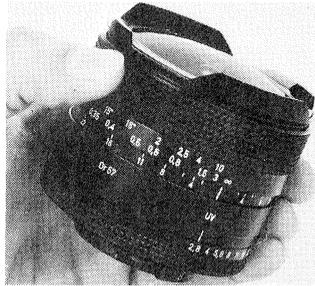


16mm f/2.8 ZEISS F-DISTAGON FISHEYE

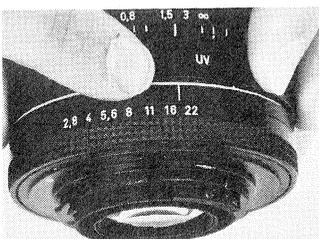
Mounts: Contax RTS, Yashica FX, FR
Filter size: Internal filter turret
Apertures: f/2.8 to f/22
Min. focus dist.: 12 in. (0.3m)
Features: Multicoating, internal filter set (UV, Orange 57, Yellow 50, Blue correction 11)
Serial no.: 5861949
Size: 2.75 in. diam., 2.4 in. long (70 x 61.5mm)
Weight: 16 oz. (454g)
Price: \$645; may be available at a discount price



Lens appears fairly compact, but thick front element leads to hidden ounces.

Practical Comments: Zeiss has avoided the fisheye lens for amateur cameras in the past, making this entry unusual. Typically, the design includes two very thick elements which greatly improve image quality, but also result in added bulk (16 oz.). A fisheye-type lens has a lot of barrel distortion in the image. Zeiss designed this lens to follow a sine-of-the-angle rule which enables corner illumination to almost equal that at the center (see performance chart). This usually results in bunching-up of the subject details toward the corners; however, in this lens it is slight and not too obvious. Pictures have good quality over the full format. The images formed by this fisheye fill a full 35mm frame; shorter focal length fisheyes produce circular images on the negative. It's fast at f/2.8 but heavier. This type lens is particularly useful for photography in tight spaces or to produce images with exotic distortion.

The built-in filters are excellent and don't change image quality at the center or corners. The filter collar detents lock securely in



Pull up and turn filter ring to change—red warning line below appears if filter isn't properly indexed into detent position.

place; you can't take pictures at midpoints. With Type A film the blue, color-correcting filter showed very slight pinkish tones in daylight shadow areas. There is always a filter in position, but even with the UV filter indexed in we saw no noticeable coloration in spite of the very thick front glass elements.

Performance

Our Standard	Tested
Focal length: ±5% (15.2-16.8mm)	16.5mm
Max. Aperture: ±5% (f/2.7-f/2.92)	f/2.78
Distortion: ±3%	fish-eye
Light Falloff: at f/5.6 ± 1 stop from theoretical limit	-0.3 stops

On the Optical Bench: The central image quality exhibited a slight undercorrected spherical aberration flare at f/2.8. This was accompanied by a small amount of red-green color flare which we judged to be less than average. Both aberrations vanished when we stopped down to f/5.6. At this point the central star image was about diffraction limited, and appeared to be well centered. The extreme off-axis image was difficult to judge because the extreme corner is equivalent to a target position 90° from the optical axis (and to the optical bench). Instead, the target was set up at an off-axis angle of about 50°, corresponding to an image point near the short edge of the 35mm film format. A small amount of lateral color was observed, less than 0.02mm, which is better than acceptable tolerances. No coma or astigmatism of any significance was seen. The axial and off-axis images were sharp and free of flare. *In field test slides:* Whether at long range, medium distance, or close in (less than 2 ft.), we could see sharp and contrasty image details. The only complaint might be the "bunching-up" of the subject near the edges and corners; but when

Resolution

at 1:51 magnification				
f/no	Center Lines/mm	Corner Lines/mm		
2.8	Exc.	80	Accept.	25
4	Exc.	80	Accept.	25
5.6	Exc.	80	Good	32
8	Exc.	80	V/Good	36
11	Exc.	80	Exc.	40
16	Exc.	56	V/Good	32
22	Exc.	50	V/Good	32

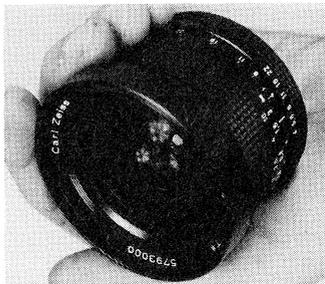
Contrast

at 30 lines/mm				
f/no	Center %	Corner %		
2.8	Low	27	V/Low	11
4	Low	32	V/Low	14
5.6	Low	38	V/Low	15
8	Low	44	V/Low	16
11	Low	48	V/Low	17
16	Low	48	V/Low	18
22	Low	38	V/Low	10

viewing 180° distortion is inherent in the design. When the lens was used to photograph panoramic views, skillful camera work minimized this squeezed-edge appearance. Straight lines are reproduced as noncircular, almost parabolic arcs. For some fisheye purists, this might be a slight annoyance. Zeiss' T* multicoating proved to be very effective in controlling residual ghosts and flare. For the great majority of users, the images from this lens will be most pleasing in terms of sharpness and clarity of detail. Excellent image quality is achieved despite a relatively simple eight-element design.

18mm f/4 DISTAGON FOR CONTAX/YASHICA

Mounts: Contax RTS, Yashica FX, FR
Filter size: 70mm screw-in
Aperture: f/4 to f/22
Min. focus dist.: 12 in. (0.3m)
Features: Multicoating, floating-element design
Serial No.: 5793000
Size: 2.76 in. diam., 2.03 in. long (70 x 51.5mm)
Weight: 12.5 oz. (354g)
Price: \$485; may be available at a discount price



Average in size and weight for ultra-wide angle, but above average in performance.

Practical Comments: This ultra wide angle has a 100° diagonal angle of view. It's the widest wide-angle lens Contax/Yashica owners can buy—the next step is a 16mm full-frame fisheye. Compared with other lenses in this category, this Distagon is of average size—not larger or heavier than most. When judging wide-angle lens performance there are two important aspects to consider: the amount of vignetting that occurs, and sharpness, especially at the corners. The somewhat slow maximum aperture of f/4 helps alleviate inherent vignetting problems. At f/5.6, in the extreme corners, illumination is only 1.1 stop less than at center, well within laboratory tolerances. Zeiss utilized a floating-element design in this Distagon optical system, thus improving image sharpness at the corners in shots at close subject distances, as our tests verified.

At a working focal length of 18mm, picture taking can generate perspective distortion prob-

lems. In outdoor pictures, the subjects near the edges of the picture showed the typical swollen, pulled-out look. But scenics and long-range shots with few straight lines were exceptionally clear. The image clarity in color transparencies taken with this lens belie the fact that they were taken with an 18mm ultra-wide-angle lens.

Performance

Our Standard	Tested
Focal length: ±5% (17.1-18.9mm)	18.4mm
Max. Aperture: ±5% (f/3.8-f/4.2)	f/4.1
Distortion: ±3% 1% (pincushion)	
Light Falloff: at f/5.6 ± 1 stop from theoretical limit (-2.5 stops)	-1.1 stops

On the Optical Bench: A small amount of overcorrected spherical flare was noticed centrally on axis, but it vanished at f/5.6. The central star image was free of color. On the bench as well as in pictures, good optical centering was observed. Off axis, a modest amount of astigmatism was seen, but no lateral color or coma. At f/8, the point images out to the extreme off-axis angle are free of flare and very compact. *In field test slides:* As we expected from our optical bench observations, the pictures were sharp all over the full-image area. Even wide open at f/4 only a bit of softness was detected, but with no loss in detail. At f/5.6 the images were critically sharp. Due to the light transmission of the glass shad-

Resolution

at 1:48 magnification				
f/no	Center Lines/mm	Corner Lines/mm		
4	Exc.	72	Exc.	44
5.6	Exc.	72	Exc.	44
8	Exc.	80	Exc.	44
11	Exc.	80	Exc.	44
16	Exc.	72	Exc.	44
22	Exc.	56	Exc.	44

Contrast

at 30 lines/mm				
f/no	Center %	Corner %		
4	Low	28	Low	20
5.6	Low	35	Low	20
8	Low	45	Low	22
11	Medium	55	Low	23
16	Medium	55	Low	23
22	Low	50	Low	24

ows tended to be a bit warm. Close in, the floating-element design appears to be doing its job well. Sharpness for off-axis points remains high, even a bit better than the off-axis images for medium and distance shots. There was no problem flare which causes softness in backlit situations, but with the sun reflecting in the field of view, a very compact orange ghost image becomes visible. Nonetheless, we judge the T* multicoating as very helpful and efficient in reducing these effects.