

**VIVITAR
SERIES 1
70-210mm f/3.5
Macro Focusing Zoom
Serial No. 22410910
(Kino Precision)**

MODERN PHOTOGRAPHY
October 1974
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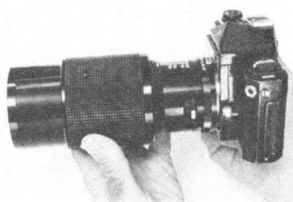
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**VIVITAR SERIES 1:
70-210MM MACRO ZOOM**

MANUFACTURER'S SPECIFICATIONS: 70 to 210mm f/3.5 Vivitar Series 1 Macro Focusing Auto Zoom for Pentax, Canon, Nikon, Minolta, Konica, Olympus OM-1 and cameras with similar mounts. **FEATURES:** Apertures to f/22 (f/16 on lenses for EE cameras), focusing to 6 ft. 6½ in. (2 meters) in standard range, to 3 in. (80mm) from front lens element in macro mode (magnification 1:2.2), accepts 67mm lens accessories. **PRICE:** \$429.50.

While we have been besieged with requests for a test report on this much heard about, much discussed but seldom seen lens, writing about it seems almost anticlimactic. We first reported its existence in Feb. 1972, did an extensive coverage of its practical general applications in March 1973 and analyzed and compared its macro abilities as recently as May 1974. Yet none of our reporting has yet involved the careful lab and field tests which make up a true MODERN TEST analysis and evaluation.

While it might indeed appear that we have been remiss, we have been so with reason. In 1972 we examined a prototype. In 1973 and even as late as May 1974, the lenses we reported on were evolutionary and not final. The growing pains of a lens which had been optically computed by Ellis I. Betensky of Opcon Associates in Stamford, Conn., and then mechanically optimized and prepared for manufacture by Renzow Watanabe of the engineering division of Kino Precision Industries, Ltd. (Japanese manufacturers of the lens for Vivitar) were considerable. The movements of the internal elements during the zoom were most complex and required extremely precise yet unusually rugged and sturdy radial cams and keyways. Yet the movements of the lens—zoom, focus, macro mode—had to be effortlessly smooth with just the right amount of friction. Such an international pooling of talents as the U.S. marketer, Ponder & Best, has accomplished, could not produce a final product swiftly. How can you distinguish the latest lenses from the earlier ones? The new lenses have a 67mm front diameter instead of the original 62mm. They accept an accessory lens hood rather than having the telescoping built-in lens hood of the earlier versions. (The built-in lens hood had to be abandoned to allow a larger front lens-cell which the im-



Vivitar's one-touch control means you zoom by push-pulling the collar and focus by twisting.

proved internal engineering required.)

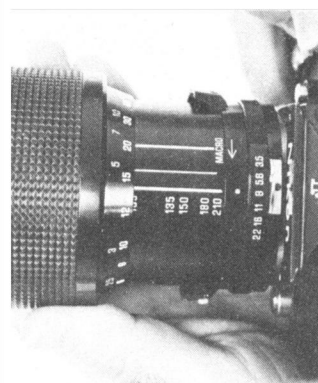
While we have given a general description of the lens before in our other stories and articles, we better get it all together here once and for all:

The 6½-in. long, 3 1/16-in. diameter, 15-element-in-10-group optic weighs 31 oz. It uses the one-touch operating control: a single 2½ in.-wide studded rubberized grip control collar causes the lens to zoom from shortest to longest length when pulled inwards and also adjusts focus by rotating. Therefore, with some dexterity, you can both zoom and focus at the same time.

In order to switch the lens into the macro focusing mode, you must first pull the control ring inwards to the 210mm marking, press a white button on the left collar grip (see photo) and twist the grip to the left so that the two yellow "macro" markings, one on the collar and one on the lens barrel, match each other. Now by using the zoom control you can vary the focusing distance and magnification in the macro mode. The shorter the focal length in macro mode the greater the magnification. At the 70mm focal length, you reach 1:2.2 (nearly as great as a standard macro lens without a life-size adapter). At this point the front of the lens will be some 3 in. from the subject and the focal plane about 11 in. away from it.

The method by which the Vivitar is able to be macro focused is no great optical mystery. Zooms contain a group of lenses which alter the focal length, known as the zooming elements. These are usually followed by a compensating group of elements which are linked to the zoom elements and move separately to maintain proper focus on the film plane. If instead there are no compensating elements or we lock the compensating elements in one place and prevent their movement, the lens still changes focal length but no longer maintains focus. As focal length decreases so does

the focusing distance. What is actually happening is that the center of the lens is moving forward, closer to the subject and away from the film plane, instead of remaining relatively fixed. As a result the lens can focus closer and closer. So when you move the Vivitar's zoom control to the 210mm position and then twist the barrel to the macro mode, you are actually detaching the compensating elements and locking them in a rear position. Now when you use the zoom control only the zoom elements will move and thus constantly change focus, getting closer and closer as focal



In normal focusing range, you set footage opposite heavy line next to focal length settings.

length decreases. It is most important not to force the macro control but make certain that when you do twist the barrel it is indeed at the full 210mm setting. You could damage the cams or keyways if you try to force the lens into the macro mode at some other position.

From a mechanical convenience standpoint, it would be virtually impossible to fault the lens except for the somewhat perverse need to push outward on the collar to decrease the zoom length when it would be more likely to push inwards. This operation, however, quickly becomes quite natural. While either pushing or pulling on the single collar actually causes many divergent movements within the lens barrel, the collar still moves with admirable smoothness, not being stiff as in some zoom lenses and yet not being so loose it will move of its own accord as in other zooms we've used. The engraved white-on-black aperture ring settings, zoom focal lengths (also white on black), brilliant yellow macro settings, bright red infrared line and easy-to-read green meter scale are all commend-

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able. The designer should be congratulated for engraving the most useful focal length markings: 85mm, 105mm, 135mm, 150mm and 180mm which equal those particular single focal lengths that this lens is designed to replace. And no one can deny that the single one-touch control is the most convenient method of operating such a lens.



To move lens into the macro range, you must set zoom to 210mm and push white button on left collar grip as shown. Then twist barrel to left.

The lens does have a liability. To accommodate the single-touch collar, there is no tripod socket. The zoom collar occupies all areas where a tripod socket or rotating tripod socket might be included. The lens is primarily meant to be hand held. The camera body proper can be locked to a tripod rather than the lens, even though the lever effect of the lens on the camera will cause the camera body to tilt downwards on anything less than a well-locked tripod head. However, we judged the added force on the lens mount to be well within the allowable limit before mount strain damage could possibly result.

Shifting into the macro focusing range can be accomplished with facility. While some of the earlier prototype lenses we tried did need a bit of fiddling, the new production units shifted with no hesitation.

For sharpest results, the focusing ring should be kept so the yellow "macro" marking travels along the bright yellow "macro" line on the lens barrel, an easy matter since the macro marking occurs at the closest focusing footage where the focusing ring stops anyway.

While the most exciting initial use of the Series 1 in the macro mode will be at the approximate 70mm position for maximum close-up magnification (where you can close in on a stamp or just an eye) we found the mid-range to be of more general day-to-day use. As we've pointed out before, zoom lenses do focus amazingly close at their maximum zooms (for instance the Vivitar does produce a very tight portrait at the 210mm setting when focused at 6½ ft. (2m) or less). But what if you should wish to shoot a close-up at a lesser focal length, say at 85 to 105mm, where apparent perspective will be more natural and the lens easier to hold steady? The zoom in its normal zoom range still will not allow you to focus any closer than the same 6½ ft. (2m), far too great a distance for a good close portrait. In such an instance a zoom owner would normally have to shift to a single focal length lens—perhaps a 105mm which would focus to 3½ ft. (1m). But the macro mode of the Vivitar (or other macro zooms) solves the problem neatly. In the macro mode, when set to the 105mm zoom setting, the Vivitar will focus to 3½ ft. (1m). At the 85mm setting in the macro mode, the Vivitar produces a shattering 18 in. (45cm) film plane to subject distance, bettering the close focusing performance of any 85mm lens that we know of.

However, into each lens's performance a little compromise must fall. It must be clearly understood that the focusing distance in the macro mode governs the focal length setting and vice versa. In other words, to change focusing distance you must change focal length or to change focal length you must change focusing distance. However, when working with the lens, we do not feel you will find this any real handicap.

The second compromise involves edge sharpness. The Vivitar is a zoom lens with added macro focusing ability but it is not a lens designed for highest possible definition in the macro mode. Tested at 1:4 in the macro mode, we found the central definition to be spectacular—earning our term "excellent" at all apertures. The edges and corners were usable but would not be acceptable by the standards of a true macro lens where edge definition should approach central. Except at f/16 or f/22 the lens should not be used for fine copywork if edge performance is vital. However, for three-dimensional objects—portraiture, na-

ture, flower photography—it will be more than merely adequate.

We were particularly anxious to try out the new Series 1 zoom in field tests. Our experience with the earlier samples had been most pleasing except for a somewhat alarming amount of contrast



In macro range, word "macro" is opposite aperture dot. "Macro" lettering on focusing ring should be kept on same line. You focus by push-pulling the zoom collar.

loss and flare in all situations where there was intense sunlight illumination. We're pleased to report that interior baffling has been improved vastly eliminating this very vexing problem. Even on the focusing screen the improved crispness and brightness could readily be seen, also providing an image that is much easier to focus on.

While on the subject of focus, we should point out that the Vivitar's relatively large-for-a-zoom-of-this-type maximum aperture of f/3.5 has an additional advantage over slower zooms. Besides simply providing more lens speed, the greater aperture makes obtaining sharp focus on the camera's micro-prism far easier.

In terms of construction and finish, we could not fault the Vivitar. It is built to exceedingly high standards and is in no way a budget priced optic—as the price certainly indicates!

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Central color fringing (causes image unsharpness with color fringing): Although purple fringing was strongly visible at large apertures in our lab examination, it disappeared by f/8 and was not noticeable at all in our picture-taking tests.

Central spherical aberration: (causes focus shift and flare): At the longest zoom focal lengths, rather large amounts of flare could be detected on our optical bench but disappeared by f/6.3. This flare could be seen in our slides and we traced it to internal reflections in the lens.

Edge lateral color fringing (causes persistent image unsharpness, possible multiple colored images): At the tele setting we detected an outward purple fringing in our lab tests, from the zonal area to the corners. The aberrations, however, were well controlled at wide and middle zoom ranges. Our slides showed very good correction at 70mm, but undercorrection at 135mm to 210mm produced purple fringes. In the macro mode at 70mm, the fringe was green.

Edge astigmatism (causes image streaks): On the optical bench the radial and tangential astigmatism in the extreme corners was large but we weren't sure it would show in actual picture taking. Our shots failed to turn up noticeable amounts except in the macro mode where it did increase, staying rather large to f/8 and f/11.

Edge coma (causes flare): In the lab, the flare appeared rather low at all focal lengths and disappeared at f/8. In our pictures the flare was rather large at big apertures but mostly disappeared in slides made from f/5.6 onward.

Optical decentering (causes problems in all areas): The Vivitar showed a normal amount at the tele setting (for a zoom) and it was smaller at a wide-angle setting. We felt decentering was well controlled.

Residual ghosts and flare: Very low for a zoom lens.

Linear distortion: It was very low at 70mm—only 0.5% barrel becoming 0.5% pincushion at 135mm, then becoming 1% at 210mm—well within permissible limits.

Resolution Power

70-210mm f/3.5 Vivitar Macro Zoom No. 22410910. At 70mm At 1:49 Magnification

f/no.	Center Lines/mm	Corner Lines/mm
3.5	V/Good	44
5.6	Exc.	62
8	Exc.	62
11	Exc.	62
16	Exc.	55
22	Good	44

Actual Focal Length:
72.9mm-200.8mm
Zoom Ratio: 2.75

At 135mm At 1:50 Magnification

f/no.	Center Lines/mm	Corner Lines/mm
3.5	Exc.	50
5.6	Exc.	70
8	Exc.	70
11	Exc.	50
16	Exc.	56
22	V/Good	45

At 210mm At 1:39 Magnification

f/no.	Center Lines/mm	Corner Lines/mm
3.5	Good	39
5.6	Good	44
8	Exc.	55
11	Exc.	55
16	V/Good	49
22	V/Good	49

Image Contrast

70-210mm f/3.5 Vivitar Macro Zoom At 70mm At 30 lines/mm

f/no.	Center Percentage	Corner Percentage
3.5	Medium	43
5.6	Medium	53
8	Medium	58
11	High	65
16	High	61
22	Medium	55

At 135mm

f/no.	Center Percentage	Corner Percentage
3.5	V/Low	24
5.6	Medium	44
8	High	65
11	High	59
16	Medium	54
22	Medium	48

At 210mm

f/no.	Center Percentage	Corner Percentage
3.5	V/Low	27
5.6	Medium	45
8	Medium	52
11	Medium	55
16	Medium	48
22	Low	43

We noted that at maximum aperture, our slides appeared to be slightly dark—approximately ½ f-stop. We did check the f/stop and found it to be well within tolerances at f/3.74 at the 70mm setting and f/3.76 at 210mm. We traced the loss of transmission to the actual transmission of light with the true T-stop varying between about T/4.2 to T/4.7. Based on this we would recommend that users increase exposure at maximum aperture approximately ½ f-stop unless, of course, you use a through-lens-meter SLR.

While MODERN's usual permissible variation from actual marked focal length range (or zoom ratio) is 5%, the Vivitar zoom lens is 8.3%. This is rather on the high side, being an actual 72.9mm at the 70mm setting and 200.8mm at the 210mm setting. It's within manufacturing and Japan Camera Inspection Institute Standards, however. Since it is a macro zoom and thus a somewhat unusual optic we did accept the 8.3% variation.

In summation, we would say that the Vivitar Macro Zoom is truly a remarkable accomplishment in which the designers have attempted and largely succeeded in providing a flexibility of close focusing, convenience of one-touch control, plus compactness and lightness all in one package. As a practical, usable lens, there is none superior.