fully twisted in and supporting them against my brow. Even then the sharp rim was uncomfortable. Another alternative was to twist them out slightly and to support them on both the brow and the bridge of my nose, but this quickly started to hurt my nose. Anyone with even a moderately sizeable nose will be forced to keep the eyecups all the way in. The eye lens diameter is 23mm, a pretty normal size for premier binoculars. Since most of the competition has succeeded in designing rather good eyecups around similarly-sized lenses, Canon could certainly also do it. Focus margin past infinity, needed by those who are very near-sighted and do not wear their spectacles while viewing, was ample; indeed, there was considerably more than in the Nikon SE. Diopter is adjusted by pulling a locking ring around the right eyepiece barrel towards the objective end of the binocular and then twisting the ring, whereby the entire eyepiece assembly rotates in or out. The locking ring is notched at approximately 1/3 diopter intervals. This eyepiece assembly is not entirely stable but rocks a bit if pressed. In the first sample I tried, this caused a slight but visible altering of binocular collimation when I pressed the binoculars against my brow. The continuous adjustment without a locking ring found in the Canon 15x50 is more solid and easier to use. Other observations: The body is rubber-armoured except for a metal top panel. The rubber has a good feel and gives a secure grip. The stubby body is easy to hold between the palms, but the focus wheel is so far back and so small that I had to move my hand from the best hold in order to reach it. The stabiliser button is roughly where my right index finger naturally rests. With bare hands it was easy to find by touch, but not when wearing gloves. It was also less responsive than in the older 15x50 model. Continuous pressing keeps the stabilisation engaged until one releases the button, and pressing it briefly turns it on for five minutes or until the button is pressed again. The stabilisation also switches off if the binocular is hung objectives down for about 10 sec. Interpupillary distance is adjusted by twisting the eyepiece assemblies towards or away from each other. It is easy to do and keeps its setting well. There are no interpupillary distance markings, although they would be very easy to incorporate into the design. Looks are a matter of taste, of course, but the Canon reminded me more of a 1980s video camera than modern top-end binoculars. A built-in tripod mounting thread situated under the body is a big plus. No clumsy adapters are needed for using a ‘finnstick’, and some weight is saved as well. Also under the body is the battery compartment lid. Two AA-size batteries or rechargeables are needed. The owner’s manual tells you to keep the lid gasket clean and to replace it every couple of years to maintain full waterproofing. I used the binocular with 2.5 Ah NiMH cells, which - to my surprise - did not have to be charged even once during the test period even though I used the binoculars quite a lot and the stabilisation was mostly on. I thus find it probable that one pair of fully charged spares is all you ever need for a day in the field.

## Summary

With three reservations, the Canon 10x42 L IS is the best 10x binocular currently available. If you get an optically good sample, can deal with the weight issue and learn to live with the uncomfortable eyecups, the Canon will offer unparalleled image quality even without the stabilisation feature. On top of this, stabilisation brings so much added value in so many situations that once you have got used to it, you might find it very difficult to be satisfied with traditional binoculars again.

Canon deserves praise for daring to take new roads in their product development and for their brilliant optical design. At the same time, we hope that they deal with the apparent quality control issues as

soon as possible. In addition, Canon should go back to the drawing board and re-design at least the eyecups from the ground up, and while we are waiting for the Mark II version, should offer replacement rubber eyecups with rounded edges for those who have already bought this model.

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