Vivitar®

Owner's Manual

80–200mm

f4.5

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AUTO ZOOM
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Capture a child's expression undisturbed at play. Stop a race car as it whizzes by. Freeze the setting sun over a stormy sea. These are just some of the wonderful pictures you'll discover as you enter the world of telephoto zoom photography. And your new Vivitar 80–200mm f4.5 lens has been designed to help you "get the picture" with a minimum of effort. However, before you begin, please take a few minutes to read this booklet. It will answer many of the questions you may have about your new lens and also includes some useful tips for better picture-taking.

Once you've read your manual, keep it as a handy reference guide. If a question arises that is not covered by this booklet, please write to: Consumer Affairs, Vivitar Corporation, 2700 Pennsylvania Avenue, Santa Monica, California 90406. Thanks.

Getting Acquainted with Your Lens

1. Accessory Thread
2. Zoom/Focus Ring
3. Distance Scales
4. Distance Index Line
5. Focal Length Scale
6. Aperture Reference Dot
7. Aperture Ring
8. Aperture Scale

A Word about Good Pictures...

Books have been written on what makes a good picture and how to take one. But *you* are the final judge. A good picture is the one that you enjoy.

There are, however, a few basic tips that can be kept in mind:

1. Keep the lens clean.
2. Hold the camera as steady as possible.
3. Be sure you focus as accurately as possible.

Just doing these three things will help.

Remember that people are more interesting when they're caught unaware of the camera. Your new

telephoto zoom lens allows you to bring far-away images closer, so experiment by trying to catch people being themselves.

Looking at the world from a new angle produces a whole new world. Try standing on a chair or bending on your knees. Every new perspective is a new picture.

Now on to specifics...

Mounting Your Lens

Because your new Vivitar Fixed Mount lens has been specifically designed and built for your individual camera brand, it will mount on your camera with the same ease as your normal lens. It's always a good idea to keep your front lens cap on while putting the lens on the camera. This helps eliminate accidental fingerprints or scratches on the front lens element.

Holding the Camera/ Lens Combination

Holding your camera steady is one of the keys to good picture-taking. A good way to support your new camera/lens combination is shown in Photo "A." By placing your left hand under the lens and holding the camera with your right hand, you ensure good balance and stability during shooting.

Focus and Zoom Control

Zooming and focusing are both controlled by the Zoom/Focus Ring ②. This "one-touch" system enables you to compose and focus your pictures quickly and easily.

Zooming: To zoom from one focal length to another, simply slide the Zoom/Focus Ring ② along the lens barrel until you see the image size and composition you want.

Sometimes you may prefer to shoot a picture at a specific focal length. Engraved on the lens barrel is your Focal Length Scale ⑤ which gives you the major focal lengths of your lens. If, for example, you want to shoot a picture at 135mm, align the Zoom/Focus Ring ② with the 135mm marking, compose, focus and shoot.

Focusing: To focus, rotate the Zoom/Focus Ring ② until your subject appears sharpest in your camera viewfinder. Since a large image can be seen more clearly, you may find it easier to focus with the lens set at 200mm and then zoom for the picture you want. The cam-operated focusing system of your lens will help you maintain the focus as you zoom. However, because zooming may cause you to turn the ring slightly, it's always a good idea to recheck your focus after zooming.

Your new Vivitar lens focuses from 6½ feet to infinity.

Exposure Control

The diaphragm within your lens is one of the ways you control the amount of light that reaches the film as you take a picture. When you rotate the Aperture Ring ⑦, the size of the opening of the diaphragm changes in accordance with the aperture or "f-stop" set. The larger the f-stop number, the smaller the opening of the lens diaphragm.

Engraved on the Aperture Ring ⑦ is your Aperture (or "f-stop") Scale ⑧. The Aperture Ring ⑦ has click stops at each marked f-stop setting. For added versatility and control, your new lens also has intermediate click-stop settings at half-stops between f5.6 and f16. You set your aperture (or f-stop) by aligning it with the red Aperture Reference Dot ⑥.

Automatic Diaphragm Control

The automatic diaphragm operation of your lens allows you to focus and compose your pictures with the diaphragm "wide open" (at maximum aperture). The diaphragm will automatically stop down to the preselected f-stop at the moment of exposure. It immediately re-opens as the exposure is completed.

NOTE: Universal Thread Mount lenses have an AUTO/MANUAL Switch (see photo "B") which must be set in the "**A**" (Auto) position for Automatic Diaphragm Control. In the "**M**" (Manual) position, the diaphragm opens and closes as the Aperture Ring ⑦ is turned.

Canon Mount lenses have an AUTO/MANUAL

Lever (see photo "C") which must be set at the clockwise end of its slot for Automatic Diaphragm Control. With the lever in the counter-clockwise end of its slot, the lens diaphragm opens and closes as the Aperture Ring is turned.

Checking for Proper Exposure

Most cameras today feature "through-the-lens" metering, which gives you fast and accurate exposure measurements. However, these measurements can change significantly as you move about looking for a new or more flattering view of your subject. As you look for new perspectives or if you just move slightly while composing a picture, the proportions of light and dark areas in the picture can change greatly. Therefore, to ensure proper exposure, remember to compose and focus your picture *before* measuring exposure.

EE Coupled Lenses

The Aperture Ring on Konica Mount lenses locks with a positive click when placed in the "**EE**" position. To remove Konica Mount lenses from EE operation, press the EE Lock Button (see photo "D") and turn the Aperture Ring to the specific f-stop you want.

Canon Mount lenses have a click-stop at the "**O**" marked EE position. The Aperture Ring may be set and removed from this position in the same manner as selecting a specifically marked f-stop.

On Minolta MD Mount lenses, the minimum aperture setting (f32) is engraved in green. When using this lens in the *shutter-priority* mode on a *Minolta XD-11* camera, the lens must be set at this minimum aperture position.

Estimating Distance

Your new Vivitar lens has two numbered Distance Scales ③ engraved on the Zoom/Focus Ring ② The *white numbers* (lower) indicate distance in *feet;* the *green numbers* (upper) show distance in *meters*. You can estimate the distance of the subject in focus by aligning the Distance Scales ③ with the Distance Index Line ④.

Depth of Field

Depth of Field is the area of acceptable sharpness in front of and behind the subject in focus. Aperture and focal length affect the size of this area of acceptable sharpness. Both can be used as a creative control in picture-taking.

Aperture: As shown in Photo "E," the smaller the aperture setting used (f32), the greater the depth of field area; the larger the aperture (f4.5 is shown in photo "F"), the smaller the area of acceptable sharpness. If you are shooting a landscape and want to record every detail as sharply as possible, use the smallest aperture possible. If you are shooting a portrait, however, you may want to emphasize your subject by blurring out the background. In this case, you would use the largest aperture setting possible. In both cases, however, be sure to check your shutter speeds to see that you are maintaining a proper exposure balance.

Focal Length: As a rule, the larger the focal length of a lens, the smaller the depth of field or area of acceptable sharpness. As you zoom, you may notice that the depth of field at 80mm (shown in Photo "G") is much larger than the depth of field at 200mm (shown in Photo "H").

Depth of Field Preview

Pressing your camera's Depth of Field Preview Button stops down the lens diaphragm to your pre-selected aperture. This allows you to see the depth of field in the viewfinder prior to taking a picture.

NOTE: On Universal Thread Mount lenses, the Auto/Manual Switch may be used for previewing depth of field. This is done by moving the switch to the "**M**" (Manual) position.

Depth of Field Tables

If you need more precise depth of field information than can be obtained by looking through your camera's viewfinder, check the Depth of Field Tables in the back of this manual. These give you precise information for select focal length/aperture combinations.

Taking Care of Your Lens

1—It's a good idea to keep a filter (such as a UV filter) on your lens at all times. This not only improves photographs, but also protects the front lens element from scratches.

2—When attaching threaded accessories (filters, etc.) to your lens, carefully align the accessory with the Filter Thread ① to prevent damage.

3—Keep your lens dust free by making sure both front and rear lens caps are in place when it's not in use.

4—Clean your lens with an air brush, anti-static brush or wipe it lightly with a camel-hair brush or lens tissue. In EXTREME cases use a clean, soft cotton cloth moistened with denatured alcohol. *Never rub the lens surface with your finger, clothing or any other abrasive material.* Cleaning your lens in this way will scratch the lens coating and can cause damage to the element surface.

5—Always store your lens in a cool, dry place.

Specifications

Focal Length: 80mm to 200mm

Optical Construction: 12 elements in 9 groups

Angle of Acceptance: 30° at 80mm; 12° at 200mm

Aperture Range: f4.5–f32*

Minimum Focusing Distance from Film Plane: 2 m (6.5 ft.)

Weight: 705 g (25 oz.)

Maximum Barrel Diameter: 70 mm (2.75 in.)

Length at Infinity: 147 mm (6 in.)

Lens Coating: MC (Multicoating)

Accessory Size: 55 mm

Lens Cap Size: 60 mm

Accessories Included: Front and rear lens caps.

*f16 on Konica mount

Specifications subject to change without notice. Weights and lengths may vary slightly, depending on lens mount.

Depth of Field Tables

80mm

ft \ f	4.5	5.6	8	11	16	22	32
7.00	6.79 ~ 7.22	6.74 ~ 7.28	6.64 ~ 7.41	6.51 ~ 7.58	6.31 ~ 7.87	6.09 ~ 8.27	5.76 ~ 9.03
8.00	7.71 ~ 8.31	7.65 ~ 8.39	7.51 ~ 8.56	7.34 ~ 8.80	7.08 ~ 9.23	6.79 ~ 9.80	6.36 ~ 10.95
9.00	8.63 ~ 9.40	8.54 ~ 9.51	8.36 ~ 9.75	8.15 ~ 10.07	7.81 ~ 10.65	7.45 ~ 11.45	6.93 ~ 13.12
10.00	9.53 ~ 10.52	9.42 ~ 10.65	9.20 ~ 10.96	8.93 ~ 11.38	8.53 ~ 12.15	8.09 ~ 13.24	7.45 ~ 15.60
12.00	11.30 ~ 12.79	11.15 ~ 12.99	10.82 ~ 13.48	10.44 ~ 14.14	9.87 ~ 15.41	9.26 ~ 17.29	8.41 ~ 21.76
15.00	13.88 ~ 16.29	13.64 ~ 16.65	13.13 ~ 17.49	12.56 ~ 18.67	11.70 ~ 21.05	10.83 ~ 24.89	9.65 ~ 35.98
20.00	17.99 ~ 22.47	17.57 ~ 23.19	16.71 ~ 24.91	15.75 ~ 27.48	14.39 ~ 33.23	13.05 ~ 44.52	11.31 ~ 104.41
30.00	25.54 ~ 36.16	24.66 ~ 38.12	22.95 ~ 43.23	21.12 ~ 51.98	18.66 ~ 78.76	16.39 ~ 209.43	13.66 ~ ∞
60.00	43.76 ~ 91.47	41.16 ~ 105.68	36.44 ~ 160.11	31.90 ~ 453.55	26.44 ~ ∞	21.98 ~ ∞	17.20 ~ ∞
∞	161.84 ~ ∞	130.05 ~ ∞	91.04 ~ ∞	66.21 ~ ∞	45.52 ~ ∞	33.10 ~ ∞	22.76 ~ ∞

m \ f	4,5	5,6	8	11	16	22	32
2,00	1,95 ~ 2,06	1,93 ~ 2,07	1,90 ~ 2,11	1,87 ~ 2,15	1,82 ~ 2,23	1,76 ~ 2,33	1,67 ~ 2,52
2,50	2,41 ~ 2,60	2,39 ~ 2,62	2,34 ~ 2,68	2,29 ~ 2,76	2,20 ~ 2,90	2,11 ~ 3,09	1,98 ~ 3,46
3,00	2,86 ~ 3,15	2,83 ~ 3,19	2,76 ~ 3,28	2,69 ~ 3,40	2,56 ~ 3,63	2,43 ~ 3,95	2,25 ~ 4,63
4,00	3,74 ~ 4,29	3,69 ~ 4,37	3,57 ~ 4,56	3,43 ~ 4,81	3,22 ~ 5,31	3,01 ~ 6,06	2,71 ~ 7,99
5,00	4,59 ~ 5,48	4,50 ~ 5,61	4,32 ~ 5,93	4,11 ~ 6,38	3,81 ~ 7,33	3,50 ~ 8,92	3,09 ~ 14,10
7,00	6,19 ~ 8,03	6,03 ~ 8,33	5,69 ~ 9,08	5,33 ~ 10,25	4,81 ~ 13,05	4,32 ~ 19,52	3,69 ~ 120,16
10,00	8,41 ~ 12,35	8,09 ~ 13,10	7,49 ~ 15,13	6,85 ~ 18,79	6,00 ~ 31,63	5,23 ~ 183,45	4,32 ~ ∞
20,00	14,23 ~ 32,20	13,33 ~ 38,14	11,71 ~ 63,99	10,18 ~ 429,59	8,37 ~ ∞	6,90 ~ ∞	5,36 ~ ∞
∞	49,33 ~ ∞	39,64 ~ ∞	27,75 ~ ∞	20,18 ~ ∞	13,87 ~ ∞	10,09 ~ ∞	6,94 ~ ∞

105mm

ft \ f	4.5	5.6	8	11	16	22	32
7.00	6.87 ~ 7.13	6.84 ~ 7.17	6.78 ~ 7.24	6.69 ~ 7.34	6.57 ~ 7.50	6.42 ~ 7.71	6.19 ~ 8.10
8.00	7.82 ~ 8.18	7.78 ~ 8.23	7.69 ~ 8.33	7.59 ~ 8.47	7.41 ~ 8.70	7.22 ~ 9.00	6.91 ~ 9.55
9.00	8.77 ~ 9.24	8.72 ~ 9.30	8.60 ~ 9.44	8.46 ~ 9.62	8.24 ~ 9.93	7.99 ~ 10.34	7.61 ~ 11.10
10.00	9.71 ~ 10.31	9.64 ~ 10.39	9.50 ~ 10.56	9.32 ~ 10.79	9.05 ~ 11.20	8.74 ~ 11.73	8.27 ~ 12.75
12.00	11.57 ~ 12.46	11.47 ~ 12.58	11.25 ~ 12.85	11.00 ~ 13.21	10.60 ~ 13.85	10.17 ~ 14.71	9.52 ~ 16.44
15.00	14.30 ~ 15.76	14.14 ~ 15.96	13.81 ~ 16.41	13.41 ~ 17.02	12.80 ~ 18.15	12.15 ~ 19.72	11.20 ~ 23.10
20.00	18.73 ~ 21.43	18.45 ~ 21.81	17.86 ~ 22.71	17.18 ~ 23.94	16.16 ~ 26.33	15.09 ~ 29.94	13.60 ~ 38.92
30.00	27.13 ~ 33.47	26.52 ~ 34.46	25.29 ~ 36.84	23.90 ~ 40.33	21.90 ~ 47.95	19.92 ~ 62.12	17.32 ~ 123.55
60.00	49.02 ~ 75.94	46.99 ~ 81.44	43.12 ~ 96.77	39.10 ~ 126.66	33.86 ~ 262.41	29.20 ~ ∞	23.79 ~ ∞
∞	266.78 ~ ∞	214.38 ~ ∞	150.06 ~ ∞	109.14 ~ ∞	75.03 ~ ∞	54.57 ~ ∞	37.52 ~ ∞

m \ f	4,5	5,6	8	11	16	22	32
2,00	1,97 ~ 2,03	1,96 ~ 2,04	1,94 ~ 2,06	1,92 ~ 2,09	1,89 ~ 2,13	1,85 ~ 2,18	1,79 ~ 2,28
2,50	2,44 ~ 2,56	2,43 ~ 2,57	2,40 ~ 2,61	2,37 ~ 2,65	2,31 ~ 2,73	2,25 ~ 2,82	2,15 ~ 3,00
3,00	2,91 ~ 3,09	2,89 ~ 3,11	2,85 ~ 3,17	2,80 ~ 3,23	2,72 ~ 3,35	2,63 ~ 3,51	2,49 ~ 3,81
4,00	3,84 ~ 4,17	3,80 ~ 4,22	3,73 ~ 4,32	3,63 ~ 4,45	3,49 ~ 4,70	3,33 ~ 5,03	3,10 ~ 5,72
5,00	4,74 ~ 5,28	4,68 ~ 5,35	4,56 ~ 5,52	4,42 ~ 5,75	4,20 ~ 6,19	3,97 ~ 6,80	3,63 ~ 8,17
7,00	6,49 ~ 7,59	6,37 ~ 7,75	6,14 ~ 8,13	5,88 ~ 8,66	5,48 ~ 9,72	5,08 ~ 11,42	4,52 ~ 16,14
10,00	8,96 ~ 11,30	8,74 ~ 11,67	8,30 ~ 12,58	7,81 ~ 13,94	7,11 ~ 17,03	6,42 ~ 23,25	5,54 ~ 60,28
20,00	16,03 ~ 25,92	15,32 ~ 28,05	13,97 ~ 34,19	12,59 ~ 47,12	10,82 ~ 128,54	9,26 ~ ∞	7,49 ~ ∞
∞	81,31 ~ ∞	65,34 ~ ∞	45,74 ~ ∞	33,26 ~ ∞	22,87 ~ ∞	16,63 ~ ∞	11,43 ~ ∞

135mm

ft \ f	4.5	5.6	8	11	16	22	32
7.00	6.92 ~ 7.08	6.90 ~ 7.10	6.86 ~ 7.14	6.81 ~ 7.20	6.73 ~ 7.29	6.64 ~ 7.41	6.49 ~ 7.62
8.00	7.89 ~ 8.11	7.87 ~ 8.14	7.81 ~ 8.20	7.75 ~ 8.27	7.64 ~ 8.41	7.51 ~ 8.57	7.31 ~ 8.86
9.00	8.86 ~ 9.14	8.83 ~ 9.18	8.76 ~ 9.26	8.67 ~ 9.36	8.53 ~ 9.54	8.36 ~ 9.76	8.11 ~ 10.15
10.00	9.82 ~ 10.18	9.78 ~ 10.23	9.69 ~ 10.33	9.58 ~ 10.46	9.40 ~ 10.69	9.20 ~ 10.97	8.88 ~ 11.48
12.00	11.74 ~ 12.27	11.67 ~ 12.34	11.54 ~ 12.50	11.38 ~ 12.70	11.12 ~ 13.05	10.82 ~ 13.49	10.37 ~ 14.31
15.00	14.57 ~ 15.44	14.47 ~ 15.56	14.26 ~ 15.81	14.00 ~ 16.15	13.59 ~ 16.74	13.14 ~ 17.51	12.45 ~ 18.98
20.00	19.21 ~ 20.83	19.04 ~ 21.05	18.65 ~ 21.54	18.20 ~ 22.19	17.50 ~ 23.37	16.72 ~ 24.96	15.58 ~ 28.20
30.00	28.21 ~ 32.00	27.81 ~ 32.53	26.98 ~ 33.77	26.01 ~ 35.46	24.54 ~ 38.69	22.99 ~ 43.47	20.81 ~ 54.84
60.00	53.00 ~ 68.86	51.55 ~ 71.48	48.66 ~ 77.98	45.48 ~ 88.01	41.03 ~ 112.14	36.74 ~ 167.52	31.32 ~ 980.37
∞	444.08 ~ ∞	356.85 ~ ∞	249.79 ~ ∞	181.67 ~ ∞	124.90 ~ ∞	90.83 ~ ∞	62.45 ~ ∞

m \ f	4,5	5,6	8	11	16	22	32
2,00	1,98 ~ 2,02	1,97 ~ 2,03	1,96 ~ 2,04	1,95 ~ 2,05	1,93 ~ 2,08	1,90 ~ 2,11	1,87 ~ 2,16
2,50	2,47 ~ 2,54	2,46 ~ 2,54	2,44 ~ 2,56	2,42 ~ 2,59	2,38 ~ 2,63	2,34 ~ 2,68	2,28 ~ 2,78
3,00	2,95 ~ 3,05	2,94 ~ 3,07	2,91 ~ 3,10	2,88 ~ 3,14	2,82 ~ 3,20	2,76 ~ 3,28	2,67 ~ 3,44
4,00	3,90 ~ 4,10	3,88 ~ 4,13	3,83 ~ 4,19	3,77 ~ 4,26	3,68 ~ 4,39	3,57 ~ 4,56	3,40 ~ 4,88
5,00	4,84 ~ 5,17	4,81 ~ 5,21	4,73 ~ 5,30	4,63 ~ 5,43	4,49 ~ 5,65	4,32 ~ 5,95	4,08 ~ 6,51
7,00	6,68 ~ 7,34	6,61 ~ 7,43	6,46 ~ 7,64	6,28 ~ 7,91	6,00 ~ 8,42	5,70 ~ 9,11	5,26 ~ 10,59
10,00	9,34 ~ 10,73	9,20 ~ 10,93	8,90 ~ 11,39	8,55 ~ 12,03	8,03 ~ 13,27	7,48 ~ 15,16	6,73 ~ 19,92
20,00	17,45 ~ 23,26	16,94 ~ 24,25	15,92 ~ 26,73	14,80 ~ 30,68	13,26 ~ 40,73	11,79 ~ 67,34	9,97 ~ ∞
∞	135,35 ~ ∞	108,77 ~ ∞	76,14 ~ ∞	55,37 ~ ∞	38,07 ~ ∞	27,69 ~ ∞	19,03 ~ ∞

150mm

ft \ f	4.5	5.6	8	11	16	22	32
7.00	6.94 ~ 7.06	6.92 ~ 7.08	6.89 ~ 7.12	6.85 ~ 7.16	6.78 ~ 7.24	6.70 ~ 7.33	6.58 ~ 7.49
8.00	7.91 ~ 8.09	7.89 ~ 8.11	7.85 ~ 8.16	7.79 ~ 8.22	7.70 ~ 8.33	7.60 ~ 8.46	7.43 ~ 8.69
9.00	8.89 ~ 9.12	8.86 ~ 9.15	8.80 ~ 9.21	8.73 ~ 9.29	8.61 ~ 9.43	8.47 ~ 9.61	8.26 ~ 9.91
10.00	9.86 ~ 10.15	9.82 ~ 10.18	9.75 ~ 10.27	9.66 ~ 10.37	9.51 ~ 10.55	9.34 ~ 10.78	9.07 ~ 11.18
12.00	11.78 ~ 12.22	11.73 ~ 12.28	11.62 ~ 12.40	11.49 ~ 12.56	11.27 ~ 12.84	11.02 ~ 13.19	10.64 ~ 13.82
15.00	14.65 ~ 15.36	14.57 ~ 15.45	14.39 ~ 15.66	14.18 ~ 15.92	13.83 ~ 16.39	13.45 ~ 16.98	12.85 ~ 18.09
20.00	19.36 ~ 20.67	19.21 ~ 20.85	18.89 ~ 21.24	18.51 ~ 21.75	17.91 ~ 22.66	17.25 ~ 23.86	16.24 ~ 26.20
30.00	28.52 ~ 31.59	28.18 ~ 32.02	27.48 ~ 32.98	26.66 ~ 34.28	25.39 ~ 36.69	24.02 ~ 40.09	22.05 ~ 47.47
60.00	54.14 ~ 66.98	52.91 ~ 68.98	50.40 ~ 73.82	47.60 ~ 80.92	43.56 ~ 96.44	39.56 ~ 125.45	34.34 ~ 253.29
∞	545.30 ~ ∞	438.19 ~ ∞	306.73 ~ ∞	223.08 ~ ∞	153.36 ~ ∞	111.54 ~ ∞	76.68 ~ ∞

m \ f	4,5	5,6	8	11	16	22	32
2,00	1,98 ~ 2,02	1,98 ~ 2,02	1,97 ~ 2,03	1,96 ~ 2,04	1,94 ~ 2,06	1,92 ~ 2,09	1,89 ~ 2,13
2,50	2,47 ~ 2,53	2,47 ~ 2,54	2,45 ~ 2,55	2,43 ~ 2,57	2,40 ~ 2,61	2,37 ~ 2,65	2,32 ~ 2,72
3,00	2,96 ~ 3,04	2,95 ~ 3,05	2,93 ~ 3,08	2,90 ~ 3,11	2,86 ~ 3,16	2,81 ~ 3,23	2,73 ~ 3,34
4,00	3,92 ~ 4,08	3,90 ~ 4,10	3,86 ~ 4,15	3,81 ~ 4,21	3,73 ~ 4,31	3,64 ~ 4,45	3,50 ~ 4,69
5,00	4,87 ~ 5,13	4,84 ~ 5,17	4,78 ~ 5,24	4,70 ~ 5,34	4,57 ~ 5,52	4,43 ~ 5,74	4,22 ~ 6,17
7,00	6,74 ~ 7,28	6,68 ~ 7,35	6,55 ~ 7,51	6,40 ~ 7,72	6,16 ~ 8,11	5,90 ~ 8,63	5,52 ~ 9,67
10,00	9,46 ~ 10,59	9,34 ~ 10,75	9,09 ~ 11,11	8,79 ~ 11,60	8,34 ~ 12,52	7,85 ~ 13,84	7,16 ~ 16,83
20,00	17,86 ~ 22,55	17,42 ~ 23,30	16,53 ~ 25,13	15,54 ~ 27,87	14,13 ~ 34,09	12,76 ~ 46,64	10,98 ~ 121,95
∞	166,21 ~ ∞	133,56 ~ ∞	93,49 ~ ∞	67,99 ~ ∞	46,75 ~ ∞	34,090 ~ ∞	23,37 ~ ∞

180mm

ft \ f	4.5	5.6	8	11	16	22	32
7.00	6.96 ~ 7.04	6.95 ~ 7.06	6.92 ~ 7.08	6.89 ~ 7.11	6.85 ~ 7.16	6.79 ~ 7.23	6.70 ~ 7.33
8.00	7.94 ~ 8.06	7.93 ~ 8.08	7.89 ~ 8.11	7.85 ~ 8.15	7.79 ~ 8.22	7.72 ~ 8.31	7.60 ~ 8.46
9.00	8.92 ~ 9.08	8.90 ~ 9.10	8.86 ~ 9.14	8.81 ~ 9.20	8.73 ~ 9.29	8.63 ~ 9.41	8.47 ~ 9.61
10.00	9.90 ~ 10.10	9.88 ~ 10.13	9.82 ~ 10.18	9.76 ~ 10.25	9.66 ~ 10.37	9.53 ~ 10.52	9.34 ~ 10.78
12.00	11.85 ~ 12.15	11.81 ~ 12.19	11.74 ~ 12.28	11.64 ~ 12.38	11.49 ~ 12.57	11.31 ~ 12.79	11.02 ~ 13.20
15.00	14.76 ~ 15.25	14.70 ~ 15.31	14.57 ~ 15.45	14.42 ~ 15.63	14.18 ~ 15.93	13.89 ~ 16.31	13.45 ~ 17.00
20.00	19.55 ~ 20.46	19.44 ~ 20.57	19.22 ~ 20.84	18.95 ~ 21.17	18.51 ~ 21.76	18.01 ~ 22.51	17.24 ~ 23.89
30.00	28.96 ~ 31.09	28.72 ~ 31.37	28.22 ~ 32.00	27.61 ~ 32.83	26.66 ~ 34.32	25.60 ~ 36.31	24.02 ~ 40.21
60.00	55.77 ~ 64.56	54.86 ~ 65.84	52.97 ~ 68.81	50.79 ~ 72.92	47.55 ~ 81.03	44.18 ~ 93.56	39.53 ~ 126.30
∞	789.89 ~ ∞	634.73 ~ ∞	444.31 ~ ∞	323.14 ~ ∞	222.16 ~ ∞	161.57 ~ ∞	111.08 ~ ∞

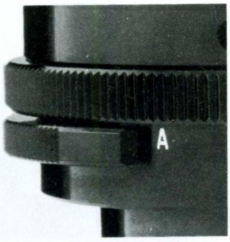
m \ f	4,5	5,6	8	11	16	22	32
2,00	1,99 ~ 2,01	1,99 ~ 2,01	1,98 ~ 2,02	1,97 ~ 2,03	1,96 ~ 2,04	1,95 ~ 2,06	1,92 ~ 2,09
2,50	2,48 ~ 2,52	2,48 ~ 2,52	2,47 ~ 2,54	2,45 ~ 2,55	2,43 ~ 2,57	2,41 ~ 2,60	2,37 ~ 2,65
3,00	2,97 ~ 3,03	2,96 ~ 3,04	2,95 ~ 3,05	2,93 ~ 3,07	2,90 ~ 3,11	2,86 ~ 3,15	2,80 ~ 3,23
4,00	3,94 ~ 4,06	3,93 ~ 4,07	3,90 ~ 4,10	3,87 ~ 4,14	3,81 ~ 4,21	3,74 ~ 4,30	3,64 ~ 4,45
5,00	4,91 ~ 5,09	4,89 ~ 5,11	4,84 ~ 5,17	4,79 ~ 5,23	4,70 ~ 5,35	4,59 ~ 5,49	4,43 ~ 5,75
7,00	6,82 ~ 7,19	6,78 ~ 7,24	6,69 ~ 7,35	6,58 ~ 7,48	6,40 ~ 7,73	6,20 ~ 8,05	5,90 ~ 8,64
10,00	9,62 ~ 10,40	9,54 ~ 10,51	9,35 ~ 10,74	9,13 ~ 11,05	8,79 ~ 11,61	8,41 ~ 12,37	7,85 ~ 13,88
20,00	18,47 ~ 21,69	18,14 ~ 22,16	17,46 ~ 23,27	16,69 ~ 24,83	15,54 ~ 27,97	14,36 ~ 32,99	12,76 ~ 47,18
∞	240,76 ~ ∞	193,47 ~ ∞	135,43 ~ ∞	98,49 ~ ∞	67,71 ~ ∞	49,25 ~ ∞	33,86 ~ ∞

200mm

ft \ f	4.5	5.6	8	11	16	22	32
7.00	6.96 ~ 7.04	6.95 ~ 7.05	6.93 ~ 7.07	6.91 ~ 7.09	6.87 ~ 7.14	6.82 ~ 7.19	6.75 ~ 7.28
8.00	7.95 ~ 8.05	7.94 ~ 8.06	7.91 ~ 8.09	7.88 ~ 8.13	7.82 ~ 8.19	7.76 ~ 8.26	7.65 ~ 8.39
9.00	8.93 ~ 9.07	8.92 ~ 9.08	8.88 ~ 9.12	8.84 ~ 9.17	8.77 ~ 9.25	8.68 ~ 9.34	8.55 ~ 9.51
10.00	9.91 ~ 10.09	9.89 ~ 10.11	9.85 ~ 10.15	9.80 ~ 10.21	9.71 ~ 10.31	9.60 ~ 10.44	9.43 ~ 10.65
12.00	11.87 ~ 12.13	11.84 ~ 12.16	11.78 ~ 12.23	11.70 ~ 12.32	11.56 ~ 12.48	11.41 ~ 12.67	11.16 ~ 13.00
15.00	14.79 ~ 15.21	14.74 ~ 15.26	14.64 ~ 15.38	14.51 ~ 15.53	14.30 ~ 15.78	14.05 ~ 16.10	13.66 ~ 16.66
20.00	19.62 ~ 20.39	19.53 ~ 20.49	19.34 ~ 20.71	19.10 ~ 20.99	18.72 ~ 21.47	18.29 ~ 22.09	17.62 ~ 23.20
30.00	29.12 ~ 30.92	28.92 ~ 31.16	28.48 ~ 31.69	27.96 ~ 32.37	27.13 ~ 33.59	26.19 ~ 35.18	24.78 ~ 38.22
60.00	56.38 ~ 63.83	55.59 ~ 64.88	53.95 ~ 67.30	52.02 ~ 70.61	49.12 ~ 76.91	46.04 ~ 86.18	41.71 ~ 108.02
∞	932.87 ~ ∞	749.63 ~ ∞	524.74 ~ ∞	381.63 ~ ∞	262.37 ~ ∞	190.81 ~ ∞	131.18 ~ ∞

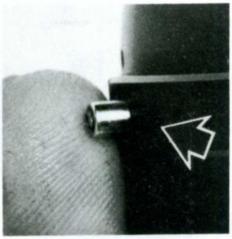
m \ f	4,5	5,6	8	11	16	22	32
2,00	1,99 ~ 2,01	1,99 ~ 2,01	1,98 ~ 2,02	1,98 ~ 2,02	1,97 ~ 2,04	1,95 ~ 2,05	1,93 ~ 2,07
2,50	2,48 ~ 2,52	2,48 ~ 2,52	2,47 ~ 2,53	2,46 ~ 2,54	2,44 ~ 2,56	2,42 ~ 2,58	2,39 ~ 2,63
3,00	2,97 ~ 3,03	2,97 ~ 3,03	2,96 ~ 3,05	2,94 ~ 3,06	2,91 ~ 3,09	2,88 ~ 3,13	2,83 ~ 3,19
4,00	3,95 ~ 4,05	3,94 ~ 4,06	3,92 ~ 4,09	3,89 ~ 4,12	3,84 ~ 4,18	3,78 ~ 4,25	3,69 ~ 4,37
5,00	4,92 ~ 5,08	4,90 ~ 5,10	4,87 ~ 5,14	4,82 ~ 5,19	4,74 ~ 5,29	4,65 ~ 5,41	4,51 ~ 5,62
7,00	6,84 ~ 7,16	6,81 ~ 7,20	6,73 ~ 7,29	6,64 ~ 7,40	6,48 ~ 7,61	6,31 ~ 7,86	6,05 ~ 8,34
10,00	9,68 ~ 10,33	9,30 ~ 10,42	9,44 ~ 10,62	9,25 ~ 10,87	8,95 ~ 11,33	8,62 ~ 11,93	8,12 ~ 13,10
20,00	18,69 ~ 21,42	18,41 ~ 21,81	17,81 ~ 22,71	17,13 ~ 23,96	16,09 ~ 26,37	15,01 ~ 30,01	13,51 ~ 39,06
∞	284,34 ~ ∞	228,49 ~ ∞	159,94 ~ ∞	116,32 ~ ∞	79,97 ~ ∞	58,16 ~ ∞	39,99 ~ ∞

A



B

C



D

E

F

G

H

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