

Vivitar.

35_{MM}—105_{MM} f3.5

AUTOMATIC FIXED MOUNT
ZOOM LENS

Owner's Manual



Before you begin —

Carefully study this Owner's Manual. Keep it with the lens for a guide when questions arise.

*Practice with your new Vivitar Lens. **Dry runs** — taking pictures without film — will help you get the **feel** of it.*

*Shoot a roll of film. After you see those first great pictures, you'll **know** that you and your new Vivitar lens are ready for an important occasion.*

Getting acquainted with your Lens

- | | |
|--------------------------|------------------|
| 1 Filter Thread | 7 Aperture Ring |
| 2 Focusing Ring | 8 Aperture Scale |
| 3 Distance Scales | 9 Lens Mount |
| 4 Distance Index Line | |
| 5 Zoom/Close-Range Ring | |
| 6 Aperture Reference Dot | |

Mounting your Lens

Your new Vivitar lens is designed to mount on your camera with the ease and simplicity of your normal lens.

Remember to keep the front lens cap in place during mounting to prevent accidentally touching the front glass element.

Holding your Lens

You'll usually find it best to support the camera/lens combination by placing your left hand under the lens (see photo "A"). This leaves your right hand free to operate the camera controls and assures good balance and stability when shooting.


Selecting Zoom or Close-Range Operation

Your new Vivitar lens has two modes of operation; Zoom and Close-Range.

To select the mode you want, turn the Zoom/Close-Range Ring ⑤ until the "35" marking aligns with the Distance Index Line ④ (see photo "B"). Now, *slide* the Zoom/Close-Range Ring *forward* for Zoom operation or *back* for Close-Range operation.

DO NOT FORCE: the Zoom/Close-Range Ring *easily slides between modes when set at the "35" marking.*

In the Zoom mode, the "∇ CLOSE-RANGE ∇" marking appears *behind* the Zoom/Close-

Range Ring (see photo "B").
In the Close-Range mode, the
"  CLOSE-RANGE — " marking
appears *in front of* the Zoom/Close-Range
Ring. (See photo "C")

Close-Range Operation

To photograph subjects between 5½ inches and
4½ feet in front of the lens —

- 1 — Set your lens for the Close-Range mode
of operation. (See page 1)
- 2 — Move the camera and/or subject until you
obtain the image size and composition you want.
- 3 — Focus by turning the Zoom/Close-Range
Ring ⑤ until the subject appears sharpest in
your camera viewfinder. (The focusing ②
ring should *always* remain set at "∞" infinity).

Helpful Hints for Close-Range Operation

- 1 — *Bracket*: shoot several pictures of the same
subject at different exposures; exposure in
close-up photography is critical. Under- and
over-expose by a half to a full stop as well as
shooting at "correct" exposure. This *insurance*
is well worth a few pennies in film.
- 2 — *Use a tripod or other firm support*: slight

movements and vibrations can ruin a great close-up photo. If, for some reason, a support can't be used, shoot the photo at the fastest possible shutter speed lighting conditions will allow.

3 — *Use a cable release:* the slight movement of your finger pressing the shutter release can cause movement of your camera (even when your camera is mounted on a tripod). After you arrange the photo, make all camera adjustments, and advance the film, wait a moment — then shoot. If your camera has a *self-timer*, use it for movement-free camera operation when a cable release is not available.

Zoom Operation

To photograph subjects between 4½ feet and infinity —

1 — Set your lens for the Zoom mode of operation. (See page 1)

2 — Turn the Zoom/Close-Range Ring ⑤ until you obtain the image size and composition you want.

If you prefer to start with a specific focal length, turn the Zoom/Close-Range Ring ⑤ until the focal length you want is aligned with the Distance Index Line ④ and then compose your

photograph. For your convenience, the major focal lengths — 35mm, 45mm, 55mm, 70mm, 85mm, and 105mm — are marked on the Zoom/Close-Range Ring.

3 — Focus by turning the Focusing Ring ② until the subject appears sharpest in your camera viewfinder.

Since a larger image can be seen more clearly, you may find it convenient to focus with the lens set at the 105mm focal length and then zoom to the focal length you have selected for the photograph. The cam-operated focusing system of your lens will maintain the focus as you zoom. When precise focus is *critical* to your photograph, *recheck* the focus after zooming.

Aperture Control

Turn the Aperture Ring ⑦ until the f-stop you have selected for proper exposure aligns with the Aperture Reference Dot ⑥. You may set the Aperture Ring at any f-stop marked on the Aperture Scale ⑧ or at any point in between. For convenience, click-stops are provided at each indicated f-stop.

Your new Vivitar lens has Automatic Diaphragm Control. As you turn the Aperture Ring, the lens diaphragm remains open to its maximum

aperture. When you release the shutter, the diaphragm automatically stops down to your preselected f-stop and instantly re-opens after the exposure is completed.

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

Canon Mount lenses have an AUTO/MANUAL Lever (see photo "E") which must be set in the clockwise end of its slot for Automatic Diaphragm Control. With the AUTO/MANUAL Switch set counterclockwise, the diaphragm opens and closes as the Aperture Ring is turned.

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 "F") 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 at and removed from this position in the same manner as selecting a specifically marked f-stop.

Estimating Distance

Your new Vivitar lens has two-numbered Distance Scales ③ engraved on the Focusing Ring ②. The *white numbers* indicate distance in *feet* and the *green numbers* indicate distance in *meters*. In the Zoom mode of operation, the approximate distance to an *object-in-focus* is indicated on these scales at the Distance Index Line ④.

Depth of Field

Depth of field is the capability of a lens to produce acceptably sharp pictures of objects which are located in an area in front of and behind a subject in focus.

You can creatively control the size of this area, making it small to emphasize a single subject or making it large to accurately record every detail of a scene.

1 — *Focus*: Depth of field becomes smaller as you focus on nearby objects and becomes larger as you focus on those that are farther away. In the Close-Range mode of operation, depth of field becomes so small that a single object

may not be entirely sharp when photographed (see photo "G"). Sometimes, a simple change of view will solve this problem. (See photo "H")

2 — *Focal Length*: As you zoom, you'll find that depth of field becomes larger as you shorten focal length. For example, the depth of field at 35mm (see photo "I") is much larger than the depth of field at 105mm. (See photo "J")

3 — *Aperture*: Depth of field becomes larger as you reduce the size of the diaphragm opening. For example, the depth of field at f16 (see photo "K") is much larger than the depth of field at f3.5. (See photo "L")

Depth of Field Preview

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


NOTE: The AUTO/MANUAL Switch on Universal Thread Mount lenses may be used for previewing depth of field by moving the switch to the "M" (Manual) position.

The Depth of Field Tables located in the back of this Owner's Manual provide precise depth of field information for selected focal length/

aperture/focus 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  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. It's a good idea to store it with the silica gel packet supplied with your lens, especially during humid or wet weather.

Specifications

Focal Length: 35mm to 105mm

Zoom Ratio: 3:1

Angle of Acceptance: 63° at 35mm; 23° at 105mm

Optical Construction: 13 elements in 11 groups

Aperture Range: f3.5 to f16

Minimum Focusing Distance (from Film Plane)

Normal: 4'7" (1.4 m)

Close-Range: 3/8" (29 cm)

(5 1/2" (14.1 cm) from Front Element)

Maximum Reproduction Ratio: 1:5X

Length (Set at ∞): 4" (101 mm)

Maximum Barrel Diameter: 2 31/32" (75 mm)

Accessory Size: 72mm

Weight: 24 3/4 oz. (700 g)

Accessories Included: Front and Rear Lens Caps, Silica Gel Packet

Depth of Field Tables



fl /	3.5	5.6	8	11	16
5	4.42 ~ 5.75	4.14 ~ 6.32	3.85 ~ 7.13	3.54 ~ 8.48	3.13 ~ 12.41
6	5.19 ~ 7.12	4.80 ~ 8.01	4.42 ~ 9.35	4.02 ~ 11.83	3.50 ~ 21.17
7	5.92 ~ 8.57	5.42 ~ 9.90	4.94 ~ 12.03	4.45 ~ 16.46	3.81 ~ 42.68
8	6.62 ~ 10.11	6.00 ~ 12.02	5.41 ~ 15.32	4.83 ~ 23.31	4.09 ~ 179.41
10	7.93 ~ 13.54	7.05 ~ 17.18	6.26 ~ 24.82	5.49 ~ 55.88	4.56 ~ ∞
12	9.14 ~ 17.48	7.99 ~ 24.08	6.99 ~ 42.34	6.04 ~ 814.38	4.93 ~ ∞
15	10.78 ~ 24.67	9.22 ~ 40.21	7.91 ~ 143.81	6.72 ~ ∞	5.37 ~ ∞
20	13.14 ~ 41.88	10.89 ~ 121.94	9.11 ~ ∞	7.57 ~ ∞	5.90 ~ ∞
30	16.82 ~ 138.72	13.31 ~ ∞	10.75 ~ ∞	8.66 ~ ∞	6.55 ~ ∞
50	21.68 ~ ∞	16.18 ~ ∞	12.54 ~ ∞	9.79 ~ ∞	7.17 ~ ∞
∞	38.28 ~ ∞	23.92 ~ ∞	16.75 ~ ∞	12.18 ~ ∞	8.37 ~ ∞

m /	3.5	5.6	8	11	16
1.5	1.33 ~ 1.72	1.24 ~ 1.69	1.16 ~ 2.12	1.07 ~ 2.52	0.94 ~ 3.64
1.7	1.48 ~ 1.99	1.38 ~ 2.22	1.28 ~ 2.55	1.17 ~ 3.14	1.02 ~ 5.09
2.0	1.71 ~ 2.41	1.57 ~ 2.76	1.44 ~ 3.29	1.30 ~ 4.34	1.12 ~ 9.25
2.5	2.06 ~ 3.16	1.86 ~ 3.60	1.68 ~ 4.90	1.49 ~ 7.66	1.26 ~ 122.50
3.0	2.39 ~ 4.04	2.13 ~ 5.10	1.89 ~ 7.28	1.66 ~ 15.64	1.38 ~ ∞
4.0	2.98 ~ 6.09	2.58 ~ 8.66	2.24 ~ 18.49	1.93 ~ ∞	1.56 ~ ∞
5.0	3.50 ~ 8.75	2.97 ~ 15.91	2.53 ~ 245.00	2.13 ~ ∞	1.69 ~ ∞
7.0	4.38 ~ 17.50	3.57 ~ 175.00	2.95 ~ ∞	2.43 ~ ∞	1.87 ~ ∞
10.0	5.38 ~ 70.00	4.22 ~ ∞	3.38 ~ ∞	2.71 ~ ∞	2.03 ~ ∞
15.0	6.56 ~ ∞	4.91 ~ ∞	3.81 ~ ∞	2.98 ~ ∞	2.18 ~ ∞
∞	11.67 ~ ∞	7.29 ~ ∞	5.90 ~ ∞	3.71 ~ ∞	2.55 ~ ∞

45mm

ft	3,5	5,6	8	11	16
5	4.63 ~ 5.43	4.44 ~ 5.72	4.24 ~ 6.10	4.01 ~ 6.65	3.67 ~ 7.83
6	5.48 ~ 6.68	5.21 ~ 7.07	4.93 ~ 7.66	4.62 ~ 8.55	4.19 ~ 10.59
7	6.30 ~ 7.87	5.95 ~ 8.51	5.59 ~ 9.37	5.19 ~ 10.73	4.65 ~ 14.16
8	7.10 ~ 9.16	6.65 ~ 10.03	6.21 ~ 11.25	5.73 ~ 13.27	5.07 ~ 18.96
10	8.64 ~ 11.88	7.98 ~ 13.38	7.35 ~ 15.66	6.68 ~ 19.87	5.81 ~ 36.03
12	10.09 ~ 14.81	9.21 ~ 17.23	8.37 ~ 21.18	7.52 ~ 29.70	6.43 ~ 90.19
15	12.13 ~ 19.66	10.88 ~ 24.17	9.73 ~ 32.74	8.60 ~ 58.83	7.20 ~ ∞
20	15.20 ~ 29.24	13.28 ~ 40.46	11.61 ~ 72.06	10.03 ~ ∞	8.18 ~ ∞
30	20.35 ~ 57.05	17.06 ~ 124.26	14.40 ~ ∞	12.05 ~ ∞	9.47 ~ ∞
50	27.93 ~ 283.30	22.08 ~ ∞	17.82 ~ ∞	14.35 ~ ∞	10.84 ~ ∞
∞	63.28 ~ ∞	39.55 ~ ∞	27.68 ~ ∞	20.13 ~ ∞	13.84 ~ ∞

m	3,5	5,6	8	11	16
1,5	1.39 ~ 1.63	1.33 ~ 1.71	1.27 ~ 1.82	1.21 ~ 1.99	1.11 ~ 2.33
1,7	1.56 ~ 1.86	1.49 ~ 1.98	1.41 ~ 2.13	1.33 ~ 2.35	1.21 ~ 2.85
2,0	1.81 ~ 2.23	1.72 ~ 2.40	1.62 ~ 2.62	1.51 ~ 2.97	1.36 ~ 3.80
2,5	2.21 ~ 2.87	2.07 ~ 3.15	1.93 ~ 3.55	1.78 ~ 4.22	1.57 ~ 6.14
3,0	2.60 ~ 3.55	2.40 ~ 3.99	2.21 ~ 4.66	2.01 ~ 5.87	1.75 ~ 10.38
4,0	3.31 ~ 5.05	3.00 ~ 5.99	2.71 ~ 7.61	2.42 ~ 11.49	2.05 ~ 77.14
5,0	3.97 ~ 6.75	3.53 ~ 8.54	3.14 ~ 12.27	2.76 ~ 27.00	2.29 ~ ∞
7,0	5.14 ~ 10.99	4.43 ~ 6.70	3.83 ~ 41.09	3.27 ~ ∞	2.63 ~ ∞
10,0	6.59 ~ 20.77	5.47 ~ 58.70	4.58 ~ ∞	3.80 ~ ∞	2.97 ~ ∞
15,0	8.44 ~ 67.50	6.68 ~ ∞	5.40 ~ ∞	4.35 ~ ∞	3.29 ~ ∞
∞	19.29 ~ ∞	12.05 ~ ∞	8.44 ~ ∞	6.14 ~ ∞	4.22 ~ ∞

fl. f	3.5	5.6	8	11	16
5	4.75 ~ 5.28	4.61 ~ 5.46	4.46 ~ 5.69	4.29 ~ 6.00	4.03 ~ 6.59
6	5.64 ~ 6.41	5.45 ~ 6.68	5.24 ~ 7.02	5.00 ~ 7.50	4.65 ~ 8.45
7	6.52 ~ 7.56	6.26 ~ 7.94	5.99 ~ 8.43	5.68 ~ 9.12	5.23 ~ 10.58
8	7.38 ~ 8.74	7.05 ~ 9.25	6.70 ~ 9.92	6.32 ~ 10.90	5.77 ~ 13.05
10	9.04 ~ 11.18	8.55 ~ 12.04	8.05 ~ 13.19	7.50 ~ 14.98	6.74 ~ 19.37
12	10.65 ~ 13.74	9.97 ~ 15.06	9.30 ~ 16.91	8.58 ~ 19.97	7.59 ~ 28.60
15	12.95 ~ 17.83	11.96 ~ 20.10	11.01 ~ 23.54	10.01 ~ 29.92	8.69 ~ 54.63
20	16.51 ~ 25.37	14.94 ~ 30.24	13.48 ~ 38.73	12.01 ~ 59.70	10.17 ~ 610.73
30	22.77 ~ 43.95	19.90 ~ 60.95	17.39 ~ 109.27	15.02 ~ ∞	12.24 ~ ∞
50	32.70 ~ 106.15	27.08 ~ 325.41	22.63 ~ ∞	18.78 ~ ∞	14.63 ~ ∞
∞	94.52 ~ ∞	59.08 ~ ∞	41.35 ~ ∞	30.08 ~ ∞	20.68 ~ ∞

m f	3.5	5.6	8	11	16
1.5	1.43 ~ 1.58	1.38 ~ 1.64	1.34 ~ 1.70	1.29 ~ 1.79	1.21 ~ 1.97
1.7	1.61 ~ 1.81	1.55 ~ 1.88	1.50 ~ 1.97	1.43 ~ 2.09	1.34 ~ 2.33
2.0	1.87 ~ 2.15	1.80 ~ 2.25	1.73 ~ 2.38	1.64 ~ 2.56	1.52 ~ 2.93
2.5	2.30 ~ 2.74	2.20 ~ 2.90	2.09 ~ 3.12	1.96 ~ 3.44	1.79 ~ 4.14
3.0	2.72 ~ 3.35	2.57 ~ 3.60	2.42 ~ 3.94	2.26 ~ 4.46	2.03 ~ 5.73
4.0	3.51 ~ 4.64	3.27 ~ 5.14	3.04 ~ 5.86	2.78 ~ 7.10	2.45 ~ 10.95
5.0	4.26 ~ 6.05	3.91 ~ 6.92	3.58 ~ 8.29	3.24 ~ 11.00	2.79 ~ 24.20
7.0	5.63 ~ 9.25	5.04 ~ 11.45	4.50 ~ 15.74	3.97 ~ 29.82	3.32 ~ ∞
10.0	7.42 ~ 15.32	6.43 ~ 22.49	5.58 ~ 48.40	4.78 ~ ∞	3.87 ~ ∞
15.0	9.86 ~ 31.29	8.18 ~ 89.85	6.85 ~ ∞	5.69 ~ ∞	4.44 ~ ∞
∞	28.81 ~ ∞	18.01 ~ ∞	12.60 ~ ∞	9.17 ~ ∞	6.30 ~ ∞

n /	3.5	5.6	8	11	16
5	4.84 ~ 5.17	4.75 ~ 5.28	4.65 ~ 5.40	4.53 ~ 5.57	4.35 ~ 5.88
6	5.77 ~ 6.24	5.65 ~ 6.40	5.51 ~ 6.59	5.34 ~ 6.84	5.09 ~ 7.31
7	6.69 ~ 7.34	6.52 ~ 7.55	6.34 ~ 7.82	6.12 ~ 8.17	5.79 ~ 8.85
8	7.60 ~ 8.44	7.38 ~ 8.73	7.15 ~ 9.08	6.87 ~ 9.57	6.46 ~ 10.51
10	9.39 ~ 10.70	9.05 ~ 11.17	8.70 ~ 11.75	8.30 ~ 12.58	7.70 ~ 14.26
12	11.13 ~ 13.02	10.66 ~ 13.72	10.18 ~ 14.62	9.63 ~ 15.92	8.83 ~ 18.70
15	13.66 ~ 16.63	12.97 ~ 17.19	12.26 ~ 19.33	11.47 ~ 21.67	10.36 ~ 27.17
20	17.69 ~ 23.00	16.54 ~ 25.28	15.40 ~ 28.51	14.18 ~ 33.93	12.52 ~ 49.64
30	25.08 ~ 37.31	22.84 ~ 43.70	20.72 ~ 54.33	18.57 ~ 78.08	15.83 ~ 287.62
50	37.69 ~ 74.25	32.84 ~ 104.71	28.63 ~ 197.17	24.68 ~ ∞	20.06 ~ ∞
∞	153.11 ~ ∞	95.70 ~ ∞	66.79 ~ ∞	48.72 ~ ∞	33.49 ~ ∞

m /	3.5	5.6	8	11	16
1.5	1.45 ~ 1.55	1.43 ~ 1.58	1.40 ~ 1.62	1.36 ~ 1.67	1.31 ~ 1.76
1.7	1.64 ~ 1.76	1.61 ~ 1.81	1.57 ~ 1.85	1.53 ~ 1.92	1.46 ~ 2.04
2.0	1.92 ~ 2.09	1.87 ~ 2.15	1.82 ~ 2.22	1.76 ~ 2.31	1.67 ~ 2.49
2.5	2.37 ~ 2.64	2.30 ~ 2.73	2.23 ~ 2.85	2.14 ~ 3.01	2.01 ~ 3.31
3.0	2.82 ~ 3.21	2.72 ~ 3.34	2.62 ~ 3.52	2.50 ~ 3.76	2.32 ~ 4.25
4.0	3.68 ~ 4.38	3.52 ~ 4.64	3.34 ~ 4.97	3.15 ~ 5.47	2.87 ~ 6.58
5.0	4.52 ~ 5.60	4.27 ~ 6.03	4.02 ~ 6.82	3.74 ~ 7.54	3.36 ~ 9.80
7.0	6.09 ~ 8.24	5.65 ~ 9.21	5.21 ~ 10.65	4.76 ~ 13.24	4.15 ~ 22.27
10.0	8.24 ~ 12.73	7.45 ~ 15.22	6.71 ~ 19.60	5.98 ~ 30.63	5.05 ~ 490.00
15.0	11.35 ~ 22.11	9.91 ~ 30.88	8.65 ~ 58.54	7.46 ~ ∞	6.07 ~ ∞
∞	46.67 ~ ∞	29.17 ~ ∞	20.42 ~ ∞	14.85 ~ ∞	10.21 ~ ∞

85mm

n/f	3.5	5.6	8	11	18
5	4.89 ~ 5.11	4.83 ~ 5.18	4.76 ~ 5.27	4.67 ~ 5.37	4.54 ~ 5.56
6	5.84 ~ 6.16	5.76 ~ 6.27	5.66 ~ 6.39	5.54 ~ 6.55	5.35 ~ 6.83
7	6.79 ~ 7.22	6.67 ~ 7.37	6.54 ~ 7.53	6.38 ~ 7.76	6.13 ~ 8.16
8	7.73 ~ 8.29	7.57 ~ 8.48	7.40 ~ 8.71	7.20 ~ 9.00	6.88 ~ 9.55
10	9.58 ~ 10.46	9.34 ~ 10.76	9.08 ~ 11.13	8.78 ~ 11.62	8.32 ~ 12.54
12	11.39 ~ 12.67	11.06 ~ 13.12	10.70 ~ 13.66	10.28 ~ 14.41	9.65 ~ 15.85
15	14.07 ~ 16.07	13.56 ~ 16.78	13.02 ~ 17.69	12.41 ~ 18.96	11.51 ~ 21.54
20	18.37 ~ 21.94	17.62 ~ 23.30	16.63 ~ 25.08	15.64 ~ 27.72	14.24 ~ 33.61
30	26.48 ~ 34.60	24.74 ~ 38.10	23.01 ~ 43.09	21.16 ~ 51.51	18.66 ~ 76.43
50	40.93 ~ 64.22	36.92 ~ 77.44	33.20 ~ 101.26	29.48 ~ 164.50	24.85 ~ ∞
∞	275.76 ~ ∞	141.10 ~ ∞	98.77 ~ ∞	71.83 ~ ∞	49.39 ~ ∞

m/f	3.5	5.6	8	11	18
1.5	1.47 ~ 1.53	1.45 ~ 1.55	1.43 ~ 1.58	1.40 ~ 1.61	1.36 ~ 1.67
1.7	1.66 ~ 1.74	1.64 ~ 1.77	1.61 ~ 1.80	1.58 ~ 1.84	1.53 ~ 1.92
2.0	1.94 ~ 2.06	1.91 ~ 2.10	1.88 ~ 2.14	1.83 ~ 2.20	1.77 ~ 2.31
2.5	2.41 ~ 2.59	2.36 ~ 2.65	2.31 ~ 2.73	2.24 ~ 2.82	2.14 ~ 3.00
3.0	2.87 ~ 3.14	2.80 ~ 3.22	2.73 ~ 3.33	2.64 ~ 3.48	2.50 ~ 3.75
4.0	3.78 ~ 4.25	3.66 ~ 4.41	3.53 ~ 4.61	3.38 ~ 4.89	3.16 ~ 5.45
5.0	4.66 ~ 5.39	4.48 ~ 5.66	4.29 ~ 6.00	4.07 ~ 6.48	3.75 ~ 7.49
7.0	6.35 ~ 7.79	6.02 ~ 8.36	5.68 ~ 9.12	5.30 ~ 10.29	4.78 ~ 13.09
10.0	8.73 ~ 11.70	8.11 ~ 13.03	7.51 ~ 14.97	6.86 ~ 18.41	6.01 ~ 29.79
15.0	12.32 ~ 19.18	11.12 ~ 23.03	10.01 ~ 29.90	8.90 ~ 47.64	7.51 ~ ∞
∞	68.81 ~ ∞	43.01 ~ ∞	30.10 ~ ∞	21.89 ~ ∞	15.05 ~ ∞

105mm

$\frac{m}{f}$	3.5	5.6	8	11	16
5	4.93 ~ 5.07	4.89 ~ 5.12	4.84 ~ 5.17	4.78 ~ 5.24	4.69 ~ 5.36
6	5.90 ~ 6.11	5.84 ~ 6.17	5.77 ~ 6.25	5.69 ~ 6.35	5.56 ~ 6.52
7	6.86 ~ 7.15	6.78 ~ 7.24	6.69 ~ 7.34	6.58 ~ 7.48	6.41 ~ 7.72
8	7.82 ~ 8.19	7.71 ~ 8.31	7.60 ~ 8.45	7.46 ~ 8.63	7.23 ~ 8.95
10	9.72 ~ 10.30	9.56 ~ 10.49	9.38 ~ 10.71	9.16 ~ 11.00	8.83 ~ 11.53
12	11.60 ~ 12.43	11.37 ~ 12.71	11.12 ~ 13.04	10.82 ~ 13.48	10.35 ~ 14.27
15	14.37 ~ 15.68	14.02 ~ 16.12	13.64 ~ 16.66	13.19 ~ 17.38	12.51 ~ 18.73
20	18.90 ~ 21.23	18.30 ~ 22.05	17.66 ~ 23.06	16.91 ~ 24.46	15.81 ~ 27.23
30	27.60 ~ 32.86	26.33 ~ 34.86	25.02 ~ 37.46	23.55 ~ 41.30	21.46 ~ 49.84
50	43.66 ~ 58.49	40.58 ~ 65.12	37.54 ~ 74.82	34.34 ~ 91.94	30.06 ~ 148.58
∞	344.50 ~ ∞	215.32 ~ ∞	150.72 ~ ∞	109.62 ~ ∞	75.36 ~ ∞

$\frac{m}{f}$	3.5	5.6	8	11	16
1.5	1.48 ~ 1.52	1.47 ~ 1.54	1.45 ~ 1.55	1.44 ~ 1.57	1.41 ~ 1.60
1.7	1.67 ~ 1.73	1.66 ~ 1.75	1.64 ~ 1.77	1.62 ~ 1.79	1.58 ~ 1.84
2.0	1.96 ~ 2.04	1.94 ~ 2.06	1.92 ~ 2.09	1.89 ~ 2.13	1.84 ~ 2.19
2.5	2.44 ~ 2.56	2.41 ~ 2.60	2.37 ~ 2.64	2.33 ~ 2.70	2.25 ~ 2.81
3.0	2.92 ~ 3.09	2.87 ~ 3.14	2.82 ~ 3.21	2.75 ~ 3.30	2.65 ~ 3.45
4.0	3.85 ~ 4.16	3.77 ~ 4.26	3.68 ~ 4.38	3.57 ~ 4.54	3.41 ~ 4.84
5.0	4.77 ~ 5.25	4.65 ~ 5.41	4.51 ~ 5.61	4.35 ~ 5.88	4.11 ~ 6.39
7.0	6.56 ~ 7.50	6.33 ~ 7.84	6.07 ~ 8.26	5.79 ~ 8.86	5.36 ~ 10.07
10.0	9.13 ~ 11.05	8.68 ~ 11.80	8.21 ~ 12.78	7.70 ~ 14.27	6.97 ~ 17.71
15.0	13.13 ~ 17.50	12.21 ~ 19.44	11.31 ~ 22.27	10.35 ~ 27.22	9.07 ~ 43.24
∞	105.00 ~ ∞	65.63 ~ ∞	45.94 ~ ∞	33.41 ~ ∞	22.97 ~ ∞



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